PART NO. TT1V1-E-01

HITACHI

Technical Manual

Troubleshooting

ZAXIS

200-3 class

200-3•200LC-3•210H-3•210LCH-3•210K-3•210LCK-3•210-3•210LC-3•
210LCN-3•240N-3

225US-3 class

225US-3•225USLC-3

225USR-3 class

225USR-3•225USRLC-3•225USRK-3•225USRLCK-3

240-3 class

240-3•240LC-3•250H-3•250LC-3•250LCN-3•250LCH-3•250K-3•250LCK-3

270-3 class

270-3•270LC-3•280LC-3•280LCN-3

Hydraulic Excavator

Service Manual consists of the following separate Part No;

Technical Manual (Operational Principle)	: Vol. No. TO1V1-E
Technical Manual (Troubleshooting)	: Vol. No. TT1V1-E
Workshop Manual	: Vol. No. W1V1-E

INTRODUCTION

TO THE READER

- This manual is written for an experienced technician to provide technical information needed to maintain and repair this machine.
  - Be sure to thoroughly read this manual for correct product information and service procedures.
  - If you have any questions or comments, at if you found any errors regarding the contents of this manual, please contact using “Service Manual Revision Request Form” at the end of this manual. (Note: Do not tear off the form. Copy it for usage.):

    Publications Marketing & Product Support
    Hitachi Construction Machinery Co. Ltd.
    TEL: 81-298-32-7173
    FAX: 81-298-31-1162

ADDITIONAL REFERENCES

- Please refer to the materials listed below in addition to this manual.
  - The Operator’s Manual
  - The Parts Catalog
  - Operation Manual of the Engine
  - Parts Catalog of the Engine
  - Hitachi Training Material

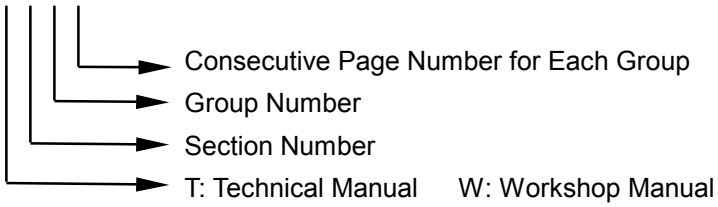
MANUAL COMPOSITION

- This manual consists of three portions: the Technical Manual (Operational Principle), the Technical Manual (Troubleshooting) and the Workshop Manual.
  - Information included in the Technical Manual (Operational Principle):
    technical information needed for redelivery and delivery, operation and activation of all devices and systems.
  - Information included in the Technical Manual (Troubleshooting):
    technical information needed for operational performance tests, and troubleshooting procedures.
  - Information included in the Workshop Manual:
    technical information needed for maintenance and repair of the machine, tools and devices needed for maintenance and repair, maintenance standards, and removal/installation and assemble/disassemble procedures.

PAGE NUMBER

- Each page has a number, located on the center lower part of the page, and each number contains the following information:

  Example : T 1-3-5



SAFETY ALERT SYMBOL AND HEADLINE NOTATIONS

In this manual, the following safety alert symbol and signal words are used to alert the reader to the potential for personal injury of machine damage.

⚠ This is the safety alert symbol. When you see this symbol, be alert to the potential for personal injury.
Never fail to follow the safety instructions prescribed along with the safety alert symbol.
The safety alert symbol is also used to draw attention to component/part weights.
To avoid injury and damage, be sure to use appropriate lifting techniques and equipment when lifting heavy parts.

- ⚠ **CAUTION:**
  Indicated potentially hazardous situation which could, if not avoided, result in personal injury or death.

- **IMPORTANT:**
  Indicates a situation which, if not conformed to the instructions, could result in damage to the machine.

- *NOTE:*
  Indicates supplementary technical information or know-how.

UNITS USED

- SI Units (International System of Units) are used in this manual.
  MKSA system units and English units are also indicated in parenthheses just behind SI units.

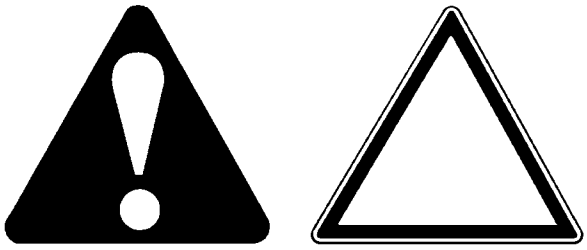
  Example : 24.5 MPa (250 kgf/cm^2, 3560 psi)

  A table for conversion from SI units to other system units is shown below for reference purposees.

Quantity	To Convert From	Into	Multiply By	Quantity	To Convert From	Into	Multiply By
Length	mm	in	0.03937	Pressure	MPa	kgf/cm^2	10.197
	mm	ft	0.003281		MPa	psi	145.0
Volume	L	US gal	0.2642	Power	kW	PS	1.360
	L	US qt	1.057		kW	HP	1.341
	m^3	yd^3	1.308	Temperature	°C	°F	°C×1.8+32
Weight	kg	lb	2.205	Velocity	km/h	mph	0.6214
Force	N	kgf	0.10197		min^{-1}	rpm	1.0
	N	lbf	0.2248	Flow rate	L/min	US gpm	0.2642
Torque	N·m	kgf·m	1.0197		mL/rev	cc/rev	1.0
	N·m	lbf·ft	0.7375				

RECOGNIZE SAFETY INFORMATION

- These are the **SAFETY ALERT SYMBOLS**.
  - When you see these symbols on your machine or in this manual, be alert to the potential for personal injury.
  - Follow recommended precautions and safe operating practices.



001-E01A-0001

SA-688

UNDERSTAND SIGNAL WORDS

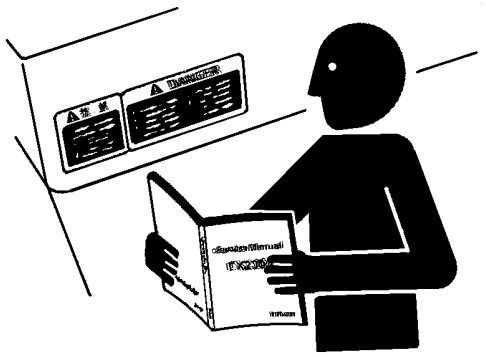
- On machine safety signs, signal words designating the degree or level of hazard - DANGER, WARNING, or CAUTION - are used with the safety alert symbol.
  - **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
  - **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
  - **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
  - **DANGER** or **WARNING safety signs** are located near specific hazards. General precautions are listed on **CAUTION safety signs**.
  - Some safety signs don't use any of the designated signal words above after the safety alert symbol are occasionally used on this machine.
- To avoid confusing machine protection with personal safety messages, a signal word **IMPORTANT** indicates a situation which, if not avoided, could result in damage to the machine.
- **NOTE** indicates an additional explanation for an element of information.

SA-1223

002-E01A-1223

FOLLOW SAFETY INSTRUCTIONS

- Carefully read and follow all safety signs on the machine and all safety messages in this manual.
- Safety signs should be installed, maintained and replaced when necessary.
  - If a safety sign or this manual is damaged or missing, order a replacement from your authorized dealer in the same way you order other replacement parts (be sure to state machine model and serial number when ordering).
- Learn how to operate the machine and its controls correctly and safely.
- Allow only trained, qualified, authorized personnel to operate the machine.
- Keep your machine in proper working condition.
  - Unauthorized modifications of the machine may impair its function and/or safety and affect machine life.
  - Do not modify any machine parts without authorization. Failure to do so may deteriorate the part safety, function, and/or service life. In addition, personal accident, machine trouble, and/or damage to material caused by unauthorized modifications will void Hitachi Warranty Policy.
  - Do not use attachments and/or optional parts or equipment not authorized by Hitachi. Failure to do so may deteriorate the safety, function, and/or service life of the machine. In addition, personal accident, machine trouble, and/or damage to material caused by using unauthorized attachments and/or optional parts or equipment will void Hitachi Warranty Policy.
- The safety messages in this SAFETY chapter are intended to illustrate basic safety procedures of machines. However it is impossible for these safety messages to cover every hazardous situation you may encounter. If you have any questions, you should first consult your supervisor and/or your authorized dealer before operating or performing maintenance work on the machine.



SA-003

003-E01B-0003

PREPARE FOR EMERGENCIES

- Be prepared if a fire starts or if an accident occurs.

  - Keep a first aid kit and fire extinguisher on hand.
  - Thoroughly read and understand the label attached on the fire extinguisher to use it properly.
  - To ensure that a fire-extinguisher can be always used when necessary, check and service the fire-extinguisher at the recommended intervals as specified in the fire-extinguisher manual.
  - Establish emergency procedure guidelines to cope with fires and accidents.
  - Keep emergency numbers for doctors, ambulance service, hospital, and fire department posted near your telephone.

SA-437

004-E01A-0437

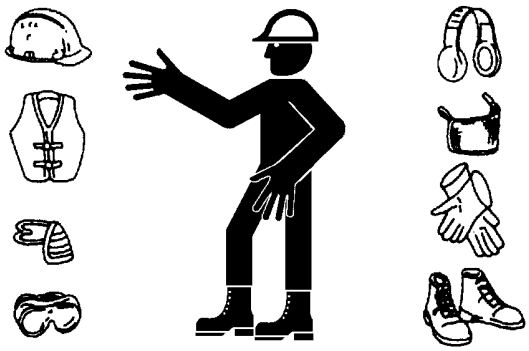
WEAR PROTECTIVE CLOTHING

- Wear close fitting clothing and safety equipment appropriate to the job.

  You may need:
  A hard hat
  Safety shoes
  Safety glasses, goggles, or face shield
  Heavy gloves
  Hearing protection
  Reflective clothing
  Wet weather gear
  Respirator or filter mask.

  Be sure to wear the correct equipment and clothing for the job. Do not take any chances.

  - Avoid wearing loose clothing, jewelry, or other items that can catch on control levers or other parts of the machine.
- Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating the machine.



SA-428

005-E01A-0438

PROTECT AGAINST NOISE

- Prolonged exposure to loud noise can cause impairment or loss of hearing.
  - Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortably loud noises.

006-E01A-0434

SA-434

INSPECT MACHINE

- Inspect your machine carefully each day or shift by walking around it before you start it to avoid personal injury.
  - In the walk-around inspection be sure to cover all points described in the "RE-START INSPECTION" chapter in the operator's manual.

007-E01A-0435

SA-435

GENERAL PRECAUTIONS FOR CAB

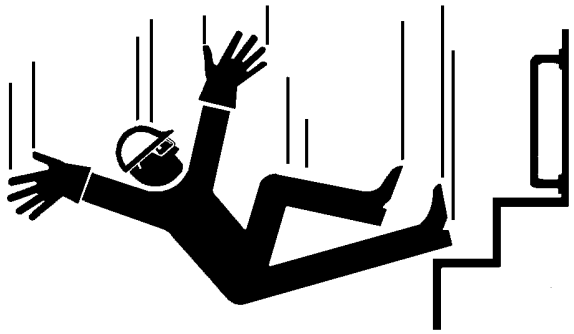
- Before entering the cab, thoroughly remove all dirt and/or oil from the soles of your work boots. If any controls such as a pedal is operated while with dirt and/or oil on the soles of the operator's work boots the operator's foot may slip off the pedal, possibly resulting in a personal accident.
- Do not leave parts and/or tools lying around the operator's seat. Store them in their specified locations.
- Avoid storing transparent bottles in the cab. Do not attach any transparent type window decorations on the windowpanes as they may focus sunlight, possibly starting a fire.
- Refrain from listening to the radio, or using music headphones or mobile telephones in the cab while operating the machine.
- Keep all flammable objects and/or explosives away from the machine.
- After using the ashtray, always cover it to extinguish the match and/or tobacco.
- Do not leave cigarette lighters in the cab. When the temperature in the cab increases, the lighter may explode.

524-E01A-0000

USE HANDHOLDS AND STEPS

- Falling is one of the major causes of personal injury.

  - When you get on and off the machine, always face the machine and maintain a three-point contact with the steps and handrails.
  - Do not use any controls as hand-holds.
  - Never jump on or off the machine. Never mount or dismount a moving machine.
  - Be careful of slippery conditions on platforms, steps, and handrails when leaving the machine.



SA-439

008-E01A-0439

ADJUST THE OPERATOR'S SEAT

- A poorly adjusted seat for either the operator or for the work at hand may quickly fatigue the operator leading to mis-operations.

  - The seat should be adjusted whenever changing the operator for the machine.
  - The operator should be able to fully depress the pedals and to correctly operate the control levers with his back against the seat back.
  - If not, move the seat forward or backward, and check again.
  - Adjust the rear view mirror position so that the best rear visibility is obtained from the operator's seat. If the mirror is broken, immediately replace it with a new one.

SA-462

009-E01A-0462

ENSURE SAFETY BEFORE RISING FROM OR LEAVING OPERATOR'S SEAT

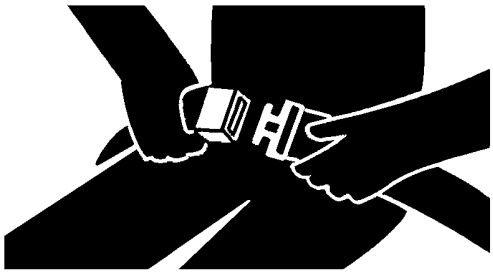
- Before rising from the operator's seat to open/close either side window or to adjust the seat position, be sure to first lower the front attachment to the ground and then move the pilot control shut-off lever to the LOCK position. Failure to do so may allow the machine to unexpectedly move when a body part unintentionally comes in contact with a control lever, possibly resulting in serious personal injury or death.

  - Before leaving the machine, be sure to first lower the front attachment to the ground and then move the pilot control shut-off lever to the LOCK position. Turn the key switch OFF to stop the engine.
  - Before leaving the machine, close all windows, doors, and access covers and lock them up.

FASTEN YOUR SEAT BELT

- If the machine should overturn, the operator may become injured and/or thrown from the cab. Additionally the operator may be crushed by the overturning machine, resulting in serious injury or death.

  - Prior to operating the machine, thoroughly examine webbing, buckle and attaching hardware. If any item is damaged or worn, replace the seat belt or component before operating the machine.
  - Be sure to remain seated with the seat belt securely fastened at all times when the machine is in operation to minimize the chance of injury from an accident.
  - We recommend that the seat belt be replaced every three years regardless of its apparent condition.



SA-237

010-E01A-0237

MOVE AND OPERATE MACHINE SAFELY

- Bystanders can be run over.

  - Take extra care not to run over bystanders. Confirm the location of bystanders before moving, swinging, or operating the machine.
  - Always keep the travel alarm and horn in working condition (if equipped). It warns people when the machine starts to move.
  - Use a signal person when moving, swinging, or operating the machine in congested areas. Coordinate hand signals before starting the machine.
  - Use appropriate illumination. Check that all lights are operable before operating the machine. If any faulty illumination is present, immediately repair it.

SA-426

011-E01A-0398

HANDLE STARTING AIDS SAFELY

Starting fluid:

- Starting fluid is highly flammable.

  - Keep all sparks and flame away when using it.
  - Keep starting fluid well away from batteries and cables.
  - Remove container from machine if engine does not need starting fluid.
  - To prevent accidental discharge when storing a pressurized container, keep the cap on the container, and store it in a cool, well-protected location.
  - Do not incinerate or puncture a starting fluid container.

SA-293

036-E01A-0293-3

OPERATE ONLY FROM OPERATOR'S SEAT

- Inappropriate engine starting procedures may cause the machine to runaway, possibly resulting in serious injury or death.

  - Start the engine only when seated in the operator's seat.
  - NEVER start the engine while standing on the track or on ground.
  - Do not start engine by shorting across starter terminals.
  - Before starting the engine, confirm that all control levers are in neutral.
  - Before starting the engine, confirm the safety around the machine and sound the horn to alert bystanders.

SA-444

012-E01B-0431

JUMP STARTING

- Battery gas can explode, resulting in serious injury.

  - If the engine must be jump started, be sure to follow the instructions shown in the "OPERATING THE ENGINE" chapter in the operator's manual.
  - The operator must be in the operator's seat so that the machine will be under control when the engine starts. Jump starting is a two-person operation.
  - Never use a frozen battery.
  - Failure to follow correct jump starting procedures could result in a battery explosion or a runaway machine.

SA-032

S013-E01A-0032

KEEP RIDERS OFF MACHINE

- Riders on machine are subject to injury such as being struck by foreign objects and being thrown off the machine.

  - Only the operator should be on the machine. Keep riders off.
  - Riders also obstruct the operator's view, resulting in the machine being operated in an unsafe manner.

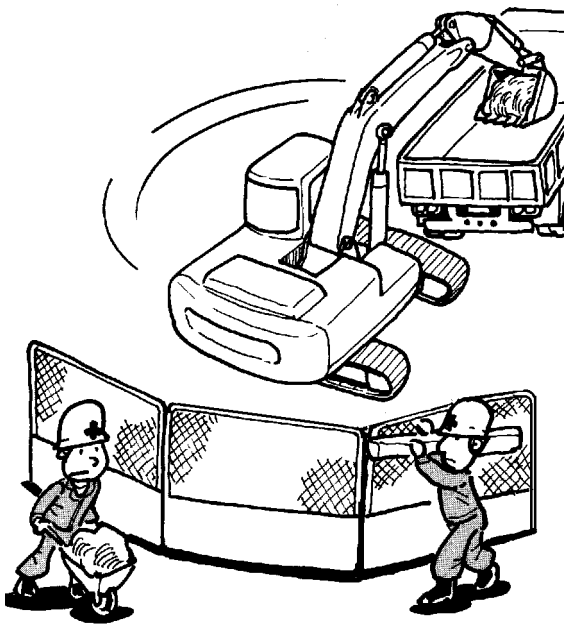
014-E01B-0427

SA-379

PRECAUTIONS FOR OPERATIONS

- Investigate the work site before starting operations.

  - Be sure to wear close fitting clothing and safety equipment appropriate for the job, such as a hard hat, etc. when operating the machine.
  - Clear all persons and obstacles from area of operation and machine movement.
    Always beware of the surroundings while operating. When working in a small area surrounded by obstacles, take care not to hit the upperstructure against obstacles.
  - When loading onto trucks, bring the bucket over the truck beds from the rear side. Take care not to swing the bucket over the cab or over any person.



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INVESTIGATE JOB SITE BEFOREHAND

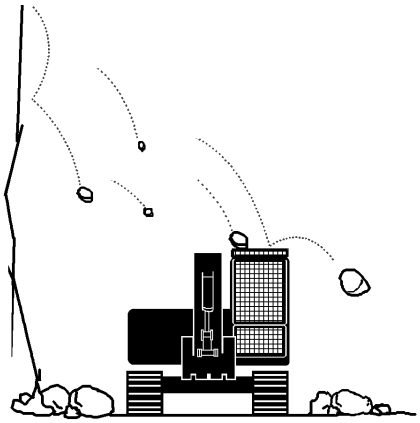
- When working at the edge of an excavation or on a road shoulder, the machine could tip over, possibly resulting in serious injury or death.
  - Investigate the configuration and ground conditions of the job site beforehand to prevent the machine from falling and to prevent the ground, stockpiles, or banks from collapsing.
  - Make a work plan. Use machines appropriate to the work and job site.
  - Reinforce ground, edges, and road shoulders as necessary. Keep the machine well back from the edges of excavations and road shoulders.
  - When working on an incline or on a road shoulder, employ a signal person as required.
  - Confirm that your machine is equipped a FOPS cab before working in areas where the possibility of falling stones or debris exist.
  - When the footing is weak, reinforce the ground before starting work.
  - When working on frozen ground, be extremely alert. As ambient temperatures rise, footing becomes loose and slippery.
  - Beware the possibility of fire when operating the machine near flammable objects such as dry grass.
- Make sure the worksite has sufficient strength to firmly support the machine.
  When working close to an excavation or at road shoulders, operate the machine with the tracks positioned perpendicular to the cliff face with travel motors at the rear, so that the machine can more easily evacuate if the cliff face collapses.
- If working on the bottom of a cliff or a high bank is required, be sure to investigate the area first and confirm that no danger of the cliff or bank collapsing exists. If any possibility of cliff or bank collapsing exists, do not work on the area.
- Soft ground may collapse when operating the machine on it, possibly causing the machine to tip over. When working on a soft ground is required, be sure to reinforce the ground first using large pieces of steel plates strong and firm enough to easily support the machine.
- Note that there is always a possibility of machine tipping over when working on rough terrain or on slopes. Prevent machine tipping over from occurring. When operating on rough terrain or on slopes:
  - Reduce the engine speed.
  - Select slow travel speed mode.
  - Operate the machine slowly and be cautious with machine movements.

SA-380

EQUIPMENT OF HEAD GUARD, ROPS, FOPS

In case the machine is operated in areas where the possibility of falling stones or debris exist, equip a head guard, ROPS, or FOPS according to the potential hazardous conditions. (The standard cab for this machine corresponds to ROPS and FOPS.)

ROPS: Roll-Over Protective Structure
FOPS: Falling Object Protective Structure



SA-490

PROVIDE SIGNALS FOR JOBS INVOLVING MULTIPLE NUMBERS OF MACHINES

- For jobs involving multiple numbers of machines, provide signals commonly known by all personnel involved. Also, appoint a signal person to coordinate the job site. Make sure that all personnel obey the signal person's directions.

018-E01A-0481

SA-481

CONFIRM DIRECTION OF MACHINE TO BE DRIVEN

- Incorrect travel pedal/lever operation may result in serious injury death.
  - Before driving the machine, confirm the position of the undercarriage in relation to the operator's position. If the travel motors are located in front of the cab, the machine will move in reverse when travel pedals/levers are operated to the front.

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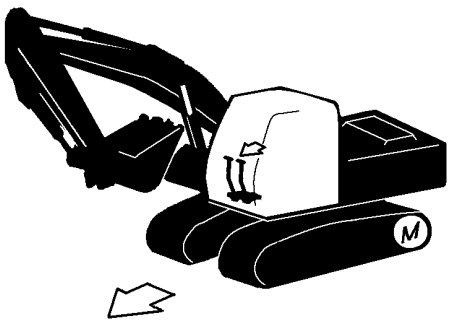


SA-491

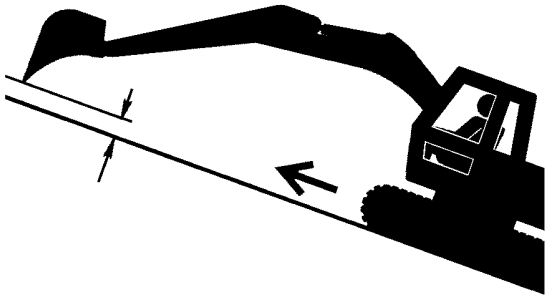
DRIVE MACHINE SAFELY

- Before driving the machine, always confirm that the travel levers/pedals direction corresponds to the direction you wish to drive.

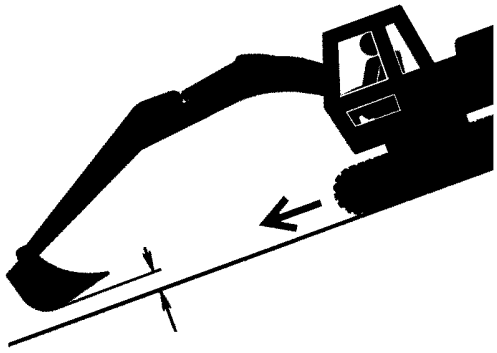
  - Be sure to detour around any obstructions.
  - Avoid traveling over obstructions. Soil, fragments of rocks, and/or metal pieces may scatter around the machine. Don't allow personnel to stay around the machine while traveling.

- Driving on a slope may cause the machine to slip or overturn, possibly resulting in serious injury or death.

  - Never attempt to ascend or descend 35 degrees or steeper slopes.
  - Be sure to fasten the seat belt.
  - When driving up or down a slope, keep the bucket facing the direction of travel, approximately 0.5 to 1.0 m (A) above the ground.
  - If the machine starts to skid or becomes unstable, immediately lower the bucket to the ground and stop.



SA-657



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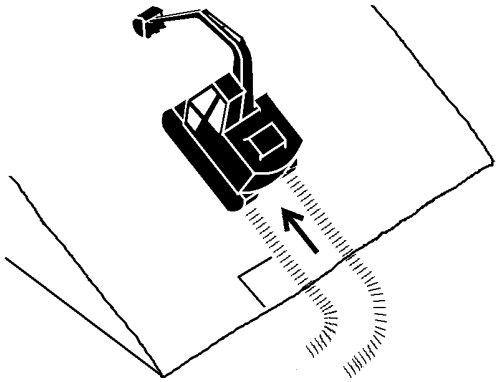

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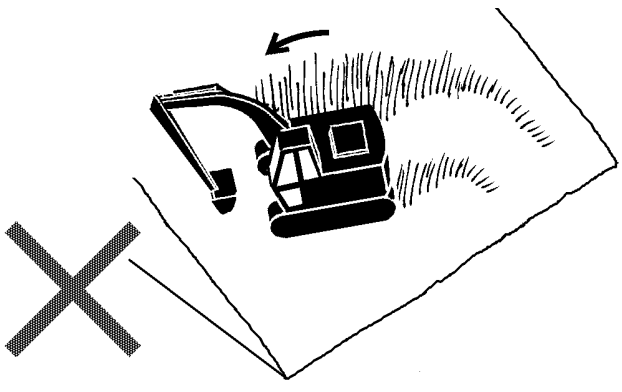
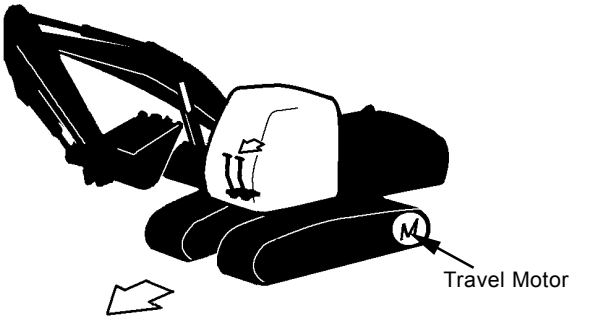


SA-442

DRIVE MACHINE SAFELY

- Driving across the face of a slope or steering on a slope may cause the machine to skid or turnover. If the direction must be changed, move the machine to level ground, then, change the direction to ensure safe operation.
- Avoid swinging the upperstructure on slopes. Never attempt to swing the upperstructure downhill. The machine may tip over. If swinging uphill is unavoidable, carefully operate the upperstructure and boom at slow speed.
- If the engine stalls on a slope, immediately lower the bucket to the ground. Return the control levers to neutral. Then, restart the engine.
- Be sure to thoroughly warm up the machine before ascending steep slopes. If hydraulic oil has not warmed up sufficiently, sufficient performance may not be obtained.
- Use a signal person when moving, swinging or operating the machine in congested areas. Coordinate hand signals before starting the machine.
- Before moving machine, determine which way to move travel pedals/levers for the direction you want to go. When the travel motors are in the rear, pushing down on the front of the travel pedals or pushing the levers forward moves the machine forward, towards the idlers.
  An arrow-mark seal is stuck on the inside surface of the side frame to indicate the machine front direction.
- Select a travel route that is as flat as possible. Steer the machine as straight as possible, making small gradual changes in direction.
- Before traveling on them, check the strengths of bridges and road shoulders, and reinforce if necessary.



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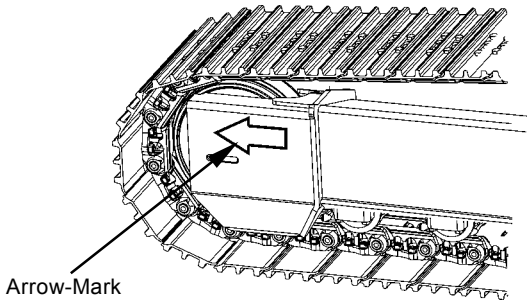
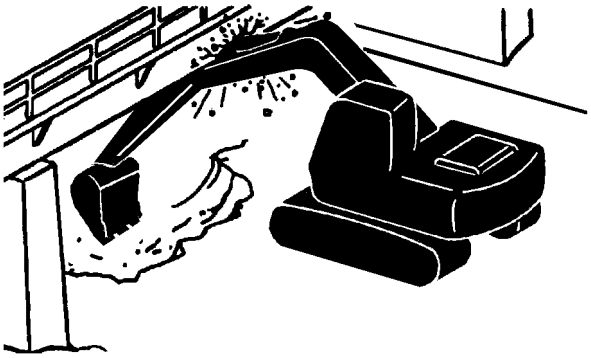


M178-03-001

- Use wood plates in order not to damage the road surface. Be careful of steering when operating on asphalt roads in summer.
- When crossing train tracks, use wood plates in order not to damage them.
- Do not make contact with electric wires or bridges.
- When crossing a river, measure the depth of the river using the bucket, and cross slowly. Do not cross the river when the depth of the river is deeper than the upper edge of the upper roller.
- When traveling on rough terrain, reduce engine speed. Select slow travel speed. Slower speed will reduce possible damage to the machine.
- Avoid operations that may damage the track and undercarriage components.
- During freezing weather, always clean snow and ice from track shoes before loading and unloading machine, to prevent the machine from slipping.



SA-011

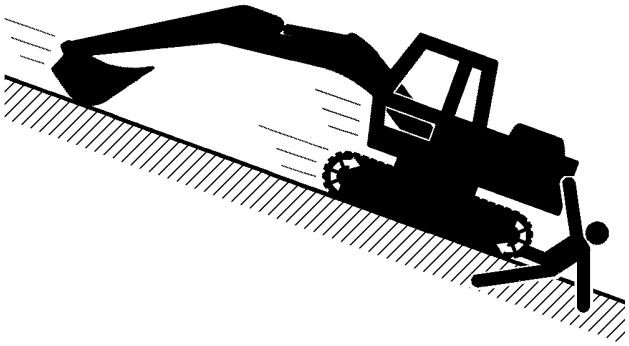
AVOID INJURY FROM ROLLAWAY ACCIDENTS

- Death or serious injury may result if you attempt to mount or stop a moving machine.

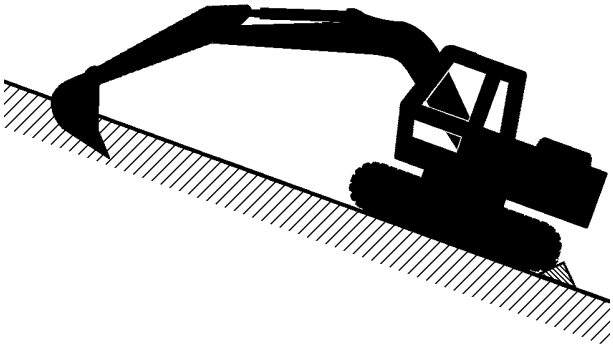
To avoid rollaways:

- Select level ground when possible to park machine.
- Do not park the machine on a grade.
- Lower the bucket and/or other work tools to the ground.
- Turn the auto-idle switch and the H/P mode switch off.
- Run the engine at slow idle speed without load for 5 minutes to cool down the engine.
- Stop the engine and remove the key from the key switch.
- Pull the pilot control shut-off lever to LOCK position.
- Block both tracks and lower the bucket to the ground. Thrust the bucket teeth into the ground if you must park on a grade.
- Position the machine to prevent rolling.
- Park a reasonable distance from other machines.

020-E02A-0493



SA-391



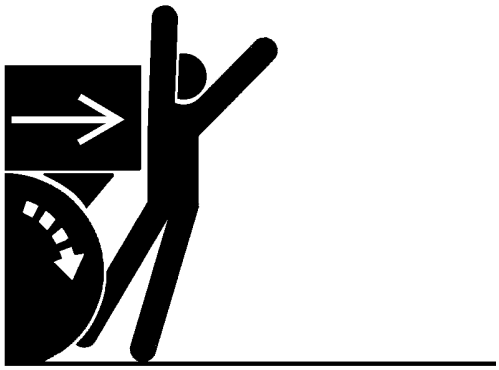
SA-392

AVOID INJURY FROM BACK-OVER AND SWING ACCIDENTS

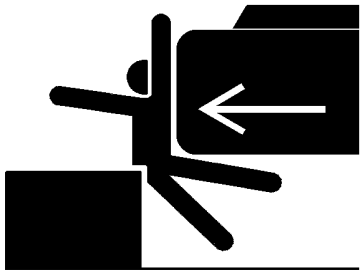
- If any person is present near the machine when backing or swinging the upperstructure, the machine may hit or run over that person, resulting in serious injury or death.

  To avoid back-over and swing accidents:
  - Always look around BEFORE YOU BACK UP AND SWING THE MACHINE. BE SURE THAT ALL BYSTANDERS ARE CLEAR.
  - Keep the travel alarm in working condition (if equipped).
    ALWAYS BE ALERT FOR BYSTANDERS MOVING INTO THE WORK AREA. USE THE HORN OR OTHER SIGNAL TO WARN BYSTANDERS BEFORE MOVING MACHINE.
  - USE A SIGNAL PERSON WHEN BACKING UP IF YOUR VIEW IS OBSTRUCTED. ALWAYS KEEP THE SIGNAL PERSON IN VIEW.
    Use hand signals, which conform to your local regulations, when work conditions require a signal person.
  - No machine motions shall be made unless signals are clearly understood by both signalman and operator.
  - Learn the meanings of all flags, signs, and markings used on the job and confirm who has the responsibility for signaling.
  - Keep windows, mirrors, and lights clean and in good condition.
  - Dust, heavy rain, fog, etc., can reduce visibility. As visibility decreases, reduce speed and use proper lighting.
  - Read and understand all operating instructions in the operator's manual.

021-E01A-0494



SA-383



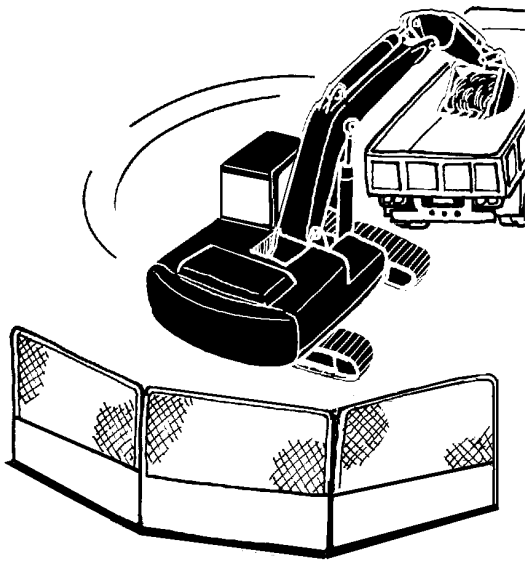
SA-384

KEEP PERSON CLEAR FROM WORKING AREA

- A person may be hit severely by the swinging front attachment or counterweight and/or may be crushed against an other object, resulting in serious injury or death.

  - Keep all persons clear from the area of operation and machine movement.
  - Before operating the machine, set up barriers to the sides and rear area of the bucket swing radius to prevent anyone from entering the work area.

022-E01A-0386



SA-386

NEVER POSITION BUCKET OVER ANYONE

- Never lift, move, or swing bucket above anyone or a truck cab.
  Serious injury or machine damage may result due to bucket load spill or due to collision with the bucket.

023-E01A-0487

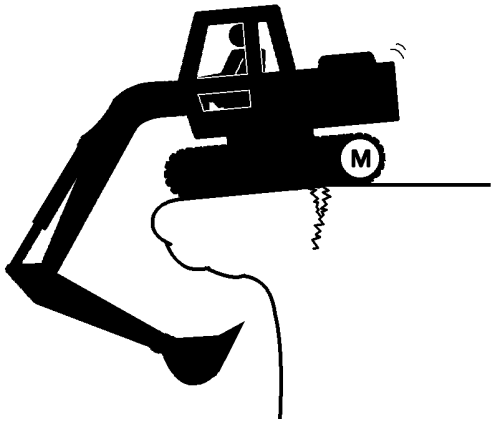
SA-487

AVOID UNDERCUTTING

- In order to retreat from the edge of an excavation if the footing should collapse, always position the undercarriage perpendicular to the edge of the excavation with the travel motors at the rear.

  - If the footing starts to collapse and if retreat is not possible, do not panic. Often, the machine can be secured by lowering the front attachment, in such cases.

024-E01A-0488



SA-488

AVOID TIPPING

DO NOT ATTEMPT TO JUMP CLEAR OF TIPPING MACHINE---SERIOUS OR FATAL CRUSHING INJURIES WILL RESULT
MACHINE WILL TIP OVER FASTER THAN YOU CAN JUMP FREE
FASTEN YOUR SEAT BELT

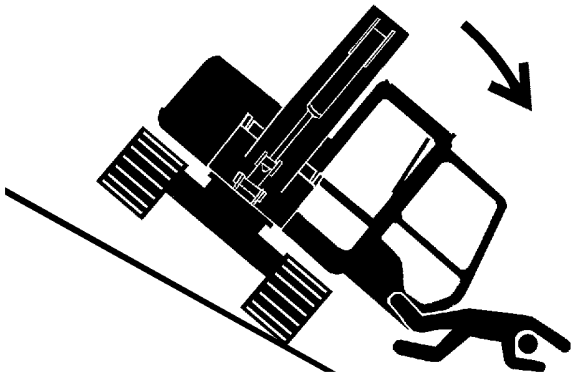
- The danger of tipping is always present when operating on a grade, possibly resulting in serious injury or death.

To avoid tipping:

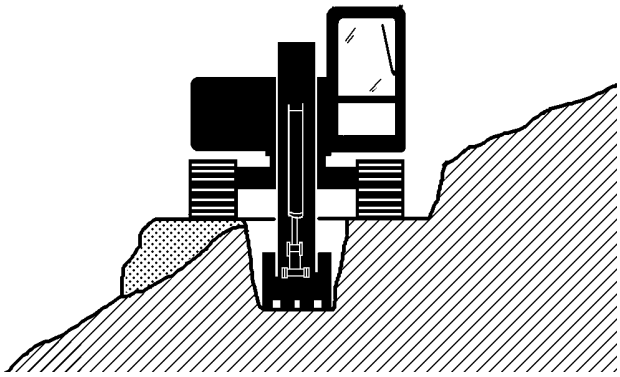
- Be extra careful before operating on a grade.
  - Prepare machine operating area flat.
  - Keep the bucket low to the ground and close to the machine.
  - Reduce operating speeds to avoid tipping or slipping.
  - Avoid changing direction when traveling on grades.
  - NEVER attempt to travel across a grade steeper than 15 degrees if crossing the grade is unavoidable.
  - Reduce swing speed as necessary when swinging loads.

- Be careful when working on frozen ground.
  - Temperature increases will cause the ground to become soft and make ground travel unstable.

025-E03B-0463



SA-012

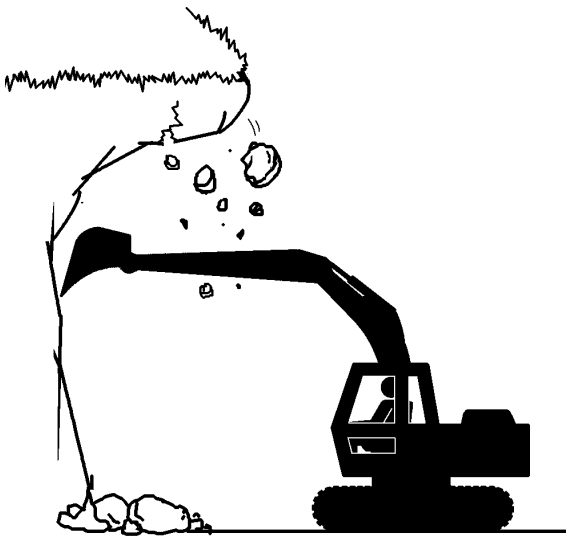


SA-440

NEVER UNDERCUT A HIGH BANK

- The edges could collapse or a land slide could occur causing serious injury or death.

026-E01A-0519



SA-489

DIG WITH CAUTION

- Accidental severing of underground cables or gas lines may cause an explosion and/or fire, possibly resulting in serious injury or death.

  - Before digging check the location of cables, gas lines, and water lines.
  - Keep the minimum distance required, by law, from cables, gas lines, and water lines.
  - If a fiber optic cable should be accidentally severed, do not look into the end. Doing so may result in serious eye injury.
  - Contact your local "diggers hot line" if available in your area, and/or the utility companies directly. Have them mark all underground utilities.

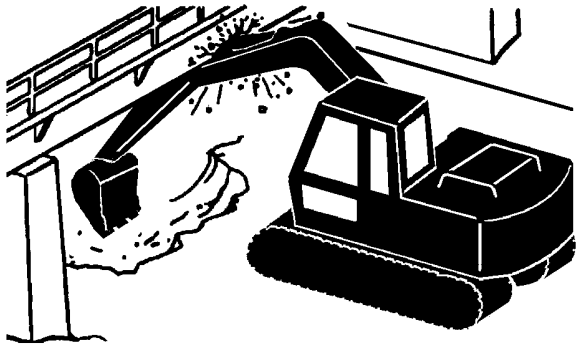
SA-382

027-E01A-0382

OPERATE WITH CAUTION

- If the front attachment or any other part of the machine hits against an overhead obstacle, such as a bridge, both the machine and the overhead obstacle will be damaged, and personal injury may result as well.

  - Take care to avoid hitting overhead obstacles with the boom or arm.



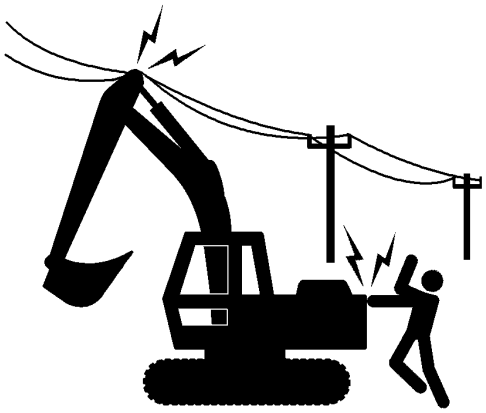
SA-389

028-E01A-0389

AVOID POWER LINES

- Serious injury or death can result if the machine or front attachments are not kept a safe distance from electric lines.
  - When operating near an electric line, NEVER move any part of the machine or load closer than 3 m plus twice the line insulator length.
  - Check and comply with any local regulations that may apply.
  - Wet ground will expand the area that could cause any person on it to be affected by electric shock. Keep all bystanders or co-workers away from the site.

029-E01A-0381



SA-381

PRECAUTIONS FOR LIGHTENING

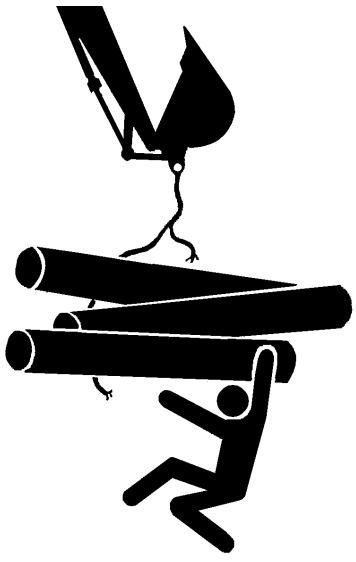
- The machine is vulnerable to lighting strikes.
  - In the event of an electrical storm, immediately stop operation, and lower the bucket to the ground. Evacuate to a safe place far away from the machine.
  - After the electrical storm has passed, check all of the machine safety devices for any failure. If any failed safety devices are found, operate the machine only after repairing them.

SA-1088

OBJECT HANDLING

- If a lifted load should fall, any person nearby may be struck by the falling load or may be crushed underneath it, resulting in serious injury or death.
  - When using the machine for craning operations, be sure to comply with all local regulations.
  - Do not use damaged chains or frayed cables, sables, slings, or ropes.
  - Before craning, position the upperstructure with the travel motors at the rear.
  - Move the load slowly and carefully. Never move it suddenly.
  - Keep all persons well away from the load.
  - Never move a load over a person's head.
  - Do not allow anyone to approach the load until it is safely and securely situated on supporting blocks or on the ground.
  - Never attach a sling or chain to the bucket teeth. They may come off, causing the load to fall.

032-E01A-0132



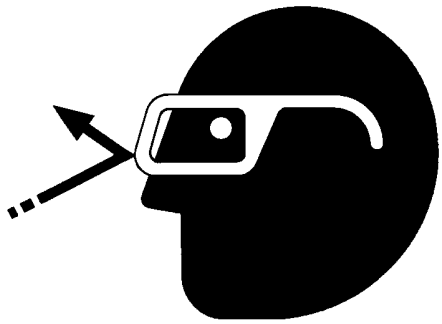
SA-014

PROTECT AGAINST FLYING DEBRIS

- If flying debris hit eyes or any other part of the body, serious injury may result.

  - Guard against injury from flying pieces of metal or debris; wear goggles or safety glasses.
  - Keep bystanders away from the working area before striking any object.

031-E01A-0432

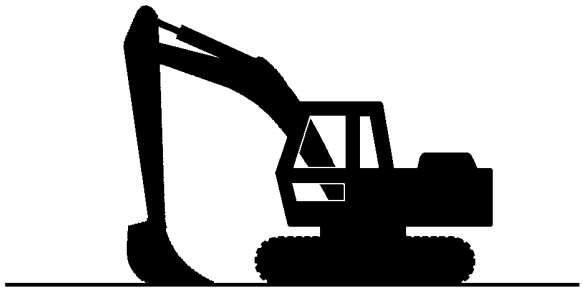


SA-432

PARK MACHINE SAFELY

To avoid accidents:

- Park machine on a firm, level surface.
- Lower bucket to the ground.
- Turn auto-idle switch and H/P mode switch OFF.
- Run engine at slow idle speed without load for 5 minutes.
- Turn key switch to OFF to stop engine.
- Remove the key from the key switch.
- Pull the pilot control shut-off lever to the LOCK position.
- Close windows, roof vent, and cab door.
- Lock all access doors and compartments.



SA-390

HANDLE FLUIDS SAFELY-AVOID FIRES

- Handle fuel with care; it is highly flammable. If fuel ignites, an explosion and/or a fire may occur, possibly resulting in serious injury or death.

  - Do not refuel the machine while smoking or when near open flame or sparks.
  - Always stop the engine before refueling the machine.
  - Fill the fuel tank outdoors.

- All fuels, most lubricants, and some coolants are flammable.

  - Store flammable fluids well away from fire hazards.
  - Do not incinerate or puncture pressurized containers.
  - Do not store oily rags; they can ignite and burn spontaneously.
  - Securely tighten the fuel and oil filler cap.

034-E01A-0496

SA-018

SA-019

TRANSPORT SAFELY

- Take care the machine may turn over when loading or unloading the machine onto or off of a truck or trailer.

  - Observe the related regulations and rules for safe transportation.
  - Select an appropriate truck or trailer for the machine to be transported.
  - Be sure to use a signal person.
  - Always follow the following precautions for loading or unloading:

  1. Select solid and level ground.
  2. Always use a ramp or deck strong enough to support the machine weight.
  3. Turn auto-idle switch OFF.
  4. Always select the slow speed mode with the travel mode switch.
  5. Never load or unload the machine onto or off a truck or trailer using the front attachment functions when driving up or down the ramp.
  6. Never steer the machine while on the ramp. If the traveling direction must be changed while the ramp, unload the machine from the ramp, reposition the machine on the ground, and then try loading again.
  7. The top end of the ramp where it meets the flatbed is a sudden bump. Take care when traveling over it.
  8. Place blocks in front of and behind the tracks. Securely hold the machine to the truck or trailer deck with wire ropes.

Be sure to further follow the details described in the TRANSPORTING section in the operator's manual.

035-E07A-0454

SA-395

PRACTICE SAFE MAINTENANCE

To avoid accidents:

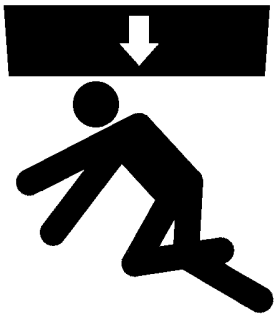
- Understand service procedures before starting work.
- Keep the work area clean and dry.
- Do not spray water or steam inside cab.
- Never lubricate or service the machine while it is moving.
- Keep hands, feet and clothing away from power-driven parts.

Before servicing the machine:

1. Park the machine on a level surface.
2. Lower the bucket to the ground.
3. Turn the auto-idle switch off.
4. Run the engine at slow idle speed without load for 5 minutes.
5. Turn the key switch to OFF to stop engine.
6. Relieve the pressure in the hydraulic system by moving the control levers several times.
7. Remove the key from the switch.
8. Attach a "Do Not Operate" tag on the control lever.
9. Pull the pilot control shut-off lever to the LOCK position.
10. Allow the engine to cool.

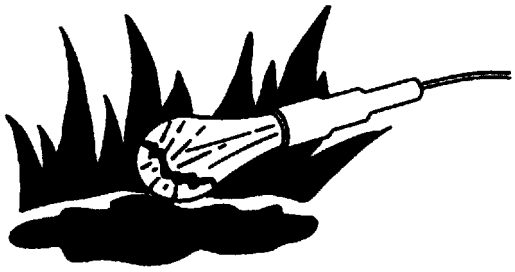
500-E02C-0520

SA-028



SA-527

- If a maintenance procedure must be performed with the engine running, do not leave machine unattended.
- If the machine must be raised, maintain a 90 to 100° angle between the boom and arm. Securely support any machine elements that must be raised for service work.
- Inspect certain parts periodically and repair or replace as necessary. Refer to the section discussing that part in the "MAINTENANCE" chapter of this manual.
- Keep all parts in good condition and properly installed.
- Fix damage immediately. Replace worn or broken parts. Remove any buildup of grease, oil, or debris.
- When cleaning parts, always use nonflammable detergent oil. Never use highly flammable oil such as fuel oil and gasoline to clean parts or surfaces.
- Disconnect battery ground cable (-) before making adjustments to electrical systems or before performing welding on the machine.
- Sufficiently illuminate the work site. Use a maintenance work light when working under or inside the machine.
- Always use a work light protected with a guard. In case the light bulb is broken, spilled fuel, oil, antifreeze fluid, or window washer fluid may catch fire.



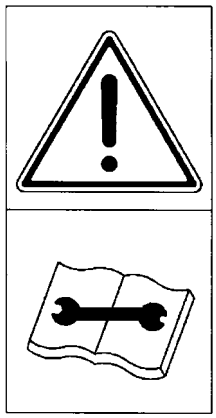
SA-037

WARN OTHERS OF SERVICE WORK

- Unexpected machine movement can cause serious injury.

  - Before performing any work on the machine, attach a "Do Not Operate" tag on the control lever. This tag is available from your authorized dealer.

501-E01A-0287

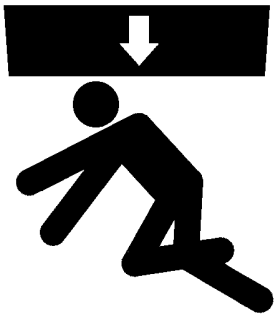


T1J1-01-01-001

SUPPORT MACHINE PROPERLY

- Never attempt to work on the machine without securing the machine first.
  - Always lower the attachment to the ground before you work on the machine.
  - If you must work on a lifted machine or attachment, securely support the machine or attachment. Do not support the machine on cinder blocks, hollow tires, or props that may crumble under continuous load. Do not work under a machine that is supported solely by a jack.

519-E01A-0527

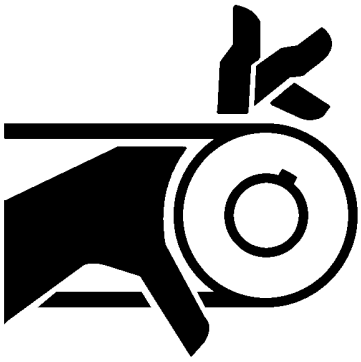


SA-527

STAY CLEAR OF MOVING PARTS

- Entanglement in moving parts can cause serious injury.
  - To prevent accidents, care should be taken to ensure that hands, feet, clothing, jewelry and hair do not become entangled when working around rotating parts.

502-E01A-0026

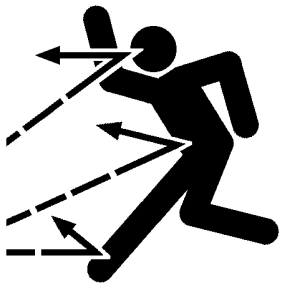


SA-026

PREVENT PARTS FROM FLYING

- Grease in the track adjuster is under high pressure. Failure to follow the precautions below may result in serious injury, blindness, or death.
  - Do not attempt to remove GREASE FITTING or VALVE ASSEMBLY.
  - As pieces may fly off, be sure to keep body and face away from valve.
  - Never attempt to disassemble the track adjuster. Inadvertent disassembling of the track adjuster may cause the parts such as a spring to fly off, possibly resulting in severe personal injury or death.
- Travel reduction gears are under pressure.
  - As pieces may fly off, be sure to keep body and face away from AIR RELEASE PLUG to avoid injury.
  - GEAR OIL is hot. Wait for GEAR OIL to cool, and then gradually loosen AIR RELEASE PLUG to release pressure.

503-E01B-0344

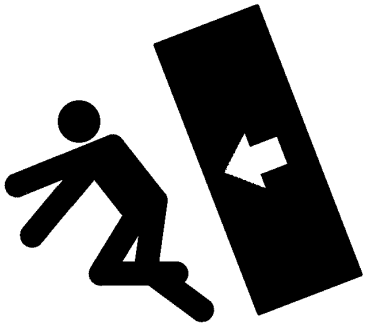


SA-344

STORE ATTACHMENTS SAFELY

- Stored attachments such as buckets, hydraulic hammers, and blades can fall and cause serious injury or death.
  - Securely store attachments and implements to prevent falling. Keep children and bystanders away from storage areas.

504-E01A-0034



SA-034

PREVENT BURNS

Hot spraying fluids:

- After operation, engine coolant is hot and under pressure. Hot water or steam is contained in the engine, radiator and heater lines.
  Skin contact with escaping hot water or steam can cause severe burns.

  - To avoid possible injury from hot spraying water. DO NOT remove the radiator cap until the engine is cool. When opening, turn the cap slowly to the stop. Allow all pressure to be released before removing the cap.
  - The hydraulic oil tank is pressurized. Again, be sure to release all pressure before removing the cap.

SA-039

Hot fluids and surfaces:

- Engine oil, gear oil and hydraulic oil also become hot during operation.
  The engine, hoses, lines and other parts become hot as well.

  - Wait for the oil and components to cool before starting any maintenance or inspection work.

SA-225

505-E01B-0498

REPLACE RUBBER HOSES PERIODICALLY

- Rubber hoses that contain flammable fluids under pressure may break due to aging, fatigue, and abrasion. It is very difficult to gauge the extent of deterioration due to aging, fatigue, and abrasion of rubber hoses by inspection alone.

  - Periodically replace the rubber hoses. (See the page of "Periodic replacement of parts" in the operator's manual.)

  - Failure to periodically replace rubber hoses may cause a fire, fluid injection into skin, or the front attachment to fall on a person nearby, which may result in severe burns, gangrene, or otherwise serious injury or death.

SA-019

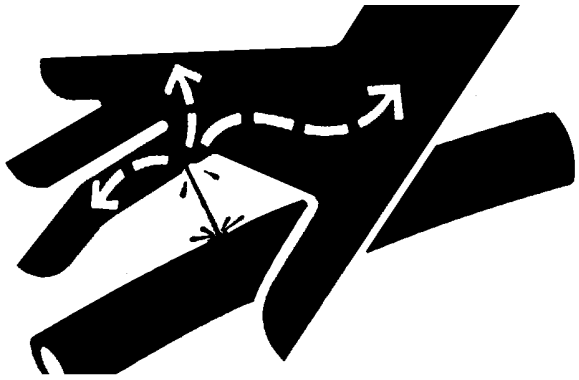
S506-E01A-0019

AVOID HIGH-PRESSURE FLUIDS

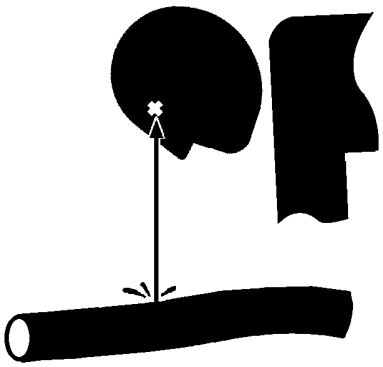
- Fluids such as diesel fuel or hydraulic oil under pressure can penetrate the skin or eyes causing serious injury, blindness or death.

  - Avoid this hazard by relieving pressure before disconnecting hydraulic or other lines.
  - Tighten all connections before applying pressure.
  - Search for leaks with a piece of cardboard; take care to protect hands and body from high-pressure fluids. Wear a face shield or goggles for eye protection.
  - If an accident occurs, see a doctor familiar with this type of injury immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result.

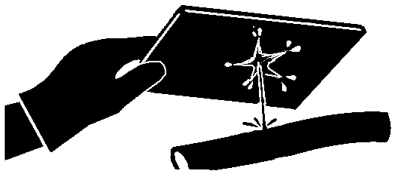
507-E03A-0499



SA-031



SA-292



SA-044

PREVENT FIRES

Check for Oil Leaks:

- Fuel, hydraulic oil and lubricant leaks can lead to fires.
  - Check for oil leaks due to missing or loose clamps, kinked hoses, lines or hoses that rub against each other, damage to the oil-cooler, and loose oil-cooler flange bolts.
  - Tighten, repair or replace any missing, loose or damaged clamps, lines, hoses, oil-cooler and oil-cooler flange bolts.
  - Do not bend or strike high-pressure lines.
  - Never install bent or damaged lines, pipes, or hoses.

SA-019

Check for Shorts:

- Short circuits can cause fires.
  - Clean and tighten all electrical connections.
  - Check before each shift or after eight(8) to ten(10) hours operation for loose, kinked, hardened or frayed electrical cables and wires.
  - Check before each shift or after eight(8) to ten(10) hours operation for missing or damaged terminal caps.
  - DO NOT OPERATE MACHINE if cable or wires are loose, kinked, etc..

Clean up Flammables:

- Spilled fuel and oil, and trash, grease, debris, accumulated coal dust, and other flammables may cause fires.
  - Prevent fires by inspecting and cleaning the machine daily and by removing spilled or accumulated flammables immediately.

Check Key Switch:

- If a fire breaks out, failure to stop the engine will escalate the fire, hampering fire fighting.
  Always check key switch function before operating the machine every day:
  1. Start the engine and run it at slow idle.
  2. Turn the key switch to the OFF position to confirm that the engine stops.
  - If any abnormalities are found, be sure to repair them before operating the machine.

508-E02B-0019

Check Heat Shields:

- Damaged or missing heat shields may lead to fires.
  - Damaged or missing heat shields must be repaired or replaced before operating the machine.

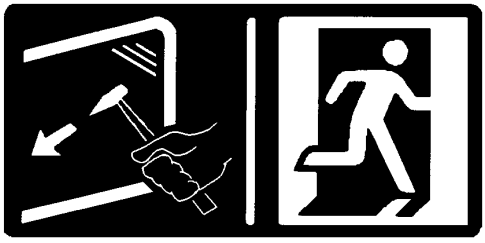
508-E02A-0393

EVACUATING IN CASE OF FIRE

- If a fire breaks out, evacuate the machine in the following way:
  - Stop the engine by turning the key switch to the OFF position if there is time.
  - Use a fire extinguisher if there is time.
  - Exit the machine.
- In an emergency, if the cab door or front window cannot be opened, break the front or rear window panes with the emergency evacuation hammer to escape from the cab. Refer the explanation pages on the Emergency Evacuation Method in the operator's manual.

18-E02B-0393

SA-393

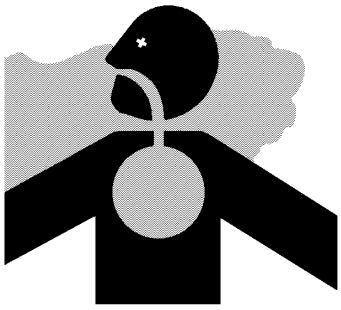


SS-1510

BEWARE OF EXHAUST FUMES

- Prevent asphyxiation. Engine exhaust fumes can cause sickness or death.
  - If you must operate in a building, be sure there is adequate ventilation. Either use an exhaust pipe extension to remove the exhaust fumes or open doors and windows to bring enough outside air into the area.

509-E01A-0016



SA-016

PRECAUTIONS FOR WELDING AND GRINDING

- Welding may generate gas and/or small fires.
  - Be sure to perform welding in a well ventilated and prepared area. Store flammable objects in a safe place before starting welding.
  - Only qualified personnel should perform welding. Never allow an unqualified person to perform welding.
- Grinding on the machine may create fire hazards. Store flammable objects in a safe place before starting grinding.
- After finishing welding and grinding, recheck that there are no abnormalities such as the area surrounding the welded area still smoldering.

523-E01A-0818

SA-818

AVOID HEATING NEAR PRESSURIZED FLUID LINES

- Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders.

  - Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials.
  - Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area. Install temporary fire-resistant guards to protect hoses or other materials before engaging in welding, soldering, etc..

SA-030

AVOID APPLYING HEAT TO LINES CONTAINING FLAMMABLE FLUIDS

- Do not weld or flame cut pipes or tubes that contain flammable fluids.
- Clean them thoroughly with nonflammable solvent before welding or flame cutting them.

510-E01B-0030

REMOVE PAINT BEFORE WELDING OR HEATING

- Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch. If inhaled, these fumes may cause sickness.

  - Avoid potentially toxic fumes and dust.
  - Do all such work outside or in a well-ventilated area. Dispose of paint and solvent properly.

  - Remove paint before welding or heating:

1. If you sand or grind paint, avoid breathing the dust.
   Wear an approved respirator.
2. If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

SA-029

511-E01A-0029

BEWARE OF ASBESTOS DUST

- Take care not to inhale dust produced in the work site. Inhalation of asbestos fibers may be the cause of lung cancer.

  - Depending on the wok site conditions, the risk of inhaling asbestos fiber may exist. Spray water to prevent asbestos from becoming airborne. Don't use compressed air.
  - When operating the machine in a work site where asbestos might be present, be sure to operate the machine from the upwind side and wear a mask rated to prevent the inhalation of asbestos.
  - Keep bystanders out of the work site during operation.
  - Asbestos might be present in imitation parts. Use only genuine Hitachi Parts.

SA-029

PREVENT BATTERY EXPLOSIONS

- Battery gas can explode.

  - Keep sparks, lighted matches, and flame away from the top of battery.
  - Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.
  - Do not charge a frozen battery or start engine with frozen battery.
    There is fear of explosion. If battery electrolyte is frozen, wait until it is liquefied completely in an atmospheric temperature room.
  - Do not continue to use or charge the battery when electrolyte level is lower than specified. Explosion of the battery may result.
  - Loose terminals may produce sparks. Securely tighten all terminals.

- Battery electrolyte is poisonous. If the battery should explode, battery electrolyte may be splashed into eyes, possibly resulting in blindness.

  - Be sure to wear eye protection when checking electrolyte specific gravity.

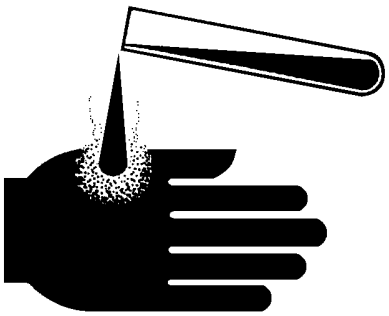
SA-032

512-E01B-0032

SERVICE AIR CONDITIONING SYSTEM SAFELY

- If spilled onto skin, refrigerant may cause a cold contact burn.
  - Refer to the instructions described on the container for proper use when handling the refrigerant.
  - Use a recovery and recycling system to avoid leaking refrigerant into the atmosphere.
  - Never touch the refrigerant.

513-E01A-0405



SA-405

HANDLE CHEMICAL PRODUCTS SAFELY

- Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with your machine include such items as lubricants, coolants, paints, and adhesives.
  - A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.
  - Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and use recommended equipment.
  - See your authorized dealer for MSDS's (available only in English) on chemical products used with your machine.

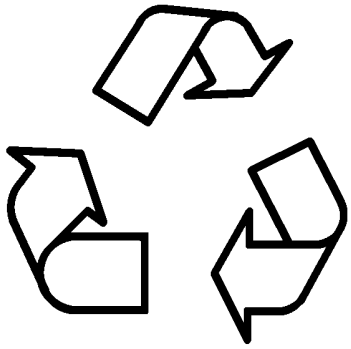
515-E01A-0309

SA-309

DISPOSE OF WASTE PROPERLY

- Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with HITACHI equipment includes such items as oil, fuel, coolant, brake fluid, filters, and batteries.

  - Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.
  - Do not pour waste onto the ground, down a drain, or into any water source.
  - Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.
  - Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your authorized dealer.



SA-226

516-E01A-0226

BEFORE RETURNING THE MACHINE TO THE CUSTOMER

- After maintenance or repair work is complete, confirm that:

  - The machine is functioning properly, especially the safety systems.
  - Worn or damaged parts have been repaired or replaced

SA-435

S517-E01A-0435

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SECTION AND GROUP CONTENTS

TECHNICAL MANUAL

(Troubleshooting)

All information, illustrations and specifications in this manual are based on the latest product information available at the time of publication. The right is reserved to make changes at any time without notice.

SECTION 4 OPERATIONAL PERFORMANCE TEST

SECTION 5 TROUBLESHOOTING

TECHNICAL MANUAL (Operational Principle)

WORKSHOP MANUAL

SECTION 4
OPERATIONAL PERFORMANCE TEST

CONTENTS

Group 5 Component Test

OPERATIONAL PERFORMANCE TESTS

Use operational performance test procedure to quantitatively check all system and functions on the machine.

Purpose of Performance Tests

1. To comprehensively evaluate each operational function by comparing the performance test data with the standard values.
2. According to the evaluation results, repair, adjust, or replace parts or components as necessary to restore the machine's performance to the desired standard.
3. To economically operate the machine under optimal conditions.

Kinds of Tests

1. Base machine performance test is to check the operational performance of each system such as engine, travel, swing, and hydraulic cylinders.
2. Hydraulic component unit test is to check the operational performance of each component such as hydraulic pump, motor, and various kinds of valves.

Performance Standards

"Performance Standard" is shown in tables to evaluate the performance test data.

Precautions for Evaluation of Test Data

1. To evaluate not only that the test data are correct, but also in what range the test data are.
2. Be sure to evaluate the test data based on the machine operation hours, kinds and state of work loads, and machine maintenance conditions.

The machine performance does not always deteriorate as the working hours increase. However, the machine performance is normally considered to reduce in proportion to the increase of the operation hours. Accordingly, restoring the machine performance by repair, adjustment, or replacement shall consider the number of the machine's working hours.

Definition of "Performance Standard"

1. Operation speed values and dimensions of the new machine.
2. Operational performance of new components adjusted to specifications. Allowable errors will be indicated as necessary.

PREPARATION FOR PERFORMANCE TESTS

Observe the following rules in order to carry out performance tests accurately and safely.

THE MACHINE

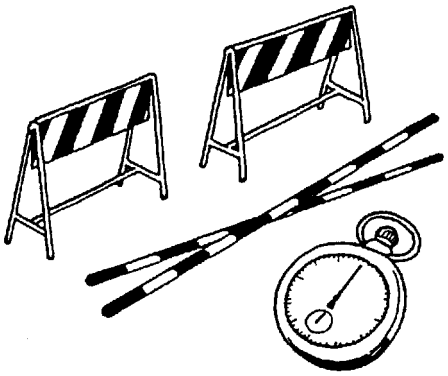
1. Repair any defects and damage found, such as oil or water leaks, loose bolts, cracks and so on, before starting to test.

TEST AREA

1. Select a hard and flat surface.
2. Secure enough space to allow the machine to run straight more than 20 m (65 ft 7 in), and to make a full swing with the front attachment extended.
3. If required, rope off the test area and provide signboards to keep unauthorized personnel away.

PRECAUTIONS

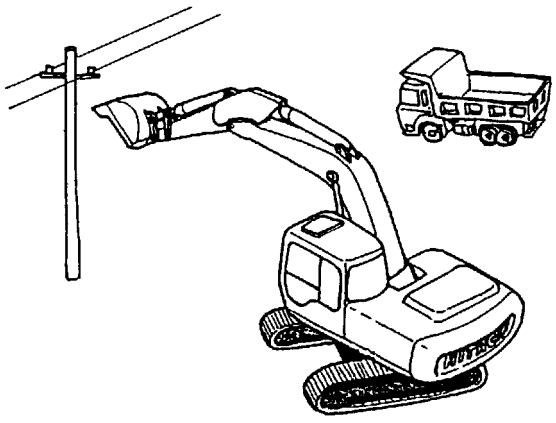
1. Before starting to test, agree upon the signals to be employed for communication among coworkers. Once the test is started, be sure to communicate with each other using these signals, and to follow them without fail.
2. Operate the machine carefully and always give first priority to safety.
3. While testing, always take care to avoid accidents due to landslides or contact with high-voltage power lines. Always confirm that there is sufficient space for full swings.
4. Avoid polluting the machine and the ground with leaking oil. Use oil pans to catch escaping oil. Pay special attention to this when removing hydraulic pipings.



T105-06-01-003

MAKE PRECISE MEASUREMENT

1. Accurately calibrate test instruments in advance to obtain correct data.
2. Carry out tests under the exact test conditions prescribed for each test item.
3. Repeat the same test and confirm that the test data obtained can be produced repeatedly. Use mean values of measurements if necessary.



T105-06-01-004

ZX200-3 CLASS OPERATIONAL PERFORMANCE STANDARD TABLE

The standard Performance values are listed in the table below. Refer to the Group T4-3 to T4-5 for performance test procedures. Values indicated in parentheses are reference values.

The following switch positions shall be selected and the hydraulic oil temperature shall be maintained as indicated below as the preconditions of performance tests unless otherwise instructed in each performance test procedure:

Engine Control Dial : Fast Idle
Power Mode Switch : P Mode
Auto-Idle Switch: OFF
Work Mode: Digging Mode
Hydraulic Oil Temperature : 50±5 °C (122±41 °F)

PERFORMANCE TEST DESIGNATION	ZX200-3 class (Performance Standard)	Remarks	Reference Page
ENGINE SPEED min^{-1}			T4-3-1
Slow Idle Speed	800±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (wirh ECO deactivated)	1800±50	↑	
Fast Idle Speed (Heater control: OFF)	1700±50	Lever in neutral, Pilot shut-off lever: UNLOCK position, Value indicated on Dr. ZX	
Fast Idle Speed (Heater control: ON)	2000±50	Pilot shut-off lever: LOCK position, Coolant temperature: 5 °C or lower, Value indicated on Dr. ZX	
Fast Idle Speed (Relief operation)	1800±50	Boom raise relief operation, Value indicated on Dr. ZX	
Fast Idle Speed (E mode)	1650±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (HP mode)	2000±50	Relief operation of boom rasie and arm roll-in, Value indicated on Dr. ZX.	
Auto-Idle Speed	1200±50	Value indicated on Dr. ZX.	
Warming-Up Speed	1400±100	↑	
ENGINE COMPRESSION PRESSURE MPa (kgf/cm^2, psi)	3.04±0.2 (31±2, 442±29)	Engine speed: 200min^{-1}	T4-3-3
VALVE CLEARANCE (IN, EX)	0.4	With the engine cold	T4-3-4
LUBRICANT CONSUMPTION (Rated output) mL/h	30 or less	Hour meter: 2000 hours or less	T4-3-7

PERFORMANCE TEST DESIGNATION	ZX200-3 class (Performance Standard)	Remarks	Reference Page
TRAVEL SPEED sec/10 m			T4-4-1
Fast Speed	6.6±0.6		
Slow Speed	(10.2±1.0)		
TRACK REVOLUTION SPEED sec/3 rev			T4-4-2
Fast Speed	17.2±1.0	LC: 18.3±1.0	
Slow Speed	26.7±2.0	LC: 28.4±2.0	
MISTRACK mm/20 m (With fast and slow travel speed modes)	200 or less		T4-4-3
TRAVEL MOTOR LEAKAGE mm/5 min	0		T4-4-4
SWING SPEED sec/3 rev	13.5±1.0	Bucket: empty	T4-4-5
SWING FUNCTION DRIFT CHECK mm /180°	1254 or less	Bucket: empty ZAXIS210H-3: 1368 or less	T4-4-6
SWING MOTOR LEAKAGE mm/5 min	0	Bucket: loaded	T4-4-8
MAXIMUM SWINGABLE SLANT ANGLE deg.	25° or more	Bucket: loaded	T4-4-10
SWING BEARING PLAY mm	0.2 to 1.0	Allowable limit: 2.0 to 3.0	T4-4-12
HYDRAULIC CYLINDER CYCLE TIME sec		2.91 m arm 0.8 m^3 (PCSA heaped) bucket, Bucket: empty	T4-4-14
Boom Raise	3.1±0.3	ZAXIS210H-3: 3.2±0.3	
Boom Lower	2.2±0.3		
Arm Roll-In	3.2±0.3		
Arm Roll-Out	2.5±0.3	ZAXIS210H-3: 2.6±0.3	
Bucket Roll-In	3.0±0.3		
Bucket Roll-Out	2.0±0.3	ZAXIS210H-3: 2.1±0.3	
DIG FUNCTION DRIFT CHECK mm/5 min		2.91 m arm 0.8 m^3 (PCSA heaped) bucket	T4-4-16
Boom Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 5 or less 5 or less	 Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 10 or less 10 or less	 Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 15 or less 7 or less	 Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In Position)	 100 or less 80 or less	 Bucket: loaded Bucket: empty	

PERFORMANCE TEST DESIGNATION	ZX200-3 class (Performance Standard)	Remarks	Reference Page
CONTROL LEVER OPERATING FORCE N (kgf, lbf)		HITACHI lever pattern	T4-4-18
Boom Lever	16 (1.6, 3.6) or less		
Arm Lever (ISO Lever Pattern: Swing Lever)	13 (1.3, 2.9) or less		
Bucket Lever	13 (1.3, 2.9) or less		
Swing Lever (ISO Lever Pattern: Arm Lever)	16 (1.6, 3.6) or less		
Travel Lever	28 (2.8, 6.3) or less		
CONTROL LEVER STROKE mm		HITACHI lever pattern	T4-4-20
Boom Lever	97±10		
Arm Lever (ISO Lever Pattern: Swing Lever)	82±10		
Bucket Lever	82±10		
Swing Lever (ISO Lever Pattern: Arm Lever)	97±10		
Travel Lever	120±10		
BOOM RAISE/SWING sec	3.6±0.4	2.91 m arm 0.8 m^3 (PCSA heaped) bucket, Bucket: empty	T4-4-22
(Bucket Teeth Height: H) mm	6600 or more		
BOOM RAISE/ARM ROLL-IN sec	4.3±0.5	2.91 m arm 0.8 m^3 (PCSA heaped) bucket	T4-4-24
HYDRAULIC SYSTEM			
PRIMARY PILOT PRESSURE MPa (kgf/cm^2, psi)			T4-5-1
Engine: Fast Idle	$4.0^{+1.0}_{-0.5}$ (41^{+10}_{-5}, 582^{+145}_{-73})		
Engine: Slow Idle	$3.8^{+1.0}_{-0.5}$ (39^{+10}_{-5}, 552^{+145}_{-73})		
SECONDARY PILOT PRESSURE MPa (kgf/cm^2, psi)			T4-5-3
(Engine: Fast Idle (normal) and Slow Idle)	3.4 to 4.0 (35 to 41, 494 to 582)	Value indicated on Dr. ZX (Lever: Full stroke)	
SOLENOID VALVE SET PRESSURE MPa (kgf/cm^2, psi)	Value Indicated On Dr. ZX±0.2 (2, 29)		T4-5-5
MAIN PUMP DELIVERY PRESSURE MPa (kgf/cm^2, psi)	$0.7^{+1.0}_{-0.5}$ (7.1^{+10}_{-5}, 102^{+145}_{-73})	In neutral, Value indicated on Dr. ZX	T4-5-8

PERFORMANCE TEST DESIGNATION	ZX200-3 class (Performance Standard)	Remarks	Reference Page
MAIN RELIEF VALVE PRESSURE MPa (kgf/cm^2, psi)			T4-5-9
Boom, Arm, Bucket (Relief operation for each)	$34.3^{+2.0}_{-0.5}$ (350^{+20}_{-5}, 4987^{+291}_{-73})	Value indicated on Dr. ZX	
Power Digging	$36.3^{+2.0}_{-1.0}$ (370^{+20}_{-10}, 5277^{+291}_{-145})	Value indicated on Dr. ZX	
RELIEF PRESSURE MPa (kgf/cm^2, psi) **(Relief operation of Swing)**	$32.9^{+2.3}_{-0}$ (335^{+23}_{-0}, 4783^{+334}_{-0})	Value indicated on Dr. ZX	T4-5-13
OVERLOAD RELIEF PRESSURE MPa (kgf/cm^2, psi)		(Reference values at 50 L/min)	T4-5-15
Boom Lower, Arm Roll-In, Bucket Roll-In	$37.2^{+1.0}_{-0}$ (379^{+10}_{-0}, 5408^{+145}_{-0})		
Boom Raise, Arm Roll-Out, Bucket Roll-Out	$39.2^{+1.0}_{-0}$ (400^{+10}_{-0}, 5699^{+145}_{-0})		
MAIN PUMP FLOW RATE (L/min)	-	Refer to pages T4-2-10, 11.	T4-5-18
SWING MOTOR DRAINAGE (L/min)			T4-5-26
With constant speed	0.2 to 0.3		
With the motor relieved	(2 to 5)		
TRAVEL MOTOR DRAINAGE (L/min)			T4-5-29
With the track jacked up	Less than 10	Allowable limit: 10	
With the motor relieved	Less than 15	Allowable limit: 15	

ZX225US-3 CLASS OPERATIONAL PERFORMANCE STANDARD TABLE

The standard Performance values are listed in the table below. Refer to the Group T4-3 to T4-5 for performance test procedures. Values indicated in parentheses are reference values.

The following switch positions shall be selected and the hydraulic oil temperature shall be maintained as indicated below as the preconditions of performance tests unless otherwise instructed in each performance test procedure:

Engine Control Dial : Fast Idle
Power Mode Switch : P Mode
Auto-Idle Switch: OFF
Work Mode: Digging Mode
Hydraulic Oil Temperature : 50±5 °C (122±41 °F)

PERFORMANCE TEST DESIGNATION	ZX225US-3 class (Performance Standard)	Remarks	Reference Page
ENGINE SPEED min^{-1}			T4-3-1
Slow Idle Speed	800±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (wirh ECO deactivated)	1800±50	↑	
Fast Idle Speed (Heater control: OFF)	1700±50	Lever in neutral, Pilot shut-off lever: UNLOCK position, Value indicated on Dr. ZX	
Fast Idle Speed (Heater control: ON)	2000±50	Pilot shut-off lever: LOCK position, Coolant temperature: 5 °C or lower, Value indicated on Dr. ZX	
Fast Idle Speed (Relief operation)	1800±50	Boom raise relief operation, Value indicated on Dr. ZX	
Fast Idle Speed (E mode)	1650±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (HP mode)	2000±50	Relief operation of boom rasie and arm roll-in, Value indicated on Dr. ZX.	
Auto-Idle Speed	1200±50	Value indicated on Dr. ZX.	
Warming-Up Speed	1400±100	↑	
ENGINE COMPRESSION PRESSURE MPa (kgf/cm^2, psi)	3.04±0.2 (31±2, 442±29)	Engine speed: 200min^{-1}	T4-3-3
VALVE CLEARANCE (IN, EX)	0.4	With the engine cold	T4-3-4
LUBRICANT CONSUMPTION (Rated output) mL/h	30 or less	Hour meter: 2000 hours or less	T4-3-7

PERFORMANCE TEST DESIGNATION	ZX225US-3 class (Performance Standard)	Remarks	Reference Page
TRAVEL SPEED sec/10 m			T4-4-1
Fast Speed	6.6±0.6		
Slow Speed	(10.2±1.0)		
TRACK REVOLUTION SPEED sec/3 rev			T4-4-2
Fast Speed	17.2±1.0	LC: 18.3±2.0	
Slow Speed	26.7±2.0	LC: 28.4±2.0	
MISTRACK mm/20 m (With fast and slow travel speed modes)	200 or less		T4-4-3
TRAVEL MOTOR LEAKAGE mm/5 min	0		T4-4-4
SWING SPEED sec/3 rev	13.5±1.0	Bucket: empty	T4-4-5
SWING FUNCTION DRIFT CHECK mm /180°	1263 or less	Bucket: empty	T4-4-6
SWING MOTOR LEAKAGE mm/5 min	0	Bucket: loaded	T4-4-8
MAXIMUM SWINGABLE SLANT ANGLE deg.	22° or more	Bucket: loaded	T4-4-10
SWING BEARING PLAY mm	0.2 to 1.0	Allowable limit: 2.0 to 3.0	T4-4-12
HYDRAULIC CYLINDER CYCLE TIME sec		2.91 m arm 0.8 m^3 (PCSA heaped) bucket, Bucket: empty	T4-4-14
Boom Raise	3.1±0.3		
Boom Lower	2.2±0.3		
Arm Roll-In	3.2±0.3		
Arm Roll-Out	2.5±0.3		
Bucket Roll-In	3.0±0.3		
Bucket Roll-Out	2.0±0.3		
DIG FUNCTION DRIFT CHECK mm/5 min		2.91 m arm 0.8 m^3 (PCSA heaped) bucket	T4-4-16
Boom Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 5 or less 5 or less	 Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 10 or less 10 or less	 Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 15 or less 7 or less	 Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In Position)	 100 or less 80 or less	 Bucket: loaded Bucket: empty	

PERFORMANCE TEST DESIGNATION	ZX225US-3 class (Performance Standard)	Remarks	Reference Page
CONTROL LEVER OPERATING FORCE N (kgf, lbf)		HITACHI lever pattern	T4-4-18
Boom Lever	16 (1.6, 3.6) or less		
Arm Lever (ISO Lever Pattern: Swing Lever)	13 (1.3, 2.9) or less		
Bucket Lever	13 (1.3, 2.9) or less		
Swing Lever (ISO Lever Pattern: Arm Lever)	16 (1.6, 3.6) or less		
Travel Lever	28 (2.8, 6.3) or less		
CONTROL LEVER STROKE mm		HITACHI lever pattern	T4-4-20
Boom Lever	97±10		
Arm Lever (ISO Lever Pattern: Swing Lever)	82±10		
Bucket Lever	82±10		
Swing Lever (ISO Lever Pattern: Arm Lever)	97±10		
Travel Lever	120±10		
BOOM RAISE/SWING sec	3.6±0.4	2.91 m arm 0.8 m^3 (PCSA heaped) bucket, Bucket: empty	T4-4-22
(Bucket Teeth Height: H) mm	6700 or more		
BOOM RAISE/ARM ROLL-IN sec	4.3±0.5	2.91 m arm 0.8 m^3 (PCSA heaped) bucket	T4-4-24
HYDRAULIC SYSTEM			
PRIMARY PILOT PRESSURE MPa (kgf/cm^2, psi)			T4-5-1
Engine: Fast Idle	$4.0^{+1.0}_{-0.5}$ (41^{+10}_{-5}, 582^{+145}_{-73})		
Engine: Slow Idle	$3.8^{+1.0}_{-0.5}$ (39^{+10}_{-5}, 552^{+145}_{-73})		
SECONDARY PILOT PRESSURE MPa (kgf/cm^2, psi)			T4-5-3
(Engine: Fast Idle (normal) and Slow Idle)	3.4 to 4.0 (35 to 41, 494 to 582)	Value indicated on Dr. ZX (Lever: Full stroke)	
SOLENOID VALVE SET PRESSURE MPa (kgf/cm^2, psi)	Value Indicated On Dr. ZX±0.2 (2, 29)		T4-5-5
MAIN PUMP DELIVERY PRESSURE MPa (kgf/cm^2, psi)	$0.7^{+1.0}_{-0.5}$ (7.1^{+10}_{-5}, 102^{+145}_{-73})	In neutral, Value indicated on Dr. ZX	T4-5-8

PERFORMANCE TEST DESIGNATION	ZX225US-3 class (Performance Standard)	Remarks	Reference Page
MAIN RELIEF VALVE PRESSURE MPa (kgf/cm^2, psi)			T4-5-9
Boom, Arm, Bucket (Relief operation for each)	$34.3^{+2.0}_{-0.5}$ (350^{+20}_{-5}, 4987^{+291}_{-73})	Value indicated on Dr. ZX	
Power Digging	$36.3^{+2.0}_{-1.0}$ (370^{+20}_{-10}, 5277^{+291}_{-145})	Value indicated on Dr. ZX	
RELIEF PRESSURE MPa (kgf/cm^2, psi) **(Relief operation of Swing)**	$33.3^{+2.3}_{-0.5}$ (340^{+23}_{-5}, 4841^{+334}_{-73})	Value indicated on Dr. ZX	T4-5-13
OVERLOAD RELIEF PRESSURE MPa (kgf/cm^2, psi)		(Reference values at 50 L/min)	T4-5-15
Boom Lower, Arm Roll-In, Bucket Roll-In	$37.2^{+1.0}_{-0}$ (379^{+10}_{-0}, 5408^{+145}_{-0})		
Boom Raise, Arm Roll-Out, Bucket Roll-Out	$39.2^{+1.0}_{-0}$ (400^{+10}_{-0}, 5699^{+145}_{-0})		
MAIN PUMP FLOW RATE (L/min)	-	Refer to pages T4-2-10, 11.	T4-5-18
SWING MOTOR DRAINAGE (L/min)			T4-5-26
With constant speed	0.2 to 0.3		
With the motor relieved	(2 to 5)		
TRAVEL MOTOR DRAINAGE (L/min)			T4-5-29
With the track jacked up	Less than 10	Allowable limit: 10	
With the motor relieved	Less than 15	Allowable limit: 15	

ZX225USR-3 CLASS OPERATIONAL PERFORMANCE STANDARD TABLE

The standard Performance values are listed in the table below. Refer to the Group T4-3 to T4-5 for performance test procedures. Values indicated in parentheses are reference values.

The following switch positions shall be selected and the hydraulic oil temperature shall be maintained as indicated below as the preconditions of performance tests unless otherwise instructed in each performance test procedure:

Engine Control Dial : Fast Idle
Power Mode Switch : P Mode
Auto-Idle Switch: OFF
Work Mode: Digging Mode
Hydraulic Oil Temperature : 50±5 °C (122±41 °F)

PERFORMANCE TEST DESIGNATION	ZX225USR-3 class (Performance Standard)	Remarks	Reference Page
ENGINE SPEED min^{-1}			T4-3-1
Slow Idle Speed	800±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (wirh ECO deactivated)	1800±50	↑	
Fast Idle Speed (Heater control: OFF)	1700±50	Lever in neutral, Pilot shut-off lever: UNLOCK position, Value indicated on Dr. ZX	
Fast Idle Speed (Heater control: ON)	2000±50	Pilot shut-off lever: LOCK position, Coolant temperature: 5 °C or lower, Value indicated on Dr. ZX	
Fast Idle Speed (Relief operation)	1800±50	Boom raise relief operation, Value indicated on Dr. ZX	
Fast Idle Speed (E mode)	1650±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (HP mode)	2000±50	Relief operation of boom rasie and arm roll-in, Value indicated on Dr. ZX.	
Auto-Idle Speed	1200±50	Value indicated on Dr. ZX.	
Warming-Up Speed	1400±100	↑	
ENGINE COMPRESSION PRESSURE MPa (kgf/cm^2, psi)	3.04±0.2 (31±2, 442±29)	Engine speed: 200min^{-1}	T4-3-3
VALVE CLEARANCE (IN, EX)	0.4	With the engine cold	T4-3-4
LUBRICANT CONSUMPTION (Rated output) mL/h	30 or less	Hour meter: 2000 hours or less	T4-3-7

PERFORMANCE TEST DESIGNATION	ZX225USR-3 class (Performance Standard)	Remarks	Reference Page
TRAVEL SPEED sec/10 m			T4-4-1
Fast Speed	6.6±0.6		
Slow Speed	(10.2±1.0)		
TRACK REVOLUTION SPEED sec/3 rev			T4-4-2
Fast Speed	17.2±1.0	LC: 18.3±2.0	
Slow Speed	26.7±2.0	LC: 28.4±2.0	
MISTRACK mm/20 m (With fast and slow travel speed modes)	200 or less		T4-4-3
TRAVEL MOTOR LEAKAGE mm/5 min	0		T4-4-4
SWING SPEED sec/3 rev	13.5±1.0	Bucket: empty	T4-4-5
SWING FUNCTION DRIFT CHECK mm /180°	1263 or less	Bucket: empty ZAXIS225USRK-3: 1377 or less	T4-4-6
SWING MOTOR LEAKAGE mm/5 min	0	Bucket: loaded	T4-4-8
MAXIMUM SWINGABLE SLANT ANGLE deg.	25° or more	Bucket: loaded	T4-4-10
SWING BEARING PLAY mm	0.2 to 1.0	Allowable limit: 2.0 to 3.0	T4-4-12
HYDRAULIC CYLINDER CYCLE TIME sec		2.91 m arm 0.8 m^3 (PCSA heaped) bucket, Bucket: empty	T4-4-14
Boom Raise	3.1±0.3	ZAXIS225USRK-3: 3.2±0.3	
Boom Lower	2.2±0.3		
Arm Roll-In	3.2±0.3		
Arm Roll-Out	2.5±0.3	ZAXIS225USRK-3: 2.6±0.3	
Bucket Roll-In	3.0±0.3		
Bucket Roll-Out	2.0±0.3	ZAXIS225USRK-3: 2.1±0.3	
DIG FUNCTION DRIFT CHECK mm/5 min		2.91 m arm 0.8 m^3 (PCSA heaped) bucket	T4-4-16
Boom Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 5 or less 5 or less	 Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 10 or less 10 or less	 Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 15 or less 7 or less	 Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In Position)	 100 or less 80 or less	 Bucket: loaded Bucket: empty	

PERFORMANCE TEST DESIGNATION	ZX225USR-3 class (Performance Standard)	Remarks	Reference Page
CONTROL LEVER OPERATING FORCE N (kgf, lbf)		HITACHI lever pattern	T4-4-18
Boom Lever	16 (1.6, 3.6) or less		
Arm Lever (ISO Lever Pattern: Swing Lever)	13 (1.3, 2.9) or less		
Bucket Lever	13 (1.3, 2.9) or less		
Swing Lever (ISO Lever Pattern: Arm Lever)	16 (1.6, 3.6) or less		
Travel Lever	28 (2.8, 6.3) or less		
CONTROL LEVER STROKE mm		HITACHI lever pattern	T4-4-20
Boom Lever	97±10		
Arm Lever (ISO Lever Pattern: Swing Lever)	82±10		
Bucket Lever	82±10		
Swing Lever (ISO Lever Pattern: Arm Lever)	97±10		
Travel Lever	120±10		
BOOM RAISE/SWING sec	3.6±0.4	2.91 m arm 0.8 m^3 (PCSA heaped) bucket, Bucket: empty	T4-4-22
(Bucket Teeth Height: H) mm	6700 or more	ZAXIS225USRK-3: 6200 or more	
BOOM RAISE/ARM ROLL-IN sec	4.3±0.5	2.91 m arm 0.8 m^3 (PCSA heaped) bucket	T4-4-24
HYDRAULIC SYSTEM			
PRIMARY PILOT PRESSURE MPa (kgf/cm^2, psi)			T4-5-1
Engine: Fast Idle	$4.0^{+1.0}_{-0.5}$ (41^{+10}_{-5}, 582^{+145}_{-73})		
Engine: Slow Idle	$3.8^{+1.0}_{-0.5}$ (39^{+10}_{-5}, 552^{+145}_{-73})		
SECONDARY PILOT PRESSURE MPa (kgf/cm^2, psi)			T4-5-3
(Engine: Fast Idle (normal) and Slow Idle)	3.4 to 4.0 (35 to 41, 494 to 582)	Value indicated on Dr. ZX (Lever: Full stroke)	
SOLENOID VALVE SET PRESSURE MPa (kgf/cm^2, psi)	Value Indicated On Dr. ZX±0.2 (2, 29)		T4-5-5
MAIN PUMP DELIVERY PRESSURE MPa (kgf/cm^2, psi)	$0.8^{+1.2}_{-0.5}$ (8.2^{+12}_{-5}, 116^{+174}_{-73})	In neutral, Value indicated on Dr. ZX	T4-5-8

PERFORMANCE TEST DESIGNATION	ZX225USR-3 class (Performance Standard)	Remarks	Reference Page
MAIN RELIEF VALVE PRESSURE MPa (kgf/cm^2, psi)			T4-5-9
Boom, Arm, Bucket (Relief operation for each)	$34.3^{+2.0}_{-0.5}$ (350^{+20}_{-5}, 4987^{+291}_{-73})	Value indicated on Dr. ZX	
Power Digging	$36.3^{+2.0}_{-1.0}$ (370^{+20}_{-10}, 5277^{+291}_{-145})	Value indicated on Dr. ZX	
RELIEF PRESSURE MPa (kgf/cm^2, psi) **(Relief operation of Swing)**	$33.3^{+2.3}_{-0.5}$ (340^{+23}_{-5}, 4841^{+334}_{-73})	Value indicated on Dr. ZX	T4-5-13
OVERLOAD RELIEF PRESSURE MPa (kgf/cm^2, psi)		(Reference values at 50 L/min)	T4-5-15
Boom Lower, Arm Roll-In, Bucket Roll-In	$37.2^{+1.0}_{-0}$ (379^{+10}_{-0}, 5408^{+145}_{-0})		
Boom Raise, Arm Roll-Out, Bucket Roll-Out	$39.2^{+1.0}_{-0}$ (400^{+10}_{-0}, 5699^{+145}_{-0})		
MAIN PUMP FLOW RATE (L/min)	-	Refer to pages T4-2-10, 11.	T4-5-18
SWING MOTOR DRAINAGE (L/min)			T4-5-26
With constant speed	0.2 to 0.3		
With the motor relieved	(2 to 5)		
TRAVEL MOTOR DRAINAGE (L/min)			T4-5-29
With the track jacked up	Less than 10	Allowable limit: 10	
With the motor relieved	Less than 15	Allowable limit: 15	

ZX240-3 CLASS OPERATIONAL PERFORMANCE STANDARD TABLE

The standard Performance values are listed in the table below. Refer to the Group T4-3 to T4-5 for performance test procedures. Values indicated in parentheses are reference values.

The following switch positions shall be selected and the hydraulic oil temperature shall be maintained as indicated below as the preconditions of performance tests unless otherwise instructed in each performance test procedure:

Engine Control Dial : Fast Idle
Power Mode Switch : P Mode
Auto-Idle Switch: OFF
Work Mode: Digging Mode
Hydraulic Oil Temperature : 50±5 °C (122±41 °F)

PERFORMANCE TEST DESIGNATION	ZX240-3 class (Performance Standard)	Remarks	Reference Page
ENGINE SPEED min^{-1}			T4-3-1
Slow Idle Speed	800±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (wirh ECO deactivated)	1900±50	↑	
Fast Idle Speed (Heater control: OFF)	1800±50	Lever in neutral, Pilot shut-off lever: UNLOCK position, Value indicated on Dr. ZX	
Fast Idle Speed (Heater control: ON)	2000±50	Pilot shut-off lever: LOCK position, Coolant temperature: 5 °C or lower, Value indicated on Dr. ZX	
Fast Idle Speed (Relief operation)	1900±50	Boom raise relief operation, Value indicated on Dr. ZX	
Fast Idle Speed (E mode)	1750±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (HP mode)	2000±50	Relief operation of boom rasie and arm roll-in, Value indicated on Dr. ZX.	
Auto-Idle Speed	1200±50	Value indicated on Dr. ZX.	
Warming-Up Speed	1400±100	↑	
ENGINE COMPRESSION PRESSURE MPa (kgf/cm^2, psi)	3.04±0.2 (31±2, 442±29)	Engine speed: 200min^{-1}	T4-3-3
VALVE CLEARANCE (IN, EX)	0.4	With the engine cold	T4-3-4
LUBRICANT CONSUMPTION (Rated output) mL/h	30 or less	Hour meter: 2000 hours or less	T4-3-7

PERFORMANCE TEST DESIGNATION	ZX240-3 class (Performance Standard)	Remarks	Reference Page
TRAVEL SPEED sec/10 m			T4-4-1
Fast Speed	6.6±0.6		
Slow Speed	(10.7±1.0)		
TRACK REVOLUTION SPEED sec/3 rev			T4-4-2
Fast Speed	17.6±2.0	LC: 19.1±2.0	
Slow Speed	28.6±2.0	LC: 31.0±2.0	
MISTRACK mm/20 m (With fast and slow travel speed modes)	200 or less		T4-4-3
TRAVEL MOTOR LEAKAGE mm/5 min	0		T4-4-4
SWING SPEED sec/3 rev	13.7±1.0	Bucket: empty	T4-4-5
SWING FUNCTION DRIFT CHECK mm /180°	1565 or less	Bucket: empty	T4-4-6
SWING MOTOR LEAKAGE mm/5 min	0	Bucket: loaded	T4-4-8
MAXIMUM SWINGABLE SLANT ANGLE deg.	21.5° or more	Bucket: loaded	T4-4-10
SWING BEARING PLAY mm	0.2 to 1.25	Allowable limit: 2.0 to 3.05	T4-4-12
HYDRAULIC CYLINDER CYCLE TIME (Mono Boom) sec		2.96 m arm 1.0 m^3 (PCSA heaped) bucket, Bucket: empty	T4-4-14
Boom Raise	3.5±0.3		
Boom Lower	2.3±0.3		
Arm Roll-In	3.5±0.3		
Arm Roll-Out	2.7±0.3		
Bucket Roll-In	3.4±0.3		
Bucket Roll-Out	2.4±0.3		
HYDRAULIC CYLINDER CYCLE TIME (2-Piece Boom) sec		2.96 m arm 1.0 m^3 (PCSA heaped) bucket, Bucket: empty	T4-4-14
Boom Raise	4.6±0.3		
Boom Lower	3.7±0.3		
Arm Roll-In	3.7±0.3		
Arm Roll-Out	2.7±0.3		
Bucket Roll-In	3.4±0.3		
Bucket Roll-Out	2.4±0.3		
Positioning Lower (without HRV) (with HRV)	5.9±0.3 6.3±0.3	HRV: Hose Rupture Valve	
Positioning Raise	4.1±0.3		

PERFORMANCE TEST DESIGNATION	ZX240-3 class (Performance Standard)	Remarks	Reference Page
DIG FUNCTION DRIFT CHECK (Mono Boom) mm/5 min		2.96 m arm 1.0 m^3 (PCSA heaped) bucket	T4-4-16
Boom Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 20 or less 5 or less	 Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 30 or less 15 or less	 Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 20 or less 10 or less	 Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In Position)	 150 or less 110 or less	 Bucket: loaded Bucket: empty	
DIG FUNCTION DRIFT CHECK (2-Piece Boom) mm/5 min		2.96 m arm 1.0 m^3 (PCSA heaped) bucket	T4-4-16
Boom Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 20 or less 5 or less	 Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 30 or less 15 or less	 Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 20 or less 10 or less	 Bucket: loaded Bucket: empty	
Positioning Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 40 or less 30 or less	 Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In Position)	 200 or less 150 or less	 Bucket: loaded Bucket: empty	

PERFORMANCE TEST DESIGNATION	ZX240-3 class (Performance Standard)	Remarks	Reference Page
CONTROL LEVER OPERATING FORCE N (kgf, lbf)		HITACHI lever pattern	T4-4-18
Boom Lever	16 (1.6, 3.6) or less		
Arm Lever (ISO Lever Pattern: Swing Lever)	13 (1.3, 2.9) or less		
Bucket Lever	13 (1.3, 2.9) or less		
Swing Lever (ISO Lever Pattern: Arm Lever)	16 (1.6, 3.6) or less		
Travel Lever	28 (2.8, 6.3) or less		
CONTROL LEVER STROKE mm		HITACHI lever pattern	T4-4-20
Boom Lever	97±10		
Arm Lever (ISO Lever Pattern: Swing Lever)	82±10		
Bucket Lever	82±10		
Swing Lever (ISO Lever Pattern: Arm Lever)	97±10		
Travel Lever	120±10		
BOOM RAISE/SWING sec	3.8±0.4	2.96 m arm 1.0 m^3 (PCSA heaped) bucket, Bucket: empty	T4-4-22
(Bucket Teeth Height: H) mm	6700 or more		
BOOM RAISE/ARM ROLL-IN sec	(4.0±0.5)	2.96 m arm 1.0 m^3 (PCSA heaped) bucket	T4-4-24
HYDRAULIC SYSTEM			
PRIMARY PILOT PRESSURE MPa (kgf/cm^2, psi)			T4-5-1
Engine: Fast Idle	$4.0^{+1.0}_{-0.5}$ (41^{+10}_{-5}, 582^{+145}_{-73})		
Engine: Slow Idle	$3.8^{+1.0}_{-0}$ (39^{+10}_{-0}, 552^{+145}_{-0})		
SECONDARY PILOT PRESSURE MPa (kgf/cm^2, psi)			T4-5-3
(Engine: Fast Idle (normal) and Slow Idle)	3.4 to 4.0 (35 to 41, 494 to 582)	Value indicated on Dr. ZX (Lever: Full stroke)	
SOLENOID VALVE SET PRESSURE MPa (kgf/cm^2, psi)	Value Indicated On Dr. ZX±0.2 (2, 29)		T4-5-5
MAIN PUMP DELIVERY PRESSURE MPa (kgf/cm^2, psi)	$0.8^{+1.2}_{-0.5}$ (8^{+12}_{-5}, 116^{+175}_{-73})	In neutral, Value indicated on Dr. ZX	T4-5-8

PERFORMANCE TEST DESIGNATION	ZX240-3 class (Performance Standard)	Remarks	Reference Page
MAIN RELIEF VALVE PRESSURE MPa (kgf/cm^2, psi)			T4-5-9
Boom, Arm, Bucket (Relief operation for each)	$34.3^{+2.0}_{-0.5}$ (350^{+20}_{-5}, 4987^{+291}_{-73})	Value indicated on Dr. ZX	
Relief operation of Positioning (2-piece boom only)	$35.5^{+2.0}_{-0.5}$ (362^{+20}_{-5}, 5161^{+291}_{-73})	Value indicated on Dr. ZX	
Power Digging	$36.3^{+2.0}_{-1.0}$ (370^{+20}_{-10}, 5277^{+291}_{-145})	Value indicated on Dr. ZX	
RELIEF PRESSURE MPa (kgf/cm^2, psi) **(Relief operation of Swing)**	$33.3^{+2.3}_{-0.5}$ (340^{+23}_{-5}, 4841^{+334}_{-73})	Value indicated on Dr. ZX	T4-5-13
OVERLOAD RELIEF PRESSURE MPa (kgf/cm^2, psi)		(Reference values at 50 L/min)	T4-5-15
Boom Lower, Arm Roll-In, Bucket Roll-In	$37.2^{+1.0}_{-0}$ (379^{+10}_{-0}, 5408^{+145}_{-0})		
Boom Raise, Arm Roll-Out, Bucket Roll-Out	$39.2^{+1.0}_{-0}$ (400^{+10}_{-0}, 5699^{+145}_{-0})		
MAIN PUMP FLOW RATE (L/min)	-	Refer to pages T4-2-10, 11.	T4-5-18
SWING MOTOR DRAINAGE (L/min)			T4-5-26
With constant speed	0.2 to 0.5		
With the motor relieved	(2 to 5)		
TRAVEL MOTOR DRAINAGE (L/min)			T4-5-29
With the track jacked up	Less than 10	Allowable limit: 10	
With the motor relieved	Less than 15	Allowable limit: 15	

ZX270-3 CLASS OPERATIONAL PERFORMANCE STANDARD TABLE

The standard Performance values are listed in the table below. Refer to the Group T4-3 to T4-5 for performance test procedures. Values indicated in parentheses are reference values.

The following switch positions shall be selected and the hydraulic oil temperature shall be maintained as indicated below as the preconditions of performance tests unless otherwise instructed in each performance test procedure:

Engine Control Dial : Fast Idle
Power Mode Switch : P Mode
Auto-Idle Switch: OFF
Work Mode: Digging Mode
Hydraulic Oil Temperature : 50±5 °C (122±41 °F)

PERFORMANCE TEST DESIGNATION	ZX270-3 class (Performance Standard)	Remarks	Reference Page
ENGINE SPEED min^{-1}			T4-3-1
Slow Idle Speed	800±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (wirh ECO deactivated)	2000±50	↑	
Fast Idle Speed (Heater control: OFF)	1900±50	Lever in neutral, Pilot shut-off lever: UNLOCK position, Value indicated on Dr. ZX	
Fast Idle Speed (Heater control: ON)	2000±50	Pilot shut-off lever: LOCK position, Coolant temperature: 5 °C or lower, Value indicated on Dr. ZX	
Fast Idle Speed (Relief operation)	2000±50	Boom raise relief operation, Value indicated on Dr. ZX	
Fast Idle Speed (E mode)	1850±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (HP mode)	2100±50	Relief operation of boom rasie and arm roll-in, Value indicated on Dr. ZX.	
Auto-Idle Speed	1200±50	Value indicated on Dr. ZX.	
Warming-Up Speed	1400±100	↑	
ENGINE COMPRESSION PRESSURE MPa (kgf/cm^2, psi)	3.04±0.2 (31±2, 442±29)	Engine speed: 200min^{-1}	T4-3-3
VALVE CLEARANCE (IN, EX)	0.4	With the engine cold	T4-3-4
LUBRICANT CONSUMPTION (Rated output) mL/h	25 or less	Hour meter: 2000 hours or less	T4-3-7

PERFORMANCE TEST DESIGNATION	ZX270-3 class (Performance Standard)	Remarks	Reference Page
TRAVEL SPEED sec/10 m			T4-4-1
Fast Speed	6.6±0.6		
Slow Speed	(11.0±1.0)		
TRACK REVOLUTION SPEED sec/3 rev			T4-4-2
Fast Speed	32.1±2.0	LC: 34.2±2.0	
Slow Speed	32.1±2.0	LC: 34.2±2.0	
MISTRACK mm/20 m (With fast and slow travel speed modes)	200 or less		T4-4-3
TRAVEL MOTOR LEAKAGE mm/5 min	0		T4-4-4
SWING SPEED sec/3 rev	14.3±1.0	Bucket: empty	T4-4-5
SWING FUNCTION DRIFT CHECK mm /180°	1610 or less	Bucket: empty	T4-4-6
SWING MOTOR LEAKAGE mm/5 min	0	Bucket: loaded	T4-4-8
MAXIMUM SWINGABLE SLANT ANGLE deg.	20° or more	Bucket: loaded	T4-4-10
SWING BEARING PLAY mm	0.2 to 1.25	Allowable limit: 2.0 to 3.05	T4-4-12
HYDRAULIC CYLINDER CYCLE TIME (Mono Boom) sec		3.11 m arm 1.1 m^3 (PCSA heaped) bucket, Bucket: empty	T4-4-14
Boom Raise	3.5±0.3		
Boom Lower (without HRV) (with HRV)	2.3±0.3 2.5±0.3	HRV: Hose Rupture Valve	
Arm Roll-In	3.6±0.3		
Arm Roll-Out	2.9±0.3		
Bucket Roll-In	3.1±0.3		
Bucket Roll-Out	2.5±0.3		
HYDRAULIC CYLINDER CYCLE TIME (2-Piece Boom) sec		3.11 m arm 1.1 m^3 (PCSA heaped) bucket, Bucket: empty	T4-4-14
Boom Raise	4.3±0.3		
Boom Lower (without HRV) (with HRV)	3.4±0.3 3.7±0.3	HRV: Hose Rupture Valve	
Arm Roll-In	3.8±0.3		
Arm Roll-Out	2.9±0.3		
Bucket Roll-In	3.1±0.3		
Bucket Roll-Out	2.5±0.3		
Positioning Lower (without HRV) (with HRV)	5.3±0.3 5.7±0.3	HRV: Hose Rupture Valve	
Positioning Raise	4.0±0.3		

PERFORMANCE TEST DESIGNATION	ZX270-3 class (Performance Standard)	Remarks	Reference Page
DIG FUNCTION DRIFT CHECK (Mono Boom) mm/5 min		3.11 m arm 1.1 m^3 (PCSA heaped) bucket	T4-4-16
Boom Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 20 or less 5 or less	 Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 30 or less 15 or less	 Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 20 or less 10 or less	 Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In Position)	 150 or less 110 or less	 Bucket: loaded Bucket: empty	
DIG FUNCTION DRIFT CHECK (2-Piece Boom) mm/5 min		3.11 m arm 1.1 m^3 (PCSA heaped) bucket	T4-4-16
Boom Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 20 or less 5 or less	 Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 30 or less 15 or less	 Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 20 or less 10 or less	 Bucket: loaded Bucket: empty	
Positioning Cylinder (Maximum Reach Position) (Arm Roll-In Position)	 40 or less 30 or less	 Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In Position)	 200 or less 150 or less	 Bucket: loaded Bucket: empty	

PERFORMANCE TEST DESIGNATION	ZX270-3 class (Performance Standard)	Remarks	Reference Page
CONTROL LEVER OPERATING FORCE N (kgf, lbf)		HITACHI lever pattern	T4-4-18
Boom Lever	16 (1.6, 3.6) or less		
Arm Lever (ISO Lever Pattern: Swing Lever)	13 (1.3, 2.9) or less		
Bucket Lever	13 (1.3, 2.9) or less		
Swing Lever (ISO Lever Pattern: Arm Lever)	16 (1.6, 3.6) or less		
Travel Lever	28 (2.8, 6.3) or less		
CONTROL LEVER STROKE mm		HITACHI lever pattern	T4-4-20
Boom Lever	97±10		
Arm Lever (ISO Lever Pattern: Swing Lever)	82±10		
Bucket Lever	82±10		
Swing Lever (ISO Lever Pattern: Arm Lever)	97±10		
Travel Lever	120±10		
BOOM RAISE/SWING sec	3.9±0.4	3.11 m arm 1.1 m^3 (PCSA heaped) bucket, Bucket: empty	T4-4-22
Bucket Teeth Height: H (Mono Boom) mm (2-Piece Boom)	6700 or more 5800 or more		
BOOM RAISE/ARM ROLL-IN sec	(5.5±0.5)	3.11 m arm 1.1 m^3 (PCSA heaped) bucket	T4-4-24
HYDRAULIC SYSTEM			
PRIMARY PILOT PRESSURE MPa (kgf/cm^2, psi)			T4-5-1
Engine: Fast Idle	$4.0^{+1.0}_{-0.5}$ (41^{+10}_{-5}, 582^{+145}_{-73})	Value indicated on Dr. ZX	
Engine: Slow Idle	$3.8^{+1.0}_{-0}$ (39^{+10}_{-0}, 552^{+145}_{-0})	Value indicated on Dr. ZX	
SECONDARY PILOT PRESSURE MPa (kgf/cm^2, psi)			T4-5-3
(Engine: Fast Idle (noraml) and Slow Idle)	3.4 to 4.0 (35 to 41, 494 to 582)	Value indicated on Dr. ZX (Lever: Full stroke)	
SOLENOID VALVE SET PRESSURE MPa (kgf/cm^2, psi)	Value Indicated On Dr. ZX±0.2 (2, 29)		T4-5-5
MAIN PUMP DELIVERY PRESSURE MPa (kgf/cm^2, psi)	$0.8^{+1.2}_{-0.5}$ (8.1^{+12}_{-5}, 116^{+174}_{-73})	In neutral, Value indicated on Dr. ZX	T4-5-8

NOTE: 1 mm=0.03937 in

PERFORMANCE TEST DESIGNATION	ZX270-3 class (Performance Standard)	Remarks	Reference Page
MAIN RELIEF VALVE PRESSURE MPa (kgf/cm^2, psi)			T4-5-9
Boom, Arm, Bucket (Relief operation for each)	$34.3^{+2.0}_{-0.5}$ (350^{+20}_{-5}, 4987^{+291}_{-73})	Value indicated on Dr. ZX	
Relief operation of Positioning (2-piece boom only)	$35.5^{+2.0}_{-0.5}$ (362^{+20}_{-5}, 5161^{+291}_{-73})	Value indicated on Dr. ZX	
Power Digging	$36.3^{+2.0}_{-1.0}$ (370^{+20}_{-10}, 5277^{+291}_{-145})	Value indicated on Dr. ZX	
RELIEF PRESSURE MPa (kgf/cm^2, psi) **(Relief operation of Swing)**	$33.3^{+2.3}_{-0.5}$ (340^{+23}_{-5}, 4841^{+334}_{-73})	Value indicated on Dr. ZX	T4-5-13
OVERLOAD RELIEF PRESSURE MPa (kgf/cm^2, psi)		(Reference values at 50 L/min)	T4-5-15
Boom Lower, Arm Roll-In, Bucket Roll-In	$37.2^{+1.0}_{-0}$ (379^{+10}_{-0}, 5408^{+145}_{-0})		
Boom Raise, Arm Roll-Out, Bucket Roll-Out	$39.2^{+1.0}_{-0}$ (400^{+10}_{-0}, 5699^{+145}_{-0})		
MAIN PUMP FLOW RATE (L/min)	-	Refer to pages T4-2-10, 11.	T4-5-18
SWING MOTOR DRAINAGE (L/min)			T4-5-26
With constant speed	0.2 to 0.6		
With the motor relieved	(5 to 12)		
TRAVEL MOTOR DRAINAGE (L/min)			T4-5-29
With the track jacked up	Less than 10	Allowable limit: 10	
With the motor relieved	Less than 15	Allowable limit: 15	

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MAIN PUMP P-Q DIAGRAM

- P-Q Control (Torque Control)

(REFERENCE: Measured at Test Stand)

- Rated Pump Speed:
  ZAXIS 200-3: 1800 min^{-1} (rpm)
  ZAXIS 225US-3: 1800 min^{-1} (rpm)
  ZAXIS 225USR-3: 1800 min^{-1} (rpm)
  ZAXIS 240-3: 1900 min^{-1} (rpm)
  ZAXIS 270-3: 2000 min^{-1} (rpm)
- Hydraulic Oil Temperature: 50±5 °C (122±41 °F)

NOTE: Refer to T4-5-18.

- ZAXIS 240-3 Points on P-Q Line

	Delivery Pressure MPa (kgf/cm^2, psi)	Flow Rate L/min (gpm)
A	3.9 (40, 567)	224±3 (59±0.8)
B	15.7 (160, 2282)	[222] ([59])
C	17.6 (180, 2559)	200±6 (53±1.6)
D	21.0 (214, 3053)	[164] ([43])
E	26.5 (270, 3853)	133±6 (35±1.6)
F	34.3 (350, 4987)	94±10 (25±2.6)

The valve indicated in parentheses is only a reference valve.

- ZAXIS 200-3, 225US-3, 225USR-3 Points on P-Q Line

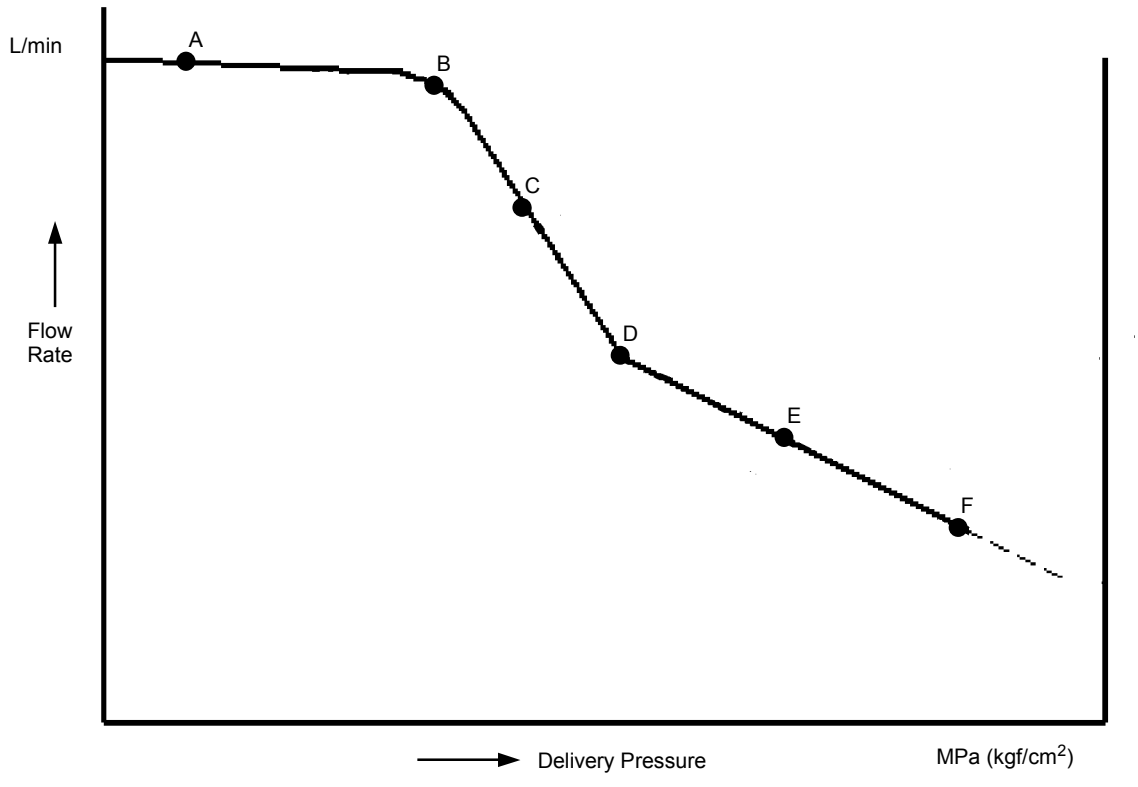
	Delivery Pressure MPa (kgf/cm^2, psi)	Flow Rate L/min (gpm)
A	3.9 (40, 567)	212±3 (56±0.8)
B	14.7 (150, 2137)	[210] ([55])
C	17.2 (175, 2500)	187±6 (49±1.6)
D	20.6 (210, 2995)	[150] ([40])
E	27.4 (279, 3983)	115±6 (30±1.6)
F	34.3 (350, 4987)	86±6 (23±1.6)

The value indicated in parentheses is only a reference value.

- ZAXIS 270-3 Points on P-Q Line

	Delivery Pressure MPa (kgf/cm^2, psi)	Flow Rate L/min (gpm)
A	3.9 (40, 567)	236±3 (62±0.8)
B	15.7 (160, 2282)	[234] ([62])
C	18.1 (185, 2631)	204±6 (54±1.6)
D	21.6 (220, 3140)	[165] ([44])
E	28.4 (290, 4129)	129±6 (34±1.6)
F	34.3 (350, 4987)	100±10 (26±2.6)

The valve indicated in parentheses is only a reference valve.



T178-04-05-001

- P-Q Control by Pump Control Pilot Pressure Signal

(REFERENCE: Measured at Test Stand)

- Rated Pump Speed:
  ZAXIS 200-3: 1800 min^{-1} (rpm)
  ZAXIS 225US-3: 1800 min^{-1} (rpm)
  ZAXIS 225USR-3: 1800 min^{-1} (rpm)
  ZAXIS 240-3: 1900 min^{-1} (rpm)
  ZAXIS 270-3: 2000 min^{-1} (rpm)
- Hydraulic Oil Temperature: 50±5 °C (122±41 °F)

NOTE: Refer to T4-5-20.

- ZAXIS 200-3, 225US-3, 225USR-3 Points on P-Q Line

	Pump Control Pressure MPa (kgf/cm^2, psi)	Flow Rate L/min (gpm)
A	1.7±0.05 (17±0.5, 247±7)	64±2 (17±0.5)
B	2.0 (20, 291)	[94] ([25])
C	$2.9^{+0.05}_{-0.29}$ ($30^{+0.5}_{-3}$, 421^{+7}_{-42})	212±3 (56±0.8)

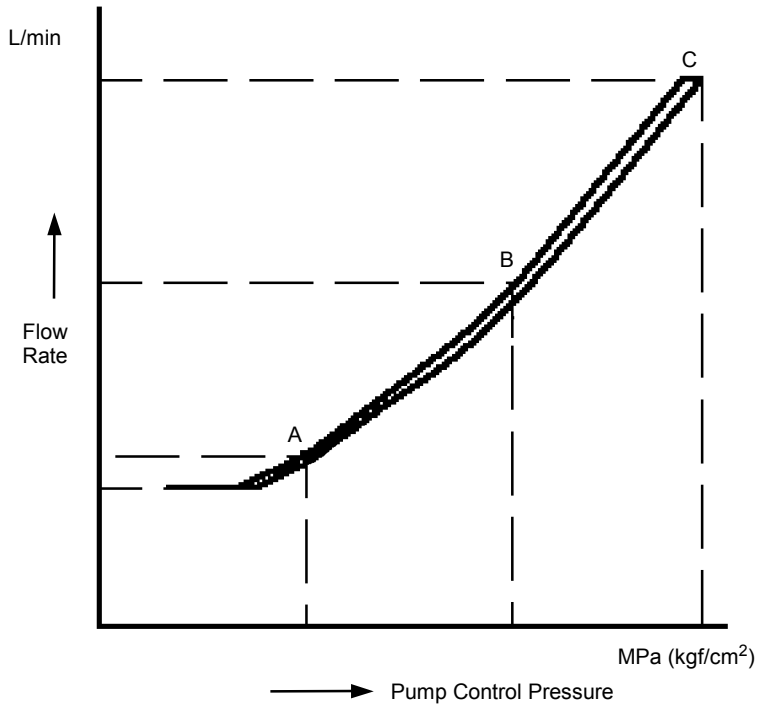
The value indicated in parentheses is only a reference value.

- ZAXIS 230-3 Points on P-Q Line

	Pump Control Pressure MPa (kgf/cm^2, psi)	Flow Rate L/min (gpm)
A	1.8±0.05 (18.4±0.5, 261±7)	84±2 (22±0.5)
B	2.0 (20, 291)	[100] ([26])
C	$2.9^{+0.05}_{-0.29}$ ($30^{+0.5}_{-3}$, 421^{+7}_{-42})	224±3 (59±0.8)

- ZAXIS 270-3 Points on P-Q Line

	Pump Control Pressure MPa (kgf/cm^2, psi)	Flow Rate L/min (gpm)
A	1.8±0.05 (18.4±0.5, 261±7)	100±2 (26±0.5)
B	2.0 (20, 291)	[118] ([31])
C	$2.9^{+0.05}_{-0.29}$ ($30^{+0.5}_{-3}$, 421^{+7}_{-42})	236±3 (62±0.8)



T178-04-05-002

SENSOR ACTIVATING RANGE

1. Checking Method

- Hydraulic Oil Temperature: 50 ± 5 °C (122±41 °F)
- Unless specified:

Engine Control Dial	Power Mode Switch	Work Mode	Auto-Idle Switch
Fast Idle	P Mode	Digging Mode	OFF

- Monitor each sensor by using Dr. ZX.

2. Sensor Activating Range

Sensor	Operation	Specification
Engine Control Dial	Fast Idle	0.3 to 1.0 V
	Slow Idle	4.0 to 4.7 V
Pressure Sensor	Control Lever: Neutral Pilot Shut-Off Lever: LOCK	0 to 0.1 MPa (0 to 1.0 kgf/cm^2, 0 to 14.5 psi)
	Control Lever: Full Stroke Pilot Shut-Off Lever: UNLOCK	3.3 to 3.9 MPa (34 to 40 kgf/cm^2, 480 to 566 psi)
Pump Control Pressure Sensor	Control Lever: Neutral	0 to 1 MPa (0 to 10 kgf/cm^2, 0 to 145 psi)
	Control Lever: Full Stroke	2.9 to 3.9 MPa (30 to 40 kgf/cm^2, 421 to 566 psi)

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ZX200-3 CLASS DR. ZX MONITOR INDICATING VALUES

Unless specified, test under the following conditions.
Engine Speed: Fast Idle
Work Mode: Digging Mode
Power Mode Switch: P mode
Auto-Idle: OFF

NOTE: Items marked (*) are measurable by using service menu/monitoring in the monitor unit.

Items marked (**) are measurable by using service menu/monitoring in the monitor unit. However, it may be difficult to read the measured value while operating the machine.

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
PUMP 1 PRESSURE (MPa)						
Control Lever in Neutral*	0.7					
Boom Raise*	37.1					When relieving
Boom Lower*	-					
Arm Roll-in*	35.6					When relieving
Arm Roll-Out*	35.4					When relieving
Bucket Roll-Out*	359					When relieving
Bucket Roll-In*	35.9					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	34.7					When relieving
PUMP 2 PRESSURE (MPa)						
Control Lever in Neutral*	0.7					
Boom Raise*	37.5					When relieving
Boom Lower*	-					
Arm Roll-in*	35.1					When relieving
Arm Roll-Out*	35.1					When relieving
Bucket Roll-Out*	0.7					When relieving
Bucket Roll-In*	0.7					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	35.1					When relieving

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
PUMP 1 PUMP CONTROL PRESSURE (MPa)						
Control Lever in Neutral*	1.02					
Boom Raise*	3.53					When relieving
Boom Lower*	-					
Arm Roll-in*	3.56					When relieving
Arm Roll-Out*	3.60					When relieving
Bucket Roll-Out*	3.84					When relieving
Bucket Roll-In*	3.82					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	3.53					When relieving
PUMP 2 PUMP CONTROL PRESSURE (MPa)						
Control Lever in Neutral*	1.05					
Boom Raise*	3.41					When relieving
Boom Lower*	-					
Arm Roll-in*	3.36					When relieving
Arm Roll-Out*	3.41					When relieving
Bucket Roll-Out*	1.05					When relieving
Bucket Roll-In*	1.05					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	3.36					When relieving

OPERATIONAL PERFORMANCE TEST / Standard

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
TARGET ENGINE SPEED (min^{-1})						
Fast Idle*	1700					
Fast Idle (When operating a control lever)*	1800					When relieving boom raise
Fast Idle (HP Mode)*	2000					When relieving boom raise
Fast Idle (E Mode)*	1650					When relieving boom raise
Auto-Idle*	1200					
Slow Idle*	800					
ACTUAL ENGINE SPEED (min^{-1})						
Fast Idle*	1704					
Fast Idle (When operating a control lever)*	1804					When relieving boom raise
Fast Idle (HP Mode)*	2001					When relieving boom raise
Fast Idle (E Mode)*	1652					When relieving boom raise
Auto-Idle*	1202					
Slow Idle*	806					
ENGINE SPEED DEVIATION (min^{-1})						
Fast Idle*	4					
Fast Idle (When operating a control lever)*	4					When relieving boom raise
Fast Idle (HP Mode)*	1					When relieving boom raise
Fast Idle (E Mode)*	2					When relieving boom raise
Auto-Idle*	2					
Slow Idle*	6					
DIAL ANGLE (Volt)						
Minimum*	0.56					
Maximum*	4.41					

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
BOOM RAISE PILOT CONTROL PRESSURE* (MPa)	4.08					When relieving boom raise
ARM ROLL-IN PILOT CONTROL PRESSURE* (MPa)	4.03					When relieving arm roll-in
SWING PILOT CONTROL PRESSURE* (MPa)	4.03					When relieving swing
TRAVEL PILOT CONTROL PRESSURE* (MPa)	4.01					
FRONT ATTACHMENT CONTROL PRESSURE* (MPa)	4.01					Operate either of boom, arm, bucket or swing
DIGGING REGENERATIVE PROPORTIONAL VALVE OUTPUT (MPa)	3.19					When relieving arm roll-in
PUMP TORQUE PROPOR-TIONAL VALVE OUTPUT (MPa)	0.33					Engine fast idle + when relieving arm roll-in
PUMP 1 LOAD RATE	69					When relieving arm roll-in
PUMP 2 LOAD RATE	70					When relieving arm roll-in
ARM REGENERATIVE PRO-PORTIONAL VALVE OUTPUT* (MPa)	2.74					Arm leveling
POWER DIGGING CONTROL PRESSURE* (MPa)						
During operation	2.99					
When relieving boom raise	2.99					
TRAVEL MOTOR CONTROL PRESSURE* (MPa)	2.99					Travel mode switch: Fast, When travel-ing
PUMP TORQUE PROPOR-TIONAL VALVE OUTPUT FB (mA)	537					When relieving arm roll-in
DIGGING REGENERATIVE PROPORTIONAL VALVE OUTPUT FB (mA)	515					When relieving arm roll-in
ARM REGENERATIVE PRO-PORTIONAL VALVE OUTPUT FB (mA)	470					Arm leveling
POWER DIGGIN CONTROL PRESSURE FB (mA)	272					
TRAVEL MODE CONTROL PRESSURE FB (mA)	507					Travel mode switch: Fast, When travel-ing

ECM

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
Engine Torque (%) *						
No load	10					
When relieving arm roll-in	0					
Actual Engine Speed (min^{-1}) *						
No load	1700					
When relieving arm roll-in	1800					
Target Engine Speed (min^{-1}) *						
No load	1700					
When relieving arm roll-in	1800					
Engine Oil Pressure (kPa) *						
No load	640					
When relieving arm roll-in	640					
Fuel Rate (L/h)						
No load	4.5					
When relieving arm roll-in	4.5					
Atmospheric Pressure (kPa) *	101					
Boost Pressure (kPa) *						
No load	114					
When relieving arm roll-in	190					
Battery Voltage (V)	29					

(Blank)

ZX225US-3 CLASS DR. ZX MONITOR INDICATING VALUES

Unless specified, test under the following conditions.
Engine Speed: Fast Idle
Work Mode: Digging Mode
Power Mode Switch: P mode
Auto-Idle: OFF

NOTE: Items marked (*) are measurable by using service menu/monitoring in the monitor unit.

Items marked (**) are measurable by using service menu/monitoring in the monitor unit. However, it may be difficult to read the measured value while operating the machine.

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
PUMP 1 PRESSURE (MPa)						
Control Lever in Neutral*	0.7					
Boom Raise*	37.1					When relieving
Boom Lower*	-					
Arm Roll-in*	35.6					When relieving
Arm Roll-Out*	35.4					When relieving
Bucket Roll-Out*	359					When relieving
Bucket Roll-In*	35.9					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	34.7					When relieving
PUMP 2 PRESSURE (MPa)						
Control Lever in Neutral*	0.7					
Boom Raise*	37.5					When relieving
Boom Lower*	-					
Arm Roll-in*	35.1					When relieving
Arm Roll-Out*	35.1					When relieving
Bucket Roll-Out*	0.7					When relieving
Bucket Roll-In*	0.7					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	35.1					When relieving

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
PUMP 1 PUMP CONTROL PRESSURE (MPa)						
Control Lever in Neutral*	1.02					
Boom Raise*	3.53					When relieving
Boom Lower*	-					
Arm Roll-in*	3.56					When relieving
Arm Roll-Out*	3.60					When relieving
Bucket Roll-Out*	3.84					When relieving
Bucket Roll-In*	3.82					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	3.53					When relieving
PUMP 2 PUMP CONTROL PRESSURE (MPa)						
Control Lever in Neutral*	1.05					
Boom Raise*	3.41					When relieving
Boom Lower*	-					
Arm Roll-in*	3.36					When relieving
Arm Roll-Out*	3.41					When relieving
Bucket Roll-Out*	1.05					When relieving
Bucket Roll-In*	1.05					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	3.36					When relieving

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
TARGET ENGINE SPEED (min^{-1})						
Fast Idle*	1700					
Fast Idle (When operating a control lever)*	1800					When relieving boom raise
Fast Idle (HP Mode)*	2000					When relieving boom raise
Fast Idle (E Mode)*	1650					When relieving boom raise
Auto-Idle*	1200					
Slow Idle*	800					
ACTUAL ENGINE SPEED (min^{-1})						
Fast Idle*	1704					
Fast Idle (When operating a control lever)*	1804					When relieving boom raise
Fast Idle (HP Mode)*	2001					When relieving boom raise
Fast Idle (E Mode)*	1652					When relieving boom raise
Auto-Idle*	1202					
Slow Idle*	806					
ENGINE SPEED DEVIATION (min^{-1})						
Fast Idle*	4					
Fast Idle (When operating a control lever)*	4					When relieving boom raise
Fast Idle (HP Mode)*	1					When relieving boom raise
Fast Idle (E Mode)*	2					When relieving boom raise
Auto-Idle*	2					
Slow Idle*	6					
DIAL ANGLE (Volt)						
Minimum*	0.56					
Maximum*	4.41					

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
BOOM RAISE PILOT CONTROL PRESSURE* (MPa)	4.08					When relieving boom raise
ARM ROLL-IN PILOT CONTROL PRESSURE* (MPa)	4.03					When relieving arm roll-in
SWING PILOT CONTROL PRESSURE* (MPa)	4.03					When relieving swing
TRAVEL PILOT CONTROL PRESSURE* (MPa)	4.01					
FRONT ATTACHMENT CONTROL PRESSURE* (MPa)	4.01					Operate either of boom, arm, bucket or swing
DIGGING REGENERATIVE PROPORTIONAL VALVE OUTPUT (MPa)	3.19					When relieving arm roll-in
PUMP TORQUE PROPOR-TIONAL VALVE OUTPUT (MPa)	0.33					Engine fast idle + when relieving arm roll-in
PUMP 1 LOAD RATE	69					When relieving arm roll-in
PUMP 2 LOAD RATE	70					When relieving arm roll-in
ARM REGENERATIVE PRO-PORTIONAL VALVE OUTPUT* (MPa)	2.74					Arm leveling
POWER DIGGING CONTROL PRESSURE* (MPa)						
During operation	2.99					
When relieving boom raise	2.99					
TRAVEL MOTOR CONTROL PRESSURE* (MPa)	2.99					Travel mode switch: Fast, When travel-ing
PUMP TORQUE PROPOR-TIONAL VALVE OUTPUT FB (mA)	537					When relieving arm roll-in
DIGGING REGENERATIVE PROPORTIONAL VALVE OUTPUT FB (mA)	515					When relieving arm roll-in
ARM REGENERATIVE PRO-PORTIONAL VALVE OUTPUT FB (mA)	470					Arm leveling
POWER DIGGIN CONTROL PRESSURE FB (mA)	272					
TRAVEL MODE CONTROL PRESSURE FB (mA)	507					Travel mode switch: Fast, When travel-ing

ECM

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
Engine Torque (%) *						
No load	10					
When relieving arm roll-in	0					
Actual Engine Speed (min^{-1}) *						
No load	1700					
When relieving arm roll-in	1800					
Target Engine Speed (min^{-1}) *						
No load	1700					
When relieving arm roll-in	1800					
Engine Oil Pressure (kPa) *						
No load	640					
When relieving arm roll-in	640					
Fuel Rate (L/h)						
No load	4.5					
When relieving arm roll-in	4.5					
Atmospheric Pressure (kPa) *	101					
Boost Pressure (kPa) *						
No load	114					
When relieving arm roll-in	190					
Battery Voltage (V)	29					

(Blank)

ZX225USR-3 CLASS DR. ZX MONITOR INDICATING VALUES

Unless specified, test under the following conditions.
Engine Speed: Fast Idle
Work Mode: Digging Mode
Power Mode Switch: P mode
Auto-Idle: OFF

NOTE: Items marked (*) are measurable by using service menu/monitoring in the monitor unit.

Items marked (**) are measurable by using service menu/monitoring in the monitor unit. However, it may be difficult to read the measured value while operating the machine.

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
PUMP 1 PRESSURE (MPa)						
Control Lever in Neutral*	0.7					
Boom Raise*	37.1					When relieving
Boom Lower*	-					
Arm Roll-in*	35.6					When relieving
Arm Roll-Out*	35.4					When relieving
Bucket Roll-Out*	359					When relieving
Bucket Roll-In*	35.9					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	34.7					When relieving
PUMP 2 PRESSURE (MPa)						
Control Lever in Neutral*	0.7					
Boom Raise*	37.5					When relieving
Boom Lower*	-					
Arm Roll-in*	35.1					When relieving
Arm Roll-Out*	35.1					When relieving
Bucket Roll-Out*	0.7					When relieving
Bucket Roll-In*	0.7					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	35.1					When relieving

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
PUMP 1 PUMP CONTROL PRESSURE (MPa)						
Control Lever in Neutral*	1.02					
Boom Raise*	3.53					When relieving
Boom Lower*	-					
Arm Roll-in*	3.56					When relieving
Arm Roll-Out*	3.60					When relieving
Bucket Roll-Out*	3.84					When relieving
Bucket Roll-In*	3.82					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	3.53					When relieving
PUMP 2 PUMP CONTROL PRESSURE (MPa)						
Control Lever in Neutral*	1.05					
Boom Raise*	3.41					When relieving
Boom Lower*	-					
Arm Roll-in*	3.36					When relieving
Arm Roll-Out*	3.41					When relieving
Bucket Roll-Out*	1.05					When relieving
Bucket Roll-In*	1.05					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	3.36					When relieving

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
TARGET ENGINE SPEED (min^{-1})						
Fast Idle*	1700					
Fast Idle (When operating a control lever)*	1800					When relieving boom raise
Fast Idle (HP Mode)*	2000					When relieving boom raise
Fast Idle (E Mode)*	1650					When relieving boom raise
Auto-Idle*	1200					
Slow Idle*	800					
ACTUAL ENGINE SPEED (min^{-1})						
Fast Idle*	1704					
Fast Idle (When operating a control lever)*	1804					When relieving boom raise
Fast Idle (HP Mode)*	2001					When relieving boom raise
Fast Idle (E Mode)*	1652					When relieving boom raise
Auto-Idle*	1202					
Slow Idle*	806					
ENGINE SPEED DEVIATION (min^{-1})						
Fast Idle*	4					
Fast Idle (When operating a control lever)*	4					When relieving boom raise
Fast Idle (HP Mode)*	1					When relieving boom raise
Fast Idle (E Mode)*	2					When relieving boom raise
Auto-Idle*	2					
Slow Idle*	6					
DIAL ANGLE (Volt)						
Minimum*	0.56					
Maximum*	4.41					

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
BOOM RAISE PILOT CONTROL PRESSURE* (MPa)	4.08					When relieving boom raise
ARM ROLL-IN PILOT CONTROL PRESSURE* (MPa)	4.03					When relieving arm roll-in
SWING PILOT CONTROL PRESSURE* (MPa)	4.03					When relieving swing
TRAVEL PILOT CONTROL PRESSURE* (MPa)	4.01					
FRONT ATTACHMENT CONTROL PRESSURE* (MPa)	4.01					Operate either of boom, arm, bucket or swing
DIGGING REGENERATIVE PROPORTIONAL VALVE OUTPUT (MPa)	3.19					When relieving arm roll-in
PUMP TORQUE PROPOR-TIONAL VALVE OUTPUT (MPa)	0.33					Engine fast idle + when relieving arm roll-in
PUMP 1 LOAD RATE	69					When relieving arm roll-in
PUMP 2 LOAD RATE	70					When relieving arm roll-in
ARM REGENERATIVE PRO-PORTIONAL VALVE OUTPUT* (MPa)	2.74					Arm leveling
POWER DIGGING CONTROL PRESSURE* (MPa)						
During operation	2.99					
When relieving boom raise	2.99					
TRAVEL MOTOR CONTROL PRESSURE* (MPa)	2.99					Travel mode switch: Fast, When travel-ing
PUMP TORQUE PROPOR-TIONAL VALVE OUTPUT FB (mA)	537					When relieving arm roll-in
DIGGING REGENERATIVE PROPORTIONAL VALVE OUTPUT FB (mA)	515					When relieving arm roll-in
ARM REGENERATIVE PRO-PORTIONAL VALVE OUTPUT FB (mA)	470					Arm leveling
POWER DIGGIN CONTROL PRESSURE FB (mA)	272					
TRAVEL MODE CONTROL PRESSURE FB (mA)	507					Travel mode switch: Fast, When travel-ing

ECM

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
Engine Torque (%) *						
No load	10					
When relieving arm roll-in	0					
Actual Engine Speed (min^{-1}) *						
No load	1700					
When relieving arm roll-in	1800					
Target Engine Speed (min^{-1}) *						
No load	1700					
When relieving arm roll-in	1800					
Engine Oil Pressure (kPa) *						
No load	640					
When relieving arm roll-in	640					
Fuel Rate (L/h)						
No load	4.5					
When relieving arm roll-in	4.5					
Atmospheric Pressure (kPa) *	101					
Boost Pressure (kPa) *						
No load	114					
When relieving arm roll-in	190					
Battery Voltage (V)	29					

(Blank)

ZX240-3 CLASS DR. ZX MONITOR INDICATING VALUES

Unless specified, test under the following conditions.
Engine Speed: Fast Idle
Work Mode: Digging Mode
Power Mode Switch: P mode
Auto-Idle: OFF

NOTE: Items marked (*) are measurable by using service menu/monitoring in the monitor unit.

Items marked (**) are measurable by using service menu/monitoring in the monitor unit. However, it may be difficult to read the measured value while operating the machine.

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
PUMP 1 PRESSURE (MPa)						
Control Lever in Neutral*	0.9					
Boom Raise*	36.3					When relieving
Boom Lower*	-					
Arm Roll-in*	36.8					When relieving
Arm Roll-Out*	35.4					When relieving
Bucket Roll-Out*	36.1					When relieving
Bucket Roll-In*	37.1					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	36.3					When relieving
PUMP 2 PRESSURE (MPa)						
Control Lever in Neutral*	0.7					
Boom Raise*	36.3					When relieving
Boom Lower*	-					
Arm Roll-in*	36.6					When relieving
Arm Roll-Out*	36.3					When relieving
Bucket Roll-Out*	0.9					When relieving
Bucket Roll-In*	0.9					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	36.1					When relieving

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
PUMP 1 PUMP CONTROL PRESSURE (MPa)						
Control Lever in Neutral*	1.07					
Boom Raise*	3.60					When relieving
Boom Lower*	-					
Arm Roll-in*	3.60					When relieving
Arm Roll-Out*	3.60					When relieving
Bucket Roll-Out*	3.91					When relieving
Bucket Roll-In*	3.87					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	3.56					When relieving
PUMP 2 PUMP CONTROL PRESSURE (MPa)						
Control Lever in Neutral*	0.97					
Boom Raise*	3.22					When relieving
Boom Lower*	-					
Arm Roll-in*	3.27					When relieving
Arm Roll-Out*	3.17					When relieving
Bucket Roll-Out*	1.00					When relieving
Bucket Roll-In*	0.97					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	3.25					When relieving

OPERATIONAL PERFORMANCE TEST / Standard

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
TARGET ENGINE SPEED (min^{-1})						
Fast Idle*	1800					
Fast Idle (When operating a control lever)*	1900					When relieving boom raise
Fast Idle (HP Mode)*	2000					When relieving boom raise
Fast Idle (E Mode)*	1700					When relieving boom raise
Auto-Idle*	1200					
Slow Idle*	800					
ACTUAL ENGINE SPEED (min^{-1})						
Fast Idle*	1801					
Fast Idle (When operating a control lever)*	1902					When relieving boom raise
Fast Idle (HP Mode)*	2002					When relieving boom raise
Fast Idle (E Mode)*	1701					When relieving boom raise
Auto-Idle*	1201					
Slow Idle*	801					
ENGINE SPEED DEVIATION (min^{-1})						
Fast Idle*	1					
Fast Idle (When operating a control lever)*	2					When relieving boom raise
Fast Idle (HP Mode)*	2					When relieving boom raise
Fast Idle (E Mode)*	1					When relieving boom raise
Auto-Idle*	1					
Slow Idle*	1					
DIAL ANGLE (Volt)						
Minimum*	0.49					
Maximum*	4.37					

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
BOOM RAISE PILOT CONTROL PRESSURE* (MPa)	4.03					When relieving boom raise
ARM ROLL-IN PILOT CONTROL PRESSURE* (MPa)	4.01					When relieving arm roll-in
SWING PILOT CONTROL PRESSURE* (MPa)	4.11					When relieving swing
TRAVEL PILOT CONTROL PRESSURE* (MPa)	4.13					
FRONT ATTACHMENT CONTROL PRESSURE* (MPa)	3.99					Operate either of boom, arm, bucket or swing
DIGGING REGENERATIVE PROPORTIONAL VALVE OUTPUT (MPa)	3.19					When relieving arm roll-in
PUMP TORQUE PROPOR-TIONAL VALVE OUTPUT (MPa)	0.45					Engine fast idle + when relieving arm roll-in
PUMP 1 LOAD RATE	68					When relieving arm roll-in
PUMP 2 LOAD RATE	68					When relieving arm roll-in
ARM REGENERATIVE PRO-PORTIONAL VALVE OUTPUT* (MPa)	2.25					Arm leveling
POWER DIGGING CONTROL PRESSURE* (MPa)						
During operation	2.99					
When relieving boom raise	2.99					
TRAVEL MOTOR CONTROL PRESSURE* (MPa)	2.99					Travel mode switch: Fast, When travel-ing
PUMP TORQUE PROPOR-TIONAL VALVE OUTPUT FB (mA)	518					When relieving arm roll-in
DIGGING REGENERATIVE PROPORTIONAL VALVE OUTPUT FB (mA)	507					When relieving arm roll-in
ARM REGENERATIVE PRO-PORTIONAL VALVE OUTPUT FB (mA)	445					Arm leveling
POWER DIGGIN CONTROL PRESSURE FB (mA)	500					
TRAVEL MODE CONTROL PRESSURE FB (mA)	492					Travel mode switch: Fast, When travel-ing

ECM

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
Engine Torque (%) *						
No load	2					
When relieving arm roll-in	71					
Actual Engine Speed (min^{-1}) *						
No load	1799					
When relieving arm roll-in	1895					
Target Engine Speed (min^{-1}) *						
No load	1800					
When relieving arm roll-in	1900					
Engine Oil Pressure (kPa) *						
No load	664					
When relieving arm roll-in	712					
Fuel Rate (L/h)						
No load	7					
When relieving arm roll-in	24.9					
Atmospheric Pressure (kPa) *	99.0					
Boost Pressure (kPa) *						
No load	116					
When relieving arm roll-in	200					
Battery Voltage (V)	28.9					

(Blank)

ZX270-3 CLASS DR. ZX MONITOR INDICATING VALUES

Unless specified, test under the following conditions.
Engine Speed: Fast Idle
Work Mode: Digging Mode
Power Mode Switch: P mode
Auto-Idle: OFF

NOTE: Items marked (*) are measurable by using service menu/monitoring in the monitor unit.

Items marked (**) are measurable by using service menu/monitoring in the monitor unit. However, it may be difficult to read the measured value while operating the machine.

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
PUMP 1 PRESSURE (MPa)						
Control Lever in Neutral*	0.9					
Boom Raise*	37.5					When relieving
Boom Lower*	-					
Arm Roll-in*	35.1					When relieving
Arm Roll-Out*	35.1					When relieving
Bucket Roll-Out*	36.1					When relieving
Bucket Roll-In*	35.9					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	35.1					When relieving
PUMP 2 PRESSURE (MPa)						
Control Lever in Neutral*	0.9					
Boom Raise*	37.5					When relieving
Boom Lower*	-					
Arm Roll-in*	35.1					When relieving
Arm Roll-Out*	35.1					When relieving
Bucket Roll-Out*	0.9					When relieving
Bucket Roll-In*	0.9					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	34.9					When relieving

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
PUMP 1 PUMP CONTROL PRESSURE (MPa)						
Control Lever in Neutral*	1.02					
Boom Raise*	3.65					When relieving
Boom Lower*	-					
Arm Roll-in*	3.65					When relieving
Arm Roll-Out*	3.65					When relieving
Bucket Roll-Out*	3.84					When relieving
Bucket Roll-In*	3.82					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	3.58					When relieving
PUMP 2 PUMP CONTROL PRESSURE (MPa)						
Control Lever in Neutral*	1.00					
Boom Raise*	3.36					When relieving
Boom Lower*	-					
Arm Roll-in*	3.32					When relieving
Arm Roll-Out*	3.36					When relieving
Bucket Roll-Out*	1.02					When relieving
Bucket Roll-In*	1.00					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	3.33					When relieving

OPERATIONAL PERFORMANCE TEST / Standard

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
TARGET ENGINE SPEED (min^{-1})						
Fast Idle*	1900					
Fast Idle (When operating a control lever)*	2000					When relieving boom raise
Fast Idle (HP Mode)*	2100					When relieving boom raise
Fast Idle (E Mode)*	1850					When relieving boom raise
Auto-Idle*	1200					
Slow Idle*	800					
ACTUAL ENGINE SPEED (min^{-1})						
Fast Idle*	1905					
Fast Idle (When operating a control lever)*	2006					When relieving boom raise
Fast Idle (HP Mode)*	2110					When relieving boom raise
Fast Idle (E Mode)*	1850					When relieving boom raise
Auto-Idle*	1195					
Slow Idle*	800					
ENGINE SPEED DEVIATION (min^{-1})						
Fast Idle*	-1					
Fast Idle (When operating a control lever)*	3					When relieving boom raise
Fast Idle (HP Mode)*	7					When relieving boom raise
Fast Idle (E Mode)*	22					When relieving boom raise
Auto-Idle*	-5					
Slow Idle*	0					
DIAL ANGLE (Volt)						
Minimum*	0.60					
Maximum*	4.39					

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
BOOM RAISE PILOT CONTROL PRESSURE* (MPa)	4.08					When relieving boom raise
ARM ROLL-IN PILOT CONTROL PRESSURE* (MPa)	4.01					When relieving arm roll-in
SWING PILOT CONTROL PRESSURE* (MPa)	4.11					When relieving swing
TRAVEL PILOT CONTROL PRESSURE* (MPa)	4.15					
FRONT ATTACHMENT CONTROL PRESSURE* (MPa)	4.0					Operate either of boom, arm, bucket or swing
DIGGING REGENERATIVE PROPORTIONAL VALVE OUTPUT (MPa)	3.10					When relieving arm roll-in
PUMP TORQUE PROPOR-TIONAL VALVE OUTPUT (MPa)	0.86					Engine fast idle + when relieving arm roll-in
PUMP 1 LOAD RATE	54					When relieving arm roll-in
PUMP 2 LOAD RATE	54					When relieving arm roll-in
ARM REGENERATIVE PRO-PORTIONAL VALVE OUTPUT* (MPa)	2.72					Arm leveling
POWER DIGGING CONTROL PRESSURE* (MPa)						
During operation	2.99					
When relieving boom raise	2.99					
TRAVEL MOTOR CONTROL PRESSURE* (MPa)	2.99					Travel mode switch: Fast, When travel-ing
PUMP TORQUE PROPOR-TIONAL VALVE OUTPUT FB (mA)	500					When relieving arm roll-in
DIGGING REGENERATIVE PROPORTIONAL VALVE OUTPUT FB (mA)	510					When relieving arm roll-in
ARM REGENERATIVE PRO-PORTIONAL VALVE OUTPUT FB (mA)	470					Arm leveling
POWER DIGGIN CONTROL PRESSURE FB (mA)	290					
TRAVEL MODE CONTROL PRESSURE FB (mA)	196					Travel mode switch: Fast, When travel-ing

ECM

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
Engine Torque (%) *						
No load	24					
When relieving arm roll-in	77					
Actual Engine Speed (min^{-1}) *						
No load	1899					
When relieving arm roll-in	1995					
Target Engine Speed (min^{-1}) *						
No load	1500					
When relieving arm roll-in	1500					
Engine Oil Pressure (kPa) *						
No load	480					
When relieving arm roll-in	480					
Fuel Rate (L/h)						
No load	9.25					
When relieving arm roll-in	31.4					
Atmospheric Pressure (kPa) *	101.5					
Boost Pressure (kPa) *						
No load	22					
When relieving arm roll-in	123					
Battery Voltage (V)	27.6					

ENGINE SPEED

Summary

1. Measure the engine speed by using the monitor unit or Dr. ZX.)
2. Measure the engine speeds in each mode.

NOTE: If the engine speed is not adjusted correctly, all other performance data will be unreliable. Consequently, measure the engine speed before performing all other tests in order to check that the engine speed meets specification.

Preparation:

1. Select the service menu of monitor (In case of Dr. ZX, install Dr. ZX first).
2. Warm up the machine until coolant temperature reaches 50 °C (122 °F) or more, and hydraulic oil temperature is 50±5 °C (122±41 °F).

Measurement:

1. Measure the items as shown in the table below.
2. When measuring, set the switch and test condition as shown in the table below in response to the engine speed to be measured.

Evaluation:

Refer to Operational Performance Standard in Group T4-2.

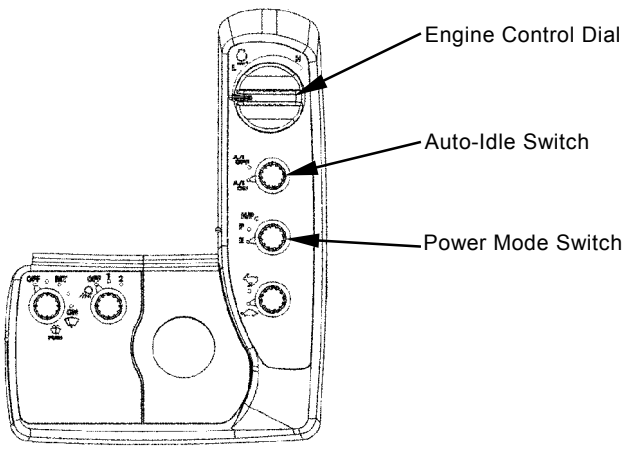
Remedy:

Refer to Troubleshooting B in Group T5-4.

NOTE: ECO stands for the auto engine speed reduction system by 100 min^{-1}.

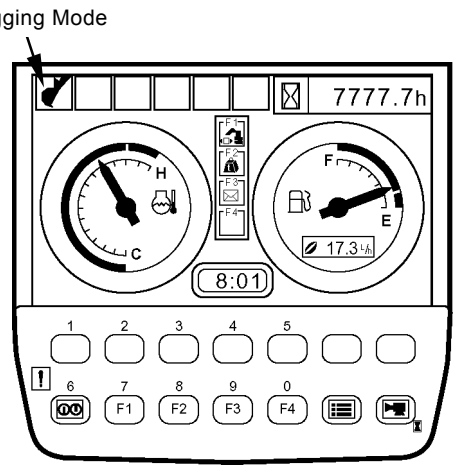
Item	Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode	Test Conditions
Slow Idle	Min. Speed	P	OFF	Digging Mode	
Fast Idle (With ECO deactivated)	Max. Speed	P	OFF	Digging Mode	Check in the Dr. ZX special functions with ECO deactivated. Measure engine speed with the lever in neutral.
Fast Idle (Heater control: OFF)	Max. Speed	P	OFF	Digging Mode	Move the pilot shut-off lever to the UNLOCK position. Measure engine speed with the lever in neutral.
Fast Idle (Heater control: ON)	Max. Speed	P	OFF	Digging Mode	Move the pilot shut-off lever to the LOCK position. Engine speed can be measured only when coolant temperature is 5 °C (41 °F) or lower.
Fast Idle (Relief operation)	Max. Speed	P	OFF	Digging Mode	Measure engine speed while relieving the boom raise circuit.
Fast Idle (E mode)	Max. Speed	E Mode	OFF	Digging Mode	
Fast Idle (HP mode)	Max. Speed	HP Mode	OFF	Digging Mode	Measure engine speed while relieving the boom raise circuit.
Auto-Idle	Max. Speed	P	ON	Digging Mode	Check engine speed 4 seconds after returning all control levers to neutral.
Warming Up	Min. Speed	P	OFF	Digging Mode	Engine speed can be measured only when oil temperature is 0 °C (32 °F) or lower.

Switch Panel:



T1V1-04-03-001

Monitor Unit:



T1V1-05-01-007

ENGINE COMPRESSION PRESSURE

Summary:

1. Measure compression pressure in the cylinders and check for a decline in engine power.
2. Check exhaust gas color. Keep track of engine oil consumption.
3. Check for abnormalities in the intake system, including the air filter.

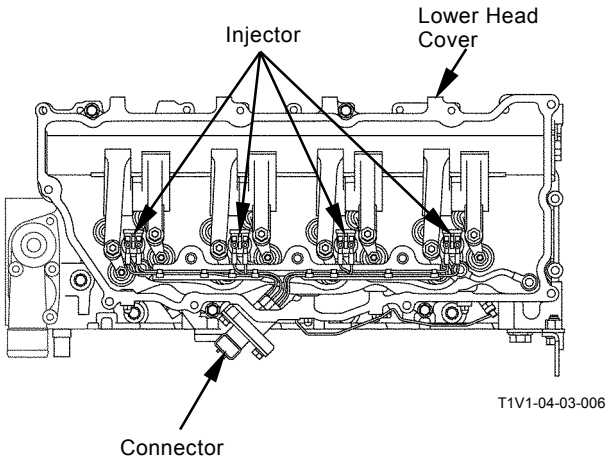
Preparation:

1. Confirm that valve clearances are correct.
2. Confirm that the batteries are charged properly.
3. Run the engine until the coolant temperature gauge reaches the operating range.
4. Remove the negative terminal of the battery. Remove all the glow plugs from each cylinder.

   : 20 N·m (2.0 kgf·m, 14.8 lbf·ft)

IMPORTANT: If disconnecting the connector of injector, fuel cannot be jetted. Therefore, ECM judges that the fuel system is faulty and the fault code is displayed. After measurement, delete the displayed fault code.

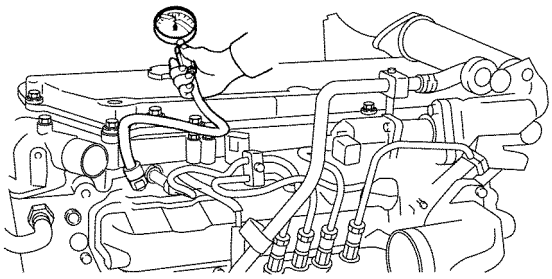
5. Disconnect the connector of injector which is installed to the lower head cover.
6. Install the negative terminal of the battery.
7. Turn the starter. Exhaust foreign subjects from the cylinder.
8. Install a pressure gauge and an adaptor (Isuzu EN-46722) to the glow plug mounting part. (Sufficiently install them in order to prevent air leakage.)



T1V1-04-03-006

Measurement:

1. Turn the starter and measure compression pressure of each cylinder.
2. Repeat the measurement three times and calculate the mean values.


T1V1-04-03-005

Evaluation:

Refer to Operational Performance Standard in Group T4-2.

Remedy:

Refer to the engine shop manual.

VALVE CLEARANCE

Summary:

1. Perform the measurement when the engine is cold.
2. Before starting any work, clean the head cover mounting area and avoid contamination in the engine.

Preparation:

1. Remove the head cover.
2. Remove the terminal nut which secures the harness to the injector.

   : 2 N·m (0.2 kgf·m, 1.5 lbf·ft)
3. Remove the harness assembly from the injector.
4. Remove the leak off pipe.

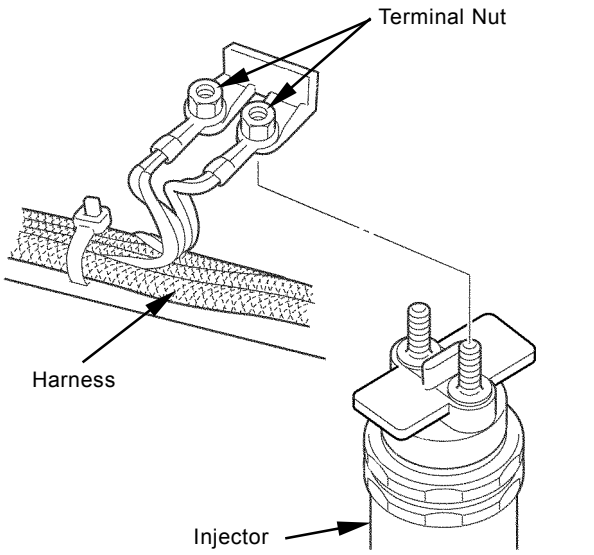
   : 12 N·m (1.2 kgf·m, 8.9 lbf·ft)
5. Rotate the crank pulley. Align the top dead center (TDC) mark on crank pulley with the top mark located on timing gear case.

NOTE: When rotating the crank pulley, remove the fan guard. Then, rotate the fan while holding the fan belt. If it is difficult to rotate, remove all glow plugs and release compression pressure.

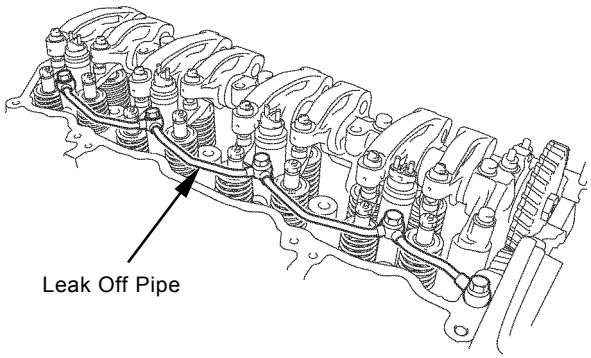
6. Check if piston No.1 (or piston No.4) is now positioned at the TDC in the compression stroke.

NOTE: Move push rods for the intake and exhaust valves on the No.1 cylinder up and down by hand. If any clearances on the both ends of the push rods are found, piston No.1 is positioned at TDC in the compression stroke. (If the exhaust valve of cylinder No.1 is pushed down, piston No.4 is positioned at TDC in the compression stroke.

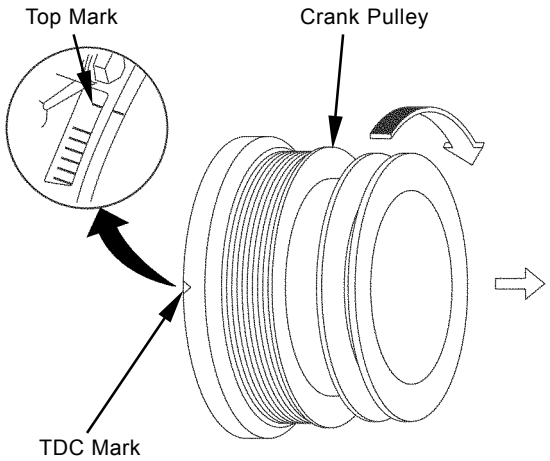
7. Start measurement from the cylinder (No.1 or No.4) positioned at TDC in the compression stroke.



T1V1-04-03-008



T1V1-04-03-007



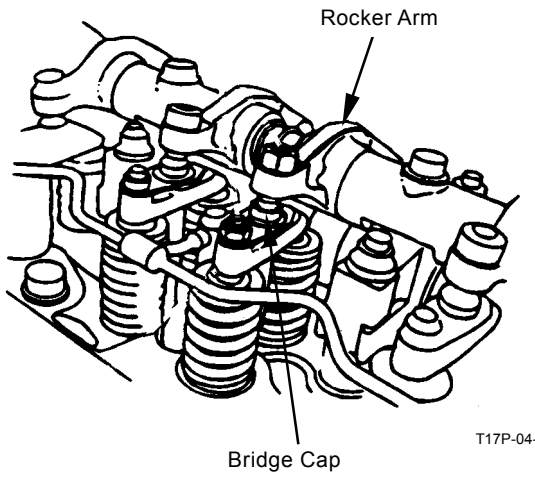
T1V1-04-03-004

Measurement:

1. Insert a thickness gauge into the clearance between rocker arm and bridge cap end and measure the valve clearance.

NOTE: The cylinders are aligned from No.1 to No.4 in that order, as viewed from the fan side. Injection Order: 1-3-4-2

2. When measurement is started from No.1 cylinder, perform the same measurement to all valves indicated with the mark "○" in the table below. (When measurement is started from No.4 cylinder, perform the measurement in the valves shown with mark "×".)



T17P-04-03-001

Cylinder No.	No.1		No.2		No.3		No.4	
Valve locations	I	E	I	E	I	E	I	E
When the measurement is started from No.1 cylinder	○	○	○			○		
When the measurement is started from No.4 cylinder				×	×		×	×

3. Rotate the crankshaft 360°. Align the TDC mark with the pointer. Continue measurement of other valves in the same way.

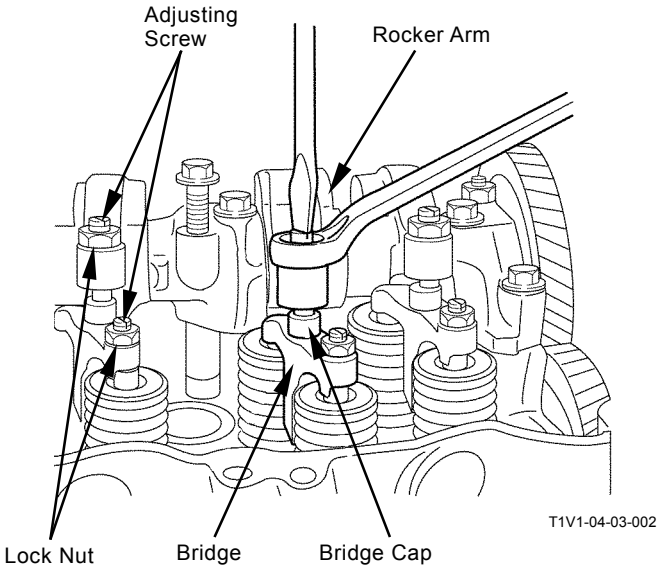
Evaluation:

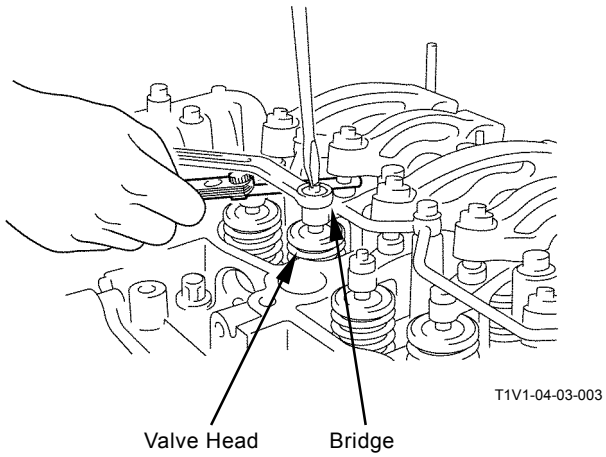
Refer to Operational Performance Standard in Group T4-2.

Adjustment:
If the measurement results are out of specification, adjust the valve clearance in the same order of measurement.

IMPORTANT: Touch the bridge to the end of valve heads (2 used) horizontally and adjust the valve clearance carefully.

1. Loosen the lock nuts (8 used) and adjusting screws (8 used), which secure the bridge and rocker arm.
2. Insert a thickness gauge into the clearance between rocker arm and bridge cap.
3. Tighten the adjusting screw of rocker arm until condition for the thickness gauge is proper.
4. Tighten the lock nut of rocker arm.
   : 22 N·m (2.2 kgf·m, 16.2 lbf·ft)
5. Tighten the adjusting screw of bridge until the bridge comes in contact with the valve head.
6. Tighten the lock nut of bridge.
   : 22 N·m (2.2 kgf·m, 16.2 lbf·ft)
7. Check the valve clearance after the lock nuts are tightened.





LUBRICANT CONSUMPTION

Measuring Method

1. Place the machine on level firm ground and leave the machine for at least one hour in order to let the lubricant lower to the oil pan when the engine stops.
   At this time, confirm that the machine is level by using a leveler.
2. Record read-out A (unit: hour) of the hour meter.
3. Replenish the lubricant up to the high-level gauge.
4. Operate the machine for at least 100 hours or until the oil level lowers to the low-level gauge.

IMPORTANT: Keep the machine-leaving time in Step 1 above.

5. Place the machine on level firm ground and leave the machine for at least one hour in order to let the lubricant lower to the oil pan when the engine stops.
   At this time, confirm that the machine is level by using a leveler.
6. Record read-out B (unit: hour) of the hour meter.
7. Replenish the lubricant up to the high-level gauge while measuring the oil-replenishing volume C.

NOTE: When measuring, use a high-precision measuring cylinder or the like.

8. Determine lubricant consumption from the following equation:

   Oil replenishing volume (C) [mL] / Operating hours (B-A) [hr]

Evaluation:

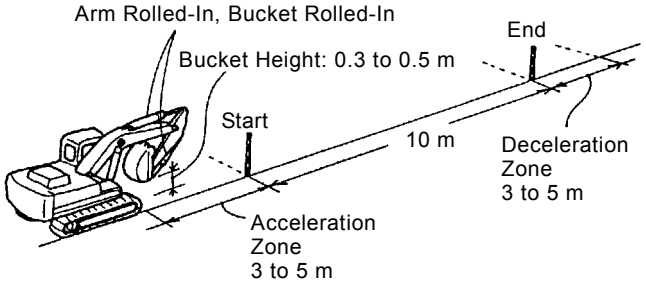
Refer to Operational Performance Standard in Group T4-2.

(Blank)

TRAVEL SPEED

Summary:
Measure the time required for the excavator to travel a test track and check the performance of travel device systems (from main pump to travel motor).

Preparation:
1. Adjust the track sag on both tracks equally.
2. Prepare a flat and solid test track 10 m (33 ft) in length with extra length of 3 to 5 m (9.8 to 16 ft) on both ends for machine acceleration and deceleration.
3. With the arm and bucket fully extended, hold the bucket 0.3 to 0.5 m (12 to 20 in) above the ground.
4. Maintain hydraulic oil temperature at 50±5 °C (122±41 °F).



T105-06-03-001

Measurement:
1. Measure at both slow and fast speeds of the machine.
2. Select the following switch positions:

Travel Mode Switch	Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Slow Mode	Fast Idle	P Mode	OFF	Digging Mode
Fast Mode	Fast Idle	P Mode	OFF	Digging Mode

3. Start traveling the machine in the acceleration zone with the travel levers to full stroke.
4. Measure the time required to travel 10 m (33 ft).
5. After measuring the forward travel speed, turn the upperstructure 180° and measure the reverse travel speed.
6. Repeat the measurement three times in each direction and calculate the average values.

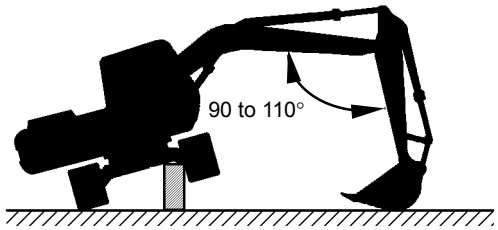
Evaluation:
Refer to the Operational Performance Standard in Group T4-2.

Remedy:
Refer to the Troubleshooting B in Group T5-7.

TRACK REVOLUTION SPEED

Summary:
Measure the track revolution cycle time with the track raised off ground and check the performance of travel device systems (from main pump to travel motor).

Preparation:
1. Adjust the track sag of both side tracks equally.
2. On the track to be measured, put the mark on one shoe by using a piece of chalk or cloth.
3. Jack up the track to be measured as illustrated.



M104-07-067

CAUTION: Securely support the raised machine by using the blocks.

4. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).

Measurement:
1. Measure on both tracks at slow and fast travel speeds of the machine.
2. Select the following switch positions:

Travel Mode Switch	Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Slow Mode	Fast Idle	P Mode	OFF	Digging Mode
Fast Mode	Fast Idle	P Mode	OFF	Digging Mode

3. Operate the travel control lever of the track to be measured to full stroke.
4. Measure the time required for 3 revolutions in both directions after a constant track revolution speed is obtained.
5. Repeat the measurement three times and calculate the average values.

Evaluation:
Refer to the Operational Performance Standard in Group T4-2.

NOTE: The measurement data obtained through the raised track revolution test may have wide variations. Therefore, the evaluation based on the results obtained from the 10 m travel speed check described before is more recommendable.

Remedy:
Refer to the Troubleshooting B in Group T5-7.

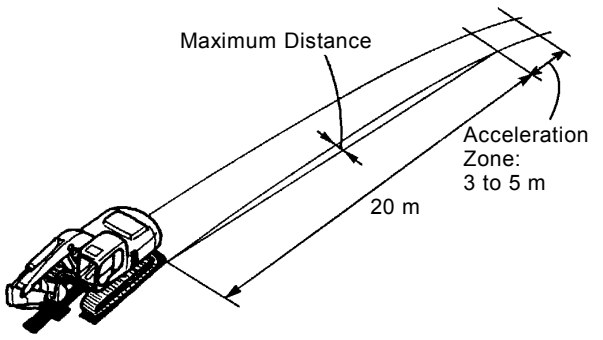
MISTRACK CHECK

Summary:

1. Allow the machine to travel 20 m (65.6 ft). Measure the maximum tread deviation from the tread chord line drawn between the travel start and end points and check the performance of travel device systems (from main pump to travel motor).
2. If measured on a concrete surface, the tread deviation has a trend to decrease.

Preparation:

1. Adjust the track sag of both tracks equally.
2. Provide a flat, solid test yard 20 m (65.6 ft) in length, with extra length of 3 to 5 m (9.8 to 16 ft) on both ends for machine acceleration and deceleration.



T105-06-03-022

3. With the arm and bucket fully extended, hold the bucket 0.3 to 0.5 m (12 to 20 in) above the ground.
4. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).

Measurement:

1. Measure at both slow and fast travel speeds of the machine.
2. Select the following switch positions:

Travel Mode Switch	Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Slow Mode	Fast Idle	P Mode	OFF	Digging Mode
Fast Mode	Fast Idle	P Mode	OFF	Digging Mode

3. Start traveling the machine in the acceleration zone with the travel levers at full stroke.
4. Measure the maximum distance between a straight 20 m (65.6 ft) tread chord line and the tread made by the machine.
5. After measuring the tracking in forward travel, turn the upperstructure 180° and measure in reverse travel.
6. Repeat the measurement three times and calculate the average values.

Evaluation:

Refer to the Operational Performance Standard in Group T4-2.

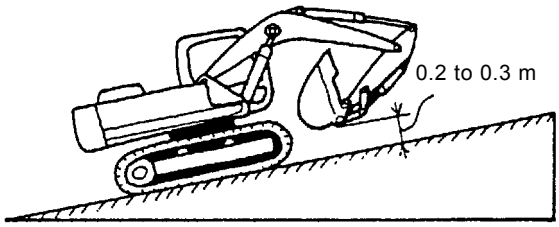
Remedy:

Refer to the Troubleshooting B in Group T5-7.

TRAVEL PARKING LEAKAGE

Summary:
Measure the parking brake function on a specified slope.

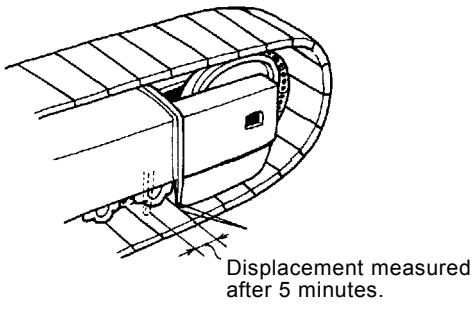
Preparation:
1. The surface of test slope shall be even with a gradient of 20 % (11.31°).
2. With the arm and bucket fully extended, hold the bucket 0.2 to 0.3 m (8 to 12 in) above the ground.
3. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).



T105-06-03-004

Measurement:
1. Measure the travel parking brake slip amount while parked.
2. Climb the slope and place the travel levers in neutral.
3. Stop the engine.
4. After the machine stops, put the matching marks on a track link or shoe and the track side frame.
5. After 5 minutes, measure the distance between marks on the track link or shoe and the track frame.

Evaluation:
Refer to the Operational Performance Standard in Group T4-2.

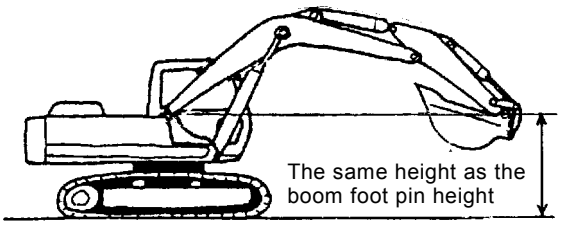


T105-06-03-006

SWING SPEED

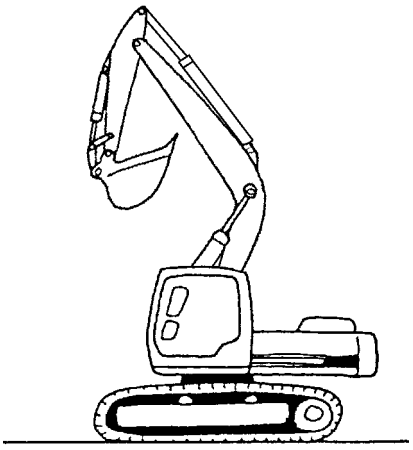
Summary:
Measure the time required to swing three complete turns and check the performance of swing device systems (from main pump to swing motor).

Preparation:
1. Check lubrication of the swing gear and swing bearing.
2. Place the machine on flat, solid ground with ample space for swinging. Do not conduct this test on slopes.
3. With the arm fully retracted and the bucket fully extended, hold the bucket so that the height of the bucket pin is the same as the boom foot pin. The bucket must be empty.



T105-06-03-013

NOTE: In case a sufficient space for the measurement is difficult to find, carry out the measurement with the boom fully raised and the arm fully rolled-in.



T178-04-03-001

4. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).

CAUTION: Prevent personal injury. Always make sure that the area is clear and that co-workers are out of the swing area before starting the measurement.

Measurement:
1. Select the following switch positions:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

2. Operate the swing control lever fully.
3. Measure the time required to swing 3 turns in one direction.
4. Operate swing control lever fully in the opposite direction and measure the time required for 3 turns.
5. Repeat the measurement three times and calculate the average values.

Evaluation:
Refer to the Operational Performance Standard in Group T4-2.

Remedy:
Refer to the Troubleshooting B in Group T5-7.

SWING FUNCTION DRIFT CHECK

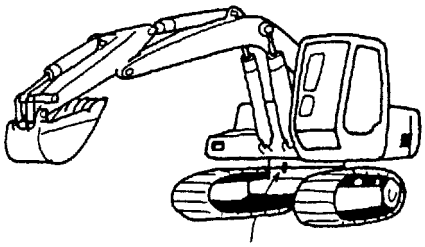
Summary:

1. Measure the swing drift on swing bearing outer circumference when stopping after a 180° full-speed swing and check the performance of swing brake valve.
2. The mechanical brake for swing parking brake is equipped for the swing motor.

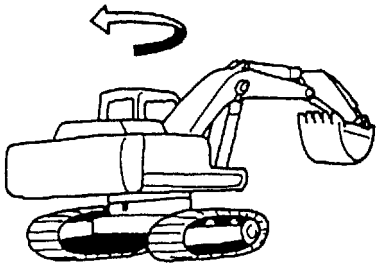
Preparation:

1. Check lubrication of the swing gear and swing bearing.
2. Place the machine on flat, solid ground with ample space for swinging. Do not conduct this test on a slope.
3. With the arm fully retracted and the bucket fully extended, hold the bucket so that the height of the bucket pin is the same as the boom foot pin. The bucket must be empty.
4. Put the matching marks on the swing bearing outer circumference (upperstructure side) and the track frame.
5. Swing the upperstructure 180°.
6. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).

CAUTION: Prevent personal injury. Always make sure that the area is clear and that co-workers are out of the swing area before starting the measurement.



Put the matching marks on swing bearing outer circumference and track frame. T105-06-03-008



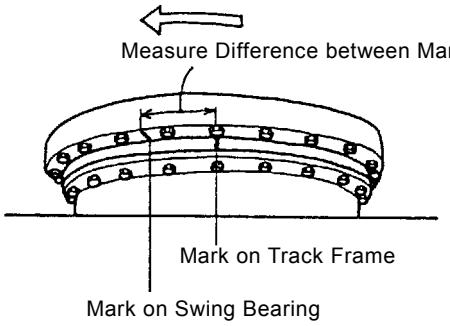
Before start the measurement, swing the upperstructure 180° T105-06-03-009

Measurement:

1. Select the following switch positions:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

2. Operate the swing control lever fully and return it to the neutral position when the mark on upperstructure aligns with that on track frame after swinging 180° .
3. Measure the distance between the two marks.
4. Align the marks again and swing 180°. Then test in the opposite direction.
5. Repeat the measurement three times each and calculate the average values.



T105-06-03-010

Evaluation:

Refer to the Operational Performance Standard in Group T4-2.

Remedy:

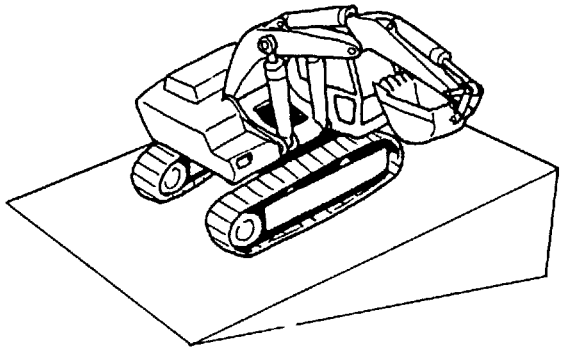
Refer to the Troubleshooting B in Group T5-7.

SWING MOTOR LEAKAGE

Summary:
Measure the upperstructure drift while suspending a load on a specified slope and check the performance of swing parking brake. (The mechanical brake for swing parking brake is equipped for the swing device.)

Preparation:

1. Check lubrication of the swing gear and swing bearing.
2. Load bucket fully. In lieu of loading the bucket, weight (W) of the following specification can be used.
   ZAXIS200-3: W=1050 kg (2315 lb)
   ZAXIS225US-3: W=1050 kg (2315 lb)
   ZAXIS225USR-3: W=1050 kg (2315 lb)
   ZAXIS240-3: W=1500 kg (3307 lb)
   ZAXIS270-3: W=1650 kg (3638 lb)
3. With the arm fully retracted and the bucket fully extended, position the arm top pin height to be level with the boom foot pin.
4. Park the machine on a smooth slope with a gradient of 26.8 % (15°).
5. Climb a slope and swing the upperstructure to position it 90° to the slope. Put the matching marks on the outer circumference of swing bearing (upperstructure side) and track frame by using the tape.
6. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).



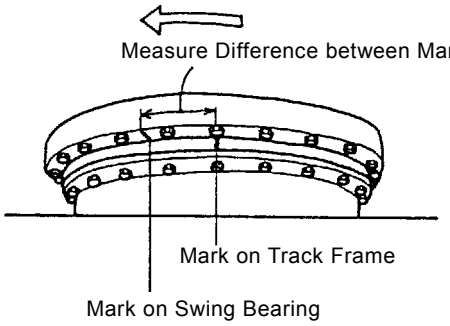
T105-06-03-011

Measurement:

1. Select the following switch position:

Power Mode Switch	Auto-Idle Switch	Work Mode
P Mode	OFF	Digging Mode

2. Maintain the engine at slow idle. After five minutes, measure difference between the marks along bearing outer circumference and track frame.
3. Perform the measurement in both right and left swing directions.
4. Repeat the measurement three times in each direction and calculate the average values.



T105-06-03-010

Evaluation:

Refer to the Operational Performance Standard in Group T4-2.

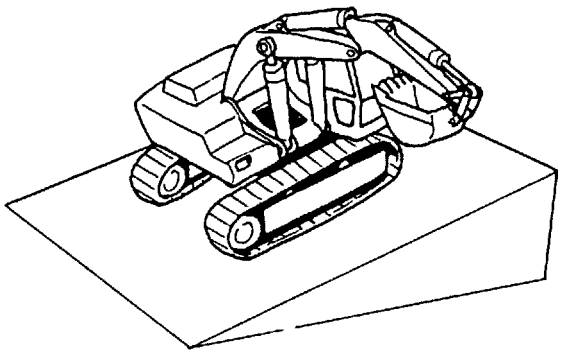
Remedy:

Refer to the Troubleshooting B in Group T5-7.

MAXIMUM SWINGABLE SLANT ANGLE

Summary:
With the upperstructure swung 90° to the slope, check the maximum slant angle on which the upperstructure can swing to the uphill side.

Preparation:
1. Check lubrication of the swing gear and bearing.
2. Load the bucket fully. In lieu of loading the bucket, weight (W) of the following specification can be used.
   ZAXIS200-3: W=1050 kg (2315 lb)
   ZAXIS225US-3: W=1050 kg (2315 lb)
   ZAXIS225USR-3: W=1050 kg (2315 lb)
   ZAXIS240-3: W=1500 kg (3307 lb)
   ZAXIS270-3: W=1650 kg (3638 lb)
3. With the arm fully retracted and the bucket fully extended, hold the arm top pin to the position flush with the boom foot pin height.
4. Climb a slope and swing the upperstructure 90° to the slope.
5. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).



T105-06-03-011

Measurement:
1. Select the following switch positions:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

2. Operate the swing lever to full stroke and swing the upperstructure to the uphill side.
3. If the machine can swing, measure the cab floor slant angle.
4. Increase the slope angle and repeat steps 2. and 3. Check both clockwise and counterclockwise.
5. Repeat the measurement three times.

Evaluation:
Refer to the Operational Performance Standard in Group T4-2.

Remedy:
Refer to the Troubleshooting B in Group T5-7.

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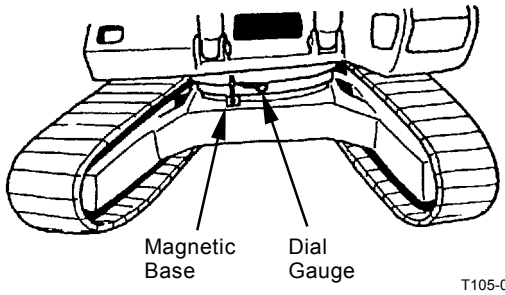
SWING BEARING PLAY

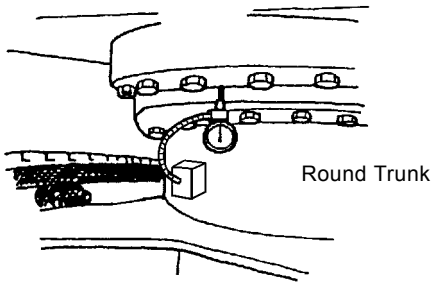
Summary:
Measure the swing bearing play and check the wear of bearing races and balls.

Preparation:
1. Check the swing bearing mounting bolts for looseness.
2. Check lubrication of the swing bearing. Confirm that bearing rotation is smooth without noise.
3. Secure a dial gauge on the round trunk of track frame by using a magnetic base.
4. Position the upperstructure so that the boom aligns with the tracks facing towards the front idlers.
5. Position the dial gauge so that its needle point comes into contact with the bottom surfaceface of swing bearing outer race.
6. The bucket should be empty.

NOTE: The measured value will vary depending on where the magnet base is secured. Secure the magnet base onto the round trunk or in a position as close to the swing bearing as possible.



T105-06-03-014



T105-06-03-015

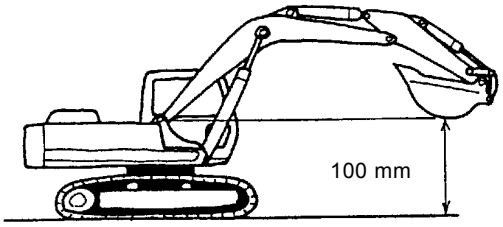
Measurement:

1. With the arm fully retracted and the bucket fully extended, hold the bucket 100 mm above the ground. Record dial gauge reading (h_1).
2. Lower the bucket to the ground and raise the front idler 0.5 m (20 in) by using the front attachment. Record dial gauge reading (h_2).
3. Calculate bearing play (H) from this data (h_1 and h_2) as follows:
   $H=h_2-h_1$

Evaluation:

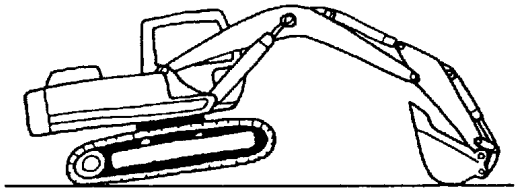
Refer to the Operational Performance Standard in Group T4-2.

Measurement: (h_1)



T105-06-03-007

Measurement: (h_2)

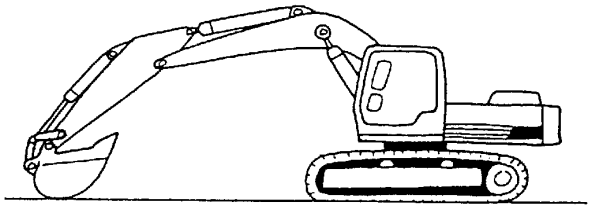


T105-06-03-017

HYDRAULIC CYLINDER CYCLE TIME

Summary:

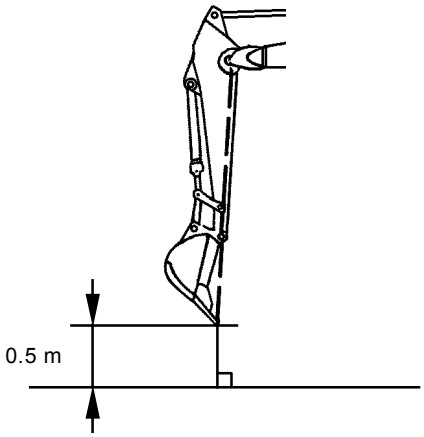
1. Measure the cycle time of boom, arm and bucket cylinders and check the performance of front attachment systems (from main pump to each cyliner).
2. The bucket must be empty.



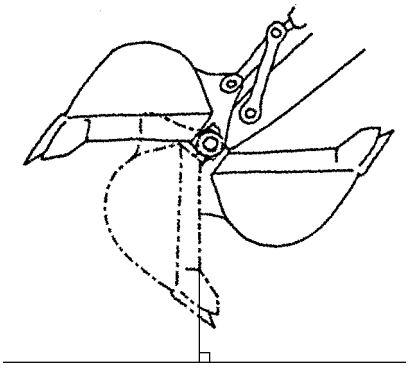
T105-06-03-018

Preparation:

1. Mmeasure at the position as follows.
   - Measurement of the cycle time of boom cylinders: With the arm fully retracted and the bucket fully extended, lower the bucket to the ground.
   - Measurement of the cycle time of arm cylinder: Retract or extend the bucket cylinder so that the arm and bucket teeth are vertical to the ground. Set the arm so that the encter of arm operation is vertical.
   - Measuremnt of the cycle time of bucket cylinder: Adjust each cyliner of boom and arm so that the center of bucket full stroke is vertical.
2. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).



T1V1-04-05-005



T105-06-03-020

Measurement:

1. Select the following switch positions:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

2. Measure the cylinder cycle times as follows:
   (Cylinder full stroke includes cylinder cushioning zone.)
   - Boom cylinder:
     Operate the boom control lever to full stroke. Measure the time to raise and lower the boom.
   - Arm cylinder:
     Operate the arm control lever to full stroke. Measure the time to roll in and roll out the arm.
   - Bucket cylinder:
     Operate the bucket control lever to full stroke. Measure the time to roll in and roll out the bucket.

3. Repeat each measurement three times and calculate the average values.

Evaluation:

Refer to the Operational Performance Standard in Group T4-2.

Remedy:

Refer to the Troubleshooting B in Group T5-7.

DIG FUNCTION DRIFT CHECK

- Maximum Reach Position

Summary:

1. Measure dig function drift, which can be caused by oil leakage in the control valve and boom, arm and bucket cylinders, with the loaded bucket.
2. When testing the dig function drift just after cylinder replacement, slowly operate each cylinder for ten minutes to its stroke end and bleed air.

Preparation:

1. Load the bucket fully. In lieu of loading the bucket, weight (W) of the following specification can be used.
   ZAXIS200-3: W=1050 kg (2315 lb)
   ZAXIS225US-3: W=1050 kg (2315 lb)
   ZAXIS225USR-3: W=1050 kg (2315 lb)
   ZAXIS240-3: W=1500 kg (3307 lb)
   ZAXIS270-3: W=1650 kg (3638 lb)
2. With the arm fully retracted and the bucket fully extended, hold the bucket so that height of the bucket pin is the same as the boom foot pin.
3. Position the arm cylinder with the rod 50 mm (2 in) extended from the fully retracted position.
   Position the bucket cylinder with the rod 50 mm (2 in) retracted from the fully extended position.
4. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).

Measurement:

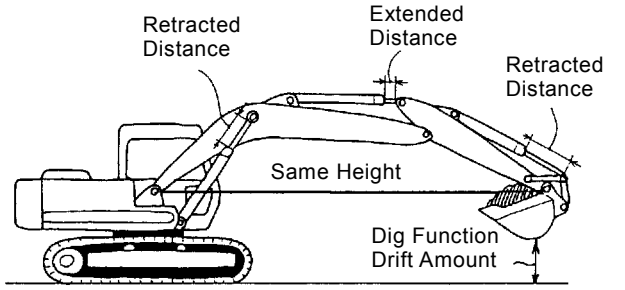
1. Stop the engine.
2. Five minutes after the engine has been stopped, measure the change in position of bottom of the bucket, as well as the boom, arm and bucket cylinders.
3. Repeat the measurement three times and calculate the average values.

Evalution:

Refer to the Operational Performance Standard in Group T4-2.

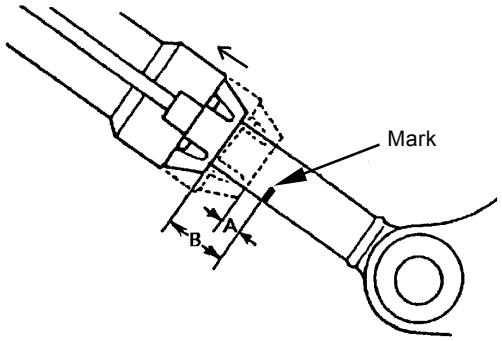
Remedy:

Refer to the Troubleshooting B in Group T5-7.



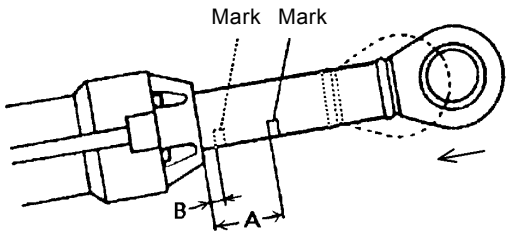
T105-06-03-021

Arm Cylinder Extension



T110-06-03-001

Boom and Bucket Cylinder Retraction

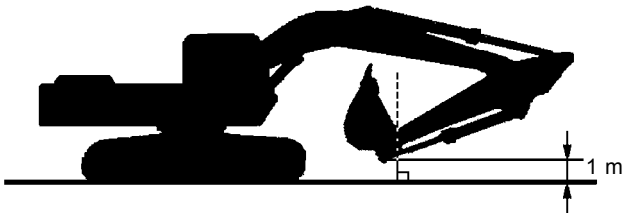


T110-06-03-002

- Arm Roll-In Position

Summary:
1. Measure dig function drift, which can be caused by oil leakage in the control valve and boom, arm and bucket cylinders.
2. When testing the dig function drift just after cylinder replacement, slowly operate each cylinder for ten minutes to its stroke end and bleed air.

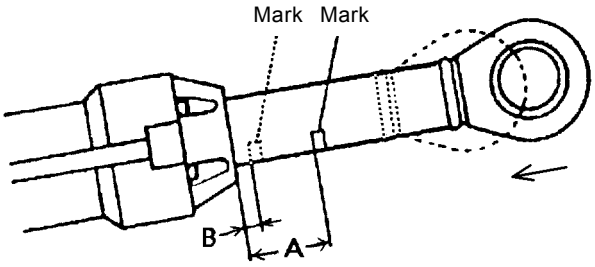
Preparation:
1. The bucket must be empty.
2. With the arm fully extended and the bucket fully extended, lower the boom until the arm tip is 1 m (40 in) above the ground.
3. Position the bucket cylinder with the rod 50 mm (2 in) retracted from the fully extended position.
4. Maintain the hydraulic oil temperature at 50±5 °C (122±9 °F).



T173-04-03-001

Measurement:
1. Stop the engine.
2. Five minutes after the engine has been stopped, measure the change in position of bottom of the arm tip, as well as the boom, arm and bucket cylinders.
3. Repeat the measuemrent three times and calculate the average values.

Cylinder Retraction



T110-06-03-002

Evalution:
Refer to the Operational Performance Standard in Group T4-2.

Remedy:
Refer to the Troubleshooting B in Group T5-7.

CONTROL LEVER OPERATING FORCE

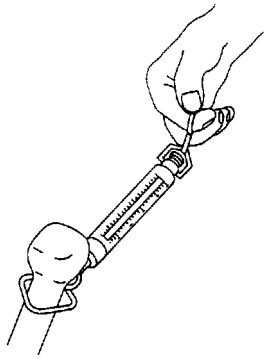
Summary:

1. Measure a play and operating condition of each control lever.
2. Measure the maximum operating force of front attachment control lever.
3. Measure the operating force at the grip center of each control lever.

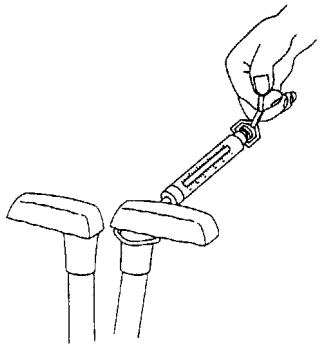
Preparation:

Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).

CAUTION: Prevent personal injury. Always make sure that the area is clear and that co-workers are out of the swing area before starting the measurement.



T107-06-03-003



T107-06-03-004

Measurement:

1. Measure each control lever.
2. Select the following switch positions:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

3. In case of boom (raise), arm and bucket lever, measure the maximum operating force for each with each actuator relieved.
4. In case of boom (lower) lever, measure the maximum operating force with the boom (lower) relieved by jacking up the machine in a safe area.
5. In case of swing lever, measure the maximum operating force with swing relieved after securing the front attachment to prevent swinging.
6. In case of travel lever, raise the track to be measured. Measure the maximum operating force required.
7. Repeat the measurement three times and calculate the average values.

Evalution:

Refer to the Orerational Performance Standard in Group T4-2.

CONTROL LEVER STROKE

Summary:

1. Check a play and operating condition and measure each control lever stroke.
2. Measure the lever stroke at the grip center of each control lever.
3. In case lever stroke play is present in the neutral position, add half (1/2) the play present to both side lever strokes.

Preparation:

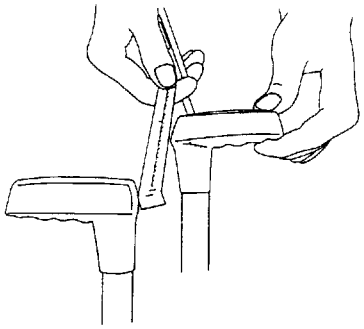
Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).

Measurement:

1. Stop the engine.
2. Measure each lever stroke from neutral to the stroke end of each control lever of boom, arm, bucket, swing and travel.
3. Repeat the measuement three times and calculate the average values.

Evalution:

Refer to the Orerational Performance Standard in Group T4-2.



T107-06-03-005

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COMBINED OPERATION OF BOOM RAISE / SWING FUNCTION CHECK

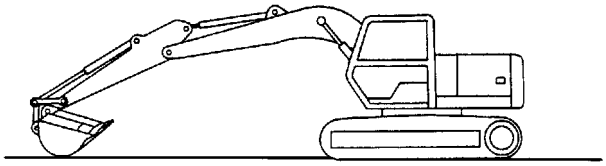
Summary:

1. Check boom raise and swing movement and speeds while operating both functions simultaneously.
2. Check if the cylinders do not hesitate while operating the cylinder with the engine running at fast idle.

Preparation:

1. With the arm fully retracted and the bucket fully extended, lower the bucket onto the ground. The bucket must be empty.
2. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).

CAUTION: Prevent personal injury. Always make sure that the area is clear and that co-workers are out of the swing area before starting the measurement.



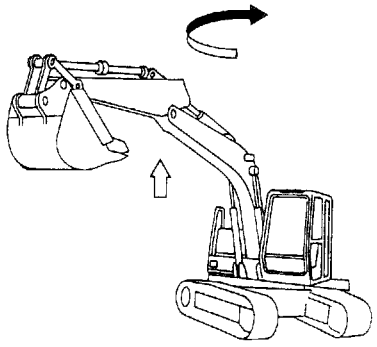
T107-06-03-009

Measurement:

1. Select the following switch positions:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

2. Raise the boom and roll the swing in full stroke at the same time.
   When the upperstructure rotates 90°, release the control levers to stop both functions. Measure the time required to swing 90° and height (H) of the bucket teeth. (The bucket must be empty.)
3. Repeat the measurement three times and calculate the average values.



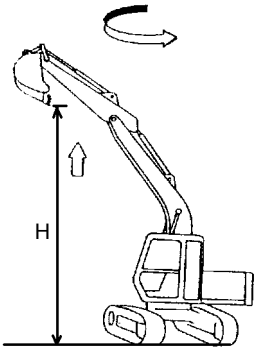
T107-06-03-010

Evalution:

Refer to the Operational Performance Standard in Group T4-2.

Remedy:

Refer to the Troubleshooting B in Group T5-7.



T107-06-03-011

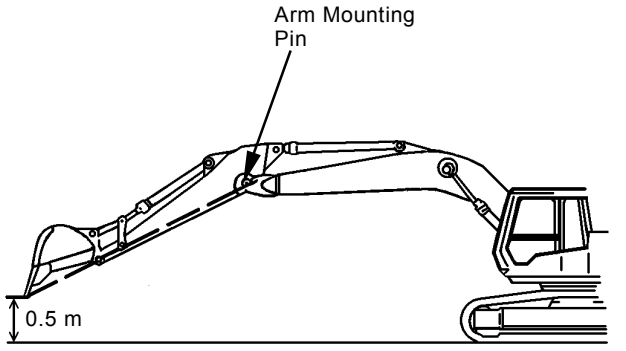
COMBINED OPERATION OF BOOM RAISE / ARM ROLL-IN FUNCTION CHECK

Summary:

1. Check boom raise and arm roll-in movement and speeds while operating both functions simultaneously.
2. Check if the cylinders do not hesitate while operating the cylinder with the engine running at fast idle.

Preparation:

1. Retract the arm cylinder fully and extend the bucket cylinder so that the bucket teeth and arm mounting pin are on a straight line. Adjust the boom cylinder so that the bucket tooth tip height is 0.5 m (1 ft 8 in) above the ground. (The bucket must be empty.)
2. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).



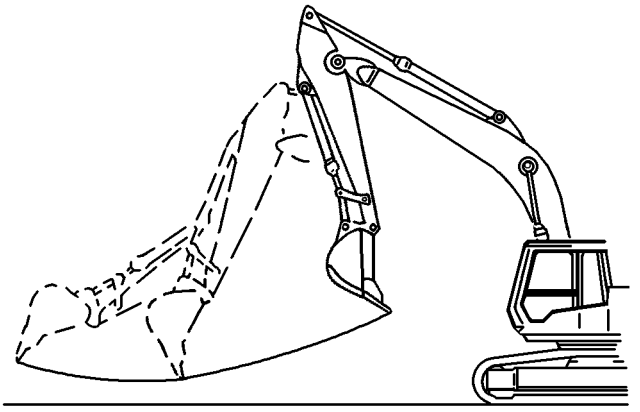
T107-06-03-006

Measurement:

1. Select the switch positions as follows.

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

2. Raise the boom and roll the arm in full stroke at the same time.
3. Measure the time required for the arm to reach the stroke end. (The bucket must be empty.)
4. Repeat the measurement three times and calculate the average value.



T1V1-04-04-001

Evaluation:

Refer to T4-2 Operational Performance Standard in Group T4-2.

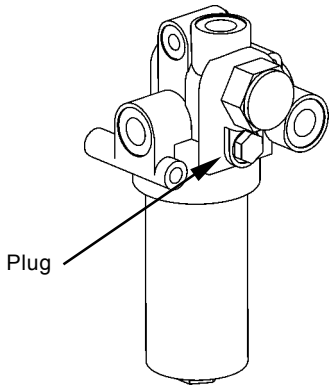
Remedy:

Refer to Troubleshooting B in Group T5-7.

PRIMARY PILOT PRESSURE

Preparation:

1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and release any remaining pressure.
3. Remove the plug from the pilot filter. Install adapter (ST 6069) and pressure gauge (ST 6942) to the pressure check port.
   : 14 mm
4. Start the engine. Confirm that no oil leakage is observed at the pressure gauge connection.
5. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).



T178-03-07-001

Measurement:

1. Select the following switch positions:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode
Slow Idle	P Mode	OFF	Digging Mode

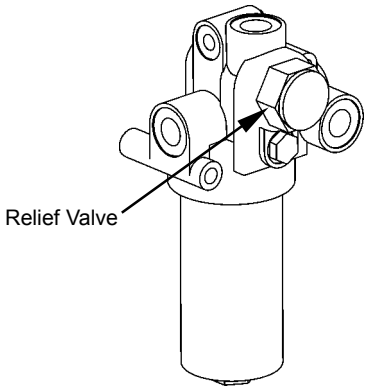
2. Measure pilot pressure in each specified setting above without load.
3. Repeat the measurement three times and calculate the average values.

Evaluation:

Refer to the Performance Standard Table in Group T4-2.

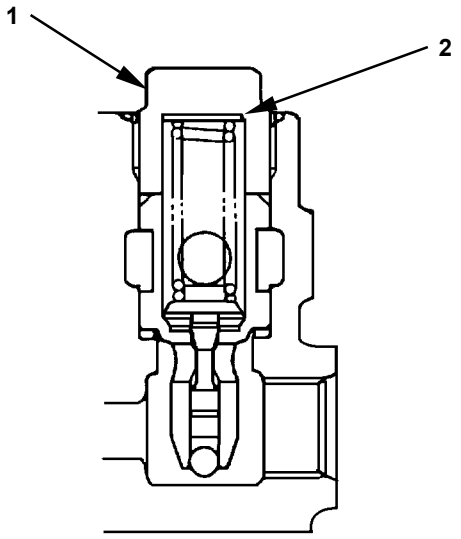
Primary Pilot Pressure Adjustment Procedure

Adjustment:
Adjust the relief valve set pressure if necessary.



T178-03-07-001

1. Remove plug (1) from the relief valve.
   : 22 mm
2. Install the estimated number of shims (2).
3. After adjustment, tighten plug (1).
   : 25^{+2} N·m ($2.5^{+0.2}$ kgf·m, $18.4^{+1.5}$ lbf·ft)
5. After adjustment, check the set pressure.



T111-06-04-004

NOTE: Standard Change in Pressure (Reference)

Shim Thickness	Change in Relief Pressure	
(mm)	kPa	(kgf/cm^2, psi)
0.25	78	(0.8, 11.3)
0.5	157	(1.6, 22.8)
1.0	304	(3.1, 44.2)

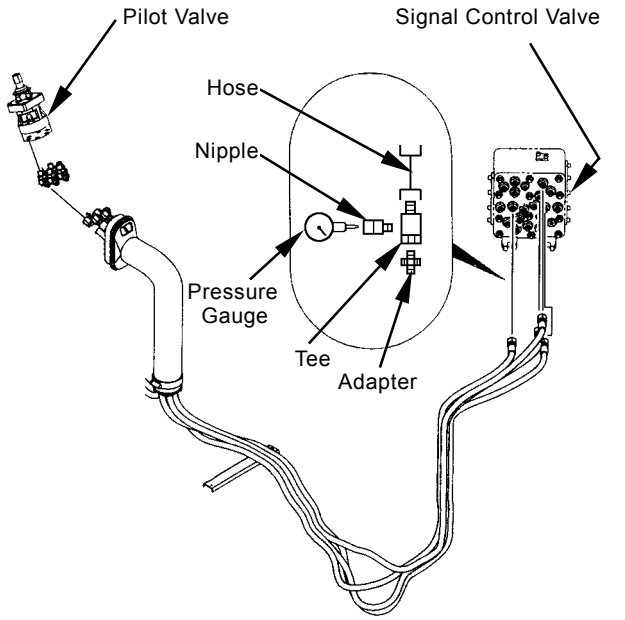
SECONDARY PILOT PRESSURE

Preparation:

1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and release any remaining pressure.
3. Measure pressure at the location between pilot valve and signal control valve. Remove the pilot hose from the circuit to be measured. Install the hose (9/16-18UNF, Length: approx. 400 mm (16 in)) to the signal control valve side. Install tee (4351843), adapter (ST 6460), nipple (ST 6069), coupling (ST 6332) and pressure gauge (ST 6315) between the hoses.
   : 17 mm, 19 mm

NOTE: When removing the lines from signal control valve, use tool (SNAP-ON GAN850812B: size 19.05 mm) in order to easily remove the lines.

4. Start the engine. Confirm that no oil leakage is observed at the pressure gauge connection.
5. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).



T1F3-04-05-008

Measurement:

1. Select the following switch positions:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode
Slow Idle	P Mode	OFF	Digging Mode

2. Measure pilot pressure by using a pressure gauge with the corresponding control lever operated to full stroke.
3. Repeat the measurement three times and calculate the average values.

Evaluation:

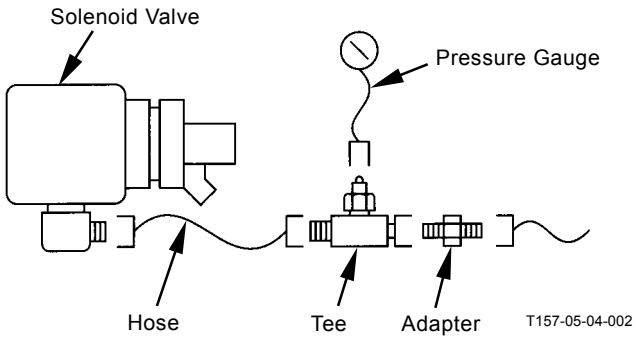
Refer to the Performance Standard Table in Group T4-2.

Remedy:

Refer to the Troubleshooting B in Group T5-7.

SOLENOID VALVE SET PRESSURE

Measure solenoid valve set pressure by using both Dr. ZX and the pressure gauge.



Preparation:

1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and release any remaining pressure.
3. Remove the line from the solenoid valve to be measured. Install tee (ST 6451), hose (Parts Number: 4216453), adapter (ST 6461) and pressure gauge (ST 6942).
   : 17 mm, 19 mm, 22 mm

   Connect Dr. ZX and select the monitoring function.
4. Start the engine. Confirm that no oil leakage is observed at the pressure gauge connection.
5. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).

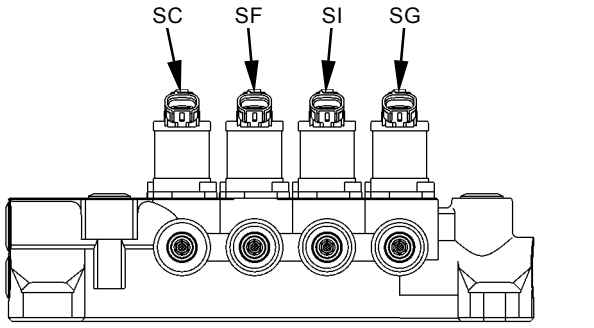
Measurement:

1. Select the following switch positions:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode
Slow Idle	P Mode	OFF	Digging Mode

2. Operate as instructed below for each measuring solenoid valve:
   Solenoid Valve SG: Turn the power digging switch ON and OFF.
   Solenoid Valve SI: Travel, Stop
   Solenoid Valve SF: Relief combined operation of boom raise and arm roll-in.
   Solenoid Valve SC: Combined operation of swing and arm roll-in.

3. Read the values on both Dr. ZX and the pressure gauge.
4. Repeat the measurement three times and calculate the average values.



T1V1-03-07-007

Evaluation:

Refer to the performance Standard Table in Group T4-2.

Solenoid Valve Adjustment Procedure

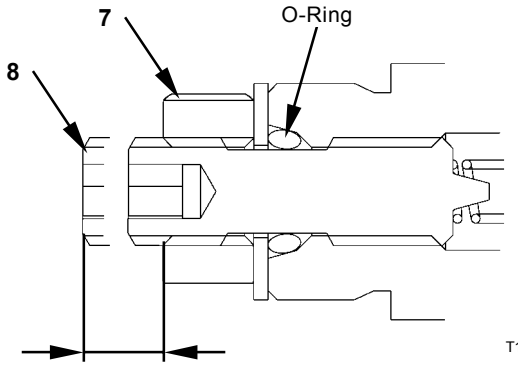
IMPORTANT: As O-ring is damaged and oil leakage may cause, do not loosen adjusting screw (8) excessively.
Do not loosen adjusting screw (8) more than 2 turns.

1. Loosen lock nut (7). Turn adjusting screw (8) and adjust the set pressure.
2. After adjustment, tighten lock nut (7).
   : 10 mm
   : 3 mm
   : 3 N·m (0.3 kgf·m, 2.2 lbf·ft)

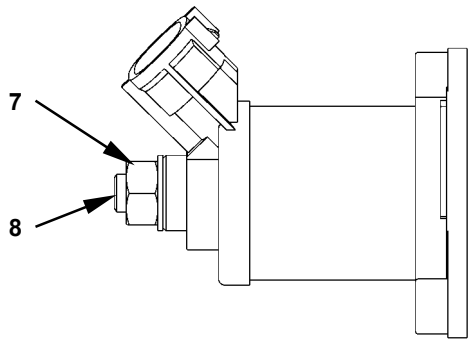
3. After adjustment, check the set pressure.

NOTE: Standard Change in Pressure (Reference)

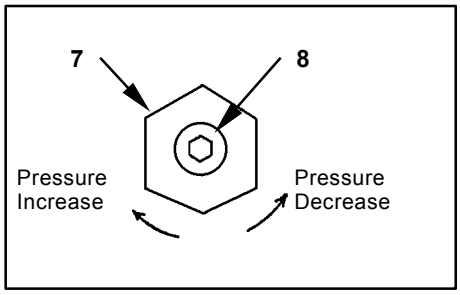
Screw Turns		1/4	1/2	3/4	1
Change in Pressure	kPa	69	137	206	275
	(kgf/cm^2)	(0.7)	(1.4)	(2.1)	(2.8)
	(psi)	(10)	(20)	(30)	(40)



T1V1-04-05-004



T1V1-04-05-003



W107-02-05-129

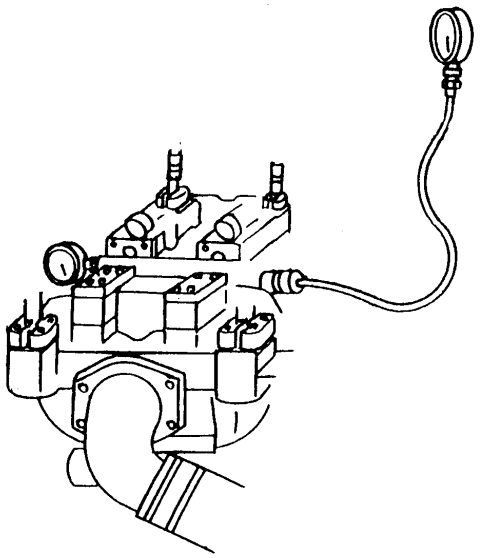
MAIN PUMP DELIVERY PRESSURE

The main pump delivery pressure can also be measured by using Dr. ZX.

Preparation:

1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and release any remaining pressure.
3. Remove the plug of pressure check port from the main pump delivery port. Install adapter (ST 6069), hose (ST 6943) and pressure gauge (ST 6941).
   : 6 mm

   Connect Dr. ZX and select the monitoring function.
4. Start the engine. Confirm that no oil leakage is observed at the pressure gauge connection.
5. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).



T157-05-04-005

Measurement:

1. Select the following switch positions:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

2. Measure pressure with the control levers in neutral without load.
3. Repeat the measurement three times and calculate the average values.

Evaluation:

Refer to the Performance Standard Table in Group T4-2.

Remedy:

Refer to the Troubleshooting B in Group T5-7.

MAIN RELIEF SET PRESSURE

Summary:

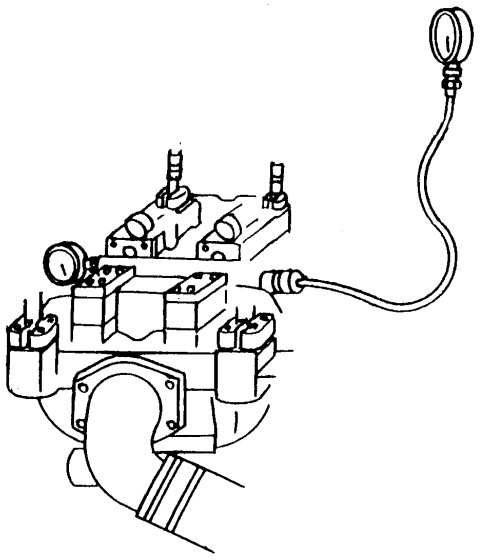
Measure the main relief valve set pressure at the delivery port in main pump. (The main relief set pressure can also be measured by using Dr. ZX.)

Preparation:

1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and release any remaining pressure.
3. Remove the plug of pressure check port from the main pump delivery port. Install adapter (ST 6069), hose (ST 6943) and pressure gauge (ST 6941).

   : 6 mm

   Connect Dr. ZX and select the monitoring function.
4. Start the engine. Confirm that no oil leakage is observed at the pressure gauge connection.
5. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).



T157-05-04-005

Measurement:

1. Select the following switch positions:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

2. First, slowly operate the bucket, arm and boom control levers to the stroke end and relieve each function.
3. As for the swing function, secure the upperstructure so it is immovable. Slowly operate the swing lever and relieve the swing function.
4. As for the travel function, secure the tracks against an immovable object. Slowly operate the travel levers and relieve the travel function.
5. With the power digging switch pushed, slowly operate the bucket, arm and boom control levers to the stroke ends and relieve each function within eight seconds.

Evaluation:

Refer to the Performance Standard in Group T4-2.

NOTE: If the measure pressures for all functions are lower than the specified range, the probable cause is a decrease of main relief valve setting pressure.
If relief pressure of a particular function is lower, the probable cause is other than main relief valve.

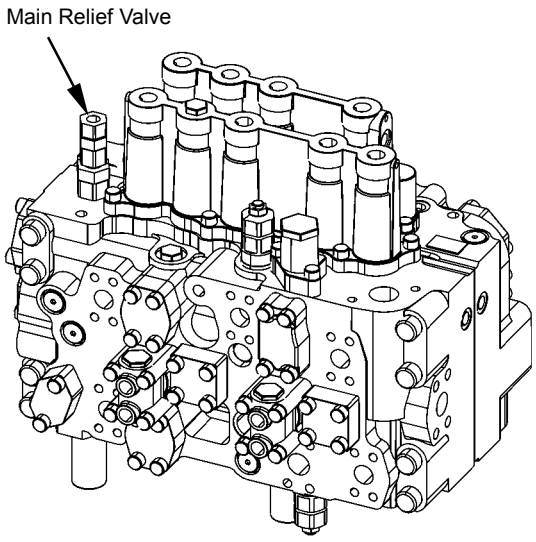
Main Relief Pressure Adjustment Procedure

Adjustment:
In case of pressure adjustment during power digging operation, adjust the high-pressure side of main relief pressure. In case of pressure adjustment in normal, adjust the low-pressure side of main relief pressure.

- **High-Pressure Side of Main Relief Pressure Adjustment Procedure**

1. Loosen lock nut (1). Lightly tighten plug (3) until plug (3) comes into contact with the end of piston (2). Tighten lock nut (1).
   : 27 mm
   : Plug (3): 19.5 N·m (2 kgf·m, 14.5 lbf·ft)
   : Lock Nut (1):
   68 to 78 N·m
   (7 to 8 kgf·m, 51 to 58 lbf·ft) or less

2. Loosen lock nut (4). Turn plug (5) and adjust pressure until the specified pressure is obtained.
   : 27 mm, 32 mm
   : Lock Nut (4):
   78 to 88 N·m
   (8 to 9 kgf·m, 58 to 65 lbf·ft) or less



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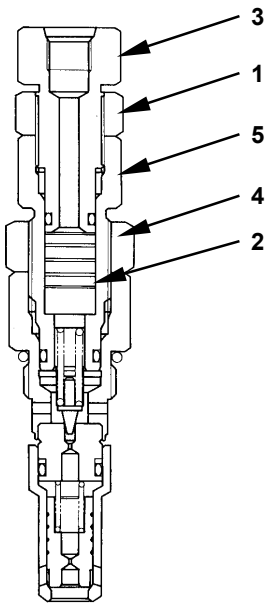
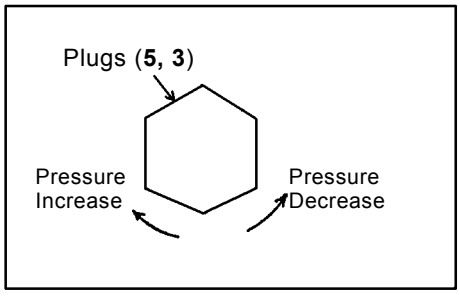
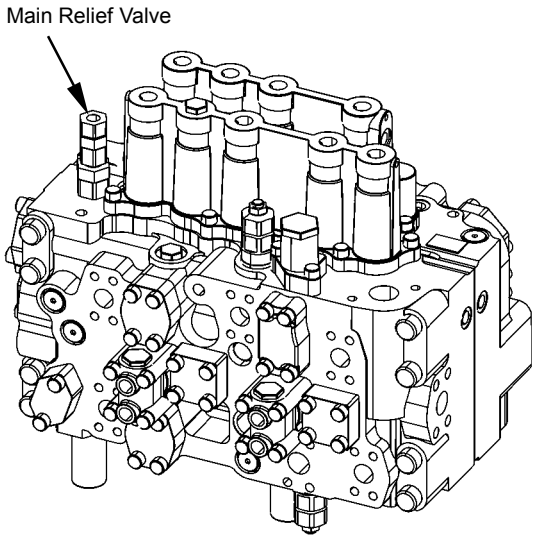


T157-05-04-009



W107-02-05-127

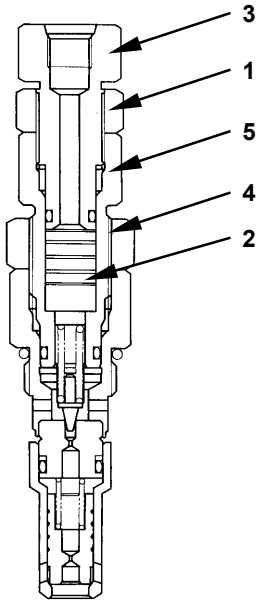
- **Low-Pressure Side of Main Relief Pressure Adjustment Procedure**
  1. Loosen lock nut (1). Turn plug (3) counterclockwise until the specified pressure is obtained. Tighten lock nut (1).
     : 27 mm
     : Lock Nut (1):
     59 to 68 N·m
     (6 to 7 kgf·m, 43 to 51 lbf·ft) or less
  2. After adjustment, check the set pressures.



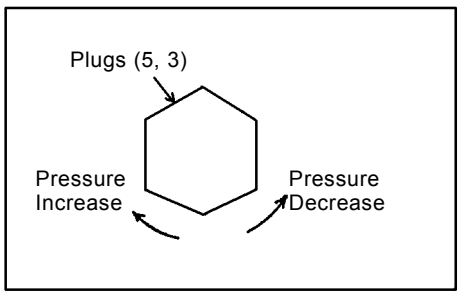
T1V1-04-05-001

NOTE: Standard Change in Pressure (Reference)

Plug Turns		1/4	1/2	3/4	1
Change in Relief Pressure: Plug (5) (High-Pressure Side)	MPa	7.1	14.2	21.3	28.4
	(kgf/cm^2)	(72.5)	(145)	(217.5)	(290)
	(psi)	(1030)	(2060)	(3090)	(4120)
Change in Relief Pressure: Plug (3) (Low-Pressure Side)	MPa	5.3	10.7	16.0	21.3
	(kgf/cm^2)	(54)	(109)	(163)	(217)
	(psi)	(770)	(1550)	(2320)	(3090)



T157-05-04-009



W107-02-05-127

RELIEF PRESSURE (WHEN RELIEVING SWING)

ZX200-3 class, ZX225US-3 class, ZX225USR-3 class, ZX240-3 class

Adjust pressure by changing the number of shims (2).

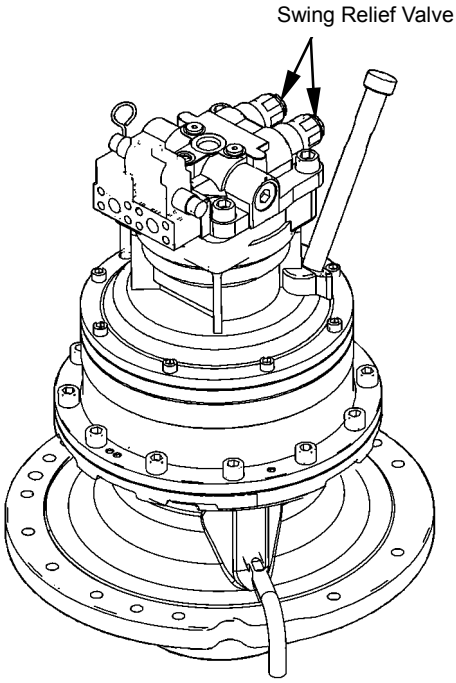
1. Remove the swing relief valve.
   : 41 mm
2. Remove plug (5), sleeve (4) and piston (3).
   : 30 mm
3. Install shims (2) between piston (3) and spring seat (1) in order to adjust pressure.
4. After adjustment, install piston (3), sleeve (4) and plug (5).
   : 118 N·m (12 kgf·m, 88 lbf·ft)

NOTE: Replace seals (A, B, C) with new ones.
A: JIS B 2401 G30 1B
B: AS568-023 (Aero-Space Standard)
C: AS568-125 (Aero-Space Standard)

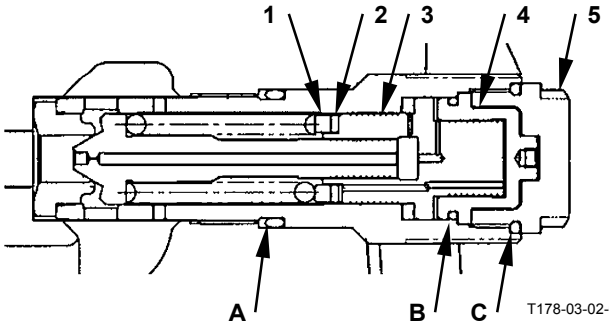
5. Install the swing relief valve.
   : 176 N·m (18 kgf·m, 130 lbf·ft)
6. Check the set pressure.

NOTE: Standard Change in Pressure (Reference)

Shim (2) Thickness	Change in Pressure	
(mm)	kPa	(kgf/cm^2, psi)
0.1	610	(6.3, 60)



T1V1-03-02-003

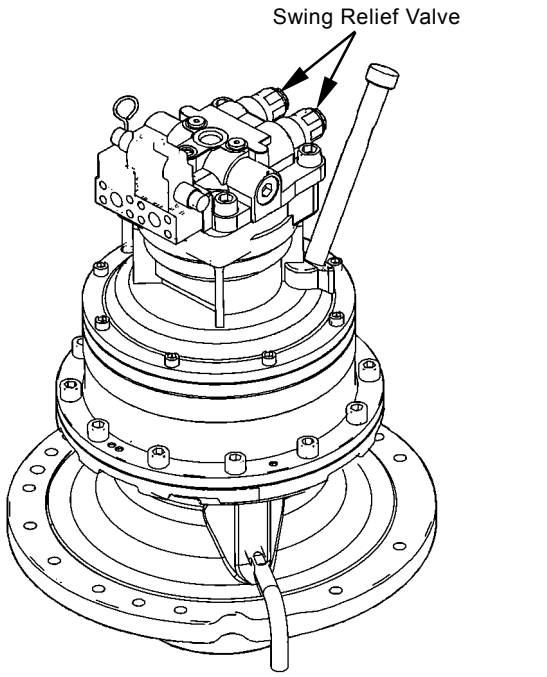


T178-03-02-005

ZX270-3 class

Loosen lock nut (2) and adjust pressure by using adjusting screw (1).

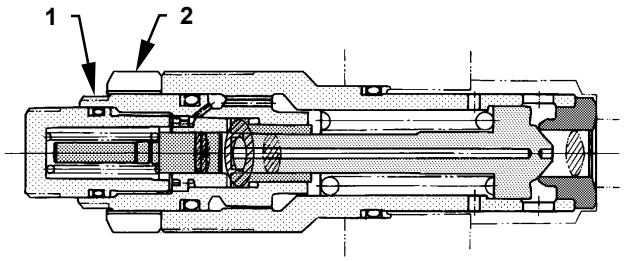
1. Loosen lock nut (2).
   :24 mm, 32 mm
2. Turn adjusting screw (1) in order to adjust pressure.
3. Tighten lock nut (2).
   : 24 mm, 32 mm
   : 177 N·m (18 kgf·m)
4. Check the set pressure.



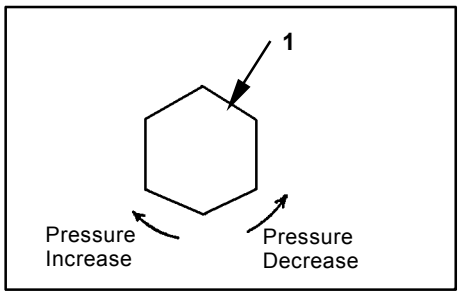
T1V1-03-02-003

NOTE: Standard Change in Pressure (Reference)

Adjusting Screw Turns		1/4	1/2	3/4	1
Change in Pressure	MPa	2.5	5.0	7.5	10.0
	(kgf/cm^2)	(25.5)	(51)	(76.5)	(102)
	(psi)	(363)	(725)	(1088)	(1450)



T107-02-04-020



T157-05-04-023

OVERLOAD RELIEF VALVE SET PRESSURE

Summary:

1. The circuit pressure must be increased by applying an external force while blocking the return circuit from the control valve. This measuring method is hazardous and the results obtained with this method are unreliable.
2. The oil flow rate used to set the overload relief pressure is far less than that used to set the main relief pressure. Therefore, measuring the overload pressure in the main circuit by increasing the main relief set pressure more than the overload valve set-pressure is not a proper method. In addition, in case a main relief valve designed to leak a small quantity of oil before reliving is used, its pre-leaking start pressure must be increased more than the overload relief valve set pressure. However, the pre-leaking start pressure is not always increased more than the overload relief valve set-pressure as the adjustable upper limit of the main relief valve set-pressure is provided. Accordingly, the overload relief valve assembly should be removed from the machine and checked on a specified test stand at a correct oil flow rate. Some overload relief valves come in contact with the control valve body to block the oil passage. When this type of overload relief valve is checked, the control valve body must be precisely finished as the test unit. Provide one control valve other than that on the machine as a test kit.
3. If the overload relief valve performance must be checked on the machine, however, measure the main relief pressure while releasing each front function respective to the measuring overload relief valve. And, assume that the overload relief valve is functioning correctly if the obtained main relief pressure is within the specified value range. Measure the main pressure of the front functions by using Dr. ZX as follows:

Preparation:

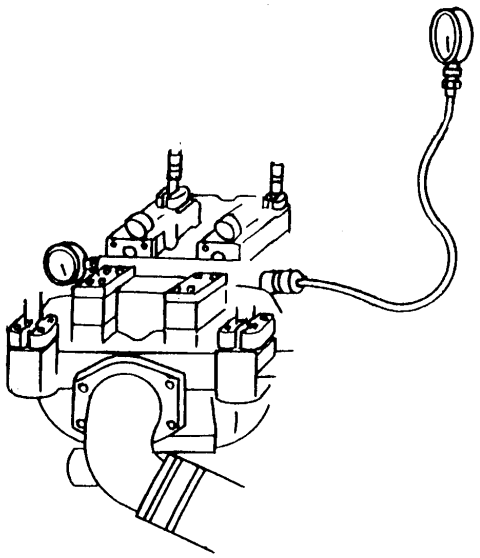
1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and release any remaining pressure.
3. Remove the plug from pressure check port of main pump delivery port. Install adapter (ST 6069), hose (ST 6943) and pressure gauge (ST 6941).
   : 6 mm
4. Connect Dr.ZX and select the monitoring function. Start the engine. Confirm that no oil leakage is observed at the pressure gauge connection.
5. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).

Measurement:

1. Select the following switch positions:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

2. Slowly operate the bucket, arm or boom control levers to the stroke ends and relieve each function.
3. Read pressures on the pressure gauge at this time.
4. Perform the measurement for the bucket, arm and boom in that order.
5. Repeat the measurement three times and calculate the average value for each.



T157-05-04-005

Evaluation:

1. Performance of the overload relief valves are normal if the measured main relief pressures are within the specified value range.

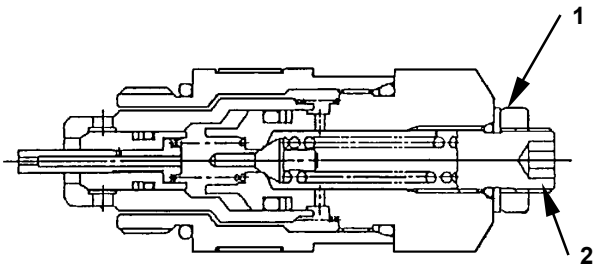
   Refer to the Performance Standard in Group T4-2.

Overload Relief Valve Pressure Adjustment Procedure

NOTE: In principle, adjust the overload relief valve pressure on a test stand.

Loosen lock nut (1) and adjust pressure by using adjusting screw (2).

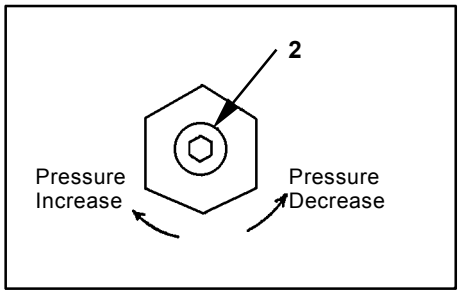
1. Loosen lock nut (1).
   : 17 mm
2. Turn adjusting screw (2) in order to adjust pressure.
   : 6 mm
3. Tighten lock nut (1).
   : 17 mm
   : 29.5 N·m (3.0 kgf·m, 22 lbf·ft)
4. Check the set pressure.



W107-02-05-128

NOTE: Standard Change in Pressure (Reference)

Adjusting Screw (2) Turns		1/4	1/2	3/4	1
Change in Pressure	MPa	5.2	10.6	15.9	21.1
	(kgf/cm^2)	(54)	(108)	(162)	(216)
	(psi)	(770)	(1540)	(2300)	(3070)



W107-02-05-129

MAIN PUMP FLOW RATE MEASUREMENT

●P-Q Control (Torque Control)

Summary:

Main pump performance is checked by measuring the pump flow rate by using a hydraulic tester installed at the main pump delivery port (one side) to be measured. Use Dr. ZX and a pressure gauge at the same time.

IMPORTANT: This measurement procedure is a simple method. The measured data will be lower by approx. 5 % than the accurately measured value. In order to measure accurately, disconnect the return circuit from the control valve and connect it to the hydraulic oil tank.

Preparation:

1. Stop the engine. Push the air bleed valve and bleed air. Install a vacuum pump to the oil filler port.

NOTE: Operate the vacuum pump while connecting the pump flow rate test line.

2. Remove the delivery hose from main pump (one side) to be measured. Install pipe (1 or 2) by using the split flanges and bolts which were used for the removed delivery hose.
   : 41 mm
   : 10 mm
3. Install pipe (1 or 2) to hydraulic tester (5) by using test hose (3) and adapter (4). Install adapter (6), joint (7), test hose (8) and flange (9) to hydraulic tester (5).
   : 41 mm
   : 10 mm
4. Install the delivery hose to flange (9) with split flanges (10) and bolt (11).
   : 10 mm
5. Install a pressure gauge to the main pump to be measured. (Refer to “Main Relief Set Pressure”.)
   : 6 mm
6. Remove pipe (13) from the regulator. Install plug (G 1/4) to pipe (13) in the regulator.
   : 17 mm
7. Remove the vacuum pump. Loosen plug (12) on top of the pump casing. Bleed air from the casing until oil only comes out.
8. Fully open the loading valve of hydraulic tester.
9. Start the engine. Check the pressure gauge connection for any oil leaks. Install Dr. ZX and select the monitoring function.

Measurement:

1. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).
2. Measure the maximum flow rate.
3. Select each switch position as follows:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

4. Adjust the relief set pressure of main relief valve in control valve to each pressure point specified along the main pump P-Q curve. (Refer to T4-2-13) Slowly restrict the loading valve of hydraulic tester while relieving pressure in the arm roll-in circuit. Measure the flow rates and engine speeds at each pressure point specified in the P-Q curve.
5. Repeat each measurement three times and calculate the average values.

Evaluation:

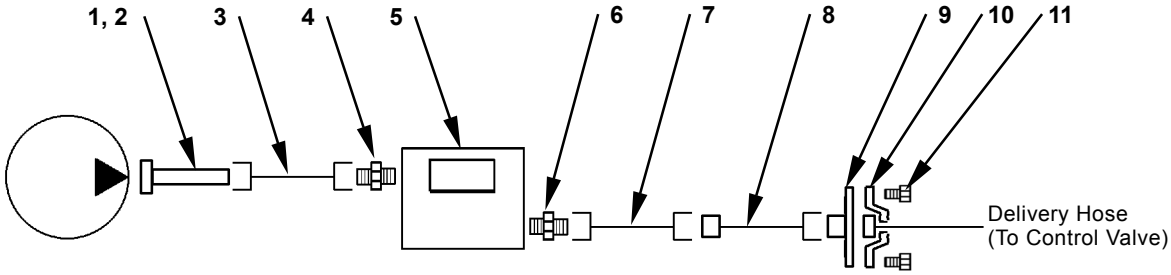
1. Convert the measured flow rates to those at the specified engine speed by using the following formulas:

$Qc = (Ns \times Q) / Ne$

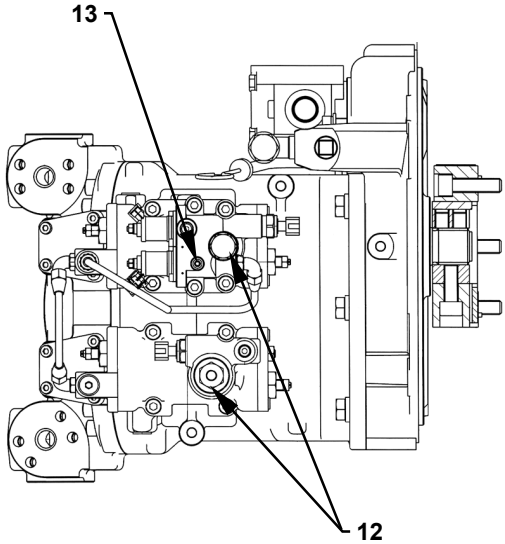
Qc : Converted Flow Rate
Q : Measured Flow Rate
Ns : Specified Engine Speed
(ZAXIS200-3: 1800 min^{-1})
(ZAXIS225US-3: 1800 min^{-1})
(ZAXIS225USR-3: 1800 min^{-1})
(ZAXIS240-3: 1900 min^{-1})
(ZAXIS270-3: 2000 min^{-1})
Ne : Measured Engine Speed**:**
Values indicated on Dr. ZX

2. Standard Flow Rate
Refer to Operational Performance Standard in Group T4-2.

NOTE: When actually measuring, install pipe (1 or 2) only to the pump to be measured.



T173-04-04-002



T1V1-04-05-002

1 - Pipe E (ST 6144)
2 - Pipe B (ST 6143)
3 - Test Hose (ST 6145)
4 - Adapter PF1 × UNF1-7/8 (ST 6146)
5 - Hydraulic Tester (ST 6299)
6 - Adapter PF1 × UNF1-7/8 (ST 6146)
7 - Joint (ST 6330)
8 - Test Hose (ST 6320)
9 - Flange (ST 6118)
10 - Split Flange (ST 6130)
11 - Bolt (ST 6409) (4 Used)
12 - Plug
13 - Pipe

•Pilot Characteristics

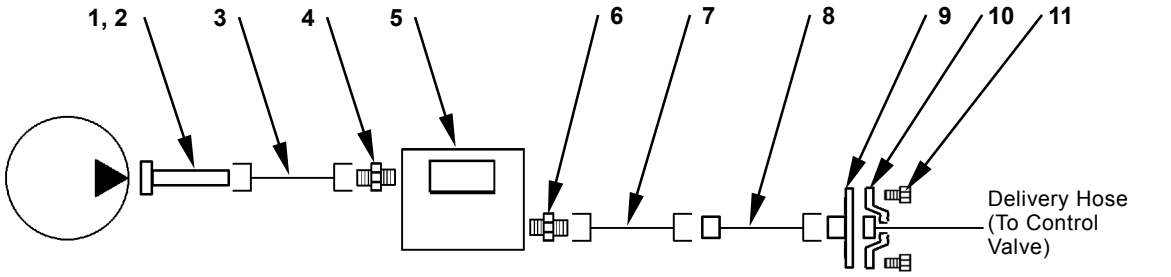
Summary:

Main pump performance is checked by measuring the pump flow rate by using a hydraulic tester installed at the main pump delivery port (one side) to be measured. Use Dr. ZX and a pressure gauge at the same time.

IMPORTANT: This measurement procedure is a simple method. The measured data will be lower by approx. 5 % than the accurately measured value. In order to measure accurately, disconnect the return circuit from the control valve and connect it to the hydraulic oil tank.

Preparation:

1. While referring to steps 1 to 4 on page T4-5-18. Install a hydraulic tester to the main pump to be measured.
2. Remove the hose from regulator port Pi of the pump to be measured. Install plug (ST 6213) to the removed hose.
   : 6 mm, 19 mm
3. Install adapters (15) (3 used) to pressure reducing valve (16). Remove plug M from the pilot filter. Install adapter (13) and hose (14) to the pilot filter. Install hose (14) to regulator port P1 on pressure reducing valve (16).
   : 19 mm
4. Install tee (17) to port P2 of pressure reducing valve (16). Install pressure gauge (18) and hose (14) to tee (17). Install hose (14) to the regulator.
   : 19 mm
5. Install hose (19) and adapter (20) to port T of pressure reducing valve (16). Remove plug L from the return pipe. Install hose (19).
   : 19 mm, 22 mm
6. Remove pipe (21) from the regulator. Install plug (G 1/4) to the mounting hole for pipe (21) in the regulator.
   : 17 mm
7. Remove the vacuum pump. Loosen the plug from top of the pump casing. Bleed air from the pump casing until oil only comes out.
8. Fully open the loading valve of hydraulic tester.
9. Start the engine. Check the connections for any oil leaks.



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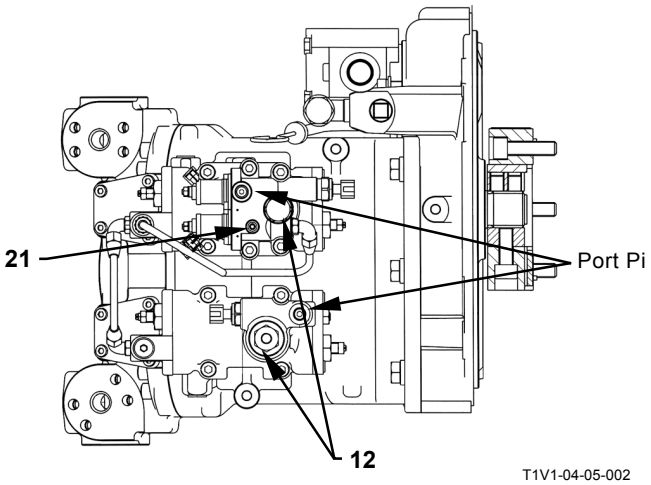

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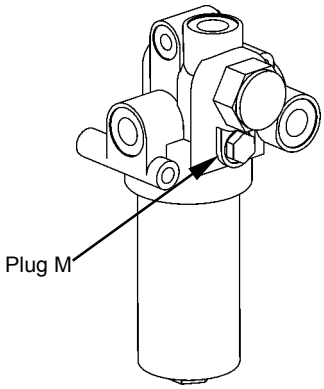

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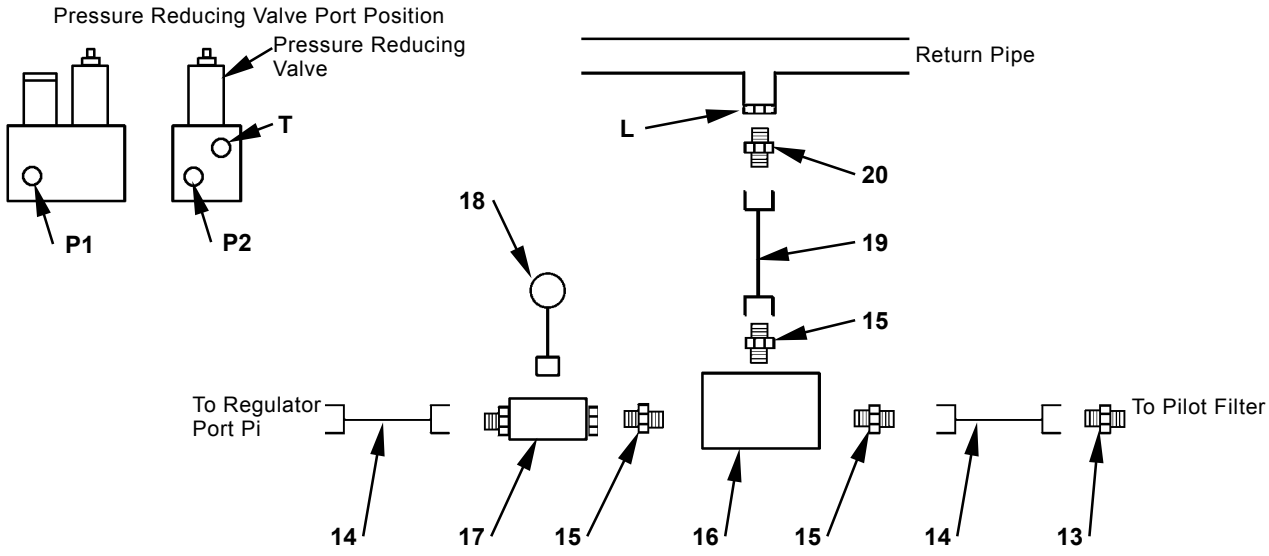


T178-04-04-004

1 - Pipe E (ST 6144)
2 - Pipe B (ST 6143)
3 - Test Hose (ST 6145)
4 - Adapter PF1 × UNF1-7/8 (ST 6146)
5 - Hydraulic Tester (ST 6299)
6 - Adapter PF1 × UNF1-7/8 (ST 6146)
7 - Joint (ST6330)
8 - Test Hose (ST 6320)
9 - Flange (ST 6118)
10 - Split Flange (ST 6130)
11 - Bolt (ST 6409) (4 Used)
12 - Plug M
13 - Adapter UNF7/16 × PF1/4 (ST 6069)
14 - Hose UNF7/16 × UNF7/16 (4334309)
15 - Adapter PF3/8 × UNF7/16 (4200465)
16 - Pressure Reducing Valve (4325439)
17 - Tee UNF7/16 × UNF7/16× PF1/4 (ST 6451)
18 - Pressure Gauge (ST 6931)
19 - Hose UNF7/16 × UNF7/16 (4334309)
20 - Adapter PF3/8 × UNF7/16 (4200465)
21 - Pipe

Measurement:

1. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F)
2. Measure pump flow rate in response to the external command pilot pressure.
3. Select each switch position as follows:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

4. Adjust the pressure reducing valve set pressure to each pressure point specified along the main pump P-Q curve. (Pilot Characteristics) (Refer to T4-2-16.) Measure the flow rates and engine speeds at the pressure points specified in the P-Q curve.
5. Repeat each measurement three times and calculate the average values.

Evaluation:

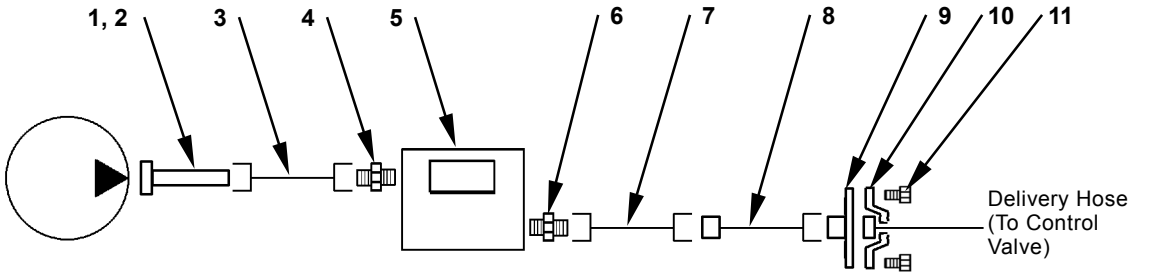
1. Convert the measured flow rates to those at the specified engine speed by using the following formulas:

$Qc = (Ns \times Q) / Ne$

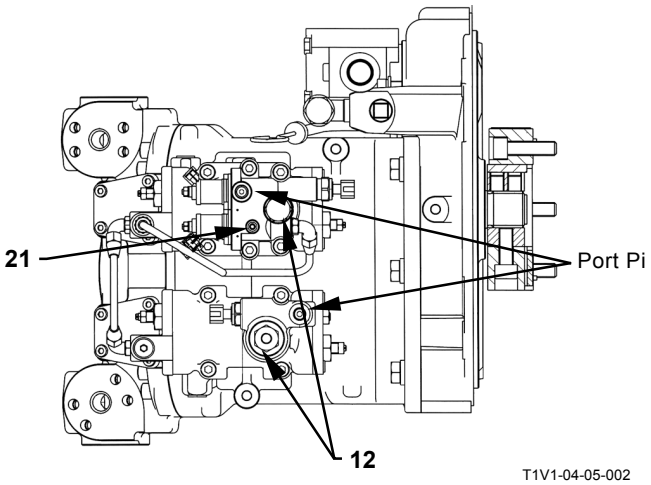
Qc : Converted Flow Rate
Q : Measured Flow Rate
Ns : Specified Engine Speed
(ZAXIS200-3: 1800 min^{-1})
(ZAXIS225US-3: 1800 min^{-1})
(ZAXIS225USR-3: 1800 min^{-1})
(ZAXIS240-3: 1900 min^{-1})
(ZAXIS270-3: 2000 min^{-1})
Ne : Measured Engine Speed
Values indicated on Dr. ZX

2. Standard Flow Rate
Refer to Operational Performance Standard in Group T4-2.

NOTE: When actually measuring, install pipe (1) (ST 6144) or (2) (ST 6143) only to the pump to be measured.



T173-04-04-002



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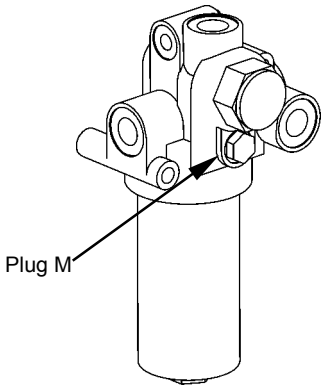

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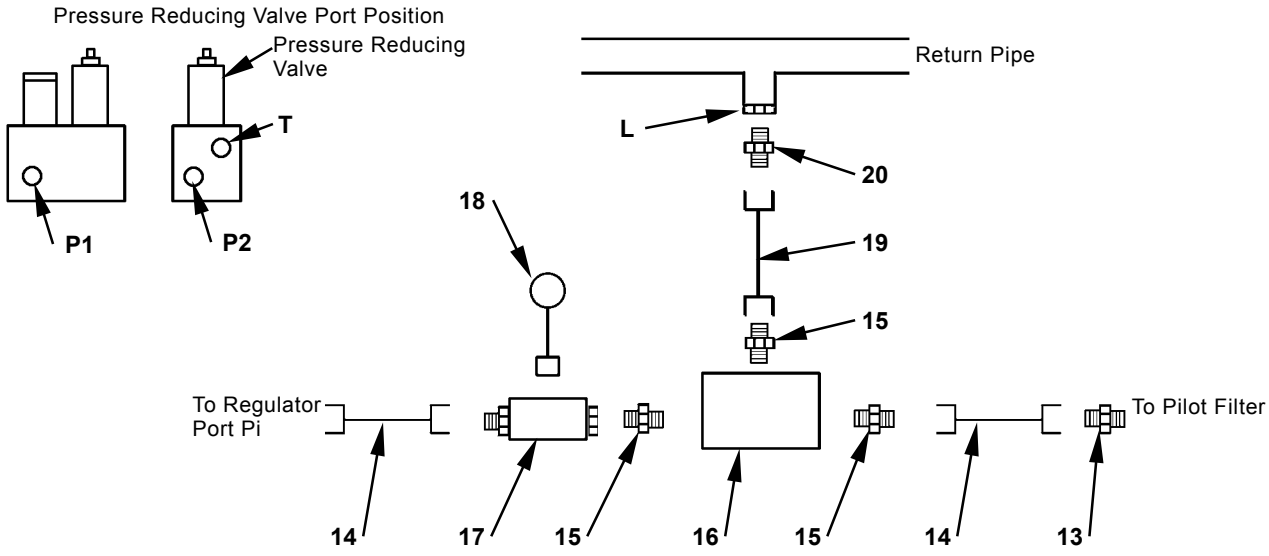
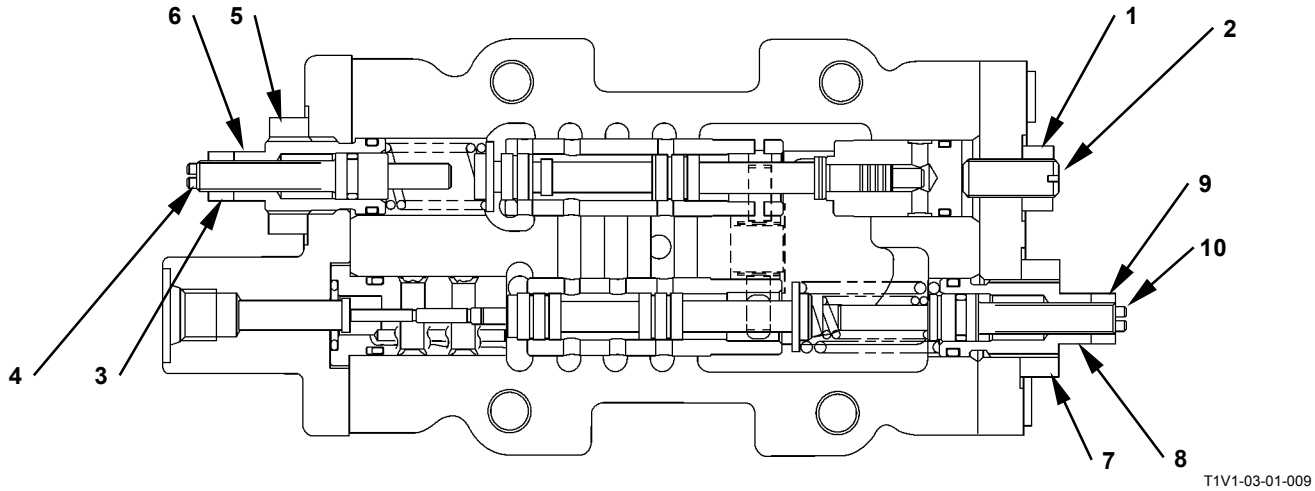


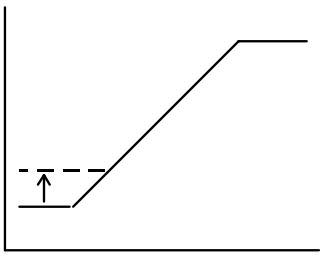
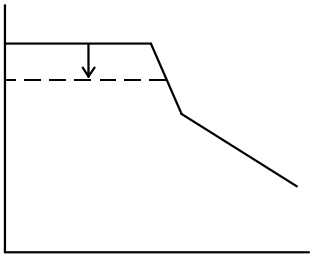
T178-04-04-004

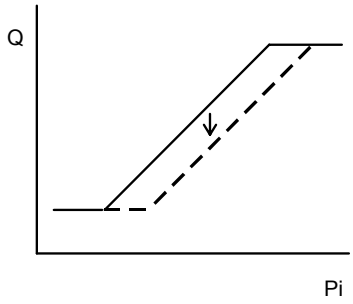
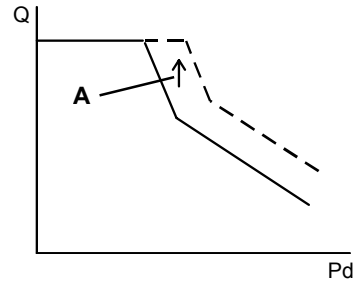
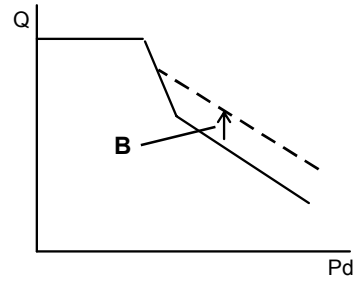
7 - Pipe E (ST 6144)
8 - Pipe B (ST 6143)
9 - Test Hose (ST 6145)
10 - Adapter PF1 × UNF1-7/8 (ST 6146)
11 - Hydraulic Tester (ST 6299)
12 - Adapter PF1 × UNF1-7/8 (ST 6146)
12 - Joint (ST6330)
13 - Test Hose (ST 6320)
14 - Flange (ST 6118)
15 - Split Flange (ST 6130)
16 - Bolt (ST 6409) (4 Used)
17 - Plug M
18 - Adapter UNF7/16 × PF1/4 (ST 6069)
19 - Hose UNF7/16 × UNF7/16 (4334309)
20 - Adapter PF3/8 × UNF7/16 (4200465)
21 - Pressure Reducing Valve (4325439)
22 - Tee UNF7/16 × UNF7/16× PF1/4 (ST 6451)
23 - Pressure Gauge (ST 6931)
24 - Hose UNF7/16 × UNF7/16 (4334309)
25 - Adapter PF3/8 × UNF7/16 (4200465)
26 - Pipe

Regulator Adjustment



1 - Lock Nut (For Minimum Flow Rate)
2 - Adjusting Screw (For Minimum Flow Rate)
3 - Lock Nut (For Maximum Flow Rate)
4 - Adjusting Screw (For Maximum Flow Rate)
5 - Lock Nut (For Pilot Pressure Characteristic)
6 - Adjusting Screw (For Pilot Pressure Characteristic)
7 - Lock Nut (For P-Q Control)
8 - Adjusting Screw (For P-Q Control)
9 - Lock Nut (For P-Q Control)
10 - Adjusting Screw (For P-Q Control)

Adjustment Item	Adjustment Procedure	Remarks
1. Minimum Flow Rate 	Loosen lock nut (1) and turn adjusting screw (2). Rotating adjusting screw (2) 1/4 a turn clockwise increases the minimum pump flow rate by 6.56 cm^3/rev. (0.4 in^3/rev). : 17 mm : 19.6 N·m (2 kgf·m, 14.4 lbf·ft)	1) Do not turn adjusting screw (2) more than two turns. 2) Securely tighten lock nut (1) after adjustment.
2. Maximum Flow Rate 	Loosen lock nut (3) and turn adjusting screw (4). Rotating adjusting screw (4) 1/4 a turn clockwise decreases the maximum pump flow rate by 8.22 cm^3/rev. (0.5 in^3/rev). : 13 mm : 9.8 N·m (1 kgf·m, 7.2 lbf·ft)	1) Do not turn adjusting screw (4) more than two turns. 2) Do not increase the maximum flow rate. In other words, do not turn adjusting screw (4) counterclockwise. 3) Securely tighten lock nut (3) after adjustment.

Adjustment Item	Adjustment Procedure	Remarks
3. Pilot Pressure Characteristics 	Loosen lock nut (5) and turn adjusting screw (6). Rotating adjusting screw (6) 1/4 a turn clockwise decreases the flow rate by 13.2 cm^3/rev. (0.71 in^3/rev). : 30 mm : 29.4 N·m (3 kgf·m, 21.7 lbf·ft)	1) Do not turn adjusting screw (6) more than one turn. 2) When adjusting screw (6) is turned clockwise, the maximum flow rate will also be decreased. In order to maintain the maximum flow rate unchanged, turn adjusting screw (4) counterclockwise twice as much as adjusting screw (6) is turned. This ratio of 2 (adjusting screw (4) counterclockwise turn) to 1 (adjusting screw (6) clockwise turn) is to counterbalance. 3) Securely tighten lock nut (5) after adjustment.
4. P-Q Control (Torque Adjustment)  	A: Loosen lock nut (7) and turn adjusting screw (8). Rotating adjusting screw (8) 1/4 a turn clockwise increases the flow rate by 15.3 cm^3/rev. (0.93 in^3/rev.). B: Loosen lock nut (9) and turn adjusting screw (10). Rotating adjusting screw (10) 1/4 a turn clockwise increases the flow rate by 3.60 cm^3/rev. (0.22 in^3/rev).	1) Do not turn the adjusting screws more than one turn. 2) Rotate the adjusting screws watching the engine performance. 3) Securely tighten lock nut (7) or (9) after adjustment.

SWING MOTOR DRAINAGE

Summary:

1. Measure amount of oil draining from the swing motor while swinging the upperstructure and check the swing motor performance.
2. The amount of drain oil from the swing motor will change depending on hydraulic oil temperature.

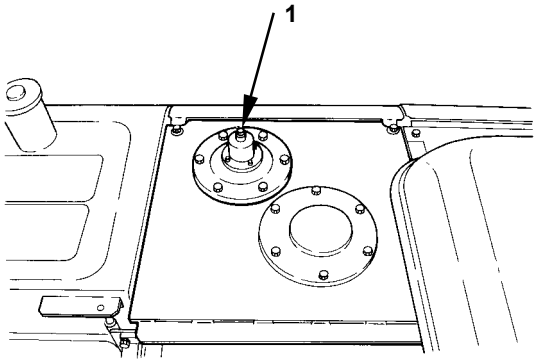
CAUTION: Prevent personal injury. Always make sure that the area is clear and that co-workers are out of the swing area before starting the measurement.
Also, take care not to fall off the machine while the measurement.

Preparation:

1. Maintain hydraulic oil temperature at 50±5 °C (122±41 °F). Rotate the swing motor in order to warm inside of the motor.

2. Stop the engine. Push air bleed valve (1) on top of the hydraulic oil tank and release any remaining pressure.

3. Remove drain hose (2) of the swing motor at the hydraulic oil tank end. Install plug (ST 6213) to the Remove end on the hydraulic oil tank.
   : 22 mm
   : 39 N·m (4 kgf·m, 29 lbf·ft)



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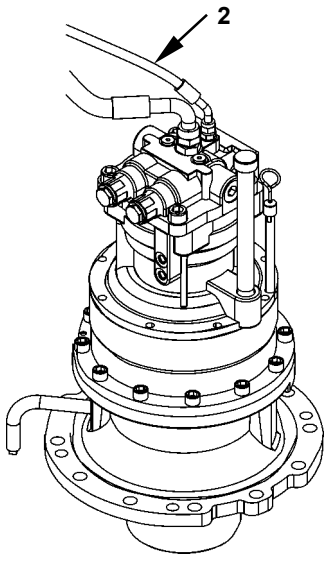


T178-04-04-005

Preconditions for Measurement:

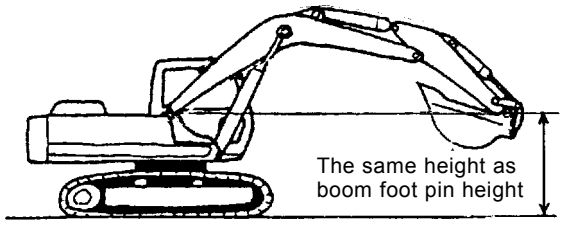
1. Select the following switch positions:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

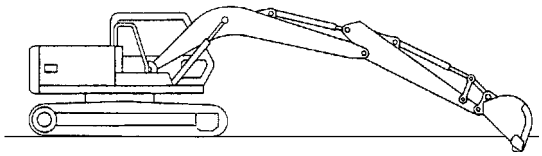
Measurement:

1. Amount of Oil Drained While Swinging the Upperstructure
   (1) Fully retract the arm cylinder. Fully extend the bucket cylinder. Hold the boom so that the arm tip pin height is the same as the boom foot pin height. The bucket must be empty.
   (2) Start the engine. Operate and hold the swing lever full stroke. After the swing speed reaches a constant maximum speed, start draining oil measurement when drain oil starts coming out of the drain hose end.
   (3) Repeat the measurement at least three times in both clockwise and counterclockwise directions, and calculate the average values.
   (4) The measuring time should be more than 45 seconds.

2. Amount of Oil Drained While Relieving Swing Motor Circuit
   (1) Thrust the bucket teeth into the ground so that the upperstructure does not rotate.
   (2) Start the engine. Operate and hold the swing lever full stroke. Start draining oil measurement when drain oil starts coming out of the drain hose end.
   (3) Repeat the measurement at least three times in both clockwise and counterclockwise directions, and calculate the average values.
   (4) The measuring time should be more than 45 seconds.



T105-06-03-013



T107-06-06-005

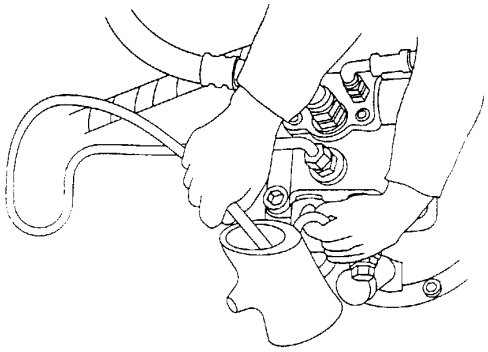
Evaluation:
Refer to the Operational Performance Standard in Group T4-2.

* Conversion of amount of drain oil measured into the per-minute value

  First measure amount of drain oil by using a calibrated container. Then, convert the measured drain oil into the per-minute value by using the formula below:

  $\Delta Q = 60 \times q / t$

  ΔQ : Amount of drain oil per minute (L/min)
  t : Measured time (seconds)
  q : Total amount of drain oil (L)



T107-06-05-008

TRAVEL MOTOR DRAINAGE

Summary:

1. While rotating the travel motor with the track to be measured jacked up, measure amount of oil draining from the travel motor and check travel motor performance.
2. Judge travel motor performance from the results including travel speed, mistrack and so on overall.
3. The amount of drain oil from the travel motor will change depending on hydraulic oil temperature.

CAUTION:Prevent personal injury. Always make sure that the area is clear and that co-workers are out before starting the measurement.
Also, take care not to fall off the machine while the measurement.

Preparation:

1. Main hydraulic oil temperature at 50±5 °C (122±41 °F). Rotate the travel motor and warm inside of the motor.

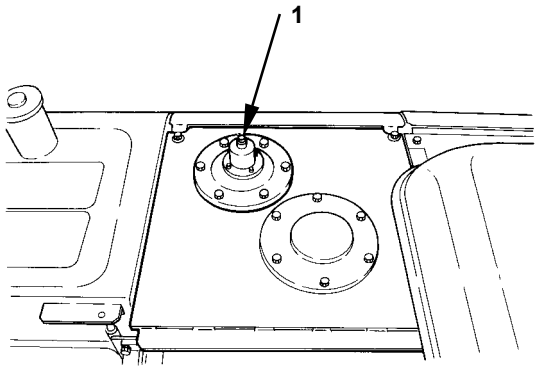
2. Stop the engine. Push air bleed valve (1) on top of the hydraulic oil tank and release any remaining pressure.

3. Remove drain hose (2) in the travel motor at the travel motor end. Install plug (ST 6637) to the removed end. Install the drain hose (3/4-16UN) to the travel motor.
   : 27 mm
   : 78 N·m (8.0 kgf·m, 58 lbf·ft)

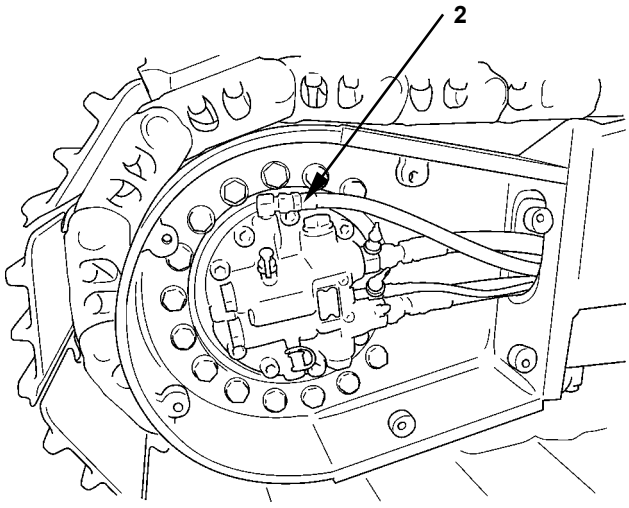
Preconditions for Measurement:

1. Select the following switch positions:

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode



T157-05-04-014



M178-07-047

Measurement:

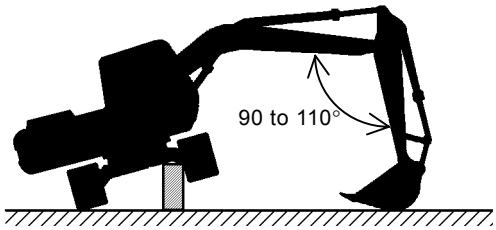
CAUTION: When working around moving parts is unavoidable, pay special attention to ensure that hands, feet, and clothing do not become entangled. Securely support the raised track by using the blocks.

(1) Start the engine. Jack up the track to be measured.

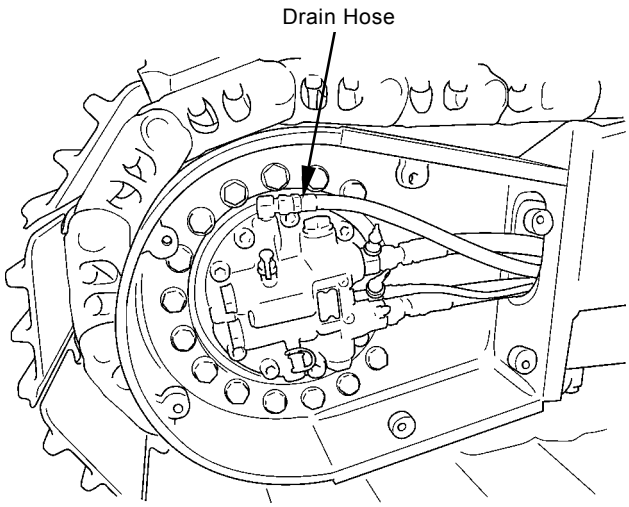
(2) Rotate the track to be measured. Start drain oil measurement when drain oil starts coming out of the drain hose end.

(3) Repeat the measurement at least three times in both forward and reverse directions, and calculate the average values.

(4) The measuring time should be more than 45 seconds.



M104-07-067



M178-07-047

Evaluation:
Refer to the Operational Performance Standard in Group T4-2.

∗Conversion of amount of drain oil measured into the per-minute value

First measure amount of drain oil using a calibrated container. Then, convert the measured drain oil into the per-minute value using the formula below:

$\Delta Q = 60 \times q / t$

ΔQ : Amount of drain oil per minute (L/min)
t : Measured time (seconds)
q : Total amount of drain oil (L)

MEMO

MEMO

SECTION 5
TROUBLESHOOTING

CONTENTS

Group 4 e-Shovel

Group 5 Component Layout

Group 6 Troubleshooting A

Group 7 Troubleshooting B

Group 8 Electrical System Inspection

INTRODUCTION

Refer to the inspection and troubleshooting procedures after any machine trouble has occurred. The inspection and troubleshooting procedures are presented in an orderly fashion in this section to quickly find the cause of the machine trouble and solution.

The troubleshooting section in this manual consists of 8 groups; Diagnosing Procedure, monitor unit, Dr. ZX, e-Shovel, Component Layout, Troubleshooting A (base machine diagnosis by using fault codes), Troubleshooting B (base machine diagnosis starting with inspection of abnormal operational status) and Electrical System Inspection.

- Monitor Unit
  Refer to this group as for the display screen and operating procedures of monitor unit.

- Dr. ZX
  This group contains the operating procedures for Dr. ZX.

- e-Shovel
  This group contains as follows.
  Download data from ICF and Upload
  Procedures when starting satellite communication, when installing the satellite communication controller and when replacing ICF
  Explanation for the satellite communication system

- Component Layout

- Troubleshooting A (base machine diagnosis by using fault codes)
  Refer to these procedures if any fault codes are displayed when each controller (MC, ECM, ICF and monitor unit) is diagnosed by using Dr. ZX (or the service menu of monitor unit).

IMPORTANT: ICF receives and retains a record of the electrical signal system malfunction of each controller in the form of fault codes by using CAN communication. In addition, ICF self-diagnosing function records the electrical signal system malfunction in the form of fault codes

Ex.) Fault Code 11004-2: Failure of CAN Communication

- Troubleshooting B (base machine diagnosis starting with inspection of abnormal operational status)
  Refer to these procedures when no fault codes are displayed after diagnosing the machine with Dr. ZX (or the service menu of monitor unit).
  Ex.) Although the engine control dial is turned, engine speed does not change.

- Electrical System Inspection
  Refer to this group when required to obtain precautions and/or information for the electrical system inspection.
  Ex.) Fuse Check

DIAGNOSING PROCEDURE

These six basic steps are essential for efficient troubleshooting:

1. Study the System
   Study the machine's technical manuals. Know the system and how it works, and what the construction, functions and specifications of the system components are.

2. Ask the operator
   Before inspecting, get the full story of malfunctions from the operator below.

   (a) How is the machine being used? (Find out if the machine is being operated correctly)

   (b) When was the trouble noticed, and what types of work the machine doing at that time?

   (c) What are the details of the trouble? Is the trouble getting worse, or did it appear suddenly for the first time?

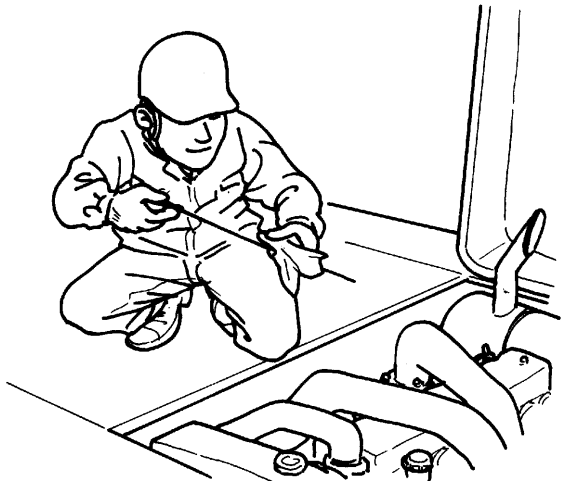
   (d) Did the machine have any other troubles previously? If so, which parts were repaired before?

3. Inspect the machine
   Before starting the troubleshooting procedure, check the machine's daily maintenance points, as shown in the operator's manual.

   Also, check the electrical system, including the batteries, as troubles in the electrical system such as low battery voltage, loose connections and blown fuses will result in malfunction of the controllers, causing total operational failure of the machine.
   If troubleshooting is started without checking for blown fuses, a wrong diagnosis may result, wasting time. Check for blown fuses before troubleshooting. Even if a fuse looks normal by visual inspection, a fine crack is difficult to find. Always use a tester when checking the fuses.

T107-07-01-001

T107-07-01-002



T107-07-01-003

4. Operate the machine yourself
   Try to identify the trouble by operating the machine yourself.
   If the trouble cannot be confirmed, stop the engine and obtain further details of the malfunction from the operator.
   Also, check for any incomplete connections of the wire harnesses correponding to the trouble.

5. Perform troubleshooting

CAUTION: Do not disconnect harnesses or hydraulic lines while the engine is running. The machine may malfunction or pressurized oil may spout, possibly resulting in personal injury. Stop the engine before disconnecting harnesses or hydraulic lines.

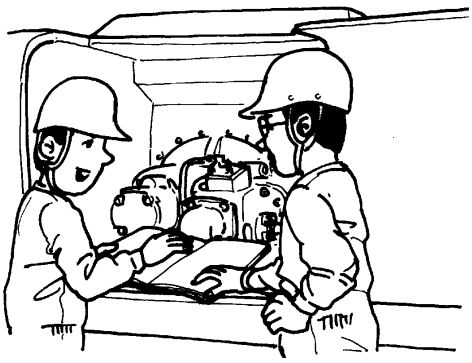
Perform diagnosis by connecting Palm to the machine or by using the service menu of monitor unit. In case any fault code has been displayed by diagnosis by using Dr. ZX (the service menu of monitor unit), check the cause of the trouble by referring to Troubleshooting A in this section. In case any fault code has been displayed by diagnosis by using Dr. ZX (the service menu of monitor unit), write the fault code. Delete the fault code once and retry self-diagnosis again. If the fault code is displayed again, check the cause of the trouble by referring to Troubleshooting A in this section. After the machine trouble has been corrected, the fault code (displayed by the service menu of monitor unit) will be deleted. Therefore, in case the problems which are not easily re-predicable are encountered, check the fault code by using Dr. ZX.

In case the fault code is not displayed, check operating condition of each component by referring to Troubleshooting B in this section and by using Dr. ZX (the service menu of monitor unit).

NOTE: Note that the fault codes displayed do not necessarily indicate machine trouble. The controller stores even temporary electrical malfunctions, such as a drop in battery output voltage or disconnections of the switches, sensors, etc., for inspections.
For this reason, the "RETRIAL" is required to erase the accumulated fault codes from the controller memory and to confirm if any fault codes are indicated after the "RETRIAL".

T107-07-01-005

T107-07-01-006



T107-07-01-007

6. Trace possible causes
   Before reaching a conclusion, check the most likely causes again. Try to identify the actual cause of the trouble.
   Based on your conclusion, make a plan for appropriate repairs to avoid consequent malfunctions.

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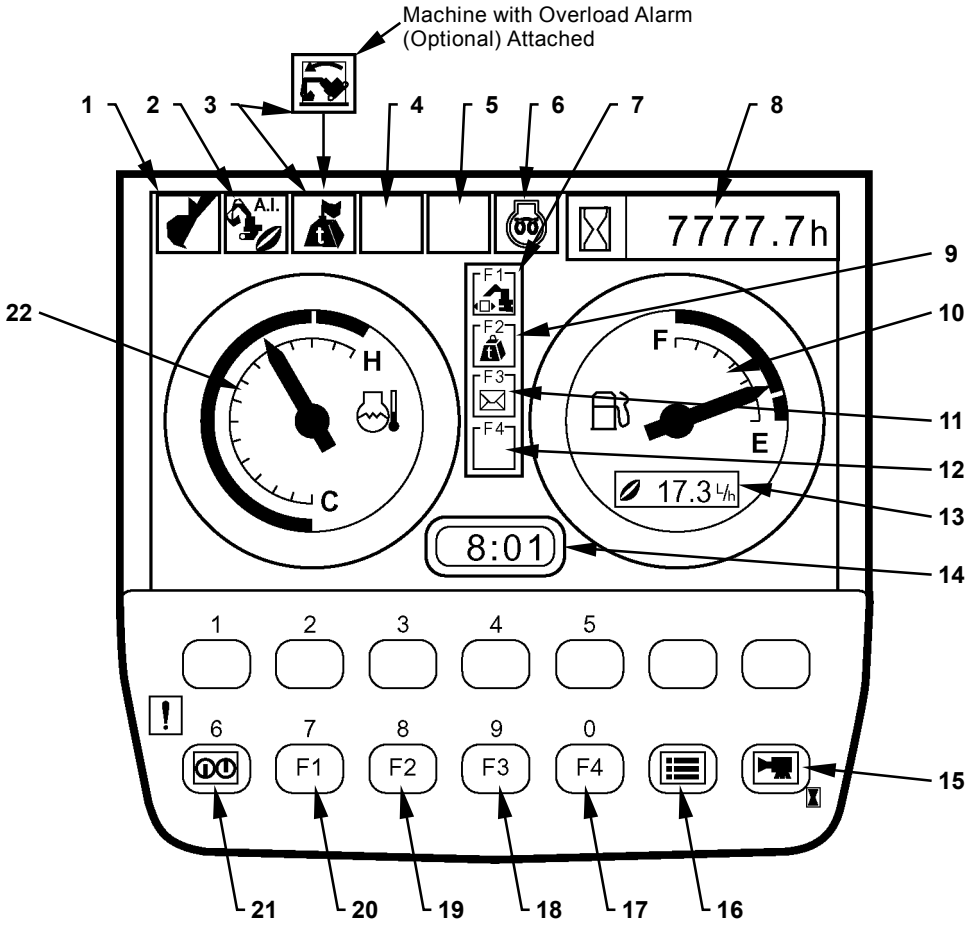
OUTLINE

Primary Screen



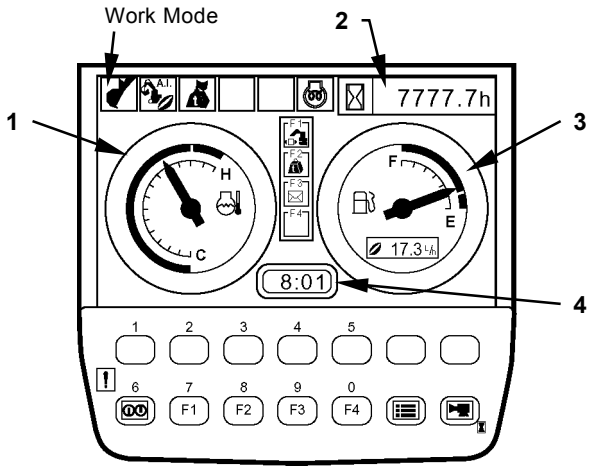
T1V1-05-01-094

1 - Work Mode Display
2 - Auto-Idle Display
3 - *ML Crane Display or Overload Alarm Display (Optional)
4 - Auxiliary
5 - Auxiliary
6 - Glow Display
7 - Work Mode Display
8 - Hour Meter
9 - *ML Crane Display (Optional)
10 - Fuel Gauge
11 - Mail Display (Optional)
12 - Auxiliary
13 - Fuel Consumption Gauge
14 - Clock
15 - Back-Screen Selection
16 - Menu
17 - Auxiliary Selection
18 - Mail Selection (Optional)
19 - *ML Crane Selection (Optional)
20 - Work Mode Selection
21 - Return to Primary Screen
22 - Coolant Temperature Gauge

*NOTE: *ML crane display and ML crane selection is only available in Japanese domestic marked.*

- Display of Meters
  Data to be displayed on each meter from are displayed on the monitor unit according to the input signal from sensor, the signal received by using CAN and the internal data of monitor unit.

  Items to be displayed
  1. Coolant Temperature Gauge (Input signal from the coolant temperature sensor)
  2. Hour Meter (Internal data of the monitor unit)
  3. Fuel Consumption Gauge (Input signal from the fuel sensor)
  4. Clock (Signal received from ICF by using CAN)



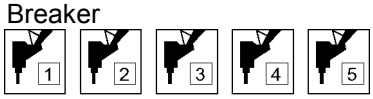
T1V1-05-01-008

- Work Mode Display
  The attachments being used are displayed according to the signals received from MC by using CAN.

  Digging Mode

T1V1-05-01-108

  Attachment Mode
  Breaker



T1V1-05-01-104

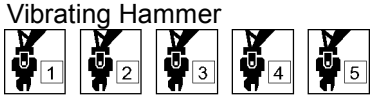
  Pulverizer

T1V1-05-01-105

  Crusher

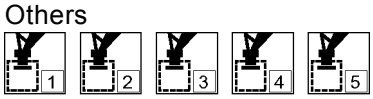
T1V1-05-01-106

  Vibrating Hammer



T1V1-05-01-107

  Others

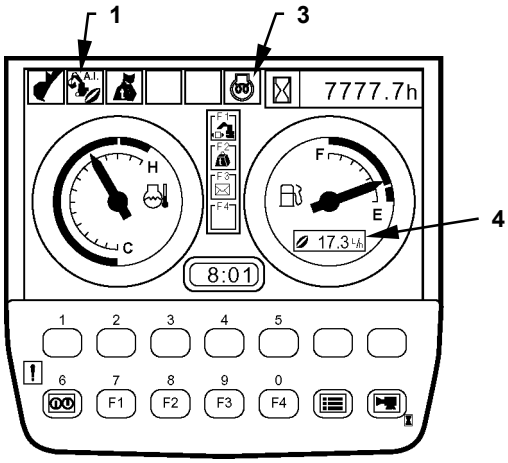


T1V1-05-02-003

NOTE: The items on monitor unit and HITACHI pattern are same.

Monitor Unit	HITACHI pattern
Breaker1	Hydraulic Breaker1
Breaker2	Hydraulic Breaker2
Pulverizer1	Secondary Crusher1
Crusher1	Primary Crusher1

- Auto-Idle Display (1)
  When the switch is turned ON, the data is displayed. When the key switch is turned ON with the auto-idle switch ON, the data blinks for 10 seconds.

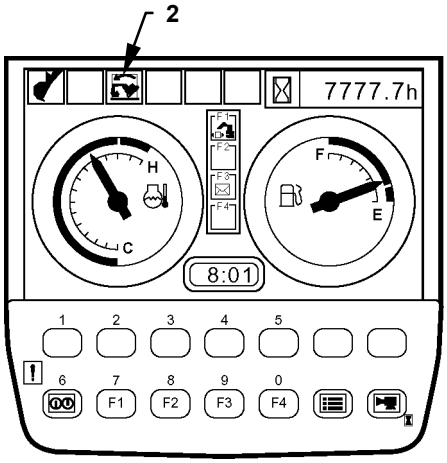


T1V1-05-01-008

Overload Alarm (2)

T1V1-05-02-002

The system measures the load of suspended load from the bottom pressure of boom cylinder. When overload is detected, an alarm is displayed.
(Refer to T5-2-10.)



T1V1-05-01-128

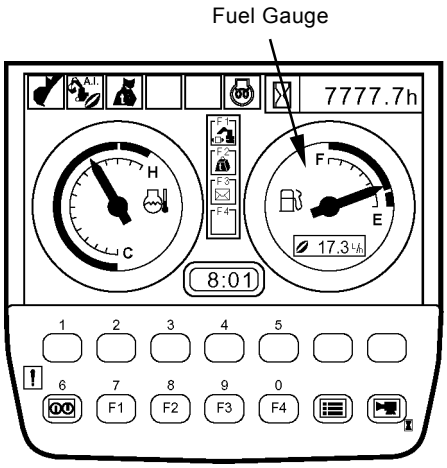
- Glow Display (3)
  While ECM is supplying current to the glow plug, the date is displayed according to the signal from ECM.

- Fuel Consumption Gauge Display (4)

IMPORTANT: The values on fuel gauge are references and different from the measured values.

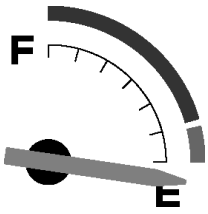
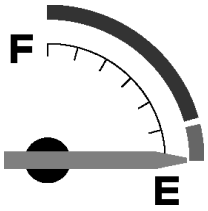
Fuel consumption is displayed according to the signal from ECM, which is received through MC by using CAN bus line.

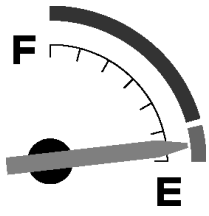
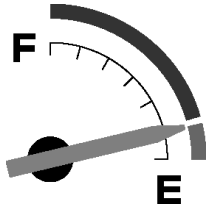
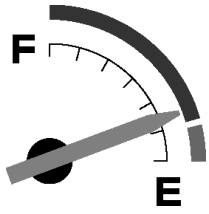
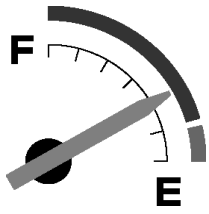
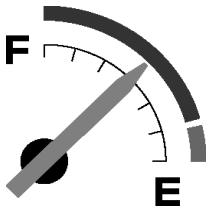
- Fuel Gauge
  Fuel level is displayed on .

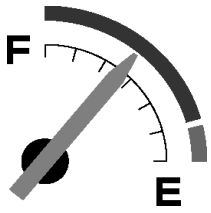
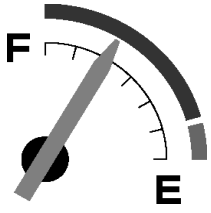
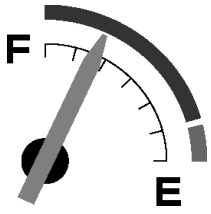
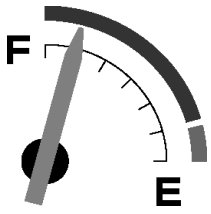
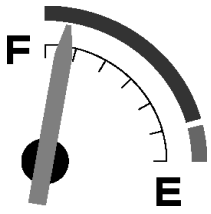
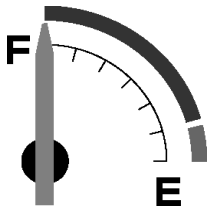


Primary Screen

T1V1-05-01-008

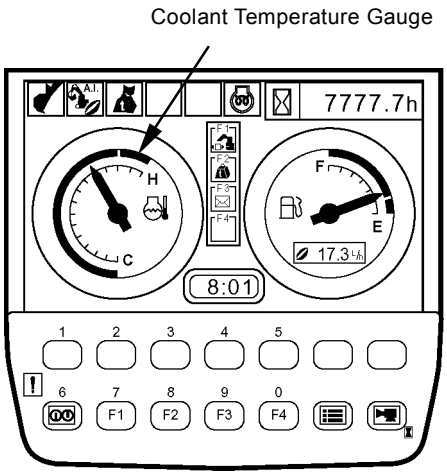
Fuel Level	Primary Screen
Less than 1%	 T1V1-05-02-010
1% or more Less than 3%	 T1V1-05-02-012

Fuel Level	Primary Screen
3% or more Less than 5%	 T1V1-05-02-014
5% or more Less than 12%	 T1V1-05-02-016
12% or more Less than 20%	 T1V1-05-02-018
20% or more Less than 30%	 T1V1-05-02-020
30% or more Less than 40%	 T1V1-05-02-022
40% or more Less than 50%	 T1V1-05-02-024

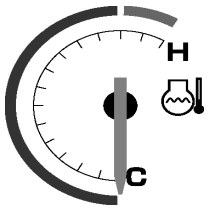
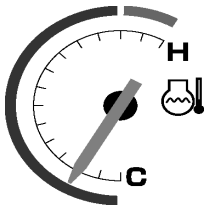
Fuel Level	Primary Screen
50% or more Less than 60%	 T1V1-05-02-026
60% or more Less than 70%	 T1V1-05-02-028
70% or more Less than 80%	 T1V1-05-02-030
80% or more Less than 90%	 T1V1-05-02-032
90% or more Less than 100%	 T1V1-05-02-034
100% or more	 T1V1-05-02-036

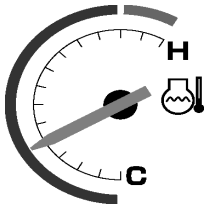
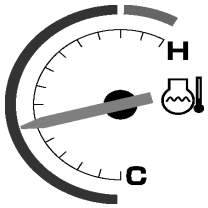
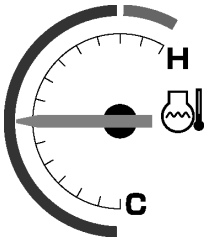
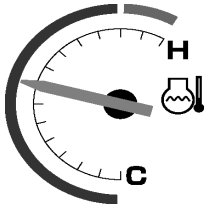
(Blank)

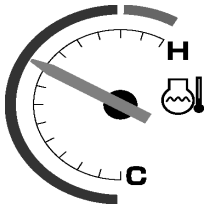
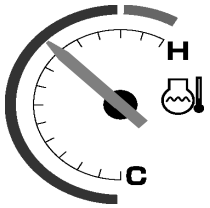
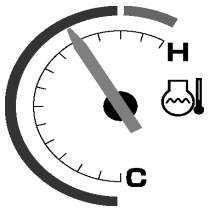
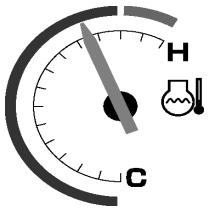
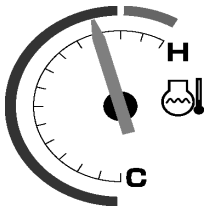
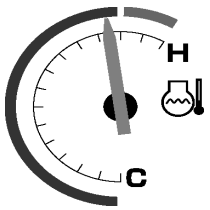
- Coolant Temperature Gauge
  Temperature of engine coolant is displayed on.

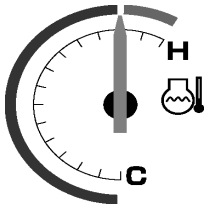
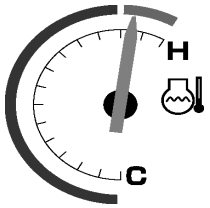
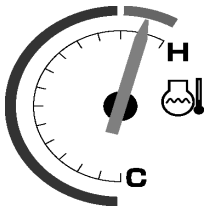
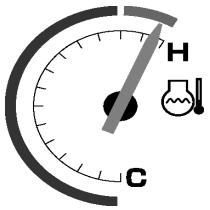
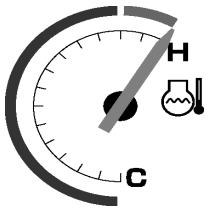
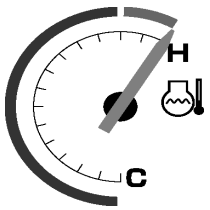


Primary Screen T1V1-05-01-008

Coolant Temperature	Primary Screen
Less than 40°C	 T1V1-05-02-038
40°C or more Less than 45°C	 T1V1-05-02-040

Coolant Temperature	Primary Screen
45°C or more Less than 50°C	 T1V1-05-02-042
50°C or more Less than 60°C	 T1V1-05-02-045
60°C or more Less than 80°C	↑
80°C or more Less than 96°C	 T1V1-05-02-047
96°C or more Less than 98°C	 T1V1-05-02-049

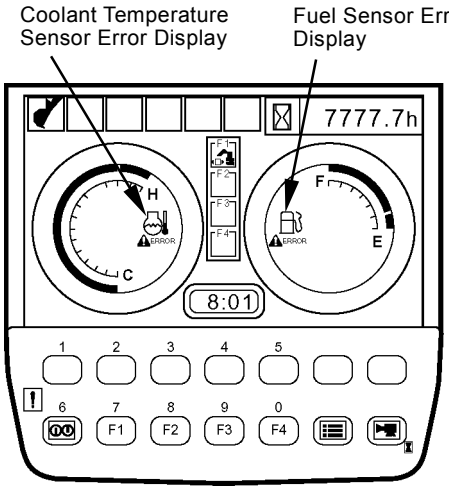
Coolant Temperature	Primary Screen
98°C	 T1V1-05-02-051
99°C	 T1V1-05-02-053
100°C	 T1V1-05-02-054
101°C	 T1V1-05-02-056
102°C	 T1V1-05-02-058
103°C	 T1V1-05-02-060

Coolant Temperature	Primary Screen
104°C	 T1V1-05-02-062
105°C or more Less than 110°C	 T1V1-05-02-064
110°C or more Less than 115°C	 T1V1-05-02-066
115°C or more Less than 120°C	 T1V1-05-02-067
120°C or more	 T1V1-05-02-068
Overheat SW=ON	 T1V1-05-02-068

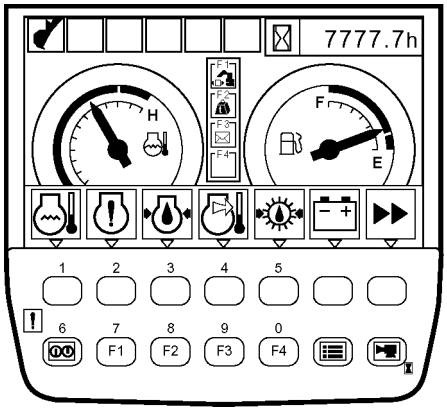
- Fuel Sensor Error Display
  When the fuel sensor is faulty or if the harness between fuel sensor and monitor unit is open circuit, the data is displayed on the fuel gauge.

- Coolant Temperature Sensor Error Display
  When the coolant temperature sensor is faulty, the data is displayed on the coolant temperature gauge.

- Alarm and Remedy Displays against Alarm
  Alarm marks are displayed on bottom of the screen according to the alarm signals from pilot shut-off lever, overheat switch, fuel sensor, hydraulic oil filter alarm switch (optional), air cleaner restriction switch, alternator, battery system and ECM and the alarm signals received by using CAN bus line. The remedy for each alarm is displayed by key operation.

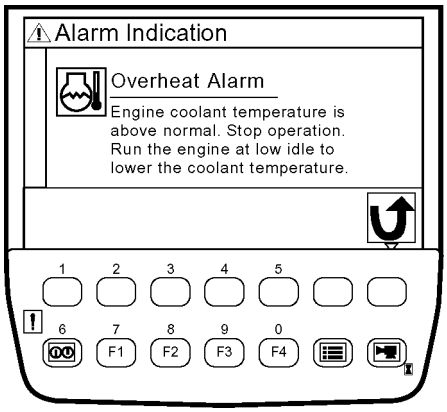


T1V1-05-02-005



Alarm Display

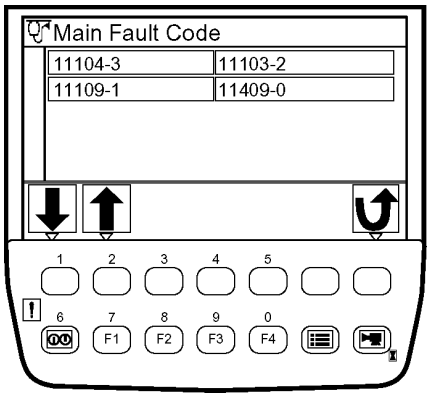
T1V1-05-01-096



Remedy Display against Alarm

T1V5-05-01-013

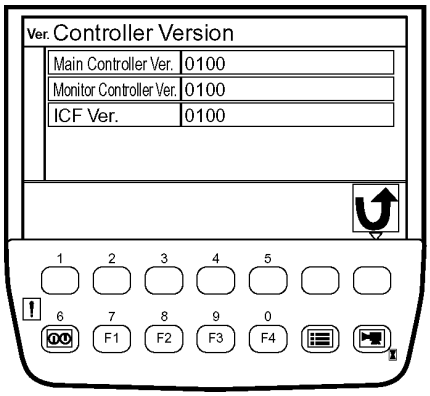
- Troubleshooting
  This screen displays the fault codes according to the signals received from each controller by using CAN.



Fault Code Display T1V5-05-01-097

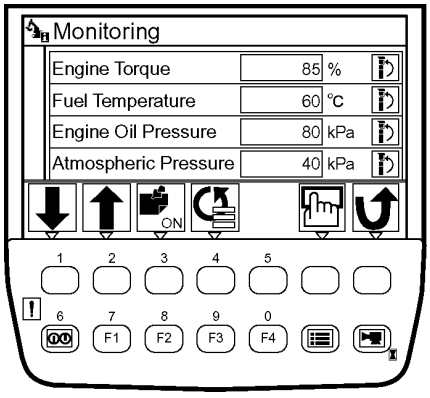
- Controller Version
  This screen displays the version of MC, ICF and monitor unit.

NOTE: The version of ECM is not displayed.



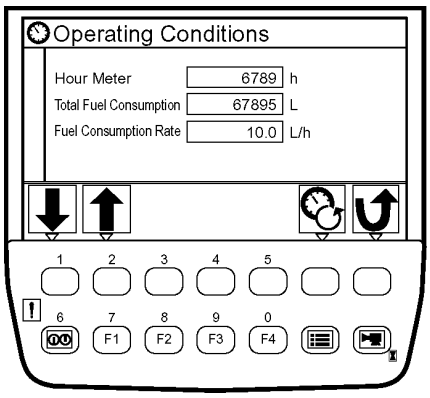
Controller Version Display T1V5-05-01-122

- Monitoring
  This screen displays temperature and pressure data received from each controller by using CAN.
  By key operation, the displayed data is hold.



Monitoring Screen T1V5-05-01-087

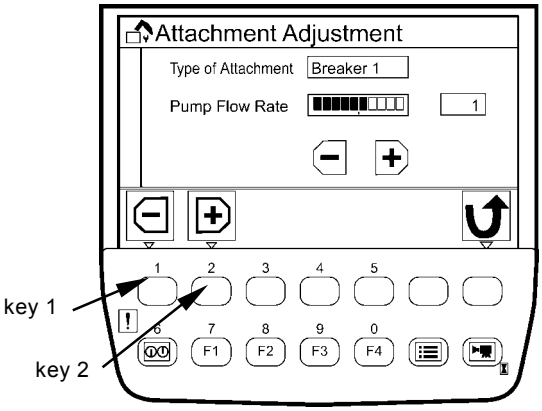
- Operating Conditions
  This screen displays machine operating hour, fuel usage and fuel consumption rate registered by the monitor unit.



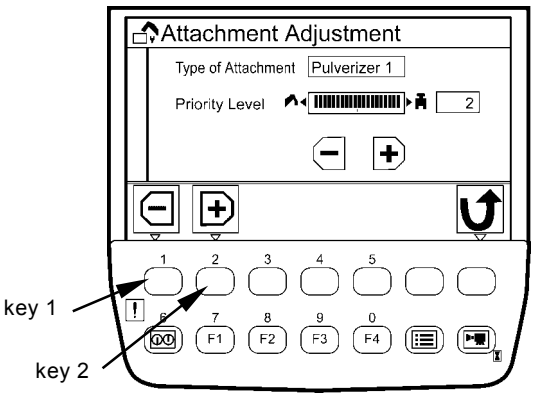
Operating Conditions Screen T1V5-05-01-025

- Pump 2 Flow Rate Adjustment
  (Only machines equipped with optional parts)
  When using the attachments, fine adjust flow rate of pump 2 by keys 1 and 2 operation.
  The signals from the monitoring unit are sent to MC by using CAN.
  When breaker 1 or 2 is used, MC adjusts flow rate of pump 2 while controlling maximum pump 2 flow rate limit control solenoid valve. When pulverizer 1 or crusher 1 is used, MC adjusts flow rate of pressure oil that flows from pump 2 to pulverizer or crusher while controlling the auxiliary flow rate control solenoid valve. (Refer to "Control Systems.")

NOTE: When the 2-speed selector circuit is OFF, flow rate of pump 2 can be adjusted while controlling the maximum pump 2 flow rate limit control solenoid valve. When the 2-speed selector circuit is ON, flow rate of pressure oil that flows from pump 2 to the attachments can be adjusted while controlling the auxiliary flow rate control solenoid valve.
The table blow is the setting of various factors at the time of shipment from the factory.



When using Breaker 1 T1V5-05-01-111



When using Pulverizer 1 T1V5-05-01-024

Type of Attachments	2-Speed Selector Circuit	Valve Selector Circuit	Accumulator Circuit	Secondary Hydraulic Relief Selector Circuit	Pump 2 Flow Rate Control	Auxiliary Flow Rate Control
Breaker 1	OFF	to Hydraulic Oil Tank	OFF	ON	ON	OFF
Breaker 2	OFF	to Hydraulic Oil Tank	ON	OFF	ON	OFF
Pulverizer 1	ON	to Control Valve	OFF	OFF	OFF	ON
Crusher 1	ON	to Control Valve	OFF	OFF	OFF	ON

NOTE: The items on monitor unit and HITACHI pattern are same.

Monitor Unit	HITACHI pattern
Breaker1	Hydraulic Breaker1
Breaker2	Hydraulic Breaker2
Pulverizer1	Secondary Crusher1
Crusher1	Primary Crusher1

- Attachment Selection
  (Only machines equipped with optional parts)
  Select digging mode and attachment mode set by Dr. ZX on this screen.

NOTE: In attachment mode, the following five modes are set at the time of shipping from the factory.

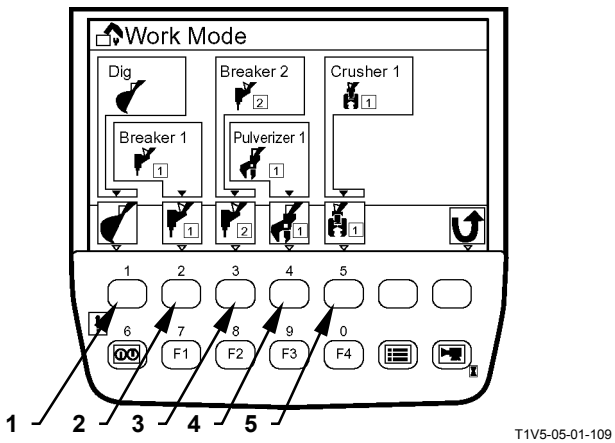
1 - Digging

2 - Breaker 1

3 - Breaker 2

4 - Pulverizer 1

5 - Crusher 1

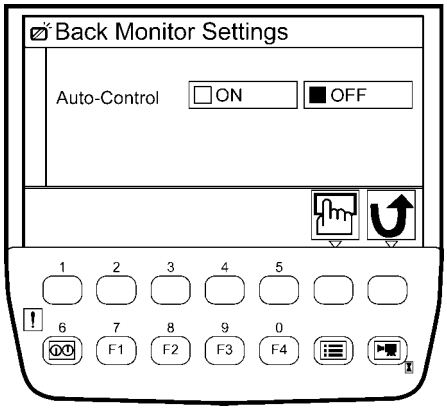


Attachment Selection Screen

NOTE: The items on monitor unit and HITACHI pattern are same.

Monitor Unit	HITACHI pattern
Breaker1	Hydraulic Breaker1
Breaker2	Hydraulic Breaker2
Pulverizer1	Secondary Crusher1
Crusher1	Primary Crusher1

- Back Monitor Settings
  By key operation, image display ON and OFF of Auto-Control for switching image of the back monitor while traveling can be set.



T1V5-05-01-173

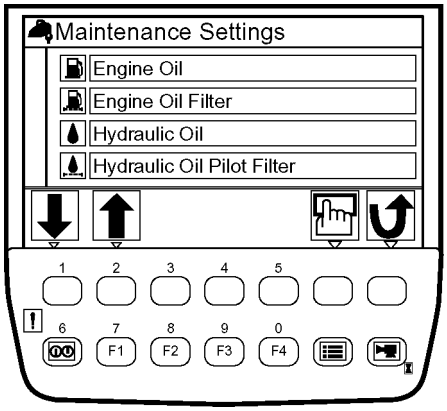
- Maintenance Settings
  This screen displays the hour meter reading at replacement time and the remaining hours until the next replacement.
  As the items to be replaced are displayed in a list, record performed replacement by selecting an item from the list.

  - Interval ON/OFF Settings
    Set change interval for each item to be replaced.

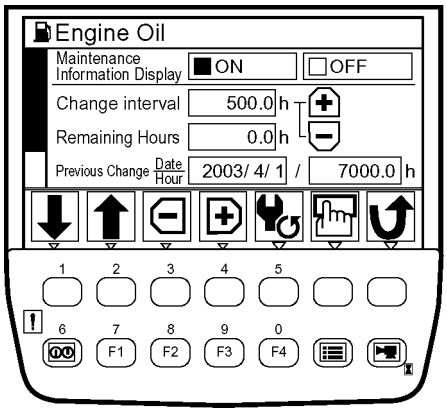
  - Items included in Maintenance Settings
    Engine Oil
    Engine Oil Filter
    Hydraulic Oil
    Hydraulic Oil Pilot Filter
    Hydraulic Oil Full-Flow Filter
    Pump Transmission Oil
    Travel Device Oil
    Swing Device Oil
    Swing Bearing Grease
    Air Cleaner Filter
    Engine/Air Conditioner V-belt
    Fuel Filter
    Air Conditioner Filter

- Language Settings
  Select a language to be used in screens from among preset languages, according to work environment.

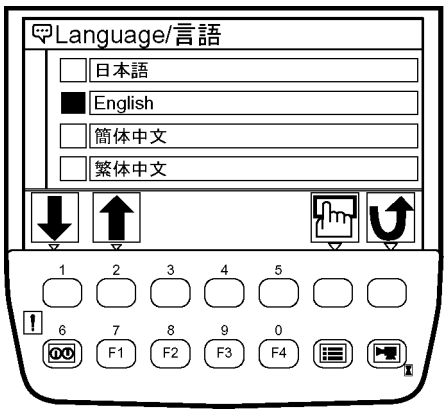
- Mail
  (Optional Function)
  Send requests such as general, fuel replenishment, service maintenance and forwarding requests in the mail switch screen.
  Contents of mails are registered in ICF, and are sent to the central server by a satellite terminal.



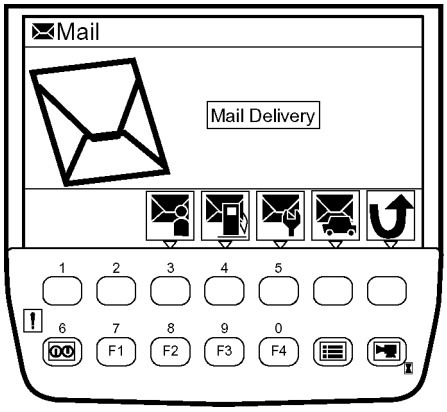
Maintenance Setup Screen T1V5-05-01-049



Interval ON/OFF Setup Screen T1V5-05-01-052



Language Setup Screen T1V1-05-01-137



Mail Switch Screen T1V5-05-01-037

- Overload Alarm
  (Only machines equipped with optional parts)

IMPORTANT: When using overload alarm, make overload alarm available by using Dr. ZX.

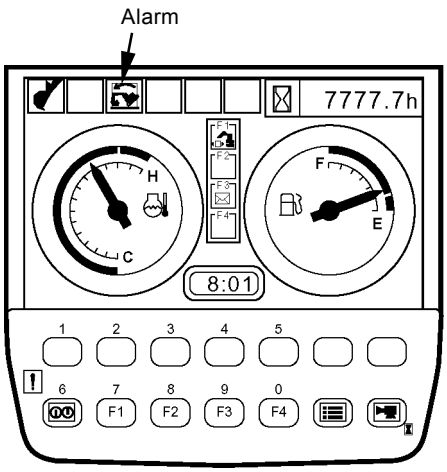
The system measures load of the suspended load from bottom pressure of the boom cylinder. An alarm message is displayed and a buzzer is rung, if overload is detected.

1. If load of the suspended load becomes overloaded, the boom bottom pressure sensor (optional) sends a signal to MC.

2. If the overload alarm ON/OFF switch (optional) is turned ON, the monitor unit displays an alarm message and rings a buzzer according to the signal from MC by using CAN.

3. If overload of the suspended load is dissolved, the alarm message disappears and the buzzer stops ringing.

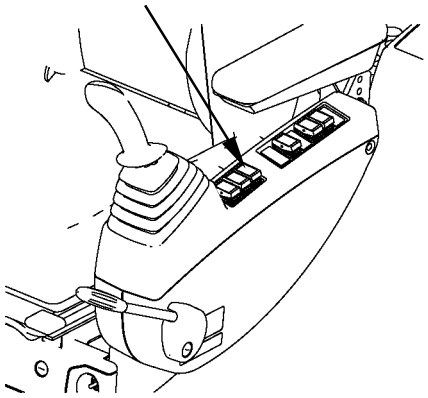
NOTE: Even if the work is done while displaying a screen except the primary screen, when an overload condition is reached, the screen of monitor unit is switched to the primary screen, an alarm message is displayed, and a buzzer is rung.
Even after the overload alarm is dissolved, the monitor unit keeps on displaying the primary screen without returning to the screen while the work is done.



T1V1-05-01-128

Primary Screen

Overload Alarm ON/OFF Switch (Optional)



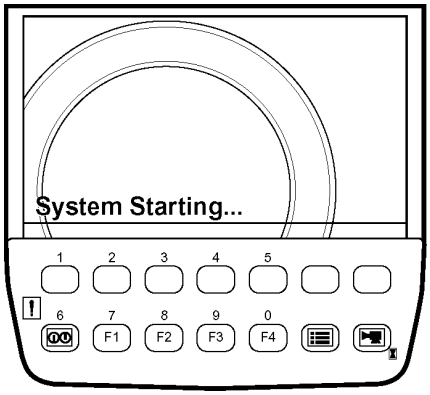
T1V1-05-02-004

HOW TO USE SCREENS

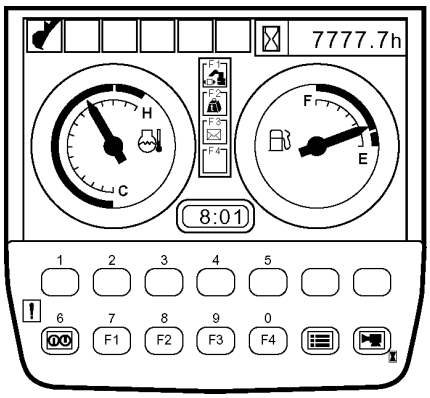
Displaying Primary Screen

IMPORTANT: Start the engine after the primary screen is displayed.

When the key switch is turned to the ON position, the starting screen appears for about two seconds and the primary screen appears.

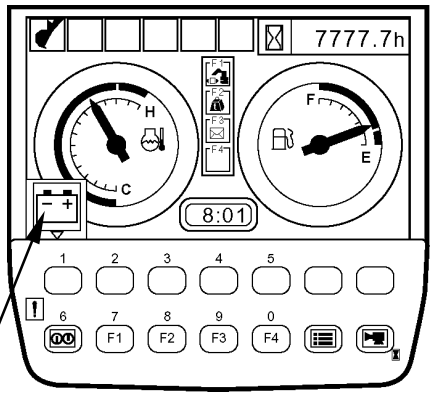


Key Switch: ON T1V1-05-01-115



Primary Screen T1V1-05-01-123

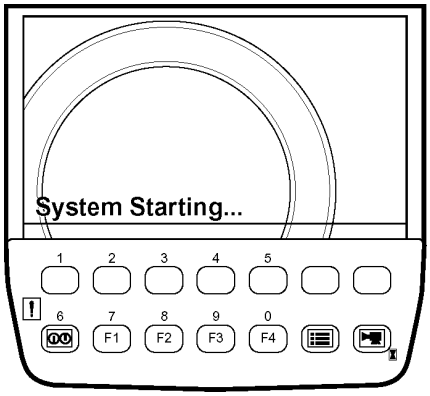
IMPORTANT: After the engine starts and the alternator starts generating power, alternator alarm is displayed on the primary screen.



Alternator Alarm T1V1-05-01-117

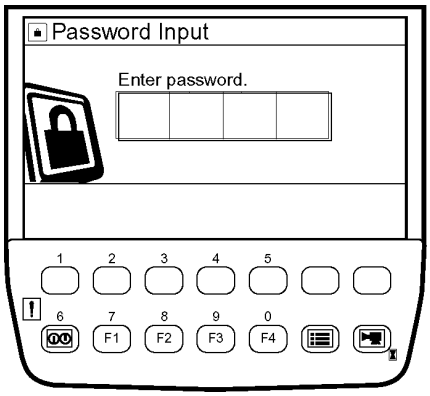
Displaying Primary Screen by Password Input (Optional)

IMPORTANT: Before performing this operation, make the password function available by using Dr. ZX.



Starting Screen T1V1-05-01-115

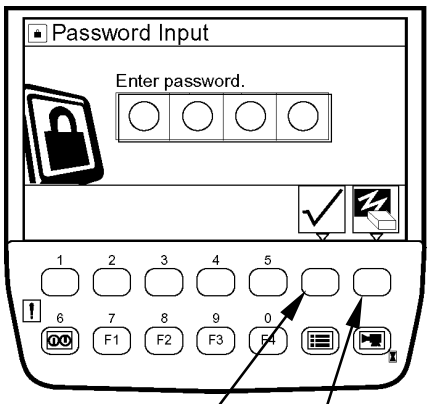
1. When the key switch is turned to the ON position, the starting screen appears and the password input screen appears.



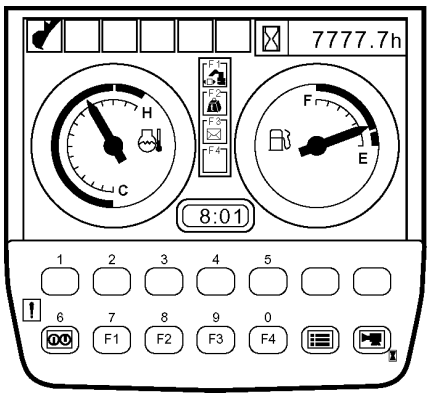
Password Input Screen T1V5-05-01-093

2. Input a password by using the keys located under the screen. If pushing the confirm key, the monitor unit matches the input password to the registered one. If they match, the primary screen appears.

NOTE: When inputting the password again, the entered characters can be erased by pushing the erase key.



T1V5-05-01-002

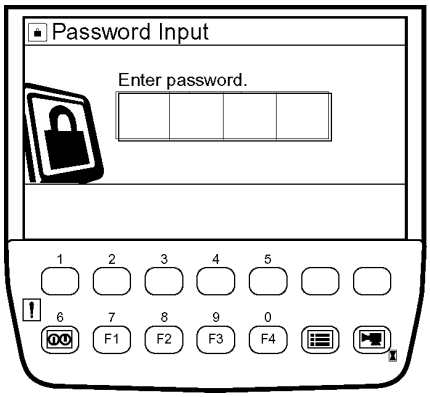


Primary Screen T1V1-05-01-123

(Blank)

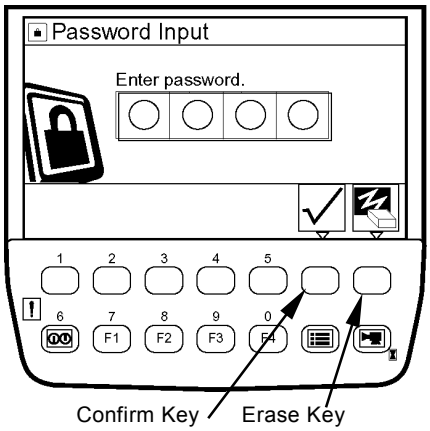
In Case of Inputting an Incorrect Password

1. If inputting an incorrect password, the message "password is incorrect." appears by pushing the confirm key.



Password Input Screen

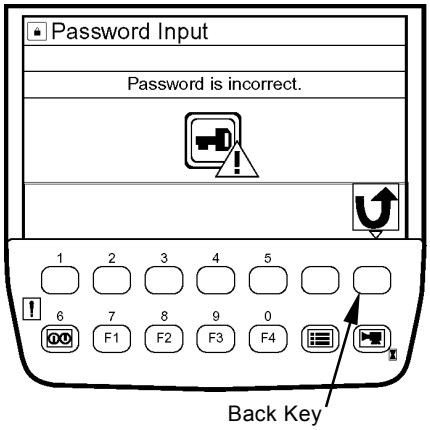
T1V5-05-01-093



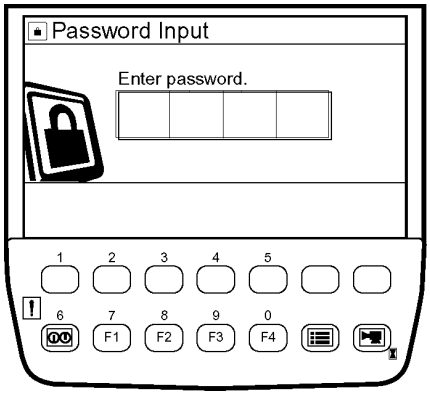
T1V5-05-01-002

2. Return to the password input screen by pushing the back key.

NOTE: When inputting the password again, the entered characters can be erased by pushing the erase key.

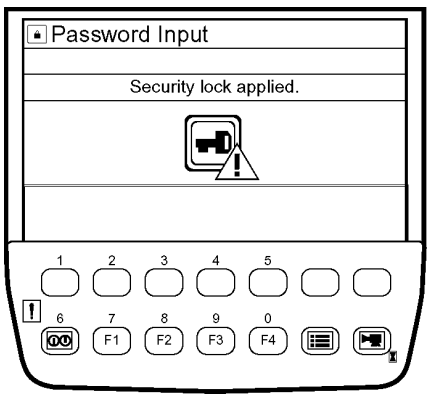


T1V5-05-01-004



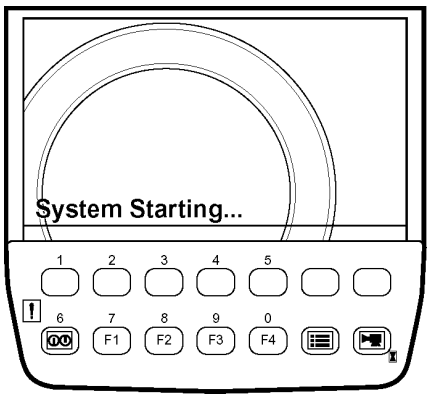
T1V5-05-01-093

3. If inputting an incorrect password three times, a screen appears informing that the security lock has been applied, and a buzzer rings. While the key switch is turned to the ON position, the buzzer does not stop ringing. When the key switch is turned to the OFF position, the buzzer rings for thirty seconds.



Security Lock Screen T1V5-05-01-005

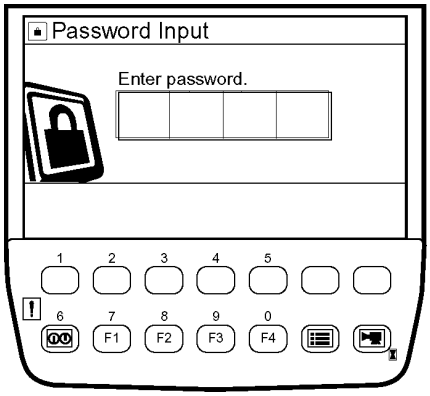
4. After thirty seconds, if the key switch is turned to the ON position, the starting screen appears and the password input screen appears again. Then a password can be input again. If inputting an incorrect password even once this time, the security lock screen appears again and a buzzer rings. While the key switch is turned to the ON position, the buzzer does not stop ringing. When the key switch is turned to the OFF position, the buzzer rings for thirty seconds.



Starting Screen T1V1-05-01-115

5. After the buzzer stops ringing, a password can be input again. Turn the key switch to the ON position and input a password after the password input screen appears. (Refer to T5-2-20).

6. If inputting an incorrect password again, the security lock screen appears again and a buzzer rings. While the key switch is turned to the ON position, the buzzer does not stop ringing. When the key switch is turned to the OFF position, the buzzer rings for thirty seconds.



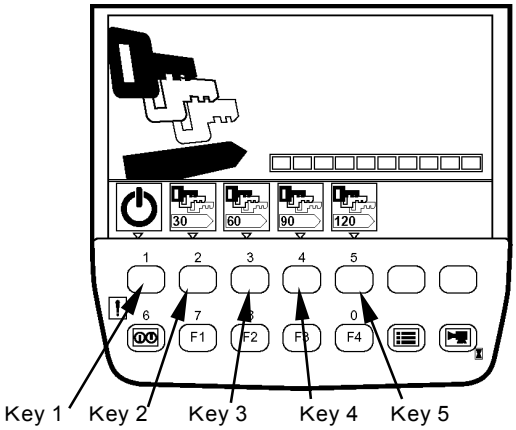
Password Input Screen T1V5-05-01-093

Extending Password Duration Time

IMPORTANT: This operation is applicable only to those machines that display the primary screen based upon password input.

By using the password duration screen, password duration time can be set. When restarting the machine, a password need not be input within that timeframe.

1. When turn the key switch to the OFF position, the monitor unit displays the password duration screen for ten seconds.

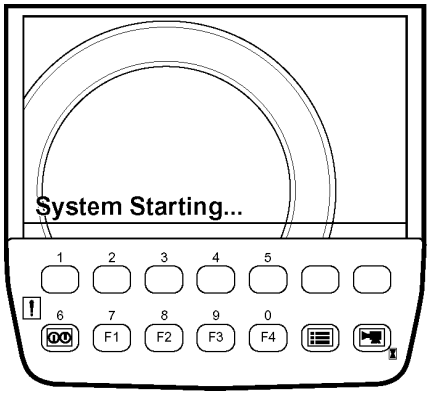


T1V1-05-01-012

Password Duration Screen (Key Switch: OFF)

2. While the password duration screen is still displayed, push a relevant key, and password duration time is set. Duration time assigned to each key is as follows:
   key 1: 0 minute
   key 2: 30 minutes
   key 3: 60 minutes
   key 4: 90 minutes
   key 5: 120 minutes

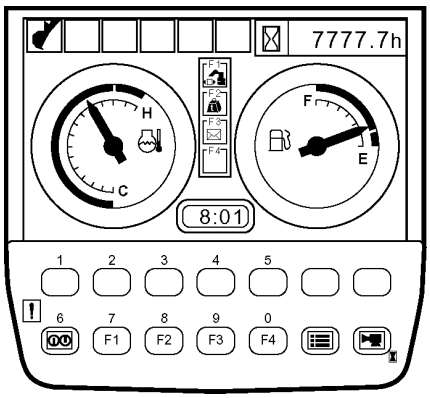
NOTE: If password duration time is not set explicitly, 0 minute on duration time is assumed.



Key Switch: ON

T1V1-05-01-115

3. If turning the key switch to the ON position within password duration time, the monitor unit displays the primary screen after the starting screen.



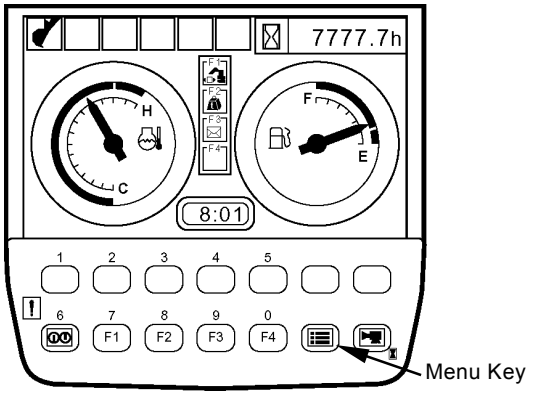
Primary Screen

T1V1-05-01-123

(Blank)

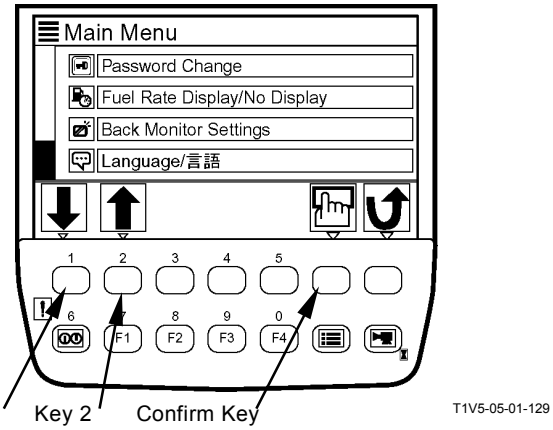
Password Change (Optional)

1. After the primary screen is displayed, push the menu key in order to display the main menu.

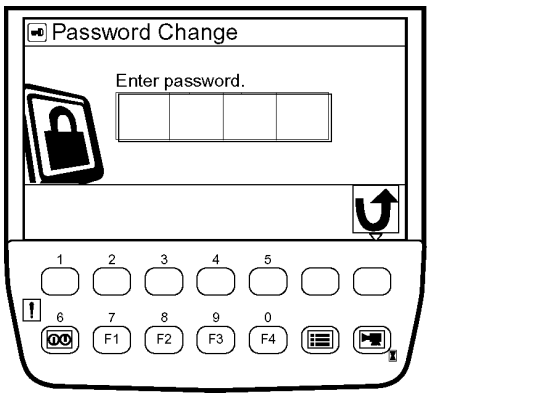


Primary Screen T1V5-05-01-123

2. Select password change from main menu by using keys1 and 2. Push the confirm key. Then, the password change screen appears.



T1V5-05-01-129

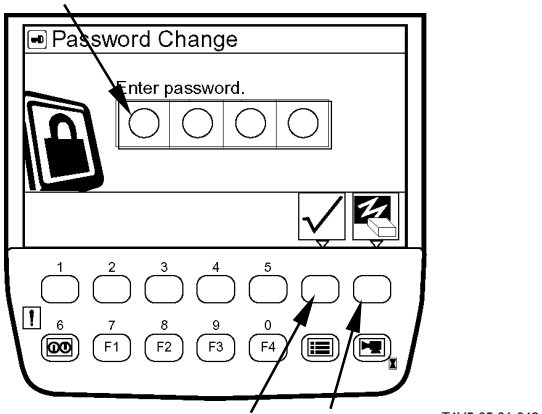


T1V5-05-01-041

Registered Password

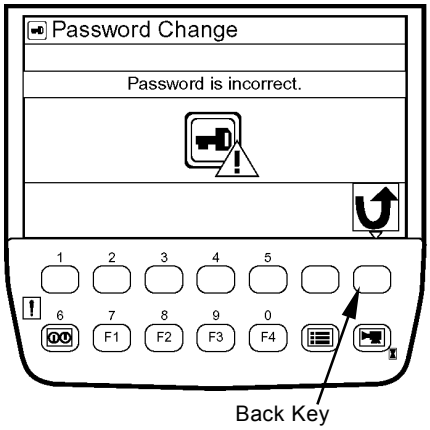
3. Input the registered password and push the confirm key.

4. If inputting the password again, the entered characters can be erased by pushing the erase key.



T1V5-05-01-042

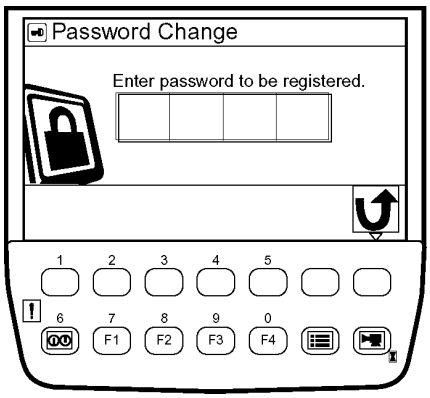
NOTE: If inputting an incorrect password after pushing the confirm key, the message "Password is incorrect." appears.
Push the back key and go back to the previous screen, Input the password again.



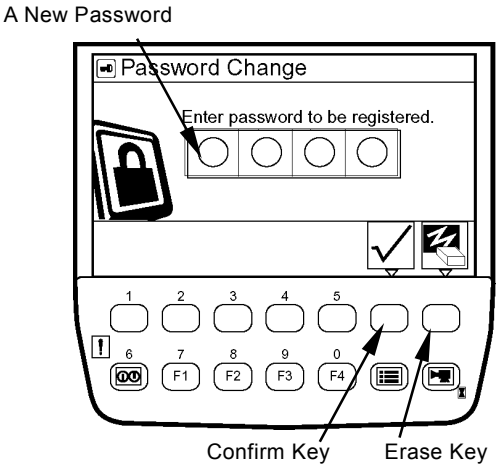
T1V5-05-01-044

5. The message "Enter password to be registered." appears. Then, input a new password with three or four digits and push the confirm key.

6. If inputting the password again, push the erase key.



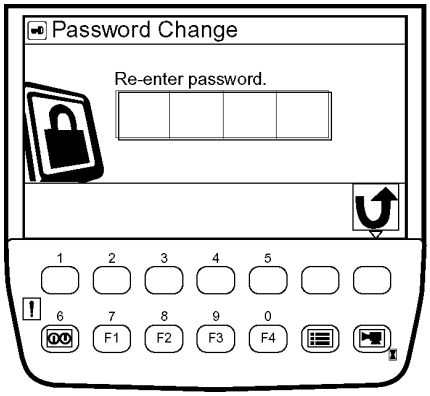
T1V5-05-01-130



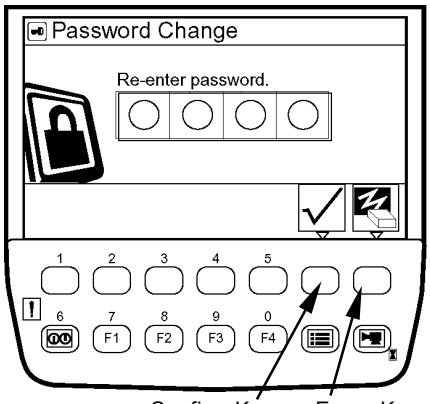
T1V5-05-01-131

7. The message "Re-enter password." appears. Then, input a new password again and push the confirm key.

8. If inputting the password again, push the erase key in order to erase the entered characters.

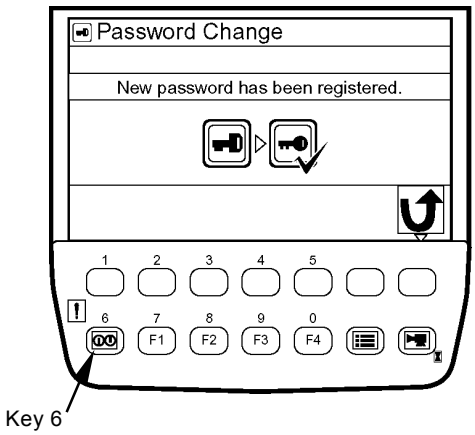


T1V5-05-01-132



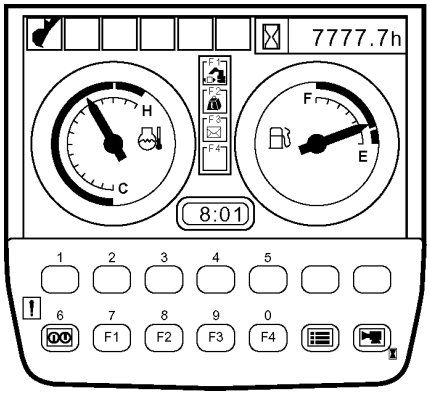
T1V5-05-01-133

9. The message "New password has been registered." appears. This completes the password change process.



T1V5-05-01-043

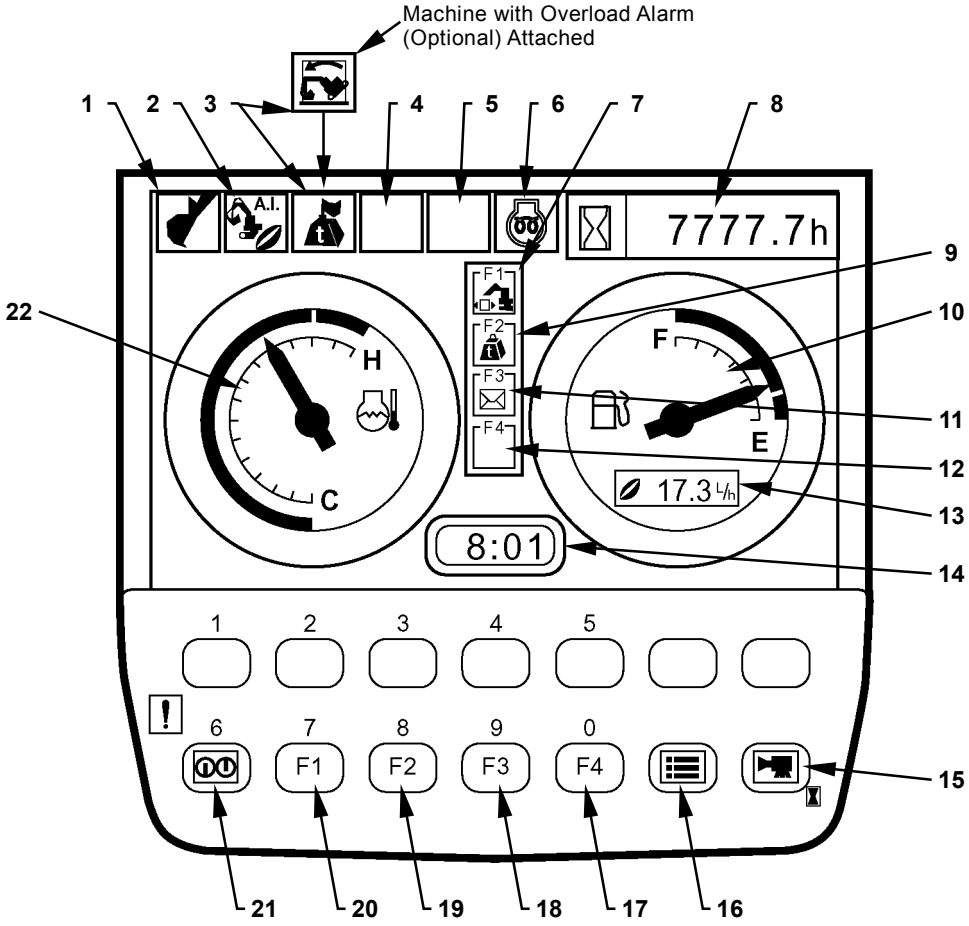
10. Push key 6 and the primary screen appears.



Primary Screen

T1V1-05-01-123

PRIMARY SCREEN



T1V1-05-01-094

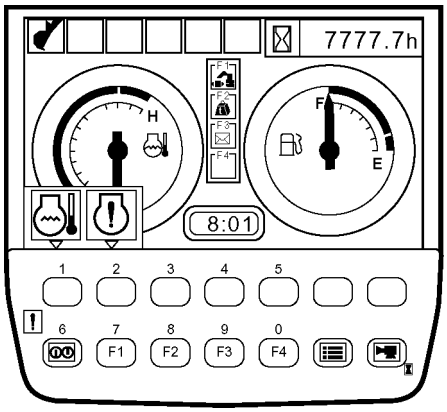
1 - Work Mode Display
2 - Auto-Idle Display
3 - *ML Crane Display or Overload Alarm Display (Optional)
4 - Auxiliary
5 - Auxiliary
6 - Glow Display
7 - Work Mode Display
8 - Hour Meter
9 - *ML Crane Display (Optional)
10 - Fuel Gauge
11 - Mail Display (Optional)
12 - Auxiliary
13 - Fuel Consumption Gauge
14 - Clock
15 - Screen Selection
16 - Menu
17 - Auxiliary Selection
18 - Mail Selection (Optional)
19 - *ML Crane Selection (Optional)
20 - Work Mode Selection
21 - Return to Primary Screen
22 - Coolant Temperature Gauge

*NOTE: *ML crane display and ML crane selection is only available in Japanese domestic marked.*

SCREEN DISPLAY WHEN AN ALARM IS ISSUED

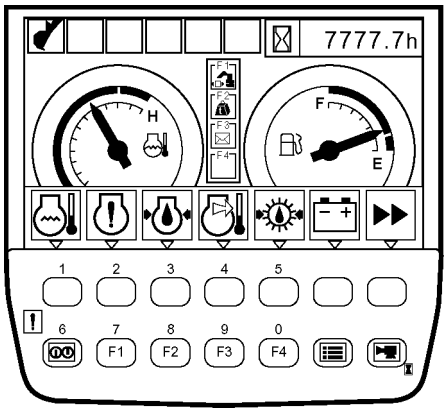
When an alarm is issued, the alarm marks are displayed at the bottom of screen.

- When the number of alarms is two or less



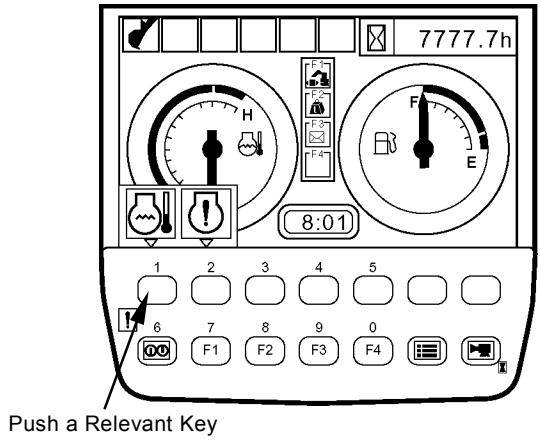
T1V1-05-01-095

- When the number of alarms is three or more

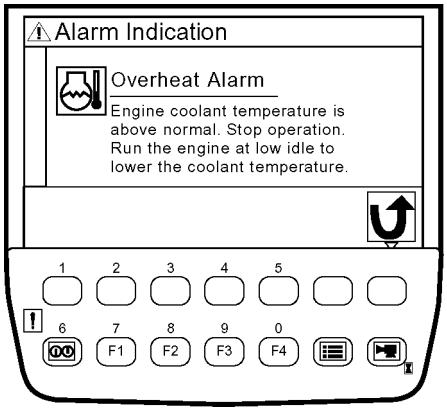


T1V1-05-01-096

When an alarm is issued, if the key under a relevant alarm mark is pushed, the remedy against the alarm is displayed.

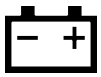
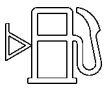


T1V1-05-01-095



T1V5-05-01-013

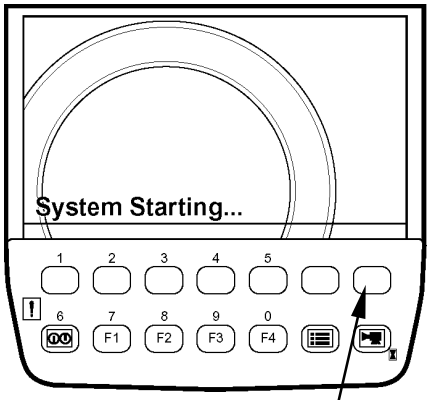
CONTENTS OF ALARMS

Display	Contents of Alarms	Remedy
 M178-01-036	Overheat Alarm	Temperature of engine coolant is going up abnormally higher. Stop the work and turn the engine into low idle in order to lower the coolant temperature.
 M183-01-080	Engine Warning Alarm	Failure of the engine or its related parts. Please contact our authorized distributor or dealer.
 M178-01-037	Engine Oil Pressure Alarm	Pressure of engine lubricant oil is decreasing. Stop the engine immediately and inspect the engine oil system and oil volume of the engine.
 M183-01-071	Alternator Alarm	The electronic system is faulty. Inspect the alternator and battery system.
 M178-01-034	Fuel Level Alarm	Volume of remaining oil is becoming less. Refuel oil earlier.
 M1CC-01-039	Hydraulic Oil Filter Alarm	The hydraulic oil filter is clogged. Clean or replace the hydraulic oil filter.
 M183-01-067	Air Filter Restriction Alarm	The air filter is clogged. Clean or replace the air filter.
 T1V1-05-01-102	Work Mode Alarm	The network system is abnormal. Please contact our authorized distributor or dealer.
 T1V1-05-01-103	Pilot Shut-Off Lever Alarm	The pilot shut-off lever system is abnormal. Please contact our authorized distributor or dealer.

(Blank)

TROUBLESHOOTING

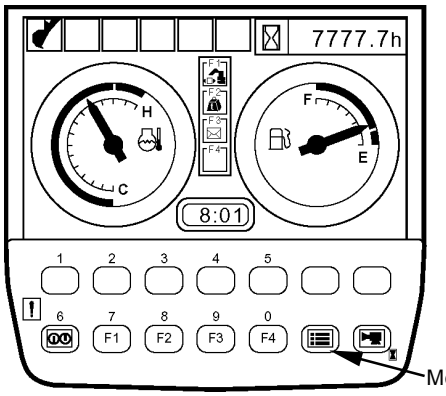
1. Displaying Service Menu
   Turn the key switch to the ON position while pushing the key at upper right corner of the monitor unit. Therefore, service menu is added to main menu.



Turn key switch ON while pushing the key

T1V1-05-01-115

2. When the primary screen appears, push the menu key and display main menu.



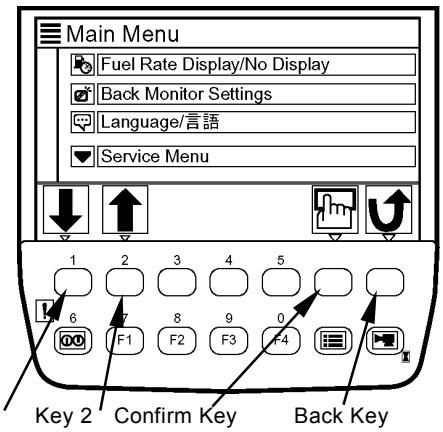
Menu Key

Primary Screen

T1V1-05-01-123

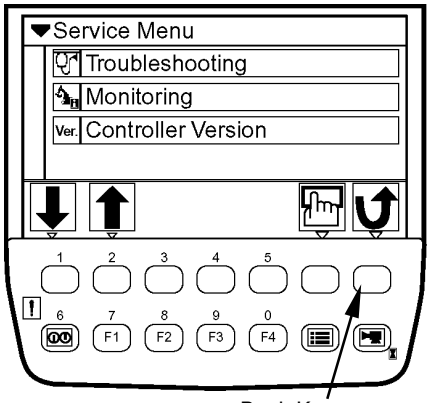
3. Select service menu from main menu by using keys 1 and 2. Push the confirm key. Then, the service menu screen appears.

NOTE: When pushing the back key, return to the previous screen.



Key 1 Key 2 Confirm Key Back Key

T1V5-05-01-114



Back Key

T1V5-05-01-083

4. Select troubleshooting by using keys 1 and 2. Push the confirm key. Then, the troubleshooting screen appears.

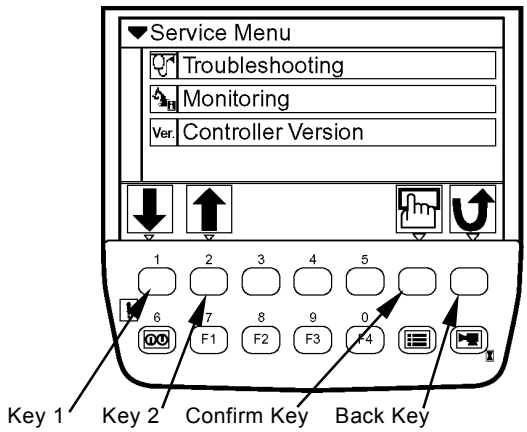
5. Results of trouble analyses for each controller are displayed on the screen.

6. Select Abnormal of a faulty controller by using keys 1 and 2. Push the confirm key. Then, fault code screen appears.
   For details of trouble analyses, refer to "Troubleshooting A."

IMPORTANT: Up to twenty fault codes can be displayed. But, one screen can contain only ten fault codes maximum.
If the screen is fully filled with ten items, push key 1 and check other fault codes on the next page.
When returning to the previous page, push key 2.

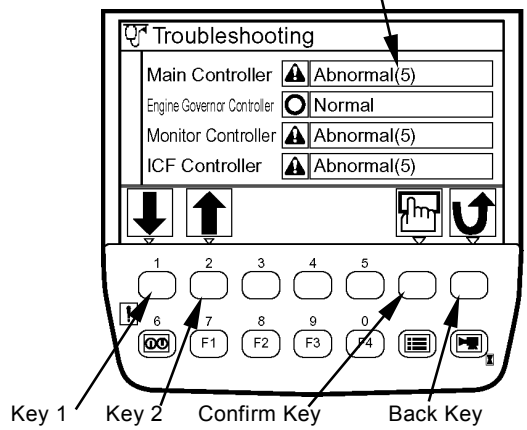
NOTE: When pushing the back key, return to the previous screen.

7. Push key 6, and the primary screen appears.

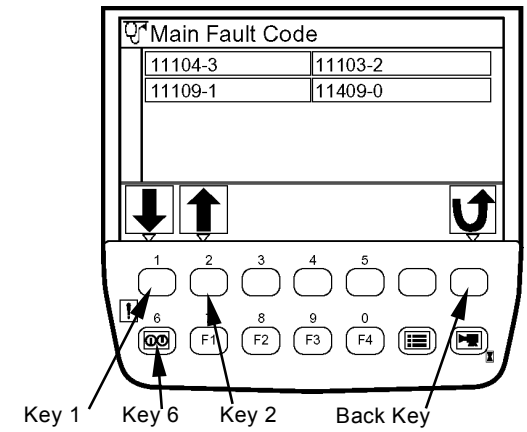


T1V5-05-01-083

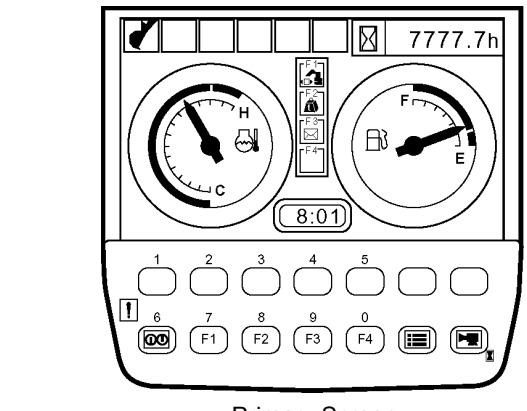
A figure enclosed in ( ) indicates the number of failure codes.



T1V5-05-01-085



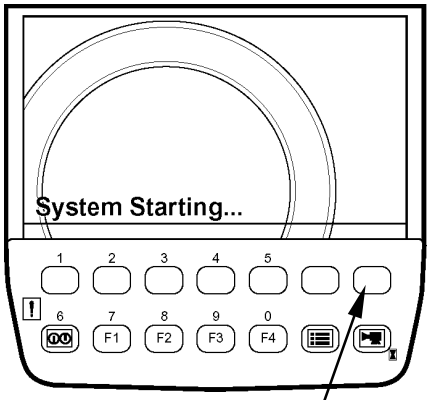
T1V5-05-01-097



Primary Screen
T1V1-05-01-123

CONTROLLER VERSION

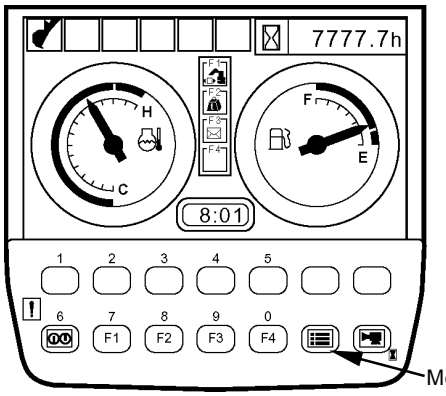
1. Displaying Service Menu
   Turn the key switch to the ON position while pushing the key at upper right corner of the monitor unit. Therefore, service menu is added to main menu.



Turn the key switch ON while pushing the key

T1V1-05-01-115

2. When the primary screen appeared, push the menu key to display main menu.

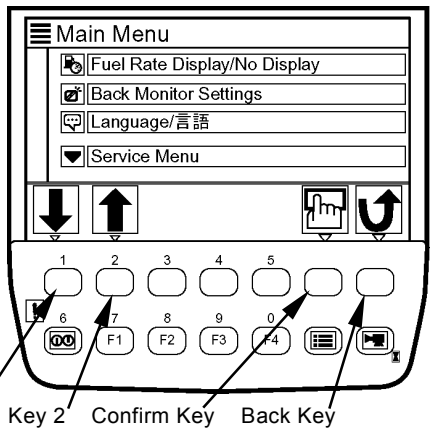


Primary Screen

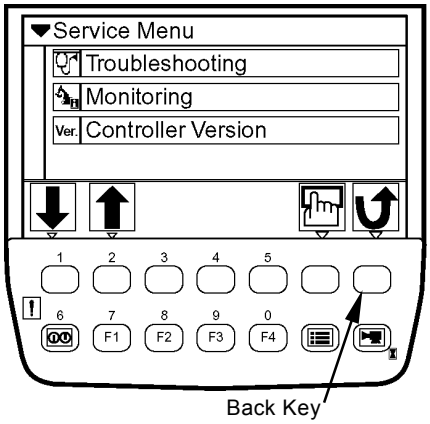
T1V1-05-01-123

3. Select service menu from main menu by using keys 1 and 2. Push the confirm key. Then, the service menu screen appears.

NOTE: When pushing the back key, return back to the previous screen.



T1V5-05-01-114

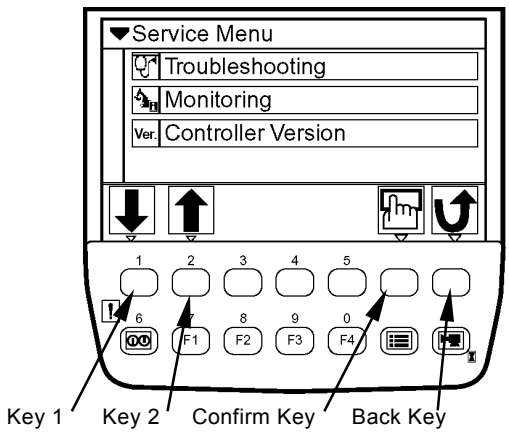


T1V5-05-01-083

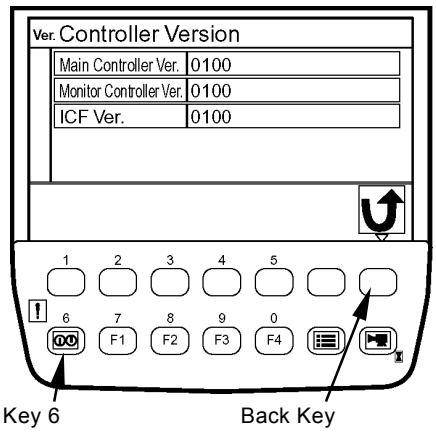
4. Select controller version by using keys 1 and 2. Push the confirm key. Then, the controller version screen appears.

NOTE: The version of ECM is not displayed.

NOTE: When pushing the back key, return to the previous screen.

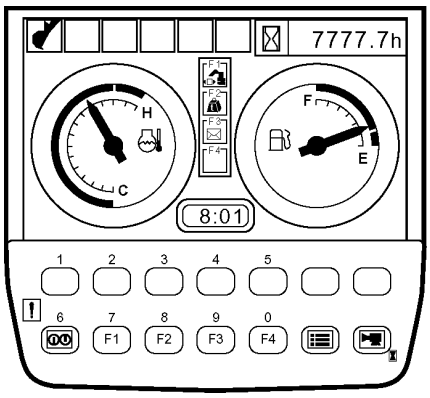


T1V5-05-01-083



T1V5-05-01-122

5. Push key 6, and the primary screen appears.

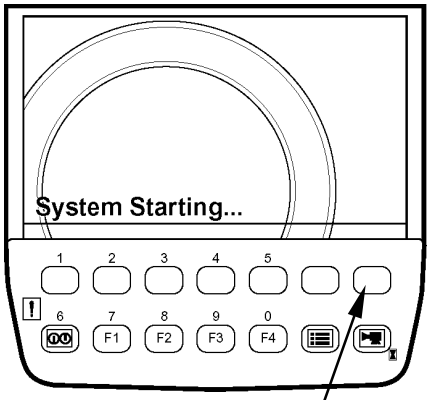


Primary Screen

T1V1-05-01-123

MONITORING

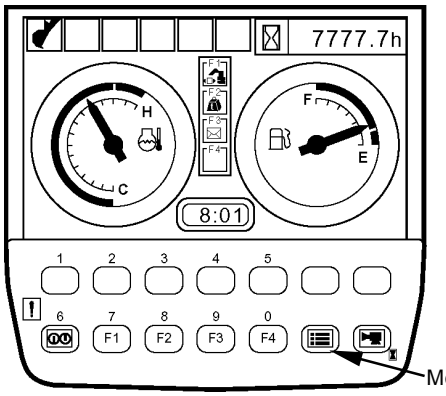
1. Displaying Service Menu
   Turn the key switch to the ON position while pushing the key at upper right corner of the monitor unit. Therefore, service menu is added to main menu.



Turn the key switch ON while pushing the key

T1V1-05-01-115

2. When the primary screen appeared, push the menu key and display main menu.

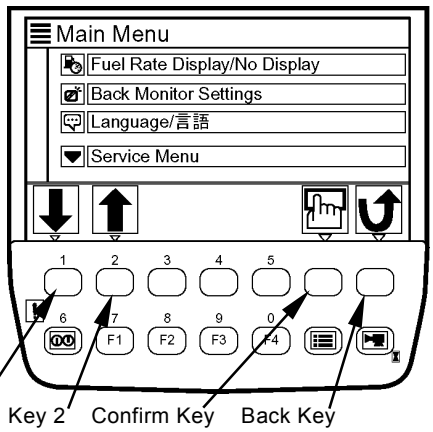


Primary Screen

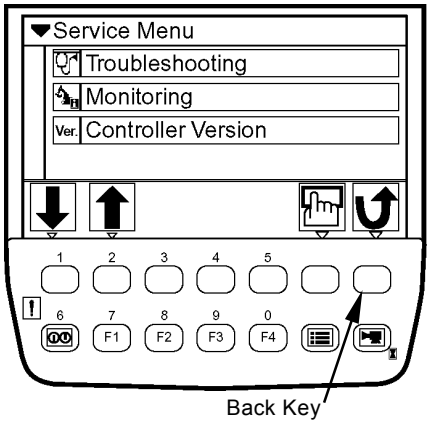
T1V1-05-01-123

3. Select service menu from main menu by using keys 1 and 2. Push the confirm key. Then, the service menu screen appears.

NOTE: When pushing the back key, return to the previous screen.

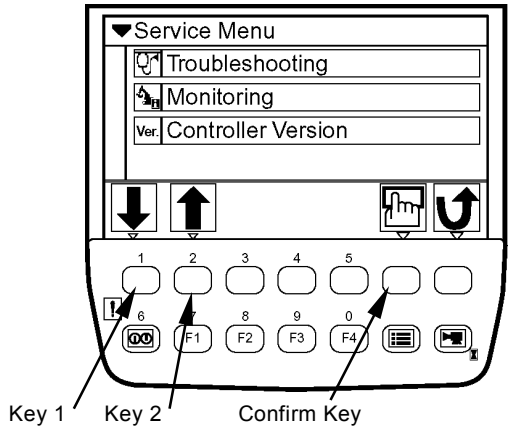


T1V5-05-01-114



T1V5-05-01-083

4. Select monitoring by using keys 1 and 2. Push the confirm key. Then, the monitoring screen appears. For items to be monitored, refer to the next page.



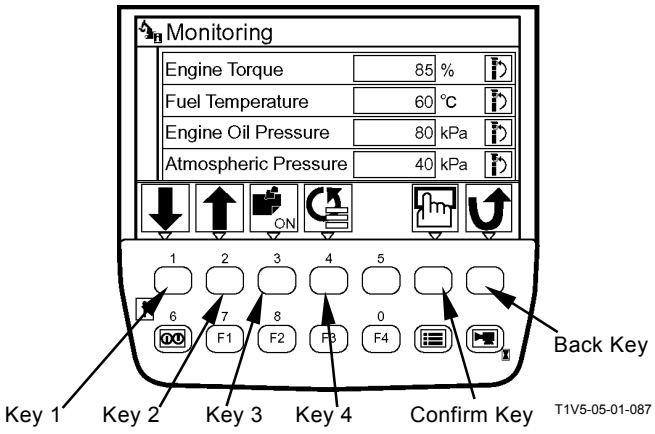
T1V5-05-01-083

5. Select an item to be monitored by using keys 1 and 2. Push the confirm key. Then, the selected item is brought up to the top.

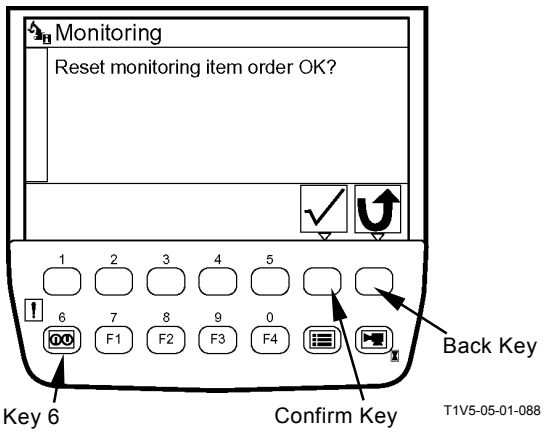
6. Push key 3, and the displayed data are put on hold.
   Push key 3 again, and the records are updated with the displayed data.

7. The monitoring item order is reset to the initial state by pushing key 4.
   When key 4 is pushed and a confirmation message appears, push the confirm key.

NOTE: When pushing the back key, return to the previous screen.

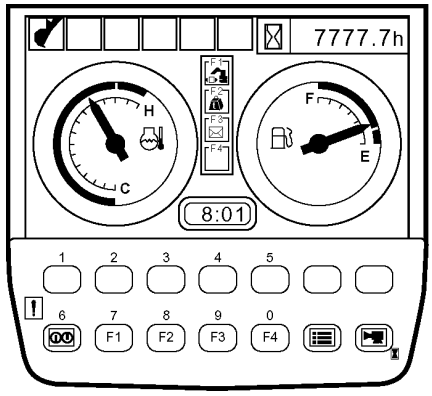


T1V5-05-01-087



T1V5-05-01-088

8. Push key 6, and the primary screen appears.



Primary Screen

T1V1-05-01-123

A List of Items to be Monitored

Items	Units
Engine Torque	%
Coolant Temperature (E)	°C
Fuel Temperature	°C
Engine Oil Pressure	kPa
Atmospheric Pressure	kPa
Intake Air Temperature	°C
Boost Pressure	kPa
Boost Temperature	°C
Coolant Temperature (M)	°C
Target Engine Speed	min^{-1}
Actual Engine Speed	min^{-1}
Pump 1 Delivery Pressure	MPa
Pump 1 Pump Control Pressure	MPa
Pump 1 Target Flow Rate	L/min
Pump 2 Delivery Pressure	MPa
Pump 2 Pump Control Pressure	MPa
Pump 2 Target Flow Rate	L/min
Front Attachment Control Pilot Pressure	MPa
Boom Raise Control Pilot Pressure	MPa
Arm Roll-In Pilot Pressure	MPa
Swing Control Pilot Pressure	MPa
Travel Control Pilot Pressure	MPa
Attachment Control Pilot Pressure	MPa
EC Dial Angle	V
Hydraulic Oil Temperature	°C
Pump Torque Proportional Valve	MPa
Digging Regenerative Valve	MPa
Arm Regenerative Valve	MPa
Travel Mode Control Pressure	MPa
Power Digging Control Pressure	MPa
Power Mode	-
Travel Mode Switch	-
Power Digging Switch	-
Radio Signal Strength	-

DISPLAYING OPERATING CONDITIONS

1. When the primary screen appears, push the menu key and display main menu.

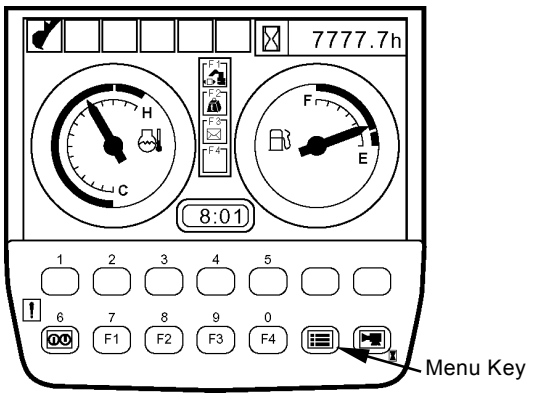
2. Select operating conditions from main menu by using keys 1 and 2. Push the confirm key. Then, the operating conditions screen appears.

3. Push the reset key, and a screen appears to confirm if it's OK to reset data.
   If it's OK to reset data, push the confirm key.

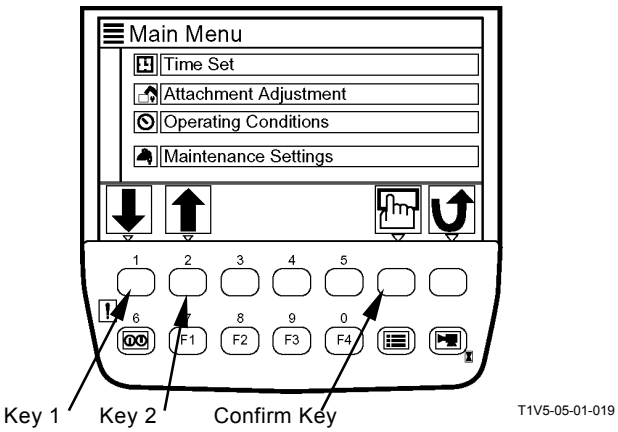
NOTE: When pushing the back key, return to the previous screen.

IMPORTANT: Total fuel consumption and fuel consumption rate depend on the operating environment and the operation method of machine.
The values shown on the screen are just for reference.
There could arise ± 20% of differences between actual fuel consumption and fuel consumption which is displayed by the monitor unit.

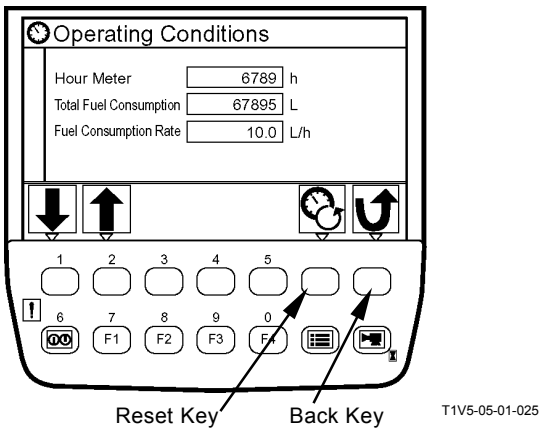
4. Push key 6, and the primary screen appears.



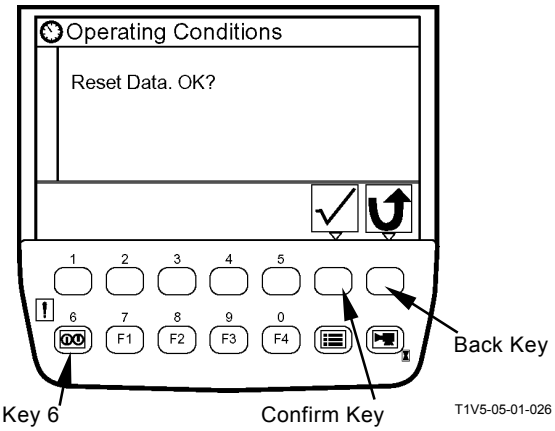
Primary Screen T1V1-05-01-123



T1V5-05-01-019



T1V5-05-01-025



T1V5-05-01-026

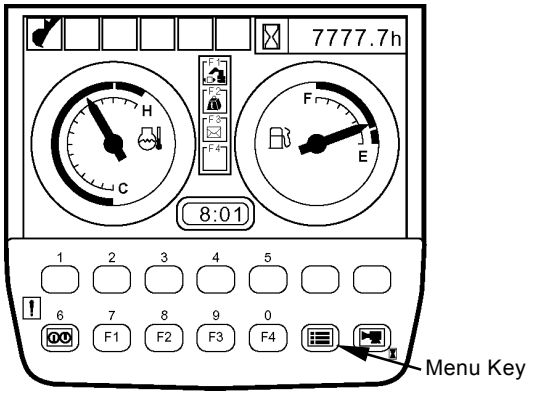
PUMP 2 FLOW RATE ADJUSTMENT (Only Machines Equipped with Optional Parts)

IMPORTANT: This operation is effective when attachments are used.

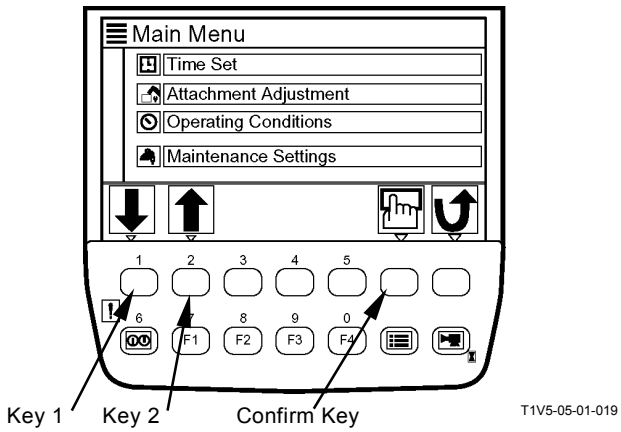
1. When the primary screen appears, push the menu key and display main menu.

2. Select attachment adjustment from main menu by using keys 1 and 2. Push the confirm key. Then, the attachment adjustment screen appears.

3. Push key 2. Then, the attachment adjustment screen for currently installed attachments appears.

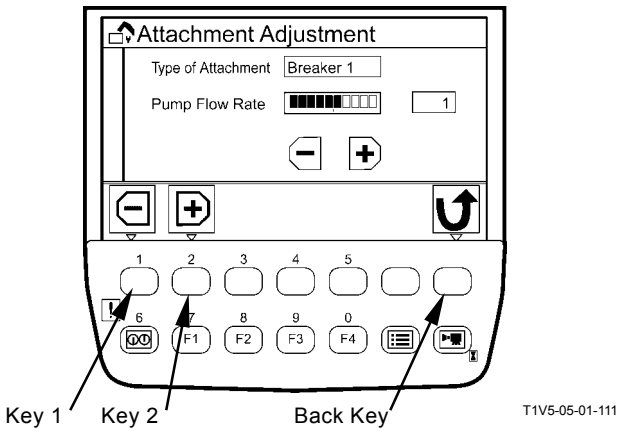


Primary Screen T1V1-05-01-123



T1V5-05-01-019

4. Adjust flow rate of pump 2 by using keys 1 and 2. When breaker 1 or breaker 2 is used, pushing key 1 will decrease flow rate of pump 2 and pushing key 2 will increase respectively.

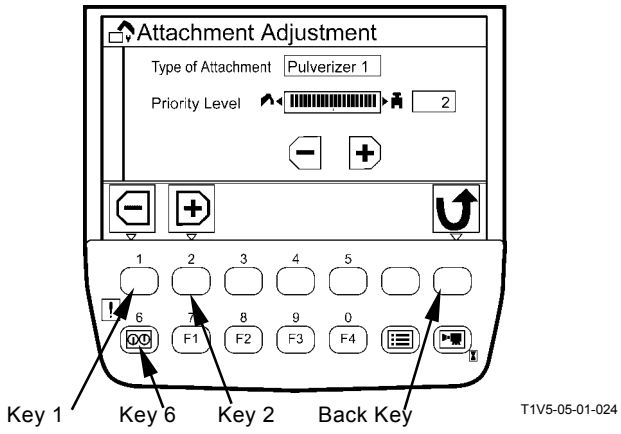


T1V5-05-01-111

When using the pulverizer or crusher is used, pushing key 1 will increase flow rate of boom raise, arm roll-out, swing or travel circuit sides.
Pushing key 2 will increase flow rate of attachment side.

NOTE: When pushing the back key, return to the previous screen.

5. Push key 6, and the primary screen appears.



T1V5-05-01-024

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ATTACHMENT SELECTION (Only Machines Equipped with Optional Parts)

IMPORTANT: Select the attachments from the work mode screen.
In order to display the work mode screen, push key F1 after primary screen appears, or select from main menu.

Selecting Attachment by Using Key F1

1. When the primary screen appears, push key F1 and display the work mode screen.

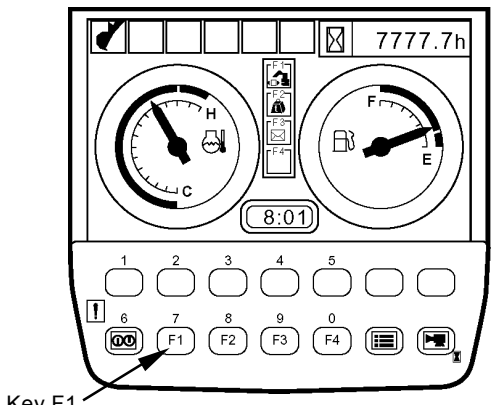
2. Push a relevant key under an attachment mark to be used in order to select the attachment.
(In the right example, Crusher 1 is selected.)

NOTE: When selecting Digging, return to the primary screen.

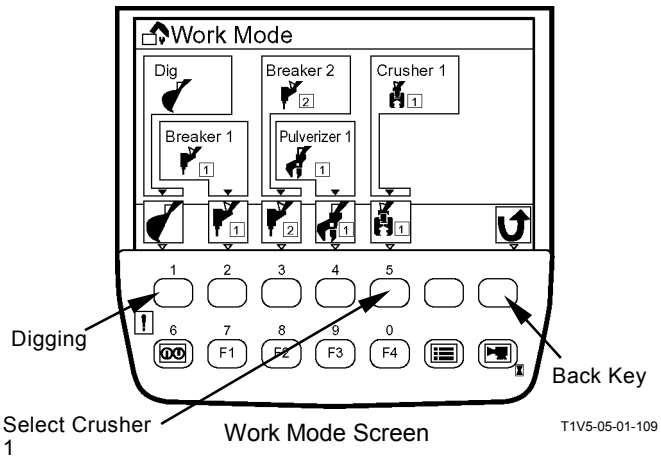
3. On the attachment specification screen, confirm if specification of the installed attachment agrees with that displayed on the screen.

NOTE: When pushing the back key, return to the previous screen.

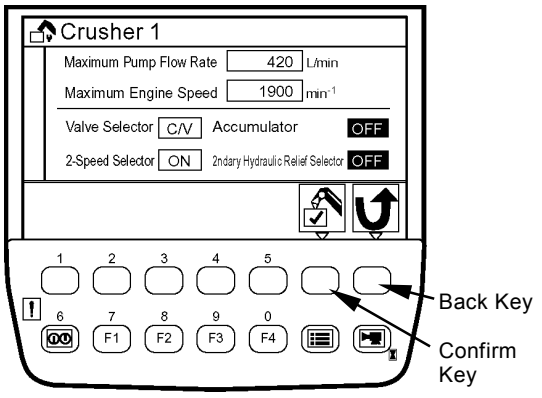
4. Push confirm the key, and the primary screen appears.



Primary Screen T1V1-05-01-123



Work Mode Screen T1V5-05-01-109



Attachment Specification Screen T1V5-05-01-028

Selecting Attachment from Main Menu

1. When the primary screen appears, push the menu key and display main menu.

2. Select work mode from main menu by using keys 1 and 2. Push the confirm key. Then, the work mode screen appears.

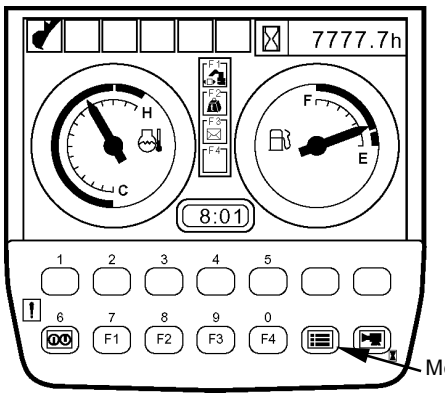
3. Push the relevant key under an attachment mark to be used in order to select the attachment.
   (In the right example, Crusher 1 is selected.)

NOTE: When selecting digging, return to main menu.

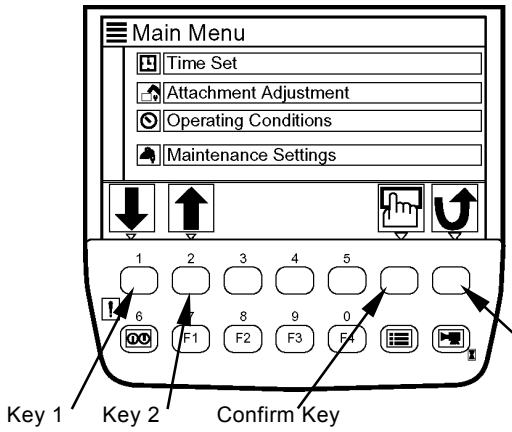
4. On the attachment specification screen, confirm if specification of the installed attachment agrees with that displayed on the screen.
   If they do not match, perform the setting of attachment by using Dr. ZX.
   For details of the attachment specification screen, refer to T5-2-46 and 47.

NOTE: When pushing the back key, return to the previous screen.

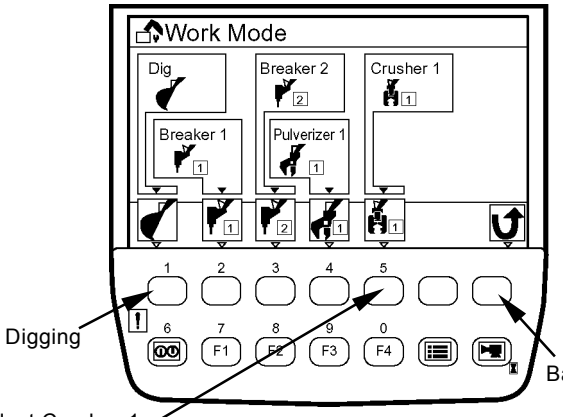
5. Push the confirm key, and the primary screen appears.



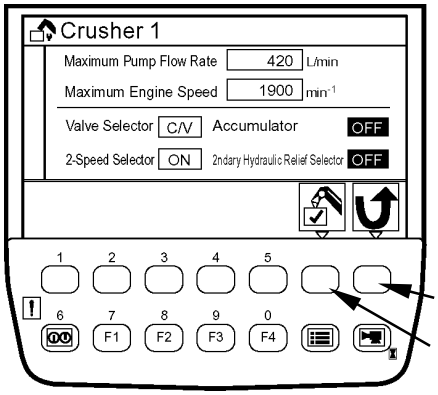
Primary Screen T1V1-05-01-123



T1V5-05-01-019

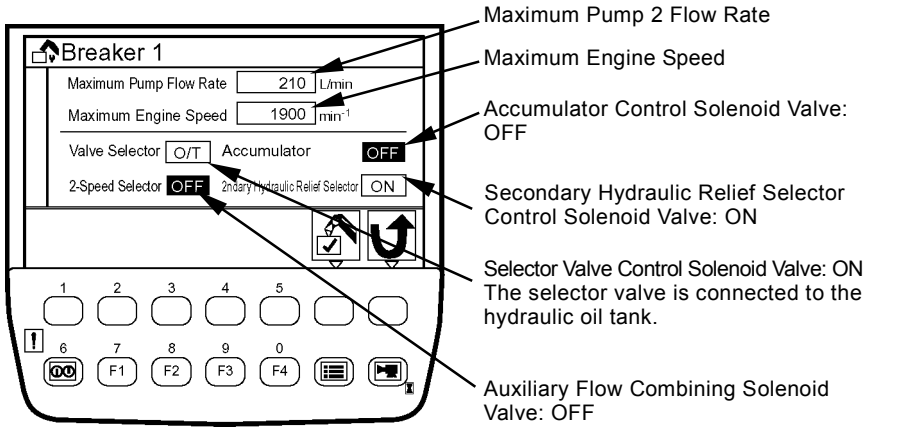


Work Mode Screen T1V5-05-01-109

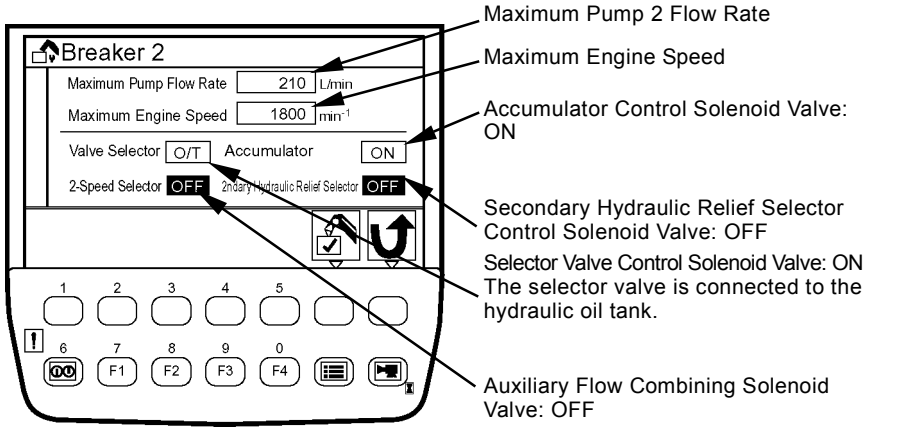


Attachment Specification Screen T1V5-05-01-028

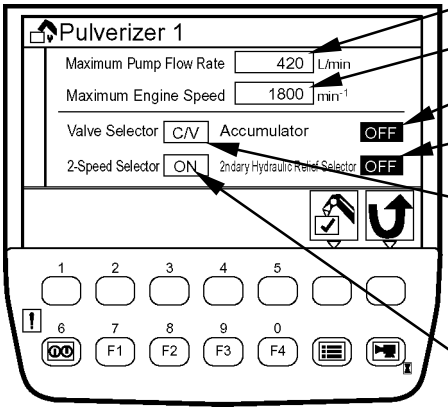
Attachment Specification Screen



T1V5-05-01-001



T1V5-05-01-006



Maximum Pump 1 and 2 Flow Rate

Maximum Engine Speed

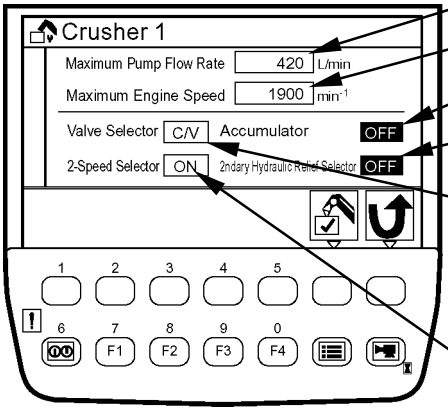
Accumulator Control Solenoid Valve: OFF

Secondary Hydraulic Relief Selector Control Solenoid Valve: OFF

Selector Valve Control Solenoid Valve: OFF
The selector valve is connected to the control valve.

Auxiliary Flow Combining Solenoid Valve: ON

T1V5-05-01-011



Maximum Pump 1 and 2 Flow Rate

Maximum Engine Speed

Accumulator Control Solenoid Valve: OFF

Secondary Hydraulic Relief Selector Control Solenoid Valve: OFF

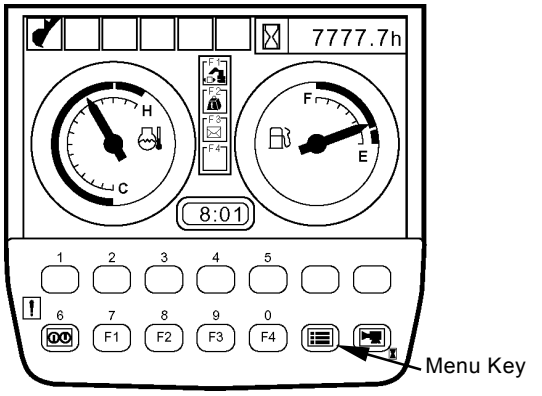
Selector Valve Control Solenoid Valve: OFF
The selector valve is connected to the control valve.

Auxiliary Flow Combining Solenoid Valve: ON

T1V5-05-01-028

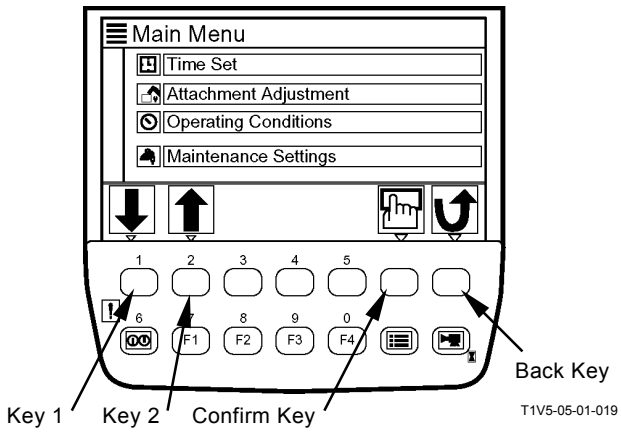
TIME SETTING

1. When the primary screen appears, push the menu key and display main menu.



Primary Screen T1V1-05-01-123

2. Select time set from main menu by using keys 1 and 2. Push the confirm key. Then, the time set screen appears.



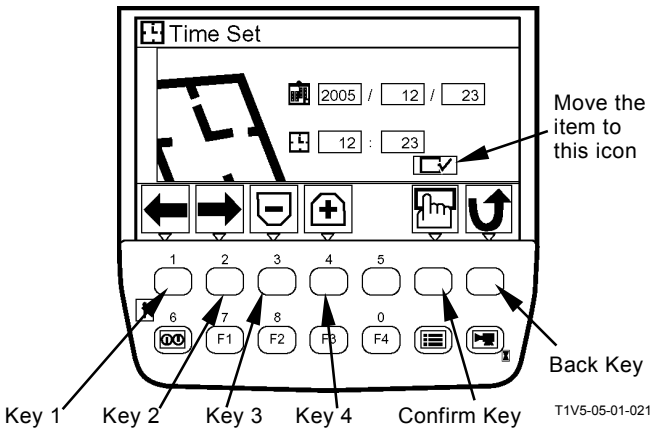
T1V5-05-01-019

3. On the time set screen, select the items to be set (Year, Month, Day and Time) by using keys 1 and 2 and set the figures by using keys 3 and 4.

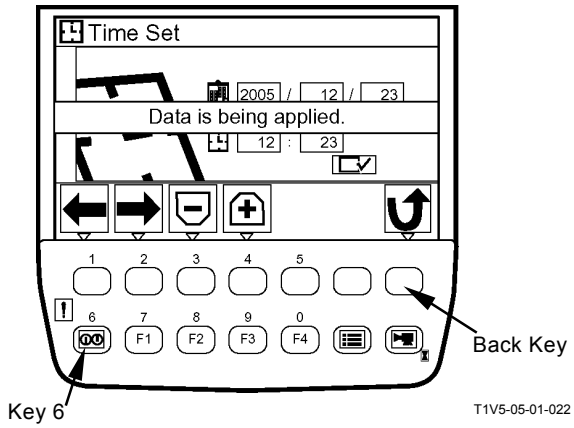
4. By using key 2, move the item to . Push the confirm key. Then, system time is updated with the values specified on the screen.

NOTE: When pushing the back key, return to the previous screen.

5. Push key 6, and return to the primary screen.



T1V5-05-01-021



T1V5-05-01-022

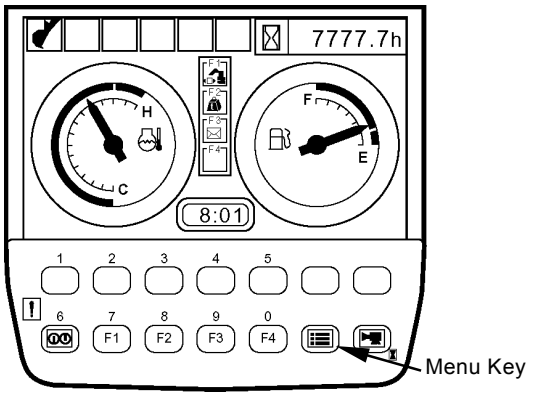
(Blank)

FUEL RATE DISPLAY/NO DISPLAY

IMPORTANT: The values displayed on the fuel gauge are just for reference and different from actual values.

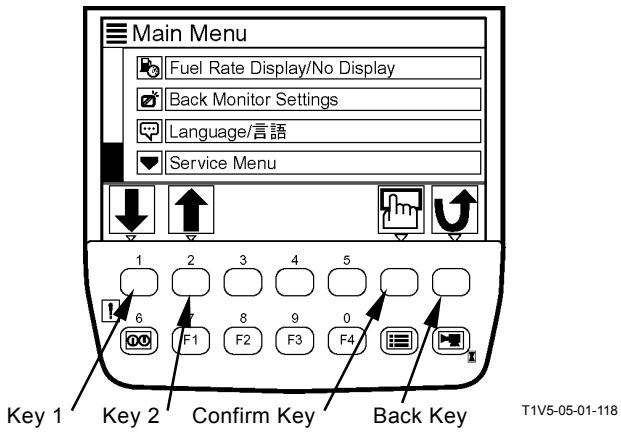
Fuel Rate Display

1. When the primary screen appears, push the menu key and display main menu.



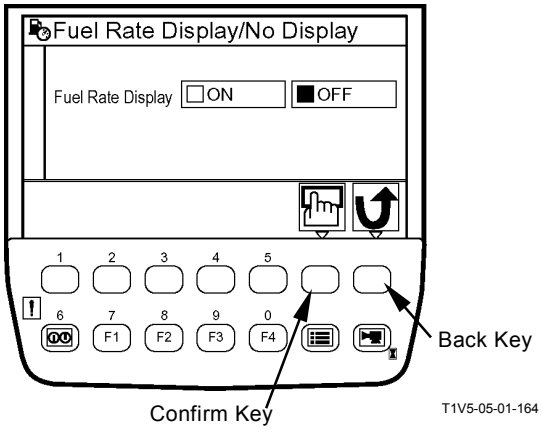
Primary Screen T1V1-05-01-123

2. Select fuel rate display/no display from main menu by using keys 1 and 2. Push the confirm key. Then, the fuel rate display/no display screen appears.



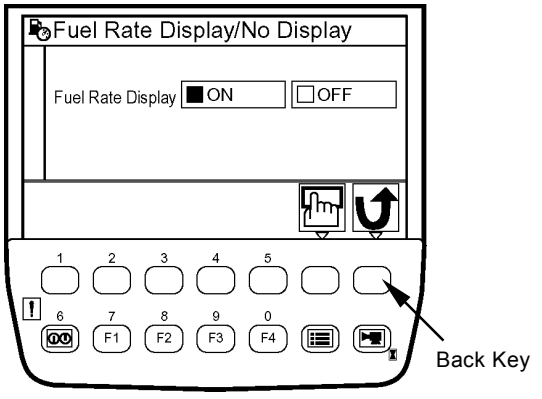
T1V5-05-01-118

3. Push the confirm key, and fuel rate display is set to ON.



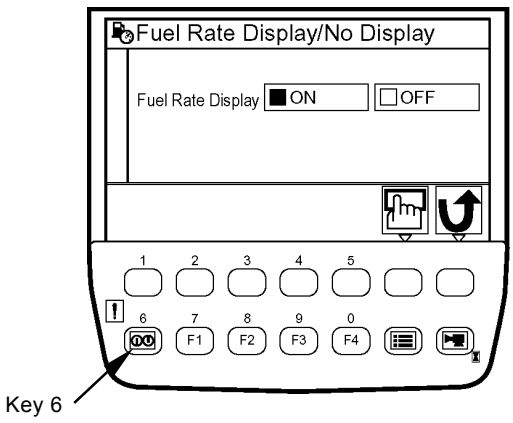
T1V5-05-01-164

NOTE: When pushing the back key, return to the previous screen.

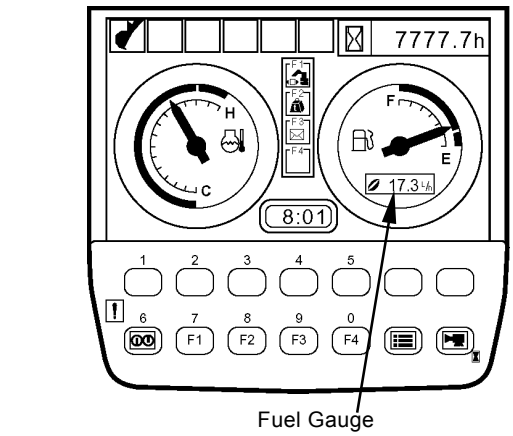


T1V5-05-01-119

4. Push key 6, and the fuel gauge is added to the primary screen.



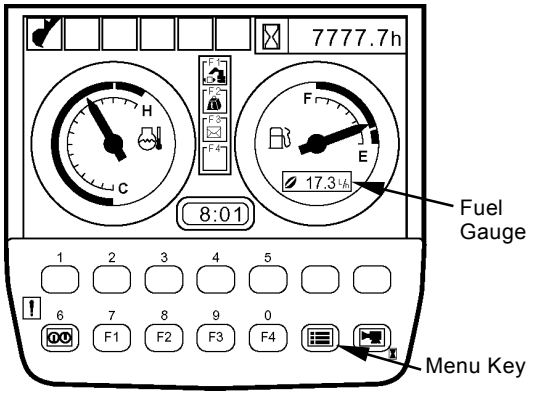
T1V5-05-01-119



T1V1-05-01-007

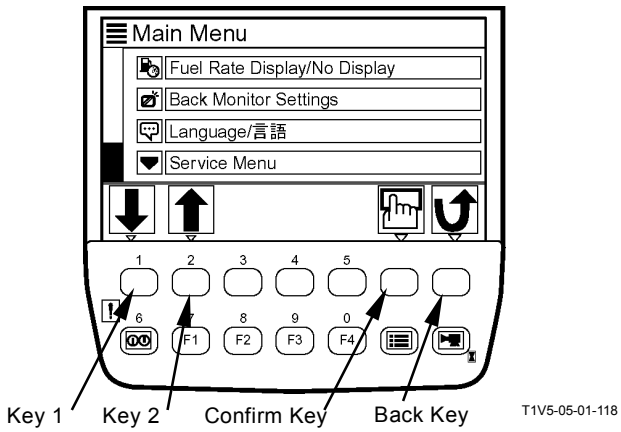
Fuel Rate No Display

1. When the primary screen appears, push the menu key and display main menu.



Primary Screen T1V1-05-01-007

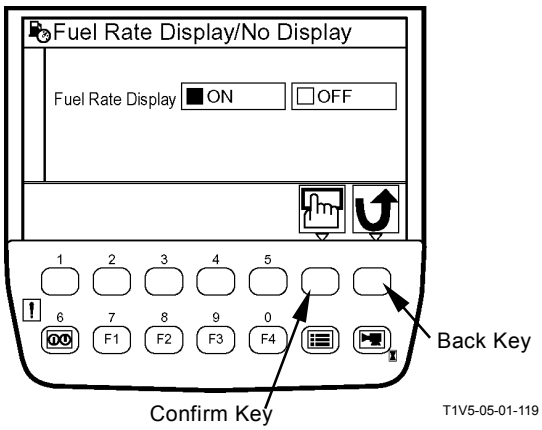
2. Select fuel rate display/no display from main menu by using keys 1 and 2. Push the confirm key. Then, the fuel rate display/no display screen appears.



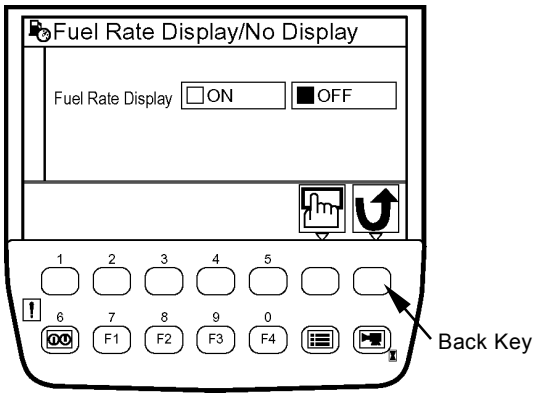
T1V5-05-01-118

3. Push the confirm key, and fuel rate display is set to OFF.

NOTE: When pushing the back key, return to the previous screen.

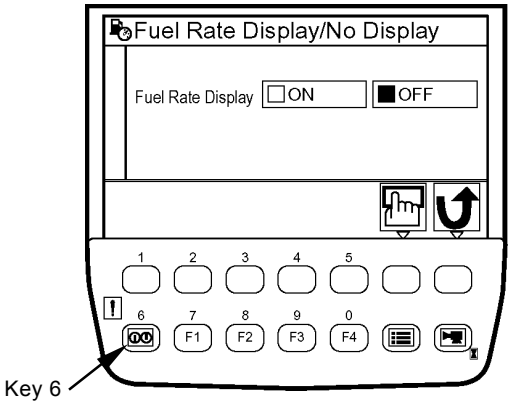


T1V5-05-01-119

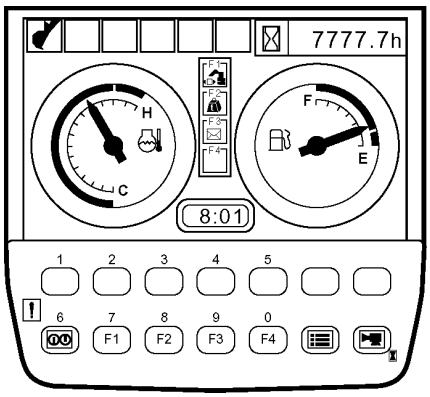


T1V5-05-01-164

4. Push key 6, and return to the primary screen.



T1V5-05-01-164



Primary Screen

T1V1-05-01-123

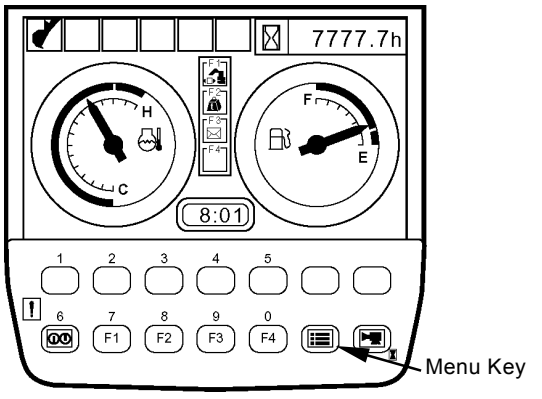
BACK MONITOR SETTINGS

IMPORTANT: Image displayed on the back monitor is of auxiliary nature at best. When the machine is operated pay thorough attention to surrounding situation.

Auto-Control: ON

Image on the monitor unit when traveling is automatically switched to that of the back monitor.

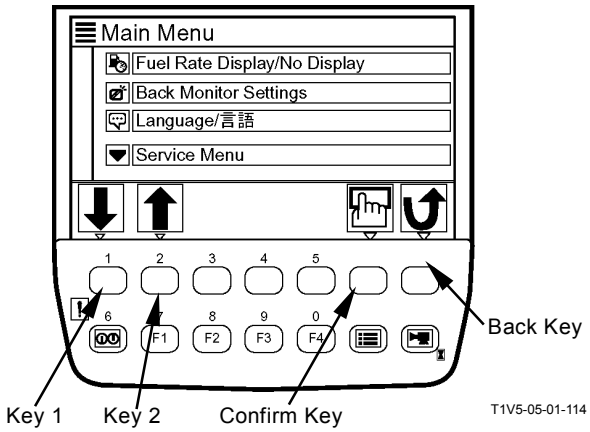
1. When the primary screen appears, push the menu key and display main menu.



Primary Screen

T1V1-05-01-123

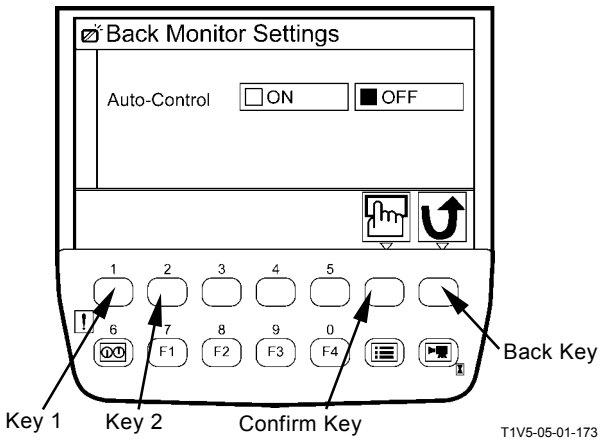
2. Select back monitor settings from main menu by using keys 1 and 2. Push the confirm key. Then, the back monitor settings screen appears.



T1V5-05-01-114

3. Push the confirm key. Then, auto-control is set to ON.

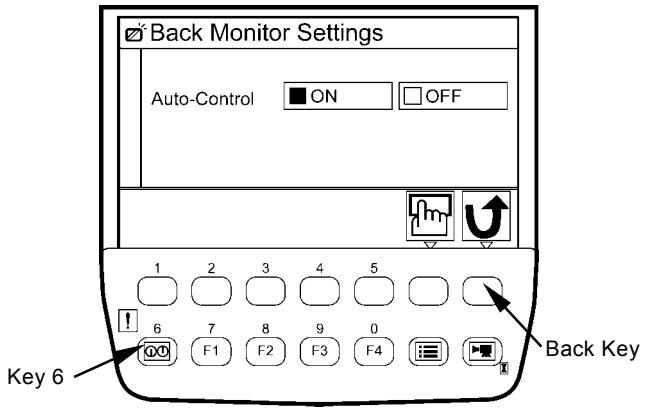
NOTE: When pushing the back key, return to the primary screen.



T1V5-05-01-173

4. Push key 6, and return to the primary screen.

5. If travel operation is done, backward image is displayed on the screen of monitor unit.

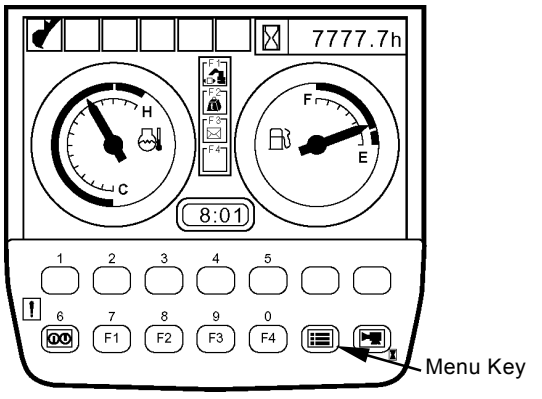


T1V5-05-01-174

Auto-Control: OFF

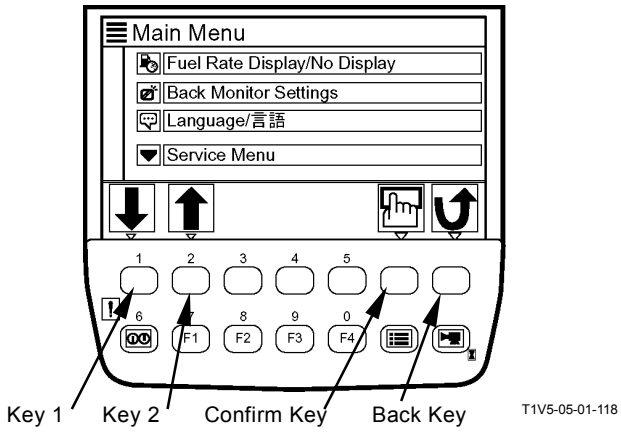
Set automatic switching function of images between monitor unit and back monitor when traveling to OFF.

1. When the primary screen appears, push the menu key and display main menu.



Primary Screen T1V1-05-01-123

2. Select back monitor settings from main menu by using keys 1 and 2. Push the confirm key. Then, the back monitor settings screen appears.

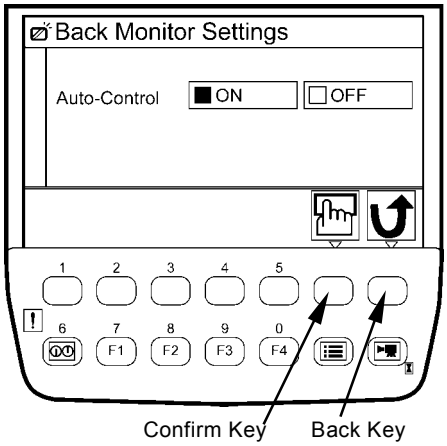


T1V5-05-01-118

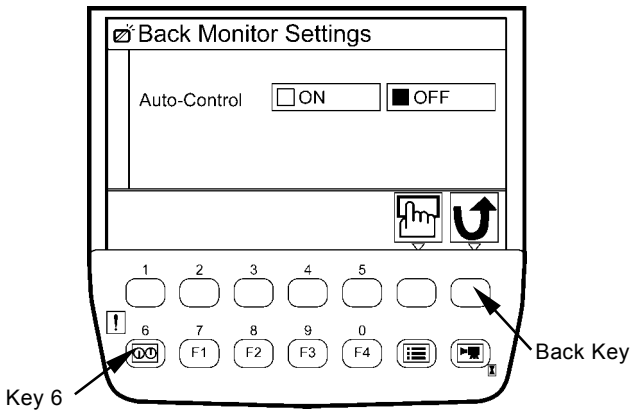
3. Push the confirm key. Then, auto-control is set to OFF.

NOTE: When pushing the back key, return to the previous screen.

4. Push key 6, and return to the primary screen.



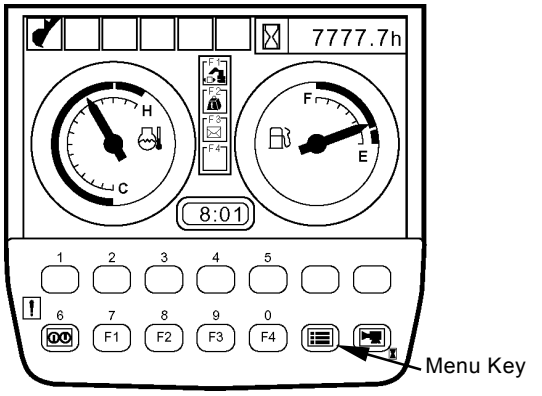
T1V5-05-01-174



T1V5-05-01-173

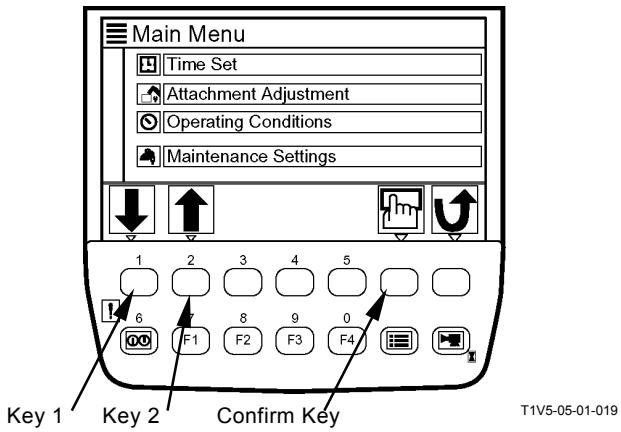
MAINTENANCE SETTINGS

1. When the primary screen appears, push the menu key and display main menu.



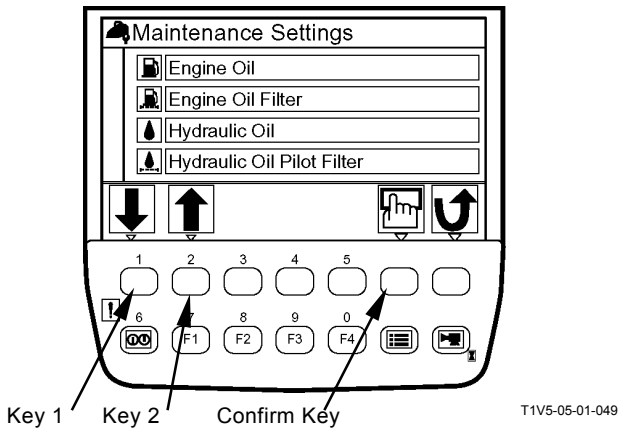
Primary Screen T1V1-05-01-123

2. Select maintenance settings from main menu by using keys 1 and 2. Push the confirm key. Then, the maintenance settings screen appears.



T1V5-05-01-019

3. Select an item to be set from among the list of maintenance settings screen by using keys 1 and 2. Push the confirm key. Then, the Interval ON/OFF setup screen appears.
(In the right example, Engine Oil is selected.)



T1V5-05-01-049

Maintenance Information Display ON/OFF

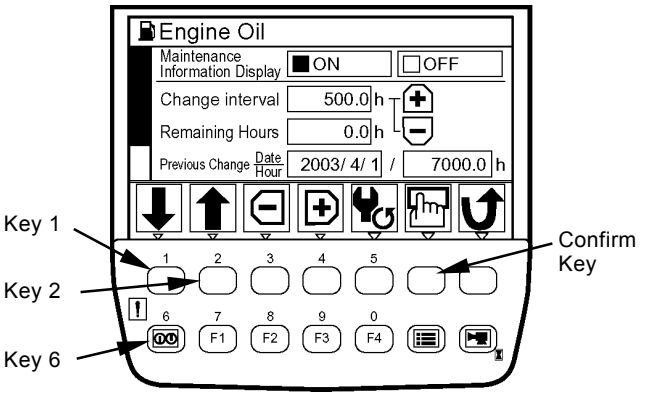
Example: Maintenance Information Display OFF→ON

ON: When time comes to change, a information message is displayed on the screen.
OFF: No information message is displayed.

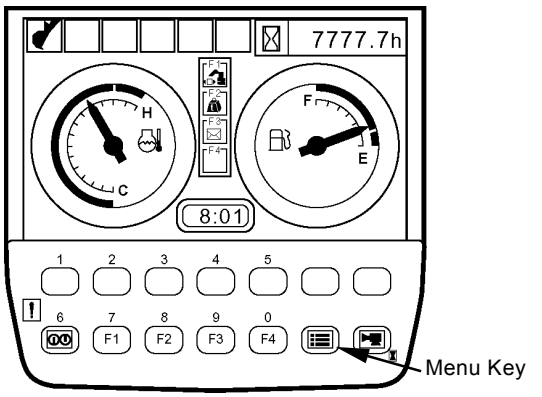
1. Select maintenance information display by using keys 1 and 2.

2. Push the confirm key and select ON.

3. In order to complete setting, push key 6. Then, the primary screen appears.



Interval ON/OFF Setup Screen T1V5-05-01-052

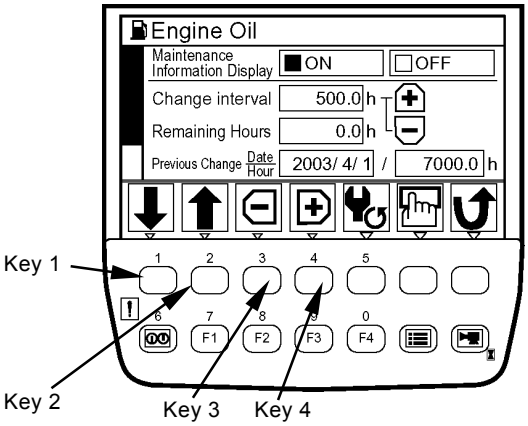


Primary Screen T1V1-05-01-123

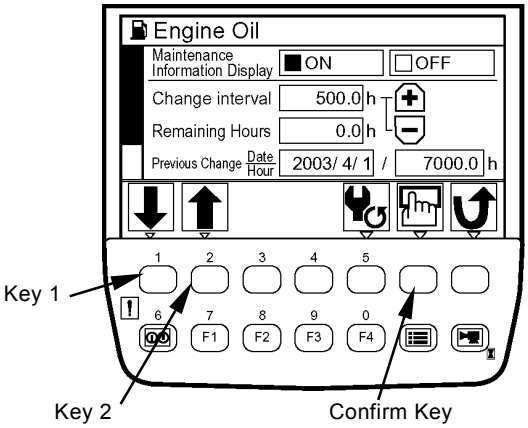
Change Interval Settings

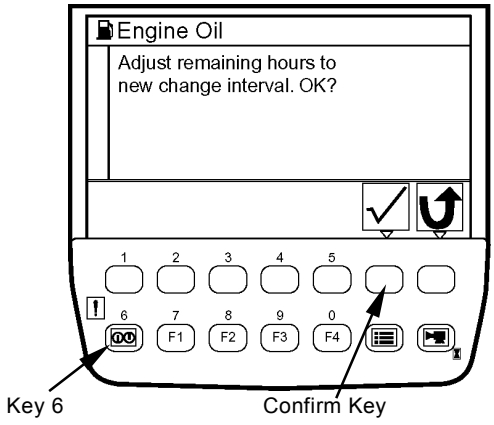
IMPORTANT: Change interval can only be set when maintenance information display is set to ON.

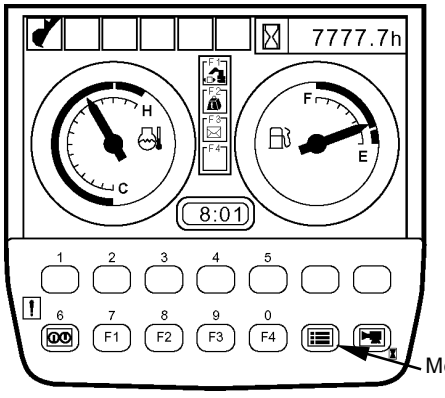
1. Select change interval by using keys 1 and 2.
2. Set time for change interval by using keys 3 and 4.
3. Select remaining hours by using keys 1 and 2 and push the confirm key.
4. The message "Adjust remaining hours to new change interval. OK?" appears. Then, push the confirm key.
5. Push key 6, and the primary screen appears.



Interval ON/OFF Setup Screen



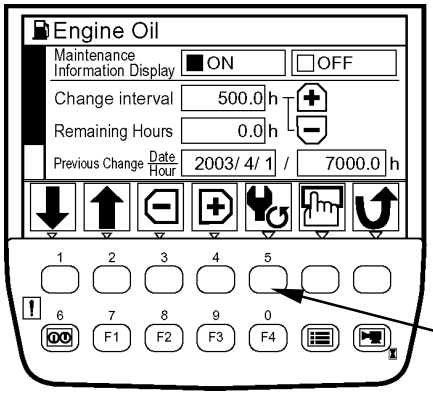




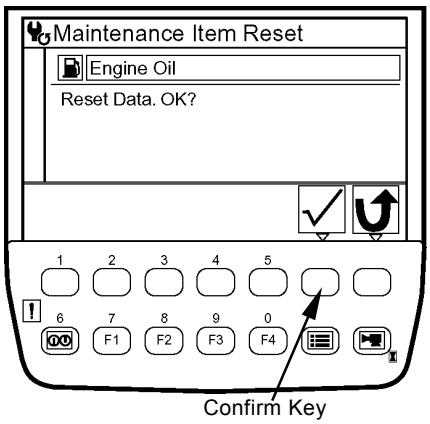
Primary Screen

Resetting Data

If data is reset, push key 5 on the Interval ON/OFF setup screen.
The message "Reset Data. OK?" appears. Then, push the confirm key.
The value of remaining hours is reset to that of change interval. The previous change date/hour is updated with current date and time.



Interval ON/OFF Setup Screen T1V5-05-01-052



T1V5-05-01-140

Screen Display when Maintenance Information Display is ON

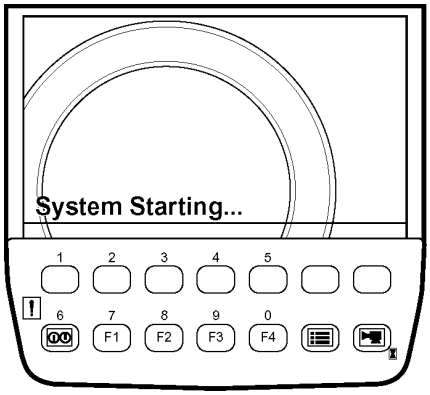
- When only one item is displayed
  1. If turning the key switch to the ON position, the starting screen appears. Then, the maintenance information display screen for the item whose change interval has expired appears for ten seconds. Finally the primary screen appears.
     (In the right example, Hydraulic Oil is displayed.)

NOTE: As for a machine which the primary screen is displayed according to a password on, the maintenance information display screen for the item whose change interval has expired appears for ten seconds, after the password is input successfully and the confirm key is pushed. And then the primary screen appears.

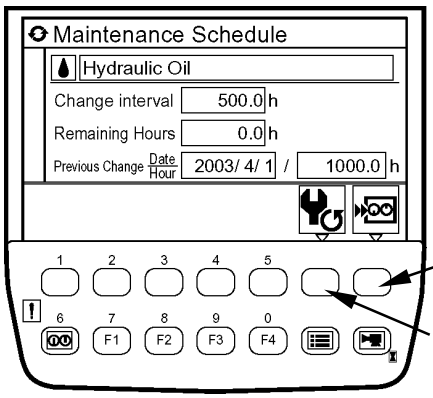
  2. If data is rest, push the reset key while the maintenance information display screen is displayed.
     The message "Reset Data. OK?" appears. Then, push the confirm key.
     The value of remaining hours is reset to that of change interval. The previous change date/hour is updated with current date and time.

NOTE: When pushing the back key while the maintenance information display screen is displayed, return to the primary screen.

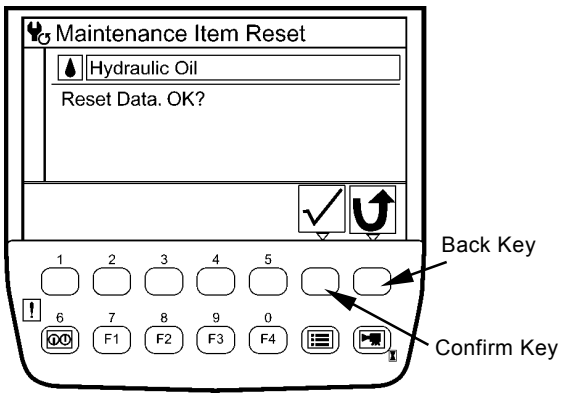
NOTE: When pushing the back key while reset screen is displayed, return to the maintenance information display screen.



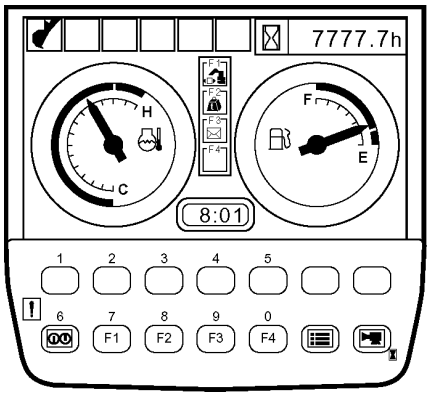
Starting Screen T1V1-05-01-115



Maintenance Information Display Screen T1V5-05-01-170



Reset Screen T1V5-05-01-171



Primary Screen T1V1-05-01-123

- When more than two items are displayed

1. If turning the key switch to the ON position, the starting screen appears. Then, the scheduled maintenance screen for the items whose change interval has expired appears for ten seconds. Finally the primary screen appears.

NOTE: As for a machine which the primary screen is displayed according to a password on, the scheduled maintenance screen for the items whose change interval has expired appears for ten seconds, after the password is input successfully and the confirm key is pushed. And then the primary screen appears.

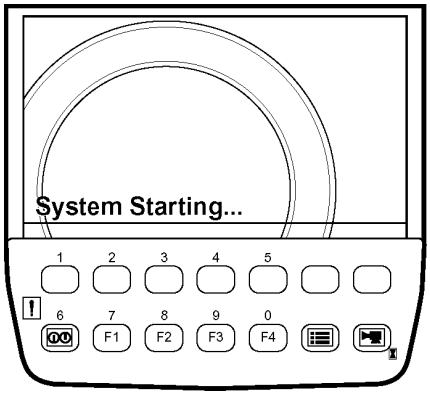
2. If data is reset, while the scheduled maintenance screen is displayed, select desired item by using keys 1 and 2. Push the confirm key. Then, the maintenance information display screen for the selected item appears.
   (In the right example, Hydraulic Oil is selected.)

NOTE: When pushing the back key while the scheduled maintenance screen is displayed, the primary screen appears.

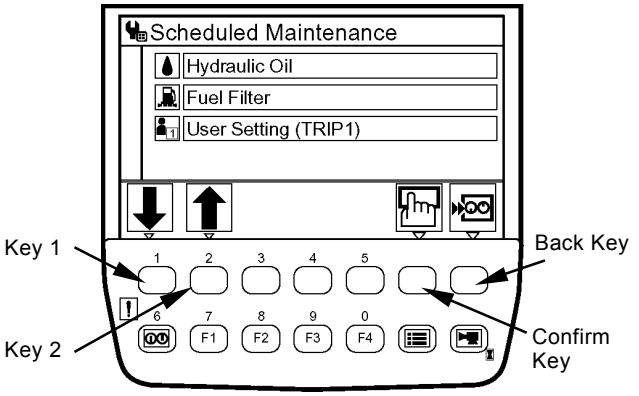
3. Push the reset key while the maintenance information display screen is displayed.
   The message "Reset Data. OK?" appears. Then, push the confirm key.
   The value of remaining hours is reset to that of change interval. The previous change date/hour is updated with current date and time.

NOTE: When pushing the back key while the maintenance information display screen is displayed, return to the scheduled maintenance screen.

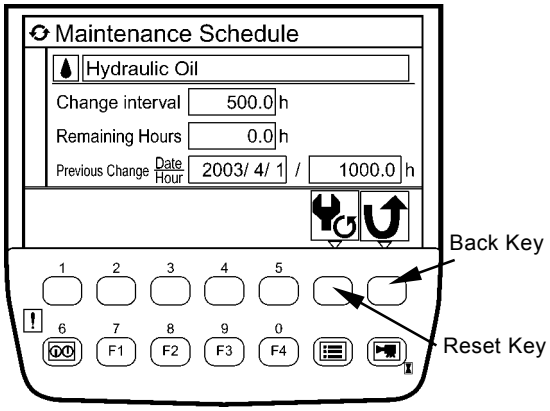
NOTE: When pushing the back key while the reset screen is displayed, return to the maintenance information display screen.



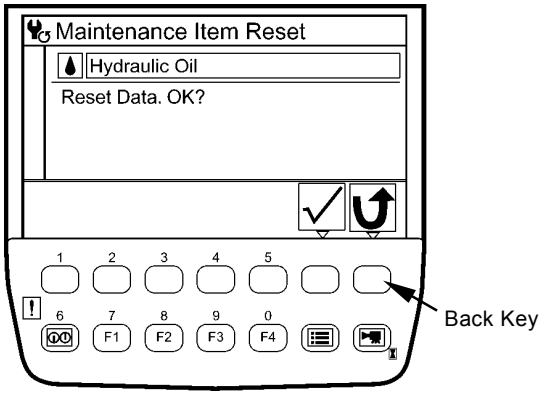
Starting Screen T1V1-05-01-115



Scheduled Maintenance Screen T1V5-05-01-169



Maintenance Information Display Screen TCHB-05-02-011



Reset Screen T1V5-05-01-171

LANGUAGE SETTINGS

1. When the primary screen appears, push the menu key and display main menu.

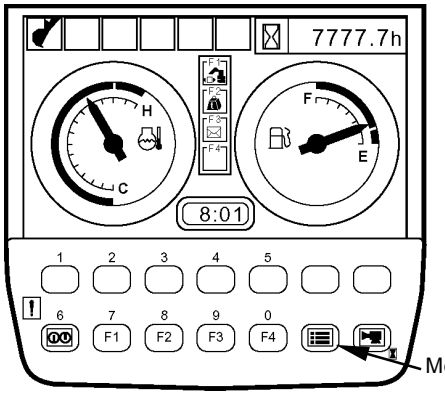
2. Select language from main menu by using keys 1 and 2. Push the confirm key. Then, the language settings screen appears.

3. Select a desired language by using keys 1 and 2. Push the confirm key.

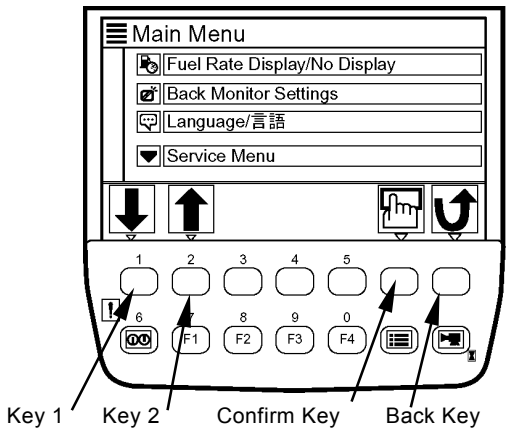
NOTE: Languages to be displayed on the screen of monitor unit have been selected from twelve languages, namely display languages 1 or 2, at the time of shipping from the factory.
(Refer to the next page.)

NOTE: When pushing the back key, return to the previous screen.

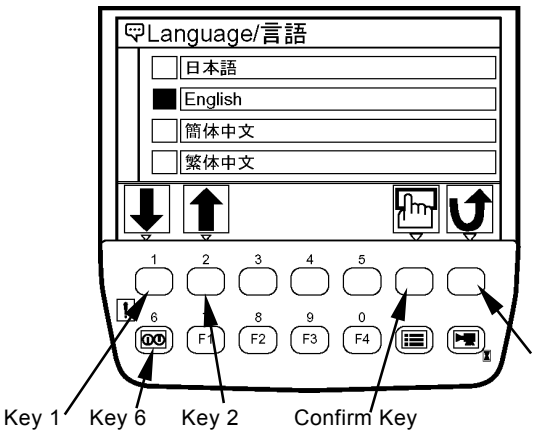
4. Push key 6, and the primary screen appears.



Primary Screen T1V1-05-01-123



T1V5-05-01-114



T1V1-05-01-137

Lists of Display Languages

Display Languages 1

Language	Screen Display
Japanese	日本語 T1V1-05-01-141
English	English T1V1-05-01-142
Chinese	簡体中文 T1V1-05-01-143
Taiwanese	繁体中文 T1V1-05-01-144
Korean	한국어 T1V1-05-01-145
Indonesian	Bahasa Indonesia T1V1-05-01-146
Thai	ภาษาไทย T1V1-05-01-147
Vietnamese	Tiếng Viêt T1V1-05-01-148
Myanmarese	မြန်မာဘာသာ T1V1-05-01-149
Arabic	اللغة العربية T1V1-05-01-150
Persian	اللغة الفارسية T1V1-05-01-151
Turkish	Türkçe T1V1-05-01-152

Display Languages 2

Language	Screen Display
English	English T1V1-05-01-142
Spanish	Español T1V1-05-01-153
Italian	Italiano T1V1-05-01-154
French	Français T1V1-05-01-155
German	Deutsch T1V1-05-01-156
Netherlandish	Nederlands T1V1-05-01-157
Russian	Русский T1V1-05-01-158
Portugese	Português T1V1-05-01-159
Finlandish	Suomi T1V1-05-01-160
Swedish	Svensk T1V1-05-01-161
Norwegean	Norsk T1V1-05-01-162
Danish	Dansk T1V1-05-01-163

MAIL
(Optional)

IMPORTANT: This function is available only to a machine equipped with a satellite terminal.
When using the mail function, make the mail function available by using Dr. ZX.

1. When the primary screen appears, push key F3 and display the mail screen.

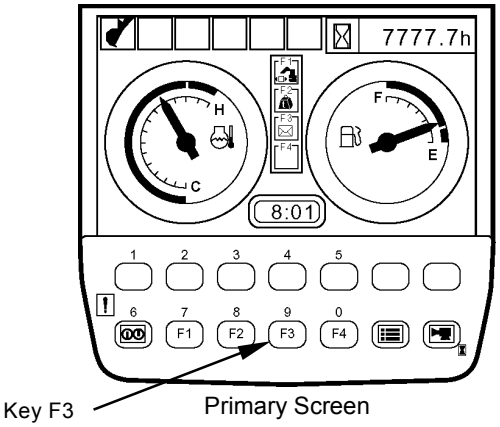
2. If pushing a relevant request key, mail information is sent to ICF.
   1 - General Request
   2 - Fuel Replenishment Request
   3 - Service Maintenance Request
   4 - Forwarding Request

3. While mail information is sent to ICF, the message "Mail is being delivered." is displayed on the screen.

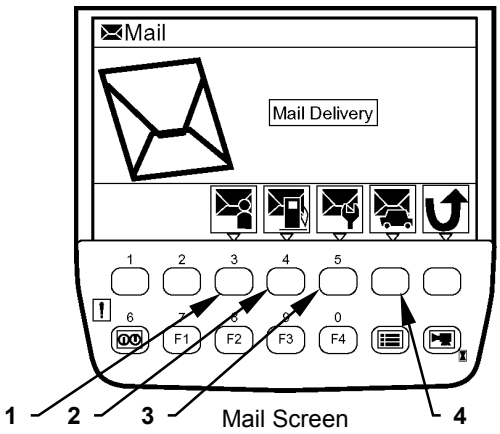
4. When ICF completes receives mail information, the message "Mail delivery successful." is displayed on the screen.
   When pushing the back key, return to the mail screen.

5. Then, a mail is sent from the satellite terminal to the central server via the satellite.

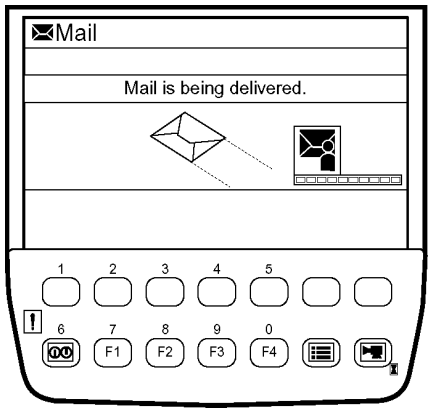
NOTE: Depending on machine operating environment or position of the satellite on its orbit, the mail may not be sent.



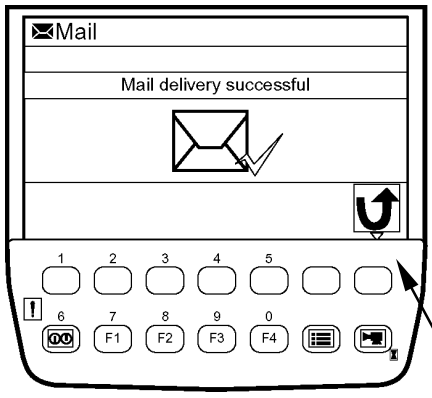
T1V1-05-01-123



T1V5-05-01-037

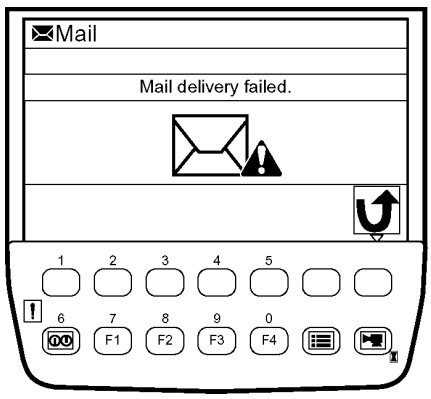


T1V5-05-01-038



T1V5-05-01-039

NOTE: When ICF could not receive the mail, the message "Mail delivery failed." is displayed on the screen.



T1V5-05-01-040

LIST OF MONITOR UNIT SETTING FUNCTION

○: with setting function
×: without setting function

Function	Item	Setting Function		Factory Setting
		Monitor Unit	Dr. ZX	
Alarm	The alarm which the trouble occurs on is checked.	○	○(Trouble shooting)	-
Security	Password function is used/ is not used.	×	○(Security)	Not used
	The password is changed.	○	×	0000
	The password is changed/ is not changed by the monitor.	×	○(Security)	Changed
	The max. digit number of password is changed.	×	○(Security)	Max.: 4 digits
	The password is checked.	×	○(Security)	-
	Extension function is used/ is not used.	×	○(Security)	Used
	Extension time is selected.	○	×	-
Time Setting	Time is is changed/ is not changed by the monitor.	×	○(Monitor Controller)	Changed
	Time is is changed.	○	○(ICF)	-
Operating Condition	Machine operating condition is displayed/ is not displayed on the main menu.	×	○(Monitor Controller)	Displayed
	Machine operating condition is reset.	○	×	-
Maintenance Setting	Maintenace setting is operated/ is not operated.	×	○(Monitor Controller)	Operated
	Engine oil is displayed/ is not displayed.	×	○(Monitor Controller)	Displayed
	Information display of engine oil is turned ON/OFF.	○	○(Monitor Controller)	OFF
	Replacement interval of engine oil is changed.	○	×	500 hours
	The engine oil replacement switch is pushed.	○	×	-
	Date/ the hourmeter when engine oil was replaced last time are checked.	○	×	-
	The engine oil filter is displayed/ is not displayed.	×	○(Monitor Controller)	Displayed
	Information display of engine oil filter is turned ON/OFF.	○	○(Monitor Controller)	OFF
	Replacement interval of engine oil filter is changed.	○	×	500 hours
	The engine oil filter replacement switch is pushed.	○	×	-
	Date/ the hourmeter when engine oil filter was replaced last time are checked.	○	×	-
	Hydraulic oil is displayed/ is not displayed.	×	○(Monitor Controller)	Displayed
	Information display of hydraulic oil is turned ON/OFF.	○	○(Monitor Controller)	OFF
	Replacement interval of hydraulic oil is changed.	×	×	5000 hours
	The hydraulic oil replacement switch is pushed.	○	×	-
	Date/ the hourmeter when hydraulic oil was replaced last time are checked.	○	×	-

Function	Item	Setting Function		Factory Setting
		Monitor Unit	Dr. ZX	
Maintenance Setting	Hydraulic oil pilot fileter is displayed/ is not displayed.	×	○(Monitor Controller)	Displayed
	Information display of hydraulic oil pilot filter is turned ON/OFF.	○	○(Monitor Controller)	OFF
	Replacement interval of hydraulic oil pilot filter is changed.	×	×	1000 hours
	The hydraulic oil pilot filter replacement switch is pushed.	○	×	-
	Date/ the hourmeter when hydraulic oil pilot filter was replaced last time are checked.	○	×	-
	Hydraulic oil full-flow fileter is displayed/ is not displayed.	×	○(Monitor Controller)	Displayed
	Information display of hydraulic oil full-flow filter is turned ON/OFF.	○	○(Monitor Controller)	OFF
	Replacement interval of hydraulic oil full-flow filter is changed.	×	×	1000 hours
	The hydraulic oil full-flow filter replacement switch is pushed.	○	×	-
	Date/ the hourmeter when hydraulic oil full-flow filter was replaced last time are checked.	○	×	-
	Pump transmission oil is displayed/ is not displayed.	×	○(Monitor Controller)	Displayed
	Information display of pump transmission oil is turned ON/OFF.	○	○(Monitor Controller)	OFF
	Replacement interval of pump transmission oil is changed.	×	×	1000 hours
	The pump transmission oil replacement switch is pushed.	○	×	-
	Date/ the hourmeter when pump transmission oil was replaced last time are checked.	○	×	-
	Travel device oil is displayed/ is not displayed.	×	○(Monitor Controller)	Displayed
	Information display of travel device oil is turned ON/OFF.	○	○(Monitor Controller)	OFF
	Replacement interval of travel device oil is changed.	×	×	2000 hours
	The travel device oil replacement switch is pushed.	○	×	-
	Date/ the hourmeter when travel device oil was replaced last time are checked.	○	×	-
	Swing device oil is displayed/ is not displayed.	×	○(Monitor Controller)	Displayed
	Information display of swing device oil is turned ON/OFF.	○	○(Monitor Controller)	OFF
	Replacement interval of swing device oil is changed.	×	×	1000 hours
	The swing device oil replacement switch is pushed.	○	×	-
	Date/ the hourmeter when swing device oil was replaced last time are checked.	○	×	-
	Swing bearing lubrication is displayed/ is not displayed.	×	○(Monitor Controller)	Displayed
	Information display of swing bearing lubrication is turned ON/OFF.	○	○(Monitor Controller)	OFF

Function	Item	Setting Function		Factory Setting
		Monitor Unit	Dr. ZX	
Maintenance Setting	Replacement interval of swing bearing lubrication is changed.	×	×	500 hours
	The swing bearing lubrication replacement switch is pushed.	○	×	-
	Date/ the hour meter when swing bearing lubrication was replaced last time are checked.	○	×	-
	The air cleaner filter is displayed/ is not displayed.	×	○(Monitor Controller)	Displayed
	Information display of air cleaner filter is turned ON/OFF.	○	○(Monitor Controller)	OFF
	Replacement interval of air cleaner filter is changed.	×	×	1500 hours
	The air cleaner filter replacement switch is pushed.	○	×	-
	Date/ the hourmeter when air cleaner filter was replaced last time are checked.	○	×	-
	The engine/ air conditioner V-belt is displayed/ is not displayed.	×	○(Monitor Controller)	Displayed
	Information display of engine/ air conditioner V-belt is turned ON/OFF.	○	○(Monitor Controller)	OFF
	Replacement interval of engine/ air conditioner V-belt is changed.	×	×	1000 hours
	The engine/ air conditioner V-belt replacement switch is pushed.	○	×	-
	Date/ the hourmeter when engine/ air conditioner V-belt was replaced last time are checked.	○	×	-
	The fuel filter is displayed/ is not displayed.	×	○(Monitor Controller)	Displayed
	Information display of fuel filter is turned ON/OFF.	○	○(Monitor Controller)	OFF
	Replacement interval of fuel filter is changed.	×	×	500 hours
	The fuel filter replacement switch is pushed.	○	×	-
	Date/ the hourmeter when fuel filter was replaced last time are checked.	○	×	-
	The air conditioner filter is displayed/ is not displayed.	×	○(Monitor Controller)	Displayed
	Information display of air conditioner filter is turned ON/OFF.	○	○(Monitor Controller)	OFF
	Replacement interval of air conditioner filter is changed.	×	×	3000 hours
	The air conditioner filter replacement switch is pushed.	○	×	-
	Date/ the hourmeter when air conditioner filter was replaced last time are checked.	○	×	-
	The user setting (TRIP1) is displayed/ is not displayed.	×	×	Displayed
	Information display of user setting (TRIP1) is turned ON/OFF.	○	×	OFF
	Replacement interval of user setting (TRIP1) is changed.	○	×	5000 hours
	The user setting (TRIP1) replacement switch is pushed.	×	×	-
	Date/ the hour meter when user setting (TRIP1) was replaced last time are checked.	○	×	-
	The user setting (TRIP2) is displayed/ is not displayed.	×	×	Displayed

Function	Item	Setting Function		Factory Setting
		Monitor Unit	Dr. ZX	
Maintenance Setting	Information display of user setting (TRIP2) is turned ON/OFF.	○	×	OFF
	Replacement interval of user setting (TRIP2) is changed.	○	×	5000 hours
	The user setting (TRIP2) replacement switch is pushed.	×	×	-
	Date/ the hourmeter when user setting (TRIP2) was replaced last time are checked.	○	×	-
Optional Function	Work mode function is displayed/ is not displayed.	×	○(Monitor Controller)	Displayed
	ML carne function is displayed/ is not displayed.	×	○(Monitor Controller)	Not displayed
	ML crane switch is turned ON/OFF.	○	×	-
	The switch ON/OFF is stored/ is not stored.	×	○(Monitor Controller)	Stored
	Mail function is displayed/ is not displayed.	×	○(Monitor Controller)	Not displayed
	The mail is sent.	○	×	-
Overload Alarm	Overload alarm is displayed/ is not displayed.	×	○(Monitor Controller)	Not displayed
Fuel Rate Display/No Display	Fuel rate display/No display is displayed/ is not displayed on the main menu.	×	○(Monitor Controller)	Displayed
	Fuel consumption gauge is turned ON/OFF.	○	×	OFF
Back Monitor Setting	Back monitoring setting is displayed/ is not displayed on the main menu.	×	○(Monitor Controller)	Displayed
	The camera image is selected/ is not selected automatically when the machine travels. (Auto-switch)	○	×	Not selected
	The camera image is flipped horizontally. (Display type)	×	○(Monitor Controller)	Normal image
	The camera image is flipped vertically. (Display type 2)	×	○(Monitor Controller)	Flip vertical
	NTSC/PAL is selected. (Image type)	×	○(Monitor Controller)	NTSC
Language Setting	The language displayed on the monitor is selected.	○	×	Japanese
	The language is registerd to the monitor / is deleted from the monitor.	×	×	-
	The language registered on the monitor is checked.	○	×	-
Trouble-shooting	The fault code which the trouble occurs on is checked.	○	○(Trouble shooting)	-
	The fault code which the trouble occurred is checked.	×	○(Trouble shooting)	-
	The fault code is completed. (Retrial B)	×	○(Trouble shooting)	-
Monitoring	The item order is changed.	○	×	-
	The item order is set to the initialized one.	○	×	-

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OUTLINE

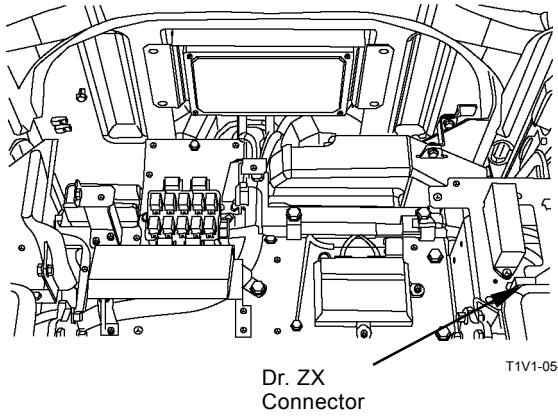
Dr. ZX is used for diagnosis of electrical system including MC, EMC, ICF and monitor unit.
Dr. ZX is connected to ICF and failure of each controller and each sensor is displayed as a fault code. (Self-Fiagnostic Result)

Dr. ZX displays the input status of sensors and switches connected to each controller and the output status to actuator including solenoid valve from controller with the machine operated in real time. (Controller Diagnosis)

Operation

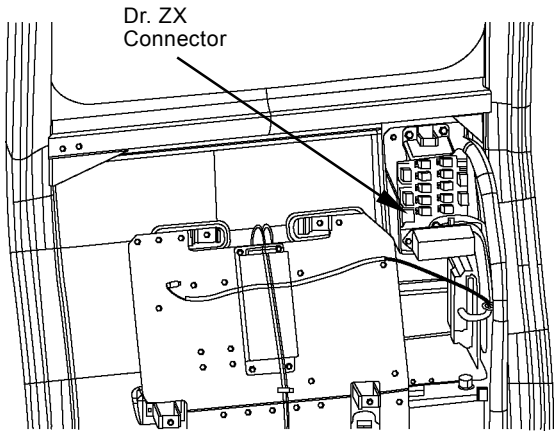
1. Connect Palm (Dr. ZX) to the diagnosing connector in the cab by using the Hot Sync cable and connecting harness.
2. Turn the key switch ON or start the engine.
3. When turning Palm ON, the following screen is displayed on the display of Palm.
   - 3-1. Initial Screen
     Select Dr. ZX icon.
   - 3-2. Password Setup Screen (When the password has unset) Set the password.
   - 3-3. Service Software Selection Screen
     [+] Select ZX-3 Mid.
   - 3-4. Function Selection Screen
     [+] Self-Diagnostic Result
     [+] Select Controller
4. Select Self-Diagnostic Result and operate according to the instruction under the screen.

ZX200-3 class, ZX240-3 class, 270-3 class

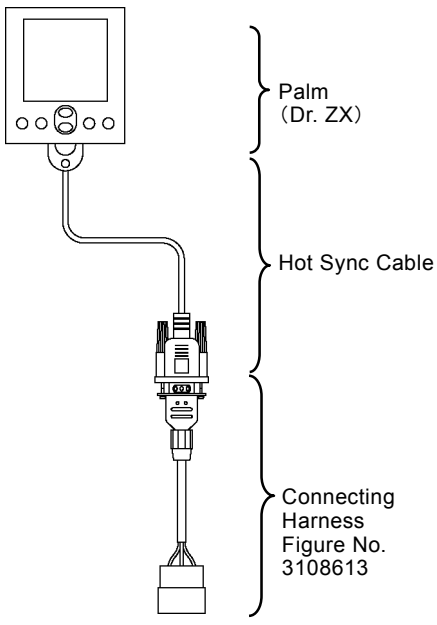


T1V1-05-07-001

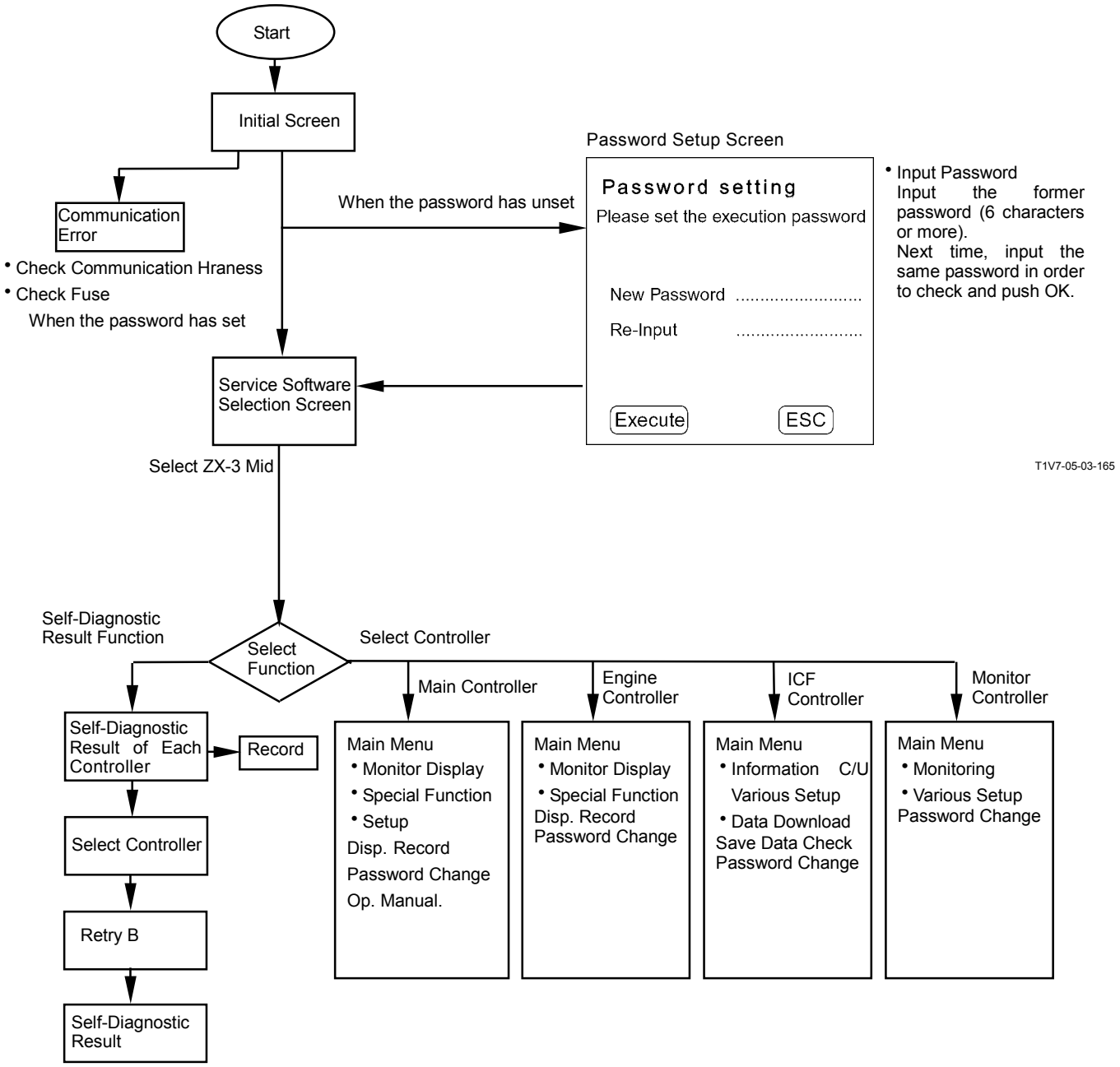
ZX225US-3 class, ZX225USR-3 class



T1V1-01-02-047

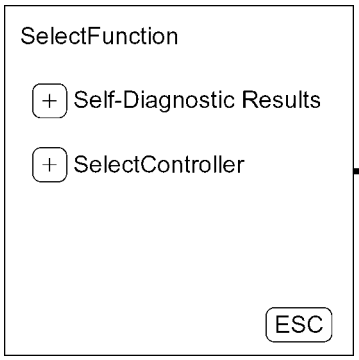


T1V1-05-07-002


Start
Initial Screen
Communication Error
• Check Communication Hraness
• Check Fuse
When the password has set
When the password has unset
Password Setup Screen
Password setting
Please set the execution password
New Password .....
Re-Input .....
Execute
ESC
• Input Password
Input the former password (6 characters or more).
Next time, input the same password in order to check and push OK.
Service Software Selection Screen
Select ZX-3 Mid
T1V7-05-03-165
Self-Diagnostic Result Function
Select Function
Select Controller
Main Controller
Engine Controller
ICF Controller
Monitor Controller
Self-Diagnostic Result of Each Controller
Record
Select Controller
Retry B
Self-Diagnostic Result
Main Menu
• Monitor Display
• Special Function
• Setup
Disp. Record
Password Change
Op. Manual.
Main Menu
• Monitor Display
• Special Function
Disp. Record
Password Change
Main Menu
• Information C/U
Various Setup
• Data Download
Save Data Check
Password Change
Main Menu
• Monitoring
• Various Setup
Password Change

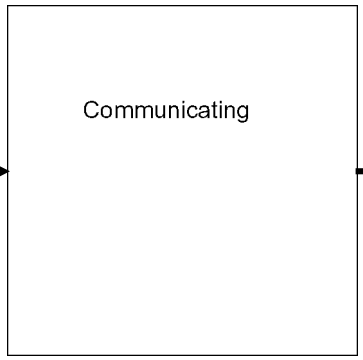
Self-Diagnostic Result

The self-diagnostic result of each controller is displayed.
After starting Dr. ZX, push Self-Diagnostic Result.

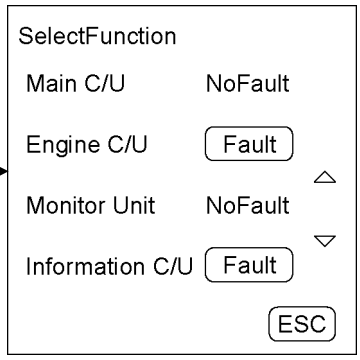


T1V7-05-03-001

Function Selection Screen



T1V7-05-03-008



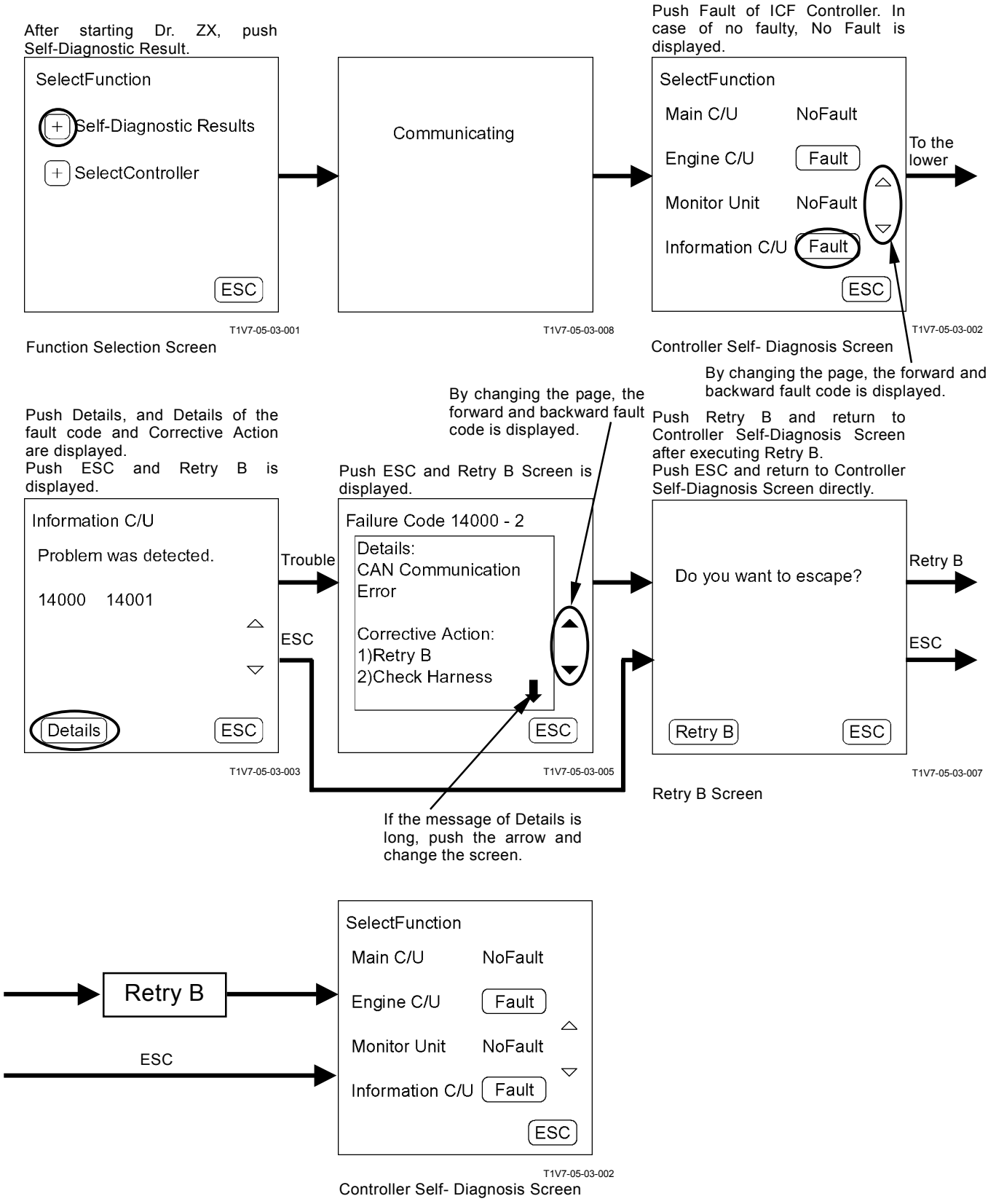
T1V7-05-03-002

Controller Self- Diagnosis Screen

NOTE: Main C/U: MC
Engine C/U: ECM
Monitor Unit: Monitor Unit
Information C/U: ICF

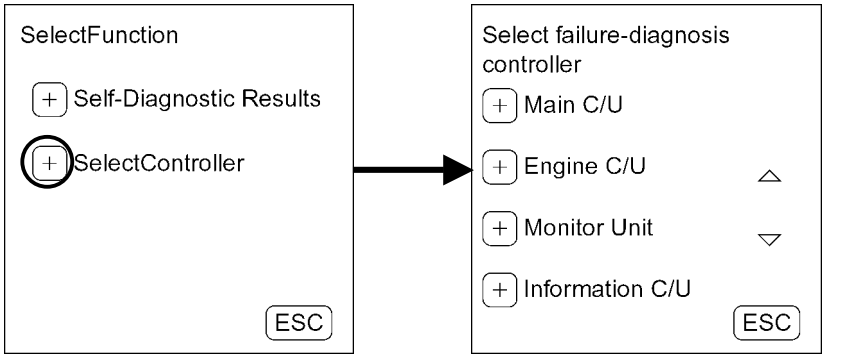
NOTE: Self-diagnosis of ICF controller is done on the next page.

Self-Diagnosis



SELECT CONTROLLER

Select failure-diagnosis controller.
After starting Dr. ZX, push Select Controller.



Function Selection Screen

NOTE: Main C/U: MC
Engine C/U: ECM
Monitor Unit: Monitor Unit
Information C/U: ICF

MAIN CONTROLLER

Recorded Data

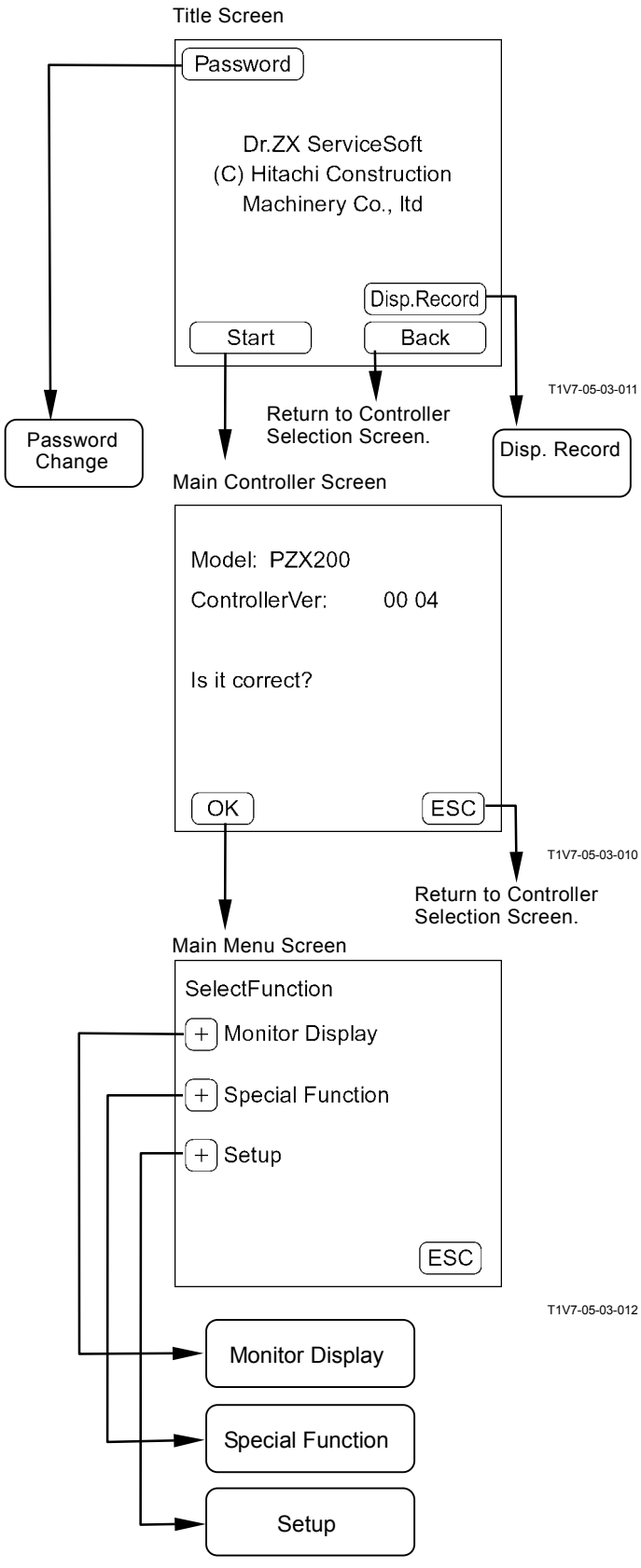
Displays data recorded in MC by one day by using Dr. ZX.

Password Change

Changes the password input when setting.

Main Menu

- Monitor Display
  Displays the control signals of MC and the input signals from each switch and sensor.
- Special Function
  Makes Special Function disabled.
- Setup
  Adjusts engine speed, pump delivery flow rate, solenoid valve output pressure and so on.



MAIN MENU MONITOR DISPLAY

Dr. ZX displays the input signals from switches and sensors and the control signals from MC.

List of Monitor Item

Item		Data	Unit
Selecting	Monitoring		
Required Engine Speed	Requested Engine Speed	Input signal from engine control dial	min^{-1}
Actual Engine Speed	Actual Engine Speed	Input signal from ECM	min^{-1}
Engine Speed Deviation	Engine Speed Deviation	Input signal from ECM	min^{-1}
Pump 1 Delivery Pressure	Pump 1 Delivery Pressure	Input signal from pump 1 delivery pressure sensor	MPa
Pump 1 Pump Control Pressure	Pump 1 Flow Control Pressure	Input signal from pump 1control pressure sensor	MPa
Pump 1 Flow Rate Limit Proportional Valve Output	Pump 1 Flow Rate Limit P/S/V Out	Control instruction signal to maximum pump 1 flow rate limit control solenoid valve	MPa
Pump 1 Max. Displacement	Pump 1 Upper Limit Displacement	Calculated value from engine speed and pump 1 delivery pressure (only when using the attachment)	cm^3
Pump 1 Target Flow Rate	Pump 1 Target Flaw Rate	Control instruction signal to maximum pump 1 flow rate limit control solenoid valve	L/min
Pump 2 Delivery Pressure	Pump 2 Delivery Pressure	Input signal from pump 2 delivery pressure sensor	MPa
Pump 2 Pump Control Pressure	Pump 2 Flow Control Pressure	Input signal from pump 2control pressure sensor	MPa
Pump 2 Flow Rate Limit Proportional Valve Output	Pump 2 Flow Rate Limit P/S/V Out	Control instruction signal to maximum pump 2 flow rate limit control solenoid valve	MPa
Pump 2 Max. Displacement	Pump 2 Upper-Limit Displacement	Calculated value from engine speed and pump 2 delivery pressure (only when using the attachment)	cm^3
Pump 2 Target Flow Rate	Pump 2 Target Flaw Rate	Control instruction signal to maximum pump 2 flow rate limit control solenoid valve	L/min
Pump Torque Proportional Valve Output	Pump Torque P/S Valve Output	Control instruction signal to torque control solenoid valve	MPa
Pump 3 Delivery Pressure (Optional)	Pump 3 Delivery Pressure	Input signal from pump 3 delivery pressure sensor	MPa
Pump 1 Load Rate	Pump 1 Load Factor (Rate)	Load rate of pump 1	%
Pump 2 Load Rate	Pump 2 Load Factor (Rate)	Load rate of pump 2	%

Item		Data	Unit
Selecting	Monitoring		
Type of Current ATT	Current ATT Type	Communication from monitor unit	BK, BR, PU, CR, VI, Others
Number of Current ATT	Current ATT No.	Communication from monitor unit	1, 2, 3, 4, 5
Type of ATT1	ATT1 Type	Communication from monitor unit	BK, BR, PU, CR, VI, Others
Number of ATT1	ATT1 No.	Communication from monitor unit	1, 2, 3, 4, 5
Type of ATT2	ATT2 Type	Communication from monitor unit	BK, BR, PU, CR, VI, Others
Number of ATT2	ATT2 No.	Communication from monitor unit	1, 2, 3, 4, 5
Type of ATT3	ATT3 Type	Communication from monitor unit	BK, BR, PU, CR, VI, Others
Number of ATT3	ATT3 No.	Communication from monitor unit	1, 2, 3, 4, 5
Type of ATT4	ATT4 Type	Communication from monitor unit	BK, BR, PU, CR, VI, Others
Number of ATT4	ATT4 No.	Communication from monitor unit	1, 2, 3, 4, 5
Type of ATT5	ATT5 Type	Communication from monitor unit	BK, BR, PU, CR, VI, Others
Number of ATT5	ATT5 No.	Communication from monitor unit	1, 2, 3, 4, 5
Front Att. Control Pressure	Front Pilot Pressure	Input signal from pressure sensor (front att.)	MPa
Boom Raise Control Pressure	Boom Raise Pilot Pressure	Input signal from pressure sensor (boom raise)	MPa
Arm Roll-In Control Pressure	Arm Roll-in Pilot Pressure	Input signal from pressure sensor (arm roll-in)	MPa
Arm Dump Control Pressure	Arm Roll-Out Pilot Pressure	Input signal from pressure sensor (arm roll-out)	MPa
Swing Control Pressure	Swing Pilot Pressure	Input signal from pressure sensor (swing)	MPa
Travel Control Pressure	Travel Pilot Pressure	Input signal from pressure sensor (travel)	MPa
ATT Control Pressure (Optional)	Att. Control Pilot Pressure	Input signal from pressure sensor (auxiliary)	MPa
EC Dial Angle	EC Dial Angle	Input signal from EC sensor	V
Boom Cylinder Bottom Pressure (Optional)	Boom Bottom Pressure	Input signal from boom bottom pressure sensor	MPa
Boom Cylinder Rod Pressure (Optional)	Boom Rod Pressure	Input signal from boom rod pressure sensor	MPa
Arm Cylinder Bottom Pressure (Optional)	Arm Bottom Pressure	Input signal from arm bottom pressure sensor	MPa
Boom Angle (Optional)	Boom Angle	Input signal from boom angle sensor	V
Arm Angle (Optional)	Arm Angle	Input signal from arm angle sensor	V
E/P Mode Switch	E/P SW	Power mode switch selection status	E, P
HP Mode Switch	HP Mode SW	Power mode switch selection status	ON, OFF
Auto-Idle Switch	Auto-Idle SW	Auto-idle switch ON/OFF status	AI
Travel Mode Switch	Travel Mode SW	Travel mode switch selection status	LO, HI
Power Digging Switch	Power Boost SW	Power digging switch selection status	ON, OFF
Key Switch	Key SW	Key switch ON/OFF status	ON, OFF

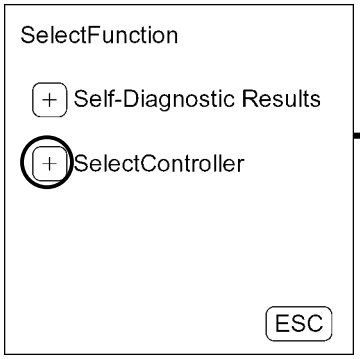
Item		Data	Unit
Selecting	Monitoring		
Boom Dampener Switch 1 (Optional)	Boom Damping SW1	Boom dampener switch 1 ON/OFF status	ON, OFF
Boom Dampener Switch 2 (Optional)	Boom Damping SW2	Boom dampener switch 2 ON/OFF status	ON, OFF
Low Vibration Switch (Optional)	Low Vibration SW	Low vibration switch ON/OFF status	ON, OFF
Low Vibration Mode ON/OFF Switch (Optional)	Low Vibration Mode ON/OFF SW	Low vibration mode switch 1 ON/OFF status	ON, OFF
Digging Regenerative Proportional Valve Output	Dig-Regenerative P/S Valve Output	Control instruction signal to solenoid valve unit SF	MPa
Arm Regenerative Proportional Valve Output	Arm Regenerative P/S Valve Output	Control instruction signal to solenoid valve unit SC	MPa
Power Digging Control Pressure	Power Boost Control Pressure	Control instruction signal to solenoid valve unit SG	MPa
Travel Mode Control Pressure	Travel Motor Control Pressure	Control instruction signal to solenoid valve unit SI	MPa
ATT. Proportional Valve Output (Optional)	ATT P/S Valve Output	Control instruction signal to ATT. proportional valve output	MPa
Boom Dampener Proportional Valve Output (Optional)	Boom Damper P/S Valve Output	Control instruction signal to boom dampener proportional valve	MPa
Low Vibration Proportional Valve Output (Optional)	Low Vibration P/S Valve Output	Control instruction signal to low vibration proportional valve	MPa
Pump 1 Flow Rate Limit Proportional Valve Output (Optional) FB	Pump 1 Flow Rate Limit P/S/V Out FB	Feedback of pump 1 flow rate limit proportional valve output	mA
Pump 2 Flow Rate Limit Proportional Valve Output FB	Pump 2 Flow Rate Limit P/S/V Out FB	Feedback of pump 2 flow rate limit proportional valve output	mA
Pump Torque Proportional Valve Output FB	Pump Torque P/S Valve Output FB	Feedback of pump torque proportional valve output	mA
ATT Proportional Valve Output (Optional) FB	ATT P/S Valve Output FB	Feedback of ATT proportional valve output	mA
Boom Dampener Proportional Valve Output (Optional) FB	Boom Damper P/S Valve Output FB	Feedback of boom dampener proportional valve output	mA
Low Vibration Proportional Valve Output (Optional) FB	Low Vibration P/S Valve Output FB	Feedback of low vibration proportional valve output	mA
Digging Regenerative Proportional Valve Output FB	Dig-Regenerative P/S/V Output FB	Feedback of digging regenerative proportional valve output	mA
Arm Regenerative Proportional Valve Output FB	Arm Regenerative P/S/V Output FB	Feedback of arm regenerative proportional valve output	mA
Power Digging Control Pressure FB	Power Boost Chg. Over Pressure FB	Feedback of power digging control pressure	mA
Travel Mode Control Pressure FB	Travel 2-Speed Chg. Ovr. Pressure FB	Feedback of travel mode control pressure	mA

Item		Data	Unit
Selecting	Monitoring		
Travel Alarm (Optional)	Travel Alarm	Travel alarm Action/No Action status	Action, No Action
Swing Alarm (Optional)	Swing Alarm	Swing alarm Action/No Action status	Action, No Action
Load Alarm (Optional)	Load Alarm	Load alarm Action/No Action status	Action, No Action
Auto Air Bleeding (Optional)	Auto-Air Bleeder	Auto air bleeding ON/OFF status	ON, OFF
Hydraulic Oil Temperature	Hydraulic Oil Temperature (HOT)	Input signal from hydraulic oil temperature sensor	°C
Overload Alarm ON/OFF Switch (Optional)	Load Alarm ON/OFF SW	Overload alarm switch ON/OFF status	ON, OFF
Angle Sensor Learning Status (Optional)	Angle Sensor Learning Status	Communication from monitor unit	Not Learn, Finish, Final

NOTE: ATT: Attachment
BR: Hydraulic Breaker
CR: Primary Crusher
VI: Vibrating Hammer
BK: Digging
PU: Secondary Crusher

Monitor Display

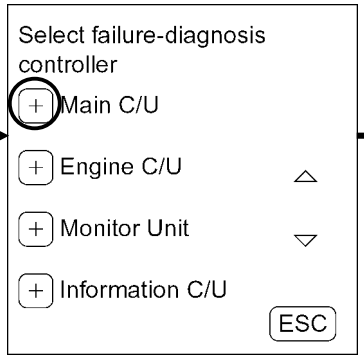
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

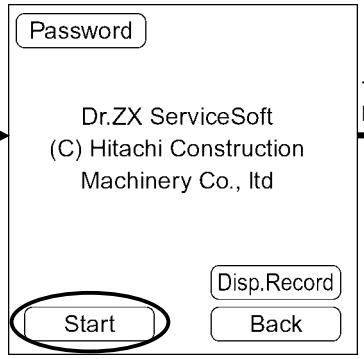
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

Push Start.

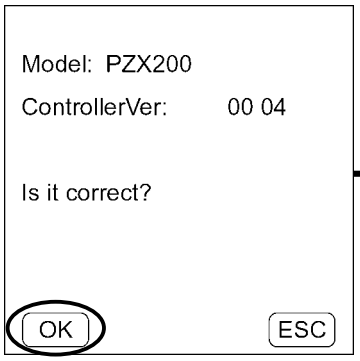


To the lower

T1V7-05-03-011

Main Controller Screen

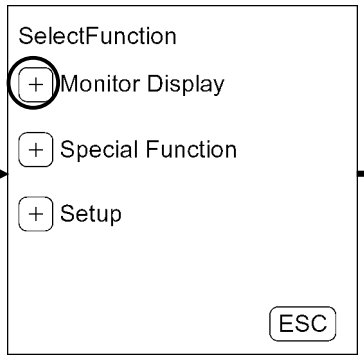
Push OK.



T1V7-05-03-010

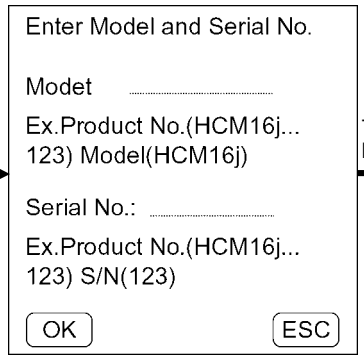
Title Screen

Push Monitor Display.



T1V7-05-03-012

Main Menu Screen

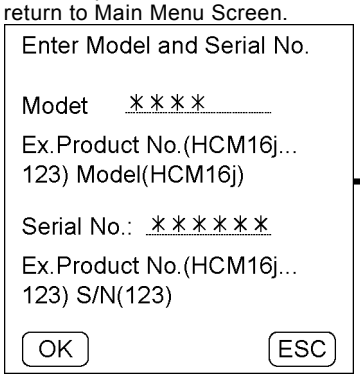


To the lower

T1V7-05-03-013

Enter Model and Serial No. Screen

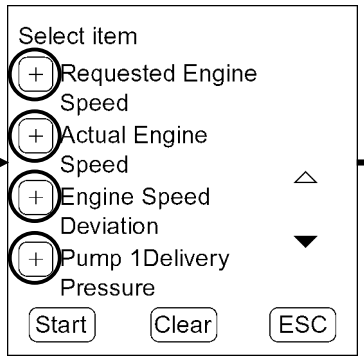
Input the model code and serial No. and push OK. Push ESC and return to Main Menu Screen.



T1V7-05-03-065

Enter Model and Serial No. Screen

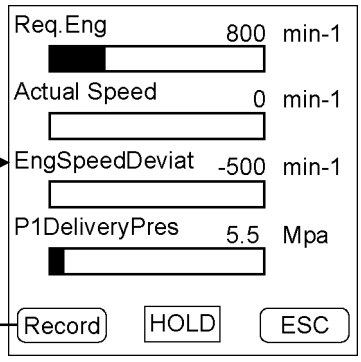
Push the item for Monitor Display and push OK. Refer to T5-3-8 as for the monitor item. Push ESC and return to Main Menu Screen.



T1V7-05-03-014

Display Item Selection Screen

Push Hold and the monitor is stopped temporarily. When the monitor is started again, push Hold again. Push ESC and return to Display Item Selection Screen.

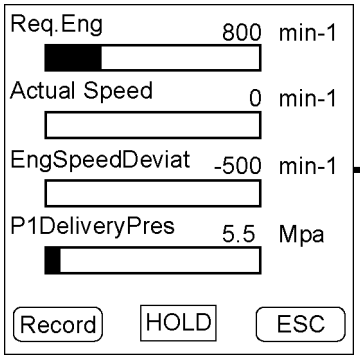


T1V7-05-03-015

Monitor Screen

To the next page

Push Record.

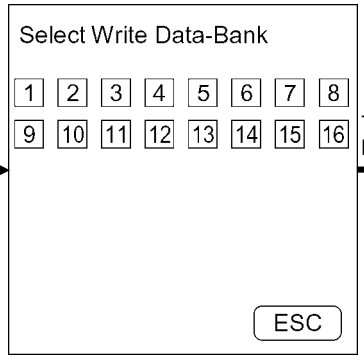


T1V7-05-03-015

Monitor Screen

T1V7-05-03-096

Push Rec. No. and the recording screen for Rec. No. is made.

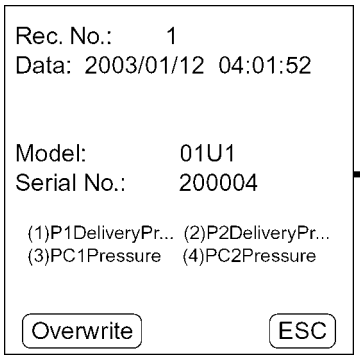


To the lower

T1V7-05-03-097

Select Write Data-Bank Screen

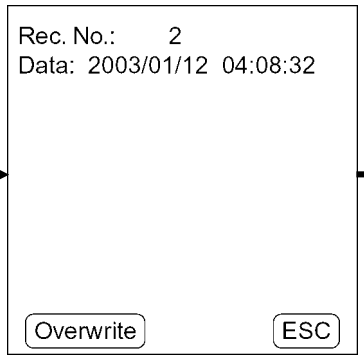
If Rec. No. has already been recorded and push Over Write, data is overwritten. Push ESC and return to Main Menu Screen.



T1V7-05-03-098

Recording Screen

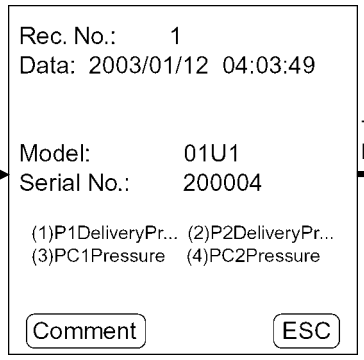
If Rec. No. has not been recorded yet and push Write, data is written to the recording screen. Push ESC and return to Main Menu Screen.



T1V7-05-03-100

Recording Screen

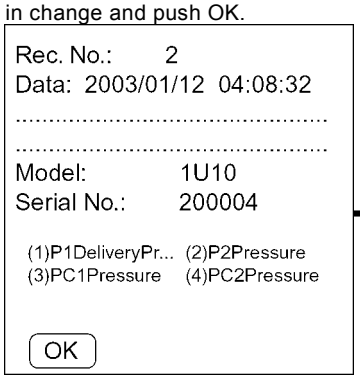
Push Comment.
Push ESC and return to Main Menu Screen.



To the lower

T1V7-05-03-099

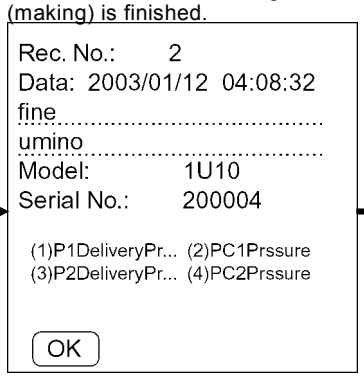
Input Weather and Person's name in change and push OK.



T1V7-05-03-101

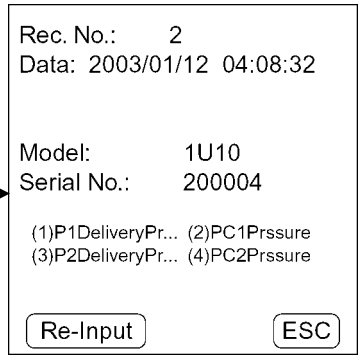
Recording Screen (Comment Input)

Push OK and the recording screen (making) is finished.



T1V7-05-03-102

Push Re-Input and return to Recording Screen (Comment Input).
Push ESC and return to Main Menu Screen.

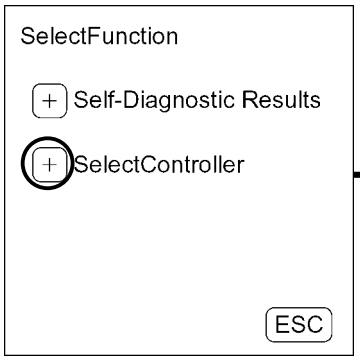


T1V7-05-03-103

SPECIAL FUNCTION

Auto Warm-Up Control: Deactivation

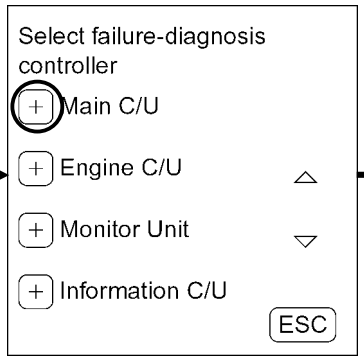
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

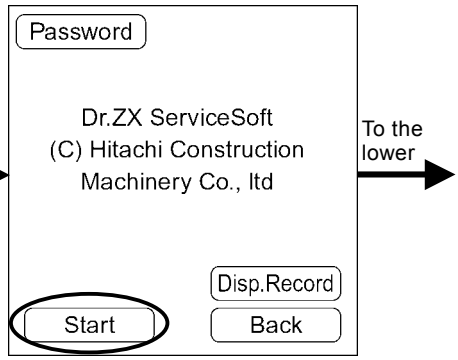
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

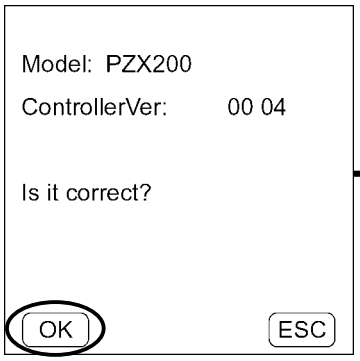
Push Start.



T1V7-05-03-011

Main Controller Screen

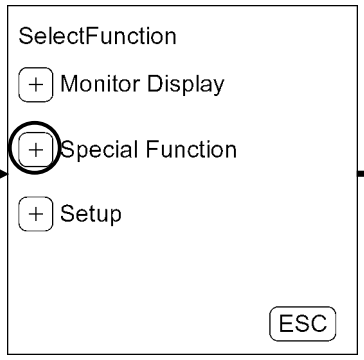
Push OK.



T1V7-05-03-010

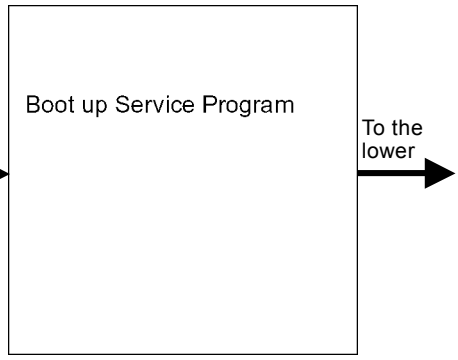
Title Screen

Push Special Function.



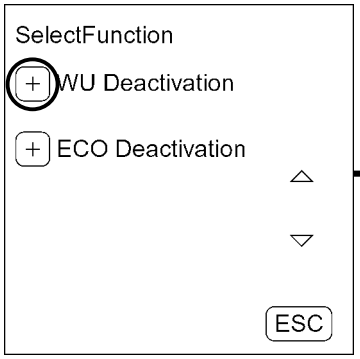
T1V7-05-03-012

Main Menu Screen



T1V7-05-03-016

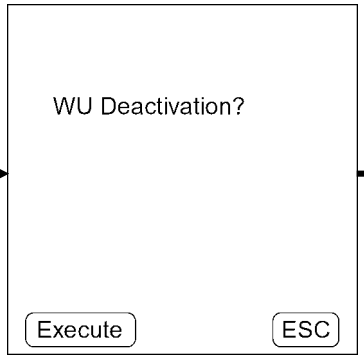
Push WU Dectivation.
Push ESC and return to Main Menu Screen.



T1V7-05-03-017

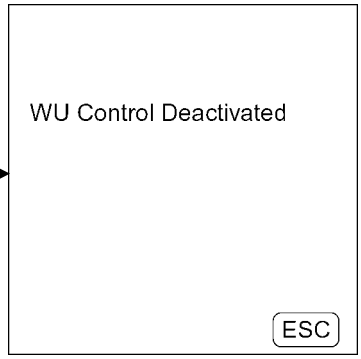
WU Deactivation/ECO Deactivation Selection Screen

Push Exec. Push ESC and return to WU Deactivation/ECO Deactivation Selection Screen.



T1V7-05-03-018

Push ESC and return to WU Deactivation/ECO Deactivation Selection Screen.

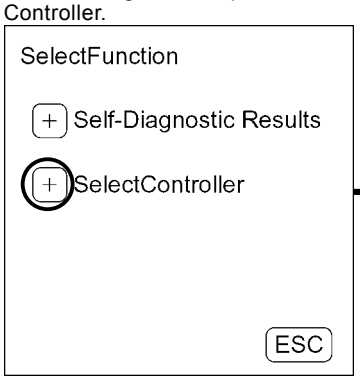


T1V7-05-03-019

NOTE: If starting again with the key switch OFF, auto warm-up control becomes activated.

ECO Control: Deactivation

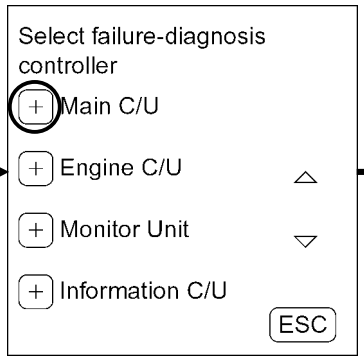
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

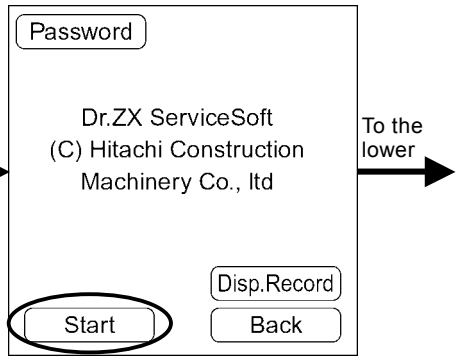
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

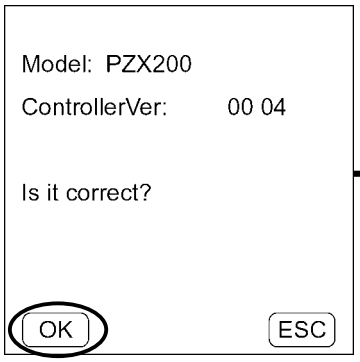
Push Start.



T1V7-05-03-011

Main Controller Screen

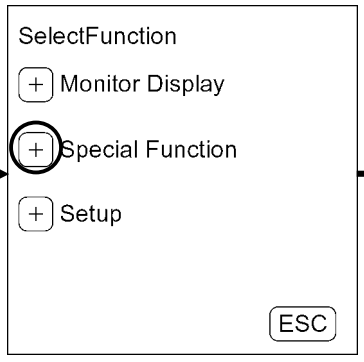
Push OK.



T1V7-05-03-010

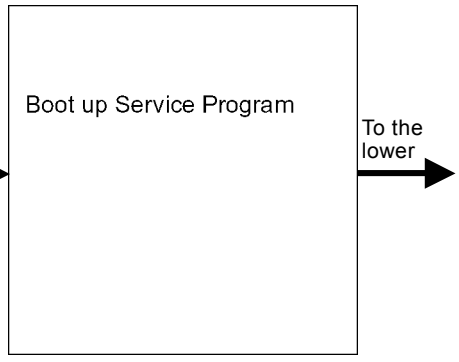
Title Screen

Push Special Function.



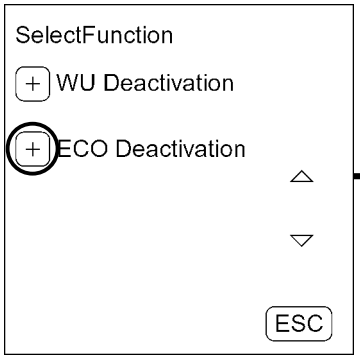
T1V7-05-03-012

Main Menu Screen



T1V7-05-03-016

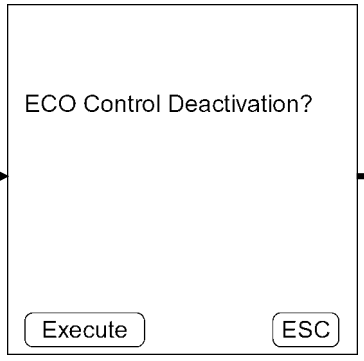
Push ECO Deactivation.
Push ESC and return to Main Menu Screen.



T1V7-05-03-017

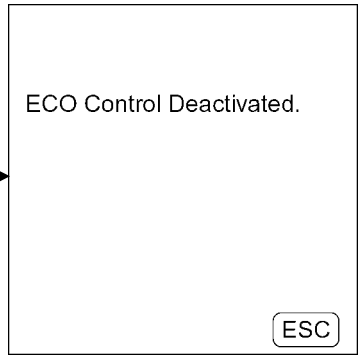
WU Deactivation/ECO Deactivation Selection Screen

Push Exec.
Push ESC and return to WU Deactivation/ECO Deactivation Selection Screen.



T1V7-05-03-020

Push ESC and return to WU Deactivation/ECO Deactivation Selection Screen.



T1V7-05-03-021

NOTE: If starting again with the key switch OFF, ECO control becomes activated.

SETTING

Engine speed, pump delivery flow rate, solenoid valve output pressure and so on can be adjusted.

Parameter Change

Item	Data	Unit
Li Speed Adjustment	Adjustment of slow idle engine speed	min^{-1}
WU Speed Adjustment	Adjustment of auto warming-up engine speed	min^{-1}
AI Speed Adjustment	Adjustment of auto-idle engine speed	min^{-1}
P Speed Adjustment	Adjustment of P mode engine speed	min^{-1}
Pump PQ Torque Adjustment	Adjustment of pump P-Q curve	N·m
Boom Dampener Proportional Valve Adjustment	Adjustment of solenoid valve	MPa
ATT Proportional Valve Adjustment	Adjustment of optional solenoid valve	MPa
ATT Speed Increase Down Waiting Time	Setting of time required for engine speed decrease	ms
ATT Torque Down ON/OFF	ON/OFF of torque down control when the attachment is operated	ON, OFF
ECO Control Selection	ON/OFF of ECO control	ON, OFF
HP Control Selection	ON/OFF of HP control	ON, OFF
ATT Mode Memory ON/OFF Selection	ON/OFF of attachment mode memory	ON, OFF
Heater Control Selection	ON/OFF of heater control	ON, OFF
Engine Control Theft Prevention Selection	ON/OFF of engine control theft prevention	ON, OFF
Pump Control Theft Prevention Selection	ON/OFF of pump control theft prevention	ON, OFF
Min, Boom CYL. Bottom Pressure Over Balance	Setting of minimum boom cylinder bottom pressure over balance	MPa

IMPORTANT: When turning the key switch to the OFF position with the ATT mode memory ON/OFF selection OFF, the selected work mode becomes ineffective and returns to the digging mode. Next time, the work mode should be selected. When turning the key switch to the OFF position with the ATT mode memory ON/OFF selection ON, the selected work mode becomes effective.

Attachment Parameter Change

Item	Data	Unit
ATT1		
ATT1 ATT Type	Attachment selection	BR PU CR VI Others Non
ATT1 ATT No.	Attachment setting number selection	1 2 3 4 5
ATT1 P1 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 1 flow rate when using attachment	L/min
ATT1 P2 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 2 flow rate when using attachment	L/min
ATT1 Engine Speed Increase/Decrease	Adjustment of engine speed when using attachment	min^{-1}
ATT1 Secondary Pilot Relief Pressure Selection	Secondary pilot relief valve ON/OFF selection	ON, OFF
ATT1 Selector Valve Selection	Selector valve ON/OFF selection	ON, OFF
ATT1 Accumulator Selection	Accumulator ON/OFF selection	ON, OFF
ATT1 2-Speed Selection	2-speed selection ON/OFF selection	ON, OFF
ATT2		
ATT2 ATT Type	Attachment selection	BR PU CR VI Others Non
ATT2 ATT No.	Attachment setting number selection	1 2 3 4 5
ATT2 P1 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 1 flow rate when using attachment	L/min
ATT2 P2 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 2 flow rate when using attachment	L/min
ATT2 Engine Speed Increase/Decrease	Adjustment of engine speed when using attachment	min^{-1}
ATT2 Secondary Pilot Relief Pressure Selection	Secondary pilot relief valve ON/OFF selection	ON, OFF
ATT2 Selector Valve Selection	Selector valve ON/OFF selection	ON, OFF
ATT2 Accumulator Selection	Accumulator ON/OFF selection	ON, OFF
ATT2 2-Speed Selection	2-speed selection ON/OFF selection	ON, OFF

NOTE: ATT: Attachment
BR: Hydraulic Breaker
PU: Secondary Crusher
CR: Primary Crusher
VI: Vibrating Hammer
Others: Other Attachments
Non: Attachment Unset

Item	Data	Unit
ATT3		
ATT3 ATT Type	Attachment selection	BR PU CR VI Others Non
ATT3 ATT No.	Attachment setting number selection	1 2 3 4 5
ATT3 P1 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 1 flow rate when using attachment	L/min
ATT3 P2 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 2 flow rate when using attachment	L/min
ATT3 Engine Speed Increase/Decrease	Adjustment of engine speed when using attachment	min^{-1}
ATT3 Secondary Pilot Relief Pressure Selection	Secondary pilot relief valve ON/OFF selection	ON, OFF
ATT3 Selector Valve Selection	Selector valve ON/OFF selection	ON, OFF
ATT3 Accumulator Selection	Accumulator ON/OFF selection	ON, OFF
ATT3 2-Speed Selection	2-speed selection ON/OFF selection	ON, OFF
ATT4		
ATT4 ATT Type	Attachment selection	BR PU CR VI Others Non
ATT4 ATT No.	Attachment setting number selection	1 2 3 4 5
ATT4 P1 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 1 flow rate when using attachment	L/min
ATT4 P2 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 2 flow rate when using attachment	L/min
ATT4 Engine Speed Increase/Decrease	Adjustment of engine speed when using attachment	min^{-1}
ATT4 Secondary Pilot Relief Pressure Selection	Secondary pilot relief valve ON/OFF selection	ON, OFF
ATT4 Selector Valve Selection	Selector valve ON/OFF selection	ON, OFF
ATT4 Accumulator Selection	Accumulator ON/OFF selection	ON, OFF
ATT4 2-Speed Selection	2-speed selection ON/OFF selection	ON, OFF

NOTE: ATT: Attachment
BR: Hydraulic Breaker
PU: Secondary Crusher
CR: Primary Crusher
VI: Vibrating Hammer
Others: Other Attachments
Non: Attachment Unset

Item	Data	Unit
ATT5		
ATT5 ATT Type	Attachment selection	BR PU CR VI Others Non
ATT5 ATT No.	Attachment setting number selection	1 2 3 4 5
ATT5 P1 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 1 flow rate when using attachment	L/min
ATT5 P2 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 2 flow rate when using attachment	L/min
ATT5 Engine Speed Increase/Decrease	Adjustment of engine speed when using attachment	min^{-1}
ATT5 Secondary Pilot Relief Pressure Selection	Secondary pilot relief valve ON/OFF selection	ON, OFF
ATT5 Selector Valve Selection	Selector valve ON/OFF selection	ON, OFF
ATT5 Accumulator Selection	Accumulator ON/OFF selection	ON, OFF
ATT5 2-Speed Selection	2-speed selection ON/OFF selection	ON, OFF

NOTE: ATT: Attachment
BR: Hydraulic Breaker
PU: Secondary Crusher
CR: Primary Crusher
VI: Vibrating Hammer
Others: Other Attachments
Non: Attachment Unset

ADJUSTMENT DATA LIST

ZX200-3 class

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
		Range		
Li Speed	10 min^{-1}	0 to 400 min^{-1}	0 min^{-1}	
WU Speed	10 min^{-1}	-450 to 200 min^{-1}	0 min^{-1}	
AI Speed	10 min^{-1}	-400 to 400 min^{-1}	0 min^{-1}	
P Speed	10 min^{-1}	-200 to 200 min^{-1}	0 min^{-1}	
Pump PQ Torque Adjustment	2.45 N·m	-60 to 60 N·m	0 N·m	
Boom Dampener Proportional Valve	0.0196 MPa	-0.9996 to 0.9996 MPa	0 MPa	
ATT Proportional Valve	0.0196 MPa	-0.9996 to 0.9996 MPa	0 MPa	
ATT Speed Increase Down Waiting Time	40 ms	0 to 3000 ms	0 ms	
Min, Boom CYL. Bottom Pressure Over Balance	0.2 MPa	-9.8 to 14.7 MPa	0 MPa	

ZX225US-3 class

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
		Range		
Li Speed	10 min^{-1}	0 to 400 min^{-1}	0 min^{-1}	
WU Speed	10 min^{-1}	-450 to 200 min^{-1}	0 min^{-1}	
AI Speed	10 min^{-1}	-400 to 400 min^{-1}	0 min^{-1}	
P Speed	10 min^{-1}	-200 to 200 min^{-1}	0 min^{-1}	
Pump PQ Torque Adjustment	2.45 N·m	-60 to 60 N·m	0 N·m	
Boom Dampener Proportional Valve	0.0196 MPa	-0.9996 to 0.9996 MPa	0 MPa	
ATT Proportional Valve	0.0196 MPa	-0.9996 to 0.9996 MPa	0 MPa	
ATT Speed Increase Down Waiting Time	40 ms	0 to 3000 ms	0 ms	
Min, Boom CYL. Bottom Pressure Over Balance	0.2 MPa	-9.8 to 14.7 MPa	0 MPa	

NOTE: 1 MPa=10.197 kgf/cm^2
1 kgf/cm^2=0.098 MPa

ZX225USR-3 class

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
		Range		
Li Speed	10 min^{-1}	0 to 400 min^{-1}	0 min^{-1}	
WU Speed	10 min^{-1}	-450 to 200 min^{-1}	0 min^{-1}	
AI Speed	10 min^{-1}	-400 to 400 min^{-1}	0 min^{-1}	
P Speed	10 min^{-1}	-200 to 200 min^{-1}	0 min^{-1}	
Pump PQ Torque Adjustment	2.45 N·m	-60 to 60 N·m	0 N·m	
Boom Dampener Proportional Valve	0.0196 MPa	-0.9996 to 0.9996 MPa	0 MPa	
ATT Proportional Valve	0.0196 MPa	-0.9996 to 0.9996 MPa	0 MPa	
ATT Speed Increase Down Waiting Time	40 ms	0 to 3000 ms	0 ms	
Min, Boom CYL. Bottom Pressure Over Balance	0.2 MPa	-9.8 to 14.7 MPa	0 MPa	

ZX240-3 class

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
		Range		
Li Speed	10 min^{-1}	0 to 400 min^{-1}	0 min^{-1}	
WU Speed	10 min^{-1}	-450 to 200 min^{-1}	0 min^{-1}	
AI Speed	10 min^{-1}	-400 to 400 min^{-1}	0 min^{-1}	
P Speed	10 min^{-1}	-200 to 100 min^{-1}	0 min^{-1}	
Pump PQ Torque Adjustment	2.45 N·m	-60 to 60 N·m	0 N·m	
Boom Dampener Proportional Valve	0.0196 MPa	-0.9996 to 0.9996 MPa	0 MPa	
ATT Proportional Valve	0.0196 MPa	-0.9996 to 0.9996 MPa	0 MPa	
ATT Speed Increase Down Waiting Time	40 ms	0 to 3000 ms	0 ms	
Min, Boom CYL. Bottom Pressure Over Balance	0.2 MPa	-9.8 to 14.7 MPa	0 MPa	

NOTE: 1 MPa=10.197 kgf/cm^2
1 kgf/cm^2=0.098 MPa

ZX270-3 class

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
		Range		
Li Speed	10 min^{-1}	0 to 400 min^{-1}	0 min^{-1}	
WU Speed	10 min^{-1}	-450 to 200 min^{-1}	0 min^{-1}	
AI Speed	10 min^{-1}	-400 to 400 min^{-1}	0 min^{-1}	
P Speed	10 min^{-1}	-200 to 100 min^{-1}	0 min^{-1}	
Pump PQ Torque Adjustment	2.45 N·m	-100 to 100 N·m	0 N·m	
Boom Dampener Proportional Valve	0.0196 MPa	-0.9996 to 0.9996 MPa	0 MPa	
ATT Proportional Valve	0.0196 MPa	-0.9996 to 0.9996 MPa	0 MPa	
ATT Speed Increase Down Waiting Time	40 ms	0 to 3000 ms	0 ms	
Min, Boom CYL. Bottom Pressure Over Balance	0.2 MPa	-9.8 to 14.7 MPa	0 MPa	

NOTE: 1 MPa=10.197 kgf/cm^2
1 kgf/cm^2=0.098 MPa

(Blank)

ATTACHMENT ADJUSTMENT DATA LIST

ZX200-3 class

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT1				
ATT1 ATT Type/No.	-	0 to 5	Breaker 1	
ATT1 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT1 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT1 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	0 min^{-1}	
ATT1 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT1 Selector Valve Selection	-	C/V or O/T	O/T	
ATT1 Accumulator Selection	-	ON/OFF	OFF	
ATT1 2-Speed Selection	-	ON/OFF	OFF	
ATT2				
ATT2 ATT Type/No.	-	0 to 5	Breaker 2	
ATT2 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT2 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT2 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	0 min^{-1}	
ATT2 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT2 Selector Valve Selection	-	C/V or O/T	O/T	
ATT2 Accumulator Selection	-	ON/OFF	ON	
ATT2 2-Speed Selection	-	ON/OFF	OFF	
ATT3				
ATT3 ATT Type/No.	-	0 to 5	Secondary Crusher 1	
ATT3 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT3 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT3 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	200 min^{-1}	
ATT3 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT3 Selector Valve Selection	-	C/V or O/T	C/V	
ATT3 Accumulator Selection	-	ON/OFF	OFF	
ATT3 2-Speed Selection	-	ON/OFF	ON	

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT4				
ATT4 ATT Type/No.	-	0 to 5	Primary Crusher 1	
ATT4 P1 Max Swash Angl4 Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT4 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT4 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	200 min^{-1}	
ATT4 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT4 Selector Valve Selection	-	C/V or O/T	C/V	
ATT4 Accumulator Selection	-	ON/OFF	OFF	
ATT4 2-Speed Selection	-	ON/OFF	ON	
ATT5				
ATT5 ATT Type/No.	-	0 to 5	Unregistration	
ATT5 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT5 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT5 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	0 min^{-1}	
ATT5 Secondary Pilot Relief Pressure Selection	-	ON/OFF	Unregistration	
ATT5 Selector Valve Selection	-	C/V or O/T	Unregistration	
ATT5 Accumulator Selection	-	ON/OFF	Unregistration	
ATT5 2-Speed Selection	-	ON/OFF	Unregistration	

NOTE: 1 MPa=10.197 kgf/cm^2
1 kgf/cm^2=0.098 MPa

NOTE: ATT: Attachment *BK: Digging*
BR: Hydraulic Breaker *PU: Secondary Crusher*
CR: Primary Crusher *C/V: Control Valve*
VI: Vibrating Hammer *O/T: Hydraulic Oil Tank*

ZX225US-3 class

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT1				
ATT1 ATT Type/No.	-	0 to 5	Breaker 1	
ATT1 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT1 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT1 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	0 min^{-1}	
ATT1 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT1 Selector Valve Selection	-	C/V or O/T	O/T	
ATT1 Accumulator Selection	-	ON/OFF	OFF	
ATT1 2-Speed Selection	-	ON/OFF	OFF	
ATT2				
ATT2 ATT Type/No.	-	0 to 5	Breaker 2	
ATT2 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT2 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT2 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	0 min^{-1}	
ATT2 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT2 Selector Valve Selection	-	C/V or O/T	O/T	
ATT2 Accumulator Selection	-	ON/OFF	ON	
ATT2 2-Speed Selection	-	ON/OFF	OFF	
ATT3				
ATT3 ATT Type/No.	-	0 to 5	Secondary Crusher 1	
ATT3 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT3 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT3 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	200 min^{-1}	
ATT3 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT3 Selector Valve Selection	-	C/V or O/T	C/V	
ATT3 Accumulator Selection	-	ON/OFF	OFF	
ATT3 2-Speed Selection	-	ON/OFF	ON	

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT4				
ATT4 ATT Type/No.	-	0 to 5	Primary Crusher 1	
ATT4 P1 Max Swash Angl4 Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT4 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT4 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	200 min^{-1}	
ATT4 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT4 Selector Valve Selection	-	C/V or O/T	C/V	
ATT4 Accumulator Selection	-	ON/OFF	OFF	
ATT4 2-Speed Selection	-	ON/OFF	ON	
ATT5				
ATT5 ATT Type/No.	-	0 to 5	Unregistration	
ATT5 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT5 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT5 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	0 min^{-1}	
ATT5 Secondary Pilot Relief Pressure Selection	-	ON/OFF	Unregistration	
ATT5 Selector Valve Selection	-	C/V or O/T	Unregistration	
ATT5 Accumulator Selection	-	ON/OFF	Unregistration	
ATT5 2-Speed Selection	-	ON/OFF	Unregistration	

NOTE: 1 MPa=10.197 kgf/cm^2
1 kgf/cm^2=0.098 MPa

NOTE: ATT: Attachment *BK: Digging*
BR: Hydraulic Breaker *PU: Secondary Crusher*
CR: Primary Crusher *C/V: Control Valve*
VI: Vibrating Hammer *O/T: Hydraulic Oil Tank*

ZX225USR-3 class

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT1				
ATT1 ATT Type/No.	-	0 to 5	Breaker 1	
ATT1 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT1 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT1 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	0 min^{-1}	
ATT1 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT1 Selector Valve Selection	-	C/V or O/T	O/T	
ATT1 Accumulator Selection	-	ON/OFF	OFF	
ATT1 2-Speed Selection	-	ON/OFF	OFF	
ATT2				
ATT2 ATT Type/No.	-	0 to 5	Breaker 2	
ATT2 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT2 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT2 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	0 min^{-1}	
ATT2 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT2 Selector Valve Selection	-	C/V or O/T	O/T	
ATT2 Accumulator Selection	-	ON/OFF	ON	
ATT2 2-Speed Selection	-	ON/OFF	OFF	
ATT3				
ATT3 ATT Type/No.	-	0 to 5	Secondary Crusher 1	
ATT3 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT3 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT3 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	200 min^{-1}	
ATT3 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT3 Selector Valve Selection	-	C/V or O/T	C/V	
ATT3 Accumulator Selection	-	ON/OFF	OFF	
ATT3 2-Speed Selection	-	ON/OFF	ON	

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT4				
ATT4 ATT Type/No.	-	0 to 5	Primary Crusher 1	
ATT4 P1 Max Swash Angl4 Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT4 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT4 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	200 min^{-1}	
ATT4 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT4 Selector Valve Selection	-	C/V or O/T	C/V	
ATT4 Accumulator Selection	-	ON/OFF	OFF	
ATT4 2-Speed Selection	-	ON/OFF	ON	
ATT5				
ATT5 ATT Type/No.	-	0 to 5	Unregistration	
ATT5 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT5 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212 L/min	212 L/min	
ATT5 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	0 min^{-1}	
ATT5 Secondary Pilot Relief Pressure Selection	-	ON/OFF	Unregistration	
ATT5 Selector Valve Selection	-	C/V or O/T	Unregistration	
ATT5 Accumulator Selection	-	ON/OFF	Unregistration	
ATT5 2-Speed Selection	-	ON/OFF	Unregistration	

NOTE: 1 MPa=10.197 kgf/cm^2
1 kgf/cm^2=0.098 MPa

NOTE: ATT: Attachment *BK: Digging*
BR: Hydraulic Breaker *PU: Secondary Crusher*
CR: Primary Crusher *C/V: Control Valve*
VI: Vibrating Hammer *O/T: Hydraulic Oil Tank*

ZX240-3 class

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT1				
ATT1 ATT Type/No.	-	0 to 5	Breaker 1	
ATT1 P1 Max Swash Angle Adjustment	0.5 L/min	112 to 224 L/min	224 L/min	
ATT1 P2 Max Swash Angle Adjustment	0.5 L/min	112 to 224 L/min	224 L/min	
ATT1 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 100 min^{-1}	0 min^{-1}	
ATT1 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT1 Selector Valve Selection	-	C/V or O/T	O/T	
ATT1 Accumulator Selection	-	ON/OFF	OFF	
ATT1 2-Speed Selection	-	ON/OFF	OFF	
ATT2				
ATT2 ATT Type/No.	-	0 to 5	Breaker 2	
ATT2 P1 Max Swash Angle Adjustment	0.5 L/min	112 to 224 L/min	224 L/min	
ATT2 P2 Max Swash Angle Adjustment	0.5 L/min	112 to 224 L/min	224/min	
ATT2 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 200 min^{-1}	0 min^{-1}	
ATT2 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT2 Selector Valve Selection	-	C/V or O/T	O/T	
ATT2 Accumulator Selection	-	ON/OFF	ON	
ATT2 2-Speed Selection	-	ON/OFF	OFF	
ATT3				
ATT3 ATT Type/No.	-	0 to 5	Secondary Crusher 1	
ATT3 P1 Max Swash Angle Adjustment	0.5 L/min	112 to 224 L/min	224 L/min	
ATT3 P2 Max Swash Angle Adjustment	0.5 L/min	112 to 224 L/min	224 L/min	
ATT3 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 100 min^{-1}	100 min^{-1}	
ATT3 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT3 Selector Valve Selection	-	C/V or O/T	C/V	
ATT3 Accumulator Selection	-	ON/OFF	OFF	
ATT3 2-Speed Selection	-	ON/OFF	ON	

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT4				
ATT4 ATT Type/No.	-	0 to 5	Primary Crusher 1	
ATT4 P1 Max Swash Angl4 Adjustment	0.5 L/min	112 to 224 L/min	224 L/min	
ATT4 P2 Max Swash Angle Adjustment	0.5 L/min	112 to 224 L/min	224 L/min	
ATT4 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 100 min^{-1}	100 min^{-1}	
ATT4 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT4 Selector Valve Selection	-	C/V or O/T	C/V	
ATT4 Accumulator Selection	-	ON/OFF	OFF	
ATT4 2-Speed Selection	-	ON/OFF	ON	
ATT5				
ATT5 ATT Type/No.	-	0 to 5	Unregistration	
ATT5 P1 Max Swash Angle Adjustment	0.5 L/min	112 to 224 L/min	224 L/min	
ATT5 P2 Max Swash Angle Adjustment	0.5 L/min	112 to 224 L/min	224 L/min	
ATT5 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 100 min^{-1}	0 min^{-1}	
ATT5 Secondary Pilot Relief Pressure Selection	-	ON/OFF	Unregistration	
ATT5 Selector Valve Selection	-	C/V or O/T	Unregistration	
ATT5 Accumulator Selection	-	ON/OFF	Unregistration	
ATT5 2-Speed Selection	-	ON/OFF	Unregistration	

NOTE: 1 MPa=10.197 kgf/cm^2
1 kgf/cm^2=0.098 MPa

NOTE: ATT: Attachment *BK: Digging*
BR: Hydraulic Breaker *PU: Secondary Crusher*
CR: Primary Crusher *C/V: Control Valve*
VI: Vibrating Hammer *O/T: Hydraulic Oil Tank*

ZX270-3 class

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT1				
ATT1 ATT Type/No.	-	0 to 5	Breaker 1	
ATT1 P1 Max Swash Angle Adjustment	0.5 L/min	118 to 236 L/min	236 L/min	
ATT1 P2 Max Swash Angle Adjustment	0.5 L/min	118 to 236 L/min	236 L/min	
ATT1 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 100 min^{-1}	0 min^{-1}	
ATT1 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT1 Selector Valve Selection	-	C/V or O/T	O/T	
ATT1 Accumulator Selection	-	ON/OFF	OFF	
ATT1 2-Speed Selection	-	ON/OFF	OFF	
ATT2				
ATT2 ATT Type/No.	-	0 to 5	Breaker 2	
ATT2 P1 Max Swash Angle Adjustment	0.5 L/min	118 to 236 L/min	236 L/min	
ATT2 P2 Max Swash Angle Adjustment	0.5 L/min	118 to 236 L/min	236 L/min	
ATT2 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 100 min^{-1}	0 min^{-1}	
ATT2 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT2 Selector Valve Selection	-	C/V or O/T	O/T	
ATT2 Accumulator Selection	-	ON/OFF	ON	
ATT2 2-Speed Selection	-	ON/OFF	OFF	
ATT3				
ATT3 ATT Type/No.	-	0 to 5	Secondary Crusher 1	
ATT3 P1 Max Swash Angle Adjustment	0.5 L/min	118 to 236 L/min	236 L/min	
ATT3 P2 Max Swash Angle Adjustment	0.5 L/min	118 to 236 L/min	236 L/min	
ATT3 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 100 min^{-1}	100 min^{-1}	
ATT3 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT3 Selector Valve Selection	-	C/V or O/T	C/V	
ATT3 Accumulator Selection	-	ON/OFF	OFF	
ATT3 2-Speed Selection	-	ON/OFF	ON	

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT4				
ATT4 ATT Type/No.	-	0 to 5	Primary Crusher 1	
ATT4 P1 Max Swash Angl4 Adjustment	0.5 L/min	118 to 236 L/min	236 L/min	
ATT4 P2 Max Swash Angle Adjustment	0.5 L/min	118 to 236 L/min	236 L/min	
ATT4 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 100 min^{-1}	100 min^{-1}	
ATT4 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT4 Selector Valve Selection	-	C/V or O/T	C/V	
ATT4 Accumulator Selection	-	ON/OFF	OFF	
ATT4 2-Speed Selection	-	ON/OFF	ON	
ATT5				
ATT5 ATT Type/No.	-	0 to 5	Unregistration	
ATT5 P1 Max Swash Angle Adjustment	0.5 L/min	118 to 236 L/min	236 L/min	
ATT5 P2 Max Swash Angle Adjustment	0.5 L/min	118 to 236 L/min	236 L/min	
ATT5 Engine Speed Increase/Decrease	10 min^{-1}	-500 to 100 min^{-1}	0 min^{-1}	
ATT5 Secondary Pilot Relief Pressure Selection	-	ON/OFF	Unregistration	
ATT5 Selector Valve Selection	-	C/V or O/T	Unregistration	
ATT5 Accumulator Selection	-	ON/OFF	Unregistration	
ATT5 2-Speed Selection	-	ON/OFF	Unregistration	

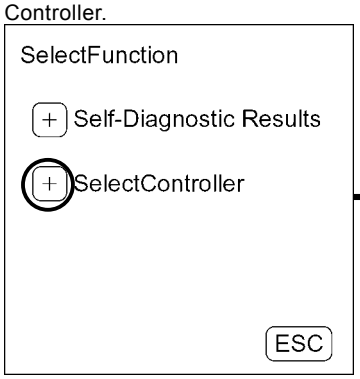
NOTE: 1 MPa=10.197 kgf/cm^2
1 kgf/cm^2=0.098 MPa

NOTE: ATT: Attachment *BK: Digging*
BR: Hydraulic Breaker *PU: Secondary Crusher*
CR: Primary Crusher *C/V: Control Valve*
VI: Vibrating Hammer *O/T: Hydraulic Oil Tank*

Setting

- Parameter Change

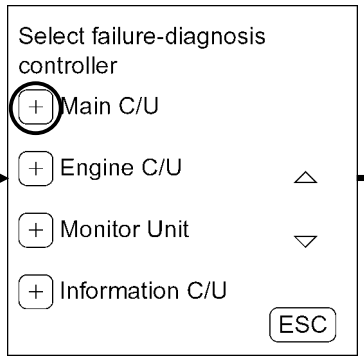
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

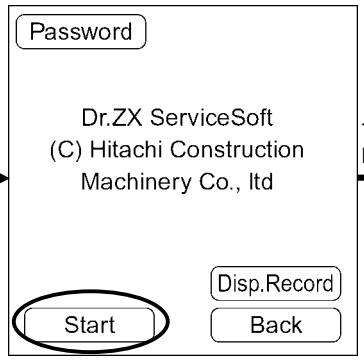
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

Push Start.

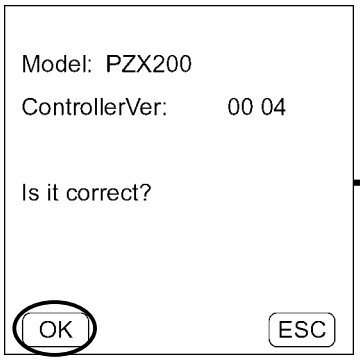


To the lower

T1V7-05-03-011

Main Controller Screen

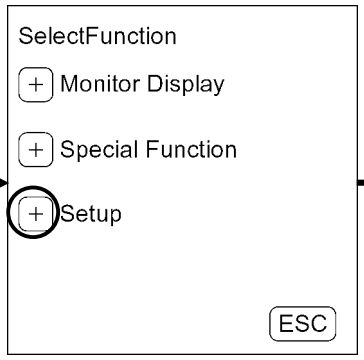
Push OK.



T1V7-05-03-010

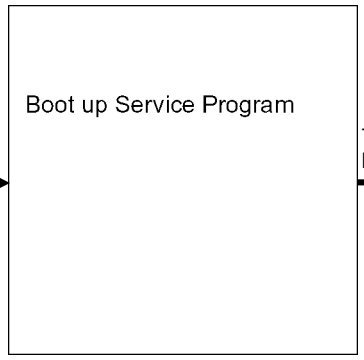
Title Screen

Push Setup.



T1V7-05-03-012

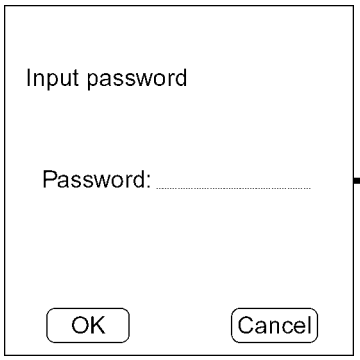
Main Menu Screen



To the lower

T1V7-05-03-016

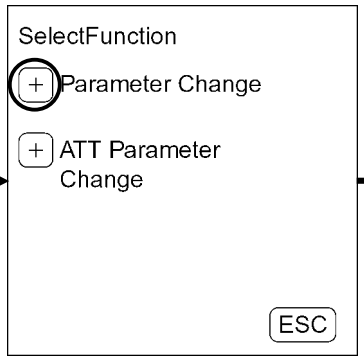
Input the password and push OK. Push Cancel and return to Main Menu Screen.



T1V7-05-03-022

Setup Password Input Screen

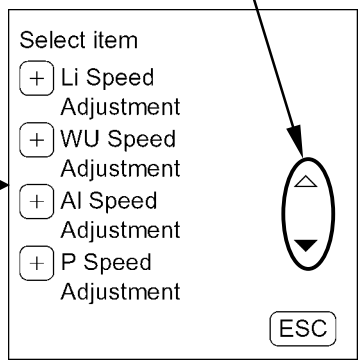
Push Parameter Change. Push ESC and return to Main Menu Screen.



T1V7-05-03-206

Setup Item Selection Screen

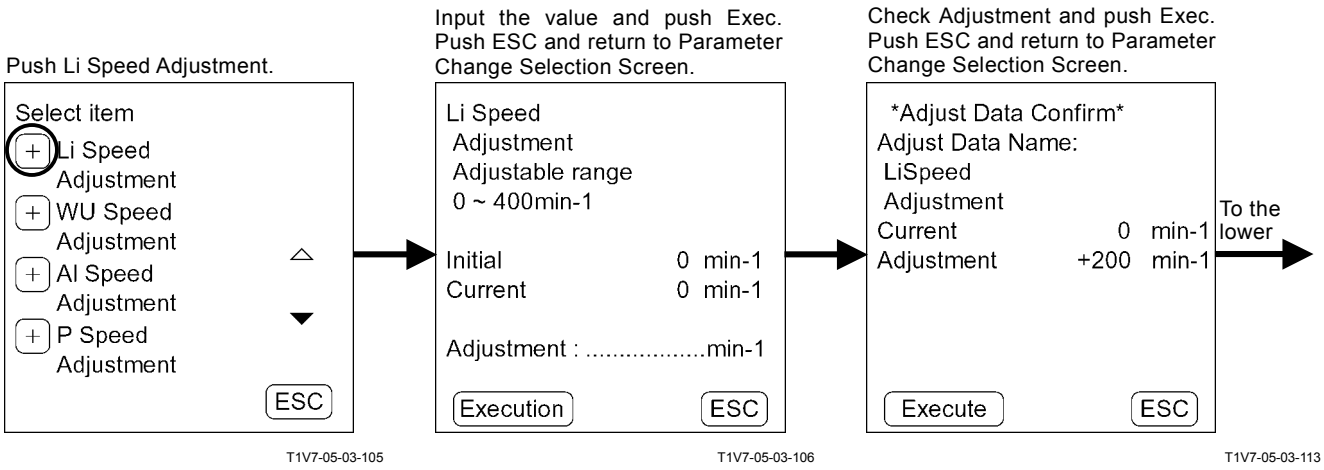
Refer to T5-3-16 as for the item of Parameter Change.Display the forward and backward item by pushing these marks.

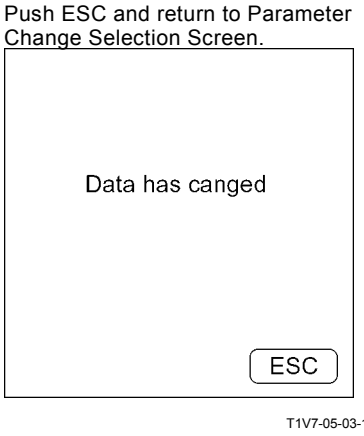


T1V7-05-03-105

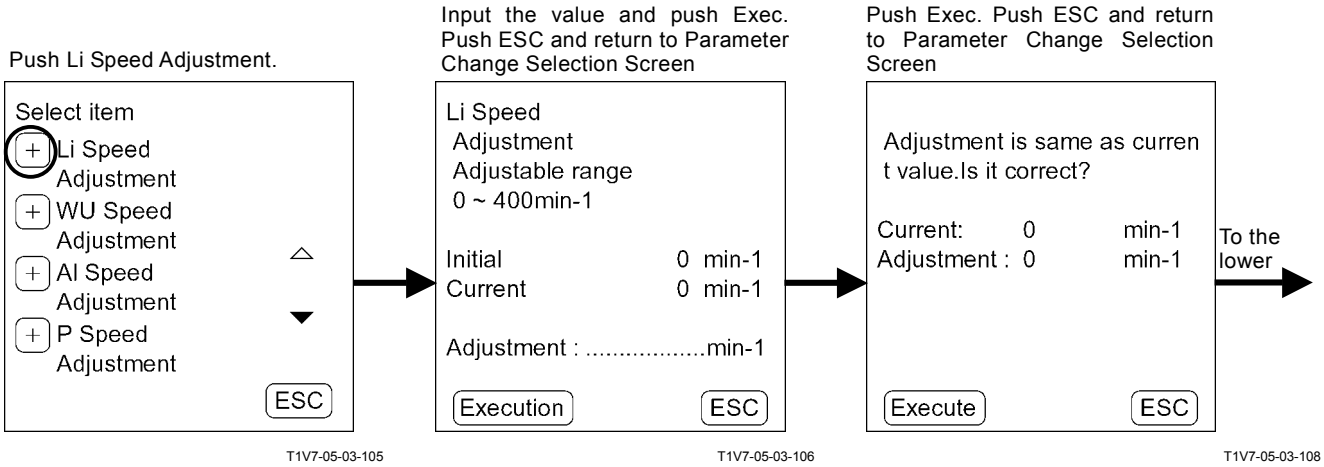
Parameter Change Selection Screen

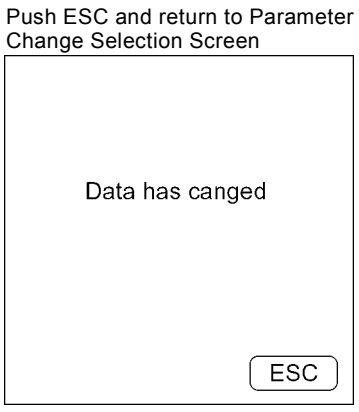
Parameter Input
Example: Li Speed Adjustment
Input Value = Normal Value





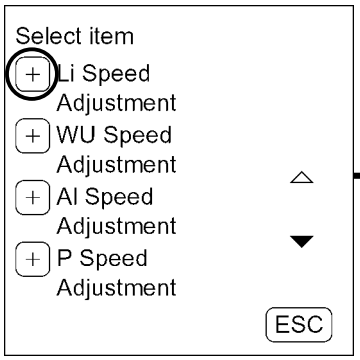
Input Value = Current Value





Input Value > Maximum Value
(Input Value < Minimum Value)

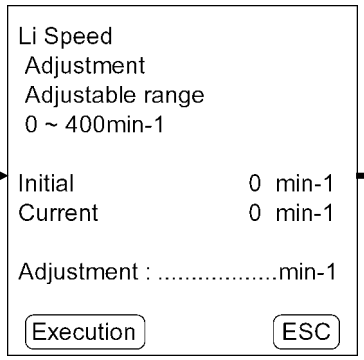
Push Li Speed Adjustment.



T1V7-05-03-105

Parameter Change Selection Screen

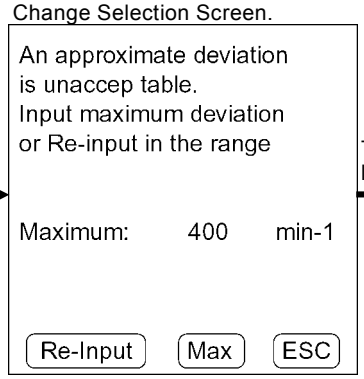
Input the value and push Exec. Push ESC and return to Parameter Change Selection Screen.



T1V7-05-03-106

Parameter Input Screen

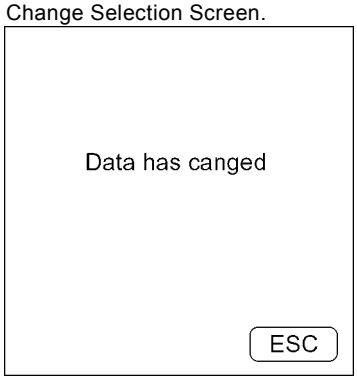
Push Re-Input and return to Parameter Input Screen. Push Max and the maximum value is input. Push ESC and return to Parameter Change Selection Screen.



T1V7-05-03-109

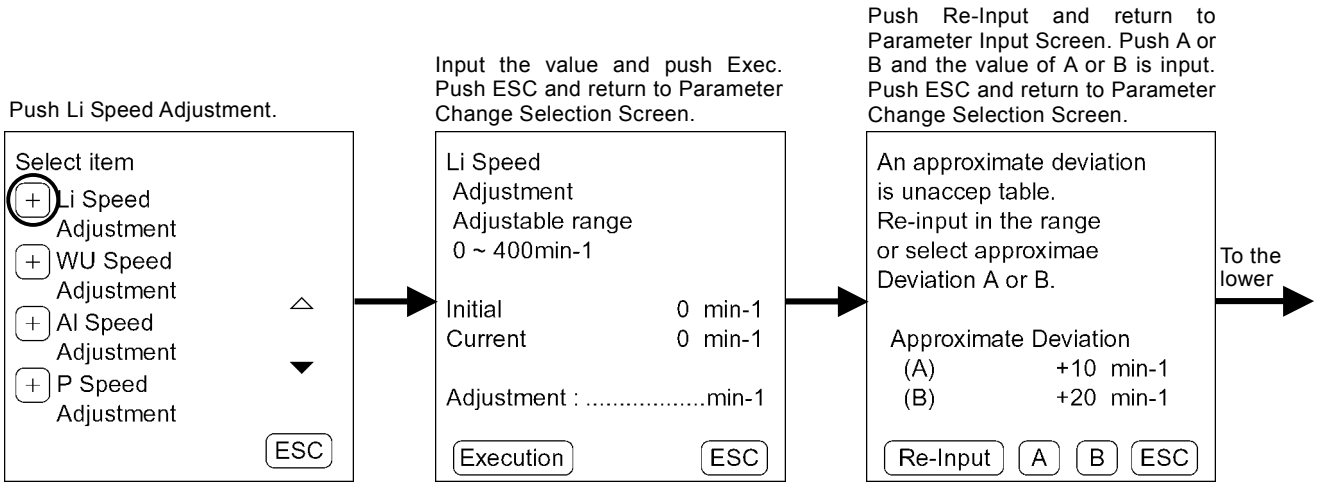
To the lower

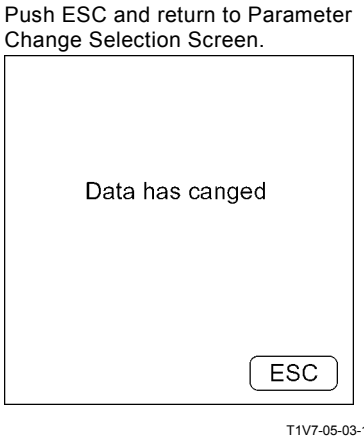
Push ESC and return to Parameter Change Selection Screen.



T1V7-05-03-107

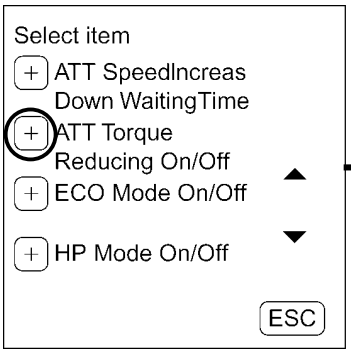
When the input value cannot be divided





Status Selection
Example: ATT Torque Reducing On/Off: Off

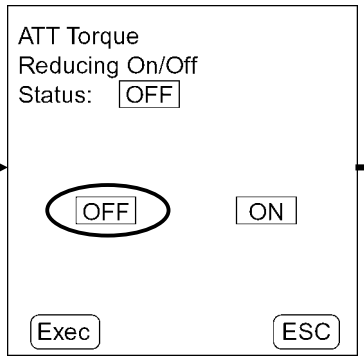
Push ATT Torque Reducing On/Off.



T1V7-05-03-179

Parameter Change Selection Screen

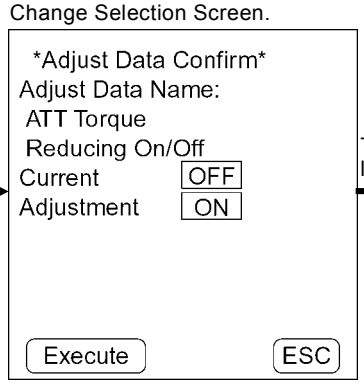
Push OFF and Push Exec. Push ESC and return to Parameter Change Selection Screen.



T1V7-05-03-111

Status Selection Screen

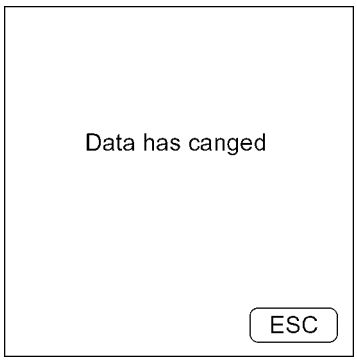
Check OFF and push Exec. Push ESC and return to Parameter Change Selection Screen.



To the lower

T1V7-05-03-112

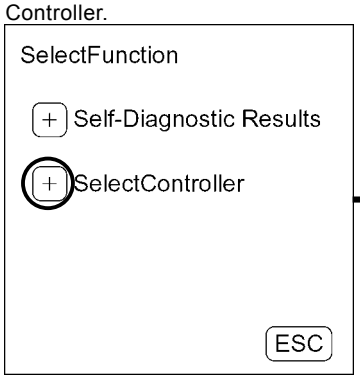
Push ESC and return to Parameter Change Selection Screen.



T1V7-05-03-107

- Attachment Parameter Change

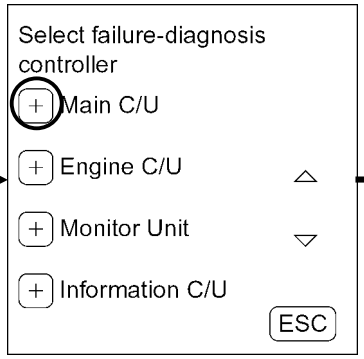
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

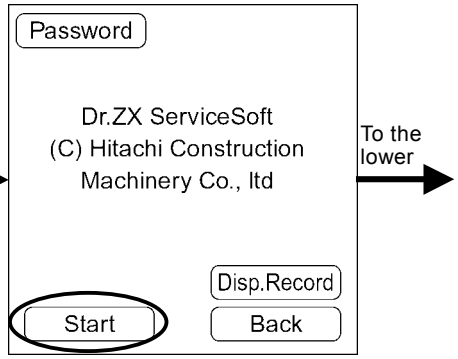
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

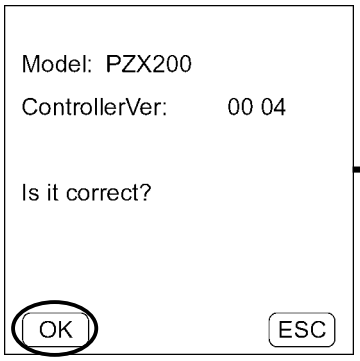
Push Start.



T1V7-05-03-011

Main Controller Screen

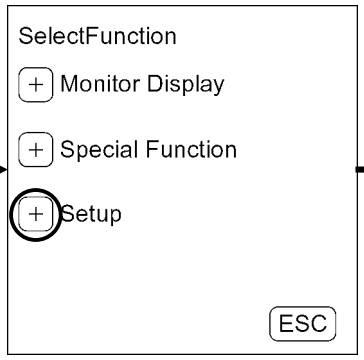
Push OK.



T1V7-05-03-010

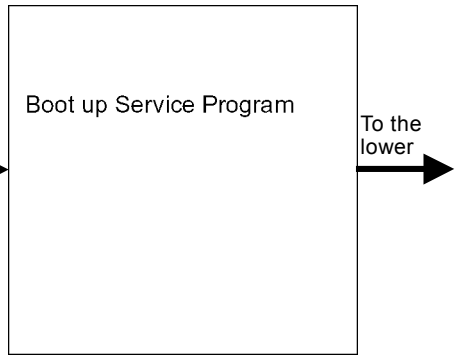
Title Screen

Push Setup.



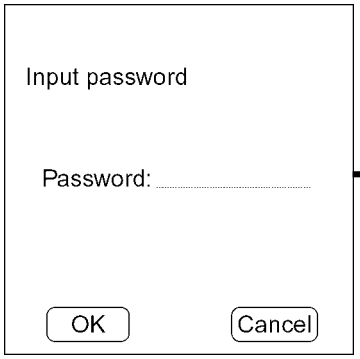
T1V7-05-03-012

Main Menu Screen



T1V7-05-03-016

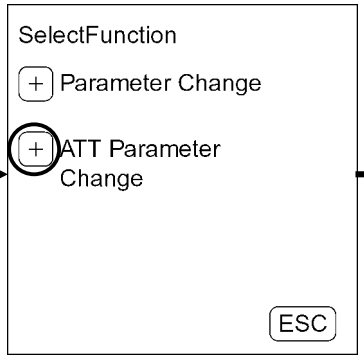
Input the password and push OK. Push ESC and return to Main Menu Screen.



T1V7-05-03-022

Setup Password Input Screen

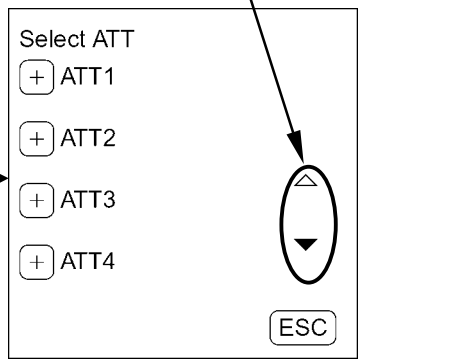
Push ATT Parameter Change. Push ESC and return to Main Menu Screen.



T1V7-05-03-206

Setup Item Selection Screen

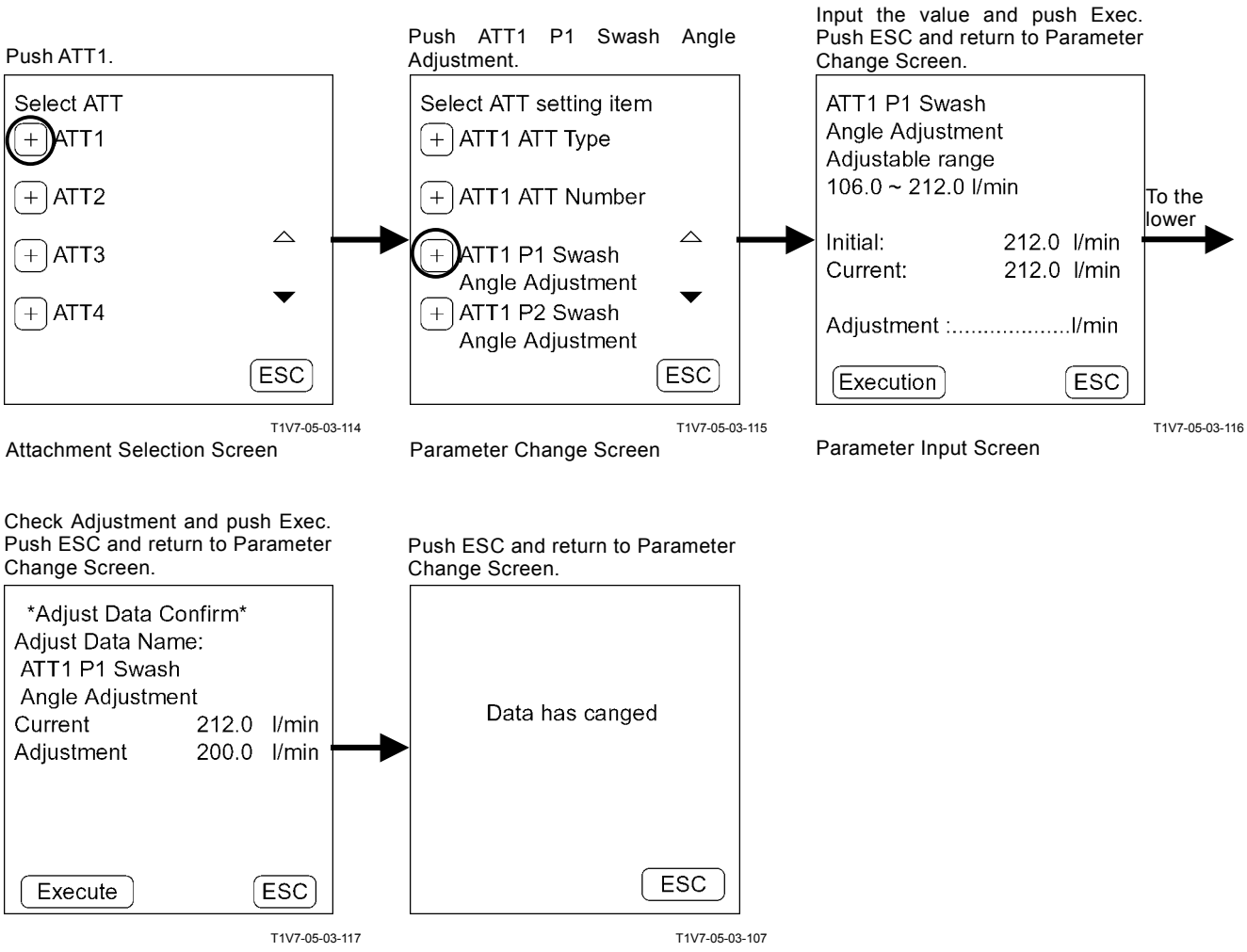
Refer to T5-3-17 as for the item of ATT Parameter Change. Display the forward and backward item by pushing these marks.



T1V7-05-03-114

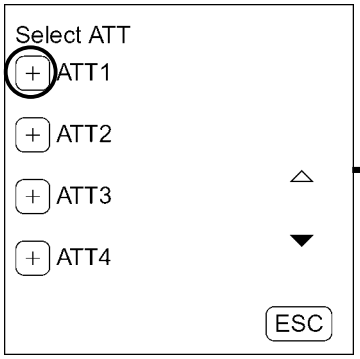
Attachment Selection Screen

Attachment Parameter Input
Input Value = Normal Value



Input Value = Current Value

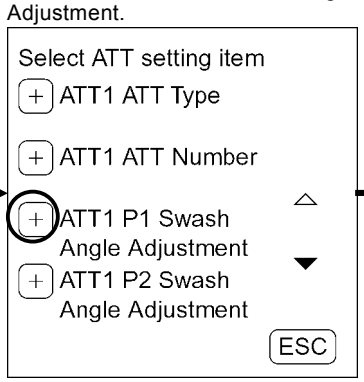
Push ATT1.



T1V7-05-03-114

Attachment Selection Screen

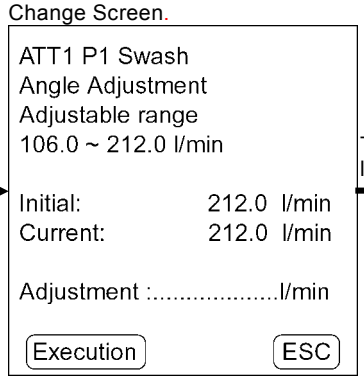
Push ATT1 P1 Swash Angle Adjustment.



T1V7-05-03-115

Parameter Change Screen

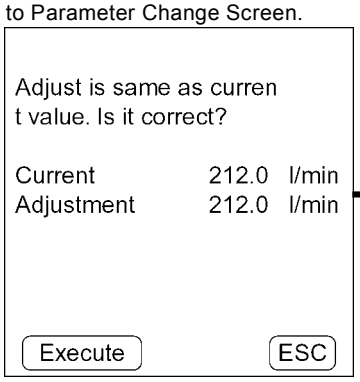
Input the value and push Exec. Push ESC and return to Parameter Change Screen.



T1V7-05-03-116

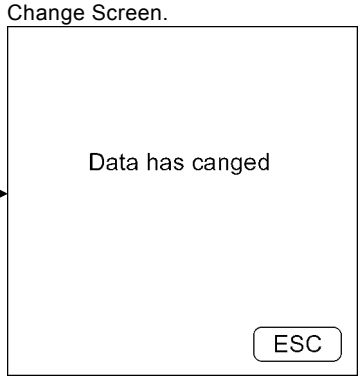
Parameter Input Screen

Push Exec. Push ESC and return to Parameter Change Screen.



T1V7-05-03-118

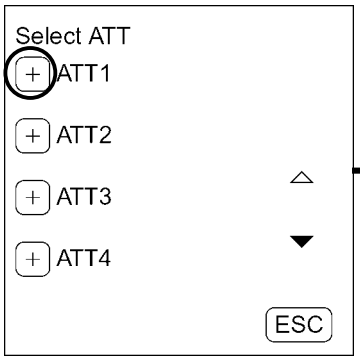
Push ESC and return to Parameter Change Screen.



T1V7-05-03-107

Input Value > Maximum Value
(Input Value < Minimum Value)

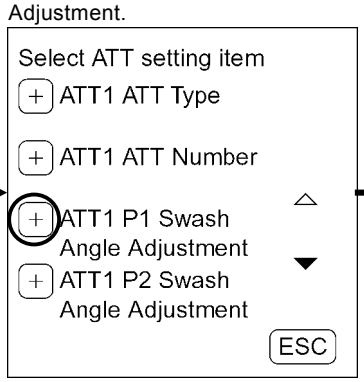
Push ATT1.



T1V7-05-03-114

Attachment Selection Screen

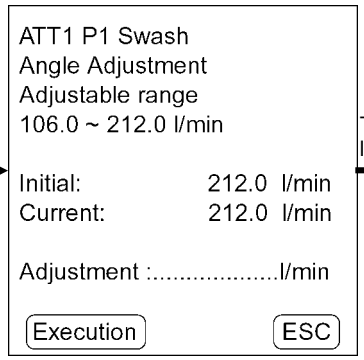
Push ATT1 P1 Swash Angle Adjustment.



T1V7-05-03-115

Parameter Change Screen

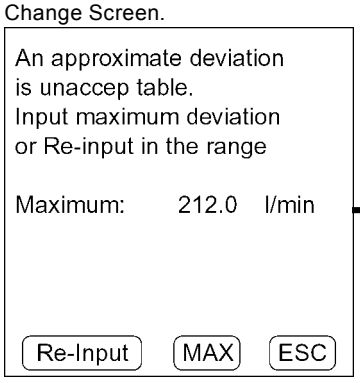
Input the value and push Exec. Push ESC and return to Parameter Change Screen.



T1V7-05-03-116

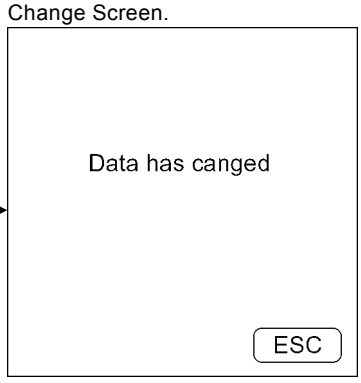
Parameter Input Screen

Push Re-Input and return to Parameter Input Screen. Push Max and the maximum value is input. Push ESC and return to Parameter Change Screen.



T1V7-05-03-119

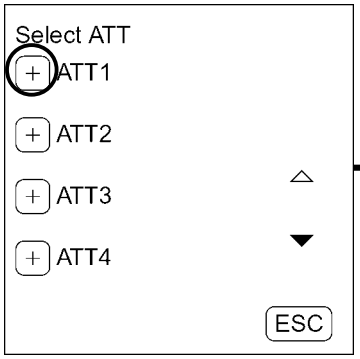
Push ESC and return to Parameter Change Screen.



T1V7-05-03-107

When the input value cannot be divided

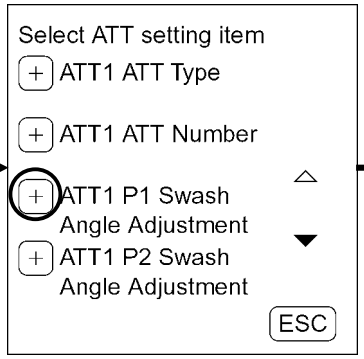
Push ATT1.



T1V7-05-03-114

Attachment Selection Screen

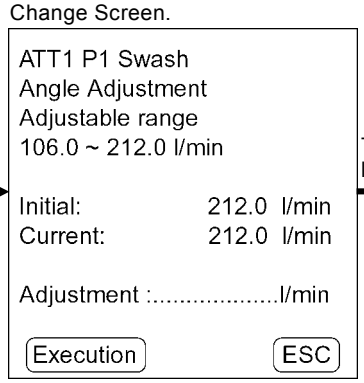
Push ATT1 P1 Swash Angle Adjustment.



T1V7-05-03-115

Parameter Change Screen

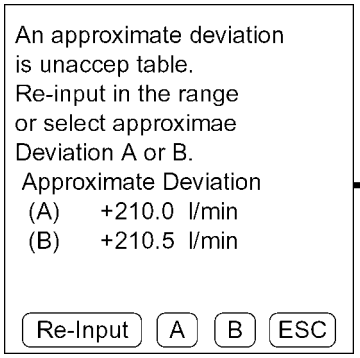
Input the value and push Exec. Push ESC and return to Parameter Change Screen.



T1V7-05-03-116

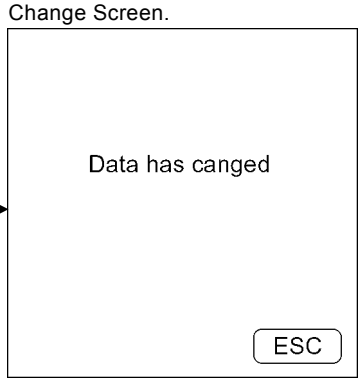
Parameter Input Screen

Push Re-Input and return to Parameter Input Screen. Push A or B and the value of A or B is input. Push ESC and return to Parameter Change Screen.



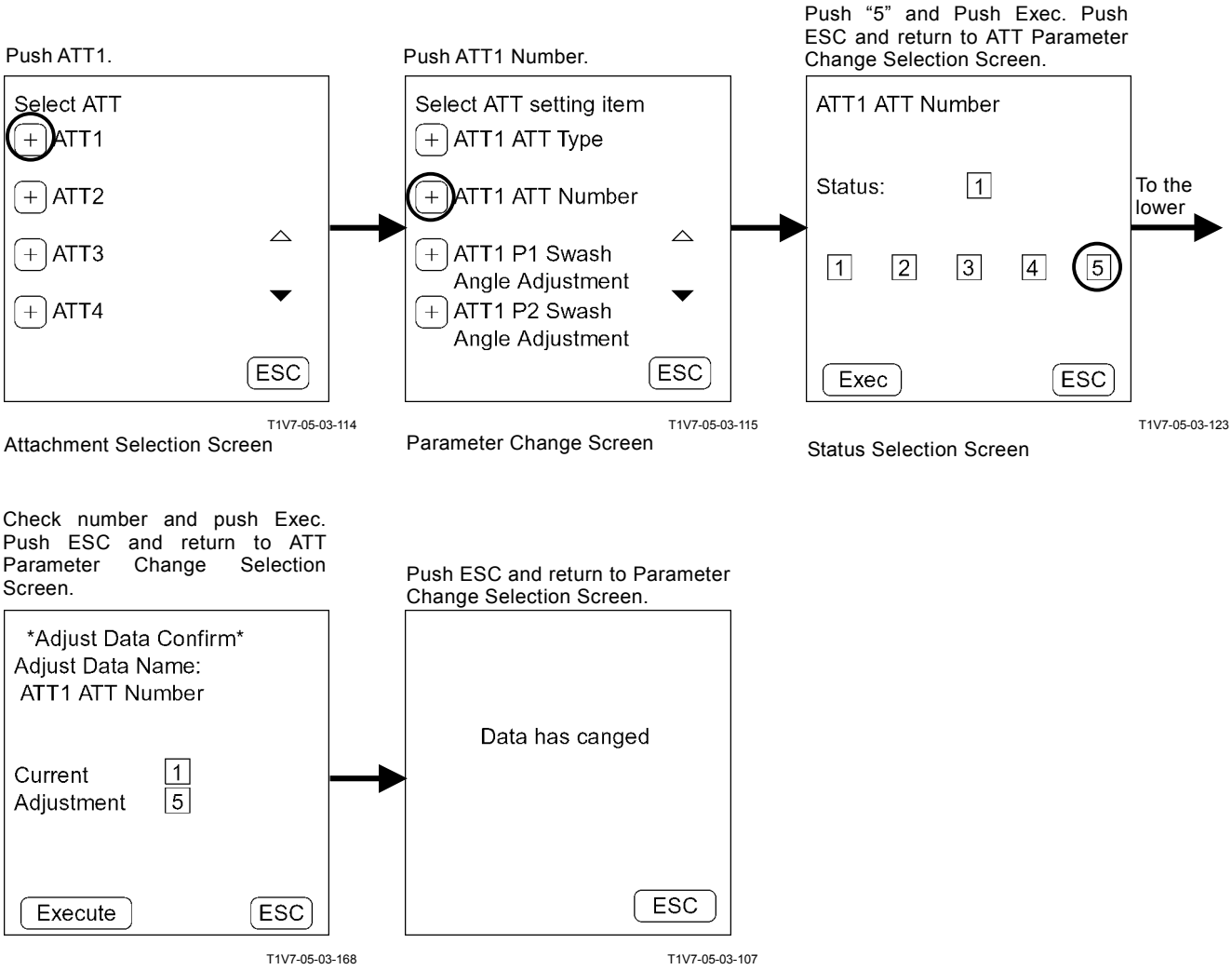
T1V7-05-03-120

Push ESC and return to Parameter Change Screen.



T1V7-05-03-107

Status Selection
Example: ATT1, ATT No.



ATTACHMENT SETTING

When the attachment is set by Dr. ZX, the attachment specification screen can be selected and displayed on the work mode screen of monitor unit.
(Push key 2 and select Breaker 1 in this group.)

NOTE: Refer to the monitor unit group as for the display on work mode screen of monitor unit.

When pushing key 6 and displaying the primary screen, the attachment mode which is selected on display the work mode is displayed.

Work Mode Display
Attachment Mode
Breaker

T1V1-05-01-104

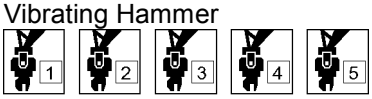
Pulverizer

T1V1-05-01-105

Crusher

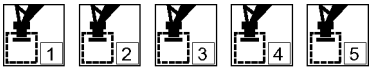
T1V1-05-01-106

Vibrating Hammer



T1V1-05-01-107

Others

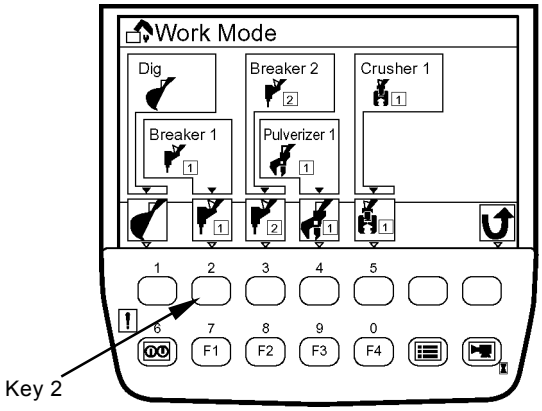


T1V1-05-02-003

NOTE: The items on monitor unit and HITACHI pattern are same.

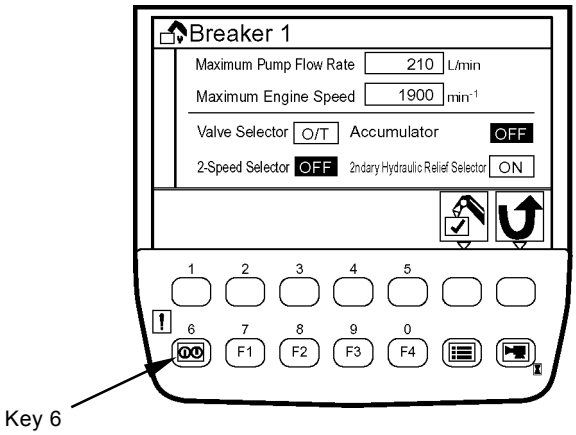
Monitor Unit	HITACHI pattern
Breaker1	Hydraulic Breaker1
Breaker2	Hydraulic Breaker2
Pulverizer1	Secondary Crusher1
Crusher1	Primary Crusher1

Monitor Unit



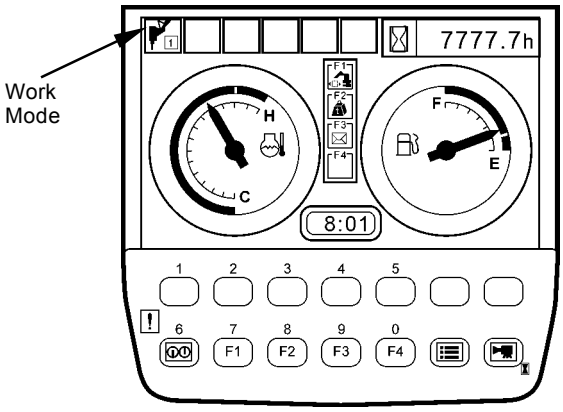
T1V5-05-01-109

Work Mode Screen



T1V5-05-01-001

Attachment Specification Screen (Breaker 1)

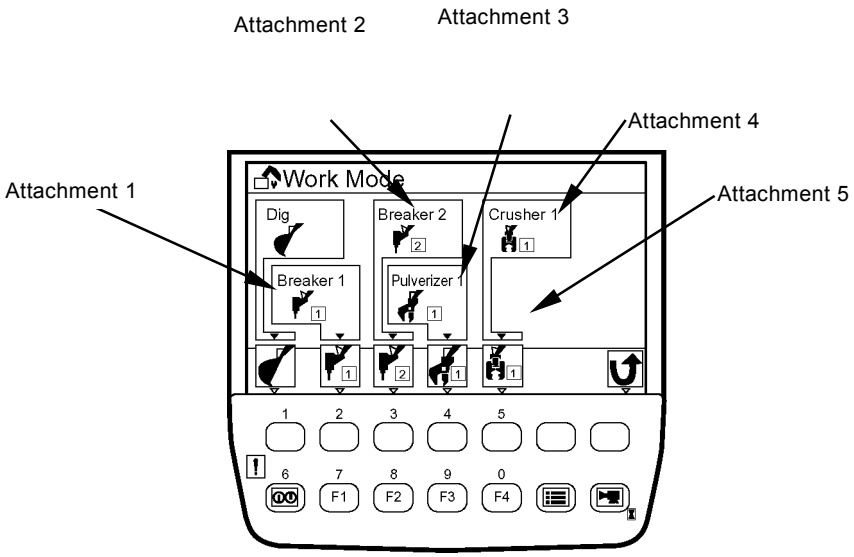


T1V1-05-03-006

Primary Screen

Five kinds attachment can be selected from Breaker 1 to 5, pulverizer 1 to 5, crusher 1 to 5, vibrating hammer 1 to 5 and others 1 to 5.
(Refer to T5-3-17 to 19.)

NOTE: Attachment setting at the time of shipping from the factory
Attachment 1: Breaker 1
Attachment 2: Breaker 2
Attachment 3: Pulverizer 1
Attachment 4: Crusher 1
Attachment 5: Non-setting

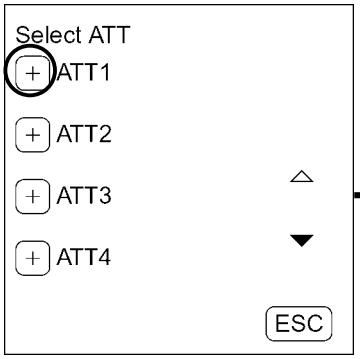


T1V5-05-01-109

Attachment Setting

Example: Set Pulverizer 5 to Attachment 1

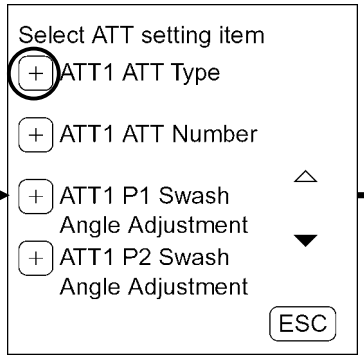
Push ATT 1.



T1V7-05-03-114

Attachment Selection Screen

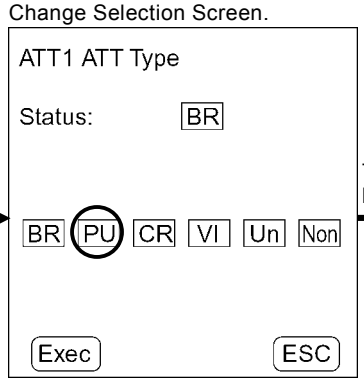
Push ATT1 ATT Type.



T1V7-05-03-115

ATT Parameter Change Screen

Push PU and push Exec. Push ESC and return to ATT Parameter Change Selection Screen.

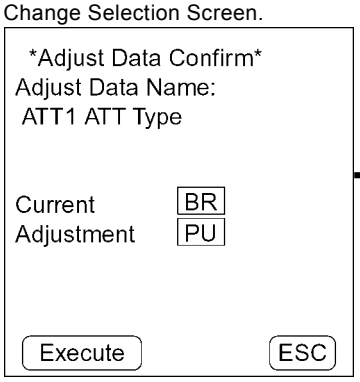


To the lower

T1V7-05-03-121

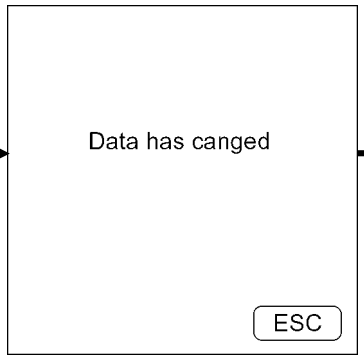
Status Selection Screen

Check PU and push Exec. Push ESC and return to ATT Parameter Change Selection Screen.



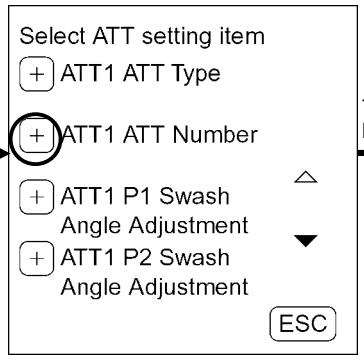
T1V7-05-03-122

Push ESC and return to ATT Parameter Change Selection Screen.



T1V7-05-03-107

Push ATT 1 Number.

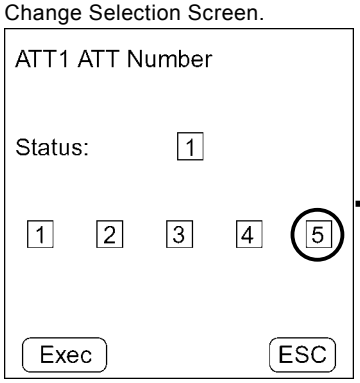


To the lower

T1V7-05-03-115

ATT Parameter Change Screen

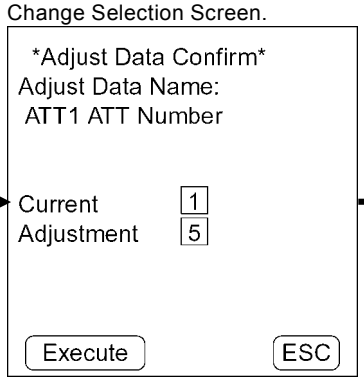
Push “5” and push Exec. Push ESC and return to ATT Parameter Change Selection Screen.



T1V7-05-03-123

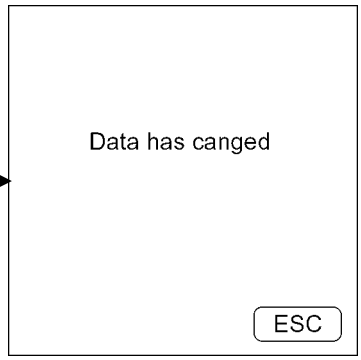
Status Selection Screen

Check No. and push Exec. Push ESC and return to ATT Parameter Change Selection Screen.



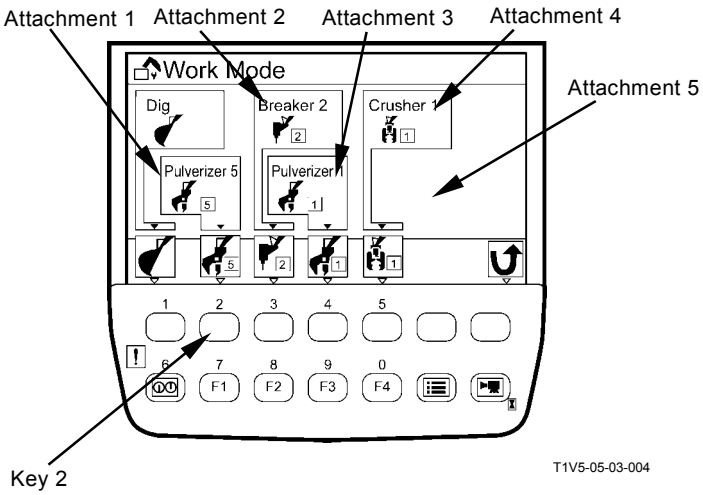
T1V7-05-03-168

Push ESC and return to ATT Parameter Change Selection Screen.



T1V7-05-03-107

When the work mode screen of monitor unit is displayed, Pulverizer 5 is displayed at Attachment 1. When pushing key 2, Pulverizer 5 is selected and the Pulverizer 5 specification screen is displayed.

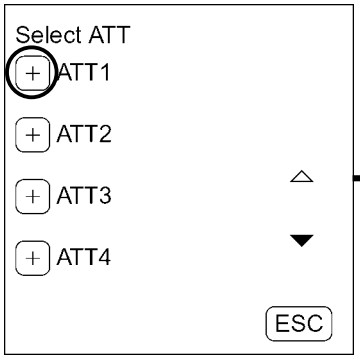


Attachment Non-Setting

IMPORTANT: When the attachment is "non-setting", the attachment cannot be selected on the monitor unit.

Example: Set Attachment to Non-Setting

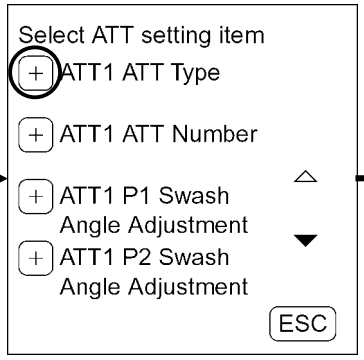
Push ATT 1.



T1V7-05-03-114

Attachment Selection Screen

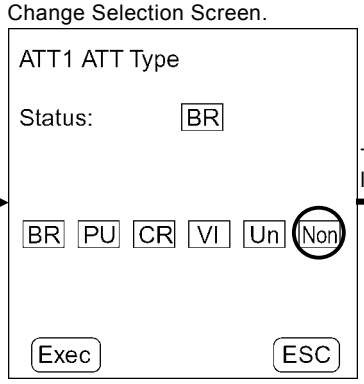
Push ATT1 ATT Type.



T1V7-05-03-115

ATT Parameter Change Screen

Push Non and push Exec. Push ESC and return to ATT Parameter Change Selection Screen.

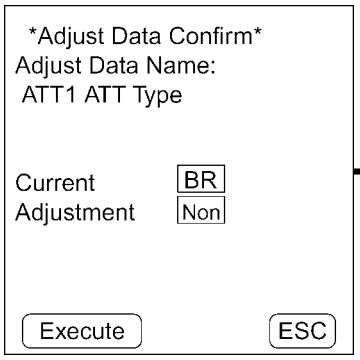


To the lower

T1V7-05-03-121

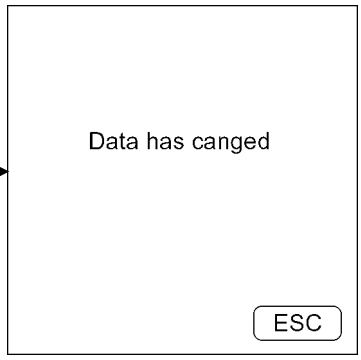
Status Selection Screen

Check Non and push Exec. Push ESC and return to ATT Parameter Change Selection Screen.



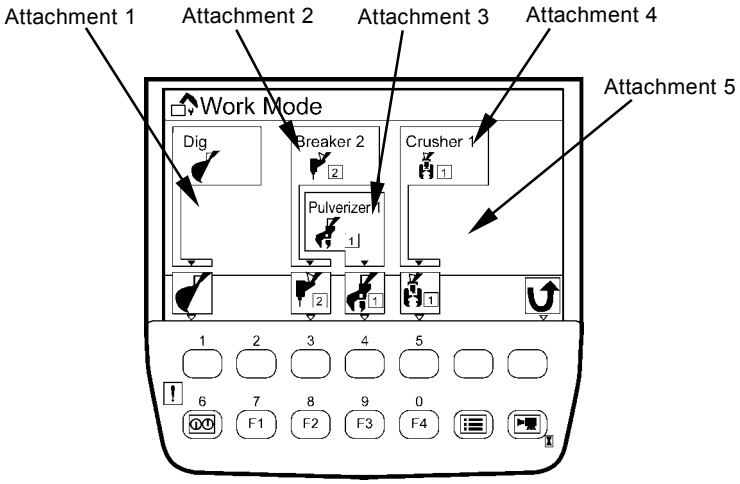
T1V7-05-03-178

Push ESC and return to ATT Parameter Change Selection Screen.



T1V7-05-03-107

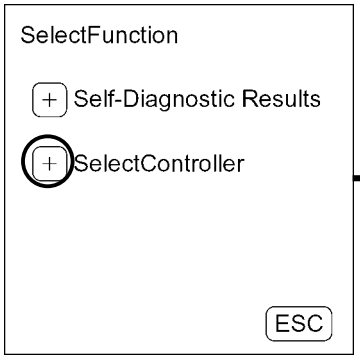
When the work mode of monitor unit is displayed, attachment 1 display disappears.



T1V5-05-03-005

Recorded Data Display

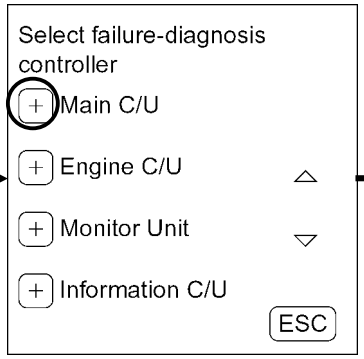
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

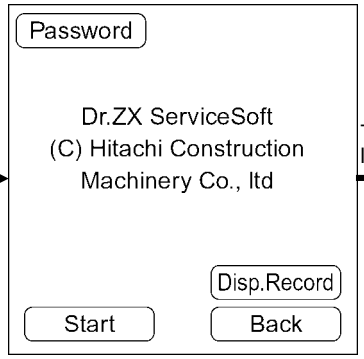
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

Push Disp. Record.

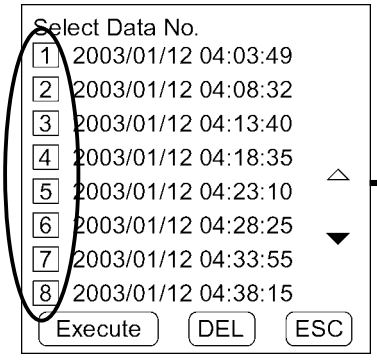


To the lower

T1V7-05-03-011

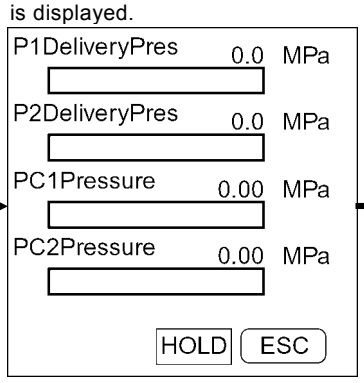
Title Screen

Push and select No. Push Regeneration and the recorded data is regenerated.Push DEL and data of selected No. is deleted.



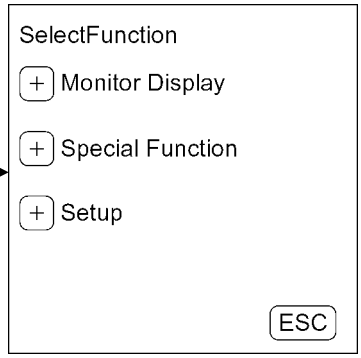
T1V7-05-03-124

Push Hold and the monitor is stopped temporarily. Push Hold again and restart regeneration. Push ESC and Main Menu Screen is displayed.



T1V7-05-03-125

Recorded Data Regeneration Screen

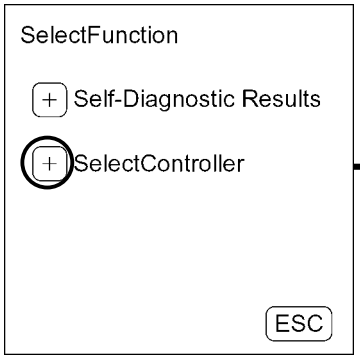


T1V7-05-03-012

Main Menu Screen

Password Change

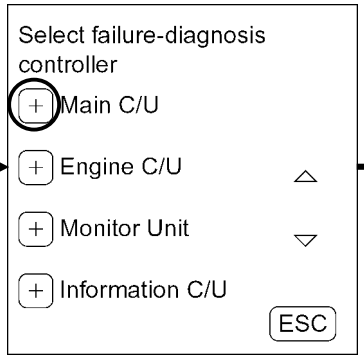
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

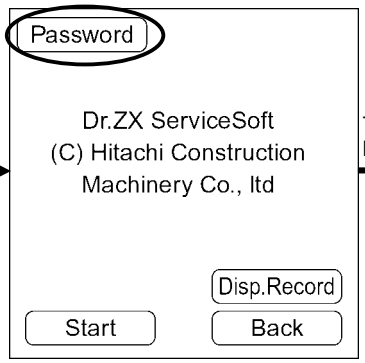
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

Push Password.

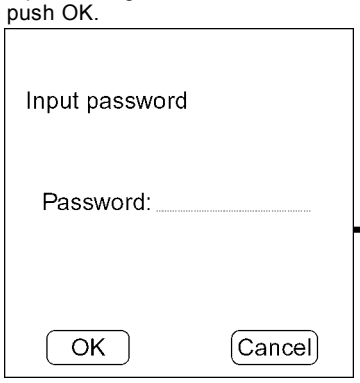


To the lower

T1V7-05-03-011

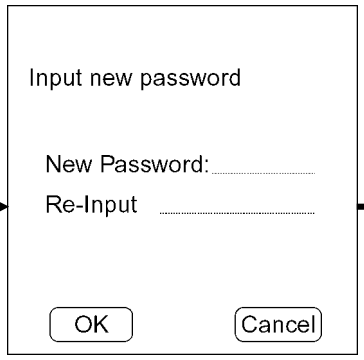
Title Screen

Input the registered Password and push OK.



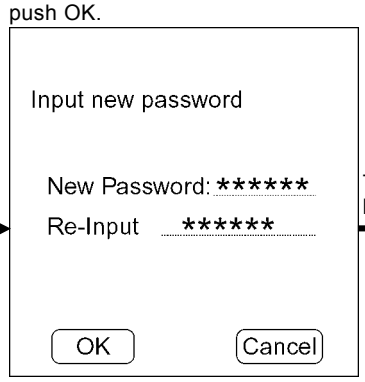
T1V7-05-03-126

Input the new password and push OK.



T1V7-05-03-127

Input the new password again and push OK.



To the lower

T1V7-05-03-169

Push OK and return to Title Screen.

T1V7-05-03-128

(Blank)

ENGINE CONTROLLER

Recorded Data Display

Data recorded in ECM is displayed by one day by using Dr. ZX.

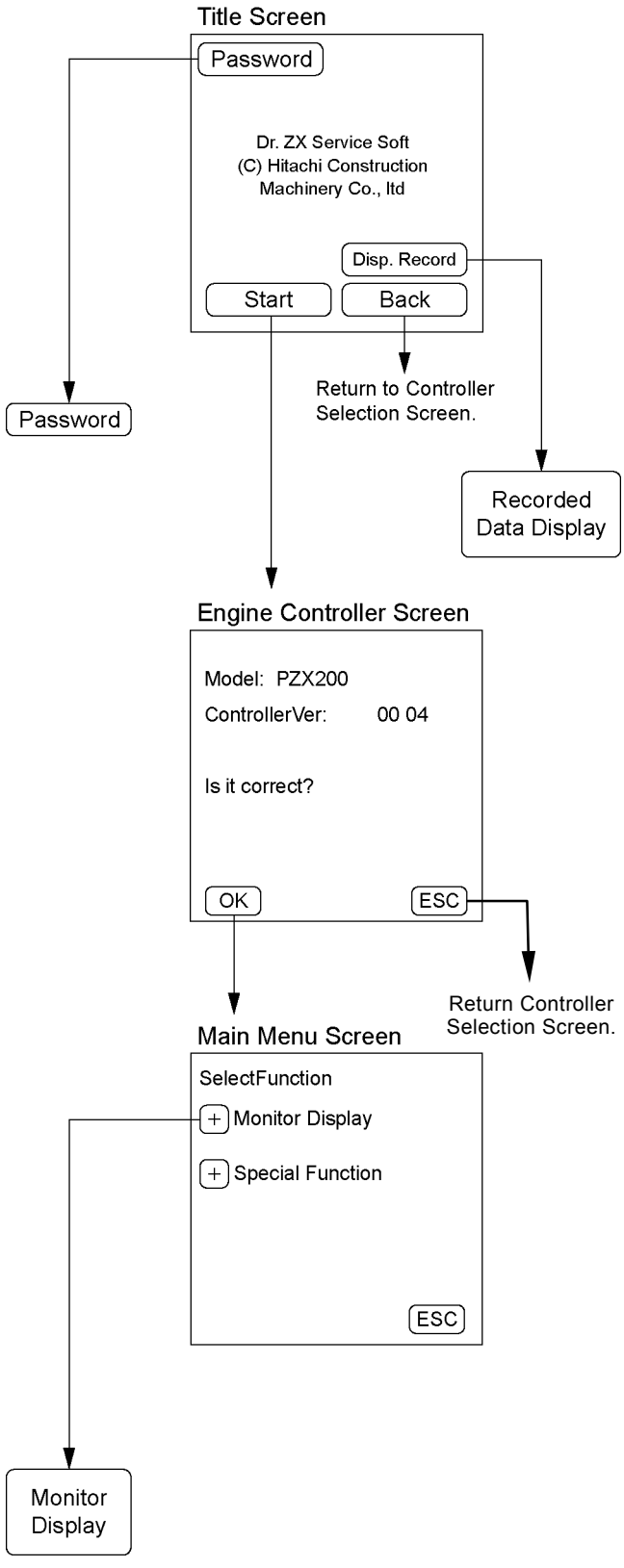
Password Change

The password can be changed.

Main Menu

- Monitor Display

Dr. ZX displays the input signals from sensors and the control signals of ECM.



T1V7-05-03-204

Special Function

- Data Upload From ECM
  Upload one set of data from ECM to Dr.ZX.
  Move ECM data to Dr.ZX before exchanging the ECM.

- Data Download To ECM
  After exchanging the ECM, download ECM data from Dr. ZX to new ECM.

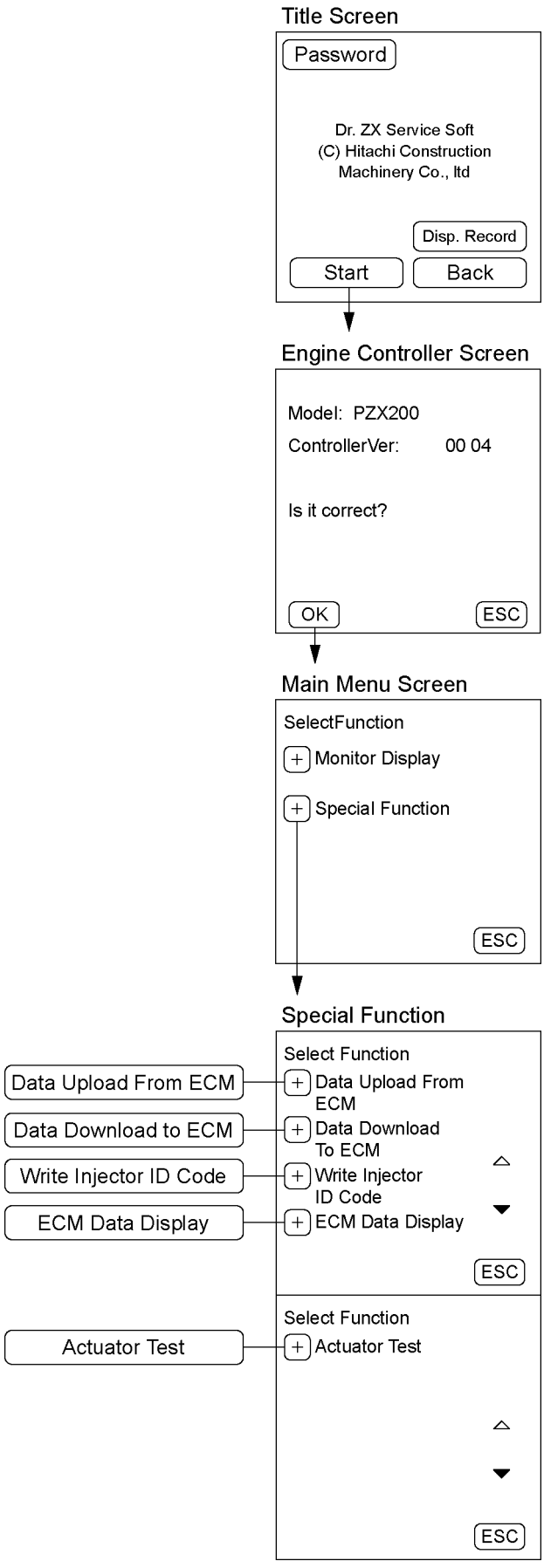
- Write Injector ID Code
  When changing a cylinder injector, write injector ID code by Dr. ZX.

- ECM Data Display
  Displaying the engine serial number, ID code of each cylinder injector on the Dr. ZX.

- Actuator Test
  IMPORTANT: The actuator test should be done by setting the engine control dial to the minimum speed position.

  Engine Speed Down
  Decrease engine speed 200 min^{-1} from current speed for 5 seconds.

  Engine Speed Down & Stop Cylinder
  Decrease engine speed 200 min^{-1} from current speed for 5 seconds, and shut injector fuel injection of selected cylinder for 5 seconds.



T1V7-05-03-205

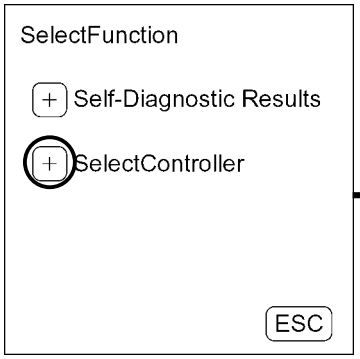
MAIN MENU
MONITOR DISPLAY

List of Monitor Item

Item		Unit	Data
Selecting	Monitoring		
Engine Torque	Engine Torque	%	Input signal from ECM
Actual Engine Speed (Engine Speed)	Actual Engine Speed	min^{-1}	Input signal from crank speed sensor and cam angle sensor
Target Engine Speed	Target Engine Speed	min^{-1}	Input signal from engine control dial
Glow Signal	Glow Signal	OFF, ON	Glow relay ON/OFF status
Coolant Temperature (Engine Coolant Temperature)	Coolant Temperature (E)	°C	Input signal from coolant temperature sensor
Fuel Temperature	Fuel Temperature	°C	Input signal from fuel sensor
Engine Oil Pressure	Engine Oil Pressure	kPa	Input signal from engine oil pressure sensor
Fuel Flow Rate	Fuel Flow	L/h	Input signal from ECM
Atmospheric Pressure	Barometric Pressure	kPa	Input signal from atmospheric pressure sensor
Suction Temperature (Intake Air Temperature)	Intake Air Temperature	°C	Input signal from intake-air temperature sensor
Boost Pressure	Boost Pressure	kPa	Input signal from boost pressure sensor
Boost Temperature	Boost Temperature	°C	Input signal from boost temperature sensor
Battery Voltage	Battery Voltage	V	Input signal from ECM
Total Amount of Fuel Use	Total Used Fuel	L	Input signal from ECM

Monitor Display

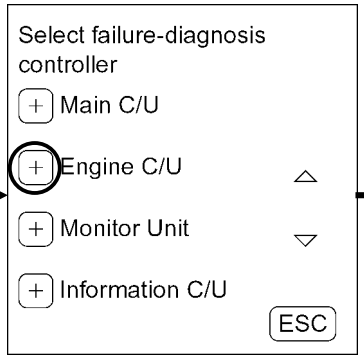
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

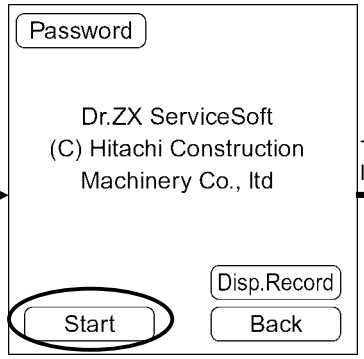
Push Engine C/U.



T1V7-05-03-009

Controller Selection Screen

Push Start.

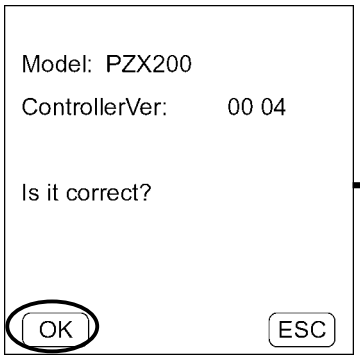


To the lower

T1V7-05-03-011

Title Screen

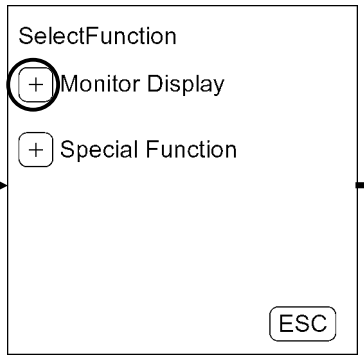
Push OK.



T1V7-05-03-010

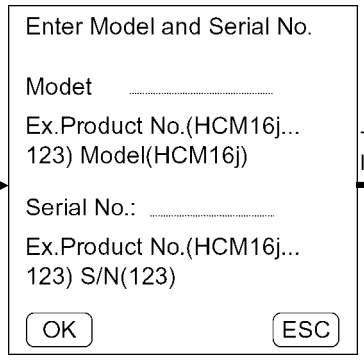
Engine Controller Screen

Push Monitor Display.



T1V7-05-03-130

Main Menu Screen

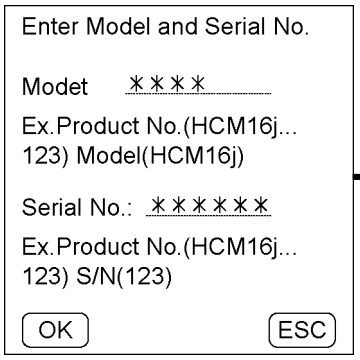


To the lower

T1V7-05-03-013

Enter Model and Serial No. Screen

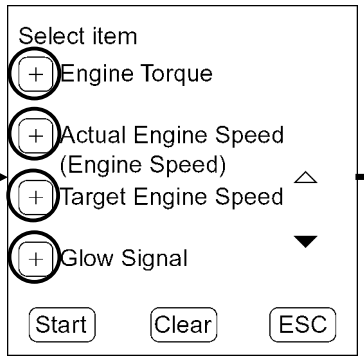
Input the model code and serial No. and push OK. Push ESC and return to Main Menu Screen.



T1V7-05-03-065

Enter Model and Serial No. Screen

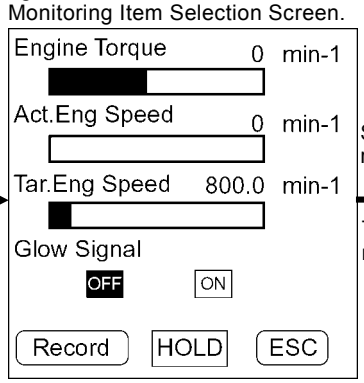
Push the item for Monitor Display and push OK. Refer to T5-3-57 as for the monitor item.
Push ESC and return to Main Menu Screen.



T1V7-05-03-132

Display Item Selection Screen

Push Hold and the monitor is stopped temporarily. When the monitor is started again, push Hold again. Push ESC and return to Monitoring Item Selection Screen.



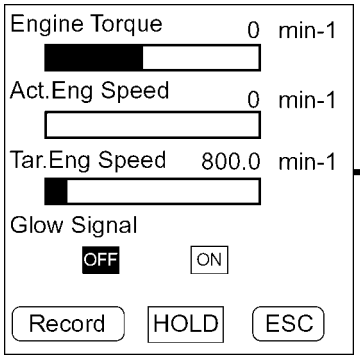
Start recoding.

To the next page

T1V7-05-03-133

Monitor Screen

Push Record.

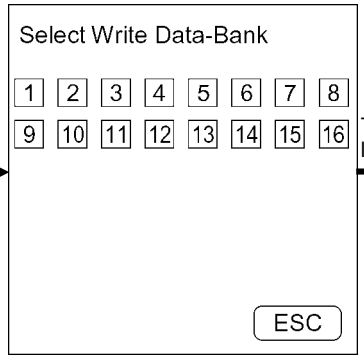


T1V7-05-03-133

Monitor Screen

T1V7-05-03-134

Push Rec. No. and the recording screen for Rec. No. is made.

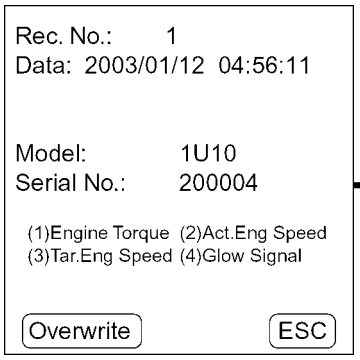


To the lower

T1V7-05-03-135

Select Write Data-Bank Screen

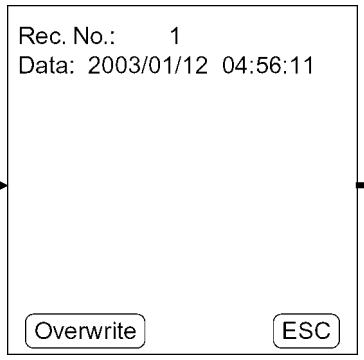
If Rec. No. has already been recorded and push Over Write, data is overwritten.
Push ESC and return to Main Menu Screen.



T1V7-05-03-170

Recording Screen

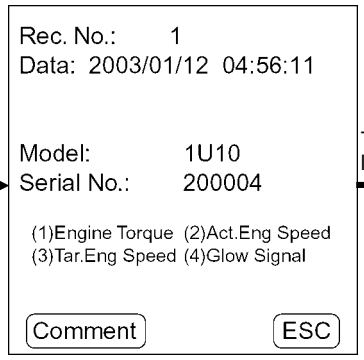
If Rec. No. has not been recorded yet and push Write, data is written to the recording screen.
Push ESC and return to Main Menu Screen.



T1V7-05-03-136

Recording Screen

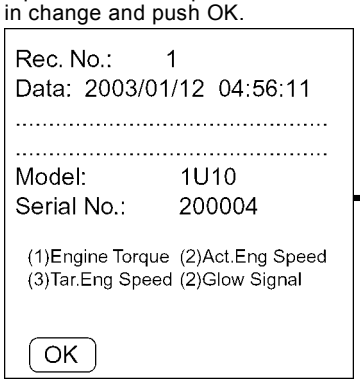
Push Comment.
Push ESC and return to Main Menu Screen.



To the lower

T1V7-05-03-137

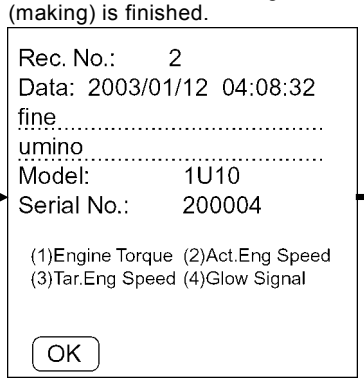
Input weather and person's name in change and push OK.



T1V7-05-03-138

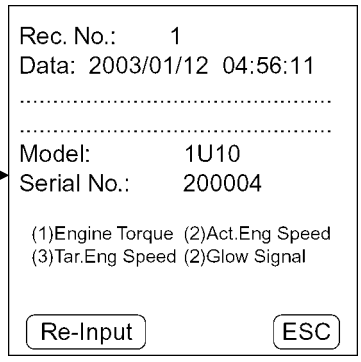
Recording Screen (Comment Input)

Push OK and the recording screen (making) is finished.



T1V7-05-03-171

Push Re-Input and return to Recording Screen (Comment Input).
Push ESC and return to Main Menu Screen.

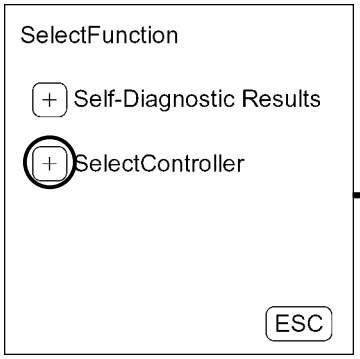


T1V7-05-03-139

DATA UPLOAD FROM ECM

IMPORTANT: Upload one set of data from ECM. ECM data should be uploaded before removing the ECM when exchanging it.

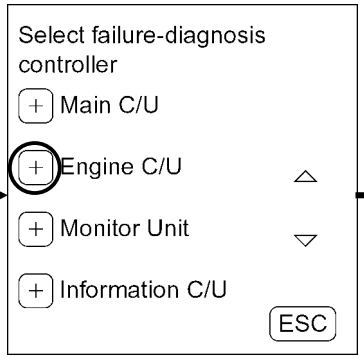
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

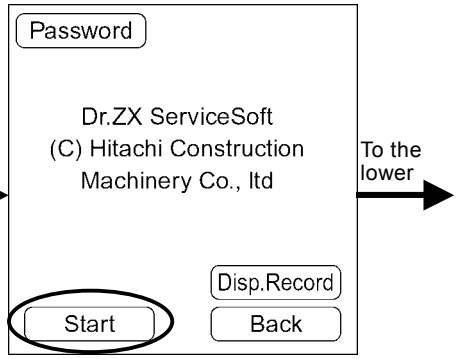
Push Engine C/U.



T1V7-05-03-009

Controller Selection Screen

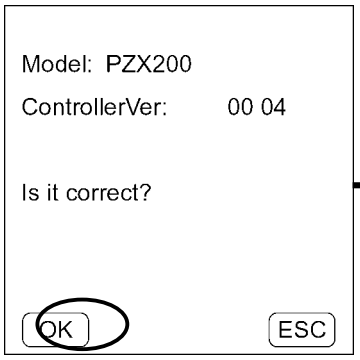
Push Start.



T1V7-05-03-011

Title Screen

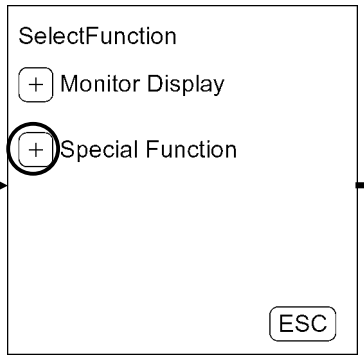
Push OK.



T1V7-05-03-010

Engine Controller Screen

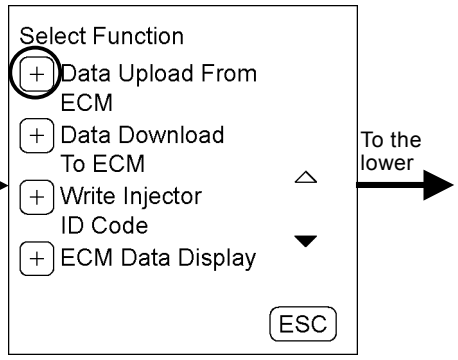
Push Special Function.



T1V7-05-03-130

Main Menu Screen

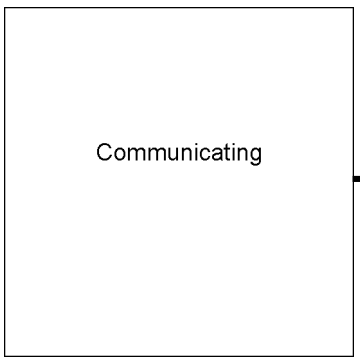
Push Data Upload From ECM.



T1V7-05-03-180

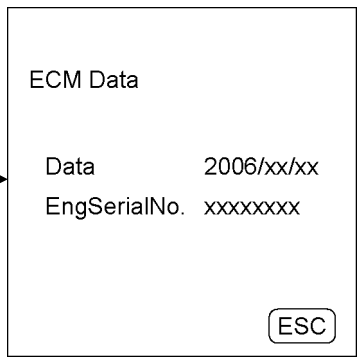
Special Function Setup Screen

It takes 10 to 60 sec. for communication.



T1V7-05-03-181

Push ESC to return to the Special Function Setup Screen.

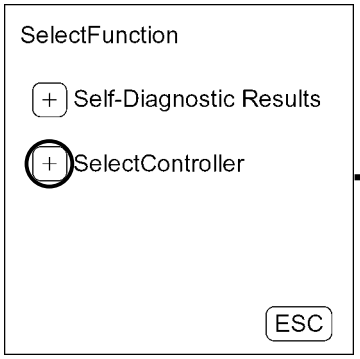


T1V7-05-03-182

(Blank)

DATA DOWNLOAD TO ECM

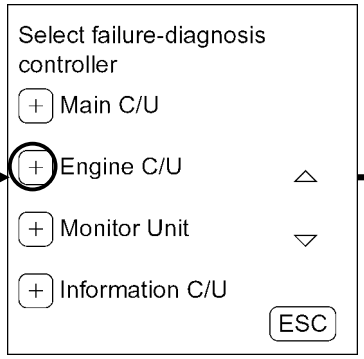
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

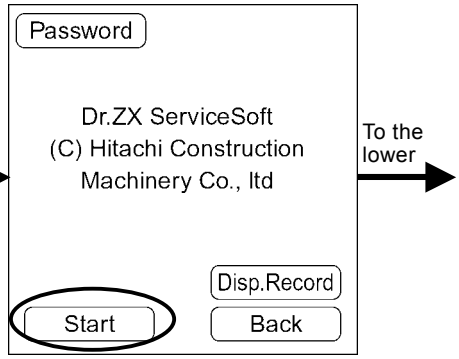
Push Engine C/U.



T1V7-05-03-009

Controller Selection Screen

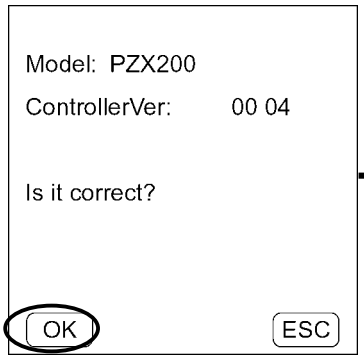
Push Start.



T1V7-05-03-011

Title Screen

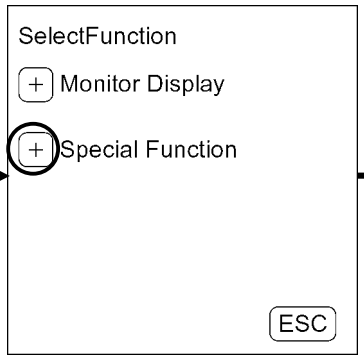
Push OK.



T1V7-05-03-010

Engine Controller Screen

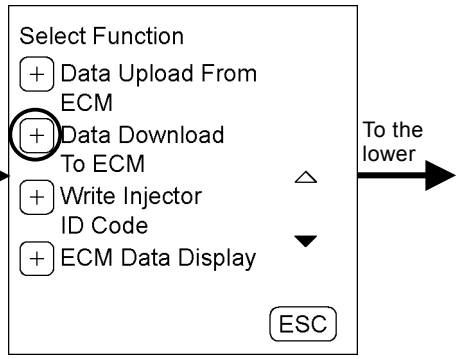
Push Special Function.



T1V7-05-03-130

Main Menu Screen

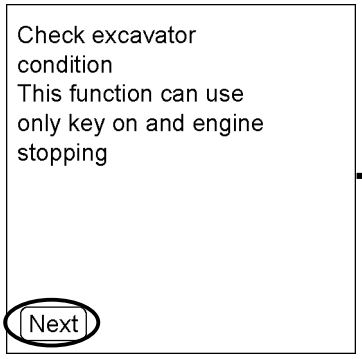
Push Data Download To ECM.



T1V7-05-03-180

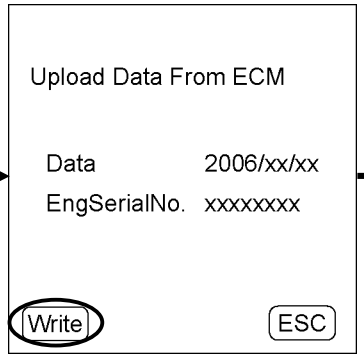
Special Function Setup Screen

Push Next.



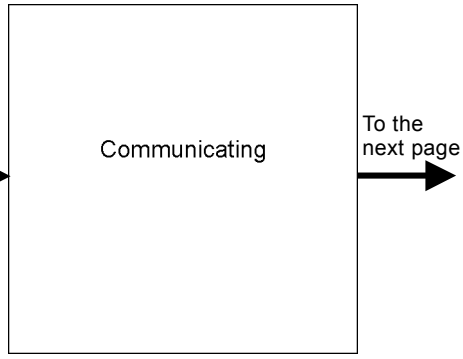
T1V7-05-03-183

Push Write.
Push ESC to return to the Special Function Setup Screen.

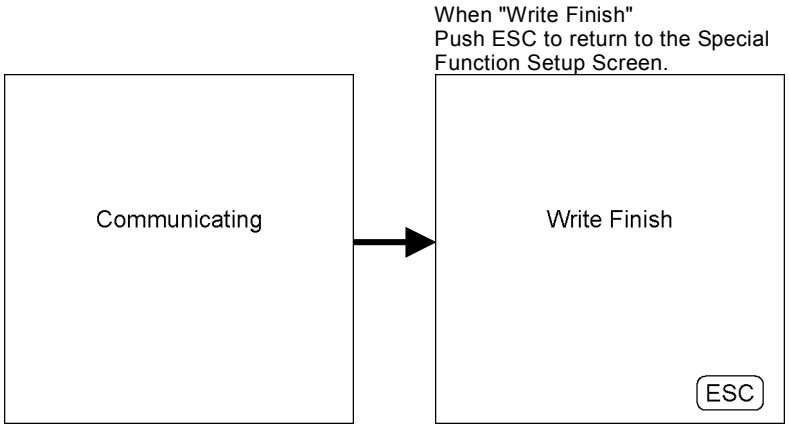


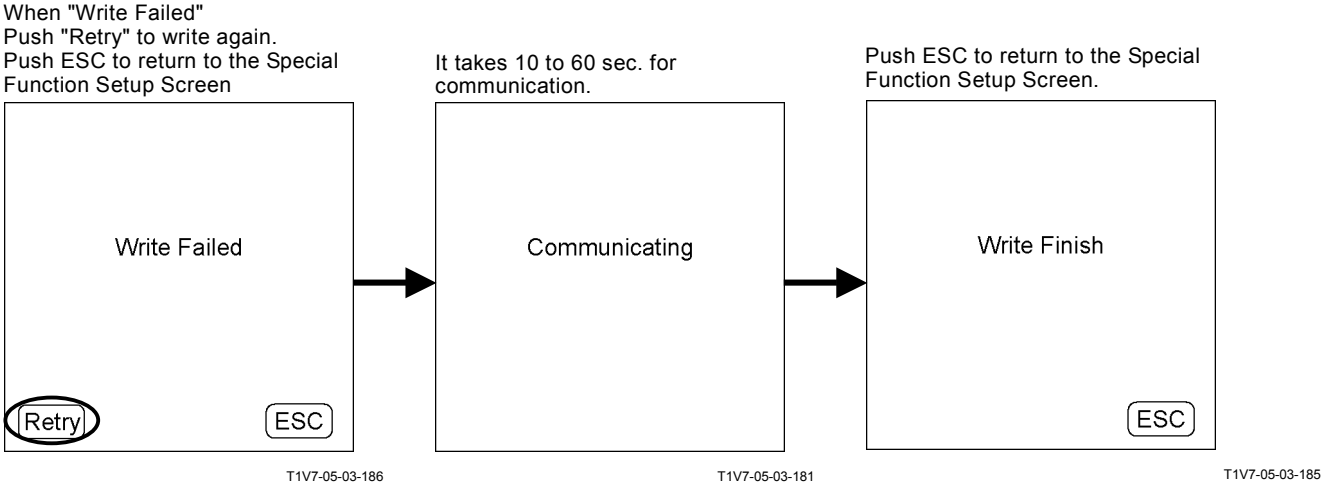
T1V7-05-03-184

It takes 10 to 60 sec. for communication.



T1V7-05-03-181

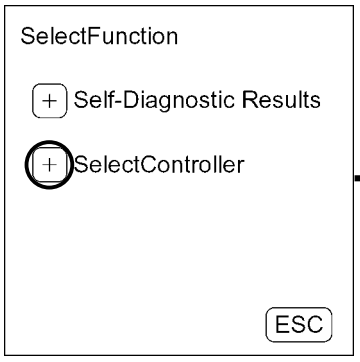

When "Write Finish"
Push ESC to return to the Special Function Setup Screen.
Communicating
Write Finish
ESC
T1V7-05-03-181
T1V7-05-03-185


When "Write Failed"
Push "Retry" to write again.
Push ESC to return to the Special Function Setup Screen
It takes 10 to 60 sec. for communication.
Push ESC to return to the Special Function Setup Screen.
Write Failed
Retry
ESC
Communicating
Write Finish
ESC
T1V7-05-03-186
T1V7-05-03-181
T1V7-05-03-185

WRITE INJECTOR ID CODE

Cylinder 1 to 4

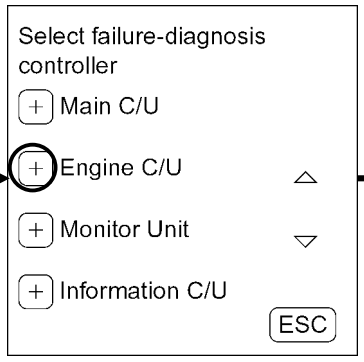
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

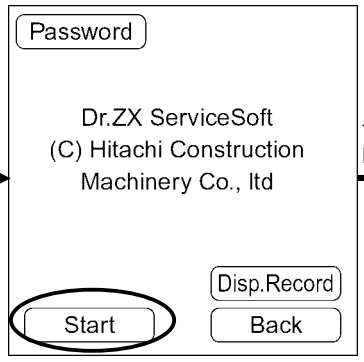
Push Engine C/U.



T1V7-05-03-009

Controller Selection Screen

Push Start.

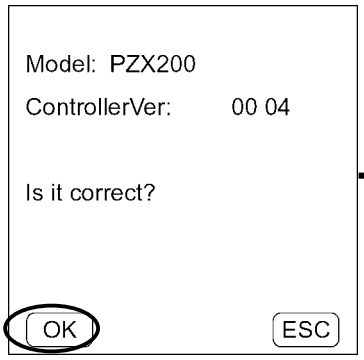


To the lower

T1V7-05-03-011

Title Screen

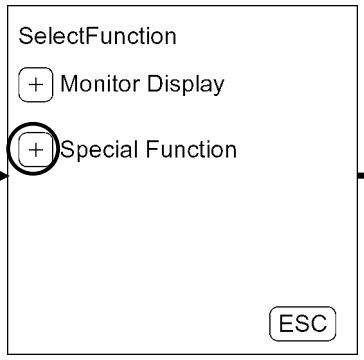
Push OK.



T1V7-05-03-010

Engine Controller Screen

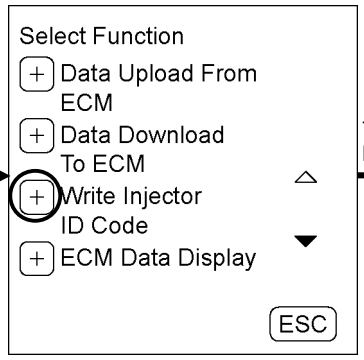
Push Special Function.



T1V7-05-03-130

Main Menu Screen

Push Write Injector ID Code.

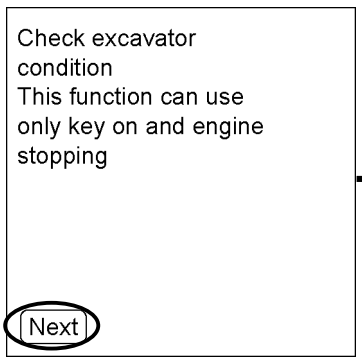


To the lower

T1V7-05-03-180

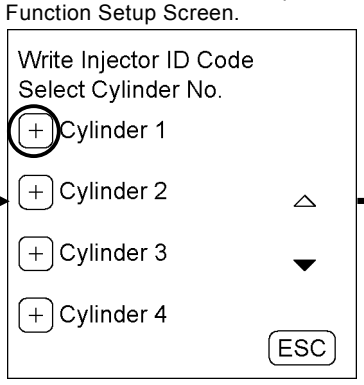
Special Function Setup Screen

Push Next.



T1V7-05-03-183

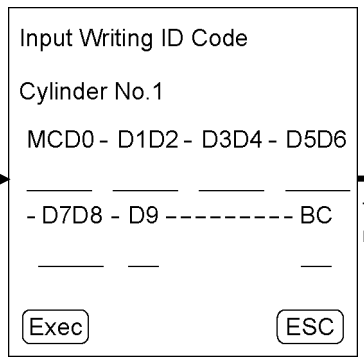
Push a cylinder number which Injector ID code to be written.
(Cylinder 1 is pushed in this example.)
Push ESC to return to the Special Function Setup Screen.



T1V7-05-03-187

Cylinder Selection Screen

Push ESC to return to the Cylinder Selection Screen.



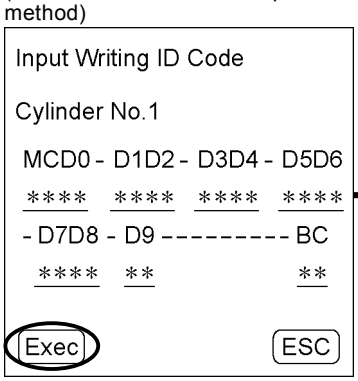
Write Injector ID Code

To the next page

T1V7-05-03-188

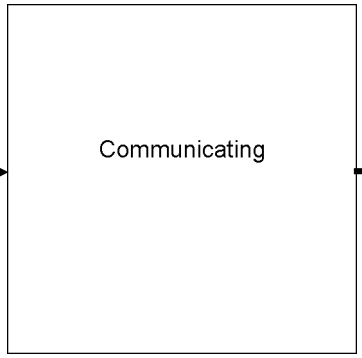
Input Writing ID Code Screen

Input Injector ID code, and then push "Exec"
(Please reffer to ID code input method)



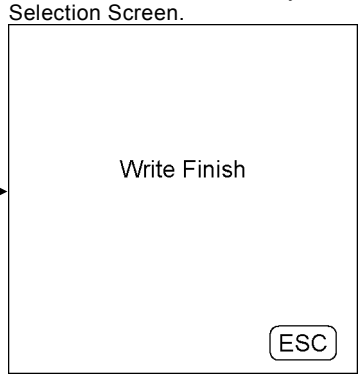
T1V7-05-03-189

It takes 10 to 60 sec. for communication.



T1V7-05-03-181

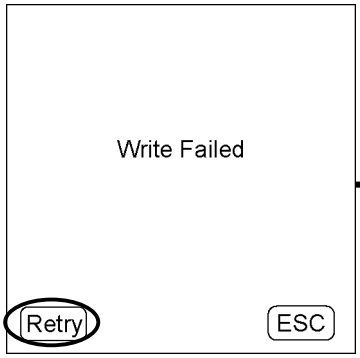
When "Write Finish"
Push ESC to return to the Cylinder Selection Screen.



T1V7-05-03-185

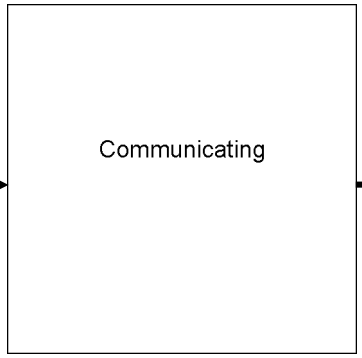
Input Writing ID Code Screen

When "Write Failed"
Push "Retry" to write again.
Push ESC to return to the Cylinder Selection Screen



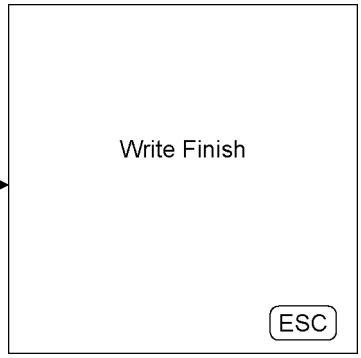
T1V7-05-03-186

It takes 10 to 60 sec. for communication.



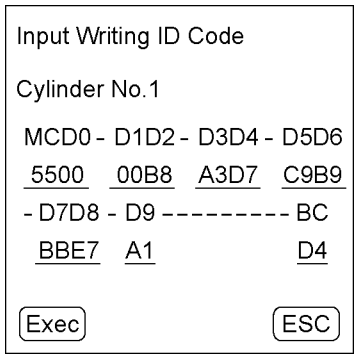
T1V7-05-03-181

Push ESC to return to the Cylinder Selection Screen.

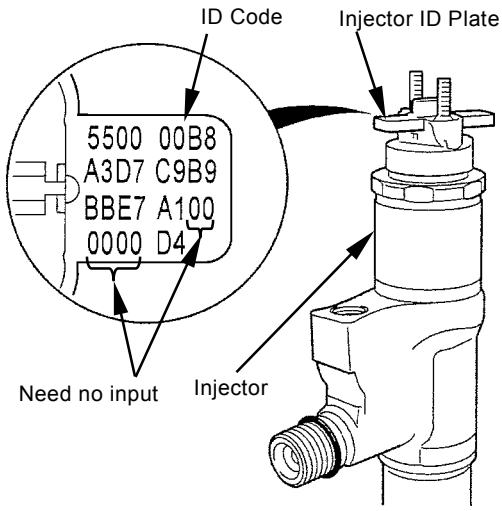


T1V7-05-03-185

Injector ID code input method
Input ID code of injecter ID plate of relevant cylinder. In the case of figure,
Input following alpha-numerals:
MCD0→5500
D1D2→00B8
D3D4→A3D7
D5D6→C9B9
D7D8→BBE7
D9→A1
BC→D4



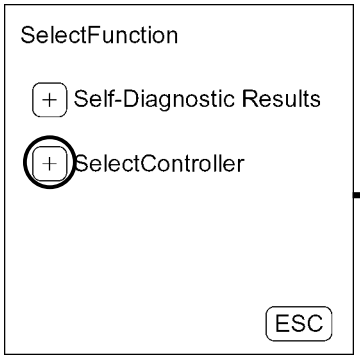
T1V7-05-03-190



T1V1-05-03-007

ECM DATA DISPLAY

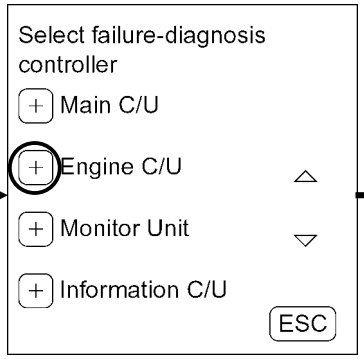
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

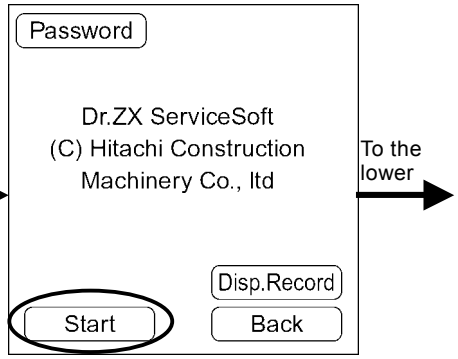
Push Engine C/U.



T1V7-05-03-009

Controller Selection Screen

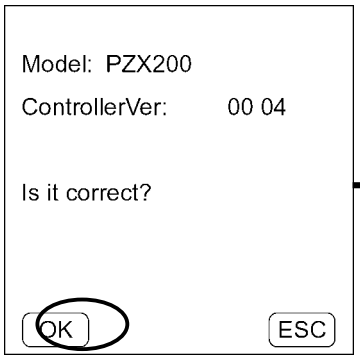
Push Start.



T1V7-05-03-011

Title Screen

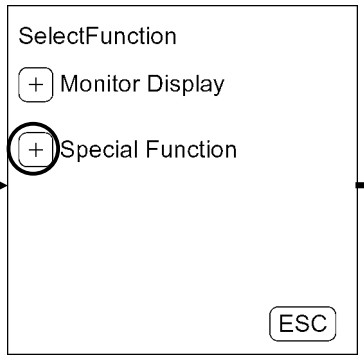
Push OK.



T1V7-05-03-010

Engine Controller Screen

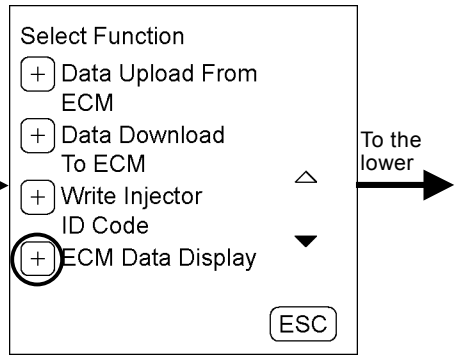
Push Special Function.



T1V7-05-03-130

Main Menu Screen

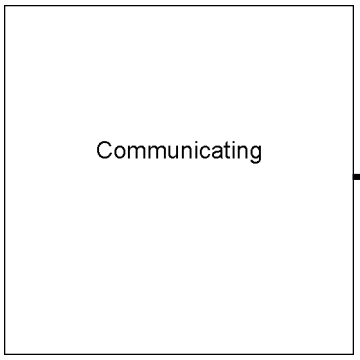
Push ECM Data Display.



T1V7-05-03-180

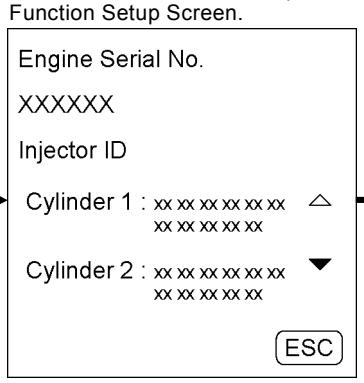
Special Function Setup Screen

It takes 10 to 60 sec. for communication.



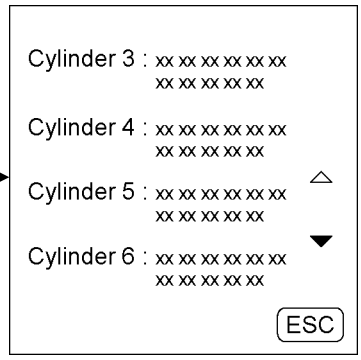
T1V7-05-03-181

Engine serial number and injector ID codes of cylinder 1 and 2 are displayed.
Push ESC to return to the Special Function Setup Screen.



T1V7-05-03-192

Scroll down the screen by pushing ▼, injector ID code of cylinder 3 to 6 will be displayed.
Push ESC and return to Monitoring Item Selection Screen.



T1V7-05-03-193

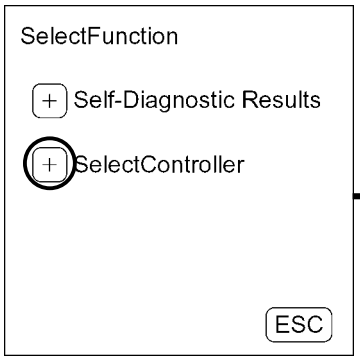
NOTE: On a four-cylinder engine, injector ID code of cylinder 5 and 6 can be neglected.

ACTUATOR TEST

Engine Speed Down

IMPORTANT: Operation must be done after setting engine control dial to the munimum speed position.

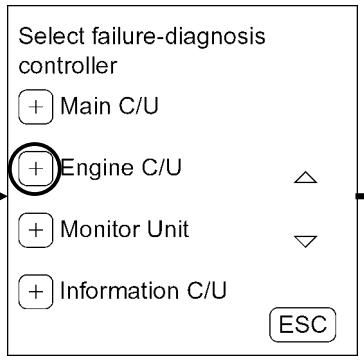
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

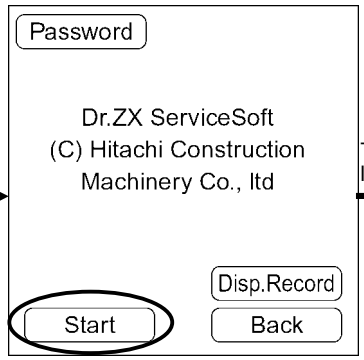
Push Engine C/U.



T1V7-05-03-009

Controller Selection Screen

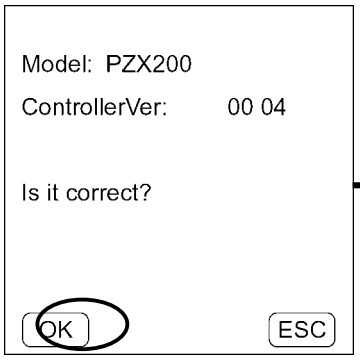
Push Start.



T1V7-05-03-011

Title Screen

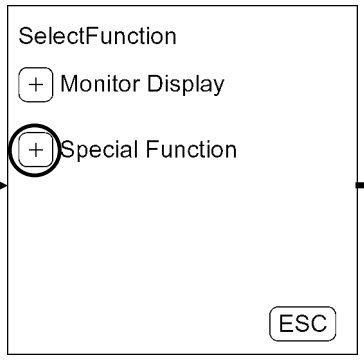
Push OK.



T1V7-05-03-010

Engine Controller Screen

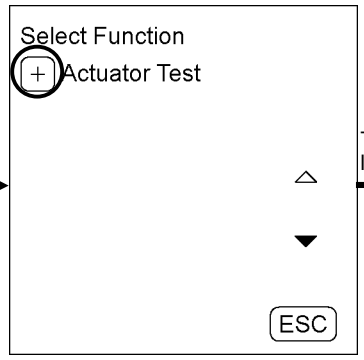
Push Special Function.



T1V7-05-03-130

Main Menu Screen

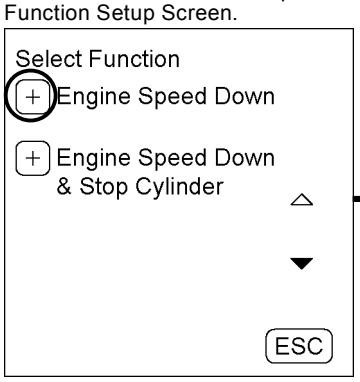
Move the item by using ▼ and Push Actuator Test.



T1V7-05-03-194

Special Function Setup Screen

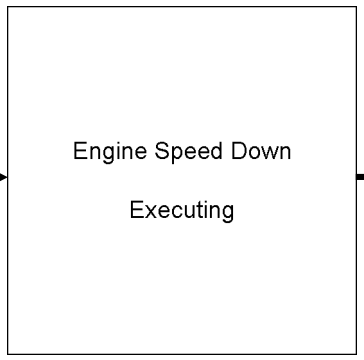
Push Engine Speed Down.
Push ESC to return to the Special Function Setup Screen.



T1V7-05-03-195

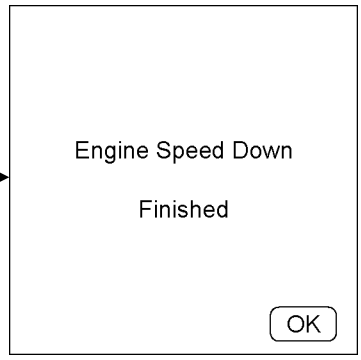
Actuator Test Selection Screen

Decrease engine speed for 5 seconds.



T1V7-05-03-196

Push "OK" to return to the Actuator Test Selection Screen.

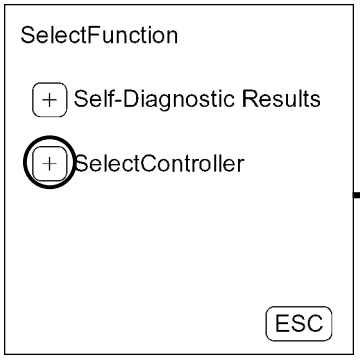


T1V7-05-03-197

Engine Speed Down & Stop Cylinder

IMPORTANT: Operation must be done after setting engine control dial to the munimum speed position.

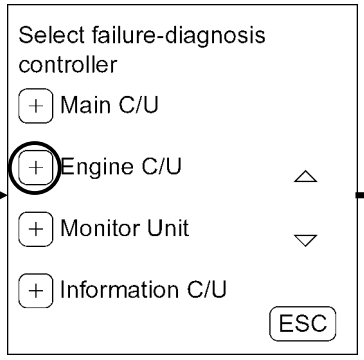
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

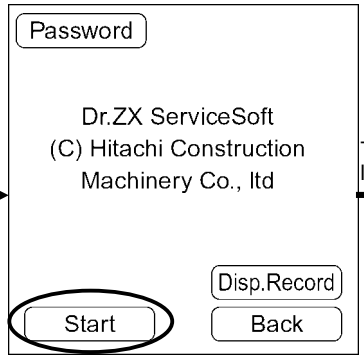
Push Engine C/U.



T1V7-05-03-009

Controller Selection Screen

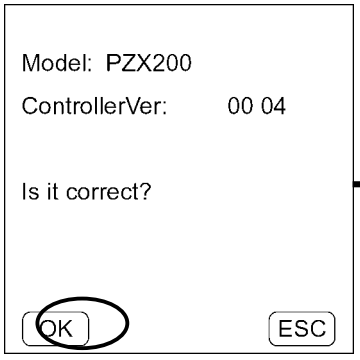
Push Start.



To the lower

T1V7-05-03-011

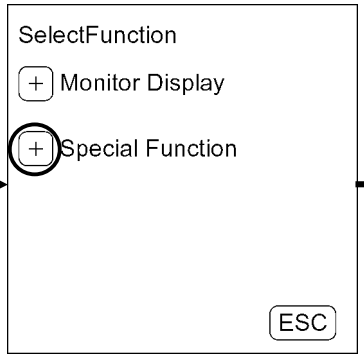
Title Screen



T1V7-05-03-010

Engine Controller Screen

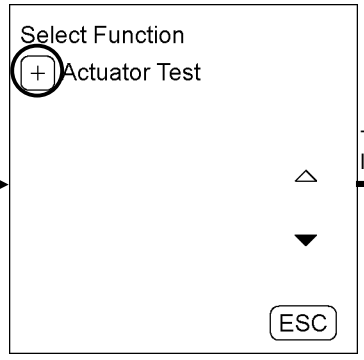
Push Special Function.



T1V7-05-03-130

Main Menu Screen

Move the item by using ▼ and Push Actuator Test.

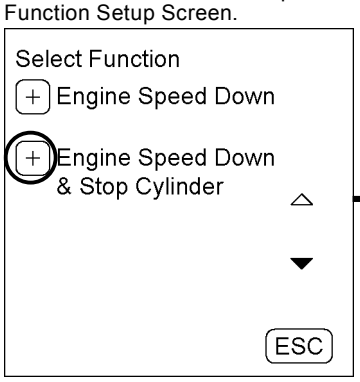


To the lower

T1V7-05-03-194

Special Function Setup Screen

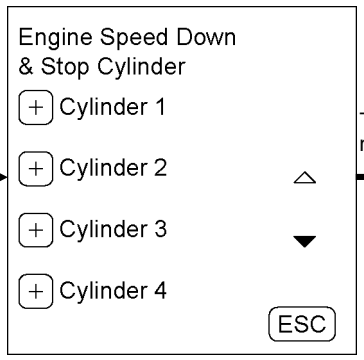
Push Engine Speed Down & Stop Cylinder.
Push ESC to return to the Special Function Setup Screen.



T1V7-05-03-195

Actuator Test Selection Screen

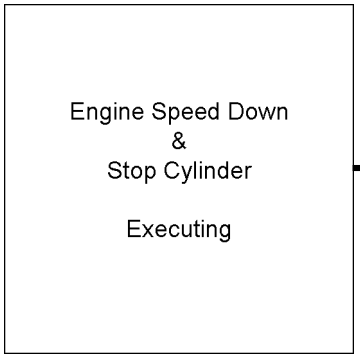
Push a cylinder number which is to be shutoff fuel injection.
Push ESC to return to the Actuator Test Selection Screen.



To the next page

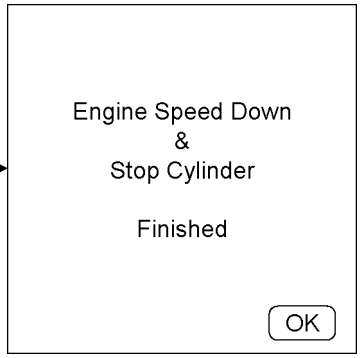
T1V7-05-03-198

When pushing a cylinder, engine speed sill be decreased for 5 seconds, and shutoff fuel injection of the selected cylinder for 5 seconds.



T1V7-05-03-200

Push “OK” to return to the Actuator Test Selection Screen.



T1V7-05-03-201

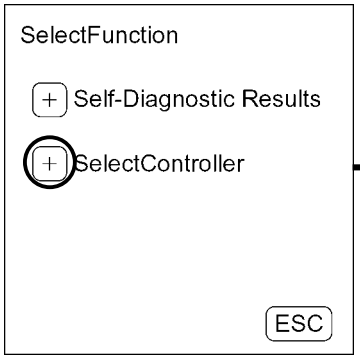
EXAMPLE OF HOW ENGINE SPEED DOWN & STOP CYLINDER FUNCTION USED (ON A FOUR-CYLINDER ENGINE)

When fuel can not be injected on the cylinder 1, the engine runs with three cylinders.

1. Set the engine control dial to the minumum speed postion, and then decrease engine speed at 800 min^{-1}.
2. Stop the cylinder 1 by operating Engine Speed Down & Stop Cylinder function, engine will run with 600 min^{-1} and three-cylinder for 5 seconds. The engine sounds like strained.
3. When stop the cylinder 2 by operating Engine Speed Down & Stop Cylinder function, engine will run with 600 min^{-1} and two-cylinder for 5 seconds. The engine sounds like strained even worse.
4. By hearing sound difference of 2 and 3, the cylinder 1 is determined to be failed.

RECORED DATA DISPLAY

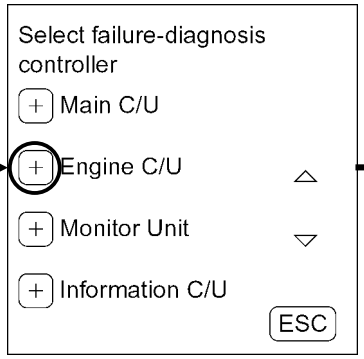
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

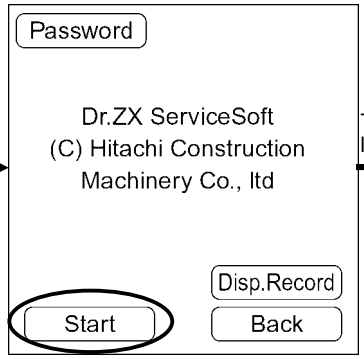
Push Engine C/U.



T1V7-05-03-009

Controller Selection Screen

Push Disp. Record.

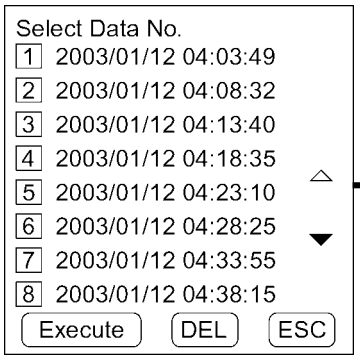


To the lower

T1V7-05-03-011

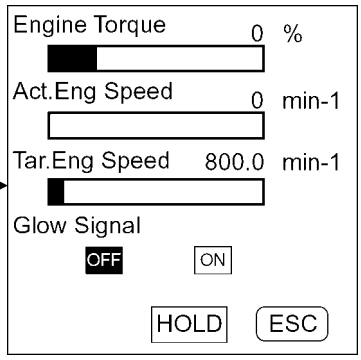
Title Screen

Push and select No. Push Regeneration and the recorded data is regenerated. Push DEL and data of selected No. is deleted. Push ESC and return to Main Menu Screen.



T1V7-05-03-124

Push Hold and the monitor is stopped temporarily
When the monitor is started again, push Hoid again.
Push ESC and return to Main Menu Screen.

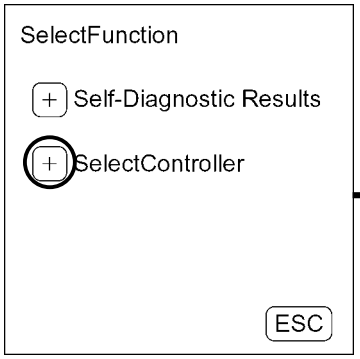


T1V7-05-03-141

Recorded Data Regeneration Screen

PASSWORD CHANGE

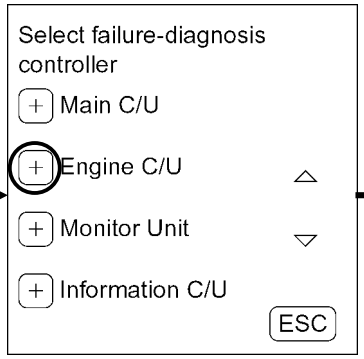
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

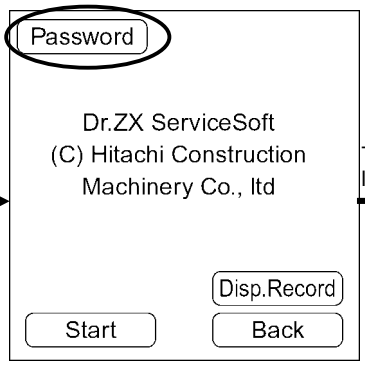
Push Engine C/U.



T1V7-05-03-009

Controller Selection Screen

Push Password.

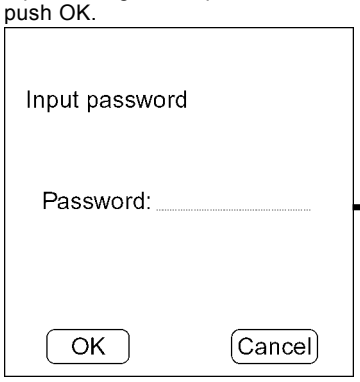


T1V7-05-03-011

Title Screen

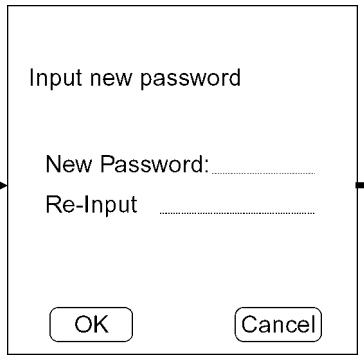
To the lower

Input the registered password and push OK.



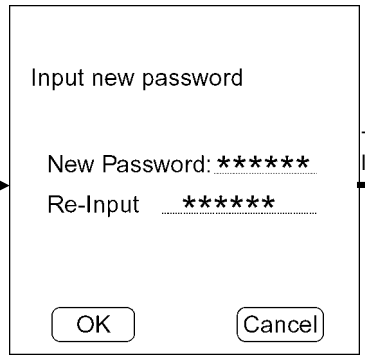
T1V7-05-03-126

Input the new password and push OK.



T1V7-05-03-127

Input the new password and push OK.



T1V7-05-03-169

To the lower

Push OK and return to Title Screen.

T1V7-05-03-128

ICF CONTROLLER

Save Data Check

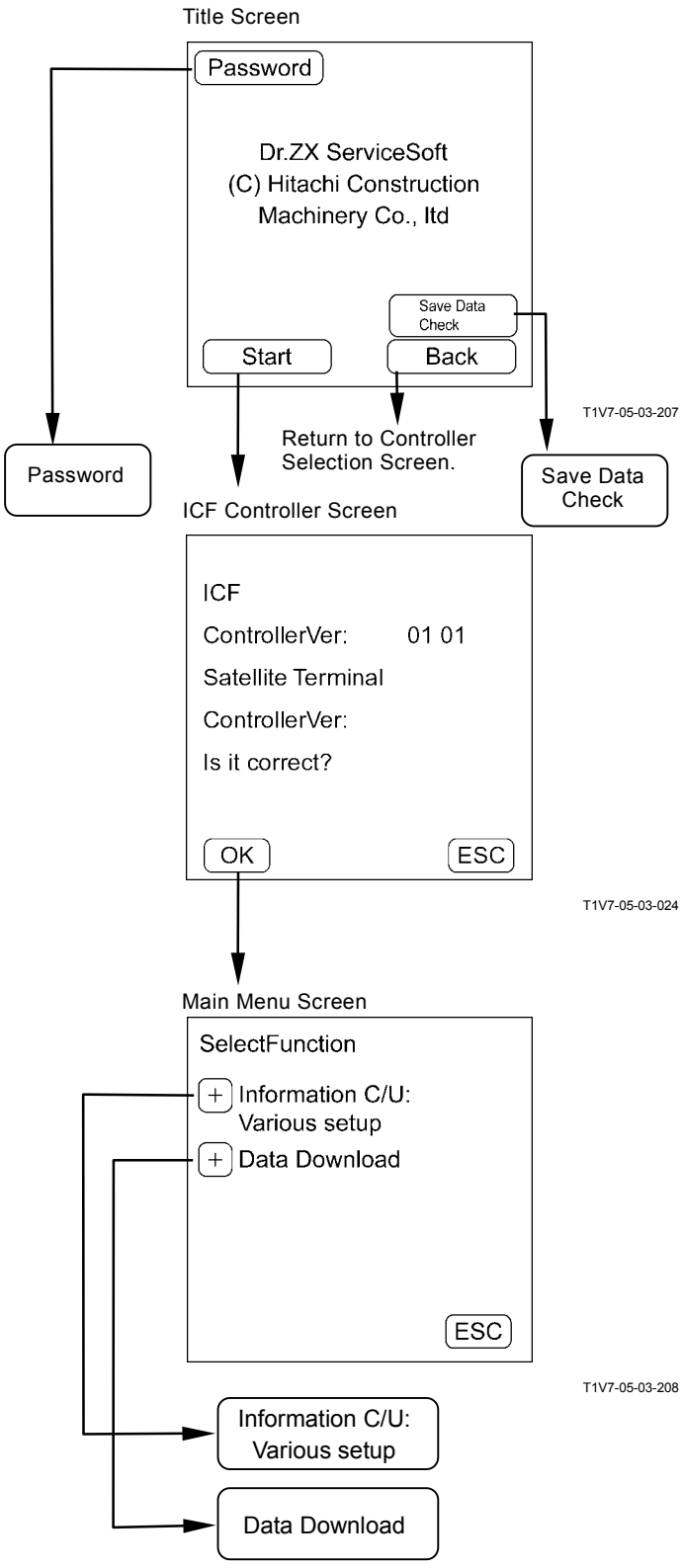
Daily report data, frequency distribution data, total operating hours, alarm and failure which are saved in ICF can be checked by using Dr. ZX.

Password Change

The password can be changed.

Main Menu

- Information C/U Various Setup
  Initialization of information C/U, setting of model, serial No. and time, and initialization of control data can be done.
- Data Download
  Daily report data, frequency distribution data, total operating hours, alarm and failure which are recorded in ICF can be downloaded to Dr. ZX.



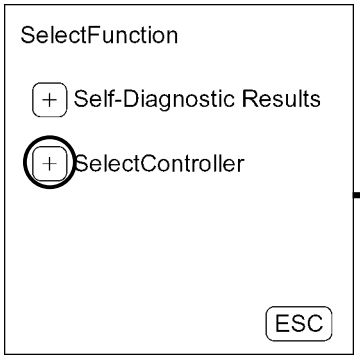
MAIN MENU
INFORMATION C/U VARIOUS SETUP

List of Controller Data Setting Item

Item			Range of Data
Information C/U: Initialize			Initialize/ESC
Enter Model and Serial No.	Model		ASCII (4 characters) 0 to 9, A to Z
	Serial No.		000000 to 999999
Enter Date and Time	Date	YY	2000 to 2100
		MM	1 to 12
		DD	1 to 31
	Time	HH	0 to 23
		MM	0 to 59
Control Data: Initialize			Initialize/ESC
Satellite Terminal: Initialize			DEL/ESC
Satellite Terminal No. Confirmation			12 digits: 0 to 9, A to Z
Communicating State Check	ICF < = > Satellite Terminal	Connect	Conn/UnConn
		Comm.	OK/NG
	Satellite Terminal	Power	ON/OFF
		Comm.	Enable/Stop
	Rod Aerial		OK/NG
	GPS Aerial		OK/NG
	Wave State		ON/OFF
	Un-Transmit Data Number		0～99
	Last Transmitting Time		YYYY/MM/DD hh: mm: ss
Enter Satellite Comm. Start/Stop			Start/Stop

INFORMATION C/U: INITIALIZE

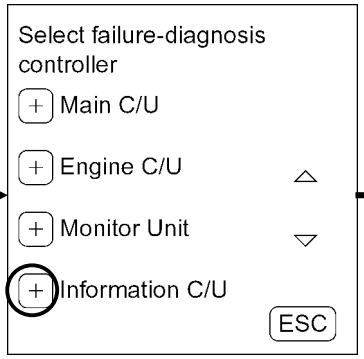
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

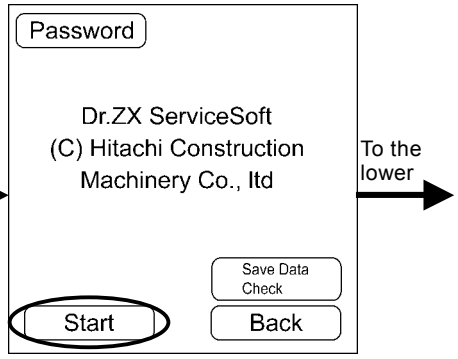
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

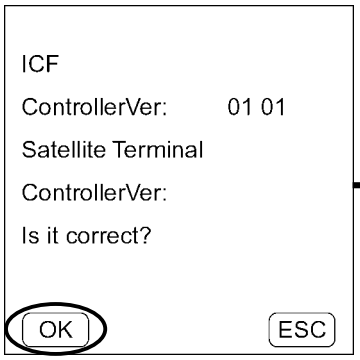
Push Start.



T1V7-05-03-209

Title Screen

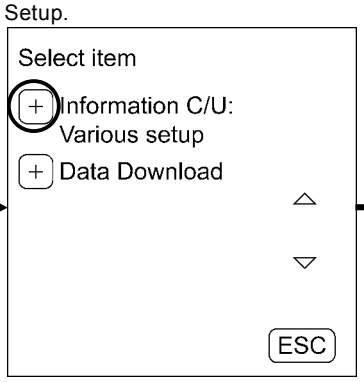
Push OK.



T1V7-05-03-024

ICF Controller Screen

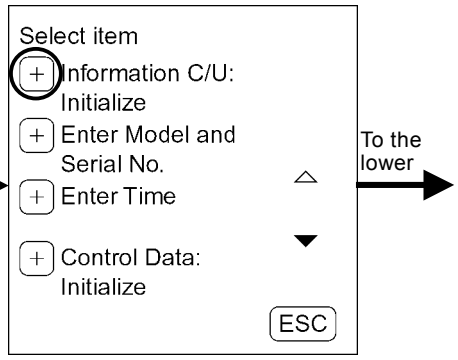
Push Information C/U: Various Setup.



T1V7-05-03-210

Main Menu Screen

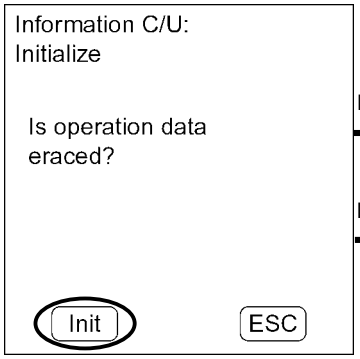
Push Information C/U: Initialize.



T1V7-05-03-027

Information C/U: Various Setup Screen

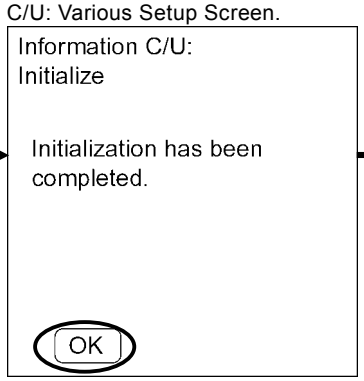
Push Init and the controller operating data is initialied. Push ESC and return to Information C/U: Various Setup Screen.



T1V7-05-03-028

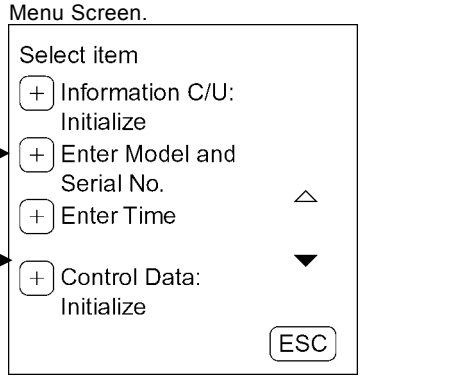
Information C/U: Initialize Screen

Push OK and return to Information C/U: Various Setup Screen.



T1V7-05-03-029

Push ESC and return to Main Menu Screen.

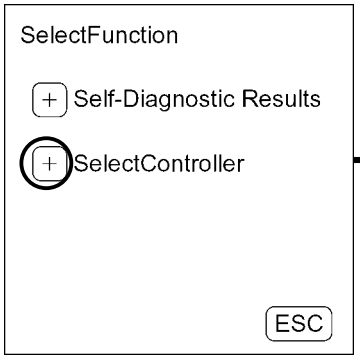


T1V7-05-03-027

Information C/U: Various Setup Screen

ENTER MODEL AND SERIAL No.

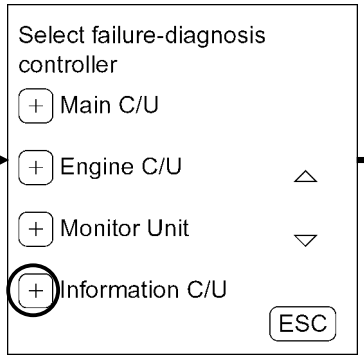
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

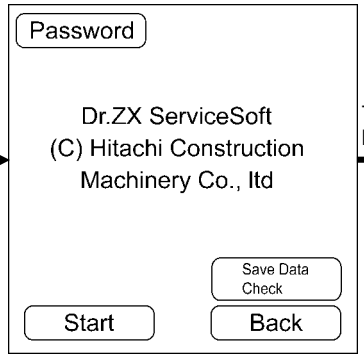
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push Start.

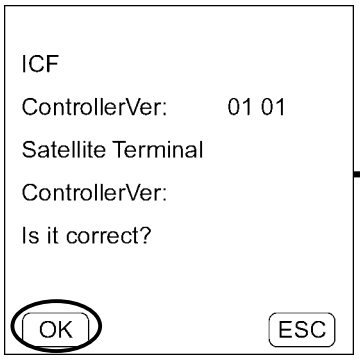


To the lower

T1V7-05-03-209

Title Screen

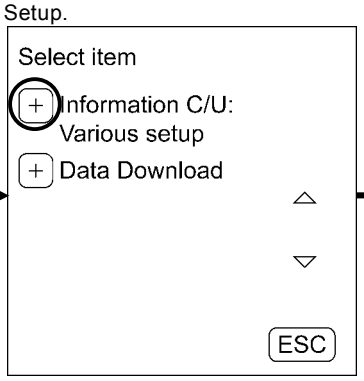
Push OK.



T1V7-05-03-024

ICF Controller Screen

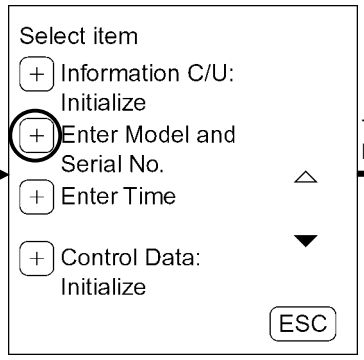
Push Information C/U: Various Setup.



T1V7-05-03-210

Main Menu Screen

Push Enter Model and Serial No.

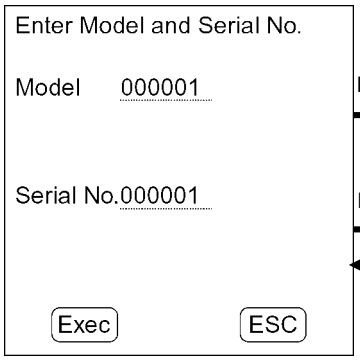


To the lower

T1V7-05-03-027

Information C/U: Various Setup Screen

Push Exec and model and serial No. can be input.
Push ESC and return to Information C/U: Various Setup Screen.



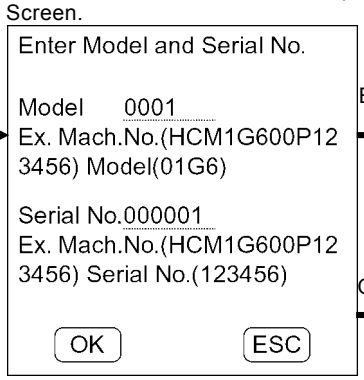
T1V7-05-03-030

Enter Model and Serial No. Screen

Exes

ESC

Push OK after inputting model and serial No. and return to Enter Model and Serial No. Screen.
Push ESC and return to Information C/U: Various Setup Screen.

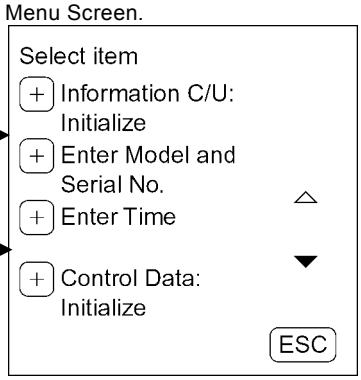


T1V7-05-03-031

ESC

OK

Push ESC and return to Main Menu Screen.

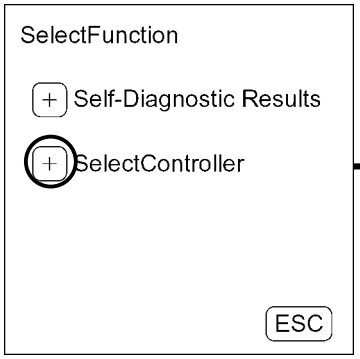


T1V7-05-03-027

Information C/U: Various Setup Screen

ENTER DATE AND TIME

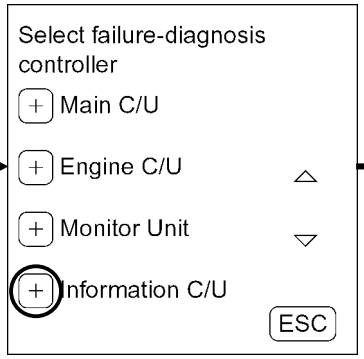
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

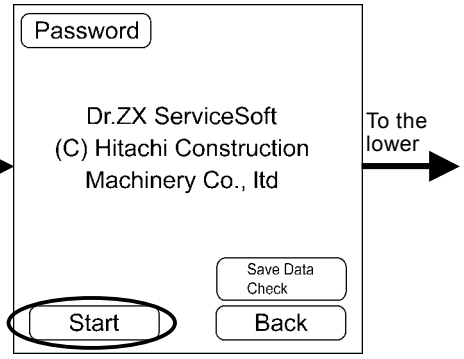
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

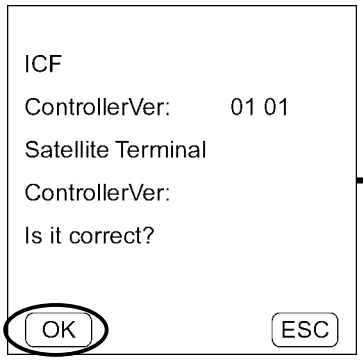
Push Start.



T1V7-05-03-209

Title Screen

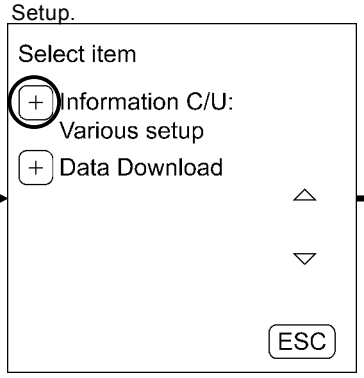
Push OK.



T1V7-05-03-024

ICF Controller Screen

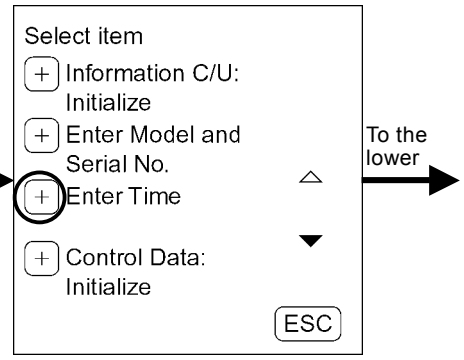
Push Information C/U: Various Setup.



T1V7-05-03-210

Main Menu Screen

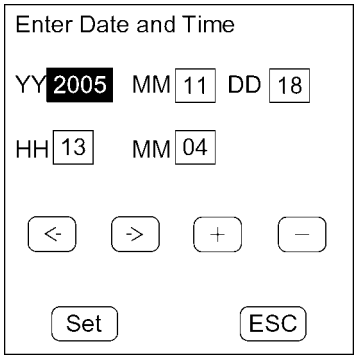
Push Enter Date and Time.



T1V7-05-03-027

Information C/U: Various Setup Screen

Push Set and the focused item is YY. Push ESC and return to Information C/U: Various Setup Screen.



T1V7-05-03-032

Enter Date and Time Screen

YY, MM, DD, HH and MM
The focused item is displayed reversely.
At first, the focused item is YY.

<- ->

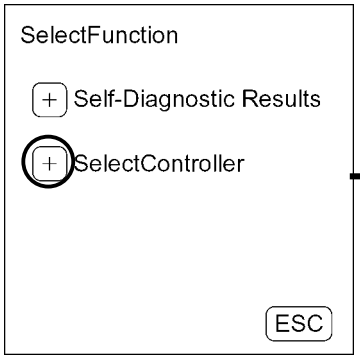
YY, MM, DD, HH and MM
Move the focused item.
No repeat input.

− +

YY, MM, DD, HH and MM
Value of the focused item is increased or decreased one by one.
In case value is beyond maximum one: Change value into the minimum one
In case value is below minimum one: Change value into the maximum one
No repeat input.

CONTROL DATA: INITIALIZE

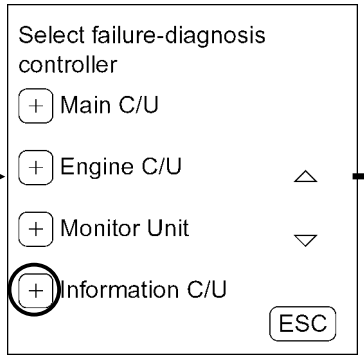
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

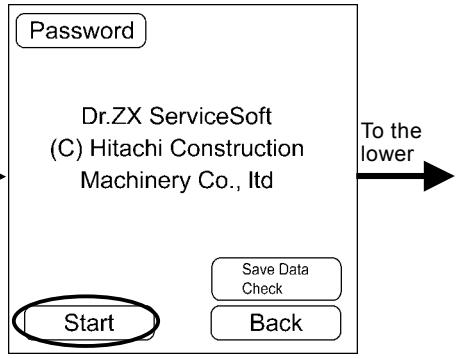
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

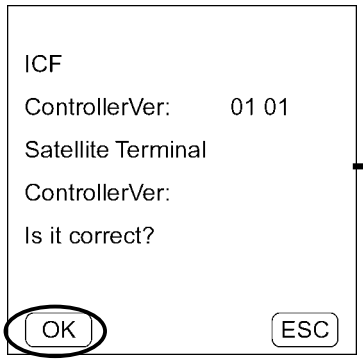
Push Start.



T1V7-05-03-209

Title Screen

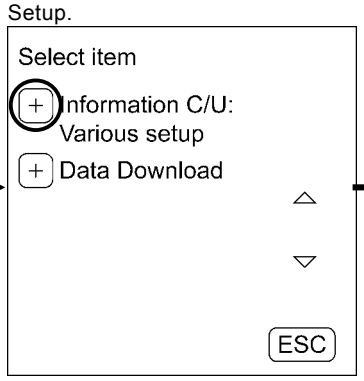
Push OK.



T1V7-05-03-024

ICF Controller Screen

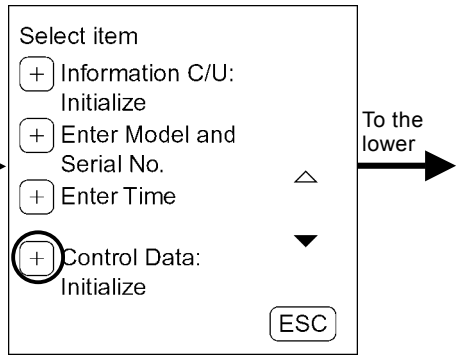
Push Information C/U: Various Setup.



T1V7-05-03-210

Main Menu Screen

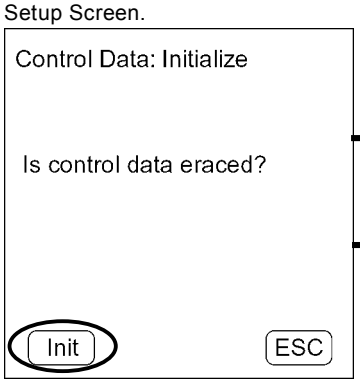
Push Control Data: Initialize.



T1V7-05-03-027

Information C/U: Various Setup Screen

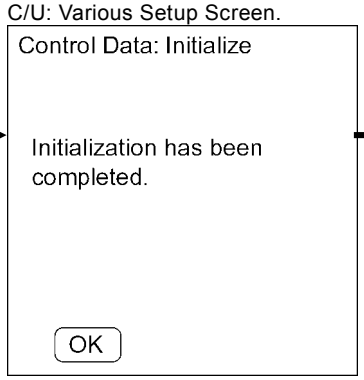
Push Init and the controller control data is initialied. Push ESC and return to Information C/U: Various Setup Screen.



T1V7-05-03-033

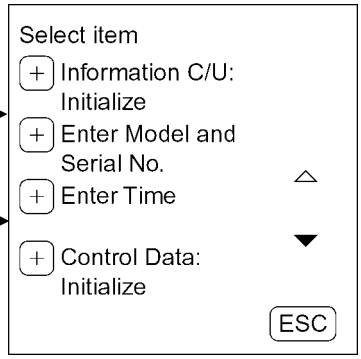
Control Data: Initialize Screen

Push OK and return to Information C/U: Various Setup Screen.



T1V7-05-03-034

Push ESC and return to Main Menu Screen.

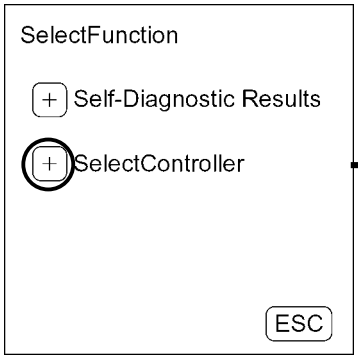


T1V7-05-03-027

Information C/U: Various Setup Screen

SATELLITE TERMINAL: INITIALIZE

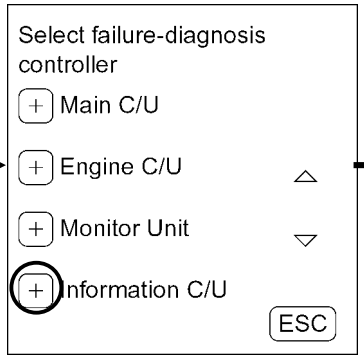
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

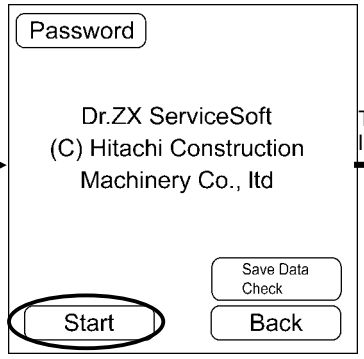
Push ICF Controller.



T1V7-05-03-009

Controller Selection Screen

Push Start.

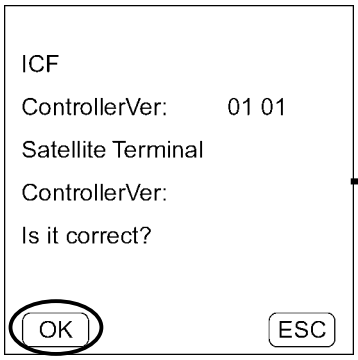


To the lower

T1V7-05-03-209

Title Screen

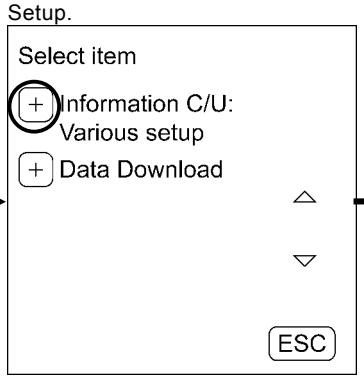
Push OK.



T1V7-05-03-024

ICF Controller Screen

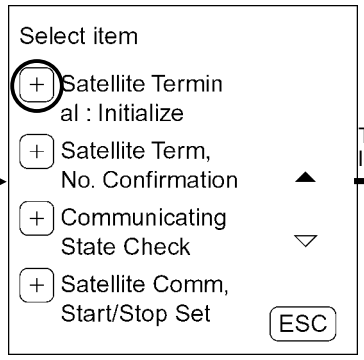
Push Information C/U: Various Setup.



T1V7-05-03-210

Main Menu Screen

Push ▼ and move to the next screen of Information C/U: Various Setup Screen. Push Satellite Terminal: Initialize.

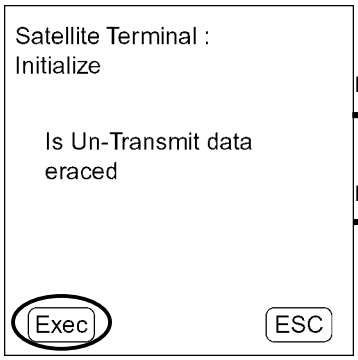


To the lower

T1V7-05-03-035

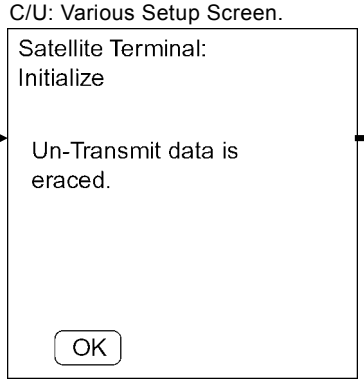
Information C/U: Various Setup Screen

Push Exec.
Push ESC and return to Information C/U: Various Setup Screen.

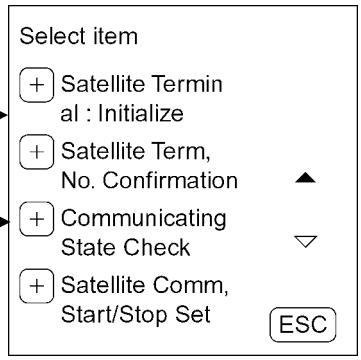


T1V7-05-03-036

Push OK and return to Information C/U: Various Setup Screen.



T1V7-05-03-145

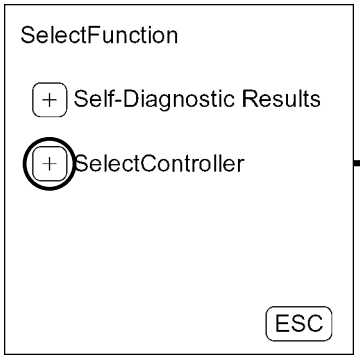


T1V7-05-03-035

Information C/U: Various Setup Screen

SATELLITE TERMINAL No. CONFIRMATION

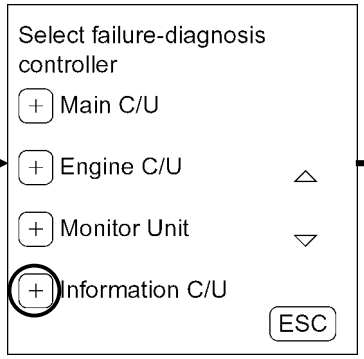
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

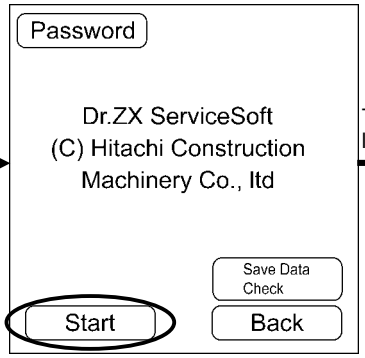
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push Start.

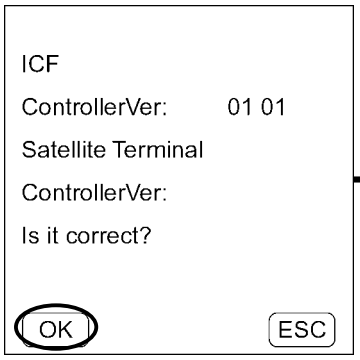


To the lower

T1V7-05-03-209

Title Screen

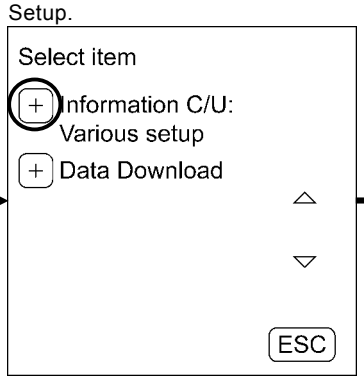
Push OK.



T1V7-05-03-024

ICF Controller Screen

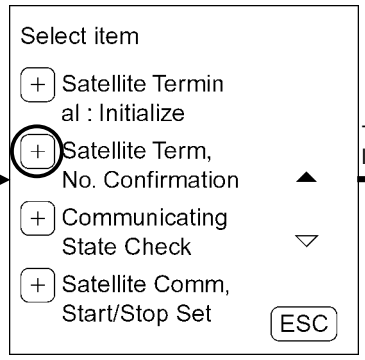
Push Information C/U: Various Setup.



T1V7-05-03-210

Main Menu Screen

Push ▼ and move to the next screen of Information C/U: Various Setup Screen. Push Satellite Terminal No. Confirmation.

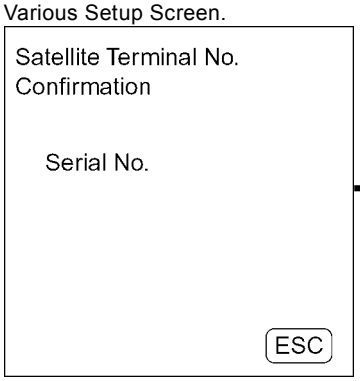


To the lower

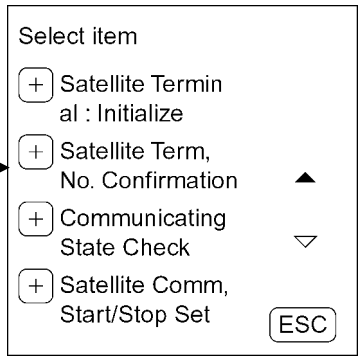
T1V7-05-03-035

Information C/U: Various Setup Screen

Confirm serial No. (12 digits). Push ESC and return to Information C/U: Various Setup Screen.



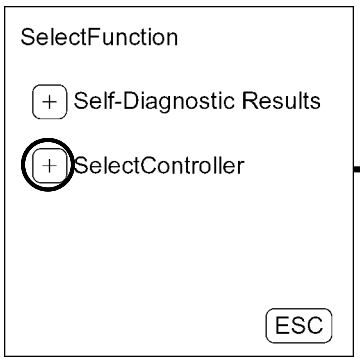
T1V7-05-03-037



T1V7-05-03-035

COMMUNICATING STATE CHECK

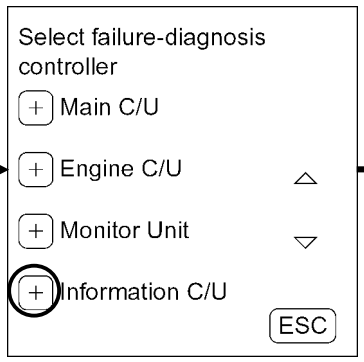
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

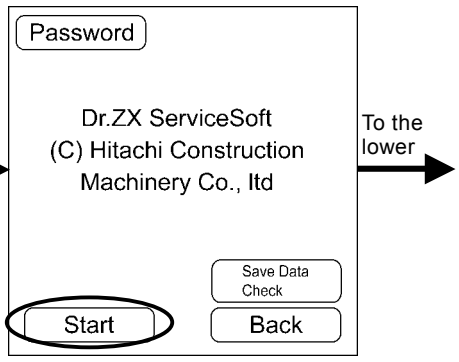
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

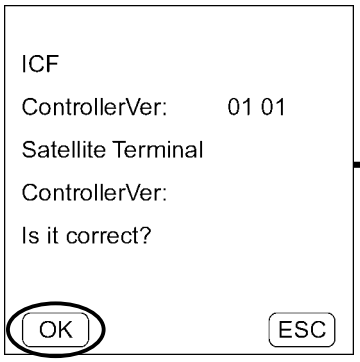
Push Start.



T1V7-05-03-209

Title Screen

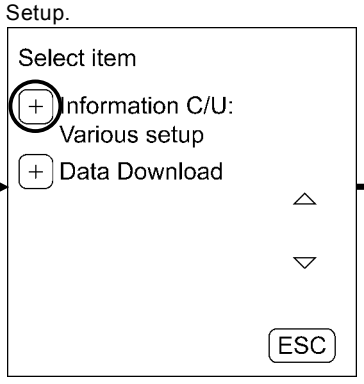
Push OK.



T1V7-05-03-024

ICF Controller Screen

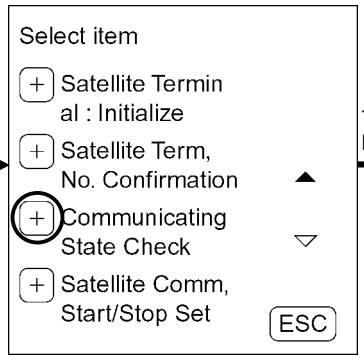
Push Information C/U: Various Setup.



T1V7-05-03-210

Main Menu Screen

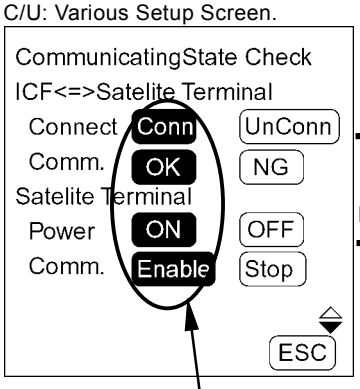
Push ▼ and move to the next screen of Information C/U: Various Setup Screen. Push Communicating State Check.



T1V7-05-03-035

Information C/U: Various Setup Screen

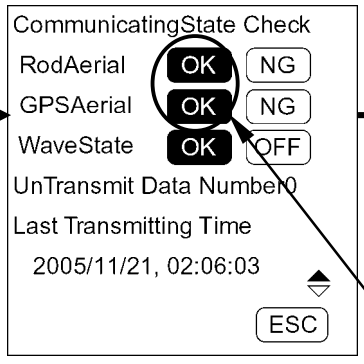
Check communicating state.
Unconn: Faulty harness
NG: Faulty harness for Comm.
OFF: Faulty harness, Faulty controller
Stop: Enter Satellite Comm. Start/Stop
Push ESC and return to Information C/U: Various Setup Screen.



T1V7-05-03-142

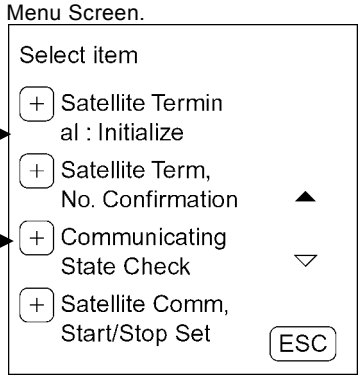
Check the enclosed state.

Push ▼ and move to the next screen. Check communicating state of Rod Aerial and GPS Aerial. Push ESC and return to Information C/U: Various Setup Screen.



T1V7-05-03-143

Push ESC and return to Main Menu Screen.



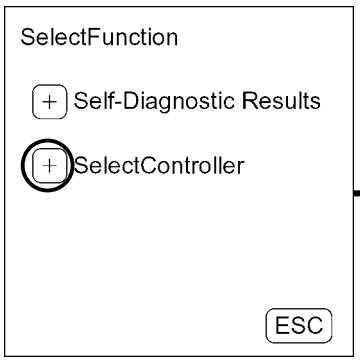
T1V7-05-03-035

When electrical wave of the satellite is caught, the items are turned into OK.

IMPORTANT: Check this with the key of machine ON in outdoor. According to state of electrical wave, it may take a little longer time.

ENTER SATELLITE COMM. START / STOP

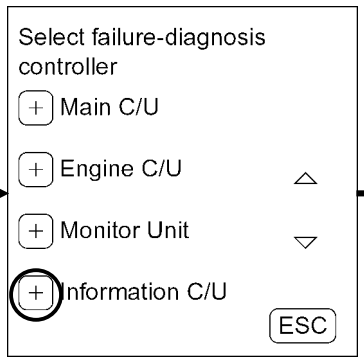
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

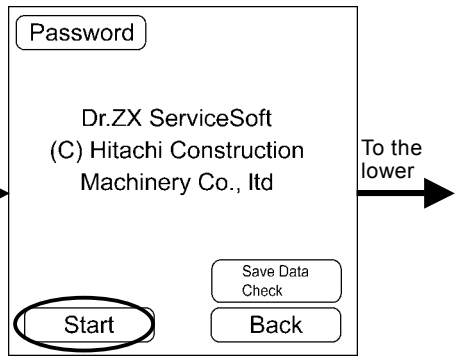
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

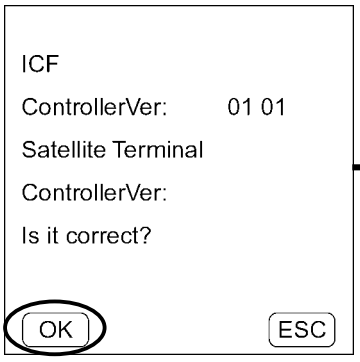
Push Start.



T1V7-05-03-209

Title Screen

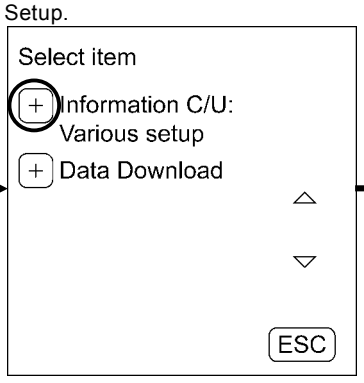
Push OK.



T1V7-05-03-024

ICF Controller Screen

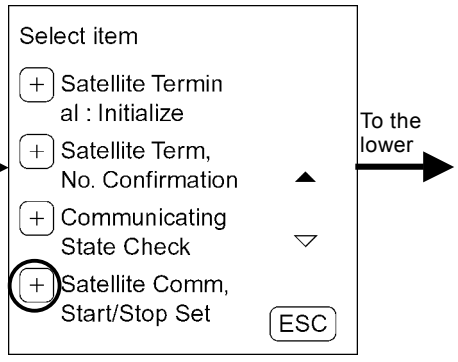
Push Information C/U: Various Setup.



T1V7-05-03-210

Main Menu Screen

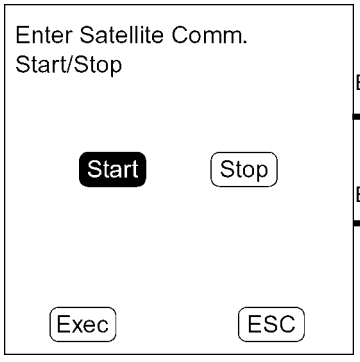
Push ▼ and move to the next screen of Information C/U: Various Setup Screen. Push Enter Satellite Comm. Start/Stop Set.



T1V7-05-03-035

Information C/U: Various Setup Screen

When starting Satellite Comm., push Start and push Exec. When stopping Satellite Comm., push Stop and push Exec.
Push ESC and return to Information C/U: Various Setup Screen.

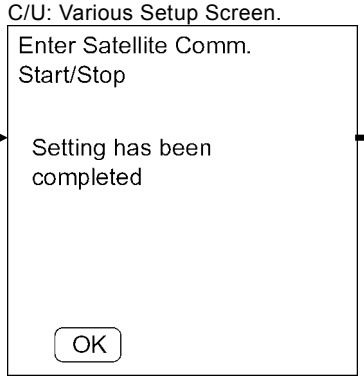


T1V7-05-03-146

Exec

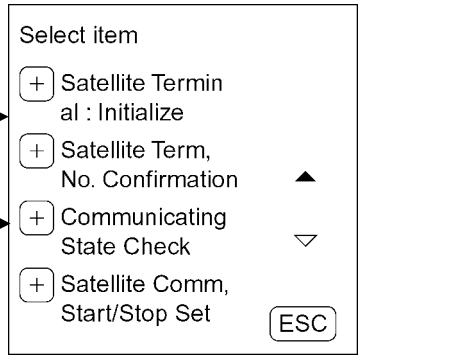
ESC

Push OK and return to Information C/U: Various Setup Screen.



T1V7-05-03-147

Push ESC and return to Main Menu Screen.

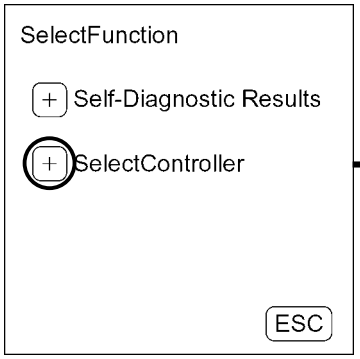


T1V7-05-03-035

Information C/U: Various Setup Screen

DATE DOWNLOAD

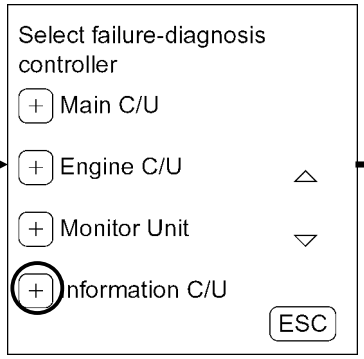
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

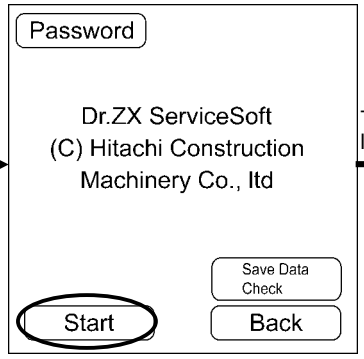
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

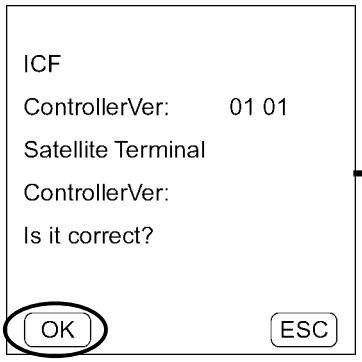
Push Start.



T1V7-05-03-209

Title Screen

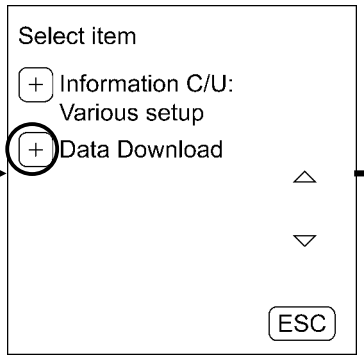
Push OK.



T1V7-05-03-024

ICF Controller Screen

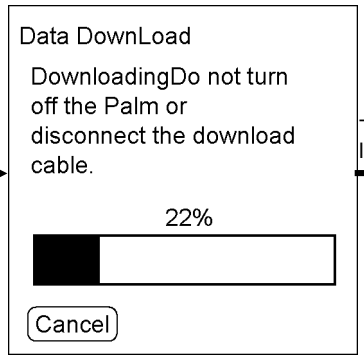
Push Data Download.



T1V7-05-03-210

Main Menu Screen

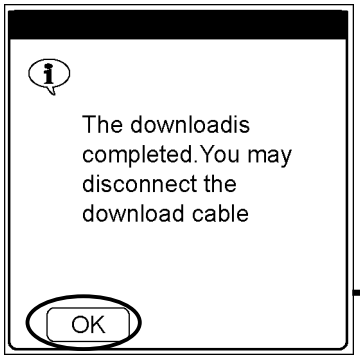
While downloading data, Download Screen is displayed.



T1V7-05-03-038

Data Download Screen

When downloading is completed normally, Normal End Screen is displayed. Push OK and return to Main Menu Screen.



T1V7-05-03-039

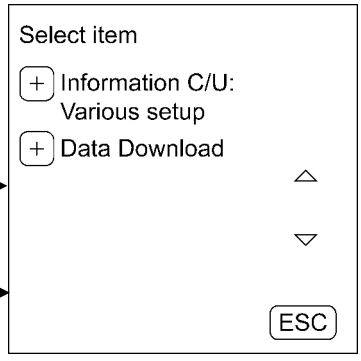
Normal End Screen

If pushing Cancel on Data Download Screen, Alarm Screen is displayed. Push OK and return to Main Menu Screen.

T1V7-05-03-148

Alarm Screen

Push ESC and return to Title Screen.

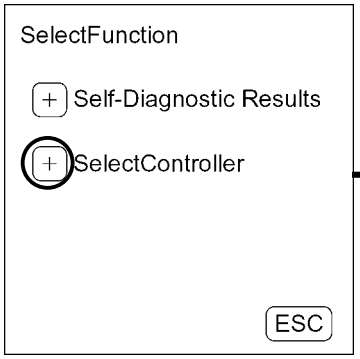


T1V7-05-03-210

Main Menu Screen

SAVE DATA CHECK

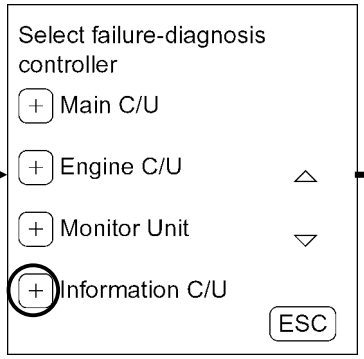
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

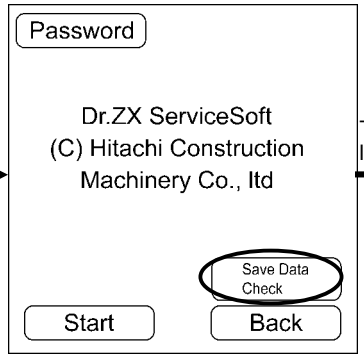
Push Information C/U.

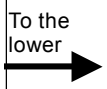


T1V7-05-03-009

Controller Selection Screen

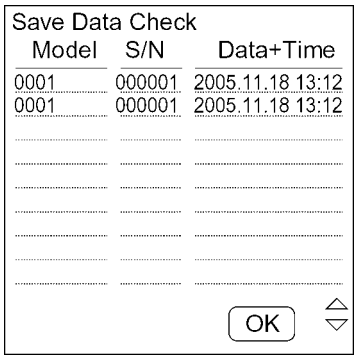
Push Save Data Check.





T1V7-05-03-209

Data saved in ICF is displayed.
Push OK and return to Main Menu Screen.

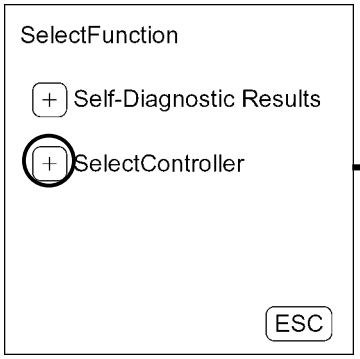


T1V7-05-03-040

Save Data Check Screen

PASSWORD CHANGE

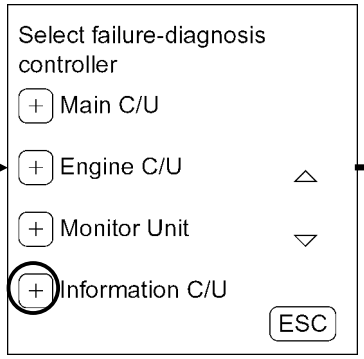
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

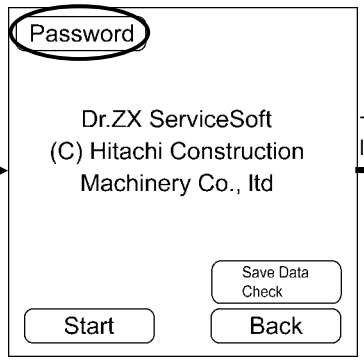
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push Password.

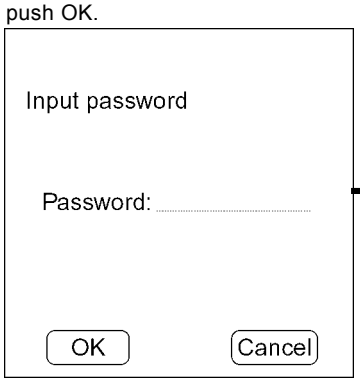


To the lower

T1V7-05-03-209

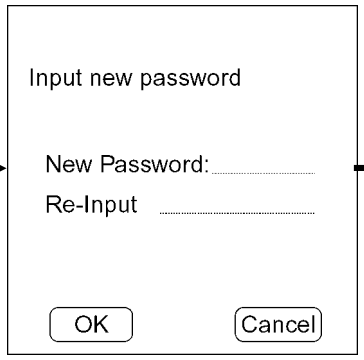
Title Screen

Input the registered password and push OK.



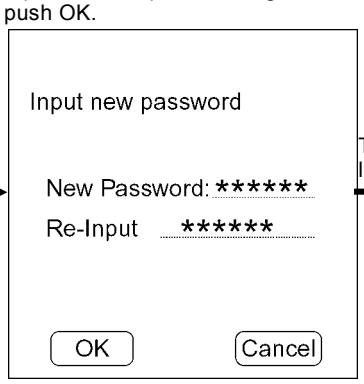
T1V7-05-03-126

Input the new password and push OK.



T1V7-05-03-127

Input the new password again and push OK.



To the lower

T1V7-05-03-169

Push OK and return to Title Screen.

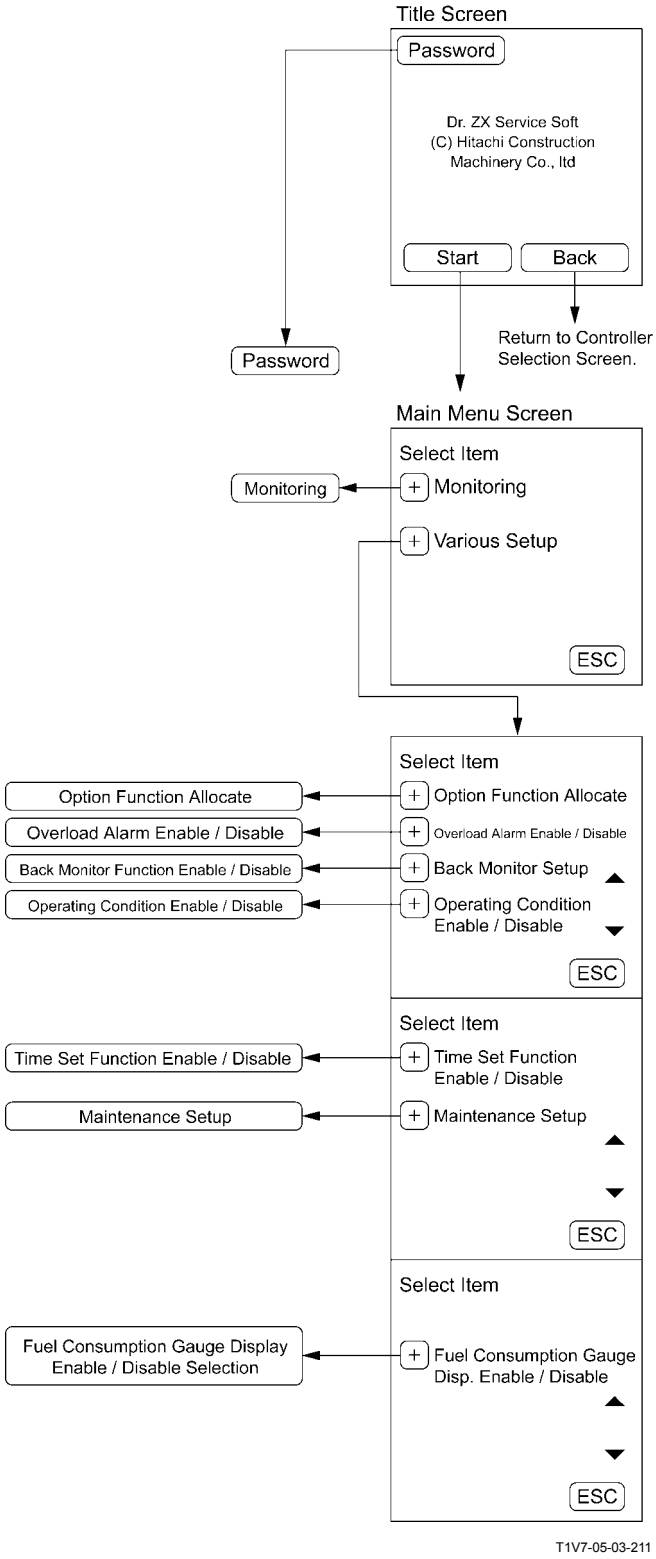
T1V7-05-03-128

MONITOR CONTROLLER

Main Menu

- Monitoring
  Dr. ZX displays the control signals of each controller and the input signals from each sensor.
- Various Settings
  Dr. ZX can set optional function setting, back monitor setting, operating condition enable/ disable, time set function enable / disable, maintenance setting, inner hour meter synchronization and fuel consumption gauge display ON/OFF selection.

Password Change
The password can be changed.



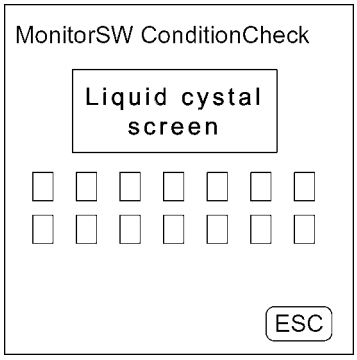
T1V7-05-03-211

MONITORING

List of Monitoring Item

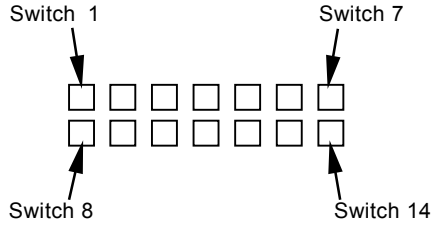
Item		Unit	Data
Selecting	Monitoring		
Monitor Switch Condition Check	*	**	Switch state of monitor unit
Radiator Coolant Temperature	Coolant Temperature	°C	Input signal from coolant temperature sensor
Fuel Level	Fuel Level	%	Input signal from fuel sensor
Security Signal	Security Signal	OFF, ON	Communication from monitor unit
Mail Switch	Mail Switch	OFF, Fuel, Forwarding, Repair, General	Operating state of mail

* Display when monitoring



T1V7-05-03-044

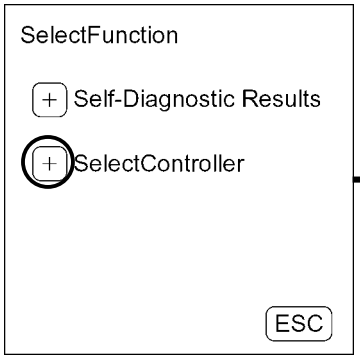
** Unit



Monitor Switch Condition Check

IMPORTANT: During Monitor Switch Condition Check, another monitoring item cannot be selected.

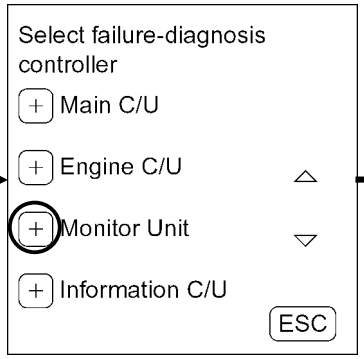
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

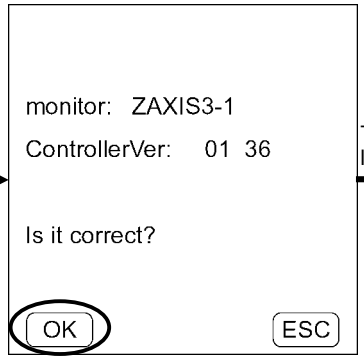
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1V7-05-03-041

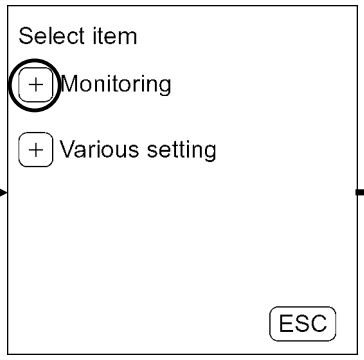
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

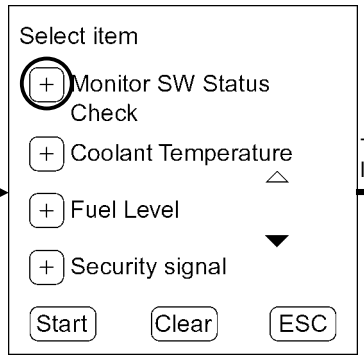
Push Monitoring.



T1V7-05-03-042

Main Menu Screen

Push item for monitoring and push OK.
Push ESC and return to Main Menu Screen.

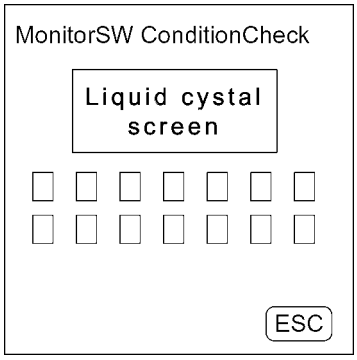


To the lower

T1V7-05-03-043

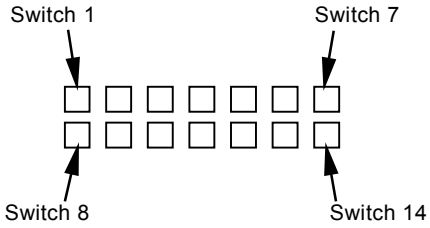
Monitor Item Selection Screen

Push ESC and return to Main Menu Screen.



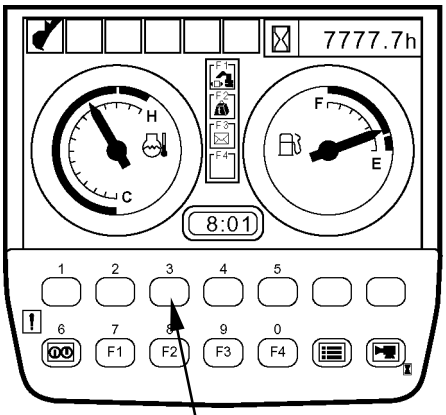
T1V7-05-03-044

Monitor Switch Condition Check Screen



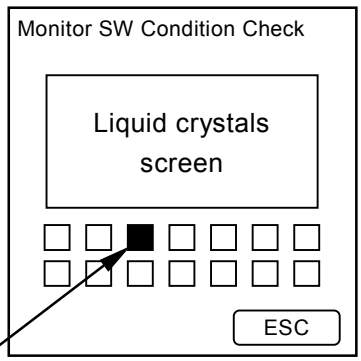
When the key on monitor unit is pushed, the switch on Monitor Switch Condition Check Screen related to the key is turned into black. (Key 3 is pushed here.)
If the switch is not turned into black, check the monitor unit and the CAN harness.

Monitor Unit



Push key 3.

T1V1-05-01-123

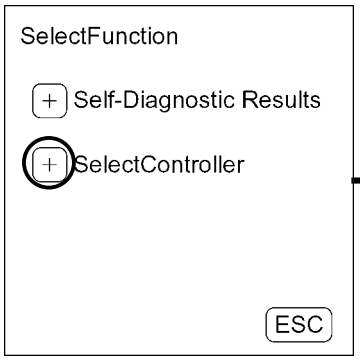


Monitor Switch Condition Check Screen

Switch 3 is turned into black.

Other Monitoring

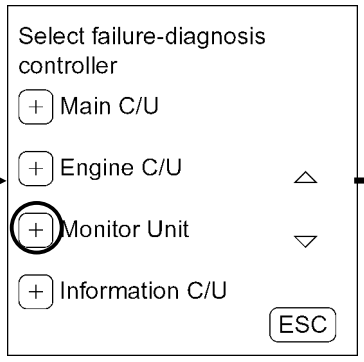
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

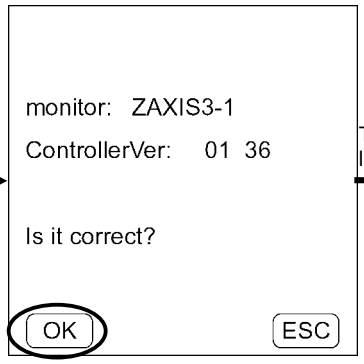
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1V7-05-03-041

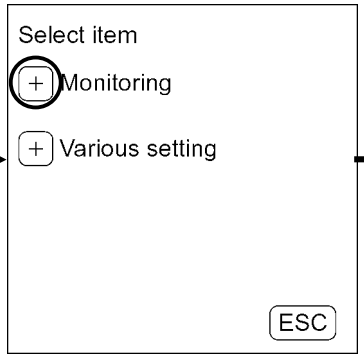
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

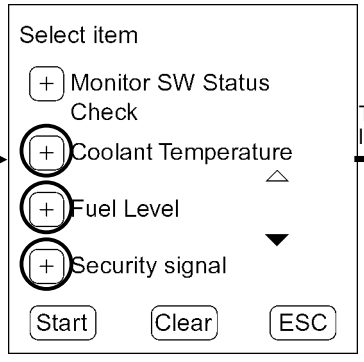
Push Monitoring.



T1V7-05-03-042

Main Menu Screen

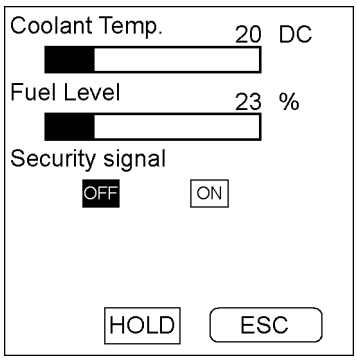
Push item for monitoring and push OK. Refer to T5-3-87 as for the monitoring item.
Push ESC and return to Main Menu Screen.



T1V7-05-03-043

Monitoring Item Selection Screen

When pushing Hold, the monitor is stopped temporarily.
When re-starting the monitor, push Hold again. Push ESC and return to Monitoring Item Selection Screen.



T1V7-05-03-045

Monitoring Screen

VARIOUS SETTINGS

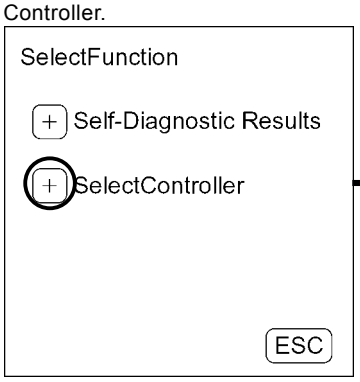
List of Various Setup Item

Item		Unit
Optional Function	M1 (Optional Function 1 Allocate)	
	M2 (Optional Function 2 Allocate)	Unset
	M3 (Optional Function 3 Allocate)	Work Mode Function
	M4 (Optional Function 4 Allocate)	Mail Function
	M5 (Optional Function 5 Allocate)	Auto Lubrication Function
	M6 (Optional Function 6 Allocate)	Collision Prevention Function
	M7 (Optional Function 7 Allocate)	
	M8 (Optional Function 8 Allocate)	
	M9 (Optional Function 9 Allocate)	
Overload Alarm Enable / Disable		Disable/Enable
Back Monitor Setup	Back Monitor Function Enable/Disable	Disable/Enable
	Back Monitor Display Normal/Flip Vertical	Flip Vertical/Normal
Operating Condition Enable / Disable		Disable/Enable
Time Set Function Enable / Disable		Disable/Enable
Maintenance Setup	Maintenance Function Enable / Disable	Disable/Enable
	Notification Function Enable / Disable	Disable/Enable
	Maintenance Display Item ON/OFF	
	Engine Oil	OFF/ON
	Engine Oil Filter	OFF/ON
	Hydraulic Oil	OFF/ON
	Hydraulic Oil Pilot Filter	OFF/ON
	Hydraulic Oil Full-Flow Filter	OFF/ON
	Pump Transmission	OFF/ON
	Swing Bearing Grease	OFF/ON
	Travel Device Oil	OFF/ON
	Swing Device Oil	OFF/ON
	Air Cleaner Filter	OFF/ON
	Engine/Air Conditioner V-belt	OFF/ON
	Air Conditioner Filter	OFF/ON
	Fuel Filter	OFF/ON
Fuel Consumption Gauge Display ON/OFF Selection		Disable/Enable

OPTIONAL FUNCTION ALLOCATION

Example: Allocate E-mail for Menu 7

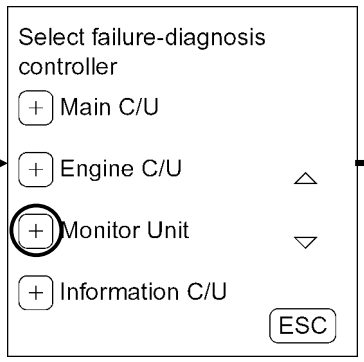
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

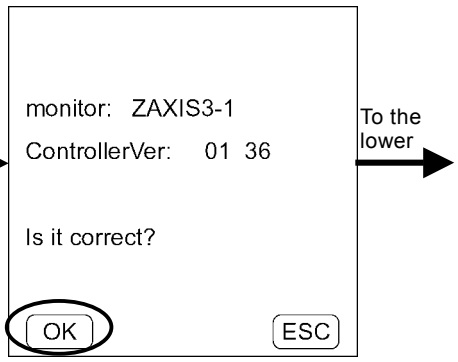
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1V7-05-03-041

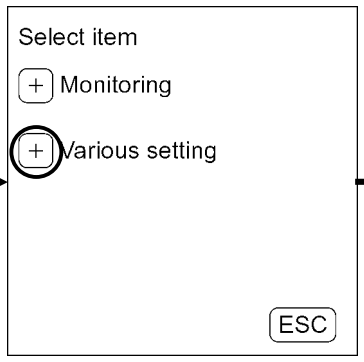
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

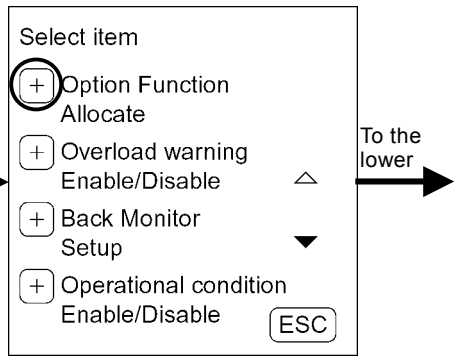
Push Various Setting.



T1V7-05-03-042

Main Menu Screen

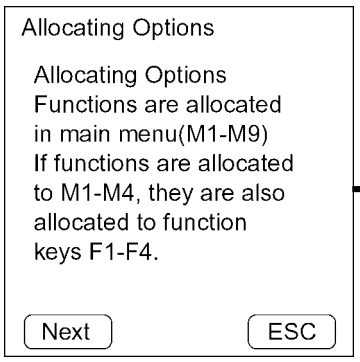
Push Option Function Allocate.



T1V7-05-03-046

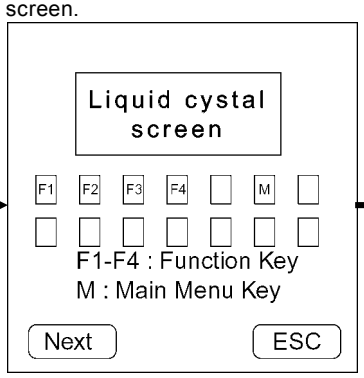
Various Setup Item Screen

Push Next.
Push ESC and return to Main Menu Screen.



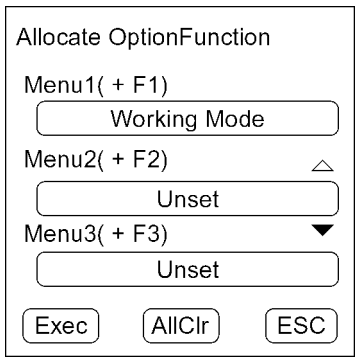
T1V7-05-03-047

Push Next.
Push Back and return to the former screen.



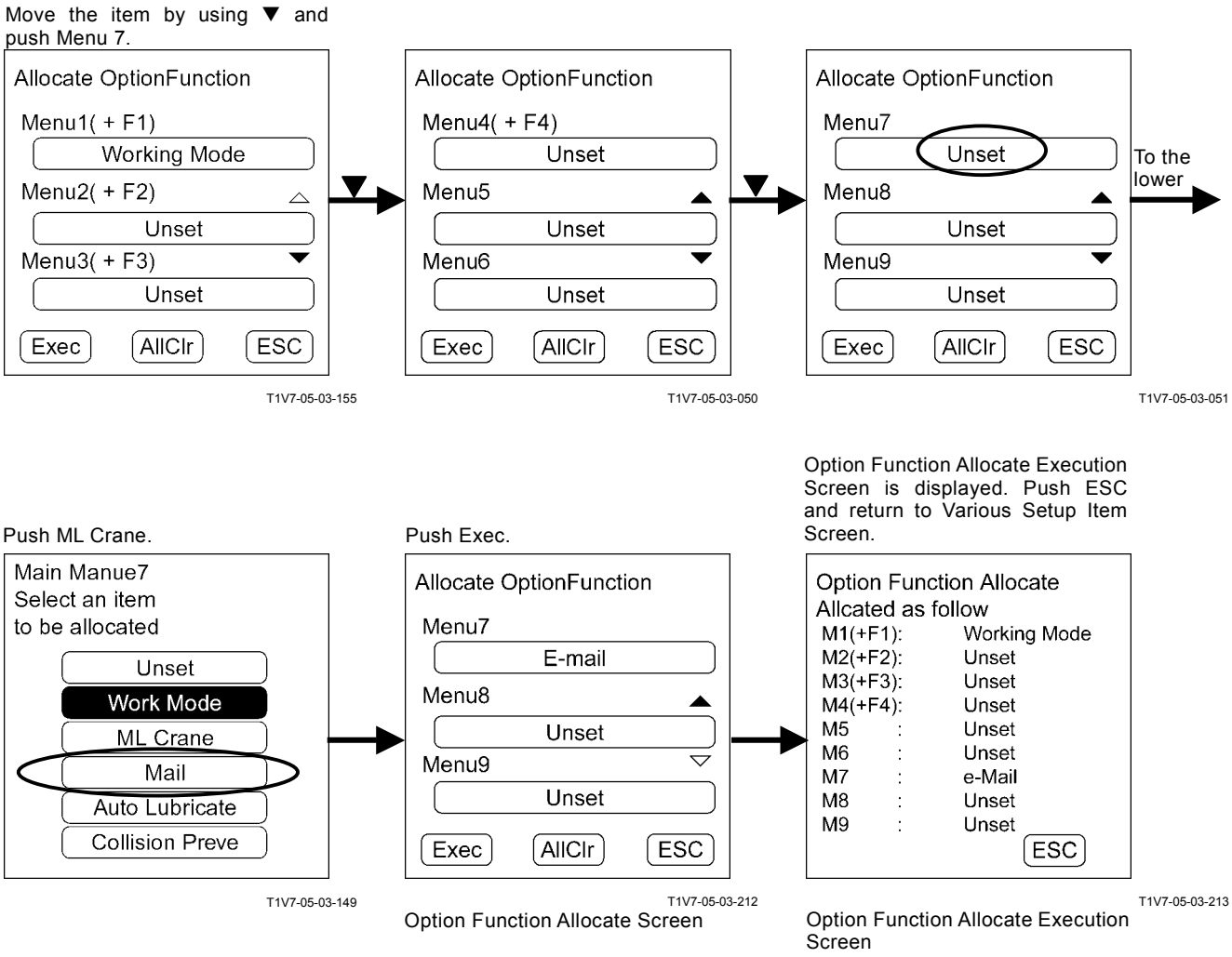
T1V7-05-03-048

Execusion: Refer to the next page.
All Clear: Unset all settings of menus 1 to 9.
ESC: Return to Various Setting Screen.



T1V7-05-03-155

Option Function Allocate Screen



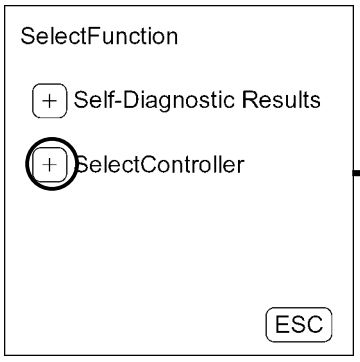
Function that can be selected: Unset
Work Mode
ML Crane
Collision Prevention
Auto Lubrication
Mail

If the functions that can be selected are too much to be settled in one page, the next page can be displayed by using a page change button.

IMPORTANT: The function that has already been allocated cannot be selected.

Allocate Mail for Menu 3

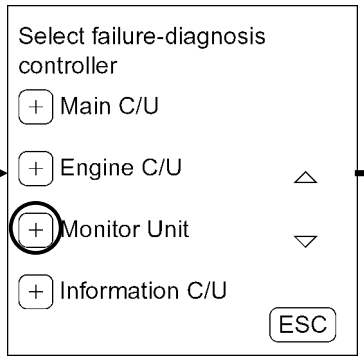
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

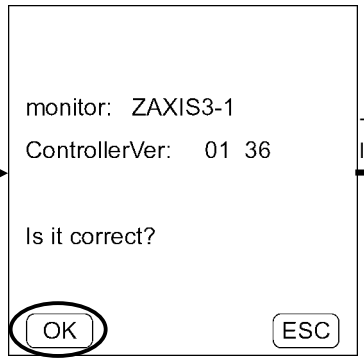
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1V7-05-03-041

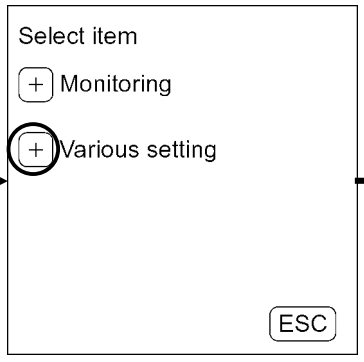
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

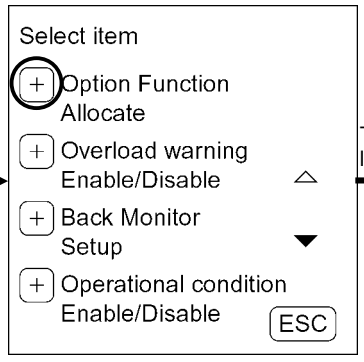
Push Various Setup.



T1V7-05-03-042

Main Menu Screen

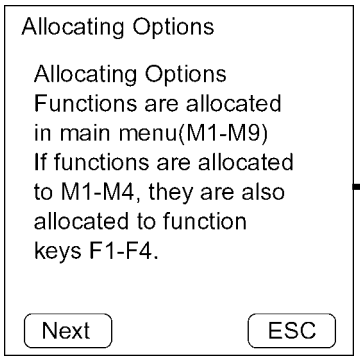
Push Option Function Allocate.



T1V7-05-03-046

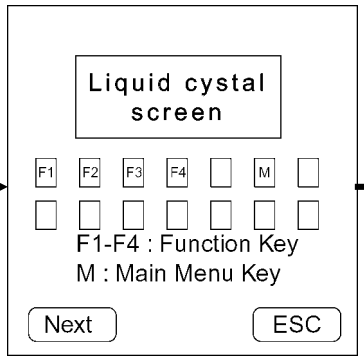
Various Setup Item Screen

Push Next.
Push ESC and return to Main Menu Screen.

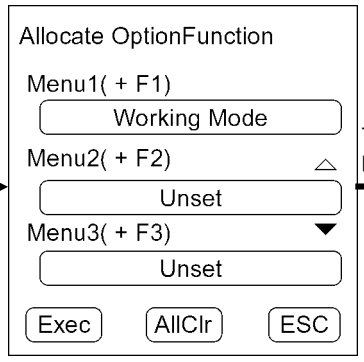


T1V7-05-03-047

Push Next.
Push Back and return to the former screen.

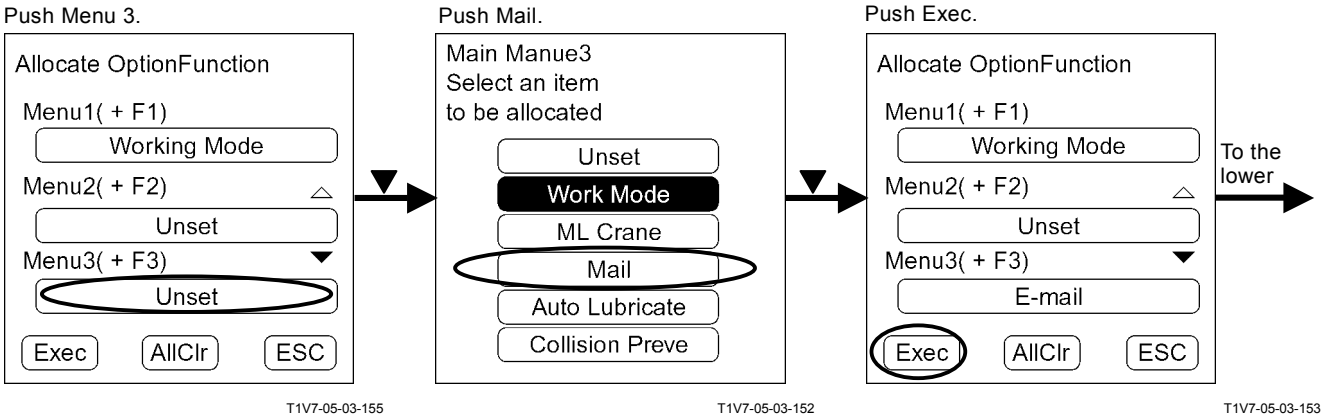


T1V7-05-03-048



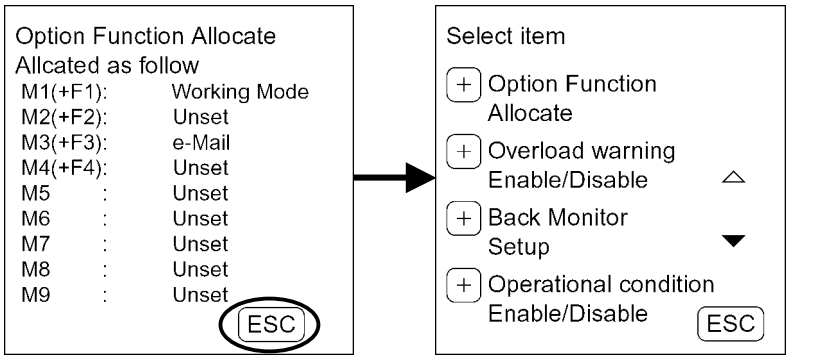
T1V7-05-03-155

Option Function Allocate Screen



Option Function Allocate Screen

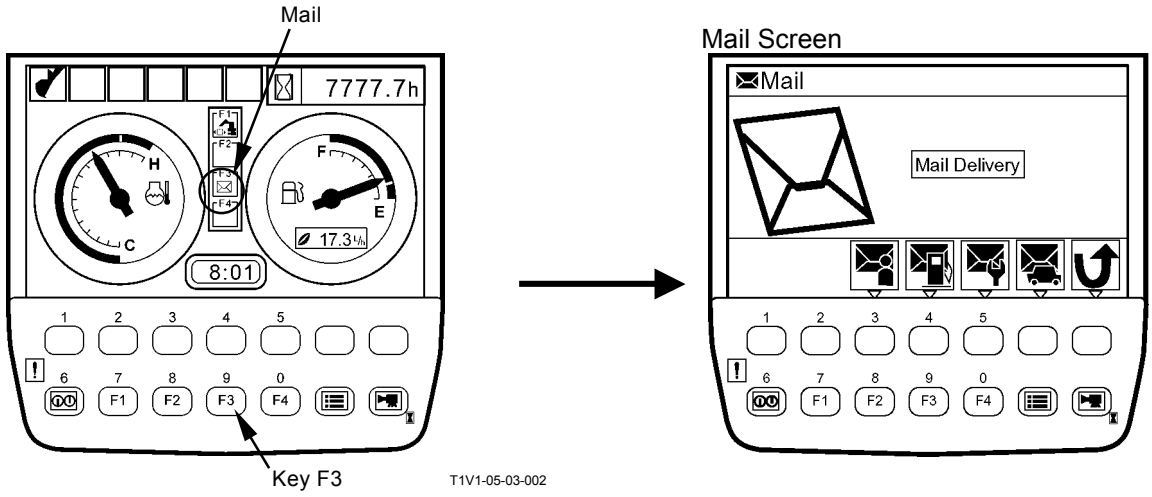
Option Function Allocate Execution Screen is displayed. Push ESC and return to Various Setup Item Screen.



Option Function Allocate Execution Screen

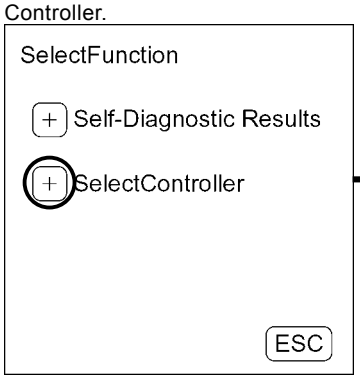
Various Setup Item Screen

Mail is displayed on the monitor unit screen.
When pushing key F3, Mail Screen is displayed.



Make ML Crane for Menu 2 Disable

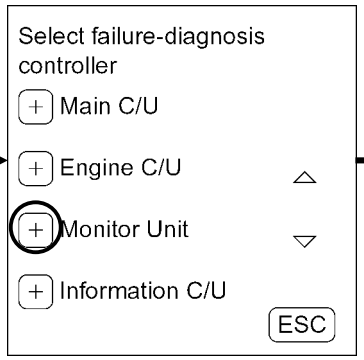
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

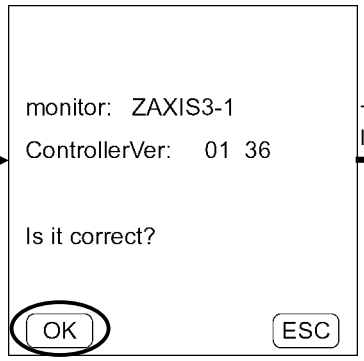
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.

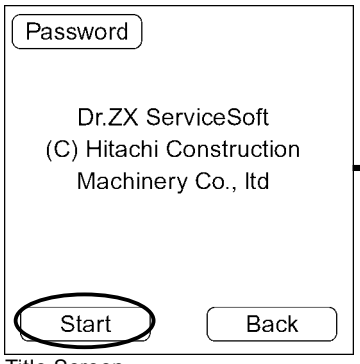


T1V7-05-03-041

Monitor Controller Screen

To the lower

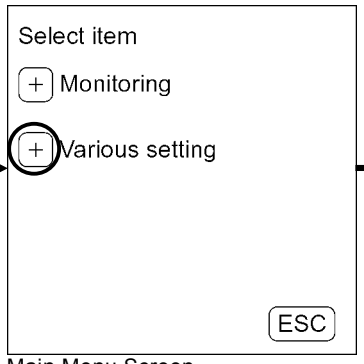
Push Start.



Title Screen

T1V7-05-03-025

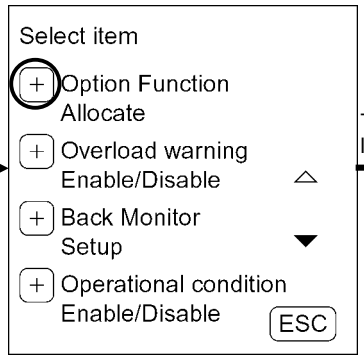
Push Various Setting.



Main Menu Screen

T1V7-05-03-042

Push Option Function Allocate.

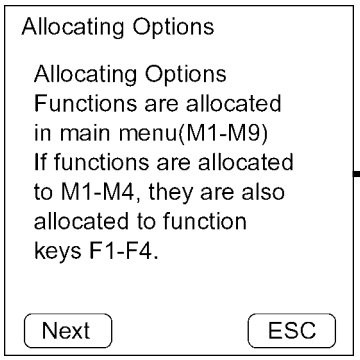


Various Setup Item Screen

T1V7-05-03-046

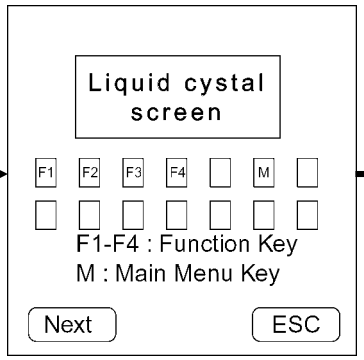
To the lower

Push Next.
Push ESC and return to Main Menu Screen.

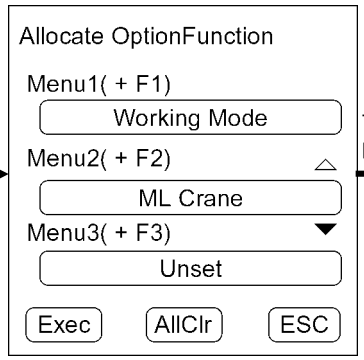


T1V7-05-03-047

Push Next.
Push Back and return to the former screen.



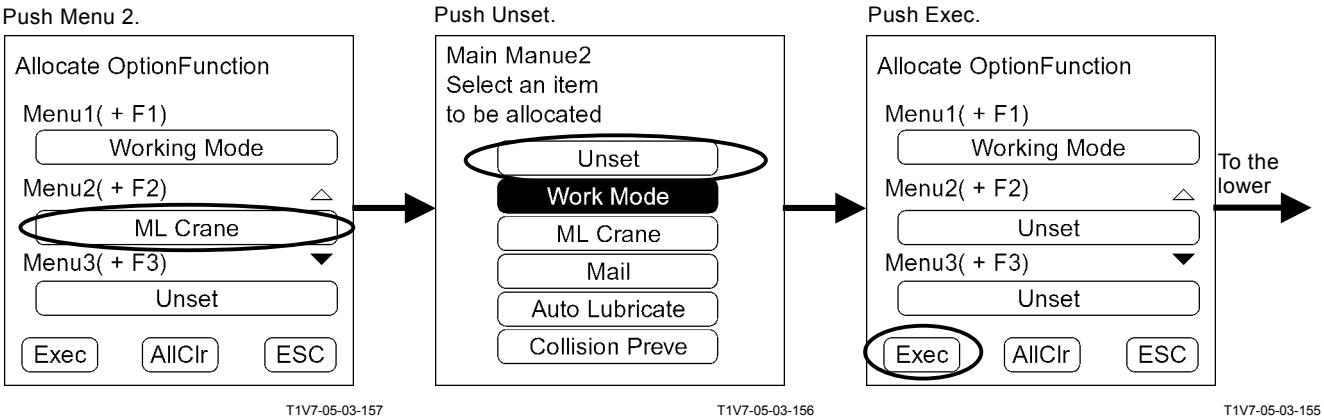
T1V7-05-03-048



T1V7-05-03-157

Option Function Allocate Screen

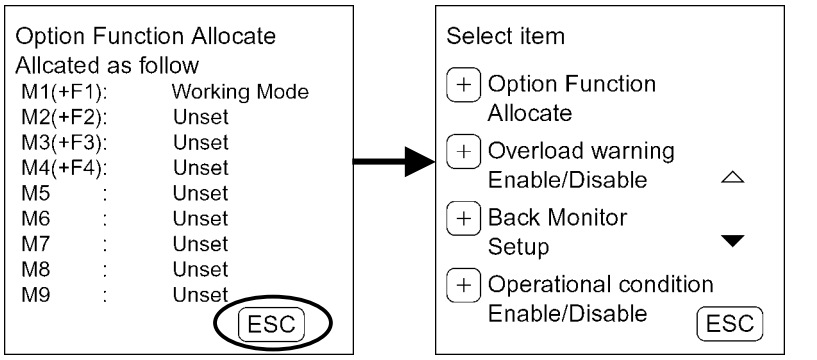
To the next page



Option Function Allocate Screen

Option Function Allocate Screen

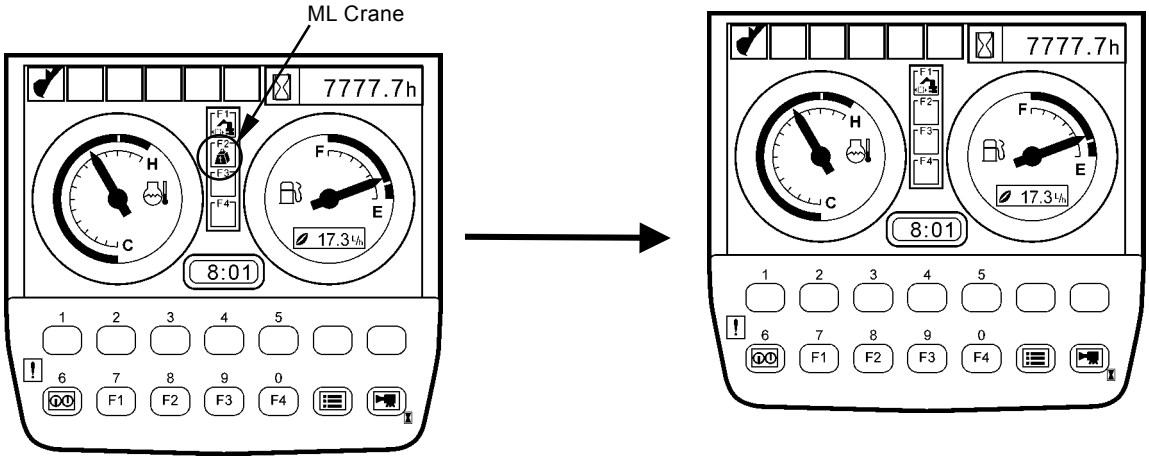
Option Function Allocate Execution Screen is displayed. Push ESC and return to Various Setup Item Screen.



Option Function Allocate Execution Screen

Various Setup Item Screen

ML Crane is disappeared on the monitor unit screen.

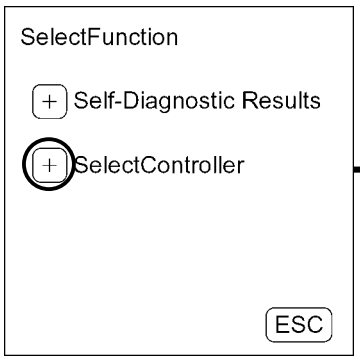


OVERLOAD ALARM ENABLE / DISABLE SELECTION

IMPORTANT: In case ML Crane is set to any one of Menu 1 to 9 of Option Function Allocate, make ML Crane disable.

Overload Alarm: Enable

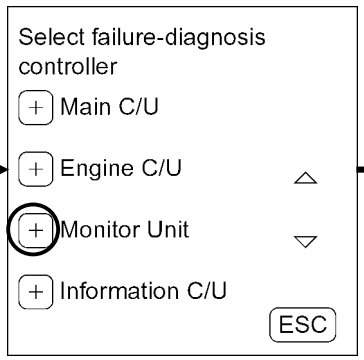
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

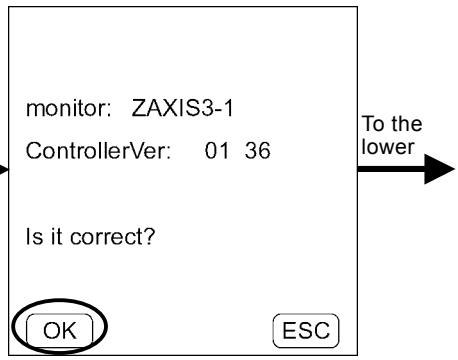
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1V7-05-03-041

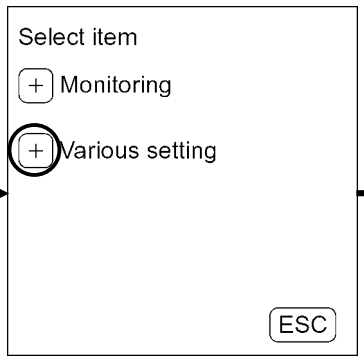
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

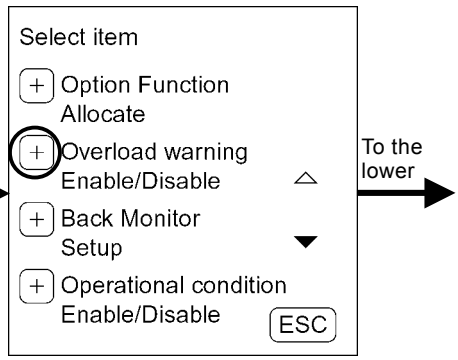
Push Various setting.



T1V7-05-03-042

Main Menu Screen

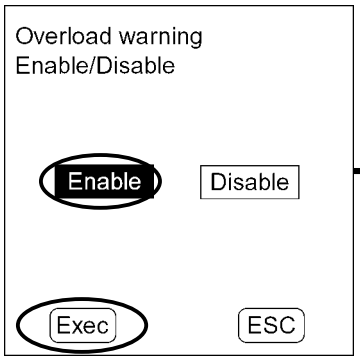
Push Overload warnig Enable/ Disable.



T1V7-05-03-046

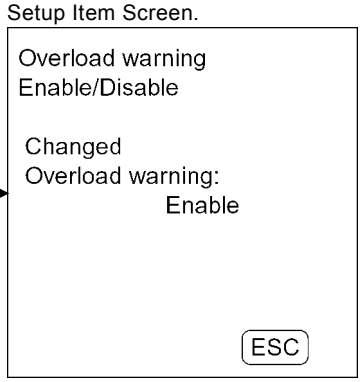
Various Setup Item Screen

Push Enable and push Exec. Push ESC and return to the former screen.



T1V7-05-03-161

Push ESC and return to Various Setup Item Screen.

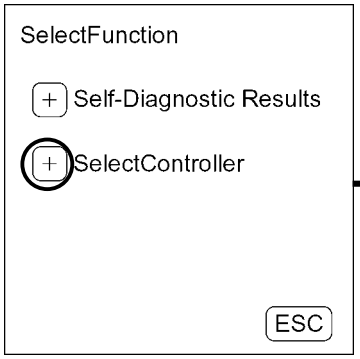


T1V7-05-03-162

NOTE: Push Enable, push ESC and return to Various Setup Item Screen, so that Overload Alarm Enable is not set.

Overload Alarm: Disable

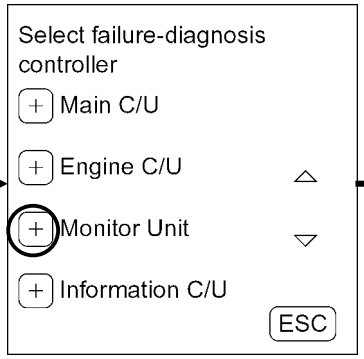
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

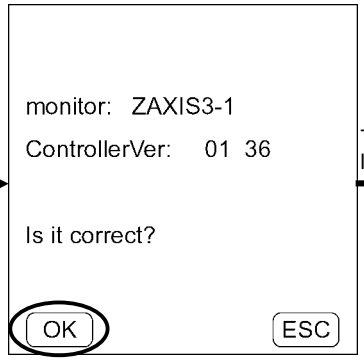
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1V7-05-03-041

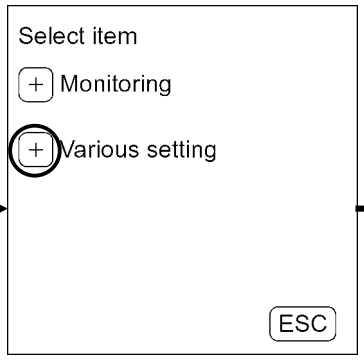
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

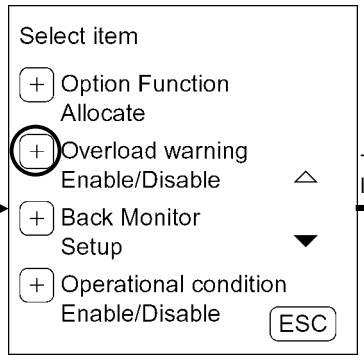
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Push Overload warnig Enable/ Disable.

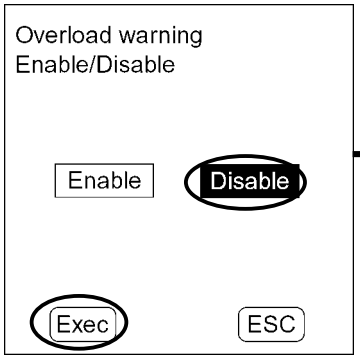


To the lower

T1V7-05-03-046

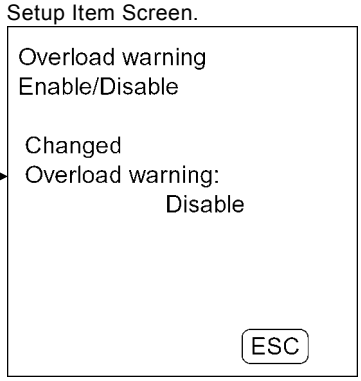
Various Setup Item Screen

Push Disable and push Exec. Push ESC and return to the former screen.



T1V7-05-03-163

Push ESC and return to Various Setup Item Screen.



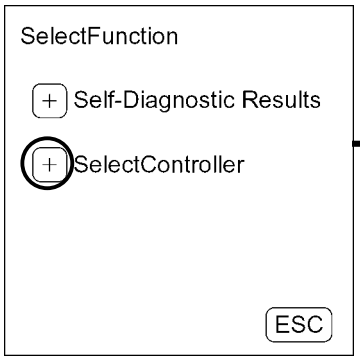
T1V7-05-03-164

NOTE: Push Disable, push ESC and return to Various Setup Item Screen, so that Overload Alarm Disable is not set

BACK MONITOR SETTING

Back Monitor Function: Enable

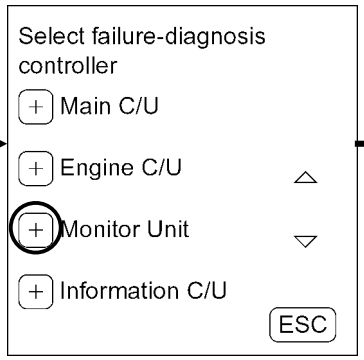
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

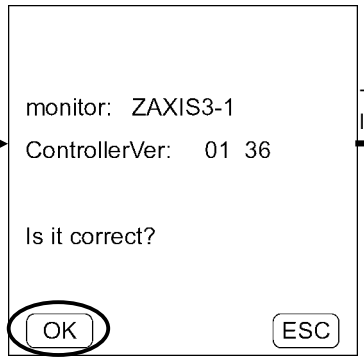
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

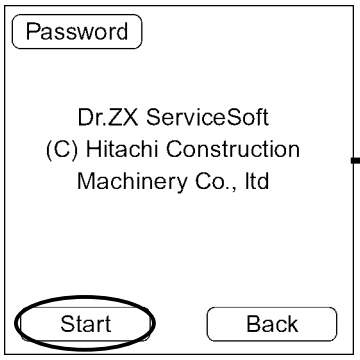
Push OK.



T1V7-05-03-041

Monitor Controller Screen

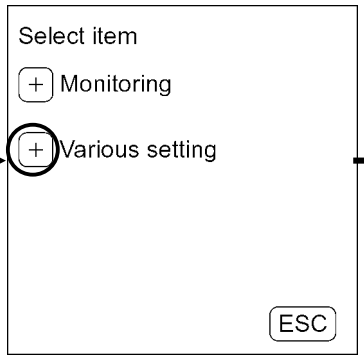
Push Start.



T1V7-05-03-025

Title Screen

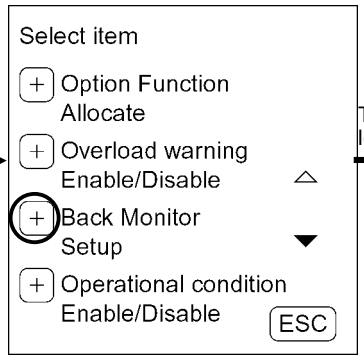
Push Various setting.



T1V7-05-03-042

Main Menu Screen

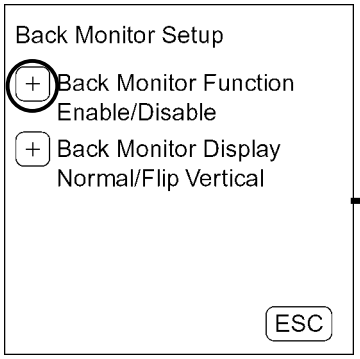
Push Back Monitor Setup.



T1V7-05-03-046

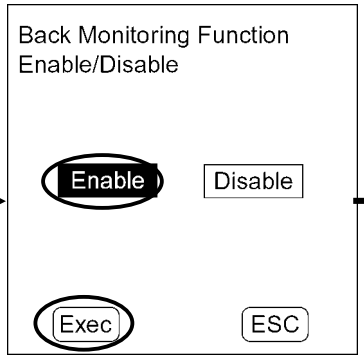
Various Setup Item Screen

Push Back Monitor Function Enable / Disable. Push ESC and return to the former screen.



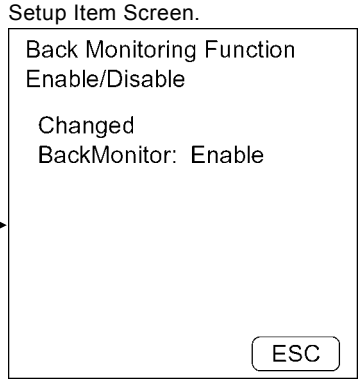
T1V7-05-03-052

Push Enable and push Exec. Push ESC and return to Various Setup Item Screen.



T1V7-05-03-053

Push ESC and return to Various Setup Item Screen.

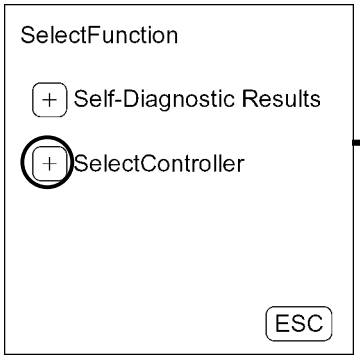


T1V7-05-03-054

NOTE: Push Enable, push ESC and return to Various Setup Item Screen, so that Back Monitor Function Enable is not set.

Back Monitor Function: Disable

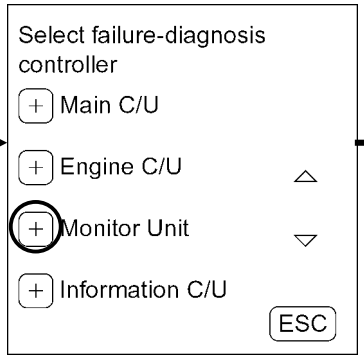
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

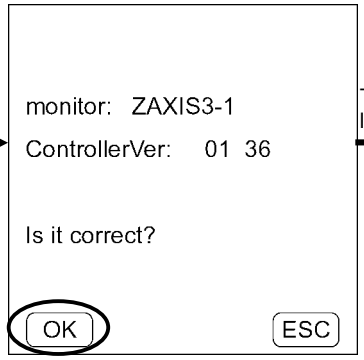
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1V7-05-03-041

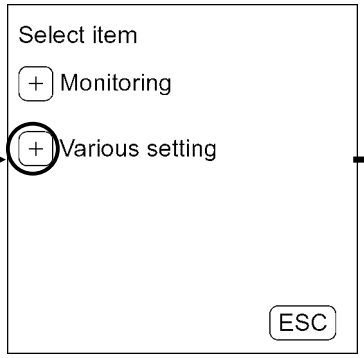
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

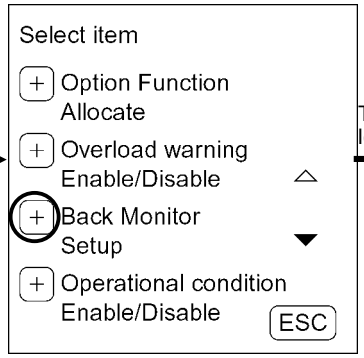
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Push Back Monitor Setup.

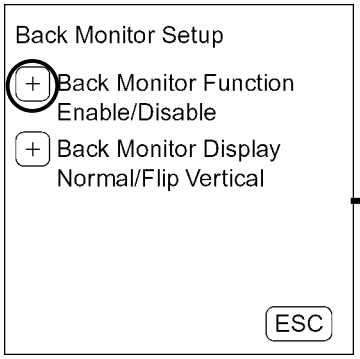


To the lower

T1V7-05-03-046

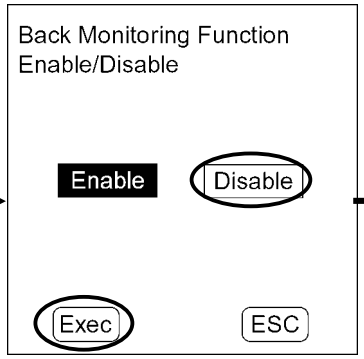
Various Setup Item Screen

Push Back Monitor Function Enable / Disable. Push ESC and return to the former screen.



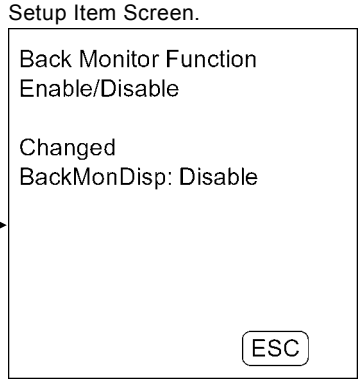
T1V7-05-03-052

Push Disable and push Exec. Push ESC and return to Various Setup Item Screen.



T1V7-05-03-053

Push ESC and return to Various Setup Item Screen.

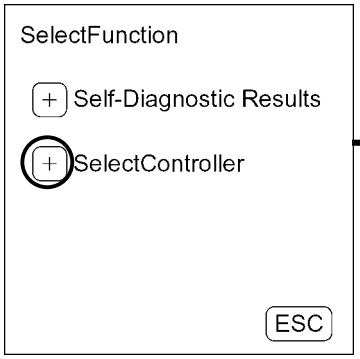


T1V7-05-03-057

NOTE: Push Disable, push ESC and return to Various Setup Item Screen, so that Back Monitor Function Disable is not set.

Back Monitor Function: Normal

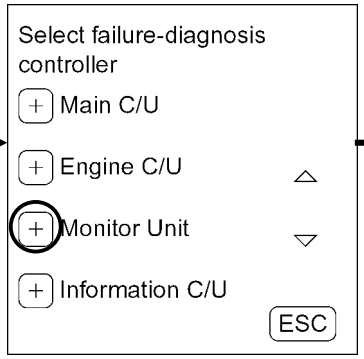
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

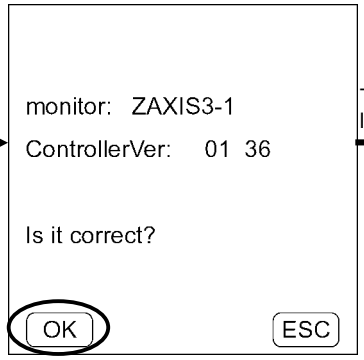
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1V7-05-03-041

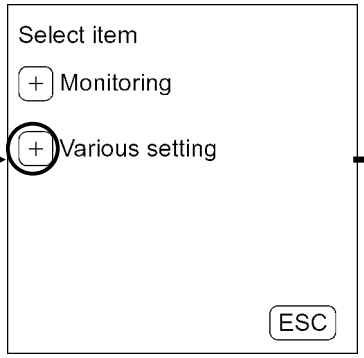
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

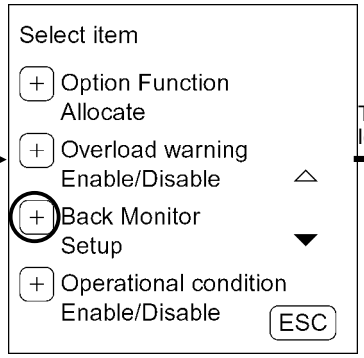
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Push Back Monitor Setup.

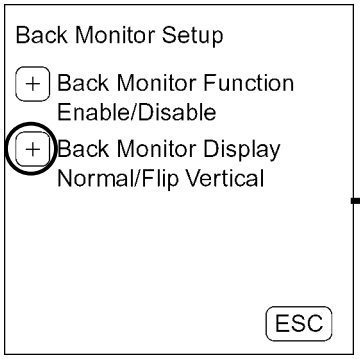


To the lower

T1V7-05-03-046

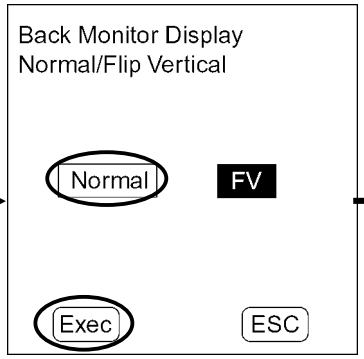
Various Setup Item Screen

Push Back Monitor Display Normal / Filip Vartical. Push ESC and return to the former screen.



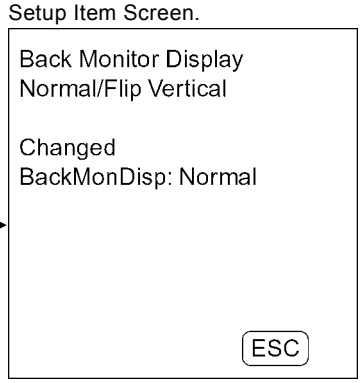
T1V7-05-03-052

Push Normal and push Exec. Push ESC and return to Various Setup Item Screen.



T1V7-05-03-055

Push ESC and return to Various Setup Item Screen.

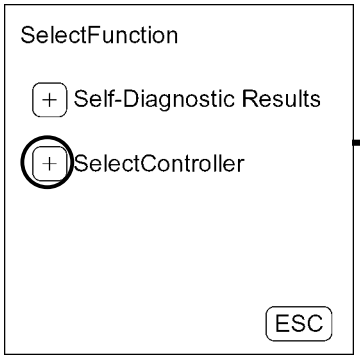


T1V7-05-03-058

NOTE: Push Normal, push ESC and return to Various Setup Item Screen, so that Back Monitor Display Normal is not set.

Back Monitor Display: Flip Vertical

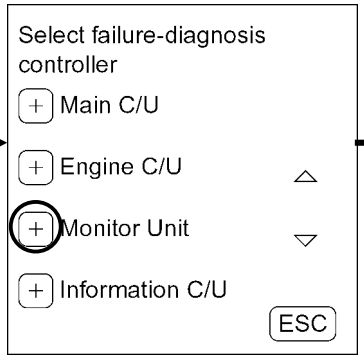
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

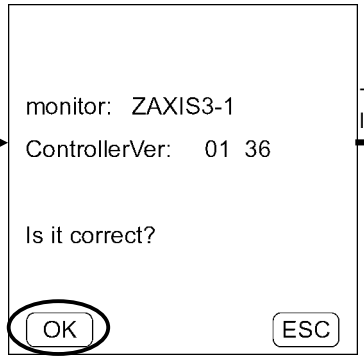
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1V7-05-03-041

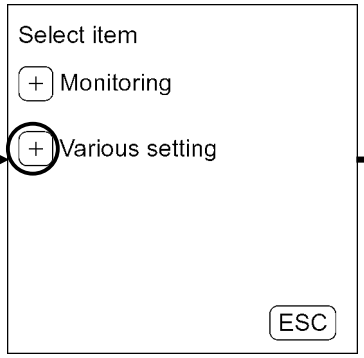
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

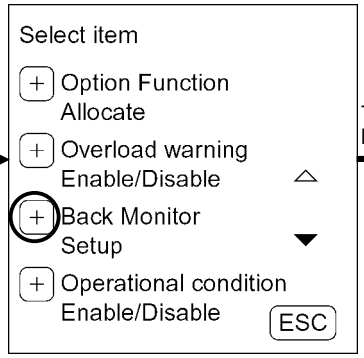
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Push Back Monitor Setup.

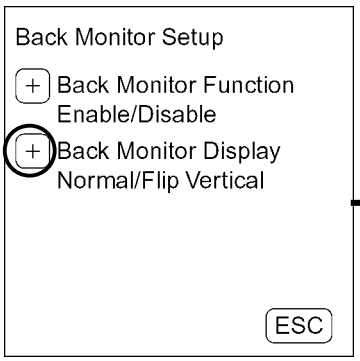


To the lower

T1V7-05-03-046

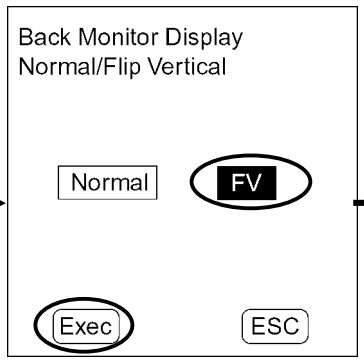
Various Setup Item Screen

Push Back Monitor Display Normal/Flip Vartical. Push ESC and return to the former screen.



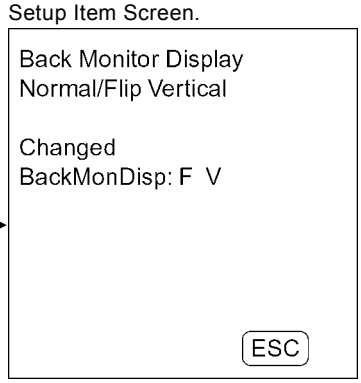
T1V7-05-03-052

Push FV and push Exec. Push ESC and return to Various Setup Item Screen.



T1V7-05-03-055

Push ESC and return to Various Setup Item Screen.



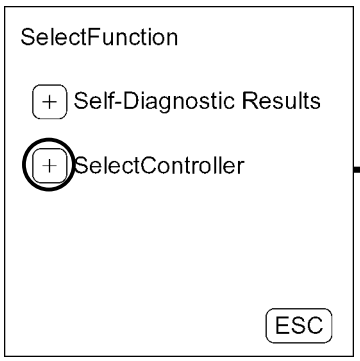
T1V7-05-03-056

NOTE: Push FV, push ESC and return to Various Setup Item Screen, so that Back Monitor Display Flip Vertical is not set.

OPERATING CONDITION ENABLE / DISABLE SELECTION

Operating Condition: Enable

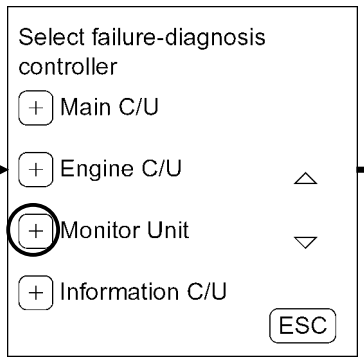
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

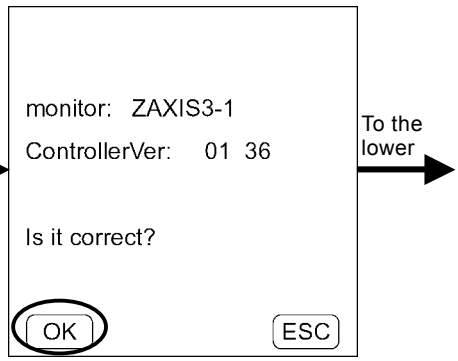
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1V7-05-03-041

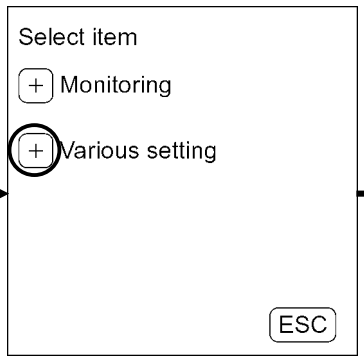
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

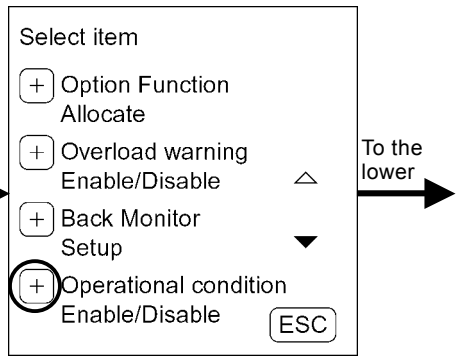
Push Various setting.



T1V7-05-03-042

Main Menu Screen

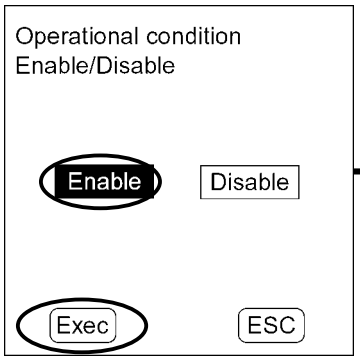
Push Operational condition Enable/ Disable.



T1V7-05-03-046

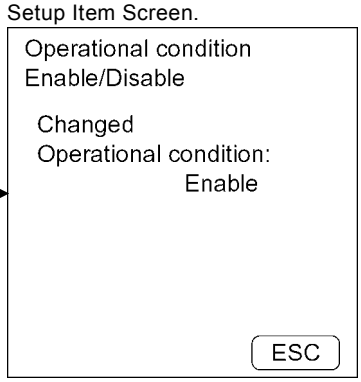
Various Setup Item Screen

Push Enable and push Exec. Push ESC and return to the former screen.



T1V7-05-03-059

Push ESC and return to Various Setup Item Screen.

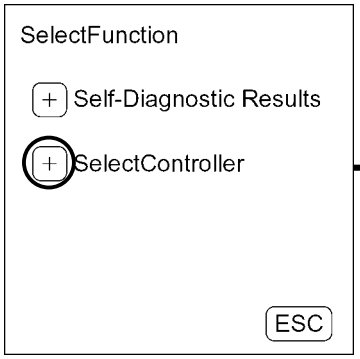


T1V7-05-03-060

NOTE: Push Enable, push ESC and return to Various Setup Item Screen, so that Operating Condition Enable is not set.

Operating Condition: Disable

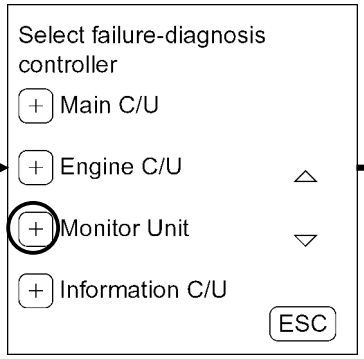
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

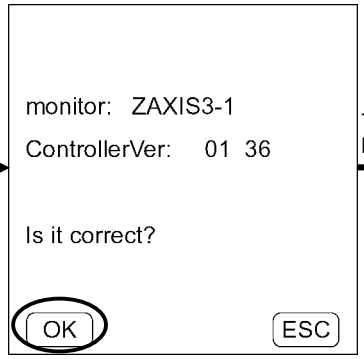
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1V7-05-03-041

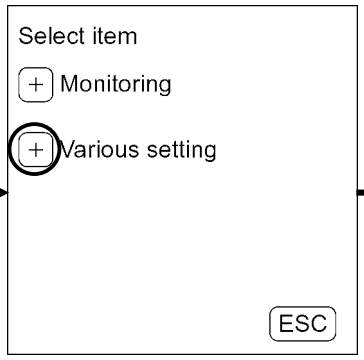
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

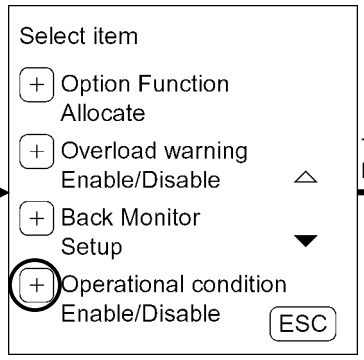
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Push Operational condition Enable/ Disable.

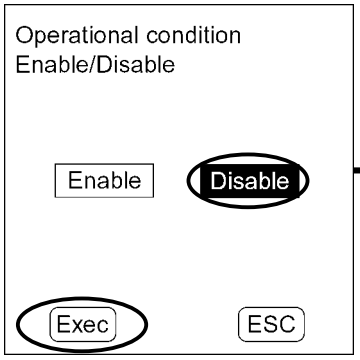


To the lower

T1V7-05-03-046

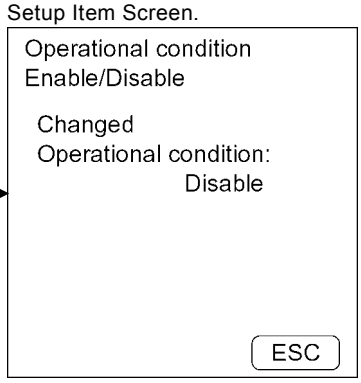
Various Setup Item Screen

Push Disable and push Exec. Push ESC and return to the former screen.



T1V7-05-03-061

Push ESC and return to Various Setup Item Screen.



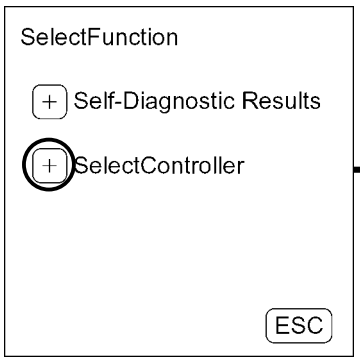
T1V7-05-03-062

NOTE: Push Disable, push ESC and return to Various Setup Item Screen, so that Operating Condition Disable is not set.

TIME SETTING FUNCTION ENABLE / DISABLE SELECTION

Time Setting Function: Enable

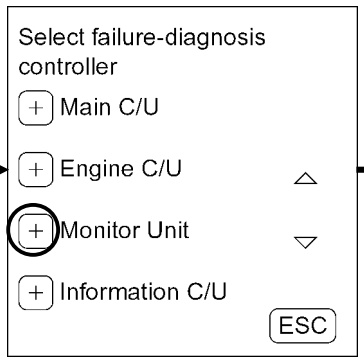
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

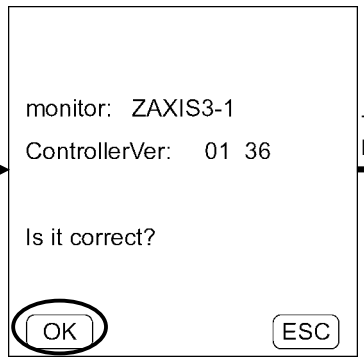
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1V7-05-03-041

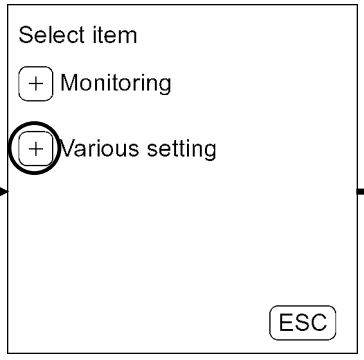
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

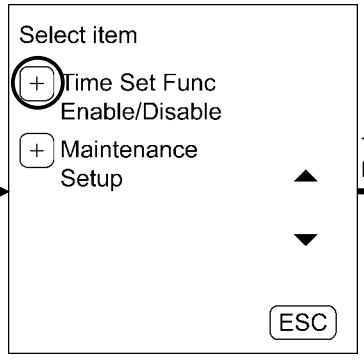
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Move the item by using ▼ and push Time Set Func Enable/Disable.

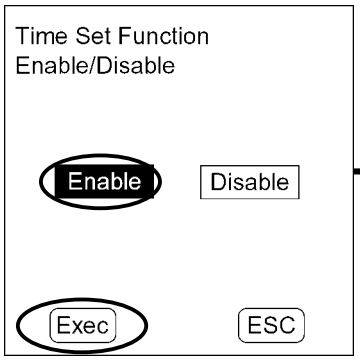


To the lower

T1V7-05-03-214

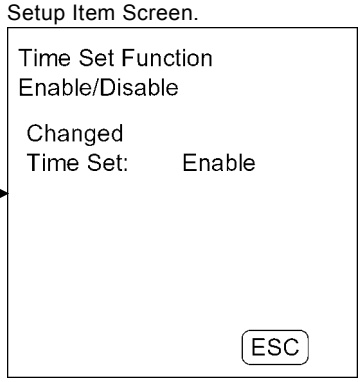
Various Setup Item Screen

Push Enable and push Exec. Push ESC and return to the former screen.



T1V7-05-03-064

Push ESC and return to Various Setup Item Screen.

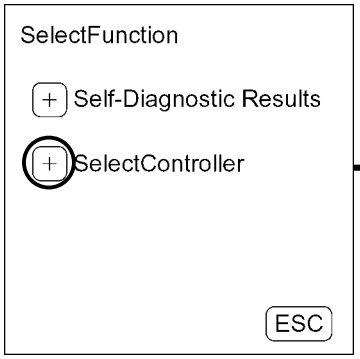


T1V7-05-03-066

NOTE: Push Enable, push ESC and return to Various Setup Item Screen, so that Time Set Function Enable is not set.

Time Setting Function: Disable

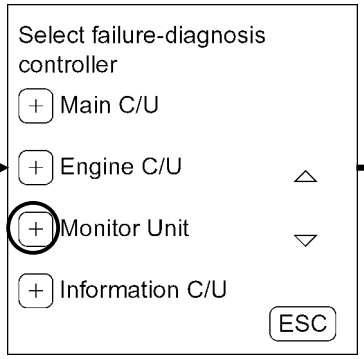
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

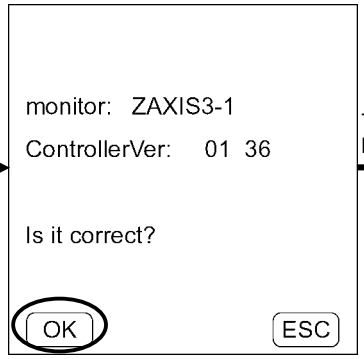
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1V7-05-03-041

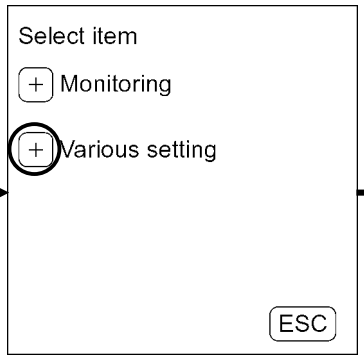
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

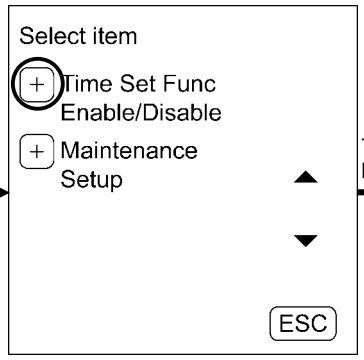
Push Various setting.



T1V7-05-03-042

Main Menu Screen

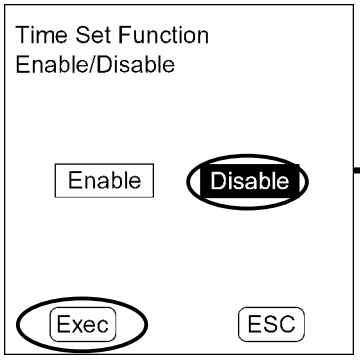
Move the item by using ▼ and push Time Set Func Enable/Disable.



T1V7-05-03-214

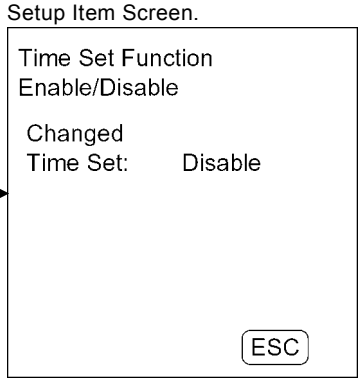
Various Setup Item Screen

Push Disable and push Exec. Push ESC and return to the former screen.



T1V7-05-03-067

Push ESC and return to Various Setup Item Screen.



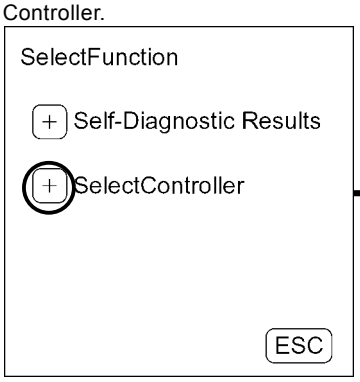
T1V7-05-03-068

NOTE: Push Disable, push ESC and return to Various Setup Item Screen, so that Time Set Function Disable is not set

MAINTENANCE SETTING MAINTENANCE OPERATION ALLOW / NOT ALLOW SELECTION

Maintenance Operation: Allow

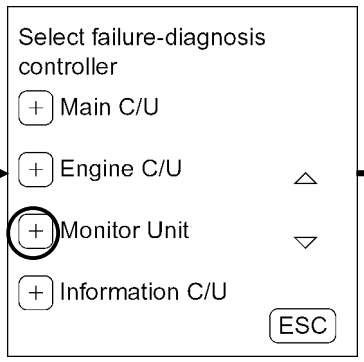
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

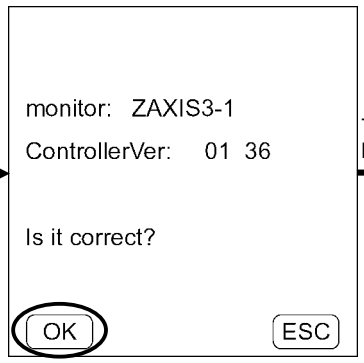
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1V7-05-03-041

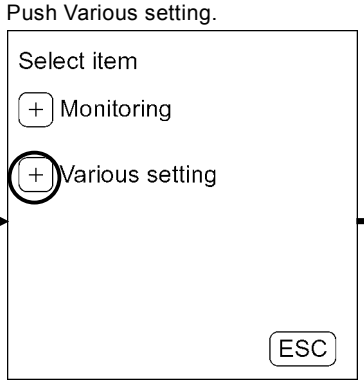
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

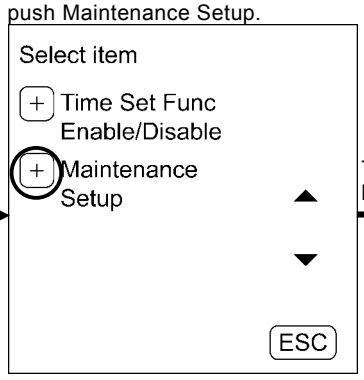
Push Various setting.



T1V7-05-03-042

Main Menu Screen

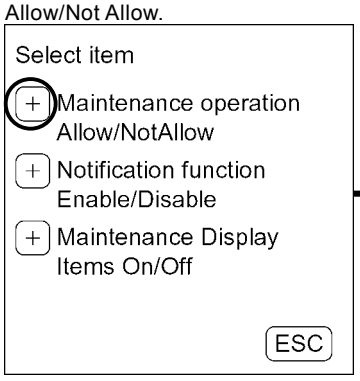
Move the item by using ▼ and push Maintenance Setup.



T1V7-05-03-214

Various Setup Item Screen

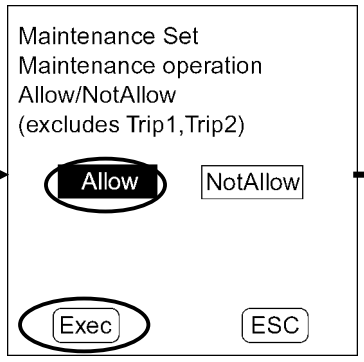
Push Maintenance operation Allow/Not Allow.



T1V7-05-03-069

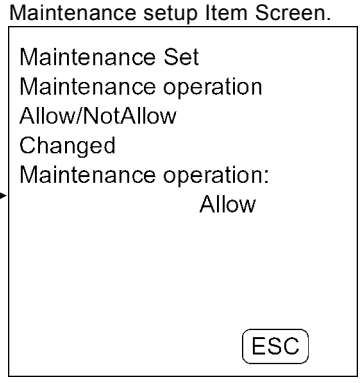
Maintenance Setup Item Screen

Push Allow and push Exec. Push ESC and return to the former screen.



T1V7-05-03-070

Push ESC and return to Maintenance setup Item Screen.

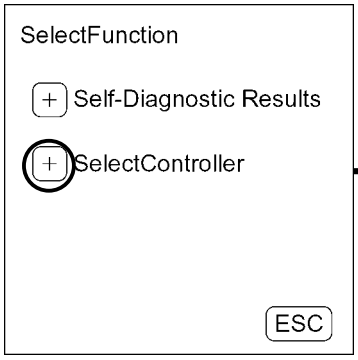


T1V7-05-03-071

NOTE: Push Allow, push ESC and return to Maintenance Setup Item Screen, so that Maintenance Operation Allow is not set.

Maintenance Operation: Not Allow

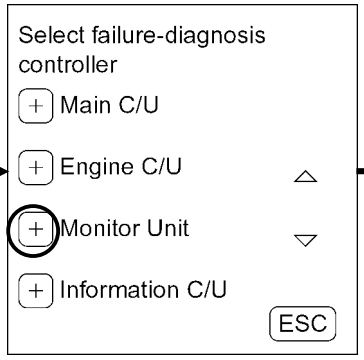
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

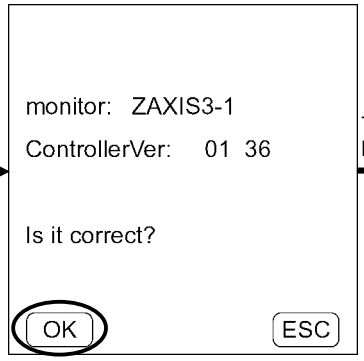
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1V7-05-03-041

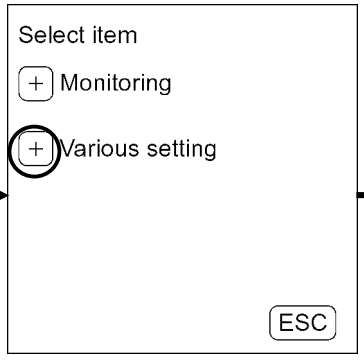
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

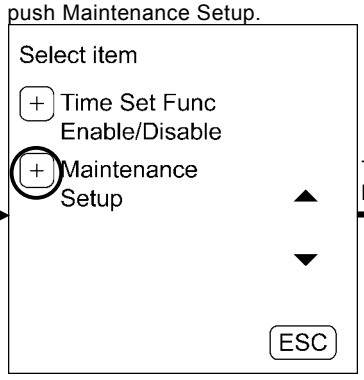
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Move the item by using ▼ and push Maintenance Setup.

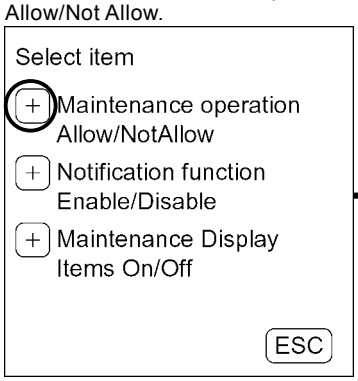


To the lower

T1V7-05-03-214

Various Setup Item Screen

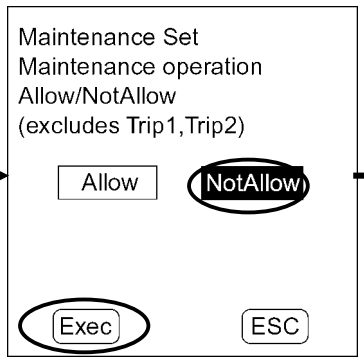
Push Maintenance operation Allow/Not Allow.



T1V7-05-03-069

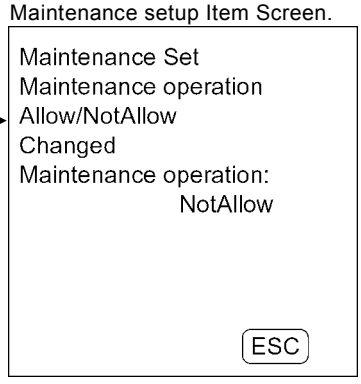
Maintenance Setup Item Screen

Push Not Allow and push Exec. Push ESC and return to the former screen.



T1V7-05-03-072

Push ESC and return to Maintenance setup Item Screen.



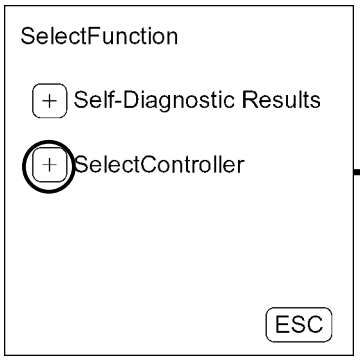
T1V7-05-03-073

NOTE: Push Not Allow, push ESC and return to Maintenance Setup Item Screen, so that Maintenance Operation Not Allow is not set.

NOTIFICATION FUNCTION ENABLE / DISABLE SELECTION

Notification Function: Enable

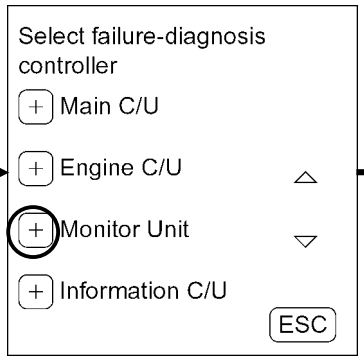
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

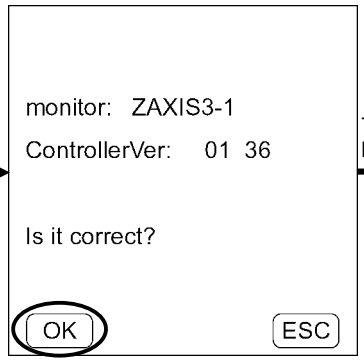
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1V7-05-03-041

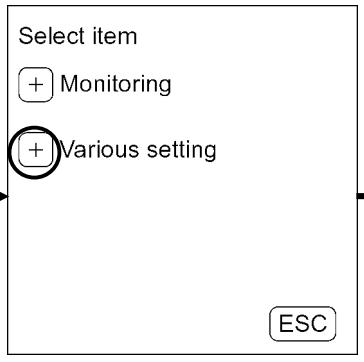
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

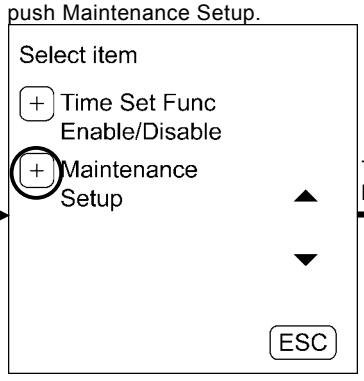
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Move the item by using ▼ and push Maintenance Setup.

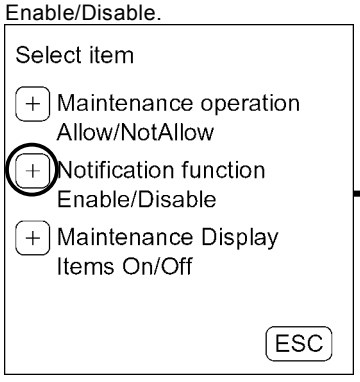


To the lower

T1V7-05-03-214

Various Setup Item Screen

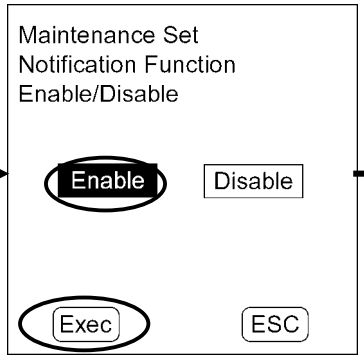
Push Notification function Enable/Disable.



T1V7-05-03-069

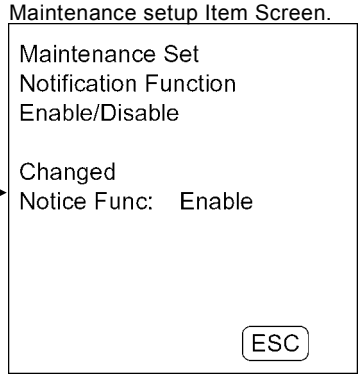
Maintenance Setup Item Screen

Push Enable and push Exec. Push ESC and return to the former screen



T1V7-05-03-074

Push ESC and return to Maintenance setup Item Screen.

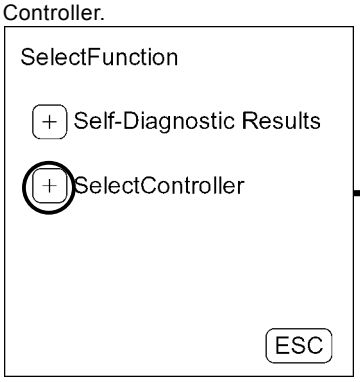


T1V7-05-03-075

NOTE: Push Enable, push ESC and return to Maintenance Setup Item Screen, so that Notification Function Enable is not set.

Notification Function: Disable

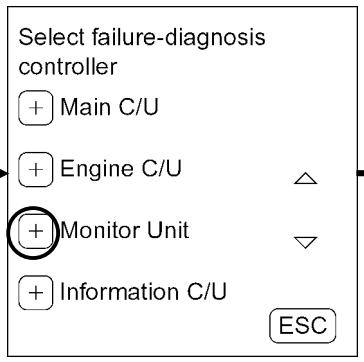
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

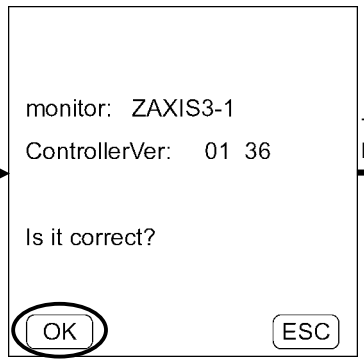
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1V7-05-03-041

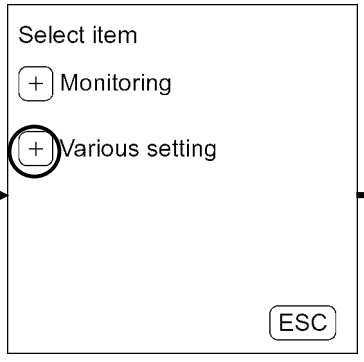
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

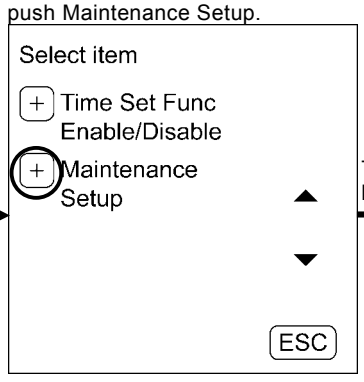
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Move the item by using ▼ and push Maintenance Setup.

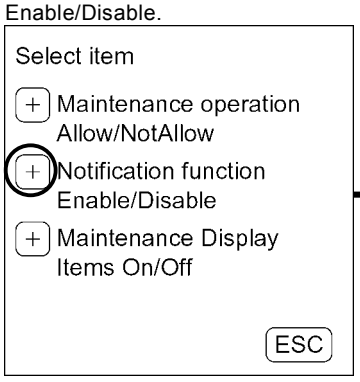


To the lower

T1V7-05-03-214

Various Setup Item Screen

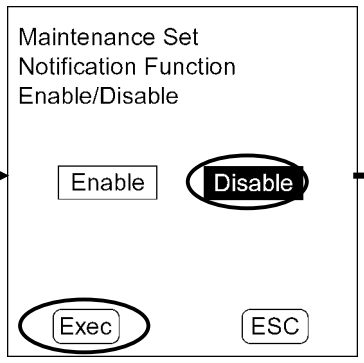
Push Notification function Enable/Disable.



T1V7-05-03-069

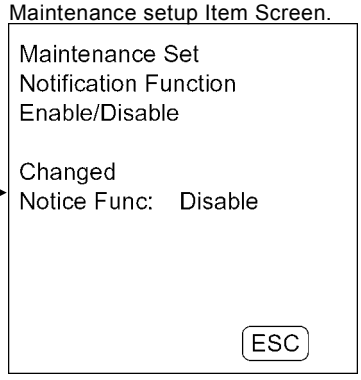
Maintenance Setup Item Screen

Push Disable and push Exec. Push ESC and return to the former screen.



T1V7-05-03-076

Push ESC and return to Maintenance setup Item Screen.



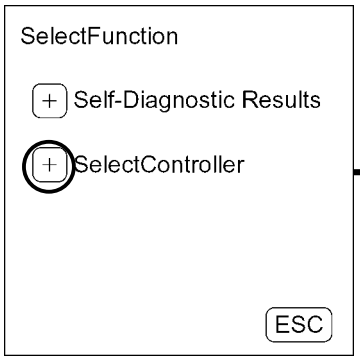
T1V7-05-03-077

NOTE: Push Disable, push ESC and return to Maintenance Setup Item Screen, so that Notification Function Disable is not set.

MAINTENANCE DISPLAY ITEM ON/OFF SELECTION

Maintenance Display Item: ON

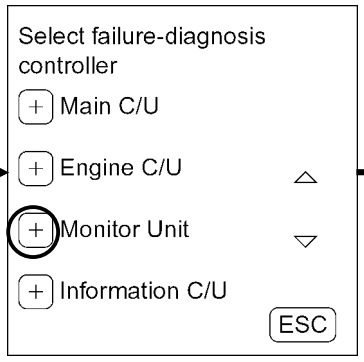
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

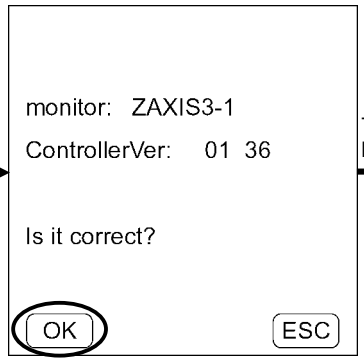
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1V7-05-03-041

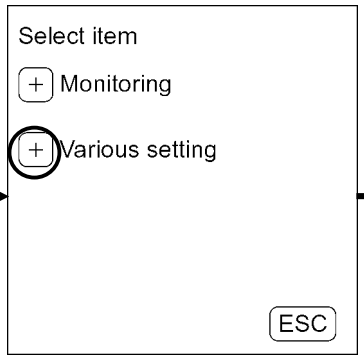
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

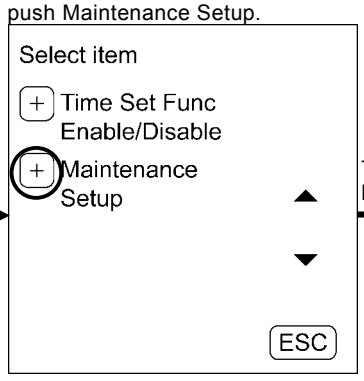
Push Various setting.



T1V7-05-03-042

Main Menu Screen

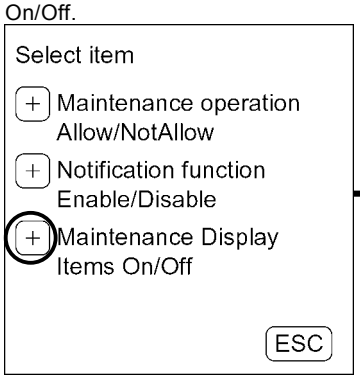
Move the item by using ▼ and push Maintenance Setup.



T1V7-05-03-214

Various Setup Item Screen

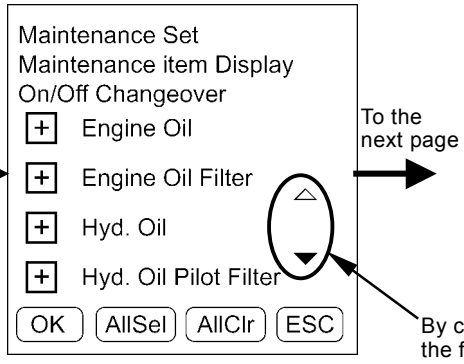
Push Maintenance Display Items On/Off.



T1V7-05-03-069

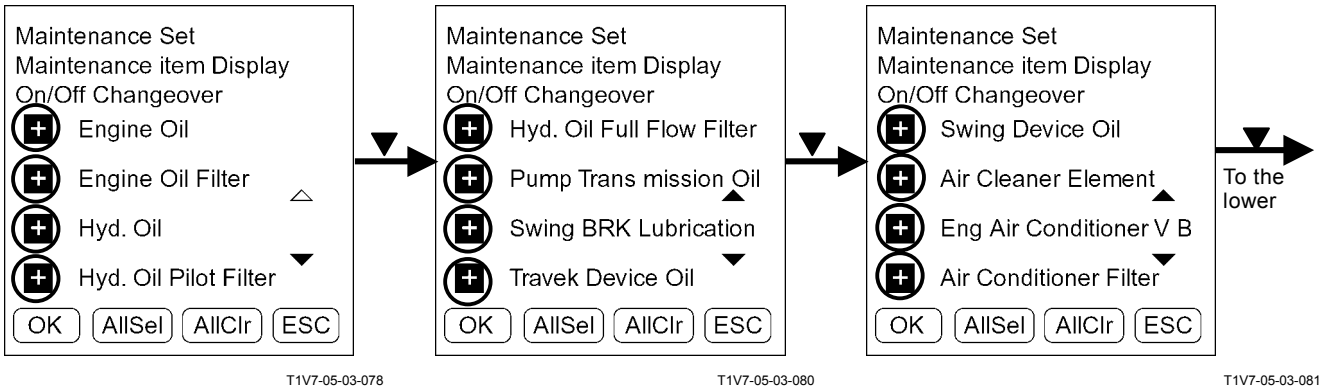
Maintenance Setup Item Screen

Push ESC and return to the former screen.



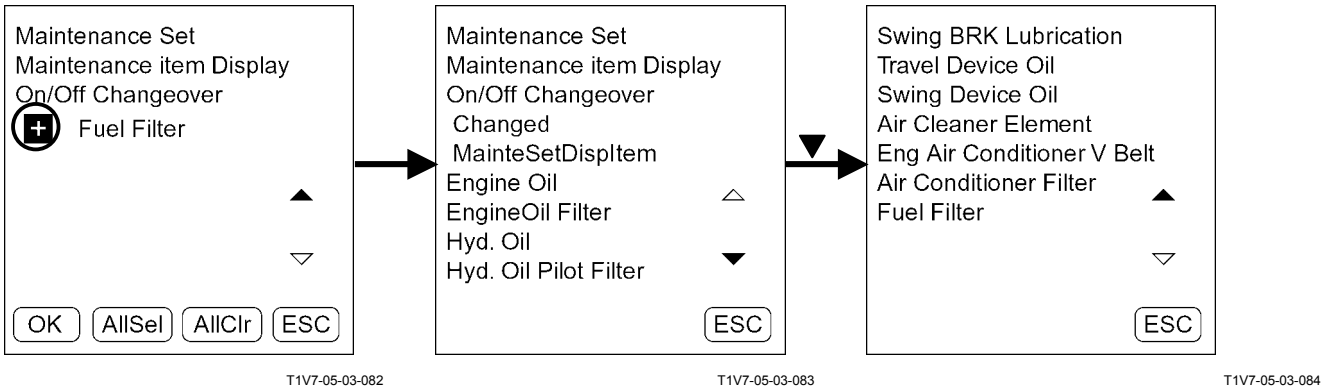
T1V7-05-03-174

Push the displayed item and finally push OK. Push All Sel and select all the items.



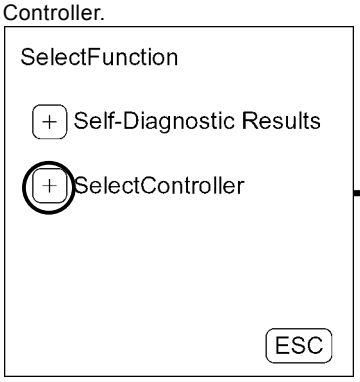
Display Item Selection Screen

Push ESC and return to Maintenance Setup Item Screen.



Maintenance Display Item: OFF

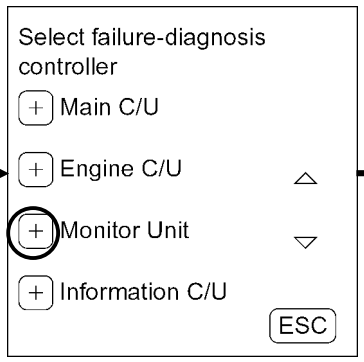
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

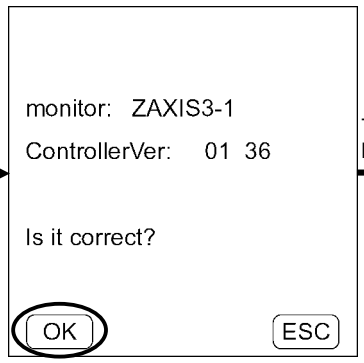
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1V7-05-03-041

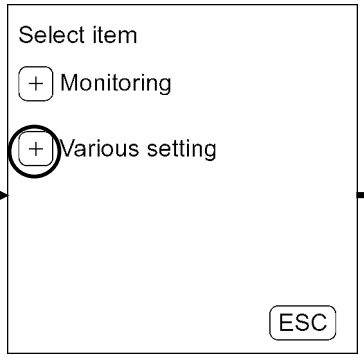
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

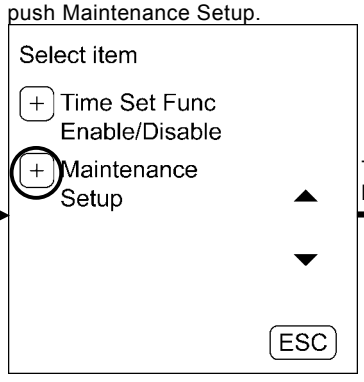
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Move the item by using ▼ and push Maintenance Setup.

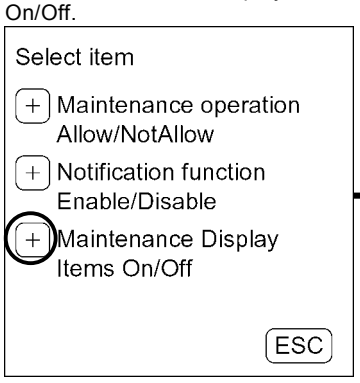


To the lower

T1V7-05-03-214

Various Setup Item Screen

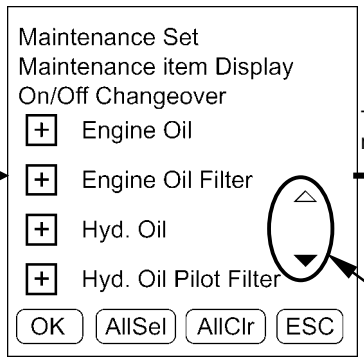
Push Maintenance Display Items On/Off.



T1V7-05-03-069

Maintenance Setup Item Screen

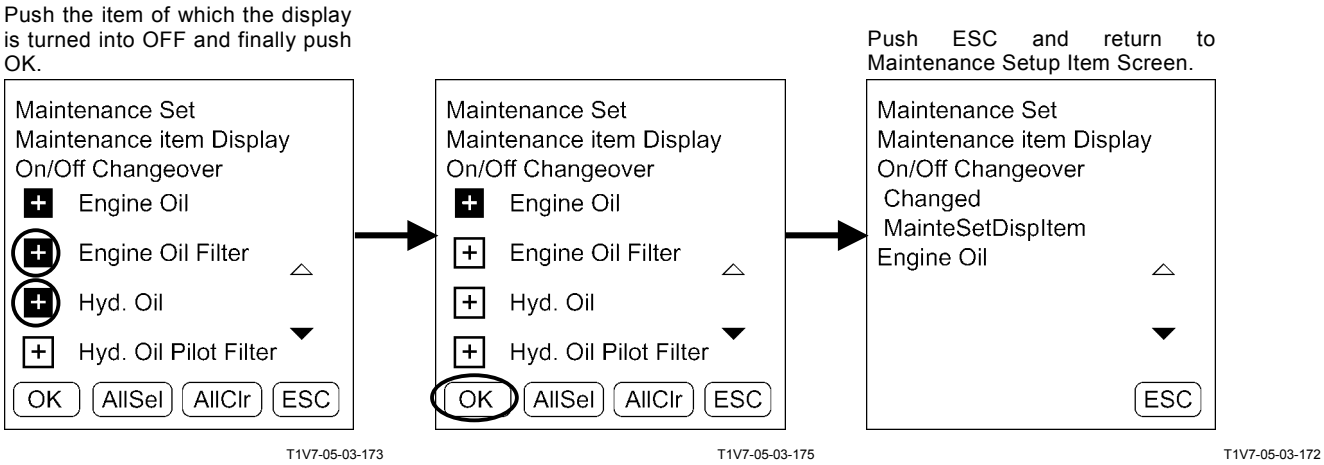
Push All Clr and all the selected Maintenance Display Items are turned into OFF.



To the next page

By changing the page, the forward and backward items are displayed.

T1V7-05-03-174



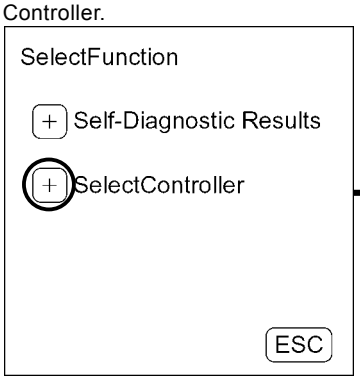
Display Item Selection Screen

FUEL CONSUMPTION GAUGE DISPLAY ENABLE / DIABLE SELECTION

IMPORTANT: The valve on fuel gauge is reference only and is not equal to autual valve.

Fuel Consumption Gauge Display: Enable

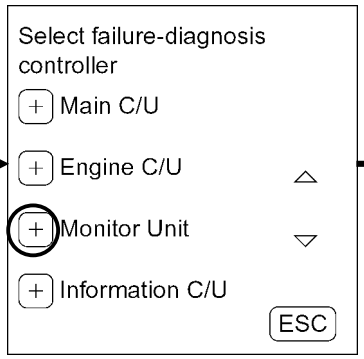
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

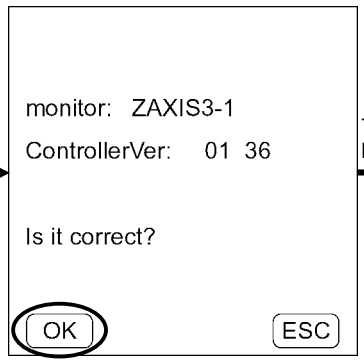
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.

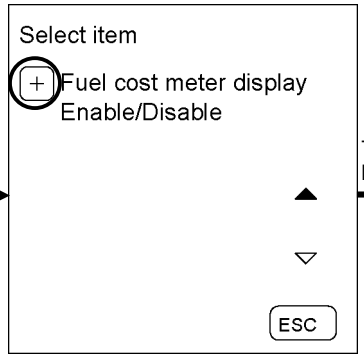


To the lower

T1V7-05-03-041

Monitor Controller Screen

Move the item by using ▼ and push Fuel cost meter display Enable/Disable.



To the lower

T1V7-05-03-087

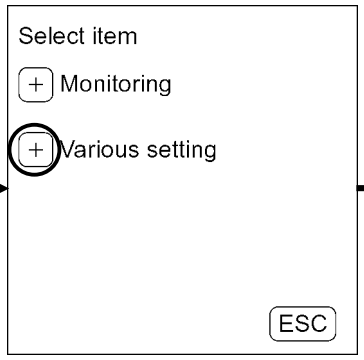
Various Setup Item Screen

Push Start.

T1V7-05-03-025

Title Screen

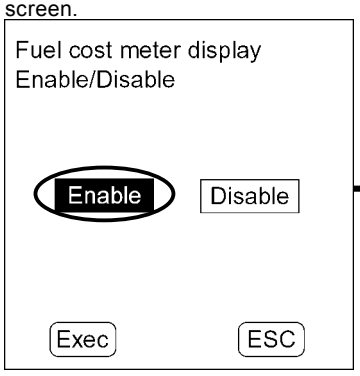
Push Various setting.



T1V7-05-03-042

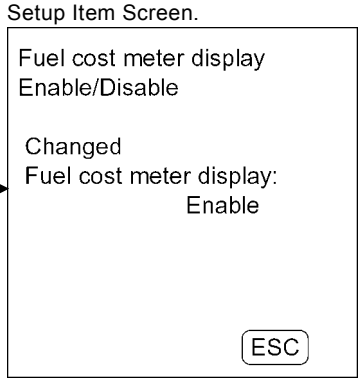
Main Menu Screen

Push Enable and push Exec. Push ESC and return to the former screen.



T1V7-05-03-088

Push ESC and return to Various Setup Item Screen.

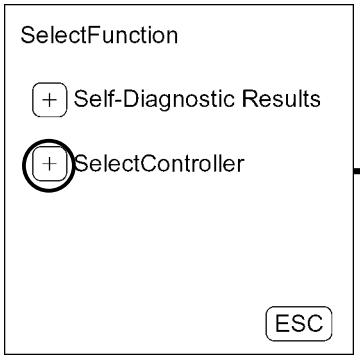


T1V7-05-03-089

NOTE: Push Enable, push ESC and return to Various Setup Item Screen, so that Fuel Consumption Gauge Display Enable is not set.

Fuel Consumption Gauge Display: Disable

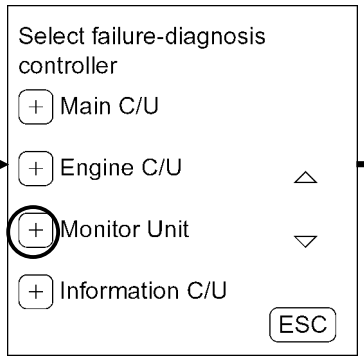
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

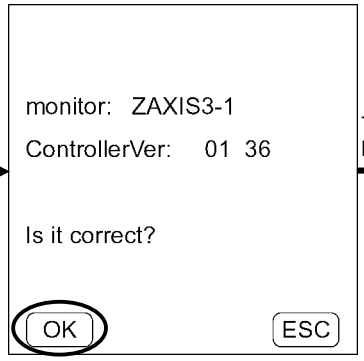
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1V7-05-03-041

Monitor Controller Screen

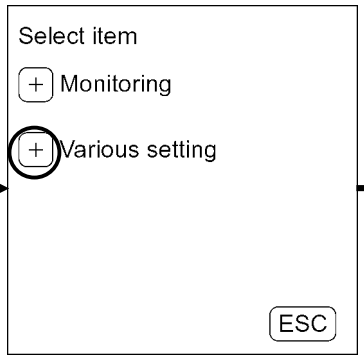
To the lower

Push Start.

T1V7-05-03-025

Title Screen

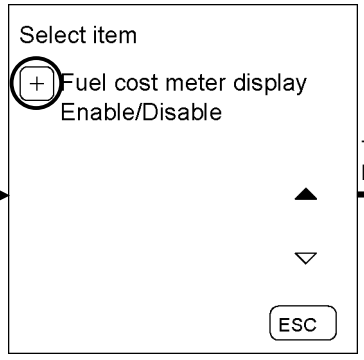
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Move the item by using ▼ and push Fuel cost meter display Enable/Disable.

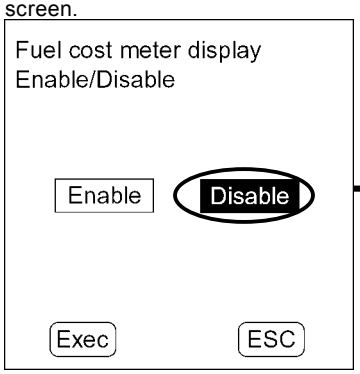


T1V7-05-03-087

Various Setup Item Screen

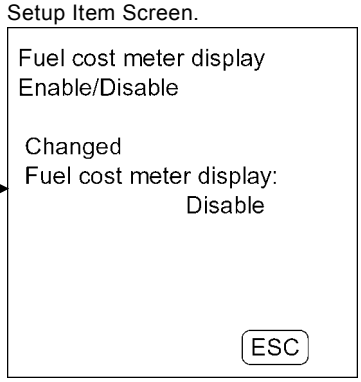
To the lower

Push Disable and push Exec. Push ESC and return to the former screen.



T1V7-05-03-090

Push ESC and return to Various Setup Item Screen.

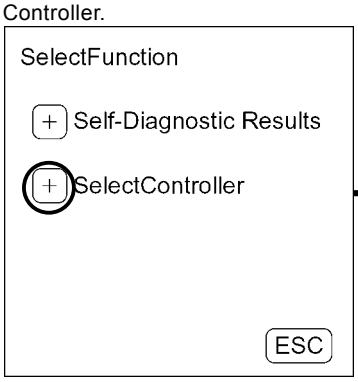


T1V7-05-03-091

NOTE: Push Disable, push ESC and return to Various Setup Item Screen, so that Fuel Consumption Gauge Display Disable is not set.

PASSWORD CHANGE

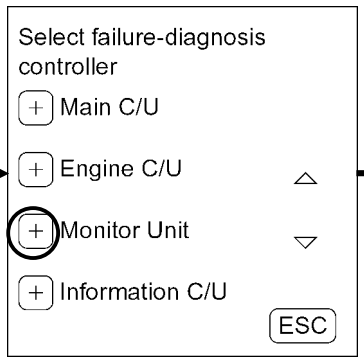
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

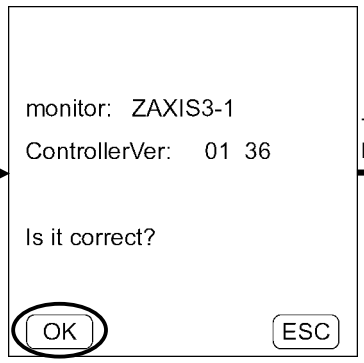
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1V7-05-03-041

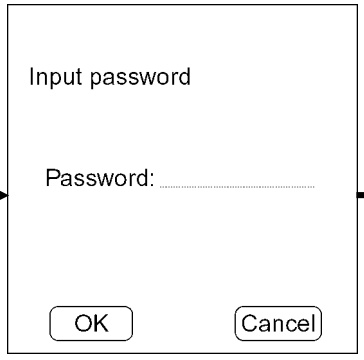
Monitor Controller Screen

Push Password.

T1V7-05-03-025

Title Screen

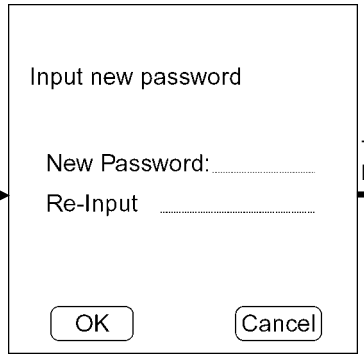
Input the registered password and push OK.



T1V7-05-03-126

Main Menu Screen

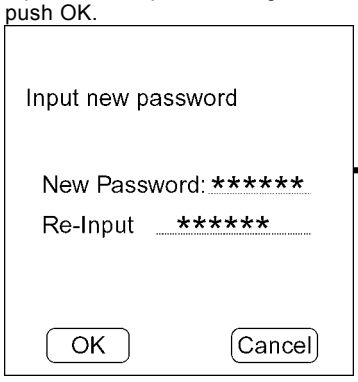
Input the new password and push OK.



To the lower

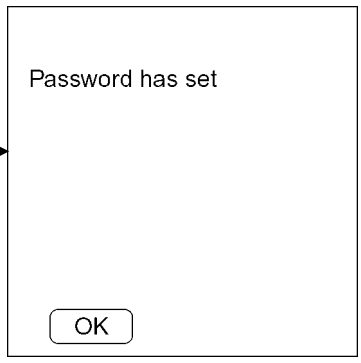
T1V7-05-03-127

Input the new password again and push OK.



T1V7-05-03-169

Push OK and return to Title Screen.



T1V7-05-03-128

OUTLINE

ICF (Information Controller) saves the input signals from various sensors and switches of the machine as data.
Various input signals are recorded as “list of daily report data”, “list of frequency distribution data”, “list of total operating hours”, “list of alarm” and “list of failure” in ICF.

The recorded data is downloaded to the personal computer and is uploaded to the center server via LAN, so that the data can be used as “e-Service”.
The machine equipped with the optional satellite communication terminal sends the data to center server by using satellite communication. (As for the satellite communication system, refer to T5-4-24.)

LIST OF DAILY REPORT DATA

Data which can be downloaded by Dr. ZX (Palm)

Item		Details
Date		Date of daily report data
Start: Time		Time when key switch is first turned ON during a day (Time is recorded by key switch ON signal.)
Stop: Time		Time when key switch is last turned OFF during a day (Time is recorded by key switch ON signal.)
Fuel Level		The value of the final remained fuel during a day (Value is recorded by fuel sensor data from monitor unit.)
Fuel Usage Amount		The value of fuel used during a day (Value is calculated and recorded by accumulated fuel usage amount from ECM.)
Machine Hour Meter		Hour meter cumulative hours (Hours are recorded by hour meter from monitor unit.)
Engine Operating Hours	HP Mode Hours	Total engine operating hours selecting HP mode during a day (Hours are recorded by power mode switch information from MC.)
	P Mode Hours	Total engine operating hours selecting P mode during a day (Hours are recorded by power mode switch information from MC.)
	E Mode Hours	Total engine operating hours selecting E mode during a day (Hours are recorded by power mode switch information from MC.)
Auto-Idle Switch ON Hours		Hours when auto-idle switch is turned ON during a day (Hours are recorded by switch information from MC.)
Travel Operating Hours	Fast Idle (Hi) Traveling Hours	Total operating hours of travel mode (Hi) during a day (Hours are recorded by travel mode switch information from MC.)
	Slow Idle (Lo) Traveling Hours	Total operating hours of travel mode (Lo) during a day (Hours are recorded by travel mode switch information from MC.)
Swing Operating Hours		Total swing operating hours during a day (Hours are recorded by swing pressure sensor information from MC.)
Digging Operating Hours		Total operating hours selecting front attachment during a day (Hours are recorded by front attachment pressure sensor information from MC.)
Attachment Operating Hours	Breaker Operating Hours	Total operating hours selecting breaker during a day (Hours are recorded by attachment information from MC.)
	Secondary Crusher Operating Hours	Total operating hours selecting secondary crusher during a day (Hours are recorded by attachment information from MC.)
	Primary Crusher Operating Hours	Total operating hours selecting primary crusher during a day (Hours are recorded by attachment information from MC.)
	Vibrating Hammer Operating Hours	Total operating hours selecting vibrating hammer during a day (Hours are recorded by attachment information from MC.)
	Bucket Operating Hours or Others	Total operating hours selecting bucket during a day (Hours are recorded by attachment information from MC.)

Item	Details
No Load Hours	Total machine's waiting hours during a day (Hours are recorded by each pressure sensor information from MC.)
Radiator Coolant Temperature	The highest radiator coolant temperature during a day (Value is recorded from monitor unit.)
Hydraulic Oil Temperature	The highest hydraulic oil temperature during a day (Value is recorded from MC.)
Intake-Air Temperature	The highest intake-air temperature during a day (Value is recorded from ECM.)
Engine Operating Hour Distribution Data	Engine operating hour distribution during a day (Operating hours are recorded only when alternator output signal is continuously delivered for more than 10 minutes.)
Loaded Hours Distribution Data	Machine operating hour distribution during a day (Operating hours are recorded only when operating pressure is continuously detected for more than 5 minutes while the engine runs.)

NOTE: The daily operation in this table is equivalent to the hours between 0:00 and 23:59:59 counted by the ICX built-in clock. In case the engine is kept operated beyond 0:00, such data are recorded as those for the following day.

Data which can be sent by Satellite Communication

Item	Details
Date	Date of daily report data
Fuel Level	The value of the final remained fuel during a day (Value is recorded by fuel sensor data from monitor unit.)
Fuel Usage Amount	The value of fuel used during a day (Value is calculated and recorded by accumulated fuel usage amount from ECM.)
Machine Hour Meter	Hour meter cumulative hours (Hours are recorded by hour meter from monitor unit.)
Engine Operating Hours	Total engine operating hours during daily operation (Hours are recorded with alternator signal ON.)
Travel Operating Hours	Total travel operating hours during daily operation
Swing Operating Hours	Total swing operating hours during daily operation
Front Attachment Operating Hours	Total front attachment and swig operating hours during daily operation
Attachment Operating Hours	Total attachment operating hours during daily operation
No Load Hours	Total machine's waiting hours during daily operation
Radiator Coolant Temperature	The highest radiator coolant temperature during a day
Hydraulic Oil Temperature	The highest hydraulic oil temperature during a day
Intake-Air Temperature	The highest intake-air temperature during a day
Engine Operating Hour Distribution Data	Engine operating hour distribution during daily operation (Operating hours are recorded only when alternator output signal is continuously delivered for more than 10 minutes.)
Loaded Hour Distribution Data	Machine operating hour distribution during daily operation (Operating hours are recorded only when operating pressure is continuously detected for more than 5 minutes while the engine runs.)

NOTE: The daily operation in this table is equivalent to the hours between 0:00 and 23:59:59 counted by the ICX built-in clock. In case the engine is kept operated beyond 0:00, such data are recorded as those for the following day.

LIST OF FREQUENCY DISTRIBUTION DATA

Item	Details
Fuel Temperature	Frequency distribution of fuel temperature
Pump Load	Frequency distribution of average pump delivery pressure of pumps 1 and 2
Average Pump Delivery Pressure in Digging Operation	Frequency distribution of average delivery pressure from pumps during digging operation
Average Pump Delivery Pressure in Travel Operation	Frequency distribution of average delivery pressure from pumps during travel operation
Radiator Coolant Temperature	Frequency information of coolant temperature
Hydraulic Oil Temperature	Frequency information of hydraulic oil temperature
Radiator Coolant Temperature − Intake-Air Temperature	Frequency information on temperature in which intake air temperature is pulled from coolant temperature
Hydraulic Oil Temperature − Intake-Air Temperature	Frequency information on temperature in which intake air temperature is pulled from hydraulic oil temperature
Pump Load Rate	Frequency information of engine speed andaverage load rate (average of pump 1 load rate and pump 2 load rate)
Engine Load Rate	Frequency information of engine spood and engine torque
Radiator Coolant Temperature/Intake-Air Temperature	Frequency information of coolant temperature and intake air temperature
Hydraulic Oil Temperature/Intake-Air Temperature	Frequency information of hydraulic oil temperature and intake air temperature

LIST OF TOTAL OPERATING HOURS

Item		Details
Inner Hour Meter		Hour meter's value accumulated inside ICF
Machine Hour Meter		Hour meter's value accumulated in machine's monitor
Engine Operating Hour	HP Mode Hours	Total engine operating hours selecting HP mode
	P Mode Hours	Total engine operating hours selecting P mode
	E Mode Hours	Total engine operating hours selecting E mode
Auto-Idle Switch ON Hours		Hours when auto-idle switch is turned ON
Travel Operating Hour	Fast Idle (Hi) Traveling Hours	Total operating hours of travel mode (Hi)
	Slow Idle (Lo) Traveling Hours	Total operating hours of travel mode (Lo)
Swing Operating Hour		Total swing operating hours during
Front Attachment Operating Hour		Total front attachment and swig operating hours
Attachment Operating Hour	Breaker Operating Hours	Total operating hours selecting breaker during daily operation
	Secondary Crusher Operating Hours	Total operating hours selecting secondary crusher during daily operation
	Primary Crusher Operating Hours	Total operating hours selecting primary crusher during daily operation
	Vibrating Hammer Operating Hours	Total operating hours selecting vibrating hammer during daily operation
	Bucket Operating Hours or Others	Total operating hours selecting bucket during daily operation
No Load Hours		Total machine's waiting hours

(Blank)

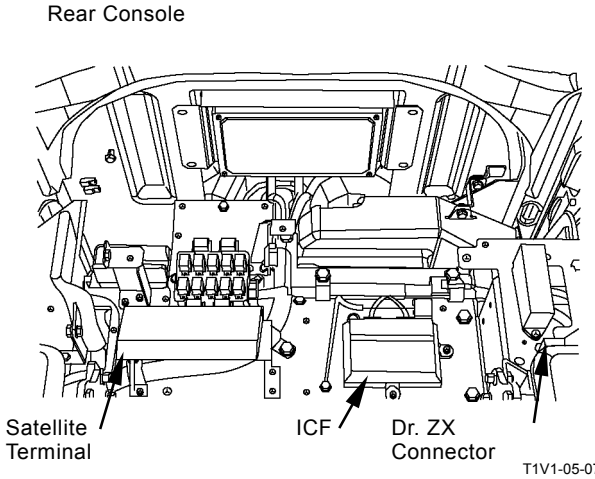
HOW TO DOWNLOAD AND UPLOAD DATA OF ICF

After the data saved in ICF is downloaded to Palm (Dr. ZX), is uploaded to the personal computer, and is uploaded to the center server by using LAN, the data can be used as “e-Service”.

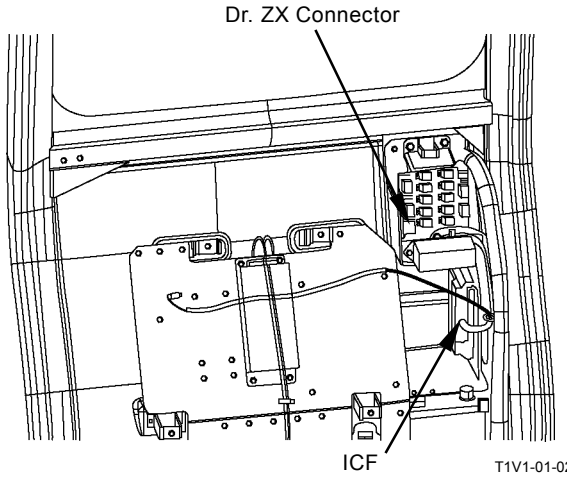
How to Download Data from Machine to Palm

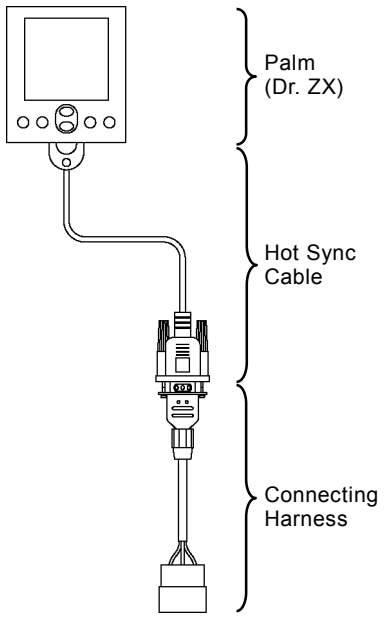
1. Connect the Dr. ZX connectors in Palm (Dr. ZX) and machine by using the Hot Sync cable and connecting harness.
2. Turn Palm (Dr. ZX) ON and start downloading the data. (Refer to the next page.)

ZX200-3 class, ZX240-3 class, ZX270-3 class



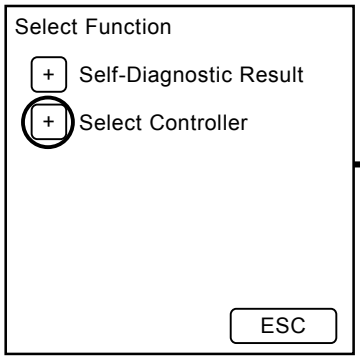
ZX225US-3 class, ZX225USR-3 class





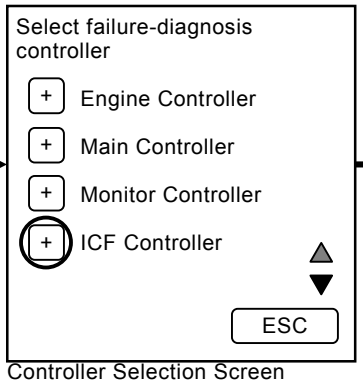
Data Download

After starting Dr. ZX, push Select Controller.



Function Selection Screen

Push ICF Controller.



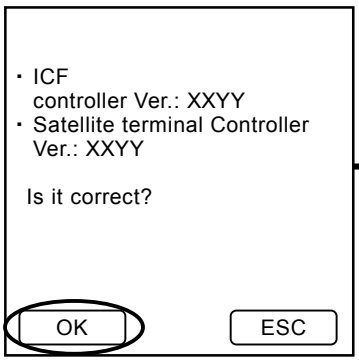
Controller Selection Screen

Push Start.

Title Screen

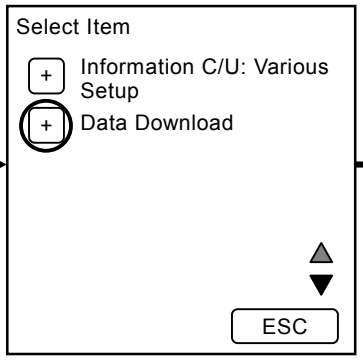
To the lower

Push OK.



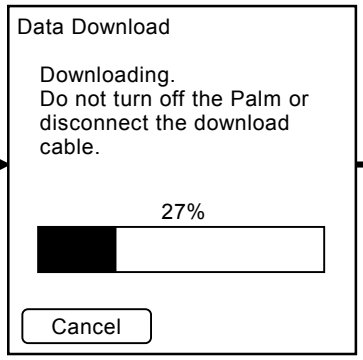
ICF Controller Screen

Push Date Download.



Main Menu Screen

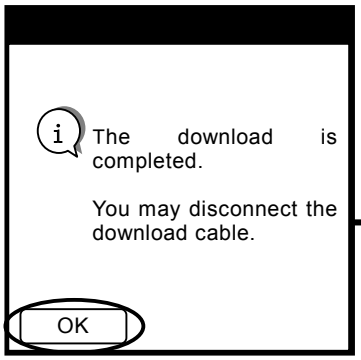
While downloading data, Download Screen is displayed.



Data Download Screen

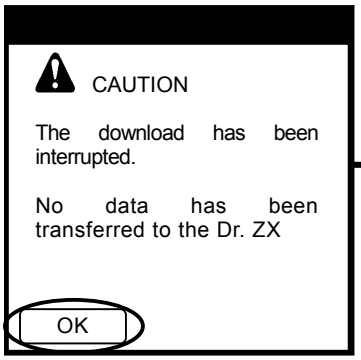
To the lower

When downloading is completed normally, Normal End Screen is displayed.
Push OK and return to Main Menu Screen.



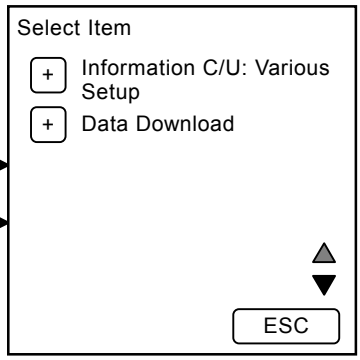
Normal End Screen

If pushing Cancel on Data Download Screen, Alarm Screen is displayed. Push OK and return to Main Menu Screen.



Alarm Screen

Push ESC and return to Title Screen.

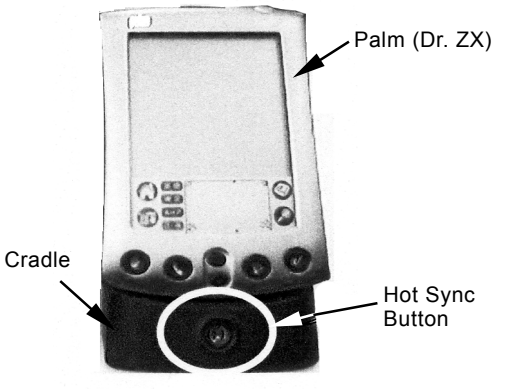


Main Menu Screen

How to Upload Data from Palm (Dr. ZX) to Personal Computer

1. Set Palm (Dr. ZX) to the cradle. Connect the USB cable to the personal computer.
2. Push the Hot Sync button.

NOTE: When pushing the Hot Sync button and uploading the data to the personal computer, the Palm Desktop software attached with (Dr. ZX) Palm need to be installed.

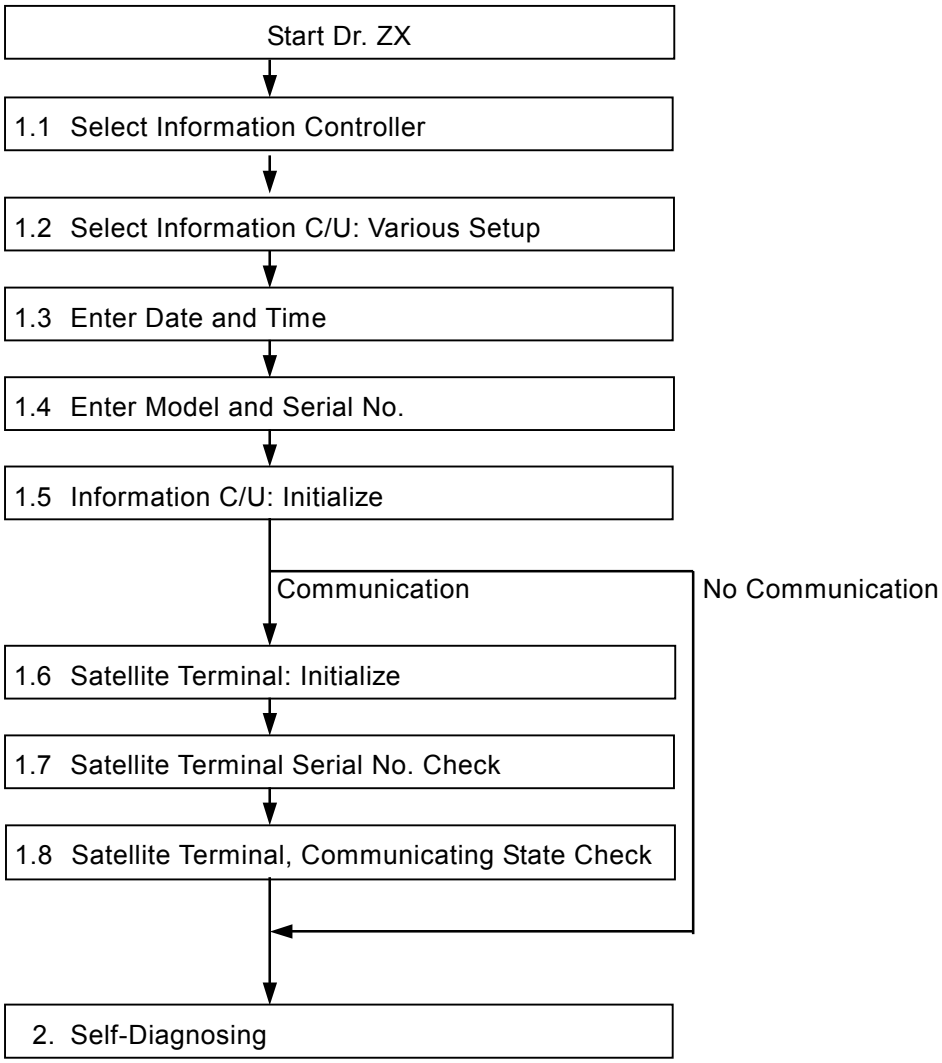


T178-05-07-033

VARIOUS SETUP OF ICF AND SATELLITE COMMUNICATION TERMINAL BY USING Dr. ZX

Before starting satellite communication, installing the satellite communication terminal and replacing ICF, perform the following procedures by using Dr. ZX.

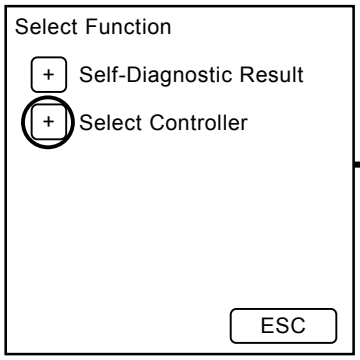
ICF Setup Procedures



1.1 Select Information Controller
1.2 Select Information C/U: Various Setup

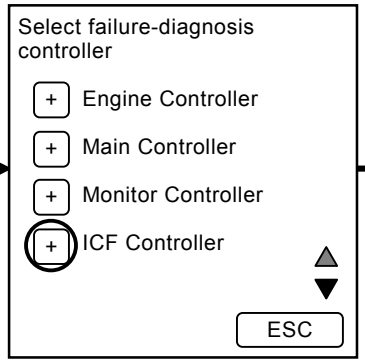
1.1 Select Information Controller

After starting Dr. ZX, push Select Controller.



Function Selection Screen

Push ICF Controller.



Controller Selection Screen

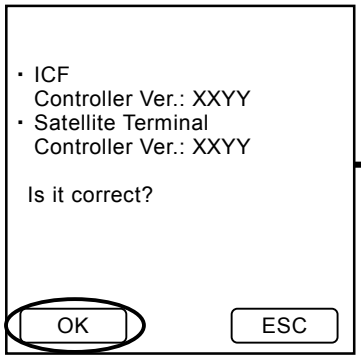
Push Start.

To the lower

Title Screen

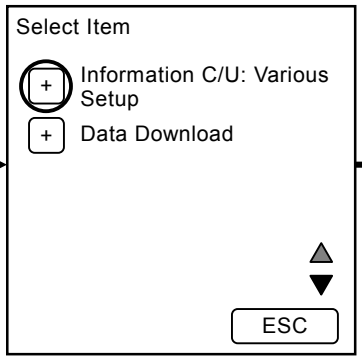
1.2 Select Information C/U: Various Setup

Push OK.

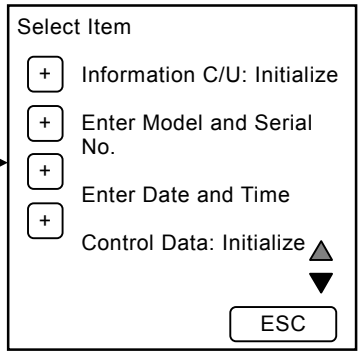


ICF Controller Screen

Push Information C/U: Various Setup.

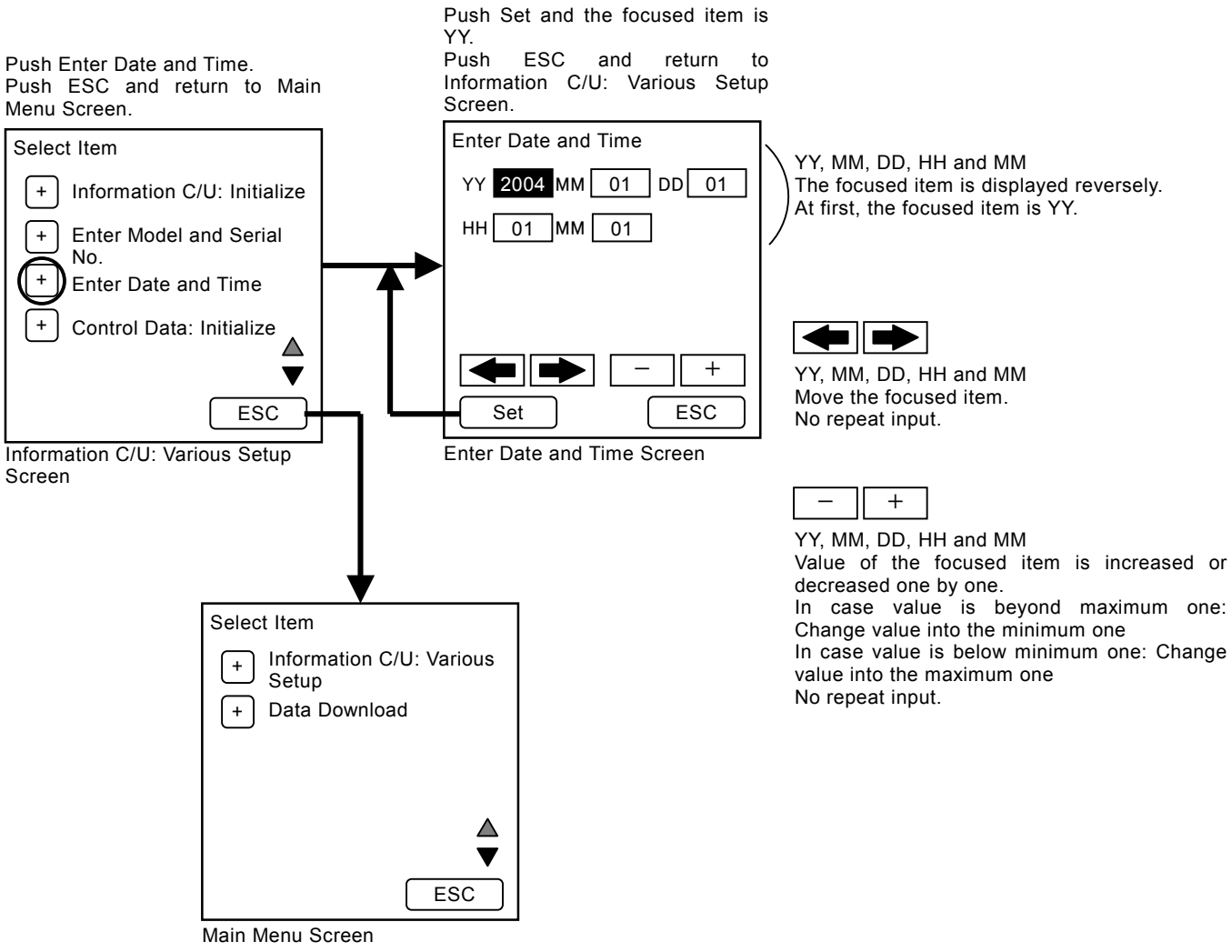


Main Menu Screen

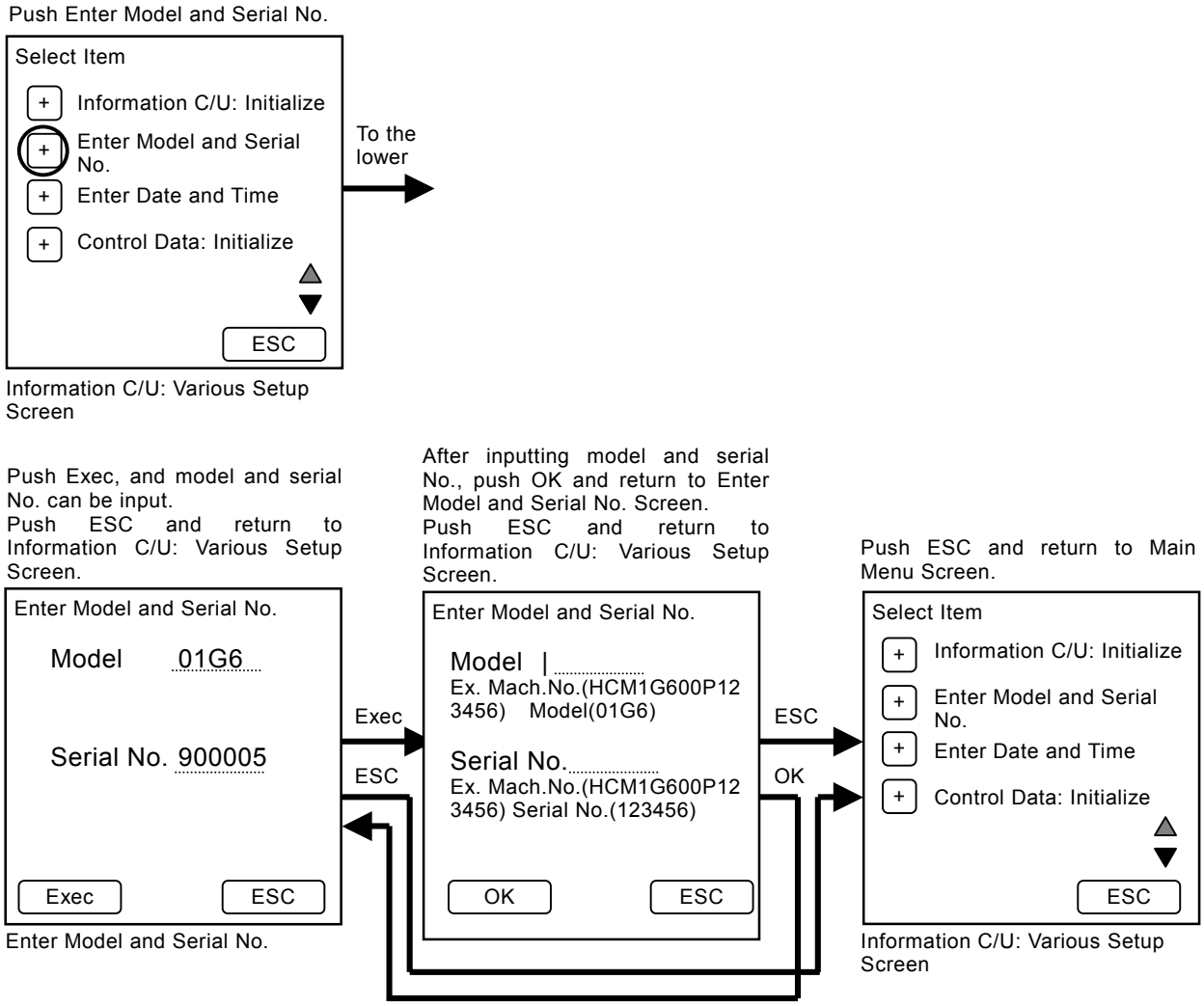


Information C/U: Various Setup Screen

1.3 Enter Date and Time

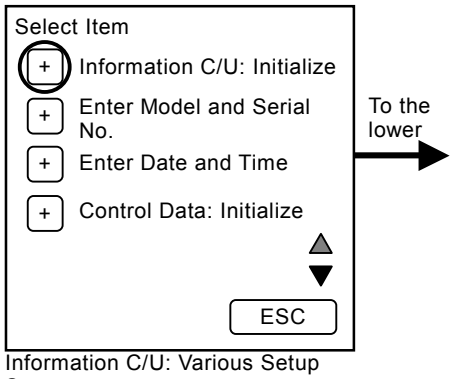


1.4 Enter Model and Serial No.



1.5 Information C/U: Initialize

Push Information C/U: Initialize.

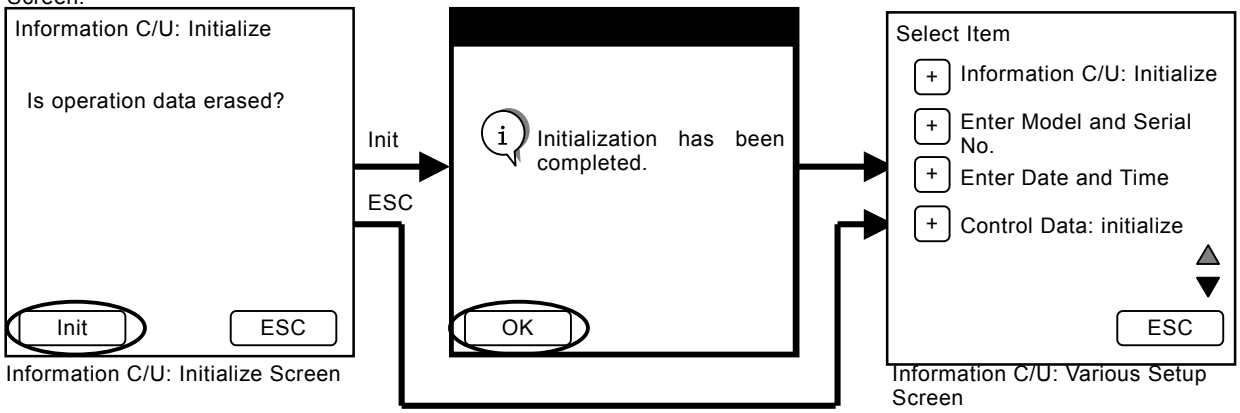


Information C/U: Various Setup Screen

Push Init and the controller operating data is initialized.
Push ESC and return to Information C/U: Various Setup Screen.

Push OK and return to Information C/U: Various Setup Screen.

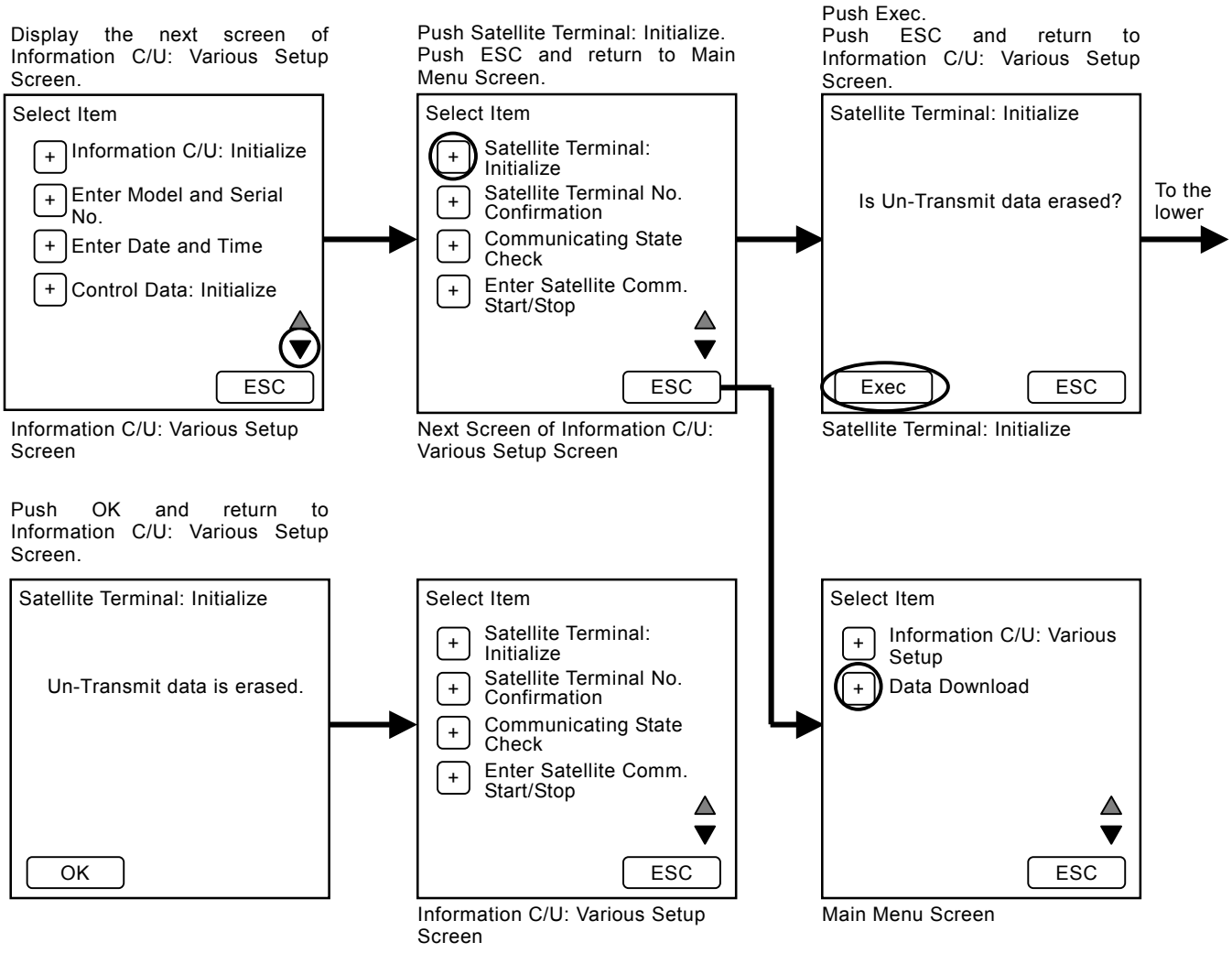
Push ESC and return to Main Menu Screen.



Information C/U: Initialize Screen

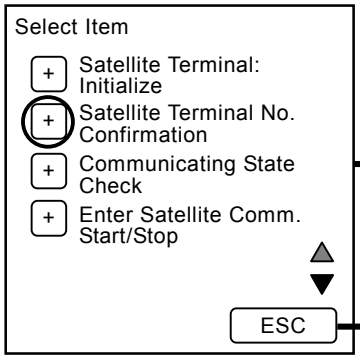
Information C/U: Various Setup Screen

1.6 Satellite Terminal: Initialize



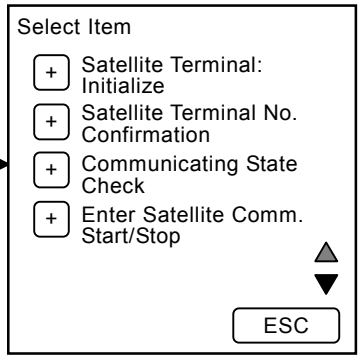
1.7 Satellite Terminal Serial No. Check

Push Satellite Terminal No. Confirmation.
Push ESC and return to Main Menu Screen.

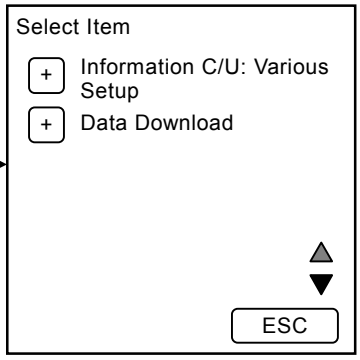


Information C/U: Various Setup Screen

Confirm serial no. (12 digits). Push ESC and return to Information C/U: Various Setup Screen.



Information C/U: Various Setup Screen

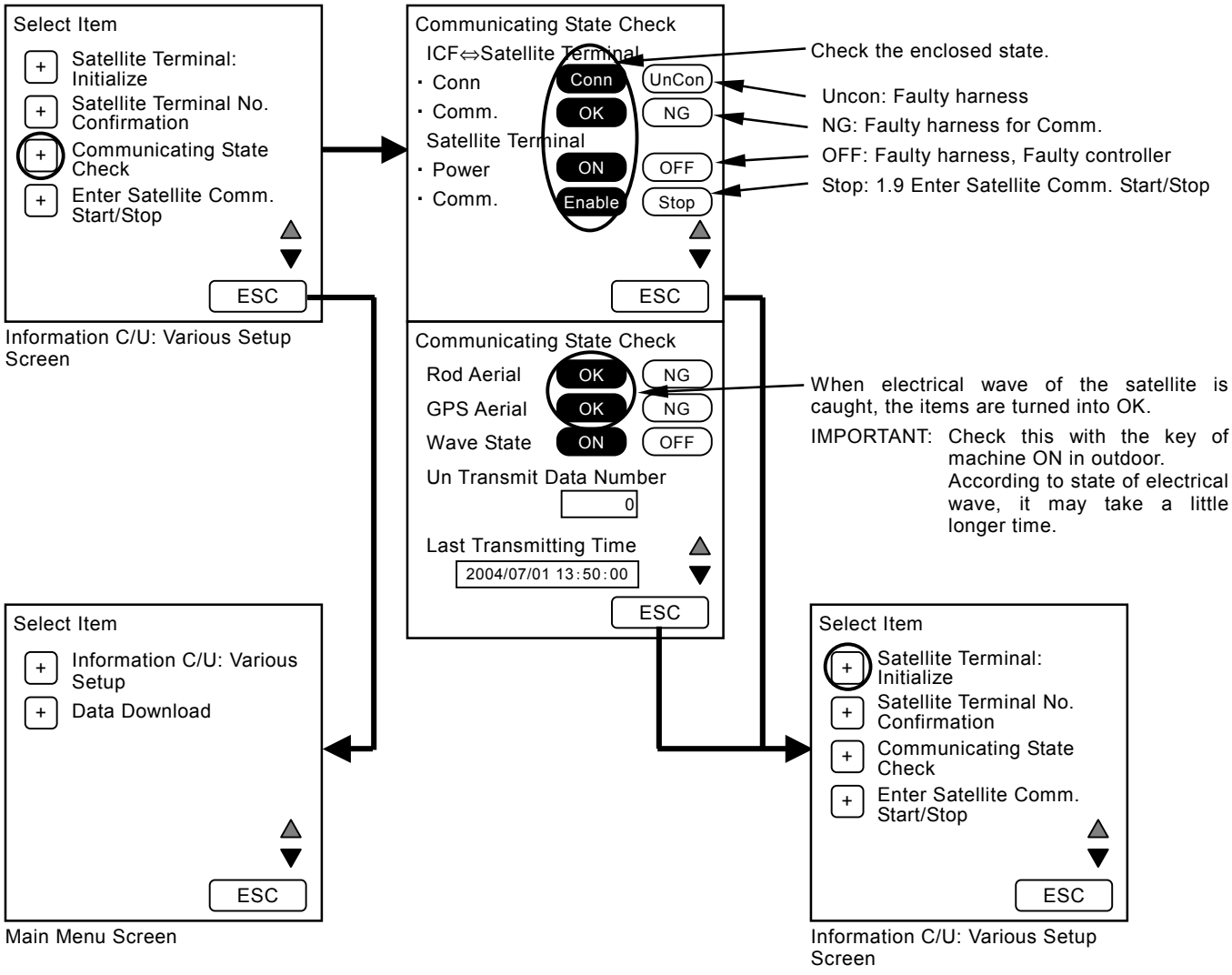


Main Menu Screen

1.8 Satellite Terminal, Communicating State Check

Push Communicating State Check.
Push ESC and return to Main Menu Screen.

Check communicating state.



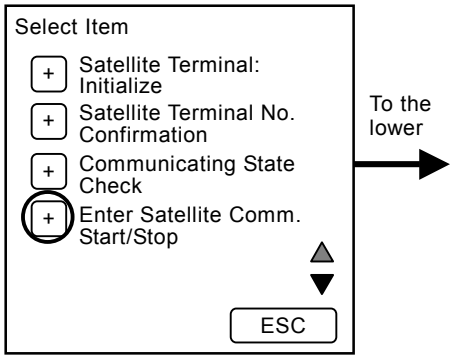
Information C/U: Various Setup Screen

Main Menu Screen

Information C/U: Various Setup Screen

1.9 Enter Satellite Comm. Start/Stop

Push ▼ and move to the next screen of Information C/U: Various Setup Screen.
Push Enter Satellite Comm. Start/Stop.

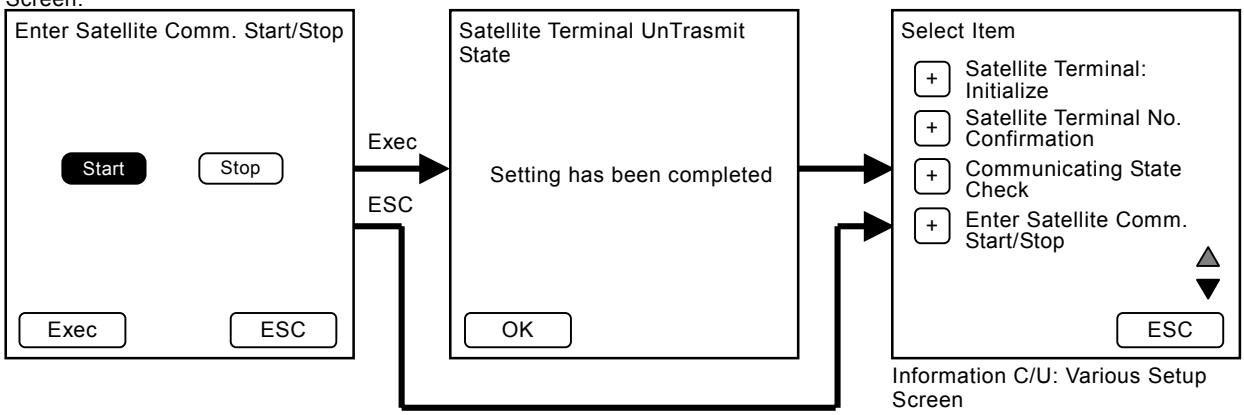


Information C/U: Various Setup Screen

When starting Satellite Comm., push Start and push Exec.
When stopping Satellite Comm., push Stop and push Exec.
Push ESC and return to Information C/U: Various Setup Screen.

Push OK and return to Information C/U: Various Setup Screen.

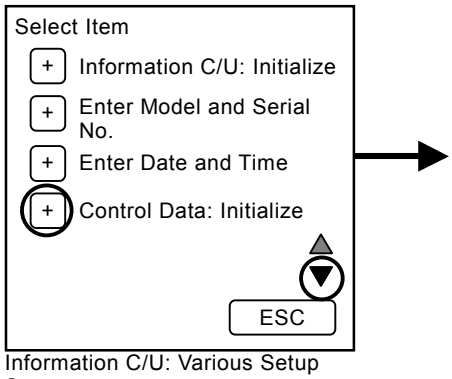
Push ESC and return to Main Menu Screen.



Information C/U: Various Setup Screen

1.10 Control Data: Initialize

Push Control Data: Initialize.

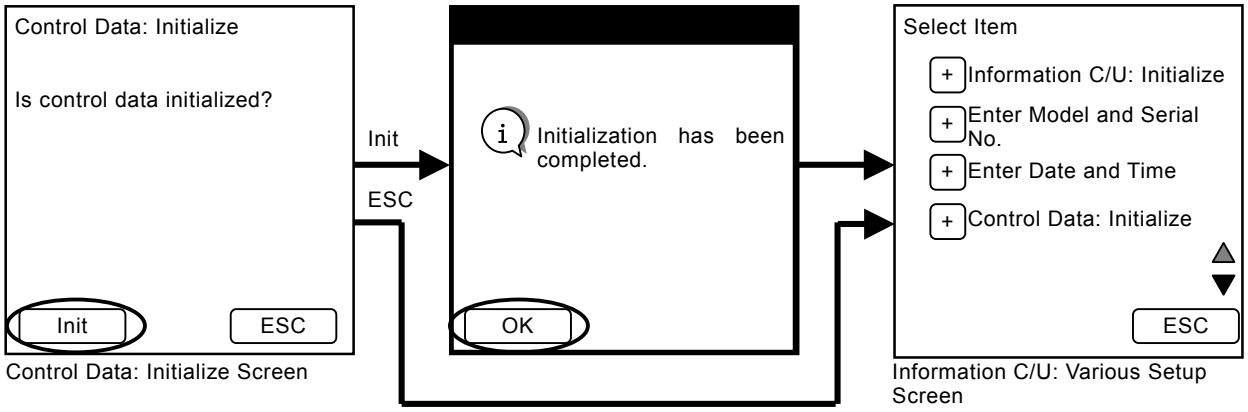


Information C/U: Various Setup Screen

Push Init and the controller operating data is initialized.
Push ESC and return to Information C/U: Various Setup Screen.

Push OK and return to Information C/U: Various Setup Screen.

Push ESC and return to Main Menu Screen.

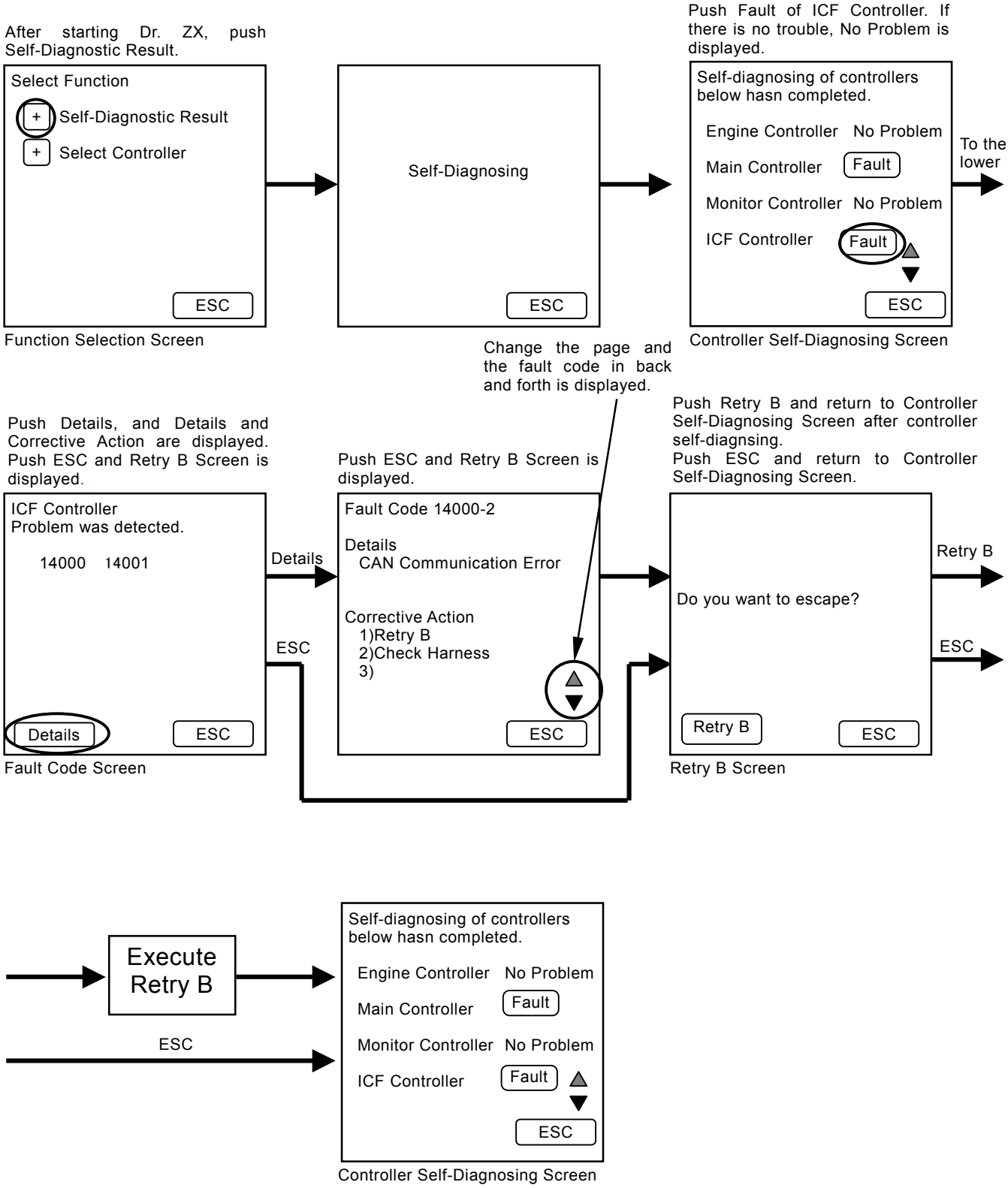


Control Data: Initialize Screen

Information C/U: Various Setup Screen

(Blank)

2. Self-Diagnosing



LIST OF FAULT CODE

Fault Code	Details	Remedy
14000-2	CAN Communication Error	Execute retry B in self-diagnosing. If this error code is displayed after re-try, check the following item. Check the CAN communication line (check the harness).
14001-2	ICF: Flash Memory: Read / Write Error	Execute retry B in self-diagnosing and execute the following item. Execute 1.5 Information C/U: Initialize (T5-4-15).
14002-2	ICF: External RAM: Read / Write Error	
14003-2	ICF: EEPROM: Sum Check Error	Execute retry B in self-diagnosing. If this error code is displayed after re-try, check the following item. 1. Execute 1.10 Control Data: Initialize (T5-4-20). 2. Execute 1.4 Enter Model and Serial No. (T5-4-14). Then, execute self-diagnosing and execute retry B.
14006-2	ICF: Satellite Communication Terminal: Communication Error	Execute retry B in self-diagnosing. If this error code is displayed after re-try, check the following item. Check the communication line. Check the power source line of satellite terminal. Check the fuse. Then, execute self-diagnosing and execute retry B.
14008-2	ICF: Abnormal Internal RAM	Execute retry B in self-diagnosing. If this error code is displayed after re-try, replace the controller.
14100-2	Satellite Communication Terminal: Abnormal EEPROM	
14101-2	Satellite Communication Terminal: Abnormal IB/OB Queue	
14102-2	Satellite Communication Terminal: Abnormal Local Loup Back	Check the communication aerial of satellite terminal.
14103-2	Satellite Communication Terminal: The satellite is not found.	
14104-2	Satellite Communication Terminal: Fail 1 of Remote Loup Back	Execute retry B in self-diagnosing. If this error code is displayed after re-try, replace the controller.
14105-2	Satellite Communication Terminal: Fail 2 of Remote Loup Back	
14106-2	Satellite Communication Terminal: Sending and receiving data are unmatched.	

SATELLITE COMMUNICATION SYSTEM

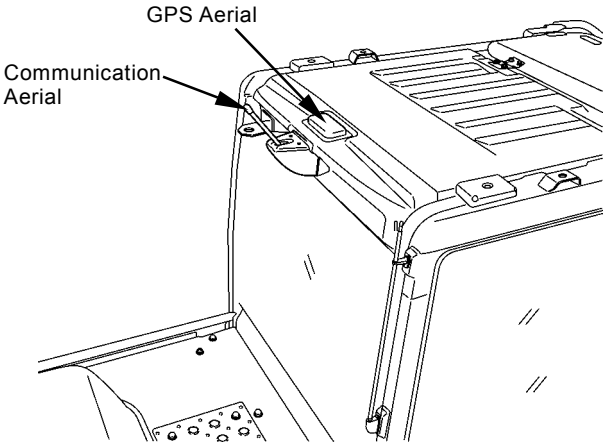
The satellite communication system is used for maintenance of the machine, “e-Service” by transmitting various data of the machine regularly via a low earth orbit satellite.

NOTE: Depending on the circumstances of the machine (ex. in the constructions, in the tunnel, affected by the surrounding building and affected of noise), the data transfer rate may become slower, or the communication might not be established.
The satellite communication system using a low earth orbit satellite transmits digital data through the radio wave. If there is excessively noise or use of electrical equipment which causes noise near the machine, they cause reduces data transfer rate or communication might not be established at worst.

The satellite communication system consists of satellite communication terminal, GPS aerial and communication aerial. The mail function of monitor unit becomes effective.
The functions of each equipment are:

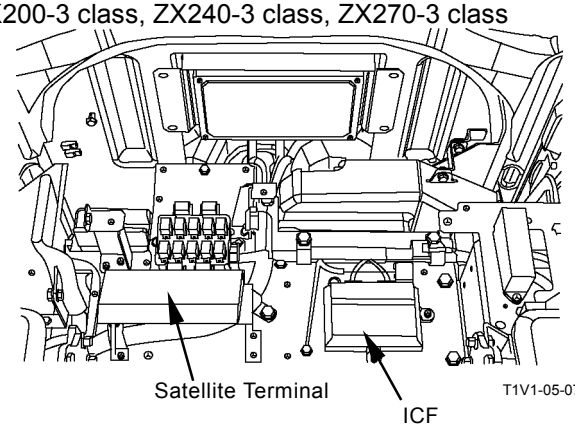
- Satellite Communication Terminal
  Receives the data from ICF, GPS aerial and monitor unit, and sends the data to the communication aerial.
- GPS Aerial
  Receives location information of the machine from a low earth orbit satellite.
- Communication Aerial
  Communicates the data with a low earth orbit satellite.
- Monitor Unit
  Sends the mail when pushing the key corresponding to requirement.

1. General Requirement
2. Fuel Replenishing Requirement
3. Service Maintenance Requirement
4. Forwarding Requirement



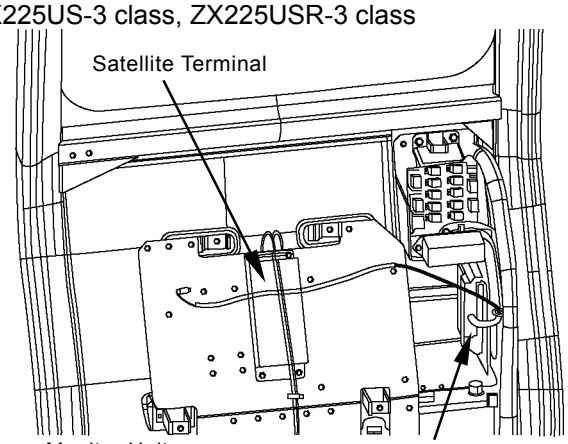
T1V1-05-07-003

ZX200-3 class, ZX240-3 class, ZX270-3 class

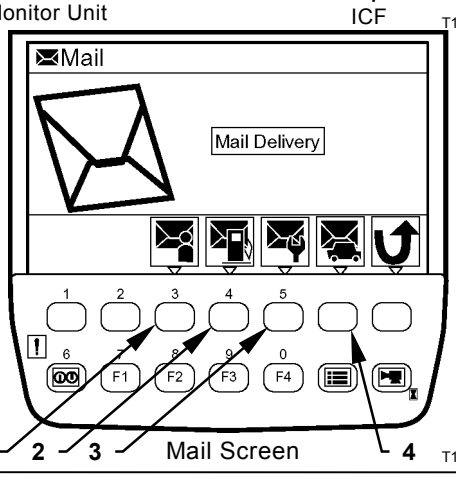


T1V1-05-07-001

ZX225US-3 class, ZX225USR-3 class



T1V1-01-02-047



T1V5-05-01-037

On the machine equipped with the satellite communication system, the data are sent according to the condition as follows:

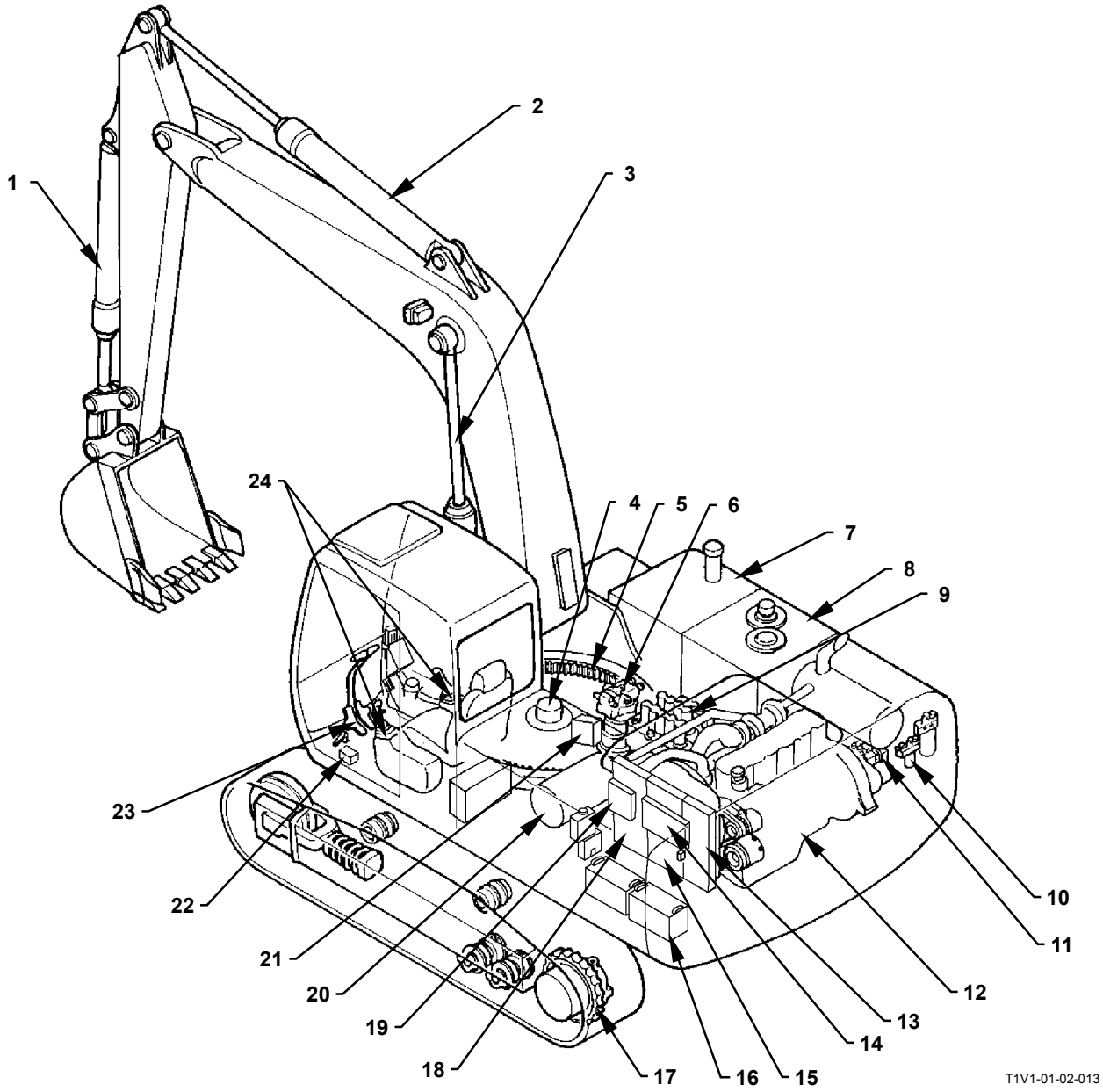
Data Type sent from the machine by using satellite communication:

Items	Data Type	Condition
Periodical Transmission	Daily Report Data, Latest Location Information, Fuel Level	The data are sent once a day. In order to avoid congested traffic in the communication line, the data is sent randomly between 0:00 and 02:00.
Transmitting Data at Engine Start	Latest Location Information	The data is sent only when the machine is moved more than 5 km from the place where it is recorded last time.
Emergency Transmission	Alarm and Error Information	The transmission starts immediately when the alarm and error occurs.
Hour Meter 100 Hours Transmission	Frequency Distribution Information	The data is sent when the hour meter exceeds every 100 hours.
Transmission by Mail	General Requirement, Fuel Replenishing Requirement, Service Maintenance Requirement and Forwarding Requirement	The transmission starts when the key on monitor unit corresponding to requirement is pushed.

(Blank)

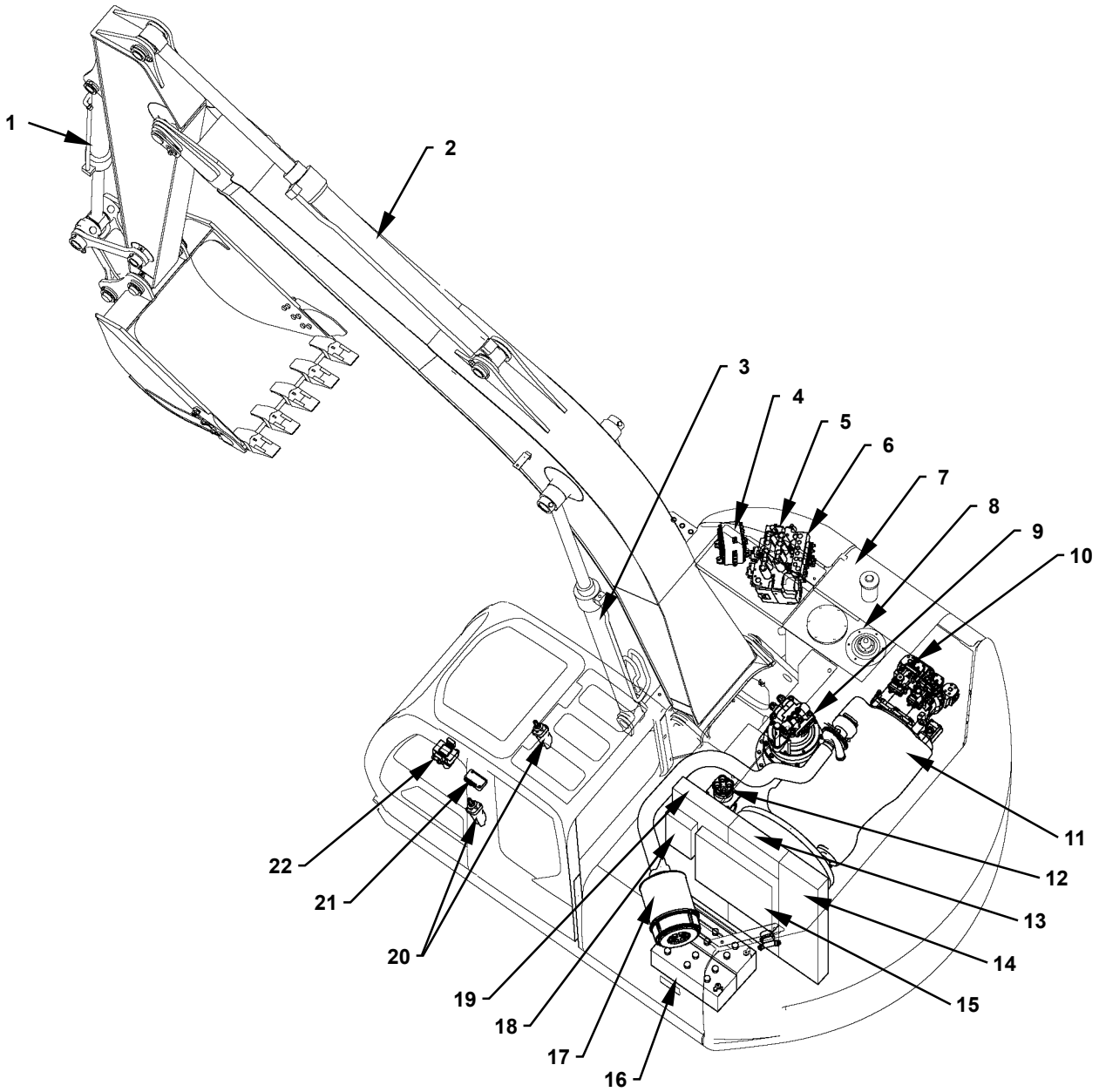
MAIN COMPONENTS

ZX200-3 class, ZX240-3 class, ZX270-3 class



1 - Bucket Cylinder
2 - Arm Cylinder
3 - Boom Cylinder
4 - Center Joint
5 - Swing Bearing
6 - Swing Device
7 - Fuel Tank
8 - Hydraulic Oil Tank
9 - Control Valve
10 - Pilot Filter/ Pilot Relief Valve
11 - Pump Device
12 - Engine
13 - Intercooler
14 - Air Conditioner Condenser
15 - Radiator
16 - Battery
17 - Travel Device
18 - Oil Cooler
19 - Fuel Cooler
20 - Air Cleaner
21 - Signal Control Valve
22 - Pilot Shut-Off Solenoid Valve
23 - Travel Pilot Valve
24 - Front Attachment / Swing Pilot Valve

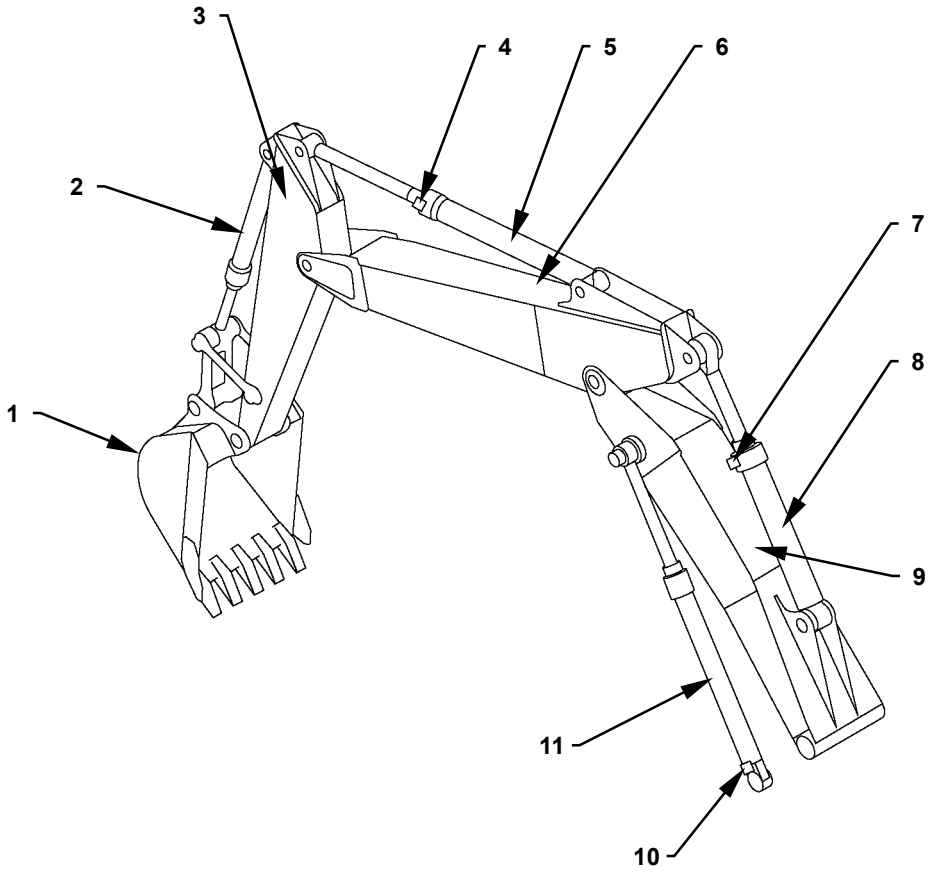
ZX225US-3class, ZX225USR-3 class



1V1-01-02-031

1 - Bucket Cylinder
2 - Arm Cylinder
3 - Boom Cylinder
4 - Signal Control Valve
5 - Control Valve
6 - Solenoid Valve Unit
7 - Fuel Tank
8 - Hydraulic Oil Tank
9 - Swing Device
10 - Pump Device
11 - Engine
12 - Center Joint
13 - Radiator
14 - Intercooler
15 - Air Conditioner Condenser
16 - Battery
17 - Air Cleaner
18 - Fuel Cooler
19 - Oil Cooler
20 - Front Attachment/ Swing Pilot Valve
21 - Pilot Shut-Off Solenoid Valve
22 - Travel Pilot Valve

Front Attachment (2-Piece Boom)

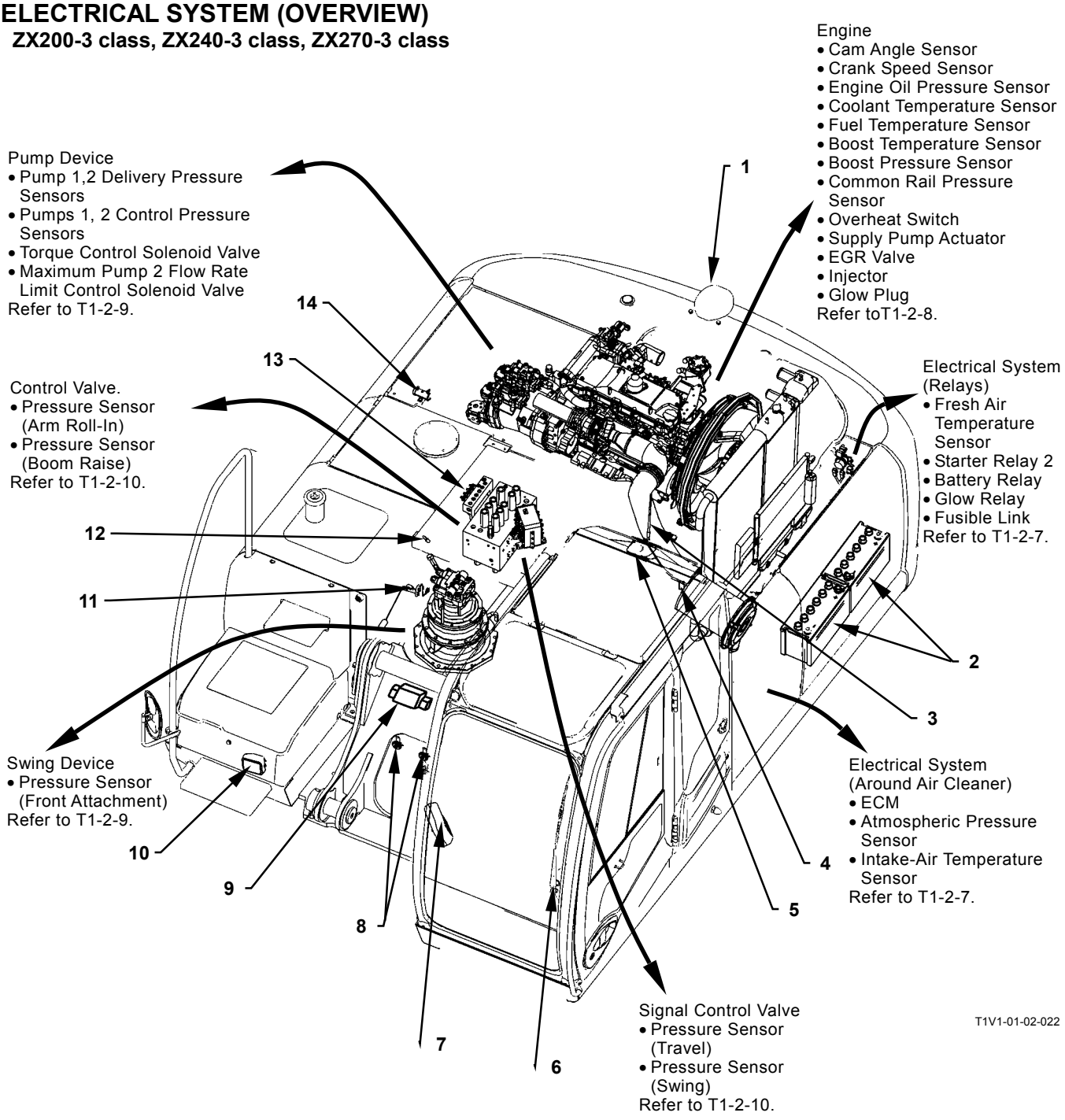


T1V1-01-02-006

1 - Bucket
2 - Bucket Cylinder
3 - Arm
4 - Hose Rupture Valve (Arm Cylinder)
5 - Arm Cylinder
6 - Upper Boom
7 - Hose Rupture Valve (Positioning Cylinder)
8 - Positioning Cylinder
9 - Bottom Boom
10 - Hose Rupture Valve (Boom Cylinder)
11 - Boom Cylinder

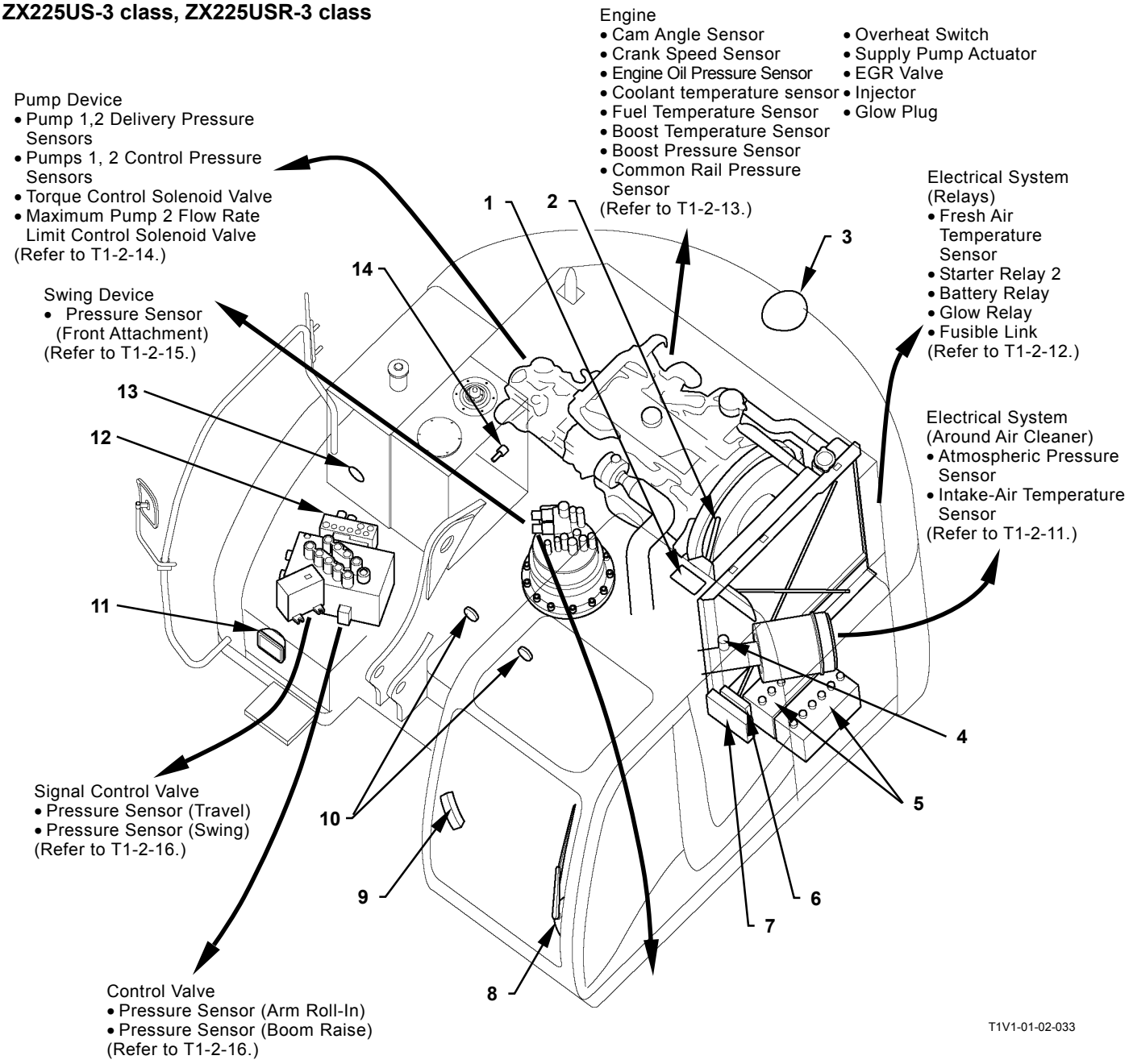
ELECTRICAL SYSTEM (OVERVIEW)

ZX200-3 class, ZX240-3 class, ZX270-3 class



1 - Rear View Camera	5 - GPS (Global Positioning System) Aerial	9 - Positioning Control Valve (2-Piece Boom Machine Only)	12 - Hydraulic Oil Temperature Sensor
2 - Battery	6 - Wiper Motor	10 - Working Light	13 - Solenoid Valve Unit
3 - Communication Aerial	7 - Monitor Unit	11 - Fuel Sensor	14 - Solenoid Pump
4 - Air Filter Restriction Switch	8 - Horn		

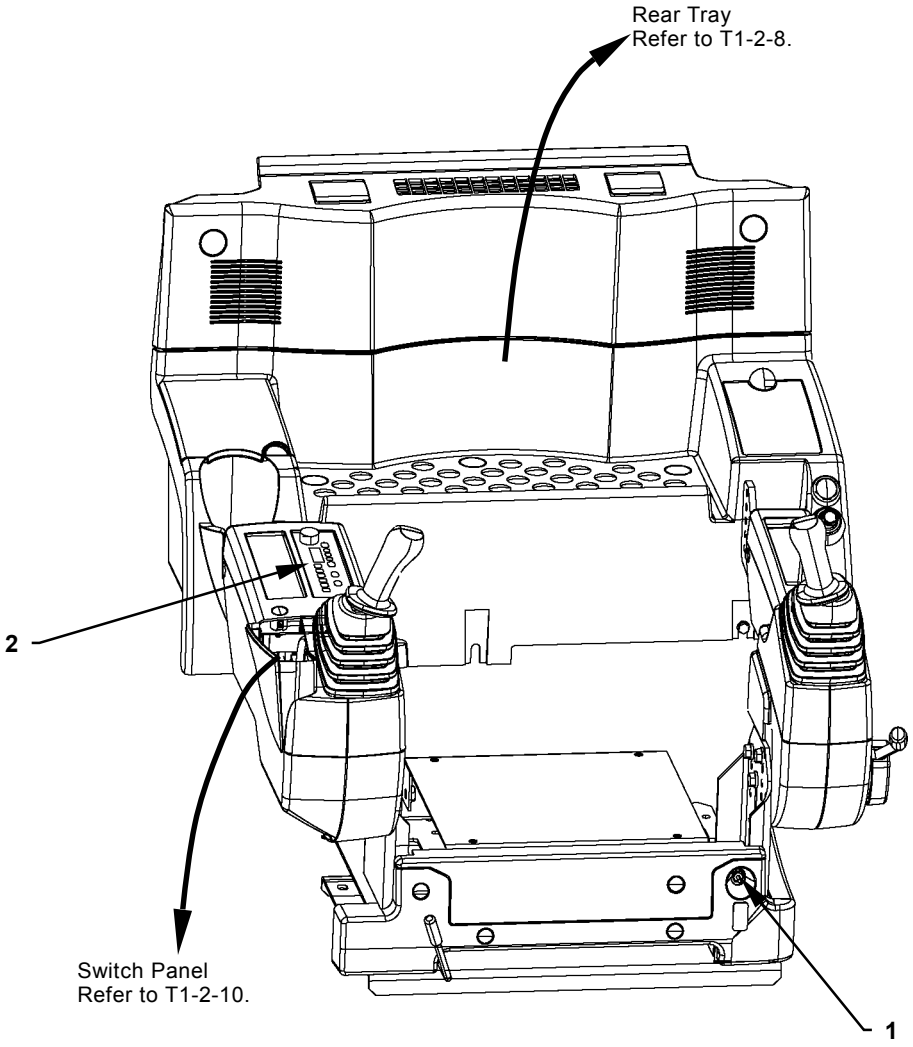
ZX225US-3 class, ZX225USR-3 class



1 - GPS (Global Positioning System) Aerial
2 - Communication Aerial
3 - Rear View Camera
4 - Air Filter Restriction Switch
5 - Battery
6 - ECM (Engine Control Module)
7 - MC (Main Controller)
8 - Wiper Motor
9 - Monitor Unit
10 - Horn
11 - Working Light
12 - Solenoid Valve Unit
13 - Fuel Sensor
14 - Hydraulic Oil Temperature Sensor

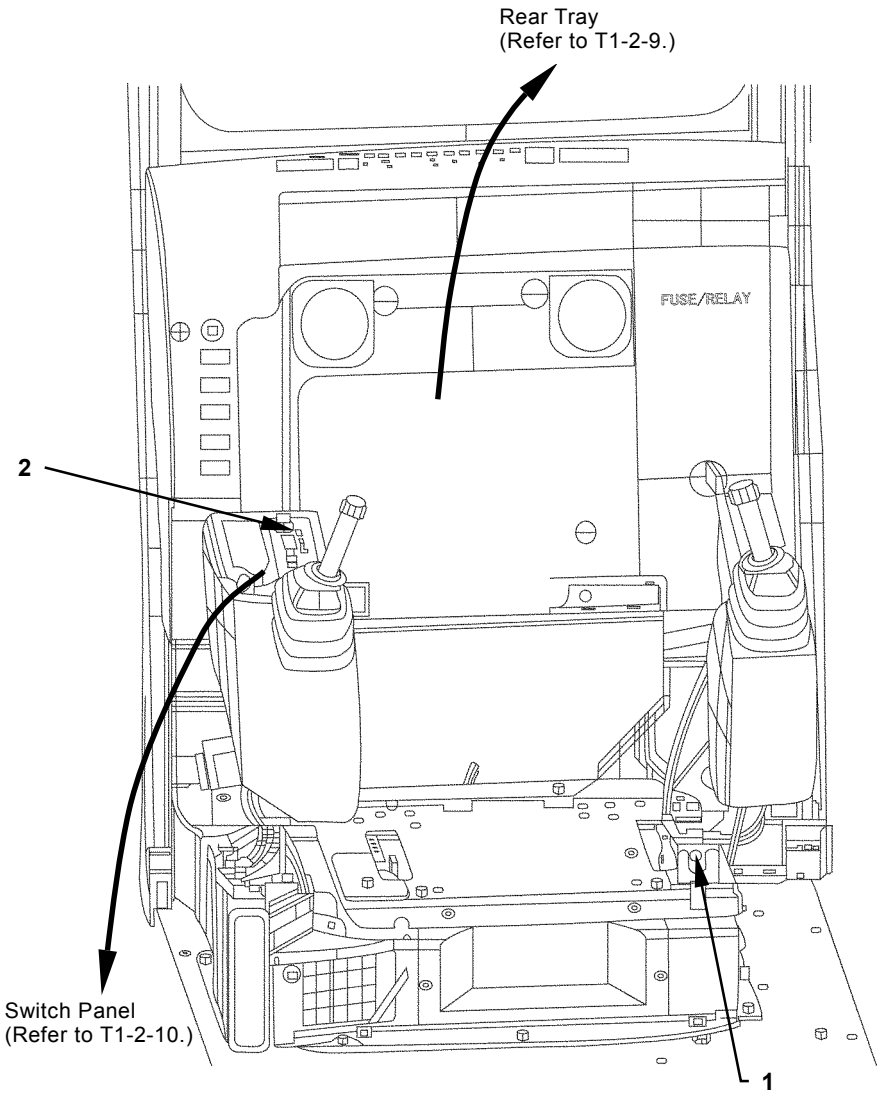
ELECTRICAL SYSTEM (IN CAB)

ZX200-3 class, ZX240-3 class, ZX270-3 class



1 - Engine Stop Switch 2 - Radio

ZX225US-3 class, ZX225USR-3 class

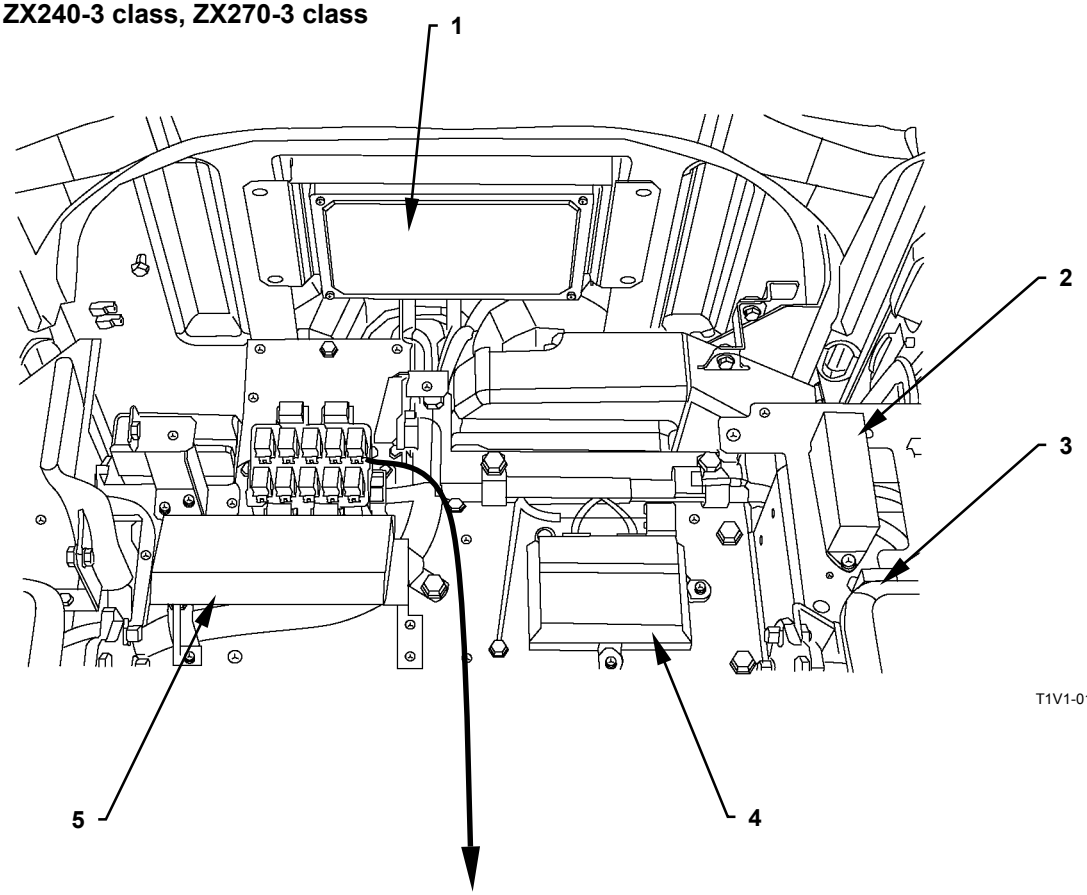


T1V1-01-02-034

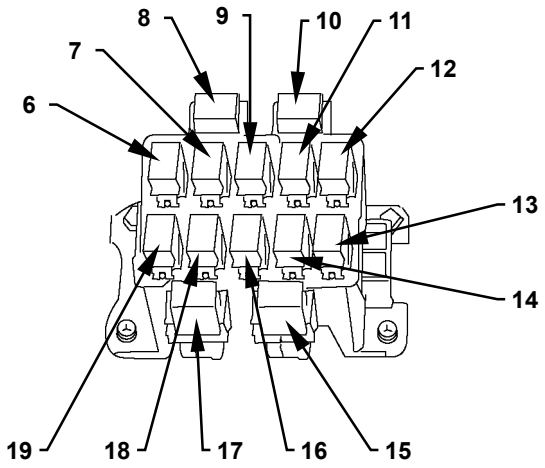
1 – Engine Stop Switch 2 - Radio

ELECTRICAL SYSTEM (REAR TRAY)

ZX200-3 class, ZX240-3 class, ZX270-3 class



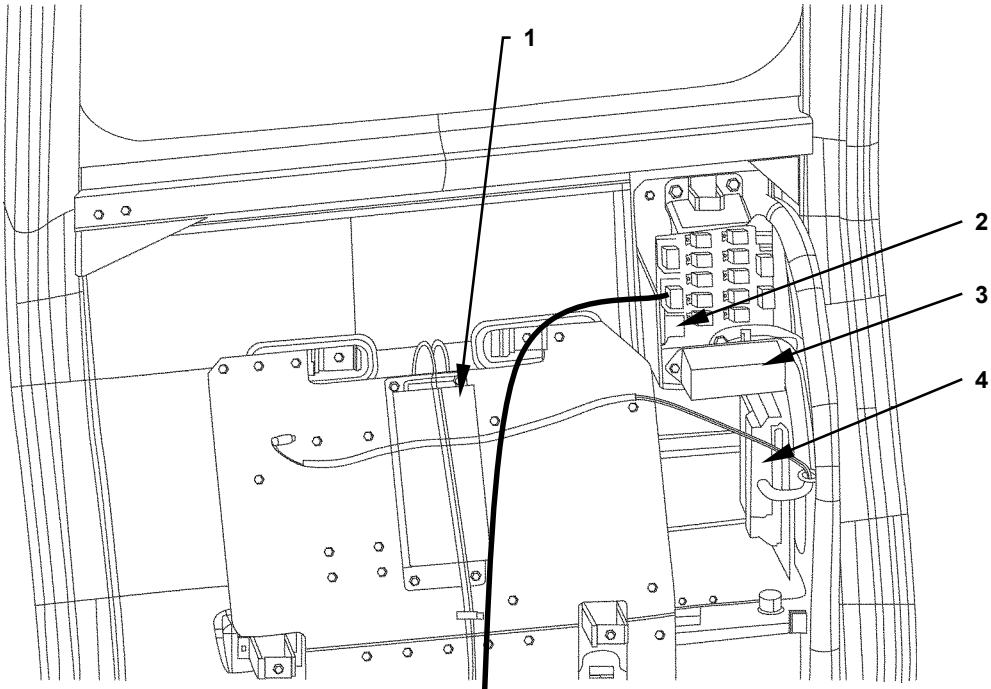
T1V1-01-02-007



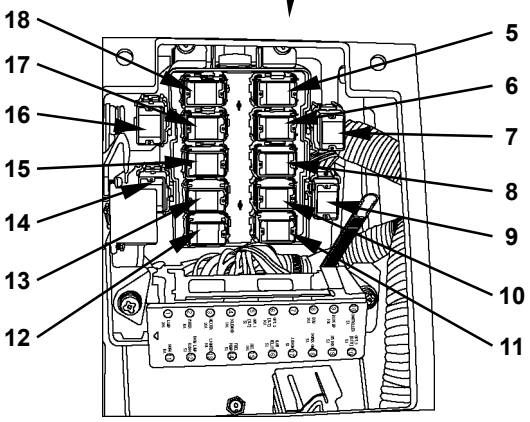
T1V1-01-02-009

1 - MC (Main Controller)
2 - Fuse Box
3 - Dr. ZX Connector (Download Connector Using Combinedly)
4 - ICF (Information Controller)
5 - Satellite Communication Terminal (Optional)
6 - Starter Relay 2 (R5)
7 - Starter Cut Relay (R4)
8 - OFF Relay (Air Conditioner) (R12)
9 - Security Horn Relay (R3)
10 - Air Conditioner Relay (R11)
11 - Pilot Shut-Off Relay (R12)
12 - Load Damp Relay (R1)
13 - Wiper Relay (R6)
14 - Light Relay 1 (R7)
15 - MAX HI Relay (Air Conditioner) (R13)
16 - Light Relay 2 (R8)
17 - ECM (Engine Control Module) Main Relay (R14)
18 - Washer Relay (R9)
19 - Horn Relay (R10)

ZX225US-3 class, ZX225USR-3 class



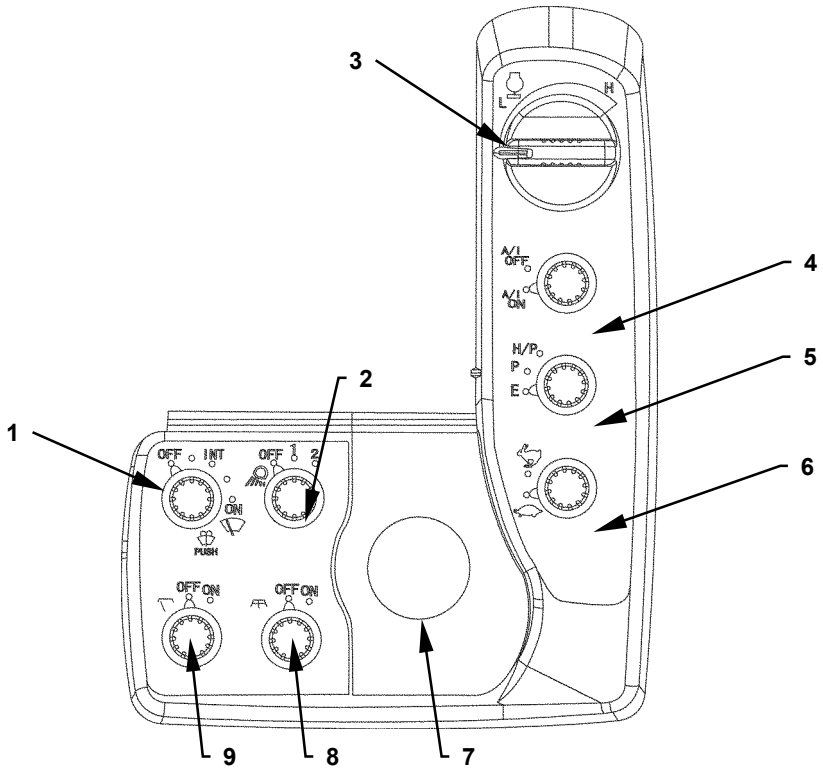
T1V1-01-02-035



T1V1-01-02-036

1 - Satellite Communication Terminal (Optional)
2 - Dr. ZX Connector (Download Connector Using Combinedly)
3 - Fuse Box
4 - ICF (Information Controller)
5 - Wiper Relay (R6)
6 - Light Relay 1 (R7)
7 - MAX HI Relay (Air Conditioner) (R13)
8 - Light Relay 2 (R8)
9 - ECM (Engine Control Module) Main Relay (R14)
10 - Washer Relay (R9)
11 - Horn Relay (R10)
12 - Starter Relay 2 (R5)
13 - Starter Cut Relay (R4)
14 - OFF Relay (Air Conditioner) (R12)
15 - Security Horn Relay (R3)
16 - Air Conditioner Relay (R11)
17 - Pilot Shut-Off Relay (R2)
18 - Load Damp Relay (R1)

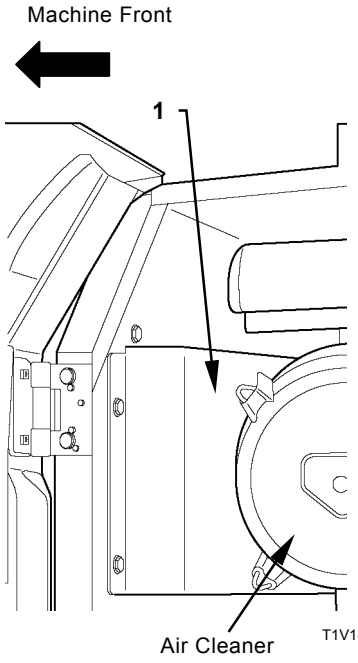
ELECTRICAL SYSTEM (SWITCH PANEL)



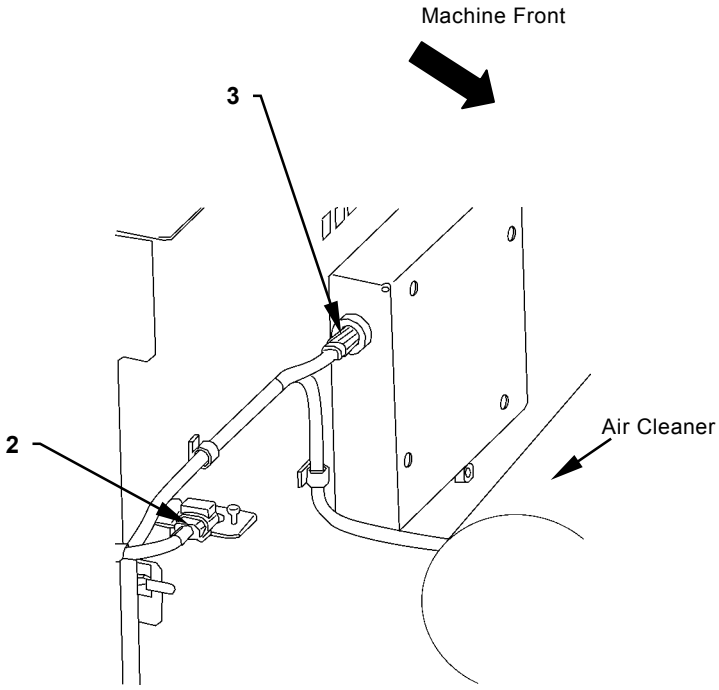
1 − Wiper / Washer Switch
2 − Working Light Switch
3 − Engine Control Dial
4 - Auto-Idle Switch
5 - Power Mode Switch
6 - Travel Mode Switch
7 - Key Switch
8 - Overhead Window Washer Switch (Optional)
9 - Overhead Window Wiper Switch (Optional)

ELECTRICAL SYSTEM (AROUND AIR CLEANER)

ZX200-3 class, ZX240-3 class, ZX270-3 class

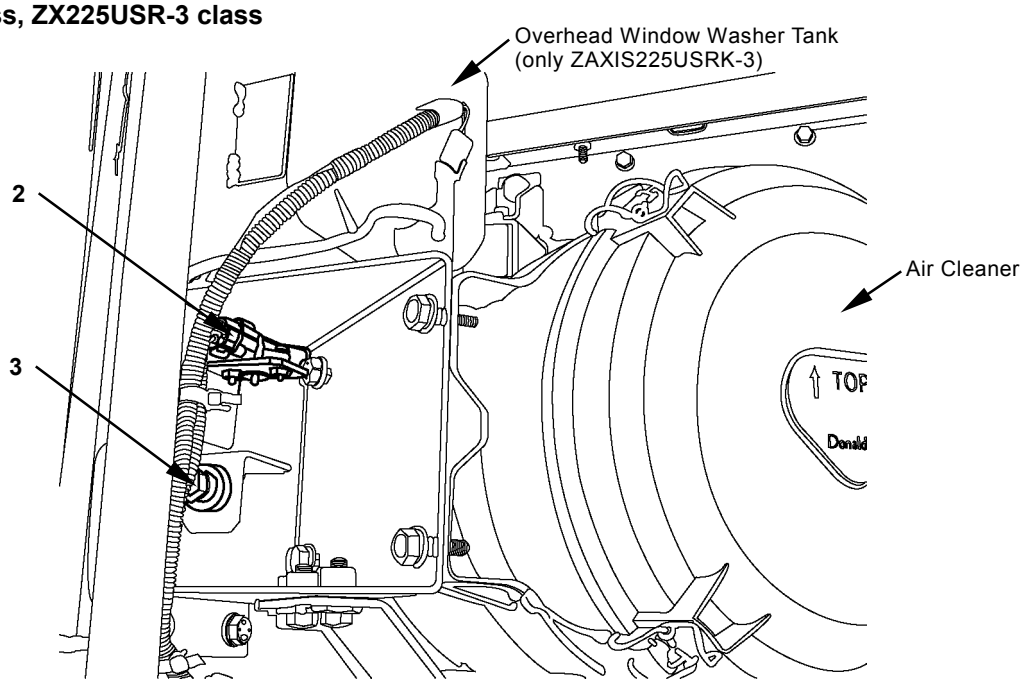


T1V1-01-02-023



T1V1-01-02-012

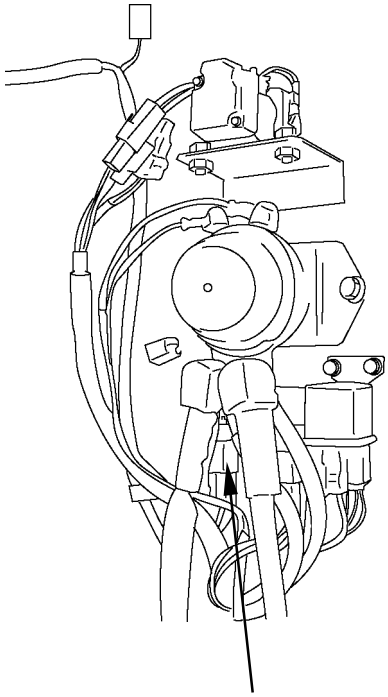
ZX225US-3 class, ZX225USR-3 class



T1V1-01-02-038

1 - ECM (Engine Control Module)
2 - Atmospheric Pressure Sensor
3 - Intake-Air Temperature Sensor

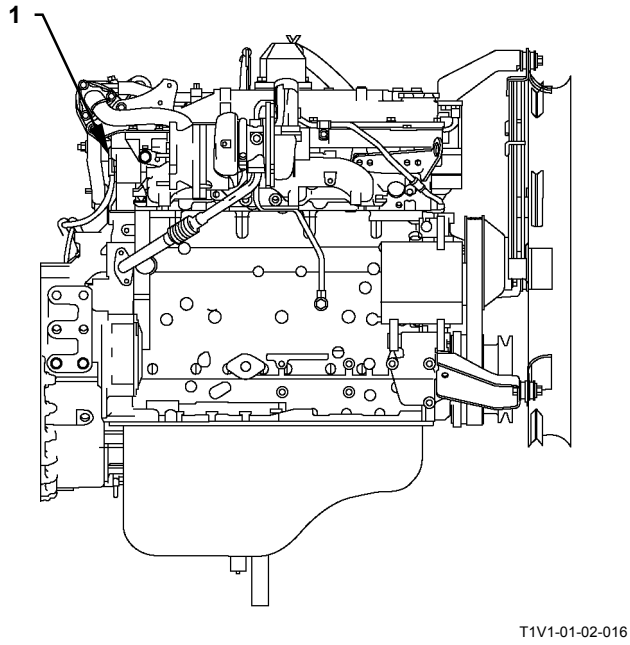
ELECTRICAL SYSTEM (RELAYS)



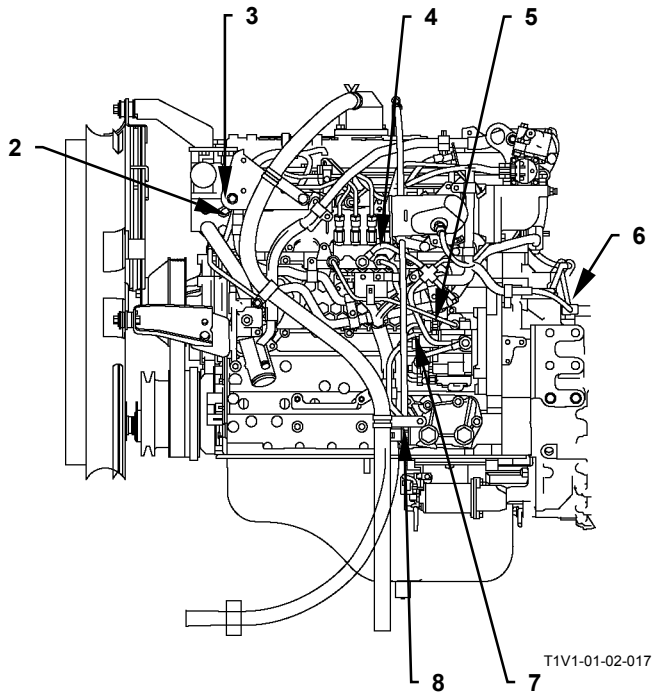
T1V1-01-02-018

1 - Fresh Air Temperature Sensor
2 - Starter Relay 2
3 - Battery Relay
4 - Glow Relay
5 - Fusible Link

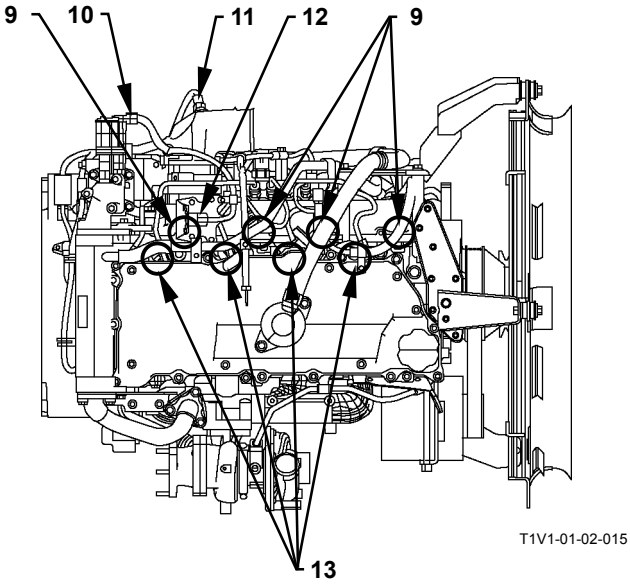
ENGINE



T1V1-01-02-016



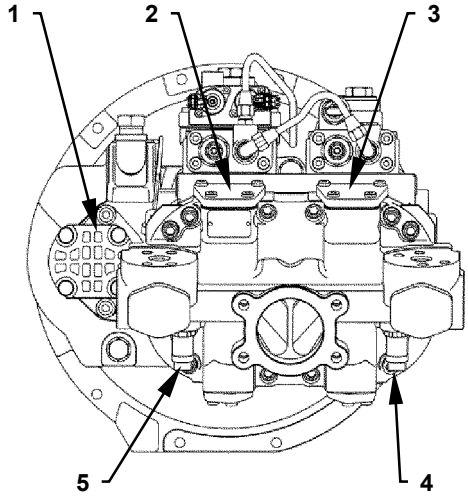
T1V1-01-02-017



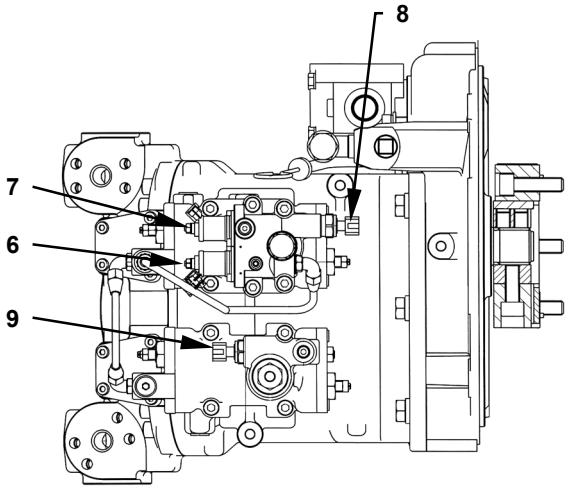
T1V1-01-02-015

1 - Cam Angle Sensor
2 - Overheat Switch
3 - Coolant temperature sensor
4 - Common Rail Pressure Sensor
5 - Fuel Temperature Sensor
6 - Crank Speed Sensor
7 - Supply Pump Actuator
8 - Hydraulic Oil Pressure Sensor
9 - Injector
10 - EGR (Exhaust Gas Recirculation) Valve
11 - Boost Temperature Sensor
12 - Boost Pressure Sensor
13 - Glow Plug

PUMP DEVICE

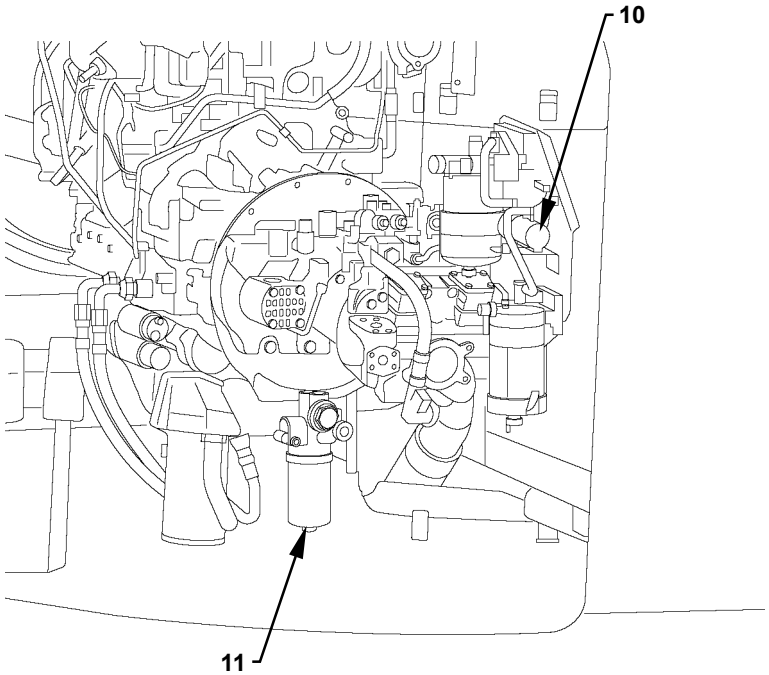


T1V1-01-02-032



T1V1-04-05-002

AROUND PUMP DEVICE
(ZX225US-3 class, ZX225USR-3 class)

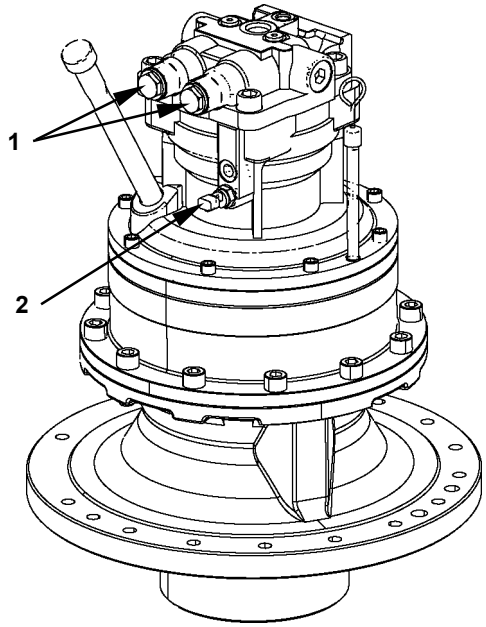


T1V1-01-02-039

1 - Pilot Pump
2 - Pump 2
3 - Pump 1
4 - Pump 1 Delivery Pressure Sensor
5 - Pump 2 Delivery Pressure Sensor
6 - Torque Control Solenoid Valve
7 - Maximum Pump 2 Flow Rate Limit Control Solenoid Valve
8 - Pump 2 Control Pressure Sensor
9 - Pump 1 Control Pressure Sensor
10 - Solenoid Pump
11 - Pilot Filter/ Pilot Relief Valve

SWING DEVICE

ZX200-3 class, ZX225US-3 class, ZX225USR-3 class, ZX240-3 class

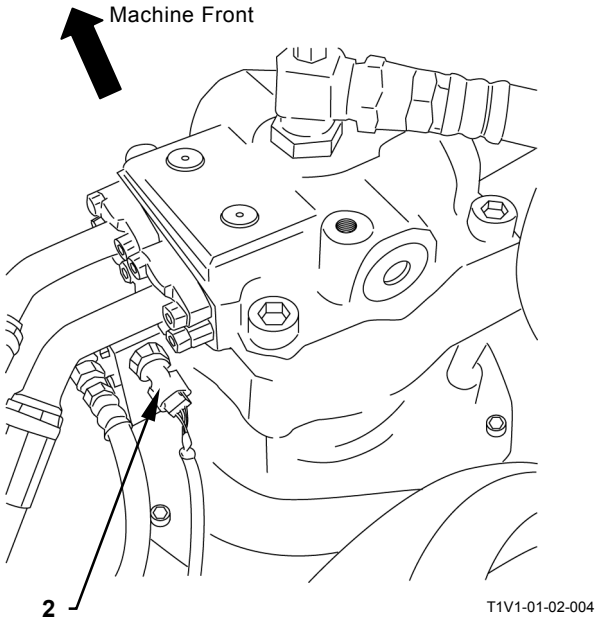


T1V1-01-02-005

1 − Swing Relief Valve

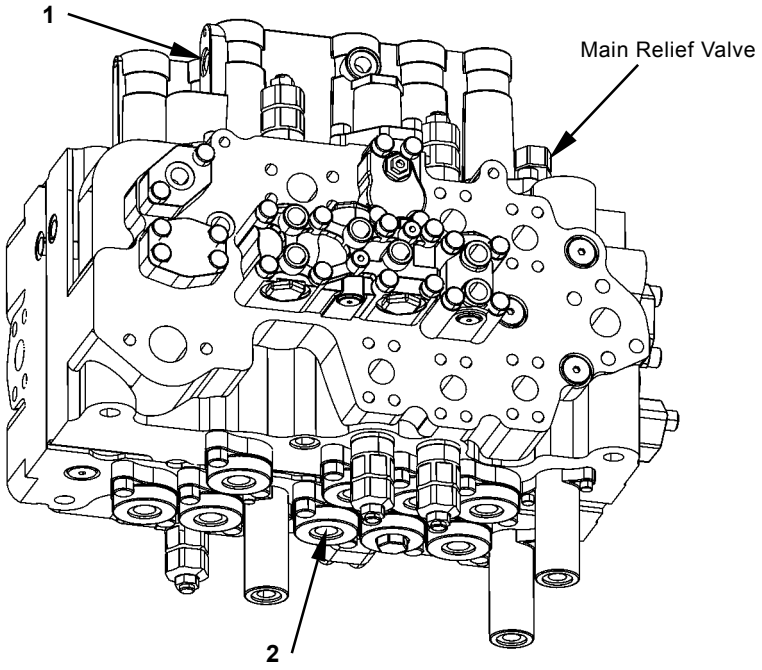
2 - Pressure Sensor (Front Attachment)

ZX270-3 class



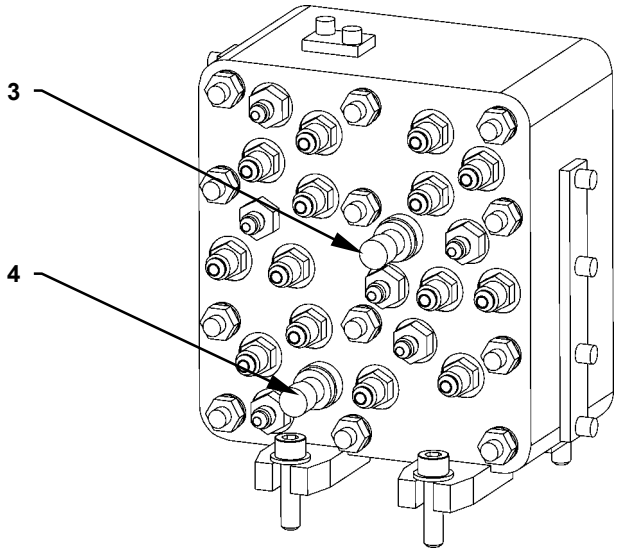
T1V1-01-02-004

CONTROL VALVE



T1V1-03-03-073

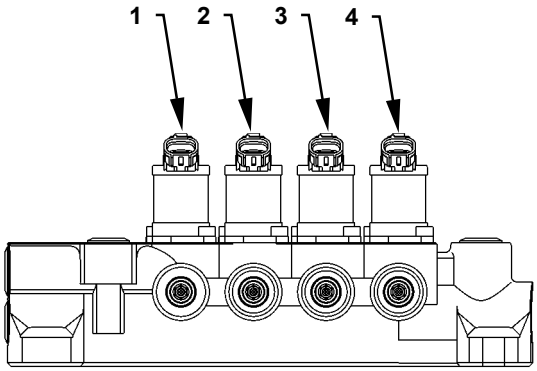
SIGNAL CONTROL VALVE



T1V1-01-02-014

1 - Pressure Sensor (Arm Roll-In)
2 - Pressure Sensor (Boom Raise)
3 - Pressure Sensor (Swing)
4 - Pressure Sensor (Travel)

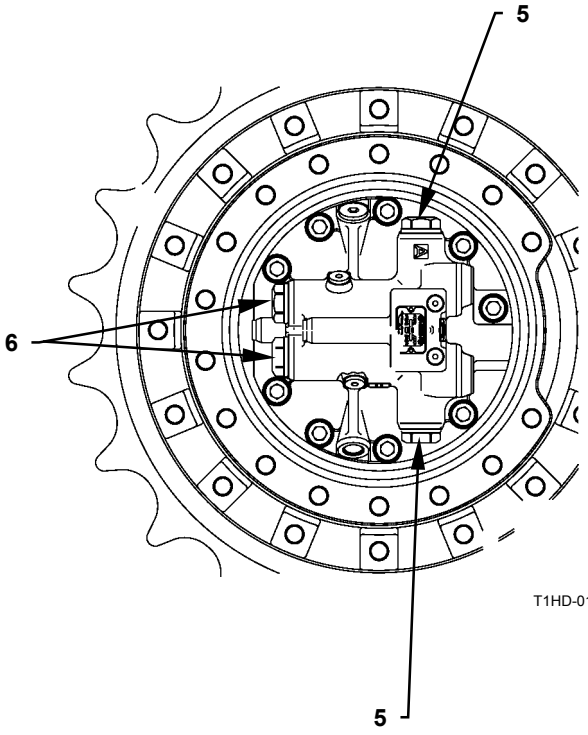
SOLENOID VALVE UNIT



T1V1-03-07-007

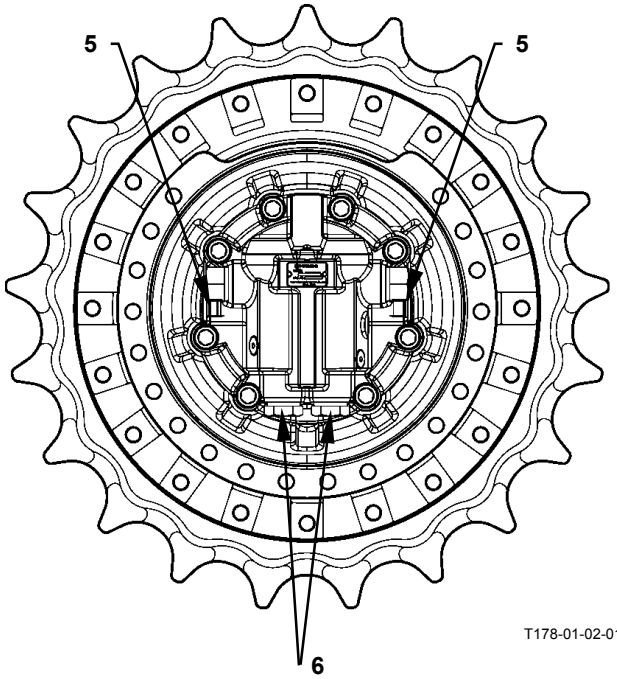
TRAVEL DEVICE

ZX200-3 class, ZX225US-3 class, ZX225USR-3 class, ZX240-3 class



T1HD-01-02-001

ZX270-3 class

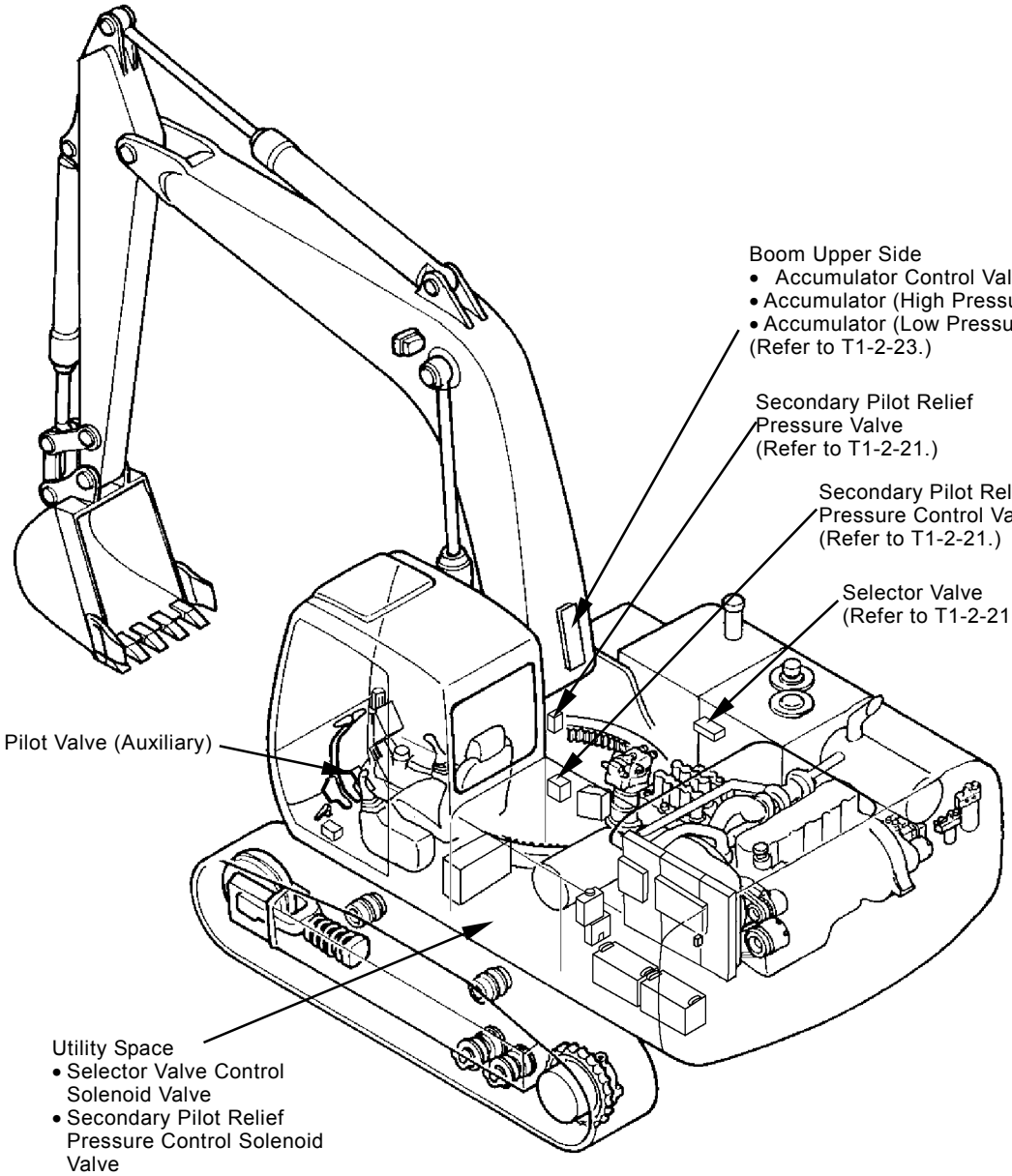


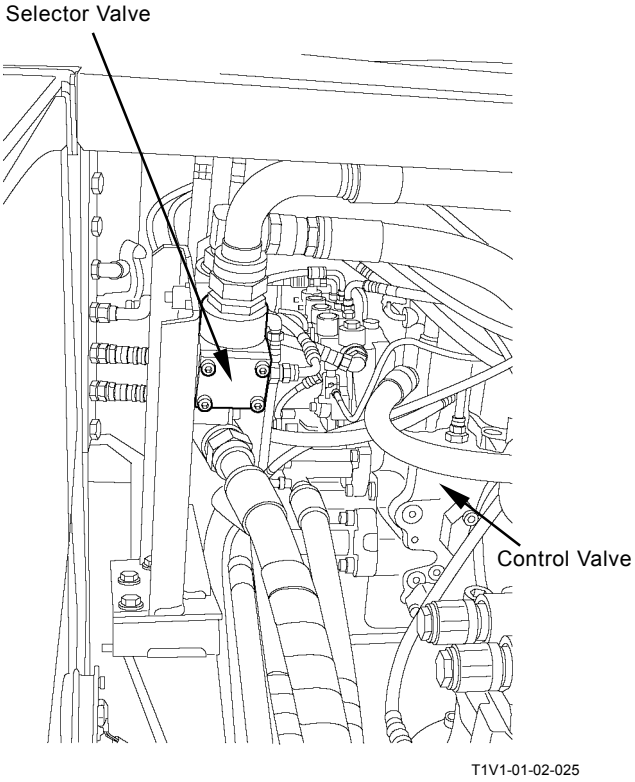
T178-01-02-014

1 - Solenoid Valve Unit SC
2 - Solenoid Valve Unit SF
3 - Solenoid Valve Unit SI
4 - Solenoid Valve Unit SG
5 - Counterbalance Valve
6 − Travel Relief Valve

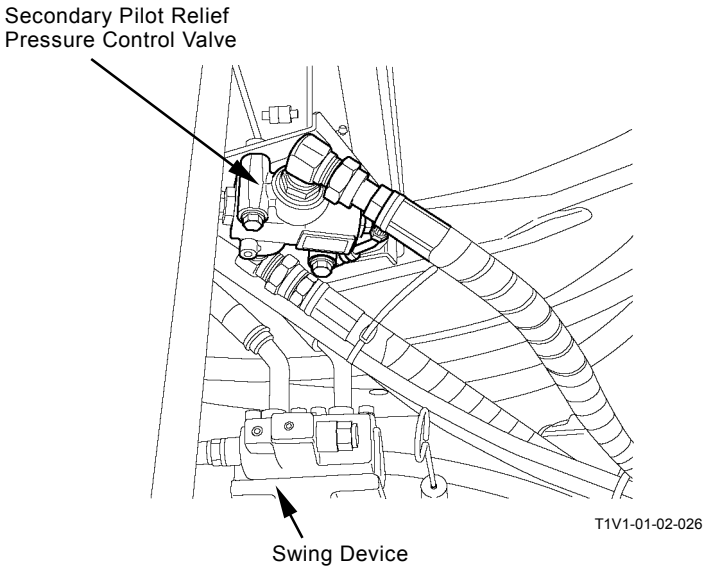
LAYOUT OF ATTACHMENT SPEC. PARTS

ZX200-3 class, ZX240-3 class, ZX270-3 class





T1V1-01-02-025



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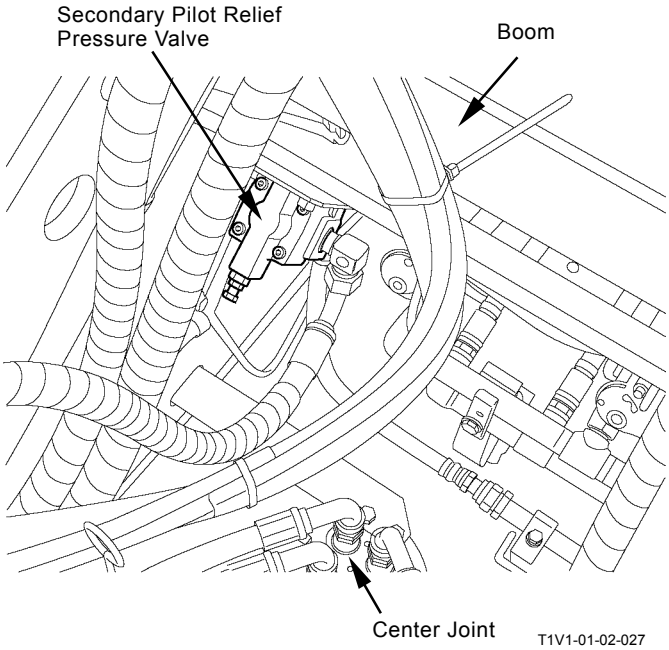
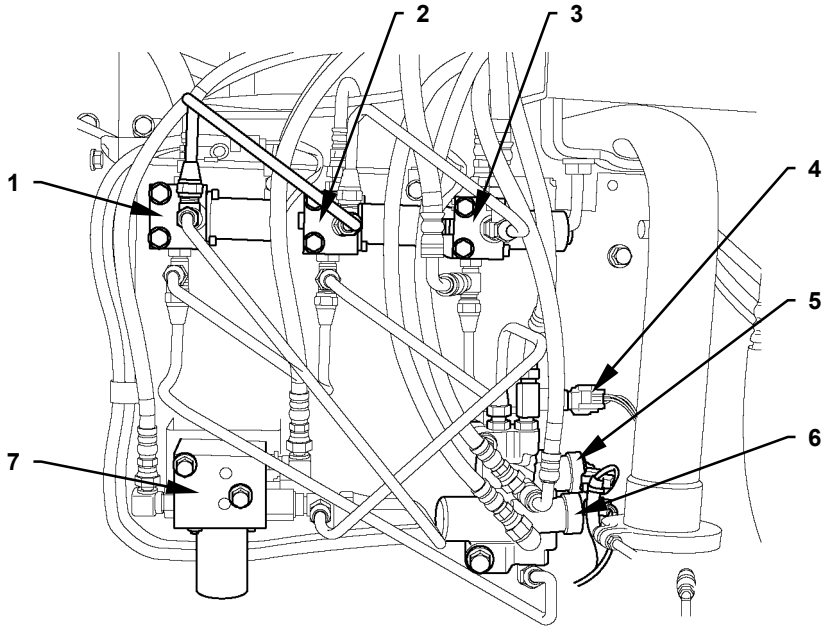
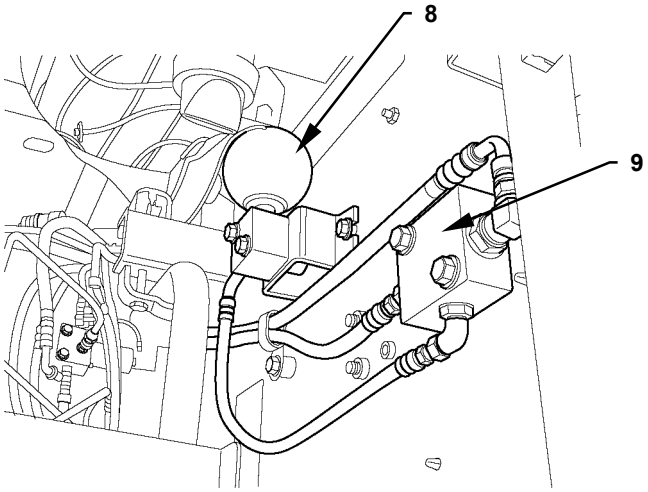


T1V1-01-02-027

Utility Space



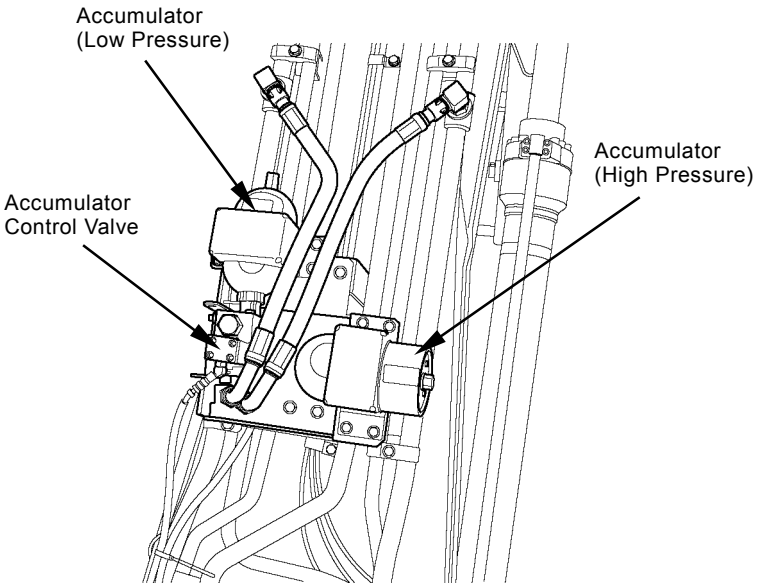
T1V1-01-02-028



T1V1-01-02-029

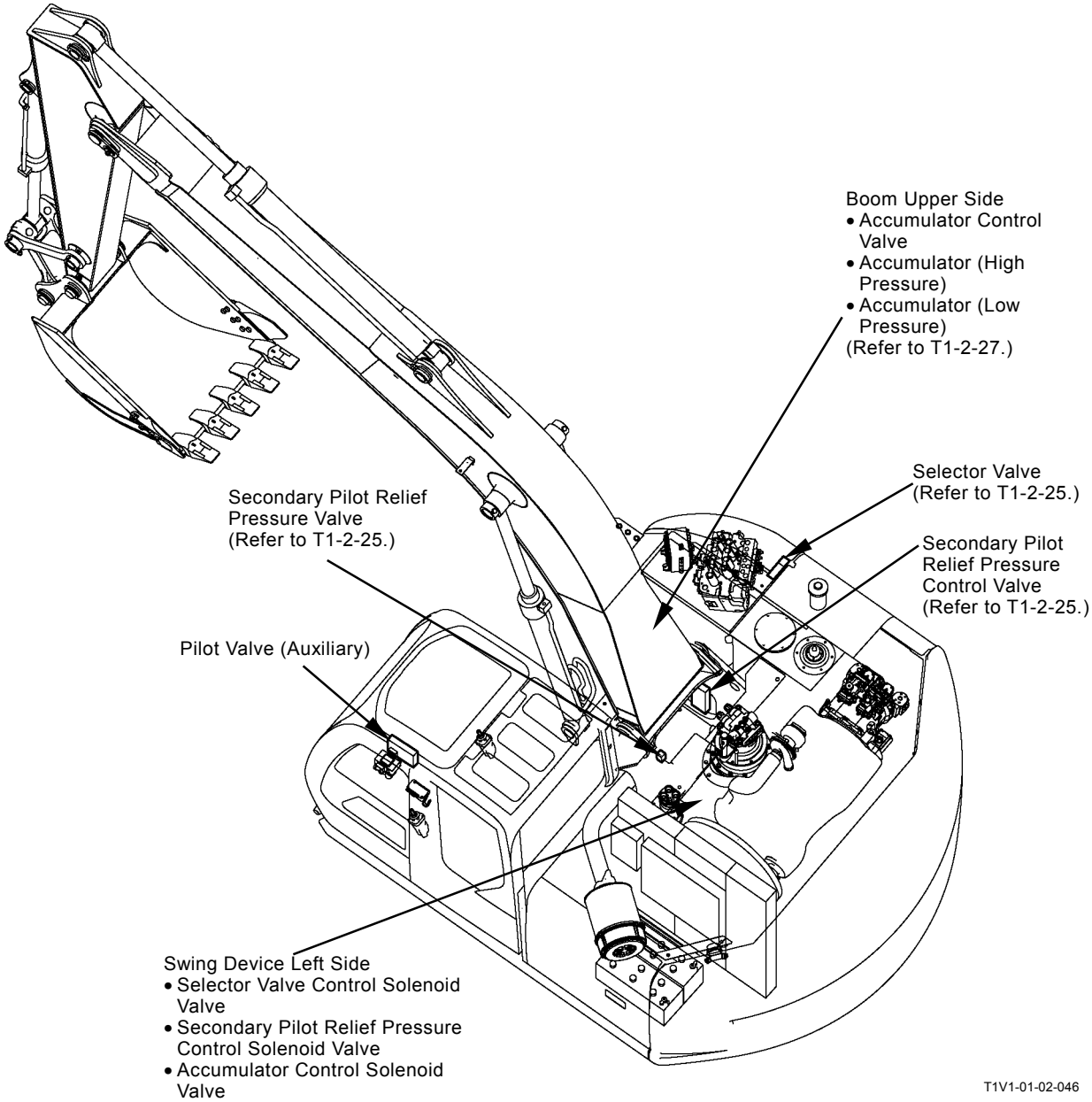
1 - Selector Valve Control Solenoid Valve
2 - Secondary Pilot Relief Pressure Control Solenoid Valve
3 - Accumulator Control Solenoid Valve
4 - Pressure Sensor (Auxiliary)
5 - Auxiliary Flow Combining Solenoid Valve
6 - Auxiliary Flow Rate Control Solenoid Valve
7 - Pressure Reducing Valve:
8 - Accumulator (Pilot Circuit)
9 - Check Valve

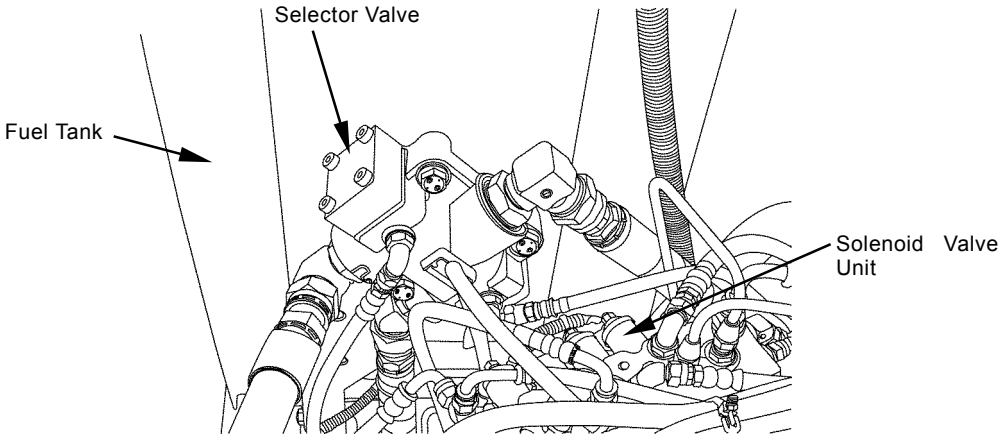
Boom Upper Side



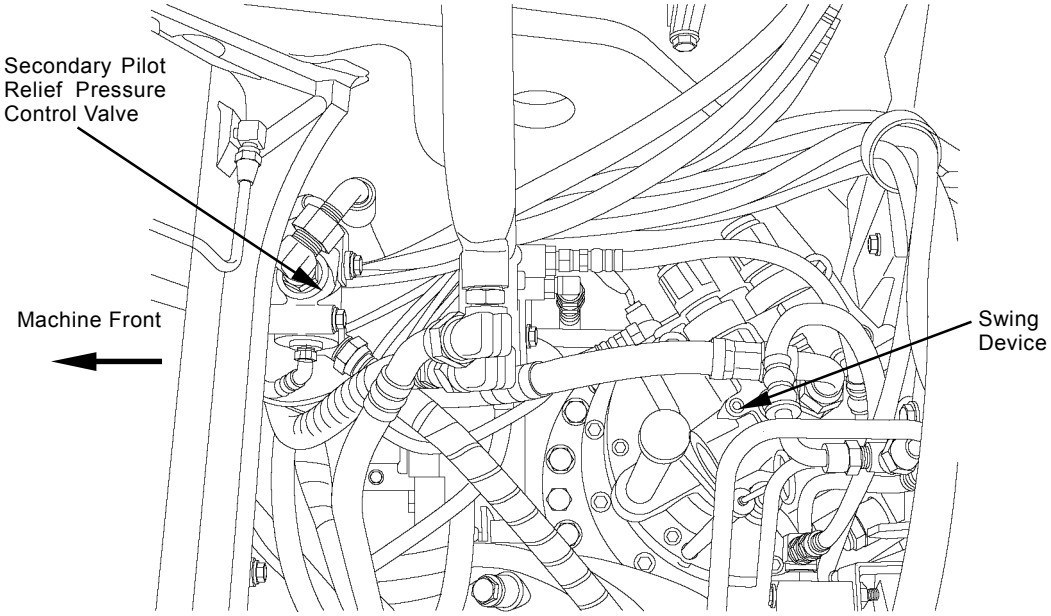
T1V1-01-02-030

ZX225US-3 class, ZX225USR-3 class

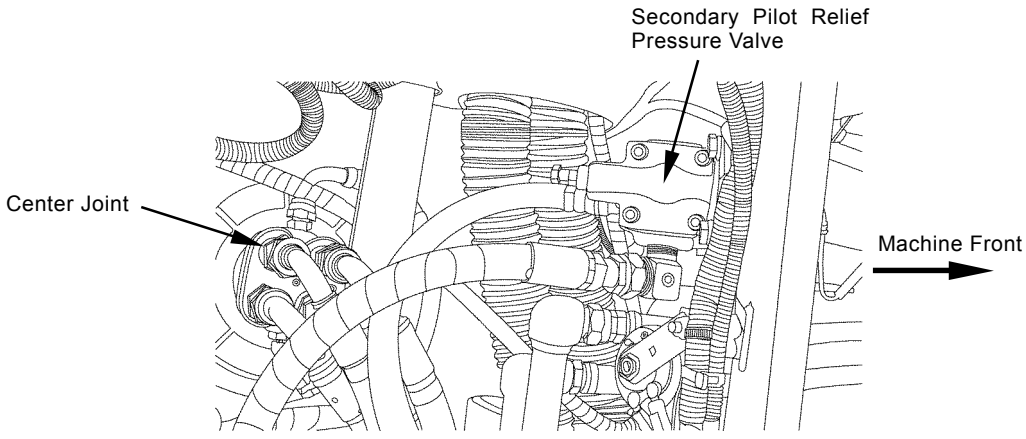




T1V1-01-02-040

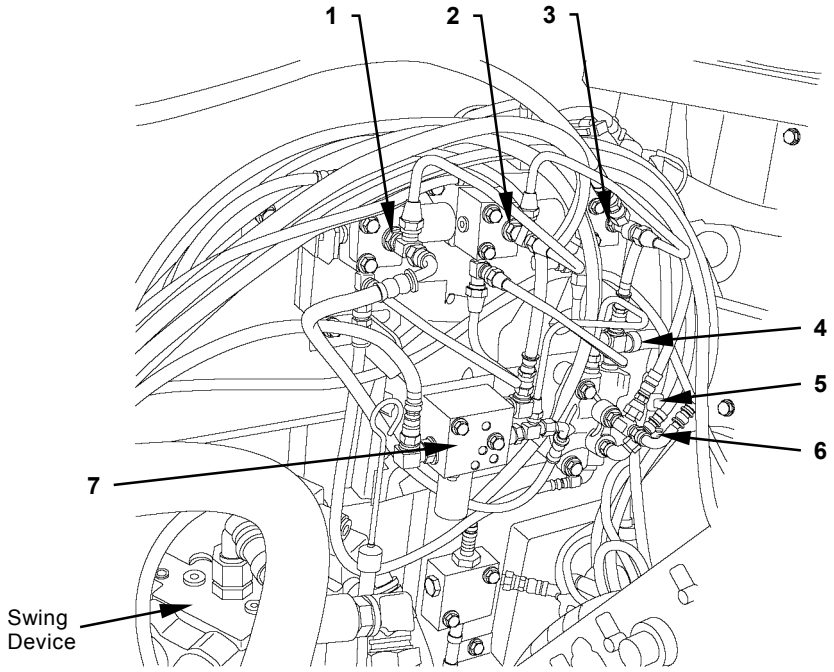


T1V1-01-02-042



T1V1-01-02-041

Swing Device Left Side



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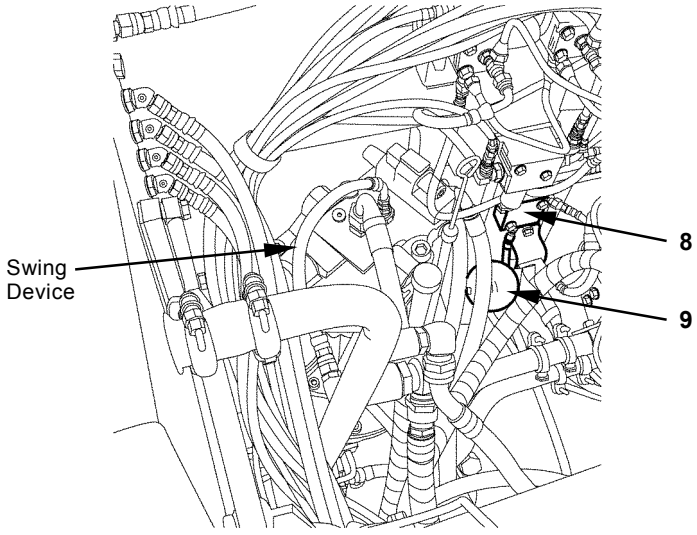
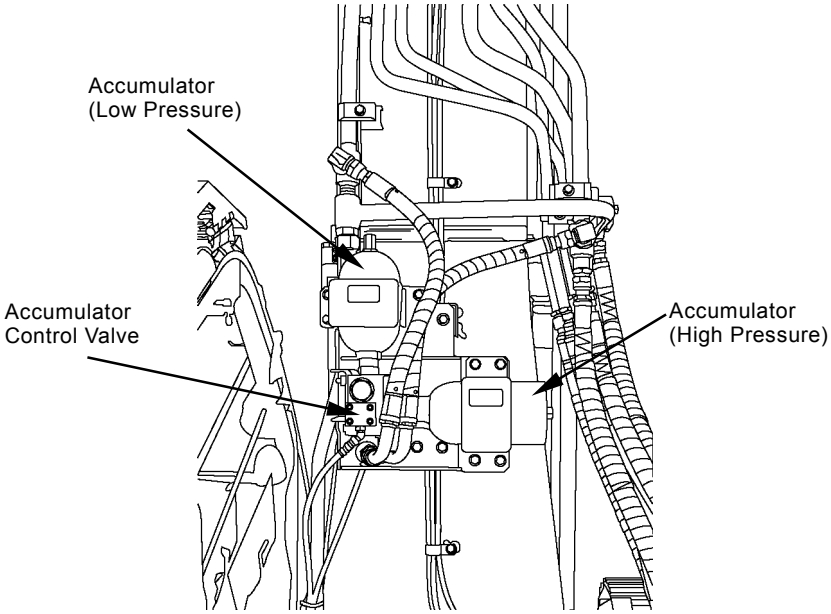


T1V1-01-02-044

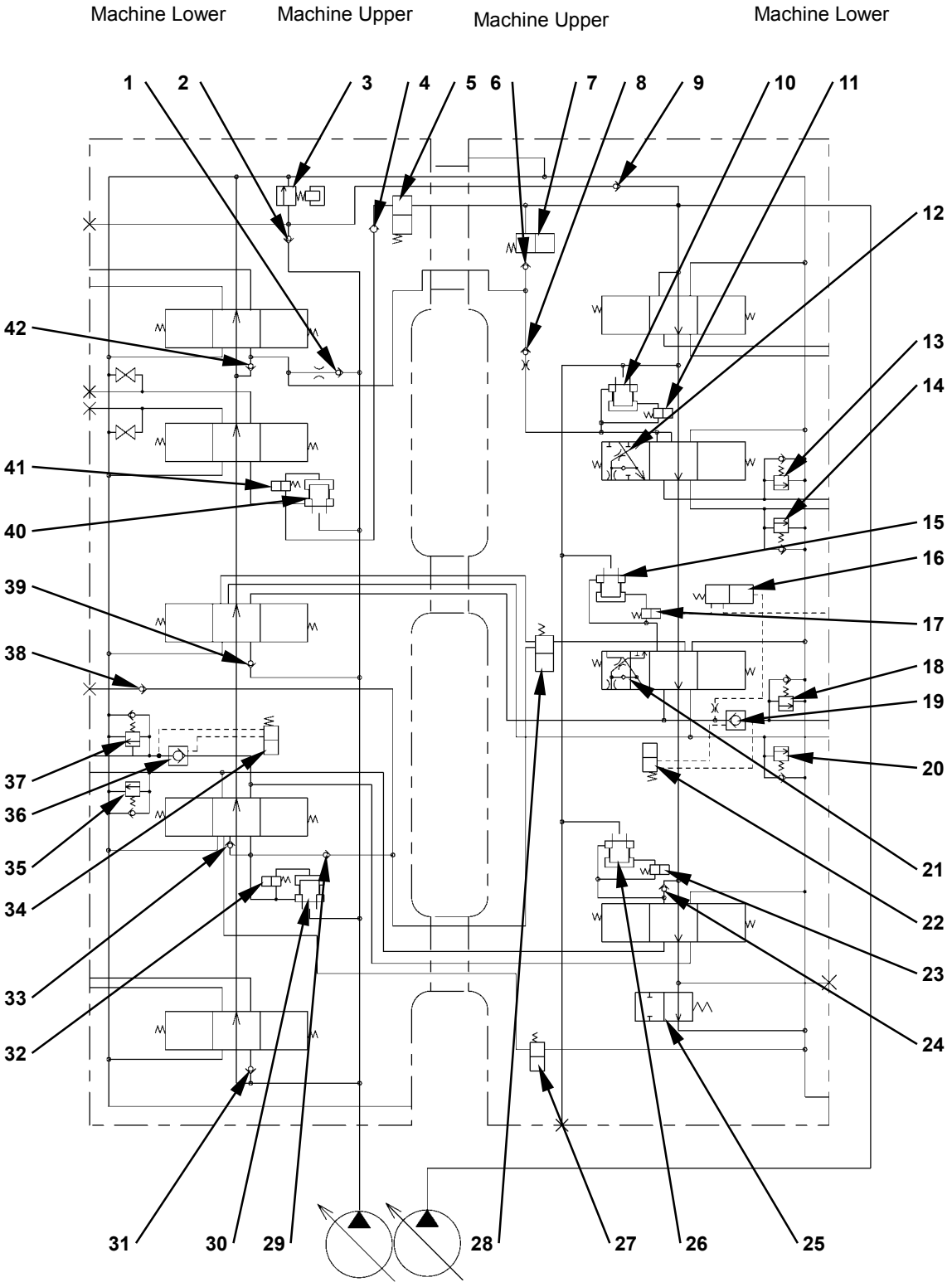
1 - Selector Valve Control Solenoid Valve
2 - Secondary Pilot Relief Pressure Control Solenoid Valve
3 - Accumulator Control Solenoid Valve
4 - Pressure Sensor (Auxiliary)
5 - Auxiliary Flow Combining Solenoid Valve
6 - Auxiliary Flow Rate Control Solenoid Valve
7 - Pressure reducing valve:
8 - Check Valve
9 - Accumulator (Pilot Circuit)

Boom Upper Side



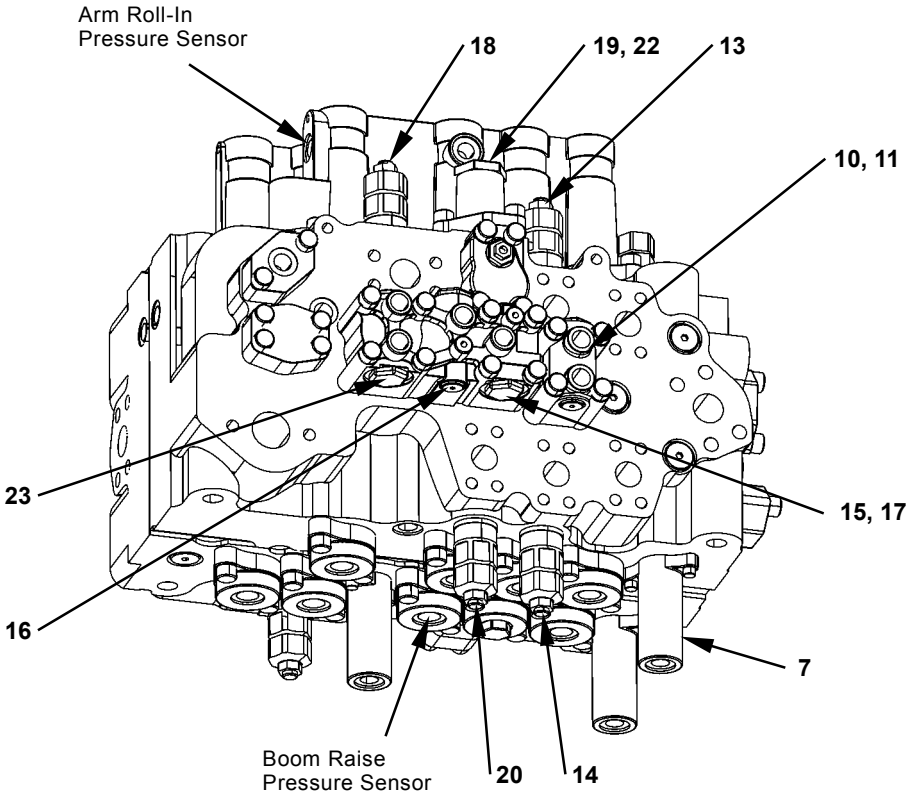
T1V1-01-02-045

Layout of Control Valve

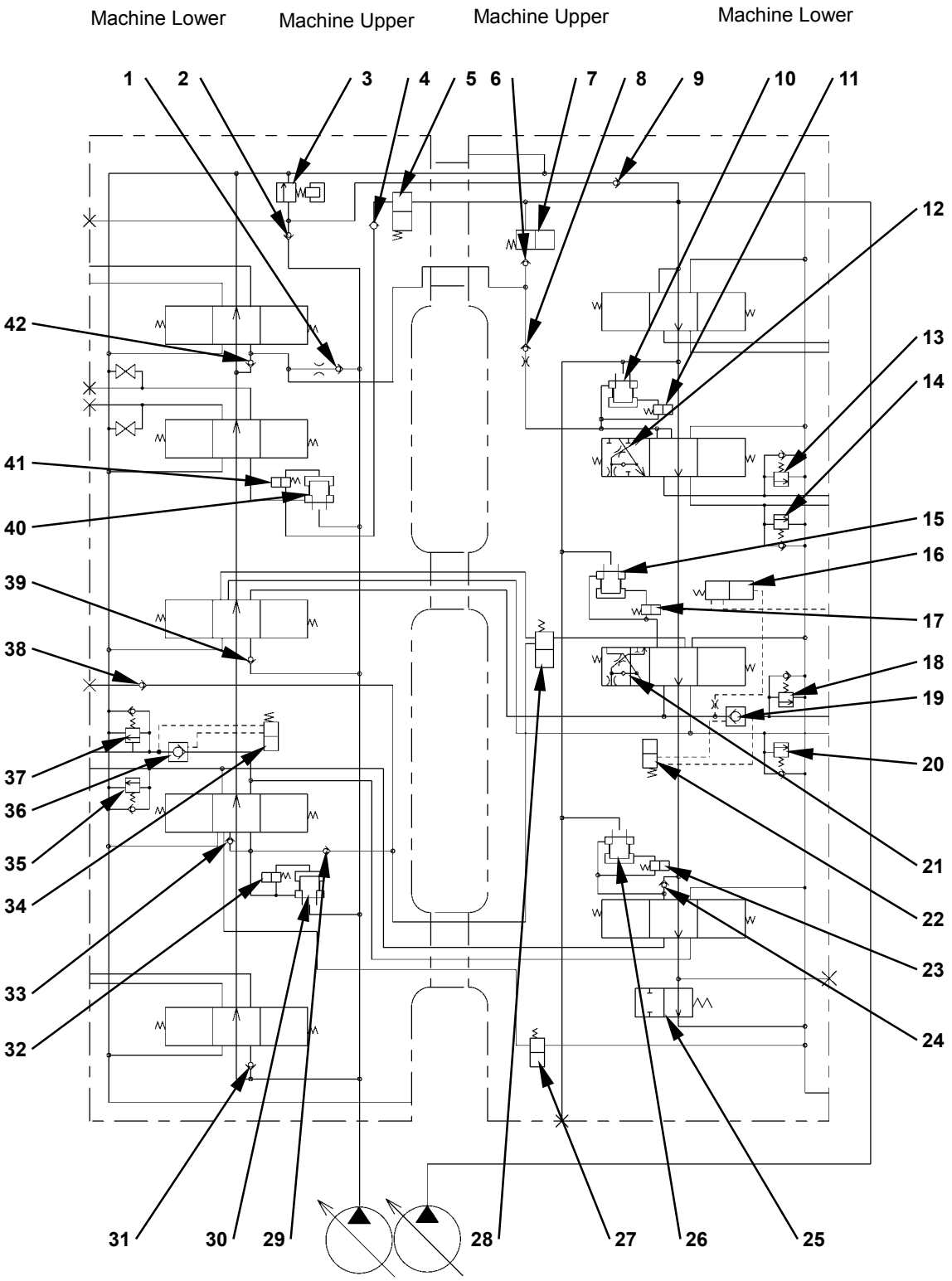


T1V1-03-03-021

4-Spool Section

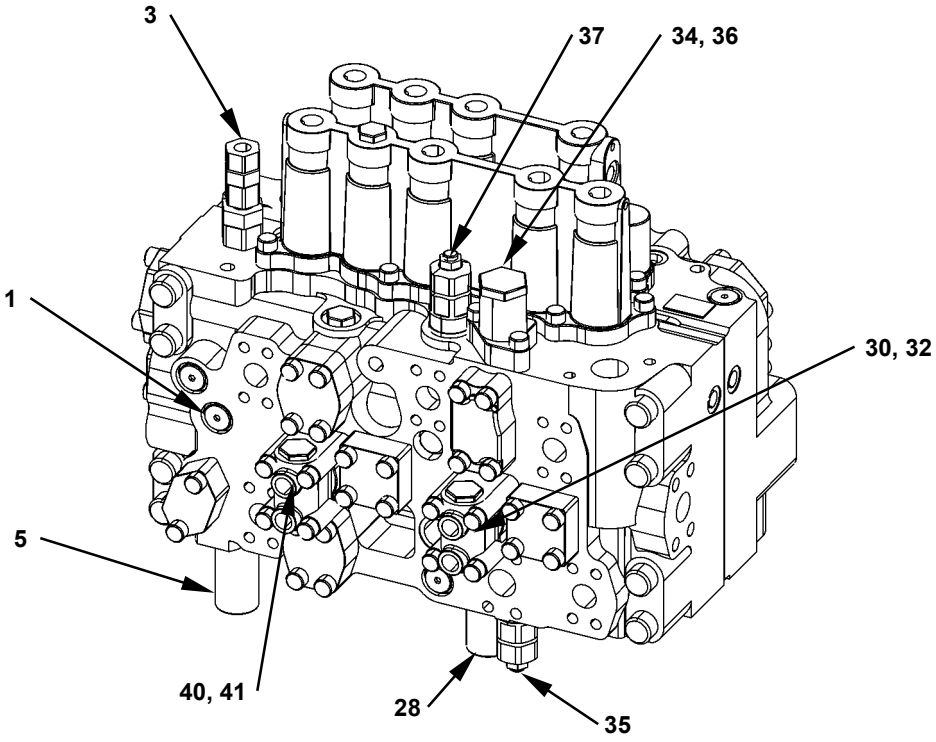


1 - Load Check Valve (Left Travel Parallel Circuit)
2 - Check Valve (Main Relief Circuit)
3 - Main Relief Valve
4 - Check Valve (Auxiliary Combining Valve Circuit)
5 - Auxiliary Flow Combiner Valve
6 - Check Valve (Flow Combiner Valve Circuit)
7 - Flow Combiner Valve
8 - Load Check Valve (Orifice) (Bucket)
9 - Check Valve (Main Relief Circuit)
10 - Bucket Flow Rate Control Valve (Poppet Valve)
11 - Bucket Flow Rate Control Valve (Switch Valve)
12 - Bucket Regenerative Valve
13 - Overload Relief Valve (Bucket: Rod Side)
14 - Overload Relief Valve (Bucket: Bottom Side)
15 - Boom Flow Control Valve (Poppet Valve)
16 - Boom Lower Meter-In Cut Valve
17 - Boom Flow Rate Control Valve (Switch Valve)
18 - Overload Relief Valve (Boom: Bottom Side)
19 - Boom Anti-Drift Valve (Check Valve)
20 - Overload Relief Valve (Boom: Rod Side)
21 - Boom Regenerative Valve
22 - Boom Anti-Drift Valve (Switch Valve)
23 - Arm 2 Flow Rate Control Valve (Switch Valve)
24 - Load Check Valve (Arm 2 Tandem Circuit)
25 - Bypass Shut-Out Valve
26 - Arm 2 Flow Rate Control Valve (Poppet Valve)
27 - Arm Regenerative Valve
28 - Digging Regenerative Valve
29 - Load Check Valve (Digging Regenerative Circuit)
30 - Arm 1 Flow Rate Control Valve (Poppet Valve)
31 - Load Check Valve (Swing Circuit)
32 - Arm 1 Flow Rate Control Valve (Switch Valve)
33 - Load Check Valve (Arm Regenerative Circuit)
34 - Arm Anti-Drift Valve (Switch Valve)
35 - Overload Relief Valve (Arm: Bottom Side)
36 - Arm Anti-Drift Valve (Check Valve)
37 - Overload Relief Valve (Arm: Rod Side)
38 - Check Valve (Digging Regenerative Circuit)
39 - Load Check Valve (Boom 2 Parallel Circuit)
40 - Auxiliary Flow Rate Control Valve (Poppet Valve)
41 - Auxiliary Flow Rate Control Valve (Switch Valve)
42 - Load Check Valve (Left Travel Tandem Circuit)



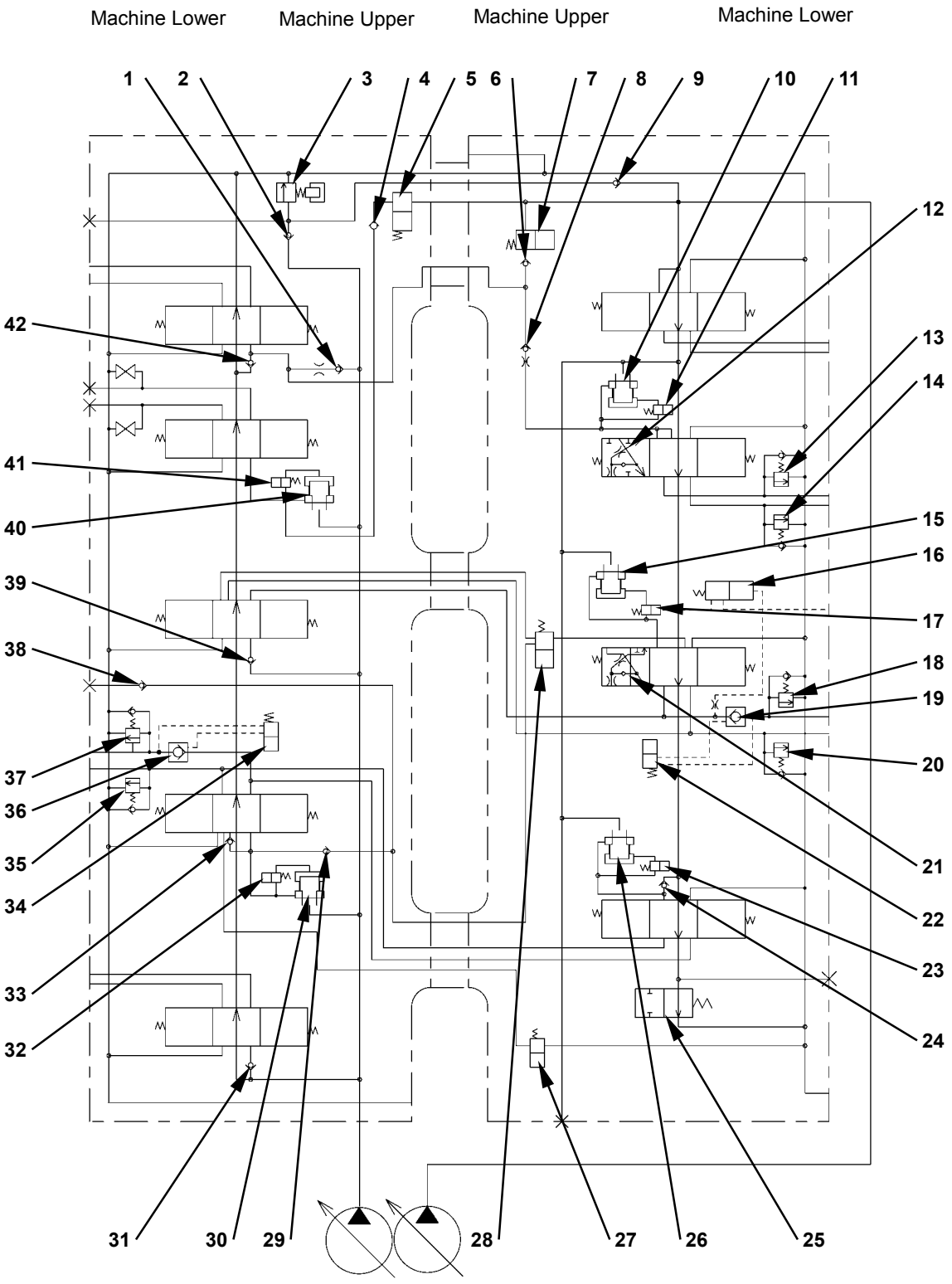
T1V1-03-03-021

5-Spool Section

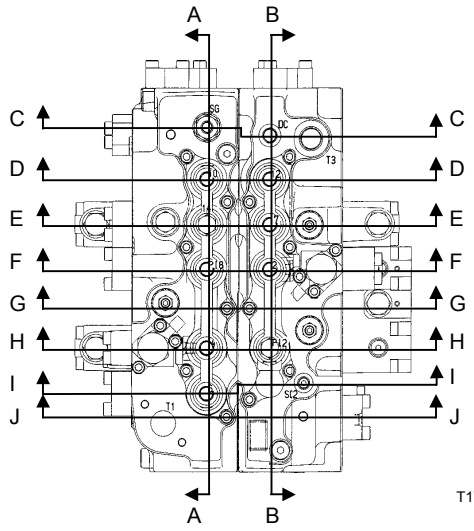


T1V1-03-03-072

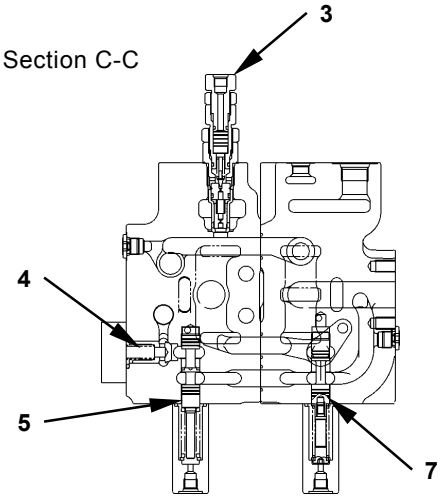
1 - Load Check Valve (Left Travel Parallel Circuit)
2 - Check Valve (Main Relief Circuit)
3 - Main Relief Valve
4 - Check Valve (Auxiliary Combining Valve Circuit)
5 - Auxiliary Flow Combiner Valve
6 - Check Valve (Flow Combiner Valve Circuit)
7 - Flow Combiner Valve
8 - Load Check Valve (Orifice) (Bucket)
9 - Check Valve (Main Relief Circuit)
10 - Bucket Flow Rate Control Valve (Poppet Valve)
11 - Bucket Flow Rate Control Valve (Switch Valve)
12 - Bucket Regenerative Valve
13 - Overload Relief Valve (Bucket: Rod Side)
14 - Overload Relief Valve (Bucket: Bottom Side)
15 - Boom Flow Control Valve (Poppet Valve)
16 - Boom Lower Meter-In Cut Valve
17 - Boom Flow Rate Control Valve (Switch Valve)
18 - Overload Relief Valve (Boom: Bottom Side)
19 - Boom Anti-Drift Valve (Check Valve)
20 - Overload Relief Valve (Boom: Rod Side)
21 - Boom Regenerative Valve
22 - Boom Anti-Drift Valve (Switch Valve)
23 - Arm 2 Flow Rate Control Valve (Switch Valve)
24 - Load Check Valve (Arm 2 Tandem Circuit)
25 - Bypass Shut-Out Valve
26 - Arm 2 Flow Rate Control Valve (Poppet Valve)
27 - Arm Regenerative Valve
28 - Digging Regenerative Valve
29 - Load Check Valve (Digging Regenerative Circuit)
30 - Arm 1 Flow Rate Control Valve (Poppet Valve)
31 - Load Check Valve (Swing Circuit)
32 - Arm 1 Flow Rate Control Valve (Switch Valve)
33 - Load Check Valve (Arm Regenerative Circuit)
34 - Arm Anti-Drift Valve (Switch Valve)
35 - Overload Relief Valve (Arm: Bottom Side)
36 - Arm Anti-Drift Valve (Check Valve)
37 - Overload Relief Valve (Arm: Rod Side)
38 - Check Valve (Digging Regenerative Circuit)
39 - Load Check Valve (Boom 2 Parallel Circuit)
40 - Auxiliary Flow Rate Control Valve (Poppet Valve)
41 - Auxiliary Flow Rate Control Valve (Switch Valve)
42 - Load Check Valve (Left Travel Tandem Circuit)



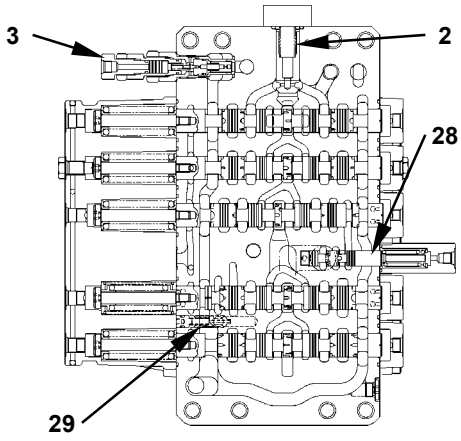
T1V1-03-03-021



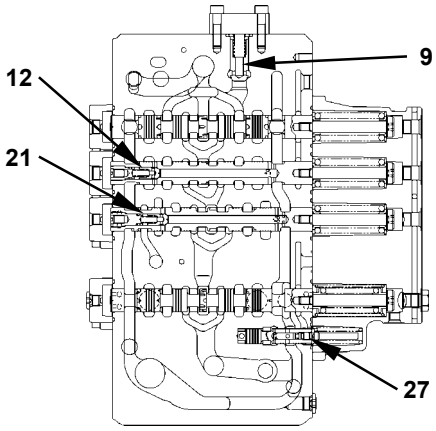
Cross Section C-C



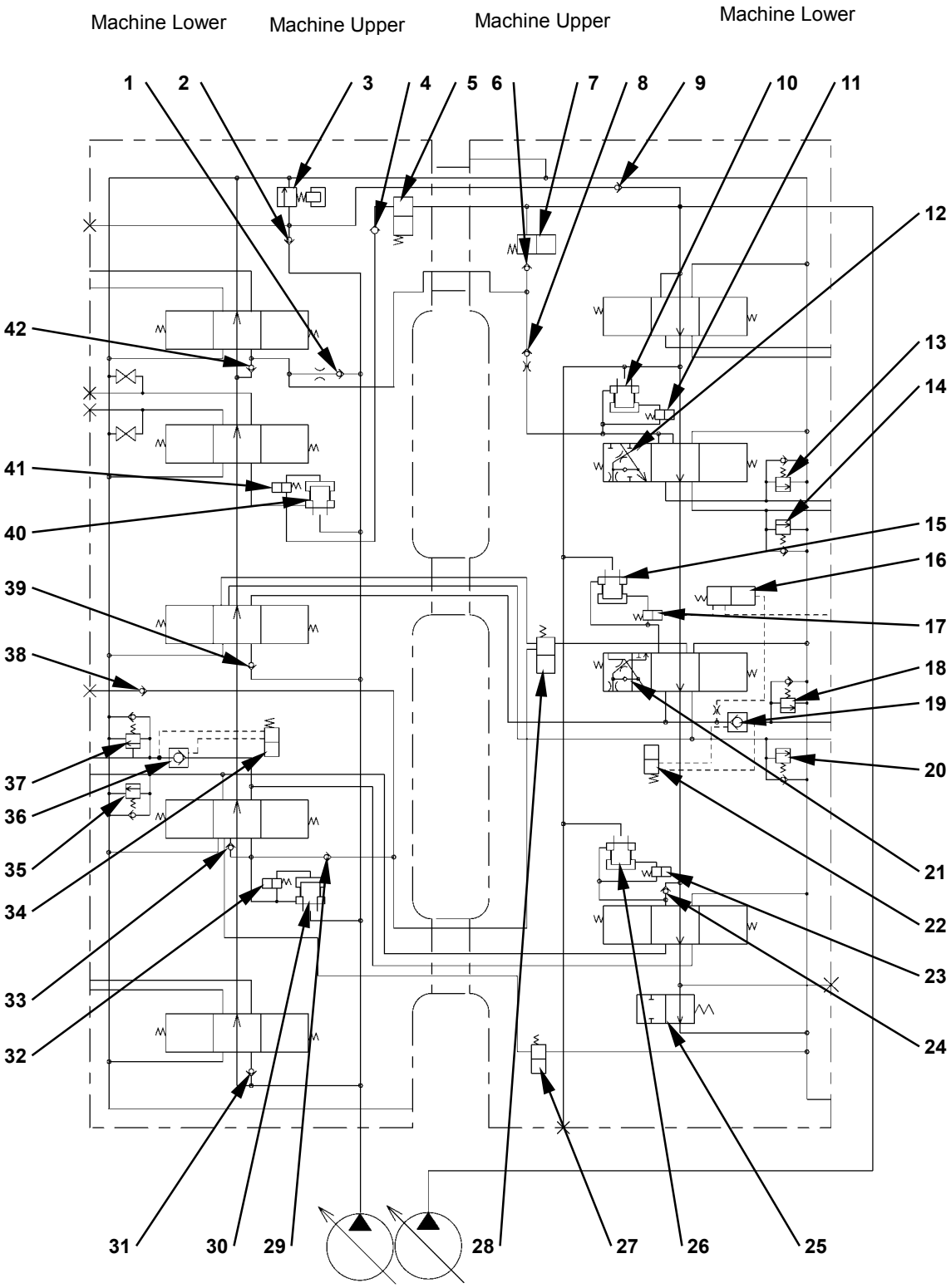
Cross Section A-A



Cross Section B-B

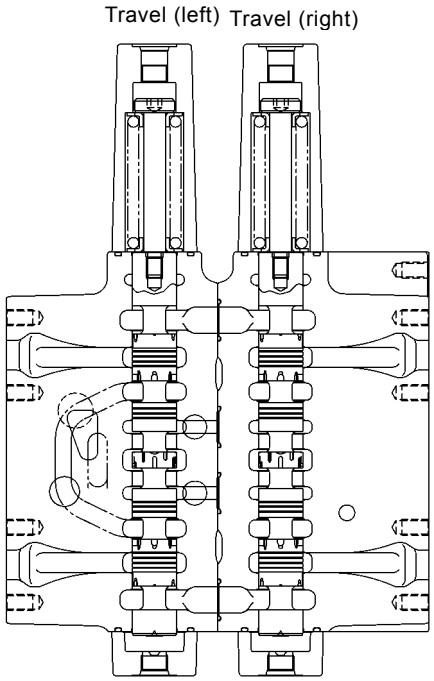


1 - Load Check Valve (Left Travel Parallel Circuit)
2 - Check Valve (Main Relief Circuit)
3 - Main Relief Valve
4 - Check Valve (Auxiliary Combining Valve Circuit)
5 - Auxiliary Flow Combiner Valve
6 - Check Valve (Flow Combiner Valve Circuit)
7 - Flow Combiner Valve
8 - Load Check Valve (Orifice) (Bucket)
9 - Check Valve (Main Relief Circuit)
10 - Bucket Flow Rate Control Valve (Poppet Valve)
11 - Bucket Flow Rate Control Valve (Switch Valve)
12 - Bucket Regenerative Valve
13 - Overload Relief Valve (Bucket: Rod Side)
14 - Overload Relief Valve (Bucket: Bottom Side)
15 - Boom Flow Control Valve (Poppet Valve)
16 - Boom Lower Meter-In Cut Valve
17 - Boom Flow Rate Control Valve (Switch Valve)
18 - Overload Relief Valve (Boom: Bottom Side)
19 - Boom Anti-Drift Valve (Check Valve)
20 - Overload Relief Valve (Boom: Rod Side)
21 - Boom Regenerative Valve
22 - Boom Anti-Drift Valve (Switch Valve)
23 - Arm 2 Flow Rate Control Valve (Switch Valve)
24 - Load Check Valve (Arm 2 Tandem Circuit)
25 - Bypass Shut-Out Valve
26 - Arm 2 Flow Rate Control Valve (Poppet Valve)
27 - Arm Regenerative Valve
28 - Digging Regenerative Valve
29 - Load Check Valve (Digging Regenerative Circuit)
30 - Arm 1 Flow Rate Control Valve (Poppet Valve)
31 - Load Check Valve (Swing Circuit)
32 - Arm 1 Flow Rate Control Valve (Switch Valve)
33 - Load Check Valve (Arm Regenerative Circuit)
34 - Arm Anti-Drift Valve (Switch Valve)
35 - Overload Relief Valve (Arm: Bottom Side)
36 - Arm Anti-Drift Valve (Check Valve)
37 - Overload Relief Valve (Arm: Rod Side)
38 - Check Valve (Digging Regenerative Circuit)
39 - Load Check Valve (Boom 2 Parallel Circuit)
40 - Auxiliary Flow Rate Control Valve (Poppet Valve)
41 - Auxiliary Flow Rate Control Valve (Switch Valve)
42 - Load Check Valve (Left Travel Tandem Circuit)



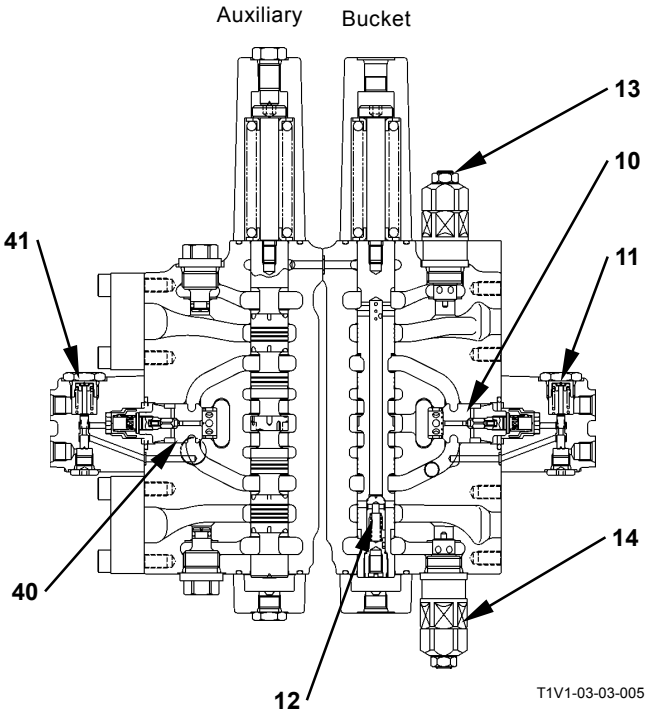
T1V1-03-03-021

Cross Section D-D



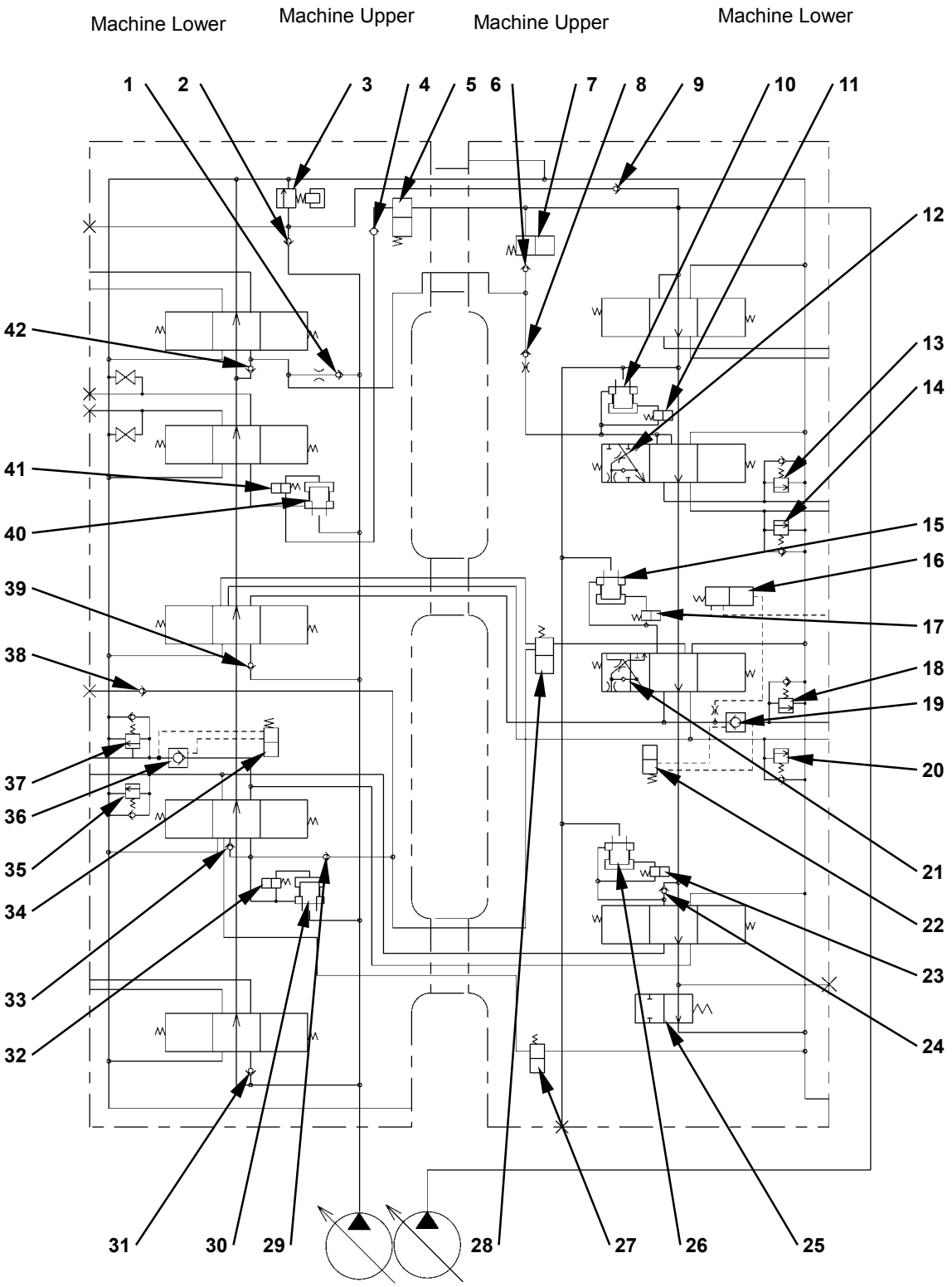
T1V1-03-03-004

Cross Section E-E



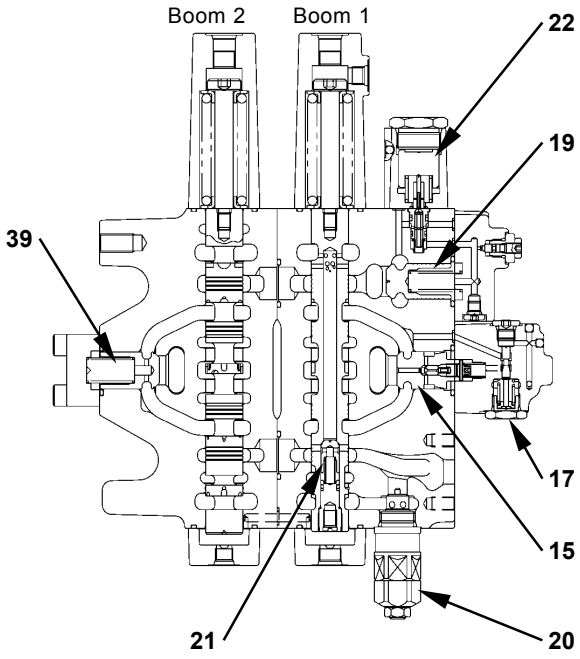
T1V1-03-03-005

1 - Load Check Valve (Left Travel Parallel Circuit)
2 - Check Valve (Main Relief Circuit)
3 - Main Relief Valve
4 - Check Valve (Auxiliary Combining Valve Circuit)
5 - Auxiliary Flow Combiner Valve
6 - Check Valve (Flow Combiner Valve Circuit)
7 - Flow Combiner Valve
8 - Load Check Valve (Orifice) (Bucket)
9 - Check Valve (Main Relief Circuit)
10 - Bucket Flow Rate Control Valve (Poppet Valve)
11 - Bucket Flow Rate Control Valve (Switch Valve)
12 - Bucket Regenerative Valve
13 - Overload Relief Valve (Bucket: Rod Side)
14 - Overload Relief Valve (Bucket: Bottom Side)
15 - Boom Flow Control Valve (Poppet Valve)
16 - Boom Lower Meter-In Cut Valve
17 - Boom Flow Rate Control Valve (Switch Valve)
18 - Overload Relief Valve (Boom: Bottom Side)
19 - Boom Anti-Drift Valve (Check Valve)
20 - Overload Relief Valve (Boom: Rod Side)
21 - Boom Regenerative Valve
22 - Boom Anti-Drift Valve (Switch Valve)
23 - Arm 2 Flow Rate Control Valve (Switch Valve)
24 - Load Check Valve (Arm 2 Tandem Circuit)
25 - Bypass Shut-Out Valve
26 - Arm 2 Flow Rate Control Valve (Poppet Valve)
27 - Arm Regenerative Valve
28 - Digging Regenerative Valve
29 - Load Check Valve (Digging Regenerative Circuit)
30 - Arm 1 Flow Rate Control Valve (Poppet Valve)
31 - Load Check Valve (Swing Circuit)
32 - Arm 1 Flow Rate Control Valve (Switch Valve)
33 - Load Check Valve (Arm Regenerative Circuit)
34 - Arm Anti-Drift Valve (Switch Valve)
35 - Overload Relief Valve (Arm: Bottom Side)
36 - Arm Anti-Drift Valve (Check Valve)
37 - Overload Relief Valve (Arm: Rod Side)
38 - Check Valve (Digging Regenerative Circuit)
39 - Load Check Valve (Boom 2 Parallel Circuit)
40 - Auxiliary Flow Rate Control Valve (Poppet Valve)
41 - Auxiliary Flow Rate Control Valve (Switch Valve)
42 - Load Check Valve (Left Travel Tandem Circuit)



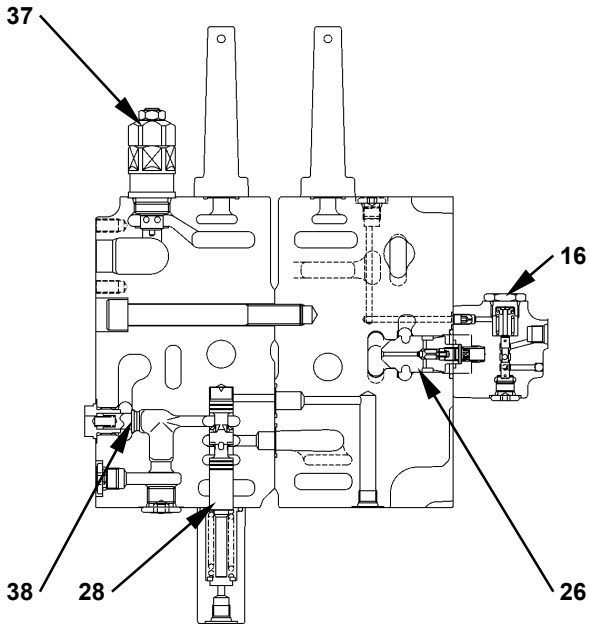
T1V1-03-03-021

Cross Section F-F



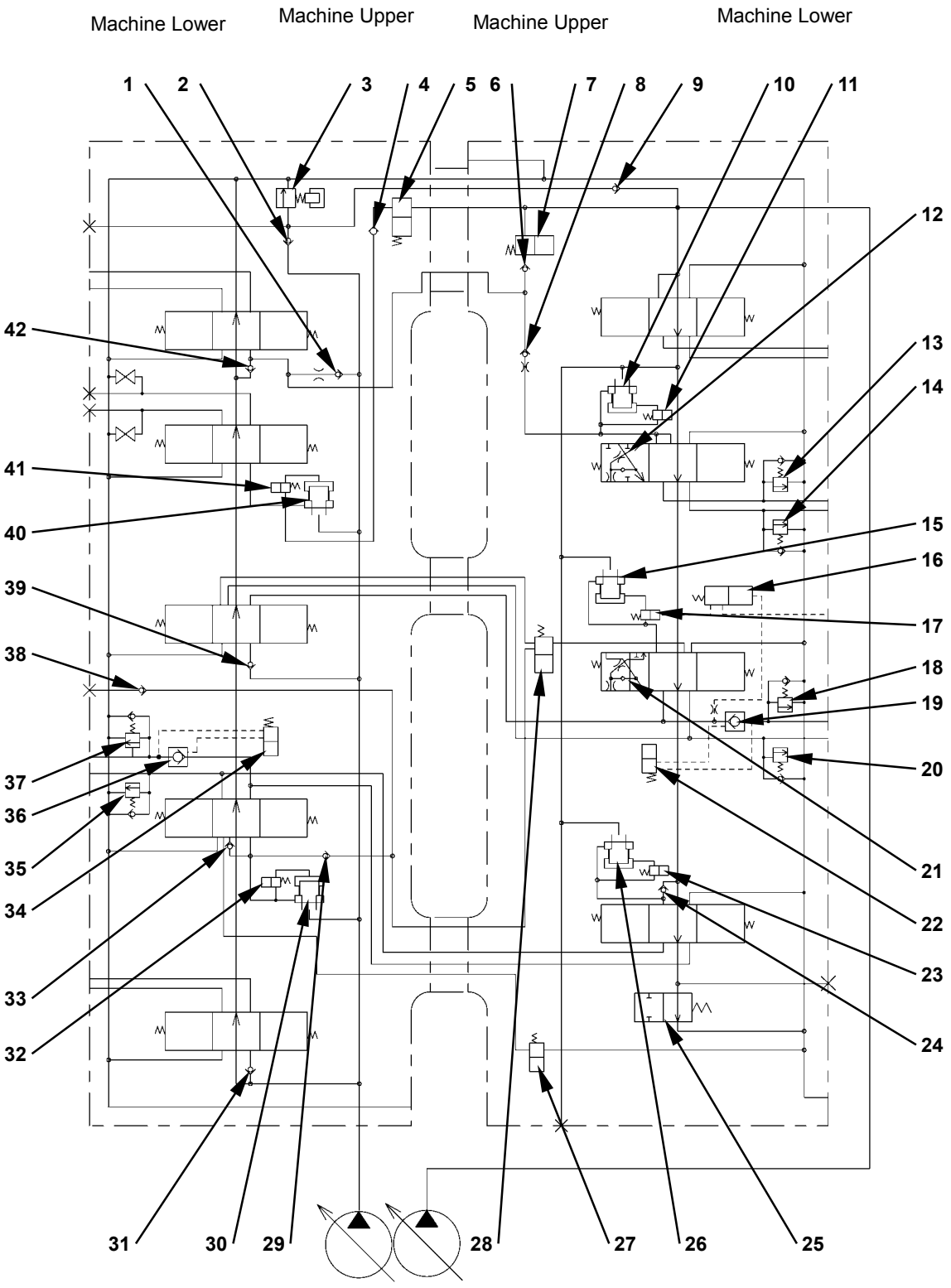
T1V1-03-03-006

Cross Section G-G



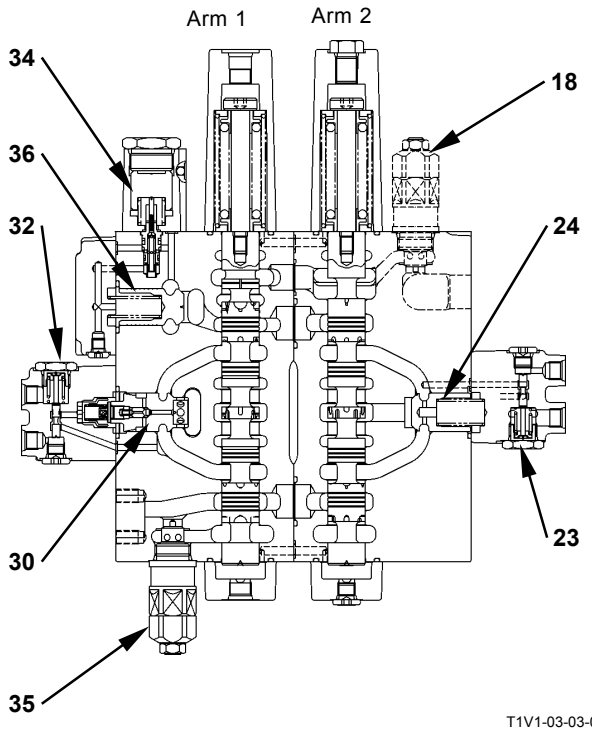
T1V1-03-03-007

1 - Load Check Valve (Left Travel Parallel Circuit)
2 - Check Valve (Main Relief Circuit)
3 - Main Relief Valve
4 - Check Valve (Auxiliary Combining Valve Circuit)
5 - Auxiliary Flow Combiner Valve
6 - Check Valve (Flow Combiner Valve Circuit)
7 - Flow Combiner Valve
8 - Load Check Valve (Orifice) (Bucket)
9 - Check Valve (Main Relief Circuit)
10 - Bucket Flow Rate Control Valve (Poppet Valve)
11 - Bucket Flow Rate Control Valve (Switch Valve)
12 - Bucket Regenerative Valve
13 - Overload Relief Valve (Bucket: Rod Side)
14 - Overload Relief Valve (Bucket: Bottom Side)
15 - Boom Flow Control Valve (Poppet Valve)
16 - Boom Lower Meter-In Cut Valve
17 - Boom Flow Rate Control Valve (Switch Valve)
18 - Overload Relief Valve (Boom: Bottom Side)
19 - Boom Anti-Drift Valve (Check Valve)
20 - Overload Relief Valve (Boom: Rod Side)
21 - Boom Regenerative Valve
22 - Boom Anti-Drift Valve (Switch Valve)
23 - Arm 2 Flow Rate Control Valve (Switch Valve)
24 - Load Check Valve (Arm 2 Tandem Circuit)
25 - Bypass Shut-Out Valve
26 - Arm 2 Flow Rate Control Valve (Poppet Valve)
27 - Arm Regenerative Valve
28 - Digging Regenerative Valve
29 - Load Check Valve (Digging Regenerative Circuit)
30 - Arm 1 Flow Rate Control Valve (Poppet Valve)
31 - Load Check Valve (Swing Circuit)
32 - Arm 1 Flow Rate Control Valve (Switch Valve)
33 - Load Check Valve (Arm Regenerative Circuit)
34 - Arm Anti-Drift Valve (Switch Valve)
35 - Overload Relief Valve (Arm: Bottom Side)
36 - Arm Anti-Drift Valve (Check Valve)
37 - Overload Relief Valve (Arm: Rod Side)
38 - Check Valve (Digging Regenerative Circuit)
39 - Load Check Valve (Boom 2 Parallel Circuit)
40 - Auxiliary Flow Rate Control Valve (Poppet Valve)
41 - Auxiliary Flow Rate Control Valve (Switch Valve)
42 - Load Check Valve (Left Travel Tandem Circuit)



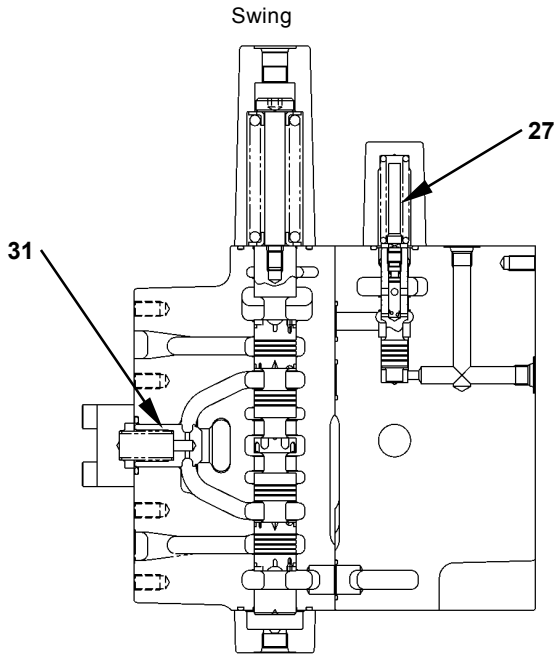
T1V1-03-03-021

Cross Section H-H



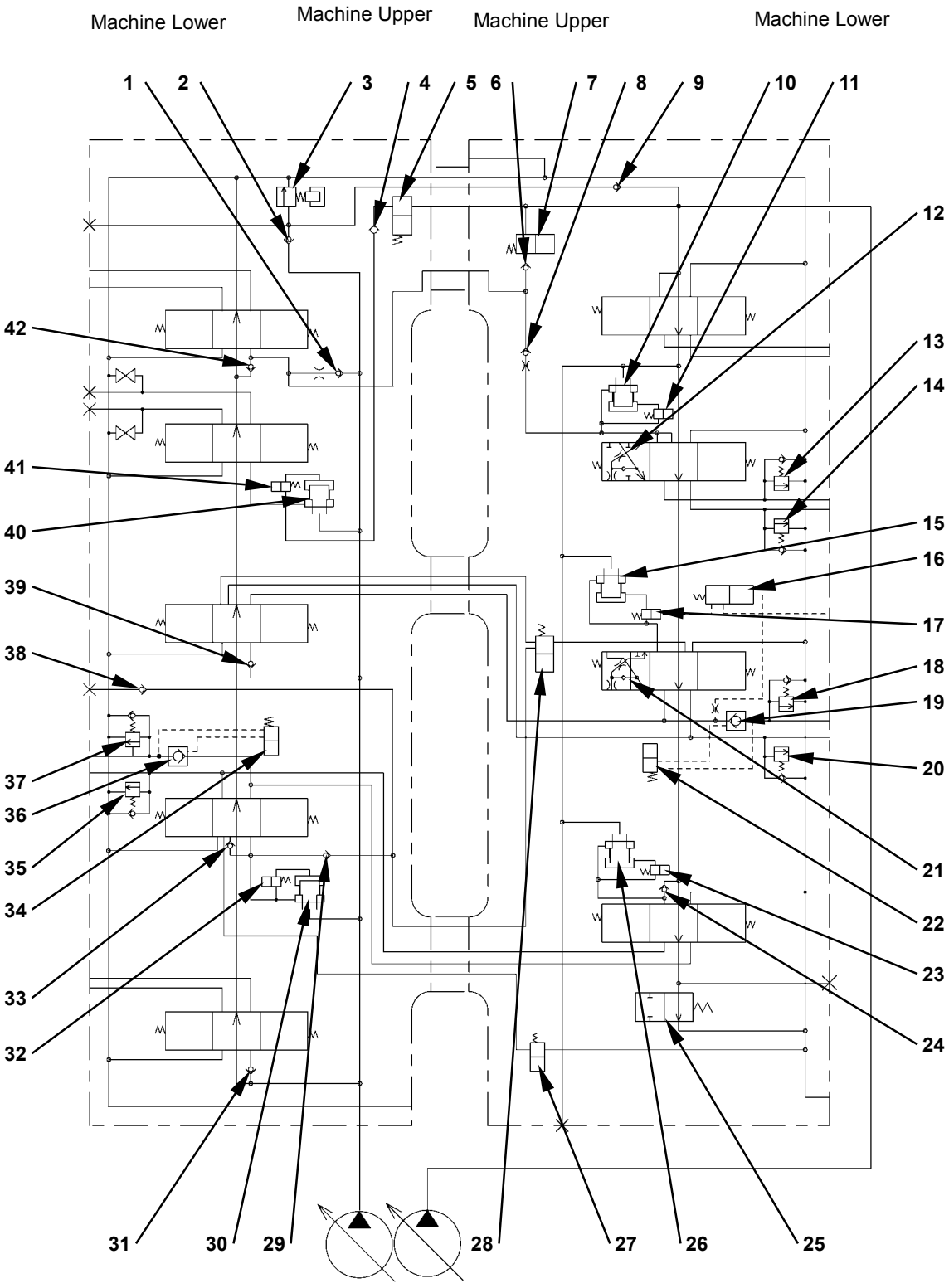
T1V1-03-03-008

Cross Section I-I



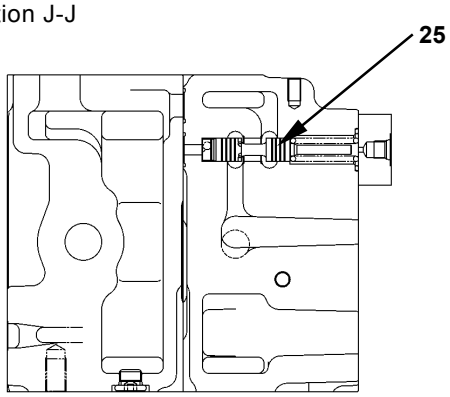
T1V1-03-03-009

1 - Load Check Valve (Left Travel Parallel Circuit)
2 - Check Valve (Main Relief Circuit)
3 - Main Relief Valve
4 - Check Valve (Auxiliary Combining Valve Circuit)
5 - Auxiliary Flow Combiner Valve
6 - Check Valve (Flow Combiner Valve Circuit)
7 - Flow Combiner Valve
8 - Load Check Valve (Orifice) (Bucket)
9 - Check Valve (Main Relief Circuit)
10 - Bucket Flow Rate Control Valve (Poppet Valve)
11 - Bucket Flow Rate Control Valve (Switch Valve)
12 - Bucket Regenerative Valve
13 - Overload Relief Valve (Bucket: Rod Side)
14 - Overload Relief Valve (Bucket: Bottom Side)
15 - Boom Flow Control Valve (Poppet Valve)
16 - Boom Lower Meter-In Cut Valve
17 - Boom Flow Rate Control Valve (Switch Valve)
18 - Overload Relief Valve (Boom: Bottom Side)
19 - Boom Anti-Drift Valve (Check Valve)
20 - Overload Relief Valve (Boom: Rod Side)
21 - Boom Regenerative Valve
22 - Boom Anti-Drift Valve (Switch Valve)
23 - Arm 2 Flow Rate Control Valve (Switch Valve)
24 - Load Check Valve (Arm 2 Tandem Circuit)
25 - Bypass Shut-Out Valve
26 - Arm 2 Flow Rate Control Valve (Poppet Valve)
27 - Arm Regenerative Valve
28 - Digging Regenerative Valve
29 - Load Check Valve (Digging Regenerative Circuit)
30 - Arm 1 Flow Rate Control Valve (Poppet Valve)
31 - Load Check Valve (Swing Circuit)
32 - Arm 1 Flow Rate Control Valve (Switch Valve)
33 - Load Check Valve (Arm Regenerative Circuit)
34 - Arm Anti-Drift Valve (Switch Valve)
35 - Overload Relief Valve (Arm: Bottom Side)
36 - Arm Anti-Drift Valve (Check Valve)
37 - Overload Relief Valve (Arm: Rod Side)
38 - Check Valve (Digging Regenerative Circuit)
39 - Load Check Valve (Boom 2 Parallel Circuit)
40 - Auxiliary Flow Rate Control Valve (Poppet Valve)
41 - Auxiliary Flow Rate Control Valve (Switch Valve)
42 - Load Check Valve (Left Travel Tandem Circuit)

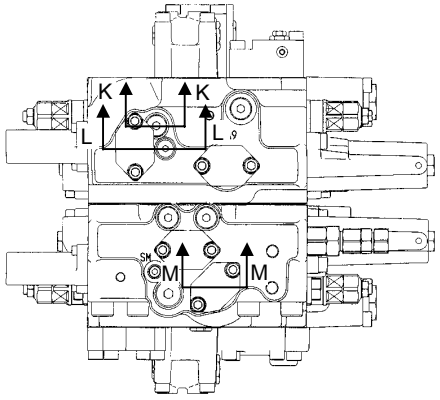


T1V1-03-03-021

Cross Section J-J

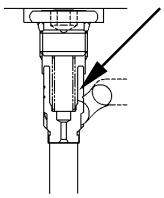


T1V1-03-03-010

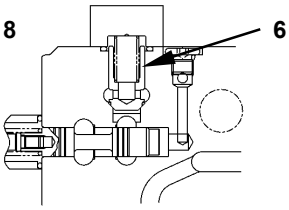


T1V1-03-03-027

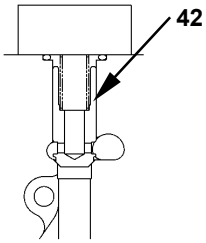
Cross Section K-K



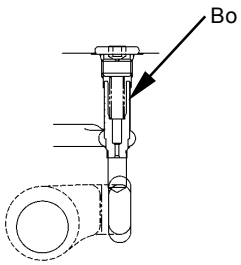
Cross Section L-L



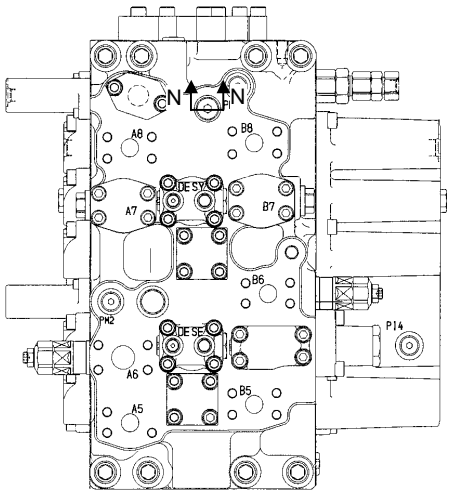
Cross Section M-M



Cross Section N-N



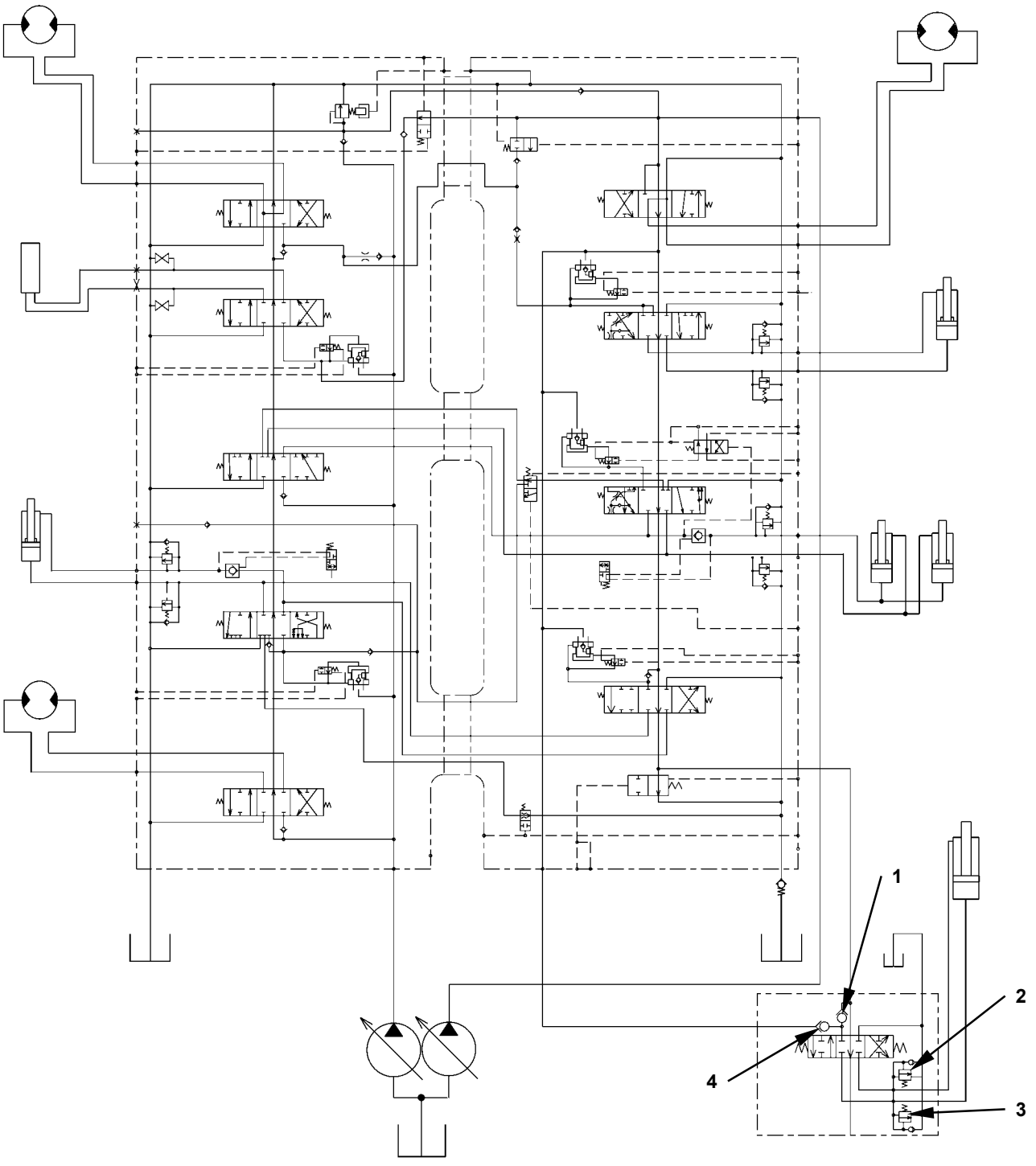
T1V1-03-03-022



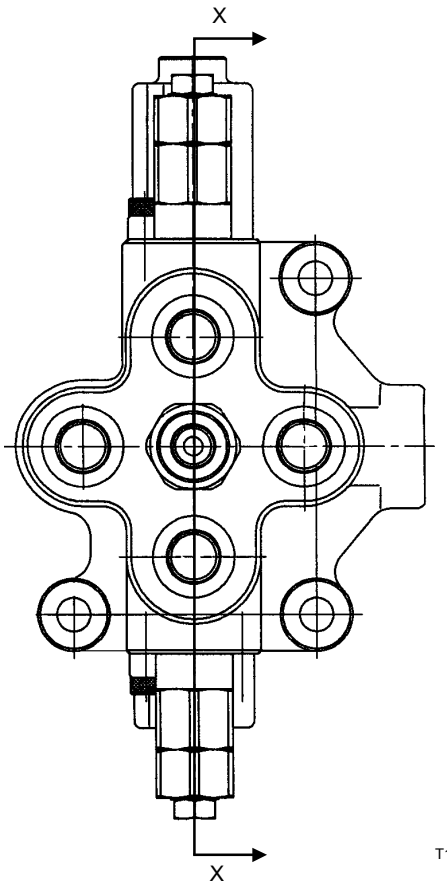
T1V1-03-03-028

1 − Load Check Valve (Left Travel Parallel Circuit)
2 − Check Valve (Main Relief Circuit)
3 − Main Relief Valve
4 − Check Valve (Auxiliary Combining Valve Circuit)
5 − Auxiliary Flow Combiner Valve
6 − Check Valve (Flow Combiner Valve Circuit)
7 − Flow Combiner Valve
8 − Load Check Valve (Orifice) (Bucket)
9 − Check Valve (Main Relief Circuit)
10 − Bucket Flow Rate Control Valve (Poppet Valve)
11 − Bucket Flow Rate Control Valve (Switch Valve)
23 - Bucket Regenerative Valve
24 - Overload Relief Valve (Bucket: Rod Side)
25 - Overload Relief Valve (Bucket: Bottom Side)
26 - Boom Flow Control Valve (Poppet Valve)
27 - Boom Lower Meter-In Cut Valve
28 - Boom Flow Control Valve (Switch Valve)
29 - Overload Relief Valve (Boom: Bottom Side)
30 - Boom Anti-Drift Valve (Check Valve)
31 - Overload Relief Valve (Boom: Rod Side)
32 - Boom Regenerative Valve
33 - Boom Anti-Drift Valve (Switch Valve)
34 - Arm 2 Flow Rate Control Valve (Switch Valve)
35 - Load Check Valve (Arm 2 Tandem Circuit)
36 - Bypass Shut-Out Valve
37 - Arm 2 Flow Rate Control Valve (Poppet Valve)
38 - Arm Regenerative Valve
39 - Digging Generative Valve
40 - Load Check Valve (Digging Regenerative Circuit)
41 - Arm 1 Flow Rate Control Valve (Poppet Valve)
42 - Load Check Valve (Swing Circuit)
43 - Arm 1 Flow Rate Control Valve (Switch Valve)
44 - Load Check Valve (Arm Regenerative Circuit)
43 - Arm Anti-Drift Valve (Switch Valve)
44 - Overload Relief Valve (Arm: Bottom Side)
45 - Arm Anti-Drift Valve (Check Valve)
46 - Overload Relief Valve (Arm: Rod Side)
47 - Check Valve (Digging Regenerative Circuit)
48 - Load Check Valve (Boom 2 Parallel Circuit)
49 - Auxiliary Flow Rate Control Valve (Poppet Valve)
50 - Auxiliary Flow Rate Control Valve (Switch Valve)
51 - Load Check Valve (Left Travel Tandem Circuit)

Layout of Positioning Control Valve (2-Piece Boom)

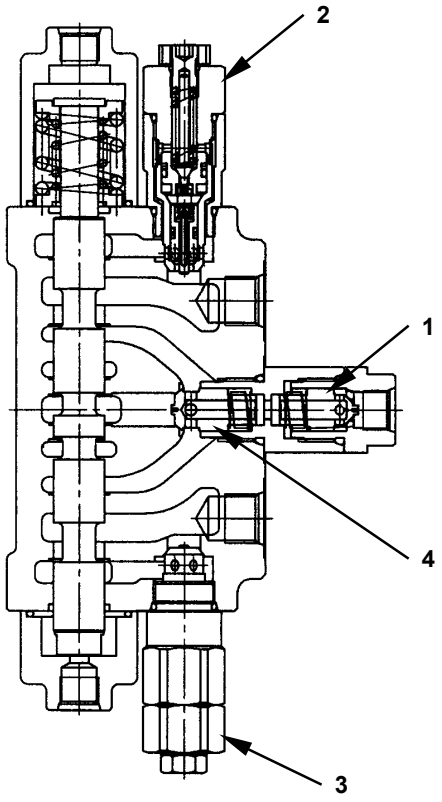


T1V1-03-03-019



T178-03-03-070

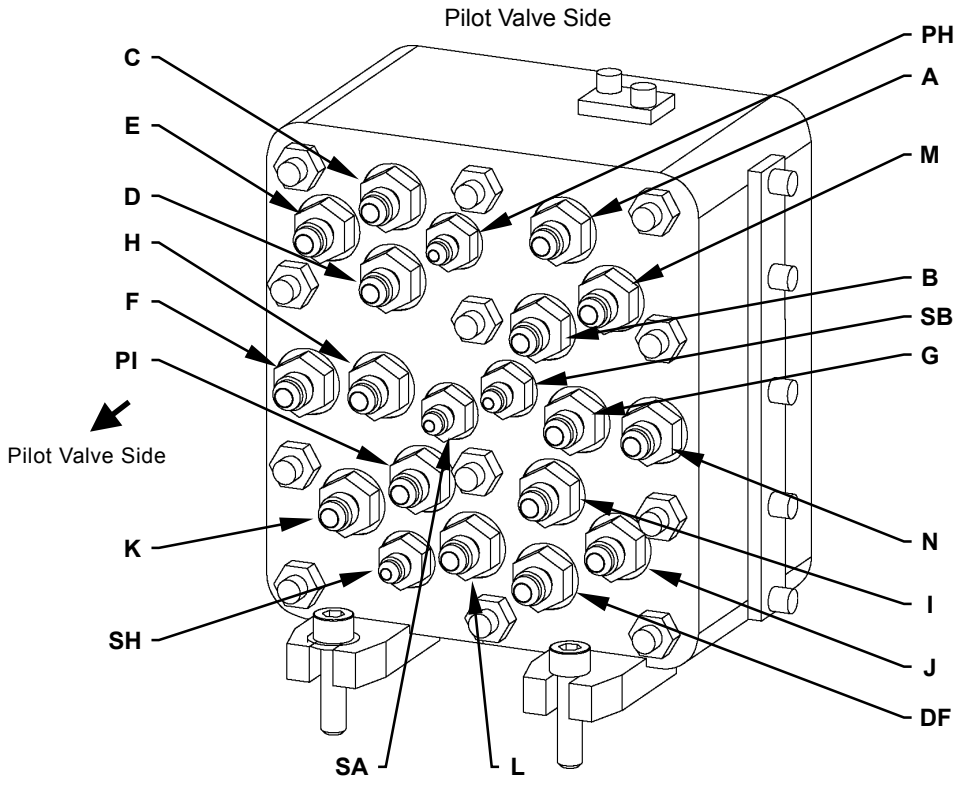
Cross Section X-X



T198-03-03-003

1 - Load Check Valve (Positioning Tandem Circuit)
2 - Overload Relief Valve (Positioning: Rod Side)
3 - Overload Relief Valve (Positioning: Bottom Side)
4 - Load Check Valve (Positioning Parallel Circuit)

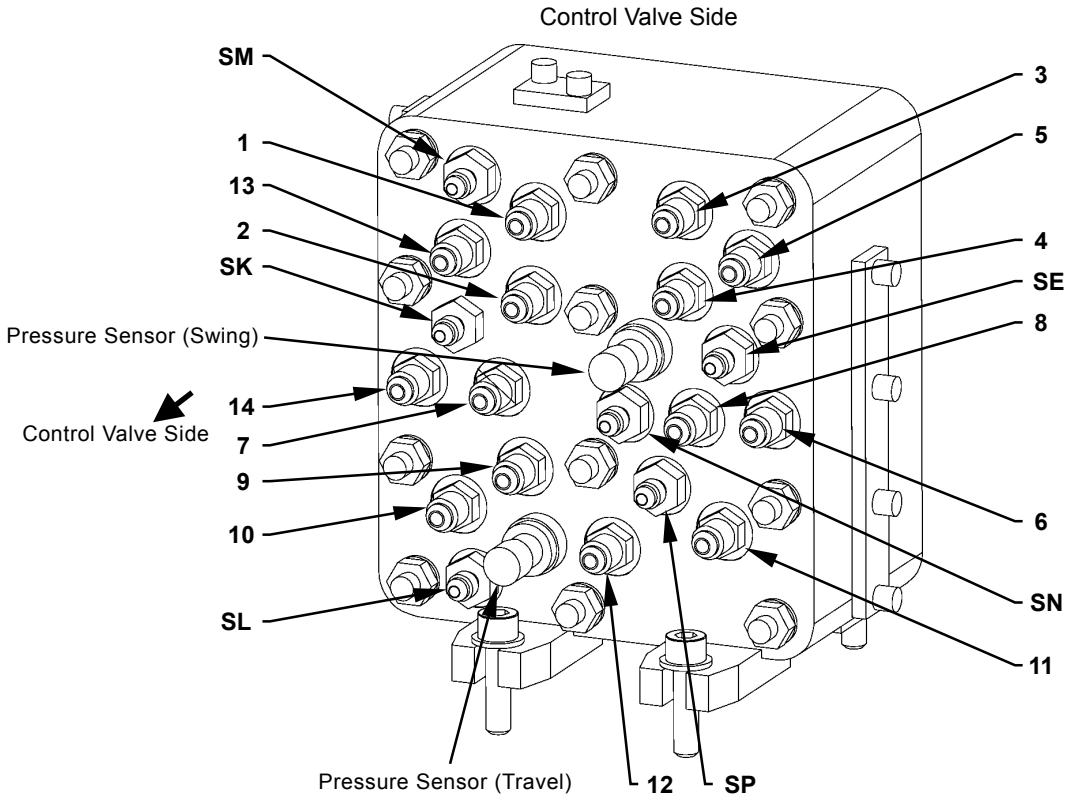
PILOT PORT (Signal Control Valve)



T178-03-06-016

Pilot Valve Side

Port Name	Connecting to	Remark
Port A	Right Pilot Valve	Boom Raise Pilot Pressure
Port B	Right Pilot Valve	Boom Lower Pilot Pressure
Port C	Left Pilot Valve	Arm Roll-Out Pilot Pressure
Port D	Left Pilot Valve	Arm Roll-In Pilot Pressure
Port E	Left Pilot Valve	Left Swing Pilot Pressure
Port F	Left Pilot Valve	Right Swing Pilot Pressure
Port G	Right Pilot Valve	Bucket Roll-In Pilot Pressure
Port H	Right Pilot Valve	Bucket Roll-Out Pilot Pressure
Port I	Travel Pilot Valve	Left Travel Forward Pilot Pressure
Port J	Travel Pilot Valve	Left Travel Reverse Pilot Pressure
Port K	Travel Pilot Valve	Right Travel Forward Pilot Pressure
Port L	Travel Pilot Valve	Right Travel Reverse Pilot Pressure
Port M	Auxiliary Pilot Valve	Auxiliary Open Pilot Pressure
Port N	Auxiliary Pilot Valve	Auxiliary Close Pilot Pressure
Port SA	Pump 1 Regulator	Pump 1 Control Pressure
Port SB	Pump 2 Regulator	Pump 2 Control Pressure
Port PI	Pilot Shut-Off Valve	Primary Pilot Pressure
Port PH	-	Plug
Port SH	Swing Parking Brake	Brake Release Pressure
Port DF	Hydraulic Oil Tank	Returning to Hydraulic Oil Tank


Control Valve Side
SM
1
13
2
SK
Pressure Sensor (Swing)
Control Valve Side
14
7
9
10
SL
3
5
4
SE
8
6
SN
11
Pressure Sensor (Travel)
12
SP
T178-03-06-015

Control Valve Side

Port Name	Connecting to	Remark
Port 1	Control Valve	Boom Raise Pilot Pressure
Port 2	Control Valve	Boom Lower Pilot Pressure
Port 3	Control Valve	Arm Roll-Out Pilot Pressure
Port 4	Control Valve	Arm Roll-In Pilot Pressure
Port 5	Control Valve	Left Swing Pilot Pressure
Port 6	Control Valve	Right Swing Pilot Pressure
Port 7	Control Valve	Bucket Roll-In Pilot Pressure
Port 8	Control Valve	Bucket Roll-Out Pilot Pressure
Port 9	Control Valve	Left Travel Forward Pilot Pressure
Port 10	Control Valve	Left Travel Reverse Pilot Pressure
Port 11	Control Valve	Right Travel Forward Pilot Pressure
Port 12	Control Valve	Right Travel Reverse Pilot Pressure
Port 13	Control Valve	Auxiliary Open Pilot Pressure
Port 14	Control Valve	Auxiliary Close Pilot Pressure
Port SE	Control Valve	Arm 1 Flow Rate Control Valve Control Pressure
Port SM	Hydraulic Oil Tank	Returning to Hydraulic Oil Tank
Port SN	-	Plug
Port SP	Hydraulic Oil Tank	Returning to Hydraulic Oil Tank
Port SL	Control Valve	Flow Combiner Valve Control Pressure
Port SK	Control Valve	Bucket Flow Rate Control Valve Control Pressure

2-Piece Boom Specification Machine

Port SP	Positioning Pilot Valve	Secondary Pilot Pressure

Machine with Front Attachment (Secondary Crushers 1 to 5 and Hydraulic Crushers 1 to 5) attached.

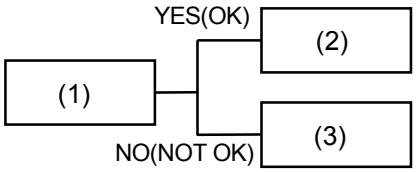
Port SM	Auxiliary Flow Rate Combiner Solenoid Valve	Auxiliary Flow Rate Combiner Valve Control Pressure
Port SN	Auxiliary Flow Rate Combiner Control Valve	Auxiliary Flow Rate Combiner Valve Control Pressure
Port SP	Auxiliary Flow Rate Combiner Solenoid Valve	Pump 1 Control Pressure

(Blank)

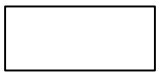
TROUBLESHOOTING A PROCEDURE

Refer to troubleshooting A procedure in case any fault codes are displayed after diagnosing by using Dr. ZX or the service menu of monitor unit.

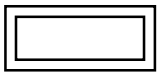
- How to Read Troubleshooting Flow Charts

- 

After completing the checking and/or measuring procedures in box (1), select YES (OK) or NO (NOT OK) and proceed to box (2) or (3).

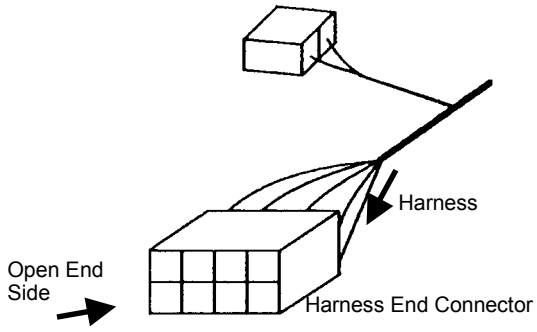
- 
· Key switch: ON
Instructions, reference, and/or inspection methods and/or measurements are occasionally described under the box. If incorrectly checked or measured, not only will troubleshooting be unsuccessful but also damage to the components may result.

- 
Refer to “Electrical System Inspection” Group (Group 8) for descriptions in the dotted-line box.

- 
Use Dr. ZX for descriptions in the double-line box.

- 
Causes of machine problems are stated in the thick-line box. Scanning quickly through the thick-line boxes allows you to estimate the possible causes before actually following the flow chart.

NOTE: Harness end connector viewed from the open end side by the all connectors image shown in this section.



T158-05-03-001

FAULT CODE LIST
MC

Controller Hardware Failure

Fault Code	Trouble	Cause	Influenced Control
11000-2	Abnormal EEPROM	Faulty MC	All Control
11001-2	Abnormal RAM	Faulty MC	All Control
11002-2	Abnormal A/D Conversion	Faulty MC	All Control
11003-3	Abnormal Sensor Voltage	Faulty MC	All Control
11004-2	Abnormal CAN Communication	Faulty MC	・Heater Control ・Speed Sensing Control ・Attachment Operation Speed Increase Control ・Attachment Operation Speed Limit Control ・Attachment Pump Torque Decrease Control ・Pump 1 Flow Rate Limit Control ・Pump 2 Flow Rate Limit Control ・Attachment Flow Rate Control (Optional) ・Attachment Valve Selection (Optional) ・CAN Cycle Data Communication

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
-	Retrial B	Replace MC
-	Retrial B	Replace MC
-	Retrial B	Replace MC
Although the engine control dial is operated, engine speed does not change.	Retrial B	・Check sensor connected to MC ・Check Harness ・Replace MC
・Machine movement is slow. ・The work mode alarm is displayed on the monitor unit.  T1V1-05-01-102	Retrial B	・Check CAN Harness ・Replace MC

Engine Failure

Fault Code	Trouble	Cause	Influenced Control
11100-2	Abnormal Engine Speed	Engine Speed: more than 4000 min^{-1}	Speed Sensing Control
11101-3	Abnormal Engine Control Dial Sensor High Voltage	Voltage: 4.78 V or higher	Engine Control Dial Control
11101-4	Abnormal Engine Control Dial Sensor Low Voltage	Voltage: Less than 0.22 V	Engine Control Dial Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
Machine movement is slow. (During speed sensing, torque is reduced.)	Retrial B	・Check Crank Speed Sensor ・Check Cam Angle Sensor
・Trouble condition with the key ON: Engine speed is kept at idle speed. ・Trouble condition with the key ON: engine speed is kept at speed immediately before trouble.	Retrial B	・Check Harness ・Replace Engine Control Dial
・Trouble condition with the key ON: Engine speed is kept at idle speed. ・Trouble condition with the key ON: engine speed is kept at speed immediately before trouble.	Retrial B	・Check Harness ・Replace Engine Control Dial

Pump Failure

Fault Code	Trouble	Cause	Influenced Control
11200-3	Abnormal Pump 1 Delivery Pressure Sensor High Voltage	Voltage: 4.5 V or higher	• HP Mode Control • Travel HP Mode Control • E Mode Control • Travel Torque-Up Control • Arm Regenerative Control • Digging Regenerative Control • Auto-Power Lift Control • Travel Motor Swash Angle Control
11200-4	Abnormal Pump 1 Delivery Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• HP Mode Control • Travel HP Mode Control • E Mode Control • Travel Torque-Up Control • Arm Regenerative Control • Digging Regenerative Control • Auto-Power Lift Control • Travel Motor Swash Angle Control
11202-3	Abnormal Pump 2 Delivery Pressure Sensor High Voltage	Voltage: 4.5 V or higher	• HP Mode Control • Travel HP Mode Control • E Mode Control • Travel Torque-Up Control • Arm Regenerative Control • Digging Regenerative Control • Travel Motor Swash Angle Control
11202-4	Abnormal Pump 2 Delivery Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• HP Mode Control • Travel HP Mode Control • E Mode Control • Travel Torque-Up Control • Arm Regenerative Control • Digging Regenerative Control • Travel Motor Swash Angle Control
11206-3	Abnormal Pump 1 Pump Control Pressure Sensor High Voltage	Voltage: 4.75 V or higher	• E Mode Control • Heater Control • Travel Motor Swash Angle Control
11206-4	Abnormal Pump 1 Pump Control Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• E Mode Control • Heater Control • Travel Motor Swash Angle Control
11208-3	Abnormal Pump 2 Pump Control Pressure Sensor High Voltage	Voltage: 4.75 V or higher	• E Mode Control • Heater Control • Travel Motor Swash Angle Control
11208-4	Abnormal Pump 2 Pump Control Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• E Mode Control • Heater Control • Travel Motor Swash Angle Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
• Combined operation of arm roll-in and boom raise or combined operation of arm-roll-in and swing: Arm speed is slow. • Single operation of boom raise: Lifting force is weak. • Travel: Slow speed	Retrial B	• Check Harness • Replace Pump 1 Delivery Pressure Sensor
• Combined operation of arm roll-in and boom raise or combined operation of arm-roll-in and swing: Arm speed is slow. • Single operation of boom raise: Lifting force is weak. • Travel: Slow speed	Retrial B	• Check Harness • Replace Pump 1 Delivery Pressure Sensor
• Combined operation of arm roll-in and boom raise or combined operation of arm-roll-in and swing: Arm speed is slow. • Travel: Slow speed	Retrial B	• Check Harness • Replace Pump 2 Delivery Pressure Sensor
• Combined operation of arm roll-in and boom raise or combined operation of arm-roll-in and swing: Arm speed is slow. • Travel: Slow speed	Retrial B	• Check Harness • Replace Pump 2 Delivery Pressure Sensor
• Although speed operating in E mode returns to P speed, returning speed becomes low due to this failure. • Travel: Slow speed	Retrial B	• Check Harness • Replace Pump 1 Control Pressure Sensor
• Although speed operating in E mode returns to P speed, returning speed becomes low due to this failure. • Travel: Slow speed	Retrial B	• Check Harness • Replace Pump 1 Control Pressure Sensor
• Although speed operating in E mode returns to P speed, returning speed becomes low due to this failure. • Travel: Slow speed	Retrial B	• Check Harness • Replace Pump 2 Control Pressure Sensor
• Although speed operating in E mode returns to P speed, returning speed becomes low due to this failure. • Travel: Slow speed	Retrial B	• Check Harness • Replace Pump 2 Control Pressure Sensor

Pilot Failure

Fault Code	Trouble	Cause	Influenced Control
11301-3	Abnormal Swing Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	• Arm Regenerative Control • Attachment Flow Rate Control • Swing Alarm Control
11301-4	Abnormal Swing Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• Arm Regenerative Control • Attachment Flow Rate Control • Swing Alarm Control
11302-3	Abnormal Boom Raise Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	• HP Mode Control • Arm Regenerative Control • Digging Regenerative Control • Auto-Power Lift Control • Attachment Flow Rate Control
11302-4	Abnormal Boom Raise Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• HP Mode Control • Arm Regenerative Control • Digging Regenerative Control • Auto-Power Lift Control • Attachment Flow Rate Control
11303-3	Abnormal Arm Roll-In Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	• HP Mode Control • Arm Regenerative Control • Digging Regenerative Control • Auto-Power Lift Control
11303-4	Abnormal Arm Roll-In Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• HP Mode Control • Arm Regenerative Control • Digging Regenerative Control • Auto-Power Lift Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
• Combined operation of arm-roll-in and swing: Arm speed is slow. • In case of the machine equipped with the swing alarm (optional) and when swing alarm is effective, swing alarm continues to ring.	Retrial B	• Check Harness • Replace Swing Pilot Pressure Sensor
• Combined operation of arm-roll-in and swing: Arm speed is slow. • In case of the machine equipped with the swing alarm (optional) and when swing alarm is effective, swing alarm continues to ring.	Retrial B	• Check Harness • Replace Swing Pilot Pressure Sensor
• During HP control, boom raise speed does not increase. • Combined operation of arm roll-in and boom raise: Arm speed is slow.	Retrial B	• Check Harness • Replace Boom Raise Pilot Pressure Sensor
• During HP control, boom raise speed does not increase. • Combined operation of arm roll-in and boom raise: Arm speed is slow.	Retrial B	• Check Harness • Replace Boom Raise Pilot Pressure Sensor
• During HP control, arm roll-in speed does not increase. • Combined operation of arm roll-in and swing: Arm speed is slow.	Retrial B	• Check Harness • Replace Arm Roll-In Pilot Pressure Sensor
• During HP control, arm roll-in speed does not increase. • Combined operation of arm roll-in and swing: Arm speed is slow.	Retrial B	• Check Harness • Replace Arm Roll-In Pilot Pressure Sensor

Fault Code	Trouble	Cause	Influenced Control
11304-3	Abnormal Travel Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	• Auto-Idle Control • Idle Speed-Up Control • ECO Control • Travel HP Mode Control • Heater Control • Travel Torque-Up Control • Pump 1 Flow Rate Limit Control • Pump 2 Flow Rate Limit Control • Travel Motor Swash Angle Control • Attachment Flow Rate Control • Travel Alarm Control
11304-4	Abnormal Travel Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• Auto-Idle Control • Idle Speed-Up Control • ECO Control • Travel HP Mode Control • Heater Control • Travel Torque-Up Control • Pump 1 Flow Rate Limit Control • Pump 2 Flow Rate Limit Control • Travel Motor Swash Angle Control • Attachment Flow Rate Control • Travel Alarm Control
11307-3	Abnormal Front Attachment Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	• Auto-Idle Control • Idle Speed-Up Control • ECO Control • Travel HP Mode Control • Heater Control • Travel Motor Swash Angle Control
11307-4	Abnormal Front Attachment Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• Auto-Idle Control • Idle Speed-Up Control • ECO Control • Travel HP Mode Control • Heater Control • Travel Motor Swash Angle Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
• When traveling at idle speed, engine speed does not increase to the specification. • When traveling, speed does not return from auto idle speed. • When traveling, speed does not return from ECO speed. • Travel: Slow speed • When operating ATT, the machine mistracks. • In case of the machine equipped with the travel alarm (optional), travel alarm continues to ring.	Retrial B	• Check Harness • Replace Travel Pilot Pressure Sensor
• When traveling at idle speed, engine speed does not increase to the specification. • When traveling, speed does not return from auto idle speed. • When traveling, speed does not return from ECO speed. • Travel: Slow speed • When operating ATT, the machine mistracks. • In case of the machine equipped with the travel alarm (optional), travel alarm continues to ring.	Retrial B	• Check Harness • Replace Travel Pilot Pressure Sensor
• When operating the front attachment at idle speed, engine speed does not increase to the specification. • When operating the front attachment, speed does not return from auto idle speed. • When operating the front attachment, speed does not return from ECO speed. • Although the front attachment is operated, travel becomes fast.	Retrial B	• Check Harness • Replace Front Pilot Pressure Sensor
• When operating the front attachment at idle speed, engine speed does not increase to the specification. • When operating the front attachment, speed does not return from auto idle speed. • When operating the front attachment, speed does not return from ECO speed. • Although the front attachment is operated, travel becomes fast.	Retrial B	• Check Harness • Replace Front Pilot Pressure Sensor

Proportional Solenoid Valve Failure

Fault Code	Trouble	Cause	Influenced Control
11400-2	Abnormal Current Feedback of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Both of Higher than 920mA or Less than 60 mA	Pump 2 Flow Rate Limit Control
11400-3	Abnormal Feedback High Current of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Higher than 920mA	Pump 2 Flow Rate Limit Control
11400-4	Abnormal Feedback Low Current of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Less than 56 mA	Pump 2 Flow Rate Limit Control
11401-2	Abnormal Current Feedback of Torque Control Solenoid Valve	Current: Both of Higher than 920mA or Less than 60 mA	・Speed Sensing Control ・Travel Torque-Up Control ・Attachment Pump Torque Decrease Control
11401-3	Abnormal Feedback High Current of Torque Control Solenoid Valve	Current: Higher than 920 mA	・Speed Sensing Control ・Travel Torque-Up Control ・Attachment Pump Torque Decrease Control
11401-4	Abnormal Feedback Low Current of Torque Control Solenoid Valve	Current: Less than 56 mA	・Speed Sensing Control ・Travel Torque-Up Control ・Attachment Pump Torque Decrease Control
11402-2	Abnormal Current Feedback of Solenoid Valve Unit (SF) (Digging Regeneration)	Current: Both of Higher than 920mA or Less than 60 mA	Digging Regenerative Control
11402-3	Abnormal Feedback High Current of Solenoid Valve Unit (SF) (Digging Regeneration)	Current: Higher than 920mA	Digging Regenerative Control
11402-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SF) (Digging Regeneration)	Current: Less than 56 mA	Digging Regenerative Control
11403-2	Abnormal Current Feedback of Solenoid Valve Unit (SC) (Arm Regeneration)	Current: Both of Higher than 920mA or Less than 60 mA	Arm Regenerative Control
11403-3	Abnormal Feedback High Current of Solenoid Valve Unit (SC) (Arm Regeneration)	Current: Higher than 920mA	Arm Regenerative Control
11403-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SC) (Arm Regeneration)	Current: Less than 56 mA	Arm Regenerative Control
11404-2	Abnormal Current Feedback of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Both of Higher than 920mA or Less than 60 mA	・Power Digging Control ・Auto-Power Lift Control
11404-3	Abnormal Feedback High Current of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Higher than 920mA	・Power Digging Control ・Auto-Power Lift Control
11404-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Less than 56 mA	・Power Digging Control ・Auto-Power Lift Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
In case ATT flow rate is limited, it cannot be limited.	Retrial B	• Check Harness
Actual Operation of Proportional Valve during High Current: • Travel mistakes. • Boom raise operation is slow. • Arm operation is slow. • Swing operation is slow.	Retrial B	• Check Harness
Actual Operation of Proportional Valve during Low Current: • In case ATT flow rate is limited, it cannot be limited.	Retrial B	• Check Harness
Machine overall operation is slow.	Retrial B	• Check Harness
Actual Operation of Proportional Valve during High Current: • The engine is stalled at Li speed. • Engine Speed: Middle to Fast: Engine Stall or Large Lug Down	Retrial B	• Check Harness
Actual Operation of Proportional Valve during Low Current: • Machine overall operation is slow.	Retrial B	• Check Harness
During digging, arm speed is slow. (As deceleration rate is low, this state is not easy to find.)	Retrial B	• Check Harness
Actual Operation of Proportional Valve during High Current: • Combined operation of boom rasie and arm roll-in during lifting/precision: The boom raise operation is not smooth.	Retrial B	• Check Harness
Actual Operation of Proportional Valve during Low Current: • During digging, arm speed is slow. (As deceleration rate is low, this state is not easy to find.)	Retrial B	• Check Harness
Combined operation of boom raise and arm roll-in with the front attachment over ground, the boom is not raised smoothly and the arm roll-in full-speed is slow.	Retrial B	• Check Harness
Actual Operation of Proportional Valve during High Current: • Digging force (arm) becomes weak.	Retrial B	• Check Harness
Actual Operation of Proportional Valve during Low Current: • Combined operation of boom raise and arm roll-in with the front attachment over ground, the boom is not raised smoothly and the arm roll-in full-speed is slow.	Retrial B	• Check Harness
Pressure increasing is impossible.	Retrial B	• Check Harness
Actual Operation of Proportional Valve during High Current: • Pressure always increases.	Retrial B	• Check Harness
Actual Operation of Proportional Valve during Low Current: • Pressure increasing is impossible.	Retrial B	• Check Harness

Fault Code	Trouble	Cause	Influenced Control
11405-2	Abnormal Current Feedback of Solenoid Valve Unit (SI) (Travel Motor Fast Speed Selection)	Current: Both of Higher than 920mA or Less than 60 mA	Travel Motor Swash Angle Selection Control
11405-3	Abnormal Feedback High Current of Solenoid Valve Unit (SI) (Travel Motor Fast Speed Selection)	Current: Higher than 920mA	Travel Motor Swash Angle Selection Control
11405-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SI) (Travel Motor Fast Speed Selection)	Current: Less than 56 mA	Travel Motor Swash Angle Selection Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
Travel motor is always slow.	Retrial B	・Check Harness
Operation of Proportional Valve during High Current: ・Travel motor is always slow.	Retrial B	・Check Harness
Operation of Proportional Valve during Low Current: ・Travel motor is always slow.	Retrial B	・Check Harness

CAN Data Reception Failure

Fault Code	Trouble	Cause	Influenced Control
11910-2	Actual Engine Speed Received from ECM	Faulty Harness	・Speed Sensing Control ・Send to ICF
11918-2	Work Mode Received from Monitor Unit	Faulty Harness	・Attachment Operation Speed Increase Control ・Attachment Operation Speed Limit Control ・Attachment Pump Torque Decrease Control ・Pump 1 Flow Rate Limit Control ・Pump 2 Flow Rate Limit Control ・ Attachment Flow Rate Control ・Attachment Valve Selection (Optional)
11911-2	Security Signal Received from ECM	Faulty Harness	Theft Prevention Engine Speed, Engine Torque
11920-2	Fuel Flow Rate Received from ECM	Faulty Harness	Fuel Flow Rate
11914-2	Radiator Coolant Temperature Received from ECM	Faulty Harness	Heater Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
Machine operation speed is slow. (During speed sensing, torque is decreased.) During e-service, the engine is stalled.	Retrial B	• Check Harness
• Digging Mode: Lock In case flow rate is decreased and speed decreases during ATT, stop this control, or Digging is not changed into ATT mode. • Work Mode Alarm is displayed on the monitor unit.  T1V1-05-01-102	Retrial B	• Check Harness
In case theft prevention is turned ON by Dr. ZX, engine speed is kept at Minimum speed and pump torque is kept Minimum.	Retrial B	• Check Harness
When the monitor setting is displayed fuel consumption at moment, engine display at moment is “----“.	Retrial B	• Check Harness
Heater Control: Ineffective	Retrial B	• Check Harness

Other Failures

Fault Code	Trouble	Cause	Influenced Control
11901-3	Hydraulic Oil Temperature Sensor High Voltage	Voltage: 4.52 V or higher	・Auto-Warming Up Control ・Arm Regenerative Control ・Digging Regenerative Control
11901-4	Hydraulic Oil Temperature Sensor Low Voltage	Voltage: Less than 0.23 V	・Auto-Warming Up Control ・Arm Regenerative Control ・Digging Regenerative Control
11905-3	Abnormal Boom Bottom Pressure Sensor High Voltage (Optional)	Voltage: 4.5 V or higher	・Overload Alarm
11905-4	Abnormal Boom Bottom Pressure Sensor Low Voltage (Optional)	Voltage: Less than 0.25 V	・Overload Alarm

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
When temperature is low (hydraulic oil temperature is less than 0 °C), the auto-warming up control is inoperable.	Retrial B	• Check Harness
When temperature is low (hydraulic oil temperature is less than 0 °C), the auto-warming up control is inoperable.	Retrial B	• Check Harness
When overload alarm is used. • Overload alarm buzzer rings. • The overload alarm is displayed on the monitor unit.  T1V1-05-02-002	Retrial B	• Check Harness • Replace Boom Bottom Pressure Sensor
When overload alarm is used. • Overload alarm buzzer rings. • The overload alarm is displayed on the monitor unit.  T1V1-05-02-002	Retrial B	• Check Harness • Replace Boom Bottom Pressure Sensor

ECM

Sensor System

Fault Code	Trouble	Cause
636-2	Abnormal Cam Angle Sensor (No Signal)	Although the crank signal is present, the cam signal is not present.
636-2	Abnormal Cam Angle Sensor (Abnormal Signal)	The pulse of cam signal is not matched.
723-2	Abnormal Crank Speed Sensor (No Signal)	Although the cam signal is present, the crank signal is not present.
723-2	Abnormal Crank Speed Sensor (Abnormal Signal)	The pulse of crank signal is not matched.
636-7	Phase Mismatch of Cam Angle Sensor	The right cam pulse is not present at the gap in the crank.
172-3	Abnormal Intake-Air Temperature Sensor (Abnormal High Voltage)	Voltage at the intake-air temperature sensor is beyond 4.95 V in 3 minutes after the engine starts.
172-4	Abnormal Intake-Air Temperature Sensor (Abnormal Low Voltage)	Voltage at the intake-air temperature sensor is below 0.1 V.
110-3	Abnormal Coolant Temperature Sensor (Abnormal High Voltage)	Voltage at the coolant temperature sensor is beyond 4.85 V.
110-4	Abnormal Coolant Temperature Sensor (Abnormal Low Voltage)	Voltage at the coolant temperature sensor is below 0.1 V
102-4	Abnormal Boost Pressure Sensor (Abnormal High Voltage)	Voltage at the boost pressure sensor is beyond 4.9 V.
102-3	Abnormal Boost Pressure Sensor (Abnormal Low Voltage)	Voltage at the boost pressure sensor is below 0.1 V
10001-3	Abnormal EGR Position (Brushless spec.)	The condition which the output signal of EGR position cannot be present in.
108-4	Abnormal Atmospheric Pressure Sensor (Abnormal High Voltage)	Voltage at the atmospheric pressure sensor is beyond 3.8 V.
108-3	Abnormal Atmospheric Pressure Sensor (Abnormal Low Voltage)	Voltage at the atmospheric pressure sensor is below 0.5 V.
174-3	Abnormal Fuel Temperature Sensor (Abnormal High Voltage)	Voltage at the fuel temperature sensor is beyond 4.85 V in 3 minutes after the engine starts.
174-4	Abnormal Fuel Temperature Sensor (Abnormal Low Voltage)	Voltage at the fuel temperature sensor is below 0.1 V.

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
• While the engine runs, there is nothing abnormal with machine operation. • After the engine is stalled, the re-start is impossible.	While the engine runs, operate according to standard of the crank sensor. When the engine stops, the start is impossible (in order to prevent the engine from damaging).	P0340 P0341
• The output power may decrease, white smoke may occur and vibration may occur. • The engine may be stalled. (If the cam senor is normal, the engine can re-start.)	Operate according to standard of the cam sensor.	P0335 P0336
• While the engine runs, there is nothing abnormal with machine operation. • After the engine is stalled, the re-start is impossible.	The timing chain and the belt does not turn smoothly but turn in reverse.	P1345
Nothing special	When starting: -10 °C (14 °F) (Start the engine although what state.) When operating: 25 °C (77 °F) (Operate normally.)	P0113 P0112
Normal temperature: When starting, dark smoke may occur and engine combustion sound may be become loud. While warming up with fresh air in low temperature: Rough idle, engine stall or while smoke may be occur.	When starting: -20 °C (-4 °F) (Start the engine although what state.) When operating: 80 °C (176 °F) (Operate normally.)	P0118 P0117
Dark smoke occurs.	Boost pressure cannot be corrected.	P0238 P0237
There is influence to exhaust gas.	As the sensor input is not certain, it cannot be controlled. Exhaust gas becomes bad. Operate the engine with EGR valve fully open.	P0487
Dark smoke occurs at high altitude.	Atmospheric pressure 80 kPa (0.8 kgf/cm^2, 12 psi) (2000 m above the sea)	P0108 O0107
Nothing special	When starting: -20 °C (-4 °F) (Start the engine although what state.) When operating: 70 °C (158 °F) (Operate normally.)	P0183 P0182

Fault Code	Trouble	Cause
157-3	Abnormal Common Rail Pressure Sensor (Abnormal High Voltage)	Voltage at the common rail pressure sensor is beyond 4.5 V.
157-3	Abnormal Common Rail Pressure Sensor (Abnormal Low Voltage)	Voltage at the common rail pressure sensor is below 0.7 V.
100-4	Abnormal Engine Oil Pressure Sensor (Abnormal High Voltage)	Voltage at the engine oil pressure sensor is beyond 4.85 V.
100-3	Abnormal Engine Oil Pressure Sensor (Abnormal Low Voltage)	Voltage at the engine oil pressure sensor is below 0.1 V.
105-3	Abnormal Boost Temperature Sensor (Abnormal High Voltage)	Voltage at the boost temperature sensor is beyond 4.95 V over 5 minutes after the engine starts or when coolant temperature is beyond 50 °C (122 °F).
105-4	Abnormal Boost Temperature Sensor (Abnormal Low Voltage)	Voltage at the boost temperature sensor is below 0.1 V.

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
The engine may be stalled. The output power decreases.	The supply pump can not be controlled.	P0193
		P0192
There is no influence when operating the machine.	Nothing special	P0523
		P0522
There is no influence when operating the machine.	Nothing special	P1113
		P1112

Fault Code	Trouble	Influence to Engine Performance (Presumption)	Operating Rank (Current State)				Remark
			A	B	C	D	
636-2	Abnormal Cam Angle Sensor (No Signal)	No influence during operationg After stopping, the re-start is impossible.	○			○	
636-2	Abnormal Cam Angle Sensor (Abnormal Signal)		○			○	
723-2	Abnormal Crank Speed Sensor (No Signal)	No output power decrease	○				
723-2	Abnormal Crank Speed Sensor (Abnormal Signal)		○				
636-7	Phase Mismatch of Cam Angle Sensor	No influence during operationg After stopping, the re-start is impossible.	○			○	
172-3	Abnormal Intake-Air Temperature Sensor (Abnormal High Voltage)	No output power decrease	○				
172-4	Abnormal Intake-Air Temperature Sensor (Abnormal Low Voltage)		○				
110-3	Abnormal Coolant Temperature Sensor (Abnormal High Voltage)	No output power decrease	○				
110-4	Abnormal Coolant Temperature Sensor (Abnormal Low Voltage)		○				
102-4	Abnormal Boost Pressure Sensor (Abnormal High Voltage)	No output power decrease	○				
102-3	Abnormal Boost Pressure Sensor (Abnormal Low Voltage)		○				
10001-3	Abnormal EGR Position (Brushless spec.)	No output power change	○				
108-4	Abnormal Atmospheric Pressure Sensor (Abnormal High Voltage)	No output power decrease	○				
108-3	Abnormal Atmospheric Pressure Sensor (Abnormal Low Voltage)		○				
174-3	Abnormal Fuel Temperature Sensor (Abnormal High Voltage)	No output power decrease	○				
174-4	Abnormal Fuel Temperature Sensor (Abnormal Low Voltage)		○				
157-3	Abnormal Common Rail Pressure Sensor (Abnormal High Voltage)	Output power decrease: 70%			○		
157-4	Abnormal Common Rail Pressure Sensor (Abnormal Low Voltage)				○		
100-4	Abnormal Engine Oil Pressure Sensor (Abnormal High Voltage)	No output power change	○				
100-3	Abnormal Engine Oil Pressure Sensor (Abnormal Low Voltage)		○				

Fault Code	Trouble	Influence to Engine Performance (Presumption)	Operating Rank (Current State)				Remark
105-3	Abnormal Boost Temperature Sensor (Abnormal High Voltage)	No output power change	○				
105-4	Abnormal Boost Temperature Sensor (Abnormal Low Voltage)		○				

Operating Rank
A: Diggings operable.
B: Machine can travel with boom raised. (Steering is impossible.)
C: The engine only runs. (Travel, digging and operation with light load are impossible.)
D: The engine cannot stop / start.

IMPORTANT: When fault code 723-2 (abnormal crank speed sensor) is displayed and the engine does not start, the cam angle sensor is faulty although fault codes 636-2 (abnormal cam angle sensor) and 636-7 (phase mismatch of cam angle sensor) are not displayed.

External Device System

Fault Code	Trouble	Cause
10002-2	Abnormal EGR valve control	Difference between the target valve lift and actual position isbeyond 20%.
1347-0	Open circuit in suction control valve drive system, Shorted circuit in + B or GND	The suctioncontrol valve drive current is beyond 2400 mA or below 50 mA. Or, difference between the tartget current and actual current is 1000 mA or more.
651-3	Open circuit in injection nozzle ＃1 drive system	No input signal of injector 1 monitor.
652-3	Open circuit in injection nozzle ＃2 drive system	No input signal of injector 2 monitor.
653-3	Open circuit in injection nozzle ＃3 drive system	No input signal of injector 3 monitor.
654-3	Open circuit in injection nozzle #4 drive system	No input signal of injector 4 monitor.

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
There is influence to exhaust gas.	EGR cannot be controlled. As exhaust gas becomes bad, EGR stops.	P0488
The engine may be stalled and the rotation speed increases automatically and abnormally according to open or shorted circuitc ondition. Dark smoke occurs. Output power is too large.	The supply pump cannot be controlled. → Prevent the engine from increasing the rotation speed automatically and abnormally (Protect the engine).	P0090
Vibration of the engine is large, Rough idle, output power decrease, faulty increasing of rotation speed, output power decrease	#1 injector cannot be controlled. → Stop drive pulse output of #1 injector.	P0201
	#2 injector cannot be controlled. → Stop drive pulse output of #2 injector.	P0202
	#3 injector cannot be controlled. → Stop drive pulse output of #3 injector.	P0203
	#4 injector cannot be controlled. → Stop drive pulse output of #4 injector.	P0204

Fuel System

Fault Code	Trouble	Cause
157-0	Abnormal common rail pressure (First stage)	Common rail pressure is beyond 185 Mpa.
157-0	Abnormal commo rail pressure (Second stage)	The first stage “Abnormal common rail presure” is approveand commonrail pressure is beyond 190 Mpa.
157-2	Abnormal commonrail pressure (Pump over-pressure)	When DUTY to the suction control valve is 40 % or more, or target pressure to the suction control valve is 90 mm^3/sec or less, actual rail pressure is 40 MPa (410 kgf/cm^2, 5820 psi) higher than the target rail pressure.
633-7	Pressure limiter open	The pressure limiter is open.
1240-1	No pressure to pump (Fuel leakage)	When DUTY to the suction control valve is 33 % or less, or pressure to the suction control valve is 28000 mm^3/sec or more and 1200 min^{-1}, actual rail pressure is 50 MPa (510 kgf/cm^2, 7270 psi) lower than the target rail pressure.
1239-1	No pressure to pump (Fuel leakage)	When pressure to the suction control valve is 900 min^{-1}, actual rail pressure is 15Mpa (150 kgf/cm^2, 2180 psi) or less.

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed, dark smoke may occur, output power may be too large.	Prevention the junection system (pump) from damage (Protect the RP sensor by over-pressure)	P0088
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed, dark smoke may occur, output power may be too large.	Prevention the junection system from damage (Pressure is too much as PR is clogged.)	P0088
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed, dark smoke may occur, output power may be too large.	Prevention the junection system (pmp) from damage (Protect the RP sensor by over-pressure)	P0089
Output power decrease	Rial pressure is beyond the allowable pressure.	P1095
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed, dark smoke may occur, output power may be too large.	Fuel leakage is too much. Difference between target rail pressure and actual rail pressure is larger than the specification. (Large deflection)	P1093
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed, dark smoke may occur, output power may be too large.	Fuel leakage is too much. Actual rail pressure does not increase to the required pressure.	P0087

Fault Code	Trouble	Influence to Engine Performance (Presumption)	Operating Rank (Current)				Remark
			A	B	C	D	
10002-2	Abnormal EGR valve control	No output power change	○				
1347-0	Open circuit in suction control valve drive system, Shorted circuit in + B or GND	Output power decrease: 50%		○			
651-3	Open circuit in injection nozzle # 1 drive system	Output power decrease: 15% (Five cylinders drive.)		○			
652-3	Open circuit in injection nozzle # 2 drive system			○			
653-3	Open circuit in injection nozzle # 3 drive system			○			
654-3	Open circuit in injection nozzle # 4 drive system			○			
655-3	Open circuit in injection nozzle # 5 drive system			○			
656-3	Open circuit in injection nozzle # 6 drive system			○			

Fault Code	Trouble	Influence to Engine Performance (Presumption)	Operating Rank (Current)				Remark
			A	B	C	D	
157-0	Abnormal common rail pressure (First stage)	Output power decrease: 50%		○			
157-0	Abnormal commo rail pressure (Second stage)	Output power decrease: 50%		○			
157-2	Abnormal commonrail pressure (Pump over-pressure)	Output power decrease: 50%		○			
633-7	Pressure limiter open	Output power decrease: 50%		○			
1240-1	No pressure to pump (Fuel leakage)	Output power decrease: 50%		○			
1239-1	No pressure to pump (Fuel leakage)			○			

Operating Rank
A: Diggings operable.
B: Machine can travel with boom raised. (Steering is impossible.)
C: The engine only runs. (Travel, digging and operation with light load are impossible.)
D: The engine cannot stop / start.

(Blank)

Fault Code	Trouble	Cause
110-0	Overheating	Coolant temperature is beyond 120 °C (248 °F) when operating the engine.
190-0	Overrunning	In case the engine speed is beyond 2500 min^{-1}

Fault Code	Trouble	Cause
987-3	Abnormal check engine lamp	No monitor signal of the check engine lamp
1485-2	Abnormal main relay system	Voltage in the main relay system is 1 V or less with the main relay coil output ON.
		Although the main relay coil output is turned OFF, the main relay is kept ON.

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
There is no influence when operating the machine.	Nothing special (The history of overheating is recorded.)	P1173
Engine speed of the excavator may not increase 2500 min^{-1} or more.	Mistake of gear change, etc.	P0219

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
There is no influence when operating the machine.	Nothing special	P0650
The engine cannot start.	Nothing	P1625
Electrical power is kept supplying to the machine.	Nothing	

Fault Code	Trouble	Influence to Engine Performance (Presumption)	Operating Ranke (Current)				Remark
			A	B	C	D	
110-0	Overheating	No output power change	○				
190-0	Overrunning	No output power change	○				

Fault Code	Trouble	Influence to Engine Performance (Presumption)	Operating Ranke (Current)				Remark
			A	B	C	D	
987-3	Abnormal check engine lamp	No output power change	○				
1485-2	Abnormal main relay system	The engine stops.				○	
		Nothing (The engine cannot re-start according to battery voltage.)	○			○	

Operating Rank
A: Diggings operable.
B: Machine can travel with boom raised. (Steering is impossible.)
C: The engine only runs. (Travel, digging and operation with light load are impossible.)
D: The engine cannot stop / start.

(Blank)

Internal Circuit System

Fault Code	Trouble	Cause
10005-1	Abnormal Charge Circuit (Bank 1)	In case volate at bank 1 of charge circuit in ECM is low
10006-1	Abnormal Charge Circuit (Bank 2)	In case volate at bank 2 of charge circuit in ECM is low
10008-2	Abnormal A/D Conversion	A/D conversion cannot be done.
10007-2	Abnormal CPU	Within 100 msec after the key switch is turned ON, failure of main CPU is detected by sub CPU. (Sub CPU resets CPU.)
1077-2	Abnormal IC for CPU watching	No change of RUN-SUB pulse in 20 msec
628-2	Abnormal ROM	ROM is broken.
10013-2	Abnormal EEPROM	EEPROM is broken.
1079-2	Abnormal 5 V Power Source 1 Voltage	When battery volate is between 16 V and 32 V, voltage of IGKEY power source is 5.5 V or more or 4.5 V or less.
1080-2	Abnormal 5 V Power Source 2 Voltage	When battery volate is between 16 V and 32 V, voltage of IGKEY power source is 5.5 V or more or 4.5 V or less.
10009-2	Abnormal 5 V Power Source 3 Voltage	When battery volate is between 16 V and 32 V, voltage of IGKEY power source is 5.5 V or more or 4.5 V or less.
10010-2	Abnormal 5 V Power Source 4 Voltage	When battery volate is between 16 V and 32 V, voltage of IGKEY power source is 5.5 V or more or 4.5 V or less.
10011-2	Abnormal 5 V Power Source 5 Voltage	When battery volate is between 16 V and 32 V, voltage of IGKEY power source is 5.5 V or more or 4.5 V or less.
10003-2	Abnormal Injection Nozzle Common 1 Drive System	No monitor siganals of injectors 1, 3, 5
10004-2	Abnormal Injection Nozzle Common 2 Drive System	No monitor siganals of injectors 2, 4, 6

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed may occur, the engine may be stalled.	The injector cannot be controlled. → Stop output of drive signal at broken common side (Protect the engine from damage)	P0611
		P0612
Output power decrease, dark smoke occur.	All analogue sensor cannot be used.	P1630
Output power decrease	CPU is broken.	P0606
The engine cannot start.		P0606
Output power decrease	Sub CPU is broken.	P0601
The engine stops.	Data of ROM cannot be read.	P1603
There is no influence when operating the machine.	Data cannot be written to EEPROM.	P1631
Same as Abnormal accelerator Sensor	←	P1632
Same as Abnomal atmospheric and in-take temperaturecsensors	←	P1633
Same as Abnomal coolant temperature, fuel temperature and hydraulic oil pressure sensors	←	P1634
Same as Abnomal boost pressure and boost temperature sensors	←	P1635
Same as Abnomal rail pressure and EGR position sensors	←	P1261
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed may occur, the engine may be stalled.	The injector cannot be controlled. → Stop output of drive signal at broken common side (Protect the engine from damage)	P1262

Fault Code	Trouble	Influence to Engine Performance (Presumption)	Operating Rank (Current)				Remark
			A	B	C	D	
10005-1	Abnormal Charge Circuit (Bank 1)	Output power decrease: 60% (Three cylinders drive.)		○	○		
10006-1	Abnormal Charge Circuit (Bank 2)			○	○		
10008-2	Abnormal A/D Conversion	Output power decrease: 50%		○			
10007-2	Abnormal CPU	Output power decrease: 50%		○			
		The engine cannot start.				○	
1077-2	Abnormal IC for CPU watching	Output power decrease: 50%		○			
628-2	Abnormal ROM	The engine stops.				○	
10013-2	Abnormal EEPROM	No output power decrease	○				
1079-2	Abnormal 5 V Power Source 1 Voltage	Idle Speed Operation	○				
1080-2	Abnormal 5 V Power Source 2 Voltage	No output power decrease	○				
10009-2	Abnormal 5 V Power Source 3 Voltage	No output power change	○				
10010-2	Abnormal 5 V Power Source 4 Voltage	No output power decrease	○				
10011-2	Abnormal 5 V Power Source 5 Voltage	Output power decrease: 50%		○	○		
10003-2	Abnormal Injection Nozzle Common 1 Drive System	Output power decrease: 60% (Three cylinders drive.)		○	○		
10004-2	Abnormal Injection Nozzle Common 2 Drive System			○	○		

Operating Rank
A: Diggings operable.
B: Machine can travel with boom raised. (Steering is impossible.)
C: The engine only runs. (Travel, digging and operation with light load are impossible.)
D: The engine cannot stop / start.

(Blank)

Communication System

Fault Code	Trouble	Cause
639-2	Abnormal CAN Bus Line	Detect the bus line off.
639-3	Abnormal CAN Time Out	In case the CAN data reception is not approved in prescribedtime

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
Speed is turnd into idle speed.	CAN communication is operable.	U2104
		U2106

Fault Code	Trouble	Influence to Engine Performance (Presumption)	Operating Rank (Current)				Remark
			A	B	C	D	
639-2	Abnormal CAN Bus Line	Idle speed	○				
639-3	Abnormal CAN Time Out		○				

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ICF

Fault Code	Trouble	Cause
14000-2	Abnormal CAN Communication	Data cannot be received due to the noise on the CAN bus line.
14001-2	ICF: Flash Memory: Read / Write Error	In case the internal memory is abnormal when the key is turned ON
14002-2	ICF: External RAM: Read / Write Error	In case the internal memory is abnormal when the key is turned ON
14003-2	ICF: EEPROM: Sum Check Error	In case the internal memory is abnormal when the key is turned ON
14006-2	ICF: Satellite Communication Terminal: Communication Error	In casse communication to the satellite terminal cannot be done over 30 seconds.
14008-2	ICF: Abnormal Internal RAM	In case the internal memory is abnormal when the key is turned ON

Fault Code	Remedy
14000-2	Check for CAN communication bus line.
14001-2	After initializng the information C/U by using Dr. ZX, re-try in the troubleshooting. If the error code is displayed after re-try, ICF may be broken. Replace ICF. *NOTE: When initialising the information C/U, all stored data is deleted.*
14002-2	After initializng the information C/U by using Dr. ZX, re-try in the troubleshooting. If the error code is displayed after re-try, ICF may be broken. Replace ICF. *NOTE: When initialising the information C/U, all stored data is deleted.*
14003-2	As ICF may be broken, replace ICF.
14006-2	Check for the items below. 1. Check if the communication line is abnormal. 2. Check if the electrical power source of communication terminal is abnormal. • Electrical power source • Fuses 3. Check if the satellilte terminal is broken.
14008-2	Re-try in the troubleshooting by using Dr.ZX. If the error code is displayed after re-try, ICF may be broken.

Satellite Terminal

Fault Code	Trouble	Cause
14100-2	Satellite Communication Terminal: Abnormal EEPROM	Data cannot be received due to the noise on the CAN bus line.
14101-2	Satellite Communication Terminal: Abnormal IB/OB Queue	In case the internal memory is abnormal when the key is turned ON
14102-2	Satellite Communication Terminal: Abnormal Local Loup Back	In case the internal memory is abnormal when the key is turned ON
14103-2	Satellite Communication Terminal: The satellite is not found.	In case the internal memory is abnormal when the key is turned ON
14104-2	Satellite Communication Terminal: Fail 1 of Remote Loup Back	In casse communication to the satellite terminal cannot be done over 30 seconds.
14105-2	Satellite Communication Terminal: Fail 2 of Remote Loup Back	In case the internal memory is abnormal when the key is turned ON
14106-2	Satellite Communication Terminal: Sending and receiving data are mistached.	In case sending and receiving data are unmatched.

Fault Code	Remedy
14100-2	Replace the controller.
14101-2	Replace the controller.
14102-2	• Check communication aerial of satellite terminal.
14103-2	• Check communication aerial of satellite terminal.
14104-2	Replace the controller.
14105-2	Replace the controller.
14106-2	Replace the controller.

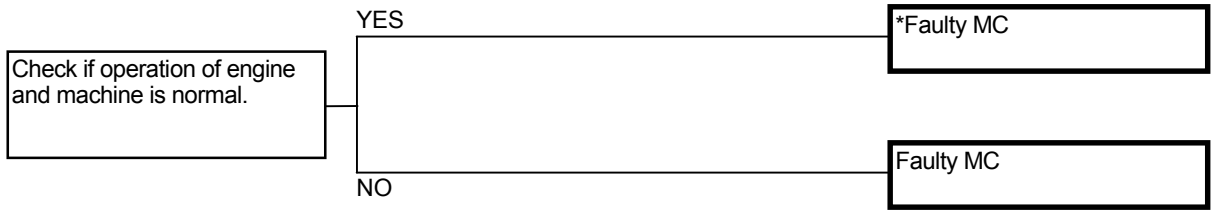
Monitor Unit

Fault Code	Trouble	Cause
13303-2	Abnormal Thermister Temperature	Thermister temperature is 85 °C (185 °F) or higher.
13304-2	Abnormal REG Input H Level	During REG input H level
13306-2	Abnormal EEPROM	When failure reading EEPROM occurs
13308-2	Abnormal CAN Communication	Bus off occurs beyond five times.
13310-3	Shorted circuit in Coolant Temperature Sensor	The state, input 105±30 Ω or less, is kept over 60 seconds.
13311-3	Shorted circuit in Fuel Leverl Sensor	The state, input 3±1 Ω or less, is kept over 60 seconds.
13311-4	Open circuit in Fuel Leverl Sensor	The state, input 135±20 Ω or less, is kept over 60 seconds.

Fault Code	Remedy
13303-2	Cool the monitor unit and so on until temperature inside the monitor unit is less than 85 °C (185 °F).
13304-2	(Refer to the Troubleshooting flow chart.)
13306-2	If this fault code is displayed after retarial, replace the monitor unit.
13308-2	Refer to “Check CAN Harness” on page T5-6-54.
13310-3	Check coolant temperature sensor and harness.
13311-3	Check fuel level sensor and harness.
13311-4	Check fuel level sensor and harness.

CONTROLLER HARDWARE FAILURE
MC FAULT CODE 11000 to 11002

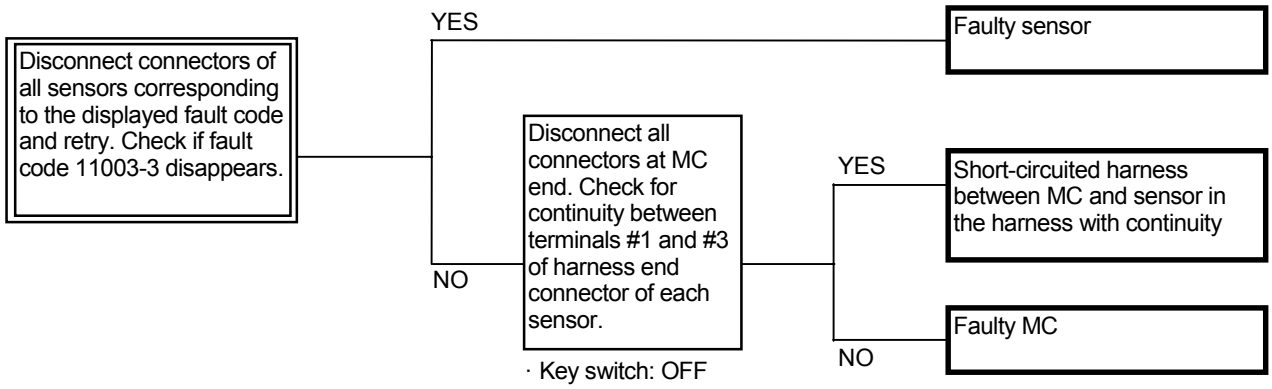
Fault Code	Trouble	Cause	Influenced Control
11000-2	Abnormal EEPROM	Faulty MC	All Control
11001-2	Abnormal RAM	Faulty MC	All Control
11002-2	Abnormal A/D Conversion	Faulty MC	All Control



* When the fault code is displayed in the result of retrial and If operation of engine and machine is normal, the machine can be used.

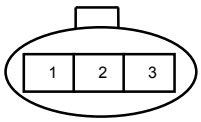
MC FAULT CODE 11003

Fault Code	Trouble	Cause	Influenced Control
11003-3	Abnormal Sensor Voltage	Faulty MC	All Control

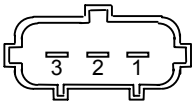


Connector (Harness end of connector viewed from the open side)

- Pressure Sensor (Travel)
- Pressure Sensor (Front Attachment)
- Pressure Sensor (Swing)
- Pressure Sensor (Boom Raise)
- Pressure Sensor (Arm Roll-In)
- Pressure Sensor (Auxiliary) (Optional)
- Pump 1 Control Pressure Sensor
- Pump 2 Control Pressure Sensor

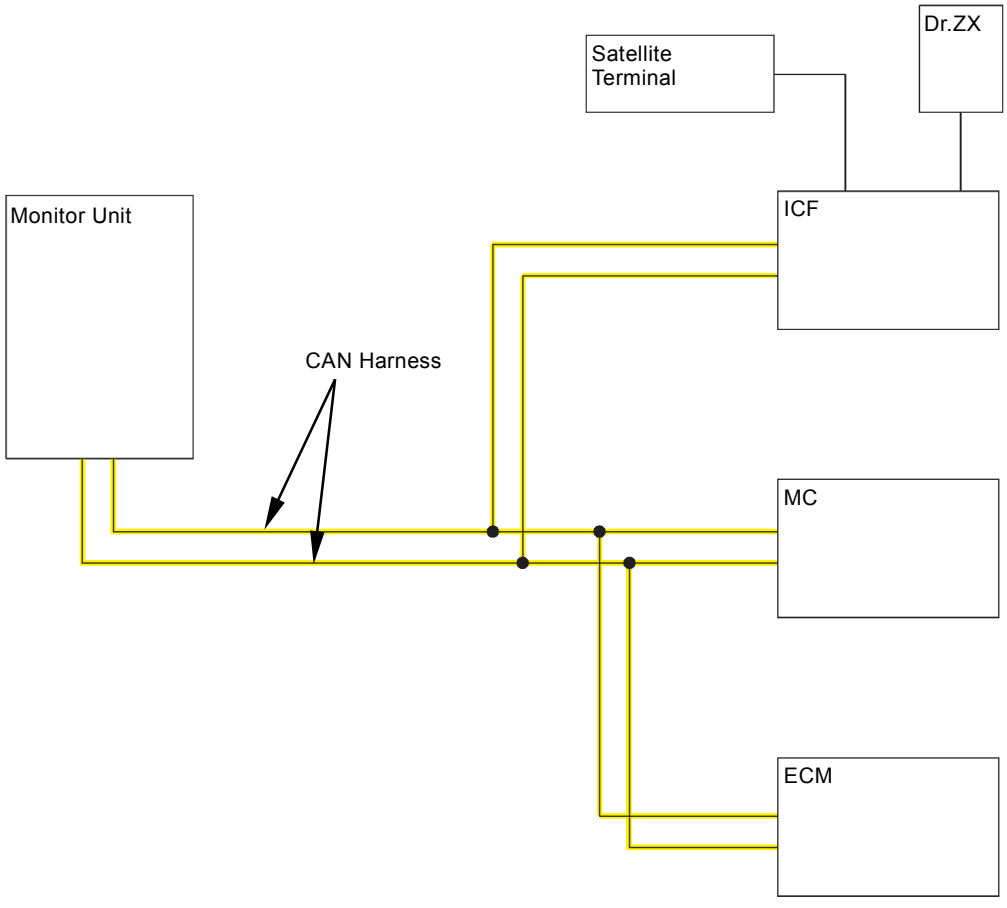


- Pump 1 Delivery Pressure Sensor:
- Pump 2 Delivery Pressure Sensor



MC FAULT CODE 11004

Fault Code	Trouble	Cause	Influenced Control
11004-2	Abnormal CAN Communication	Faulty MC	• Heater Control • Speed Sensing Control • Attachment Operation Speed Increase Control • Attachment Operation Speed Limit Control • Attachment Pump Torque Decrease Control • Pump 1 Flow Rate Limit Control • Pump 2 Flow Rate Limit Control • Attachment Flow Rate Control (Optional) • Attachment Valve Selection (Optional) • CAN Cycle Data Communication



T1V1-02-01-050

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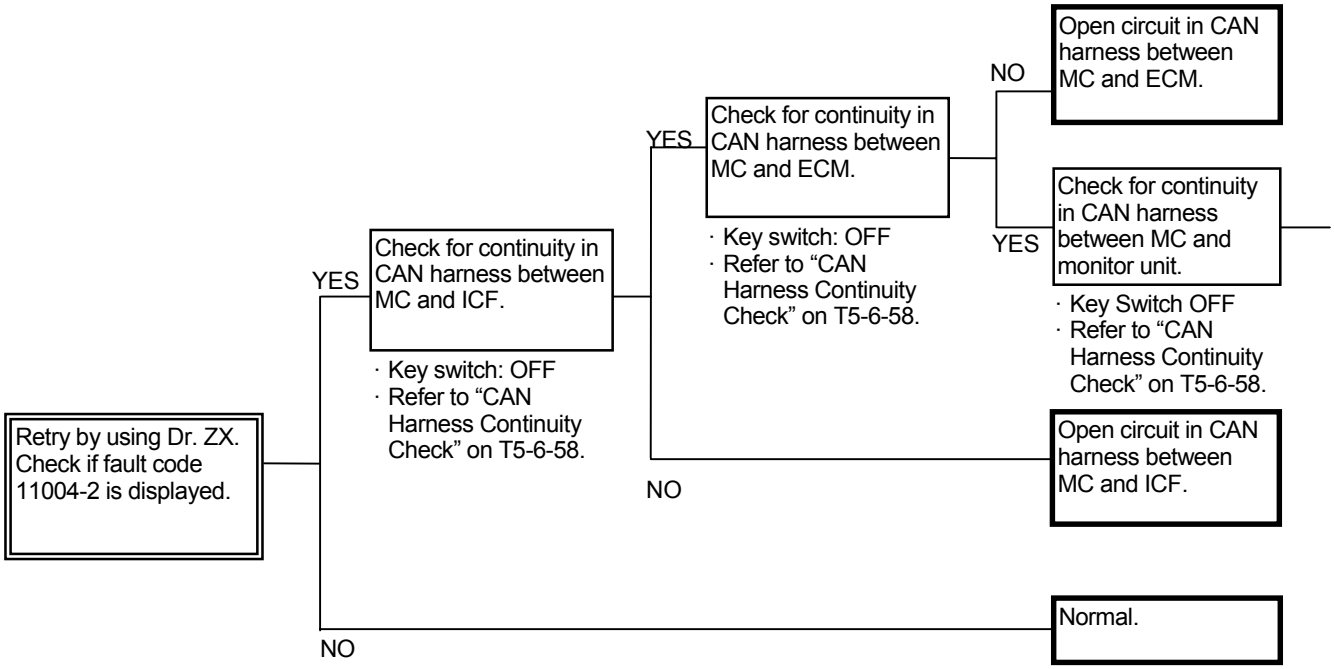
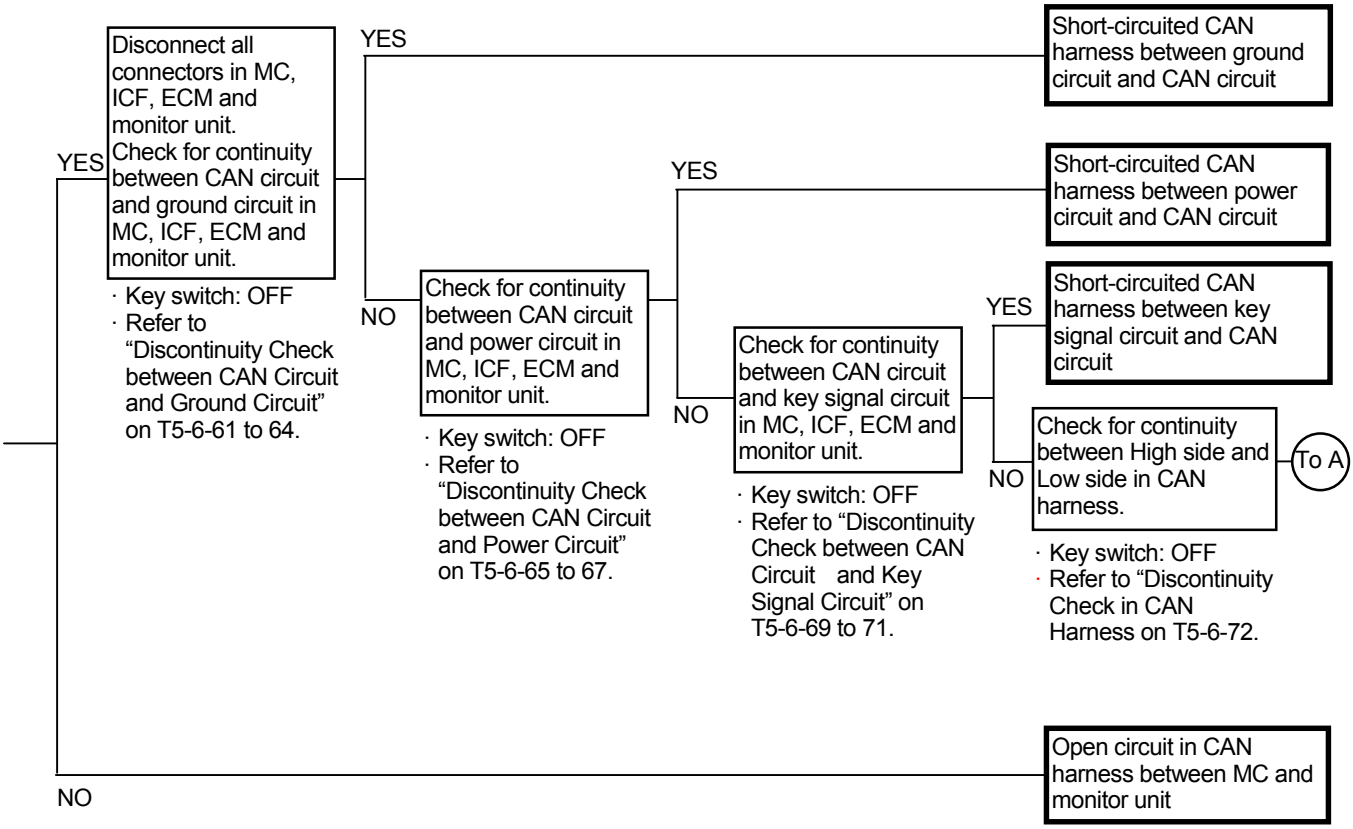
CAN HARNESS CHECK

- Check the wiring connections first.




Disconnect all connectors in MC, ICF, ECM and monitor unit. Check for continuity between CAN circuit and ground circuit in MC, ICF, ECM and monitor unit.
· Key switch: OFF
· Refer to "Discontinuity Check between CAN Circuit and Ground Circuit" on T5-6-61 to 64.
YES
NO
Short-circuited CAN harness between ground circuit and CAN circuit
Check for continuity between CAN circuit and power circuit in MC, ICF, ECM and monitor unit.
· Key switch: OFF
· Refer to "Discontinuity Check between CAN Circuit and Power Circuit" on T5-6-65 to 67.
YES
NO
Short-circuited CAN harness between power circuit and CAN circuit
Check for continuity between CAN circuit and key signal circuit in MC, ICF, ECM and monitor unit.
· Key switch: OFF
· Refer to "Discontinuity Check between CAN Circuit and Key Signal Circuit" on T5-6-69 to 71.
YES
NO
Short-circuited CAN harness between key signal circuit and CAN circuit
Check for continuity between High side and Low side in CAN harness.
· Key switch: OFF
· Refer to "Discontinuity Check in CAN Harness on T5-6-72.
To A
Open circuit in CAN harness between MC and monitor unit

A

Connect all connectors except connector MC-C in MC.
Check if resistance between terminals #C4 and #C15 of harness end of connector MC-C is within 60±10 Ω.
· Key switch: OFF

YES → Short-circuited CAN harness.

NO → Connect connector in MC. Disconnect connector ICF-C in ICF.
Check if resistance between terminals #C5 and #C11 of harness end of connector is within 60±10 Ω.
· Key switch: OFF

YES → Connect connector in MC.
Check if fault code 11004-2 is displayed.
· Key switch: ON

NO → Check the connection of MC and connector.

YES → Faulty MC.

NO → Connect connector in ICF.
Check if fault code 11004-2 is displayed.
· Key switch: ON

NO → Check the connection of ICF and connector.

YES → Faulty ICF.

YES → Connect connector in ICF.
Disconnect connector in ECM.
Check if resistance between terminals #18 and #37 of harness end of connector is within 120±10 Ω.
· Key switch: OFF

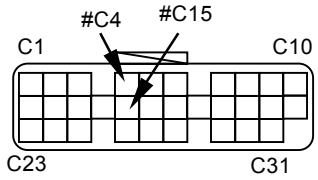
NO → Connect connector in ECM. Check if fault code 11004-2 is displayed.
· Key switch: ON

YES → Connect connector in ECM.
Disconnect connector monitor-B in monitor unit.
Check if resistance between terminals #B6 and #B7 of harness end of connector is within 120±10 Ω.
· Key switch: OFF

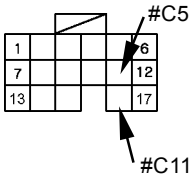
NO

Connector

MC
Connector MC-C
(Harness end)

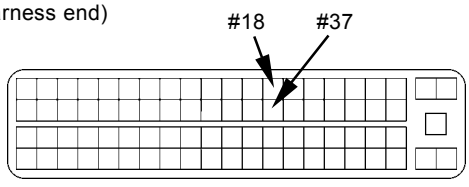


ICF
Connector ICF-C
(Harness end)



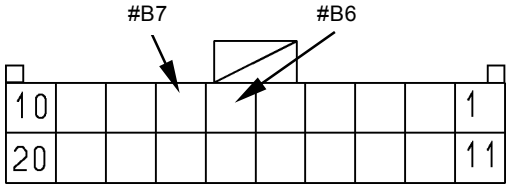
T1V1-05-04-002

ECM
Connector
(Harness end)

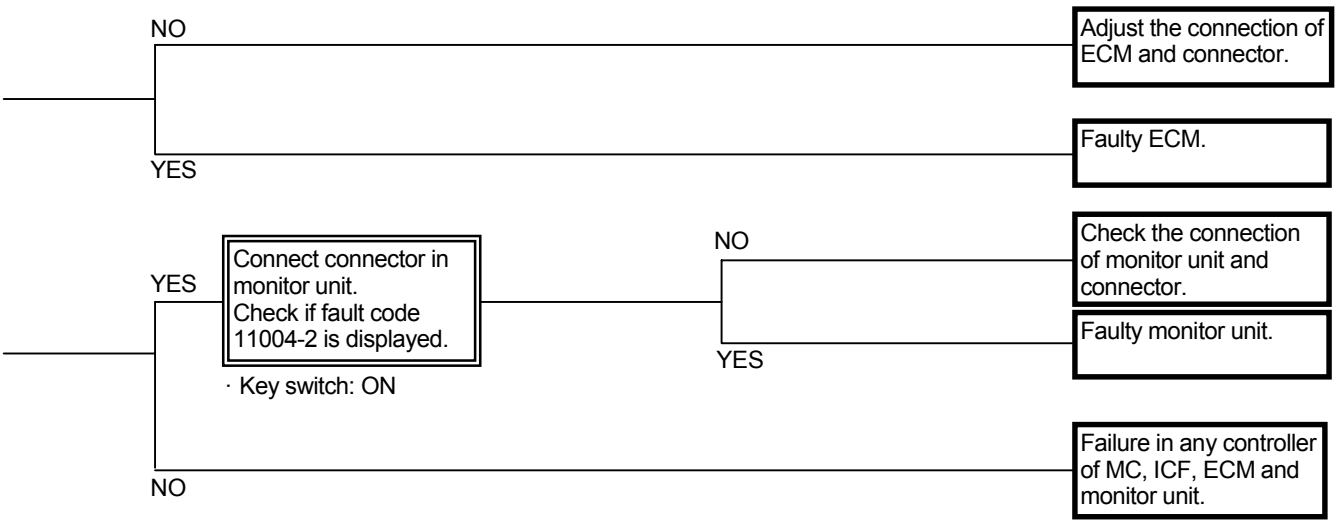


T1GR-05-04-002

Monitor Unit
Connector Monitor-B Connector
(Harness end)



T183-05-04-013


NO
Adjust the connection of ECM and connector.
Faulty ECM.
YES
YES
Connect connector in monitor unit.
Check if fault code 11004-2 is displayed.
· Key switch: ON
NO
Check the connection of monitor unit and connector.
Faulty monitor unit.
YES
Failure in any controller of MC, ICF, ECM and monitor unit.
NO

Continuity Check in CAN Harness

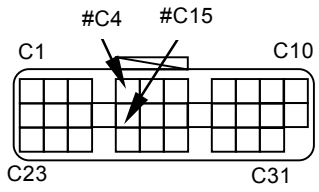
IMPORTANT: Before continuity check, turn the key switch OFF.

- Between MC and ECM
  CAN Harness (High Side)
  Check for continuity between terminal #C4 of harness end of connector MC-C in MC and terminal #18 of harness end of connetor in ECM.

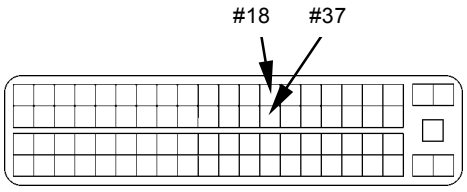
  CAN Harness (Low Side)
  Check for continuity between terminal #C15 of harness end of connector MC-C in MC and terminal #37 of harness end of connetor in ECM.

Connector

MC
Connector MC-C
(Harness end)



ECM
Connector
(Harness end)



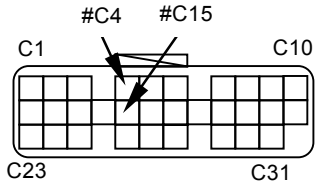
T1GR-05-04-002

- Between MC and ICF
  CAN Harness (High Side)
  Check for continuity between terminal #C4 of harness end of connector MC-C in MC and terminal #C5 of harness end of connetor ICF-C in ICF.

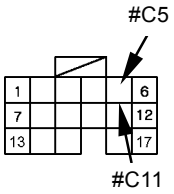
  CAN Harness (Low Side)
  Check for continuity between terminal #C15 of harness end of connector MC-C in MC and terminal #C11 of harness end of connetor ICF-C in ICF.

Connector

MC
Connector MC-C
(Harness end)



ICF
Connector ICF-C
(Harness end)



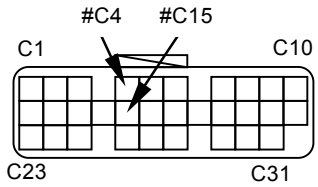
T1V1-05-04-002

- Between MC and Monitor Unit
  CAN Harness (High Side)
  Check for continuity between terminal #C4 of harness end of connector MC-C in MC and terminal #B7 of harness end of connetor monitor-B in the monitor unit.

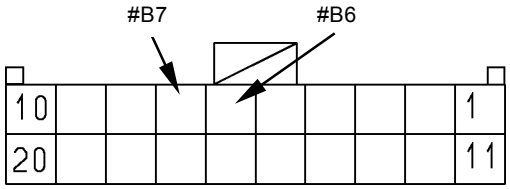
  CAN Harness (Low Side)
  Check for continuity between terminal #C15 of harness end of connector MC-C in MC and terminal #B6 of harness end of connetor monitor-B in the monitor unit.

Connector

MC
Connector MC-C
(Harness end)



Monitor Unit
Connector Monitor-B
(Harness end)



T183-05-04-013

Discontinuity Check between CAN Circuit and Ground Circuit

IMPORTANT: Before continuity check, turn the key switch OFF.

- In case of continuity, the circuit between CAN circuit and ground circuit is shorted.
- In case of discontinuity, the circuit is normal.

- MC

  Between CAN Circuit (High Side) and Ground Circuit

  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #A2 of harness end of connetor in MC-A.

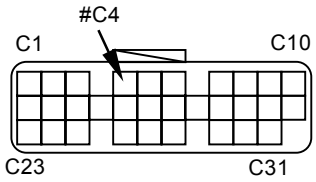
  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #A13 of harness end of connetor in MC-A.

  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B8 of harness end of connetor in MC-B.

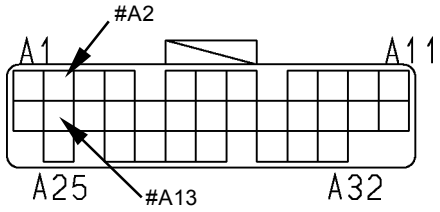
  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B18 of harness end of connetor in MC-B.

Connector

Connector MC-C
(Harness end)

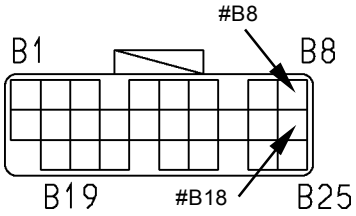


Connector MC-A
(Harness end)



T183-05-04-008

Connector MC-B
(Harness end)



T183-05-04-021

Between CAN Circuit (Low Side) and Ground Circuit
Check for continuity between terminal #C5 of harness end of connector MC-C and terminal #A2 of harness end of connetor in MC-A.

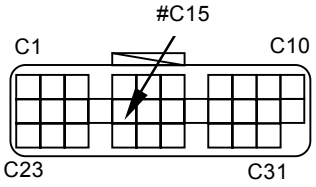
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #A13 of harness end of connetor in MC-A.

Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B8 of harness end of connetor in MC-B.

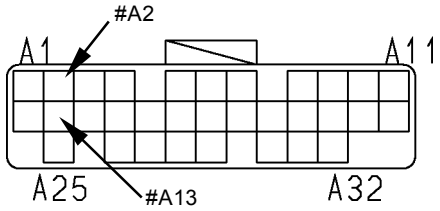
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B18 of harness end of connetor in MC-B.

Connector

Connector MC-C
(Harness end)

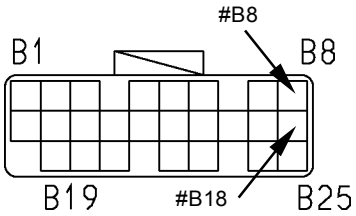


Connector MC-A
(Harness end)



T183-05-04-008

Connector MC-B
(Harness end)



T183-05-04-021

- ECM

  Between CAN Circuit (High Side) and Ground Circuit

  Check for continuity between terminals #18 and #1 of harness end of connector.

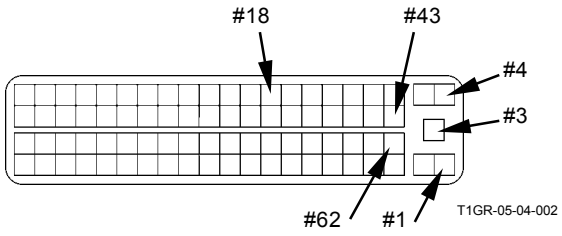
  Check for continuity between terminals #18 and #3 of harness end of connector.

  Check for continuity between terminals #18 and #4 of harness end of connector.

  Check for continuity between terminals #18 and #43 of harness end of connector.

  Check for continuity between terminals #18 and #62 of harness end of connector.

ECM
Connector
(Harness end)



  Between CAN Circuit (Low Side) and Ground Circuit

  Check for continuity between terminals #37 and #1 of harness end of connector.

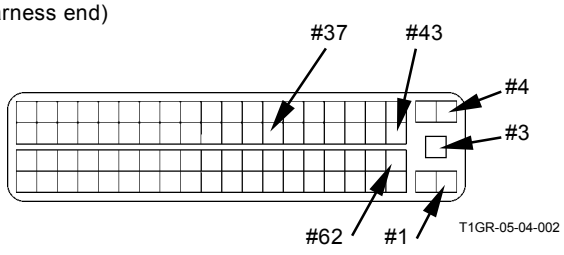
  Check for continuity between terminals #37 and #3 of harness end of connector.

  Check for continuity between terminals #37 and #4 of harness end of connector.

  Check for continuity between terminals #37 and #43 of harness end of connector.

  Check for continuity between terminals #37 and #62 of harness end of connector.

ECM
Connector
(Harness end)

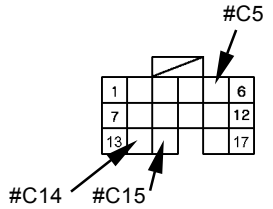


- ICF

  Between CAN Circuit (High Side) and Ground Circuit
  Check for continuity between terminals #C5 and #C14 of harness end of connector ICF-C.

  Check for continuity between terminals #C5 and #C15 of harness end of connector ICF-C.

ICF
Connector ICF-C
(Harness end)

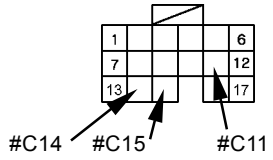


T1V1-05-04-002

  Between CAN Circuit (Low Side) and Ground Circuit
  Check for continuity between terminals #C11 and #C14 of harness end of connector ICF-C.

  Check for continuity between terminals #C11 and #C15 of harness end of connector ICF-C.

ICF
Connector ICF-C
(Harness end)

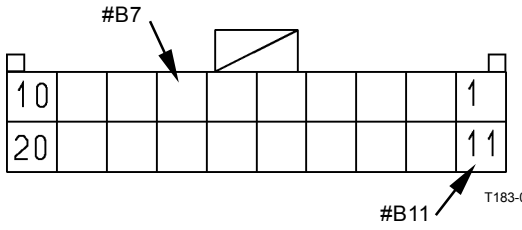


T1V1-05-04-002

- Monitor Unit

  Between CAN Circuit (High Side) and Ground Circuit
  Check for continuity between terminals #B7 and #B11 of harness end of connector in the monitor unit.

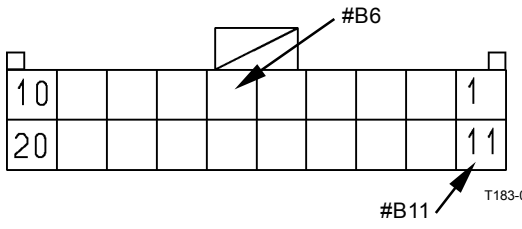
Monitor Unit
Connector Monitor-B
(Harness end)



T183-05-04-013

  Between CAN Circuit (Low Side) and Ground Circuit
  Check for continuity between terminals #B6 and #B11 of harness end of connector in the monitor unit.

Monitor Unit
Connector Monitor-B
(Harness end)



T183-05-04-013

Discontinuity Check between CAN Circuit and Power Circuit

IMPORTANT: Before continuity check, turn the key switch OFF.

- In case of continuity, the circuit between CAN circuit and power circuit is shorted.
- In case of discontinuity, the circuit is normal.

- MC

  Between CAN Circuit (High Side) and Power Circuit

  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #A1 of harness end connector MC-A.

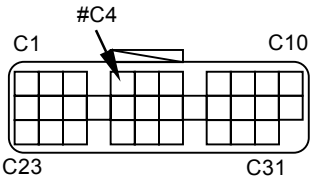
  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #A12 of harness end connector MC-A.

  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B7 of harness end connector MC-B.

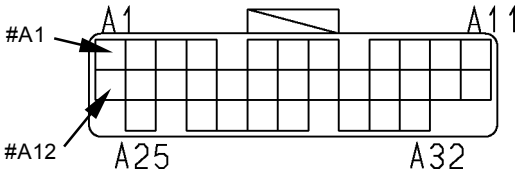
  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B17 of harness end connector MC-B.

Connector

Connector MC-C
(Harness end)

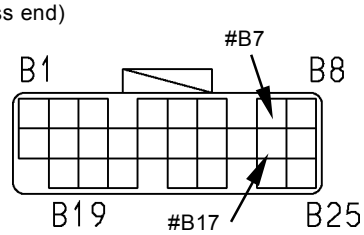


Connector MC-A
(Harness end)



T183-05-04-008

Connector MC-B
(Harness end)



T183-05-04-021

Between CAN Circuit (Low Side) and Power Circuit
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #A2 of harness end connector MC-A.

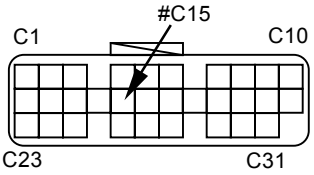
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #A12 of harness end connector MC-A.

Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B7 of harness end connector MC-B.

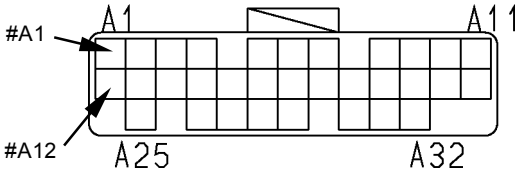
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B17 of harness end connector MC-B.

Connector

Connector MC-C
(Harness end)

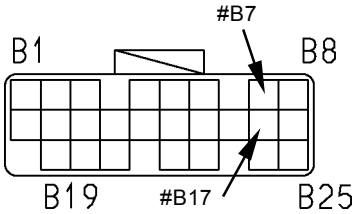


Connector MC-A
(Harness end)



T183-05-04-008

Connector MC-B
(Harness end)



T183-05-04-021

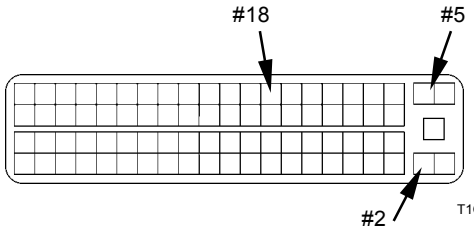
- ECM

  Between CAN Circuit (High Side) and Power Circuit

  Check for continuity between terminals #18 and #2 of harness end of connector.

  Check for continuity between terminals #18 and #5 of harness end of connector.

ECM
Connector
(Harness end)



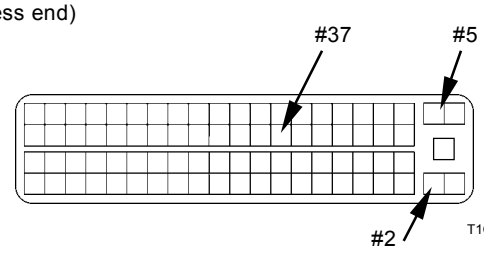
T1GR-05-04-002

  Between CAN Circuit (Low Side) and Power Circuit

  Check for continuity between terminals #37 and #2 of harness end of connector.

  Check for continuity between terminals #37 and #5 of harness end of connector.

ECM
Connector
(Harness end)



T1GR-05-04-002

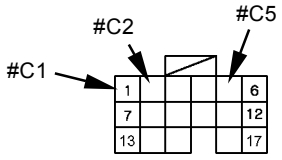
- ICF

  Between CAN Circuit (High Side) and Power Circuit

  Check for continuity between terminals #C5 and #C1 of harness end of connector ICF-C.

  Check for continuity between terminals #C5 and #C2 of harness end of connector ICF-C.

ICF
Connector ICF-C
(Harness end)



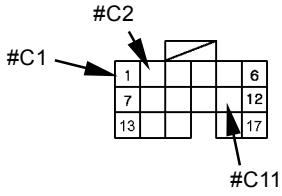
T1V1-05-04-002

  Between CAN Circuit (Low Side) and Power Circuit

  Check for continuity between terminals #C11 and #C1 of harness end of connector ICF-C.

  Check for continuity between terminals #C11 and #C2 of harness end of connector ICF-C.

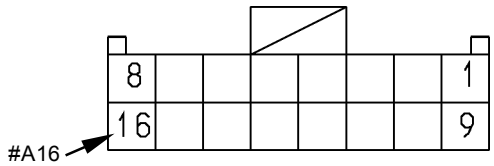
ICF
Connector ICF-C
(Harness end)



T1V1-05-04-002

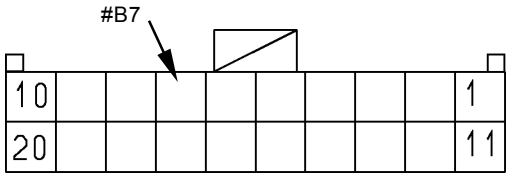
- Monitor Unit
  Between CAN Circuit (High Side) and Power Circuit
  Check for continuity between terminal #B7 of harness endo of connector in the monitor unit and terminal #A16 of harness endo of connector monitor-A in the monitor unit.

Monitor Unit
Connector Monitor-A
(Harness end)



T183-05-05-001

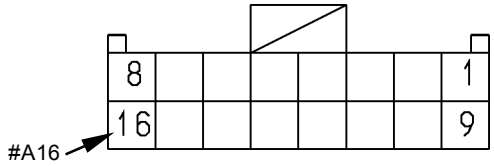
Monitor Unit
Connector Monitor-B
(Harness end)



T183-04-013

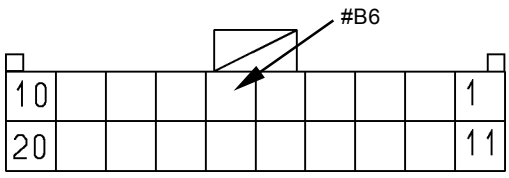
Between CAN Circuit (Low Side) and Power Circuit
Check for continuity between terminal #B6 of harness endo of connector in the monitor unit and terminal #A16 of harness endo of connector monitor-A in the monitor unit.

Monitor Unit
Connector Monitor-A
(Harness end)



T183-05-05-001

Monitor Unit
Connector Monitor-B
(Harness end)



T183-04-013

Discontinuity Check between CAN Circuit and Key Signal Circuit

IMPORTANT: Before continuity check, turn the key switch OFF.

- In case of continuity, the circuit between CAN circuit and key signal circuit is shorted.
- In case of discontinuity, the circuit is normal.

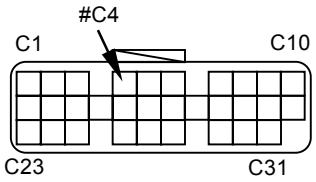
- MC

  Between CAN Circuit (High Side) and Key Signal Circuit

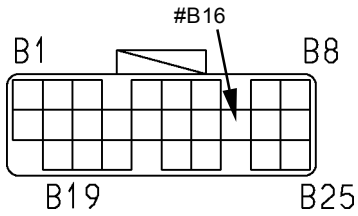
  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B16 of harness end of connector MC-B.

Connector

Connector MC-C
(Harness end)



Connector MC-B
(Harness end)



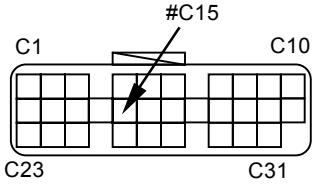
T183-05-04-021

Between CAN Circuit (Low Side) and Key Signal Circuit

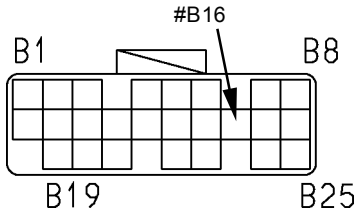
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B16 of harness end of connector MC-B.

Connector

Connector MC-C
(Harness end)



Connector MC-B
(Harness end)



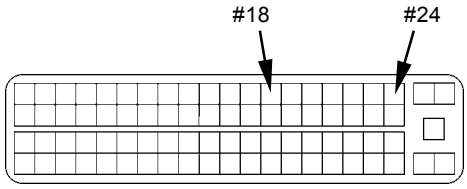
T183-05-04-021

• ECM

Between CAN Circuit (High Side) and Key Signal Circuit

Check for continuity between terminals #18 and #24 of harness end of connector.

ECM
Connector
(Harness end)

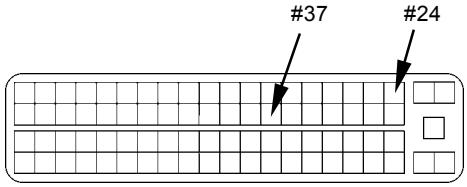


T1GR-05-04-002

Between CAN Circuit (Low Side) and Key Signal Circuit

Check for continuity between terminals #37 and #24 of harness end of connector.

ECM
Connector
(Harness end)



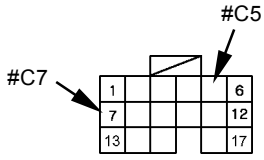
T1GR-05-04-002

• ICF

Between CAN Circuit (High Side) and Key Signal Circuit

Check for continuity between terminals #C5 and #C7 of harness end of connector ICF-C.

ICF
Connector ICF-C
(Harness end)

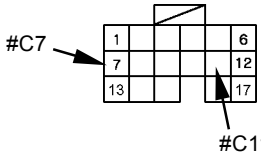


T1V1-05-04-002

Between CAN Circuit (Low Side) and Key Signal Circuit

Check for continuity between terminals #C11 and #C7 of harness end of connector ICF-C.

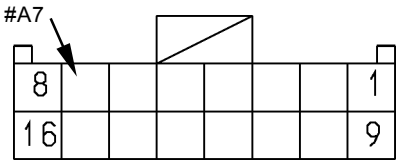
ICF
Connector ICF-C
(Harness end)



T1V1-05-04-002

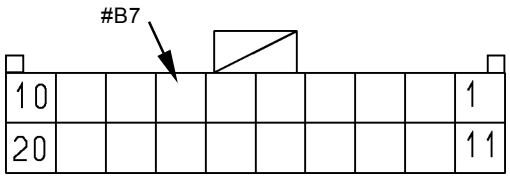
- Monitor Unit
  Between CAN Circuit (High Side) and Power Circuit
  Check for continuity between terminal #B7 of harness end of connector in the monitor unit and terminal #A7 of harness end of connector monitor-A in the monitor unit.

Monitor Unit
Connector Monitor-A
(Harness end)



T183-05-05-001

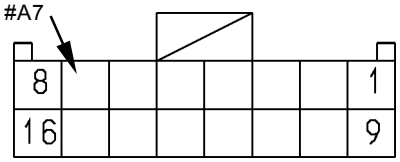
Monitor Unit
Connector Monitor-B
(Harness end)



T183-05-04-013

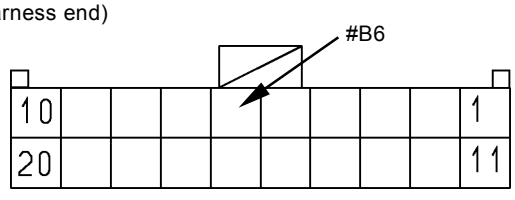
Between CAN Circuit (Low Side) and Power Circuit
Check for continuity between terminal #B6 of harness end of connector in the monitor unit and terminal #A7 of harness end of connector monitor-A in the monitor unit.

Monitor Unit
Connector Monitor-A
(Harness end)



T183-05-05-001

Monitor Unit
Connector Monitor-B
(Harness end)



T183-05-04-013

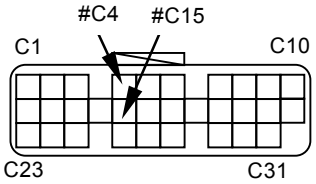
Discontinuity Check in CAN Harness

IMPORTANT: Before continuity check, turn the key switch OFF.

- In case of continuity, the circuit between CAN (high side) circuit and CAN (low side) circuit is shorted.
- In case of discontinuity, the circuit is normal.

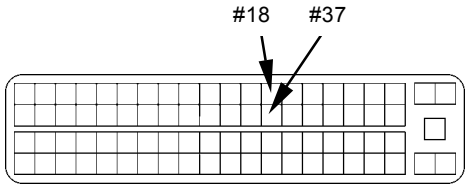
- Connector MC-C
  Check for continuity between terminals #C4 and #C15 of harness end of connector MC-C in MC.

MC
Connector MC-C
(Harness end)



- Connector ECM
  Check for continuity between terminals #18 and #37 of harness end of connector in ECM.

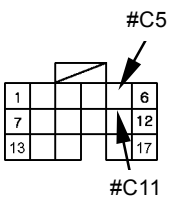
ECM
Connector
(Harness end)



T1GR-05-04-002

- Connector ICF-C
  Check for continuity between terminals #C5 and #C11 of harness end of connector ICF-C in ICF.

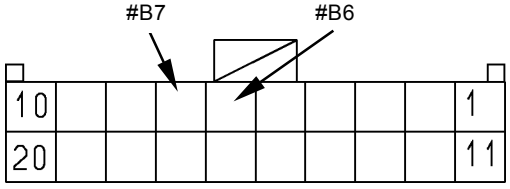
ICF
Connector ICF-C
(Harness end)



T1V1-05-04-002

- Connector Monitor-B in Monitor Unit
  Check for continuity between terminals #B6 and #B7 of harness end of connector monitor-B in the monitor unit.

Monitor Unit
Connector Monitor-B
(Harness end)



T183-05-04-013

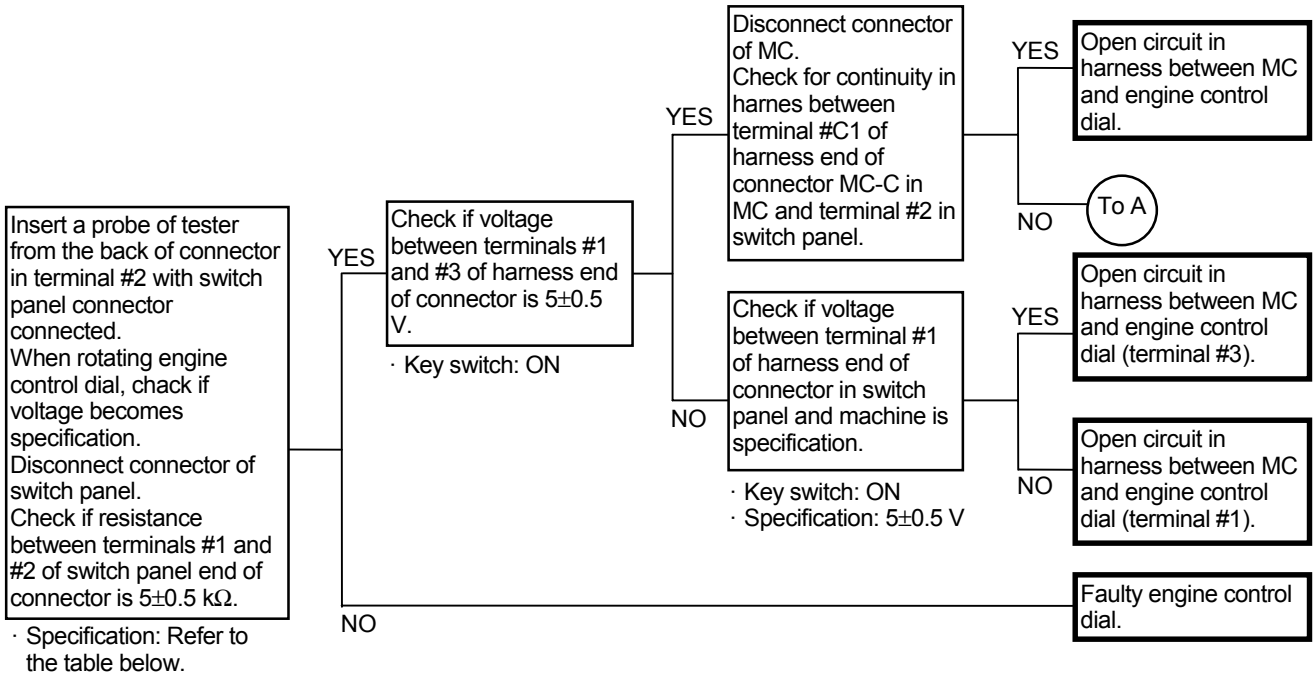
ENGINE FAILURE
MC FAULT CODE 11100

Fault Code	Trouble	Cause	Influenced Control
11100-2	Abnormal Engine Speed	Engine Speed: 4000 min^{-1} or faster	Speed Sensing Control

- ECM sends by using CAN bus line.
  The actual engine speed is abnormal.
  Perform self-diagnosis of ECM.

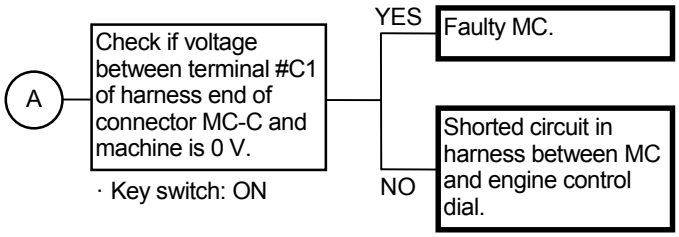
MC FAULT CODE 11101

Fault Code	Trouble	Cause	Influenced Control
11101-3	Abnormal Engine Control Dial Sensor High Voltage	Voltage: 4.78 V or higher	Engine Control Dial Control
11101-4	Abnormal Engine Control Dial Sensor Low Voltage	Voltage: Less than 0.22 V	Engine Control Dial Control

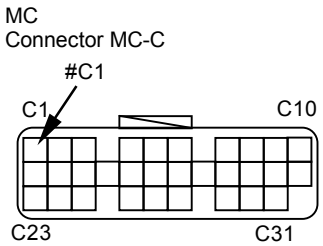


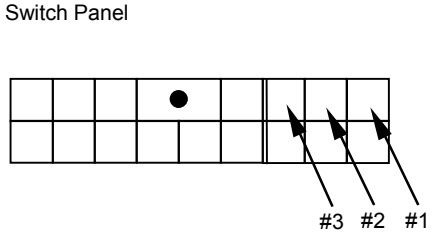
Specification of Engine Control Dial

Slow Idle	0.3 to 1.0 V
Fast Idle	4.0 to 4.7 V



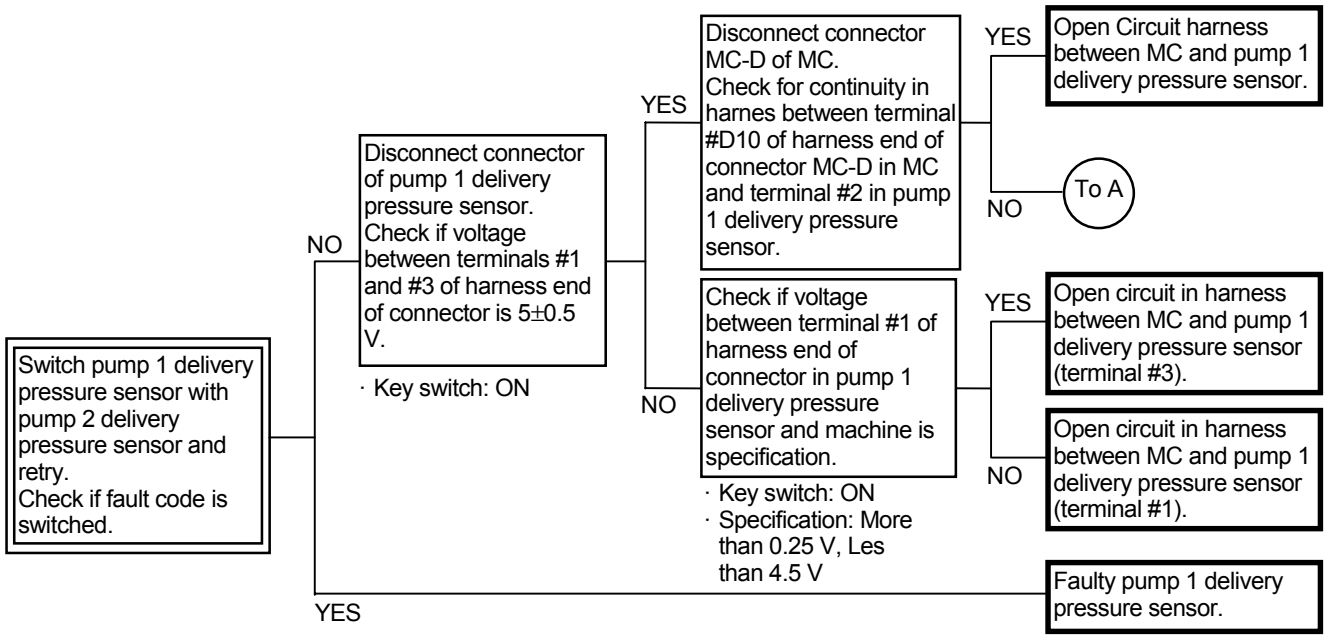
Connector (Harness end of connector viewed from the open side)



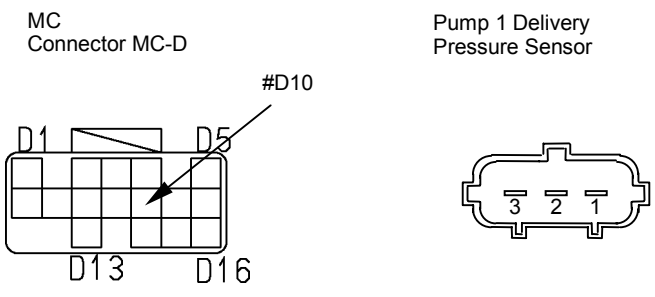


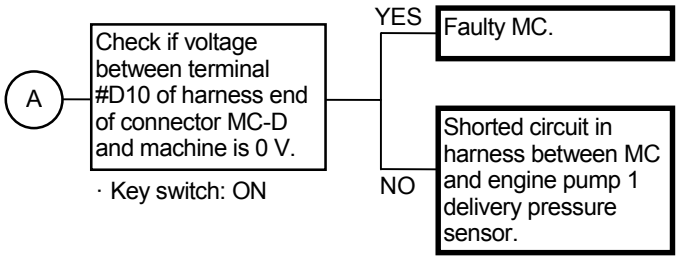
PUMP FAILURE
MC FAULT CODE 11200

Fault Code	Trouble	Cause	Influenced Control
11200-3	Abnormal Pump 1 Delivery Pressure Sensor High Voltage	Voltage: 4.5 V or higher	• HP Mode Control • Travel HP Mode Control • E Mode Control • Travel Torque-Up Control • Arm Regenerative Control • Digging Regenerative Control • Auto-Power Lift Control • Travel Motor Swash Angle Selection Control
11200-4	Abnormal Pump 1 Delivery Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• HP Mode Control • Travel HP Mode Control • E Mode Control • Travel Torque-Up Control • Arm Regenerative Control • Digging Regenerative Control • Auto-Power Lift Control • Travel Motor Swash Angle Selection Control



Connector (Harness end of connector viewed from the open side)

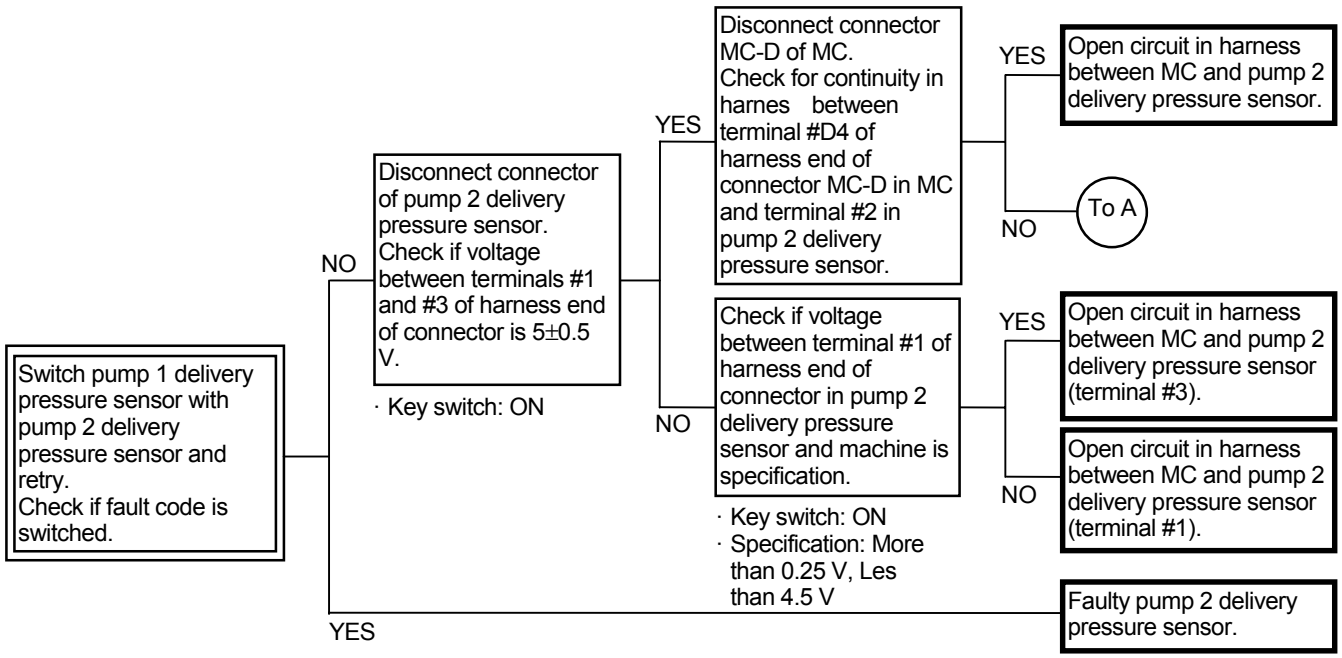




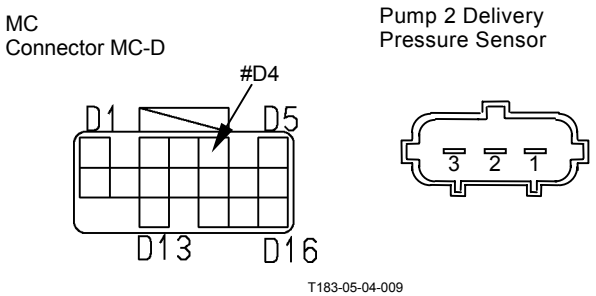
T183-05-04-009

MC FAULT CODE 11202

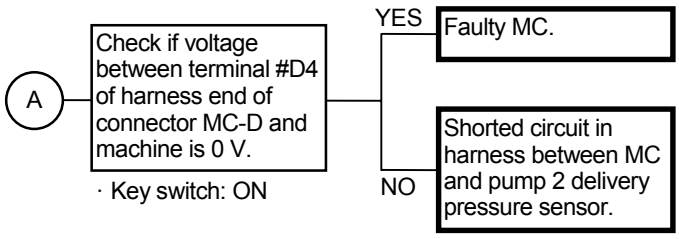
Fault Code	Trouble	Cause	Influenced Control
11202-3	Abnormal Pump 2 Delivery Pressure Sensor High Voltage	Voltage: 4.5 V or higher	• HP Mode Control • Travel HP Mode Control • E Mode Control • Travel Torque-Up Control • Arm Regenerative Control • Digging Regenerative Control • Travel Motor Swash Angle Selection Control
11202-4	Abnormal Pump 2 Delivery Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• HP Mode Control • Travel HP Mode Control • E Mode Control • Travel Torque-Up Control • Arm Regenerative Control • Digging Regenerative Control • Travel Motor Swash Angle Selection Control



Connector (Harness end of connector viewed from the open side)

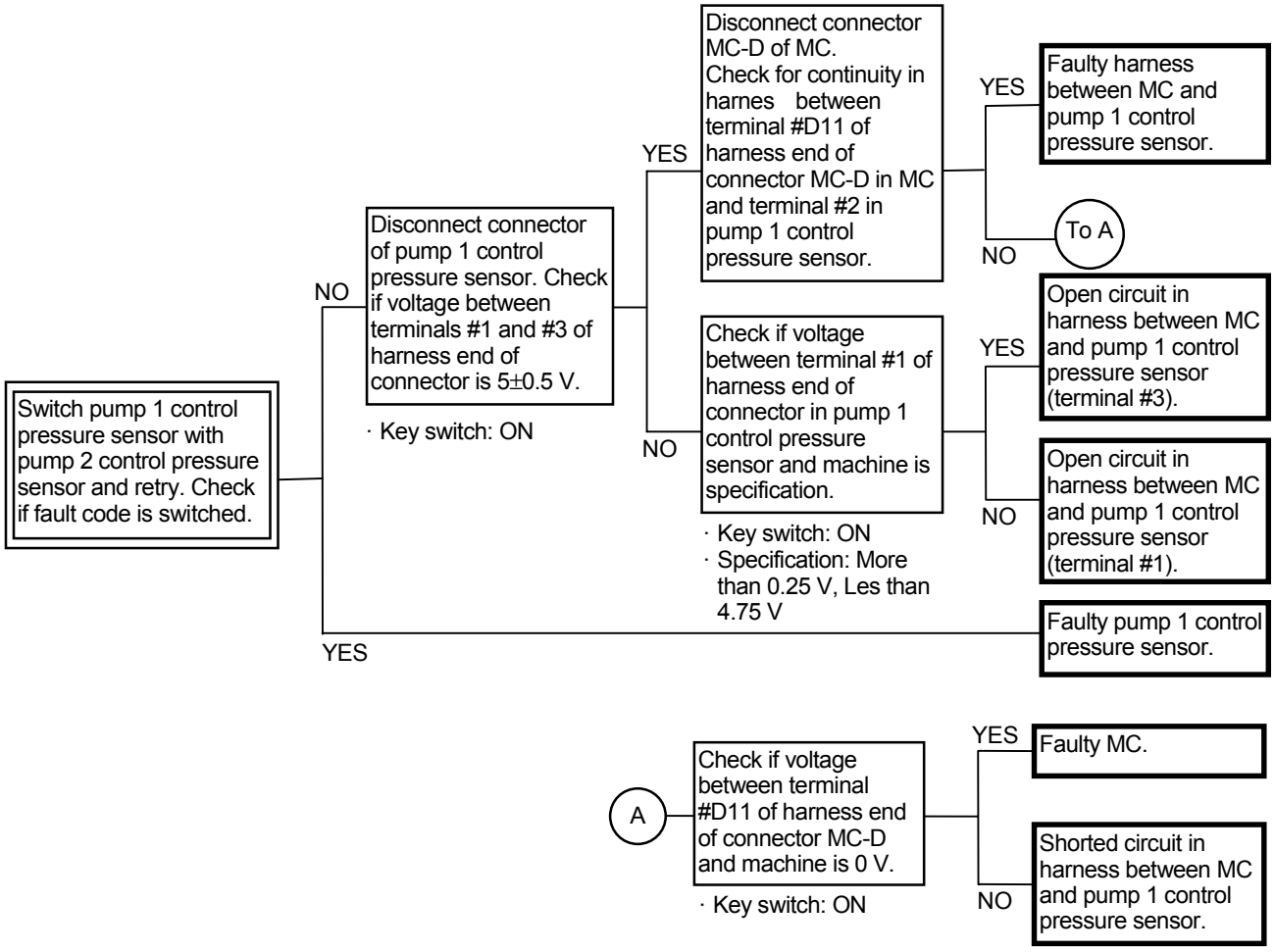


T183-05-04-009



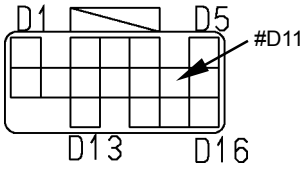
MC FAULT CODE 11206

Fault Code	Trouble	Cause	Influenced Control
11206-3	Abnoraml Pump 1 Control Pressure Sensor High Voltage	Voltage: 4.75 V or higher	• E Mode Control • Heater Control • Travel Motor Swash Angle Selection Control
11206-4	Abnormal Pump 1 Control Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• E Mode Control • Heater Control • Travel Motor Swash Angle Selection Control



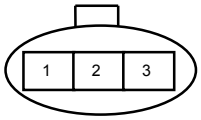
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-D



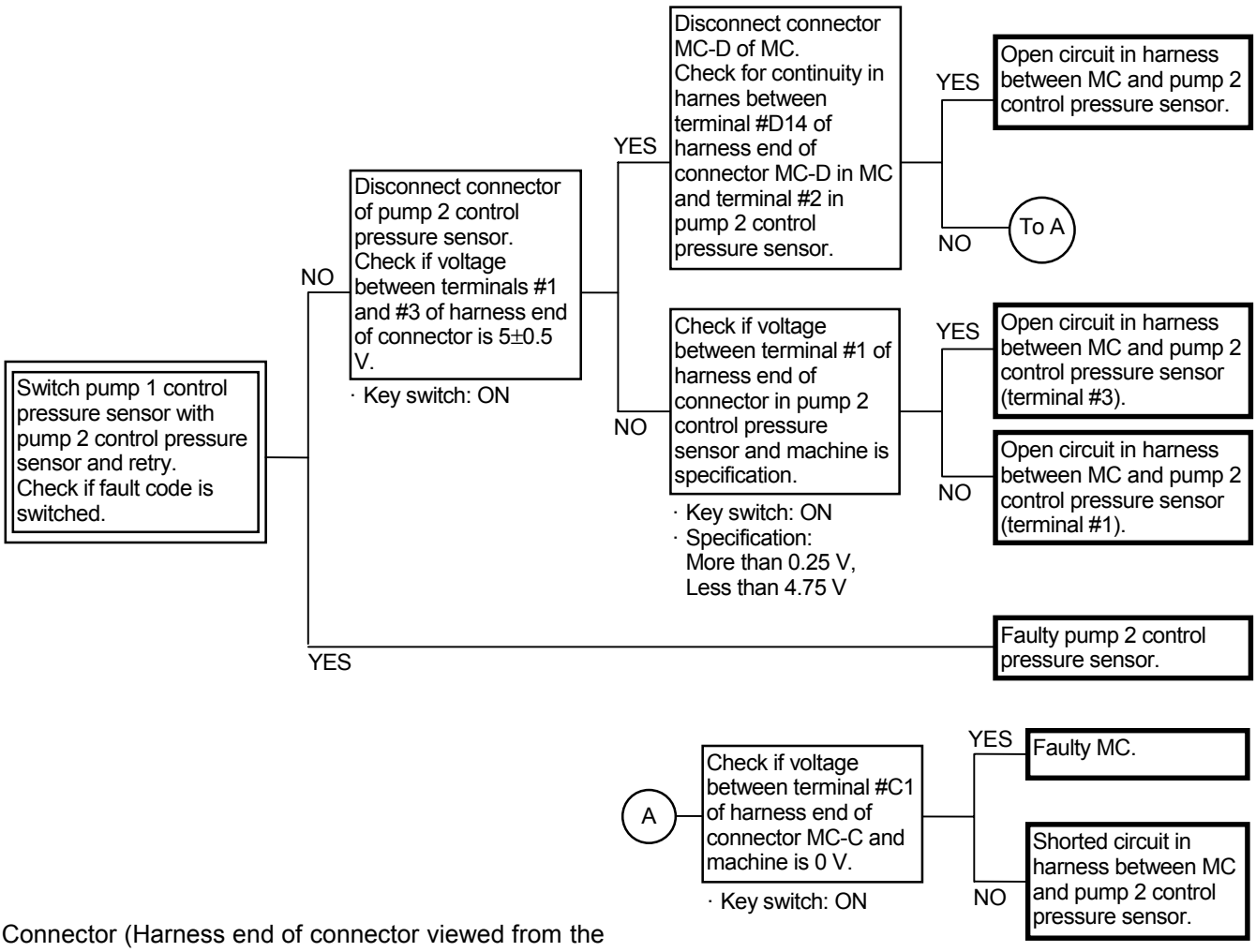
T183-05-04-009

Pump 1 Control Pressure Sensor



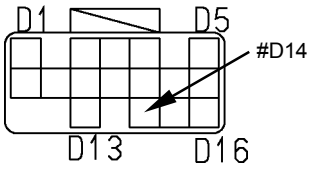
MC FAULT CODE 11208

Fault Code	Trouble	Cause	Influenced Control
11208-3	Abnormal Pump 2 Control Pressure Sensor High Voltage	Voltage: 4.75 V or higher	• E Mode Control • Heater Control • Travel Motor Swash Angle Selection Control
11208-4	Abnormal Pump 2 Control Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• E Mode Control • Heater Control • Travel Motor Swash Angle Selection Control



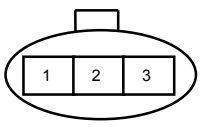
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-D



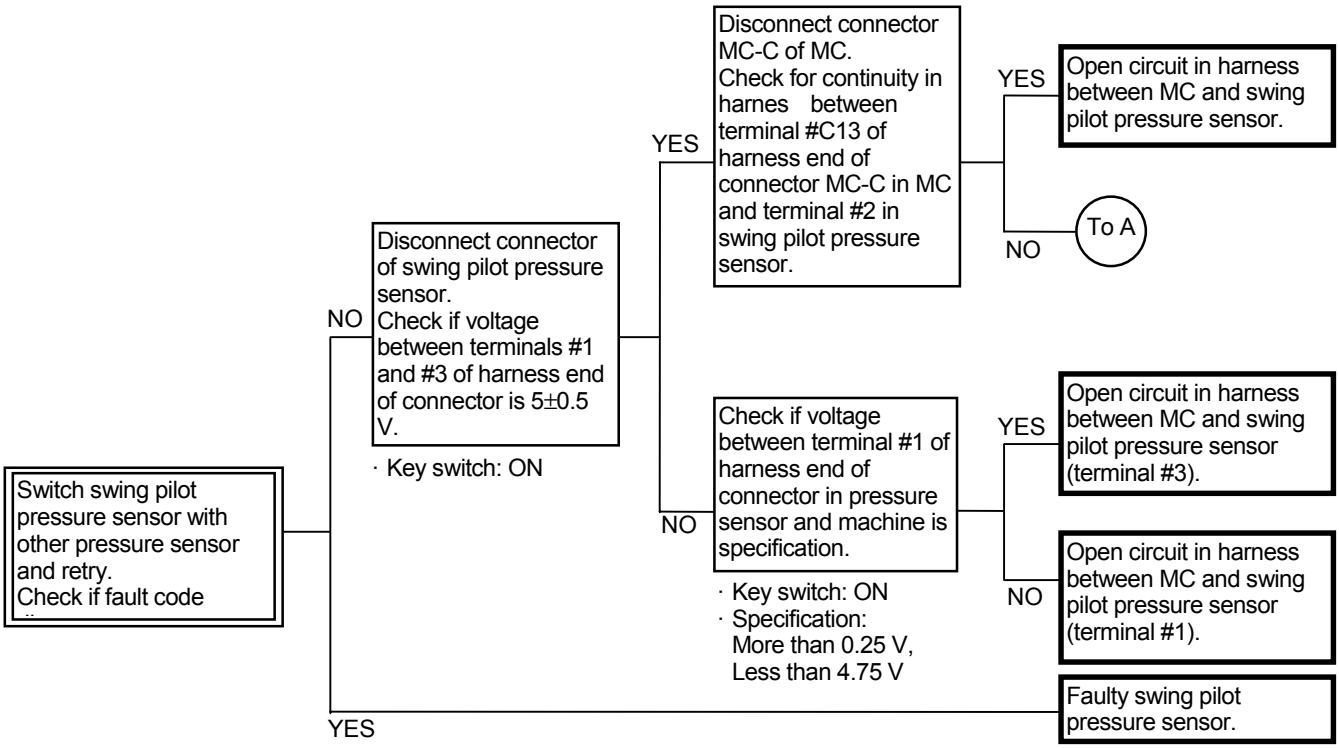
T183-05-04-009

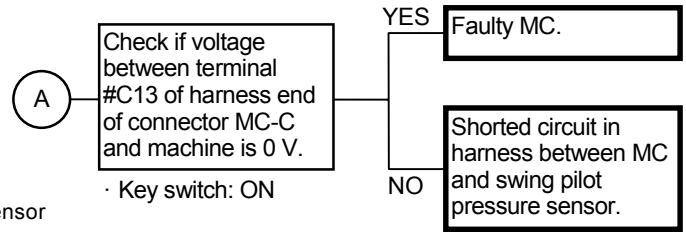
Pump Control Pressure Sensor



PILOT FAILURE
MC FAULT CODE 11301

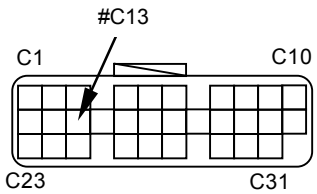
Fault Code	Trouble	Cause	Influenced Control
11301-3	Abnormal Swing Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	• Arm Regenerative Control • Attachment Flow Rate Control • Swing Alarm Control
11301-4	Abnormal Swing Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• Arm Regenerative Control • Attachment Flow Rate Control • Swing Alarm Control



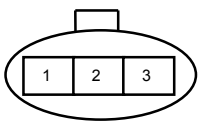


Connector (Harness end of connector viewed from the open side)

MC
Connector MC-C

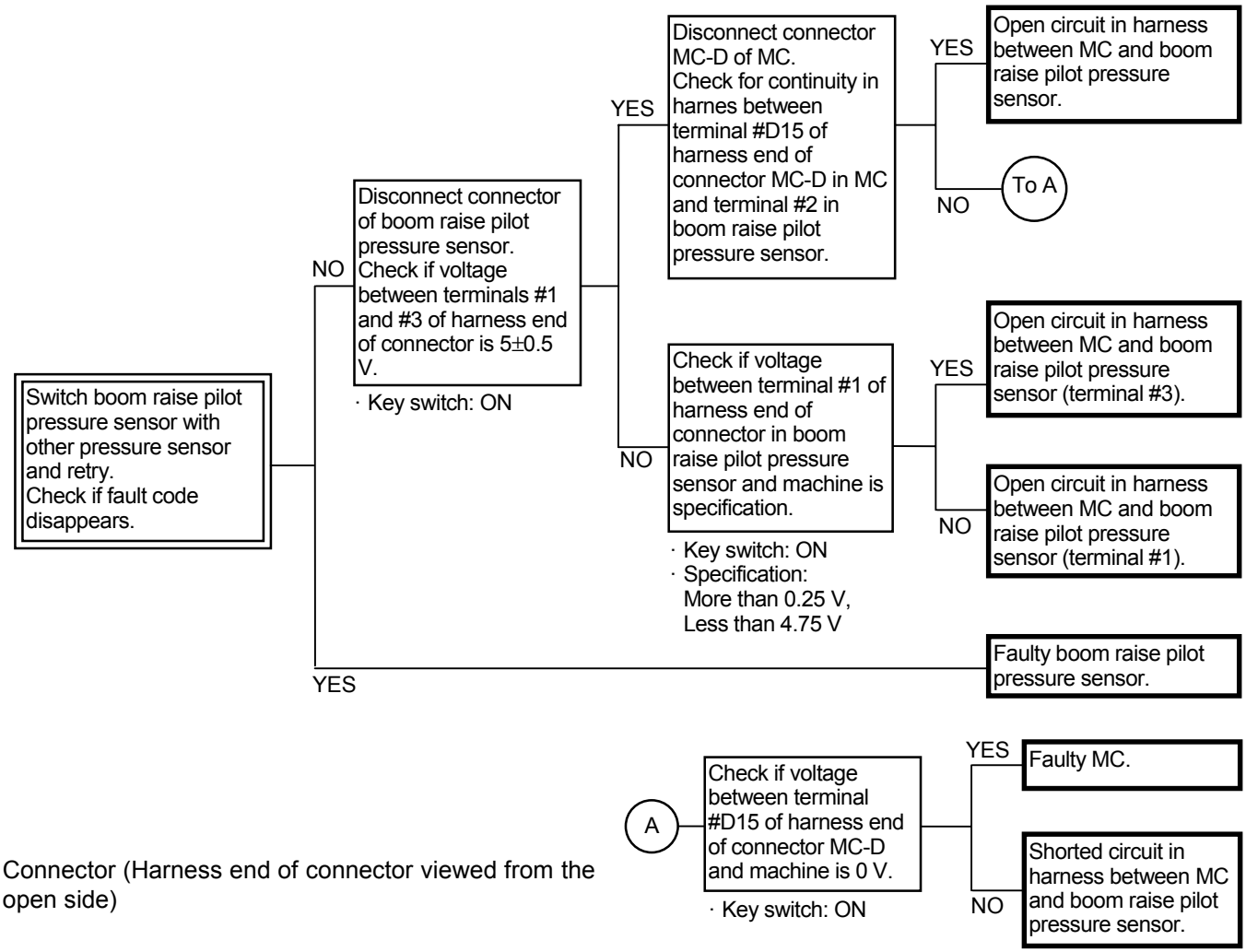


Pilot Pressure Sensor
(Swing)



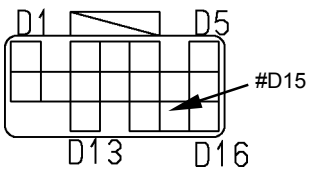
MC FAULT CODE 11302

Fault Code	Trouble	Cause	Influenced Control
11302-3	Abnormal Boom Raise Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	• HP Mode Control • Arm Regenerative Control • Digging Regenerative Control • Auto-Power Lift Control • Attachment Flow Rate Control
11302-4	Abnormal Boom Raise Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• HP Mode Control • Arm Regenerative Control • Digging Regenerative Control • Auto-Power Lift Control • Attachment Flow Rate Control



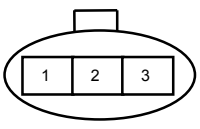
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-D



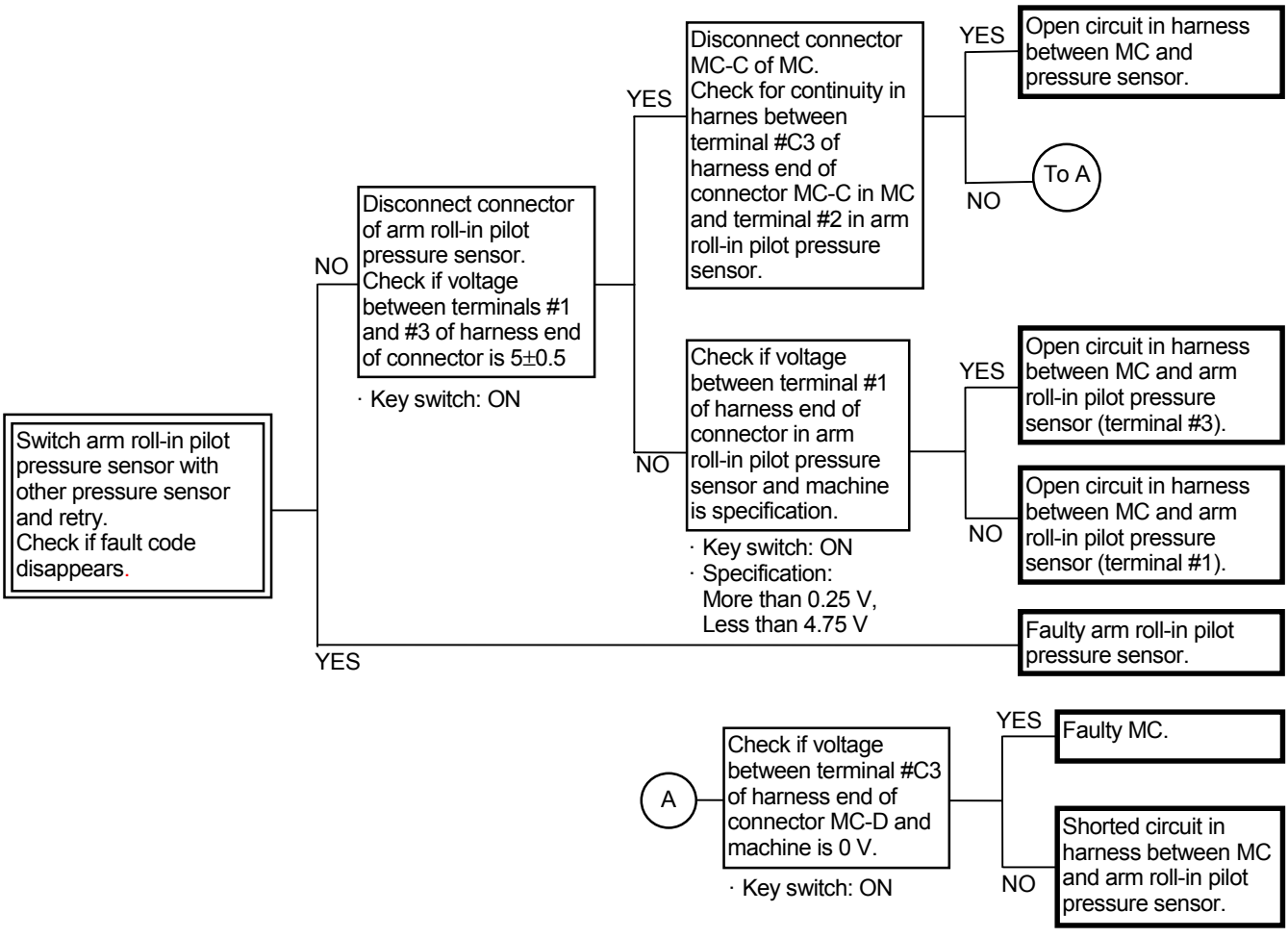
T183-05-04-009

Pilot Pressure Sensor (Boom Raise)



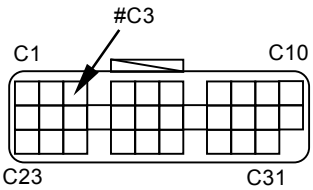
MC FAULT CODE 11303

Fault Code	Trouble	Cause	Influenced Control
11303-3	Abnormal Arm Roll-In Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	• HP Mode Control • Arm Regenerative Control • Digging Regenerative Control • Auto-Power Lift Control
11303-4	Abnormal Arm Roll-In Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• HP Mode Control • Arm Regenerative Control • Digging Regenerative Control • Auto-Power Lift Control

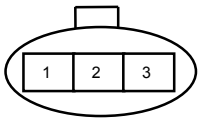


Connector (Harness end of connector viewed from the open side)

MC
Connector MC-C

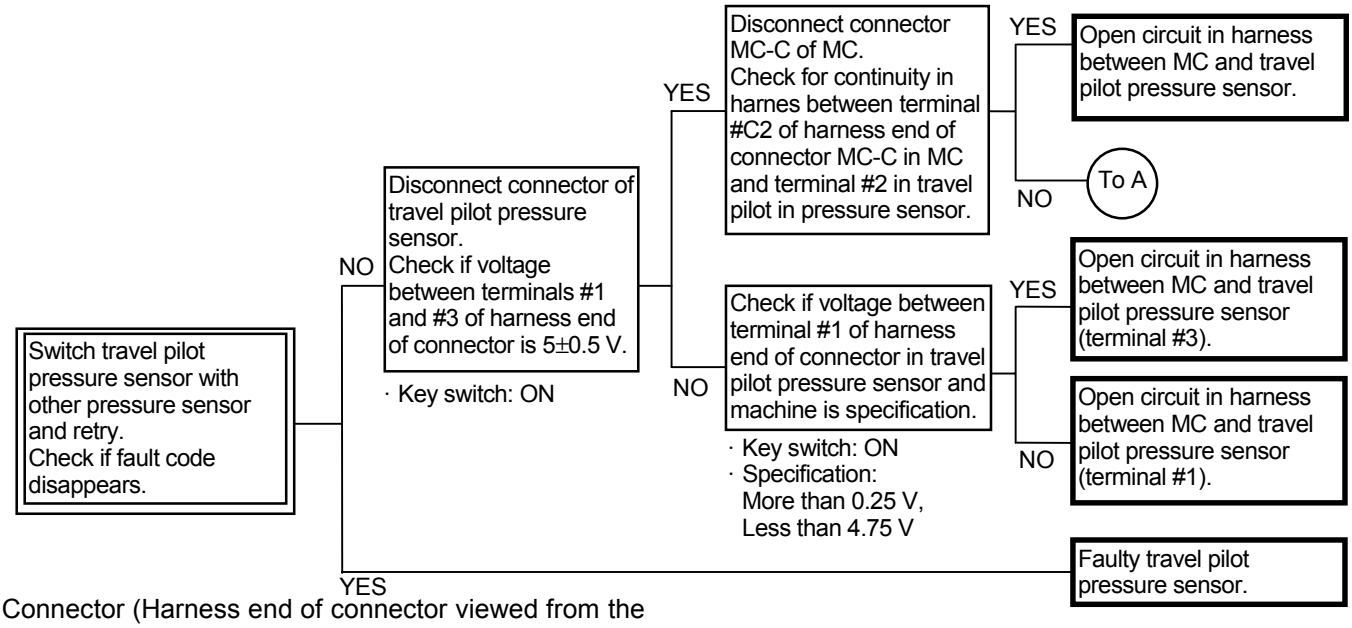


Pilot Pressure Sensor
(Arm Roll-In)

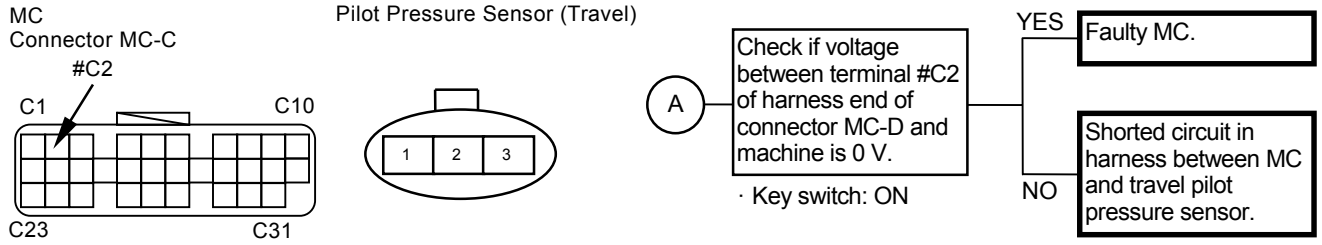


MC FAULT CODE 11304

Fault Code	Trouble	Cause	Influenced Control
11304-3	Abnormal Travel Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	• Auto-Idle Control • Idle Speed-Up Control • ECO Control • Travel HP Mode Control • Heater Control • Travel Torque-Up Control • Pump 1 Flow Rate Limit Control • Pump 2 Flow Rate Limit Control • Travel Motor Swash Angle Control • Attachment Flow Rate Control • Travel Alarm Control
11304-4	Abnormal Travel Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	• Auto-Idle Control • Idle Speed-Up Control • ECO Control • Travel HP Mode Control • Heater Control • Travel Torque-Up Control • Pump 1 Flow Rate Limit Control • Pump 2 Flow Rate Limit Control • Travel Motor Swash Angle Control • Attachment Flow Rate Control • Travel Alarm Control

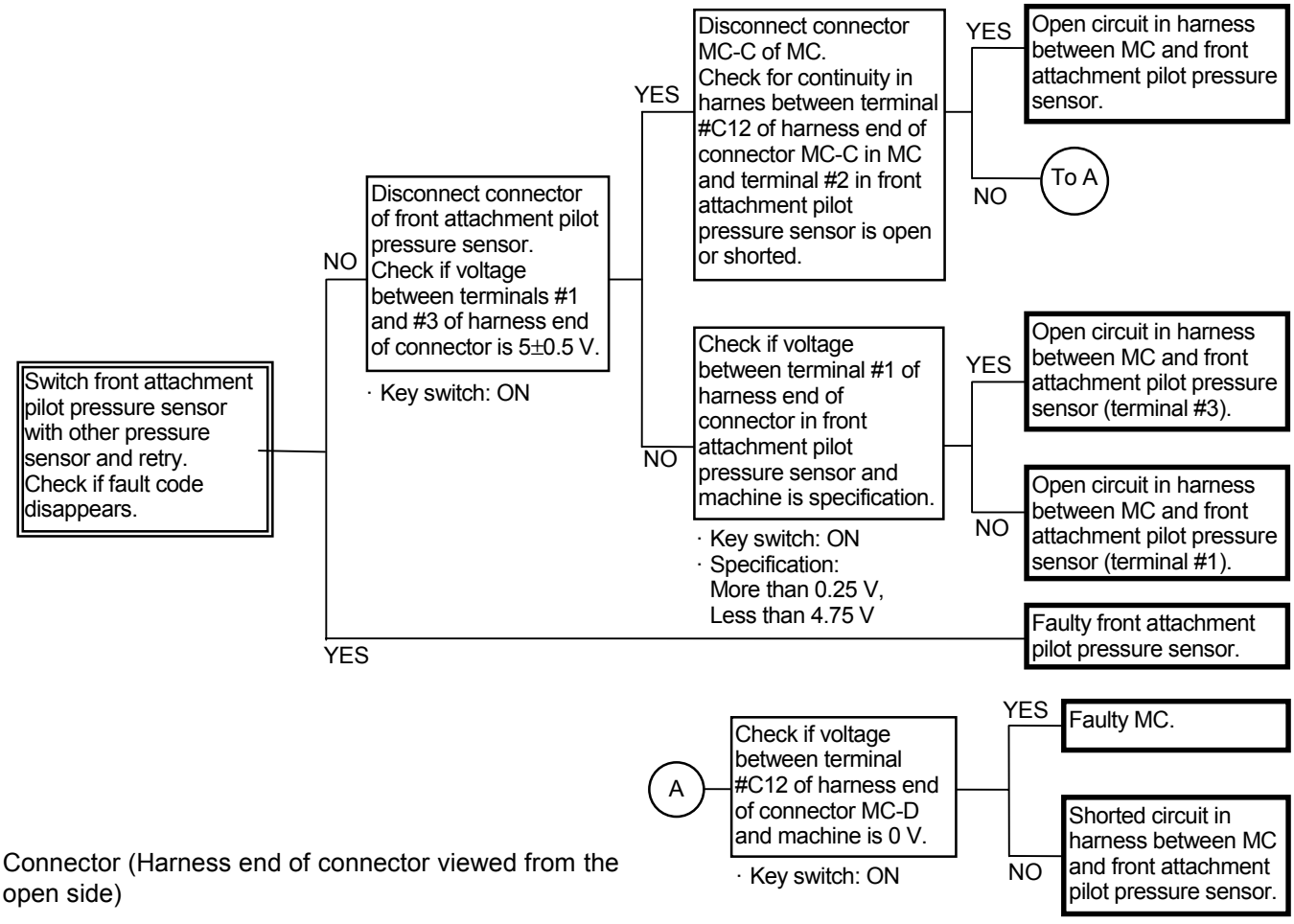


Connector (Harness end of connector viewed from the open side)

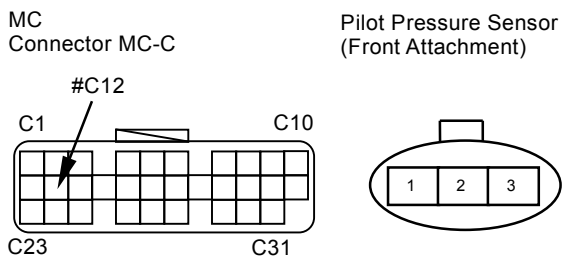


MC FAULT CODE 11307

Fault Code	Trouble	Cause	Influenced Control
11307-3	Abnormal Front Attachment Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	• Auto-Idle Control • Idle Speed-Up Control • ECO Control • Travel HP Mode Control • Heater Control • Travel Motor Swash Angle Control
11307-4	Replace Front Attachment Pilot Pressure Sensor	Voltage: Less than 0.25 V	• Auto-Idle Control • Idle Speed-Up Control • ECO Control • Travel HP Mode Control • Heater Control • Travel Motor Swash Angle Control

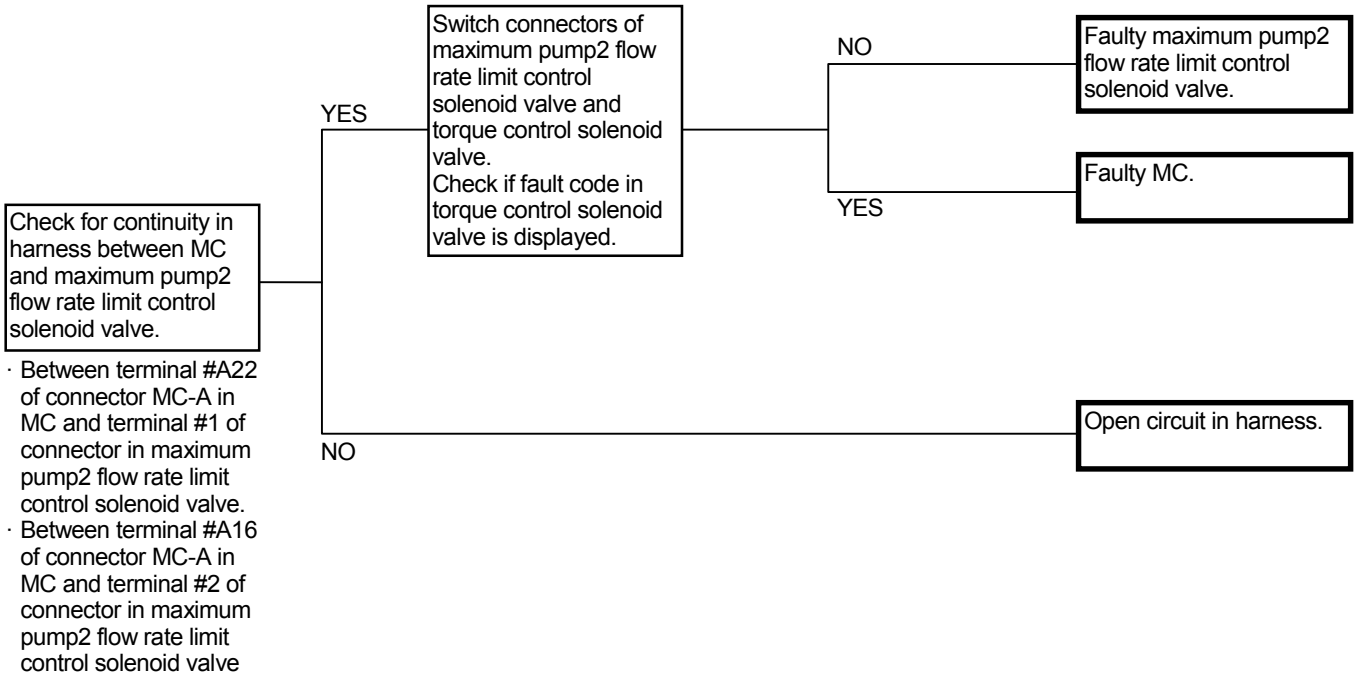


Connector (Harness end of connector viewed from the open side)



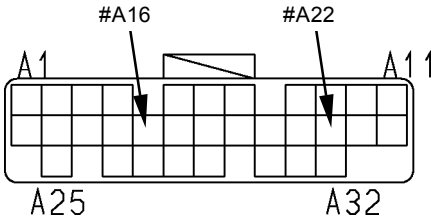
PROPORTIONAL SOLENOID VALVE FAILURE
MC FAULT CODE 11400

Fault Code	Trouble	Cause	Influenced Control
11400-2	Abnormal Current Feedback of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Both of Higher than 920 mA or Less than 60 mA	Pump 2 Flow Rate Limit Control
11400-3	Abnormal Feedback High Current of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Higher than 920 mA	Pump 2 Flow Rate Limit Control
11400-4	Abnormal Feedback Low Current of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Less than 56 mA	Pump 2 Flow Rate Limit Control



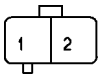
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-A



T183-05-04-008

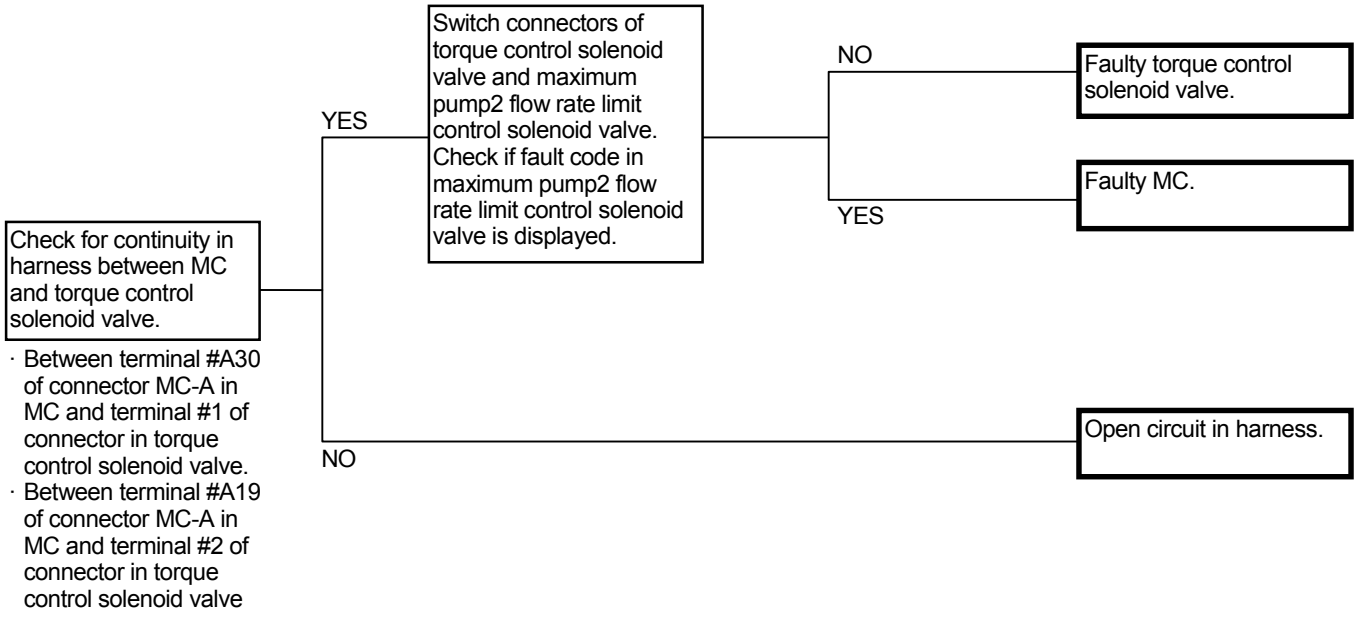
Maximum Pump 2 Flow Rate Limit Control Solenoid Valve



T1V1-05-04-003

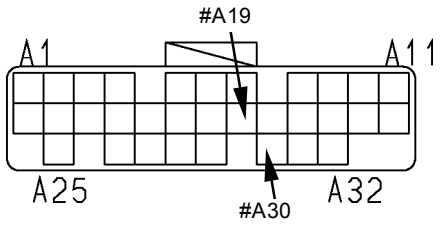
MC FAULT CODE 11401

Fault Code	Trouble	Cause	Influenced Control
11401-2	Abnormal Current Feedback of Torque Control Solenoid Valve	Current: Both of Higher than 920mA or Less than 60 mA	• Speed Sensing Control • Travel Torque-Up Control • Attachment Pump Torque Decrease Control
11401-3	Abnormal Feedback High Current of Torque Control Solenoid Valve	Current: Higher than 920mA	• Speed Sensing Control • Travel Torque-Up Control • Attachment Pump Torque Decrease Control
11401-4	Abnormal Feedback Low Current of Torque Control Solenoid Valve	Current: Less than 56 mA	• Speed Sensing Control • Travel Torque-Up Control • Attachment Pump Torque Decrease Control



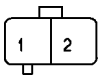
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-A



T183-05-04-008

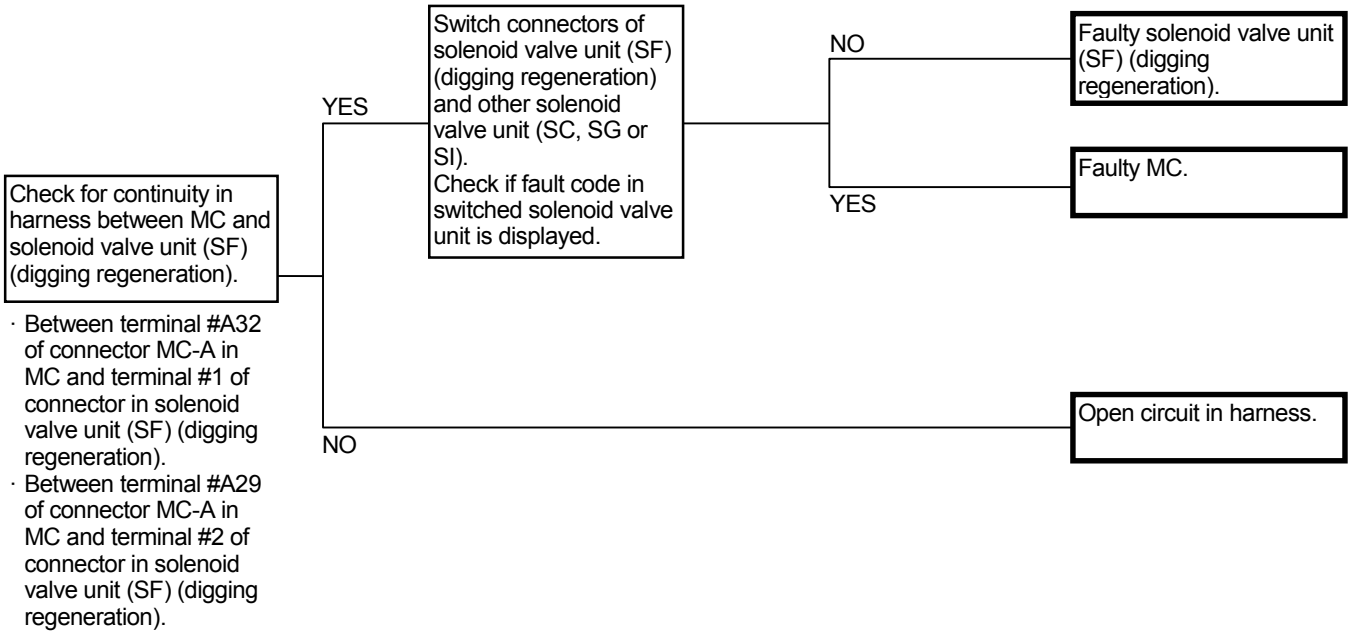
Torque Control Solenoid Valve



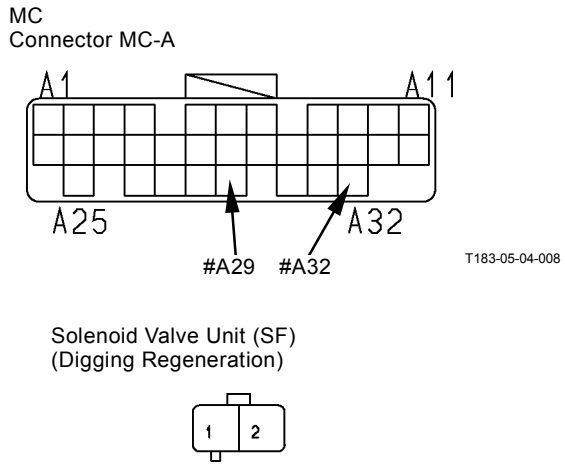
T1V1-05-04-003

MC FAULT CODE 11402

Fault Code	Trouble	Cause	Influenced Control
11402-2	Abnormal Current Feedback of Solenoid Valve Unit (SF) (Digging Regeneration)	Current: Both of Higher than 920mA or Less than 60 mA	Digging Regenerative Control
11402-3	Abnormal Feedback High Current of Solenoid Valve Unit (SF) (Digging Regeneration)	Current: Higher than 920mA	Digging Regenerative Control
11402-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SF) (Digging Regeneration)	Current: Less than 56 mA	Digging Regenerative Control

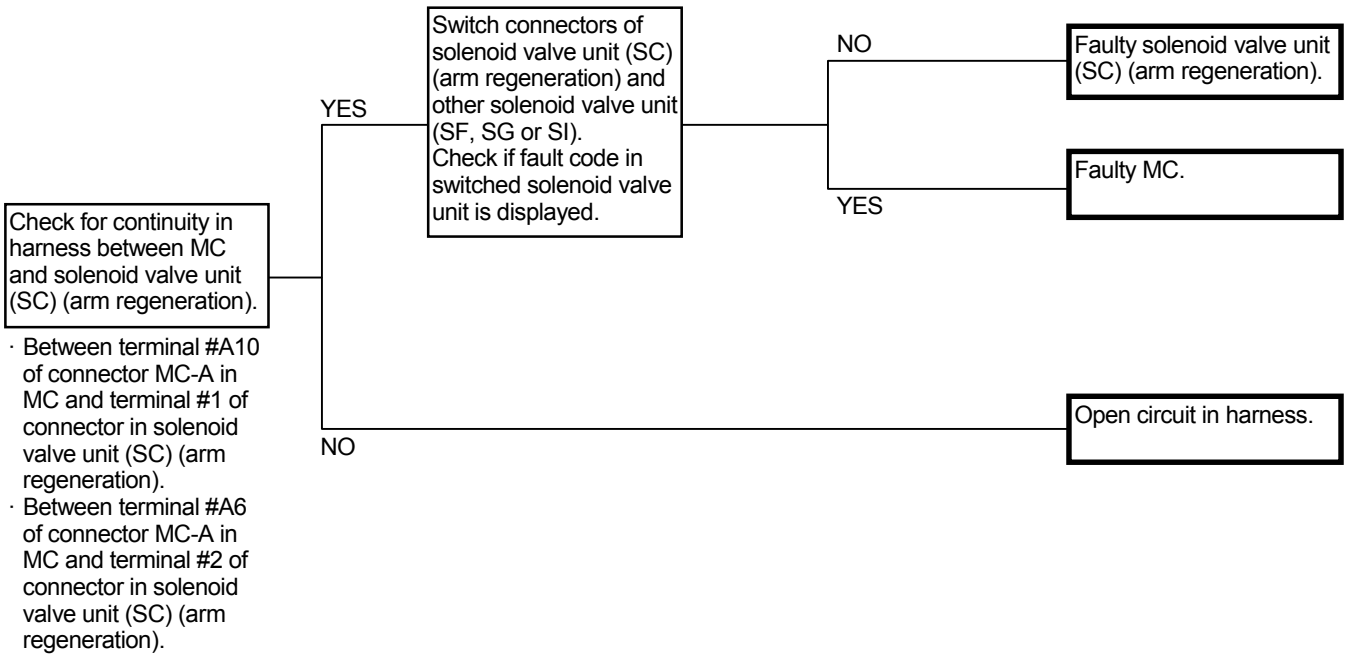


Connector (Harness end of connector viewed from the open side)



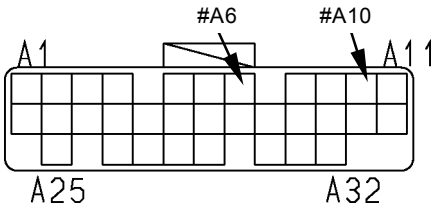
MC FAULT CODE 11403

Fault Code	Trouble	Cause	Influenced Control
11403-2	Abnormal Current Feedback of Solenoid Valve Unit (SC) (Arm Regeneration)	Current: Both of Higher than 920mA or Less than 60 mA	Arm Regenerative Control
11403-3	Abnormal Feedback High Current of Solenoid Valve Unit (SC) (Arm Regeneration)	Current: Higher than 920mA	Arm Regenerative Control
11403-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SC) (Arm Regeneration)	Current: Less than 56 mA	Arm Regenerative Control



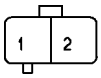
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-A



T183-05-04-008

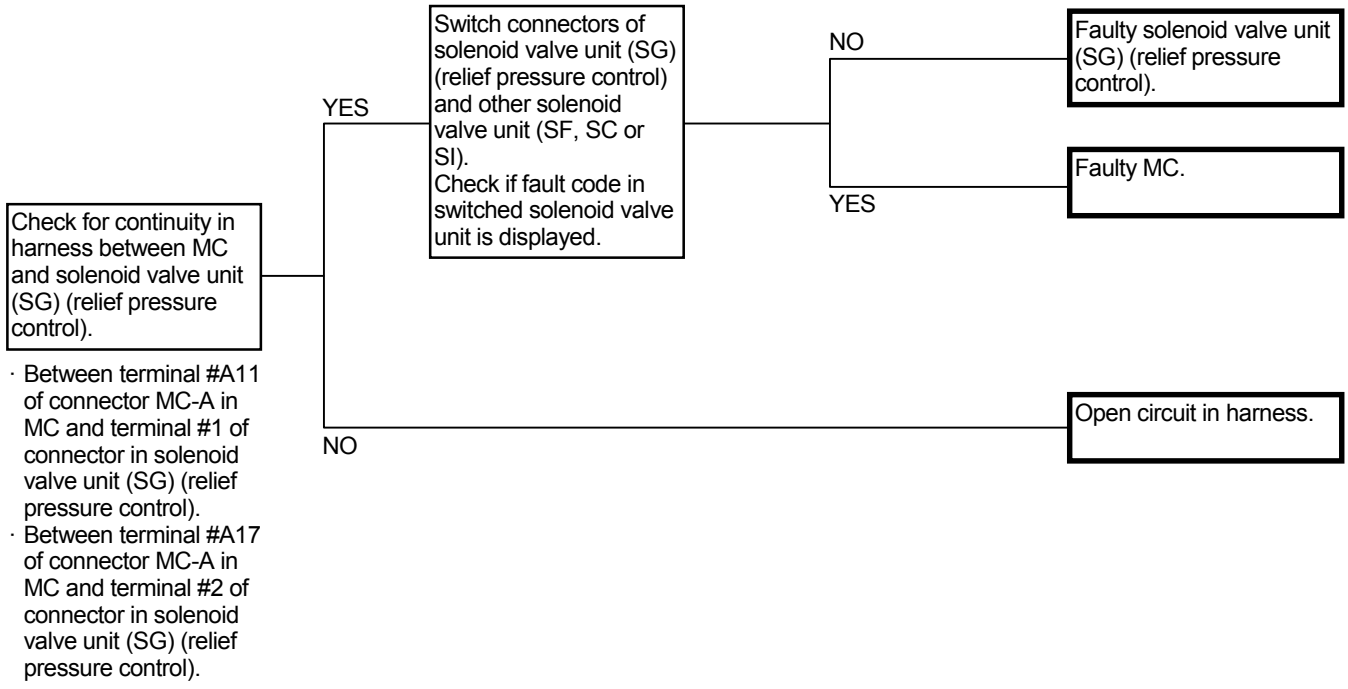
Solenoid Valve Unit (SC)
(Arm Regeneration)



T1V1-05-04-003

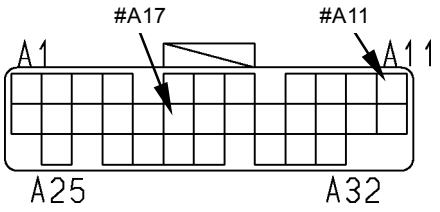
MC FAULT CODE 11404

Fault Code	Trouble	Cause	Influenced Control
11404-2	Abnormal Current Feedback of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Both of Higher than 920mA or Less than 60 mA	• Power Digging Control • Auto-Power Lift Control
11404-3	Abnormal Feedback High Current of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Higher than 920mA	• Power Digging Control • Auto-Power Lift Control
11404-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Less than 56 mA	• Power Digging Control • Auto-Power Lift Control



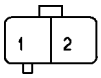
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-A



T183-05-04-008

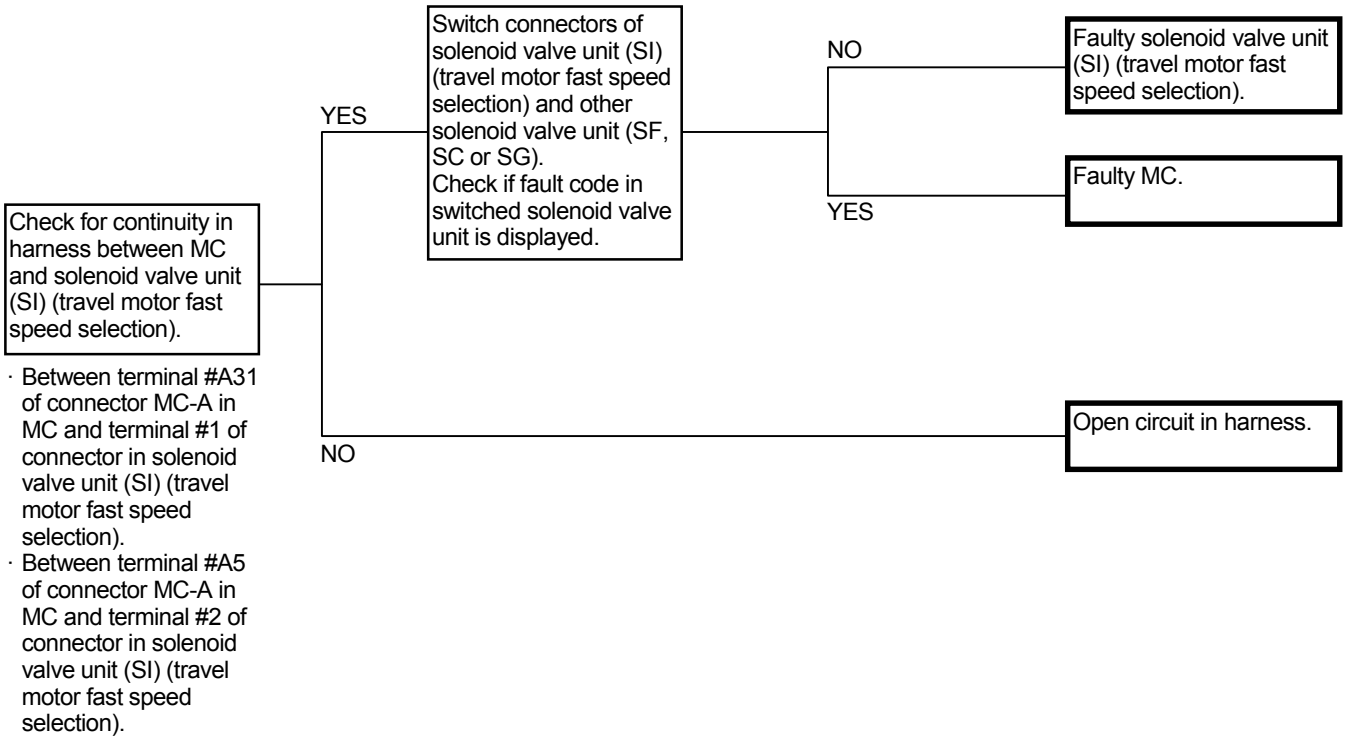
Solenoid Valve Unit (SG)
(Relief Pressure Control)



T1V1-05-04-003

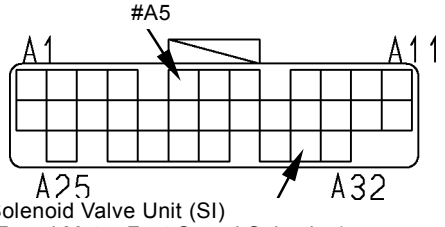
MC FAULT CODE 11405

Fault Code	Trouble	Cause	Influenced Control
11405-2	Abnormal Current Feedback of Solenoid Valve Unit (SI) (Travel Motor Fast Speed Selection)	Current: Both of Higher than 920mA or Less than 60 mA	Travel Motor Swash Angle Selection Control
11405-3	Abnormal Feedback High Current of Solenoid Valve Unit (SI) (Travel Motor Fast Speed Selection)	Current: Higher than 920mA	Travel Motor Swash Angle Selection Control
11405-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SI) (Travel Motor Fast Speed Selection)	Current: Less than 56 mA	Travel Motor Swash Angle Selection Control



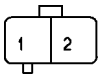
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-A



Solenoid Valve Unit (SI)
(Travel Motor Fast Speed Selection)

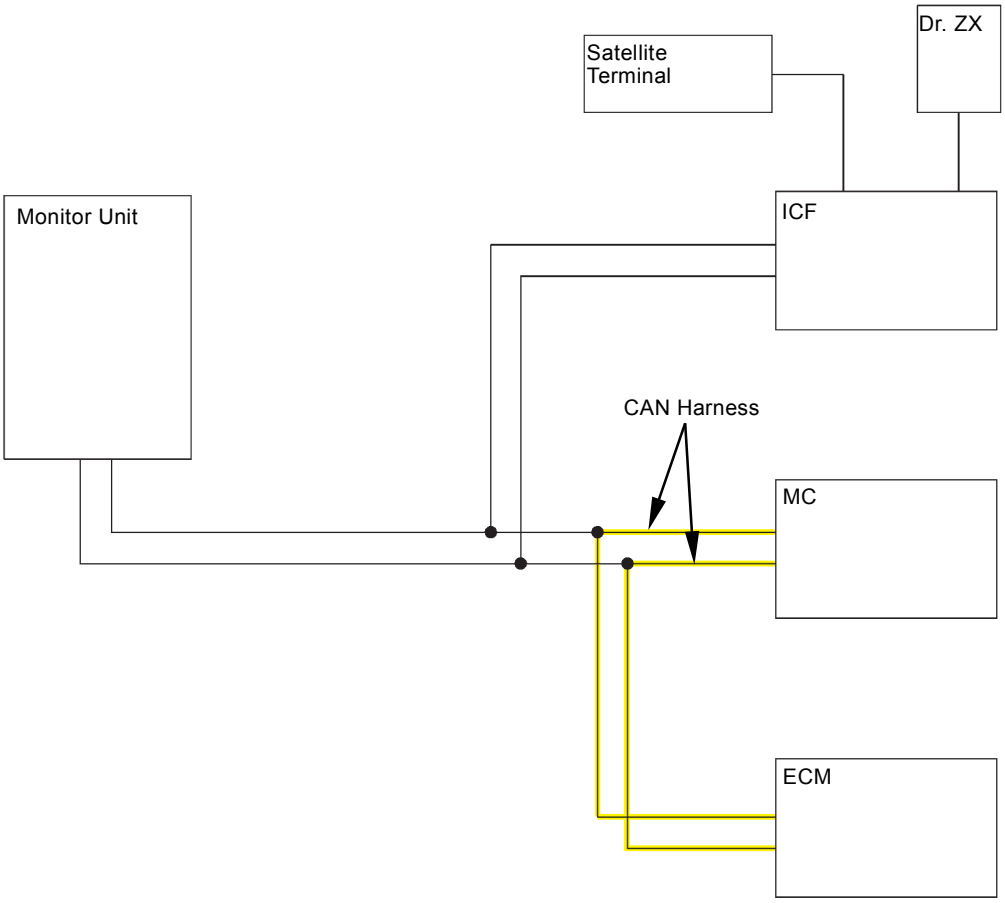
T183-05-04-008



T1V1-05-04-003

CAN DATA RECEPTION FAILURE
MC FAULT CODE 11910, 11914, 11920

Fault Code	Trouble	Cause	Influenced Control
11910-2	Actual Engine Speed Received from ECM	Faulty CAN Harness	• Speed Sensing Control • Send to ICF
11914-2	Radiator Coolant Temperature Received from ECM	Faulty Harness	Heater Control
11920-2	Fuel Flow Rate Received form ECM	Faulty CAN Harness	Fuel Flow Rate

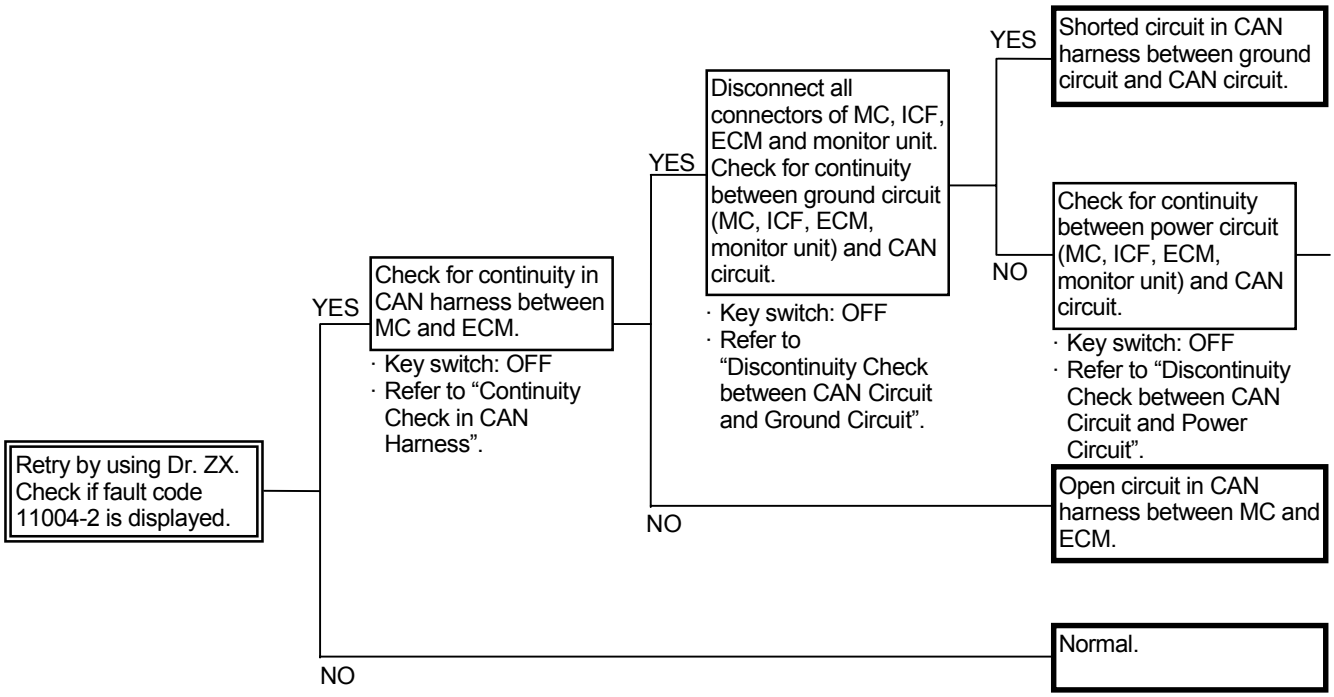


T1V1-02-01-051

(Blank)

CAN HARNESS CHECK (MC FAULT CODE 11910, 11914, 11920)

- Check the wiring connections first.



YES

Shorted circuit in CAN harness between power circuit and CAN circuit.

YES

Shorted circuit in CAN harness between key signal circuit and CAN circuit.

YES

Shorted circuit in CAN harness.

NO

Check for continuity between key signal circuit (MC, ICF, ECM, monitor unit) and CAN circuit.

· Key switch: OFF
· Refer to "Discontinuity Check between CAN Circuit and Key Signal Circuit".

NO

Check for continuity between High side and Low side in CAN harness.

· Key switch: OFF
· Refer to "Discontinuity Check in CAN Harness".

NO

Connect all connectors except connector MC-C in MC. Check if resistance between terminals #C4 and #C15 of harness end of connector MC-C is within 60±10 Ω.

· Key switch: OFF

YES

To A

NO

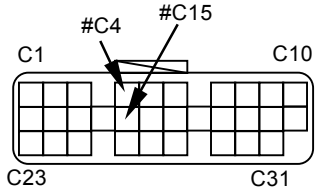
Disconnect connector in MC. Connect connector of harness end. Check if resistance between terminals #18 and #37 of connector in ECM is within 120±10 Ω.

· Key switch: OFF

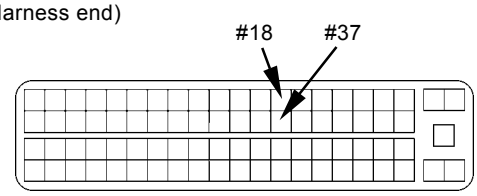
To B

Connector

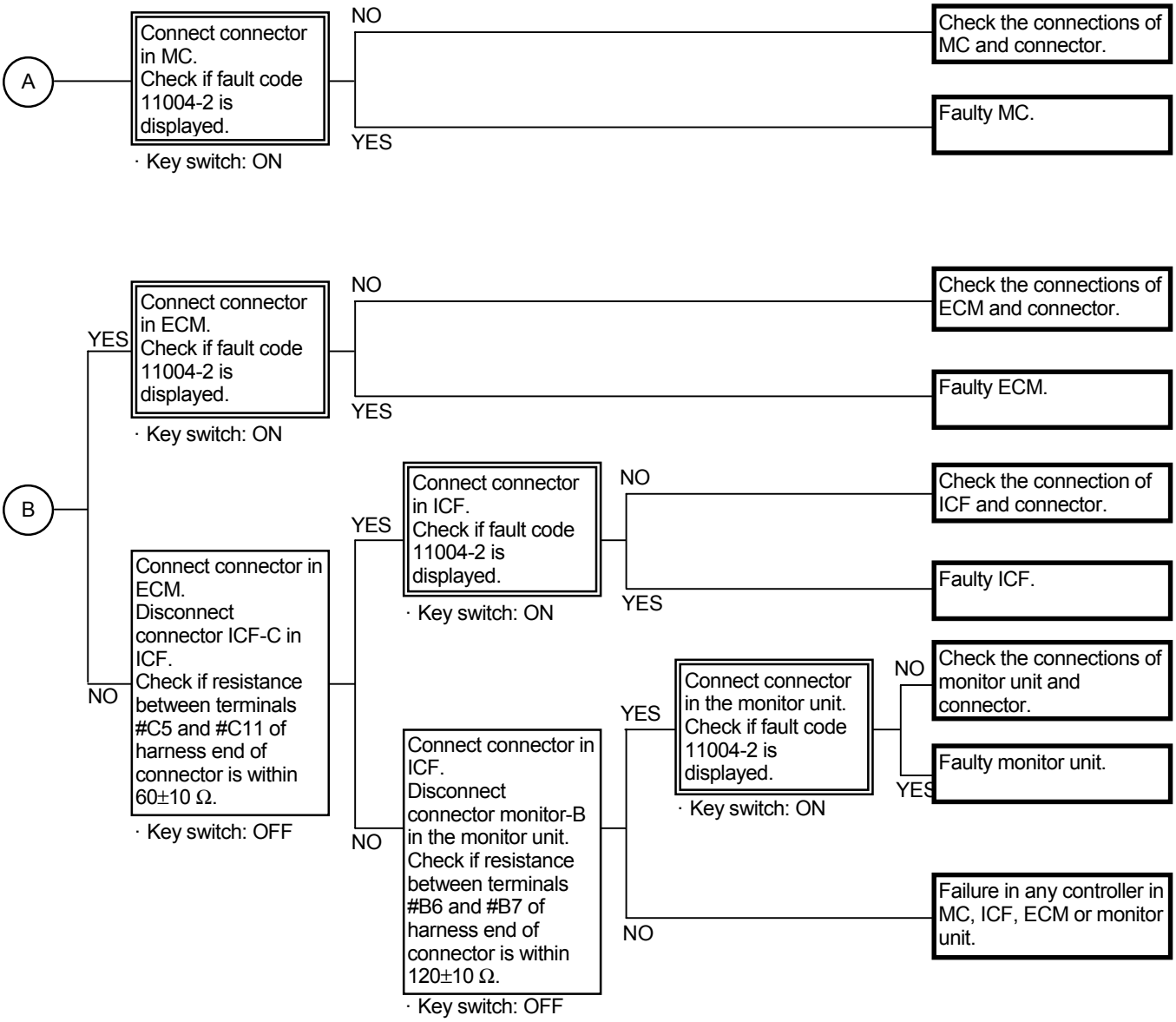
MC
Connector MC-C
(Harness end)



ECM
Connector
(Harness end)

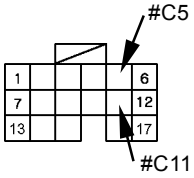


T1GR-05-04-002



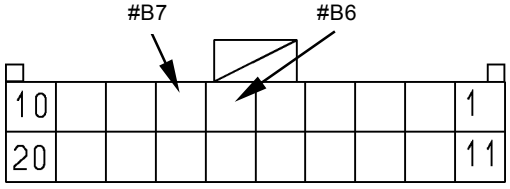
Connector

ICF
Connector ICF-C
(Harness end)



T1V1-05-04-002

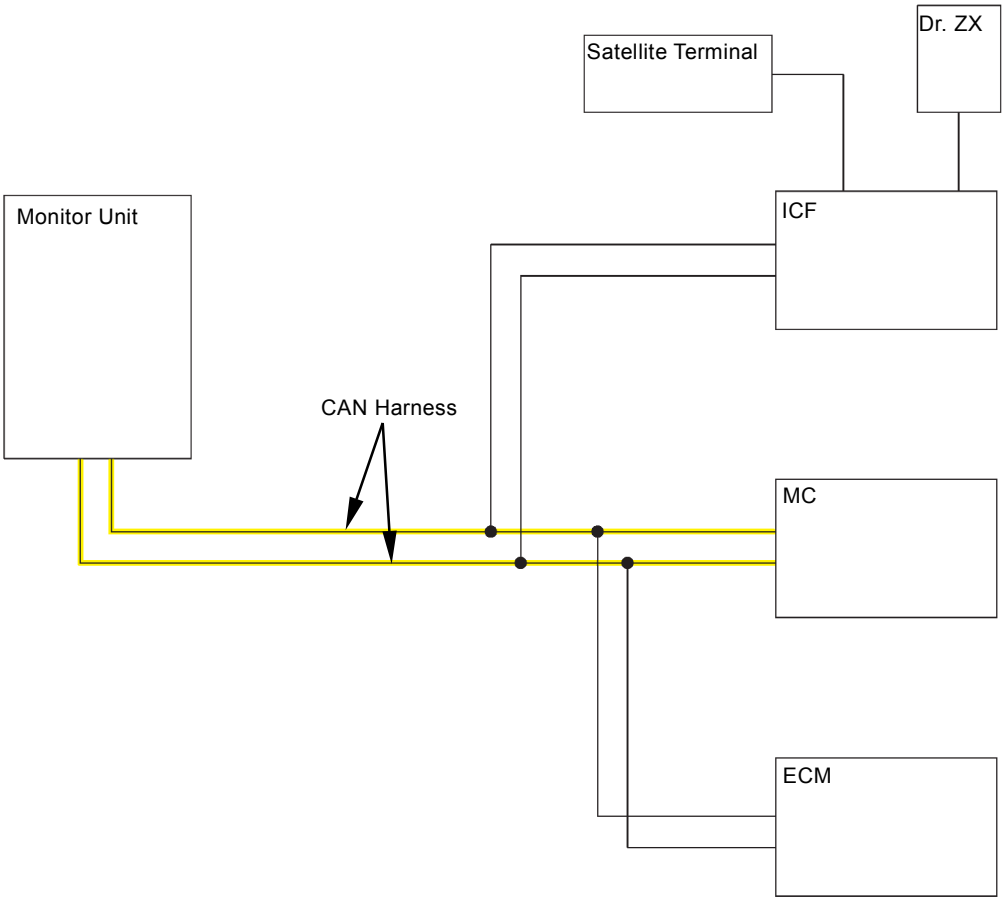
Monitor Unit
Connector Monitor-B
(Harness end)



T183-05-04-013

MC FAULT CODE 11911, 11918

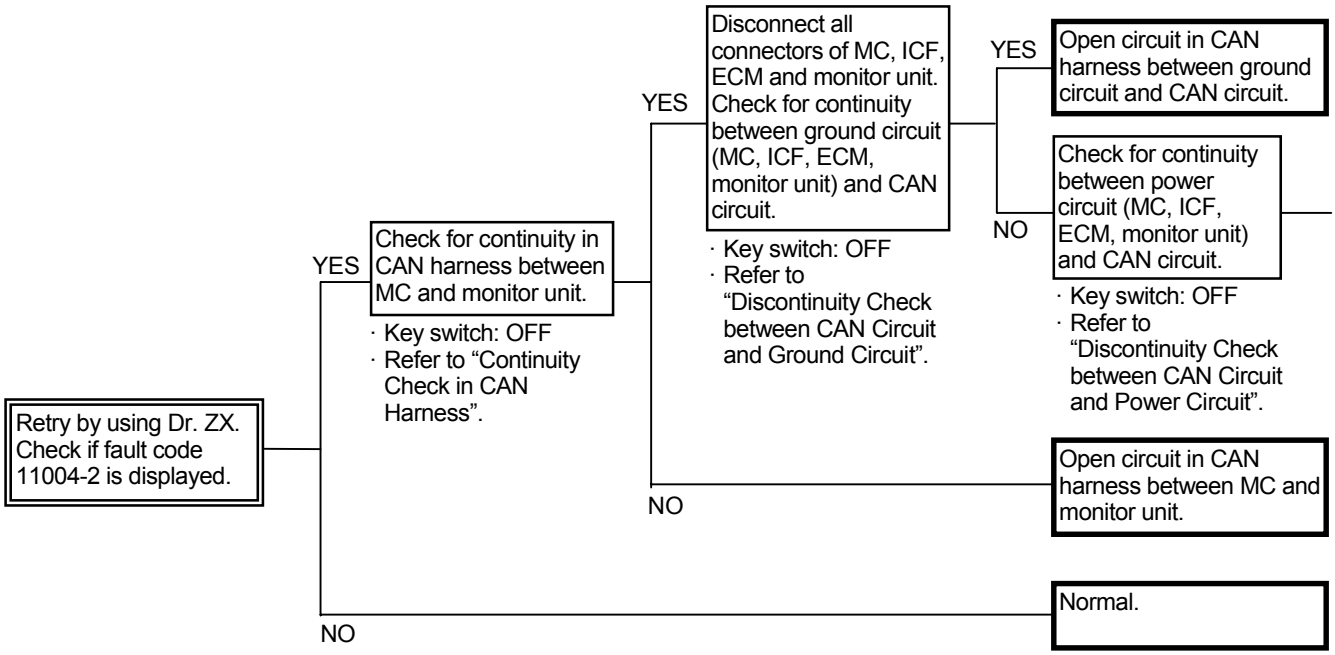
Fault Code	Trouble	Cause	Influenced Control
11911-2	Security Signal Received from Monitor Unit	Faulty CAN Harness	Theft Prevention Engine Speed, Engine Torque
11918-2	Work Mode Received from Monitor Unit	Faulty CAN Harness	• Attachment Operation Speed Increase Control • Attachment Operation Speed Limit Control • Attachment Pump Torque Decrease Control • Pump 1 Flow Rate Limit Control • Pump 2 Flow Rate Limit Control • Attachment Flow Rate Control • Attachment Valve Selection Control



T1V1-02-01-052

CAN HARNESS CHECK (MC FAULT CODE 11911, 11918)

- Check the wiring connections first.



YES

Shorted circuit in CAN harness between power circuit and CAN circuit.

YES

Shorted circuit in CAN harness between key signal circuit and CAN circuit.

NO

Check for continuity between key signal circuit (MC, ICF, ECM, monitor unit) and CAN circuit.

· Key switch: OFF
· Refer to "Discontinuity Check between CAN Circuit and Key Signal Circuit".

YES

Shorted circuit in CAN harness.

NO

Check for continuity between High side and Low side in CAN harness.

· Key switch: OFF
· Refer to "Discontinuity Check in CAN Harness".

NO

Connect all connectors except connector MC-C in MC.
Check if resistance between terminals #C4 and #C15 of harness end of connector MC-C is within 60±10 Ω.

· Key switch: OFF

YES

To A

NO

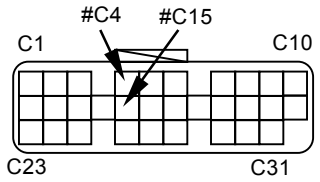
Connect connector in MC.
Disconnect connector monitor-B in the monitor unit.
Check if resistance between terminals #B6 and #B7 of harness end of connector is within 120±10 Ω.

· Key switch: OFF

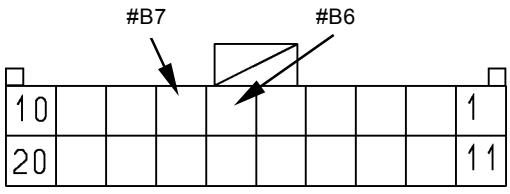
To B

Connector

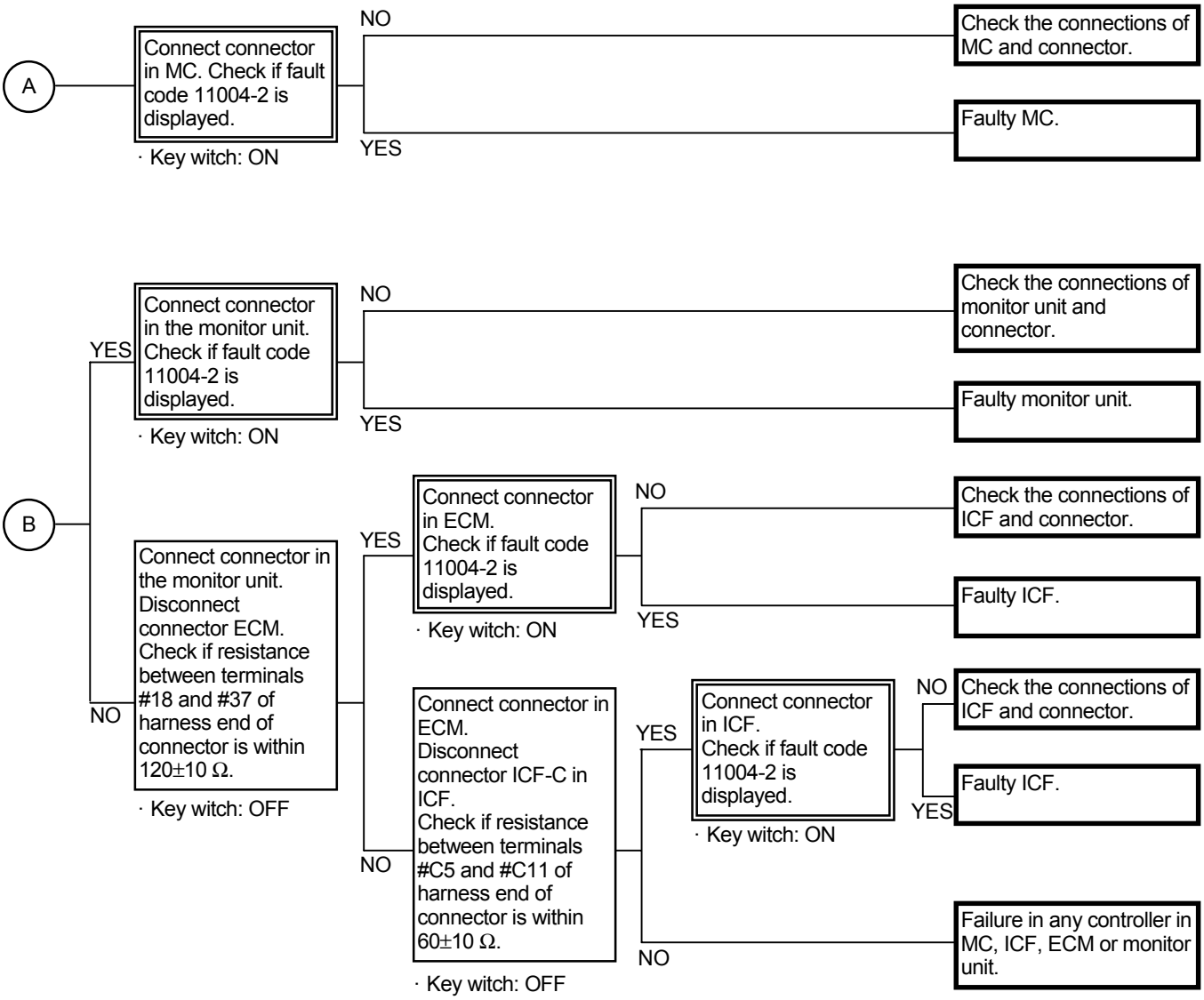
MC
Connector MC-C
(Harness end)



Monitor Unit
Connector Monitor-B
(Harness end)

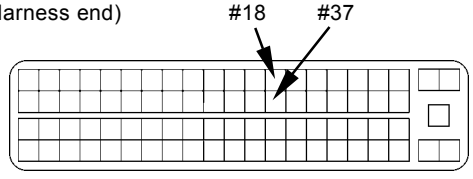


T183-05-04-013



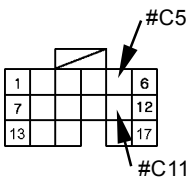
Connector

ECM
Connector
(Harness end)



T1GR-05-04-002

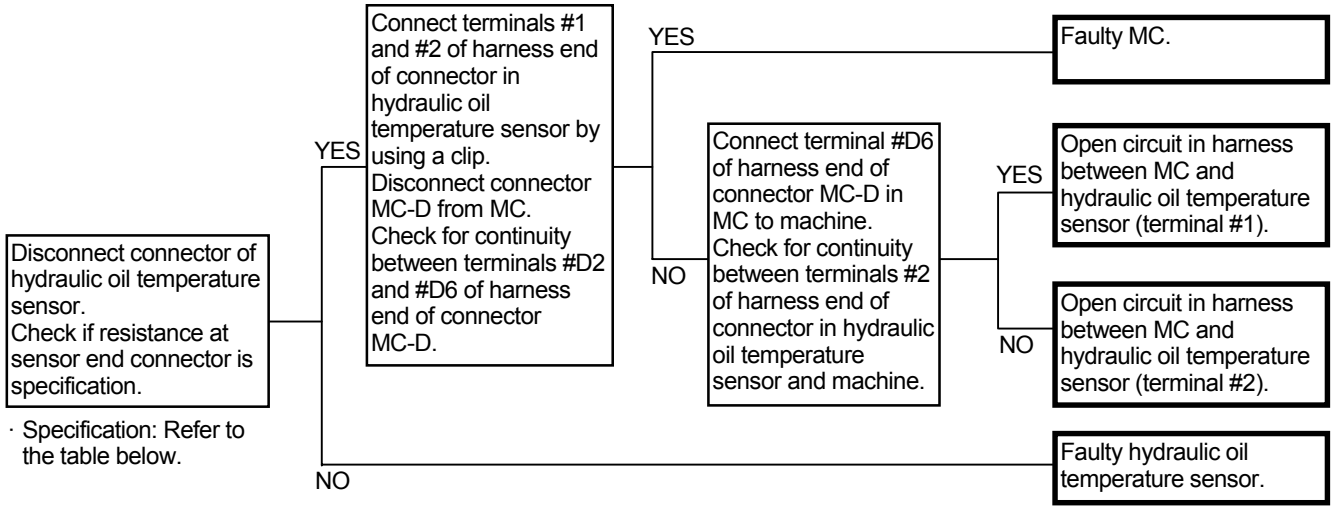
ICF
Connector ICF-C
(Harness end)



T1V1-05-04-002

OTHER FAILURES
MC FAULT CODE 11901

Fault Code	Trouble	Cause	Influenced Control
11901-3	Hydraulic Oil Temperature Sensor High Voltage	Voltage: 4.52 V or higher	• Auto-Warming Up Control • Arm Regenerative Control • Digging Regenerative Control
11901-4	Hydraulic Oil Temperature Sensor Low Voltage	Voltage: Less than 0.23 V	• Auto-Warming Up Control • Arm Regenerative Control • Digging Regenerative Control

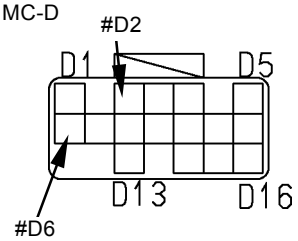


Specification of Hydraulic Oil Temperature Sensor

Hydraulic Oil Temperature (°C)	Resistance (kΩ)
-20	16.2±1.6
0	(5.88)
20	2.45±0.24
40	(1.14)
60	(0.534)
80	0.322

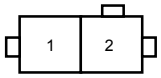
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-D



T183-05-04-009

Hydraulic Oil Temperature Sensor



ECM, SENSOR SYSTEM
ECM FAULT CODES 100, 102, 105, 108, 110, 157, 172

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
100-3	Abnormal Engine Oil Pressure Sensor (Abnormal Low Voltage)	P0522	1E-403
100-4	Abnormal Engine Oil Pressure Sensor (Abnormal High Voltage)	P0523	1E-409
102-3	Abnormal Boost Pressure Sensor (Abnormal Low Voltage)	P0237	1E-341
102-4	Abnormal Boost Pressure Sensor (Abnormal High Voltage)	P0238	1E-348
105-3	Abnormal Boost Temperature Sensor (Abnormal High Voltage)	P1113	1E-460
105-4	Abnormal Boost Temperature Sensor (Abnormal Low Voltage)	P1112	1E-452
108-3	Abnormal Atmospheric Pressure Sensor (Abnormal Low Voltage)	P0107	1E-231
108-4	Abnormal Atmospheric Pressure Sensor (Abnormal High Voltage)	P0108	1E-238
110-3	Abnormal Coolant Temperature Sensor (Abnormal High Voltage)	P0118	1E-266
110-4	Abnormal Coolant Temperature Sensor (Abnormal Low Voltage)	P0117	1E-259
157-3	Abnormal Common Rail Pressure Sensor (Abnormal High Voltage)	P0193	1E-294
157-4	Abnormal Common Rail Pressure Sensor (Abnormal Low Voltage)	P0192	1E-288
172-3	Abnormal Intake-Air Temperature Sensor (Abnormal High Voltage)	P0113	1E-251
172-4	Abnormal Intake-Air Temperature Sensor (Abnormal Low Voltage)	P0112	1E-245

ECM FAULT CODES 174, 636, 723, 10001

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
174-3	Abnormal Fuel Temperature Sensor (Abnormal High Voltage)	P0183	1E-280
174-4	Abnormal Fuel Temperature Sensor (Abnormal Low Voltage)	P0182	1E-274
636-2	Abnormal Cam Angle Sensor (No Signal)	P0340	1E-368
636-2	Abnormal Cam Angle Sensor (Abnormal Signal)	P0341	1E-375
636-7	Phase Mismatch of Cam Angle Sensor	P1345	1E-524
723-2	Abnormal Crank Speed Sensor (No Signal)	P0335	1E-355
723-2	Abnormal Crank Speed Sensor (Abnormal Signal)	P0336	1E-362
10001-3	Abnormal EGR Position (Brushless spec.)	P0487	1E-391

IMPORTANT: When fault code 723-2 (abnormal crank speed sensor) is displayed and the engine does not start, the cam angle sensor is faulty although fault codes 636-2 (abnormal cam angle sensor) and 636-7 (phase mismatch of cam angle sensor) are not displayed.

ECM, EXTERNAL DEVICE SYSTEM
ECM FAULT CODES 651, 652, 653, 654, 655, 656, 1347, 10002

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
651-3	Open Circuit in Injection Nozzle #1 Drive System	P0201	1E-301
652-3	Open Circuit in Injection Nozzle #2 Drive System	P0202	1E-308
653-3	Open Circuit in Injection Nozzle #3 Drive System	P0203	1E-315
654-3	Open Circuit in Injection Nozzle #4 Drive System	P0204	1E-322
1347-0	Open Circuit in Suction Control Valve Drive System, Shorted Circuit in + B or GND	P0090	1E-225
10002-2	Abnormal EGR Valve Control	P0488	1E-397

ECM, FUEL SYSTEM
ECM FAULT CODES 157, 633, 1239, 1240

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
157-0	Abnormal Common Rail Pressure (First Stage)	P0088	1E-215
157-0	Abnormal Common Rail Pressure (Second Stage)	P0088	1E-215
157-2	Abnormal Common Rail Pressure (Pump Over-Pressure)	P0089	1E-220
633-7	Pressure Limiter Open	P1095	1E-443
1239-1	No Pressure to Pump (Fuel Leakage)	P0087	1E-207
1240-1	No Pressure to Pump (Fuel Leakage)	P1093	1E-434

ECM, ENGINE PROTECTION
ECM FAULT CODES 110, 190

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
110-0	Overheating	P1173	1E-466
190-0	Overrunning	P0219	1E-339

ECM, ENGINE PROTECTION
ECM FAULT CODES 987, 1485

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
987-3	Abnormal Check Engine Lamp	P0650	1E-429
1485-2	Abnormal Main Relay System (None)	P1625	1E-529

ECM, INTERNAL CIRCUIT SYSTEM
ECM FAULT CODES 628, 1077, 1079, 1080, 10003, 10004, 10005

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
628-2	Abnormal ROM	P0601	1E-417
1077-2	Abnormal IC for CPU Watching	P0606	1E-421
1079-2	Abnormal 5 V Power Source 1 Voltage	P1631	1E-538
1080-2	Abnormal 5 V Power Source 2 Voltage	P1632	1E-541
10003-2	Abnormal Injection Nozzle Common 1 Drive System	P1261	1E-476
10004-2	Abnormal Injection Nozzle Common 2 Drive System	P1262	1E-487
10005-1	Abnormal Charge Circuit (Bank 1)	P0611	1E-423

ECM FAULT CODES 10006, 10007, 10008, 10009, 10010, 10011, 10013

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
10006-1	Abnormal Charge Circuit (Bank 2)	P0612	1E-426
10007-2	Abnormal CPU	P0606	1E-421
10008-2	Abnormal A/D Conversion	P1630	1E-536
10009-2	Abnormal 5 V Power Source 3 Voltage	P1633	1E-544
10010-2	Abnormal 5 V Power Source 4 Voltage	P1634	1E-547
10011-2	Abnormal 5 V Power Source 5 Voltage	P1635	1E-550
10013-2	Abnormal EEPROM	P0603	1E-419

ECM, COMMUNICATION SYSETEM
ECM FAULT CODE 639

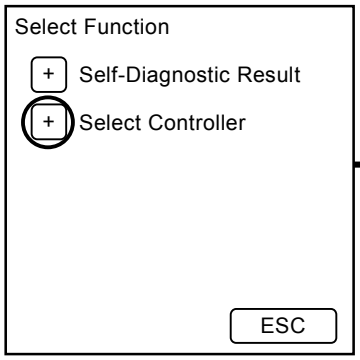
Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
639-2	Abnormal CAN Bus Line	U2104	1E-553
639-3	Abnormal CAN Time Out	U2106	1E-558

ICF, SATELLITE TERMINAL FAULT CODES 14000 to 14003

Fault Code	Trouble	Remedy
14000-2	Abnormal CAN Communication	Execute retry B in self-diagnosing. If this error code is displayed after re-try, check the following item. • Check the CAN communication line (harness).
14001-2	ICF: Flash Memory: Read / Write Error	Execute retry B in self-diagnosing and execute the following item. • Execute “Information C/U: Initialize”.
14002-2	ICF: External RAM: Read / Write Error	
14003-2	ICF: EEPROM: Sum Check Error	Execute retry B in self-diagnosing. If this error code is displayed after re-try, check the following item. • Execute “Control Data: Initialize”. • Execute “Enter Model and Serial No.”. Then, execute self-diagnosing and execute retry B.

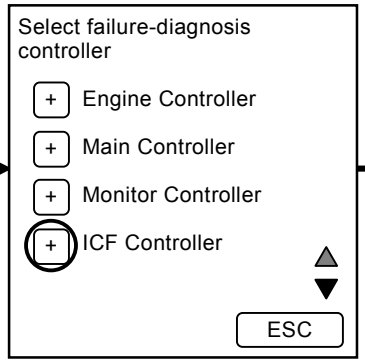
Information C/U: Initialize

After starting Dr. ZX, push Select Controller.



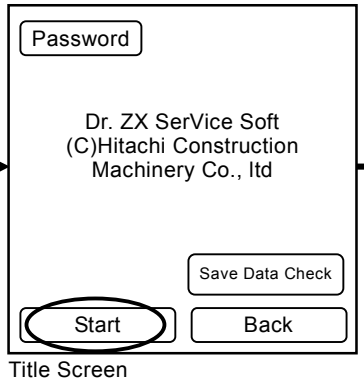
Function Selection Screen

Push ICF Controller.



Controller Selection Screen

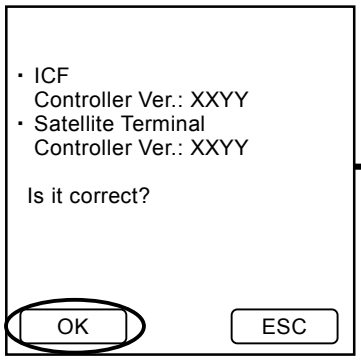
Push Start.



Title Screen

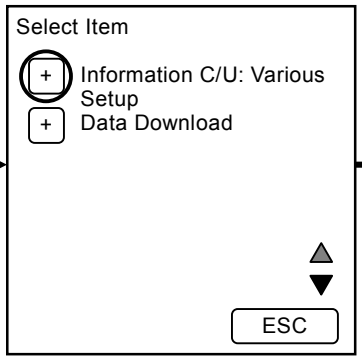
To the lower

Push OK.



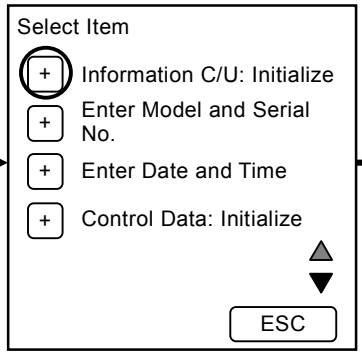
ICF Controller Screen

Push Information C/U: Various Setup.



Main Menu Screen

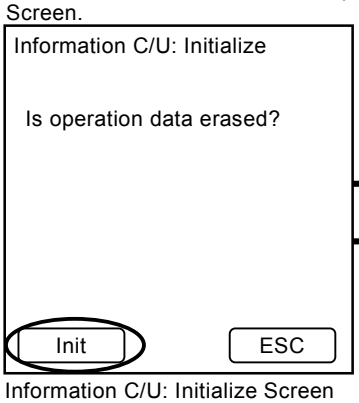
Push Information C/U: Initialize.



Information C/U: Various Setup Screen

To the lower

Push Init and the controller operating data is initialized.
Push ESC and return to Information C/U: Various Setup Screen.

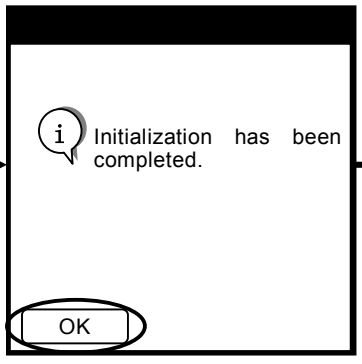


Information C/U: Initialize Screen

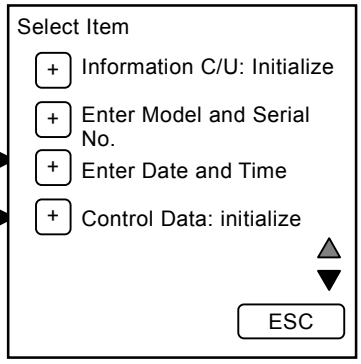
Init

ESC

Push OK and return to Information C/U: Various Setup Screen.

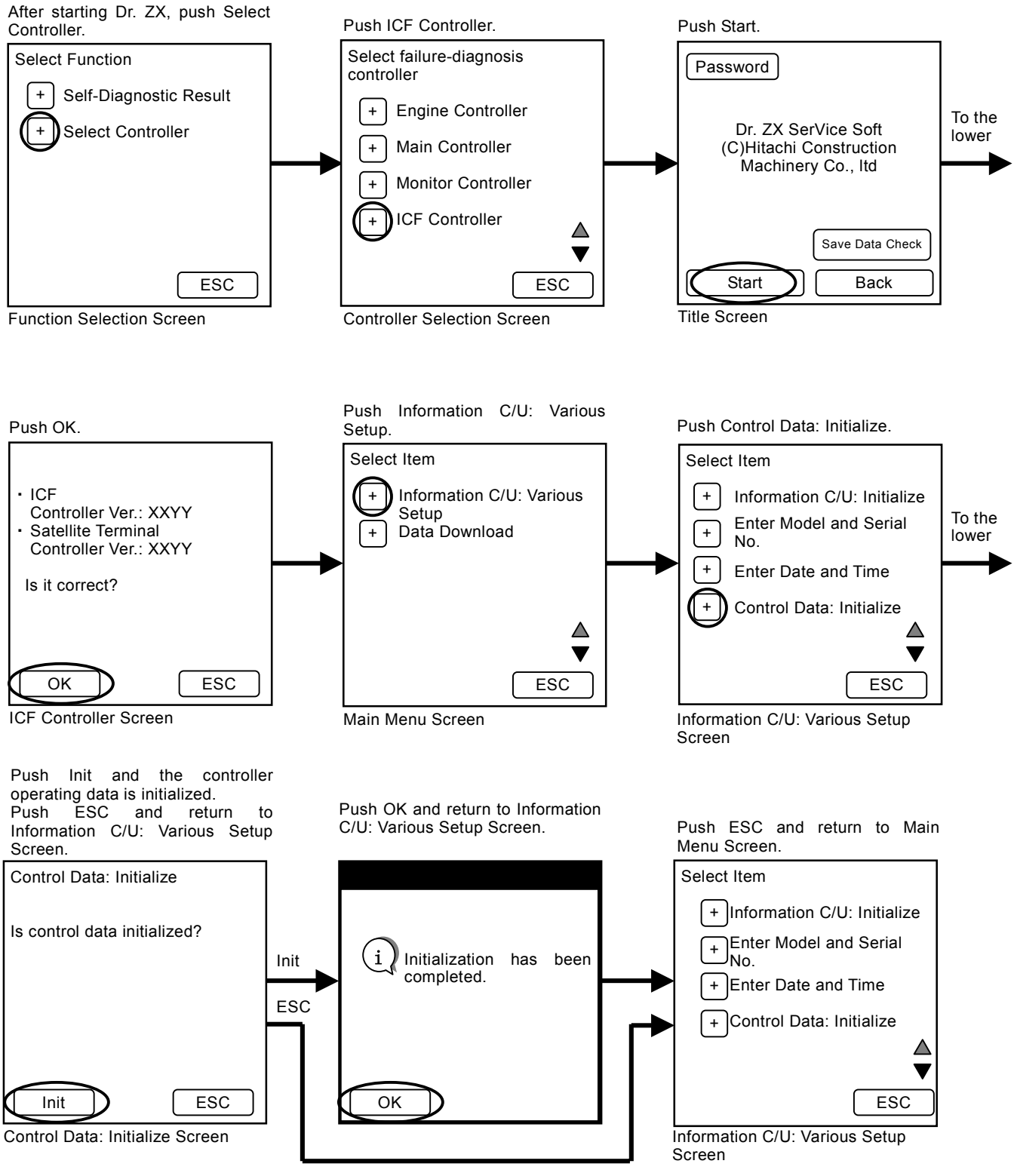


Push ESC and return to Main Menu Screen.

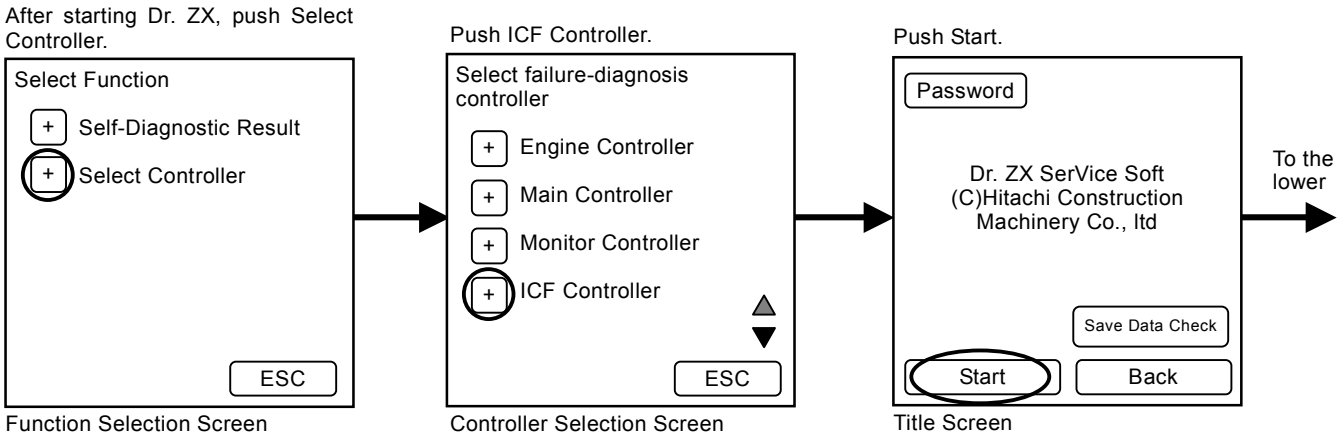


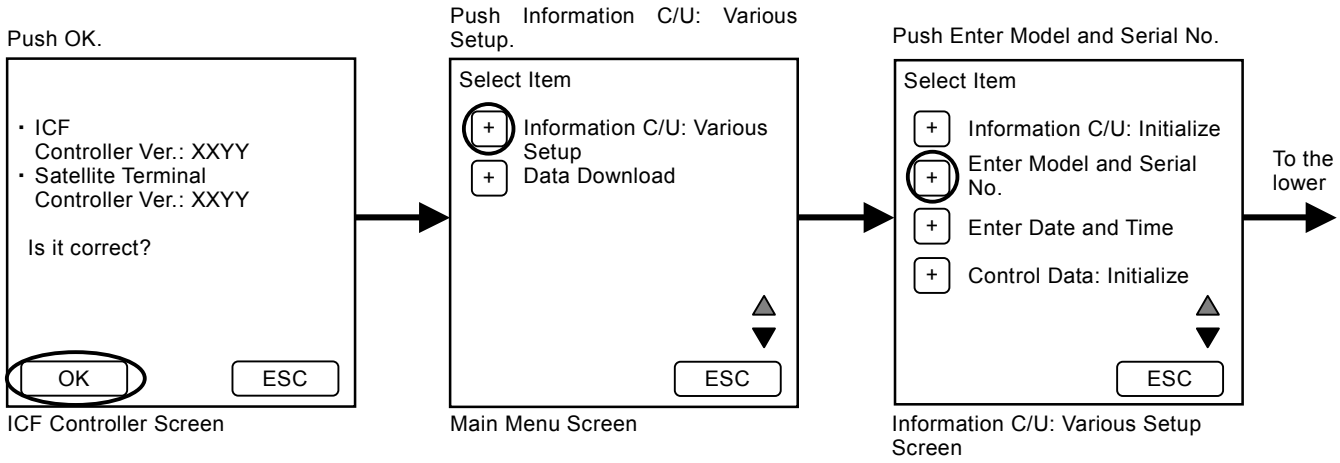
Information C/U: Various Setup Screen

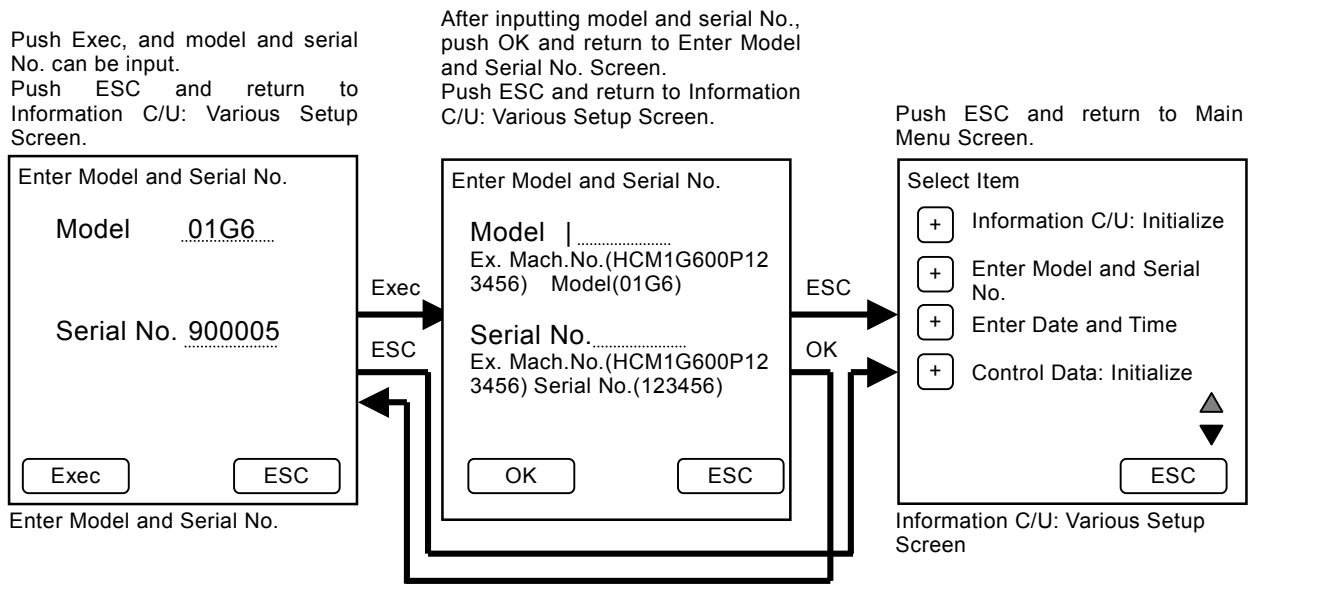
Control Data: Initialize



Enter Model and Serial No.







ICF, SATELLITE TERMINAL FAULT CODES 14006, 14008, 14100 to 14106

Fault Code	Trouble	Remedy
14006-2	ICF: Satellite Communication Terminal: Communication Error	Execute retry B in self-diagnosing. If this error code is displayed after re-try, check the following item. Check the communication line. Check the power source line of satellite terminal. Check the fuse. Then, execute self-diagnosing and execute retry B.
14008-2	ICF: Abnormal Internal RAM	Execute retry B in self-diagnosing. If this error code is displayed after re-try, replace the controller.
14100-2	Satellite Communication Terminal: Abnormal EEPROM	
14101-2	Satellite Communication Terminal: Abnormal IB/OB Queue	
14102-2	Satellite Communication Terminal: Abnormal Local Loup Back	Check the communication aerial of satellite terminal. (Refer to T5-6-113.)
14103-2	Satellite Communication Terminal: The satellite is not found.	
14104-2	Satellite Communication Terminal: Fail 1 of Remote Loup Back	Execute retry B in self-diagnosing. If this error code is displayed after re-try, replace the controller.
14105-2	Satellite Communication Terminal: Fail 2 of Remote Loup Back	
14106-2	Satellite Communication Terminal: Sending and receiving data are mismatched.	

Fault Code 14006-2

- Check the communication line

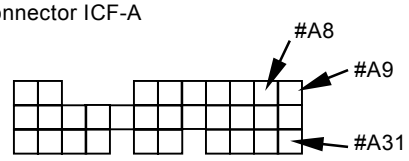
1. Check for continuity between terminal #A8 of harness end of connector ICF-A in ICF and terminal #10 of harness end of connector A in satellite terminal.
2. Check for continuity between terminal #A9 of harness end of connector ICF-A in ICF and terminal #20 of harness end of connector A in satellite terminal.
3. Check for continuity between terminal #A31 of harness end of connector ICF-A in ICF and terminal #2 of harness end of connector B in satellite terminal.

- Check the power source line of satellite terminal

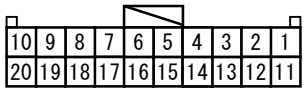
1. Check the battery power
   Check voltage between terminal #2 of harness end of connector A in satellite terminal and machine is 24 V.
2. Check the main power
   With the key switch ON, check voltage between terminal #1 of harness end of connector A in satellite terminal and machine is 24 V.
3. Check the ground power
   Check for continuity between terminals #11 and #12 of harness end of connector A in satellite terminal.

Connector (Harness end of connector viewed from the open end)

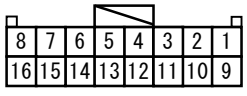
ICF
Connector ICF-A



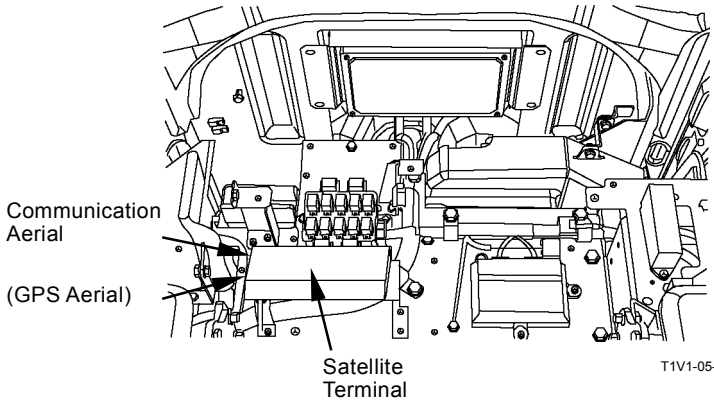
Satellite
Connector A



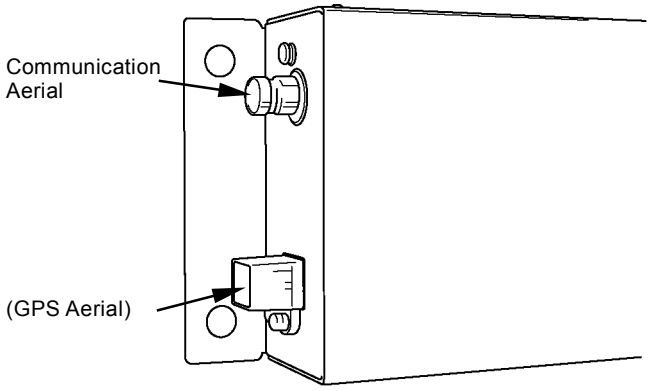
Satellite
Connector B



Fault Codes 14102-2, 14103-2



T1V1-05-07-001

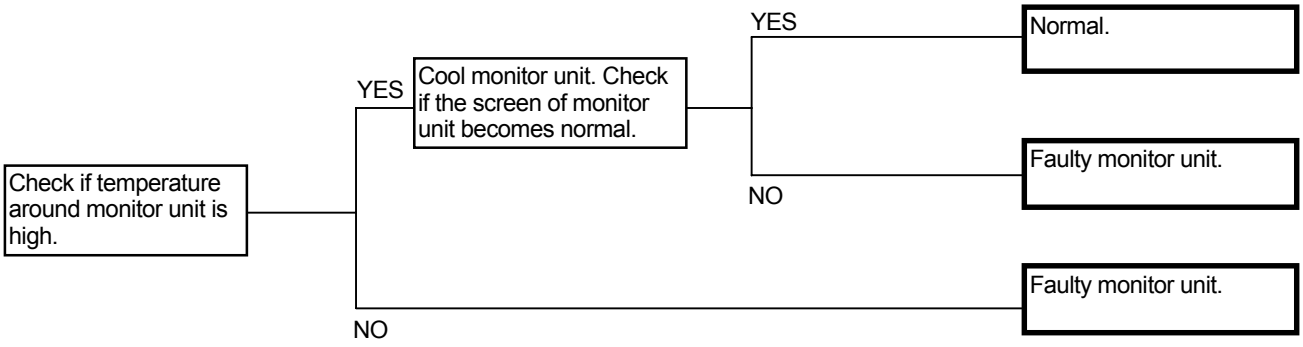


T1V1-05-06-004

MONITOR UNIT FAULT CODE 13303

Fault Code	Trouble	Remedy
13303-2	Abnormal Thermister Temperature	Cool the monitor unit until temperature inside the monitor unit becomes less than 85 °C.

The screen of monitor unit becomes dark.

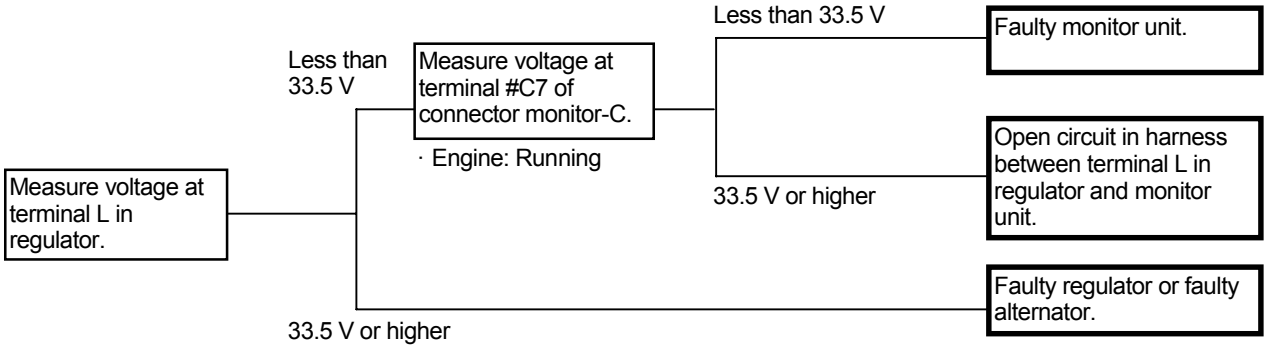


MONITOR UNIT FAULT CODE 13304

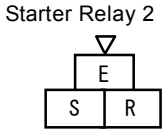
Fault Code	Trouble	Remedy
13304-2	Abnormal REG Input H Level	Refer to the following.

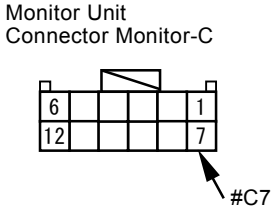
• Check the wiring connections first.

NOTE: As terminal L in the regulator is a waterproof type connector, it is difficult to measure voltage. Measure voltage at terminal R in starter relay 2. Check for continuity at terminal R in starter relay 2 and terminal L in regulator.



Connector (Harness end of connector viewed from the open end)



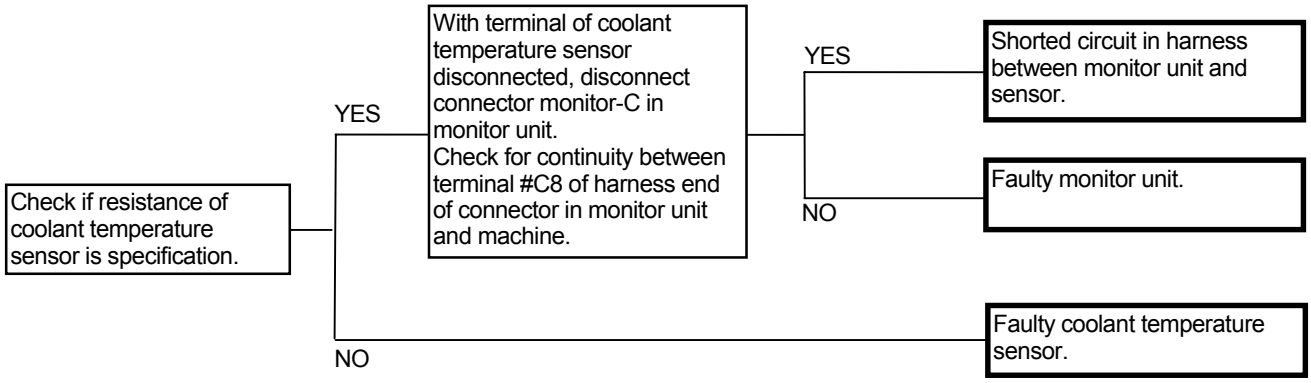


MONITOR UNIT FAULT CODES 13306, 13308

Fault Code	Trouble	Remedy
13306-2	Abnormal EEPROM	If this error code is displayed after re-try, replace the monitor unit.
13308-2	Abnormal CAN Communication	Refer to “Check CAN Harness” (T5-6-54).

MONITOR UNIT FAULT CODE 13310

Fault Code	Trouble	Remedy
13310-2	Shorted Circuit in Coolant Temperature Sensor	Check the coolant temperature sensor and harness.

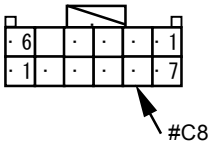


Coolant Temperature Sensor

Coolant Temperature (°C)	Resistance (kΩ)
25	7.6±0.76
40	4.0±0.35
50	2.7±0.22
80	0.92±0.07
95	0.56±0.04
105	0.42±0.03
120	0.28±0.01

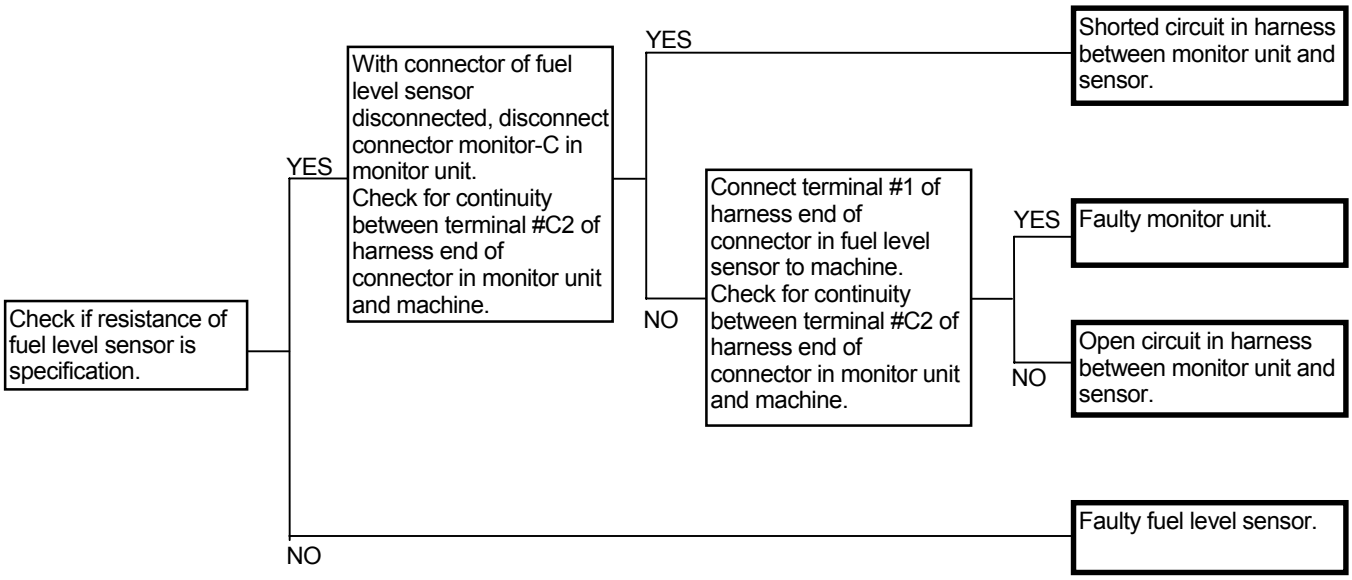
Connector (Harness end of connector viewed from the open end)

Monitor Unit
Connector Monitor-C

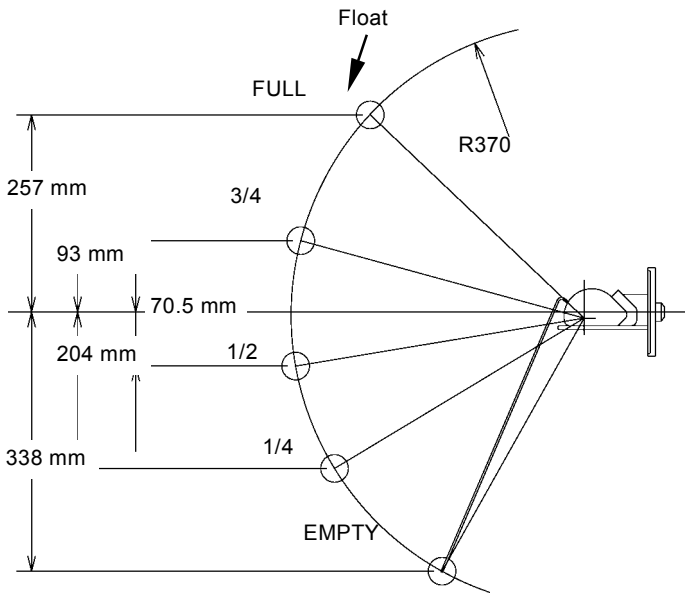


MONITOR UNIT FAULT CODE 13311

Fault Code	Trouble	Remedy
13311-3	Shorted Circuit in Fuel Level Sensor	Check the fuel level sensor and harness.
13311-4	Open Circuit in Fuel Level Sensor	Check the fuel level sensor and harness.



Fuel Level Sensor

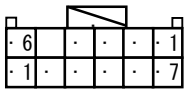


T178-05-05-001

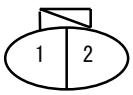
Float Position	Resistance (Ω)
Upper Limit (FULL)	10^{+0}_{-4}
3/4	26
1/2	38±5
1/4	53
Alarm Level	85±3
Lower Limit (EMPTY)	90^{+10}_{-0}

Connector (Harness end of connector viewed from the open end)

Monitor Unit
Connector Moniter-C

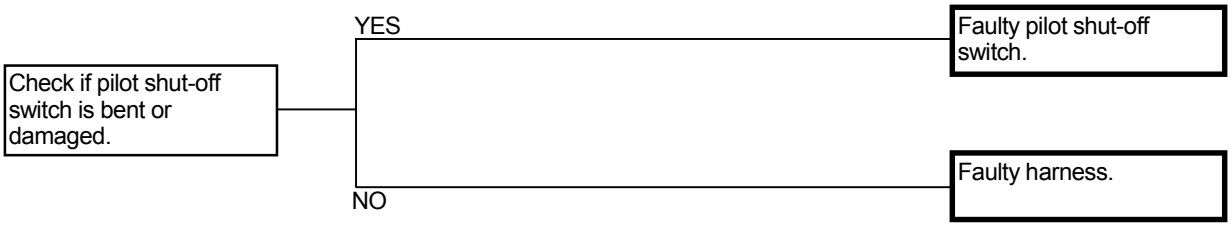


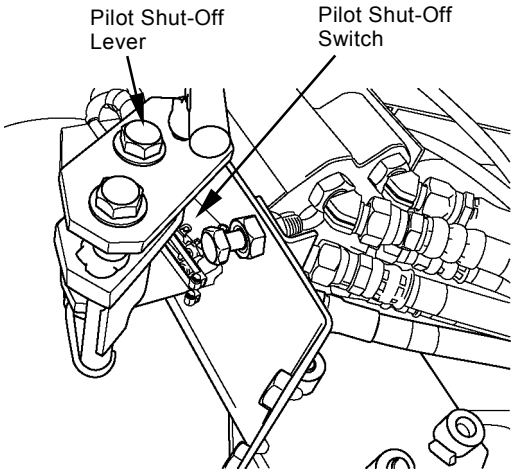
Fuel Sensor



PILOT SHUT-OFF LEVER ALARM

Pilot shut-off lever alarm is displayed on the monitor unit screen.



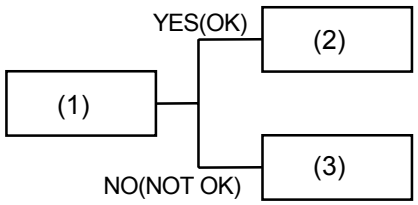


T1V1-05-06-005

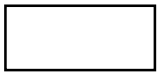
TROUBLESHOOTING B PROCEDURE

Apply troubleshooting B procedure when no fault code is displayed on the service menu in monitor unit and the diagnosing by Dr. ZX although the machine operation is abnormal.
On the front section pages of this group are the tables indicating the relationship between machine trouble symptoms and related parts which may cause such trouble if failed.
Start the troubleshooting with more probable causes selected by referring to these tables.

- How to Read the Troubleshoting Flow Charts

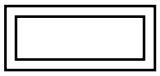


- After checking or measuring item (1), select either YES (OK) or NO (NOT OK) and proceed to item (2) or (3), as appropriate.


· Key switch: ON

- Special instructions or reference item are indicated in the spaces under the box. Incorrect measuring or checking methods will render troubleshooting impossible, and may damage components as well.

- Explanation of how to use test harness kit required. Refer to “Electrical System Inspection” Group (Group 8) in this section.



- Use the service menu (diagnosing system/monitoring) in monitor unit or the diagnosing system / monitor function in Dr. ZX.

- Causes are stated in a thick-line box. Scanning through thick-line boxes, possible causes can be seen without going through the flow chart.

RELATIONSHIP BETWEEN MACHINE TROUBLE SYMPTOMS AND RELATED PARTS

This table indicates the relationship between machine trouble symptoms and the potential problem parts, which may cause trouble if failed, and the evaluation methods of these components.

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Engine Control Dial	• Instructs engine target speed.	• Engine speed is kept at idling speed when trouble occurs with key ON. • Engine speed is kept at speed just before trouble occurred when trouble occurs during operation.	• Engine speed is kept at idling speed when trouble occurs with key ON. • Engine speed is kept at speed just before trouble occurred when trouble occurs during operation.
Pump Control Pressure Sensor	• Monitors pump control pressure in order to control travel motor swash angle control.	• E mode control In normal, P speed is returned whenever operating. P speed is not returned when this trouble opccurs. • Heater Control Heater control is ineffective. • Travel motor displacement angle control The machine travels at slow speed.	• E mode control In normal, P speed is returned whenever operating. P speed is not returned when this trouble opccurs. • As the machine is kept to travel at slow speed, speed does not change into fast automatically.
Pump 1 Delivery Pressure Sensor	• Monitors pump delivery pressure in order to control HP mode, slow speed torque increase, auto-power lift and travel motor swash angle controls.	• HP mode control Engine speed does not increase. • Travel HP mode control This control is operated by pressure except P1. • P-Q torque correction Torque does not increase. • Travel torque-up control The machine may mistrack. • Bom regeneration control Arm regeneration control is ineffective. • Digging regeneration control Digging regeneration control is ineffective. • Auto-power lift control. Auto-power lift control is ineffective. • Travel motor displacement angle control. The machine travels at slow speed.	• During combined operation of boom raise and arm roll-in or of arm roll-in and swing, arm speed is slow. • During boom raise operation, lifting power is weak. • As the machine is kept to travel at slow speed, speed does not change into fast.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11101-3, 11101-4	Monitor Item: Target engine speed, Dial angle (Possible to display by service menu and monitoring in monitor unit)	-	-	T2-2
11206-3, 11206-4, 11208-3, 11208-4	Monitor Item: Pump 1 pump control pressure, Pump 2 pump control pressure (Possible to display by service menu and monitoring in monitor unit)	-	-	T2-2
11200-3, 11200-4	Monitor Item: Pump 1 pressure (Possible to display by service menu and monitoring in monitor unit)	-	-	T2-2

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Pump 2 Delivery Pressure Sensor	• Monitors pump delivery pressure in order to control HP mode, slow speed torque increase, arm flow rate, arm regeneration and travel motor displacement angle controls.	• HP mode control Engine speed does not increase. • Travel HP mode control This control is operated by pressure except P2. • P-Q torque correction Torque does not increase. • Travel torque-up control The machine mistrackes. • Arm regeneration control Arm regeneration control is ineffective. • Digging regeneration control Digging regeneration control is ineffective. • Travel motor displacement angle control The machine travels at slow speed.	• During combined operation of boom raise and arm roll-in or of arm roll-in and swing, arm speed is slow. • As the machine is kept to travel at slow speed, speed does not change into fast.
Pump 3 Delivery Pressure Sensor (Optional)	• Monitors pump delivery pressure in order to control pump 3 torque decrease control.	• Engine stalls if pump 3 is loaded (pump torque is increased).	• Engine stalls if pump 3 is loaded (pump torque is increased).

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11202-3, 11202-4	Monitor Item: Pump 2 pressure (Possible to display by service menu and monitoring in monitor unit)	-	-	T2-2
-	-	-	-	T2-2

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Pressure Sensor (Travel)	• Monitors travel pilot pressure in order to control auto-idle, idle speed-up, engine speed automatic increase at travel (ZX270-3 class only), slow speed torque increase and travel motor displacement angle controls.	• Idle speed-up control Engine speed does not change into idle speed-up speed when traveling. • Auto-idle control Although the machine travels, auto-idle is not released. • ECO control Although the machine travels, engine speed does not increase. • Travel HP mode control Travel HP mode control is ineffective. • Operation torque decrease control Operation torque decrease control is ineffective. • Travel torque-up control Travel torque-up control is ineffective. • Travel motor displacement angle control The machine travels at slow speed. • Attachment flow rate control During combined operation of secondary crusher or primary crusher and travel, attachment operation speed may become slow. • Travel alarm (optional) control Travel alarm is kept ON.	• When the machine travels at idle speed, engine speed is not changed into idle speed-up speed. • Although the machine travels, engine speed is kept at auto-idle speed. • Although the machine travels, engine speed does not increase. • As the machine is kept to travel at slow speed, speed does not change into fast. • During combined operation of attachment and travel, the machine mistracks. • The travel alarm is kept to ring as for the machine equipped with travel alarm (optional).

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11304-3, 11304-4	Monitor Item: Travel control pressure (Possible to display by service menu and monitoring in monitor unit) Monitor pressure change while traveling machine.	-	Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor.	T2-2

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Pressure Sensor (Front Attachment)	• Monitors front attachment pilot pressure in order to control auto-idle, idle speed-up and engine speed automatic increase at travel (ZX270-3 class only) controls.	• Idle speed-up control Engine speed does not change into idle speed-up speed when operating front attachment. • Auto-idle control Although the front attachment is operated, auto-idle is not released. • ECO control Although the front attachment is operated, engine speed does not increase. • Operation torque decrease control Operation torque decrease control is ineffective. • Travel torque-up control Although the front attachment is operated, travel torque-up control is not released. • Travel motor displacement angle control Although the front attachment is operated, the machine travels at fast speed.	• When the front attachment is operated at idle speed, engine speed is not changed into idle speed-up speed. • When the front attachment is operated, engine speed is kept at auto-idle speed. • When the front attachment is operated, engine speed does not increase. • Although the front attachment is operated, the machine travels at fast speed.
Pressure Sensor (Swing)	• Monitors swing pilot pressure in order to control arm flow rate and arm regeneration controls.	• Arm regeneration control During combined operation of arm roll-in and swing, arm regeneration is reduced. • Swing alarm (optional) control Swing alarm is kept ON.	• Arm speed is slow during combined operation of arm roll-in and swing. • The swing alarm is kept to ring when swing alarm is effective as for the machine equipped with swing alarm (optional).

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11307-3, 11307-4	Monitor Item: Front attachment operation (Possible to display by service menu and monitoring in monitor unit) Monitor pressure change while operating front attachment.	-	Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor.	T2-2
11301-3, 11301-4	Monitor Item: Swing control pressure (Possible to display by service menu and monitoring in monitor unit) Monitor pressure change while swinging upperstructure.	-	Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor.	T2-2

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Pressure Sensor (Boom Raise)	• Monitors boom raise pilot pressure in order to control HP mode, arm regeneration and auto-power lift controls.	• HP mode control Engine speed does not increase when operating boom raise. • Arm regeneration control Arm regeneration is ineffective during combined operation of boom raise and arm roll-in. • Digging regeneration control Digging regeneration control is ineffective. • Travel motor displacement angle control The machine travels at slow speed. • Auto-power lift control The operating boom rasie, pressure does not increase. • Attachment flow rate control During combined operation of attachment and boom raise, attachment operation speed is fast. • Boom limit is operated.	• When operating boom raise during HP mode control, engine speed does not increase. • During combined operation of boom raise and arm roll-in, arm speed is slow. • During boom raise operation, lifting power is weak.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11302-3, 11302-4	Monitor Item: Boom raise pilot pressure (Possible to display by service menu and monitoring in monitor unit) Monitor pressure change while raising boom.	-	Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor.	T2-2

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Pressure Sensor (Arm Roll-In)	• Monitors arm roll-in pilot pressure in order to control HP mode, arm flow rate, and arm regeneration controls.	• HP mode control Engine speed does not increase when operating arm roll-in. • Arm regeneration control Arm regeneration is not operated during combined operation of arm roll-in and swing. • Digging regeneration control Arm operation speed is slightly slow when operating digging during combined operation of boom raise and arm roll-in. • Auto-power lift control Pressure increases when operating digging during combined operation of boom raise and arm roll-in.	• When operating arm roll-in with the HP mode switch ON, engine speed does not increase. • During combined operation of arm roll-in and swing, arm speed is slow.
Pressure Sensor (Auxiliary) (Optional)	• Monitors attachment pilot pressure when attachment is installed in order to control attachment operation speed increase, pump 1 flow rate limit, pump 2 flow rate limit and auxiliary flow rate controls.	• Attachment Open part: Maximum • Pump 1, 2 flow rate limits are ineffective.	• During combined operation of attachment and front attachment, front attachment speed is slow. • Pump 1, 2 flow rates are not limited at attachment mode.
Torque Control Solenoid Valve	• Supplies control pressure to pumps 1 and 2 in order to control speed sensing and slow speed torque increase controls.	• High current: Pump torque is kept maximum. The engine stalls or llug-down is remarkable at high loaded. • Low current: Pump torque is kept minimum.	• High current: If pump torque is maximum at low idle, the engine stalls or llug-down occurs. • Low current: The machine operation is totally slow.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11303-3, 11303-4	Monitor Item: Arm roll-In pilot pressure (Possible to display by service menu and monitoring in monitor unit) Monitor pressure change while rolling arm in.	-	Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor.	T2-2
-	Monitor Item: ATT control pressure (Possible to display by service menu and monitoring in monitor unit) Monitor pressure change while operating attachment.	-	Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor.	T2-2
11401-2, 11401-3, 11401-4	Monitor Item: Pump torque proportional solenoid valve output	-	-	T2-2

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Solenoid Valve Unit (SG)	• Temporarily increases main relief valve relief pressure in power digging and auto-power lift control.	• High current: Pressure is kept increasing. • Low current: Pressure cannot increase.	• High current: Pressure is kept increasing according to the valve open condition. Therefore, power increases as for all operations. • Low current: Relief pressure: 34 MPa (350 kgf/ cm2) is kept. Therefore, although the power digging switch is pushed, relief pressure does not increase. Power does not increase.
Solenoid Valve Unit (SF)	• Routes return oil from boom cylinder rod side to arm cylinder bottom side during digging operation and increases arm speed.	• High current: Digging regeneration control is always effective. • Low current: Digging regeneration control is always ineffective.	• High current: During combined operation of boom raise and arm roll-in with suspended load and fine operation, boom does not raise easily. • Low current: During digging operation, arm operation speed is slow. (Slowdown is not remarkable.)
Solenoid Valve Unit (SC)	• Routes return oil from arm cylinder rod side to arm cylinder bottom side when rolling arm in and increases arm speed.	• High current: Digging power (arm) becomes weak. • Low current: Arm regeneration is always ineffective.	• High current: Digging power (arm) becomes weak. • Low current: During combined operation of boom raise and arm roll-in above the ground, boom does not raise easily and maximum arm roll-in operation speed is slow.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11404-2, 11404-3, 11404-4	Monitor Item: Power digging control pressure	Install lamp harness (ST 7226). Check output signals from MC and harness condition.	Proportional solenoid valve is used as an ON/OFF valve. When power digging switch is pushed or released and lamp comes ON, harness is normal. If lamp goes OFF, it may be due to open circuit in harness.	T2-2
11402-2, 11402-3, 1402-4	Monitor Item: Digging regenerative valve	Install lamp harness (ST 7226). Check output signals from MC and harness condition.	-	T2-2
11403-2, 11403-3, 11403-4	Monitor Item: Arm regenerative proportional solenoid valve output	Install lamp harness (ST 7226). Check output signals from MC and harness condition.	-	T2-2

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Solenoid Valve Unit (SI)	• When pump delivery pressure is low in fast travel mode, travel motor swash angle is reduced and increases travel speed.	• High current: Travel motor is always operated at fast speed. • Low current: Travel motor is always operated at slow speed.	• High current: Travel motor is always operated at fast speed. • Low current: Travel motor is always operated at slow speed.
Max. Pump 1 Flow Rate Limit Solenoid Valve (Optional)	• Limits maximum pump 1 flow rate when operating attachment.	• High current: Pump 1 flow rate becomes minimum. • Low current: Pump 1 flow rate does not decrease. Pump 1 attachment flow rate cannot be controlled.	• High current: The machine mistracks. Boom raise operation speed is slow. Arm roll-out and roll-in operation speeds are slow. Bucket roll-in and roll-put operation speeds are slow. • Low current: Attachment flow rate cannot be controlled.
Max. Pump 2 Flow Rate Limit Solenoid Valve	• Limits maximum pump 2 flow rate when operating attachment.	• High current: Pump 2 flow rate becomes minimum. • Low current: Pump 2 flow rate does not decrease.	• High current: The machine mistracks. Boom raise operation speed is slow. Arm roll-out and roll-in operation speeds are slow. Swing operation speed is slow. • Low current: Attachment flow rate cannot be controlled.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11405-2, 11405-3, 11405-4	Monitor Item: Digging regenerative valve	Install lamp harness (ST 7226). Check output signals from MC and harness condition.	-	T2-2
-	-	-	-	T2-2
11400-2, 11400-3, 11400-4	-	-	-	T2-2

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Auxiliary Flow Rate Control Solenoid Valve (Optional)	• Restricts flow rate to auxiliary spool during combined operation and improves operability.	• If auxiliary flow rate control solenoid valve is not activated, pressure at output port becomes 0 MPa (0 kgf/cm2).	• High current: If valve is bound fully closed, attachment speed becomes slow during single operation. • Low current: If valve is bound fully open, boom does not raise during 3-combined operation of boom raise.
Auxiliary Flow Combining Solenoid Valve (Optional)	• Activates during auxiliary operation and shifts spool in auxiliary flow combining valve.	• If auxiliary flow combining solenoid valve is not activated, pressure at output port becomes 0 MPa (0 kgf/cm2) when operating attachment.	• Speed does not increase during single operation of attachment.
Selector Valve Control Solenoid Valve (Optional)	• Activates when attachment “selector valve returning to hydraulic oil tank” is selected and shifts selector valve spool.	• If selector valve control solenoid valve is not activated, pressure at output port becomes 0 MPa (0 kgf/cm2) when attachment “selector valve returning to hydraulic oil tank” is selected.	• Breaker stroke becomes few.
Accumulator Control Solenoid Valve (Optional)	• Activates when attachment “accumulator ON” is selected and shifts accumulator control valve spool.	• If accumulator control solenoid valve is not activated, pressure at output port becomes 0 MPa (0 kgf/cm2) when attachment “accumulator ON” is selected.	• When NPK breaker is used, hydraulic pulsation (hose vibration) becomes big.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T2-2
-	-	-	-	T2-2
-	-	-	When pedal is depressed, pressure in the right piping hose occurs.	T2-2
-	-	-	-	T2-2

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Secondary Pilot Relief Pressure Control Solenoid Valve (Optional)	• Activates when attachment “secondary pilot relief pressure ON” is selected and shifts secondary pilot relief pressure control valve spool.	• If secondary pilot relief pressure control solenoid valve is not activated, pressure at output port becomes 0 MPa (0 kgf/cm2) when attachment “secondary pilot relief pressure ON” is selected.	• Relief set-pressure in auxiliary circuit does not decrease.
Oil Temperature Sensor	• Monitors hydraulic oil temperature in order to control auto-warming control.	• Auto-warming control Auto-warming control is ineffective.	• When oil temperature is lower than 0 °C, auto-warming up control is not operated.
Power Digging Switch	• Activates power digging control. ON: 0V→Increasing pressure OFF: 5V→ Not increasing pressure	• Open circuit: Pressure does not increase. • Shorted circuit: Pressure does not increase for 8 seconds after the key switch is turned ON.	• Power digging control is not operated if open circuit or shorted circuit occurs.
Travel Mode Switch	• Shifts travel mode. Fast mode: 0V Slow mode: 5V	• Open circuit in switch: Travel speed remains unchanged in slow mode (5V). • Shorted circuit in switch: Travel speed remains unchanged in auto-second gear (0 V).	• Even if travel mode switch is turned to the FAST position, fast travel mode cannot be selected. • Even if travel mode switch is turned to the SLOW position, travel mode is turned to the auto-second gear.
MC	• Controls engine, pump and valve operations.	• Depending on trouble situations, control system malfunction may differ. (The following symptoms in machine operation indicates that MC logic circuit has failed.)	• Even if engine starts, engine speed remains in idle speed. • As pump displacement is kept at minimum, all operation speeds are slow.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T2-2
11901-3, 11901-4	Monitor Item: Hydraulic oil temperature	-	-	T2-2
-	Monitor Item: Power Digging Switch	-	-	T2-2
-	Monitor Item: Travel Mode	-	-	T2-2
11000-2, 11001-2, 11002-2, 11003-3	-	-	Before suspecting a failure in MC, check fuses in control system. If any sensor in 5 V system is shorted circuit, fault codes of all sensor is displayed.	T2-2

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Auto-Idle Switch	• Activates auto-idle. ON: 0 V → Auto-idle control is operated. OFF: 5 V → Auto-idle is not operated.	• Open circuit: Auto-idle is not operated. • Shorted circuit: Even if auto-idle switch is in OFF position, auto-idle control is always operated.	• Open circuit: Auto-idle is not operated. • Shorted circuit: Even if auto-idle switch is in OFF position, auto-idle control is always operated.
Power Mode Switch (HP Mode)	• Activates HP mode control. ON: 0 V → HP mode control is operated. OFF: 5 V → Normal.	• Open circuit: Even if HP mode is selected, HP mode is not operated. • Shorted circuit: Even if HP mode switch is turned OFF, HP mode is continued. Attachment speed increase control (optional) becomes ineffective.	• Open circuit: Even if HP mode is selected, HP mode is not operated. • Shorted circuit: Even if HP mode switch is turned OFF, HP mode is continued. Attachment speed increase control (optional) becomes ineffective.
Power Mode Switch (E Mode)	• Selects E mode. ON: 0 V → E mode OFF: 5 V → Normal.	• Open circuit: Even if E mode is selected, engine speed does not decrease with the control lever in neutral. When E mode is selected and engine is operated at full speed with light load, engine speed does not increase. • Shorted circuit: When the control lever is in neutral and the engine control dial is at FAT idle position and even if the power mode switch is shifted from E mode to P mode, engine speed does not increase.	• Open circuit: Even if E mode is selected, engine speed does not decrease with the control lever in neutral. When E mode is selected and engine is operated at full speed with light load, engine speed does not increase. • Shorted circuit: When the control lever is in neutral and the engine control dial is at FAT idle position and even if the power mode switch is shifted from E mode to P mode, engine speed does not increase.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T2-2
-	Monitor Item: E/P/HP mode switch	-	-	T2-2
-	Monitor Item: E/P/HP mode switch	-	-	T2-2

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Arm 2 Flow Rate Control Valve	• Be shifted by pilot pressure from solenoid valve unit (SC). • Ensures boom raise speed during combined operation of boom and arm.	• If spool is bound or spring is broken, orifice does not change	• If fully opened: Boom raise speed is slow. • If fully closed: Arm roll-in speed is slow during arm level crowd operation.
Flow Combiner Valve	• Supplies oil to both right and left travel spools from pump 1 during combined operation of travel and front/swing.	• During combined operation of travel and front/swing, oil is not supplied to left travel spool, or insufficient oil is supplied to left travel spool.	• While traveling and when front/swing lever is operated, machine mistracks to the left.
Arm 1 Flow Rate Control Valve	• Be shifted by pilot pressure from arm flow rate control valve in signal control valve. • Ensures swing power.	• If spool is bound or spring is broken, orifice does not change.	• If fully opened: swing power is lack. • If fully closed: Arm roll-in speed is slow during arm level crowd operation.
Bucket Flow Rate Control Valve	• Restricts oil flow to bucket during 3-combined operation of bucket, arm roll-in and boom raise, and allows boom to raise.	• If selector valve is bound with selector valve activated, bucket circuit is always restricted.	• If poppet valve is bound at fully closed position or if selector valve is bound when poppet valve is fully closed, bucket speed becomes slow. • If poppet valve is bound at fully open position or if selector valve is bound when poppet valve is fully open, boom does not raise during 3-combined operation of bucket, arm roll-in and boom raise.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-3
-	-	-	-	T3-3
-	-	-	-	T3-3
-	-	-	-	T3-3

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Auxiliary Flow Rate Control Valve	• Be shifted by pilot pressure from auxiliary flow rate control solenoid valve.	• If spool is bound or spring is broken, orifice does not change.	• If bound at fully closed position, attachment speed becomes slow. • If bound at fully open position, boom does not raise during 3-combined operation of swing, arm roll-in and boom raise.
Boom Regenerative Valve	• Routes return oil from boom cylinder bottom side to rod side and prevents boom cylinder hesitation.	• If check valve is kept closed, boom is not smoothly lowered. • If check valve is kept open, machine cannot be raised off ground with front attachment.	• If check valve is kept closed, boom is not smoothly lowered. • If check valve is kept open, machine cannot be raised off ground with front attachment.
Arm Regenerative Valve	• Be shifted by pilot pressure from solenoid valve unit (SC). • Routes return oil from arm cylinder rod side to bottom side and increases arm speed.	• Arm regenerative function is not operated.	• Arm speed is extremely slow during arm level crowd operation while arm regenerative valve is kept closed. • The lever operated first is given priority during combined operation of arm roll-in and swing while arm regenerative valve is kept open.
Bucket Regenerative Valve	• Routes return oil from bucket cylinder rod side to bottom side and prevents bucket cylinder hesitation.	• If check valve is kept closed, bucket is not smoothly rolled in. • If check valve is kept open, bucket power is weak.	• If check valve is kept closed, bucket is not smoothly rolled in. • If check valve is kept open, bucket power is weak.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-3
-	-	-	-	T3-3
-	-	-	-	T3-3
-	-	-	-	T3-3

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Arm Anti-Drift Valve	• Forcibly open check valve in arm roll-in return circuit and allows arm to move only when arm is rolled in. Prevents arm from drifting due to oil leaks in control valve.	• If switch valve is bound, check valve does not open.	• If check valve is kept closed, arm roll-in speed becomes slow. • If check valve is kept open, front attachment drift increases due to oil leaks in control valve. • Arm moves jerky or arm speed becomes slow depending on valve bound conditions.
Boom Anti-Drift Valve	• Forcibly open check valve in boom lower return circuit and allows boom to move only when boom is lowered. Prevents boom from drifting due to oil leaks in control valve.	• If switch valve is bound, check valve does not open.	• If check valve is kept closed, boom does not lower. • If check valve is kept open, front attachment drift increases due to oil leaks in control valve. • Boom moves jerky or boom speed becomes slow depending on valve bound conditions.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-3
-	-	-	-	T3-3

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Bypass Shut-Out Valve	• Supplies pressure oil from pump 1 to auxiliary spool when auxiliary spool is operated. • Increases pump 1 pressure when machine is raised off the ground.	• If spool is bound at fully open, single attachment operation speed becomes slow. • If spool is bound at fully closed, main relief valve continues to relieve with all control levers in neutral. • When all control levers are in neutral, pump 1 pressure is higher than pump 2 pressure by depending on spool bound condition. • If spool is bound at fully closed, machine cannot be raised off the ground.	• If spool is bound at fully open, single attachment operation speed becomes slow. • If spool is bound at fully closed, main relief valve continues to relieve with all control levers in neutral. • When all control levers are in neutral, pump 1 pressure is higher than pump 2 pressure by depending on spool bound condition. • If spool is bound at fully closed, machine cannot be raised off the ground.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-3

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Pump 1 Flow Rate Control Valve	• Supplies flow rate control pressure Pi to pump 1 regulator in response to lever stroke when boom (raise/lower), arm (roll-out/in), bucket (roll-out/in), right travel or auxiliary is operated.	• If spool is bound at fully open, even if control lever is in neutral, pump 1 swash angle is tilted to maximum. (When traveling with travel levers held in half stroke, machine mistracks to the left.) • If spool is bound at fully open, pump 1 control pressure sensor detects the maximum pressure. • If spool is bound at fully closed, even if control lever is operated, pump 1 swash angle is tilted to minimum. (Right travel is not operated during single travel operation. Bucket speed becomes very slow.) • If spool is bound at fully open, pump 1 control pressure sensor cannot detect pump control pressure. (Right travel does not run fast with right track jacked-up.)	• If spool is bound at fully open, even if control lever is in neutral, pump 1 swash angle is tilted to maximum. (When traveling with travel levers held in half stroke, machine mistracks to the left.) • If spool is bound at fully open, pump 1 control pressure sensor detects the maximum pressure. • If spool is bound at fully closed, even if control lever is operated, pump 1 swash angle is tilted to minimum. (Right travel is not operated during single travel operation. Bucket speed becomes very slow.) • If spool is bound at fully open, pump 1 control pressure sensor cannot detect pump control pressure. (Right travel does not run fast with right track jacked-up.)

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-6

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Pump 2 Flow Rate Control Valve	• Supplies flow rate control pressure Pi to pump 2 regulator in response to lever stroke when boom (raise/lower), arm (roll-out/in), swing (right/left), left travel or auxiliary is operated.	• If spool is bound at fully open, even if control lever is in neutral, pump 2 swash angle is tilted to maximum. (When traveling with travel levers held in half stroke, machine mistracks to the right.) • If spool is bound at fully open, pump 2 control pressure sensor detects the maximum pressure. • If spool is bound at fully closed, even if control lever is operated, pump 2 swash angle is tilted to minimum. (Left travel is inoperable during single travel operation. Swing speed becomes very slow.) • If spool is bound at fully open, pump 2 control pressure sensor cannot detect pump control pressure. (Left travel does not run fast with left track jacked-up.)	• If spool is bound at fully open, even if control lever is in neutral, pump 2 swash angle is tilted to maximum. (When traveling with travel levers held in half stroke, machine mistracks to the right.) • If spool is bound at fully open, pump 2 control pressure sensor detects the maximum pressure. • If spool is bound at fully closed, even if control lever is operated, pump 2 swash angle is tilted to minimum. (Left travel is inoperable during single travel operation. Swing speed becomes very slow.) • If spool is bound at fully open, pump 2 control pressure sensor cannot detect pump control pressure. (Left travel does not run fast with left track jacked-up.)
Flow Combiner Valve Control Spool	• Be shifted by right travel pilot pressure and supplies control pressure to flow combiner valve in control valve.	• If spool is bound at fully open, when boom, arm, bucket or swing is operated, flow combiner valve is shifted. • If spool is bound at fully closed, when combined operation of travel and front/swing is made, machine mistracks to the left. (Left travel speed becomes slow.)	• If spool is bound at fully open, when boom, arm, bucket or swing is operated, flow combiner valve is shifted. • If spool is bound at fully closed, when combined operation of travel and front/swing is made, machine mistracks to the left. (Left travel speed becomes slow.)

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-6
-	-	-	-	T3-6

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Swing Parking Brake Release Spool	• Be shifted by boom, arm, bucket or swing pilot pressure and supplies swing parking brake release pressure.	• If spool is bound at fully open, swing parking brake is kept released. (Machine vibrates while traveling.) • If spool is bound at fully open, pressure sensor (front attachment) is always turned into ON. Thus, engine speed does not decrease when control lever is in neutral during auto-idle control. • If spool is bound at fully closed, swing parking brake is kept applied. (Dragging is felt.) • If spool is bound at fully closed, pressure sensor (front attachment) is always turned into OFF. Thus, engine speed does not increase when control lever is operated during auto-idle control.	• If spool is bound at fully open, swing parking brake is kept released. (Machine vibrates while traveling.) • If spool is bound at fully open, pressure sensor (front attachment) is always turned into ON. Thus, engine speed does not decrease when control lever is in neutral during auto-idle control. • If spool is bound at fully closed, swing parking brake is kept applied. (Dragging is felt.) • If spool is bound at fully closed, pressure sensor (front attachment) is always turned into OFF. Thus, engine speed does not increase when control lever is operated during auto-idle control.
Bucket Flow Rate Control Valve Control Spool	• Be shifted by arm roll-in pilot pressure and supplies boom raise pilot pressure to bucket flow rate control valve as control pressure.	• If spool is bound at fully open, bucket speed becomes slow during combined operation of boom raise and bucket. (Bucket flow rate control is ineffective.) • If spool is bound at fully closed, boom does not raise during 3-combined operation of bucket, arm roll-in and boom raise.	• If spool is bound at fully open, bucket speed becomes slow during combined operation of boom raise and bucket. (Bucket flow rate control is ineffective.) • If spool is bound at fully closed, boom does not raise during 3-combined operation of bucket, arm roll-in and boom raise.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-3
-	-	-	-	T3-3

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Arm Flow Rate Control Valve Control Spool	• Be shifted by arm roll-in pilot pressure and supplies to arm flow rate control valve 1 on 5-spool side in control valve as control pressure.	• If spool is bound at fully open, arm speed decreases during single arm operation. (Arm flow rate control is always operated.) • If spool is bound at fully closed, swing power becomes insufficient during combined operation of swing and arm roll-in. (Arm flow rate control is not operated.)	• If spool is bound at fully open, arm speed decreases during single arm operation. (Arm flow rate control is always operated.) • If spool is bound at fully closed, swing power becomes insufficient during combined operation of swing and arm roll-in. (Arm flow rate control is not operated.)
Digging Regenerative Valve	• Be shifted by pilot pressure from solenoid valve unit (SF). • Routes return oil from boom cylinder rod side to arm cylinder bottom side and increases arm speed.	• If valve is kept closed, arm roll-in speed becomes slow during digging operation. • If valve is kept open, arm speed becomes fast. • Shock occurs during boom raise operation.	• If valve is kept closed, arm roll-in speed becomes slow during digging operation. • If valve is kept open, arm speed becomes fast. • Shock occurs during boom raise operation.
Boom Flow Rate Control Valve	• Be shifted by pilot pressure from boom lower meter-in cut valve. • Controls flow rate to boom 1 spool during combined operation and improves combined operation.	• If valve is at fully open, boom lower speed becomes fast during combined operation. • If valve is at fully closed, machine cannot be raised off ground with front attachment.	• If valve is at fully open, boom lower speed becomes fast during combined operation. • If valve is at fully closed, machine cannot be raised off ground with front attachment.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-6
-	-	-	-	T3-3
-	-	-	-	T3-3

Item / Parts	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Boom Lower Meter-In Cut Valve	• Be shifted by return oil from boom cylinder bottom side. • Shifts boom flow rate control valve by boom lower pilot pressure.	• If valve is kept closed, as boom flow rate control valve is not shifted, boom lower speed becomes fast during combined operation. • If valve is kept open, as boom flow rate control valve is shifted, pressure oil from pump 1 does not flow to boom 1 spool. Therefore, machine cannot be raised off ground with front attachment.	• If valve is kept closed, as boom flow rate control valve is not shifted, boom lower speed becomes fast during combined operation. • If valve is kept open, as boom flow rate control valve is shifted, pressure oil from pump 1 does not flow to boom 1 spool. Therefore, machine cannot be raised off ground with front attachment.
Auxiliary Flow Combining Valve (Optional)	• Be shifted by pilot pressure from auxiliary flow combining solenoid valve when attachment mode (secondary crusher, primary crusher) of travel speed “ON” is selected. • Supplies pressure oil from pump 1 to auxiliary spool.	• If switch valve is kept closed, attachment speed does not become fast during single auxiliary operation. • If switch valve is kept open, attachment speed does not become slow when attachment mode (HSB breaker, NPK breaker) of travel speed “OFF” is selected.	• If switch valve is kept closed, attachment speed does not become fast during single auxiliary operation. • If switch valve is kept open, attachment speed does not become slow when attachment mode (HSB breaker, NPK breaker) of travel speed “OFF” is selected.
Selector Valve (Optional)	• Be shifted by pilot pressure from selector valve control solenoid valve.	• If spool is bound or spring is broken, pressure oil from breaker does not return to hydraulic oil tank.	• Breaker stroke becomes few.
Accumulator Control Valve (Optional)	• Be shifted by pilot pressure from accumulator control solenoid valve.	• If spool is bound or spring is broken, accumulator shifting is turned OFF.	• When NPK breaker is used, hydraulic pulsation (hose vibration) becomes big.
Secondary Pilot Relief Pressure Control Valve (Optional)	• Be shifted by pilot pressure from secondary pilot relief pressure control solenoid valve.	• If spool is bound or spring is broken, relief circuit in breaker is blocked.	• Relief set-pressure in auxiliary circuit does not decrease.

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-3
-	-	-	-	T3-3
-	-	-	-	T2-2
-	-	-	-	T2-2
-	-	-	-	T2-2

CORRELATION BETWEEN TROUBLE SYMPTOMS AND PART FAILURES

This table indicates the relationship between machine troubles and parts contributing to the cause of the trouble if failed.

● : Related, required to check
○ : Related. However, in case this component fails, other trouble symptom will be more noticeable so that this component will not be the direct cause of the trouble concerned.

Engine System Troubleshooting

Trouble Symptom / Parts	E-1 Starter does not rotate.	E-2 Even if starter rotates, engine does not start.	E-3 When engine control dial is fully rotated, engine stalls. When engine control dial is fully rotated, engine speed is slow.
MC		●	●
ECM		○	
ICF		○	
Monitor Unit	●	○	
Pump 1 Delivery Pressure Sensor			
Pump 2 Delivery Pressure Sensor			
Pump 1 Control Pressure Sensor			
Pump 2 Control Pressure Sensor			
Pressure Sensor (Travel)			
Pressure Sensor (Front Attachment)			
Pressure Sensor (Swing)			
Pressure Sensor (Boom Raise)			
Pressure Sensor (Arm Roll-In)			
Pressure Sensor (Auxiliary)			
Hyd. Oil Temperature Sensor			
Coolant Temperature Sensor			
Key Switch	●		
Engine Control Dial			
Auto-Idle Switch			
Power Mode Switch			
Travel Mode Switch			
Torque Control Solenoid Valve			
Starter Cut Relay	●		
ECM Main Relay			
Battery Relay	●		
Glow Relay			
Engine Electrical Equipment			
Engine Unit		●	●
Pump Regulator			
Swing Parking Brake Release Spool (Signal Control Valve)			
Remarks	Check batteries.		

NOTE: The trouble symptoms in this table are described provided that each trouble occurs independently.

In case more than one trouble occurs at the same time, find out all faulty components while checking all suspected components in each trouble symptom.

E-4	E-5	E-6	E-7
Even if engine control dial is rotated, engine speed remains unchanged.	Engine speed does not increase when engine starts.	Faulty HP mode.	Faulty Travel HP mode.
●	●	●	●
●	●	○	○
		●	●
		●	●
			●
		●	
		●	
	●		
	●		
●			
		●	
			●
●			

● : Related, required to check
○ : Related. However, in case this component fails, other trouble symptom will be more noticeable so that this component will not be the direct cause of the trouble concerned.

Trouble Symptom / Parts	E-8 Even if key switch is turned OFF, engine does not stop.	E-9 Faulty auto-idle system.	E-10 Faulty E mode.
MC	○	●	●
ECM	●	○	○
ICF			
Monitor Unit			
Pump 1 Delivery Pressure Sensor			●
Pump 2 Delivery Pressure Sensor			●
Pump 1 Control Pressure Sensor			●
Pump 2 Control Pressure Sensor			●
Pressure Sensor (Travel)		○	
Pressure Sensor (Front Attachment)		○	
Pressure Sensor (Swing)			
Pressure Sensor (Boom Raise)			
Pressure Sensor (Arm Roll-In)			
Pressure Sensor (Auxiliary)			
Hyd. Oil Temperature Sensor			
Coolant Temperature Sensor			
Key Switch	○		
Engine Control Dial			
Auto-Idle Switch		●	
Power Mode Switch			●
Travel Mode Switch			
Torque Control Solenoid Valve			
Starter Cut Relay			
ECM Main Relay			
Battery Relay			
Glow Relay			
Engine Electrical Equipment			
Engine Unit			
Pump Regulator			
Swing Parking Brake Release Spool (Signal Control Valve)		●	
Remarks			

NOTE: The trouble symptoms in this table are described provided that each trouble occurs independently.

In case more than one trouble occurs at the same time, find out all faulty components while checking all suspected components in each trouble symptom.

E-11	E-12	E-13
When traveling or operating front attachment with engine running at slow idle, engine hunts.	Engine speed does not increase even if attachment is operated in attachment mode.	When attachment mode is selected, engine speed does not decrease.
●	●	●
○	○	○
	○	○
	●	
○		
●		

Trouble Symptom / Parts	E-14	E-15
	Engine stalls during operation under adverse condition such as at high altitude.	Engine is difficult to start at low temperature.
MC	●	
ECM	●	●
ICF		
Monitor Unit		
Pump 1 Delivery Pressure Sensor		
Pump 2 Delivery Pressure Sensor		
Pump 1 Control Pressure Sensor		
Pump 2 Control Pressure Sensor		
Pressure Sensor (Travel)		
Pressure Sensor (Front Attachment)		
Pressure Sensor (Swing)		
Pressure Sensor (Boom Raise)		
Pressure Sensor (Arm Roll-In)		
Pressure Sensor (Auxiliary)		
Hyd. Oil Temperature Sensor		
Coolant Temperature Sensor		●
Key Switch		
Engine Control Dial		
Auto-Idle Switch		
Power Mode Switch		
Travel Mode Switch		
Torque Control Solenoid Valve	●	
Starter Cut Relay		
ECM Main Relay		
Battery Relay		
Glow Relay		●
Engine Electrical Equipment	○	●
Engine Unit	○	●
Pump Regulator	●	
Swing Parking Brake Release Spool (Signal Control Valve)		
Remarks	Check batteries.	

(Blank)

All Actuator System Troubleshooting

Trouble Symptom / Parts	A-1 All actuator speeds are slow.	A-2 All actuators are not operated.	A-3 Left travel is not operated during single travel operation. Single swing operation speed becomes slow. Arm speed is slightly slow during arm level crowding.
MC	●		
ECM	○		
Monitor Unit		○	
Torque Control Solenoid Valve	●		
Pilot Shut-Off Solenoid Valve		●	
Pump 2 Delivery Pressure Sensor			
Pressure Sensor (Swing)			
Pressure Sensor (Arm Roll-In)			
Pilot Shut-Off Lever		●	
Pilot Shut-Off Relay		●	
Security Relay		●	
Spool			
Main Relief Valve	○		
Arm 1 Flow Rate Control Valve			
Main Pump	●		●
Regulator	○		●
Pilot Pump	●		
Pilot Valve			
Pilot Relief Valve	●		
Pump 1 Flow Rate Control Valve (Signal Control Valve)			
Pump 2 Flow Rate Control Valve (Signal Control Valve)			●
Arm Flow Rate Control Valve Control Spool (Signal Control Valve)			
Remarks			

NOTE: The trouble symptoms in this table are described provided that each trouble occurs independently. In case more than one trouble occurs at the same time, find out all faulty components while checking all suspected components in each trouble symptom.

● : Related, required to check
○ : Related. However, in case this component fails, other trouble symptom will be more *noticeable so that this component will not be the direct cause of the trouble concerned.*

A-4	A-5	A-6	A-7
Right travel is not operated during single travel operation. Single bucket operation speed becomes slow. Boom is not raised properly during arm level crowding.	Actuator does not stop even if control lever is turned to neutral.	Occasionally, swing or arm roll-in speed becomes slow during combined operation of swing and arm roll-in.	Actuator speed is faster than normal. Machine mistracks when travel lever is operated at half stroke. Precise control cannot be performed.
	●		
		●	
●			
●			●
	●		
●			●
			●
		●	

Trouble Symptom / Parts	A-8 Engine lug down is large when actuator in maximum flow rate gear pump (optional) is operated.
MC	●
ECM	
Monitor Unit	
Torque Control Solenoid Valve	●
Pilot Shut-Off Solenoid Valve	
Pump 2 Delivery Pressure Sensor	
Pressure Sensor (Swing)	
Pressure Sensor (Arm Roll-In)	
Pilot Shut-Off Lever	
Pilot Shut-Off Relay	
Security Relay	
Spool	
Main Relief Valve	
Arm 1 Flow Rate Control Valve	
Main Pump	
Regulator	
Pilot Pump	
Pilot Valve	
Pilot Relief Valve	
Pump 1 Flow Rate Control Valve (Signal Control Valve)	
Pump 2 Flow Rate Control Valve (Signal Control Valve)	
Arm Flow Rate Control Valve Control Spool (Signal Control Valve)	
Pump 3 Delivery Pressure Sensor (Optional)	●
Remarks	

(Blank)

Front Attachment System Troubleshooting

Trouble Symptom / Parts	F-1	F-2	F-3
	All front attachment actuator power is weak.	Even if power digging switch is pushed, power does not increase. Boom raise power is weak when digging.	Some cylinder are not operated or speeds are slow.
MC		●	
Solenoid Valve Unit (SG)		●	
Solenoid Valve Unit (SF)			
Solenoid Valve Unit (SC)			
Pump 1 Delivery Pressure Sensor			
Pump 2 Delivery Pressure Sensor			
Pressure Sensor (Swing)			
Pressure Sensor (Boom Raise)			
Pressure Sensor (Arm Roll-In)			
Power Digging Switch		●	
Spool			●
Main Relief Valve	●	●	
Overload Relief Valve		●	●
Load Check Valve			
Digging Regenerative Valve			
Boom Regenerative Valve			
Arm Regenerative Valve			
Bucket Regenerative Valve			
Boom Flow Rate Control Valve			
Arm 1 Flow Rate Control Valve			
Arm 2 Flow Rate Control Valve			
Bucket Flow Rate Control Valve			
Boom Lower Meter-In Cut Valve			
Boom Anti-Drift Valve			
Arm Anti-Drift Valve			
Emergency Valve			
Shockless Valve (Signal Control Valve)			●
Shuttle Valve (Signal Control Valve)			●
Bucket Flow Rate Control Valve Control Spool (Signal Control Valve)			
Arm Flow Rate Control Valve Control Spool (Signal Control Valve)			
Pilot Valve			●
Cylinder			
Remarks			

NOTE: The trouble symptoms in this table are described provided that each trouble occurs independently. In case more than one trouble occurs at the same time, find out all faulty components while checking all suspected components in each trouble symptom.

F-4	F-5	F-6	F-7	F-8
Arm speed is slow during combined operation. During combined operation of boom raise and arm roll-in, boom raise speed is slow. Arm speed is slow during arm level crowding.	Arm roll-in speed is slow when digging.	Bucket is slightly slow during bucket roll-in single operation. Bucket does not move smoothly during bucket roll-in single operation.	When starting to move during combined operation, arm does not smoothly move. Arm starts to move slightly slow during arm roll-in single operation. These troubles often occur when temperature is low.	When starting to move during combined operation, boom does not smoothly move. Boom starts to move slightly slow during boom lower single operation.
●	●			
	●			
●				
○	○			
○	○			
○				
○	○			
○	○			
	●			
				●
●			●	
		●		
●				
●		●		
				●
			●	
		○		
		●		
●				

● : Related, required to check

○ : Related. However, in case this component fails, other trouble symptom will be more noticeable so that this component will not be the direct cause of the trouble concerned.

NOTE: The trouble symptoms in this table are described provided that each trouble occurs independently.

In case more than one trouble occurs at the same time, find out all faulty components while checking all suspected components in each trouble symptom.

Front Attachment System Troubleshooting

Trouble Symptom	F-9 When boom raise or arm roll-out is operated, boom or arm starts to move after slightly moving downward.	F-10 Front attachment drifts remarkably.	F-11 Boom lower above ground is faster than other actuators during combined operation.	F-12 Machine cannot be raised off ground.
MC				
Solenoid Valve Unit (SG)				
Solenoid Valve Unit (SF)				
Solenoid Valve Unit (SC)				
Pump 1 Delivery Pressure Sensor				
Pump 2 Delivery Pressure Sensor				
Pressure Sensor (Swing)				
Pressure Sensor (Boom Raise)				
Pressure Sensor (Arm Roll-In)				
Power Digging Switch				
Spool		●		
Main Relief Valve				
Overload Relief Valve		●		
Load Check Valve	●			
Digging Regenerative Valve				
Boom Regenerative Valve				
Arm Regenerative Valve				
Bucket Regenerative Valve				
Boom Flow Rate Control Valve			●	●
Arm 1 Flow Rate Control Valve				
Arm 2 Flow Rate Control Valve				
Bucket Flow Rate Control Valve				
Boom Lower Meter-In Cut Valve			●	●
Boom Anti-Drift Valve	●	●		
Arm Anti-Drift Valve	●	●		
Emergency Valve		○		
Shockless Valve (Signal Control Valve)				
Shuttle Valve (Signal Control Valve)				
Bucket Flow Rate Control Valve Control Spool (Signal Control Valve)				
Arm Flow Rate Control Valve Control Spool (Signal Control Valve)		●		
Pilot Valve				
Cylinder		●		
Remarks				

● : Related, required to check

○ : Related. However, in case this component fails, other trouble symptom will be more noticeable so that this component will not be the direct cause of the trouble concerned.

Trouble Symptom / Parts	F-13	F-14	F-15
	Attachment speed is fast during combined operation of attachment (optional) and front attachment (when secondary crusher or primary crusher is used).	Attachment speed is fast during combined operation of attachment (optional) and front attachment (when breaker attached with auxiliary flow combining line is used).	Attachment speed is fast during combined operation of attachment (optional) and front attachment (when vibrating hammer is used).
MC	●	●	●
Auxiliary Flow Rate Control Solenoid Valve	●		
Auxiliary Flow Combining Solenoid Valve		●	
Maximum Pump 1 Flow Rate Limit Control Solenoid Valve			●
Pressure Sensor (Auxiliary)	●	●	●
Pressure Sensor (Travel)			●
Pressure Sensor (Arm Roll-Out)	●	●	
Auxiliary Flow Rate Control	●		
Auxiliary Flow Combining Valve		●	
Remarks			

Swing/Travel/Other System Troubleshooting

Trouble Symptom / Parts	S-1	S-2	T-1	T-2
	Swing is slow or unmoving.	Swing is slow (weak in power) during combined operation of swing and arm roll-in. Swing does not start smoothly. Swing power is weak.	Both right and left tracks do not rotate or rotate slowly.	One side track does not rotate or rotates slowly. Machine mistracks.
MC (Main Controller)		●		
Torque Control Solenoid Valve				
Solenoid Valve Unit (SC)				
Solenoid Valve Unit (SI)				
Pump 1 Delivery Pressure Sensor				
Pump 2 Delivery Pressure Sensor		○		
Pump 1 Control Pressure Sensor				
Pump 2 Control Pressure Sensor				
Pressure Sensor (Travel)				
Pressure Sensor (Swing)		○		
Pressure Sensor (Arm Roll-In)		○		
Travel Mode Switch				
Pump Device				
Spool				●
Load Check Valve				
Arm 1 Flow Rate Control Valve		●		
Flow Combiner Valve				
Swing Parking Brake Release Spool (Signal Control Valve)	●			
Pump 1 Flow Rate Control Valve (Signal Control Valve)				○
Pump 2 Flow Rate Control Valve (Signal Control Valve)	●			○
Flow Combiner Valve Control Spool (Signal Control Valve)				
Arm Flow Rate Control Valve Control Spool (Signal Control Valve)		●		
Shuttle Valve (Signal Control Valve)	○			○
Swing Device	●			
Travel Device				●
Center Joint				●
Pilot Valve	●			●
Remarks			Refer to T-5.	In case either bucket or swing is also slow, refer to A-3 or A-4.

NOTE: The trouble symptoms in this table are described provided that each trouble occurs independently.

In case more than one trouble occurs at the same time, find out all faulty components while checking all suspected components in each trouble symptom.

T-3	T-4	T-5	O-1	O-2
Machine mistracks during combined operation of travel and front attachment.	Occasionally, machine may mistrack when traveling with engine running at slow speed.	Fast travel is not selected. Travel mode does not change from slow mode to fast mode.	Wiper is not operated.	Air Conditioner is faulty.
	●			
	●			
		●		
	○	○		
	○	○		
		○		
		○		
	○	○		
		●		
	●			
●				
●				
●				
		●		
			Operate the wire switch.	

● : Related, required to check

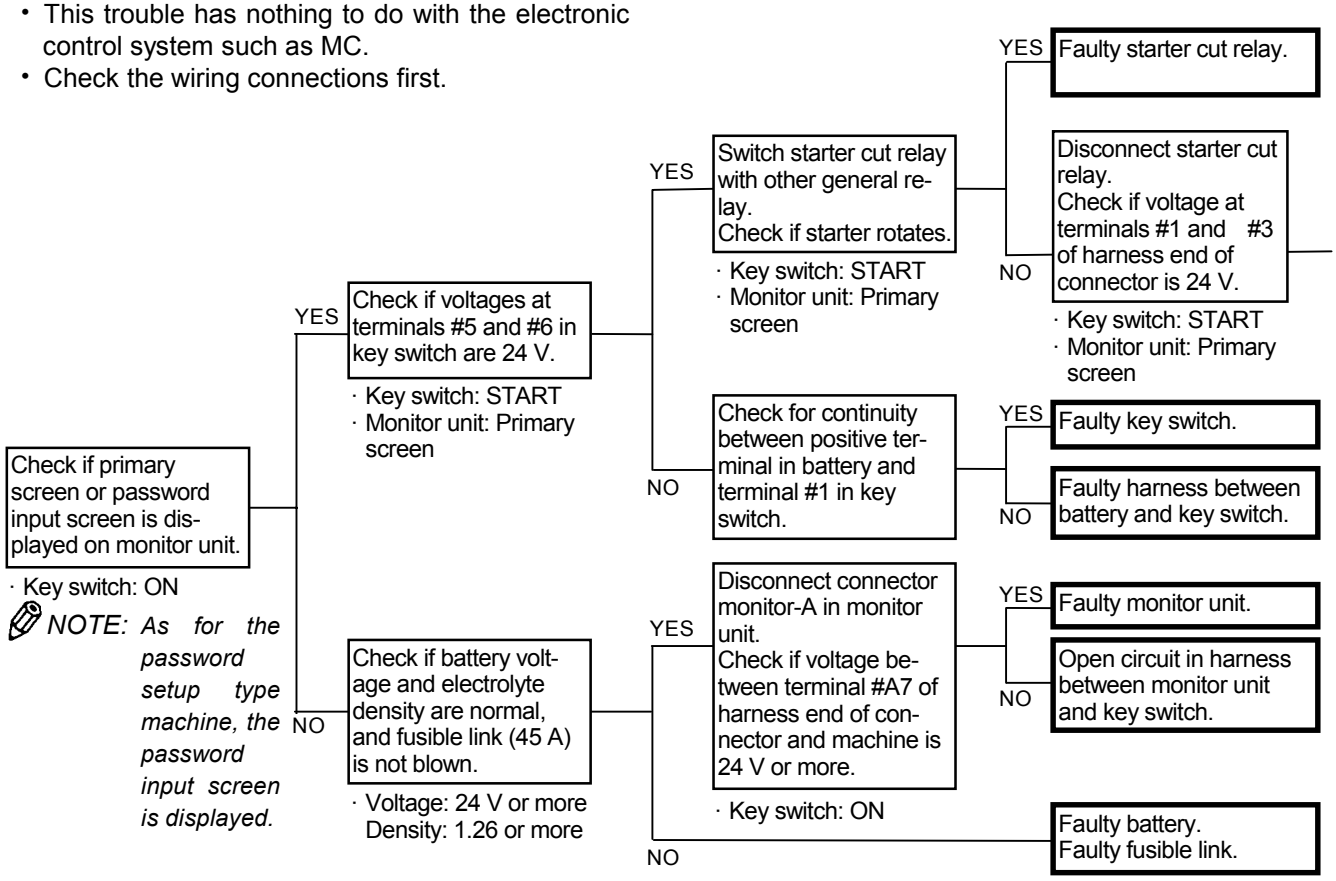
○ : Related. However, in case this component fails, other trouble symptom will be more noticeable so that this component will not be the direct cause of the trouble concerned.

ENGINE SYSTEM TROUBLESHOOTING

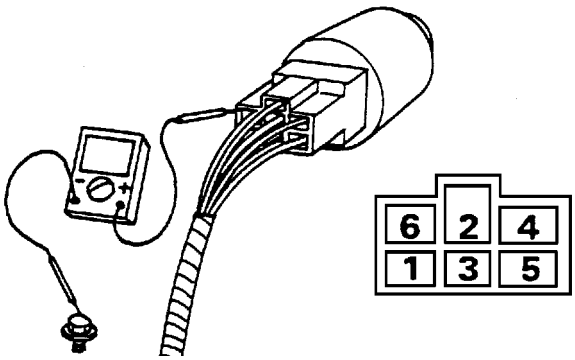
E-1 Starter does not rotate.
Related MC Fault Code: None

IMPORTANT: As electric current from the key switch is not routed to starter relay 2 with the pilot shut-off lever in ON position, the starter does not rotate. (Refer to "Electrical System".)

- This trouble has nothing to do with the electronic control system such as MC.
- Check the wiring connections first.

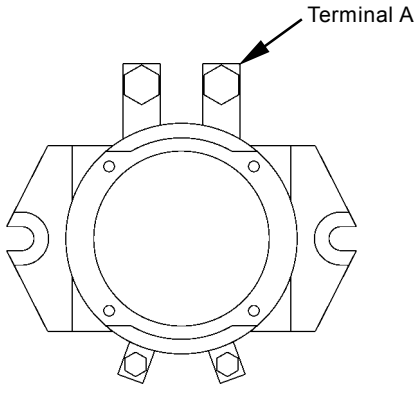


Key Switch:

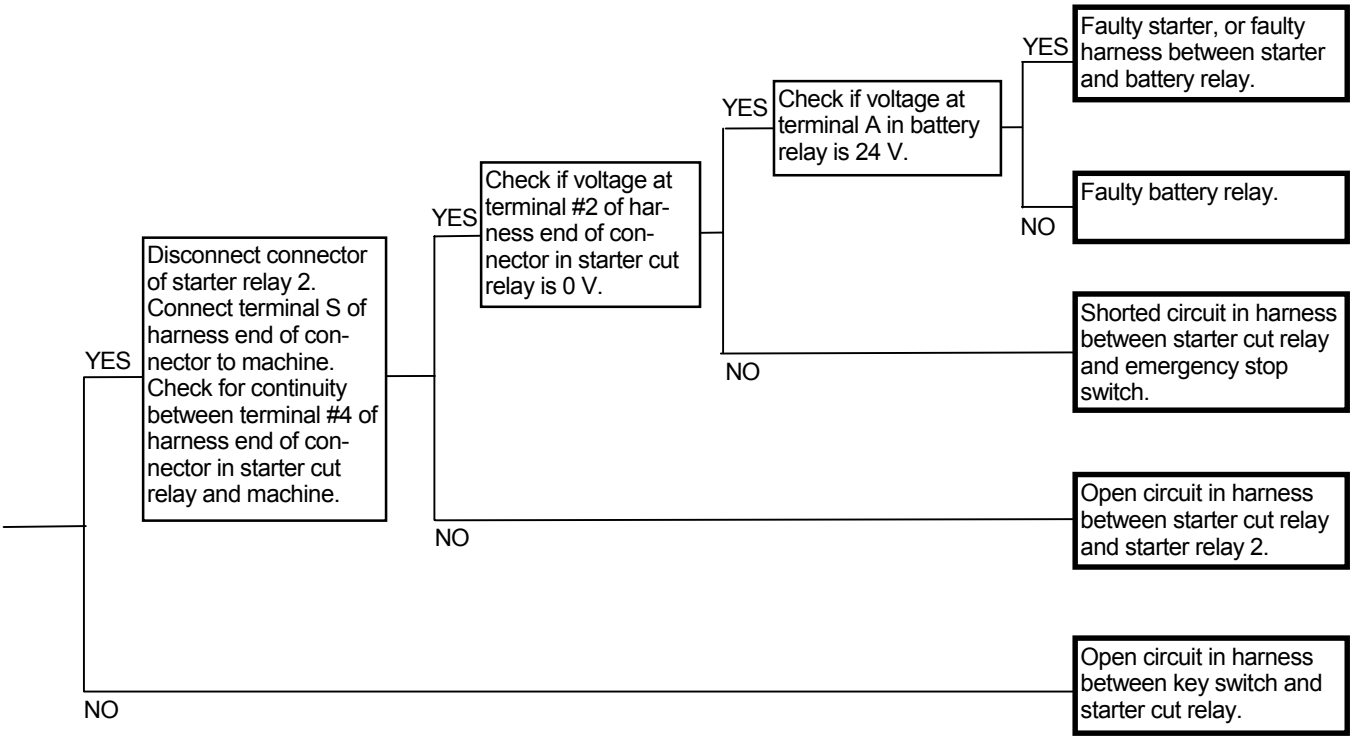


T105-07-04-002

Battery Relay:

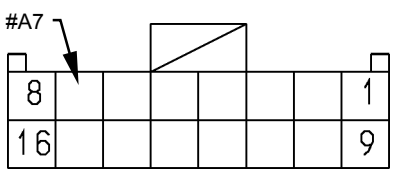


T178-05-04-001



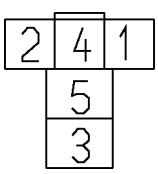
Connector (Harness end of connector viewed from the open side)

Monitor Unit
Connector Monitor-A



T183-05-05-001

Starter Cut Relay

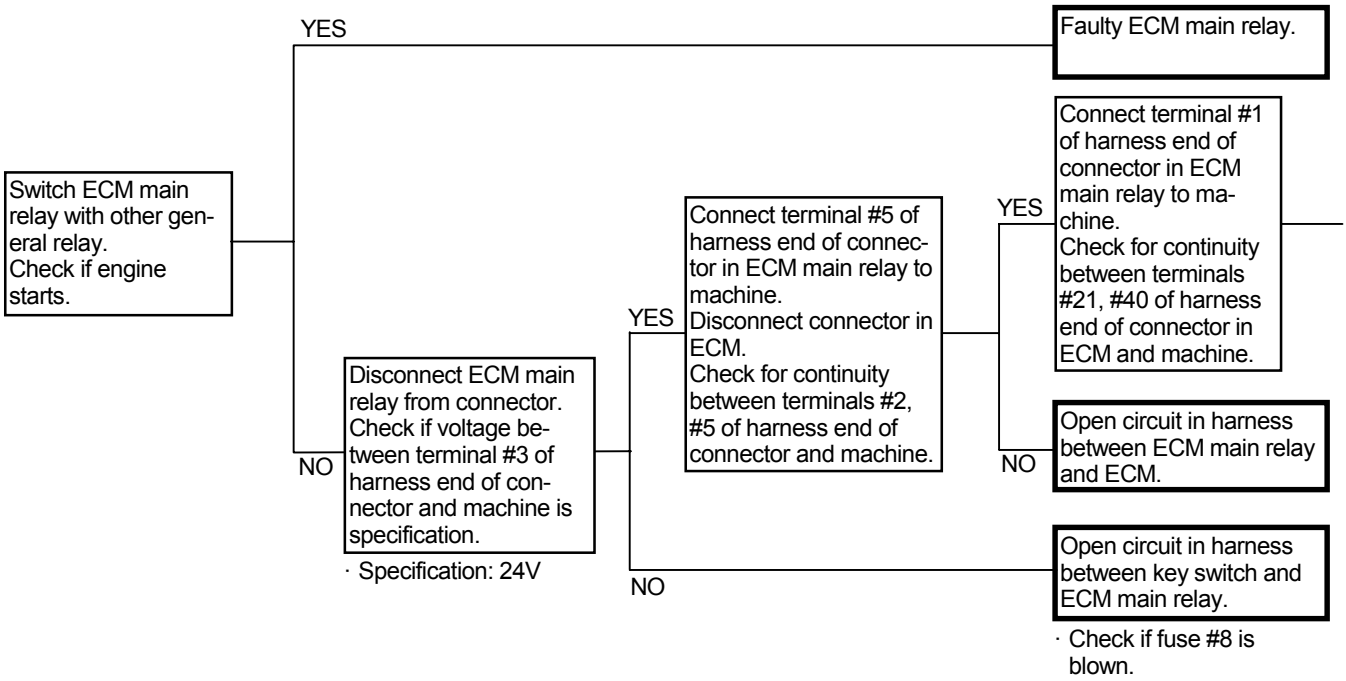


T183-05-04-003

E-2 Even if starter rotates, engine does not start.

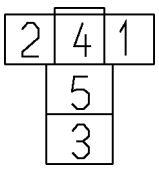
Related MC Fault Code: None

- Check the wiring connections first.



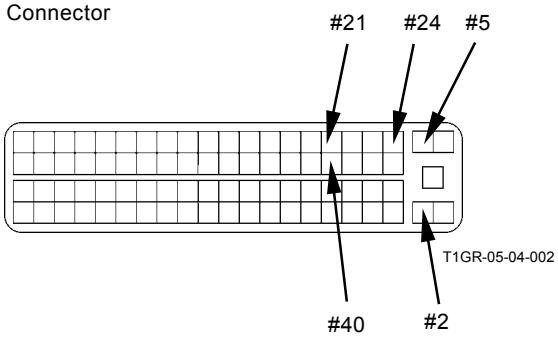
Connector (Harness end of connector viewed from the open side)

ECM Main Relay



T183-05-04-003

ECM Connector



T1GR-05-04-002

Check for continuity between terminal #2 of harness end of connector in ECM main relay and machine.

YES

Check if voltage between terminal #24 of harness end of connector in ECM and machine is specification.

- Key switch: ON
- Specification: 24 V

YES

Disconnect connector MC-B in MC. Check if voltage between terminal #B16 of harness end of connector and machine is specification.

- Key switch: ON
- Specification: 24 V

YES

Disconnect connector ICF-C in ICF. Check if voltage between terminal #C7 of harness end of connector and machine is specification.

- Key switch: ON
- Specification: 24 V

YES

Open circuit in harness between key switch and monitor unit.

Check if fuse #18 is blown.

NO

Open circuit in harness between key switch and ICF.

Check if fuse #18 is blown.

NO

Open circuit in harness between key switch and MC.

Check if fuse #18 is blown.

NO

Open circuit in harness between key switch and ECM.

Check if fuse #18 is blown.

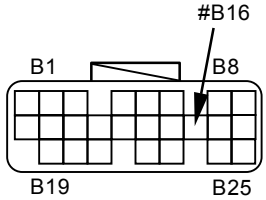
NO

Faulty ground in ECM main relay.

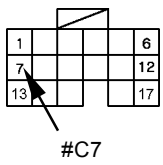
NO

Open circuit in harness between ECM main relay and ECM.

Connector MC-B



Connector ICF-C

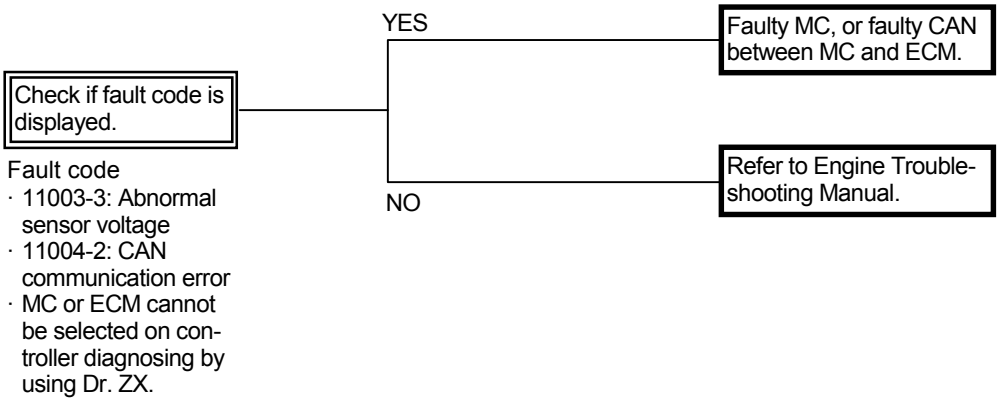


T1V1-05-04-002

E-3 When engine control dial is fully rotated, engine stalls.
When engine control dial is fully rotated, engine speed is slow.

Related MC Fault Code: 11003-3, 11004-2

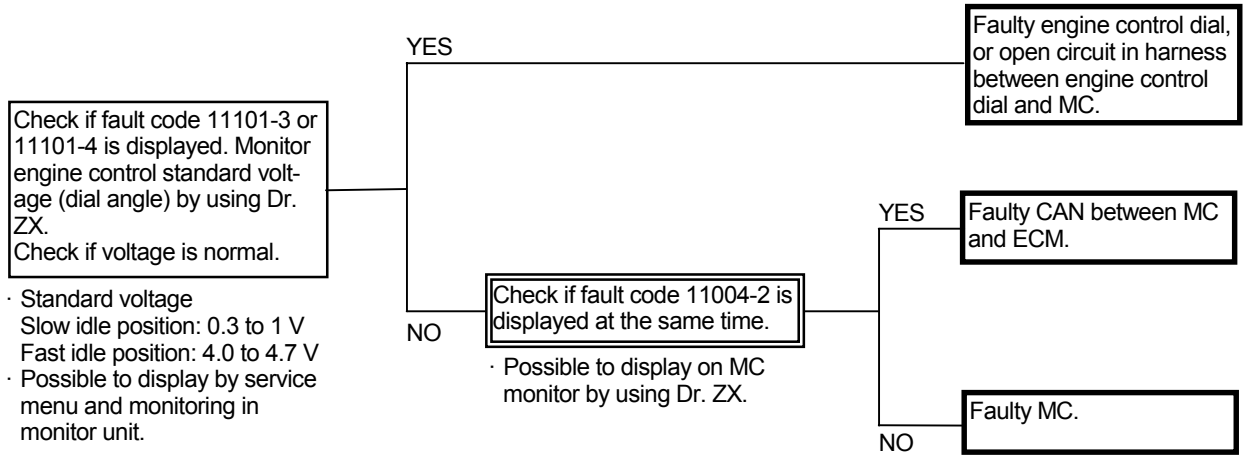
- Check the wiring connections first.



E-4 Even if engine control dial is rotated, engine speed remains unchanged.

Related MC Fault Code: 11004-2, 11101-3, 11101-4

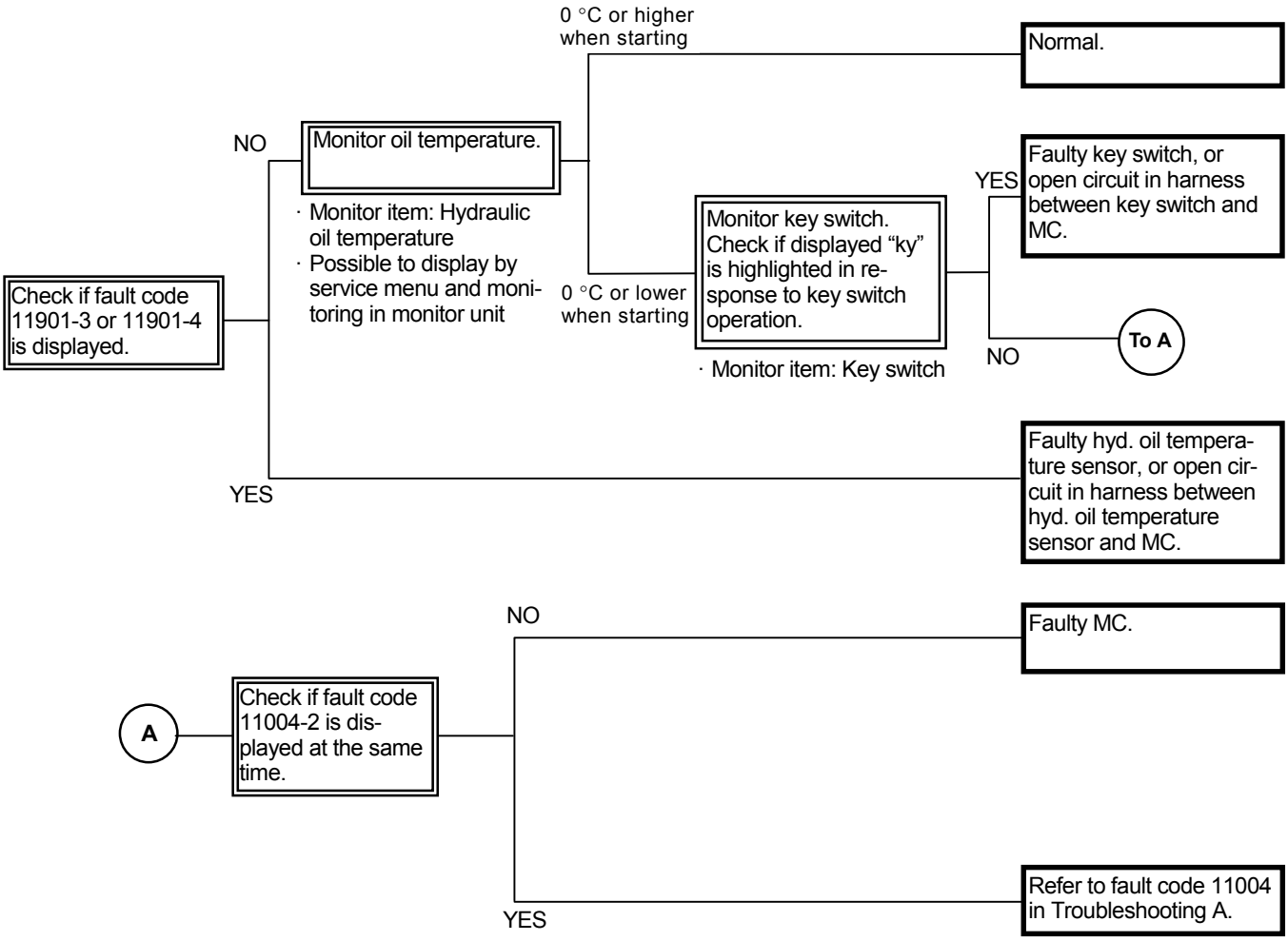
- Check the wiring connections first.



E-5 Engine speed does not increase when engine starts.

Related MC Fault Code: 11004-2, 11901-3, 11901-4

- Refer to the pages for the Auto Warming Up Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- Check the wiring connections first.



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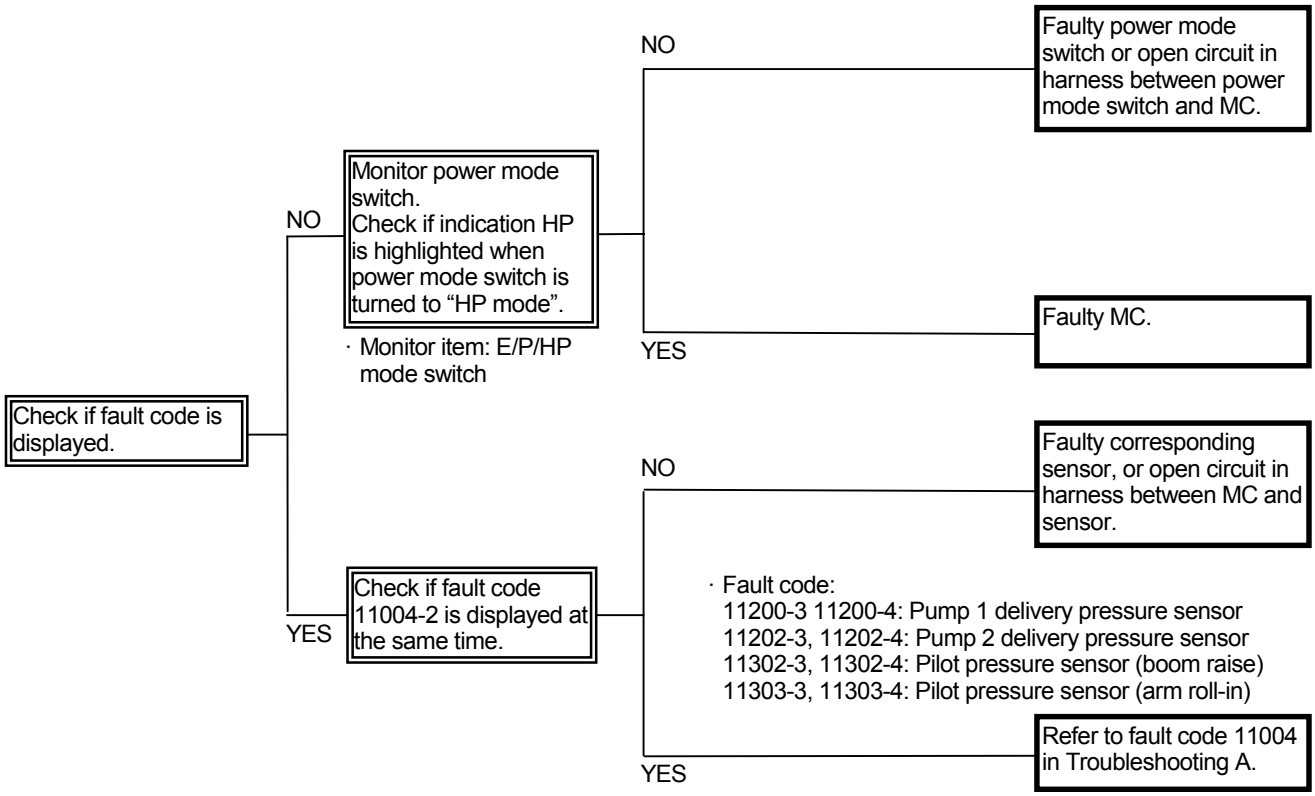
E-6 Faulty HP mode

- Even if power mode switch is turned to the HP mode position, HP mode is not operated. (General mode normally operates.)

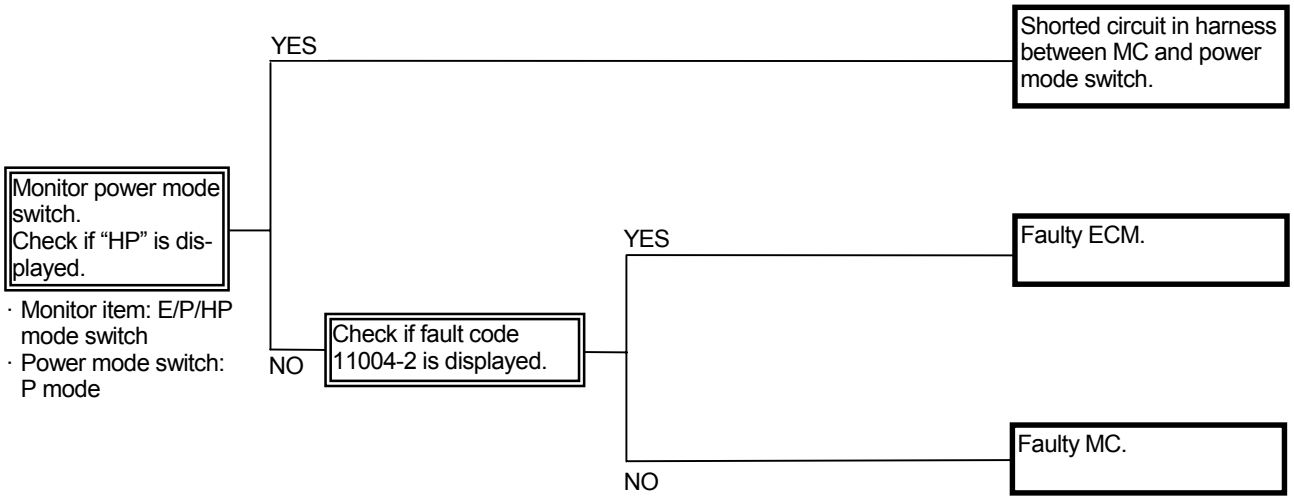
Related MC Fault Codes: 11004-2, 11200-3, 11200-4, 11202-3, 11202-4, 11302-3, 11302-4, 11303-3, 11303-4

- The sensors detect the conditions necessary to operate HP mode. Therefore, if any of these sensors fails, HP mode becomes ineffective.
- Pressure sensors (arm roll-in and boom raise) and pump 1 and 2 delivery pressure sensors are also engaged in the HP mode control. However, if these sensors fail, other operating functions will be also affected.
- Refer to the pages for HP Mode Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- Check the wiring connections first.



- Even if the power mode switch is not turned to HP mode, HP mode is operated.

  - Boom raise and arm roll-in must be operated when the average delivery pressures of pump 1 and 2 are high, if HP mode control is performed. The sensors related to this condition may not be faulty at the same time.

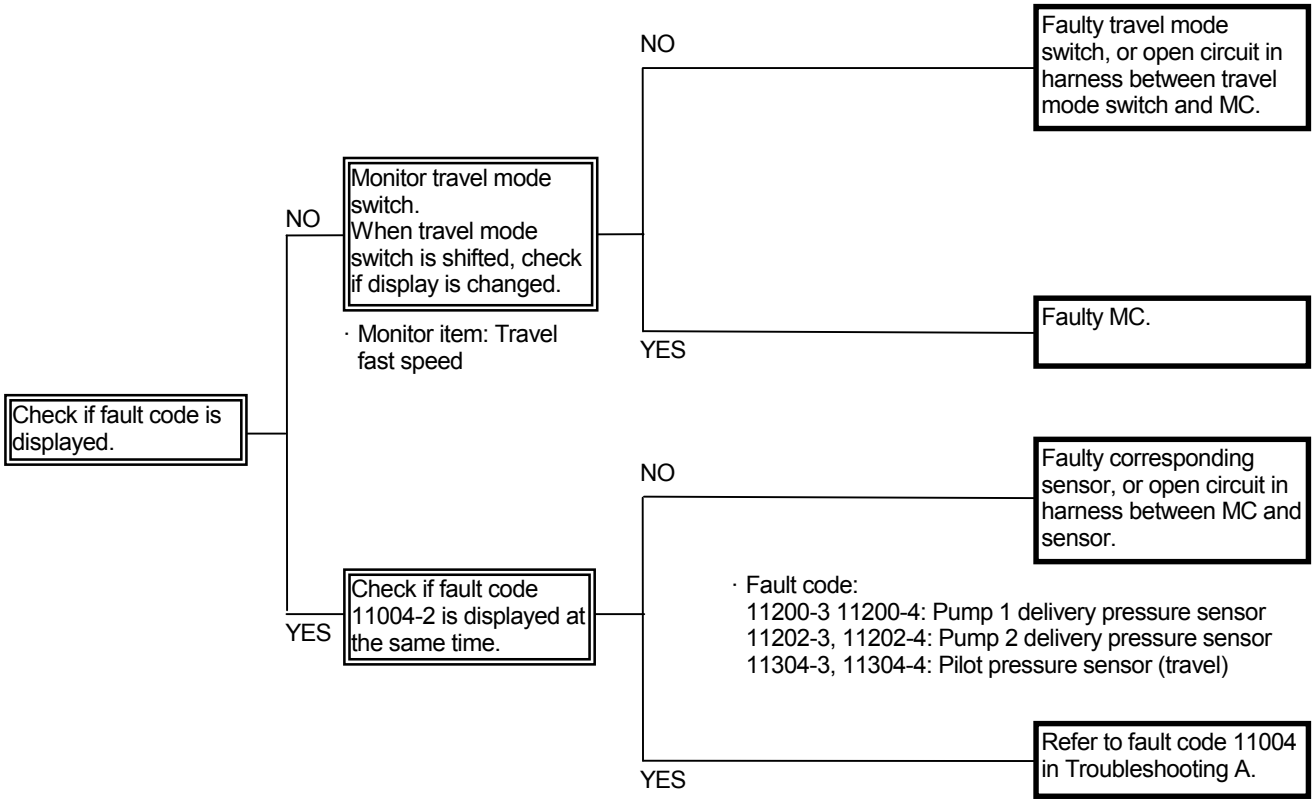


E-7 Faulty Travel HP mode

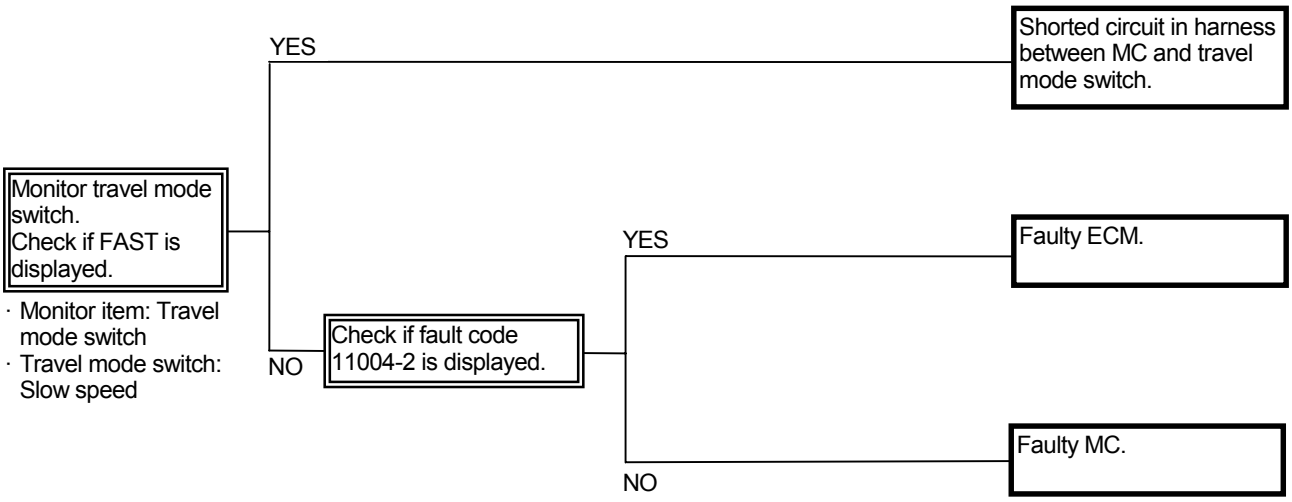
- Even if the travel mode switch is turned to FAST during single travel operation, travel HP mode is not operated.

Related MC Fault Code: 11004-2, 11200-3, 11200-4, 11202-3, 11202-4, 11304-3, 11304-4

- The sensors detect the conditions necessary to operate travel HP mode. Therefore, if any of these sensors fails, travel HP mode becomes ineffective.
- Pressure sensor (travel) and pump 1 and 2 delivery pressure sensors are also engaged in the HP mode control. However, if these sensors fails, other operating functions will be also affected.
- Refer to the pages for Travel HP Mode Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- Check the wiring connections first.



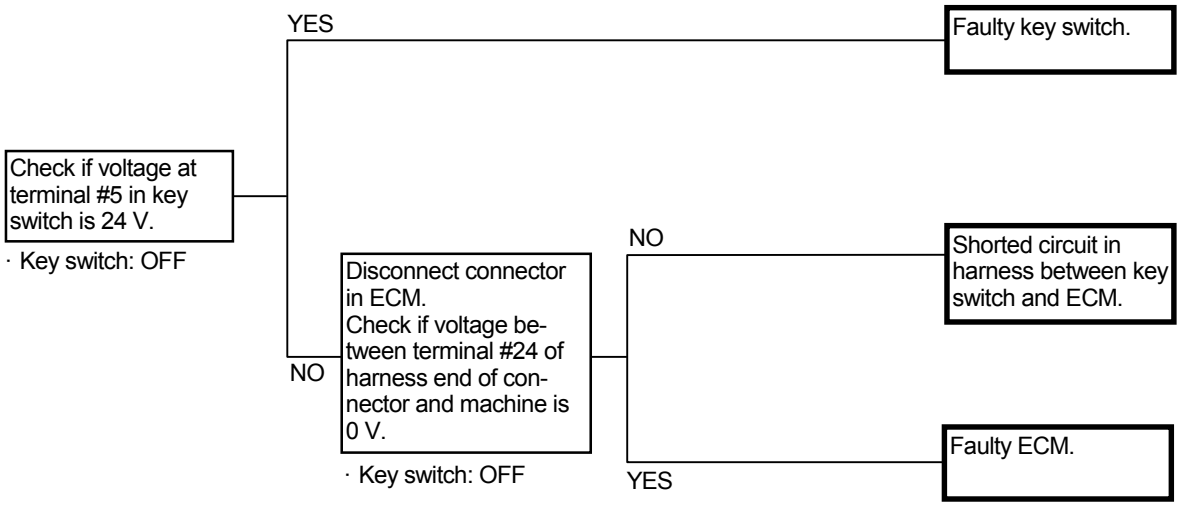
- Even if the travel mode switch is not turned to FAST, travel mode becomes fast idle.
  - Travel must be operated when the average delivery pressures of pump 1 and 2 are high, if travel HP mode control is performed. The sensors related to this condition may not be faulty at the same time.



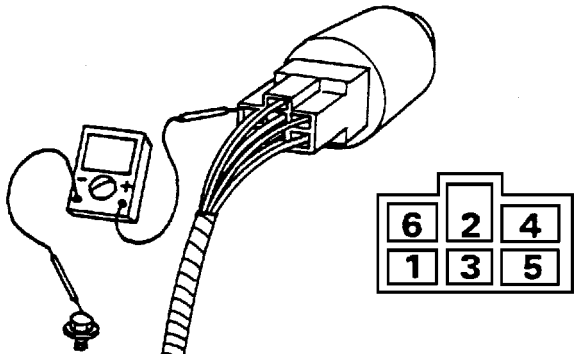
E-8 Even if key switch is turned OFF, engine does not stop. (In case engine does not stop, stop engine by turning the emergency stop switch ON located under the seat stand. Then, begin inspection.)

Related MC Fault Codes:

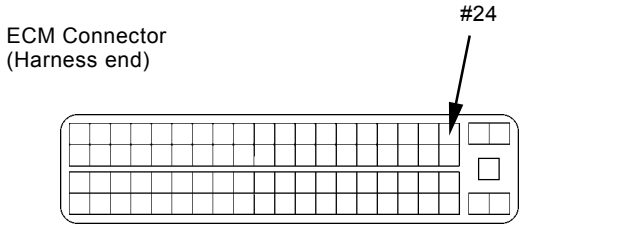
- Probably the symptoms such as “Engine speed is slower than specification in all operating ranges” or “Even if engine control dial is rotated, engine speed remains unchanged” may come up. Perform troubleshooting for these symptoms.



Key Switch



T105-07-04-002



T1GR-05-04-002

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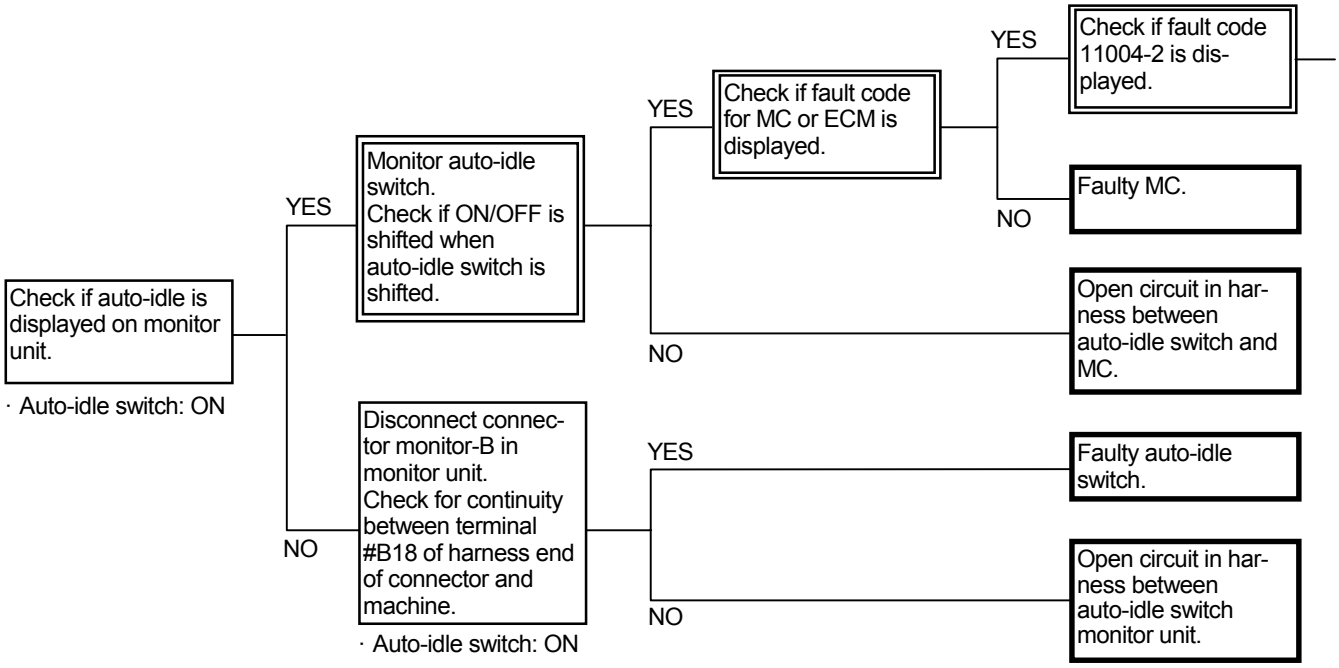
E-9 Faulty auto-idle system

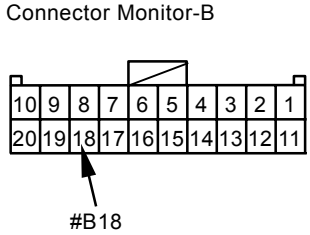
- Even if control lever is turned to neutral, auto-idle system is not operated.

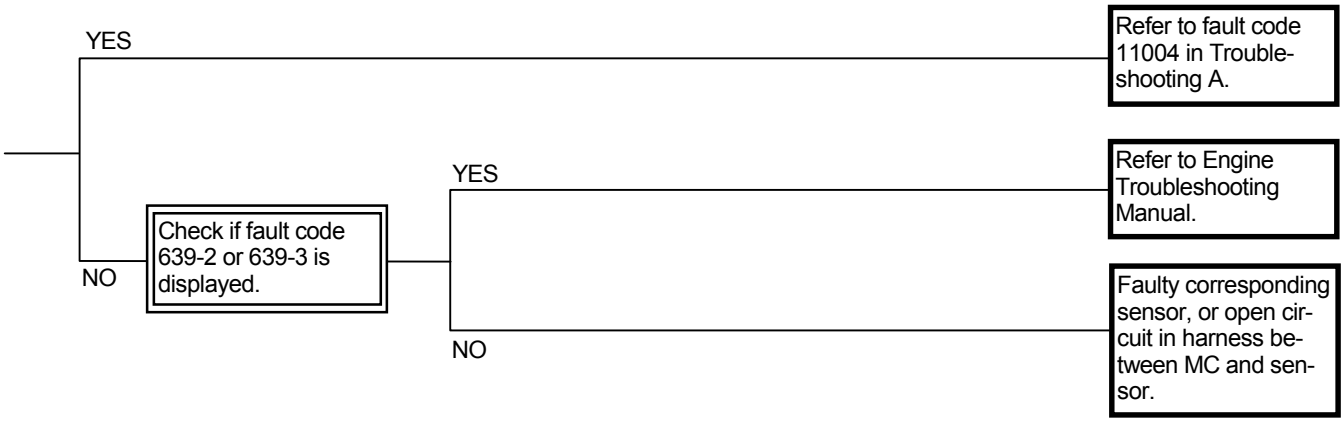
Related MC Fault Code: 11004-2, 11304-3, 11304-4, 11307-3, 11307-4
Related ECM Fault Code: 639-2, 639-3

- In case trouble symptoms E1 to E8 are recognized, perform the troubleshooting of these troubles first.
- Even if failure in pressure sensors (travel and front attachment) may have relevance to malfunction of the auto-idle control. However, if these sensors fail, other operating functions will also be affected.
- Refer to the pages for Auto-Idle Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- Check the wiring connections first.



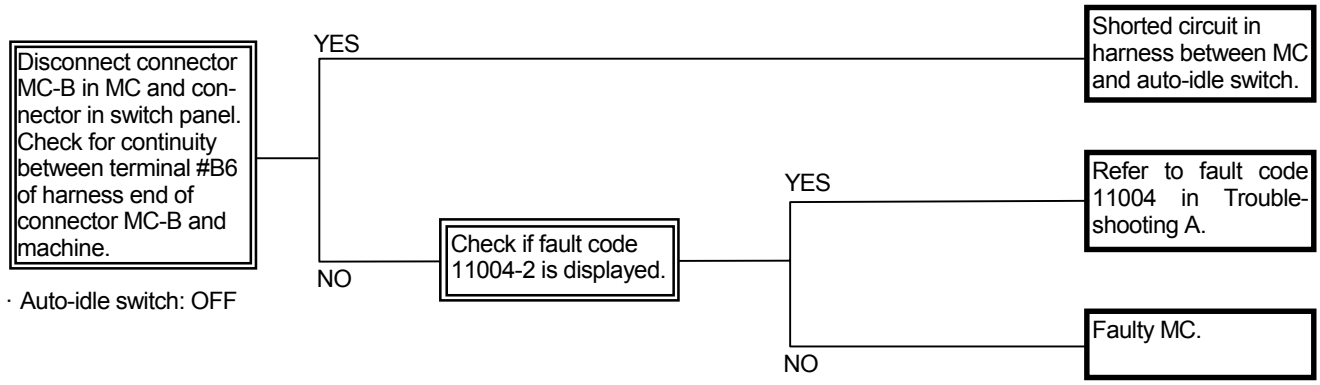
Connector (Harness end of connector viewed from the open side)



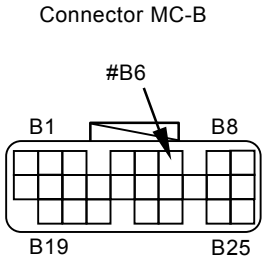


· Fault code:
11304-3, 11304-4: Pilot pressure sensor (travel)
11307-3, 11307-4: Pilot pressure sensor (front attachment)

Even if auto-idle switch is turned OFF, auto-idle is operated.



Connector (Harness end of connector viewed from the open side)



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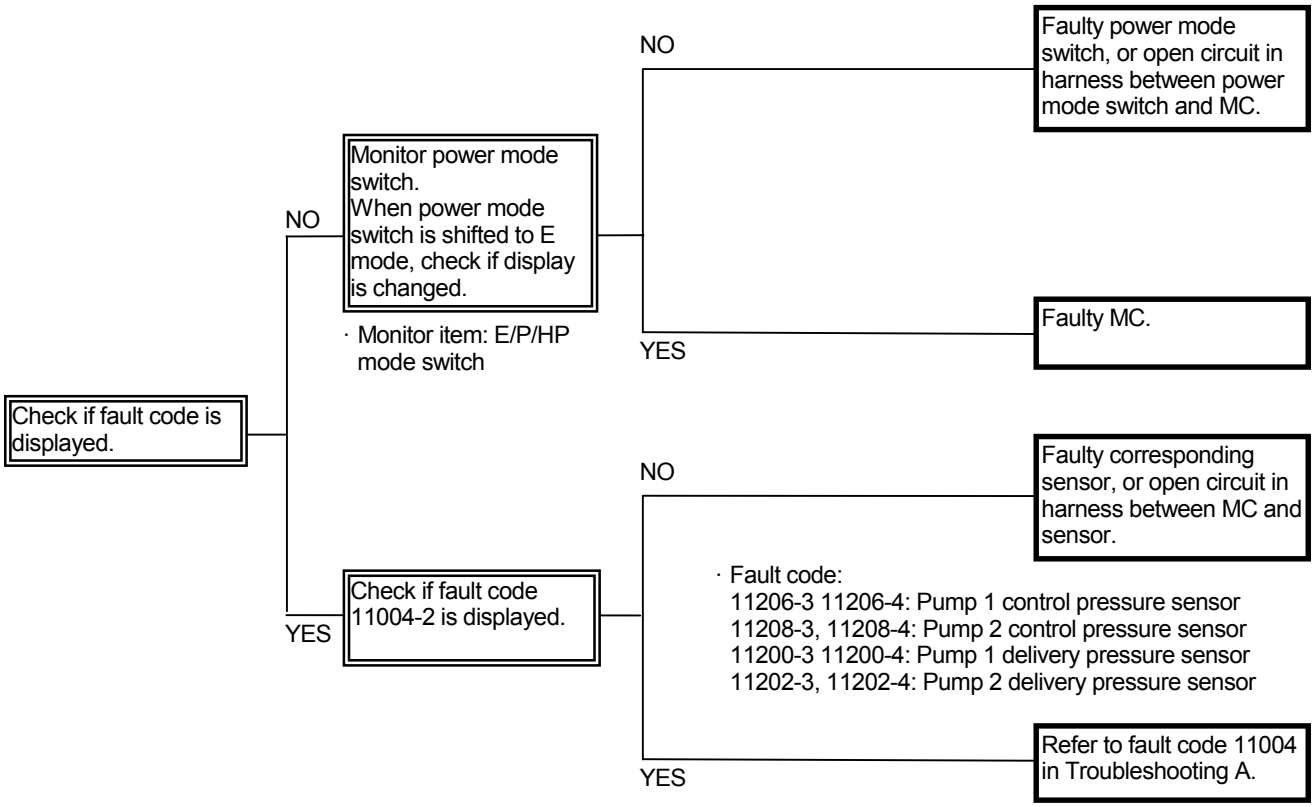
E-10 Faulty E mode

- Even if power mode switch is turned to the E mode position, engine speed remains unchanged. (Engine speed does not decrease.)

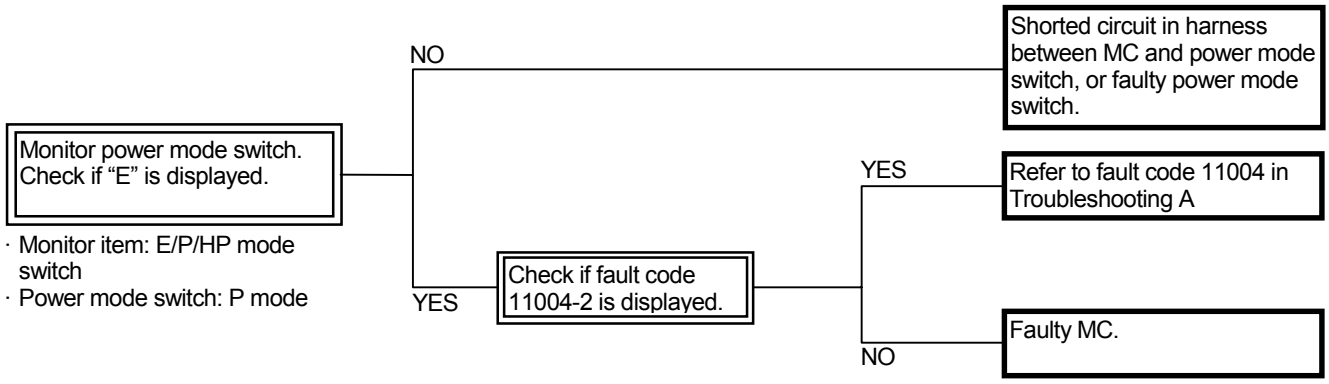
Related MC Fault Code: 11004-2, 11200-3, 11200-4, 11202-3, 11202-4, 11206-3, 11206-4, 11208-3, 11208-4

- In case trouble symptoms E-1 to E-9 are recognized, perform the troubleshooting of these troubles first.
- The sensors detect the conditions necessary to operate E mode. Therefore, if any of these sensors fails, E mode becomes ineffective.
- Pump 1, 2 control pressure sensors and pump 1, 2 delivery pressure sensors are also engaged in the E mode control. However, if these sensors fail, other operating functions will be also affected.
- Refer to the pages for E Mode Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- Check the wiring connections first.



- Even if power mode switch is not turned to E mode, engine speed decreases.

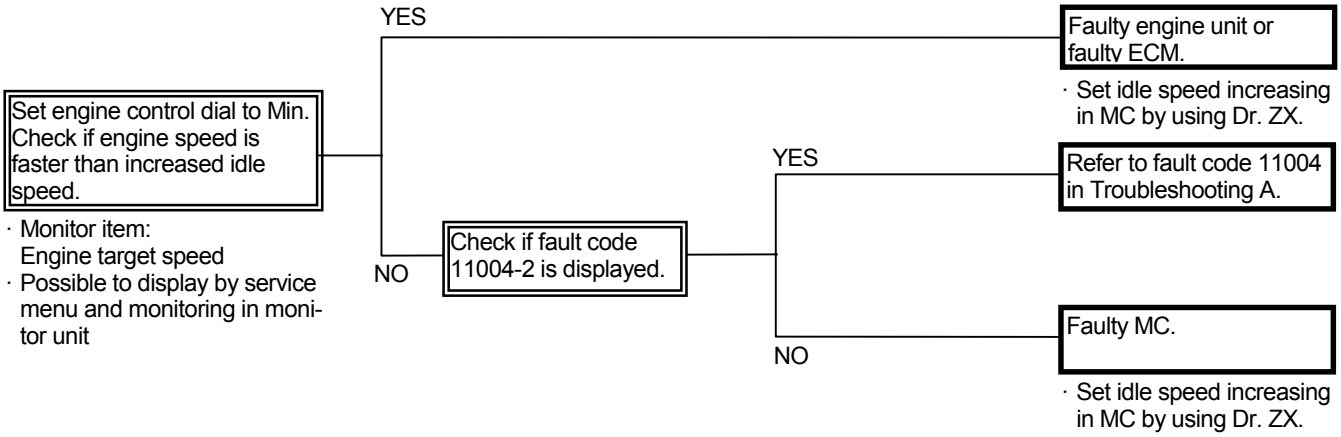
  - Required engine speed from the engine control dial must be beyond 1800 min^{-1} when the pump control pressures of pump 1 and 2 are low or the average delivery pressures of pump 1 and 2 are high, if E mode control is performed. The sensors related to this condition may not be faulty at the same time.



E-11 When traveling or operating front attachment with engine running at slow idle, engine hunts.

Related MC Fault Code: 11004-2, 11304-3, 11304-4, 11307-3, 11307-4

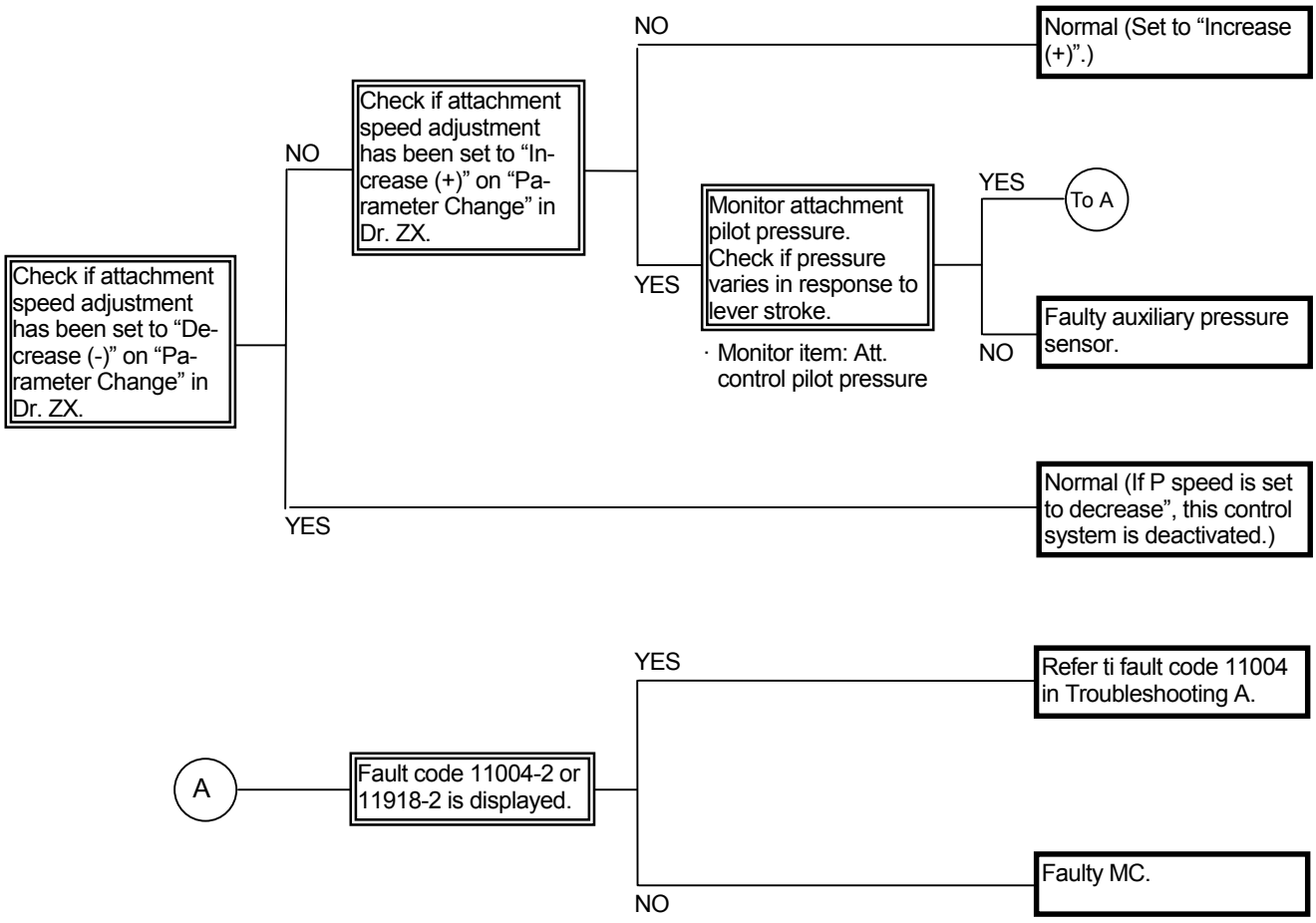
- Even if the failure in pressure sensors (travel and front attachment) may have relevance to malfunction of idle speed-up control. However, if these sensors fail, other operating functions will also be affected. (Refer to the relationship between machine trouble symptoms and related parts on page T5-5-2.)
- Refer to the pages for Idle Speed-Up Control in the SYSTEM / Control System group in the T/M (Operational Principle).



E-12 Engine speed does not increase even if attachment is operated in attachment mode.

Related MC Fault Code: 11004-2, 11918-2

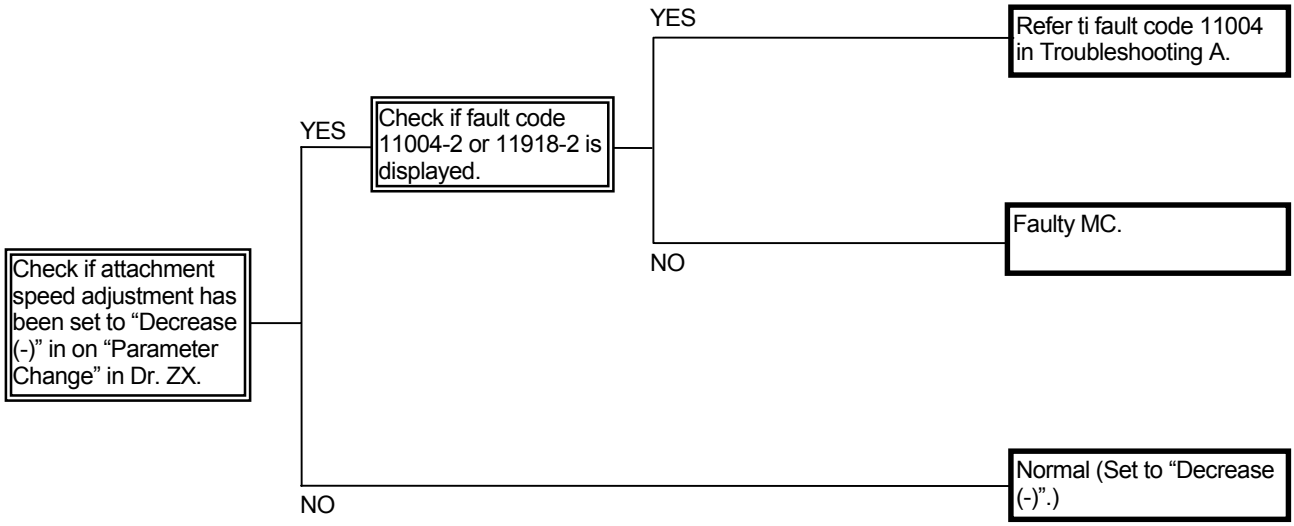
- In case trouble symptoms E-1 to E-11 are recognized, perform the troubleshooting of these troubles first.
- Even if the failure in pressure sensor (auxiliary) and power mode switch may have relevance to the malfunction of attachment operation speed increase control. However, if these sensor and switches fail, other operating functions will also be affected.
- Refer to the pages for Attachment Operation Speed Increase Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- Check the wiring connections first.



E-13 When attachment mode is selected, engine speed does not decrease.

Related MC Fault Code: 11004-2, 11918-2

- In case trouble symptoms E-1 to E-11 are recognized, perform the troubleshooting of these troubles beforehand.
- Refer to the pages for Attachment Operation Speed Limit Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- Check the wiring connections first.



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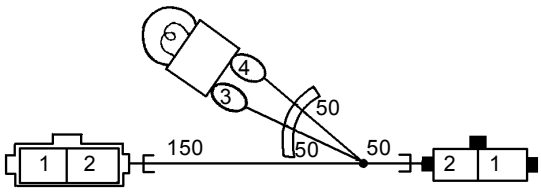
E-14 Engine stalls during operation under adverse condition such as at high altitude.

Related MC Fault Code: 11004-2, 11100-2, 11910-2, 11401-2, 11401-3, 11401-4

- If speed sensing control is not operated, the engine will stall under adverse operating conditions.
- Check the wiring connections first.

Test Harness (ST 7226)

When operating corresponding control lever and switch: ON



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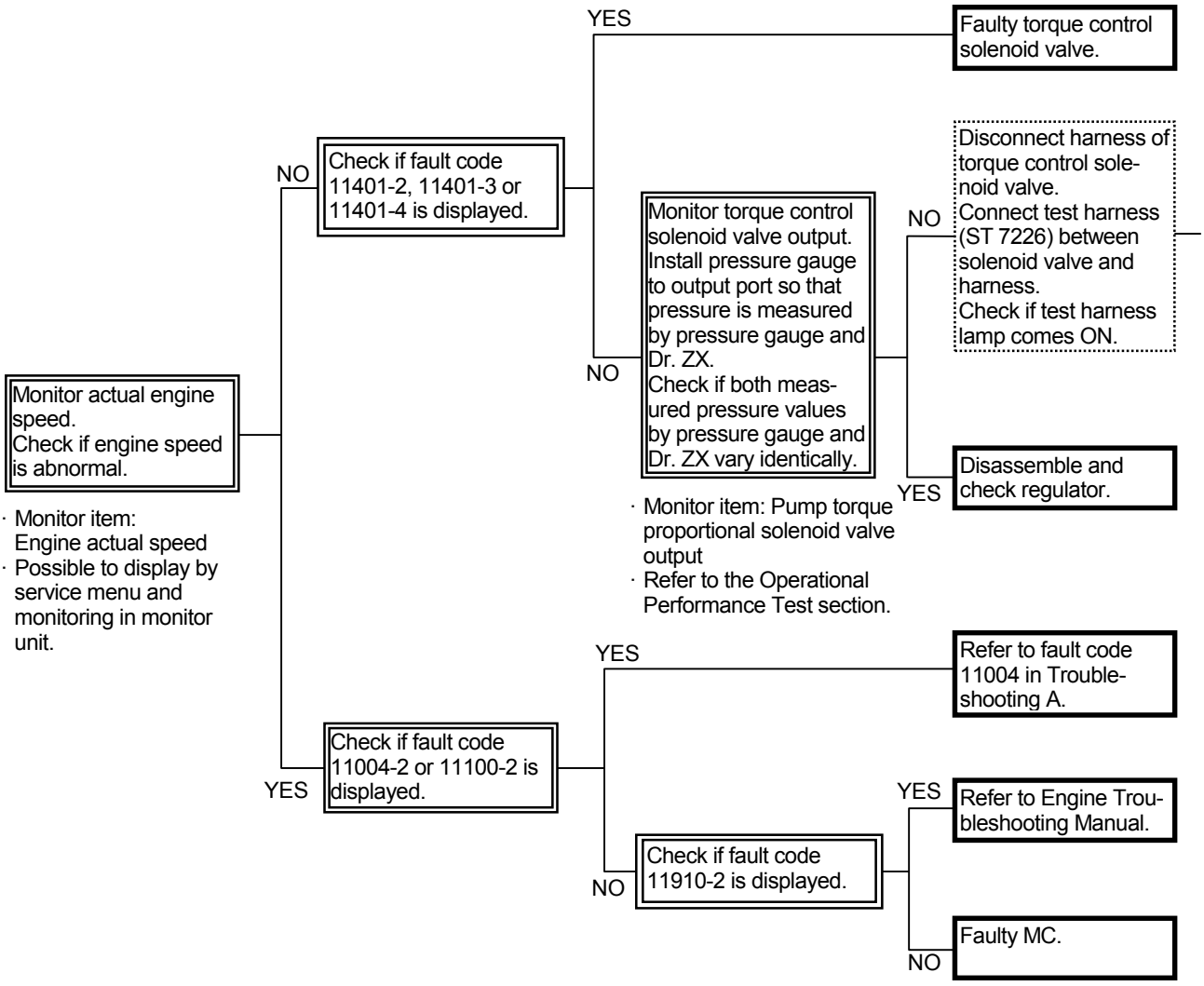
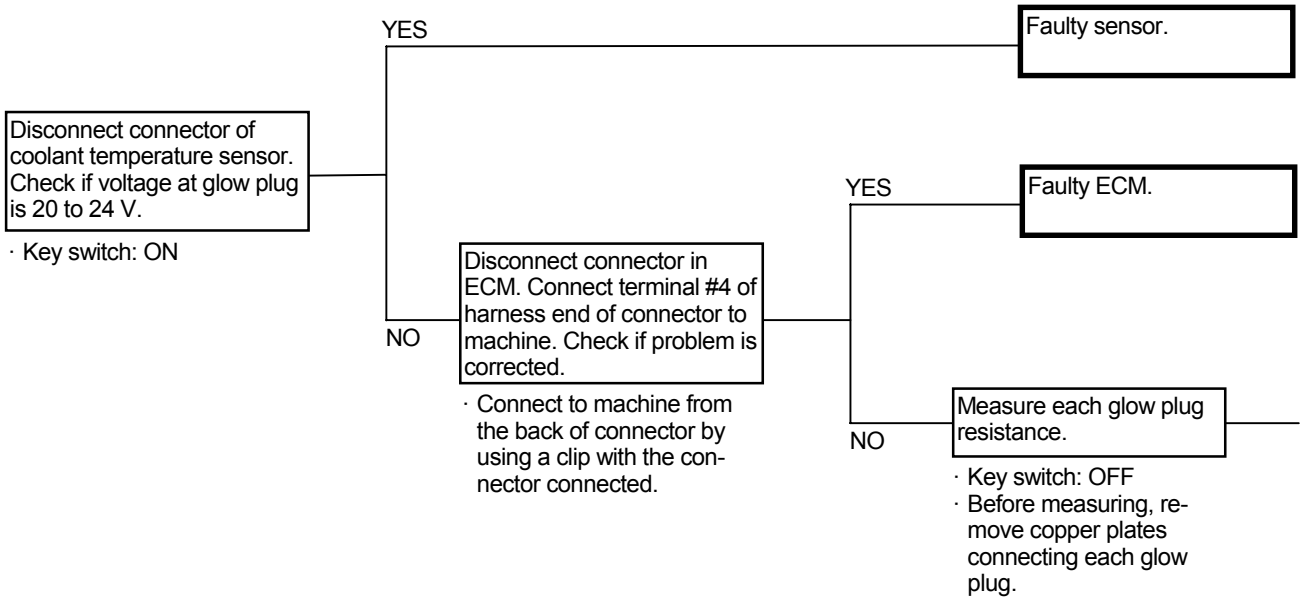



YES
Faulty torque control solenoid valve.
Open circuit in harness between torque control solenoid valve and MC.
NO

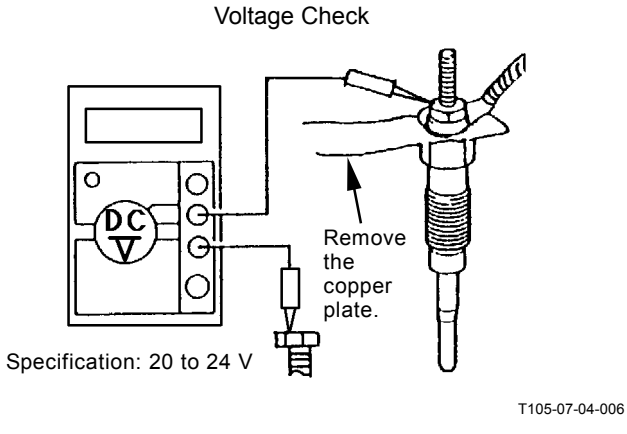
E-15 Engine is difficult to start at low temperature. (During cold weather or in cold districts, engine is difficult to start or does not start even if pre-heated.)

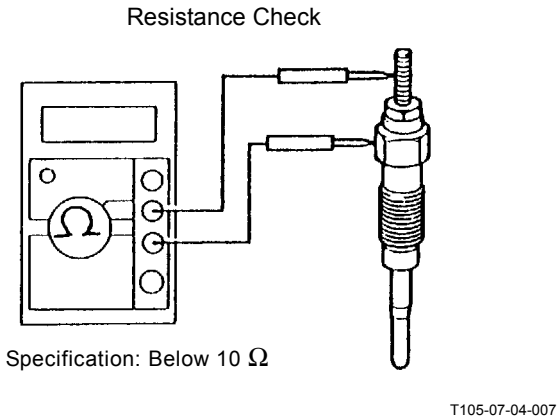
Related MC Fault Code: None

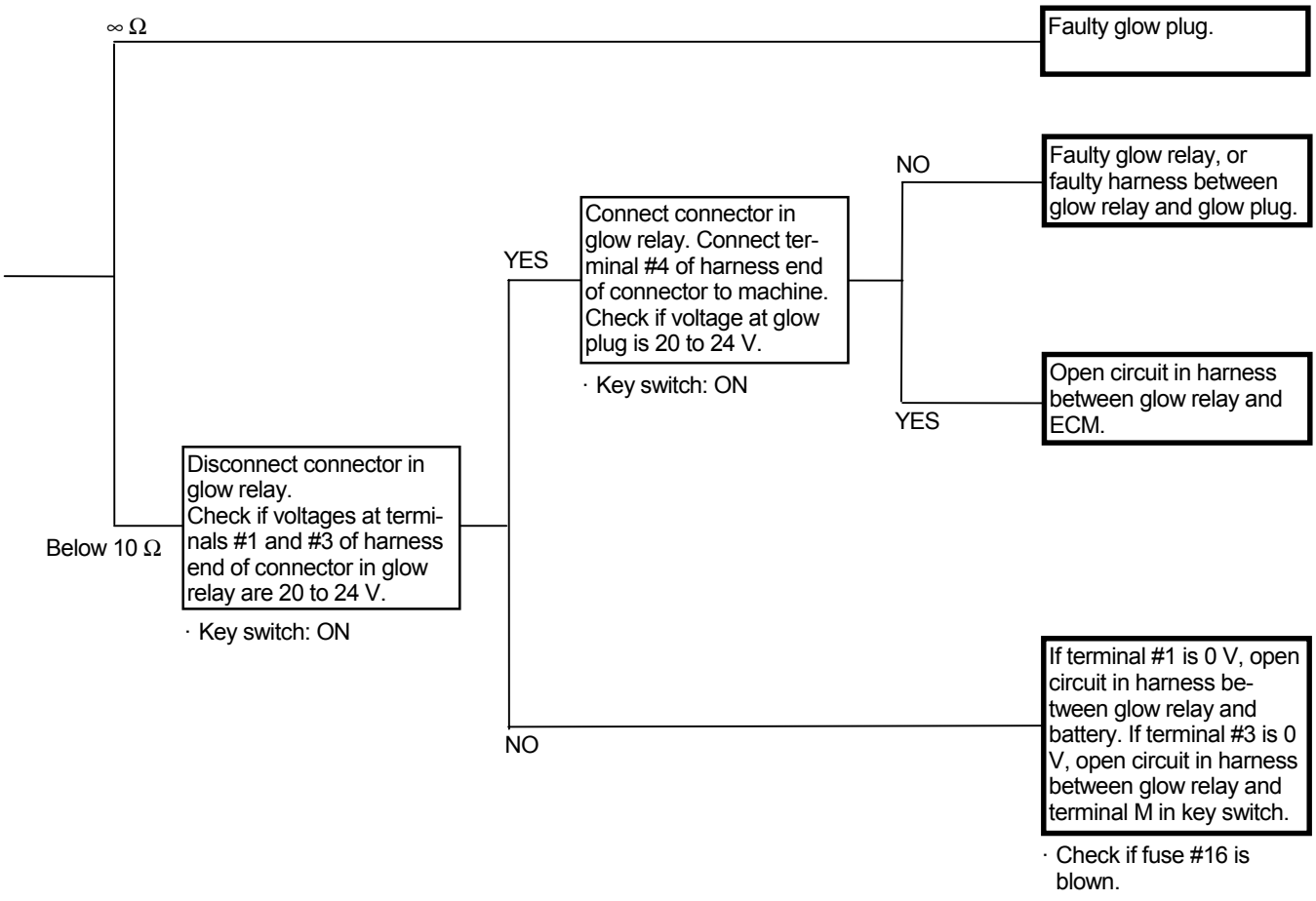
- Check if electricity is routed to the glow plugs. Check the glow plugs for any abnormality.
- The pre-heat system operates only when coolant temperature is below 20 °C (68 °F).
- Check the battery.
- Check the wiring connections first.



- Measurement of Glow Plug Voltage and Resistance





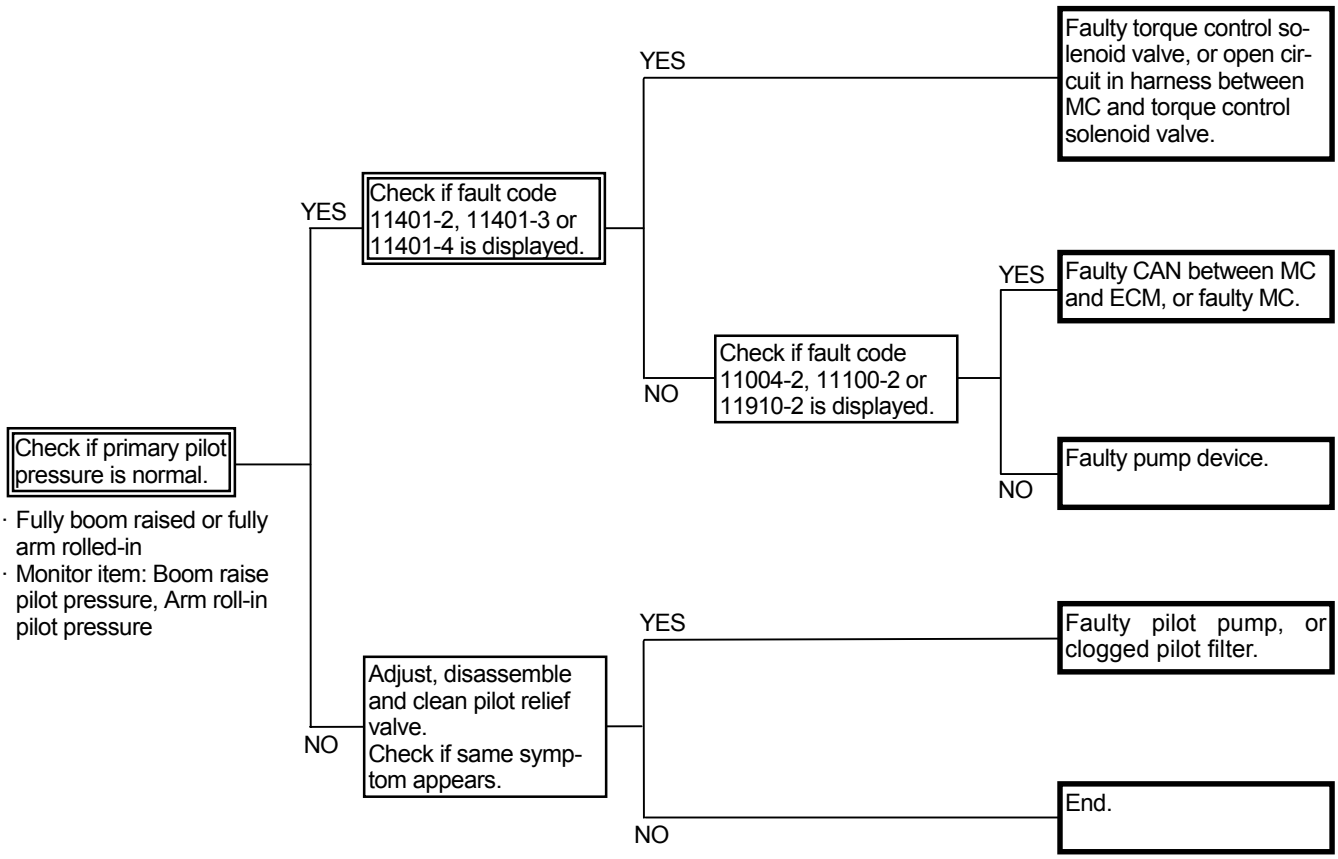

∞ Ω
Faulty glow plug.
NO
Faulty glow relay, or faulty harness between glow relay and glow plug.
YES
Connect connector in glow relay. Connect terminal #4 of harness end of connector to machine. Check if voltage at glow plug is 20 to 24 V.
· Key switch: ON
Open circuit in harness between glow relay and ECM.
YES
Below 10 Ω
Disconnect connector in glow relay.
Check if voltages at terminals #1 and #3 of harness end of connector in glow relay are 20 to 24 V.
· Key switch: ON
NO
If terminal #1 is 0 V, open circuit in harness between glow relay and battery. If terminal #3 is 0 V, open circuit in harness between glow relay and terminal M in key switch.
· Check if fuse #16 is blown.

ALL ACTUATOR SYSTEM TROUBLE-SHOOTING

A-1 All actuator speeds are slow.

Related MC Fault Code: 11004-2, 11100-2, 11910-2, 11401-2, 11401-3, 11401-4

- Reduction in pump 1 and 2 flow rate due to some reasons or faulty pilot system (A-2) may cause this trouble.
- Check fuse of the torque control solenoid valve.
- Even if speed is satisfactory, in case power is weak, refer to the troubleshooting for faulty main relief valve (F-1).
- Check the wiring connections first.



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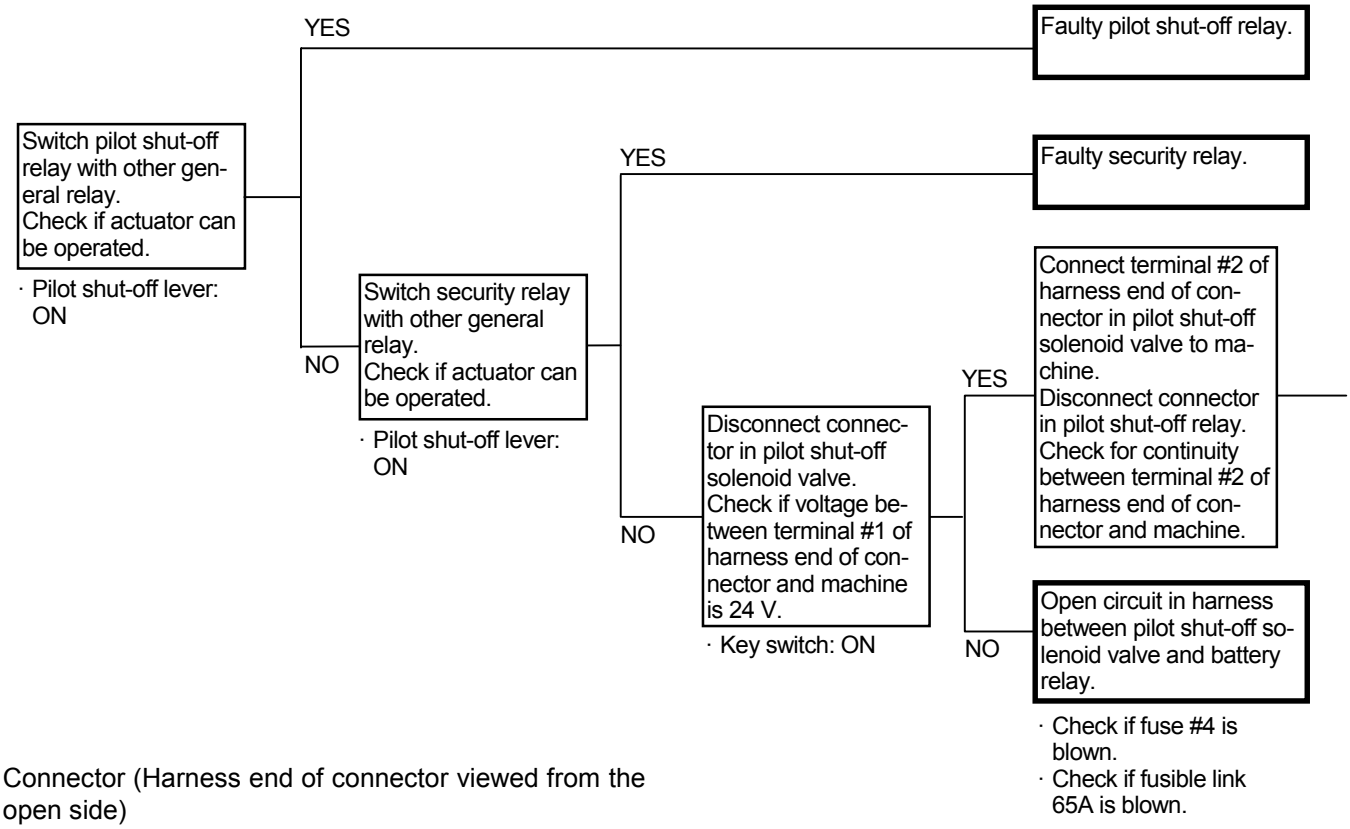
A-2 All actuator are not operated.

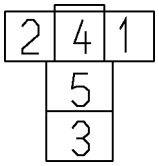
Related MC Fault Code: None

- The pilot shut-off circuit may be faulty.
- Check the wiring connections first.
- When the key switch is turned to the START position with the pilot shut-off lever in the ON position, the starter does not rotate.
- When the key switch is turned to the START position with the emergency switch and the pilot shut-off lever in the ON position, the starter rotates.
- Refer to the pages for the Electrical System group / SYSTEM in the T/M (Operational Principle).



Connector (Harness end of connector viewed from the open side)

Pilot shut-Off Relay
Security Relay



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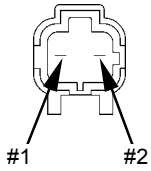
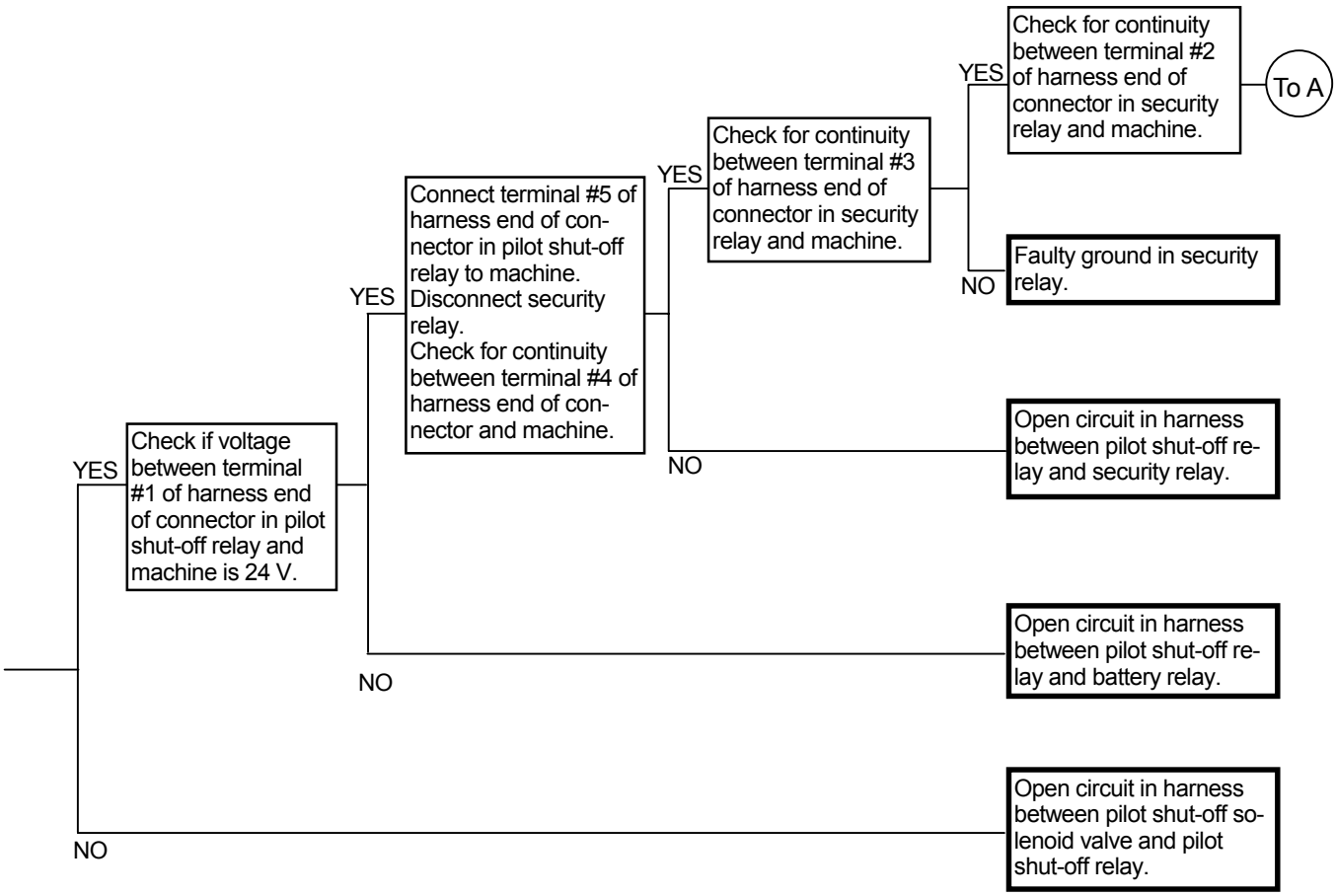
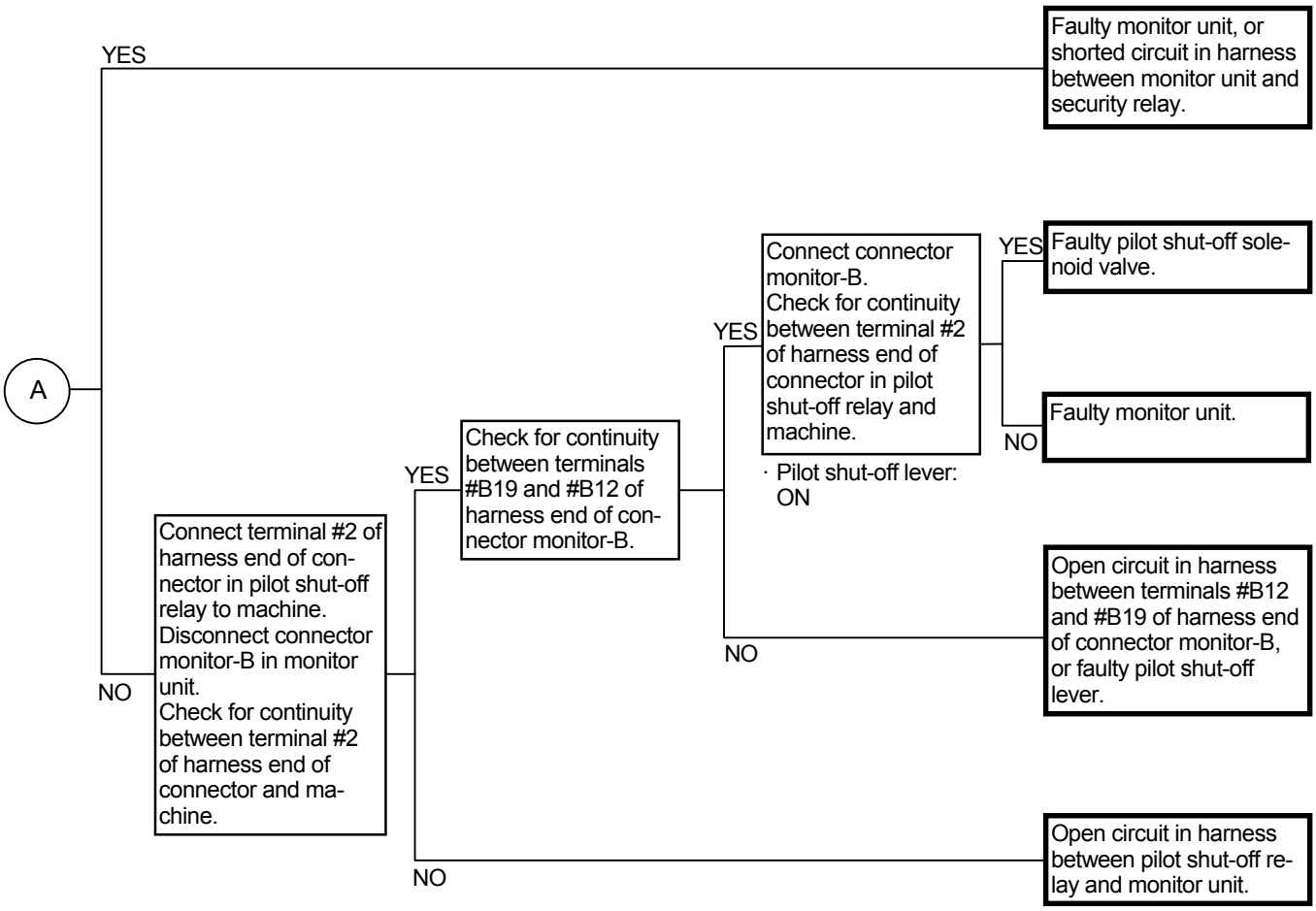
Pilot Shut-Off Solenoid Valve



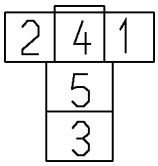
T1V1-05-04-103


Check if voltage between terminal #1 of harness end of connector in pilot shut-off relay and machine is 24 V.
YES
NO
Connect terminal #5 of harness end of connector in pilot shut-off relay to machine.
Disconnect security relay.
Check for continuity between terminal #4 of harness end of connector and machine.
YES
NO
Check for continuity between terminal #3 of harness end of connector in security relay and machine.
YES
NO
Check for continuity between terminal #2 of harness end of connector in security relay and machine.
YES
To A
Faulty ground in security relay.
Open circuit in harness between pilot shut-off relay and security relay.
Open circuit in harness between pilot shut-off relay and battery relay.
Open circuit in harness between pilot shut-off solenoid valve and pilot shut-off relay.



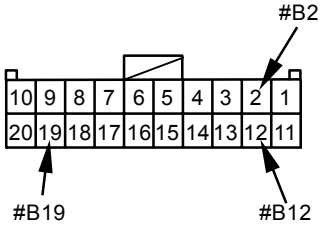
Connector (Harness end of connector viewed from the open side)

Pilot Shut-Off Relay



T183-05-04-003

Connector Monitor-B



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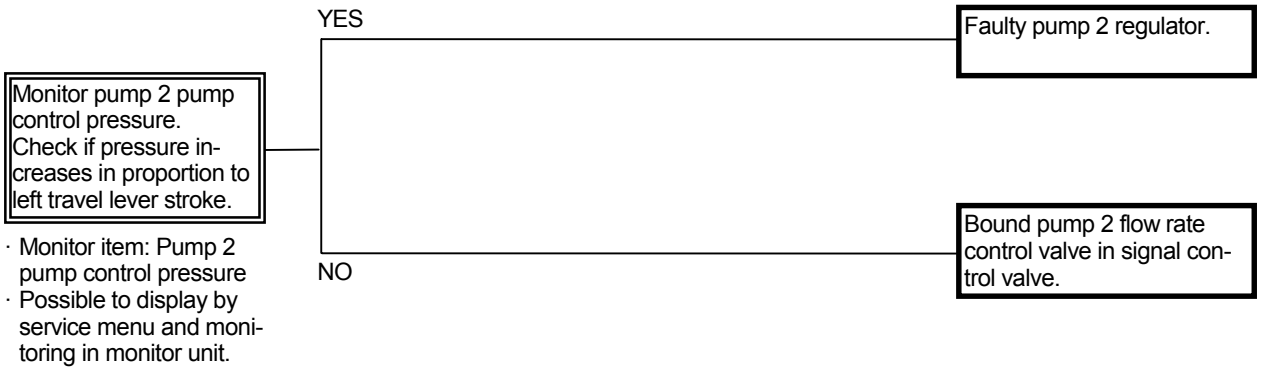
A-3 Left travel is not operated during single travel operation. Single swing operation speed becomes slow. Arm speed is slightly slow during arm level crowding. (All problems occur at the same time.)

Related MC Fault Code: None

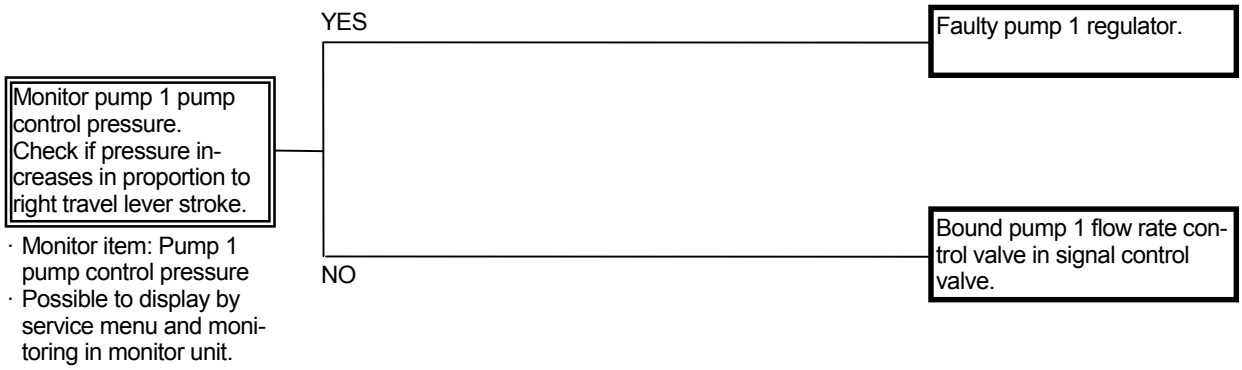
- The pump 2 flow rate is minimized (approx. 20 L/min) due to some reasons. Accordingly, the left travel and swing motors, which are driven by pressure oil from pump 2, moves very slow.
- Pressure oil from pump 1 is also routed to the arm and boom cylinders so that the arm and boom can move at a slightly slow speed in single operation. However, in level crowd operation, pressure oil is routed to the boom prior to the arm so that arm speed becomes very slow.
- Refer to the SYSTEM / Hydraulic System group in the T/M (Operational Principle).



A-4 Right travel is operated during single travel operation. Single bucket operation speed becomes slow. Boom is not raised properly during arm level crowding. (All problems occur at the same time.)

Related MC Fault Code: None

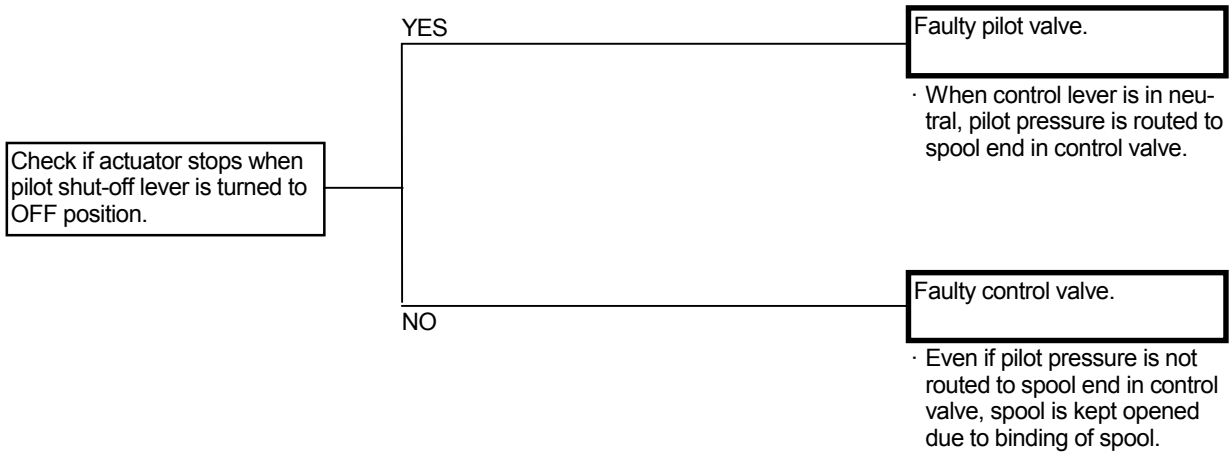
- The pump 1 flow rate is minimized (approx. 20 L/min) due to some reasons. Accordingly, the right travel motor and bucket cylinder, which are actuated by pressure oil from pump 1, moves very slow.
- Pressure oil from pump 2 is also routed to the arm and boom cylinders so that the arm and boom can move at a slightly slow speed in single operation. However, in level crowd operation, pressure oil is routed to the arm prior to the boom so that boom is scarcely raised.
- Refer to the SYSTEM / Hydraulic System group in the T/M (Operational Principle).



A-5 Actuator does not stop even if control lever is turned to neutral.

Related MC Fault Code: None

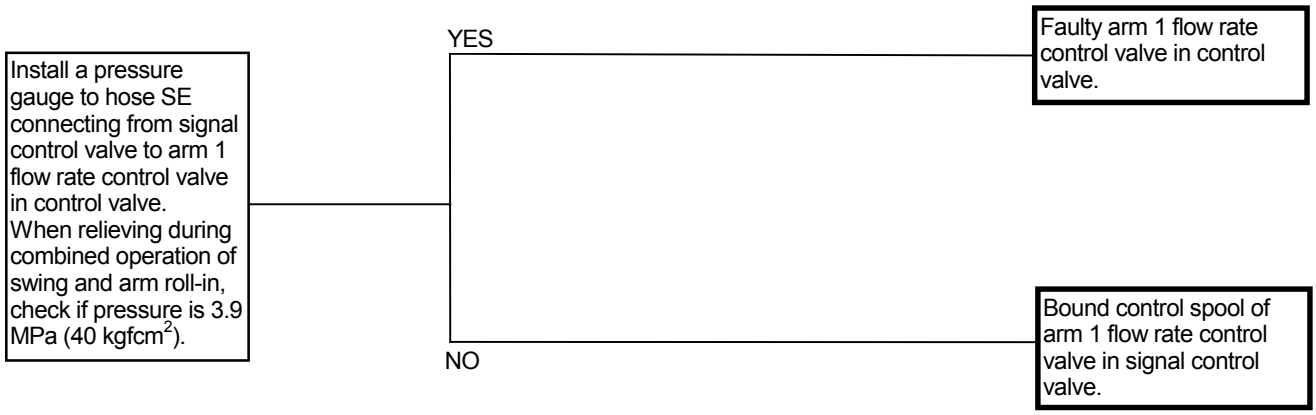
- Bound spool in the pilot valve or bound main spool in the control valve is suspected.



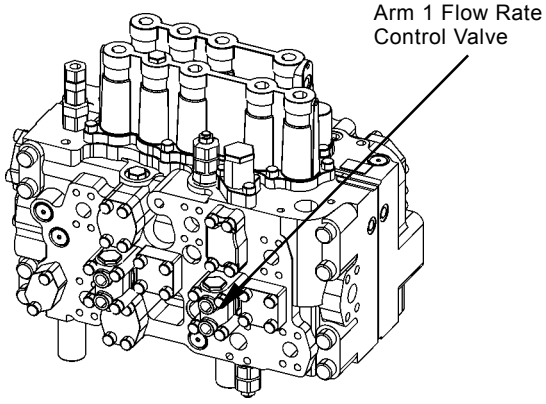
A-6 Occasionally, swing or arm roll-in speed becomes slow during combined operation of swing and arm roll-in.

Related MC Fault Code: None

- The arm 1 flow rate control valve may be faulty.
- Refer to the pages for the COMPONENT OPERATION / Control valve group in the T/M (Operational Principle).

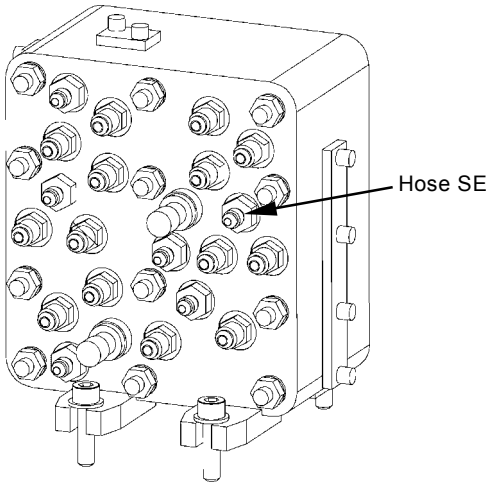


Control Valve



T1V1-05-04-004

Signal Control Valve (Control Valve Side)

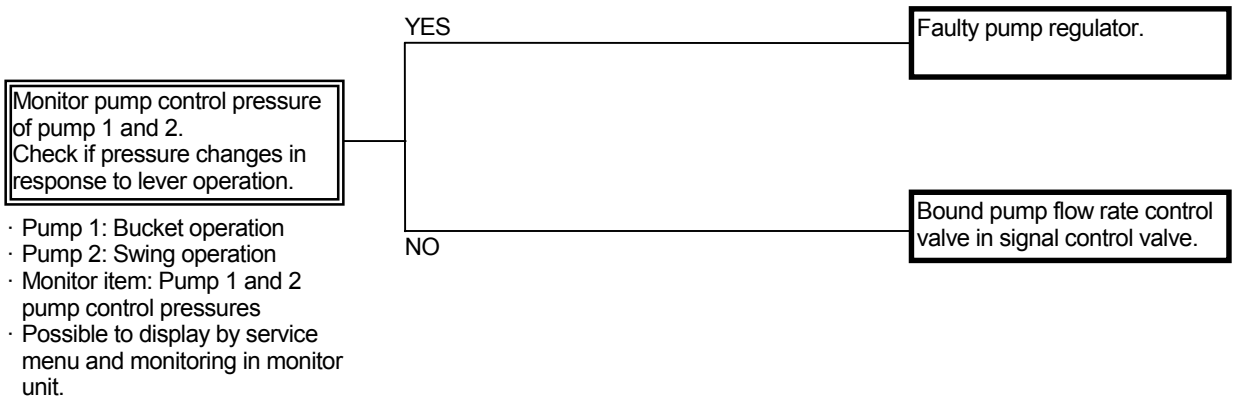


T178-03-06-015

A-7 Actuator speed is faster than normal
Machine mistracks when travel lever is operated at half stroke. Precise control cannot be performed.

Related MC Fault Code: None

- The pump 1 or 2 flow rate is maximized due to some reasons.
  Therefore, the maximum flow rate is supplied and actuator speed is faster though the control lever does not reach the full stroke.
- Pressure oil from pump 1 makes right travel perform, and pressure oil from pump 2 makes left travel during single travel operation. When the travel lever is operated at half stroke, different flow rates between pump 1 and 2 occur and the machine mistracks.
- Refer to the SYSTEM / Hydraulic System group in the T/M (Operational Principle).



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A-8 Engine lug down is large when actuator in maximum flow rate gear pump (optional) is operated.

Related MC Fault Code: None

- Check the wiring connections first.

Switch pump 3 delivery pressure sensor with pump 1 or 2 delivery pressure sensor.
Check if fault code is displayed.
· Fault code:
11200-3, 11200-4: Pump 1 delivery pressure sensor
11202-3, 11202-4: Pump 2 delivery pressure sensor

NO → Disconnect connector in pump 3 delivery pressure sensor.
Check if voltage between terminals #1 and #3 of harness end of connector is 5±0.5 V.
· Key switch: ON

YES → Check for continuity in harness between terminal #D3 of harness end of connector MC-D in MC and terminal #2 in pump 3 delivery pressure sensor.

NO → Open circuit in harness between MC and pump 3 delivery pressure sensor.

YES → Check for continuity in harness between MC and torque control solenoid valve.
· Between terminal #A30 of connector MC-A in MC and terminal #1 of connector in torque control solenoid valve
· Between terminal #A19 of connector MC-A in MC and terminal #2 of connector in torque control solenoid valve

NO → Check if voltage between terminals #1 of harness end of connector in pump 3 delivery pressure sensor and machine is between 0.25 and 4.5 V.
· Key switch: ON

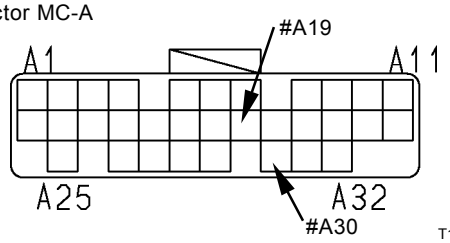
YES → Open circuit in harness between MC and pump 3 delivery pressure sensor (terminal #3).

NO → Open circuit in harness between MC and pump 3 delivery pressure sensor (terminal #1).

YES → Faulty pump 3 delivery pressure sensor.

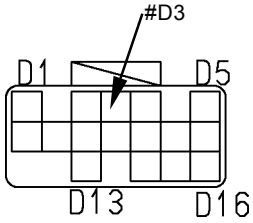
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-A



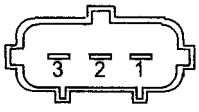
T183-05-04-008

MC
Connector MC-D



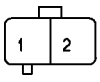
T183-05-04-009

Pump 3 Delivery Pressure Sensor

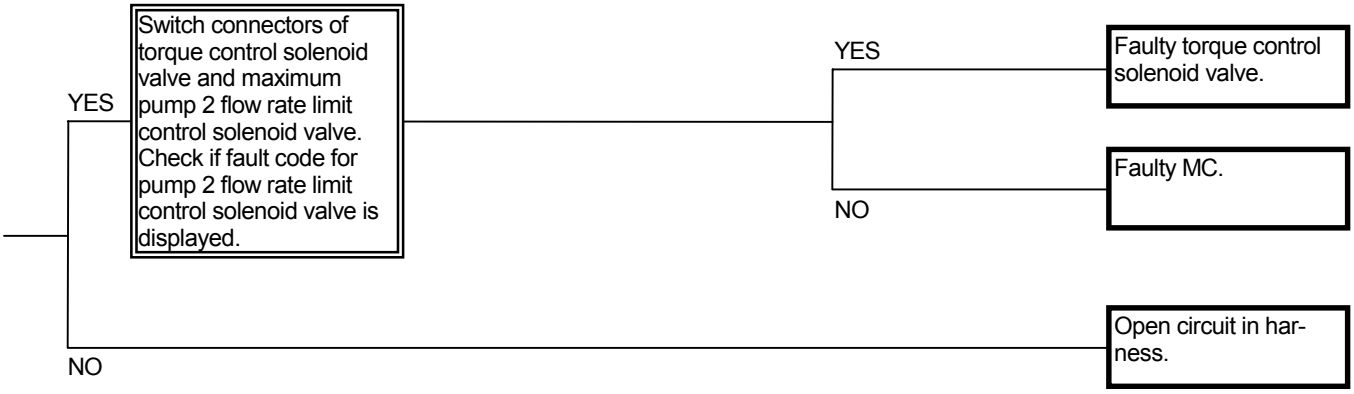


T1V1-05-07-101

Torque Control Solenoid Valve



T1V1-05-04-003

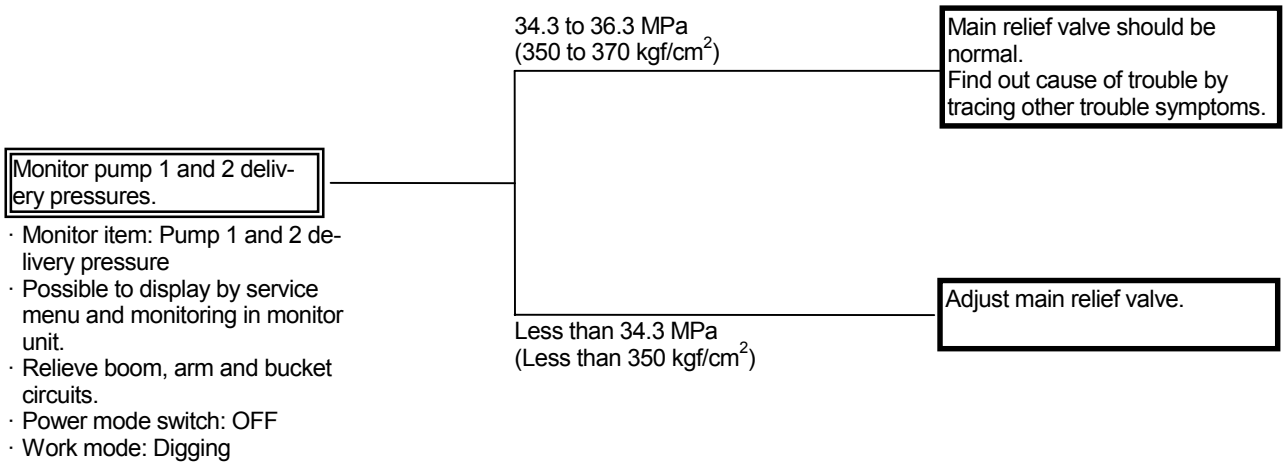

Switch connectors of torque control solenoid valve and maximum pump 2 flow rate limit control solenoid valve. Check if fault code for pump 2 flow rate limit control solenoid valve is displayed.
YES
NO
YES
NO
Faulty torque control solenoid valve.
Faulty MC.
Open circuit in harness.

FRONT ATTACHMENT SYSTEM TROUBLESHOOTING

F-1 All front attachment actuator power is weak.

Related MC Fault Code: None

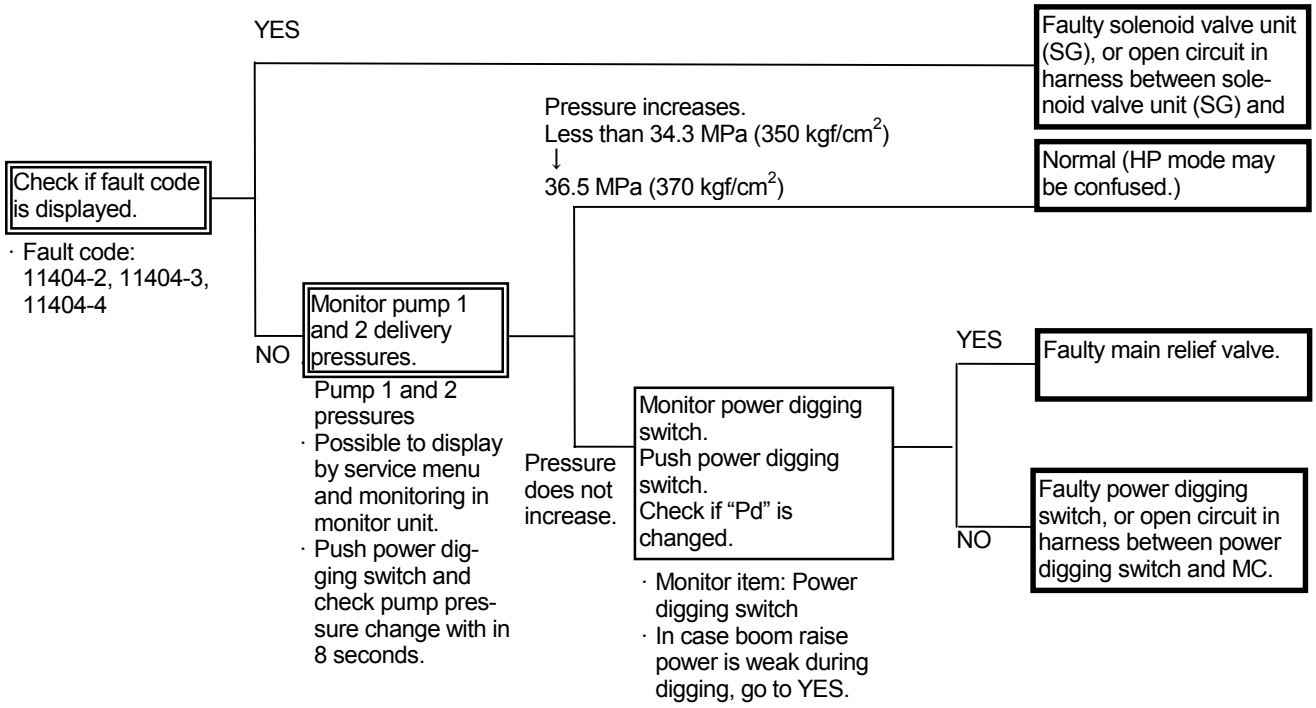
- In case operating speeds are extremely slow, pump control may be malfunctioning (A-3 and/or A-4). Faulty pilot system may also cause this trouble.



F-2 Even if power digging switch is pushed, power does not increase. Boom raise power is weak when digging.

Related MC fault Code: 11404-2, 11404-3, 11404-4

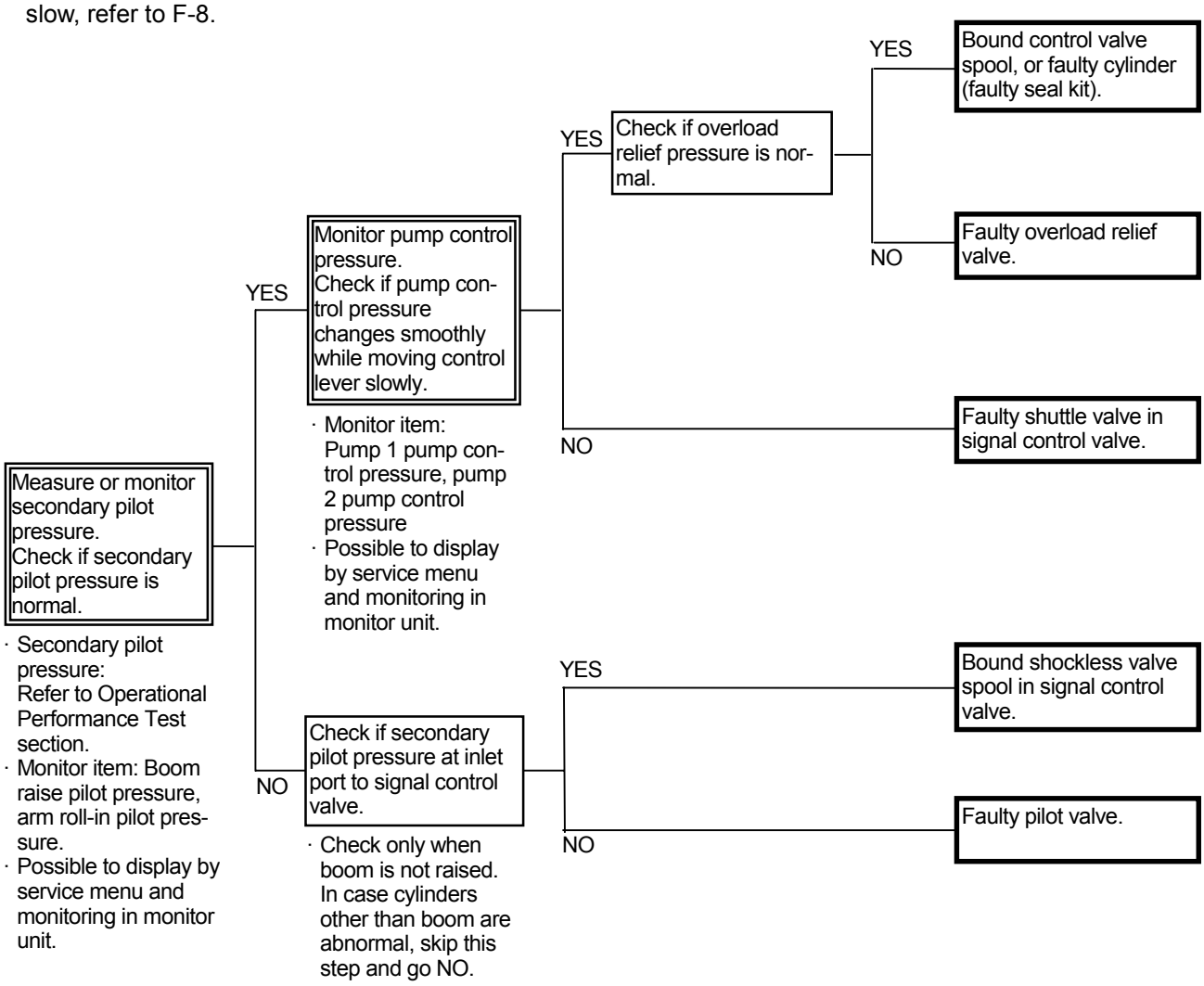
- Refer to the pages for the SYSTEM / Control System group / Power Digging Control and Auto-Power Lift Control in the T/M (Operational Principle).
- Check the wiring connections first.



F-3 Some cylinders are not operated or speeds are slow.

Related MC Fault Code: None

- When other actuators (travel and swing) operate normally, the pilot pump (primary pilot pressure) is considered to be normal.
- In case single bucket operation speed is slow, refer to F-6.
- In case single arm roll-in operation speed is slow, refer to F-7.
- In case single boom lower operation speed is slow, refer to F-8.



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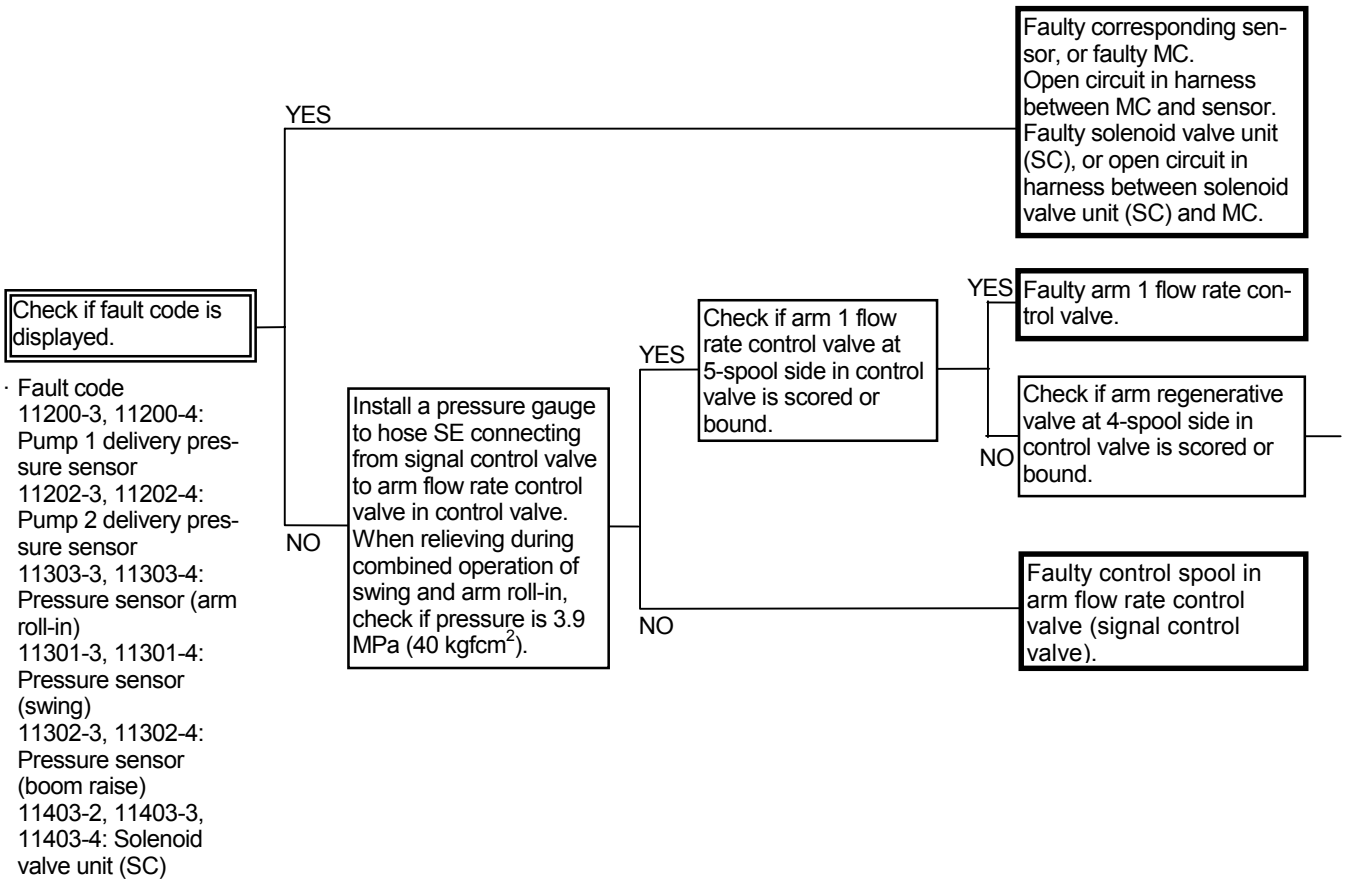
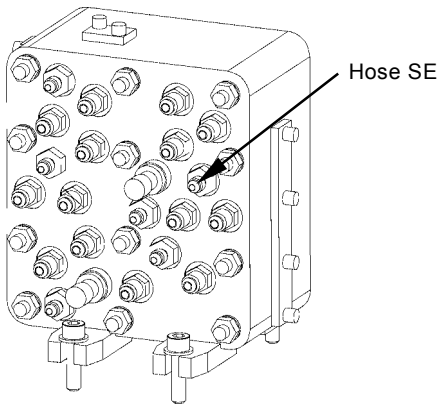
F-4 Arm speed is slow during combined operation. During combined operation of boom raise and arm roll-in, boom raise speed is slow. Arm speed is slow during arm level crowding.

Related MC Fault Codes: 11200-3, 11200-4, 11202-3, 11202-4, 11303-3, 11303-4, 11301-3, 11301-4, 11302-3, 11302-4, 11403-2, 11403-3, 11403-4

- Refer to the pages for the SYSTEM / Control System group / Arm Regenerative Control in the T/M (Operational Principle).

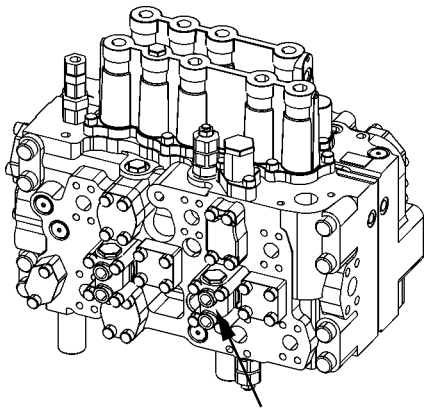


Signal Control Valve (Control Valve Side)



T178-03-06-015

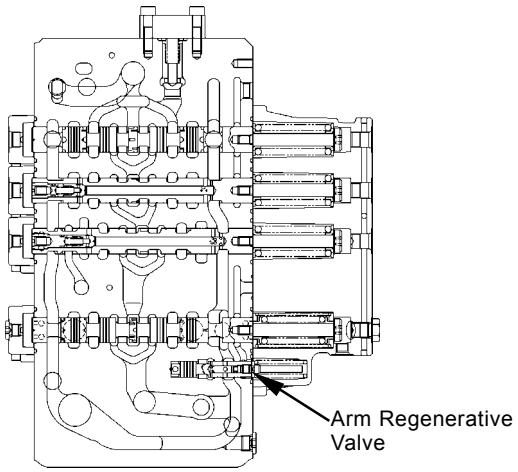
Control Valve



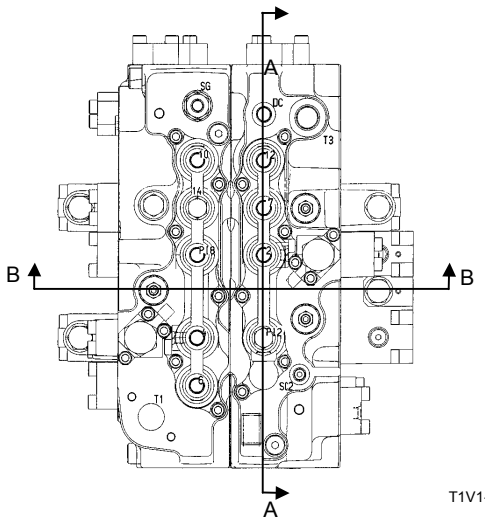
T1V1-05-04-004

Arm 1 Flow Rate Control Valve

Section A-A



T1V1-03-03-002



T1V1-03-03-026

YES

Faulty arm regenerative valve.

YES

Faulty arm 2 flow rate control valve.

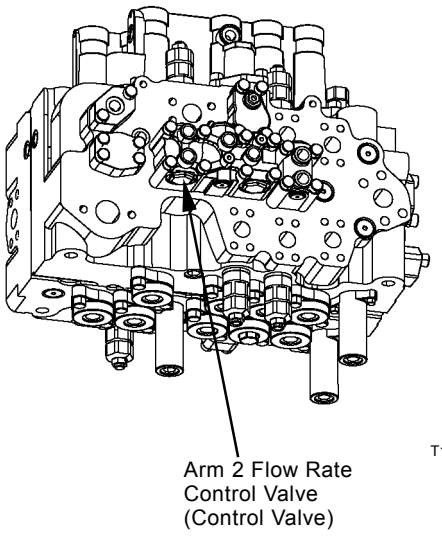
Check if arm 2 flow rate control valve at 4-spool side in control valve is scored or bound.

NO

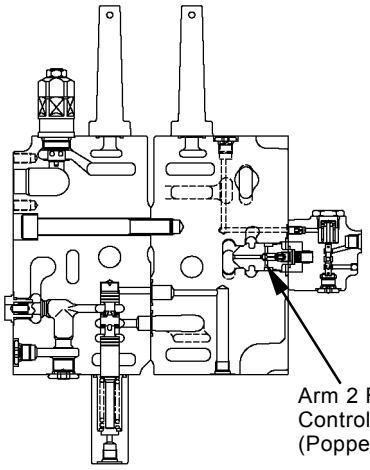
Find out cause of trouble by tracing other trouble symptoms.

NO

Section B-B



T1V1-05-04-005

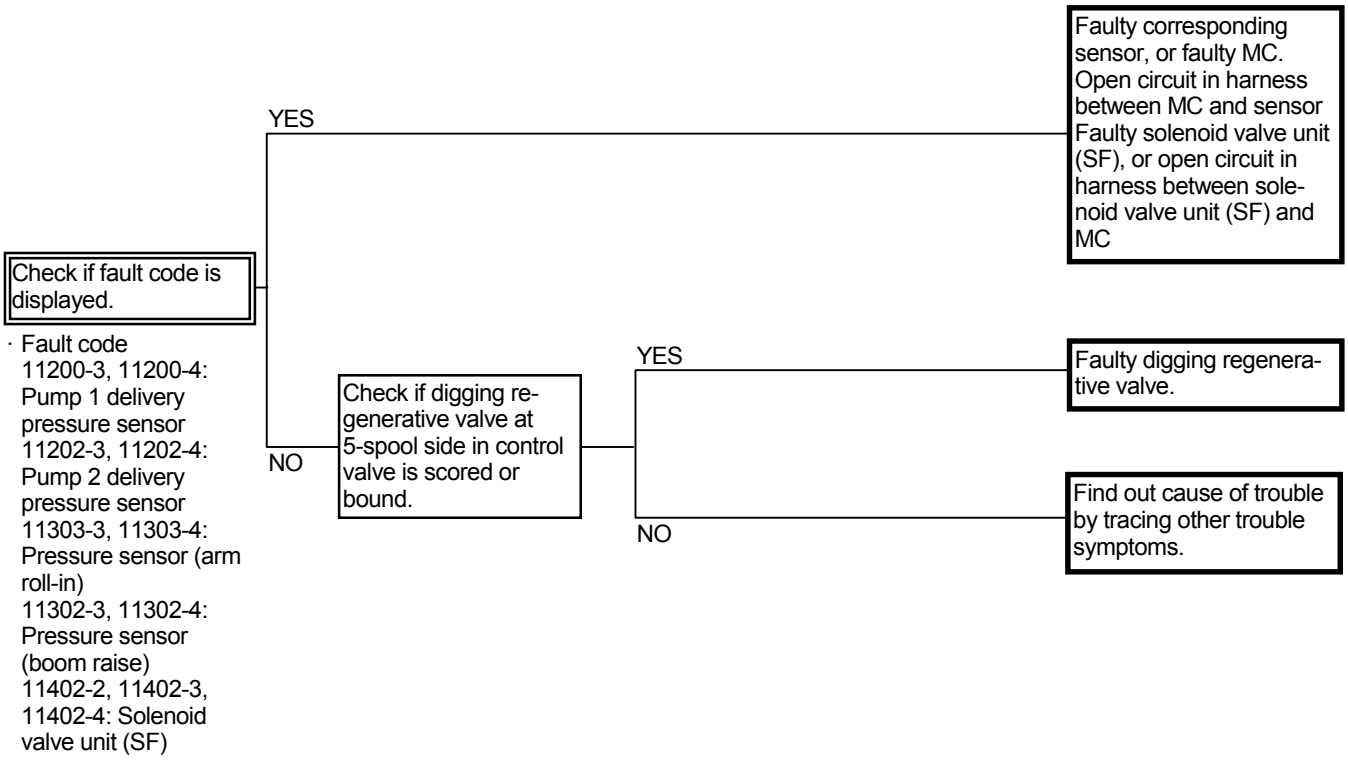


T1V1-05-04-007

F-5 Arm roll-in speed is slow when digging.

Related MC Fault Codes: 11200-3, 11200-4, 11202-3, 11202-4, 11301-3, 11301-4, 11302-3, 11302-4, 11402-2, 11402-3, 11402-4

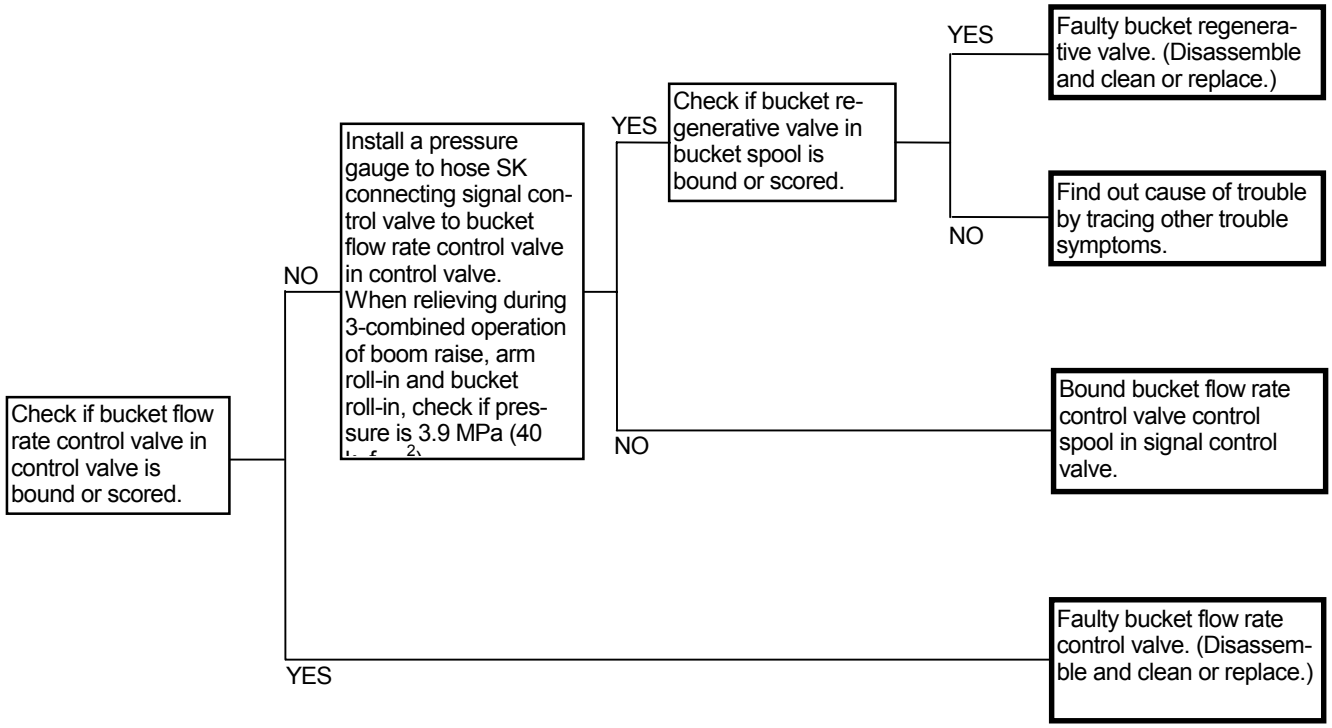
- Refer to the pages for the SYSTEM / Control System group / Digging Regenerative Control in the T/M (Operational Principle).



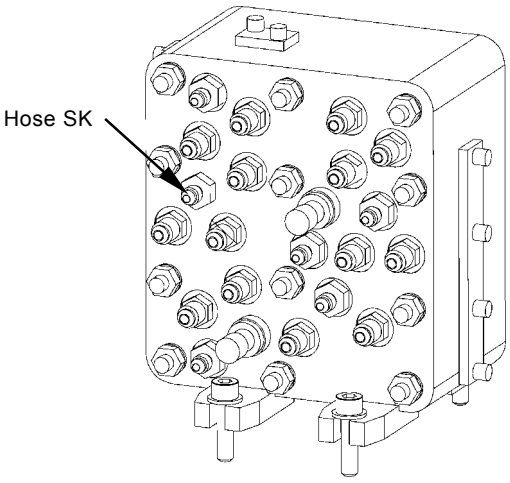
F-6 Bucket is slightly slow during bucket roll-in single operation. Bucket does not move smoothly during bucket roll-in single operation.

Related MC Fault Code: None

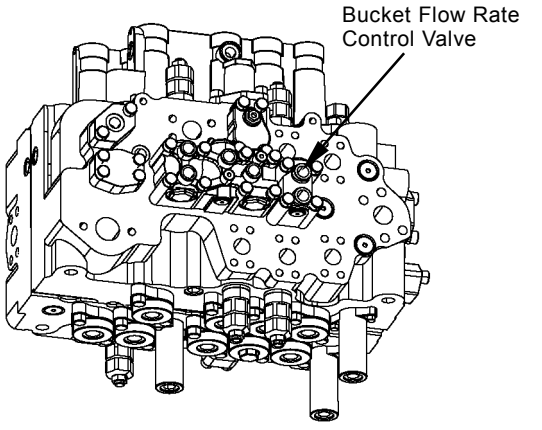
- Bucket flow rate control valve or bucket regenerative valve may be faulty.
- Refer to the COMPONENT OPERATION / Control Valve group in the T/M (Operational Principle).



Signal Control Valve (Control Valve Side)



T178-03-06-015

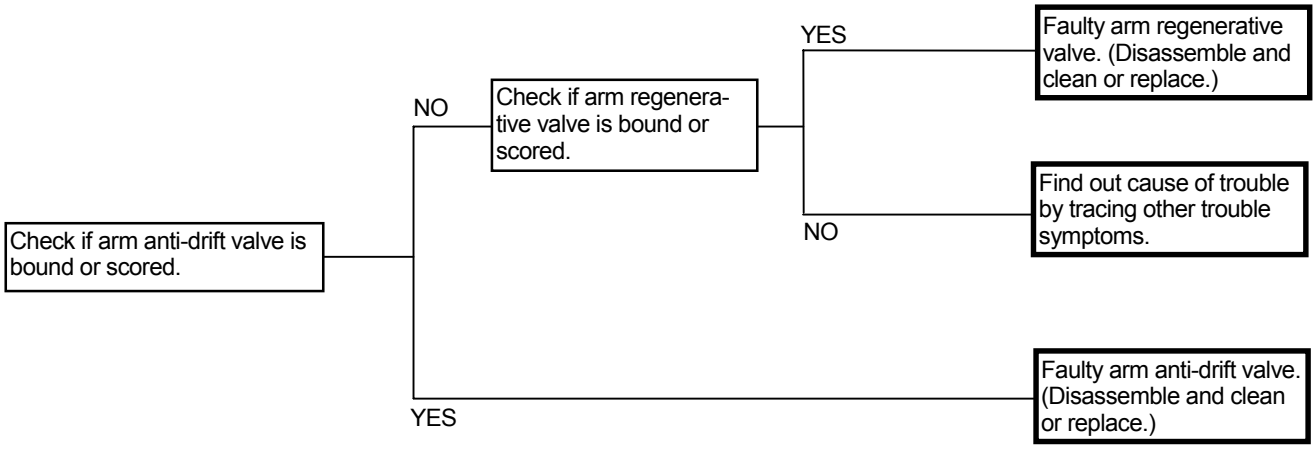


T1V1-05-04-005

F-7 When starting to move during combined operation, arm does not smoothly move. Arm starts to move slightly slow during arm roll-in single operation. These troubles often occur when temperature is low.

Related MC Fault Code: None

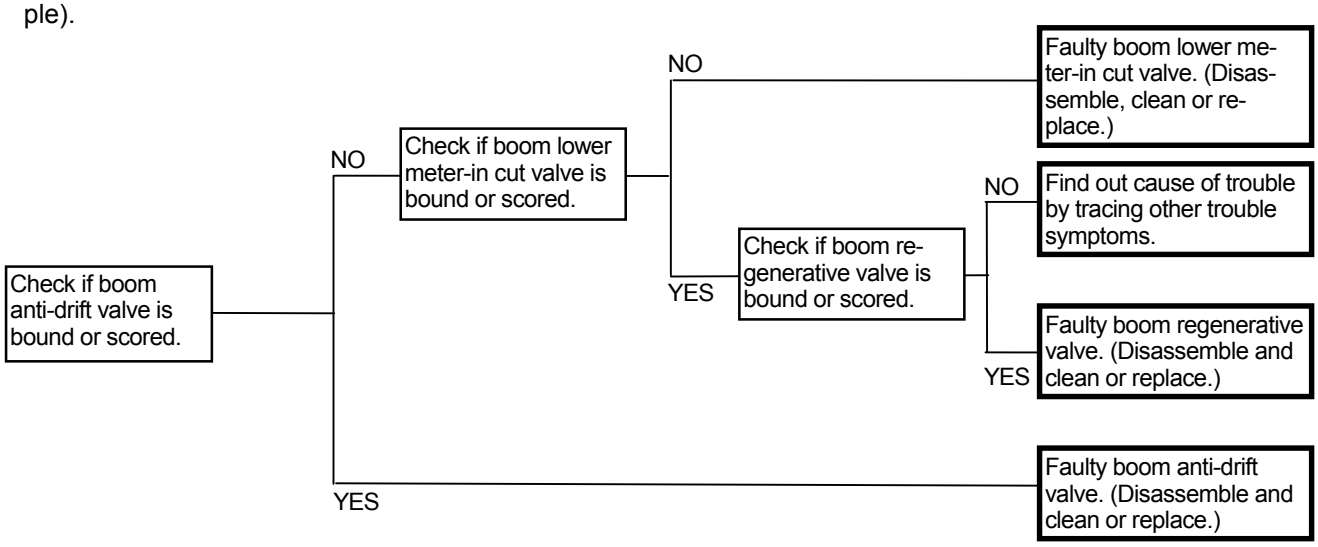
- Refer to the COMPONENT OPERATION / Control Valve group in the T/M (Operational Principle).



F-8 When starting to move during combined operation, boom does not move smoothly. Boom starts to move slightly slow during boom lower single operation.

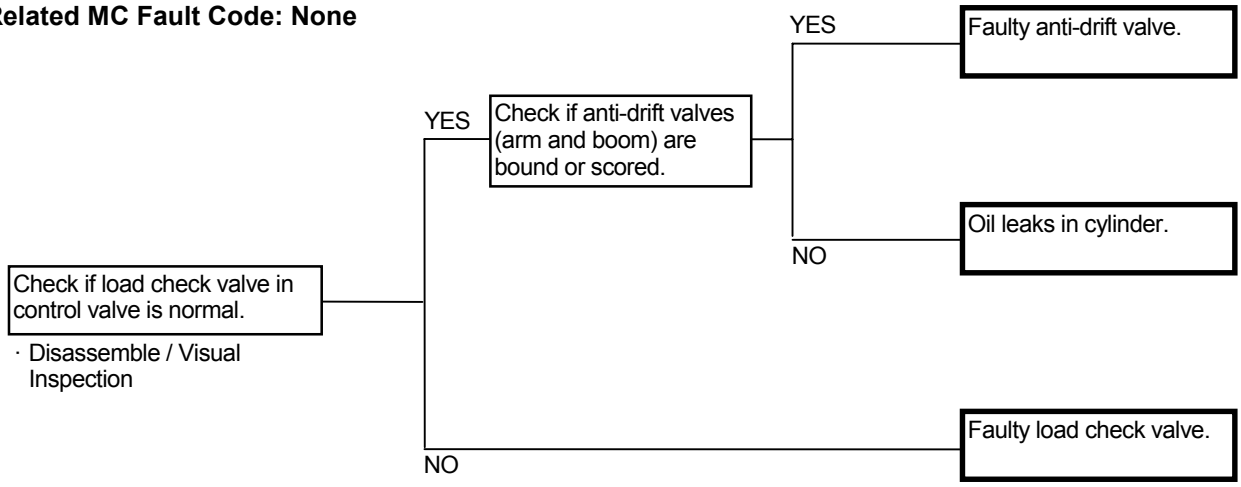
Related MC Fault Code: None

- Refer to the COMPONENT OPERATION / Control Valve group in the T/M (Operational Principle).



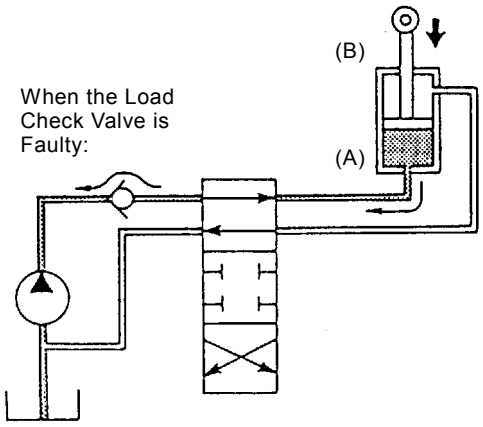
F-9 When boom raise or arm roll-out is operated, boom or arm starts to move after moving slightly downward.

Related MC Fault Code: None



NOTE: 1. During the initial stage of operation, oil pressure and flow rate from the pump is low. Therefore, if the load check valve is malfunctioning, the oil in the bottom side of the boom cylinder flows back into the circuit through the load check valve so that the boom cylinder temporarily is retracted.

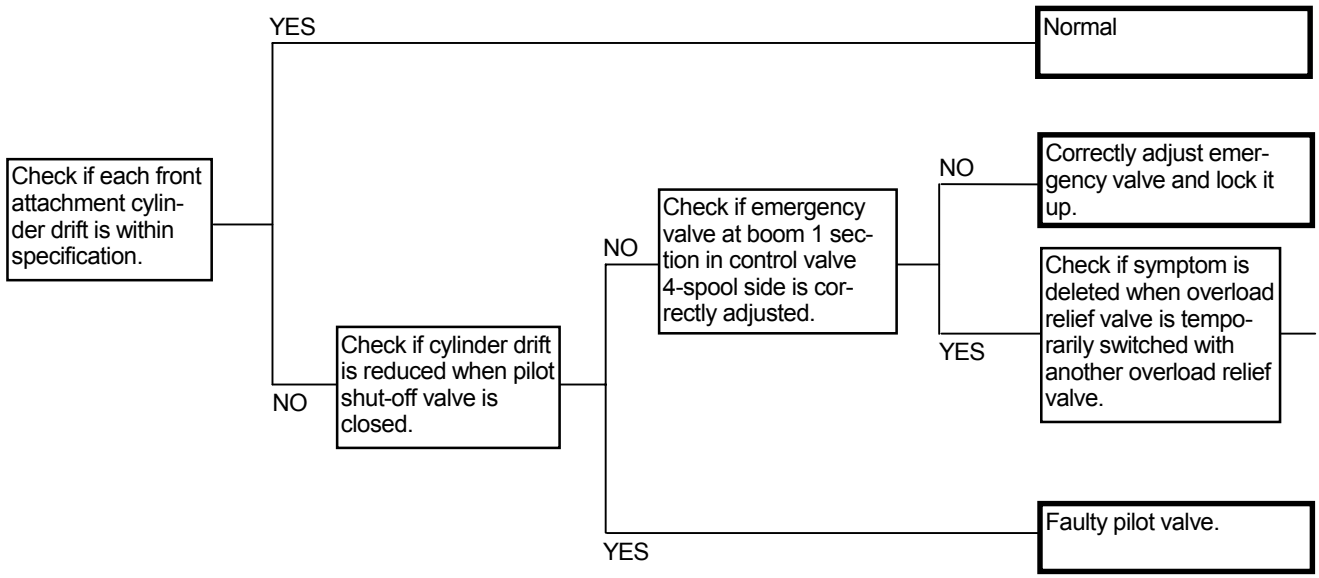
2. As oil pressure and flow rate from the pump is low, if oil leaks from bottom side (A) to rod side (B) due to faulty boom cylinder piston or cylinder barrel, the boom cylinder is temporarily retracted during the initial stage of operation. In addition, cylinder force is reduced. The cylinder drift increases in this case.



T105-07-04-012

F-10 Front attachment drifts remarkably.

Related MC Fault Code: None

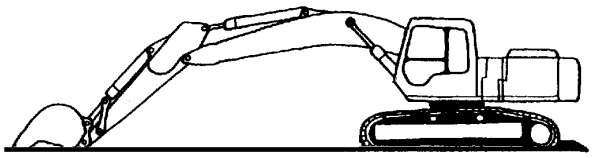


- Boom Cylinder Internal Leakage Check

1. With the bucket cylinder fully retracted and the arm cylinder slightly extended from the fully retracted position, lower the bucket tooth tips onto the ground.

2. Remove the hoses from the boom cylinder rod side. Drain oil from the hoses and cylinders. (Plug the disconnected hose ends.)

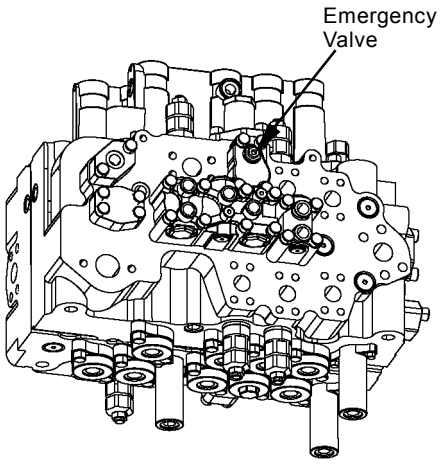
3. Retract the arm cylinder and lift the bucket off the ground. If oil flows out of the hose removed pipe ends and the boom cylinders are retracted at this time, oil leaks in the boom cylinders. In case no oil flows out of the hose removed pipe ends but the boom cylinders are retracted, oil leaks in the control valve.



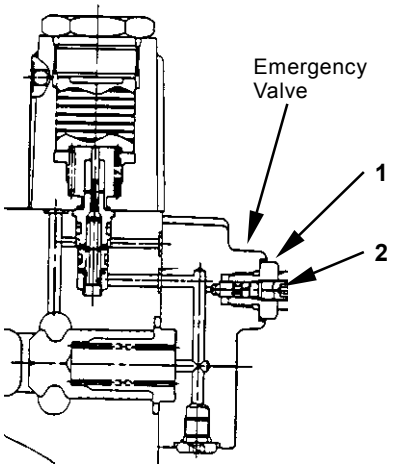
T105-07-04-009

NO — Check if oil leaks in cylinders.
- NO → Scored control valve spool, broken spring, or loose spool end.
- YES → Faulty cylinder. (Replace seal kit.)

YES → Faulty overload relief valve.



T1V1-05-04-005



T178-05-04-003

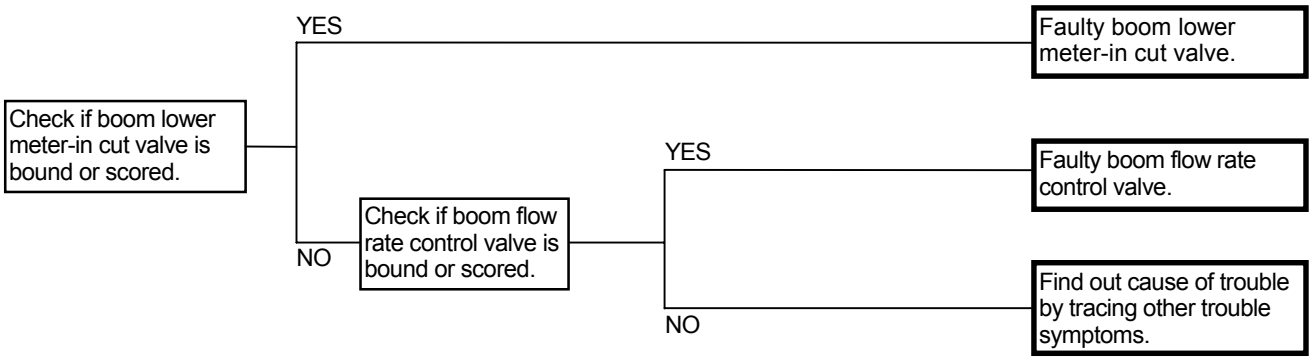
Adjustment Procedure:
Tighten (1) and tighten (2).

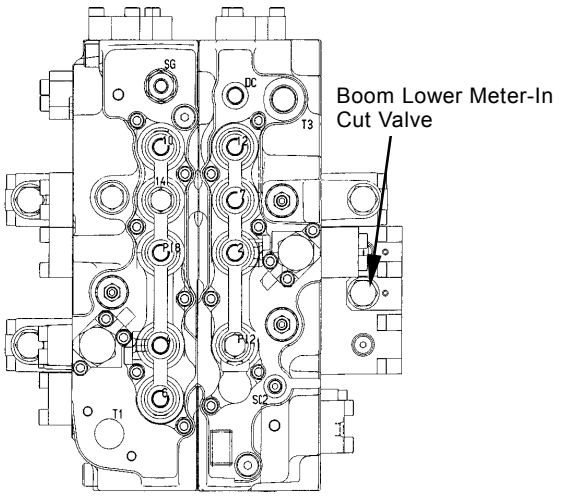
Tightening Torque:
(1)- 13 N·m (1.3 kgf·m)
(2)- 7 N·m (0.7 kgf·m)

F-11 Boom lower above ground is faster than other actuators during combined operation.

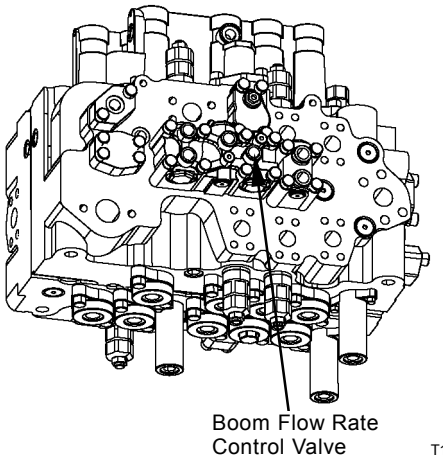
Related MC Fault Code: None

- Boom lower meter-in cut valve or boom flow rate control valve may be faulty.
- Refer to the pages for the SYSTEM / Hydraulic System group and the COMPONENT OPERATION / Control Valve group in the T/M (Operational Principle).
- In case boom lower single operation is slow, refer to F-8.





T1V1-03-03-026

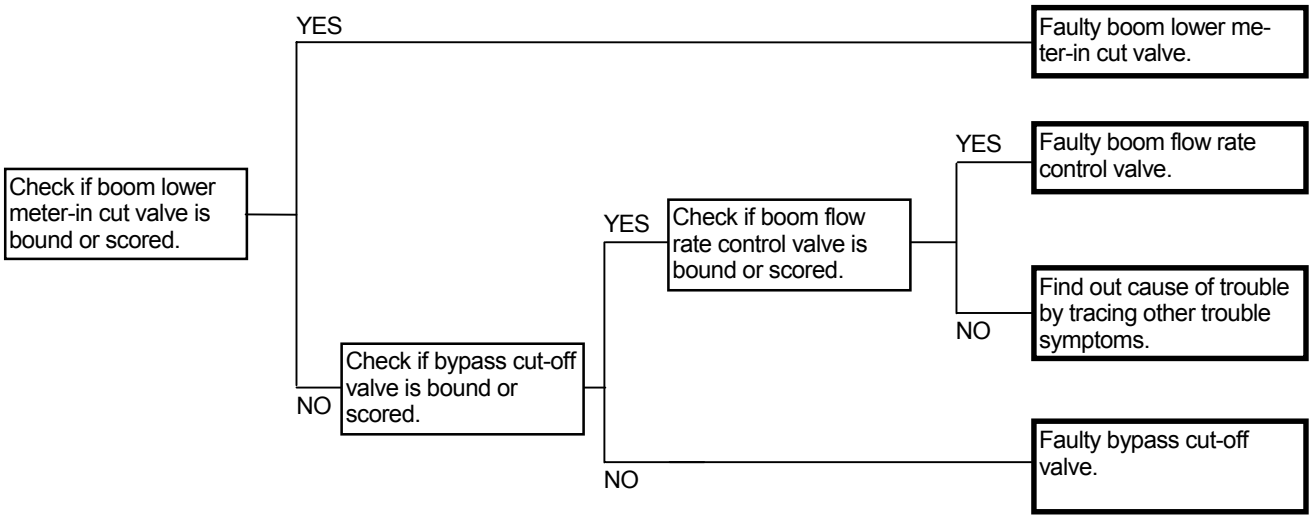


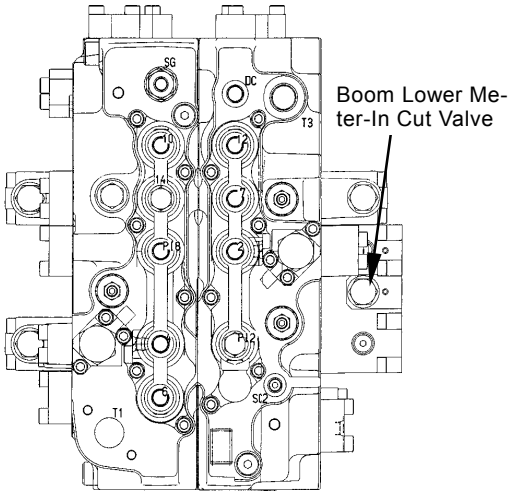
T1V1-05-04-005

F-12 Machine cannot be raised off ground.

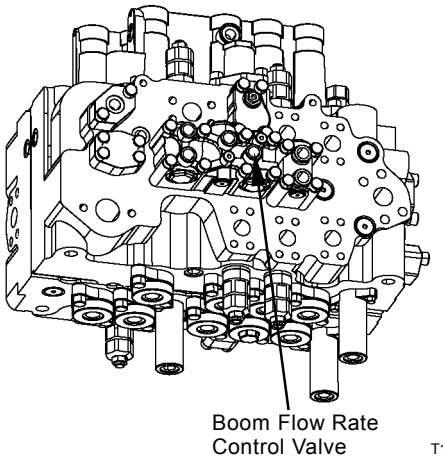
Related MC Fault Code: None

- Boom lower meter-in cut valve or boom flow rate control valve may be faulty.
- Refer to the pages for the SYSTEM / Hydraulic System group and the COMPONENT OPERATION / Control Valve group in the T/M (Operational Principle).
- In case boom lower single operation is slow, refer to F-8.





T1V1-03-03-026

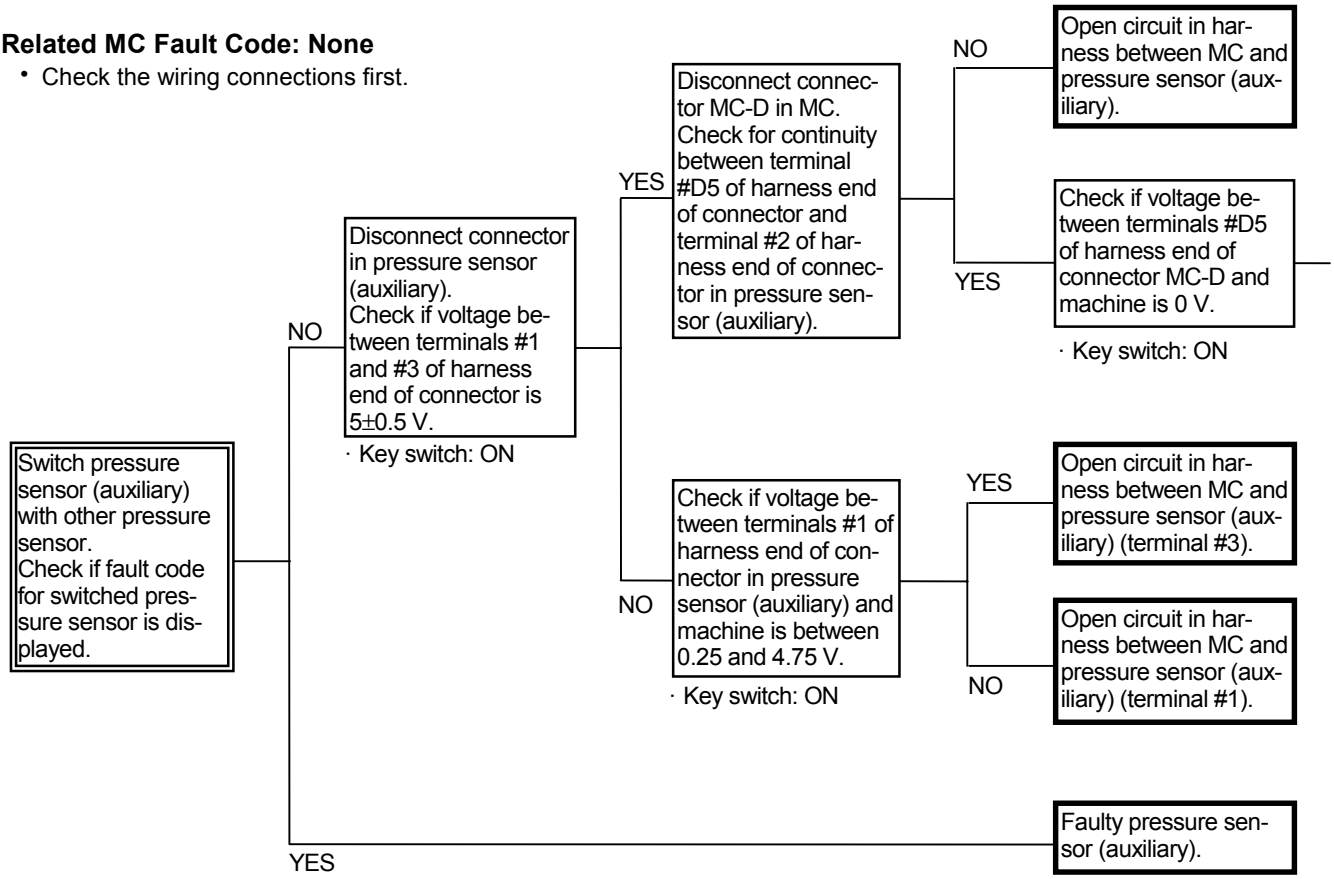


T1V1-05-04-005

F-13 Attachment speed is fast during combined operation of attachment (optional) and front attachment (when secondary crusher or primary crusher is used).

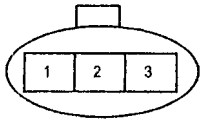
Related MC Fault Code: None

- Check the wiring connections first.



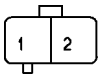
Connector (Harness end of connector viewed from the open side)

Pilot Pressure Sensor (Auxiliary)
Pilot Pressure Sensor (Arm Roll-Out)



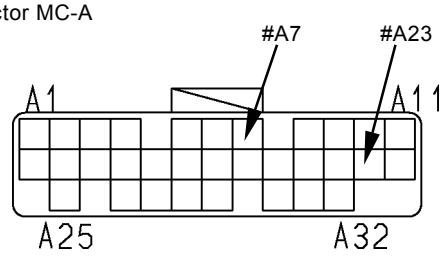
T1V1-05-07-102

Auxiliary Flow Rate Control Solenoid Valve



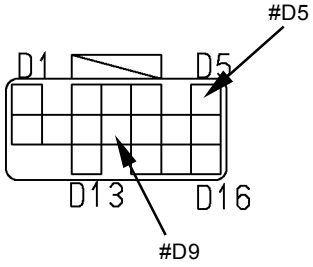
T1V1-05-04-003

MC
Connector MC-A

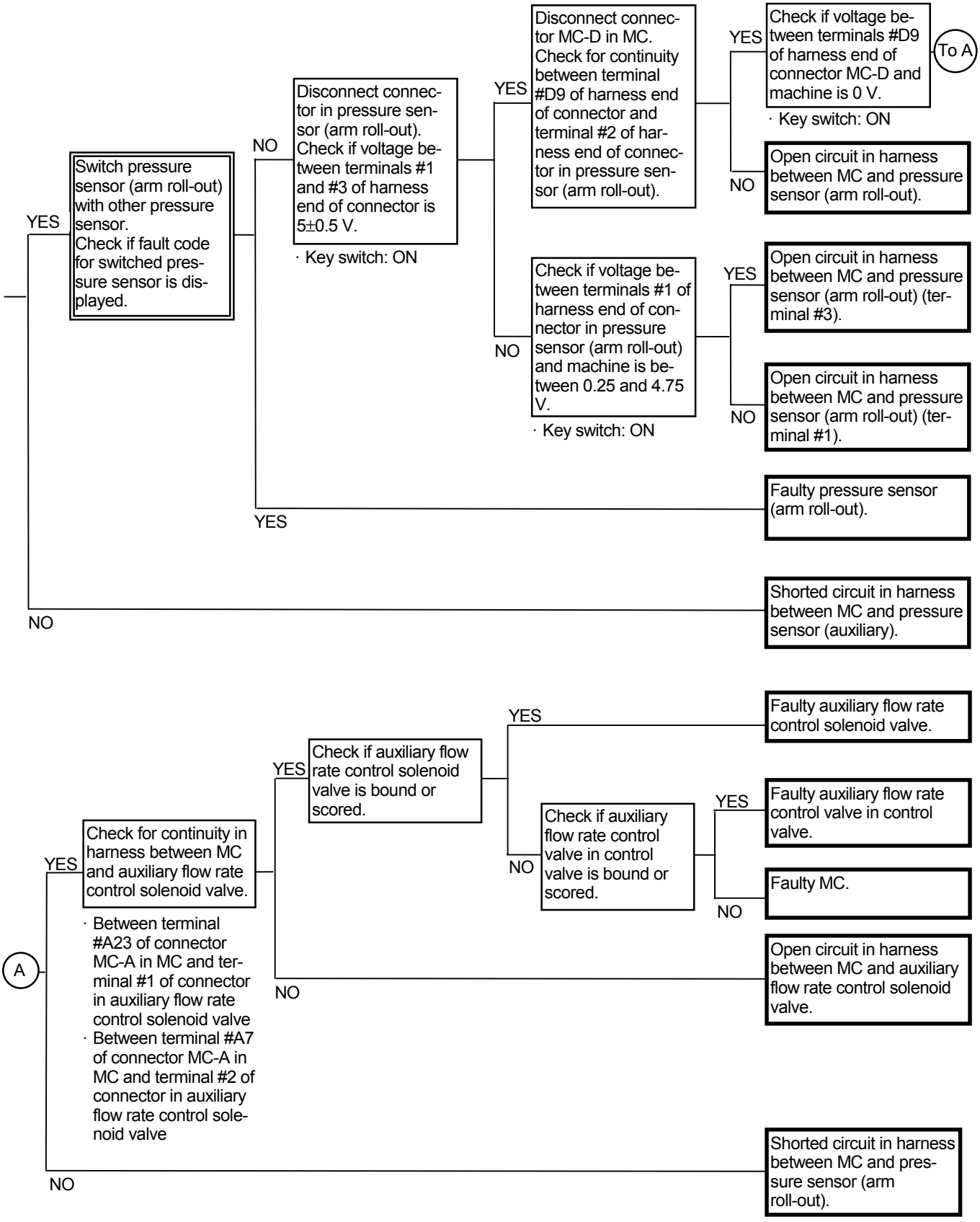


MC
Connector MC-D

T183-05-04-008



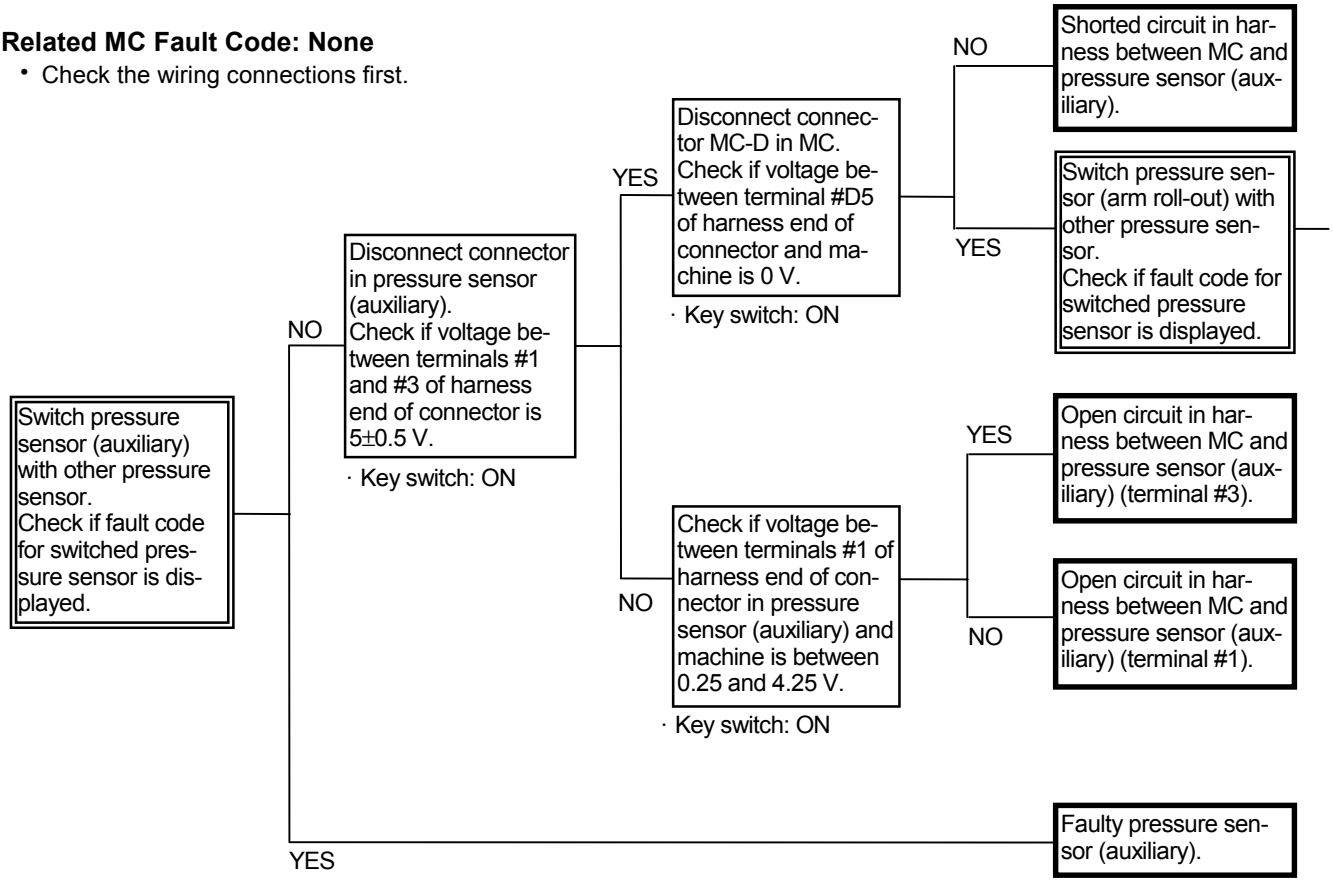
T183-05-04-009


Switch pressure sensor (arm roll-out) with other pressure sensor.
Check if fault code for switched pressure sensor is displayed.
YES
NO
Disconnect connector in pressure sensor (arm roll-out).
Check if voltage between terminals #1 and #3 of harness end of connector is 5±0.5 V.
· Key switch: ON
YES
NO
Disconnect connector MC-D in MC.
Check for continuity between terminal #D9 of harness end of connector and terminal #2 of harness end of connector in pressure sensor (arm roll-out).
YES
NO
Check if voltage between terminals #D9 of harness end of connector MC-D and machine is 0 V.
· Key switch: ON
To A
Open circuit in harness between MC and pressure sensor (arm roll-out).
Check if voltage between terminals #1 of harness end of connector in pressure sensor (arm roll-out) and machine is between 0.25 and 4.75 V.
· Key switch: ON
YES
NO
Open circuit in harness between MC and pressure sensor (arm roll-out) (terminal #3).
Open circuit in harness between MC and pressure sensor (arm roll-out) (terminal #1).
Faulty pressure sensor (arm roll-out).
Shorted circuit in harness between MC and pressure sensor (auxiliary).
A
Check for continuity in harness between MC and auxiliary flow rate control solenoid valve.
· Between terminal #A23 of connector MC-A in MC and terminal #1 of connector in auxiliary flow rate control solenoid valve
· Between terminal #A7 of connector MC-A in MC and terminal #2 of connector in auxiliary flow rate control solenoid valve
YES
NO
Check if auxiliary flow rate control solenoid valve is bound or scored.
YES
NO
Check if auxiliary flow rate control valve in control valve is bound or scored.
YES
NO
Faulty auxiliary flow rate control solenoid valve.
Faulty auxiliary flow rate control valve in control valve.
Faulty MC.
Open circuit in harness between MC and auxiliary flow rate control solenoid valve.
Shorted circuit in harness between MC and pressure sensor (arm roll-out).

F-14 Attachment speed is fast during combined operation of attachment (optional) and front attachment (when breaker attached with auxiliary flow combining line is used).

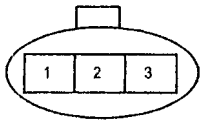
Related MC Fault Code: None

- Check the wiring connections first.



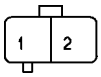
Connector (Harness end of connector viewed from the open side)

Pilot Pressure Sensor (Auxiliary)
Pilot Pressure Sensor (Arm Roll-Out)



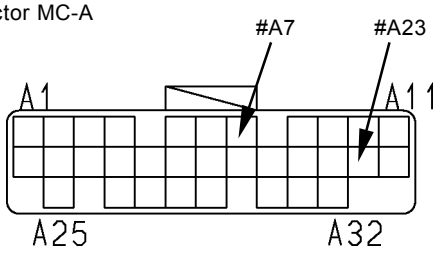
T1V1-05-07-102

Auxiliary Flow Combining Solenoid Valve



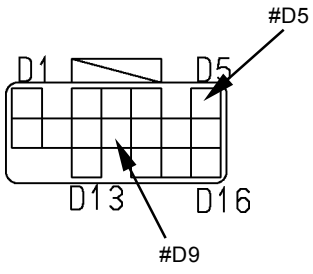
T1V1-05-04-003

MC
Connector MC-A

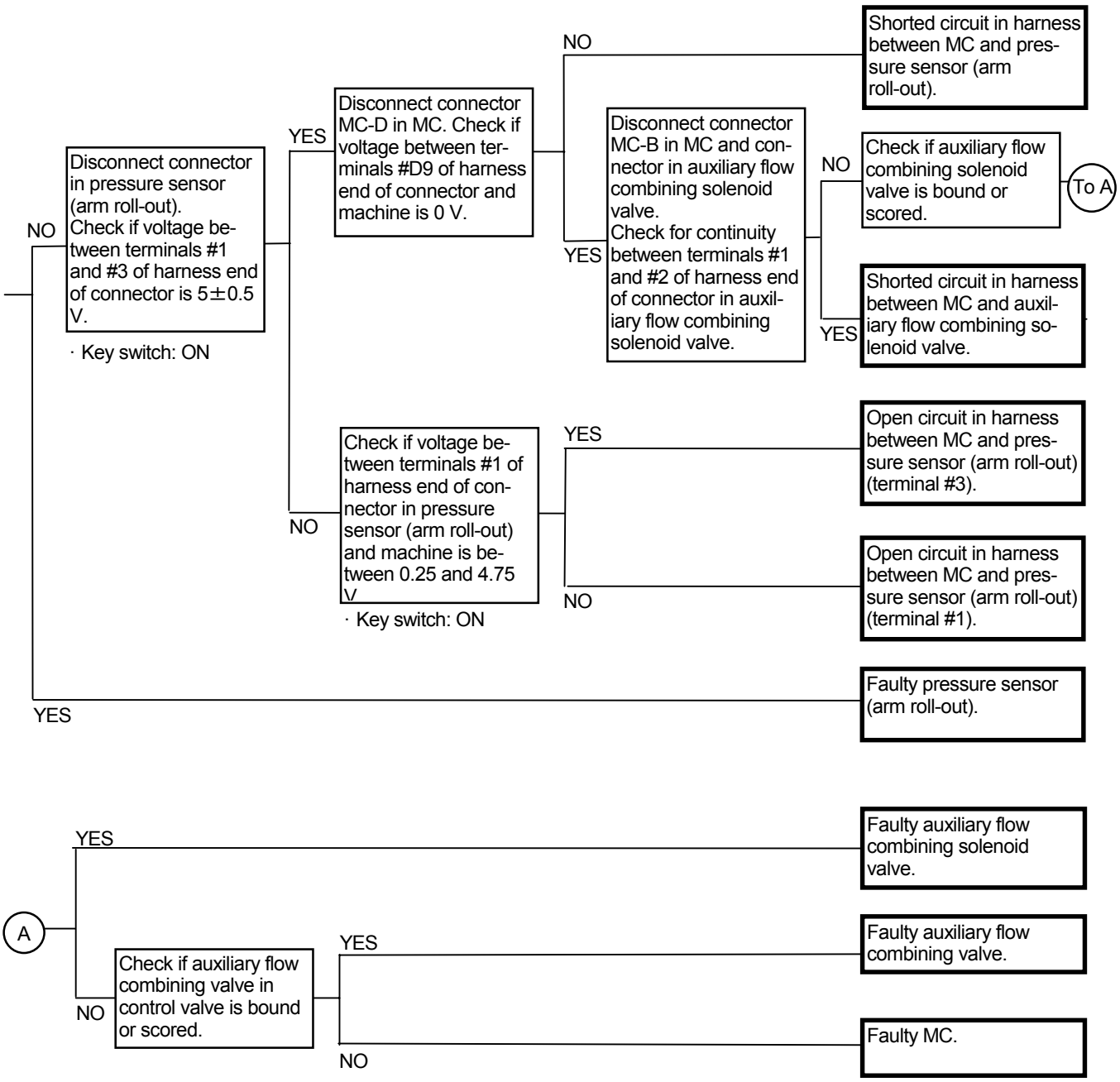


T183-05-04-008

MC
Connector MC-D



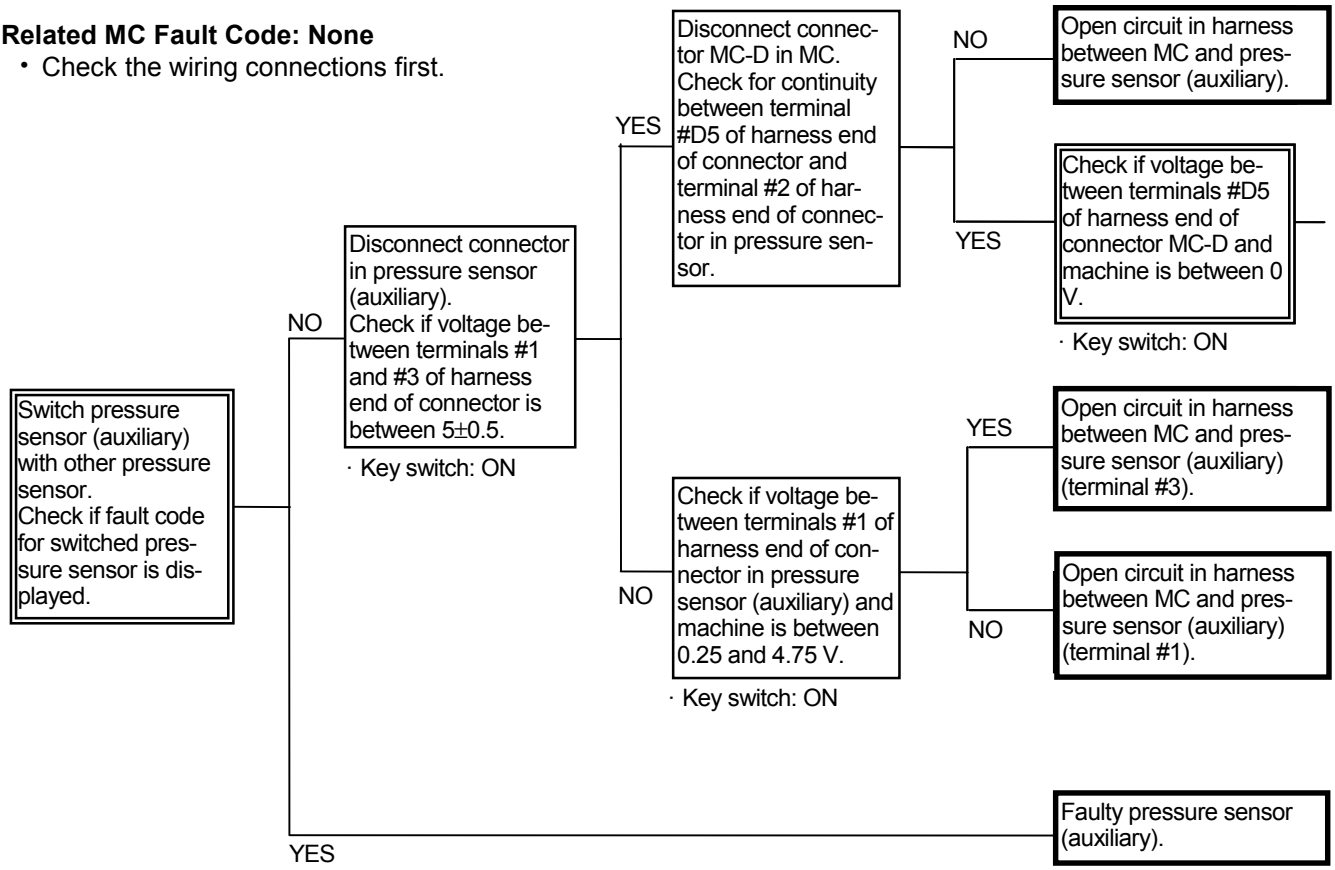
T183-05-04-009


Disconnect connector in pressure sensor (arm roll-out). Check if voltage between terminals #1 and #3 of harness end of connector is 5±0.5 V.
· Key switch: ON
NO
YES
Disconnect connector MC-D in MC. Check if voltage between terminals #D9 of harness end of connector and machine is 0 V.
YES
NO
Shorted circuit in harness between MC and pressure sensor (arm roll-out).
Disconnect connector MC-B in MC and connector in auxiliary flow combining solenoid valve. Check for continuity between terminals #1 and #2 of harness end of connector in auxiliary flow combining solenoid valve.
YES
NO
Check if auxiliary flow combining solenoid valve is bound or scored.
To A
NO
Shorted circuit in harness between MC and auxiliary flow combining solenoid valve.
YES
Check if voltage between terminals #1 of harness end of connector in pressure sensor (arm roll-out) and machine is between 0.25 and 4.75 V
· Key switch: ON
NO
YES
Open circuit in harness between MC and pressure sensor (arm roll-out) (terminal #3).
YES
NO
Open circuit in harness between MC and pressure sensor (arm roll-out) (terminal #1).
YES
Faulty pressure sensor (arm roll-out).
A
YES
Faulty auxiliary flow combining solenoid valve.
NO
Check if auxiliary flow combining valve in control valve is bound or scored.
YES
NO
Faulty auxiliary flow combining valve.
Faulty MC.

F-15 Attachment speed is fast during combined operation of attachment (optional) and front attachment (when vibrating hammer is used).

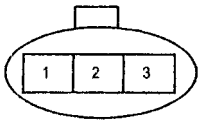
Related MC Fault Code: None

- Check the wiring connections first.



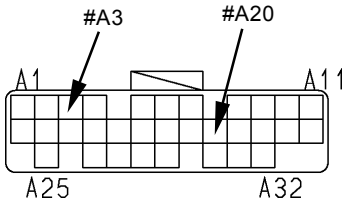
Connector (Harness end of connector viewed from the open side)

Pilot Pressure Sensor (Auxiliary)
Pilot Pressure Sensor (Travel)



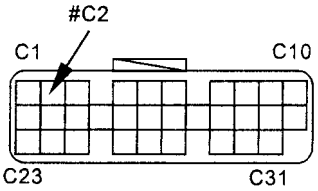
T1V1-05-07-102

MC
Connector MC-A



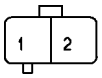
T183-05-04-008

MC
Connector MC-C



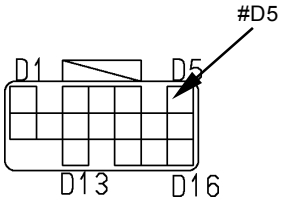
T1V1-05-07-103

Maximum Pump 1 Flow Rate Limit Control Solenoid Valve (Optional)

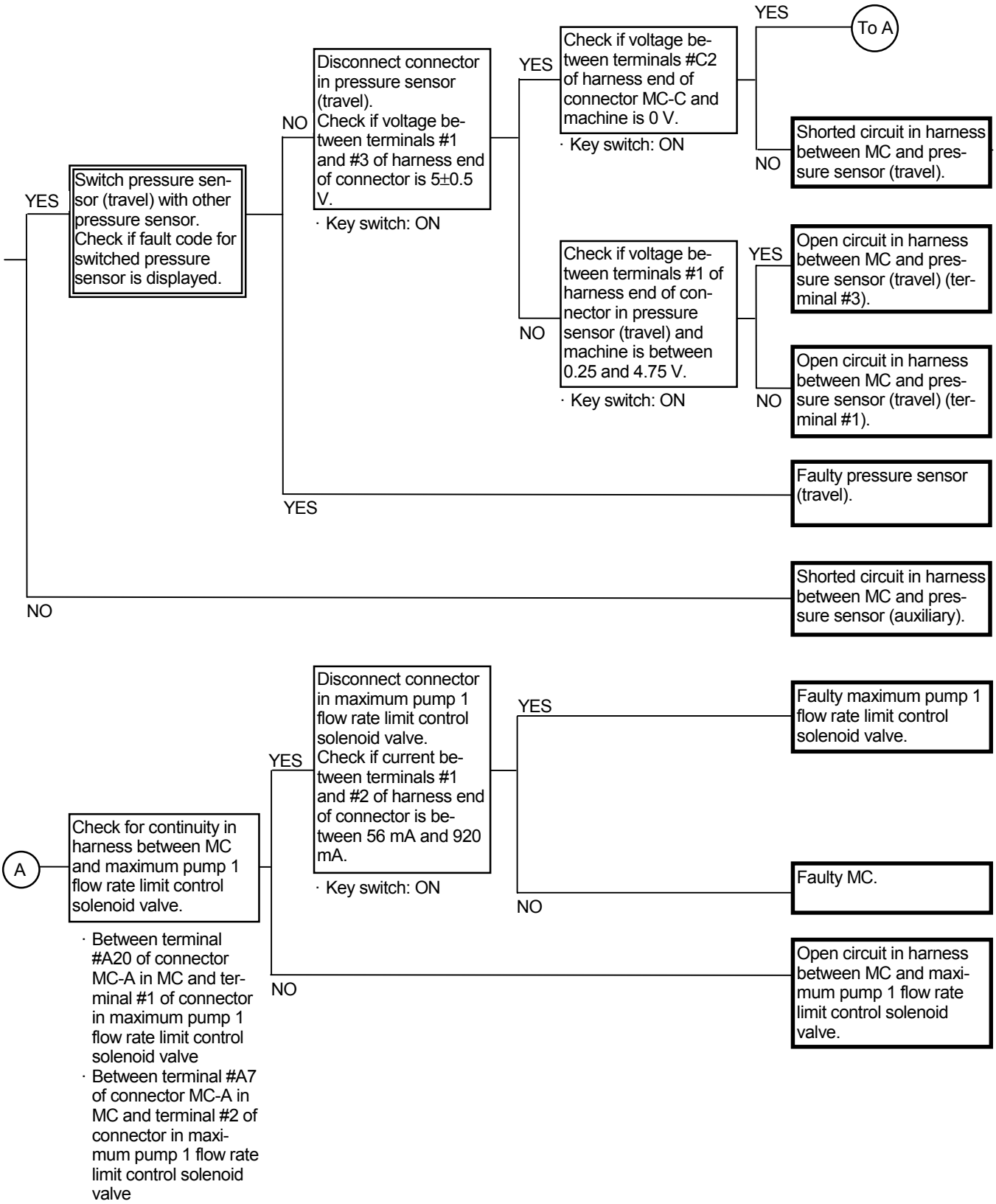


T1V1-05-04-003

MC
Connector MC-D



T183-05-04-009

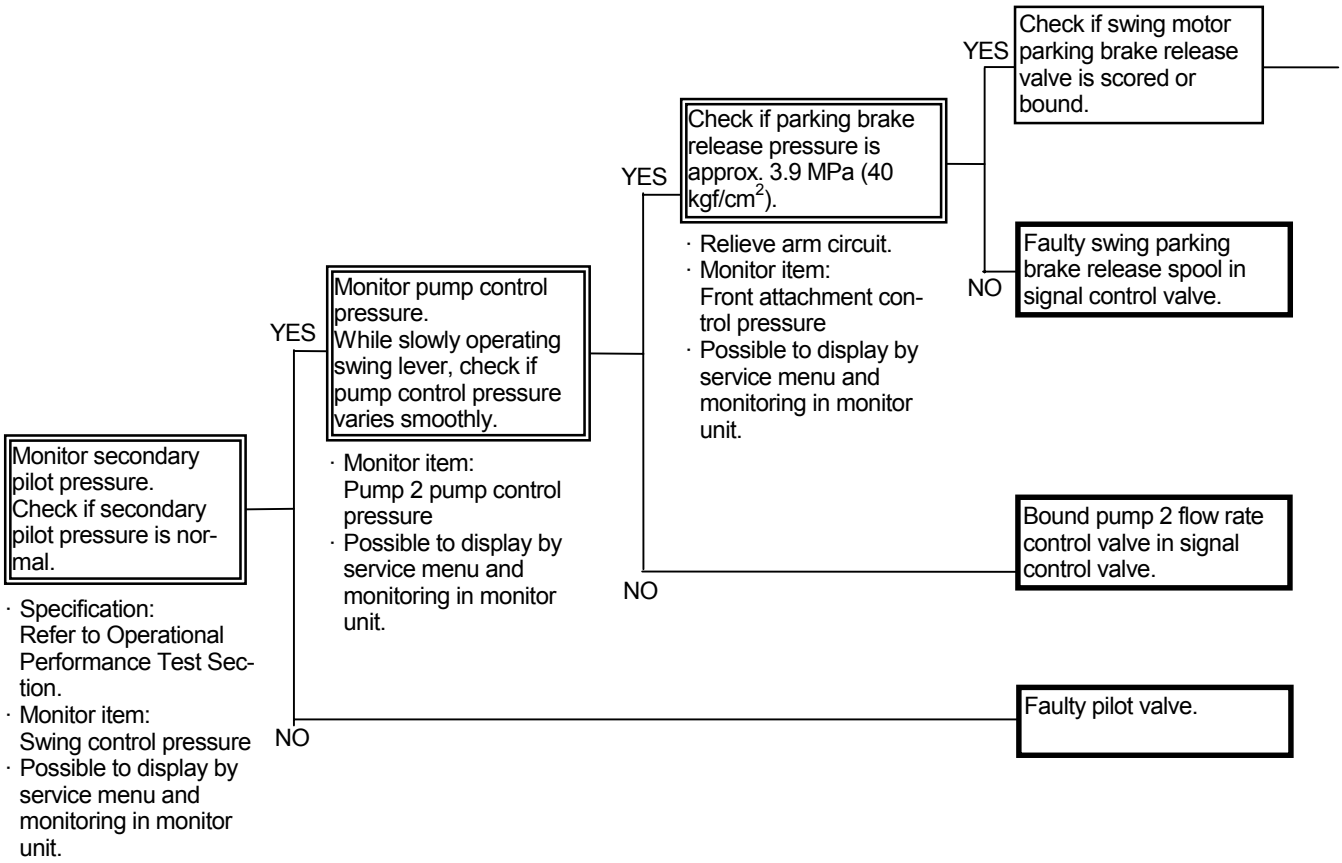

YES
To A
Check if voltage between terminals #C2 of harness end of connector MC-C and machine is 0 V.
· Key switch: ON
NO
Shorted circuit in harness between MC and pressure sensor (travel).
YES
Disconnect connector in pressure sensor (travel).
Check if voltage between terminals #1 and #3 of harness end of connector is 5±0.5 V.
· Key switch: ON
NO
Switch pressure sensor (travel) with other pressure sensor.
Check if fault code for switched pressure sensor is displayed.
YES
Check if voltage between terminals #1 of harness end of connector in pressure sensor (travel) and machine is between 0.25 and 4.75 V.
· Key switch: ON
YES
Open circuit in harness between MC and pressure sensor (travel) (terminal #3).
NO
Open circuit in harness between MC and pressure sensor (travel) (terminal #1).
YES
Faulty pressure sensor (travel).
NO
Shorted circuit in harness between MC and pressure sensor (auxiliary).
A
Check for continuity in harness between MC and maximum pump 1 flow rate limit control solenoid valve.
· Between terminal #A20 of connector MC-A in MC and terminal #1 of connector in maximum pump 1 flow rate limit control solenoid valve
· Between terminal #A7 of connector MC-A in MC and terminal #2 of connector in maximum pump 1 flow rate limit control solenoid valve
YES
Disconnect connector in maximum pump 1 flow rate limit control solenoid valve.
Check if current between terminals #1 and #2 of harness end of connector is between 56 mA and 920 mA.
· Key switch: ON
YES
Faulty maximum pump 1 flow rate limit control solenoid valve.
NO
Faulty MC.
NO
Open circuit in harness between MC and maximum pump 1 flow rate limit control solenoid valve.

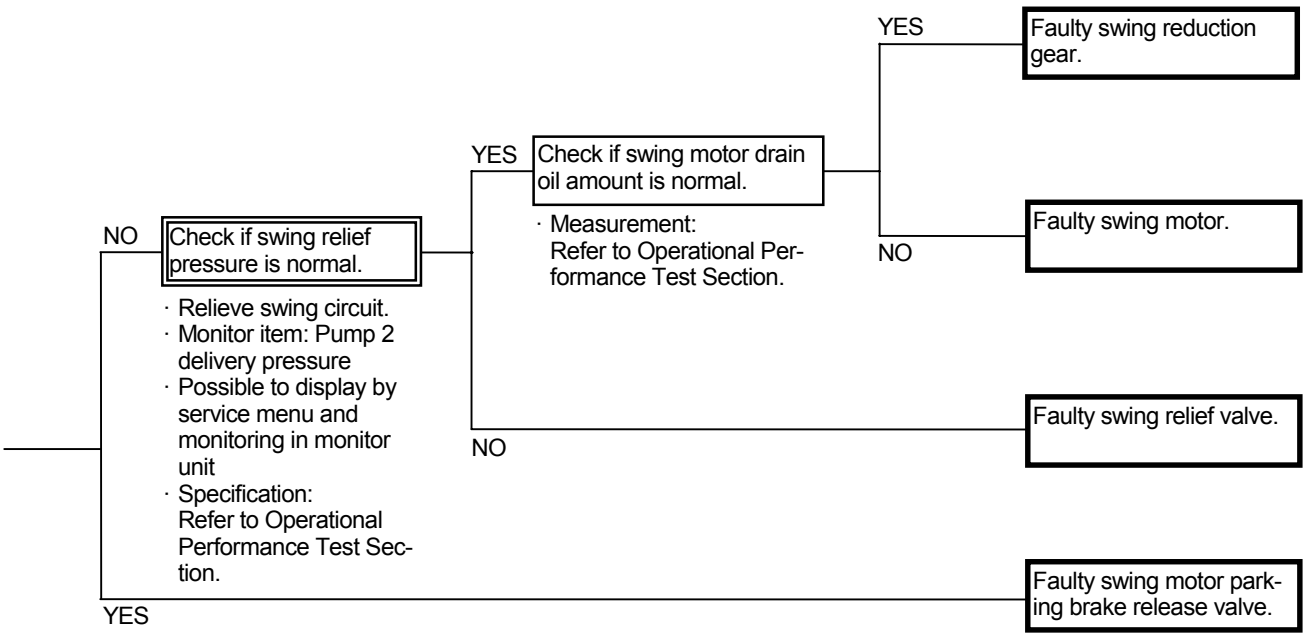
SWING SYSTEM TROUBLESHOOTING

S-1 Swing is slow or unmoving.

Related MC Fault Code: None

- Check whether the pilot system is faulty or the main circuit is faulty.
- In case other functions (front attachment and travel) operate normally, the pilot pump is considered to be normal. If the pilot system is displaying a problem, the cause of trouble may exist in the circuit after pilot valve.
- In case left travel speed is also slow, refer to A-3.

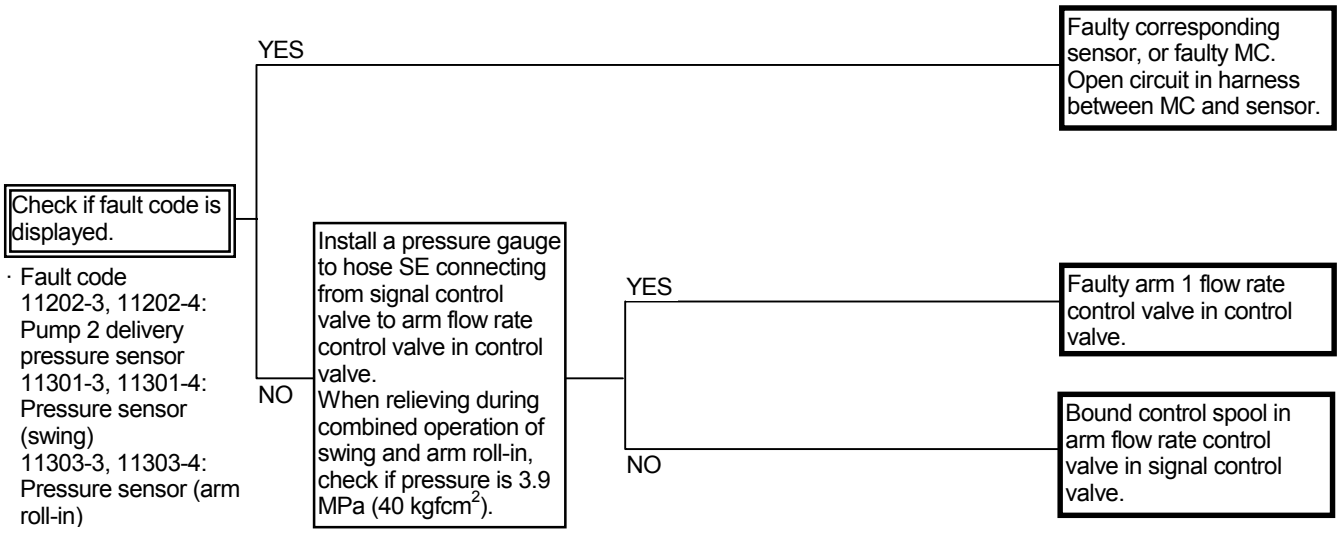



NO
Check if swing relief pressure is normal.
· Relieve swing circuit.
· Monitor item: Pump 2 delivery pressure
· Possible to display by service menu and monitoring in monitor unit
· Specification: Refer to Operational Performance Test Section.
YES
YES
Check if swing motor drain oil amount is normal.
· Measurement: Refer to Operational Performance Test Section.
NO
YES
Faulty swing reduction gear.
NO
Faulty swing motor.
Faulty swing relief valve.
Faulty swing motor parking brake release valve.

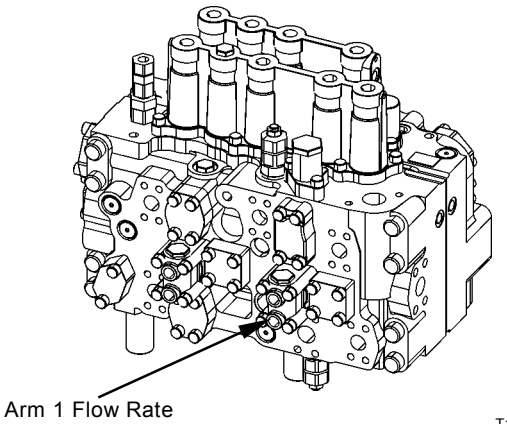
S-2 Swing is slow (weak in power) during combined operation of swing and arm roll-in.
Swing does not start smoothly.
Swing power is weak.

Related MC Fault Codes: 11202-3, 11202-4, 11301-3, 11301-4, 11303-3, 11303-4

- Refer to the pages for the SYSTEM / Hydraulic System group / Valve Control Circuit in the T/M (Operational Principle).
- Check the wiring connections first.

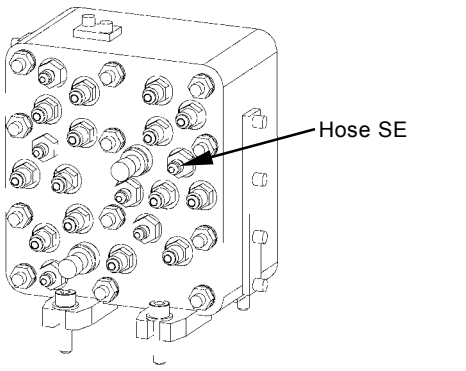


NOTE: In case other fault codes are displayed, perform troubleshooting corresponding to the displayed fault code.



T1V1-05-04-004

Signal Control Valve (Control Valve Side)



T178-03-06-015

(Blank)

TRAVEL SYSTEM TROUBLESHOOTING

T-1 Both right and left tracks do not rotate or rotate slowly.

Related MC Fault Code: None

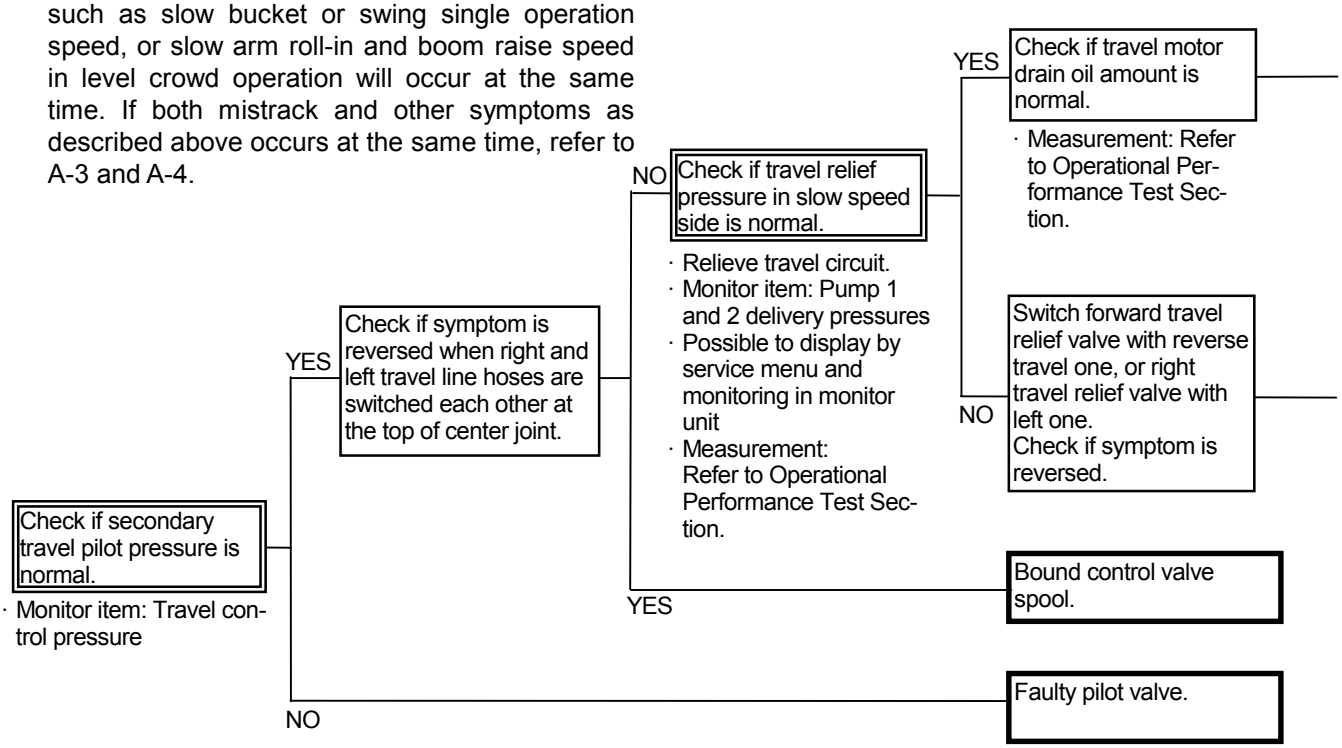
- Both right and left pilot valves, travel motors, and/or control valve spools are unlikely to be faulty at the same time.
- In case both travel systems do not operate, the pilot system, which is applied to both side travel motors, may be faulty. If primary pilot pressure is lower than specification, front attachment operating speed becomes slow as well. Refer to A-1.
- In case the fast travel mode cannot be selected, refer to T-5.

(Blank)

T-2 One side track does not rotate or rotates slowly. Machine mistracks.

Related MC Fault Code: None

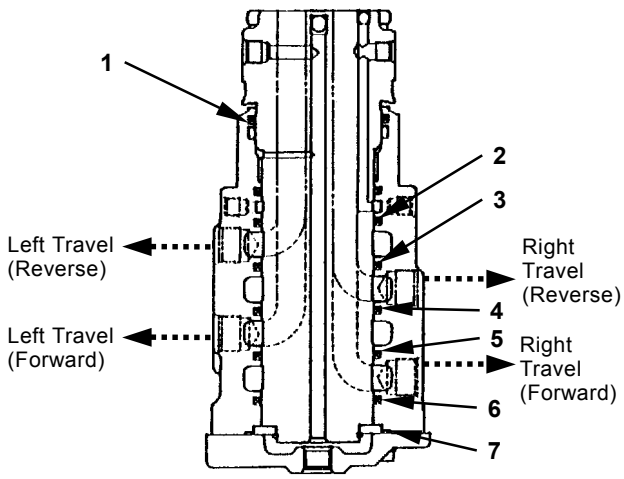
- Check that both side track sags are equally adjusted.
- Faulty pump control will cause the machine to mistrack. In this case, other trouble symptoms such as slow bucket or swing single operation speed, or slow arm roll-in and boom raise speed in level crowd operation will occur at the same time. If both mistrack and other symptoms as described above occurs at the same time, refer to A-3 and A-4.
- In one side track only does not rotate, the pilot valve, control valve, travel motor, or center joint may be faulty.



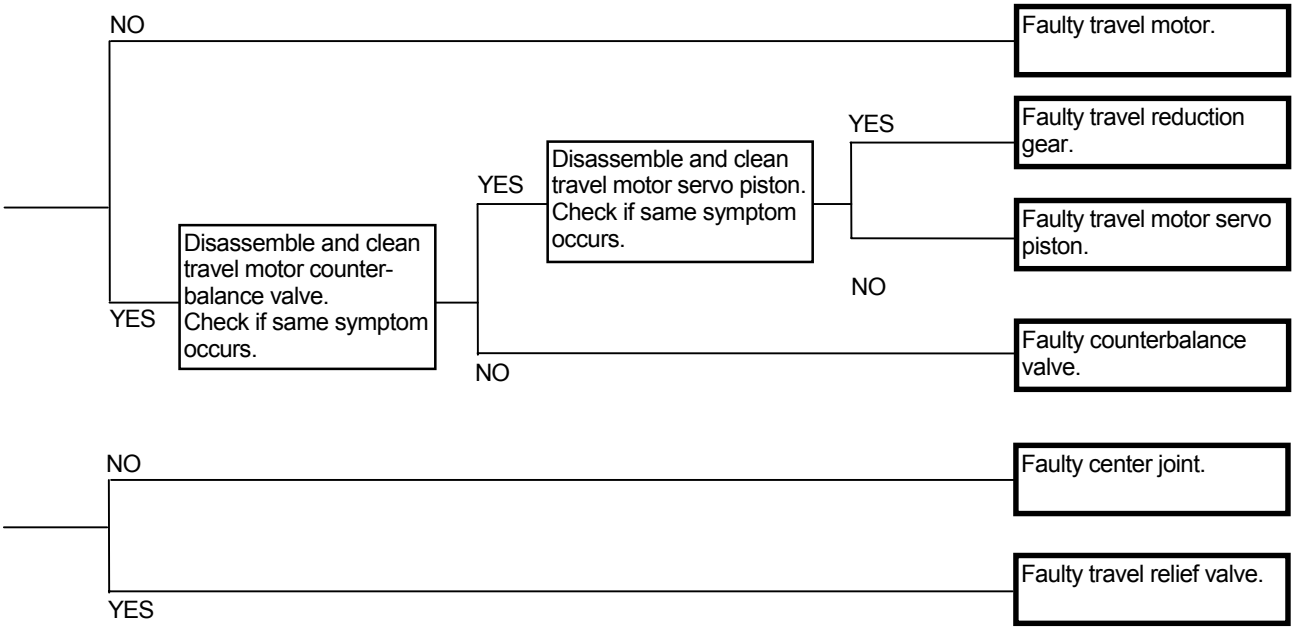
Relationship between Faulty Seal Location and Mistrack Direction

Seal No.	When traveling straight:	When pivot turn is performed:
1	External Oil Leak	←
2		
3		
4		
5		
6		
7	External Oil Leak	←

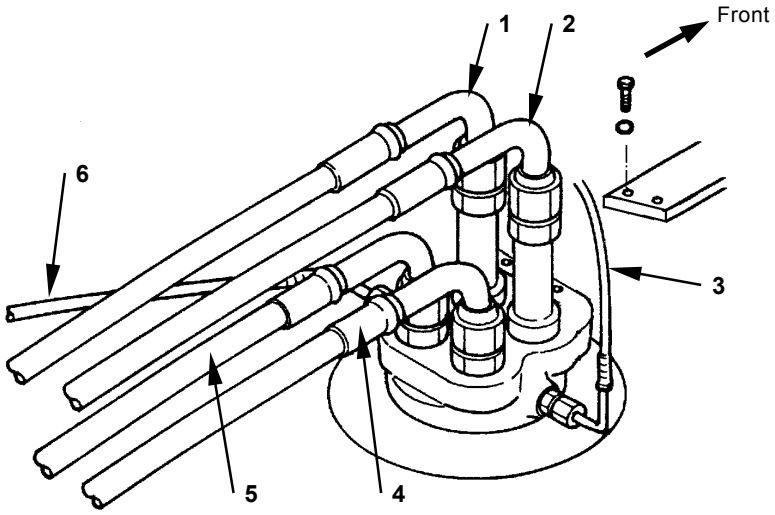
Seal Location



T105-07-04-015



Arrangement of Pipe Line

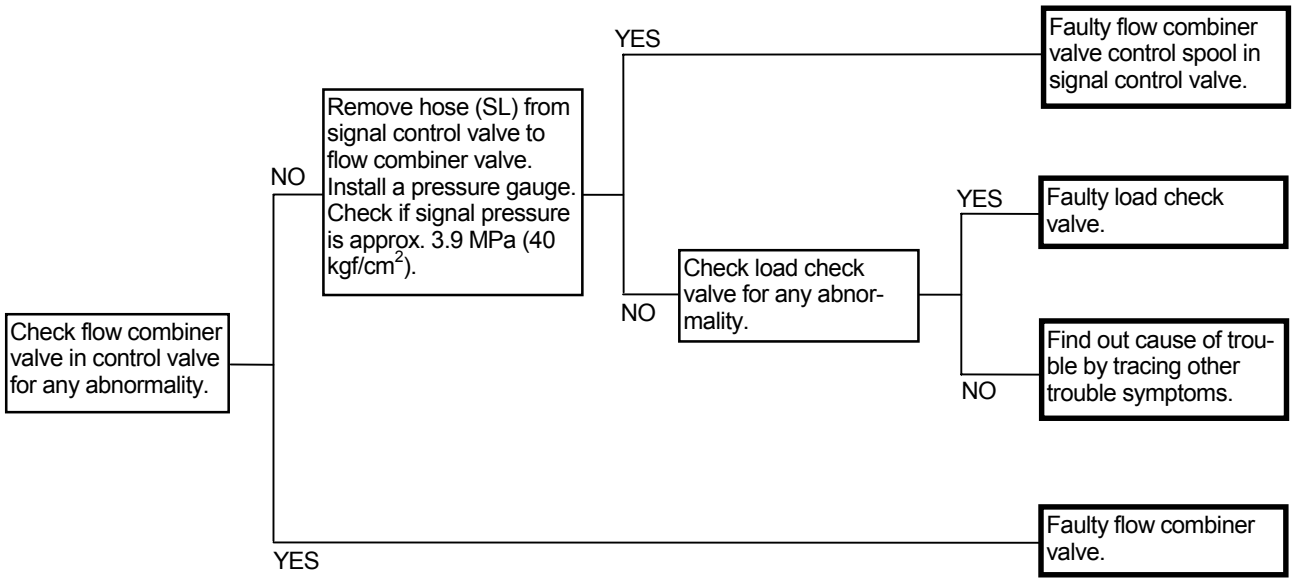


W157-03-03-003

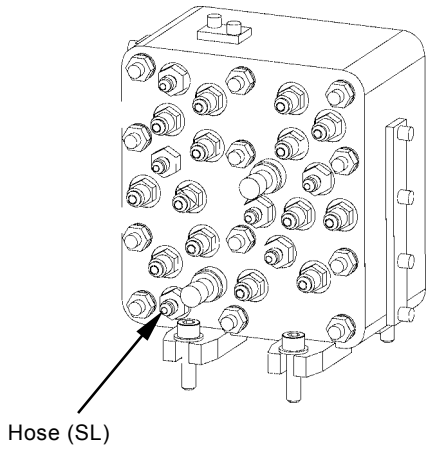
1 - Left Travel (Forward)
2 - Right Travel (Forward)
3 - Pilot
4 - Right Travel (Reverse)
5 - Left Travel (Reverse)
6 - Drain

T-3 Machine mistracks during combined operation of travel and front attachment.

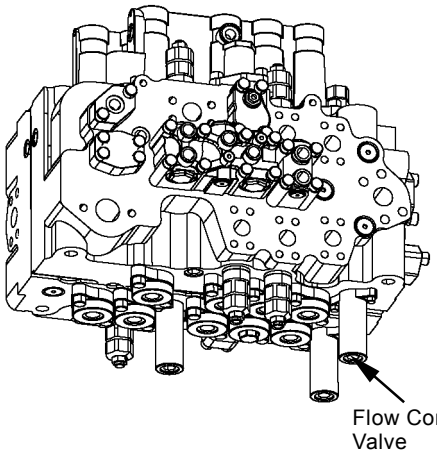
Related Fault Code: None



Signal Control Valve (Control Valve Side)



T178-03-06-015

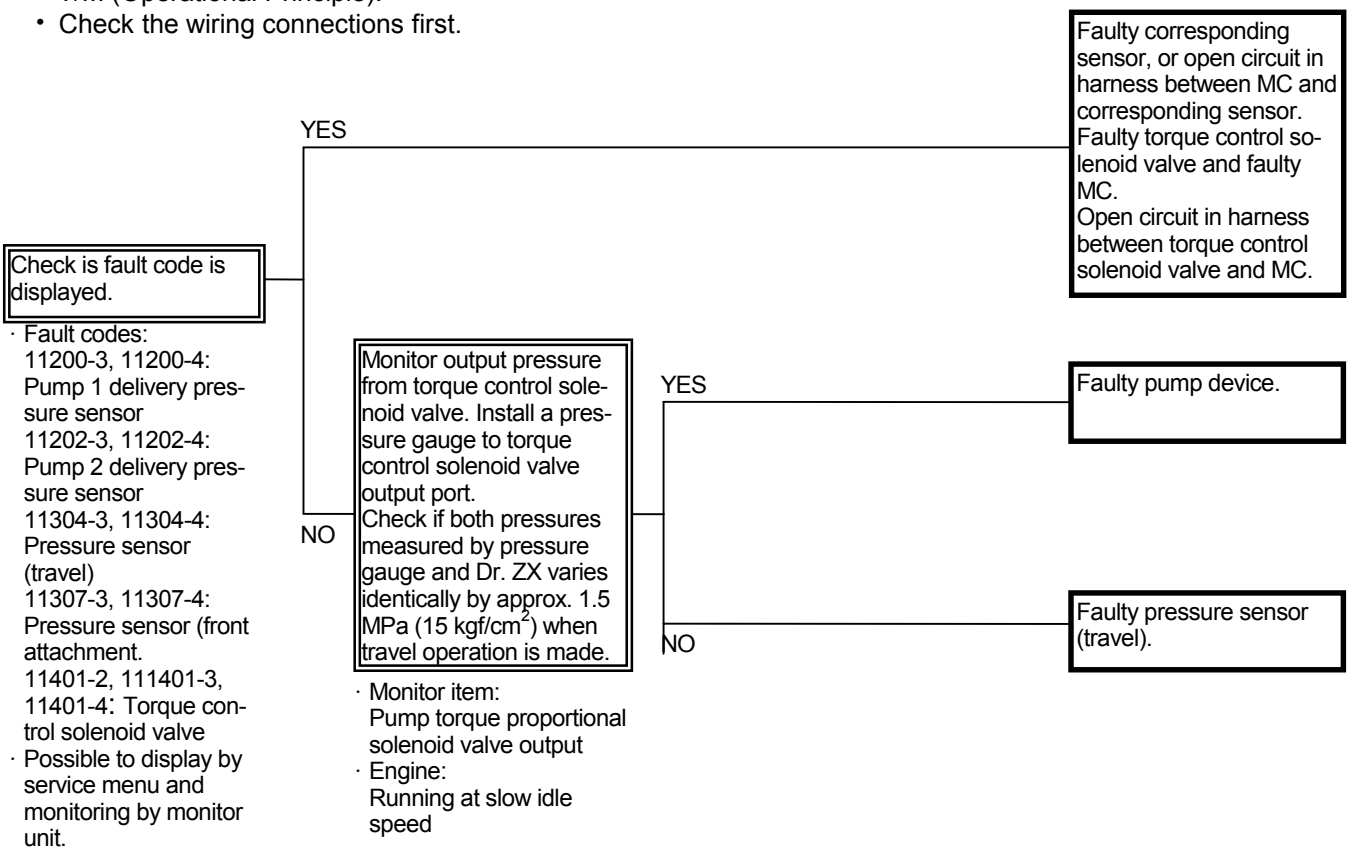


T1V1-05-04-005

T-4 Occasionally, machine may mistrack when traveling with engine running at slow speed.

Related MC Fault Codes: 11200-3, 11200-4, 11202-3, 11202-4, 11304-3, 11304-4, 11307-3, 11307-4, 11401-2, 11401-3, 11401-4

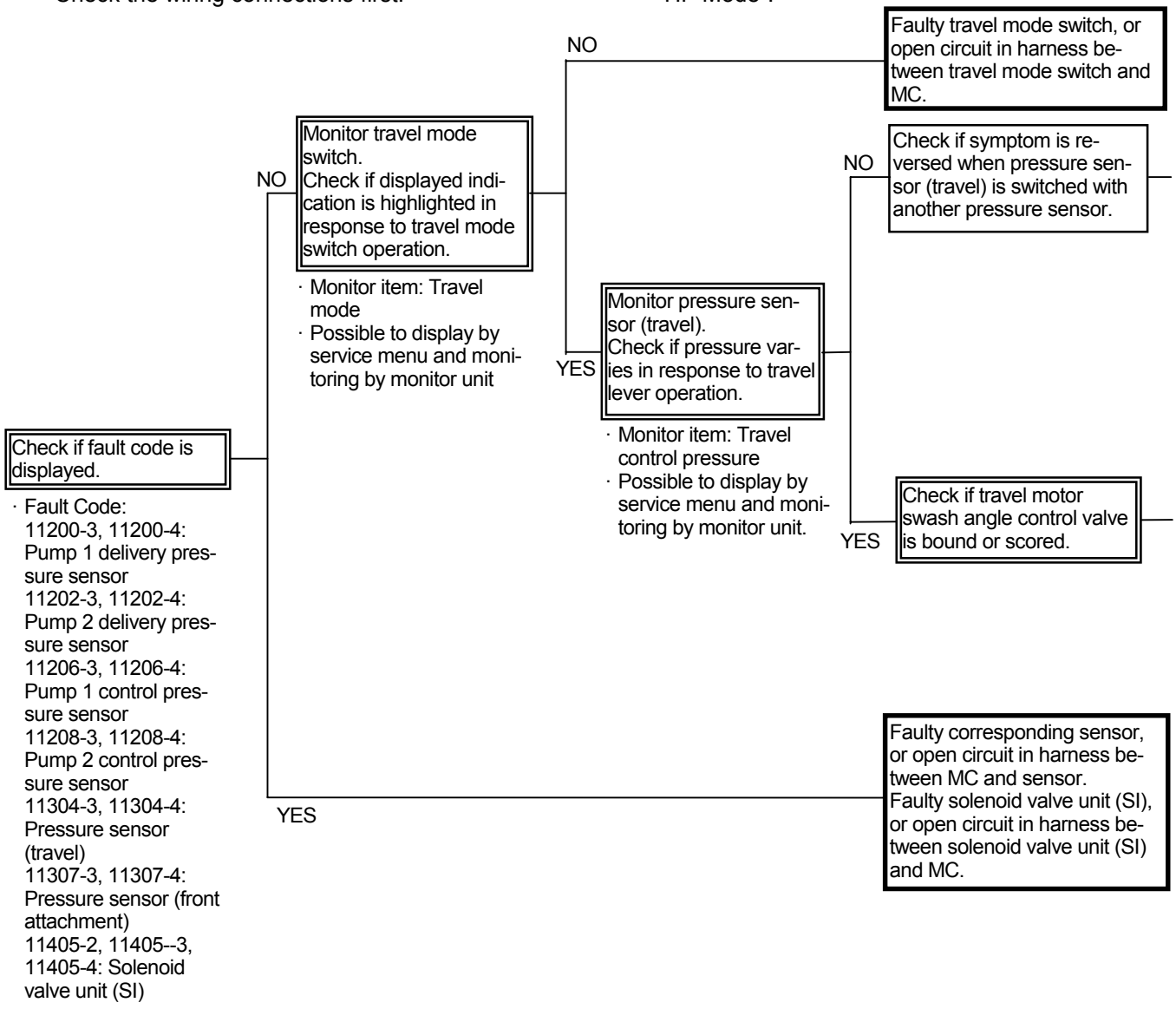
- Refer to the pages for the SYSTEM / Control System group / Travel Torque-Up Control in the T/M (Operational Principle).
- Check the wiring connections first.



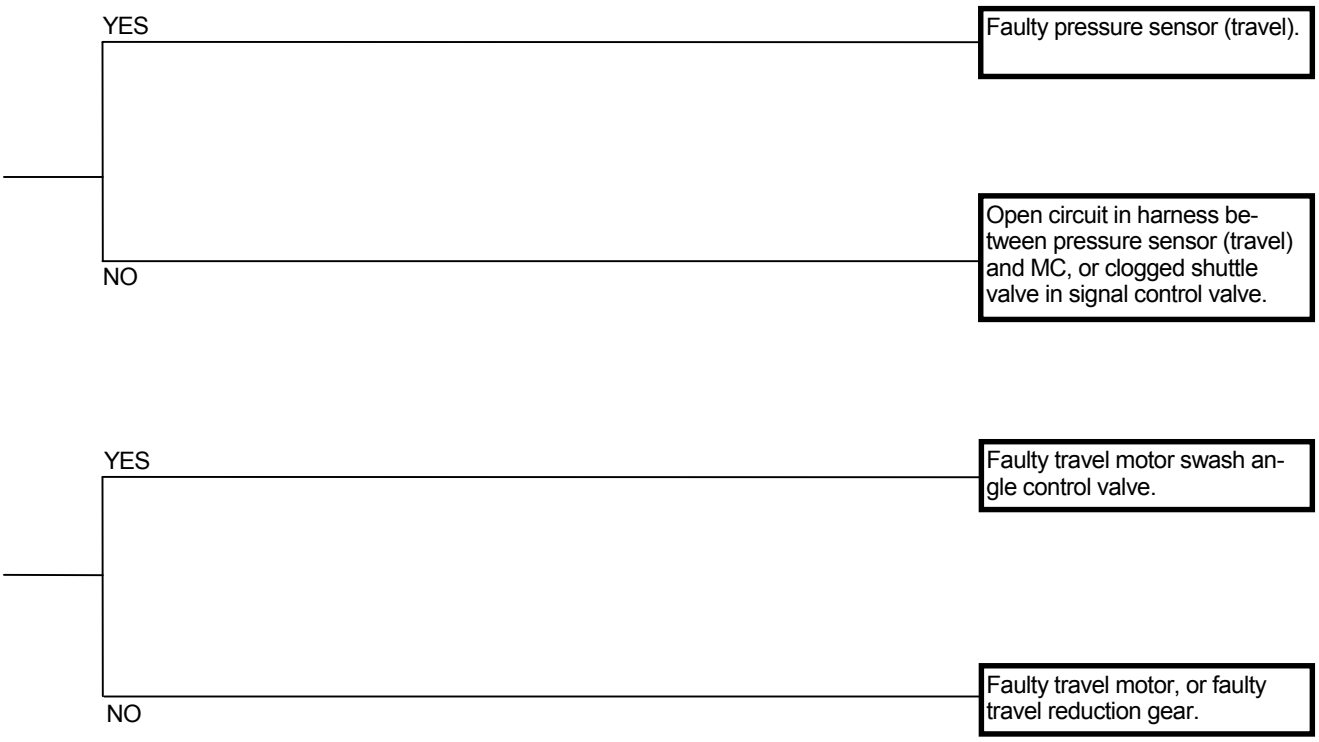
T-5 Fast travel is not operated.
Travel mode does not change from slow mode to fast mode.

Related MC Fault Codes: 11200-3, 11200-4, 11202-3, 11202-4, 11206-3, 11206-4, 11208-3, 11208-4, 11304-3, 11304-4, 11307-3, 11307-4, 11405-2, 11405-3, 11405-4

- Refer to the pages for the SYSTEM / Control section / Travel Motor Swash Angle Control in the T/M (Operational Principle).
- Check the wiring connections first.
- If the maximum speed cannot reach at the fast mode, the engine speed automatic increase control at travel may be faulty. Refer to “E-6 Faulty HP Mode”.



NOTE: In case other fault codes are displayed, perform troubleshooting corresponding to the displayed fault code.


YES
Faulty pressure sensor (travel).
Open circuit in harness between pressure sensor (travel) and MC, or clogged shuttle valve in signal control valve.
NO
YES
Faulty travel motor swash angle control valve.
Faulty travel motor, or faulty travel reduction gear.
NO

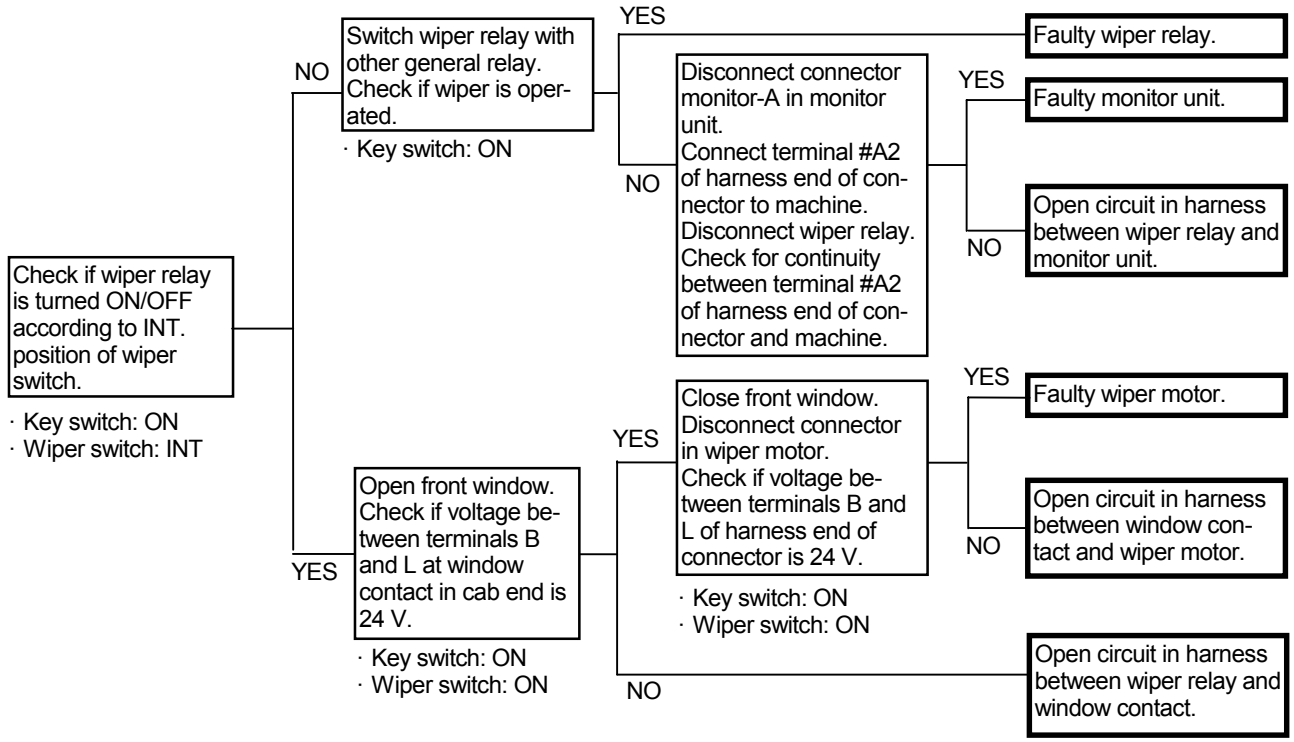
OTHER SYSTEM TROUBLESHOOTING

O-1 Wiper is not operated.

Related MC Fault Code: None

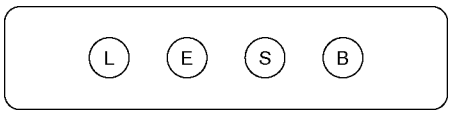
Checking Instructions

- The wiper is driven by electric power routed via the relay circuit. The relay circuit is controlled by the monitor unit. In case the wiper is not operated, first check if the wiper relay is activated. Next, check if electric power is routed to the wiper motor.



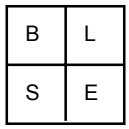
INT. Position	Setting Time
Slow Speed	8 seconds
Middle Speed	6 seconds
Fast Speed	3 seconds

Window Contact (Cab end)

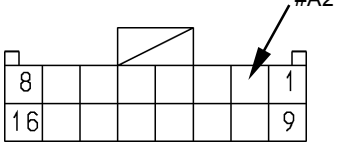


T1V1-05-07-005

Connector
Wiper Motor (harness end)

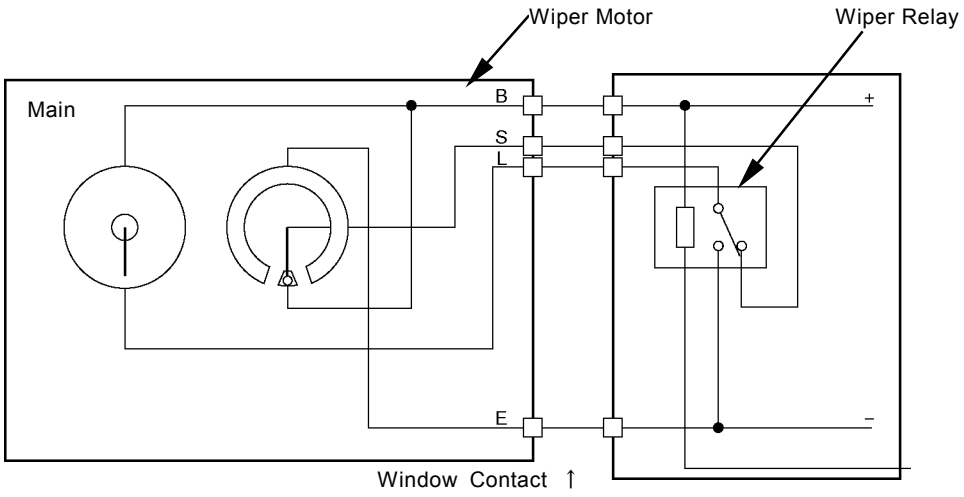


Monitor Unit
Connector Monitor-A (harness end)



T183-05-05-001

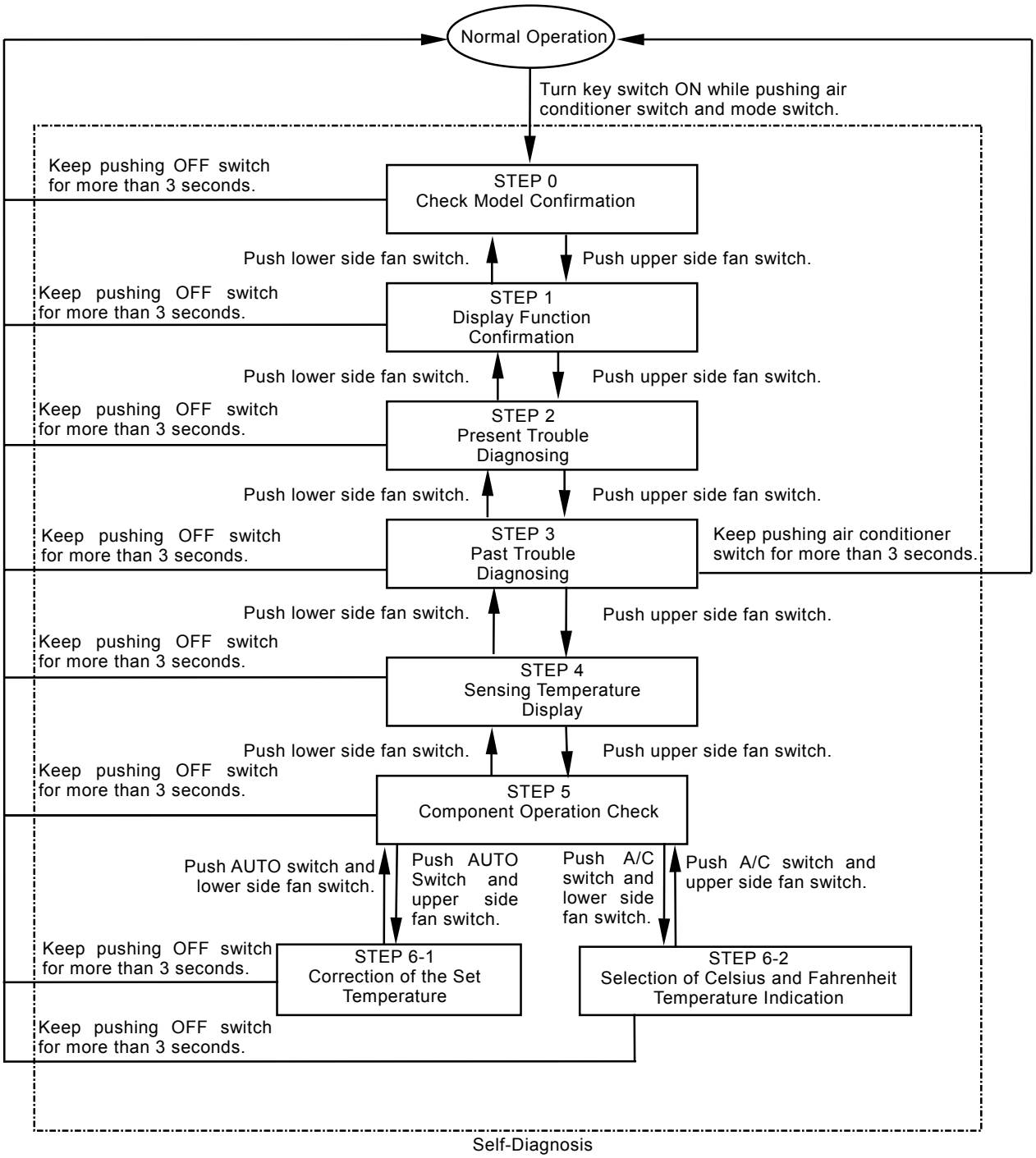
Wiper Driving Circuit



T1V1-05-07-004

O-2 Air Conditioner is faulty

The air conditioner operation system has a self-diagnosing function. This system performs the diagnosis by 8-steps as shown in the flow chart below: Check Model Confirmation, Display Function Confirmation, Present Trouble Diagnosing, Past Trouble Diagnosing, Sensing Temperature Display, and Component Operation Check, Correction of the Set Temperature and Selection of Celsius and Fahrenheit Temperature Indication.



Self-Diagnostic System Activation
Turn the key switch ON while pushing the air conditioner switch and mode switch on air conditioner control panel.

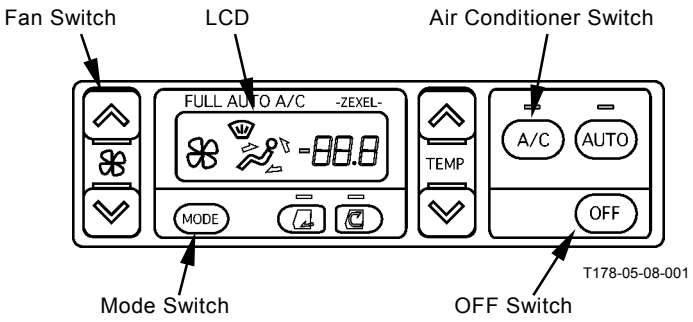
STEP 0 Check Model Confirmation
The liquid crystal display (LCD) indicates the machine model name this system can diagnose.

- The LCD will indicate “Sd” as the check model name.
- Select next step in order to be performed by operating the switch as described below.
  - Upper side fan switch: To proceed to Step 1
  - Keep pressing OFF switch for more than 3 seconds: To return to normal operation

NOTE: The system operation will automatically proceed to STEP 1 after 5 seconds have pushed after the check model is displayed.

STEP 1 Display Function Confirmation
Turn all indicators ON in order to check indicator bulbs.

- The LCD panel and all switch indicators light.
- Select the next step in order to be performed by operating the switches as follows:
  - Push the upper side of fan switch: To proceed to “STEP 2.”
  - Push the lower side of fan switch: To return to “STEP 0.”
  - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed.)



STEP 2 Present Trouble Diagnosing

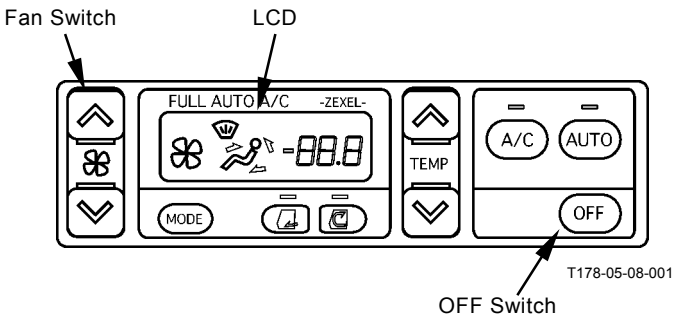
The LCD indicates the fault codes for present abnormalities of the mix door, mode encoder, and/or sensors.

- In case any abnormalities are present, the LCD indicates the fault codes. If more than one fault code is detected, the following fault code is displayed after flashing (0.5 seconds) twice.

	Fault Code	
	Open Circuit	Shorted Circuit
Mix Door	21	–21
Mode Encoder	22	
In-Cab Ambient Temperature Sensor	23	–23
Outdoor Ambient Temperature Sensor	24	–24
Coolant Temperature Sensor	25	–25
Solar Radiation Sensor	26*	–26

*: When solar radiation is shaded, the solar radiation sensor indicates the fault code of open circuit.

- Select the next step in order to be performed by operating the switches as follows:
  - Push the upper side of fan switch: To proceed to “STEP 3.”
  - Push the lower side of fan switch: To return to “STEP 1.”
  - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed)



STEP 3 Past Trouble Diagnosing

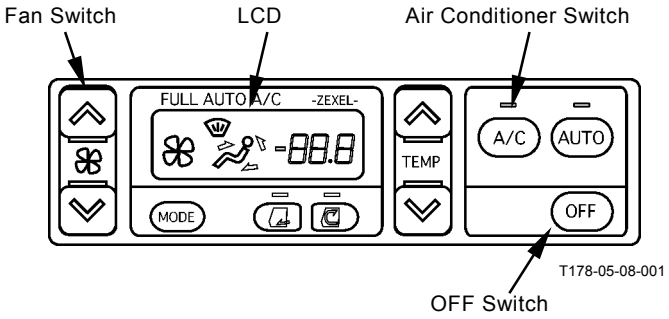
The LCD indicates the fault codes for past abnormalities of the mix door, mode encoder, and/or sensors.

The past stored fault codes are deleted.

- In case any abnormalities occurred in the past, the LCD indicates the fault codes. If more than one fault code is detected, the following fault code is displayed after flashing (0.5 seconds) twice.

	Fault Code	
	Open circuit	Shorted Circuit
Mix Door	21	–21
Mode Encoder	22	
In-Cab Ambient Temperature Sensor	23	–23
Outdoor Ambient Temperature Sensor	24	–24
Coolant Temperature Sensor	25	–25
Solar Radiation Sensor		–26

- When the air conditioner switch is kept pushing for more than 3 seconds, the failure records are deleted. After this operation, the air conditioner switch indicator flashes 5 times. Then, the self-diagnosing system is deactivated. (Normal functions are resumed.)
- Select the next step in order to be performed by operating the switches as follows:
  - Push the upper side of fan switch: To proceed to “STEP 4.”
  - Push the lower side of fan switch: To return to “STEP 2.”
  - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed.)



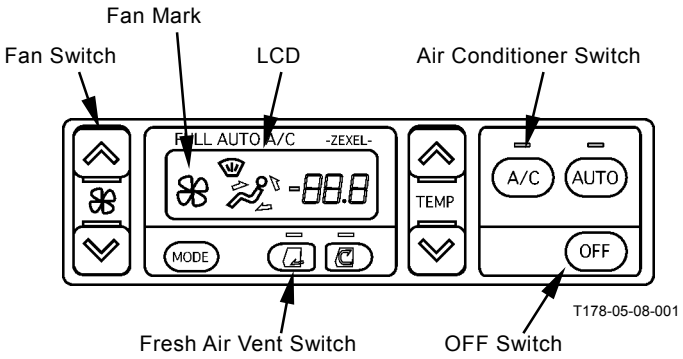
STEP 4 Sensing Temperature Display

The LCD indicates the sensing temperature detected by each temperature sensor (excluding the insulation sensor).

- The sensing temperature detected by the in-cab ambient temperature sensor, outdoor ambient temperature sensor and coolant temperature sensor are displayed on the LCD in real time. (Figures less than the decimal point are not displayed.)

NOTE: The coolant temperature sensor indicates "H" when coolant temperature is more than 21 °C (70 °F) and "L" when coolant temperature is less than 21 °C (70 °F).

- Sensing temperature detected by each sensor is automatically displayed on the LCD and is cycled at an interval of 3 seconds with the timer. The timer is turned ON or OFF by operating the fresh air vent switch.
- Referring to the fan mark can check which sensing temperature is displayed.
- Select the next step in order to be performed by operating the switches as follows:
  - Push the upper side of fan switch: To proceed to "STEP 5."
  - Push the lower side of fan switch: To return to "STEP 3."
  - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed.)



STEP 5 Component Operation Check

Each component operation is checked by performing pattern operation.

- Each time the fresh air vent switch is pushed, the component to be checked is selected in order. Check which component has been selected by referring to No. indicated on the LCD. (Refer to table 1.)
- Operating pattern of the selected component is shifted at an interval of 10 seconds. Operating pattern is cycled. (Refer to table 1.)

NOTE: The components other than selected operate under the standard conditions (shown by marks in table 1).*

- Select the next step in order to be performed by operating the switches as follows:
  - Push the AUTO switch and upper side of fan switch: To proceed to “STEP 6-1”.
  - Push the A/C switch and upper side of fan switch: To proceed to “STEP 6-2”.
  - Push the lower side of fan switch: To return to “STEP 4.”
  - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed.)

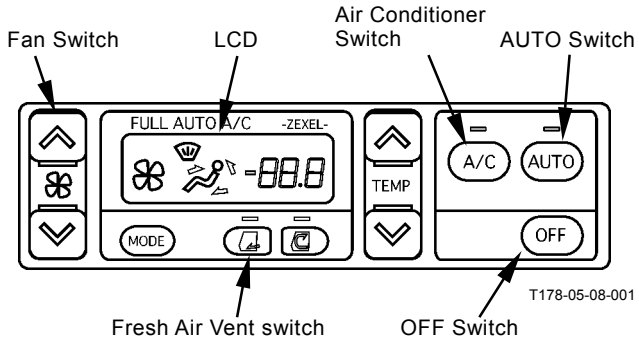


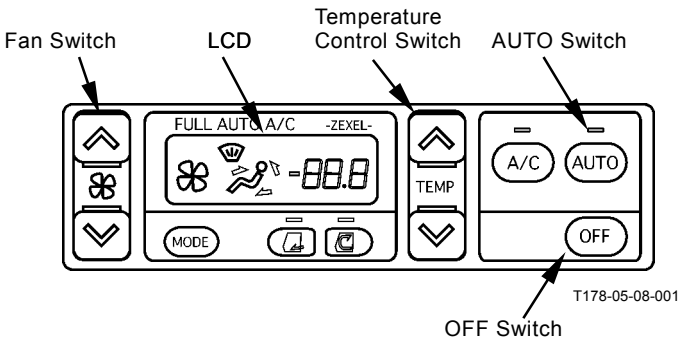
Table 1

Component	Indication on LCD	Operation Pattern	Remarks
Air Mix Damper	51	Controls opening extent of air mix damper: 0% (fully closed) → 50%*→ 100% (fully opened)	0%, 50%, 100%: “C”, “5” and “H” are indicated next to the decimal point respectively.
Fan	52	Controls air flow volume: Lo → M(Lo) → M(Hi) → Hi	Indicators corresponding to air flow volume light.
Air Vent Location	53	Selects air vent: Front*→ Front/Rear → Front/Foot → Foot	Indicator corresponding to selected air vent lights.
Fresh / Circulation Air Vent Selection	54	Select Ventilation Mode: Circulation* → Fresh	Indicator corresponding to selected mode light.
Air Conditioner	55	Turns air conditioner switch: ON* → OFF	ON: Indicator lights. OFF: Indicator is extinguished.

STEP 6-1 Correction of the Set Temperature

Fine correction of the set temperature.

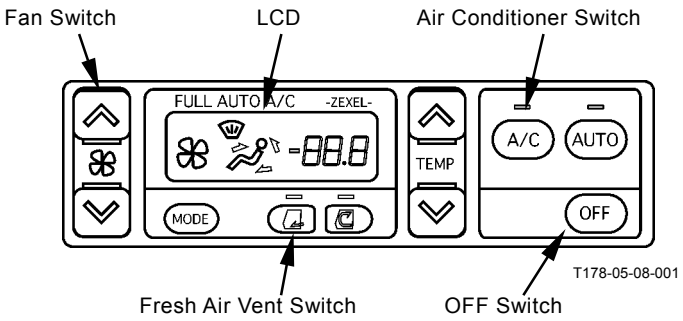
- Each time when the top or bottom of temperature control switch is pushed, temperature correction, displayed on the LCD window, can be changed.
- Actually controlled temperature is the normally set temperature plus the set temperature correction.
  For instance, when the normally set temperature is 25°C (77 °F) and set temperature correction is -1°C (-34 °F), the actually controlled temperature becomes 24°C (75 °F).
- Select the next step in order to be performed by operating the switches as follows:
  - Push the AUTO switch and lower side of fan switch: To return to “STEP 5.”
  - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed.)



STEP 6-2 Selection of Celsius and Fahrenheit Temperature Indication

Selection of Celsius and Fahrenheit Temperature Indication.

- Each time when the fresh air vent switch is pushed, Celsius or Fahrenheit temperature may be displayed alternately.
- Temperature is displayed at the top of LCD window as follows.
  (C: Celsius, F: Fahrenheit)
  C ◄► F
- Select the next step in order to be performed by operating the switches as follows:
  - Push the Air Conditioner Switch and lower side of fan switch: To return to “STEP 5.”
  - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed.)



※ Please fill in all sections and return this AIR CONDITIONER TROUBLE REPORT to Hitachi Tsuchiura Works Quality Assurance Dept. after experiencing a problem with your machine's air conditioning system.

< AIR CONDITIONER TROUBLE REPORT > File No.

(1) What

Model	(Serial No.)		
Operation Type	Manual	Semi-Auto	Full-Auto
Delivery Date	Year Month		

Checked by:

(2) When

Date	Year	Month	Day	Operating Hour (h)
Time	Morning	Daytime	Evening	Night
Frequency	Every Day	Once a Week	Once a Month	Times per

(3) Where

Job Site Address	State	County	Town
Access Road Condition	Paved	Not Paved (Gravel	Sand Soil)

(4) How (Operating Conditions)

Weather		Fine	Cloudy	Rain	Snow
Atmospheric Temperature		Very Hot	Hot	Cold	Very Cold
Operating Conditions		Parking	Traveling	Working	
Control Panel	Temperature Control	Paint blanks equal to red indicators. / Fill in set-temperature when full-auto operation			
	A/C	ON		OFF	
	Air Induction	Re-Circulation		Fresh Air Circulation	
	AUTO	ON	OFF	Not Available	
	Fill following items when operated in manual mode or when manual control type unit is used.				
	Vent Position	Front	Front / Rear	Foot	Front / Rear and Foot
	Fan	First	Second Third	Fourth	Fifth Sixth

(5) How (Problem Symptom)

Abnormal Compressor Operation	
Symptom	Not turned ON
	Not turned OFF
	Others
Uncontrollable air temperature	
Symptom	No cool air
	No warm air
	Others
Uncontrollable air volume	
Symptom	Air flows in Hi mode only
	No air flows
	Small air volume
	Others
Uncontrollable vent hole	
Symptom	Vent hole isn't selected
	Others
Abnormal panel indication	
Faulty Indicator	Vent Hole
	A/C
	AUTO
	Fresh Air Circulation
	Fan OFF
	Fan (Lo • •• Hi)
	Temperature Control
Symptom	Stays OFF
	Stays ON
	Blinks
	Others

<Check Result>

(1) Is problem reproducible ?

Reproducible
Not reproducible

(2) Pressure (To be measured at gauge manifold)

Low Pressure
High Pressure

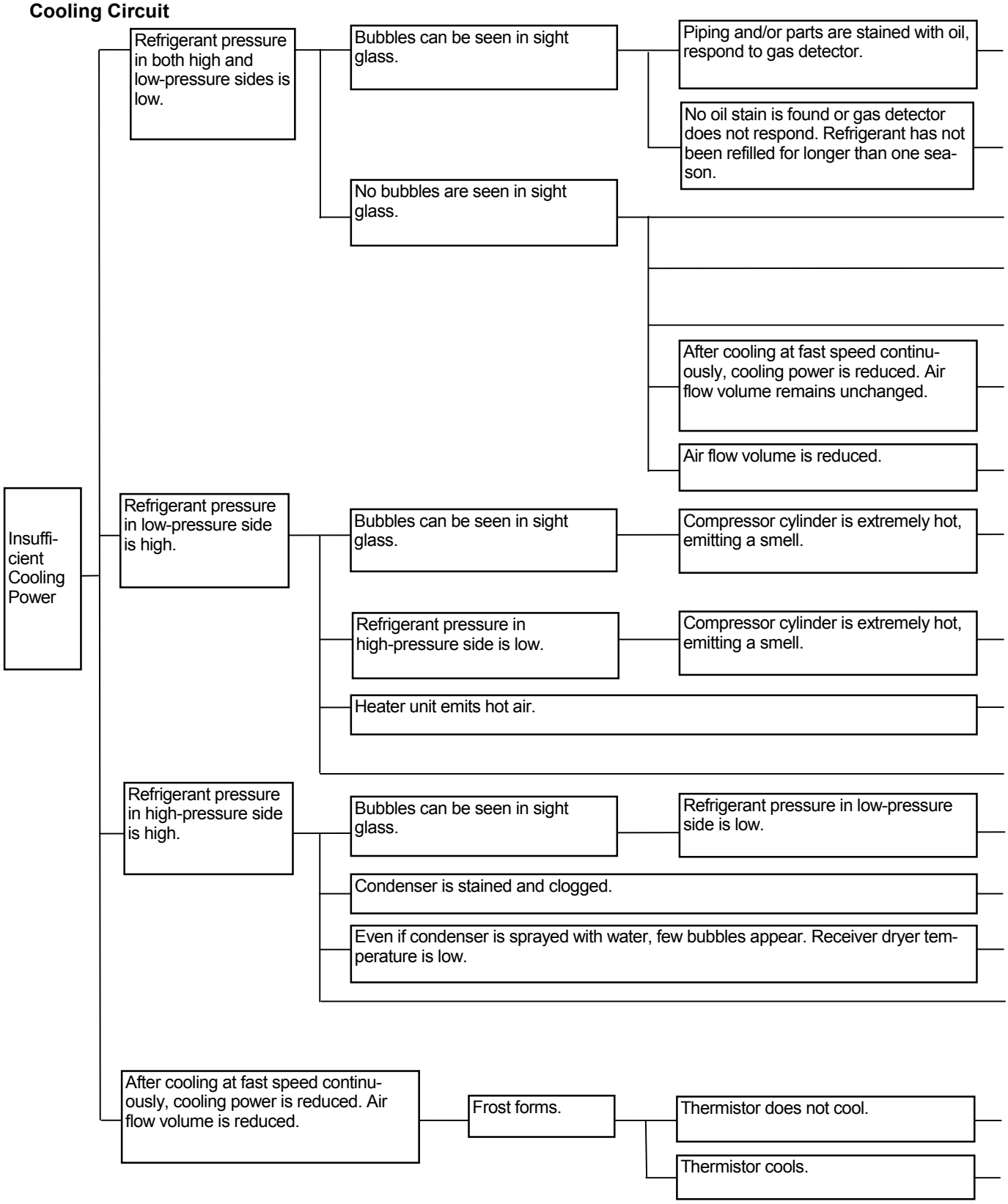
(3) Which parts have been replaced ?

1
2

* Before replacing the control amplifier, be sure to check that the connectors are correctly connected while repeatedly disconnecting and reconnecting connectors.

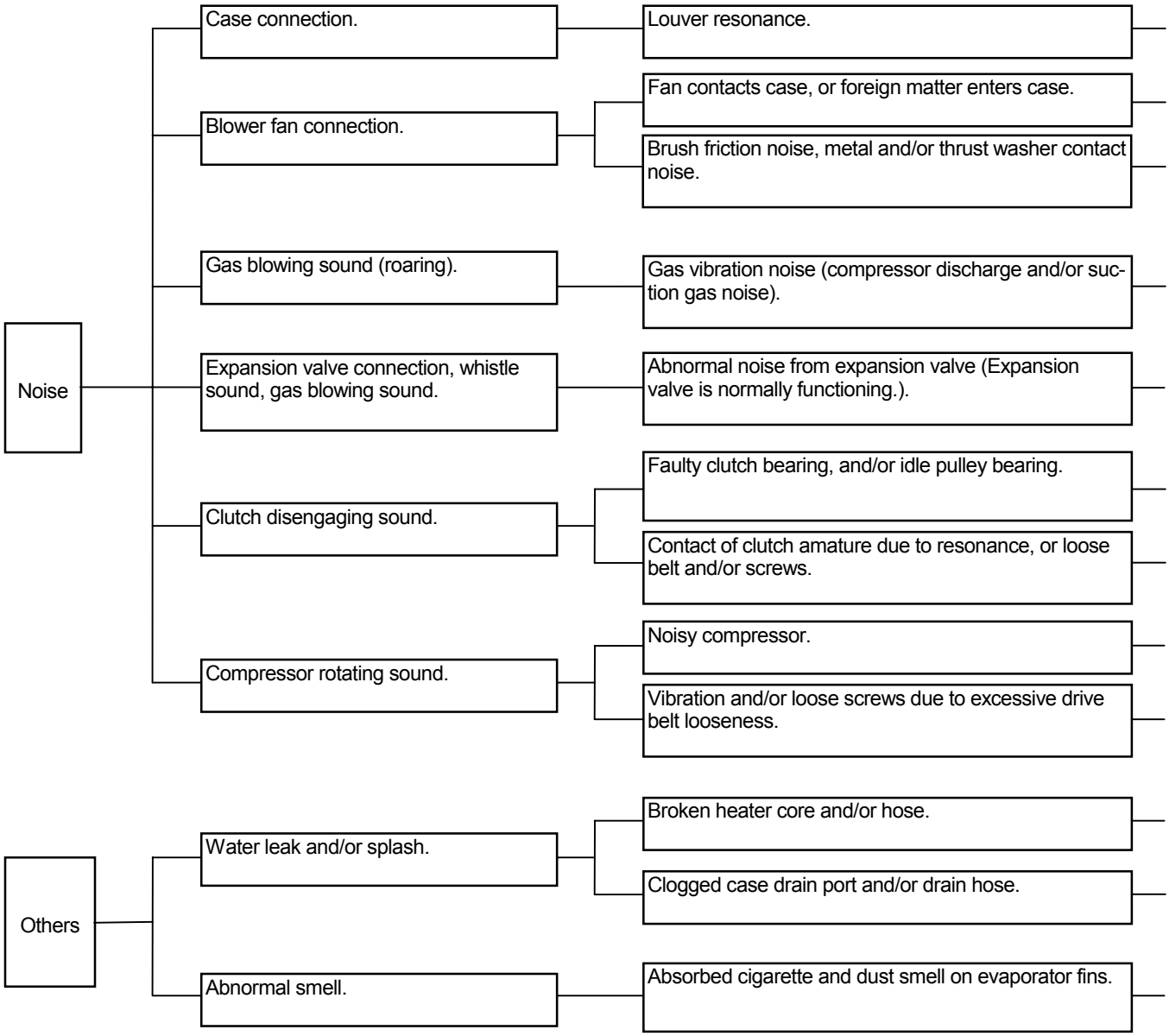
Refrigerant Quantity..... 850±50 g
Compressor Oil Quantity..... 210 cm^3

Cooling Circuit



Gas leaks from pipe joints and/or parts.	Re-tighten or replace parts.
Normal leakage of refrigerant from hoses.	Refill refrigerant.
Improper adjustment (excessive restriction) of expansion valve.	Readjust or replace expansion valve.
Clogged expansion valve.	Remove clog, or replace receiver and/or expansion valve.
Clogged low-pressure circuit and/or evaporator.	Remove clog, or replace parts.
Frozen expansion valve or water in circuit.	After evacuation, refill refrigerant and/or replace receiver dryer.
Gas leaks from case.	Seal gaps by using vinyl tape or packing compound.
Poor contact of expansion valve temperature sensing cylinder.	Make good contact. Replace temperature sensing stay.
Improper adjustment (excessive open) of expansion valve.	Readjust or replace.
Insufficient compressor discharge (faulty gasket and/or valve).	Replace.
Improper water stop valve wire adjustment and/or faulty stop valve.	Check and readjust or replace.
Poor airtight fitting of outside air damper (outside air induction type).	Repair.
Clogged high-pressure circuit before receiver dryer.	Remove clog, or replace parts.
	Clean Condenser.
Excessive refrigerant.	Remove excessive refrigerant to proper level.
Air is mixed in system.	After evacuation, refill refrigerant and/or replace receiver dryer.
Incorrect thermistor location.	Correct thermistor location.
Gas leaks from case.	Seal gaps by using vinyl tape or packing compound.
Faulty thermistor (stays ON).	Disconnected thermistor cord.
Even if function and performance are normal, when air-conditioner is kept operated for a long time with thermistor in max. cooling position and air flow in M or L mode, frost may form.	Instruct user on correct air-conditioner operation. (Reset thermistor to either minimum or middle cooling position or increase air flow.)

Cooling Circuit



Repair or replace.

Remove foreign matter. Readjust fan motor location.

Slight noise is unavoidable.
Replace if loud.

No functional problem exists.
Provide silencer if intolerable.

Replace expansion valve if whistle sound is heard. Gas flow noise can be slightly heard.

Replace.

Repair or replace clutch. Re-tighten screws.

Repair or replace.

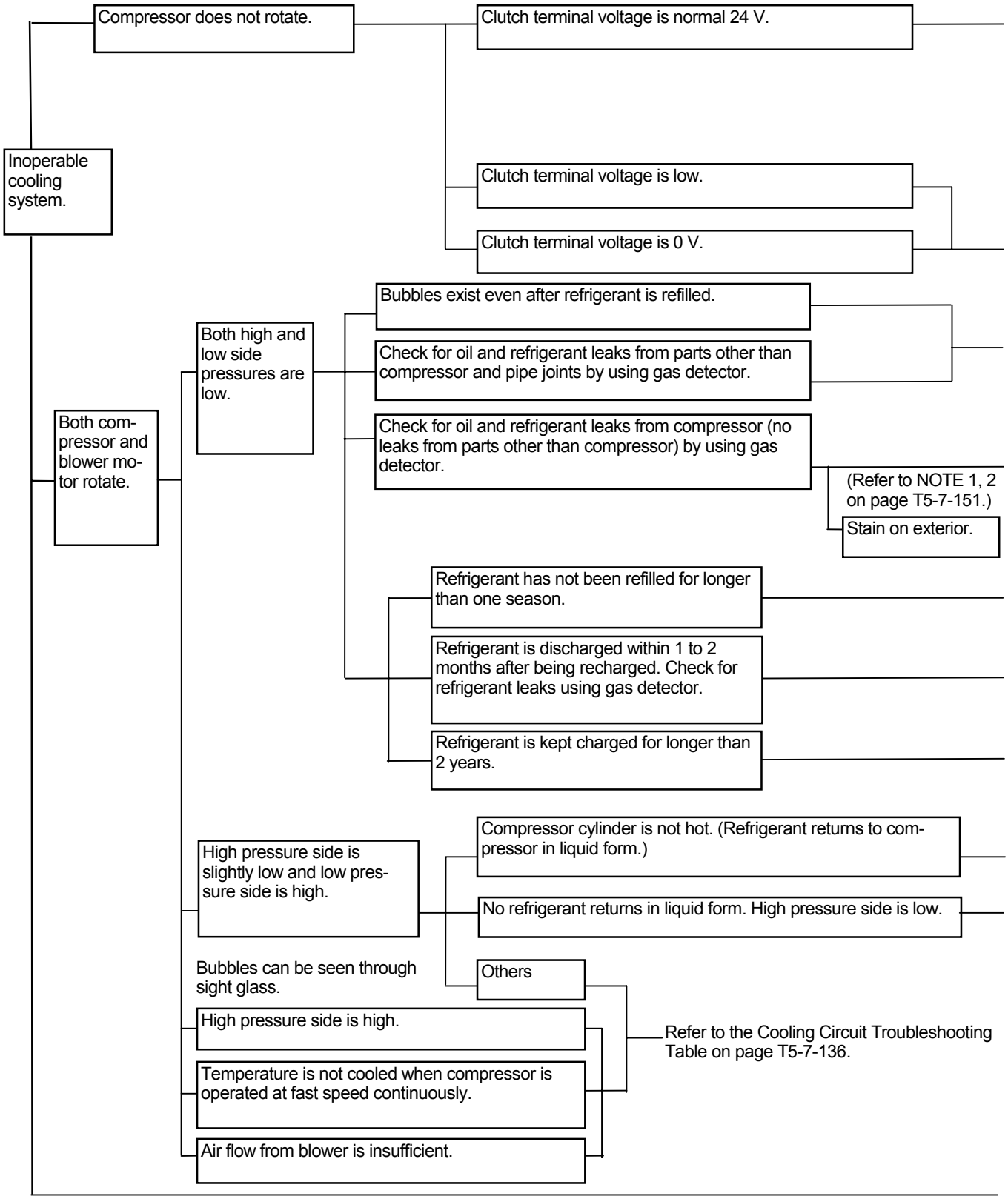
Re-adjust drive belt.

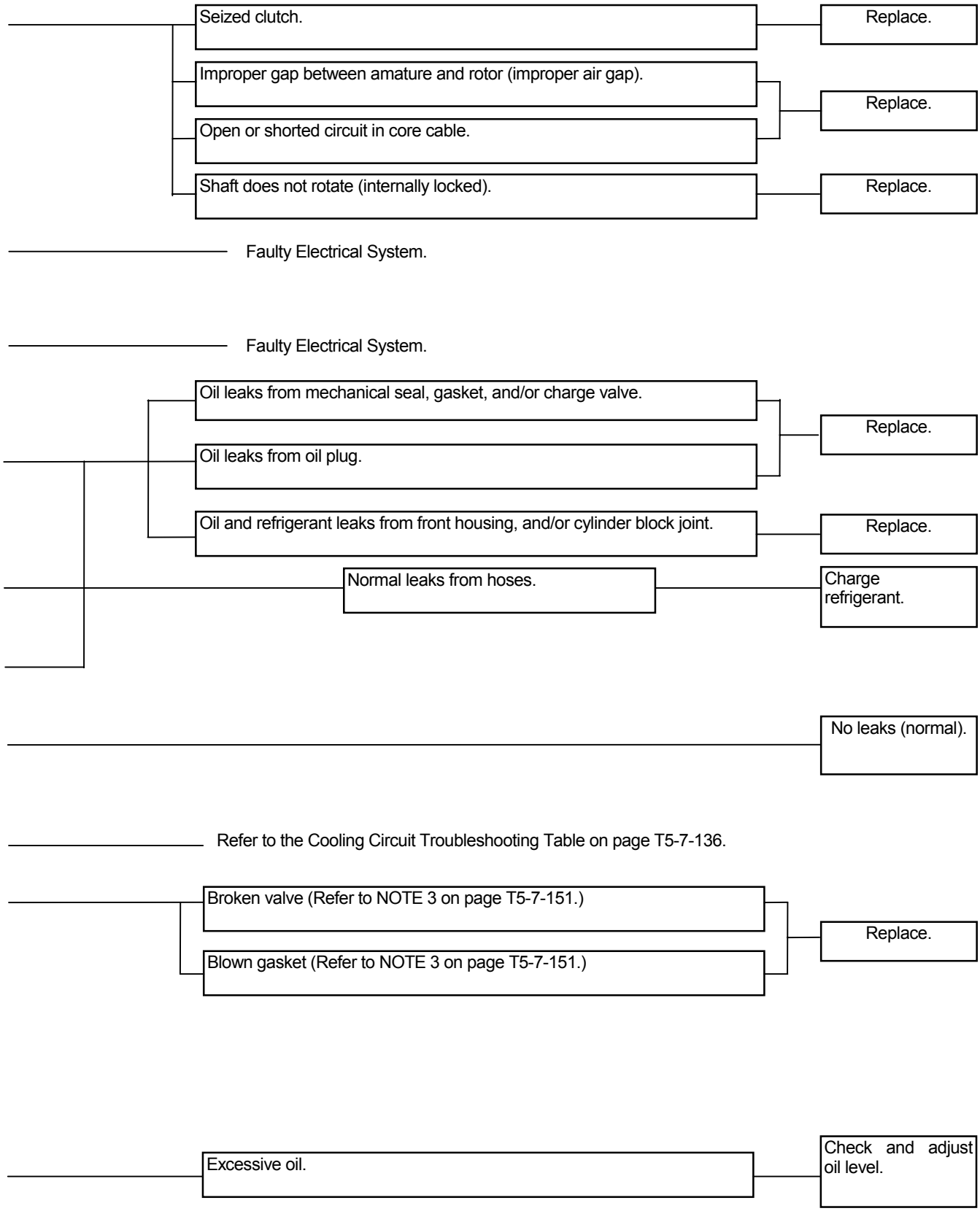
Replace.

Clean.

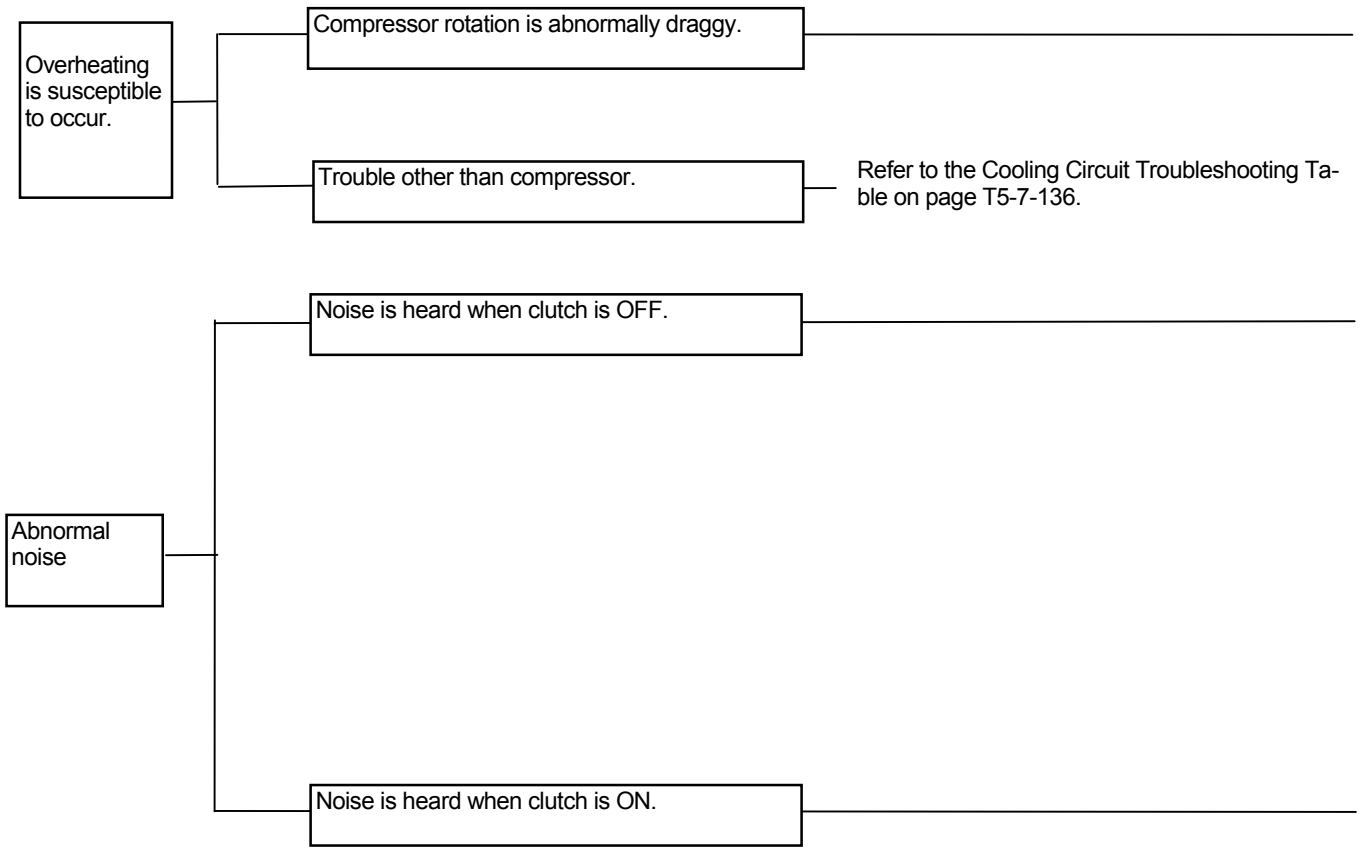
Clean evaporator. When humidity is high, open door. While rotating fan at approx. 1500 min^{-1} in L mode for more than 10 minutes, flush smell out by condensed water.

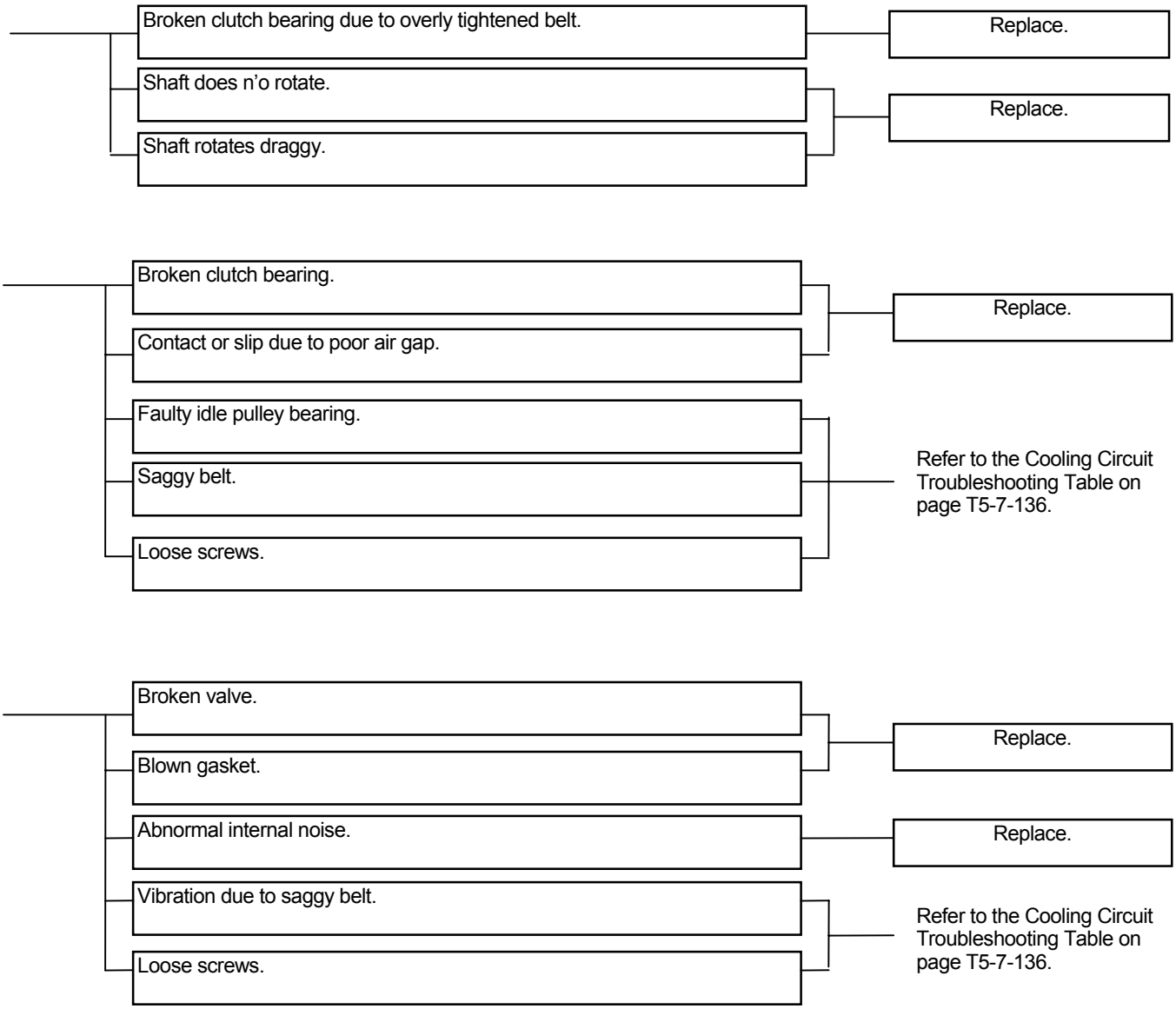
Compressor


Inoperable cooling system.
Compressor does not rotate.
Clutch terminal voltage is normal 24 V.
Clutch terminal voltage is low.
Clutch terminal voltage is 0 V.
Both compressor and blower motor rotate.
Both high and low side pressures are low.
Bubbles exist even after refrigerant is refilled.
Check for oil and refrigerant leaks from parts other than compressor and pipe joints by using gas detector.
Check for oil and refrigerant leaks from compressor (no leaks from parts other than compressor) by using gas detector.
(Refer to NOTE 1, 2 on page T5-7-151.)
Stain on exterior.
Refrigerant has not been refilled for longer than one season.
Refrigerant is discharged within 1 to 2 months after being recharged. Check for refrigerant leaks using gas detector.
Refrigerant is kept charged for longer than 2 years.
High pressure side is slightly low and low pressure side is high.
Compressor cylinder is not hot. (Refrigerant returns to compressor in liquid form.)
No refrigerant returns in liquid form. High pressure side is low.
Bubbles can be seen through sight glass.
Others
High pressure side is high.
Temperature is not cooled when compressor is operated at fast speed continuously.
Air flow from blower is insufficient.
Refer to the Cooling Circuit Troubleshooting Table on page T5-7-136.


Seized clutch.
Replace.
Improper gap between amature and rotor (improper air gap).
Replace.
Open or shorted circuit in core cable.
Shaft does not rotate (internally locked).
Replace.
Faulty Electrical System.
Faulty Electrical System.
Oil leaks from mechanical seal, gasket, and/or charge valve.
Replace.
Oil leaks from oil plug.
Oil and refrigerant leaks from front housing, and/or cylinder block joint.
Replace.
Normal leaks from hoses.
Charge refrigerant.
No leaks (normal).
Refer to the Cooling Circuit Troubleshooting Table on page T5-7-136.
Broken valve (Refer to NOTE 3 on page T5-7-151.)
Replace.
Blown gasket (Refer to NOTE 3 on page T5-7-151.)
Excessive oil.
Check and adjust oil level.

Compressor


Overheating is susceptible to occur.
Compressor rotation is abnormally draggy.
Trouble other than compressor.
Refer to the Cooling Circuit Troubleshooting Table on page T5-7-136.
Abnormal noise
Noise is heard when clutch is OFF.
Noise is heard when clutch is ON.



NOTE:

1. *Do not quickly decide that oil is leaking when a stain around the clutch and/or gasket is found. A slight oil seepage will appear due to the seal construction. However, this oil seepage will not cause malfunction. Accurately check whether oil is leaking or seeping only.*
2. *When gas detector is used in the high sensitivity range, normal gas leaks from rubber hose surface may be detected. As long as the specified rubber hoses are used, the problem should not occur. (In case a large leaks is detected, the hose may be broken.)*
3. *After allowing the compressor to idle for 10 to 15 minutes, normal pressure difference between high-pressure side and low-pressure side is 0.5 MPa (5 kgf/cm^2) or less. When the clutch is turned OFF, the pressure difference between high-pressure side and low-pressure side will disappear within about 10 seconds.*

EXCHANGE INSPECTION

Exchange inspection method is a troubleshooting method to find the trouble location by exchanging the suspected part / component with another part /component having identical characteristics.

Many sensors and solenoid valves used on this machine are identical. Therefore, by using this switch-check method, faulty part /component, and/or harness can be easily found.

Example: Abnormal pump 1 delivery pressure high voltage (MC fault code: 11200-3)

Check Method:

1. Switch two delivery pressure sensors located as shown in figure A to figure B.
2. Retry troubleshooting.

Result:
In case abnormal pump 2 delivery pressure high voltage is displayed (MC fault code 11202-3), the pump 1 delivery pressure sensor is considered to be faulty.

In case abnormal pump 1 delivery pressure high voltage is displayed (MC fault code 11200-3), the pump 1 delivery pressure sensor harness is considered to be faulty.

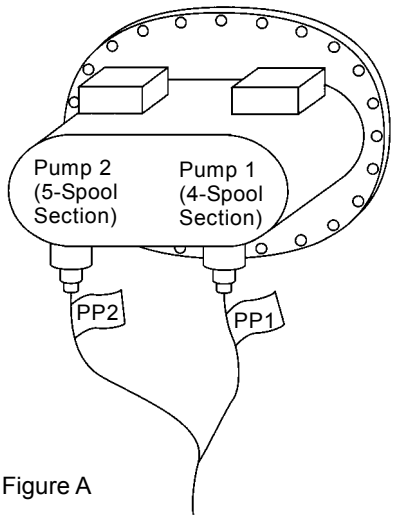


Figure A

T157-07-04-006

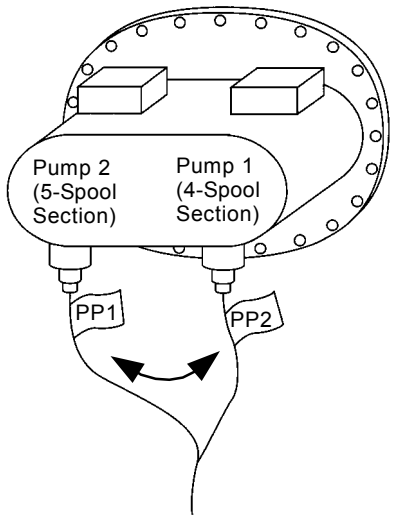


Figure B

T157-07-04-006

Applicability of Switch-Check Method

Fault Code	Trouble	Applicability
11000-2 11001-2 11002-2 11003-2	Abnormal EEPROM Abnormal RAM Abnormal A/D Conversion Abnormal Sensor Voltage	Not Applicable
11004-2	CAN Communication Error	Not Applicable
11100-2	Abnormal Engine Speed	Not Applicable
11101-3	Abnormal Engine Control Dial Sensor High Voltage	Not Applicable
11101-4	Abnormal Engine Control Dial Sensor Low Voltage	Not Applicable
11200-3	Abnormal Pump 1 Delivery Pressure Sensor High Voltage	Applicable (Harness)
11200-4	Abnormal Pump 1 Delivery Pressure Sensor Low Voltage	Applicable (Harness)
11202-3	Abnormal Pump 2 Delivery Pressure Sensor High Voltage	Applicable (Harness)
11202-4	Abnormal Pump 2 Delivery Pressure Sensor Low Voltage	Applicable (Harness)
11206-3	Abnormal Pump 1 Control Pressure Sensor High Voltage	Applicable (Harness)
11206-4	Abnormal Pump 1 Control Pressure Sensor Low Voltage	Applicable (Harness)
11208-3	Abnormal Pump 2 Control Pressure Sensor High Voltage	Applicable (Harness)
11208-4	Abnormal Pump 2 Control Pressure Sensor Low Voltage	Applicable (Harness)
11301-3	Abnormal Swing Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11301-4	Abnormal Swing Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11302-3	Abnormal Boom Raise Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11302-4	Abnormal Boom Raise Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11303-3	Abnormal Arm Roll-In Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11303-4	Abnormal Arm Roll-In Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11304-3	Abnormal Travel Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11304-4	Abnormal Travel Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11307-3	Abnormal Front Attachment Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11307-4	Abnormal Front Attachment Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11400-2	Abnormal Feedback Current of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Applicable (Harness)
11400-3	Abnormal Feedback High Voltage of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Applicable (Harness)

Fault Code	Trouble	Applicability
11400-4	Abnormal Feedback Low Voltage of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Applicable (Harness)
11401-2	Abnormal Feedback Current of Torque Control Solenoid Valve	Applicable (Harness)
11401-3	Abnormal Feedback High Voltage of Torque Control Solenoid Valve	Applicable (Harness)
11401-4	Abnormal Feedback Low Voltage of Torque Control Solenoid Valve	Applicable (Harness)
11402-2	Abnormal Feedback Current of Solenoid Valve Unit (SF)	Applicable (Harness/ Solenoid Valve)
11402-3	Abnormal Feedback High Voltage of Solenoid Valve Unit (SF)	Applicable (Harness/ Solenoid Valve)
11402-4	Abnormal Feedback Low Voltage of Solenoid Valve Unit (SF)	Applicable (Harness/ Solenoid Valve)
11403-2	Abnormal Feedback Current of Solenoid Valve Unit (SC)	Applicable (Harness/ Solenoid Valve)
11403-3	Abnormal Feedback High Voltage of Solenoid Valve Unit (SC)	Applicable (Harness/ Solenoid Valve)
11403-4	Abnormal Feedback Low Voltage of Solenoid Valve Unit (SC)	Applicable (Harness/ Solenoid Valve)
11404-2	Abnormal Feedback Current of Solenoid Valve Unit (SG)	Applicable (Harness/ Solenoid Valve)
11404-3	Abnormal Feedback High Voltage of Solenoid Valve Unit (SG)	Applicable (Harness/ Solenoid Valve)
11404-4	Abnormal Feedback Low Voltage of Solenoid Valve Unit (SG)	Applicable (Harness/ Solenoid Valve)
11405-2	Abnormal Feedback Current of Solenoid Valve Unit (SI)	Applicable (Harness/ Solenoid Valve)
11405-3	Abnormal Feedback High Voltage of Solenoid Valve Unit (SI)	Applicable (Harness/ Solenoid Valve)
11405-4	Abnormal Feedback Low Voltage of Solenoid Valve Unit (SI)	Applicable (Harness/ Solenoid Valve)
11410-2	Abnormal Feedback Current of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve	Applicable (Harness)
11410-3	Abnormal Feedback High Voltage of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve	Applicable (Harness)
11410-4	Abnormal Feedback Low Voltage of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve	Applicable (Harness)
11910-2	Actual Engine Speed	Not Applicable
11918-2	Work Mode	Not Applicable
11911-2	Security Signal	Not Applicable
11920-2	Fuel Flow Rate	Not Applicable
11914-2	Radiator Coolant Temperature	Not Applicable
11901-3	Abnormal Hydraulic Oil Temperature Sensor High Voltage	Not Applicable
11901-4	Abnormal Hydraulic Oil Temperature Sensor Low Voltage	Not Applicable

EMERGENCY BOOM LOWERING PROCEDURE

CAUTION: Prevent personal injury. Confirm that no one is under the front attachment before starting the procedure below.

If the engine stalls and cannot be restarted, lower the boom to the ground referring to the emergency boom lowering procedure stated below.

1. Loosen lock nut (1) in the control valve at the right. Loosen screw (2) one half of a turn. The boom lowering speed can be somewhat adjusted by loosening screw (2) more.

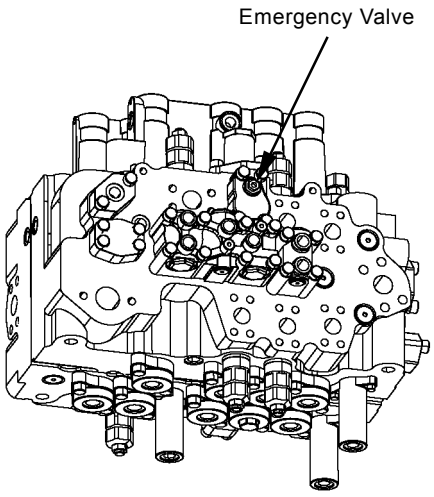
IMPORTANT: Lock nut (1) and screw (2) are located under the solenoid valve. Pay attention to the screw turns.

2. After the boom is lowered, tighten screw (2) and tighten lock nut (1) to the specifications below.

   Lock Nut (1)
   : 13 mm
   : 13 N·m (1.3 kgf·m, 9.4 lbf·ft)

   Screw (2)
   : 4 mm (Hexagonal wrench)
   : 6.9 N·m (0.7 kgf·m, 5.0 lbf·ft)

NOTE: Excessive leakage may result if the screw and the lock nut are tightened insufficiently. Retighten the screw and the lock nut to specifications.



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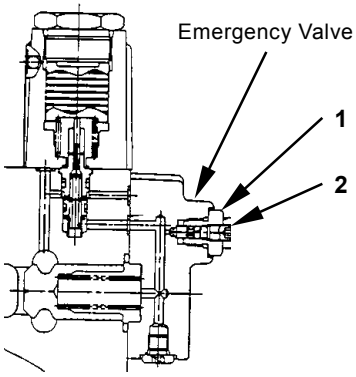
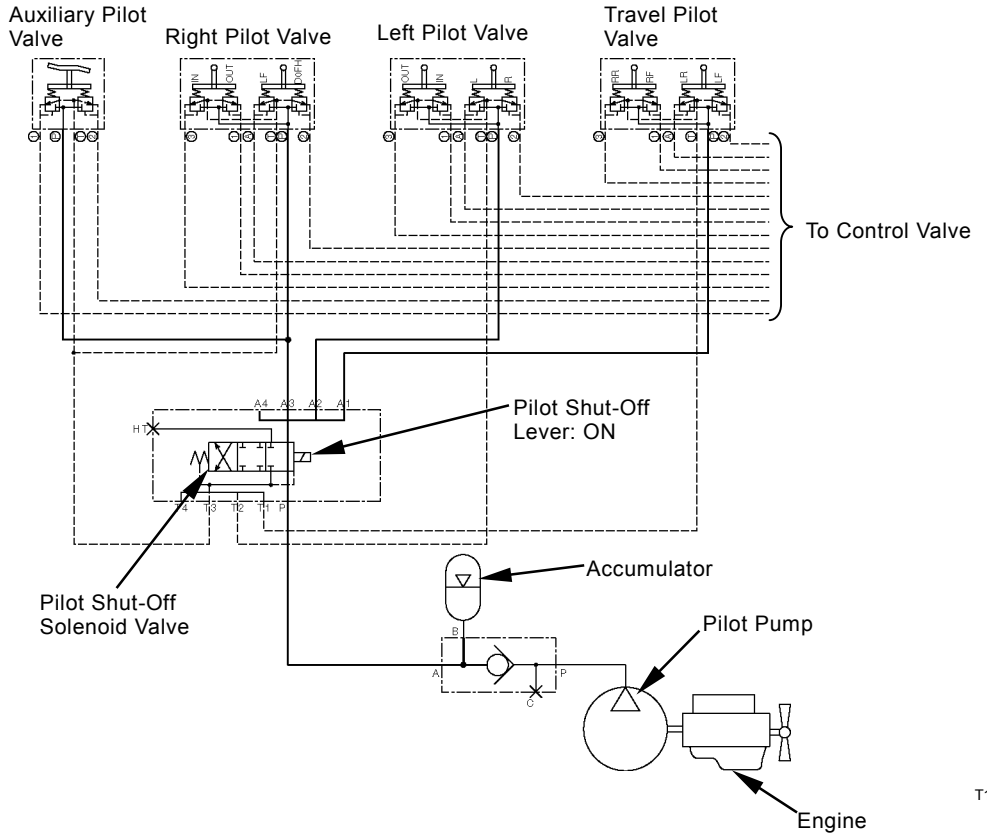


T178-05-04-003

ATTACHMENT PILOT CIRCUIT PRESSURE RELEASE PROCEDURE

As for the attachment spec machine, the accumulator is equipped between pilot pump and pilot valve.

After the engine stops, when the control lever is operated by the emergency stop switch with the pilot shut-off lever ON, the accumulator releases pressure in the pilot circuit.



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ONE PART OF DATA, “DAILY REPORT DATA”, “DISTRIBUTION DATA” AND TOTAL OPERATING HOURS” IS NOT RECORDED

- The required signal for data may not be sent to ICF. As each signal is used for some data, check the corresponding signal system according to the table below.

Data	Input Signal
Daily report data is not recorded.	Key switch, alternator
Fuel Level	Fuel sensor data sent from monitor unit
Fuel Usage Amount	Value is calculated and recorded by accumulated fuel usage amount from ECM.
Machine Hour Meter	Hour meter sent from monitor unit

Position to be checked	Remedy
Key signal line, alternator signal line	Check if voltage between terminal #C7 (power ON signal line) of connector ICF-C in ICF and machine is 24 V or more.
Communication line between monitor unit and ICF (CAN bus line)	• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #B7 of connector monitor-B in monitor unit. (Refer to T5-7-161.) • Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #B6 of connector monitor-B in monitor unit. (Refer to T5-7-161.) • Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-6-62.) • Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-6-65.) • Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-6-68.) • Check for shorted circuit in CAN harness. (Refer to T5-6-70.)
Communication line between ECM and ICF (CAN bus line)	• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #18 of connector in ECM. (Refer to T5-7-160.) • Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #37 of connector in ECM. (Refer to T5-7-160.) • Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-6-62.) • Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-6-65.) • Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-6-68.) • Check for shorted circuit in CAN harness. (Refer to T5-6-70.)
Communication line between monitor unit and ICF (CAN bus line)	• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #B7 of connector monitor-B in monitor unit. (Refer to T5-7-161.) • Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #B6 of connector monitor-B in monitor unit. (Refer to T5-7-161.) • Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-6-62.) • Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-6-65.) • Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-6-68.) • Check for shorted circuit in CAN harness. (Refer to T5-6-70.)

Data		Input Signal
Engine Operating Hours	HP Mode Hours	Power mode switch information sent from MC
	P Mode Hours	Power mode switch information sent from MC
	E Mode Hours	Power mode switch information sent from MC
Auto-Idle Switch ON Hours		Auto-idle switch information sent from MC
Travel Operating Hours	Fast Idle (Hi) Traveling Hours	Travel mode switch information sent from MC
	Slow Idle (Lo) Traveling Hours	Travel mode switch information sent from MC
Swing Operating Hours		Swing pressure sensor (swing) information sent from MC
Digging Operating Hours		Front attachment pressure sensor (front attachment) information sent from MC
Attachment Operating Hours	Breaker Operating Hours	Attachment information sent from MC
	Secondary Crusher Operating Hours	Attachment information sent from MC
	Primary Crusher Operating Hours	Attachment information sent from MC
	Vibrating Hammer Operating Hours	Attachment information sent from MC
	Bucket Operating Hours or Others	Attachment information sent from MC
No Load Time		Pressure sensor information sent from MC

Position to be checked	Remedy
Communication line between MC and ICF (CAN bus line)	• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #C4 of connector MC-C in MC. (Refer to T5-6-57.) • Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #C15 of connector MC-C in MC. (Refer to T5-6-57.) • Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-6-62.) • Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-6-65.) • Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-6-68.) • Check for shorted circuit in CAN harness. (Refer to T5-6-70.)
Communication line between MC and ICF (CAN bus line)	
Communication line between MC and ICF (CAN bus line)	
Communication line between MC and ICF (CAN bus line)	
Communication line between MC and ICF (CAN bus line)	
Communication line between MC and ICF (CAN bus line)	• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #C4 of connector MC-C in MC. (Refer to T5-6-57.) • Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #C15 of connector MC-C in MC. (Refer to T5-6-57.) • Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-6-62.) • Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-6-65.) • Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-6-68.) • Check for shorted circuit in CAN harness. (Refer to T5-6-70.)

Data	Input Signal
Radiator Coolant Temperature	Radiator coolant temperature data sent from monitor unit
Hydraulic Oil Temperature	Hydraulic oil temperature data sent from MC
Intake Air Temperature	Data sent from ECM

Position to be checked	Remedy
Communication line between MC and ICF (CAN bus line)	• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #B7 of connector monitor-B in monitor unit. (Refer to T5-7-161.) • Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #B6 of connector monitor-B in monitor unit. (Refer to T5-7-161.) • Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-6-62.) • Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-6-65.) • Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-6-68.) • Check for shorted circuit in CAN harness. (Refer to T5-6-70.)
Communication line between MC and ICF (CAN bus line)	• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #C4 of connector MC-C in MC. (Refer to T5-6-57.) • Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #C15 of connector MC-C in MC. (Refer to T5-6-57.) • Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-6-62.) • Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-6-65.) • Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-6-68.) • Check for shorted circuit in CAN harness. (Refer to T5-6-70.)
Communication line between monitor unit and ICF (CAN bus line)	• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #18 of connector in ECM. (Refer to T5-7-160.) • Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #37 of connector in ECM. (Refer to T5-7-160.) • Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-6-62.) • Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-6-65.) • Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-6-68.) • Check for shorted circuit in CAN harness. (Refer to T5-6-70.)

Discontinuity Check in CAN Harness

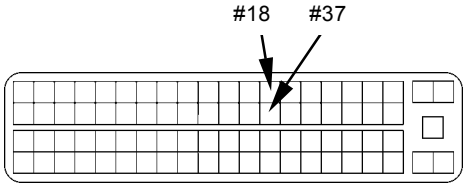
IMPORTANT: Before continuity check, turn the key switch OFF.

- Between ECM and ICF
  Can Harness (High Side)
  Check for continuity between terminal #18 of harness end of connector in ECM and terminal #C5 of harness end of connector ICF-C in ICF.

  CAN Harness (Low Side)
  Check for continuity between terminal #37 of harness end of connector in ECM and terminal #11 of harness end of connector ICF-C in ICF.

Connector

ECM
Connector
(Harness end)



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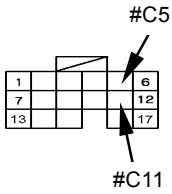
ICF
Connector ICF-C
(Harness end)



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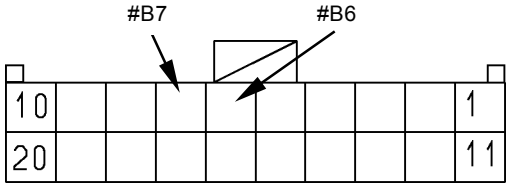
- Between Monitor Unit and ICF
  CAN Harness (High Side
  Check for continuity between terminal #B7 of harness end of connector monitor-B in the monitor unit and terminal #C5 of harness end of connector ICF-C in ICF.

  CAN Harness (Low side)
  Check for continuity between terminal #B6 of harness end of connector monitor-B in the monitor unit and terminal #C11 of harness end of connector ICF-C in ICF.

Connector

Monitor Unit
Connector Monitor-B
(Harness end)



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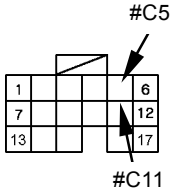
ICF
Connector ICF-C
(Harness end)



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PRECAUTIONS FOR INSPECTION AND MAINTENANCE

1. Disconnect the power source.
   Remove the harness from the negative terminal side in battery first when taking wire harnesses and connectors off for repair or replacement work. Failure to do so can result in damage to the wire harnesses, fuses and fusible links and, in some cases, cause fire due to short circuiting.
2. Color coding of wire harnesses.
   As for the color codes of wire harnesses in the electrical system, refer to the table below.
   In cases on the design sheet where two colors are indicated for one wire, the left initial stands for base color, while the right initial stands for marking color.

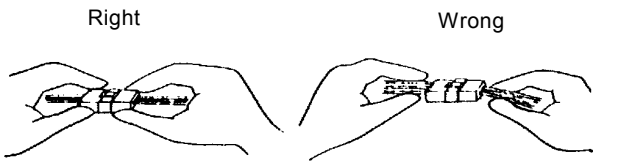
Code	Color	Code	Color
R	Red	W	White
L	Blue	G	Green
Or	Orange	Lg	Light green
Y	Yellow	B	Black
Br	Brown	P	Pink
Gr	Gray	V	Violet

NOTE: 1) Code BW indicates a black base wire with white fine-line marking.

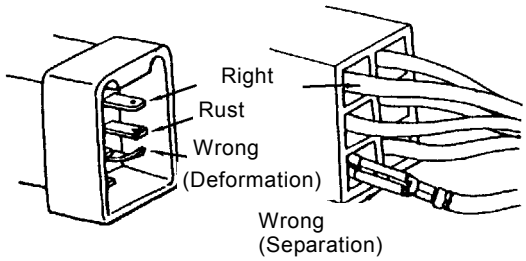
2) Initials "O" and "Or" both stand for the color orange.

3) Wires with longitudinal stripes printed on them are not color coded. Do not confuse them with color coded wires.

3. Precautions for connecting and disconnecting terminal connectors.
   1) When disconnecting the harnesses, grasp them by their connectors. Do not pull on the wire itself. Release the lock first before attempting to separate connectors, if a lock is provided. (Refer to “Instructions for Disconnecting Connector” on page T5-8-3.)
   2) The water-resistant connectors keep water out. If water enters them, water will not easily drain from them. When checking the water-resistant connectors, take extra care not to allow water to enter the connectors. In case water should enter the connectors, reconnect only after the connectors are thoroughly dried.
   3) Before connecting terminal connectors, check that no terminals are bent or coming off. In addition, as most connectors are made of brass, check that no terminals are rusting.
   4) When connecting terminal connectors provided with a lock, insert them together until the lock “clicks.”
   5) Pull the harness near the connector in order to check if it is correctly connected.

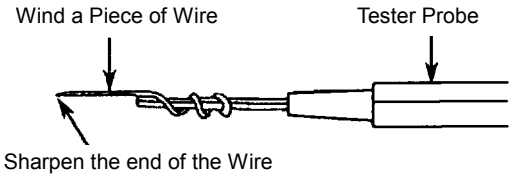


T107-07-06-001



T107-07-06-002

4. Precaution for using a circuit tester.
   1) Before using a circuit tester, refer to the instructions in the circuit tester manual.
      Then, set the circuit tester to meet the object to be measured, voltage range and current polarity.
   2) Before starting the connector test, always check the connector terminal numbers, referring to the circuit diagram.
      When the connector size is very small, and the standard probe size is too large to be used for testing, wind a fine piece of sharpened wire or a pin around the probe to make the test easier.
   3) When checking the connector by using a tester, insert a tester probe from the harness end of connector in order not to damage the terminal inside connector.



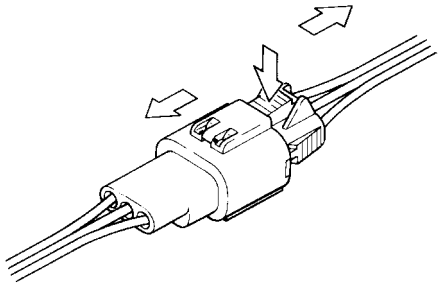
T107-07-06-003

INSTRUCTIONS FOR DISCONNECTING CONNECTORS

- Push, Unlock and Separate Type

NOTE: 1. Connectors will not be easily separated even if the lock is pushed while being pulled. Push the lock first before pulling the connectors.

2. The lock is located on female side connector (harness end side).



T107-04-05-002

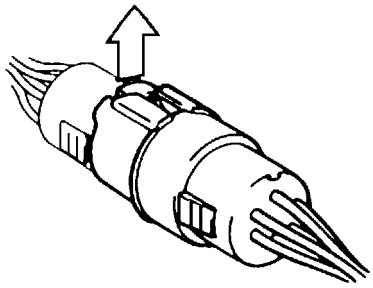
Locations of This Type Connector

Fuel Gauge	Pump Delivery Pressure Sensor	Radio
Hydraulic Oil Level Switch	General Relay	Speaker
Horn	Solenoid Valve	Wiper
Cab Harness	Diode	Monitor Unit
Pressure Sensor	Key Switch	ECM
Washer	Engine Control Dial	ICF

- Raise Lock, Pull and Separate Type

Locations of This Type Connector

Starter Relay 2



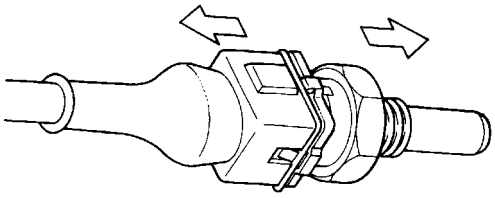
T107-04-05-003

- Pull and Separate Type

IMPORTANT: Before pulling and separating, release the lock of connector in the solenoid valve by using a pair of pincers.

Locations of This Type Connector

Hydraulic Oil Temperature Sensor
Dr. ZX



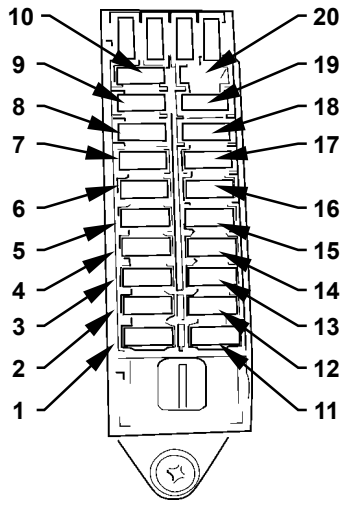
T107-04-05-004

FUSE INSPECTION

Cracks in a fuse are so fine that it is very difficult or impossible to find by visual inspection. Use a tester in order to correctly inspect fuse continuity by following the instructions described below.

1. Turn the key switch ON.
   When the key switch is turned ON, current from key switch terminal M activates the battery relay so that electric power is supplied to all circuits except the glow plug relay circuit. (Refer to the circuit diagram.)
2. Remove the fuse box cover. Set the tester. (Measurement Range: 0 to 30 V)
3. Ground the negative probe of tester to the vehicle frame. Touch the terminals located away from center of the fuse box with the positive probe of tester one at a time. When normal continuity of a fuse is intact, the tester will indicate 20 to 25 V (battery voltage).

NOTE: All terminals located along the lengthwise centerline of the fuse box are connected to the power source, while terminals located away from center of the fuse box are connected to loads (accessories). Therefore, test all fuses in the same method except for the glow relay circuit fuse. Check the glow relay circuit fuse with the key switch turned to the ON position and follow the procedure in step 3.



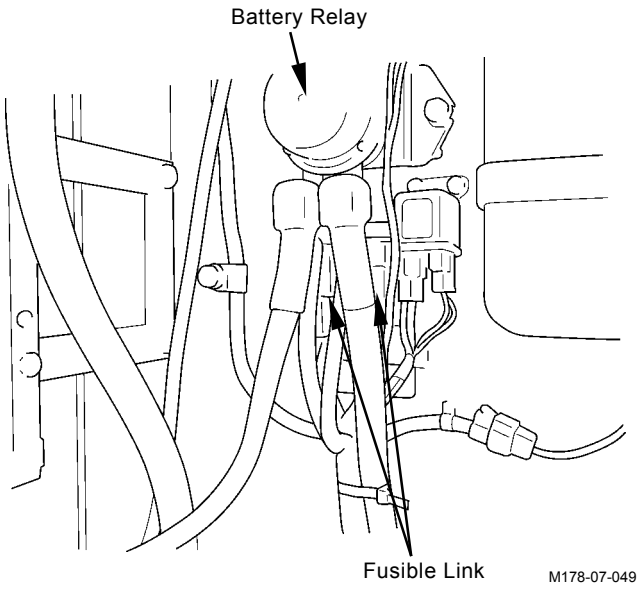
M178-07-034

Fuse No.	Capacity	Connected to	Fuse No.	Capacity	Connected to
1	20 A	Work Light Relays 1 and 2	11	10 A	Horn Relay
2	10 A	Wiper Relay, Wiper Motor, Washer Relay	12	5 A	Radio, Cab Light
3	20 A	Heater (Air Conditioner Unit)	13	10 A	Cigarette Lighter
4	10 A	MC (Solenoid Valve Power)	14	5 A	Fuel Pump
5	5 A	Optional 1	15	10 A	Auxiliary
6	10 A	Optional 2	16	5 A	Glow Relay
7	10 A	Empty	17	5 A	Air Conditioner Unit
8	30 A	ECM Main Relay	18	5 A	MC, ECM, ICF, Monitor Unit (Power ON Signal)
9	10 A	Security Horn, Security Horn Relay (Power), Radio (Backup)	19	5 A	Monitor Unit (Main Power)
10	5 A	MC, ICF (Main Power)	20	5 A	Optional 3

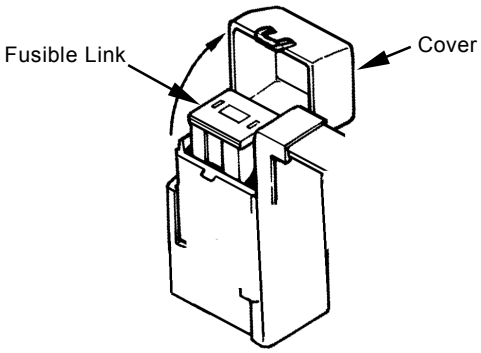
FUSIBLE LINK INSPECTION

Inspection

1. Remove the negative cable from the battery.
2. Loosen bolt M8 holding the cable routed in front of the fusible link box. Slide the cable out of the way of the front cover.
3. Open the front cover of fusible link box and visually inspect the fusible link.



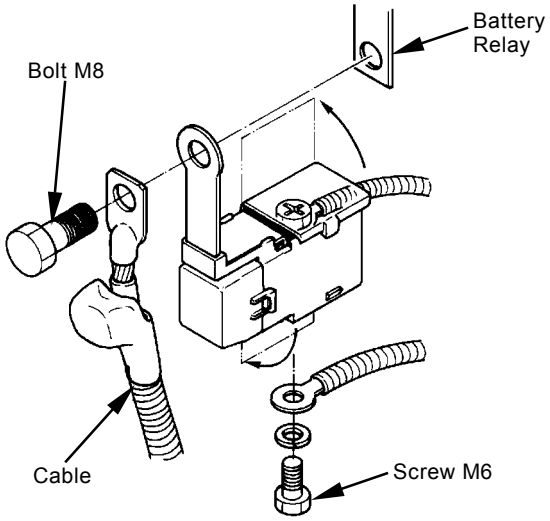
M178-07-049



T178-05-06-002

Replacement

1. Check that the negative cable is removed from the battery.
2. Remove bolt M8. Remove the fusible link from the battery relay.
3. Open the upper and bottom side covers of fusible link box. Remove screws M6 (2 used).
4. Pull out the fusible link. Replace the fusible link.
5. Install screws M6 (2 used).
6. Install the fusible link box and the cable to the battery relay.
7. Connect the negative cable to the battery.



T107-04-05-008

BATTERY VOLTAGE CHECK

1. Turn the key switch OFF. Check voltage between the battery positive terminal and the vehicle frame.

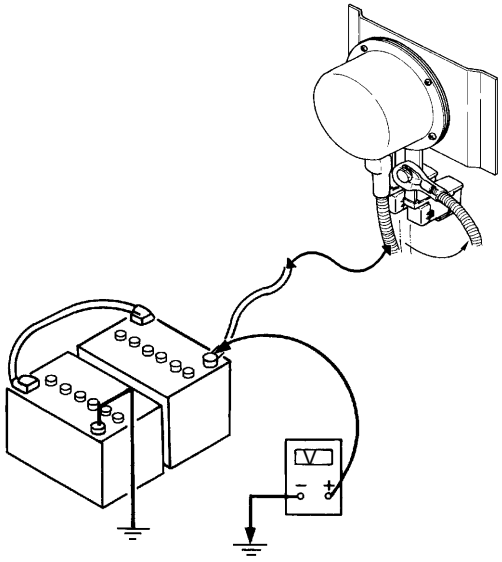
   Normal Voltage: 24 V

NOTE: If voltage is abnormal, recharge or replace the battery.

2. Start the engine. Check voltage between the battery positive terminal and the vehicle frame.

   Normal Voltage: 26 to 28 V

NOTE: If voltage is abnormal, check the charging system.



T157-07-06-007

ALTERNATOR CHECK

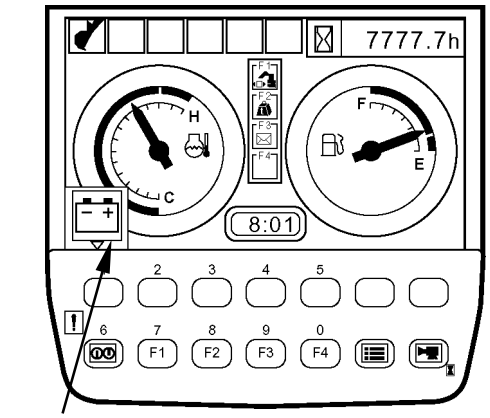
In general, the alternator indicator remains off when the alternator is generating power.
If the alternator indicator comes on while the engine is running, the alternator might be defective.

How to check the circuit

1. Turn the key switch to the ON position. Confirm that the alternator alarm is displayed.

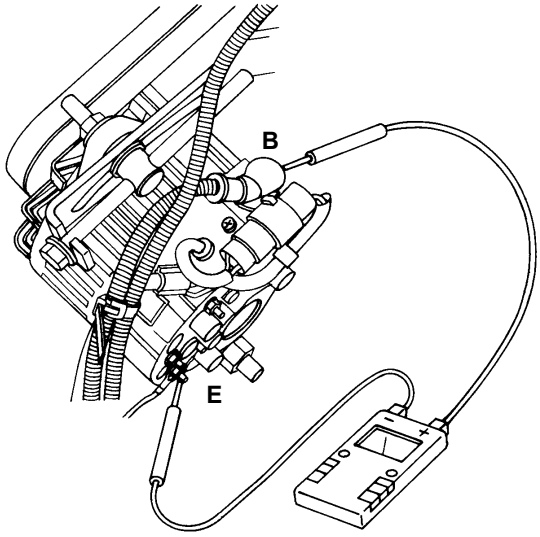
2. Measure voltage between teminals B and E of the alternator. If the measured voltage is around 24 V, the alternator circuit can be considered normal. If the measured voltage is low, a shortage in battery capacity or looseness of the wire connectors of alternator circuit might be cause of the malfunction. When voltage is 0 V, the wiring between fuse box and alternator might be loose or disconnected.
   Also, the alternator cannot generate electricity if the ground line is disconnected.

3. Next, start the engine. Measure voltage generated while as the alternator rotates.
   As described above, measure voltage between terminals B and E on the alternator side. If voltage is around 28 V, the alternator is operating normally.
   If the rated voltage is not being generated, there is some trouble with the alternator or the regulator.



Alternator Alarm — Monitor Unit

T1V1-05-01-117



T157-07-06-003

CONTINUITY CHECK

Single-line continuity check

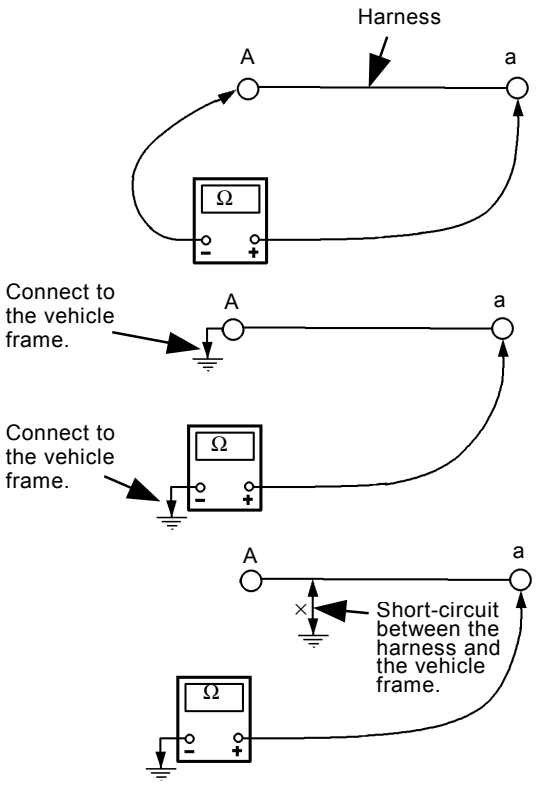
Disconnect both end connectors of the harness and check continuity between both ends:
If the ohm-meter reading is: 0 Ω = Continuity
∞ Ω = Discontinuity

NOTE: When the one end connector is far apart from the other, connect one end of connector (A) to the machine chassis using a clip. Then, check continuity of the harness through the vehicle frame as illustrated.

If the ohm-meter reading is: 0 Ω = Continuity
∞ Ω = Discontinuity

Single-line short-circuit check

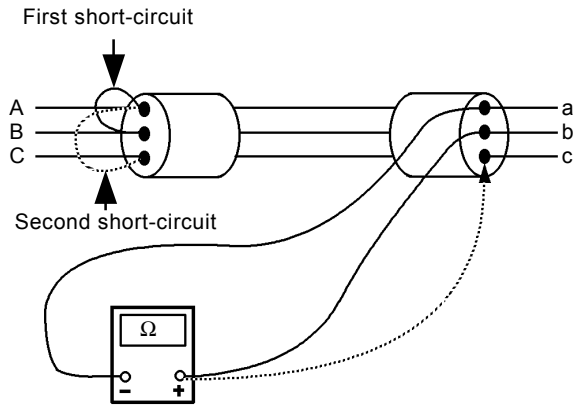
Disconnect both end connectors of the harness and check continuity between one end connector of the harness and the vehicle frame:
If the ohm-meter reading is:
0 Ω = Short circuit is present.
∞ Ω = No short circuit is present.



T107-07-05-003

Multi-line continuity check

Disconnect both end connectors of the harness, and short-circuit two terminals, (A) and (B), at one end connector, as illustrated. Then, check continuity between terminals (a) and (b) at the other connector. If the ohm-meter reading is ∞ Ω, either line (A) - (a), or (B) - (b) is in discontinuity. To find out which line is discontinued, conduct the single line continuity check on both lines individually, or, after changing the short-circuit terminals from (A) - (B) to (A) - (C), check continuity once more between terminals (a) and (c).



T107-07-05-004

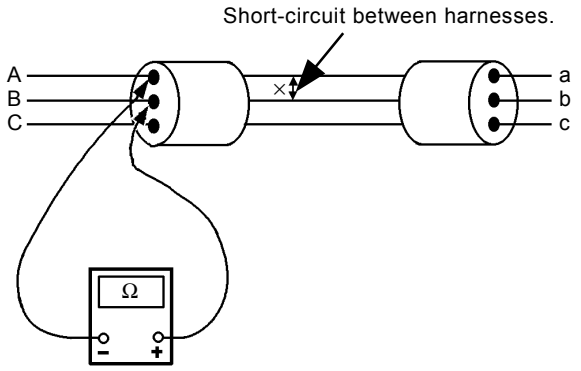
NOTE: By conducting the multi-line continuity check twice, it is possible to find out which line is discontinued. With terminals (A) and (C) short-circuited, check continuity between terminals (a) and (c).

If the ohm-meter reading is:
0 Ω = Line (B) - (b) has discontinuity.
∞ Ω = Line (A) - (a) has discontinuity.

Multi-line short-circuit check

Disconnect both end connectors of the harness, and check continuity between terminals (A) and (B) or (C).

If the ohm-meter reading is:
0 Ω = Short-circuit exists between the lines.
∞ Ω = No short-circuit exists between the lines.



T107-07-05-005

VOLTAGE AND CURRENT MEASUREMENT

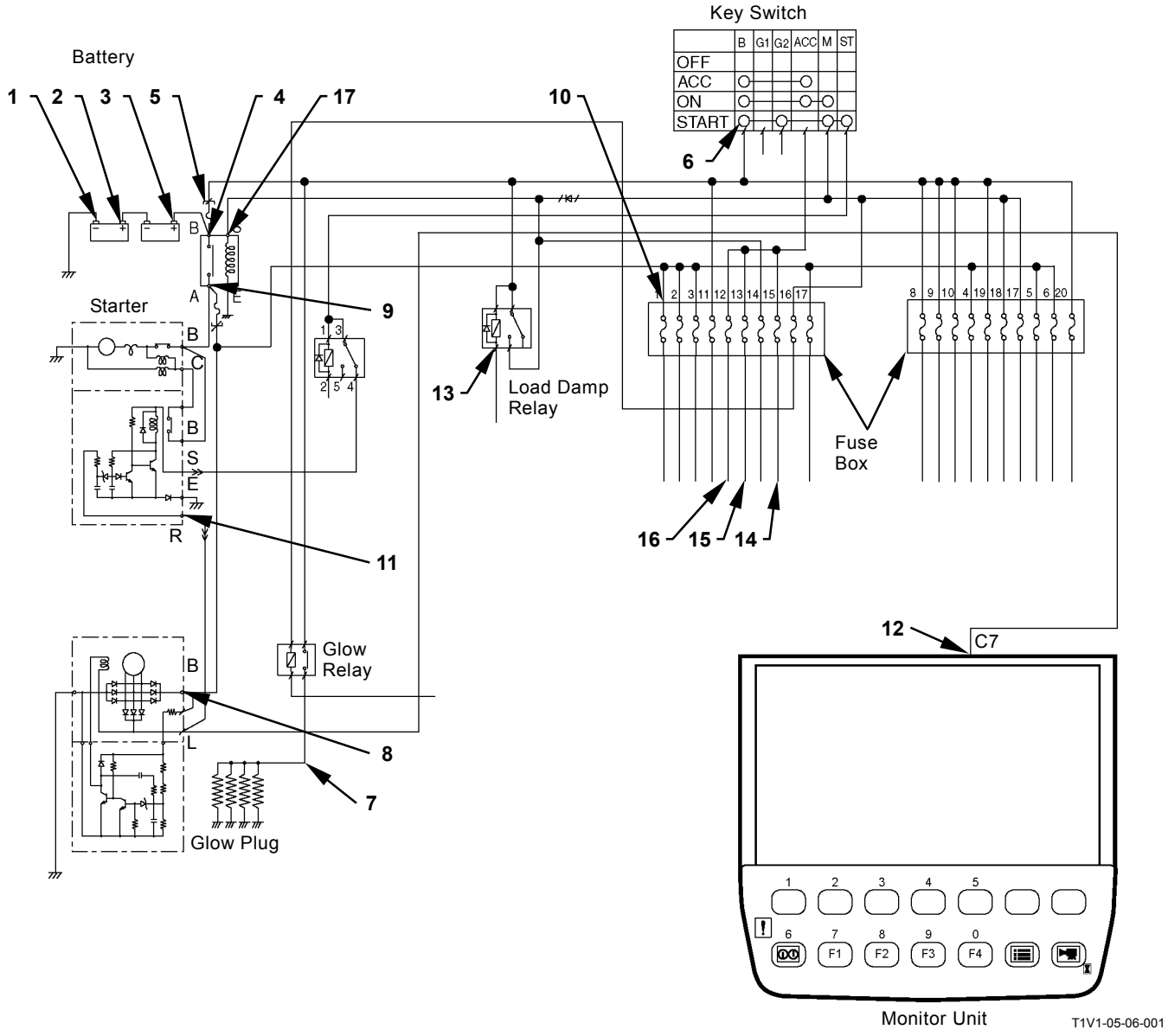
Turn key switch ON so that the specified voltage (current) is supplied to the location to be measured. Judge if the circuit is normal by evaluating whether the measured voltage (current) matches the specification.

24-Volt Circuit
Start checking the circuit in order up to the location to be measured from either power source or actuator side. Thereby, the faulty location in the circuit will be found.
Black Probe (Negative) of Tester:
To ground to the vehicle frame
Red Probe (Positive) of Tester:
To touch the location to be measured

Engine	Key Switch	Location to be Measured	Specification
Power Source Circuit			
Stopped	OFF	Between (2) and (1): One Battery	10 to 12.5 V
Stopped	OFF	Between (3) and (2): One Battery	10 to 12.5 V
Stopped	OFF	Between (3) and (1): Two Batteries	20 to 25 V
Stopped	OFF	Between (4) and Ground: Battery Power	20 to 25 V
Stopped	OFF	Between (5) and Ground: Fusible Link	20 to 25 V
Stopped	OFF	Between (1) and Ground: Backup Current*	6 mA
Preheat Circuit			
Stopped	ON or START	Between (6) and Ground: Key Switch	20 to 25 V
Stopped	ON or START	Between (7) and Ground: Glow Plug	20 to 25 V
Charging Circuit			
Fast Speed	ON	Between (8) and Ground: Alternator (B) / Generating Voltage	26 to 30 V
Fast Speed	ON	Between (9) and Ground: Battery Relay / Generating Voltage	26 to 30 V
Fast Speed	ON	Between (10) and Ground: Fuse Box / Starter Relay 2 (R) / Generating Voltage	26 to 30 V
Fast Speed	ON	Between (11) and Ground: Generating Voltage	13 to 30 V
Fast Speed	ON	Between (12) and Ground: Monitor Unit (C7)	13 to 30 V
Surge Voltage Prevention Circuit			
Idle Speed	ON	Between (8) and Ground: Alternator (B)	26 to 30 V
Idle Speed	ON	Between (11) and Ground: Starter Relay 2 (R)	13 to 30 V
Idle Speed	ON	Between (13) and Ground: Load Damp Relay	26 to 30 V
Idle Speed	ON	Between (9) and Ground: Battery Relay	26 to 30 V
Accessory Circuit			
Stopped	ON	Between (14) and Ground: Auxiliary	20 to 25 V
Stopped	ON	Between (15) and Ground: Cigarette Lighter	20 to 25 V
Stopped	ON	Between (16) and Ground: Radio, Cab Light	20 to 25 V
Stopped	ON	Between (17) and Ground: Battery Relay	20 to 25 V

*NOTE: *Before measurement, disconnect the negative cable from the battery.*

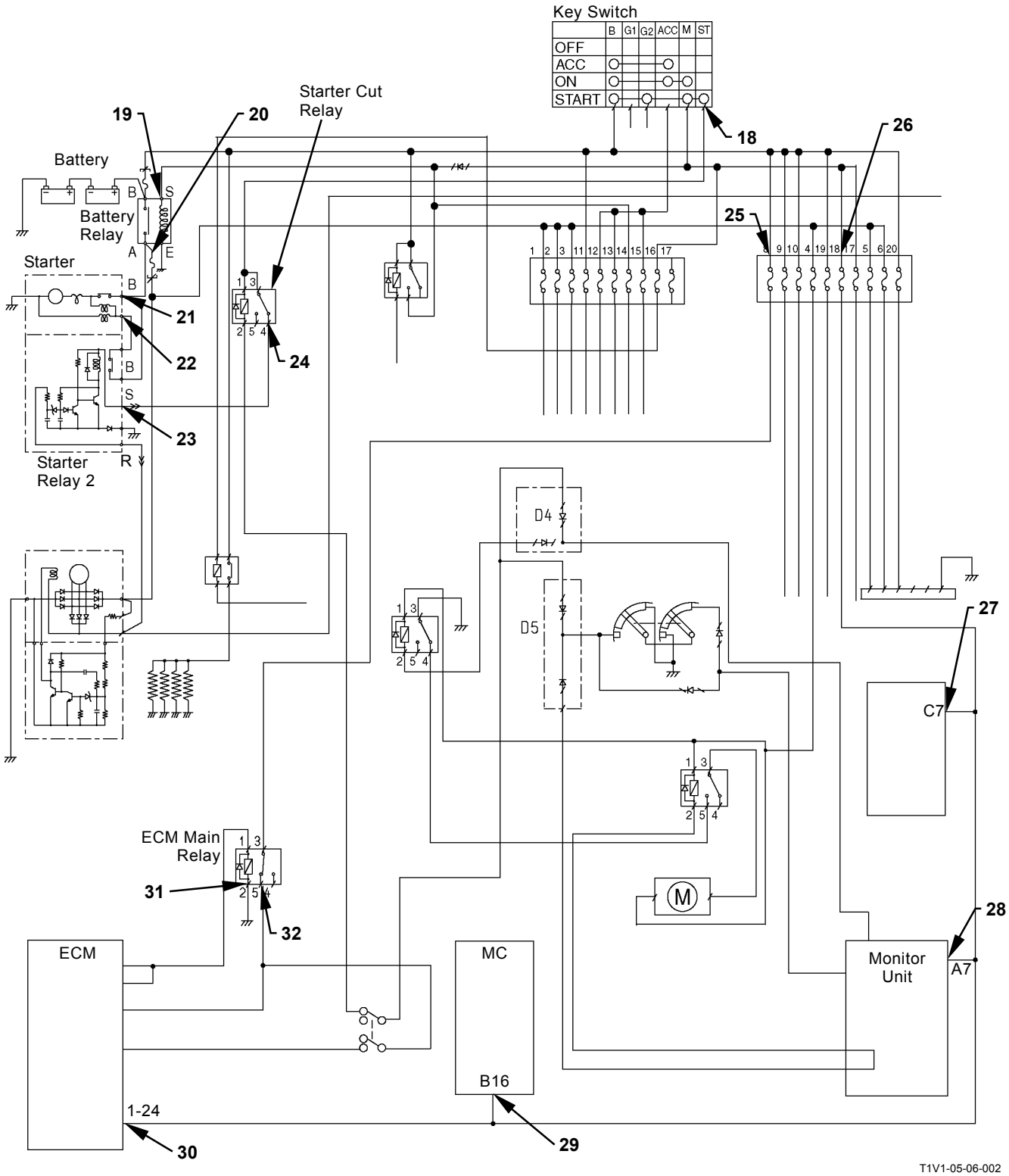
Power Source Circuit
Preheat Circuit
Charging Circuit
Surge Voltage Prevention Circuit
Accessory Circuit



Engine	Key Switch	Location to be Measured	Specification
Starting Circuit			
Started	START	Between (18) and Ground: Key Switch	20 to 25 V
Started	START	Between (19) and Ground: Battery Relay (Coil)	20 to 25 V
Started	START	Between (20) and Ground: Battery Relay (Switch)	20 to 25 V
Started	START	Between (21) and Ground: Starter (B)	20 to 25 V
Started	START	Between (22) and Ground: Starter (C)	20 to 25 V
Started	START	Between (23) and Ground: Starter Relay 2 (S)	20 to 25 V
Started	START	Between (24) and Ground: Starter Cut Relay	20 to 25 V
Started	START	Between (25) and Ground: Fuse Box	20 to 25 V
Started	START	Between (26) and Ground: Fuse Box	20 to 25 V
Started	START	Between (27) and Ground: ICF (C7)	20 to 25 V
Started	START	Between (28) and Ground: Monitor Unit (A7)	20 to 25 V
Started	START	Between (29) and Ground: MC (B16)	20 to 25 V
Started	START	Between (30) and Ground: ECM (1-24)	20 to 25 V
Started	START	Between (31) and Ground: ECM Main Relay	5 V
Started	START	Between (32) and Ground: ECM Main Relay	20 to 25 V

*NOTE: *Before measurement, disconnect the negative cable from the battery.*

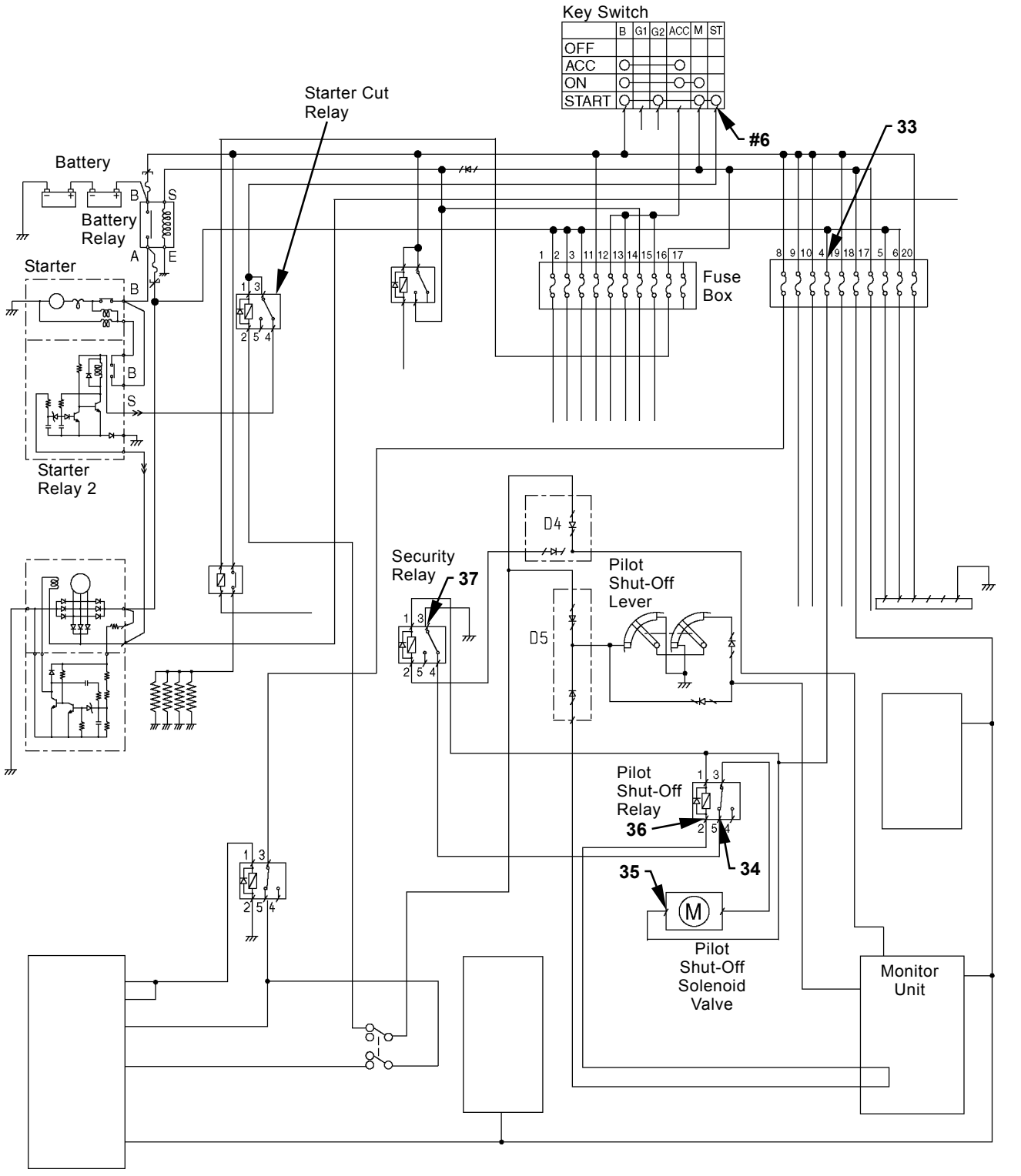
Starting Circuit



Engine	Key Switch	Location to be Measured	Specification
Pilot Shut-Off Circuit			
Stopped	ON	Between (33) and Ground: Fuse Box	20 to 25 V
Stopped	ON	Between (34) and Ground: Pilot Shut-Off Relay	20 to 25 V
Stopped	ON	Between (35) and Ground: Pilot Shut-Off Solenoid Valve	20 to 25 V
Stopped	ON	Between (36) and Ground: Pilot Shut-Off Relay	20 to 25 V
Stopped	ON	Between (37) and Ground: Security Relay	20 to 25 V

*NOTE: *Before measurement, disconnect the negative cable from the battery.*

Pilot Shut-Off Circuit



T1V1-05-06-003

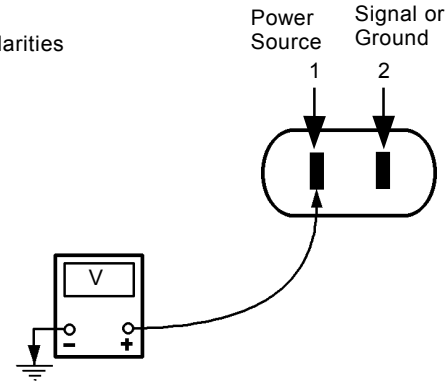
5 Voltage Circuit

- **Voltage between terminal #1 and the vehicle frame**
  Disconnect the connector with the key switch OFF.
  Measure voltage between terminal #1 on the machine harness end connector and the vehicle frame (ground).

  - Key switch: ON
  - Tester black terminal (negative): Connected to the vehicle frame (ground)
  - Tester red terminal (positive): Connected to terminal #1

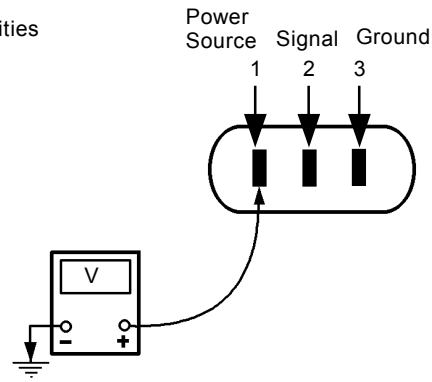
  Evaluation:
  If the measuring voltage is within 5±0.5 volts, the circuit up to terminal #1 is normal.

Two Polarities



T107-07-05-006

Three Polarities



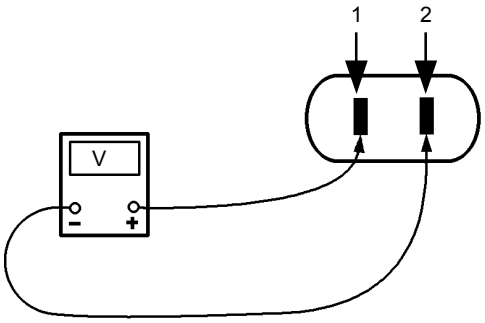
T107-07-05-007

- **Voltage between terminal #1 and the ground terminal**
  Disconnect the sensor connector with the key switch OFF.
  Measure voltage between terminal #1 on the machine harness end connector and the ground terminal (terminal #2 for two polarities, or terminal #3 for three polarities).

  - Key switch: ON
  - Tester black terminal (negative): Connected to the ground terminal (terminal #2 or #3)
  - Tester red terminal (positive): Connected to terminal #1

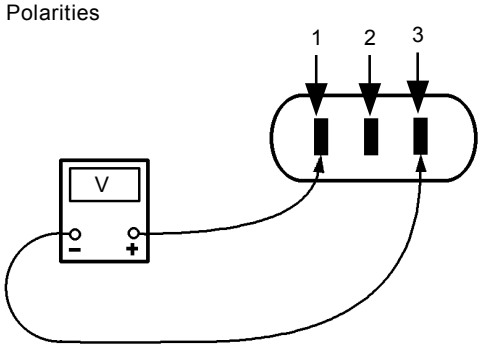
  Evaluation:
  If the measured voltage is within 5±0.5 volt, the circuit up to terminal #1 or the ground terminal (terminal #2 or #3) is normal.

Two Polarities



T107-07-05-008

Three Polarities



T107-07-05-009

CHECK BY FALSE SIGNAL

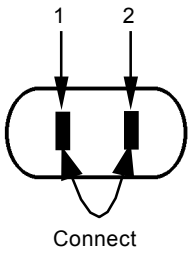
Turn the key switch OFF. Disconnect the sensor connector. Turn the key switch ON. Connect terminal #1 (power source) of machine harness end connector to terminal #2 (signal). (Power voltage is used as a false signal.) Check this state by using the monitor function of Dr. ZX. When the maximum value is displayed, MC and the circuit up to the machine harness end connector are normal. If “ON” is displayed, the pressure switch circuits are normal.

IMPORTANT: Do not connect terminal #1 or #2 to terminal #3 or to the vehicle frame (ground) when checking a three-polarity connector.

NOTE: Some kinds of sensors can be monitored by the service mode of monitor (the built-in diagnosing system). (Refer to the TROUBLESHOOTING / Diagnosing Procedure group.)

Two Polarities

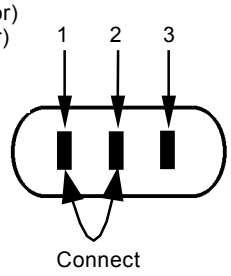
(Hydraulic Oil Temperature Sensor)



T107-07-05-010

Three Polarities

(Pressure Sensor)
(Pump Delivery Pressure Sensor)
(Pump Control Pressure Sensor)

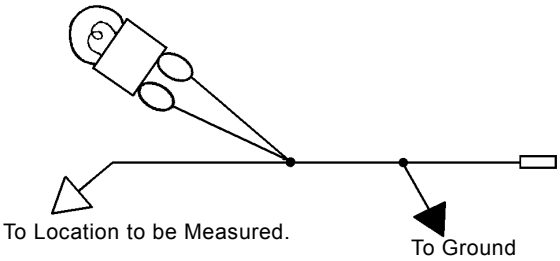


T107-07-05-011

TEST HARNESS

Install a test harness between connectors. Check the circuit condition depending on whether the test harness lamp lights or extinguishes during operation.

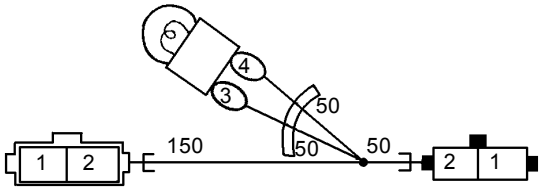
Parts Number 4283594 (ST 7126)
Use in order to check a single-line (discontinuity and/or voltage).
During Operation: Lamp is ON.



T107-07-05-012

Parts Number 4283594 (ST 7126)

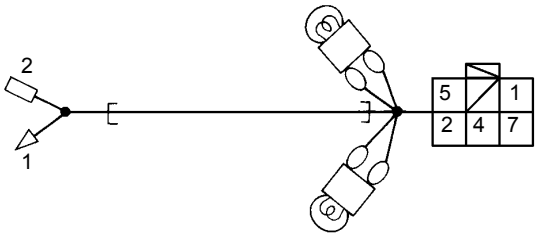
Parts Number (ST 7226)
Use in order to check the solenoid valve unit circuits.
When the corresponding control lever or switch is operated: Lamp is ON.



T107-07-06-015

Parts Number (ST 7226)

Parts Number (ST 7227)
Use in order to check the wiper circuit.



Parts Number (ST 7227)

T178-05-06-003

MEMO

MEMO

Hitachi Construction Machinery Co. Ltd
Attn: Publications, Marketing & Product Support
Fax: 81-29-831-1162

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THE ATTACHED DIAGRAM LIST

(The following diagrams are attached to this manual.)

1. ZAXIS200-3 CLASS/240-3 CLASS/270-3 CLASS/330-3 CLASS ELECTRICAL DIAGRAM
   ZAXIS225US-3 CLASS/225USR-3 CLASS ELECTRICAL DIAGRAM

2. ZAXIS200-3 CLASS/240-3 CLASS/270-3 CLASS/330-3 CLASS CONNECTORS
   ZAXIS225US-3 CLASS/225USR-3 CLASS CONNECTORS

3. ZAXIS200-3 CLASS ENGINE HARNESS 1
   ZAXIS225US-3 CLASS/225USR-3 CLASS ENGINE HARNESS 1

4. ZAXIS240-3 CLASS ENGINE HARNESS 1
   ZAXIS270-3 CLASS ENGINE HARNESS 1

5. ZAXIS200-3 CLASS/225US-3 CLASS/225USR-3 CLASS/240-3 CLASS/270-3 CLASS/330-3 CLASS ENGINE HARNESS 2
   ZAXIS200-3 CLASS/225US-3 CLASS/225USR-3 CLASS/240-3 CLASS/270-3 CLASS/330-3 CLASS MONITOR UNIT HARNESS

6. ZAXIS200-3 CLASS/240-3 CLASS/270-3 CLASS/330-3 CLASS CAB HARNESS
   ZAXIS225US-3 CLASS/225USR-3 CLASS CAB HARNESS

7. ZAXIS225US-3 CLASS/225USR-3 CLASS CONSOLE HARNESS

8. ZAXIS200-3 CLASS/225US-3 CLASS/225USR-3 CLASS /240-3 CLASS/270-3 CLASS HYDRAULIC CIRCUIT DIAGRAM

9. ZAXIS240-3 CLASS/270-3 CLASS HYDRAULIC CIRCUIT DIAGRAM
   (2-PIECE BOOM, BOOM HOSE RUPTURE VALVE, ARM HOSE RUPTURE VALVE, POSITIONING HOSE RUPTURE VALVE))
   ZAXIS200-3 CLASS/225US-3 CLASS/225USR-3 CLASS/240-3 CLASS/270-3 CLASS HYDRAULIC CIRCUIT DIAGRAM
   (BREAKER AND CRUSHER PIPING, 2-SPEED FLOW COMBINING PIPING)