PART NO. TT1J1-E-00

HITACHI

Technical Manual

Troubleshooting

ZAXIS

450-3
450LC-3
470H-3
470LCH-3
500LC-3
520LCH-3

Hydraulic Excavator

Service Manual consists of the following separate Part No;

Technical Manual (Operational Principle)	: Vol. No.TO1J1-E
Technical Manual (Troubleshooting)	: Vol. No.TT1J1-E
Workshop Manual	: Vol. No.W1J1-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: 81-29-832-7084
    FAX: 81-29-831-1162

ADDITIONAL REFERENCES

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

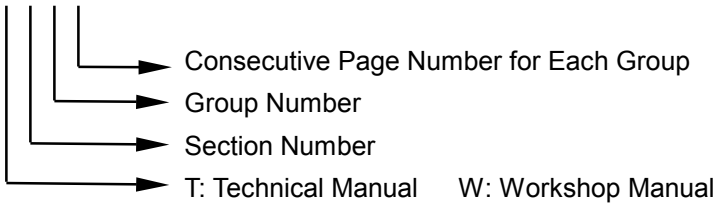
MANUAL COMPOSITION

- 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.

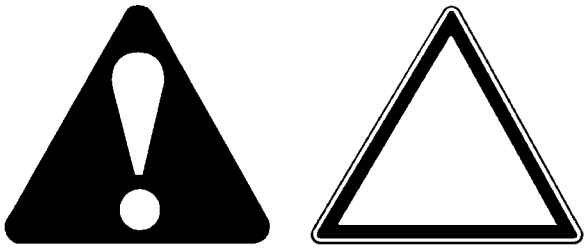
  Example : 24.5 MPa (250 kgf/cm^2, 3560 psi)

  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

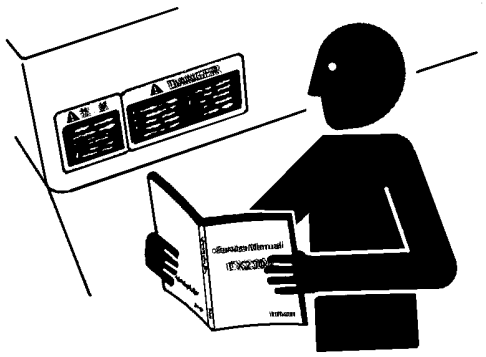
- On machine safety signs, signal words designating the degree or level of hazard - DANGER, WARNING, or CAUTION - are used with the safety alert symbol.
  - **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
  - **WARNING** indicates 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

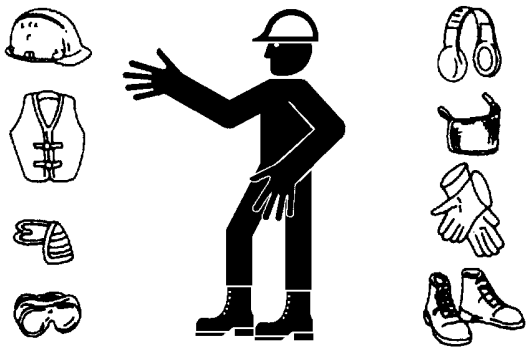
WEAR PROTECTIVE CLOTHING

- 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

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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

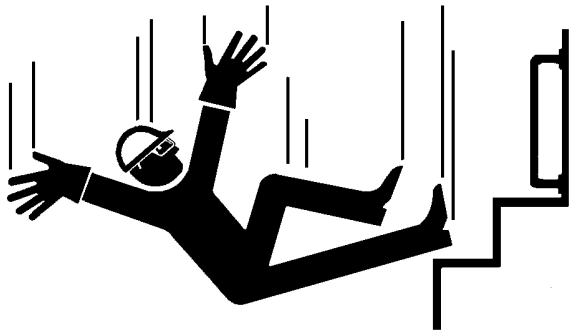
- Before entering the cab, thoroughly remove all dirt and/or oil from the soles of your work boots. If any controls such as a pedal is operated while with dirt and/or oil on the soles of the operator's work boots the operator's foot may slip off the pedal, possibly resulting in a personal accident.
- 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.



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SA-439

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.

009-E01A-0462

SA-462

ENSURE SAFETY BEFORE RISING FROM OR LEAVING OPERATOR'S SEAT

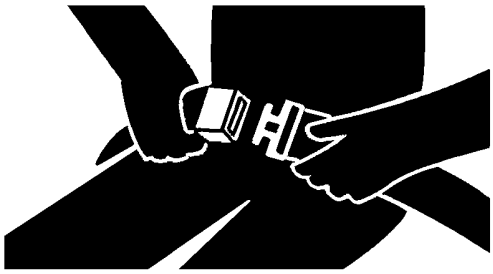
- Before rising from the operator's seat to open/close either side window or to adjust the seat position, be sure to first lower the front attachment to the ground and then move the pilot control shut-off lever to the LOCK position. Failure to do so may allow the machine to unexpectedly move when a body 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

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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.

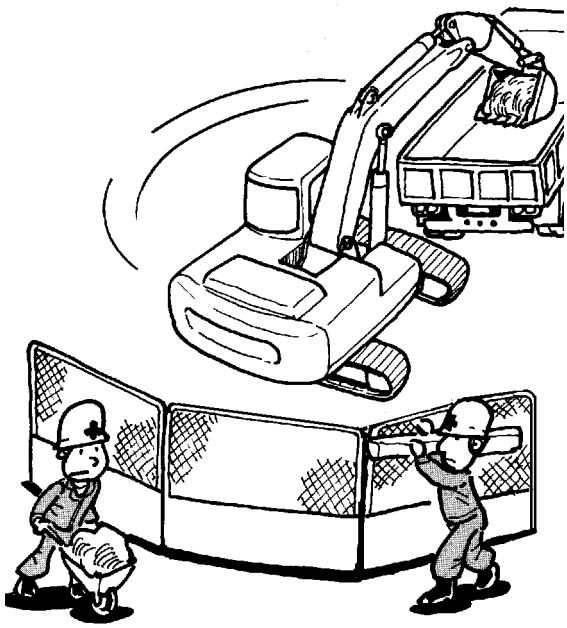
014-E01B-0427

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

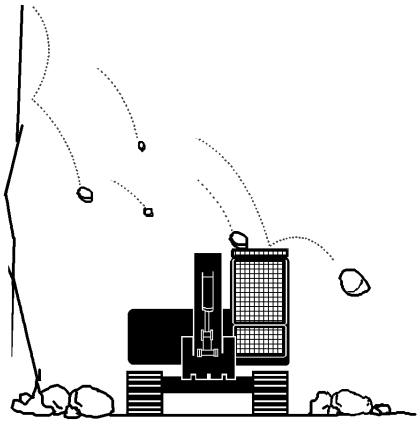
- When working at the edge of an excavation or on a road shoulder, the machine could tip over, possibly resulting in serious injury or death.
  - Investigate the configuration and ground conditions of the job site beforehand to prevent the machine from falling and to prevent the ground, stockpiles, or 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.

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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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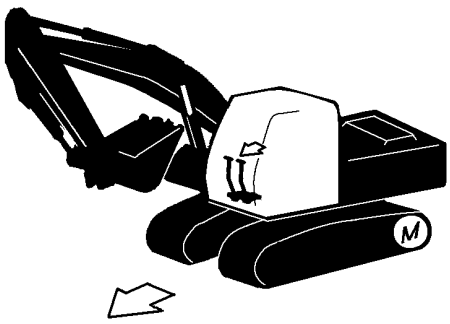


SA-491

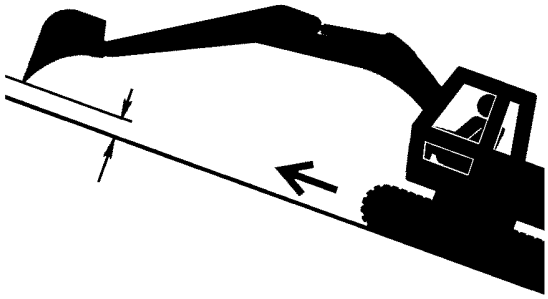
DRIVE MACHINE SAFELY

- 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.



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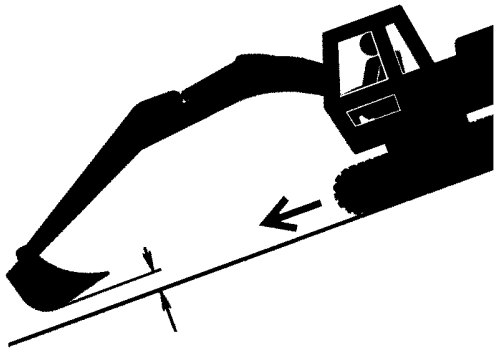

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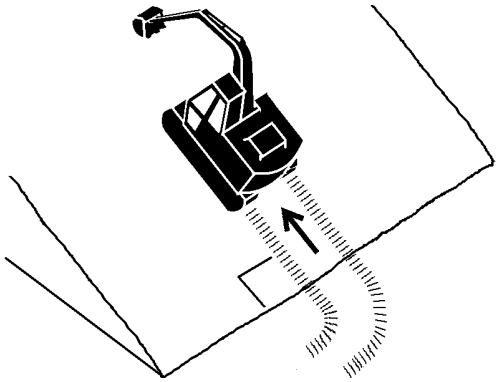

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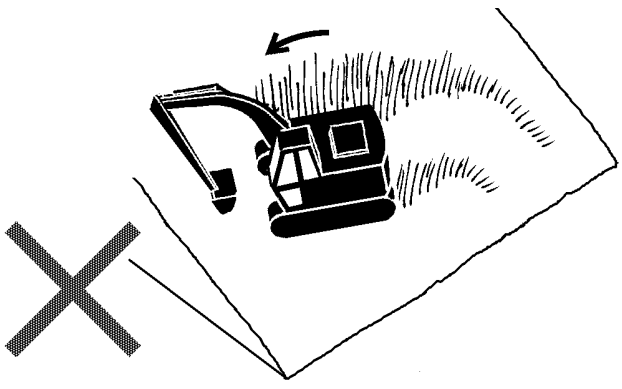
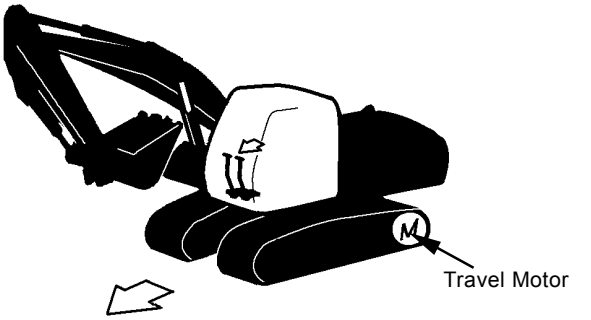


SA-442

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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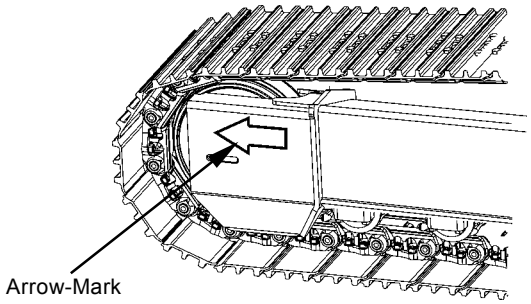

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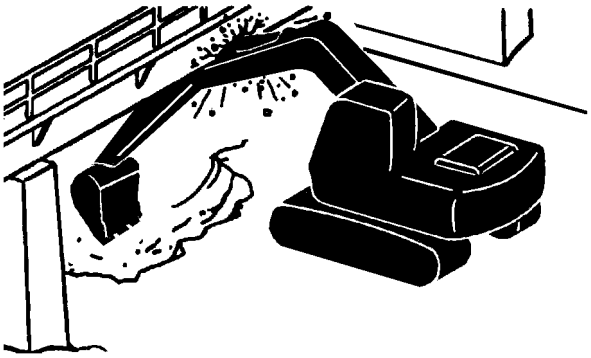
- Use wood plates in order not to damage the road surface. Be careful of steering when operating on asphalt roads in summer.
- When crossing train tracks, use wood plates in order not to damage them.
- Do not make contact with electric wires or bridges.
- When crossing a river, measure the depth of the 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.



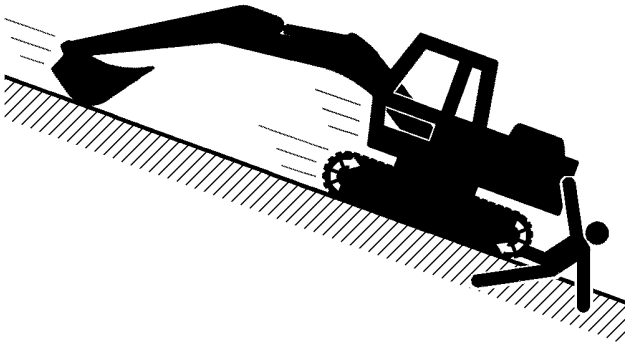
SA-011

AVOID INJURY FROM ROLLAWAY ACCIDENTS

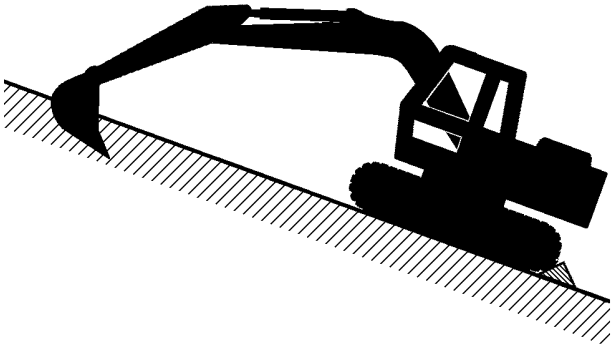
- Death or serious injury may result if you attempt to mount or stop a moving machine.

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.



SA-391



SA-392

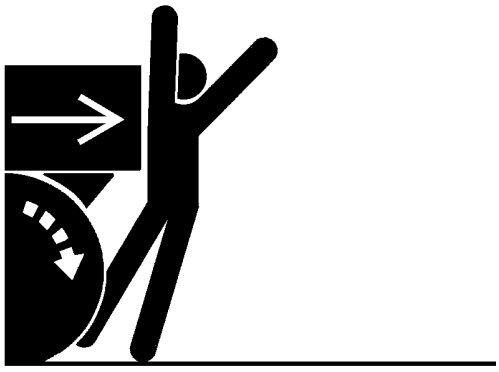
020-E02A-0493

AVOID INJURY FROM BACK-OVER AND SWING ACCIDENTS

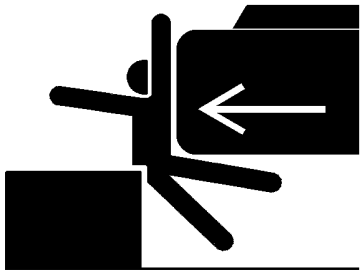
- If any person is present near the machine when backing or swinging the upperstructure, the machine may hit or run over that person, resulting in serious injury or death.

  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



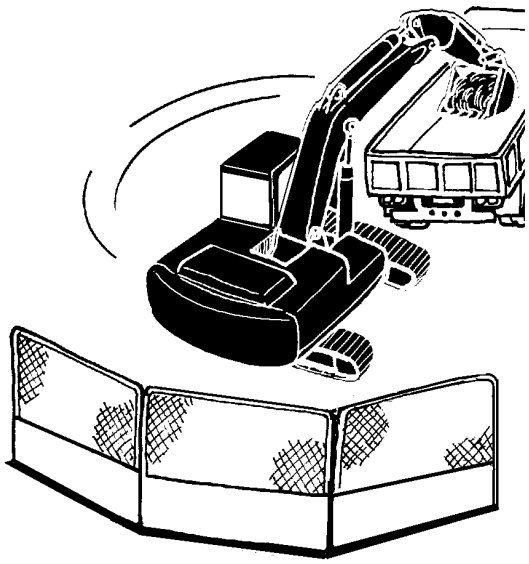
SA-384

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

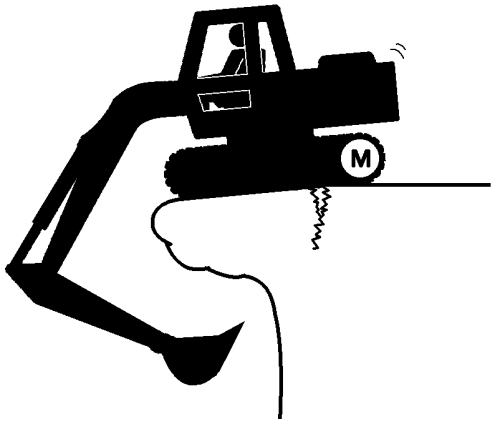
SA-487

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

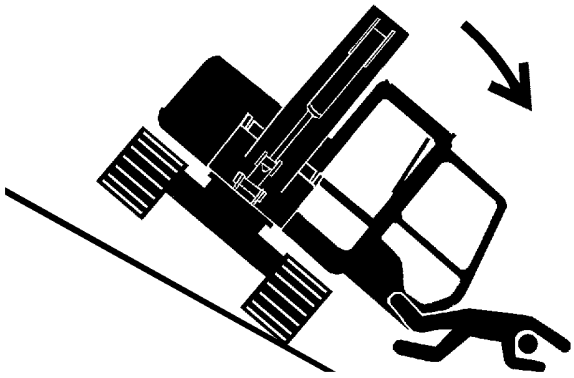
- The danger of tipping is always present when operating on a grade, possibly resulting in serious injury or death.

To avoid tipping:

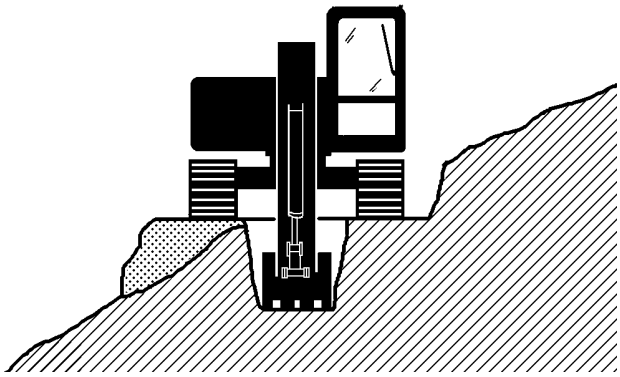
- Be extra careful before operating on a grade.
  - Prepare machine operating area flat.
  - Keep the bucket low to the ground and close to the machine.
  - Reduce operating speeds to avoid tipping or slipping.
  - Avoid changing direction when traveling on grades.
  - NEVER attempt to travel across 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

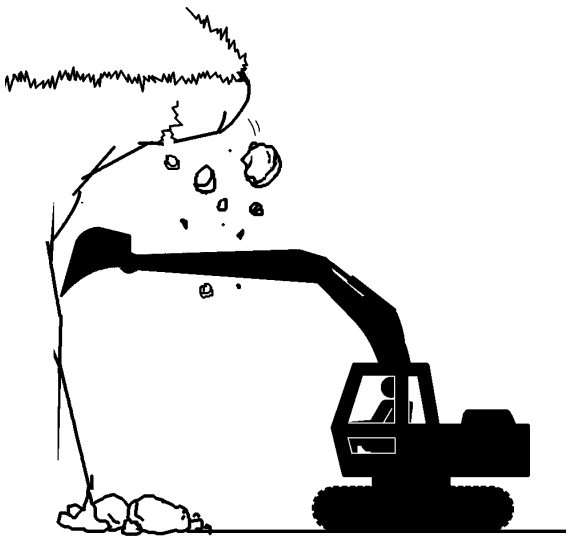


SA-440

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.

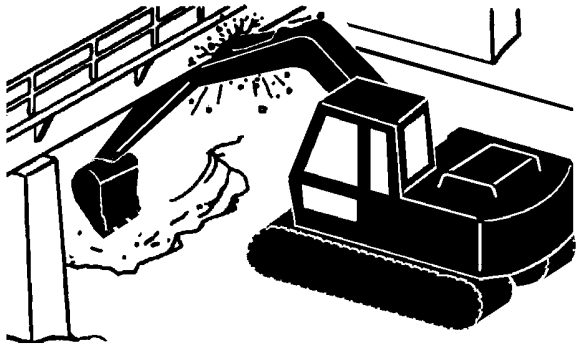
SA-382

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.



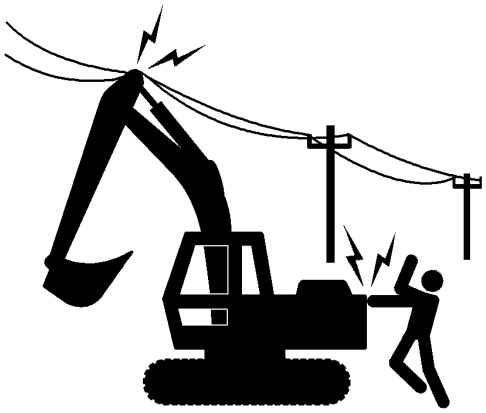
SA-389

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

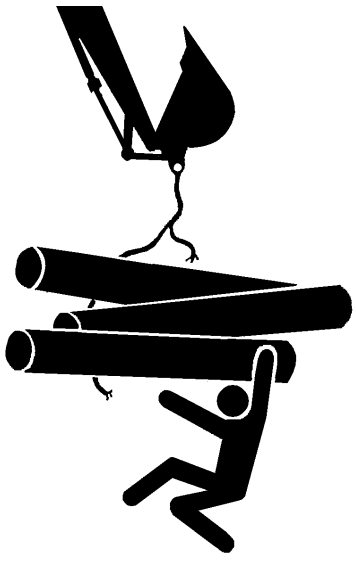
- The machine is vulnerable to lighting strikes.
  - In the event of an electrical storm, immediately stop operation, and lower the bucket to the ground. Evacuate to a safe place far away from the machine.
  - After the electrical storm has passed, check all of the machine safety devices for any failure.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



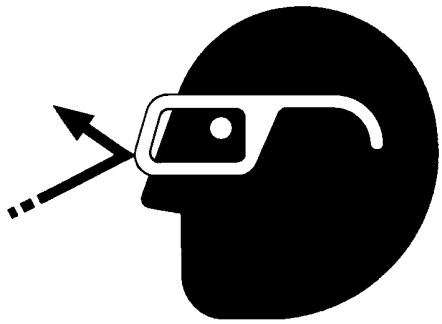
SA-014

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

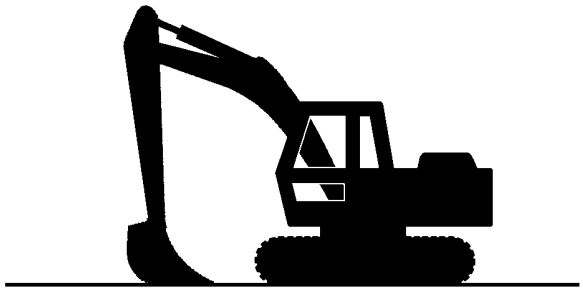


SA-432

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:

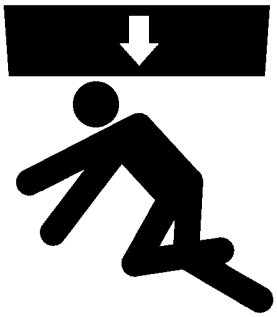
- Understand service procedures before starting work.
- Keep the work area clean and dry.
- Do not spray water or steam inside cab.
- Never lubricate or service the machine while it is moving.
- Keep hands, feet and clothing away from power-driven parts.

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.

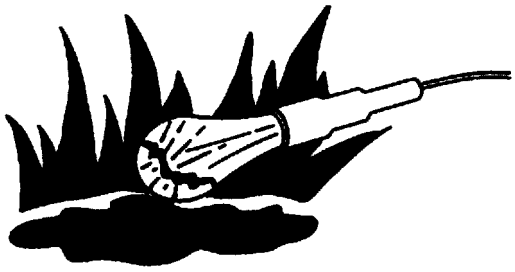
500-E02C-0520

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.



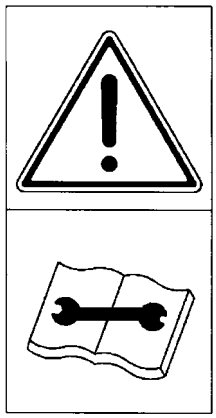
SA-037

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

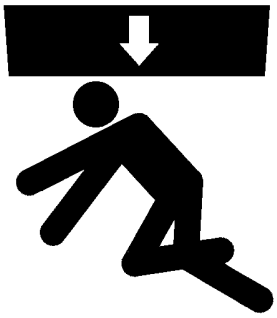


T1J1-01-01-001

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

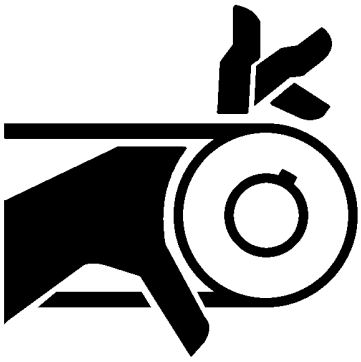


SA-527

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.

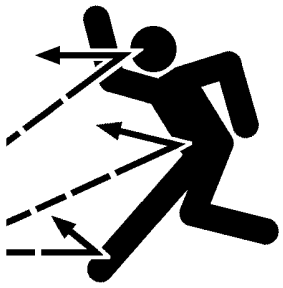
502-E01A-0026



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.



SA-344

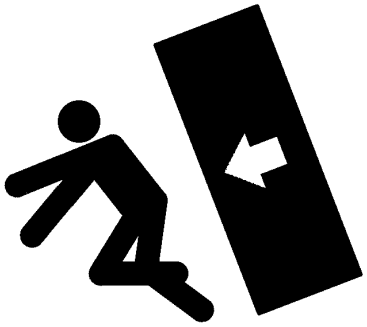
- Travel reduction gears are under pressure.
  - As pieces may fly off, be sure to keep body and face away from AIR RELEASE PLUG to avoid injury.
  - GEAR OIL is hot. Wait for GEAR OIL to cool, and then gradually loosen AIR RELEASE PLUG to release pressure.

503-E01B-0344

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

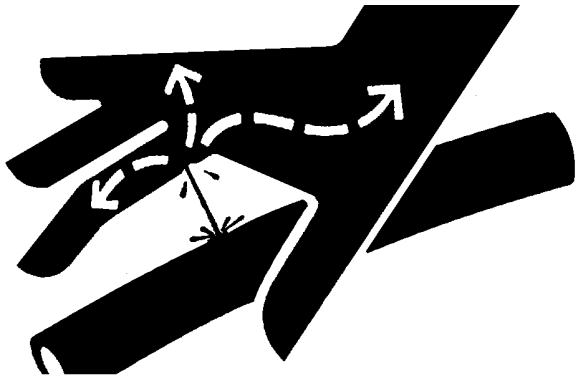
S506-E01A-0019

AVOID HIGH-PRESSURE FLUIDS

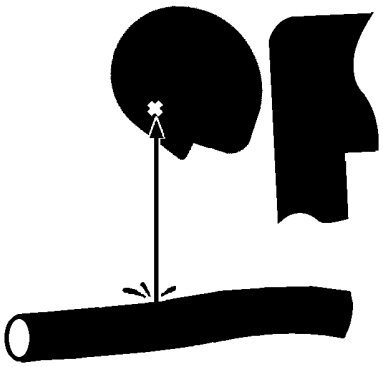
- Fluids such as diesel fuel or hydraulic oil under pressure can penetrate the skin or eyes causing serious injury, blindness or death.

  - 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.

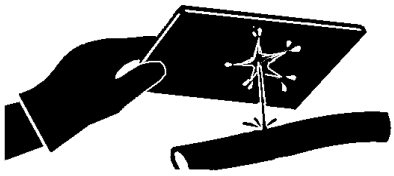
507-E03A-0499



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.

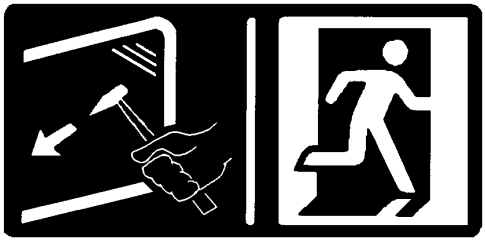
508-E02A-0393

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

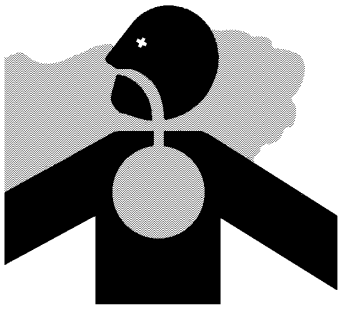


SS-1510

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.

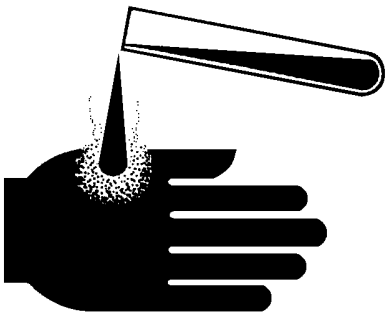
SA-032

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.

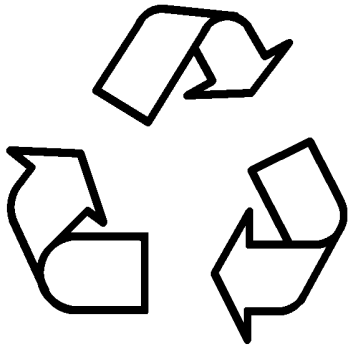
515-E01A-0309

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)

SECTION 4 OPERATIONAL PERFORMANCE TEST

SECTION 5 TROUBLESHOOTING

TECHNICAL MANUAL (Operational Principle)

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.

WORKSHOP MANUAL

SECTION 4
OPERATIONAL PERFORMANCE TEST

CONTENTS

Group 5 Component Test

Group 6 Adjustment

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

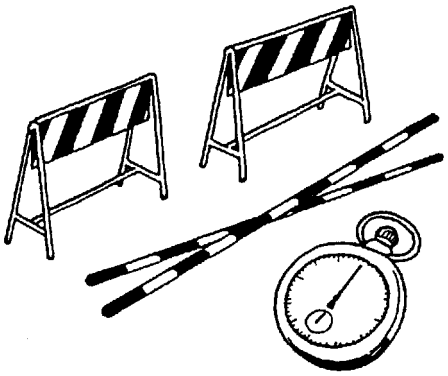
1. Repair any defects and damage found, such as oil or water leaks, loose bolts, cracks and so on, before starting to test.

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.



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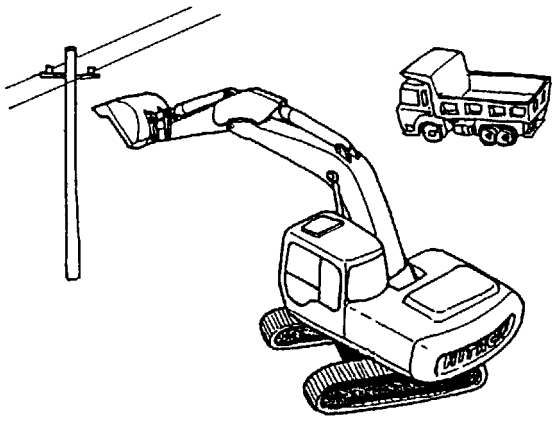
MAKE PRECISE MEASUREMENT

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.



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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.

Test procedure:
- Engine Control Dial: Fast Idle
- Power Mode Switch: HP Mode
- Auto-Idle Switch: OFF
- Work Mode: Digging Mode
- Hydraulic Oil Temperature: 50±5 °C (122±9 °F)

Performance Test		Performance Standard	Remarks	Reference Page
ENGINE SPEED	min^{-1}			T4-3-1
Slow Idle		900±50	With the lever in neutral	
Fast Idle (P mode)		1650±50	↑	
Fast Idle (E mode)		1630±50	↑	
Auto-Idle		1180±50	↑	
Fast Idle (P mode)		1750±50	With boom raise and relief operation	
Fast Idle (HP mode)		1850±50	With boom raise and arm roll-in relief operation	
ENGINE COMPRESSION PRESSURE	MPa (kgf/cm^2)	2.94 (30) or less	With the engine speed 200 min^{-1}	T4-3-3
VALVE CLEARANCE (IN, EX)	mm	0.4	With the engine cold	T4-3-4
LUBRICANT CONSUMPTION (At rated operation)	mL/h	100 or less	At new machine	T4-3-7
TRAVEL SPEED	sec/20 m			T4-4-1
Fast Speed		13.0±2.0	500LC-3/520LCH-3: 18.0±2.0	
Slow Speed		20.0±2.0	500LC-3/520LCH-3: 25.0±2.0	
TRACK REVOLUTION SPEED	sec/3 rev			T4-4-2
Fast Speed		20.5±2.0	450LC-3/470LCH-3: 22.0±2.0 500LC-3/520LCH-3: 29.5±2.0	
Slow Speed		31.5±2.0	450LC-3/470LCH-3: 34.0±2.0 500LC-3/520LCH-3: 41.5±2.0	
MISTRACK CHECK (With fast and travel speed modes)	mm/20 m	200 or less		T4-4-3
TRAVEL MOTOR LEAKAGE	mm/5 min	0		T4-4-4
SWING SPEED	sec/3 rev	20.0±1.5	Bucket empty	T4-4-5
SWING FUNCTION DRIFT CHECK	mm/180°	1267 or less	Bucket empty	T4-4-6
SWING MOTOR LEAKAGE	mm/5 min	0	Bucket loaded	T4-4-7
MAXIMUM SWINGABLE SLANT ANGLE	deg.	17 or more	Bucket loaded	T4-4-8
SWING BEARING PLAY	mm	0.6 to 1.85	Allowable limit: 3.1 to 4.35	T4-4-9

Performance Test	Performance Standard	Remarks	Reference Page
HYDRAULIC CYLINDER CYCLE TIME sec			T4-4-11
Backhoe		3.4 m Arm 1.9 m^3 (PCSA heaped) Bucket, Bucket empty	
Boom Raise	3.6±0.3		
Boom Lower	2.5±0.3		
Arm Roll-In	4.5±0.3		
Arm Roll-Out	3.1±0.3		
Bucket Roll-In	3.5±0.3		
Bucket Roll-Out	2.9±0.3		
DIG FUNCTION DRIFT CHECK mm/5 min			T4-4-13
Backhoe		3.4 m Arm 1.9 m^3 (PCSA heaped) Bucket, Bucket loaded	
Boom Cylinder	15 or less		
Arm Cylinder	20 or less		
Bucket Cylinder	20 or less		
Bucket Bottom	100 or less		
CONTROL LEVER OPERATING FORCE N (kgf)		Hitachi lever pattern	T4-4-14
Boom Lever	16.0 (1.6) or less		
Arm Lever (ISO Lever Pattern: Swing Lever)	13.0 (1.3) or less		
Bucket Lever	13.0 (1.3) or less		
Swing Lever (ISO Lever Pattern: Arm Lever)	16.0 (1.6) or less		
Travel Lever	28.0 (2.9) or less		
Bucket Open Pedal	60.0 (6.1) or less		
Bucket Close Pedal	60.0 (6.1) or less		

Performance Test	Performance Standard	Remarks	Reference Page
CONTROL LEVER STROKE mm		Hitachi lever pattern	T4-4-15
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 COMBINED OPERATION CHECK sec	5.0 or less	Backhoe: 3.4 m Arm 1.9 m^3 (PCSA heaped) Bucket, Bucket empty	T4-4-16
Bucket Teeth Height: H mm	7000 or more		
COMPONENT TEST			
PRIMARY PILOT PRESSURE MPa (kgf/cm^2)			T4-5-1
Engine: Slow Idle	$3.9^{+0.7}_{-0.2}$ ($40^{+7.0}_{-2.0}$)		
Engine: Fast Idle	3.9±0.2 (39±2)		
SECONDARY PILOT PRESSURE MPa (kgf/cm^2)	3.4 to 4.0 (34 to 40)	Value indicated on Dr. ZX (Lever: Full Stroke)	T4-5-3
SOLENOID VALVE SET PRESSURE MPa (kgf/cm^2)	±0.2 (2)	Value indicated on Dr. ZX	T4-5-4
MAIN RELIEF VALVE SET PRESSURE MPa (kgf/cm^2)			T4-5-8
Backhoe			
When each Boom Lower, Arm, Bucket Relief Operation	$31.9^{+1.0}_{-1.5}$ (325^{+10}_{-15})		
When Power Digging	$34.3^{+1.0}_{-1.5}$ (350^{+10}_{-15})		
RELIEF PRESSURE MPa (kgf/cm^2)			
Backhoe			
When relieving swing	$28.4^{+2.0}$ (290^{+20})		
When relieving travel	$34.3^{+1.0}_{-1.5}$ (350^{+10}_{-15})		

Performance Test		Performance Standard	Remarks	Reference Page
OVERLOAD RELIEF VALVE SET PRESSURE	MPa (kgf/cm^2)			T4-5-12
Backhoe				
Boom, Arm, Bucket, and Auxiliary Close		$35.3^{+1.0}_{0}$ (360^{+10}_{0})		
Auxiliary Open		$27.9^{+1.0}_{0}$ (280^{+10}_{0})		
Boom (Lower) (When operating boom mode selector)		$12.0^{+1.0}_{0}$ (120^{+10}_{0})		
MAIN PUMP FLOW RATE MEASUREMENT	L/min	–	Refer to page T4-2-5	T4-5-14
FAN PUMP FLOW RATE MEASUREMENT	L/min	–	Refer to page T4-2-6	T4-5-16
SWING MOTOR DRAINAGE With constant maximum speed	L/min	0.2 to 0.3		T4-5-22
TRAVEL MOTOR DRAINAGE With the track jacked up	L/min	5 or less	Allowable limit: 10	T4-5-24

MAIN PUMP P-Q DIAGRAM

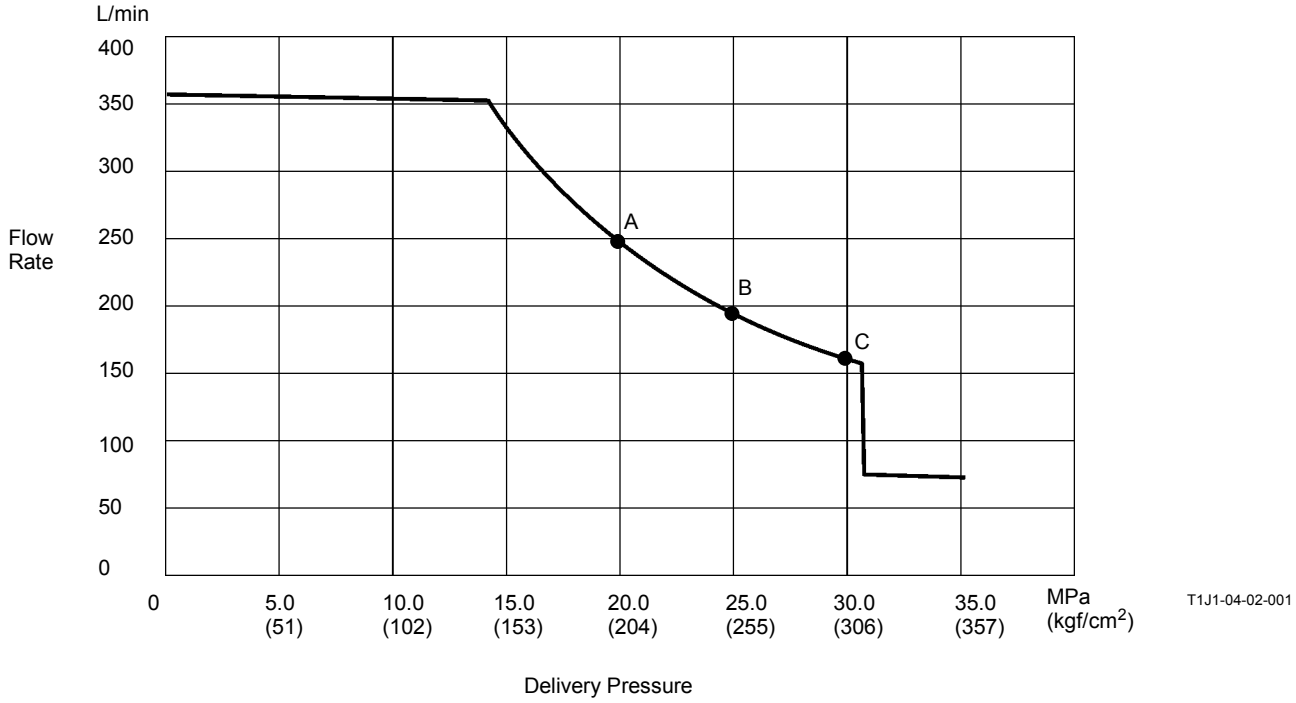
- Hydraulic P-Q Control

(REFERENCE: Measured at Test Stand)

- Rated Pump Speed: 1750 min^{-1} (rpm)
- Power Mode Switch: P Mode
- Hydraulic Oil Temperature: 50±5°C

	Delivery Pressure MPa (kgf/cm^2, psi)	Flow Rate L/min (US gpm)
A	20 (205, 2908)	Approx. 250 (66)
B	25 (255, 3635)	Approx. 190 (50)
C	30 (305, 4361)	Approx. 160 (42)

NOTE: Refer to T4-5-14.



FAN PUMP P-Q DIAGRAM

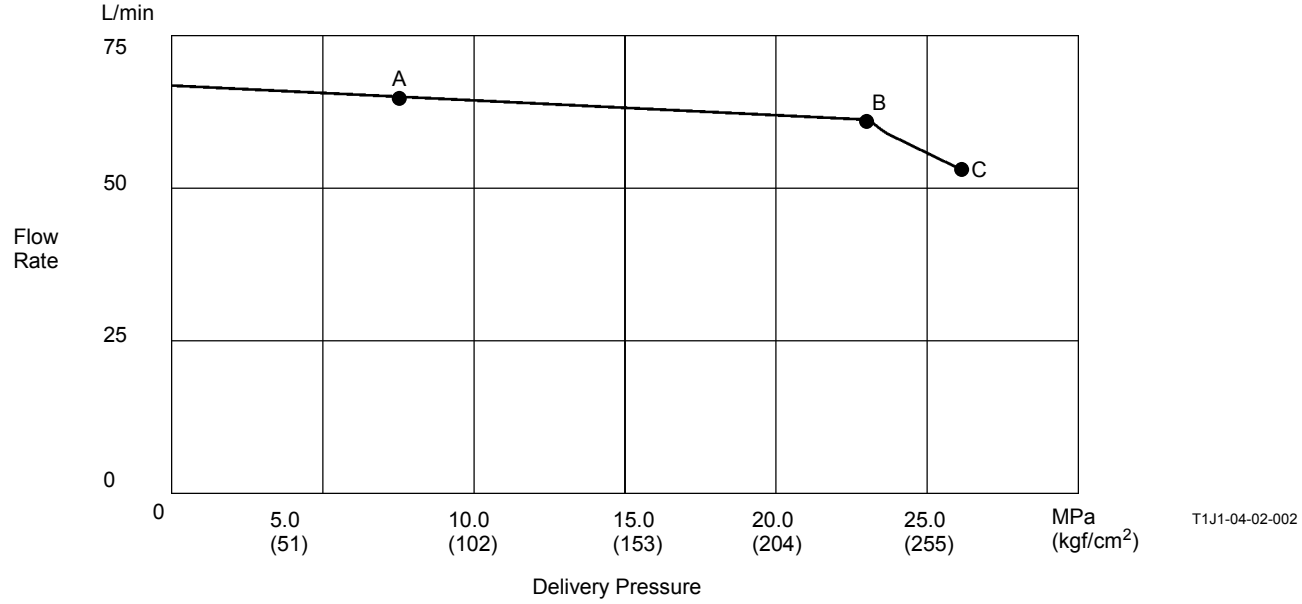
- Hydraulic P-Q Control

(REFERENCE: Measured at Test Stand)

- Rated Pump Speed: 1750 min^{-1} (rpm)
- Power Mode Switch: P Mode
- Hydraulic Oil Temperature: 50±5°C

	Delivery Pressure MPa (kgf/cm^2, psi)	Flow Rate L/min (US gpm)
A	7.8 (80, 1134)	Approx. 63 (17)
B	23.2 (235, 3373)	Approx. 59 (16)
C	26.2 (265, 3809)	Approx. 52 (14)

NOTE: Refer to T4-5-16.



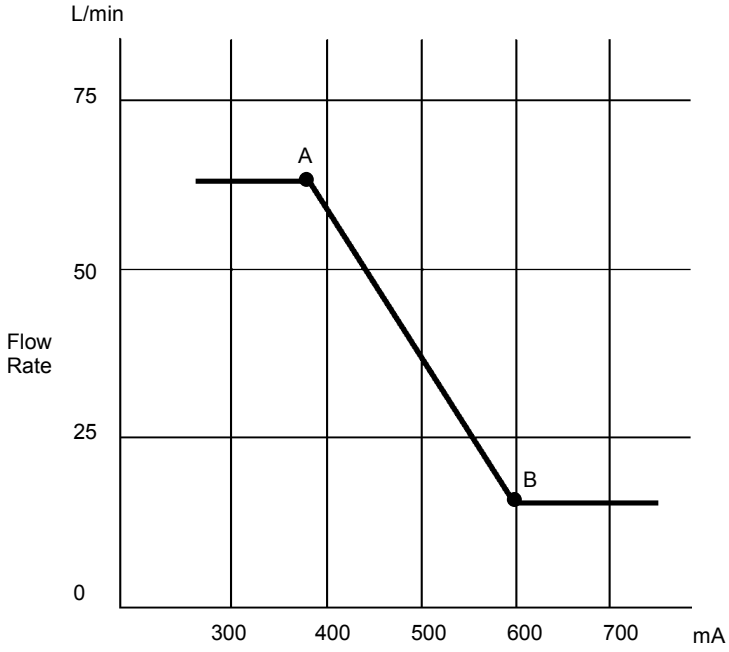
FAN PUMP I-Q DIAGRAM

- Hydraulic I-Q Control

(REFERENCE: Measured at Test Stand)

- Rated Pump Speed: 1750 min^{-1} (rpm)
- Power Mode Switch: P Mode
- Hydraulic Oil Temperature: 50±5°C

	Fan Pump Control Solenoid Valve Operating Signal mA	Flow Rate L/min (US gpm)
A	381±30	Approx. 63±3 (17±0.8)
B	597±40	Approx. 15±3 (4±0.8)



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Fan Pump Control Solenoid Valve Operating Signal

DR. ZX MONITOR INDICATING VALUES (MC)

Unless specified, test under the following conditions.

- Engine Control Dial: Fast Idle
- Power Mode Switch: P mode
- Auto-Idle Switch: OFF
- Work Mode: Digging Mode
- Hydraulic Oil Temperature: 50±5°C

NOTE: Items marked "" are measurable with the built-in diagnosing system.*

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
REQUESTED ENGINE SPEED * (min^{-1})						
Fast Idle (HP Mode)	1600					
Fast Idle (When operating a control lever)	1700					
Fast Idle (HP Mode)	1800					When boom raise relieving
Fast Idle (E Mode)	1580					
Auto-Idle	1030					
Slow Idle	750					
ACTUAL ENGINE SPEED * (min^{-1})						
Fast Idle	1650					
Fast Idle (When operating a control lever)	1750					
Fast Idle (HP Mode)	1850					When boom raise relieving
Fast Idle (E Mode)	1630					
Auto-Idle	1180					
Slow Idle	900					
ENGINE SPEED DEVIATION (min^{-1})						
Fast Idle	50					
Fast Idle (When operating a control lever)	50					
Fast Idle (HP Mode)	50					
Fast Idle (E Mode)	50					
Auto-Idle	150					
Slow Idle	150					
EC DIAL ANGLE * (V)						
Minimum	0.56					
Maximum	4.42					

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
PUMP 1 DELIVERY PRESSURE * (MPa)						
Control Lever in Neutral	0.7					
Boom Raise	34.3					When relieving
Boom Lower	-					
Arm Roll-In	31.9					When relieving
Arm Roll-Out	31.9					When relieving
Bucket Roll-Out	31.9					When relieving
Bucket Roll-In	31.9					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation	31.9					When relieving
PUMP 2 DELIVERY PRESSURE * (MPa)						
Control Lever in Neutral	0.7					
Boom Raise	34.3					When relieving
Boom Lower	-					
Arm Roll-In	31.9					When relieving
Arm Roll-Out	31.9					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	31.9					When relieving

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
PUMP 1 REGULATOR PRESSURE * (MPa)						
Control Lever in Neutral	0.5					
Boom Raise	0.5					When relieving
Boom Lower	-					
Arm Roll-In	0.5					When relieving
Arm Roll-Out	0.5					When relieving
Bucket Roll-Out	0.5					When relieving
Bucket Roll-In	0.5					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation	0.5					When relieving
PUMP 2 REGULATOR PRESSURE * (MPa)						
Control Lever in Neutral	0.45					
Boom Raise	0.45					When relieving
Boom Lower	-					
Arm Roll-In	0.45					When relieving
Arm Roll-Out	0.45					When relieving
Bucket Roll-Out	0.45					When relieving
Bucket Roll-In	0.45					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation	0.45					When relieving

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
PUMP 1 FLOW CONTROL PRESSURE * (MPa)						
Control Lever in Neutral	0.04					
Boom Raise	4.0					When relieving
Boom Lower	-					
Arm Roll-In	4.0					When relieving
Arm Roll-Out	4.0					When relieving
Bucket Roll-Out	4.0					When relieving
Bucket Roll-In	4.0					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation	4.0					When relieving
PUMP 2 FLOW CONTROL PRESSURE * (MPa)						
Control Lever in Neutral	0.04					
Boom Raise	4.0					When relieving
Boom Lower	-					
Arm Roll-In	4.0					When relieving
Arm Roll-Out	4.0					When relieving
Bucket Roll-Out	0.04					When relieving
Bucket Roll-In	0.04					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation	4.0					When relieving
PUMP 1 LOAD FACTOR (%)	25					When relieving boom or arm
PUMP 2 LOAD FACTOR (%)	25					When relieving boom or arm

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
FRONT PILOT PRESSURE * (MPa)	4.0					When relieving
TRAVEL PILOT PRESSURE * (MPa)	4.0					When relieving
BOOM RAISE PILOT PRESSURE * (MPa)	4.0					When relieving
BOOM LOWERING PILOT PRESSURE (MPa)	4.0					When relieving
ARM ROLL-IN (BH) PILOT PRESSURE * (MPa)	4.0					When relieving
ARM ROLL-OUT (BH) PILOT PRESSURE (MPa)	4.0					When relieving
BUCKET ROLL-OUT (BH) PILOT PRESSURE (MPa)	4.0					When relieving
BUCKET ROLL-IN (BH) PILOT PRESSURE (MPa)	4.0					When relieving
SWING PILOT PRESSURE * (MPa)	4.0					When relieving
LEFT TRAVEL PILOT PRESSURE (MPa)	4.0					When relieving
RIGHT TRAVEL PRESSURE (MPa)	4.0					When relieving
ATT. CONTROL PILOT PRESSURE * (MPa)	4.0					When relieving
C/W REMOVAL PILOT PRESSURE (MPa)	4.0					When relieving
BOOM BOTTOM PRESSURE (MPa)	34.3					When boom raise relieving
POWER BOOST CONTROL PRESSURE * (MPa)						
Power Digging Switch: ON, Lever in Neutral	2.15					
When Boom Raise Relieving	2.15					
TRAVEL MOTOR CONTROL PRESSURE * (MPa)	4.0					When fast speed traveling
BOOM MODE CONTROL PRESSURE (MPa)						Boom mode selector switch: ON
Lever in Neutral	0					
Boom Raise	3.23					When relieving
BOOM FLOW CONTROL PRESSURE (MPa)						
Lever in Neutral	0					
Combined Operation with Boom Lower and Arm Roll-In	4.0					

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
PUMP 1 REGULATOR VALVE CURRENT (mA)	270					When boom raise relieving
PUMP 2 REGULATOR VALVE CURRENT (mA)	270					When boom raise relieving
FAN PUMP VALVE CURRENT (mA)	381 to 555					
BOOM FLOW CONTROL VALVE CURRENT (mA)	650					When boom lower and bucket roll-in operation
FAN REVERSE VALVE 1 CURRENT (mA)	-					
FAN REVERSE VALVE 2 CURRENT (mA)	-					
AUXILIARY VALVE 1 CURRENT (mA)	-					
AUXILIARY VALVE 2 CURRENT (mA)	-					

DR. ZX MONITOR INDICATING VALUES (ECM)

Unless specified, test under the following conditions.

- Engine Control Dial: Fast Idle
- Power Mode Switch: P mode
- Auto-Idle Switch: OFF
- Work Mode: Digging Mode
- Hydraulic Oil Temperature: 50±5°C

NOTE: Items marked "" are measurable with the built-in diagnosing system.*

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
ENGINE TORQUE * (MPa)	47					When boom raise relieving
ACTUAL ENGINE SPEED * (min^{-1})	1750					When boom raise relieving
TARGET ENGINE SPEED * (min^{-1})	1700					When boom raise relieving
ENGINE OIL PRESSURE * (kPa)	444					When boom raise relieving, When Neutral: 428 kPa
FUEL FLOW (L/h)	-					When boom raise relieving
BOOST PRESSURE * (kPa)	128					When boom raise relieving
BATTERY VOLTAGE (V)	28.2					When boom raise relieving

SENSOR ACTIVATING RANGE

1. Checking Method

- Hydraulic Oil Temperature: 50±5 °C
- Unless specified:

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

- Monitor each sensor using Dr. ZX.

2. Sensor Activating Range

Sensor	Operation	Specification
Engine Control Dial	Slow Idle Speed	0.3 to 1.0 V
	Fast Idle Speed	4.0 to 4.7 V
Pilot Operation Pressure Sensor	Control Lever: Neutral Pilot Control Shut-Off Lever: LOCK	0 to 0.049 MPa (0 to 0.5 kgf/cm^2)
	Control Lever: Full Stroke Pilot Control Shut-Off Lever: UNLOCK	2.45 to 3.9 MPa (25 to 40 kgf/cm^2)
Pump Regulator Pressure Sensor	Control Lever: Neutral	Pump 1: *0.49 MPa (5.0 kgf/cm^2) Pump 2: *0.44 MPa (4.5 kgf/cm^2)
	Jack-up, Travel Lever: Full Stroke (Jack-up Side)	*1.76 to 2.55 MPa (18 to 26 kgf/cm^2)
Pump Delivery Pressure Sensor (Boom Bottom Pressure Sensor)	Control Lever: Neutral	*0.3 to 0.5 MPa (3 to 5 kgf/cm^2)
	When Boom Raise Relieving	31.9^{+1}_{-0} MPa (325^{+10}_{-0} kgf/cm^2)

*: Reference Value

(Blank)

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 unit (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.

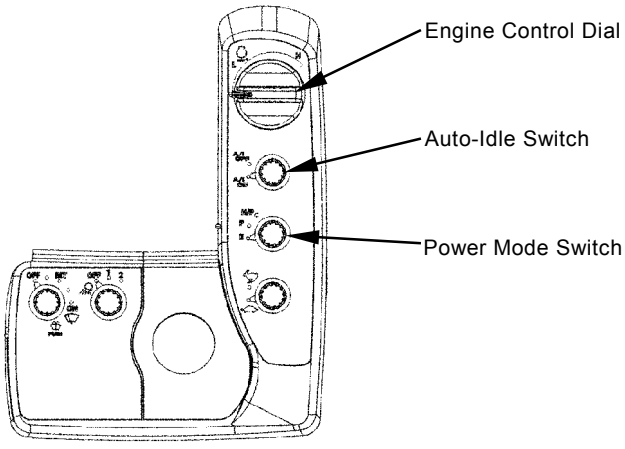
Remedy:

Refer to Troubleshooting B in Group T5-7.

NOTE: ECO stands for the auto engine speed reduction system by 1600 min^{-1}.

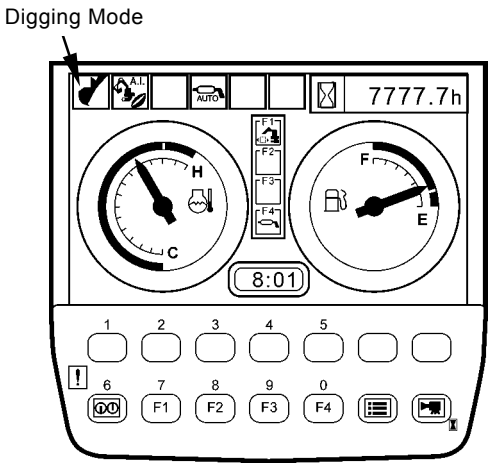
Item	Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode	Test Conditions
Slow Idle	Min. Speed	P	OFF	Digging Mode	
Fast Idle (With ECO deactivated)	Max. Speed	P	OFF	Digging Mode	Check in the Dr. ZX special functions with ECO deactivated. Measure engine speed with the lever in neutral.
Fast Idle (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.

Switch Panel:



T1V1-04-03-001

Monitor Unit:



M1J1-01-002

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 battery. Remove all the glow plugs from each cylinder.

   : 25 N·m (2.5 kgf·m, 18 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 battery.
7. Turn the starter. Exhaust foreign subjects from the cylinder.
8. Install a pressure gauge (Isuzu 5-8840-2675-0) and an adaptor (Isuzu 1-8531-7019-0) to the glow plug mounting part. (Sufficiently install them in order to prevent air leakage.)

Measurement:

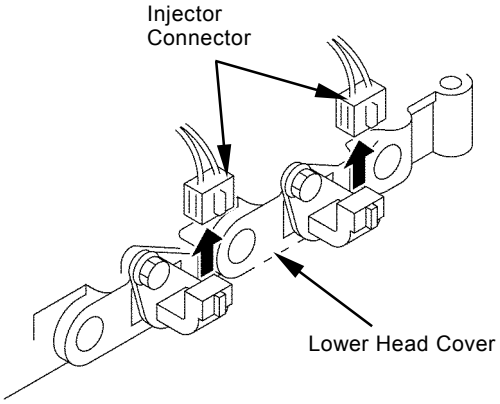
1. Turn the starter and measure compression pressure of each cylinder.
2. Repeat the measurement three times and calculate the mean values.

Evaluation:

Refer to Operational Performance Standard in Group T4-2.

Remedy:

Refer to the engine workshop manual.



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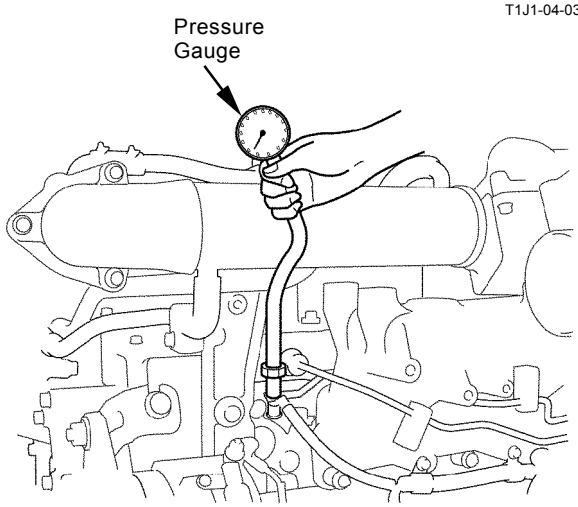


T1J1-04-03-002

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:

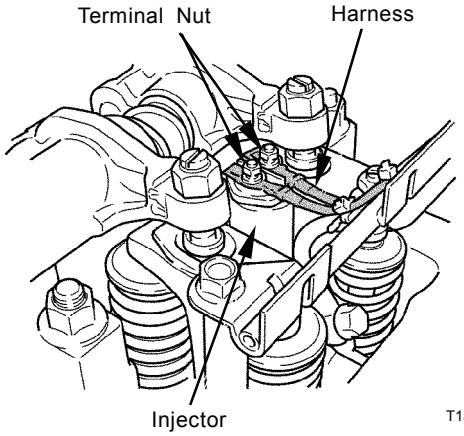
1. Remove the head cover.
2. Remove the terminal nut which secures the harness to the injector.
   : 2 N·m (0.2 kgf·m, 1.5 lbf·ft)
3. Remove the bolts (2 used). Remove the harness assembly from the injector.
   : 22 N·m (2.2 kgf·m, 16 lbf·ft)
4. Remove the leak off pipe.
   Bolt:
   : 15 N·m (1.5 kgf·m, 11 lbf·ft)
5. Rotate the crank pulley. Align the T/C mark on flywheel with the pointer on gear case in order to get TDC in the compression stroke.

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.6) is now positioned at the T/C 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 T/C in the compression stroke. (If the exhaust valve of cylinder No.1 is pushed down, piston No.6 is positioned at T/C in the compression stroke.

7. Start measurement from the cylinder (No.1 or No.6) positioned at T/C in the compression stroke.



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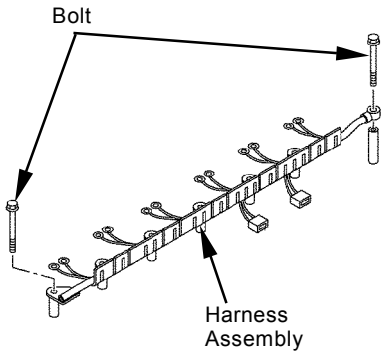
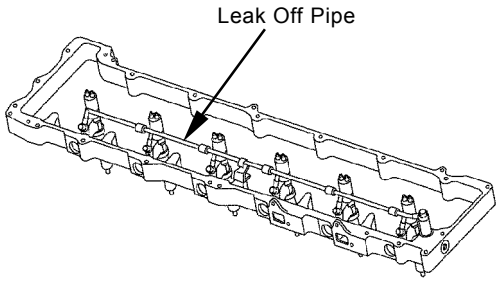
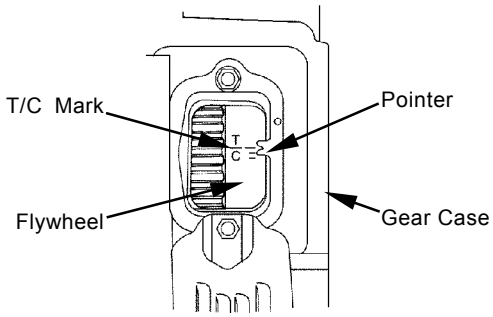


T1J1-04-03-007



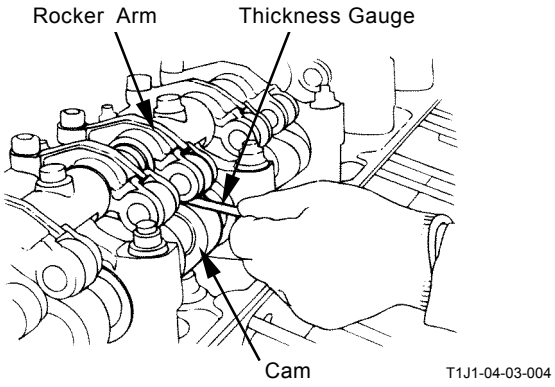
T1J1-04-03-008



T1J1-04-03-003

Measurement:

1. Insert a thickness gauge into the clearance between rocker arm and cam, and measure the valve clearance.



NOTE: The cylinders are aligned from No.1 to No.6 in that order, as viewed from the fan side. Injection Order: 1-5-3-6-2-4

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.6 cylinder, perform the measurement in the valves shown with mark "×".)

Cylinder No.	No.1		No.2		No.3		No.4		No.5		No.6	
Valve locations	E	I	E	I	E	I	E	I	E	I	E	I
When the measurement is started from No.1 cylinder	○	○		○	○			○	○			
When the measurement is started from No.6 cylinder			×			×	×			×	×	×

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

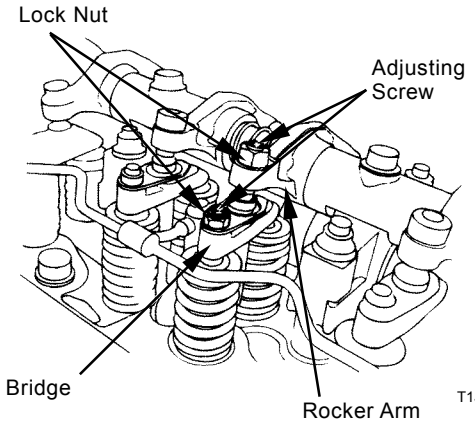
Evaluation:

Refer to Operational Performance Standard in Group T4-2.

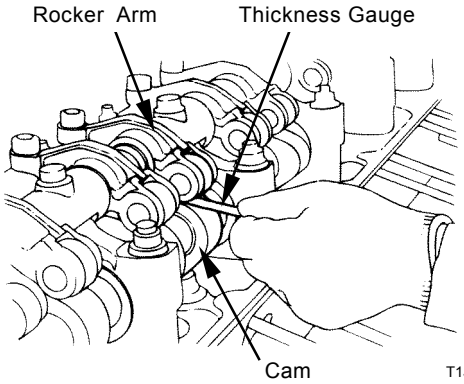
Adjustment:
If the measurement results are out of specification, adjust the valve clearance in the same order of measurement.

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

1. Loosen the lock nuts (12 used) and adjusting screws (12 used), which secure the bridge and rocker arm.
2. Insert a thickness gauge into the clearance between rocker arm and cam.
3. Tighten the adjusting screw of rocker arm until condition for the thickness gauge is proper.
4. Tighten the lock nut of rocker arm.
   : 78 N·m (8.0 kgf·m, 58 lbf·ft)
5. Tighten the adjusting screw of bridge until the thickness gauge does not move
6. Tighten the adjusting screw of bridge until condition for the thickness gauge is proper.
7. Tighten the lock nut of bridge.
   : 54 N·m (5.5 kgf·m, 40 lbf·ft)
8. Check the valve clearance after the lock nuts are tightened.



T1J1-04-03-005



T1J1-04-03-004

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.
4. Operate the machine for at least 100 hours or until the oil level lowers to the low-level.

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.

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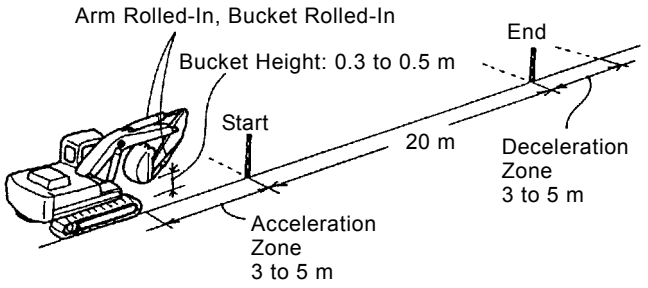
TRAVEL SPEED

Summary:
Measure the time required for the excavator to travel a 20 m (65.6 ft) test track.

Preparation:
1. Adjust the track sag on both side tracks equally.
2. Prepare a flat and solid test track 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.

IMPORTANT: The bucket teeth will hit the boom if the bucket is rolled-in with the arm fully rolled-in.
As for this condition: arm fully rolled-in + Bucket fully rolled-in, set the bucket at fully rolled-in and a perform arm roll-in operation.

3. Hold the bucket 0.3 to 0.5 m (12 to 20 in) above the ground with the arm and bucket rolled in.
4. Maintain hydraulic oil temperature at 50±5 °C (122±41 °F).



T105-06-03-001

Measurement:
1. Measure both the slow and fast speeds of the machine.
2. Measurement conditions are as below.

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

3. Start traveling the machine in the acceleration zone with the travel levers to full stroke.
4. Measure the time required to travel 20 m (65.6 ft).
5. After measuring the forward travel speed, turn the upperstructure 180° and measure the reverse travel speed.
6. Perform the measurement three times and calculate the average values.

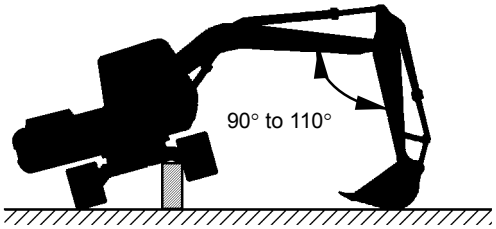
Evaluation:
Refer to the Operational Performance Standard in Group T4-2.

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

TRACK REVOLUTION SPEED

Summary:
Measure the track revolution cycle time with the track raised off ground.

Preparation:
1. Adjust the track sag of both side tracks to be equal.
2. Put the mark on the track to be measured, by using a piece of chalk.
3. Swing the upperstructure 90° and lower the bucket to raise the track off ground. Keep the boom-arm angle between 90 to 110° as shown. Place blocks under the machine frame.



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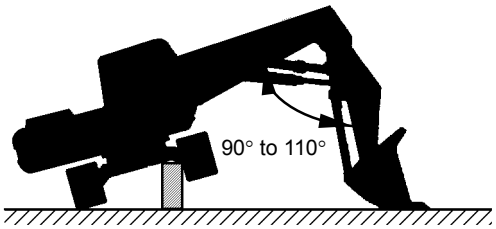
CAUTION: Securely support the raised track using wooden blocks.

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



T1J1-04-04-001

Measurement:
1. Measure the both tracks on forward and reverse directions at each travel mode.
2. Measurement conditions are as below.

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

3. Operate the travel control lever of the raised track to full stroke.
4. Measure the time required for 3 revolutions in both directions after a constant track revolution speed is obtained.
5. Perform 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 20 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 to check the performance equilibrium between both sides of the travel device systems (from the main pump to the 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 to be equal.
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.

IMPORTANT: The bucket teeth will hit the boom if the bucket is rolled-in with the arm fully rolled-in.
As for this condition: arm fully rolled-in + Bucket fully rolled-in, set the bucket at fully rolled-in and a perform arm roll-in operation.

3. Hold the bucket 0.3 to 0.5 m (12 to 20 in) above the ground with the arm and bucket rolled in.
4. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).

Measurement:

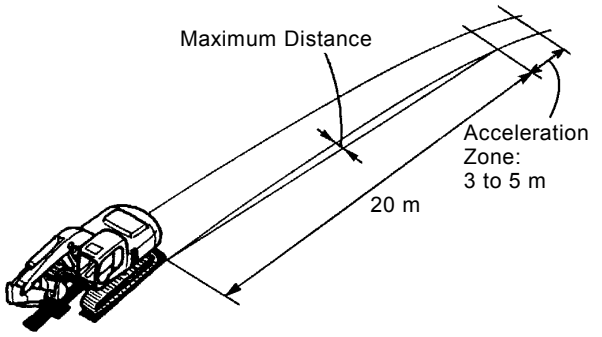
1. Measure the amount of mistracking in both fast, and slow travel speeds.
2. Measurement conditions are as below.

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

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. Perform 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.



T105-06-03-022

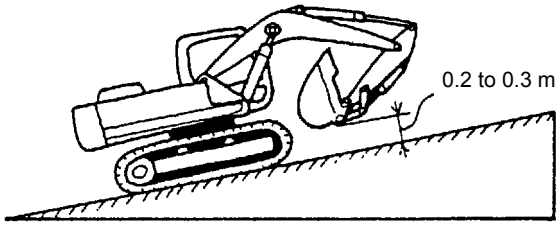
TRAVEL MOTOR LEAKAGE

Summary:
To measure the parking brake function on a specified slope.

Preparation:
1. The surface of the test slope shall be even with a gradient of 20 % (11.31°).
2. Hold the bucket 0.2 to 0.3 m (8 to 12 in) above the ground with the arm and bucket fully rolled in.

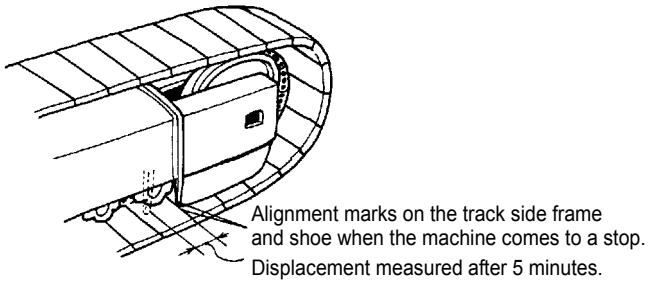
IMPORTANT: The bucket teeth will hit the boom if the bucket is rolled-in with the arm fully rolled-in.
As for this condition: arm fully rolled-in + Bucket fully rolled-in, set the bucket at fully rolled-in and a perform arm roll-in operation.

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 the marks on the track link or shoe and the track side frame.



T105-06-03-006

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

SWING SPEED

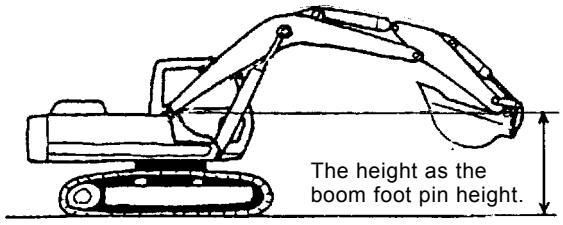
Summary:
Measure the time required to swing three complete turns.

Preparation:
1. Check the 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 bucket empty, position the front attachment as follows:
   Backhoe:
   With the arm cylinder fully retracted, and the bucket cylinder fully extended, raise the boom so that the arm tip pin height is flush with the boom foot pin height.
   Loading Shovel:
   With the arm cylinder and the bucket cylinder fully extended, raise the boom so that the arm tip pin height is flush with the boom foot pin height.

NOTE: In case of no place to be measured, measure with the boom raised and the arm rolled-in.

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.



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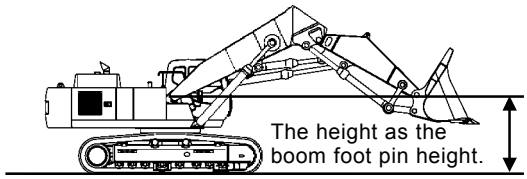


TBAR-04-04-001

Measurement:
1. Measurement conditions are as below.

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

2. Operate 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. Perform 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:
Measure the swing drift on the bearing outer circumference when stopping after a 180° full-speed swing.

Preparation:
1. Check the 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 bucket empty, position the front attachment as follows:
   Backhoe:
   With the arm cylinder fully retracted, and the bucket cylinder fully extended, raise the boom so that the arm tip pin height is flush with the boom foot pin height.
   Loading shovel:
   With the arm cylinder and the bucket cylinder fully extended, raise the boom so that the arm tip pin height is flush with the boom foot pin height.
4. Put the matching marks on the swing bearing and on the track frame by using a tape, as illustrated.
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.

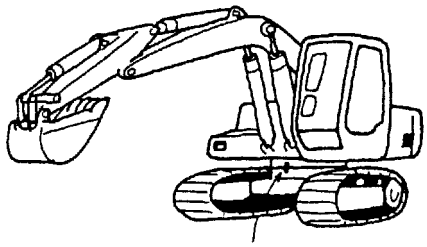
Measurement:
1. Measurement conditions are as below.

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

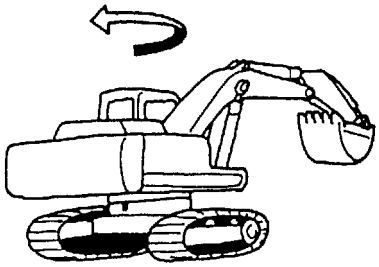
2. Operate the swing control lever fully and return it to the neutral position when the mark on upperstructure aligns with that on track frame after swinging 180° .
3. Measure the distance between the two marks.
4. Align the marks again, swing 180°, and then test in the opposite direction.
5. Perform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

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

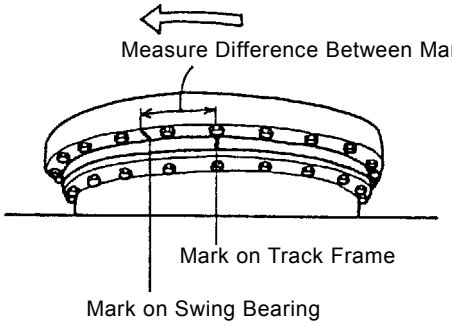
Remedy:
Refer to the Troubleshooting B in Group T5-7.



T105-06-03-008



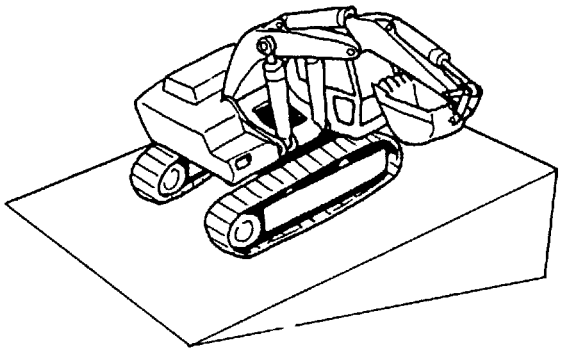
T105-06-03-009



T105-06-03-010

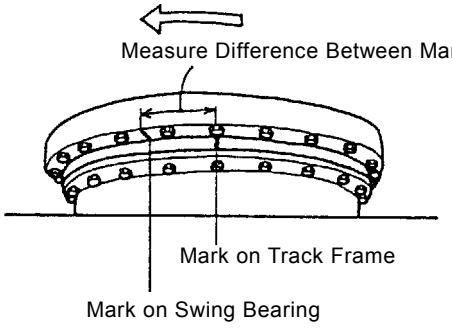
SWING MOTOR LEAKAGE

Summary:
Check for upperstructure drift while suspending a load on a slope.



T105-06-03-011

Preparation:
1. Check the 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.
   Backhoe: W=2850 kg (6280 lb)
   Loading shovel: W=3900 kg (8600 lb)
3. Position the front attachment as follows:
   Backhoe:
   With the arm cylinder fully retracted, and the bucket cylinder fully extended, raise the boom so that the arm tip pin height is flush with the boom foot pin height.
   Loading shovel:
   With the arm cylinder and the bucket cylinder fully extended, raise the boom so that the arm tip pin height is flush with the boom foot pin height.
4. Park the machine on a smooth slope with a gradient of 26.8% (15°).
5. Swing the upperstructure to position it 90° to the slope. Put the matching marks on the swing bearing periphery and track frame by using a tape, as illustrated.
6. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).



T105-06-03-010

Measurement:
1. Measurement conditions are as below.

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

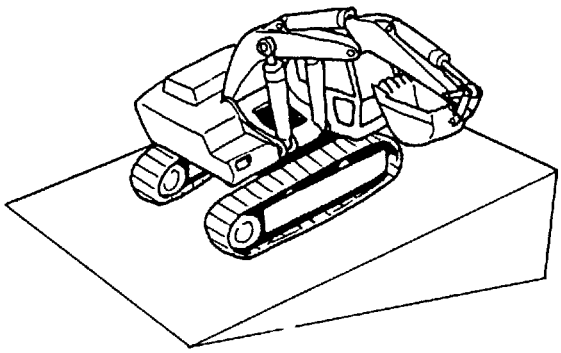
2. Maintain the engine at slow idle. After five minutes, measure the difference between the marks along the swing bearing periphery and the track frame.
3. Perform the measurement in both right and left swing directions.
4. Perform the measurement three times and calculate the average values.

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

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

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.



T105-06-03-011

Preparation:
1. Check that the swing gear and bearing are well lubricated.
2. Load bucket fully. In lieu of loading the bucket, weight (W) of the following specification can be used.
   Backhoe: W=2850 kg (6280 lb)
   Loading shovel: W=3900 kg (8600 lb)
3. Position the front attachment as follows:
   Backhoe:
   With the arm cylinder fully retracted and the bucket cylinders fully extended.
   Loading shovel:
   With the arm cylinder fully extended and the bucket cylinders fully extended. Hold the arm tip 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).

Measurement:
1. Measurement conditions are as below.

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

2. Operate the swing lever to full stroke to 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 the measurement. Check both clockwise and counterclockwise.
5. Perform 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.

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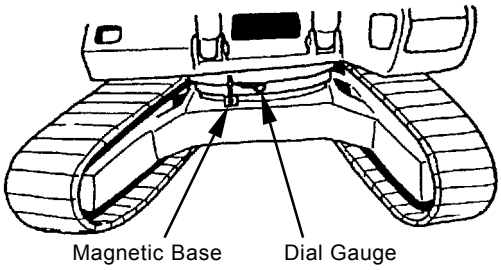
SWING BEARING PLAY

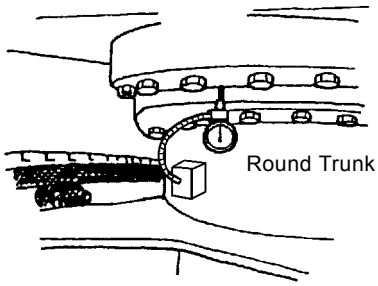
Summary:
Measure the swing bearing play using a dial gauge to check the wear of bearing races and balls.

Preparation:
1. Check swing bearing mounting bolts for looseness.
2. Check the lubrication of the swing bearing. Confirm that bearing rotation is smooth and without noise.
3. Install a dial gauge on the track frame as shown 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 face of the bearing outer race.
6. 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 round trunk as possible.



T105-06-03-014



T105-06-03-015

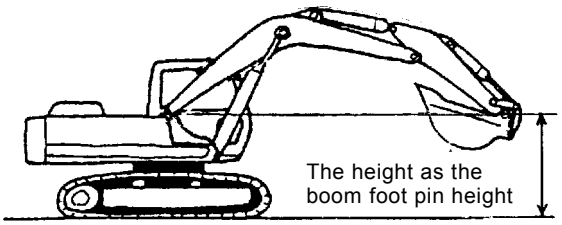
Measurement:

1. Position the front attachment as follows:
   Backhoe:
   With the arm cylinders fully retracted and the bucket cylinders fully extended, position the arm tip pin height is flush with the boom foot pin height.
   Loading shovel:
   With the arm cylinder fully extended and the bucket cylinders fully extended, position the arm top pin height is flush with the boom foot pin height.
2. Lower the bucket to the ground and use it to raise the front idler 0.5 m (20 in). Record the 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:

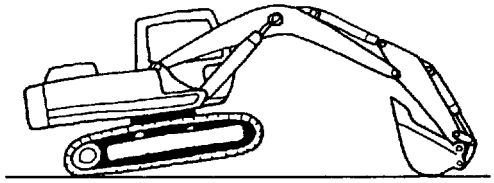
Refer to the Operational Performance Standard in Group T4-2.

Backhoe Front
Measurement: (h_1)



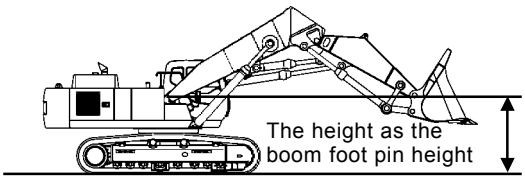
T105-06-03-013

Measurement: (h_2)



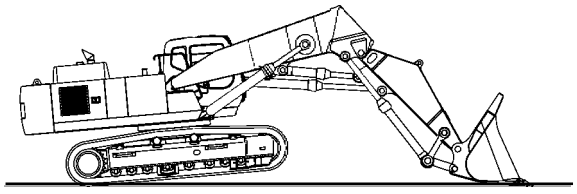
T105-06-03-017

Loading Shovel Front
Measurement: (h_1)



TBAR-04-04-001

Measurement: (h_2)



TBAR-04-04-002

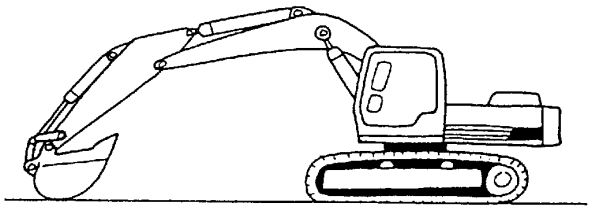
HYDRAULIC CYLINDER CYCLE TIME

Summary:

1. Check the overall operational performance of the front attachment hydraulic system (between the hydraulic pumps and each cylinder) by measuring the cycle time of the boom, arm, bucket, and bucket dump (open/close) cylinders with the empty bucket.
2. Bucket should be empty.

Preparation:

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



T105-06-03-018

Measurement:

1. Measurement conditions are as below.

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

2. Position the front attachment as described in the following. Then, measure the operating time until the cylinder reaches the stroke end by fully moving the control lever.

- Backhoe

  Boom Cylinder:

  With the bucket cylinder fully extended and the arm cylinder fully retracted, lower the bucket to the ground.

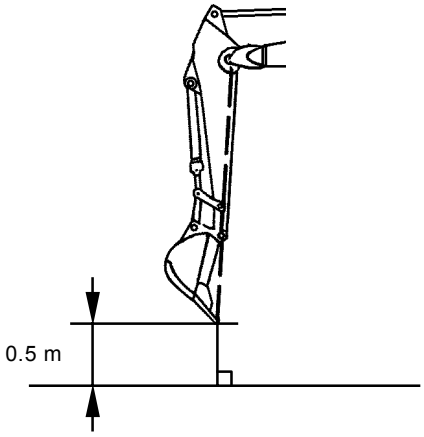
  Arm Cylinder:

  Retract the bucket cylinder so that the arm and bucket teeth are vertical to the ground.

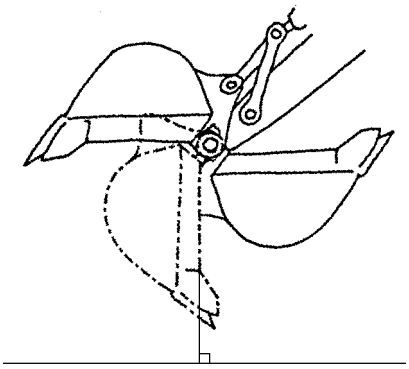
  Adjust the boom cylinder stroke so that the bucket bottom height is 0.5 m (20 in) above the ground with the bucket cylinder fully extended. Set the arm so that the center of arm operation is vertical.

  Bucket Cylinder:

  Adjust the boom and arm cylinder so that the center of full stroke movement of the bucket is positioned vertically.



T1V1-04-05-005



T105-06-03-018

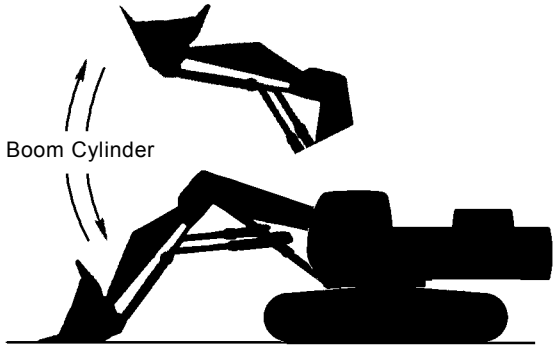
- Loading Shovel
  Boom Cylinder:
  With the bucket cylinder and the arm cylinder fully extended, lower the bucket to the ground.
  Arm Cylinder:
  With the arm fully retracted, position the bucket so that the rear bucket does not come in contact with the arm stopper. Then, adjust the boom cylinder stroke to position the bucket bottom 1 m (39 in) above the ground.
  Bucket Cylinder:
  With the bucket closed and held in a load dump position, adjust the boom cylinder stroke so that bucket bottom height is approx. 1 m (39 in) above the ground.
  Bucket Open-Close Cylinder:
  With the bucket cylinder and arm cylinder fully extended, adjust the boom cylinder stroke so that the bucket bottom height approx. 1 m (39 in) above the ground.

3. Perform 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.

Loading Shovel



TBAR-04-04-003

TBAR-04-04-004

TBAR-04-04-005

TBAR-04-04-006

DIG FUNCTION DRIFT CHECK

Summary:
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.

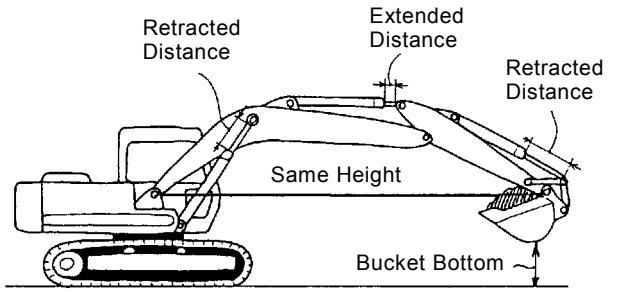
NOTE: When testing the dig function drift just after cylinder replacement, slowly operate each cylinder to its stroke end to release air.

Preparation:
1. Load bucket fully. In lieu of loading the bucket, weight (W) of the following specification can be used.
   Backhoe: W=2850 kg (6280 lb)
   Loading Shovel: W=3900 kg (8600 lb)
2. Position the front attachment as follows:
   Backhoe:
   With the arm cylinder fully retracted and the bucket cylinder fully extended.
   Loading shovel:
   With the arm cylinder and the bucket cylinder fully extended.
   Raise the boom so that the arm tip pin height is flush with the boom foot pin height concerning backhoe and loading shovel.
3. With the arm rolled out and the bucket rolled in, hold the bucket so that the height of the bucket pin is the same as the boom foot pin.
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 the position of the bottom of the bucket, as well as the boom, arm and bucket cylinders.
3. Perform the measurement three times and calculate the average values.

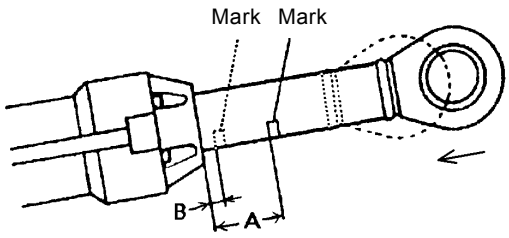
Evaluation:
Refer to the Operational Performance Standard in Group T4-2.

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



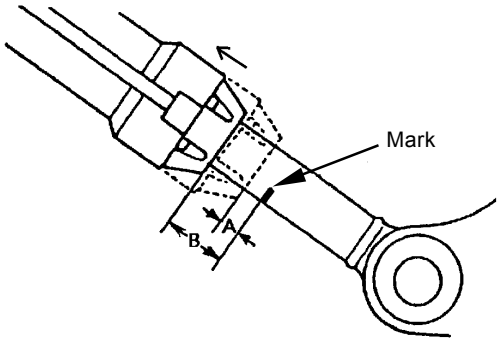
T105-06-03-021

Backhoe:
Boom and Bucket Cylinder Retraction
Loading Shovel:
Boom, Arm and Bucket Cylinder Retraction



T110-06-03-002

Backhoe:
Arm Cylinder Extension



T110-06-03-001

CONTROL LEVER OPERATING FORCE

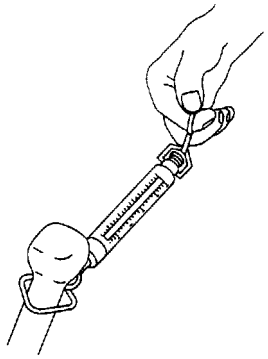
Summary:

1. Measure each lever operating force using a spring scale
2. Measure the maximum lever operating force at the grip center of each control lever.
3. Check the control lever condition.

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.



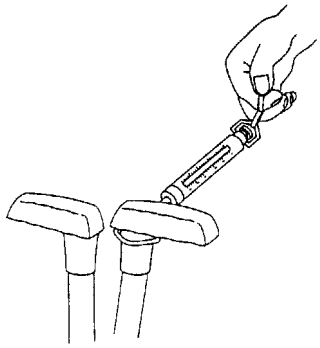
T107-06-03-003

Measurement:

1. Measure each control lever.
2. Measurement conditions are as below.

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

3. Operate each boom (raise) arm and bucket lever to the fully and measure the maximum operating force for each with each actuator relieved.
4. Operate boom (lower) lever and measure the maximum operating force with the boom lower relieved by jacking up the machine in a safe area.
5. Operate swing lever and measure the maximum operating force with swing relieved after securing the front attachment to prevent swinging.
6. Lower the bucket to the ground to raise one track off the ground. Operate the travel lever to full stroke and measure the maximum operating force required. When finished, lower the track and then jack-up the other track.
7. Perform the measurement three times and calculate the average values.



T107-06-03-004

Evaluation:

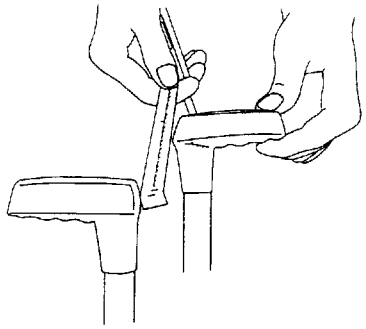
Refer to the Operational Performance Standard in Group T4-2.

CONTROL LEVER STROKE

Summary:

1. Check the lever stroke play and the lever operating condition. Measure each lever stroke at the lever top using a ruler.
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.

NOTE: When the lever has play, take a half of this value and add it to the measured stroke.



T107-06-03-005

Preparation:

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

Measurement:

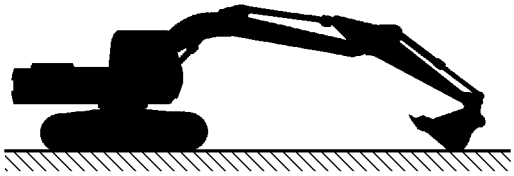
1. Stop the engine.
2. Measure each lever stroke at the lever top from neutral to the stroke end using a ruler.
3. Perform the measurement three times and calculate the average values.

Evaluation:

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

BOOM RAISE/SWING COMBINED OPERATION CHECK

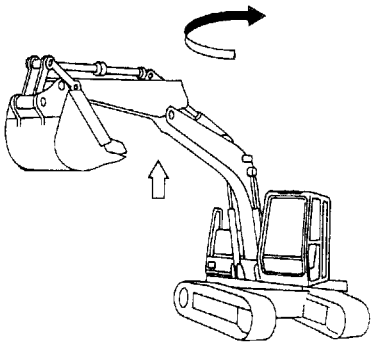
Summary:
Check boom raise and swing movement speeds while operating both functions simultaneously.



M104-07-021

Preparation:
1. Start the engine and run it at fast idle. Operate the boom raise function and check to be sure that the cylinder movement is smooth, with out sticking.
2. Position the machine with front attachment positioned as illustrated and with the bucket empty.
3. 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.

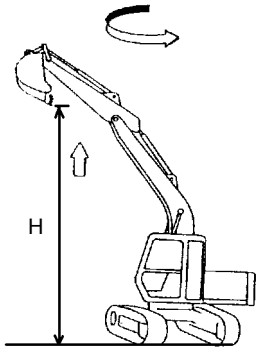


T107-06-03-010

Measurement:
1. Measurement conditions are as below.

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

2. Raise the boom and swing simultaneously.
3. When the upperstructure rotates 90°, release the control levers to stop both functions. Measure the time required to swing 90° and the height (H) of the bucket teeth.
4. Perform the measurement three times and calculate the average values.



T107-06-03-011

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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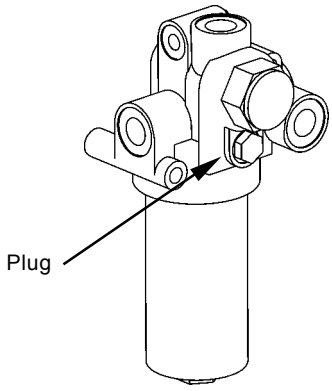
PRIMARY PILOT PRESSURE

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. Measurement conditions are as below.

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

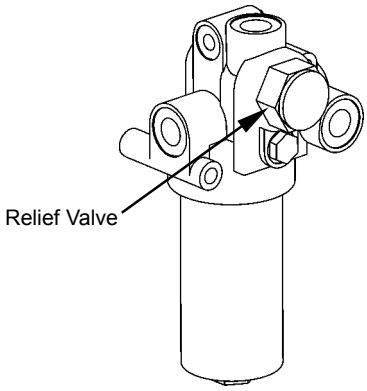
2. Measure pilot pressure in each specified setting above without load.
3. Repeat the measurement three times and calculate the average values.

Evaluation:

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

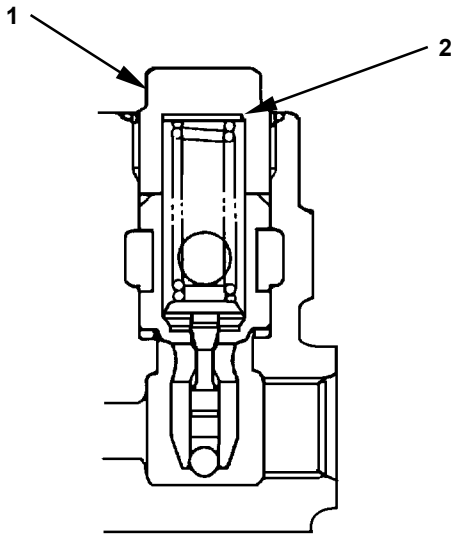
Primary Pilot Pressure Adjustment Procedure

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)
4. 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)

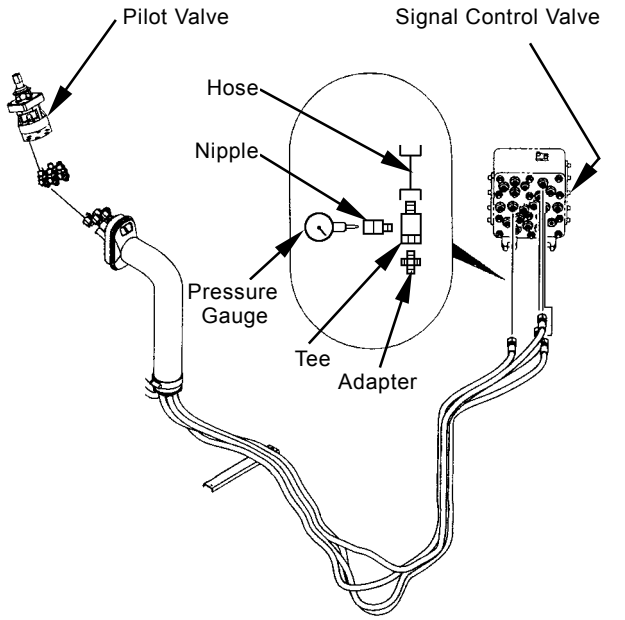
SECONDARY PILOT PRESSURE

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. Measurement conditions are as below.

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

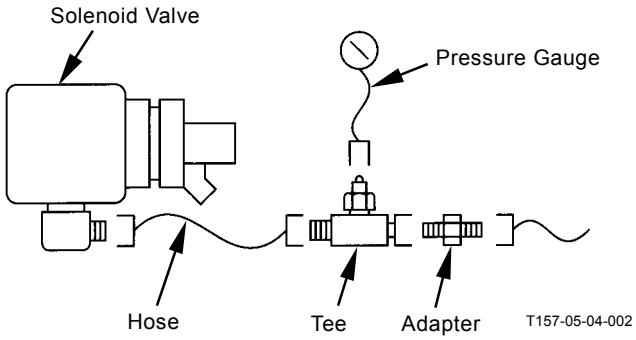
Evaluation:

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

Remedy:

Refer to the Troubleshooting B in Group T5-7.

SOLENOID VALVE SET PRESSURE



Preparation:

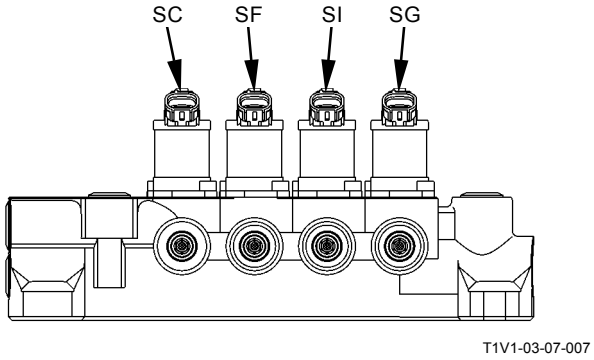
1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and release any remaining pressure.
3. Connect Dr. ZX and select the monitoring function. When Dr. ZX is not available, use the pressure gauge. Remove the line from the solenoid valve to be measured. Install tee (ST 6451), hose (Parts Number: 4216453), adapter (ST 6461) and pressure gauge (ST 6942).
   : 17 mm, 19 mm, 22 mm
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. Measurement conditions are as below.

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	HP Mode	OFF	Digging Mode
Slow Idle	HP 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: Turn the travel mode switch ON and OFF.
   Solenoid Valve SF: Combined operation of boom lower and arm, or boom lower and bucket.
   Solenoid Valve SC: Turn the boom mode selector switch ON. Operate the front and swing operation.
3. Read the values on both Dr. ZX and the pressure gauge.
4. Repeat the measurement three times and calculate the average values.



Evaluation:

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

Solenoid Valve Adjustment Procedure

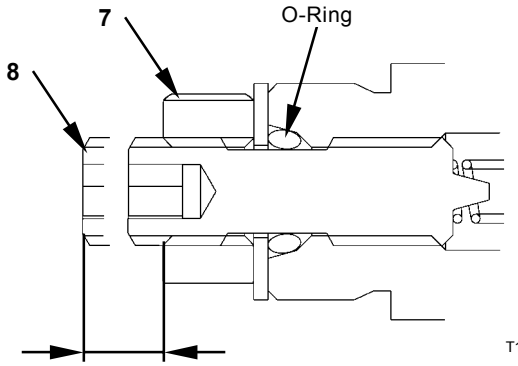
IMPORTANT: As O-ring is damaged and oil leakage may cause, do not loosen adjusting screw (8) excessively.
Do not loosen adjusting screw (8) more than 2 turns.

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)

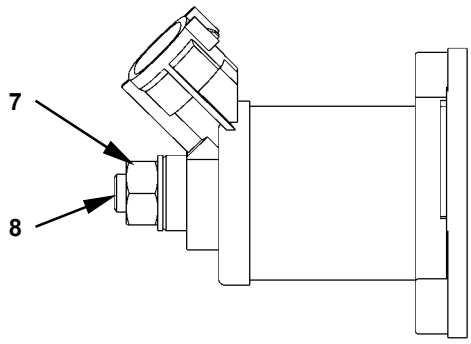
3. After adjustment, check the set pressure.

NOTE: Standard Change in Pressure (Reference)

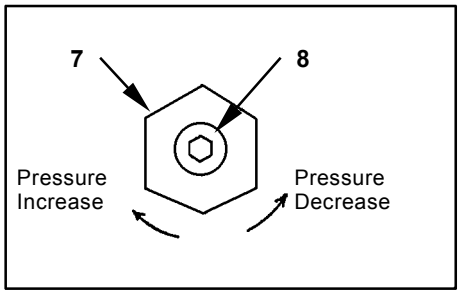
Screw Turns		1/4	1/2	3/4	1
Change in Pressure	kPa	69	137	206	275
	(kgf/cm^2)	(0.7)	(1.4)	(2.1)	(2.8)
	(psi)	(10)	(20)	(30)	(40)



T1V1-04-05-004



T1V1-04-05-003



W107-02-05-129

MAIN PUMP DELIVERY PRESSURE

Preparation:

1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and release any remaining pressure.
3. Connect Dr. ZX and select the monitoring function. When Dr. ZX is not available, use the pressure gauge. 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
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. Measurement Conditions are below.

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	HP 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.

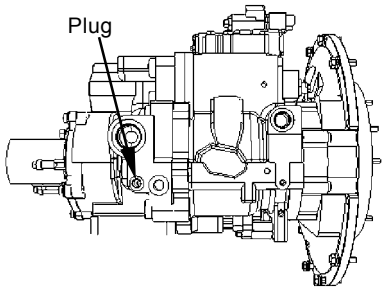
Evaluation:

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

Remedy:

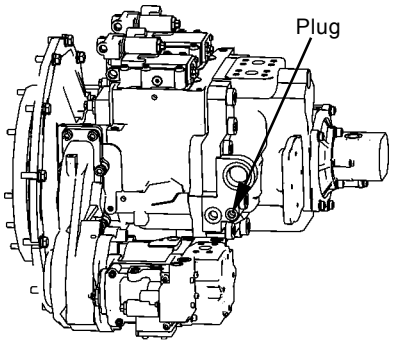
Refer to the Troubleshooting B in Group T5-7.

Main Pump 1 Side



T1J1-04-05-001

Main Pump 2 Side

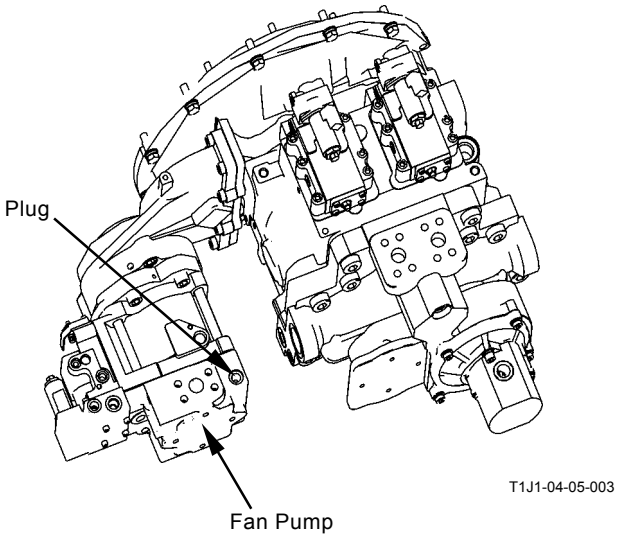


T1J1-04-05-002

FAN PUMP DELIVERY 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 of pressure check port from the fun pump delivery port. Install adapter (ST 6069), hose (ST 6943) and pressure gauge (ST 6941).
   : 6 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).



Measurement:

1. Measurement Conditions are below.

Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	HP 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 Operational Performance Standard in Group T4-2.

Remedy:

Refer to the Troubleshooting B in Group T5-7.

MAIN RELIEF VALVE SET PRESSURE

Summary:
Measure the main relief valve set pressure at the delivery port in main pump.

Preparation:
1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and release any remaining pressure.
3. Connect Dr. ZX and select the monitoring function. When Dr. ZX is not available, use the pressure gauge. 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
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. Measurement Conditions are below.

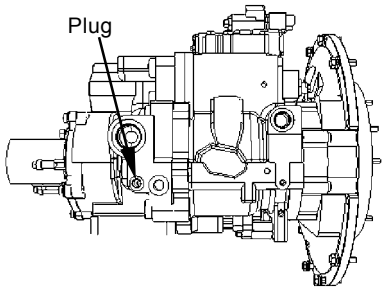
Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	HP Mode	OFF	Digging Mode

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 Operational Performance Standard in Group T4-2.

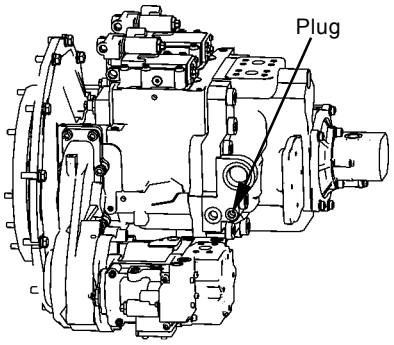
NOTE: If the measure pressures for all functions are lower than the specified range, the probable cause is a decrease of main relief valve setting pressure.
If relief pressure of a particular function is lower, the probable cause is other than main relief valve.

Main Pump 1 Side



T1J1-04-05-001

Main Pump 2 Side

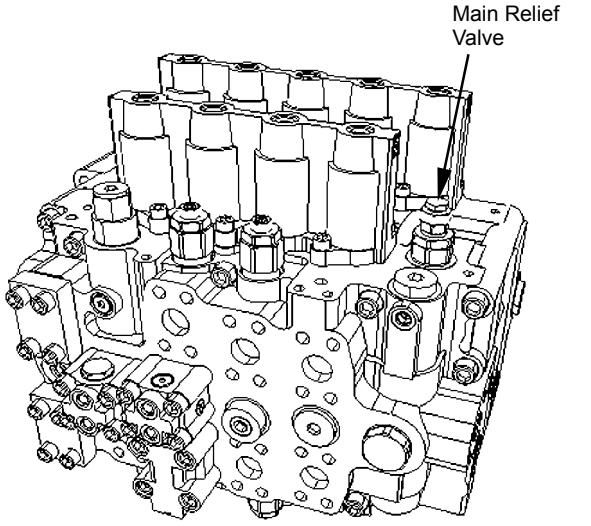


T1J1-04-05-002

NOTE: In case pressures of all circuits are low, the pressure of the main relief valve may decrease. In case pressures of specified circuits are low, pressures of some other parts except the main relief valve may decrease.

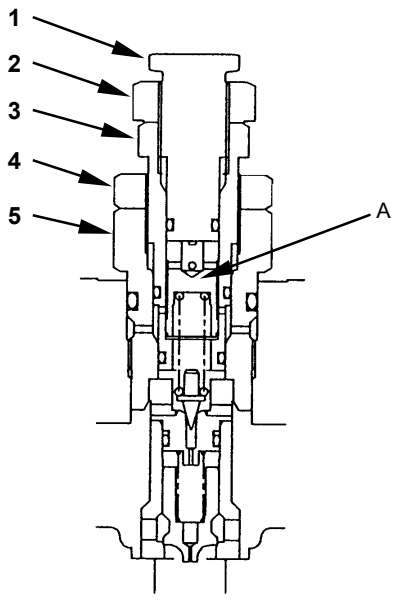
Main Relief Valve Setting Adjustment Procedure

When adjusting the increased pressure (when travel or power digging switch is ON), adjust the high-pressure side of main relief pressure.
When adjusting the normal main relief pressure, adjust the low-pressure side of main relief pressure.
When adjusting the high-pressure side of main relief pressure, the low-pressure side of main relief pressure setting is changed accordingly. Therefore, be sure to adjust the low-pressure side of main relief pressure after adjusting the high-pressure side of main relief pressure.



T1J1-03-03-008

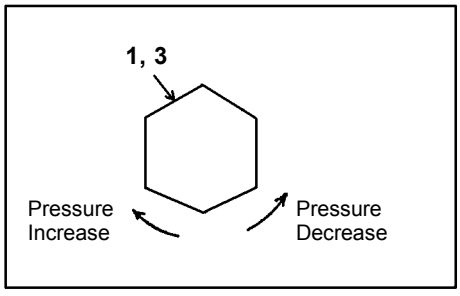
- High-pressure side of relief pressure adjustment procedure.
  1. Loosen nut (2).
     Lightly tighten plug (1) until the end of plug (1) comes into contact with sleeve A.
     Tighten lock nut (2).
     : 30 mm
     Lock Nut (2)
     : Less then 59 N·m (6 kgf·m, 44 lbf·ft)
  2. Loosen lock nut (4).
     Turn Plug (3) clockwise to adjust the relief pressure setting referring to the table below.
     : 41 mm
     Lock Nut (4)
     : Less then 98 N·m (10 kgf·m, 72 lbf·ft)



T16J-04-04-003

- Low-pressure side of relief pressure adjustment procedure.
  3. Loosen lock nut (2).
     Turn plug (1) counter clockwise to adjust the relief pressure setting referring to the table below.
     Tighten lock nut (2).
     : 30 mm
     Lock Nut (2)
     : Less then 59 N·m (6 kgf·m, 44 lbf·ft)
  4. Check the set pressure again.

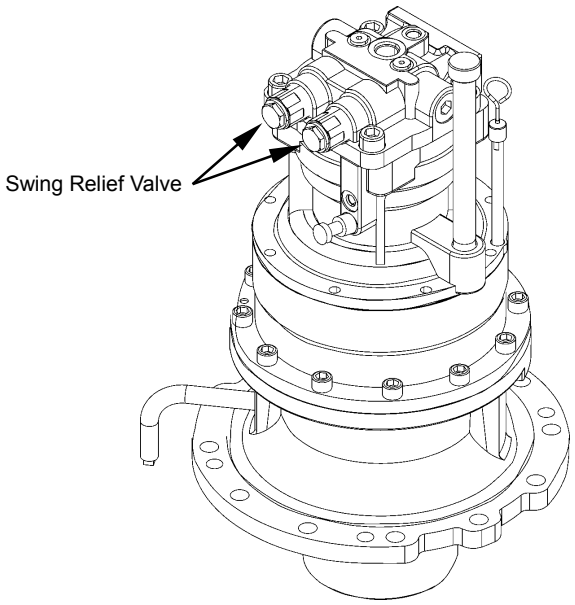
NOTE: Approx. 4.5 MPa (46 kgf/cm^2, 654 psi) increase/decreases at a quarter turning.



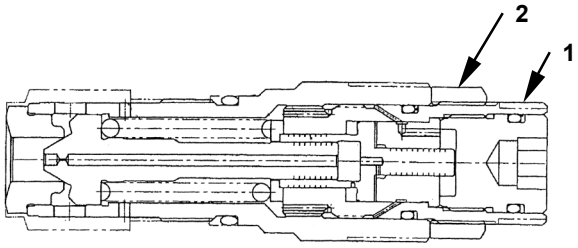
W107-02-05-127

Swing Relief Valve Set-Pressure Adjustment Procedure

1. Loosen the lock nut to adjust the adjusting plug.
2. Loosen lock nut (2).
   : 38 mm
3. Turn adjusting plug (1) to adjust.
   : 30 mm
4. Tighten lock nut (2).
   : 38 mm
   : 118 N·m (12.0 kgf·m, 87 lbf·ft)
5. Check the set pressure.



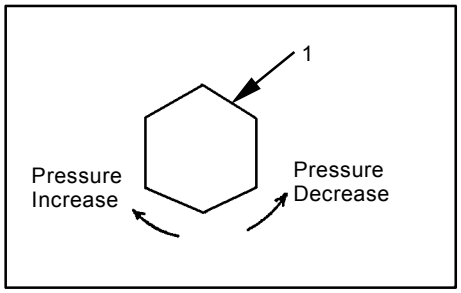
T178-03-02-001



T16J-04-05-001

NOTE: Standard Change in Pressure (Reference)

Adjusting Plug Turns	1
MPa	10.0
(kgf/cm^2)	(102)
(psi)	(1450)

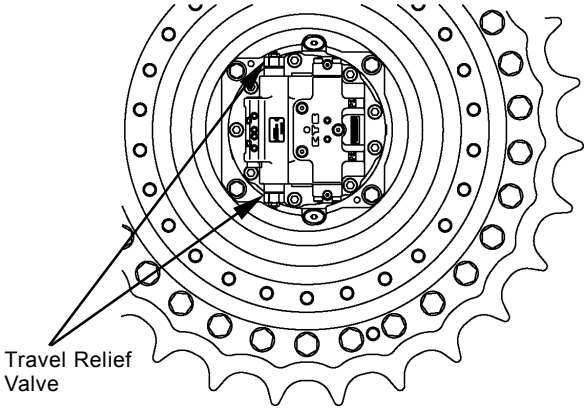


T157-05-04-023

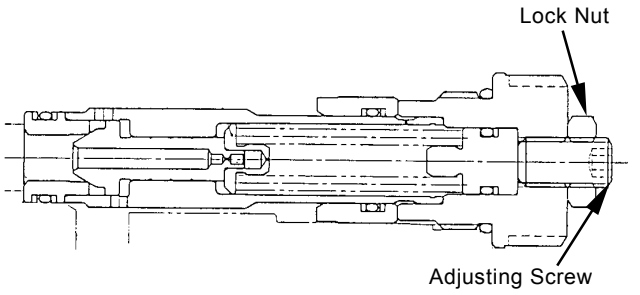
Travel Relief Pressure Setting Adjustment Procedure

Adjustment:
Adjust the set pressure of the travel relief valve using the adjusting screw after loosening the lock nut.

1. Loosen the lock nut.
   : 19 mm
2. Turn the adjusting screw to adjust the pressure setting, referring to the table below.
   : 6 mm
3. Retighten the lock nut.
   : 19 mm
   : 34.3 to 44.1 N·m
   (3.5 to 4.5 kgf·m, 25 to 32 lbf·ft)
4. Recheck the set pressure.



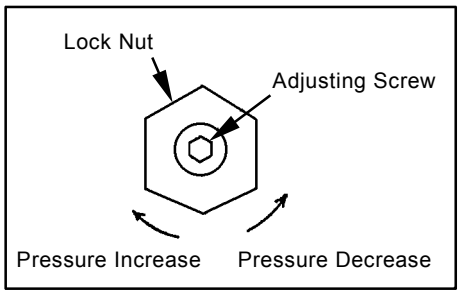
T183-01-02-012



T142-05-04-007

Reference : Change in Pressure Setting

Screw Turns		1/4	1/2	3/4	1
Change in Pressure	MPa	1.96	3.92	5.88	7.85
	(kgf/cm^2)	(20)	(40)	(60)	(80)
	(psi)	(280)	(570)	(850)	(1140)



W107-02-05-129

OVERLOAD RELIEF VALVE SET PRESSURE

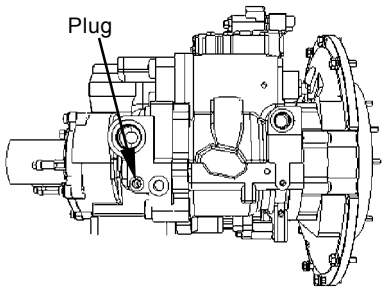
Summary:

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 as follows.

Preparation:

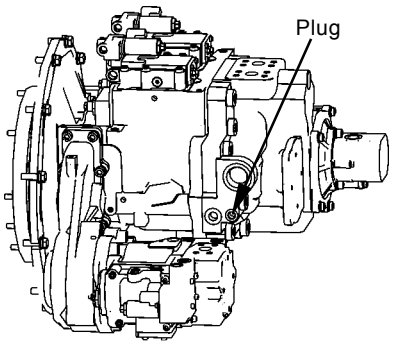
1. Stop the engine.
2. Push the air bleed valve on top of the hydraulic oil tank and release any remaining pressure.
3. Connect Dr. ZX and select the monitoring function. When Dr. ZX is not available, use the pressure gauge. Remove the plug from pressure check port of main pump delivery port. Install adapter (ST 6069), hose (ST 6943) and pressure gauge (ST 6941).
   Start the engine. Confirm that no oil leakage is observed at the pressure gauge connection
   ⌐ : 6 mm

Main Pump 1 Side



T1J1-04-05-001

Main Pump 2 Side



T1J1-04-05-002

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

Measurement:

1. Measurement Conditions are below.

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

2. Slowly operate the bucket, arm and boom control levers to the stroke ends and relieve each function.
3. Read pressures 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.

Evaluation:

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

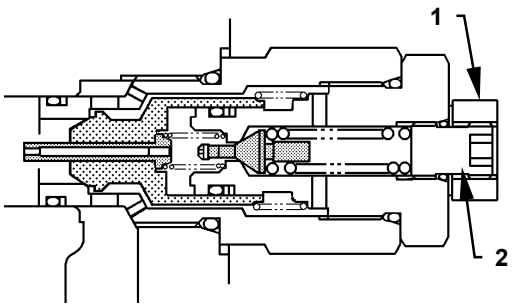
   Refer to the Operational Performance Standard in Group T4-2.

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).

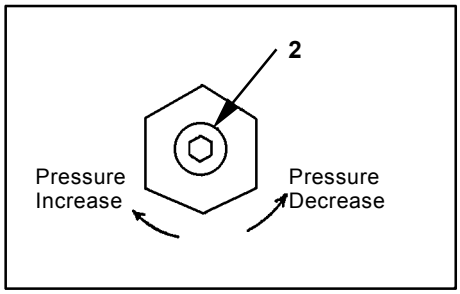
1. Loosen lock nut (1).
   : 19 mm
2. Turn adjusting screw (2) in order to adjust pressure.
   : 6 mm
3. Tighten lock nut (1).
   : 19 mm
   : 31.5 N·m (3.2 kgf·m, 23 lbf·ft)
4. Check the set pressure.



T162-04-04-004

NOTE: Standard Change in Pressure (Reference)

Screw Turns		1/4
Change in Pressure	MPa	5.0
	(kgf/cm^2)	(51)
	(psi)	(725)



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 hydraulic tester 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. Connect a vacuum pump to the oil filler port.

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

2. Disconnect the delivery hose from main pump (one side) to be measured. Connect pipe (1 or 2) by using the split flanges and bolts which were used for the disconnected delivery hose.
   : 41 mm
   : 10 mm
3. Connect 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. Connect the delivery hose to flange (9) with split flanges (10) and bolt (11).
   : 10 mm
5. Connect Dr. ZX and select the monitor function. When Dr. ZX is not available, use the pressure gauge. Install a pressure gauge to the main pump to be measured. (Refer to “Main Relief Set Pressure”.)
   : 6 mm
6. Disconnect the pipe from the port Psv (12). Connect hose (ST 6339) (14) to the disconnected the pipe hole on regulator to be measured. Install plug (ST 6212) to the disconnected the pipe hole on regulator not to be measured.
7. Remove the vacuum pump. Loosen plug (13) 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 (5).
9. Start the engine. Check the pressure gauge and hydraulic tester (5) connection for any oil leaks.

Measurement:

1. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).
2. Measure the maximum flow rate.
3. Measurement conditions are below.

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 T4-2-5) 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 the measurement three times and calculate the average values.

Evaluation:

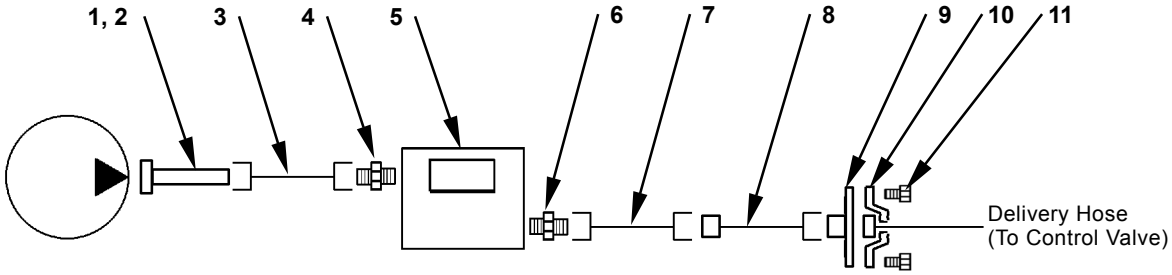
1. Convert the measured flow rates to those at the specified pump speed by using the following formulas:

$Qc = (Np \times Q) / (Ne \times i)$

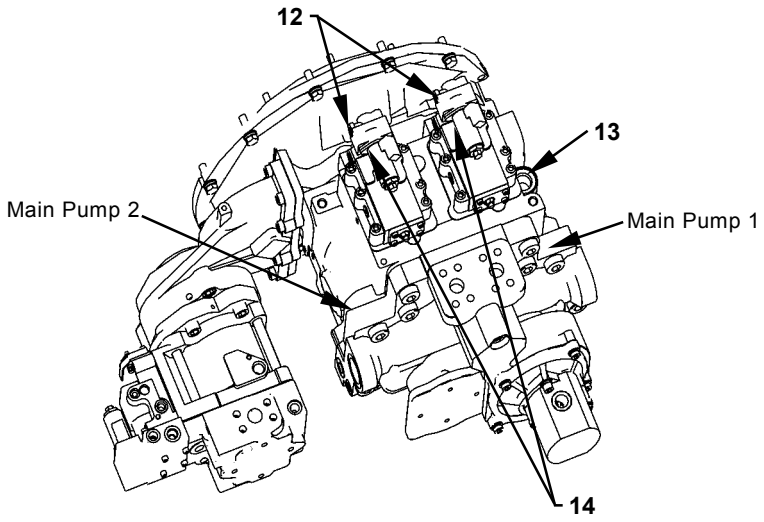
Qc : Converted Flow Rate
Q : Measured Flow Rate
Np : Specified Pump Speed:
1803 min^{-1} (Main Pump 1)
1750 min^{-1} (Main Pump 2)
Ne : Measured Engine Speed:
Values indicated on Dr. ZX
i : Pump Speed Ratio:
Main Pump 2 Side = 1.0
Main Pump 1 Side = 1.03 (32/31)

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



T1J1-04-05-003

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 - Port Psv
13 - Plug
14 - Hose (ST 6339)

FAN PUMP FLOW RATE MEASUREMENT

• P-Q Control (Torque Control)

Summary:

Fan pump performance is checked by measuring the pump flow rate by using a hydraulic tester installed at the fan pump delivery port (one side) to be measured. Use a hydraulic tester.

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. Connect a vacuum pump to the oil filler port.

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

2. Disconnect the delivery hose from fan pump to be measured. Connect pipe (1 or 2) by using the split flanges and bolts which were used for the disconnected delivery hose.
   : 41 mm
   : 10 mm
3. Connect 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. Connect the delivery hose to flange (9) with split flanges (10) and bolt (11).
   : 10 mm
5. Disconnect the pipe from the port Pr (12). Connect hose (ST 6339) (14) to the disconnected pipe hole on regulator to be measured. Install plug (ST 6212) to the disconnected pipe hole on regulator not to be measured.
6. Remove the vacuum pump. Loosen plug (13) on top of the pump casing. Bleed air from the casing until oil only comes out.
7. Fully open the loading valve of hydraulic tester (5).
8. Start the engine. Check the pressure gauge and hydraulic tester (5) connection for any oil leaks.

Measurement:

1. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).
2. Measure the maximum flow rate.
3. Measurement conditions are below.

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

4. Adjust the set pressure of relief valve in fan valve to each pressure point specified along the fan pump P-Q curve. (Refer to T4-2-6) Slowly restrict the loading valve of hydraulic tester. Measure the flow rates and engine speeds at each pressure point specified in the P-Q curve.
5. Repeat the measurement three times and calculate the average values.

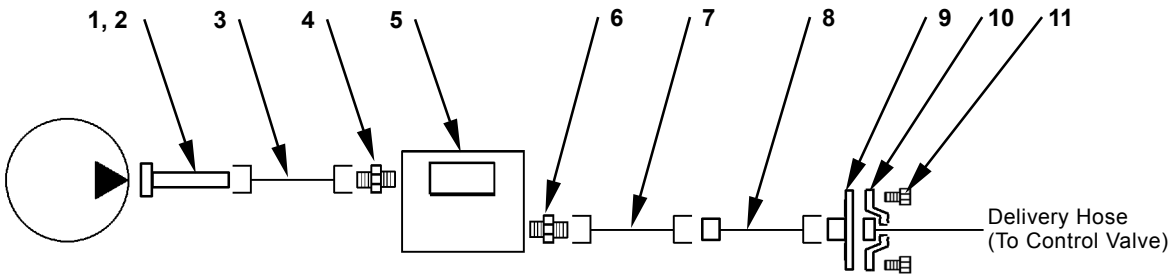
Evaluation:

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

$Qc = (Np \times Q) / (Ne \times i)$

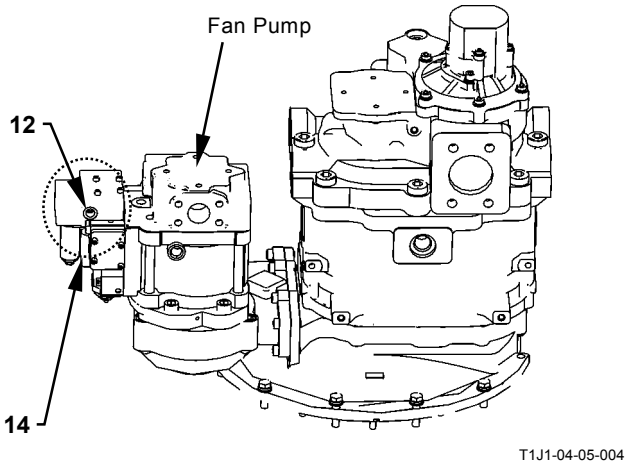
Qc : Converted Flow Rate
Q : Measured Flow Rate
Np : Specified Pump Speed:1750 min^{-1}
Ne : Measured Engine Speed**:**
Values indicated on Dr. ZX
i : Pump Speed Ratio: 1.0 (31/31)

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



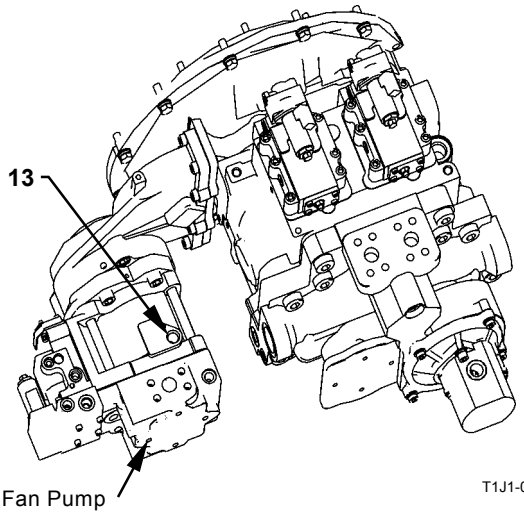
T173-04-04-002

Lower Side of Pump



T1J1-04-05-004

Upper Side of Pump



T1J1-04-05-003

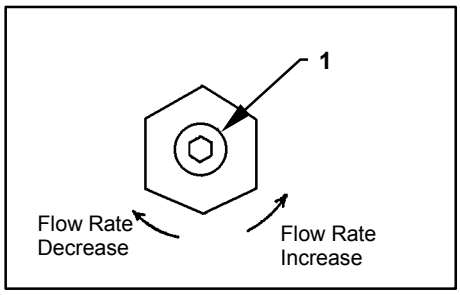
1 - Pipe E (ST 6144)
2 - Pipe B (ST 6143)
3 - Test Hose (ST 6145)
4 - Adapter PF1 × UNF1-7/8 (ST 6146)
5 - Hydraulic Tester (ST 6299)
6 - Adapter PF1 × UNF1-7/8 (ST 6146)
7 - Joint (ST 6330)
8 - Test Hose (ST 6320)
9 - Flange (ST 6118)
10 - Split Flange (ST 6130)
11 - Bolt (ST 6409) (4 Used)
12 - Port Pr
13 - Plug
14 - Hose (ST 6339)

Adjustment of Max. Flow Rate and Min. Flow Rate

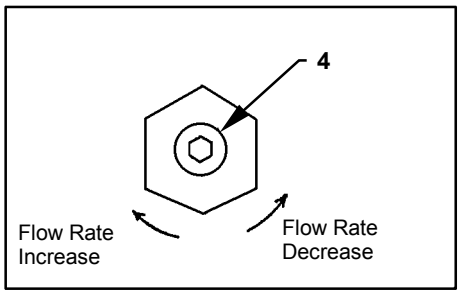
The flow rate is adjusted by changing the servo piston max. stroke. Adjustment of max flow rate. Loosen nut (2) on the large chamber side end of the servo piston and turn adjusting screw (1). Adjustment of min. flow rate. Loosen nut (3) on the small chamber side end of the servo piston and turn adjusting screw (4).

NOTE: Change in Flow Rate (Reference)
Main Pump 1 Speed: 1803 min^{-1}
Main Pump 2 Speed: 1750 min^{-1}
Fan Pump Seed: 1750 min^{-1}

Adjusting Screw Turn	1/4
Flow Rate Change (Main Pump 1)	6.9 L/min
Flow Rate Change (Main Pump 2)	6.7 L/min
Flow Rate Change (Fan Pump)	2.8 L/min

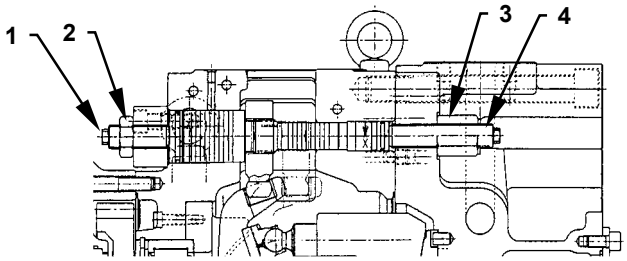


W107-02-05-129



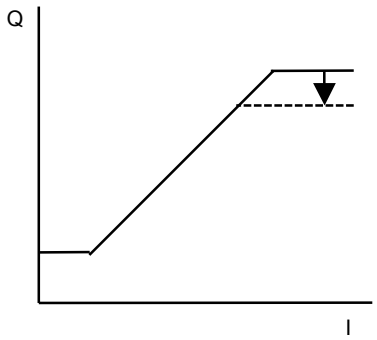
W107-02-05-129

NOTE: Illustration shows the main pump.

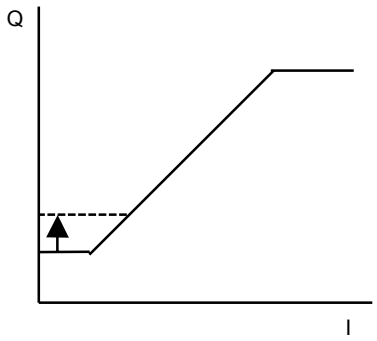


T1J1-04-05-007

Adjustment of Max. Flow Rate



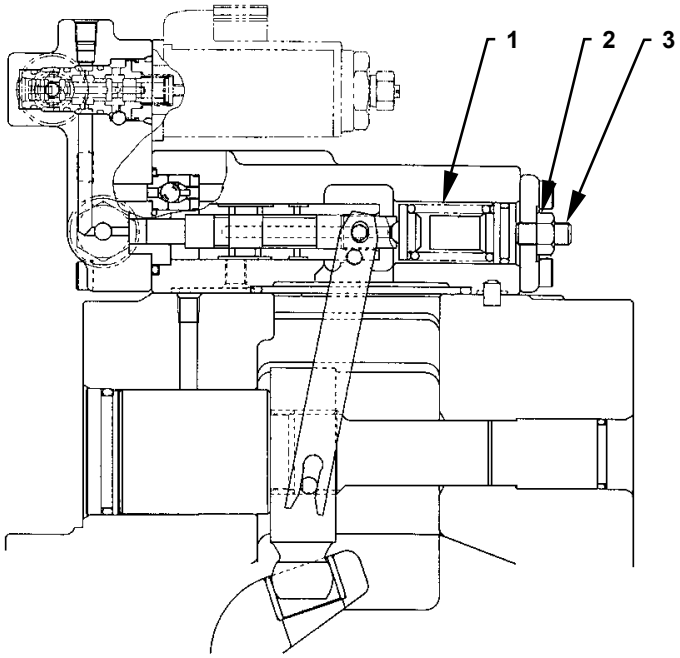
Adjustment of Min. Flow Rate



NOTE: I: The signal current of pump control solenoid valve.

Adjustment of Main Pump Flow Rate Control

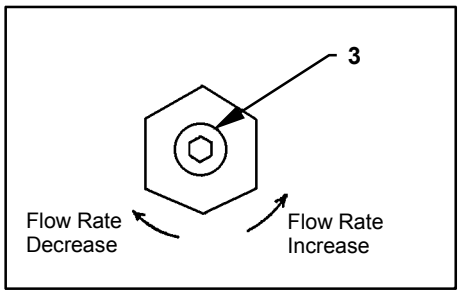
The flow rate control is performed by signal current (I) of pump control solenoid valve. The flow rate control is adjusted by changing the set-force of spring (1).
Adjustment: Loosen nut (2) and turn adjusting screw (3).



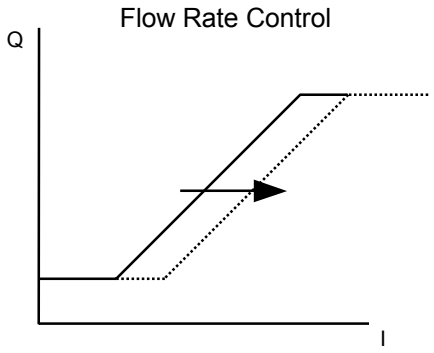
T16J-04-04-006

NOTE: Change in Flow Rate (Reference)
Main Pump 1 Speed: 1803 min^{-1}
Main Pump 2 Speed: 1750 min^{-1}

Adjusting Screw Turn	1/4
Flow Rate Change (Main Pump 1)	38.0 L/min
Flow Rate Change (Main Pump 2)	36.9 L/min



W107-02-05-129



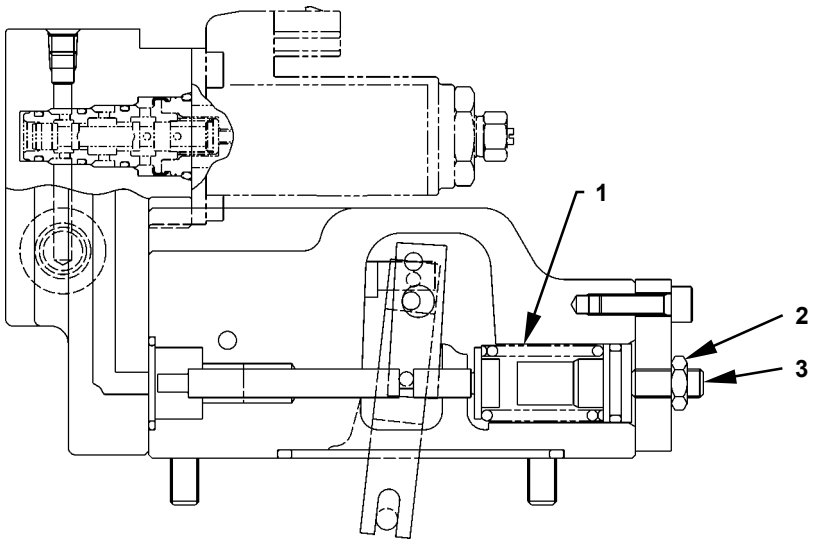
NOTE: I: The signal current of pump control solenoid valve.

Adjustment of fan pump flow rate control

The flow rate control is performed by signal current (I) of pump control solenoid valve. The flow rate control is adjusted by changing the set-force of spring (1).

Adjustment:

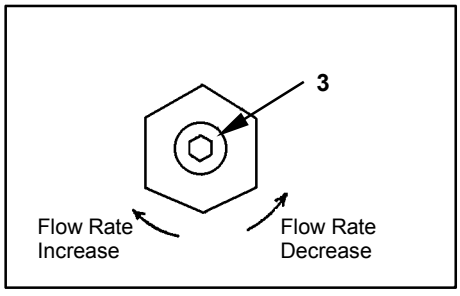
Loosen nut (2) and turn adjusting screw (3).



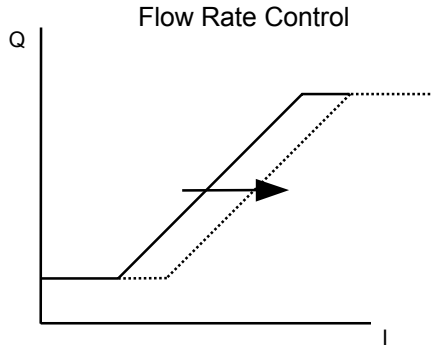
T1J1-04-05-005

NOTE: Change in Flow Rate (Reference)
Pump Speed: 1750 min^{-1}

Adjusting Screw Turn	1/4
Flow Rate Change	6.5 L/min



W107-02-05-129



NOTE: I: The signal current of pump control solenoid valve.

Adjustment of Torque Control (Fan Pump Regulator Only)

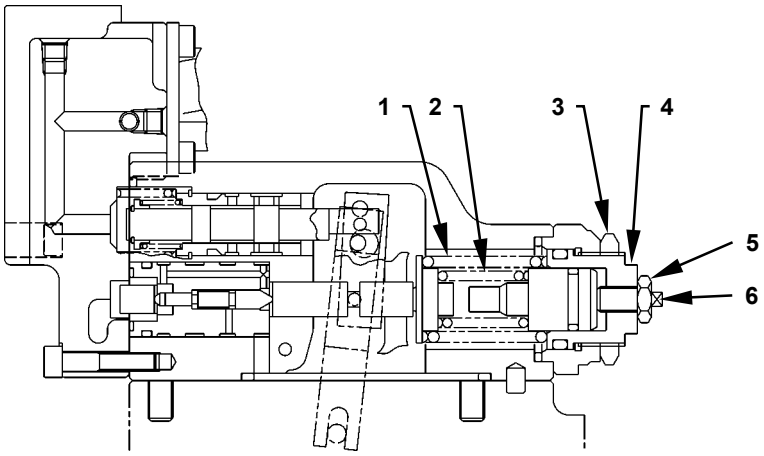
The torque control is performed by pump delivery pressure P. Therefore, the torque constant control is adjusted by changing the set-force of inner spring (2) and outer spring (1).

(Before adjusting screws (4) and (6), mark the end of the adjusting screw with a white marker for the record of the original position.)

When resetting inner spring (2), loosen nut (5) and adjusting screw (6).

When resetting outer spring (1), loosen nut (3) and adjusting screw (4).

NOTE: When adjusting screw (4) is turned, inner spring (2) set-force varies. Therefore, when adjusting screw (4) is turned, turn adjusting screw (6) 2.24 times the turns of adjusting screw (4) in the opposite direction to keep inner spring (2) set-force unchanged.

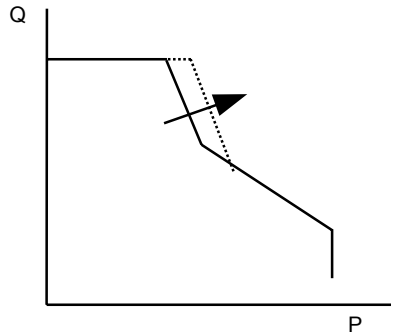


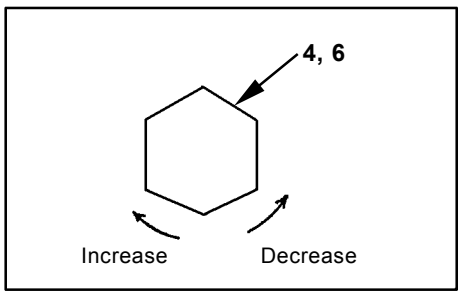
T1J1-04-05-006

NOTE: Change in pressure when adjusting outer spring pump speed: 1750 min^{-1}

Outer Spring Adjustment Data

Adjusting Screw Turn	1/4
Flow Rate Change	8.9 L/min (2.4 US gal/min)
Pressure Change	1.9 MPa (19.4 kgf/cm^2) (276 psi)
Engine Torque Change	15.1 N·m (1.5 kgf·m) (11.1 lbf·ft)





T157-05-04-023

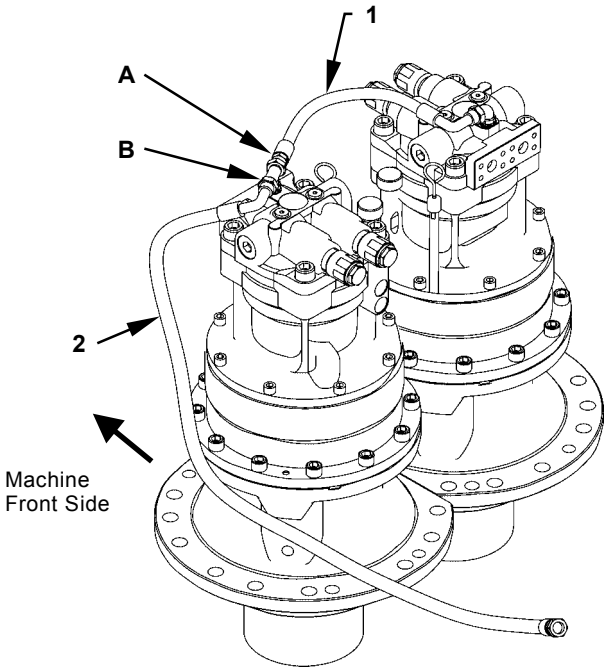
SWING MOTOR DRAINAGE

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.

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.
   : 4 mm
3. Measure the left swing motor drainage:
   Disconnect drain hose (2) at part B. Connect the test drain hose (3/4-16UN) to the motor side and plug (ST 6637) to drain hose (2).
   Measure the right swing motor drainage:
   Disconnect right drain hose (1) at part A. Install plug (ST 6491) on the tee side.
   : 27 mm
   : 93 N·m (9.5 kgf·m, 70 lbf·ft)



T16J-04-04-007

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

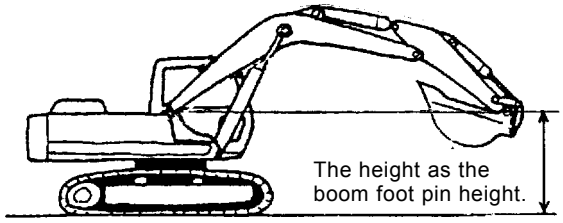
Preconditions for Measurement:

1. Measurement conditions are below.

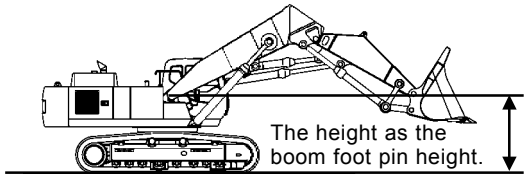
Engine Control Dial	Power Mode Switch	Work Mode	Auto-Idle Switch
Fast Idle	HP Mode	Digging Mode	OFF

Measurement:

- Amount of Oil Drained While Swinging the Upperstructure
  1. With the bucket empty, position the front attachment as follows:
     - Backhoe:
       With the arm cylinder fully retracted, and the bucket cylinder fully extended, raise the boom so that the arm tip pin height is flush with the boom foot pin height.
     - Loading Shovel:
       With the arm cylinder and the bucket cylinder fully extended, raise the boom so that the arm tip pin height is flush with the boom foot pin height.
  2. Start the engine. Operate and hold the swing lever full stroke. Start draining oil measurement after the swing speed eaches a constant maximum speed. The measuring time should be more than 20 seconds.
  3. Repeat the measurement three times in both clockwise and counterclockwise directions, and calculate the average values.



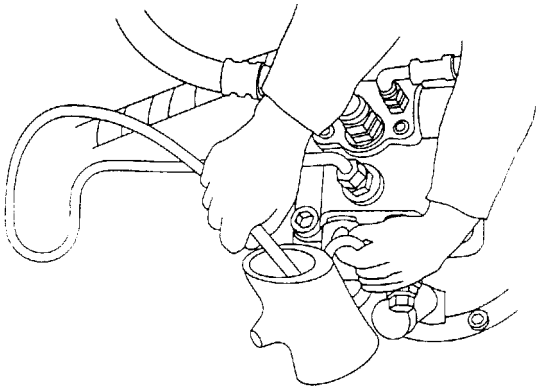
T105-06-03-013



TBAR-04-04-001

- Amount of Oil Drained While Relieving Swing Motor Circuit
  1. Thrust the bucket teeth into the ground as illustrated so that the upperstructure does not rotate when the swing lever is operated full stroke.
  2. Start the engine. Operate and hold the swing lever full stroke. Start drain oil measurement when drain oil starts coming out of the drain hose end. The measuring time should be more than 20 seconds.
  3. Repeat the measurement three times in both clockwise and counterclockwise directions, and calculate the average values.

NOTE: Because the left swing motor drain hose is connected to the right swing motor drain port, the total of the left and right swing motor drainage will be measured when measuring the right swing motor drainage according to step 4 in Preparation. For this reason, be sure to deduct the amount of left swing motor oil drainage (step 3 in Preparation) from that total amount.



T107-06-05-008

Evaluation:

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

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

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

Where:

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

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. During measuring check in order to prevent personal injury.
3. Judge travel motor performance from the results including travel speed, mistrack and so on overall.
4. The amount of drain oil from the travel motor will change depending on hydraulic oil temperature.

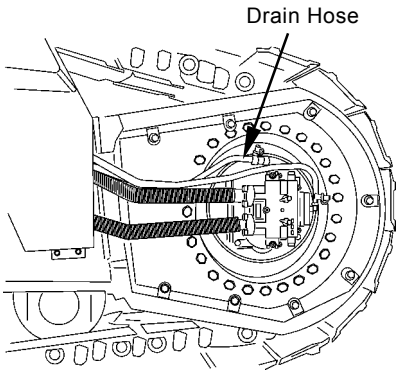
Preparation:

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 on top of the hydraulic oil tank and release any remaining pressure.
3. Disconnect the drain hose in the travel motor at the travel motor end. Install plug (ST 6637) to the disconnected end. Connect test drain hose (3/4-16UN) to the travel motor.
   : 27 mm
   : 93 N·m (9.5 kgf·m, 70 lbf·ft)

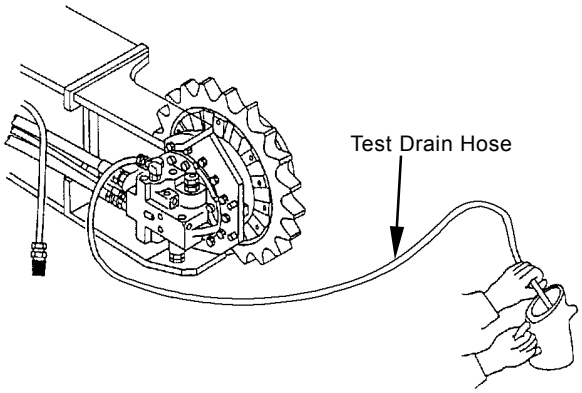
Preconditions for Measurement:

1. Measurement conditions are as below.

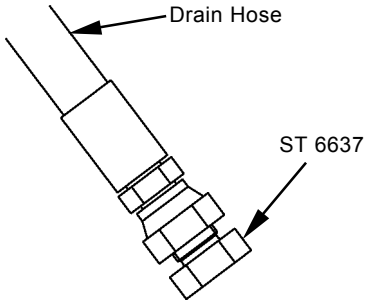
Engine Control Dial	Power Mode Switch	Work Mode	Auto-Idle Switch
Fast Idle	HP Mode	Digging Mode	OFF



M183-01-001



T157-05-04-019

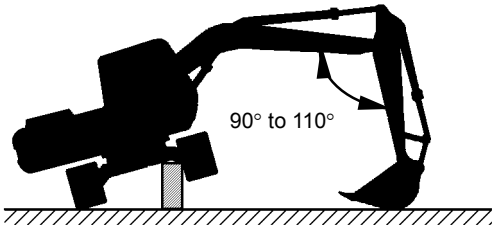


T183-04-04-011

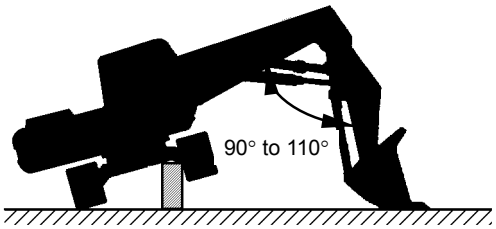
Measurement:

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 20 seconds.



M104-07-067



T1J1-04-04-001

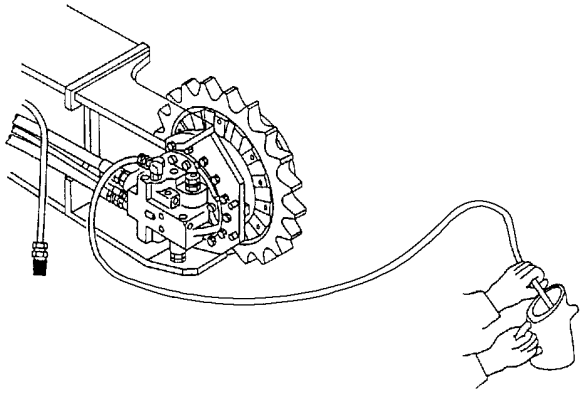
Evaluation:
Refer to the Operational Performance Standard in Group T4-2.

* Conversion of the amount of drain oil measured into the paramount value

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

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

  Where:
  - ΔQ : Amount of drain oil per minute (L/min)
  - t : Time measured (seconds)
  - q : Total amount of drain oil (L)



T157-05-04-019

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PUMP LEARNING

(Pump Regulator Pressure Learning)

Detects electrical current and pressure, which control the pump regulator, of the pump control solenoid valve, and memorize in MC. (Refer to the T/M (SYSTEM) section.)
Therefore, as difference between the signal to pump control solenoid valve from MC and the regulator pressure controlled by the pump control solenoid valve is adjusted, the pump swash angle is controlled correctly.
Dr. ZX displays the pump status during the pump learning and can check if the learning has been done correctly.

IMPORTANT: Perform the pump learning if the following work is done.
- Replace the pump, pump regulator and pump control solenoid valve
- Replace MC
- When executing all parameter initialize of MC

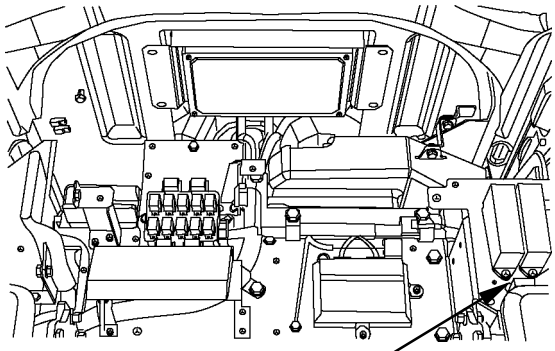
IMPORTANT: After the learning, turn the learning switch to the OFF position.
If the pump learning fails, the adjustment is not done. If the adjustment succeeds and the learning switch is turned by mistake, the learning may fail.

Learning Start Condition
- MC, ECM: No breakdown, no failure
- Engine Control Dial: Fast idle
- Auto-Idle Switch: OFF
- Power Mode Switch: HP Mode
- Pressure Sensor: Output zero. (The control lever is in neutral.)
- Hydraulic Oil Temperature: 50±5 °C (122±41 °F)
- Pilot Shut-Off Lever: LOCK Position
- Learning Switch: OFF

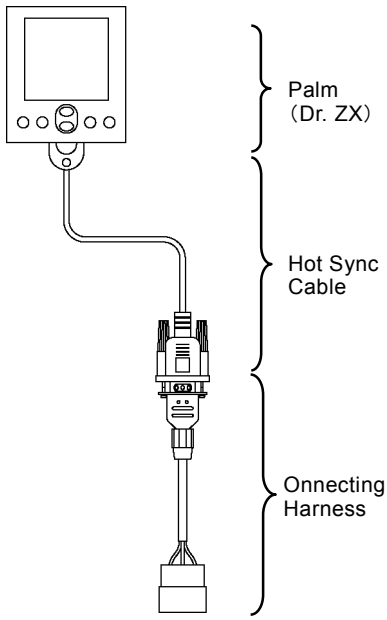
NOTE: Cancellation during learning:
When the learning switch is turned to the OFF position before finishing the learning, the adjustment is done according to the former learning result.

Procedure

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.
   - Initial Screen
     Select Dr. ZX icon.
   - Password Setup Screen (When the password has unset) Set the password.
   - Service Software Selection Screen
     [+] Select Large Class ZX-3.
   - Function Selection Screen
     [+] Self-Diagnostic Result
     [+] Select Controller
4. Select “Select (Controller)” and operate according to the instruction under display screen.



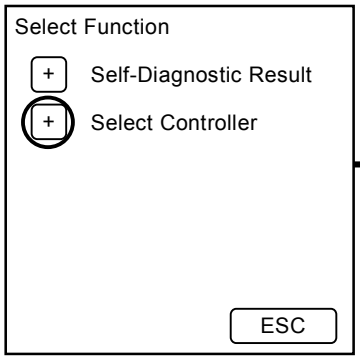
T1J1-04-06-001



T1V1-05-07-002

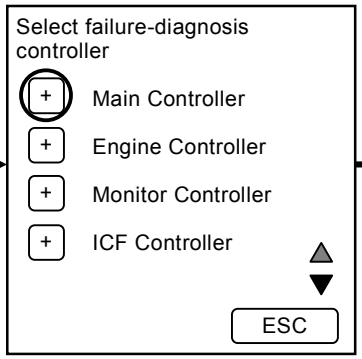
Dr. ZX Monitor Display

After starting Dr. ZX, push Select Controller.



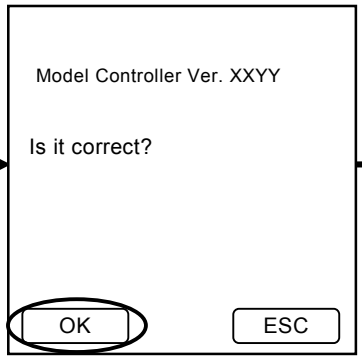
Function Selection Screen

Push Main Controller.



Controller Selection Screen

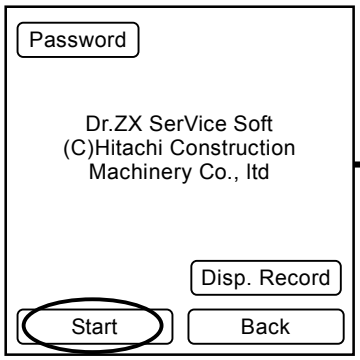
Push OK.



Main Controller Screen

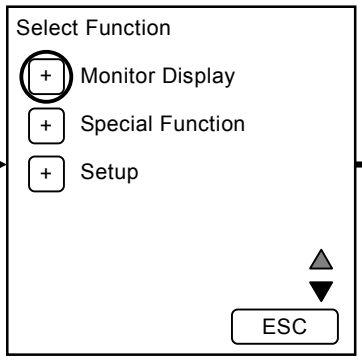
To the lower

Push Start.



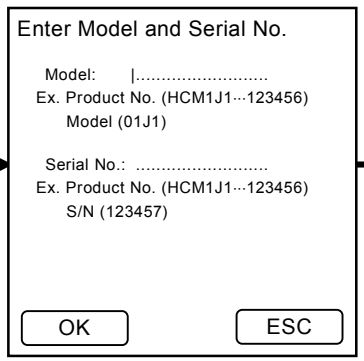
Title Screen

Push Monitor Display.



Main Menu Screen

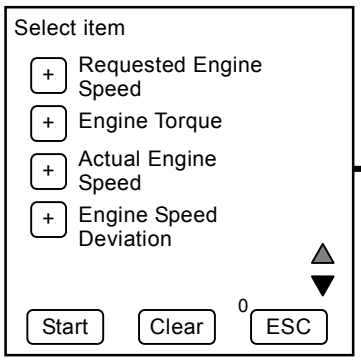
Input the model code and serial No. and push OK. Push ESC and return to Main Menu Screen.



Enter Model and Serial No. Screen

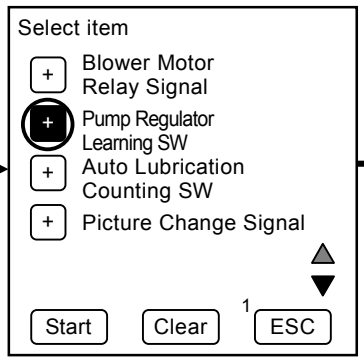
To the lower

Push ▼ and change the page.



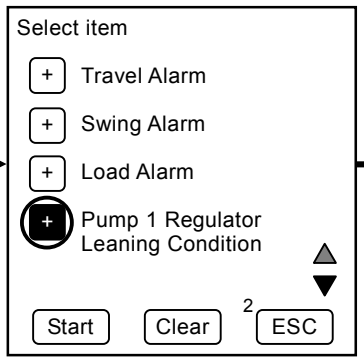
Display Item Selection Screen

Push to display Pump Regulator Learning SW reversely (black). Push ▼ and change the page.



Display Item Selection Screen

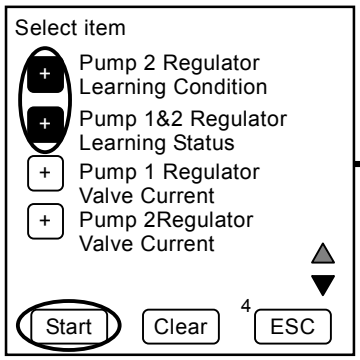
Push to display Pump 1 Regulator Learning Condition reversely (black). Push ▼ and change the page.



Display Item Selection Screen

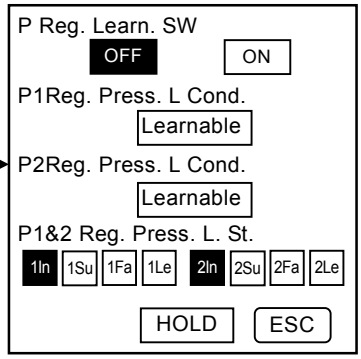
To the next page

Push to display Pump 2 Regulator Learning Condition and Pump 1 &2 Regulator Learning Status reversely (black). Push Start.



Display Item Selection Screen

If pump learing has been executed, 1Su or 1Fa (2Su or 2Fa) is displayed reversely (black).

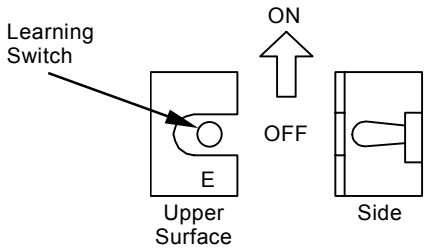


Monitor Screen

NOTE: Explanation of Display Item

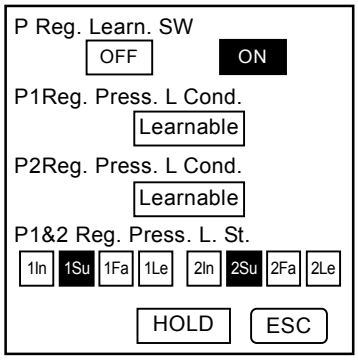
- Pump Regulator Learning Switch
  Display the part shifted by the learning switch reversely (black).
- Pump 1 Regulator Learning Condition, Pump 2 Regulator Learning Condition
  Display the condition after learning. (Refer to T4-6-6.)
- Pump 1 & 2 Regulator Learning Status
  1In, 2In: After replacing MC and when the pump learning has not been executed, these are displayed reversely (black).
  1Su, 2Su: If the former learning succeeded, these are displayed reversely (black).
  1Fa, 2Fa: If the former learning failed, these are displayed reversely (black).
  1Le, 2Le: If the learning is executed now, these are displayed reversely (black).

4. Turn the learning switch in rear console to the ON position.

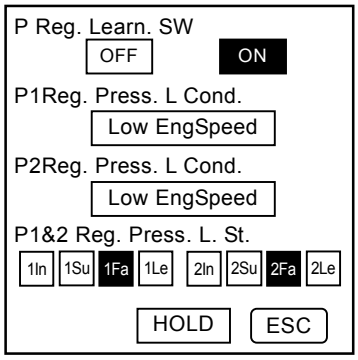


5. After 40 seconds, the monitors below are displayed on the Dr. ZX monitor.
   After the learning succeeds, turn the learning switch to the OFF position.
   If the learning fails, refer to the next page and the cause is solved. Execute the learning again.

EX) Success



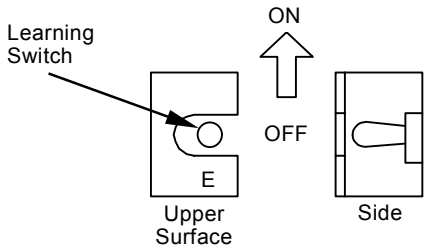
EX) Failure



IMPORTANT: After the learning, turn the learning switch to the OFF position and check the learning status by using Dr. ZX. Start the engine again, and check operation and performance.

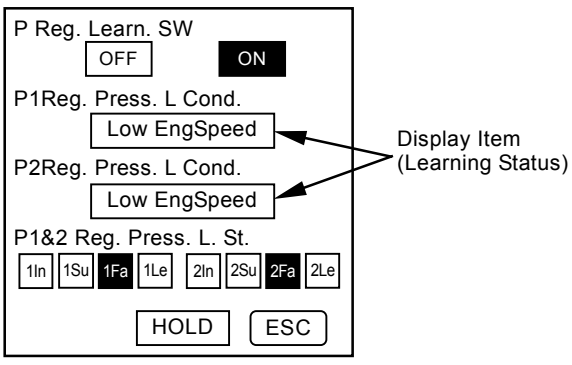
Remedy for Failure of Pump Learning

IMPORTANT: When the learning fails, check the status with the learning switch ON. When the learning switch is turned OFF to ON, the learning status detected during the learning is deleted and "Learnable" is displayed.



Display Item (Learning Status)	Cause	Remedy
Low Eng Speed	• Actual engine speed < 500 min^{-1} • Abnormal CAN communication	• Execute failure-diagnosis by using Dr. ZX. (Refer to the Troubleshooting group.) • Monitor actual engine speed and increase engine speed beyond 1600 min^{-1}.
Gate Lock Awaked	–	Move the pilot shut-off lever to the LOCK position.
Signal Over Range	• Faulty pump regulator pressure sensor or faulty harness • Faulty pump control solenoid valve or faulty harness	• Execute failure-diagnosis by using Dr. ZX. (Refer to the Troubleshooting group.) • Monitor pump regulator pressure by using Dr. ZX and check if pressure is between 0.44 MPa and 1.96 MPa. • Check if the harness is open or shorted circuit. • Replace the pump regulator pressure sensor and pump control solenoid valve.
Save Failed	Faulty MC	If saving fails when repeating the learning more than three times, replace MC.
Learnable	Normal	–

EX) Failure



TORQUE ADJUSTMENT

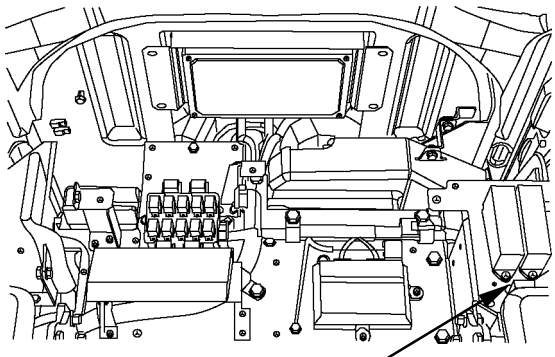
Adjust pump drive torque, sum of main pumps 1, 2, by using Dr. ZX. (Refer to the T/M (SYSTEM) section.)

IMPORTANT: These procedures are for only adjustment without repair.
When main pump drive torque need to increase or decrease, do these procedures.

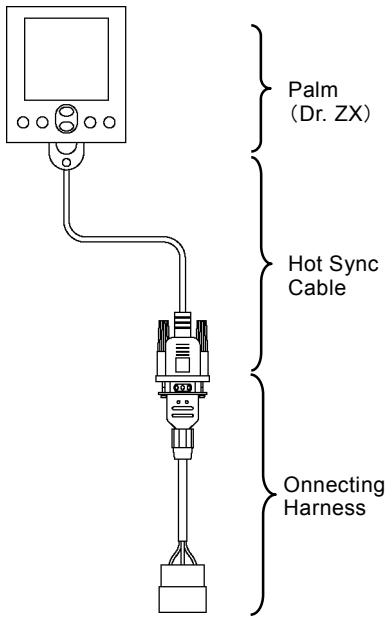
Adjustment Start Condition:
- MC, ECM: No breakdown and No malfunction (by using Dr. ZX)
- Engine output horsepower: Normal
- Hydraulic oil temperature: 50±5 °C (122±41 °F)

Procedure
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.
   - Initial Screen
     Select Dr. ZX icon.
   - Password Setup Screen (When the password has unset) Set the password.
   - Service Software Selection Screen
     [+] Select Large Class ZX-3.
   - Function Selection Screen
     [+] Self-Diagnostic Result
     [+] Select Controller

5. Select “Select (Controller)” and operate according to the instruction under display screen.



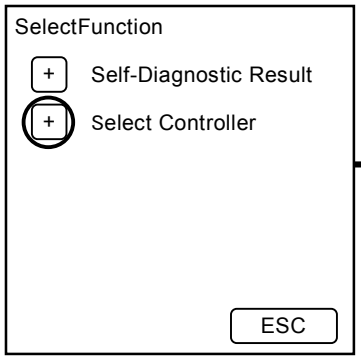
T1J1-04-06-001



T1V1-05-07-002

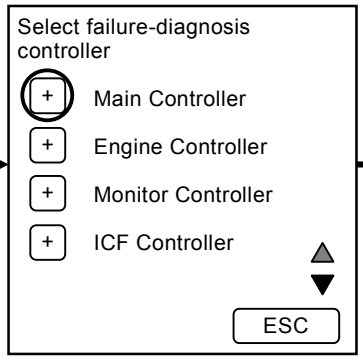
Dr. ZX Monitor Display

After starting Dr. ZX, push Select Controller.



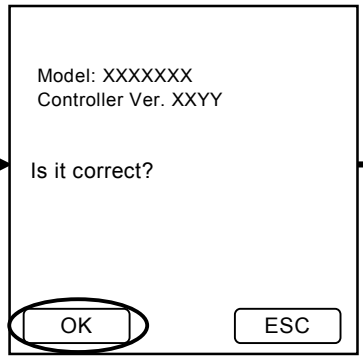
Function Selection Screen

Push Main Controller.



Controller Selection Screen

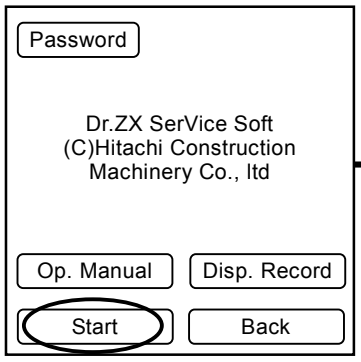
Push OK.



To the lower

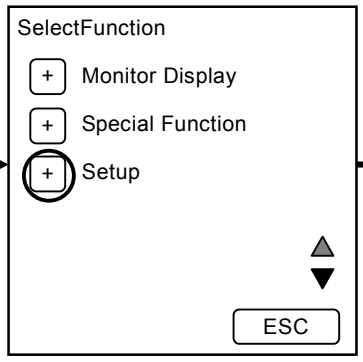
Main Controller Screen

Push Start.



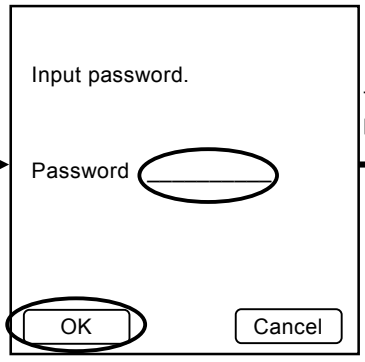
Title Screen

Push Setup.



Main Menu Screen

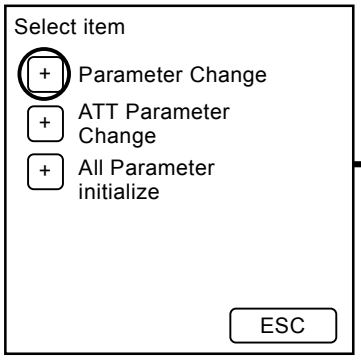
Input the password and push OK. Push ESC and return to Main Menu Screen.



To the next page

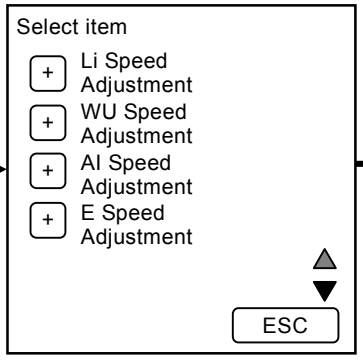
Setup Password Input Screen

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



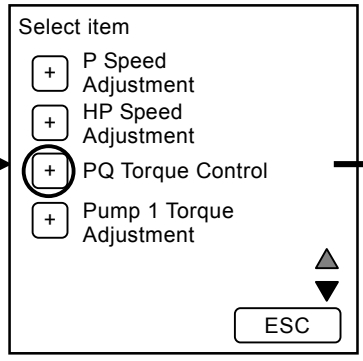
Setup Item Selection Screen

Push ▼ and change the Page.



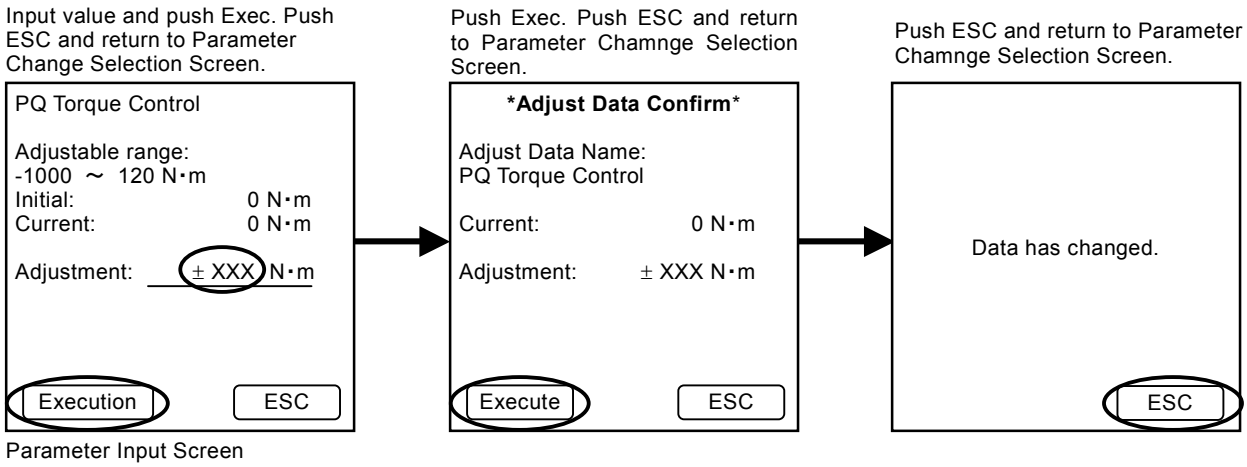
Parameter Change Selection Screen

Push PQ Torque Control.



To the lower

Parameter Change Selection Screen



NOTE: Explanation of Display Item

- Parameter Adjustable Range
  Effective range of adjustable value
- Initial
  Value when delivering becomes zero.
- Current
  Value adjusted last time, if the adjustment is not executed, current becomes zero.
- Adjustment
  Input value to increase or decrease.
  This value is added to the upper limit value of base drive torque, sum of main pumps 1, 2 at HP mode.
  (+): Increase base drive torque
  (−): Decrease base drive torque

(Blank)

MEMO

MEMO

SECTION 5
TROUBLESHOOTING

CONTENTS

Group 4 ICF

Group 5 Component Layout

Group 6 Troubleshooting A

Group 7 Troubleshooting B

Group 8 Electrical System Inspection

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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, ICF, 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.

- Diagnosing Procedure

- 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.

- ICF
  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?

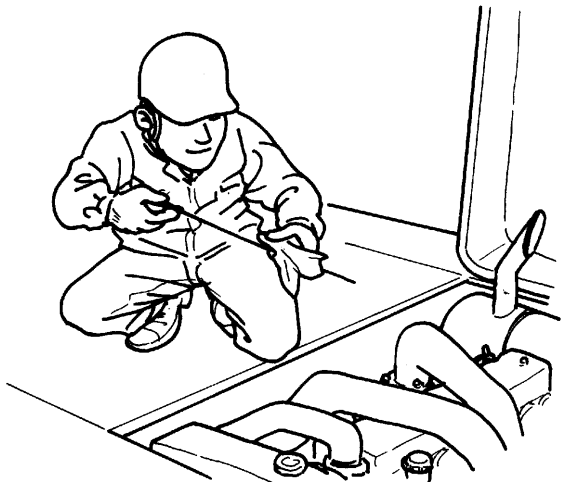
   (d) Did the machine have any other troubles previously? If so, which parts were repaired before?

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.

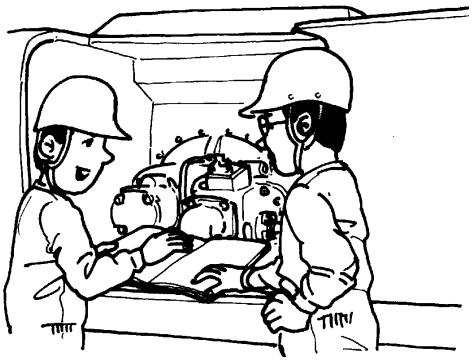
Perform diagnosis by connecting Palm to the machine or by using the service menu of monitor unit. In case any fault code has been displayed by diagnosis by using Dr. ZX (the service menu of monitor unit), check the cause of the trouble by referring to Troubleshooting A in this section. In case any fault 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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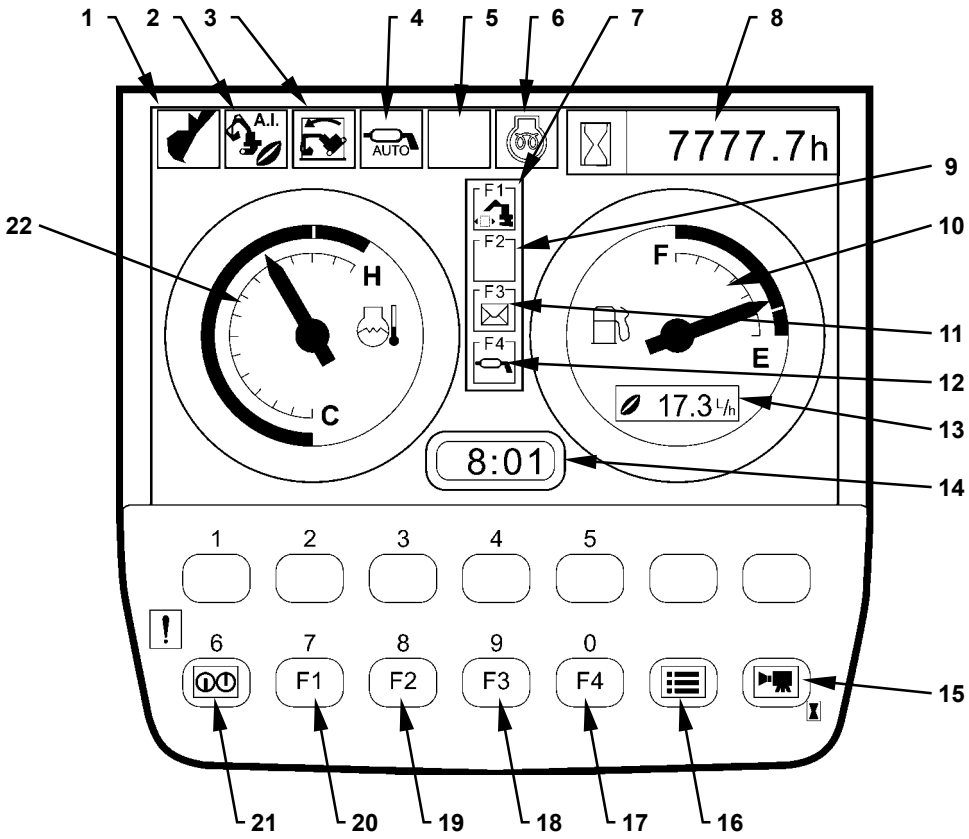
OUTLINE

Primary Screen



T1J1-02-01-003

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

- Display of Meters
  Data to be displayed on each meter are received from other controllers (MC, ICF and ECM) by using CAN, and are displayed on the monitor unit.

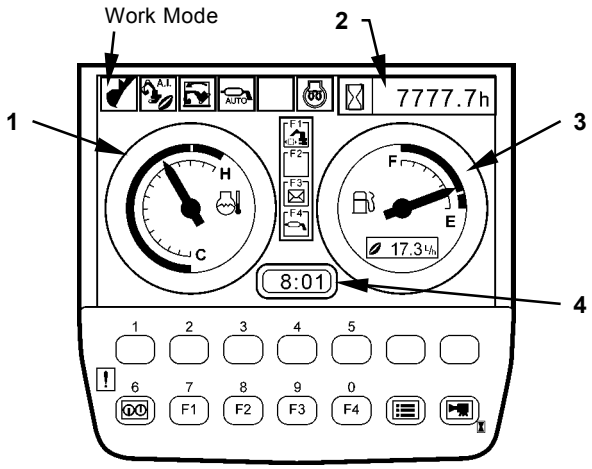
- Work Mode Display
  The attachments being used are displayed according to the signals received from MC by using CAN.

Digging Mode

T1V1-05-01-108

Attachment Mode
Breaker

M1J1-01-004



M1J1-01-003

1 - Coolant Temperature
2 - Hour Meter
3 - Fuel Gauge
4 - Clock

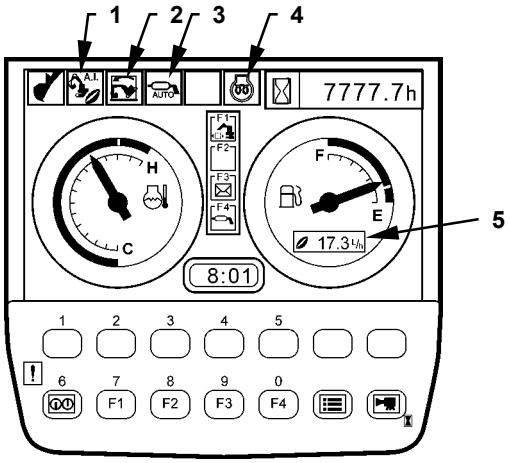
- Auto-Idle Display (1)
  When turning the auto-idle switch ON in the switch panel, the monitor displays the auto-idle.
  When the key is turned ON with the auto-idle switch ON, auto-idle display (1) blinks for 10 seconds.

- Overload Alarm Display (2) (Optional)
  MC detects suspended load according to the signal from the bottom pressure sensor in boom cylinder. When overload is detected, the monitor unit displays the alarm and sounds the buzzer according to the signal received from MC by using CAN bus line. (Refer to T2-1-34.) (Refer to the Control System group / SYSTEM.)

- Auto Lubrication Display (3) (Optional)
  When the auto lubrication switch (optional) is turned ON, the auto lubrication is displayed according to the signal received from MC by using CAN bus line.

- Glow Display (4)
  While ECM is supplying current to the glow plug, the data is displayed according to the signal from ECM. (Refer to the ECM System group / SYSTEM.)

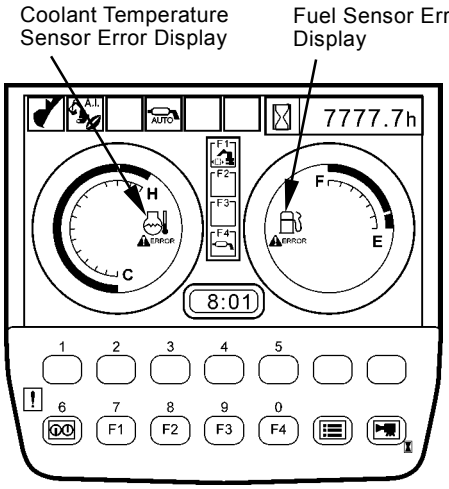
- Fuel Consumption Gauge Display (5)
  Fuel consumption is displayed according to the signal from ECM, which is received through MC by using CAN.



M1J1-01-003

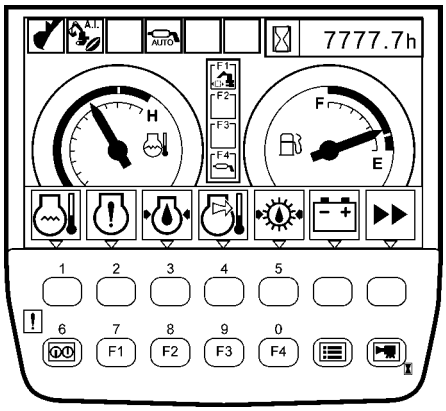
- Fuel Sensor Error Display
  When the fuel sensor is faulty or if the harness between fuel sensor and monitor unit is broken, the data is displayed on the fuel gauge.

- Coolant Temperature Sensor Error Display
  When the coolant temperature sensor is faulty or if the harness between coolant temperature sensor and monitor unit is broken, the data is displayed on the coolant temperature gauge.



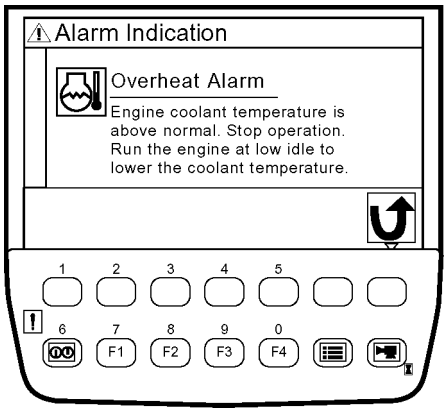
M1J1-01-010

- Alarm and Remedy Displays against Alarm
  Alarm marks are displayed on the lower part of screen according to the alarm signals received from each controller by using CAN. The remedy for each alarm is displayed by key operation.



Alarm Display

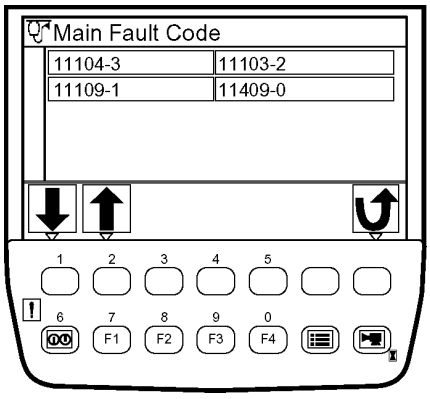
M1J1-01-008



Remedy Display against Alarm

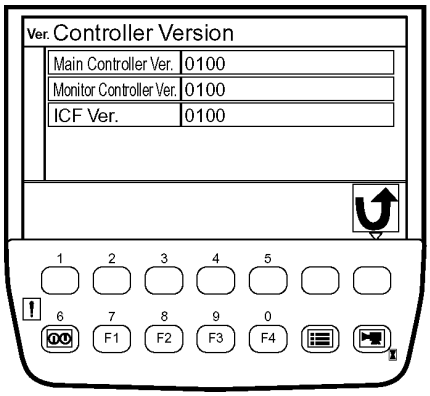
T1V5-05-01-013

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



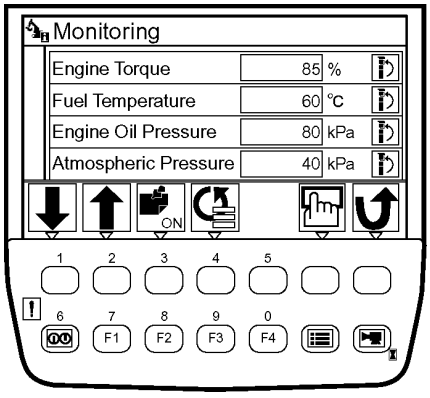
Fault Code Display T1V5-05-01-097

- Controller Version
  This screen displays the version of controller.



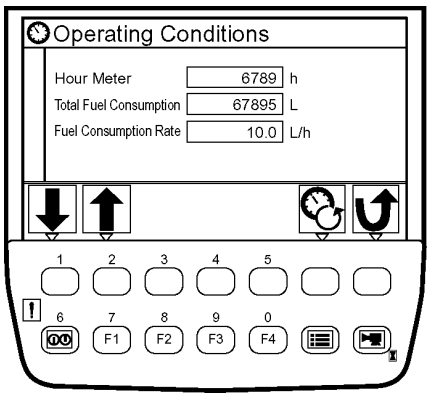
Controller Version Display T1V5-05-01-122

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



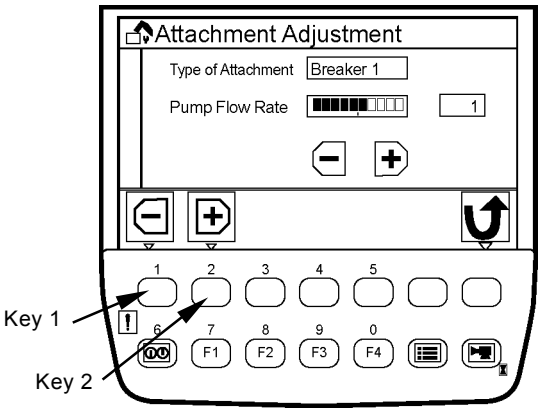
Monitoring Screen T1V5-05-01-087

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



Operating Condition 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.
  (Adjusting range: -50 to 50 L/min)
  The signals from the monitoring unit are sent to MC by using CAN.
  MC adjusts flow rate of pump 2 while controlling pump 2 control solenoid valve. (Refer to Attachment Mode Control in the Control Systems group / SYSTEM.)

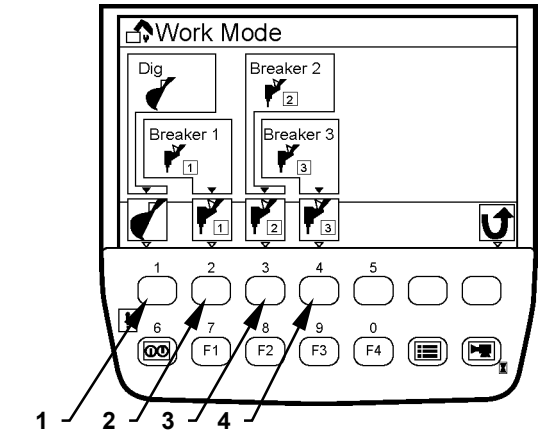


When using Breaker 1

M1J5-01-014

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

NOTE: In attachment mode, the following four modes are set at the time of shipping from the factory.
1 - Digging
2 - Breaker 1
3 - Breaker 2
4 - Breaker 3

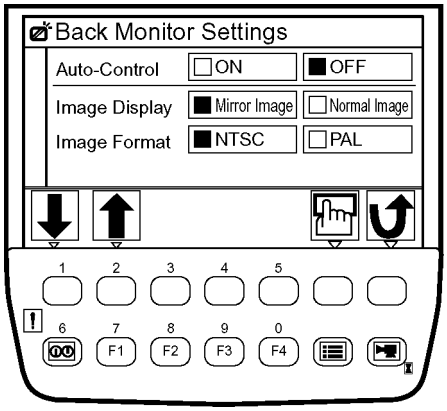


Attachment Selection Screen

M1J5-05-003

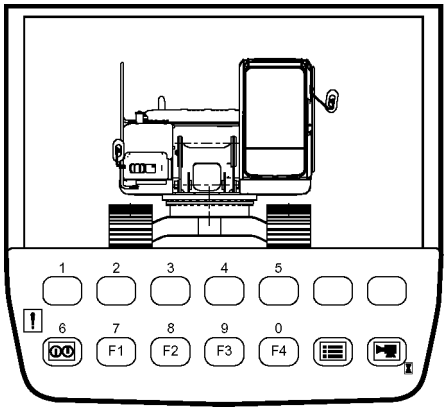
- Back Monitor Settings
  By key operation, image display ON and OFF of Auto-Control for switching image of the back monitor while traveling pilot time and display format on the screen of the rear view camera can be set.

IMPORTANT: the rear view camera is set in mirror image mode. Therefore, if image display is set as mirror image, normal image is displayed on the screen of monitor unit.
If image display is set as normal image, mirror image is displayed on the screen of monitor unit.



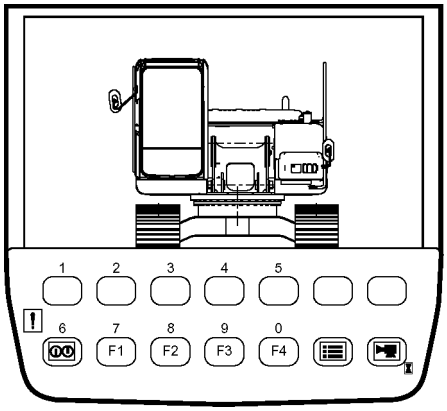
T1V5-05-01-134

Back Monitor Setting Screen



T1V1-05-01-126

Normal Image Screen



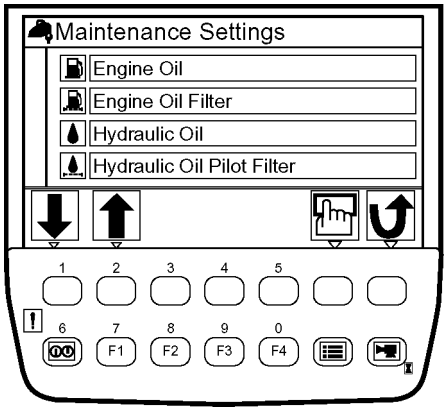
T1V1-05-01-127

Mirror Image Screen

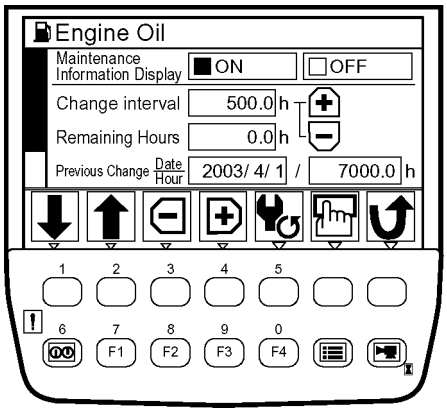
- Maintenance Settings
  This screen displays the hour meter reading at replacement time and the remaining hours until the next replacement.
  As the items to be replaced are displayed in a list, record performed replacement by selecting an item from the list.

  - 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
    Travel Device Oil
    Swing Device Oil
    Swing Bearing Grease
    Air Cleaner Filter
    Engine/Air Conditioner V-belt
    Fuel Filter
    Air Conditioner Filter

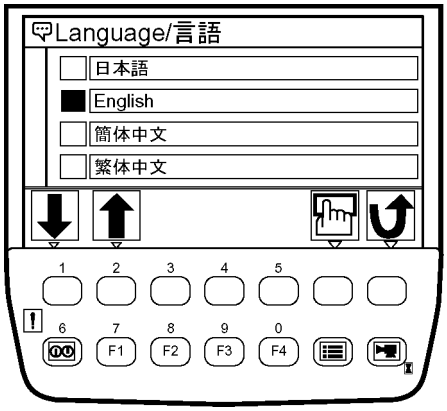


Maintenance Setting Screen T1V5-05-01-049



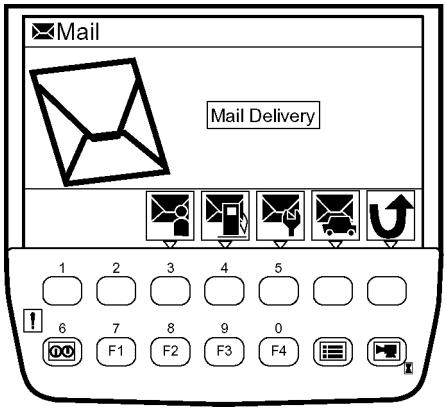
Interval ON/OFF Setting Screen T1V5-05-01-052

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



Language Setting Screen T1V1-05-01-137

- Mail (Optional Function)
  Send requests such as requests of forwarding (1), service maintenance (2), fuel replenishment (3) and general (4) in the mail switch screen.
  Contents of mails are registered in ICF, and are sent to the central server by a satellite terminal.



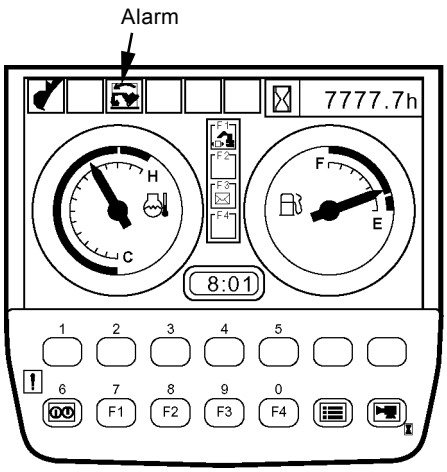
Mail Switch Screen T1V5-05-01-037

- Overload Alarm
  (Only machines equipped with optional parts)

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

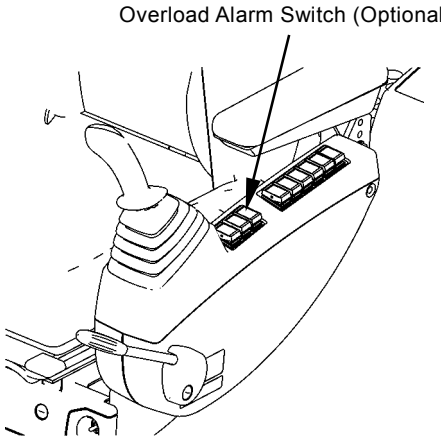
MC detects suspended load according to the signal from the bottom pressure sensor in boom cylinder. When overload is detected, the monitor unit displays the alarm and sounds the buzzer according to the signal received from MC by using CAN bus line.
If overload of the suspended load is dissolved, the alarm message disappears and the buzzer stops ringing. (Refer to the Control System group / SYSTEM.)

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



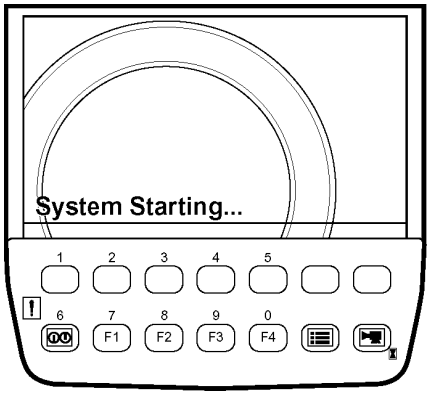
M1J1-03-001

HOW TO USE SCREENS

Displaying Primary Screen

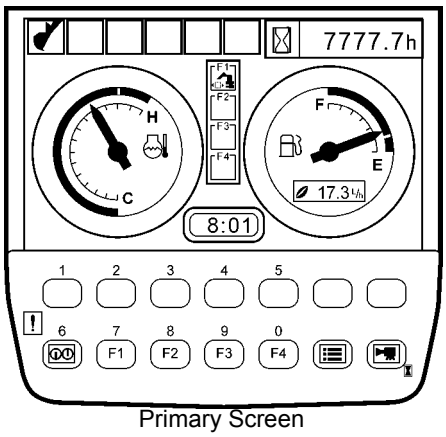
IMPORTANT: Start the engine after the primary screen is displayed.

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

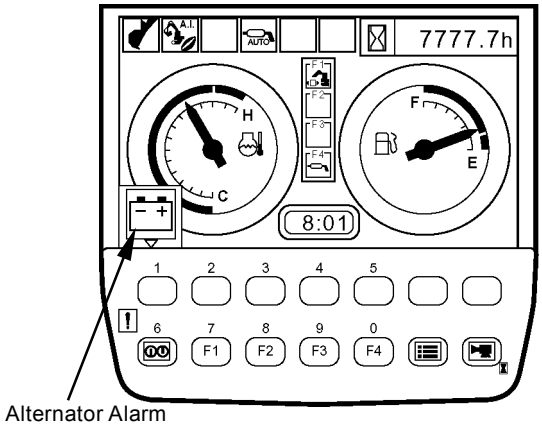
T1V1-05-01-115



Primary Screen

T1V1-05-03-001

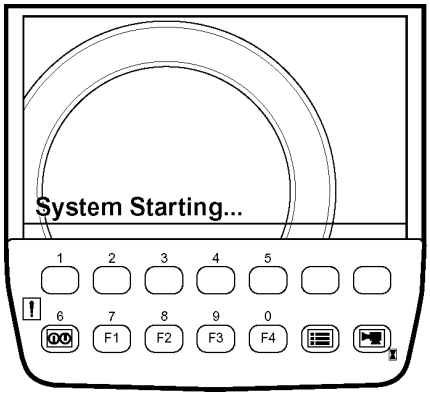
IMPORTANT: After the engine starts and the alternator starts generating power, alternator alarm is displayed on the primary screen.



M1J1-03-005

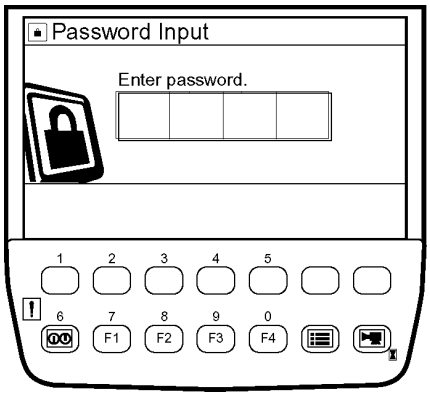
Displaying Primary Screen by Password Input (Optional)

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



Starting Screen T1V1-05-01-115

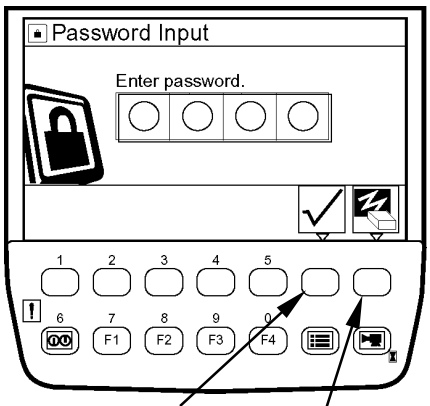
1. When the key switch is turned to the ON position, the starting screen appears and the password input screen appears.



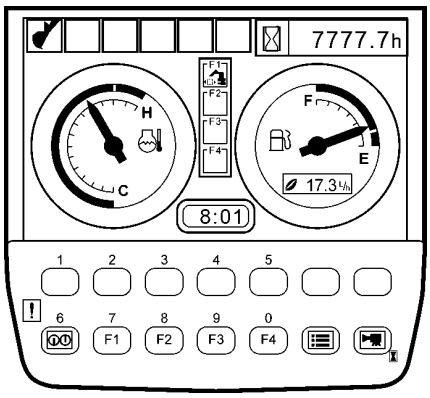
Password Input Screen T1V5-05-01-093

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.



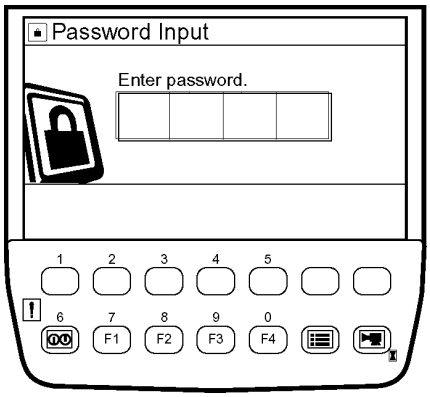
T1V5-05-01-002



Primary Screen T1V1-05-03-001

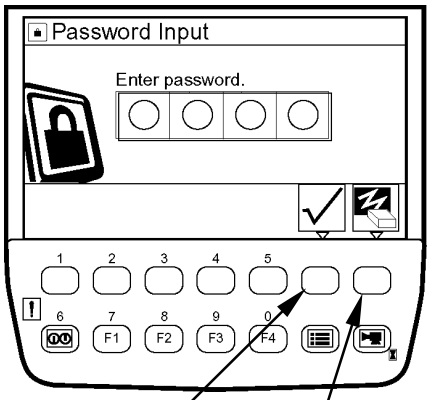
In Case of Inputting an Incorrect Password

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



Password Input Screen

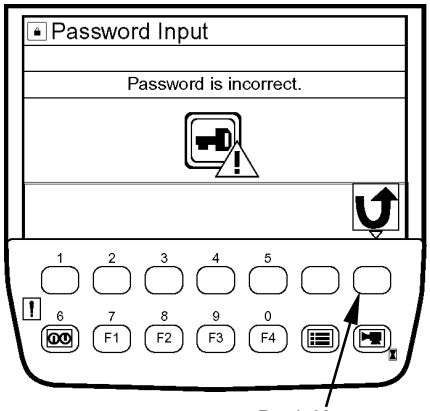
T1V5-05-01-093



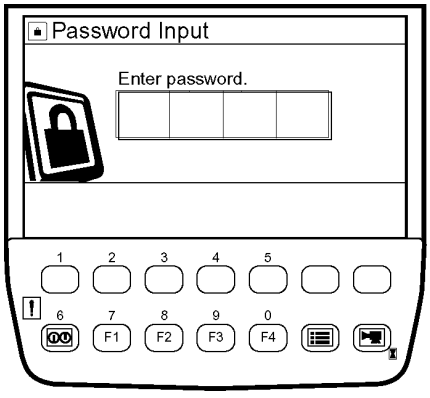
T1V5-05-01-002

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.

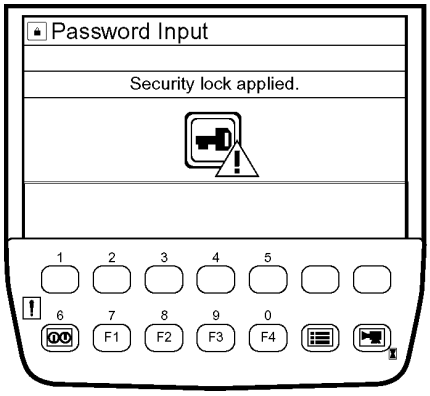


T1V5-05-01-004



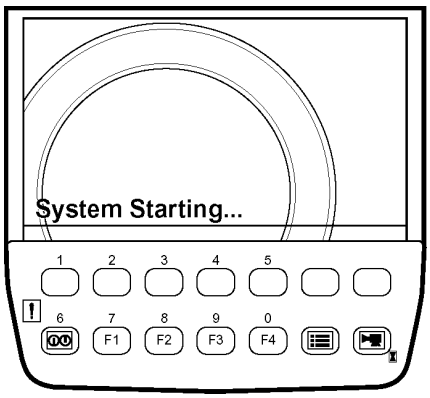
T1V5-05-01-093

3. If inputting an incorrect password three times, a screen appears informing that the security lock has been applied, and a buzzer rings for thirty seconds. During that time, the buzzer does not stop ringing even if turning of the key switch ON/OFF.



Security Lock Screen T1V5-05-01-005

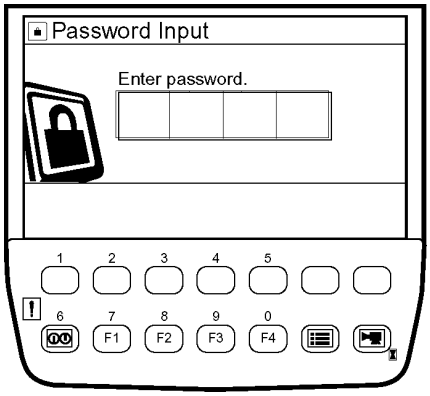
4. After thirty seconds, if the key switch is turned to the ON position, the starting screen appears and the password input screen appears again. Then a password can be input again. If inputting an incorrect password even once this time, the security lock screen appears again and a buzzer rings for thirty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



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 T5-2-11).

6. If inputting an incorrect password again, the security lock screen appears again. The buzzer does not stop ringing for thirty seconds even if turning the key switch ON/OFF.



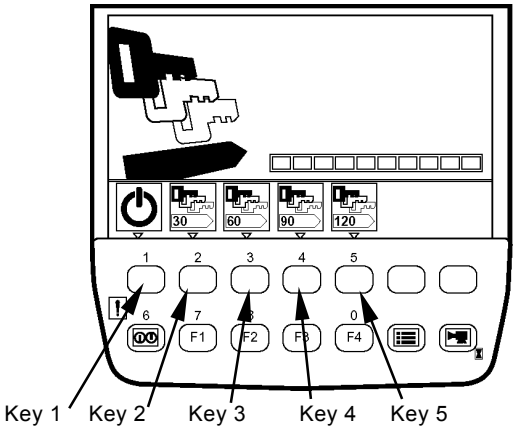
Password Input Screen T1V5-05-01-093

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 you 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.

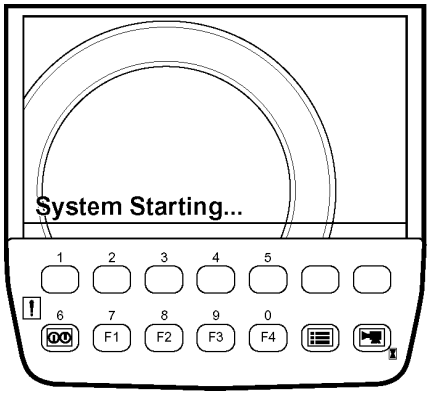


T1V1-05-01-012

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

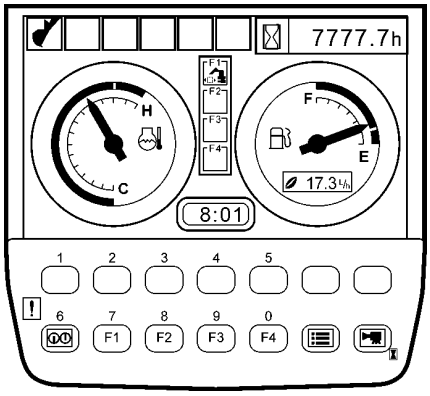
NOTE: If password duration time is not set explicitly, 0 minute on duration time is assumed.



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.

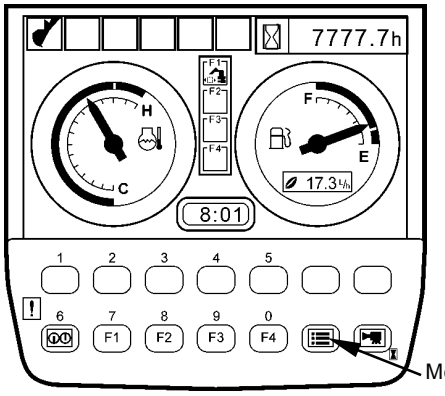


Primary Screen

T1V1-05-03-001

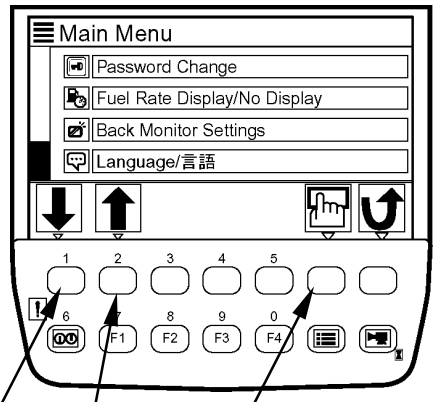
Password Change (Optional)

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

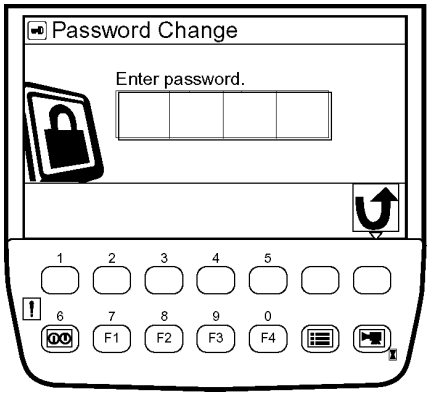


Primary Screen T1V1-05-03-001

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



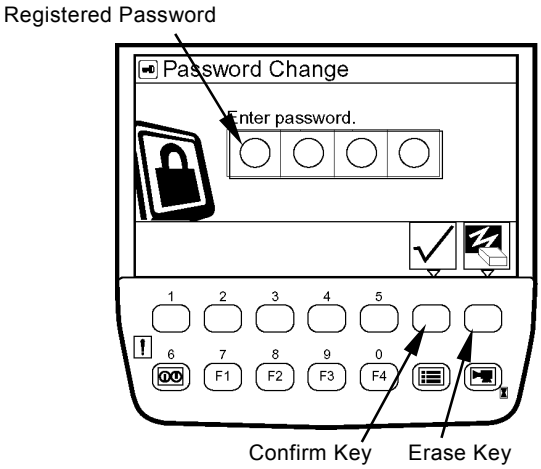
T1V5-05-01-129



T1V5-05-01-041

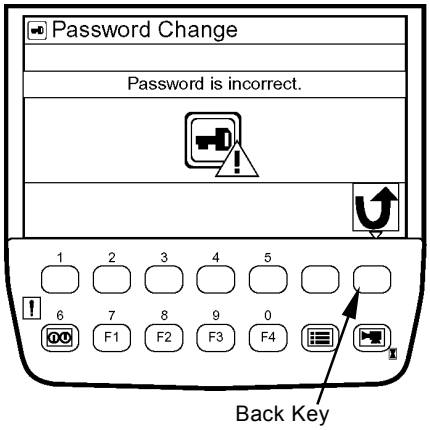
3. Input the registered password and push the confirm key.

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



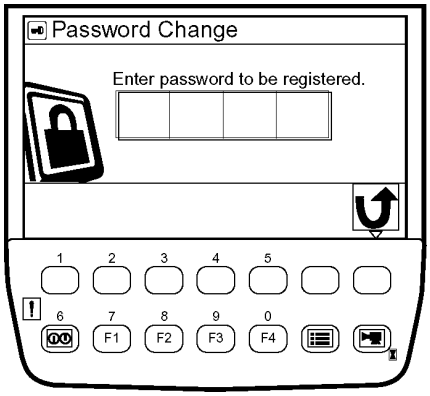
T1V5-05-01-042

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.



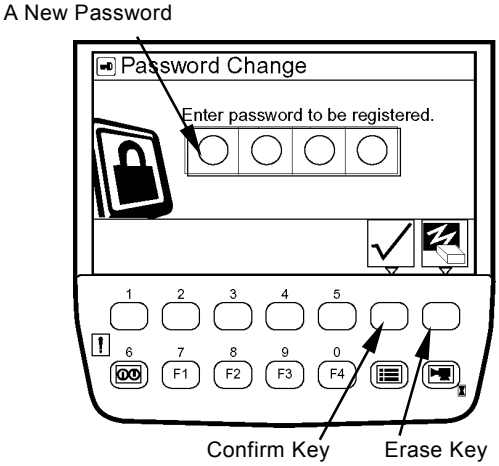
T1V5-05-01-044

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



T1V5-05-01-130

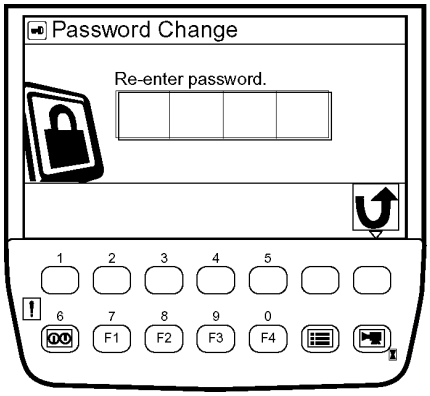
6. If inputting the password again, push the erase key.



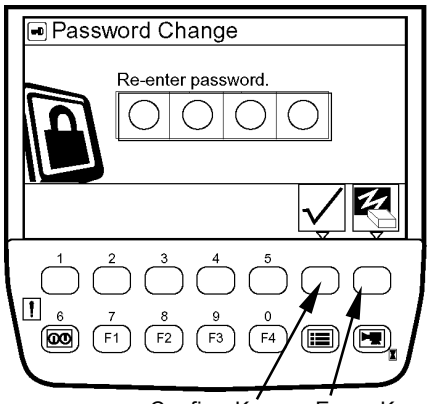
T1V5-05-01-131

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.

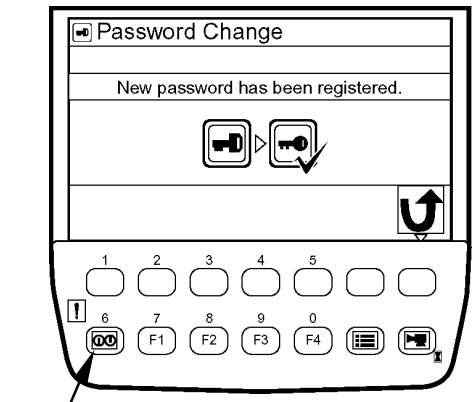


T1V5-05-01-132



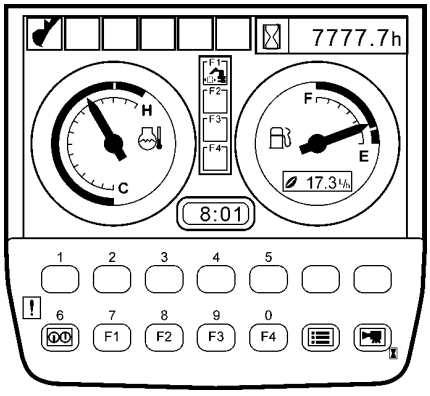
T1V5-05-01-133

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.



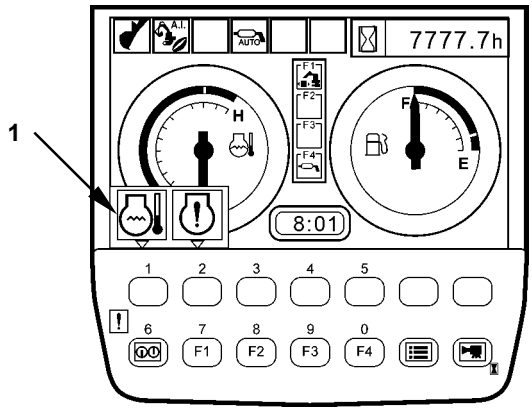
Primary Screen

T1V1-05-03-001

SCREEN DISPLAY WHEN AN ALARM IS ISSUED

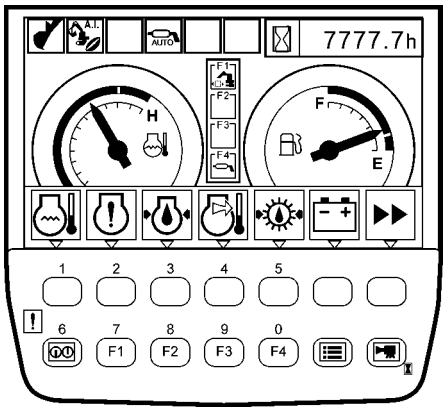
When an alarm is issued, the alarm marks are displayed at the bottom of screen.

- When the number of alarms is two or less



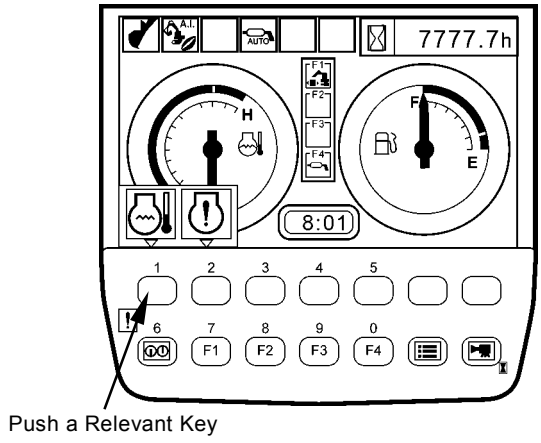
M1J1-01-007

- When the number of alarms is three or more

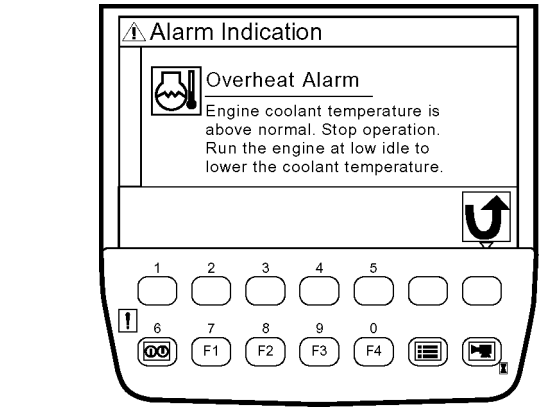


M1J1-01-008

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

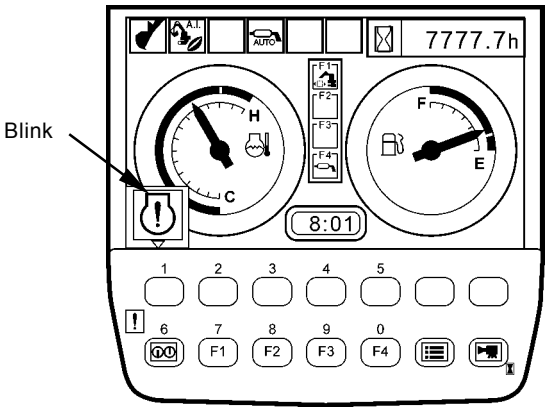


M1J1-01-007



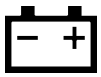
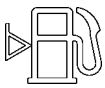
T1V5-05-01-013

IMPORTANT: When the engine warning alarm blinks and the key under the alarm mark is pushed, the remedy for alarm is not displayed.
Drain water from the fuel tank.



M1J1-01-009

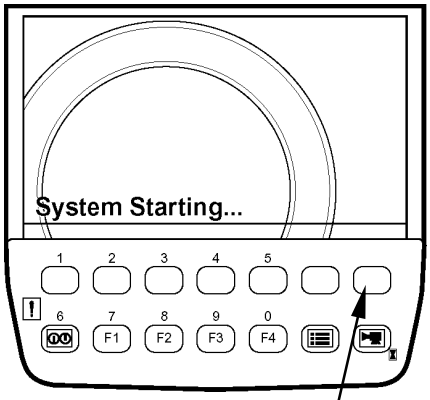
CONTENTS OF ALARMS

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 hydraulic system and oil volume of the engine.
 M183-01-071	Alternator Alarm	Fault in the electronic system. Inspect the alternator and battery system.
 M178-01-034	Remaining Fuel Alarm	Volume of remaining oil is becoming less. Refuel oil earlier.
 T1J1-05-01-005	Auto-Lubrication Alarm	Fault in the auto-lubrication system. Please contact our authorized distributor or dealer.
 M183-01-067	Air Filter Clogged Alarm	The air filter is clogged. Clean or replace the air filter.
 T1V1-05-01-102	Work Mode Alarm	Fault in the network system. Please contact our authorized distributor or dealer.
 T1V1-05-01-103	Pilot Shut-Off Lever Alarm	Fault in the pilot shut-off lever system. Please contact our authorized distributor or dealer.

(Blank)

TROUBLESHOOTING

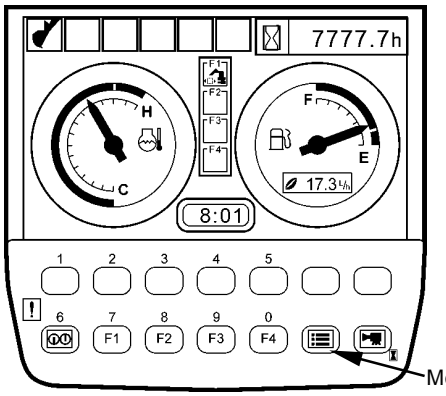
1. Displaying service menu
   Turn the key switch to the ON position while pushing the key at upper right corner of the monitor unit. Therefore, service menu is added to main menu.



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.

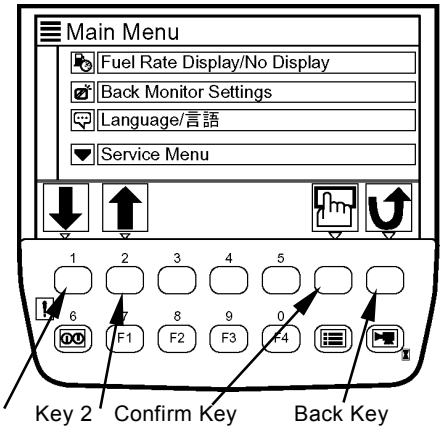


Primary Screen

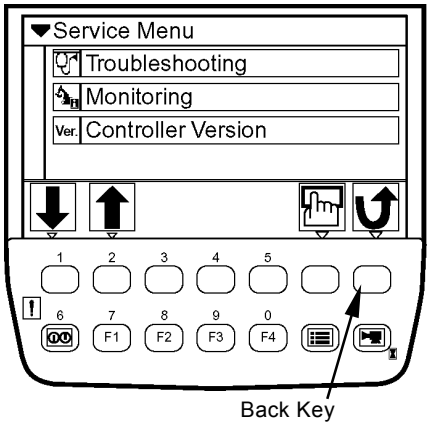
T1V1-05-03-001

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

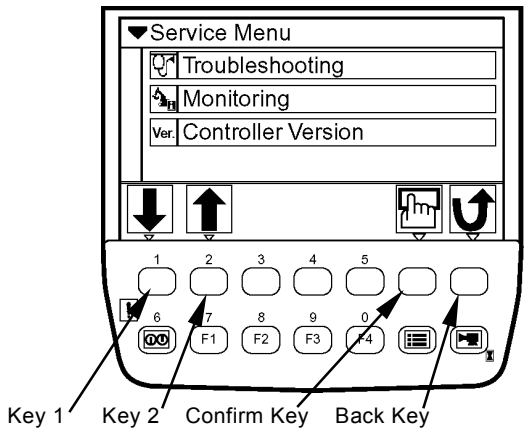
4. Select troubleshooting by using keys 1 and 2. Push the confirm key. Then, the troubleshooting screen appears.

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, failure code screen appears.
   For details of trouble analyses, refer to "Troubleshooting A."

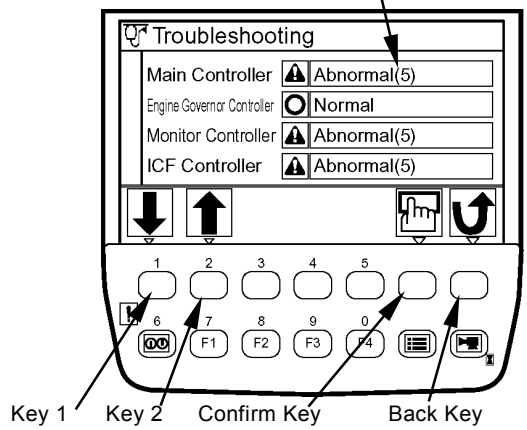
IMPORTANT: Up to twenty failure codes can be displayed. But, one screen can contain only ten failure codes maximum. If the screen is fully filled with ten items, push key 1 and check other failure codes on the next page.
When returning to the previous page, push key 2.

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



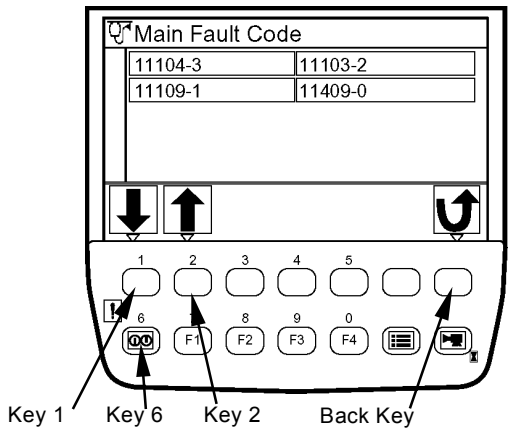
T1V5-05-01-083

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

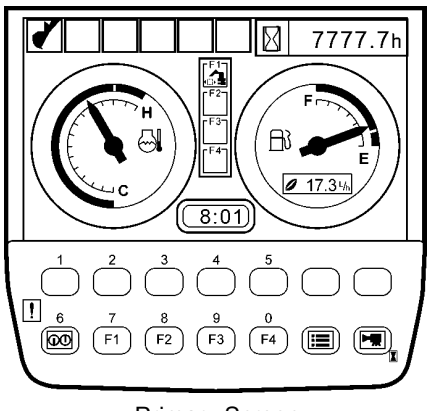


T1V5-05-01-085

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



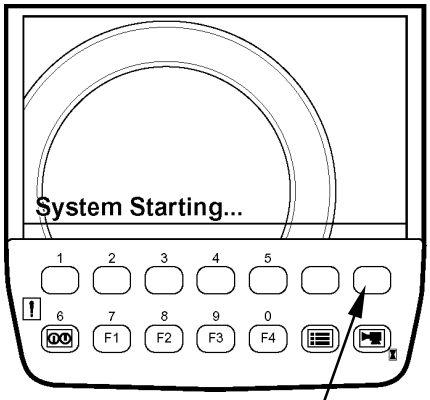
T1V5-05-01-097



Primary Screen
T1V1-05-03-001

CONTROLLER VERSION

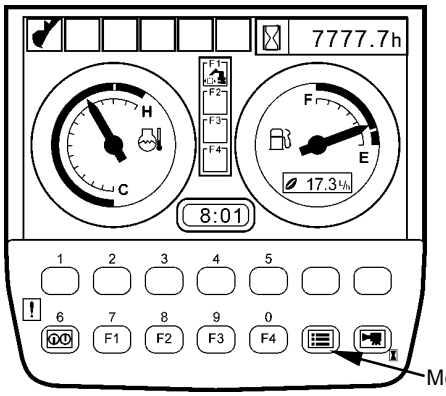
1. Displaying Service Menu
   Turn the key switch to the ON position while pushing the key at upper right of the monitor unit. Therefore, service menu is added to main menu.



Turn the key switch ON while pushing the key

T1V1-05-01-115

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

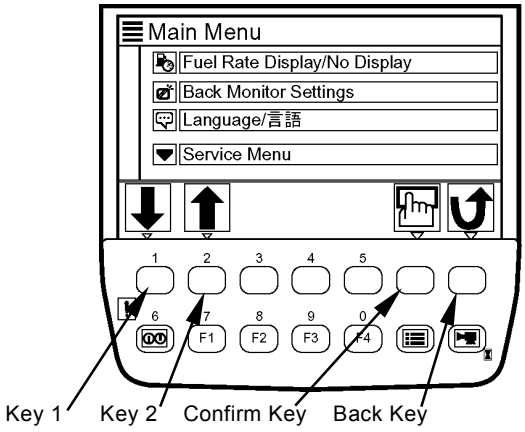


Primary Screen

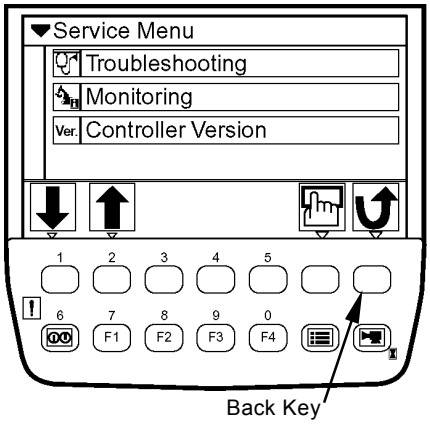
T1V1-05-03-001

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

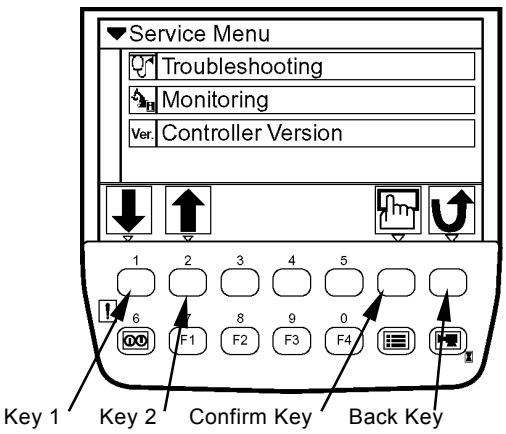


T1V5-05-01-083

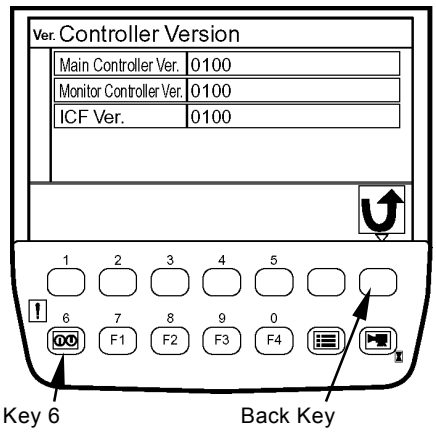
4. Select controller version by using keys 1 and 2. Push the confirm key. Then, the controller version screen appears.

NOTE: The version of ECM is not displayed.

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

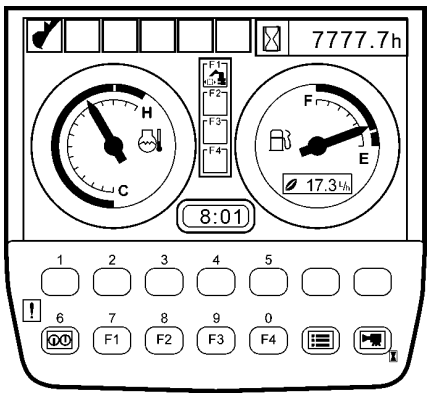


T1V5-05-01-083



T1V5-05-01-122

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

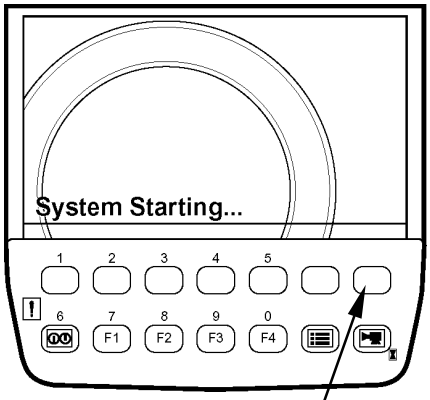


Primary Screen

T1V1-05-03-001

MONITORING

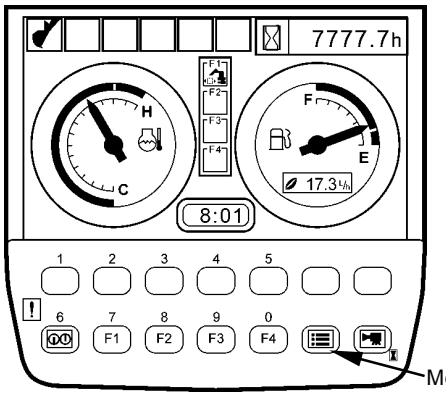
1. Displaying Service menu
   Turn the key switch to the ON position while pushing the key at upper right of the monitor unit. Therefore, the service menu is added to main menu.



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.

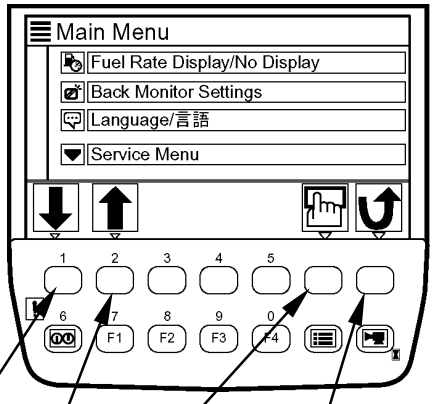


Primary Screen

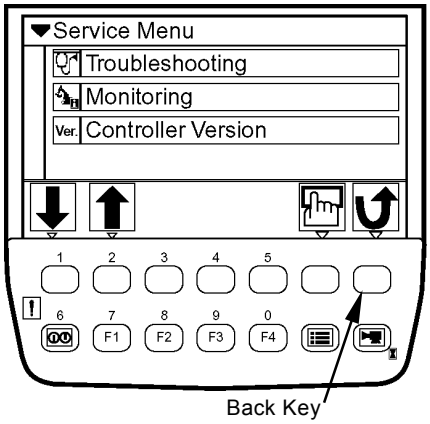
T1V1-05-03-001

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.

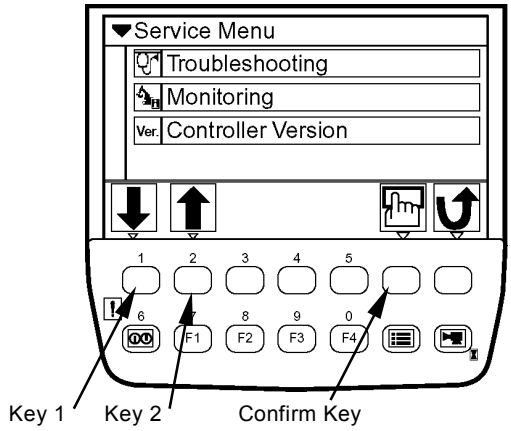


T1V5-05-01-114



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 section.

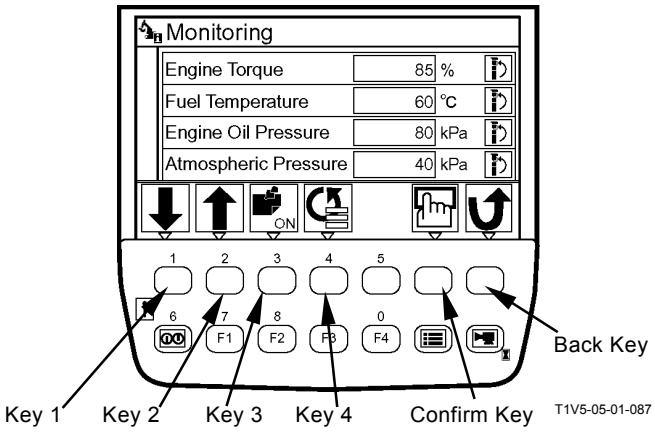


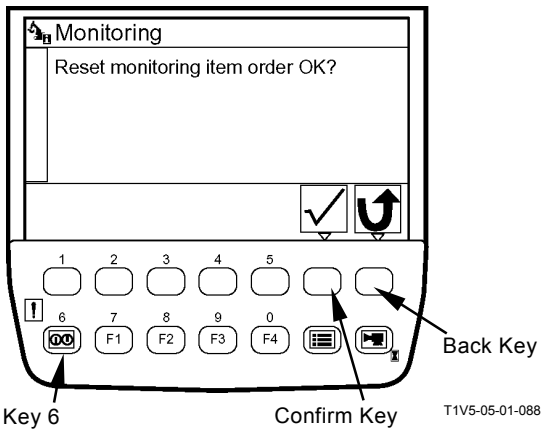
5. Select an item to be monitored by using keys 1 and 2. Push the confirm key. Then, the selected item is brought up to the top.

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.

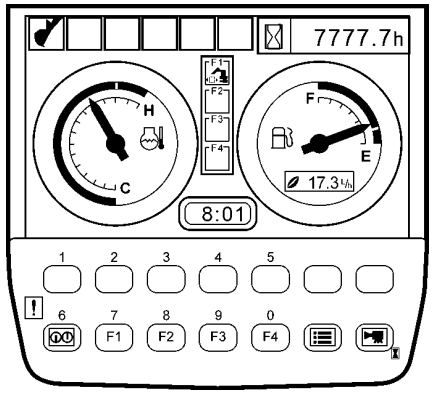
7. The monitoring item order is reset to the initial state by pushing key 4.
   When key 4 is pushed and a confirmation message appears, push the confirm key.

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





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



Primary Screen

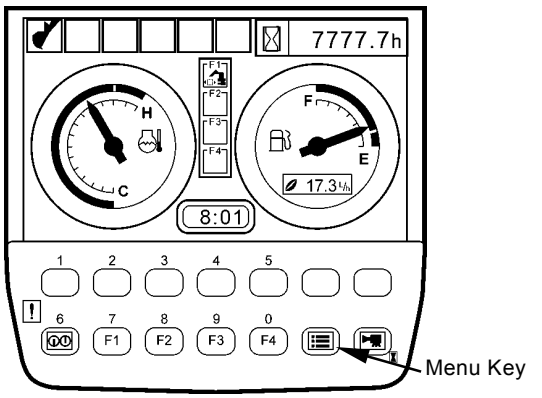
T1V1-05-03-001

A List of Items to be Monitored

Items	Units	Remarks
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 Pilot Pressure	MPa	
Boom Raise Pilot Pressure	MPa	
Arm Roll-In Pilot Pressure	MPa	
Swing Pilot Pressure	MPa	
Travel Pilot Pressure	MPa	
Att. Control Pilot Pressure	MPa	
EC Dial Angle	V	
Hydraulic Oil Temperature	°C	
Pump Torque Proportional Valve	MPa	
Digging Regeneration Valve	MPa	Pump 1 Regulator Pressure
Arm Regeneration Valve	MPa	Pump 2 Regulator Pressure
Travel Motor Control Pressure	MPa	
Power Boost Control Pressure	MPa	
Power Mode	-	
Travel Mode Switch	-	
Power Digging Switch	-	
Radio Signal Strength	-	

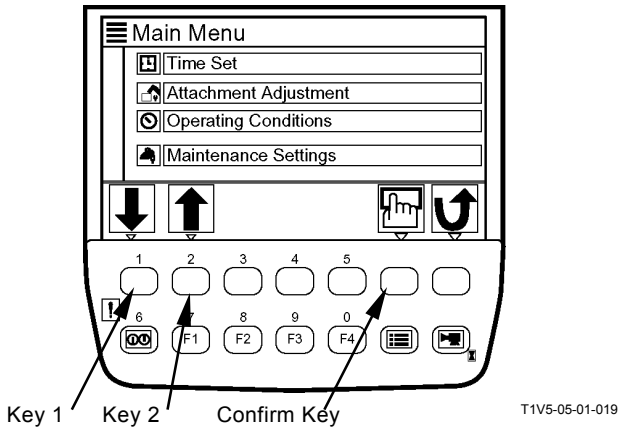
DISPLAYING OPERATING CONDITIONS

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



Primary Screen T1V1-05-03-001

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

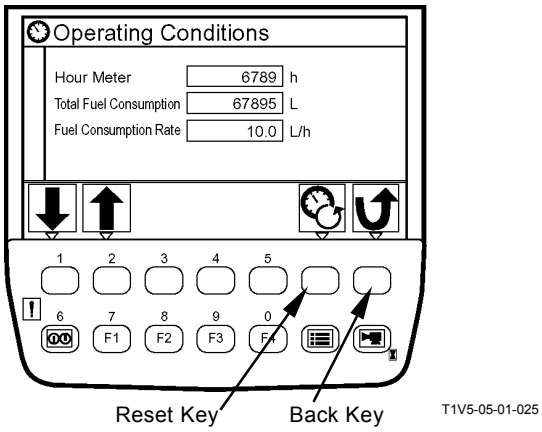


T1V5-05-01-019

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.

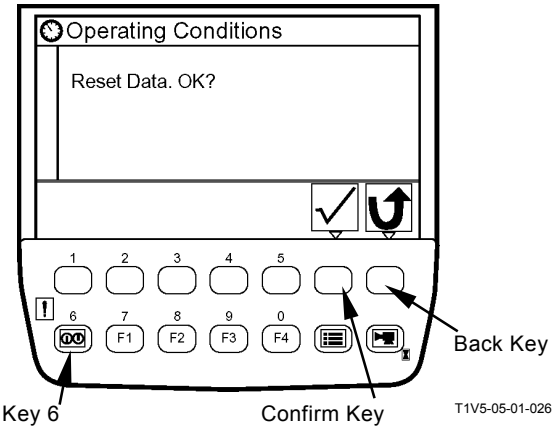
NOTE: When pushing the back key, return to the previous screen.

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.



T1V5-05-01-025

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



T1V5-05-01-026

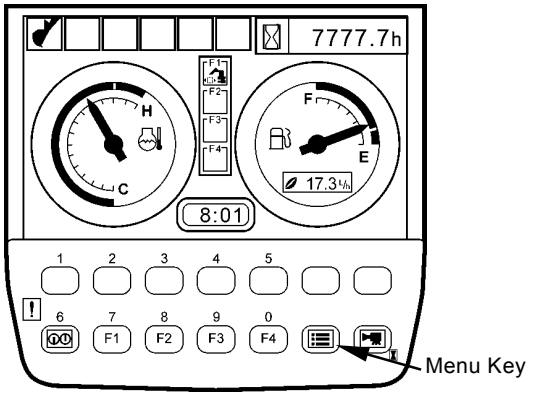
PUMP 2 FLOW RATE ADJUSTMENT (Only Machines Equipped with Optional Parts)

IMPORTANT: This operation is effective when attachments are used.

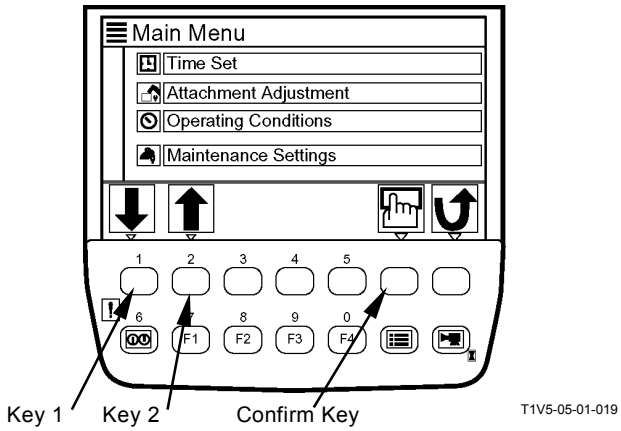
1. When the primary screen appears, push the menu key and display main menu.

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

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



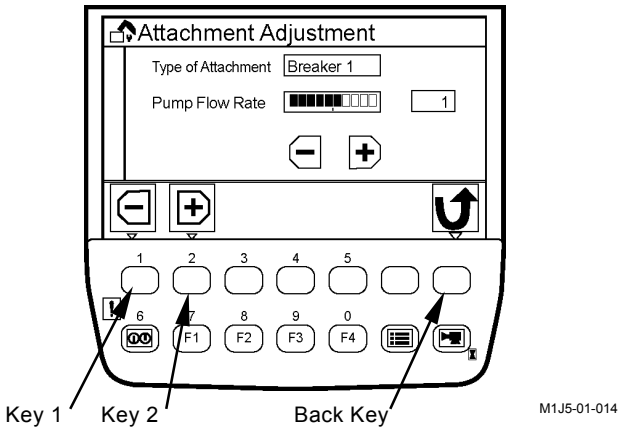
Primary Screen T1V1-05-03-001



T1V5-05-01-019

4. Adjust flow rate of pump 2 by using keys 1 and 2. When using breaker 1, breaker 2 or breaker 3, pushing key 1 will decrease flow rate of pump 2 and pushing key 2 will increase respectively.

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



M1J5-01-014

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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 an Attachment by Using Key F1

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

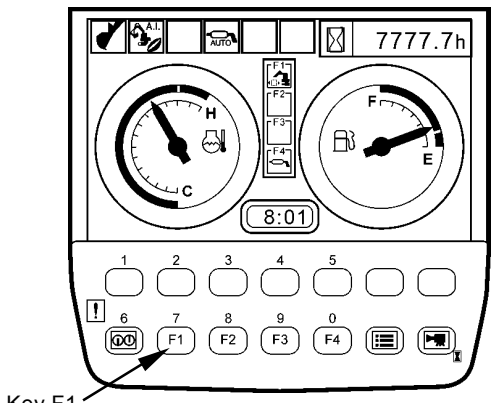
2. Push a relevant key under an attachment mark to be used in order to select the attachment.
(In the right example, Breaker 1 is selected.)

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

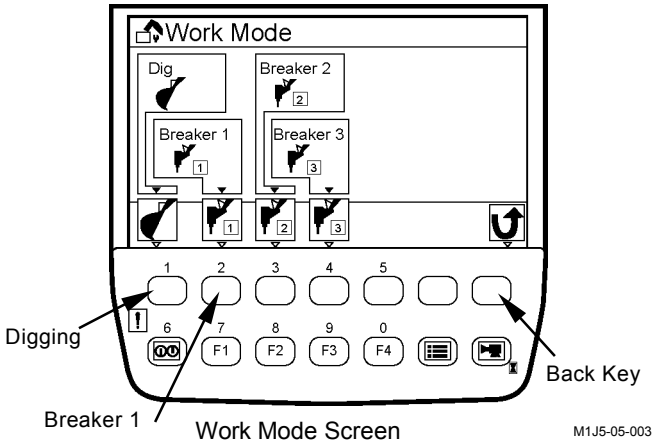
3. On the attachment specification screen, confirm if specification of the installed attachment agrees with that displayed on the screen.

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

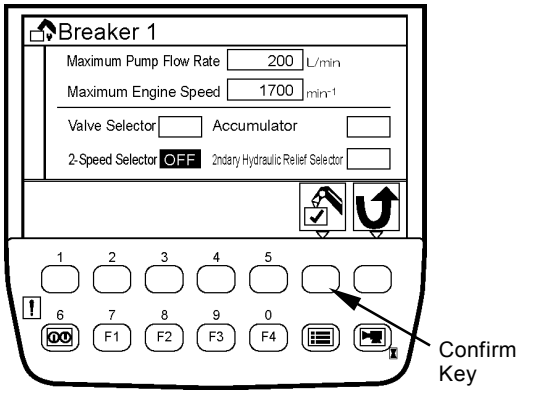
4. Push confirm the key, and the primary screen appears.



Primary Screen M1J1-01-002



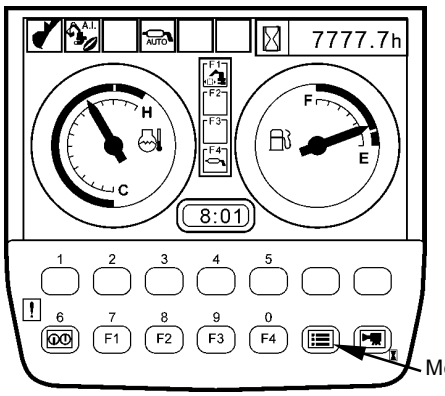
Work Mode Screen M1J5-05-003



Attachment Specification Screen M1J5-01-011

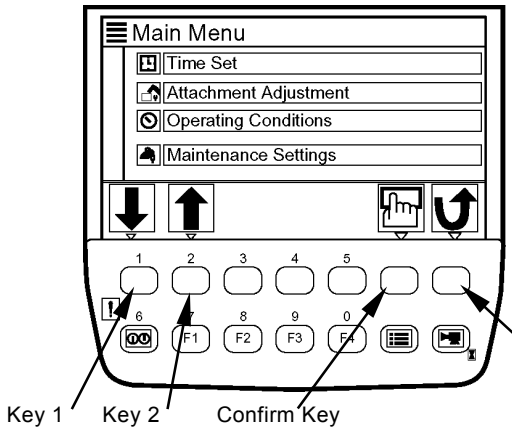
Selecting an Attachment from Main Menu

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



Primary Screen M1J1-01-002

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



T1V5-05-01-019

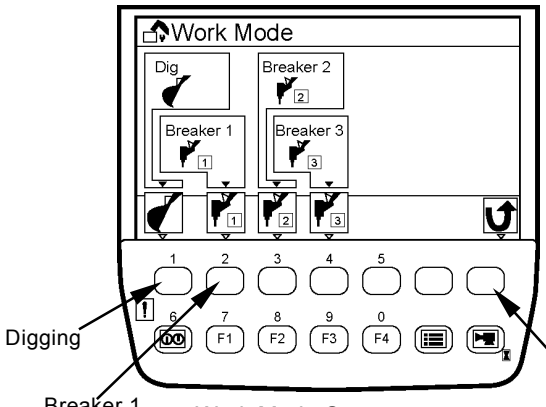
3. Push the relevant key under an attachment mark to be used in order to select the attachment. (In the right example, Breaker 1 is selected.)

NOTE: When selecting digging, return to main menu.

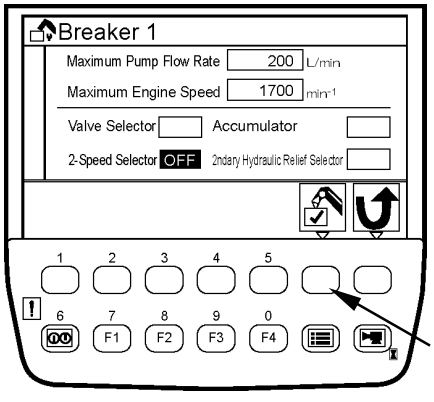
4. On the attachment specification screen, confirm if specification of the installed attachment agrees with that displayed on the screen.
   If they do not match, perform the setting of attachment by using Dr. ZX.
   For details of the attachment specification screen, refer to T5-2-38 and 39.

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

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

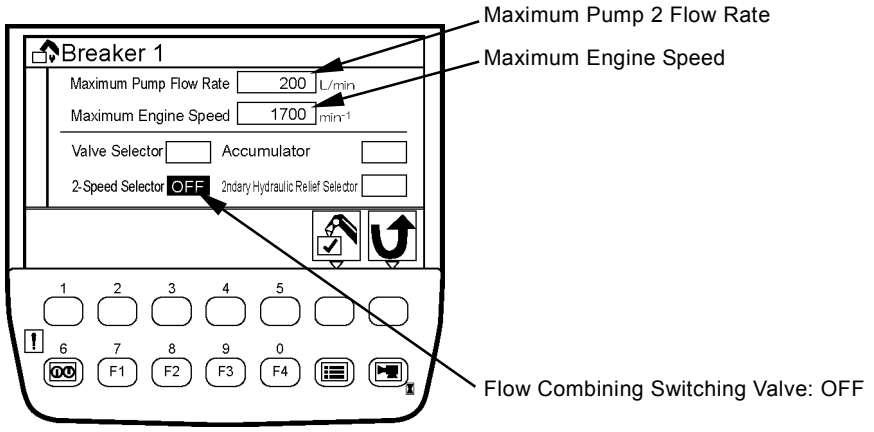


Work Mode Screen M1J5-05-003

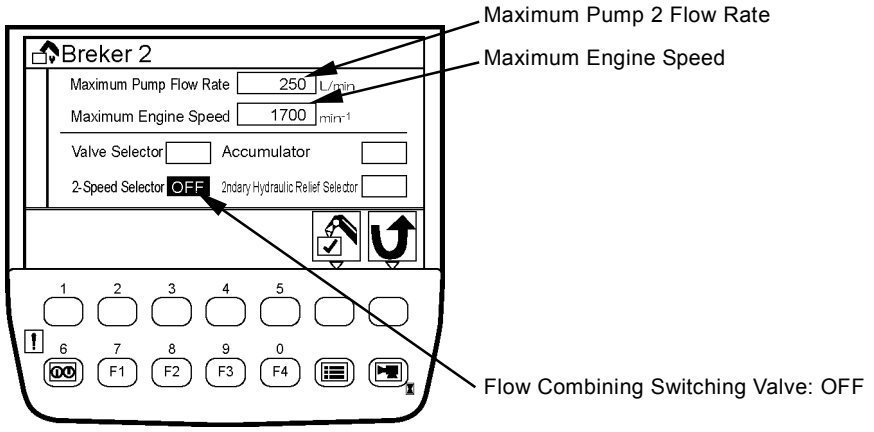


Attachment Specification Screen M1J5-01-011

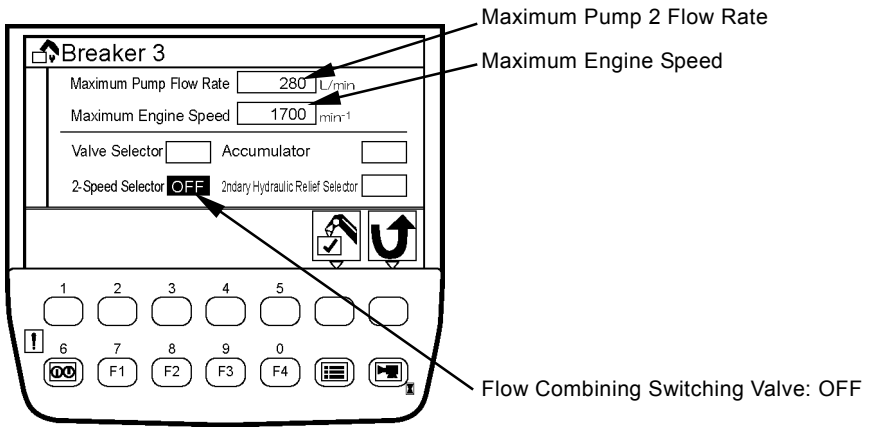
Attachment Specification Screen



M1J5-01-011



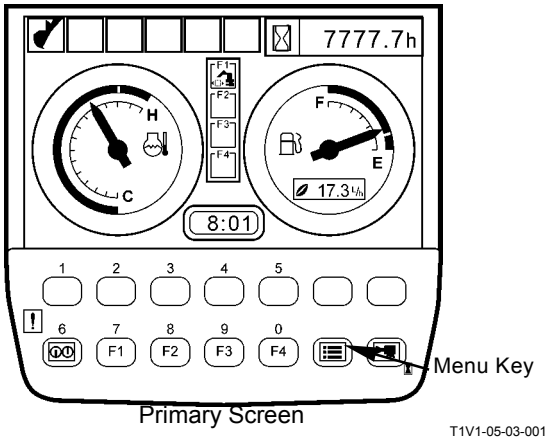
M1J5-01-012



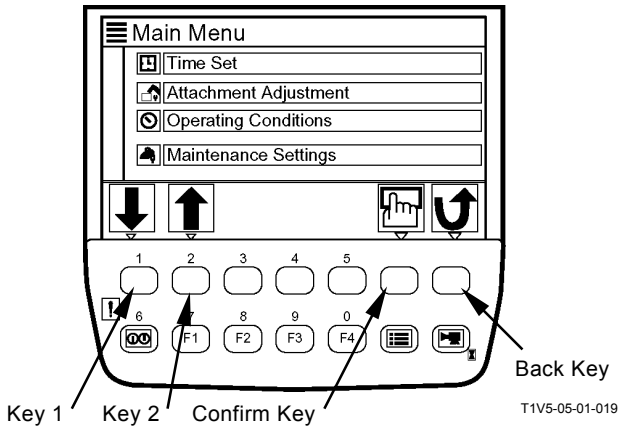
M1J5-01-013

TIME SET

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



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

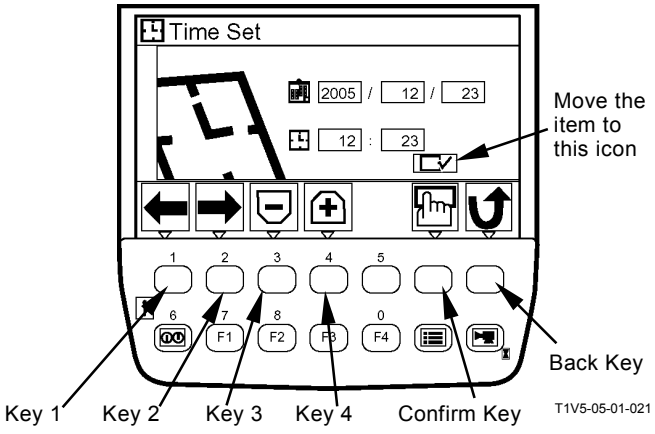


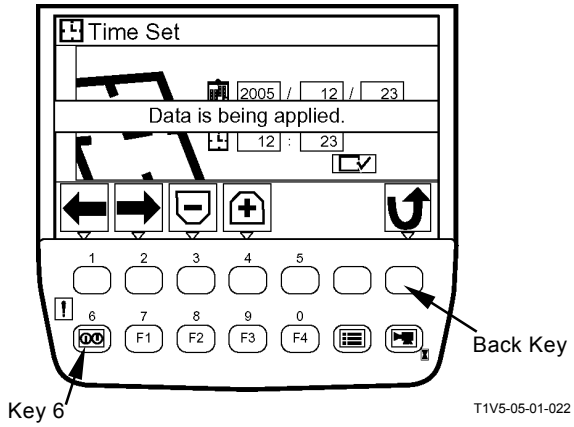
3. On the time set screen, select the items to be set (Year, Month, Day and Time) by using keys 1 and 2, and set the figures by using keys 3 and 4.

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

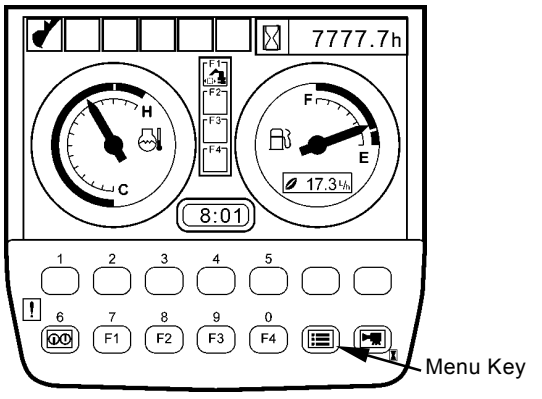




FUEL RATE DISPLAY/NO DISPLAY

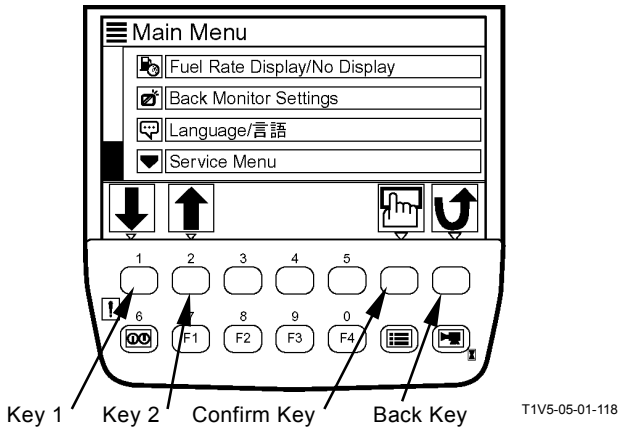
Fuel Rate Display

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



Primary Screen T1V1-05-03-001

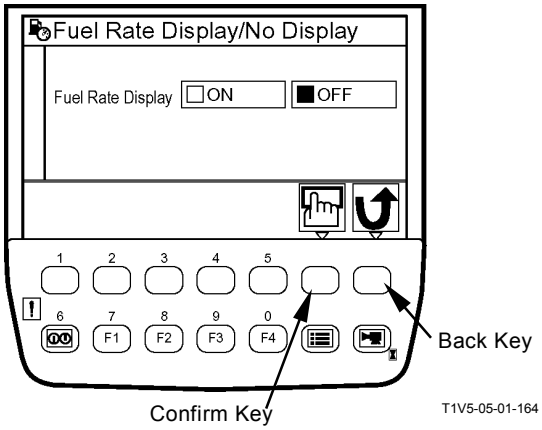
2. Select fuel rate display/no display from main menu by using keys 1 and 2. Push the confirm key. Then, the fuel rate display/no display screen appears.



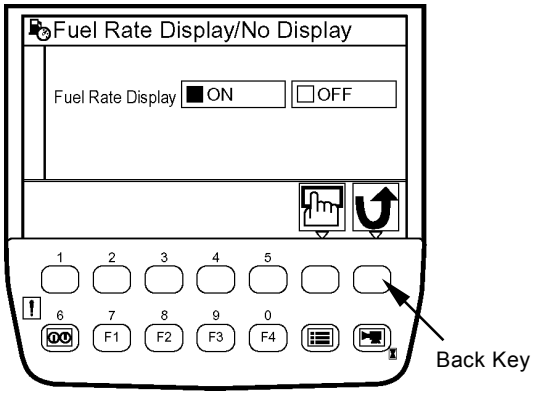
T1V5-05-01-118

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

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

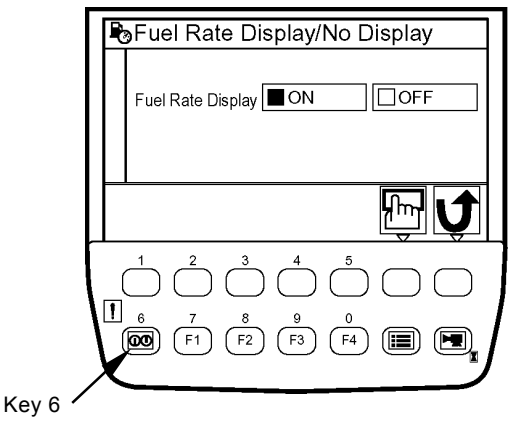


T1V5-05-01-164

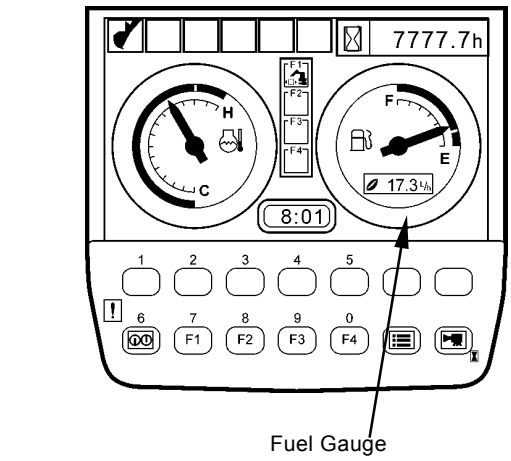


T1V5-05-01-119

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



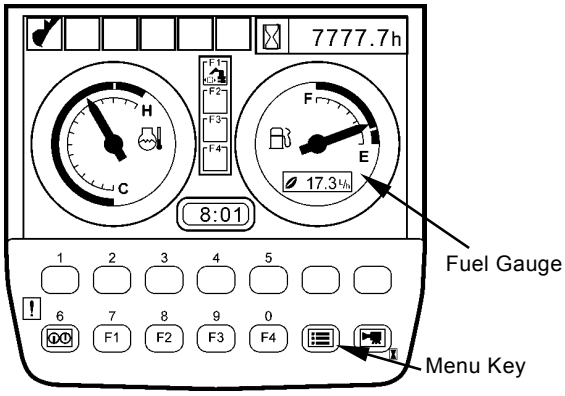
T1V5-05-01-119



T1V1-05-03-001

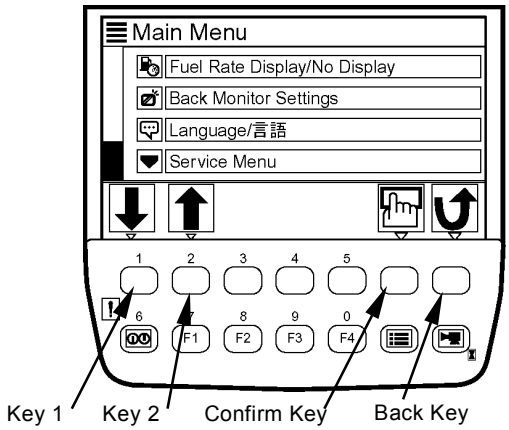
Fuel Rate No Display

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



Primary Screen T1V1-05-03-001

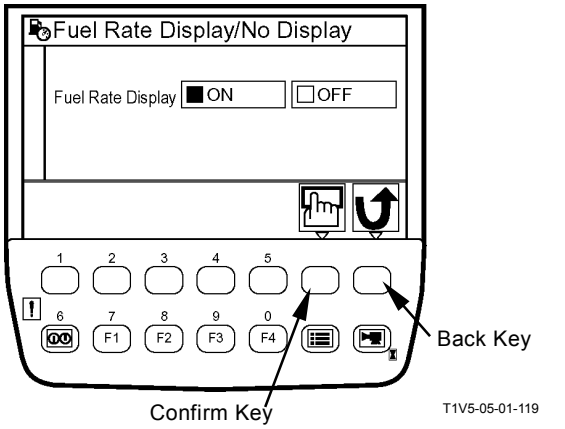
2. Select fuel rate display/no display from main menu by using keys 1 and 2. Push the confirm key. Then, the fuel rate display/no display screen appears.



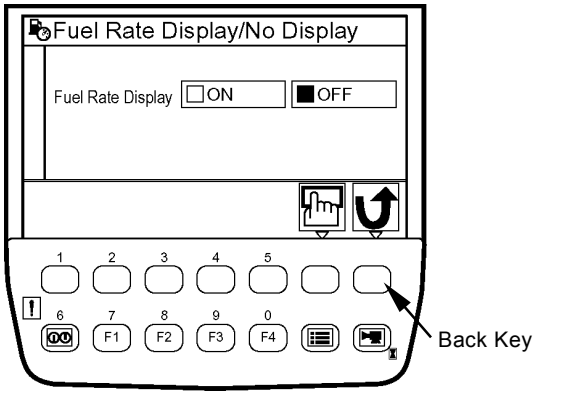
T1V5-05-01-118

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

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

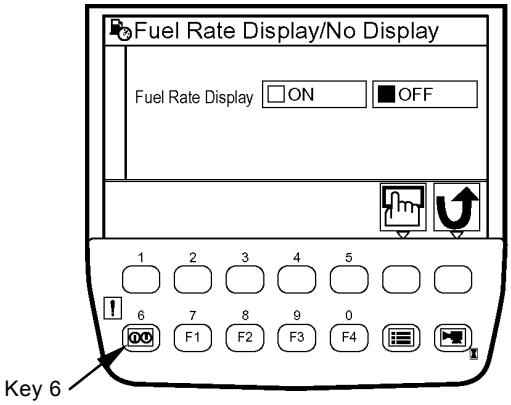


T1V5-05-01-119

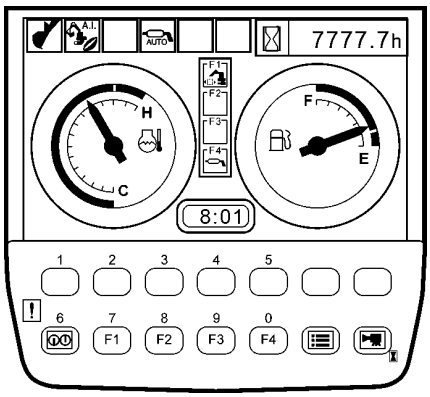


T1V5-05-01-164

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



T1V5-05-01-164



Primary Screen

M1J1-01-002

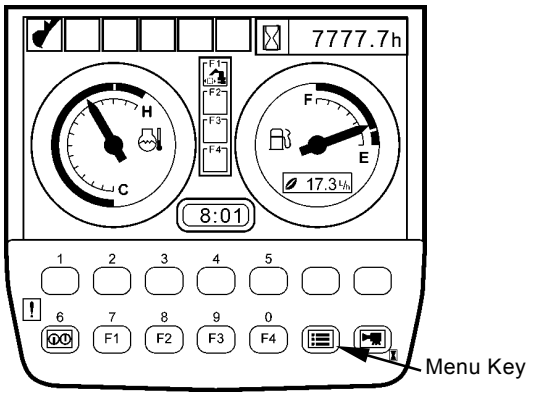
BACK MONITOR SETTINGS

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

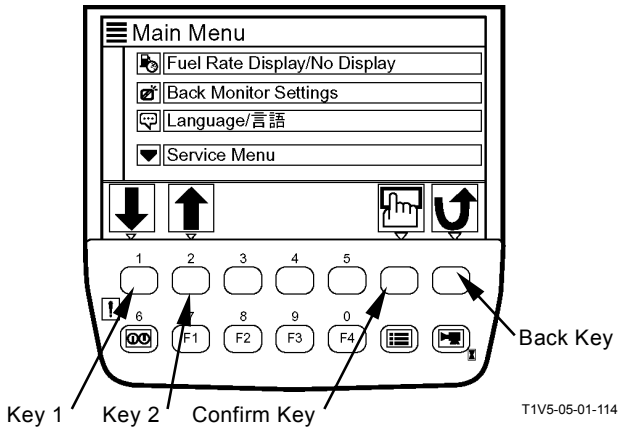
Image on the monitor unit when traveling is automatically switched to that of the back monitor.

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



Primary Screen T1V1-05-03-001

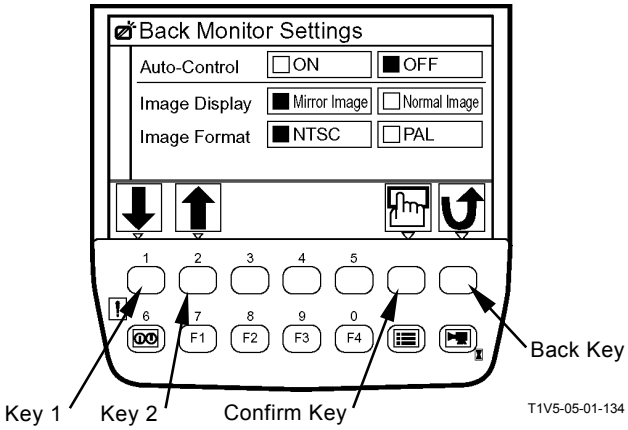
2. Select back monitor settings from main menu by using keys 1 and 2. Push the confirm key. Then, the back monitor settings screen appears.



T1V5-05-01-114

3. Select auto-control by using keys 1 and 2. Push the confirm key. Then, auto-control is set to ON.

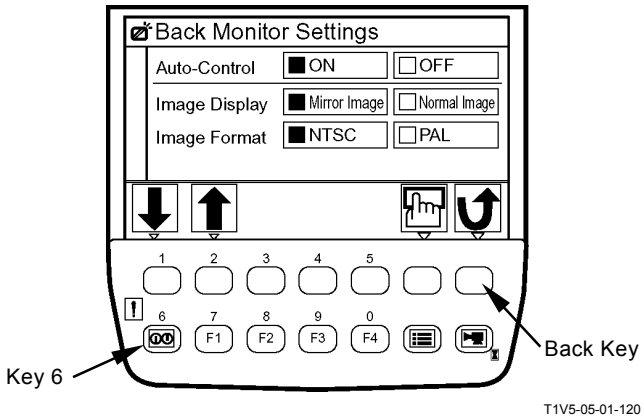
NOTE: When pushing the back key, return to the primary screen.



T1V5-05-01-134

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.

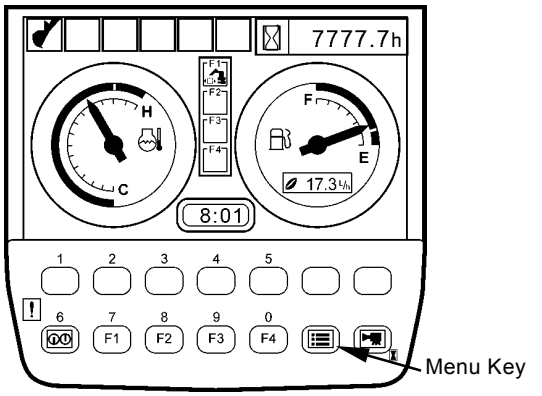


T1V5-05-01-120

Auto-Control: OFF

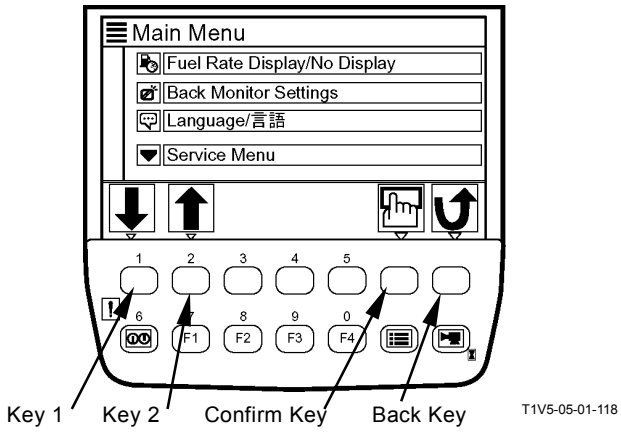
Set automatic switching function of images between monitor unit and back monitor when traveling to OFF.

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



Primary Screen T1V1-05-03-001

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.

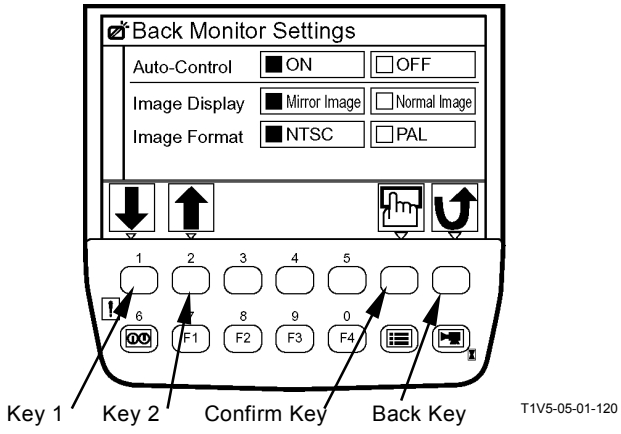


T1V5-05-01-118

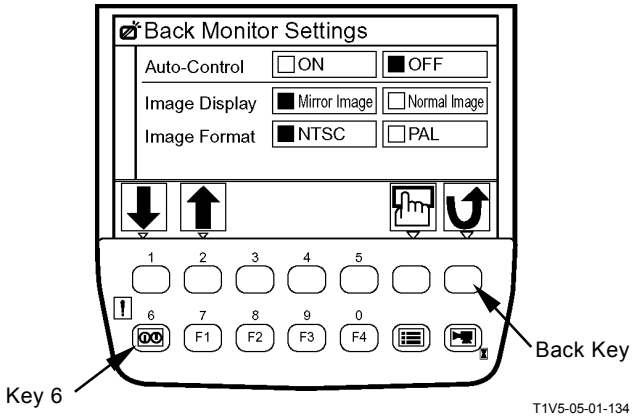
3. Select auto-control by using keys 1 and 2. Push the confirm key. Then, auto-control is set to OFF.

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

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



T1V5-05-01-120

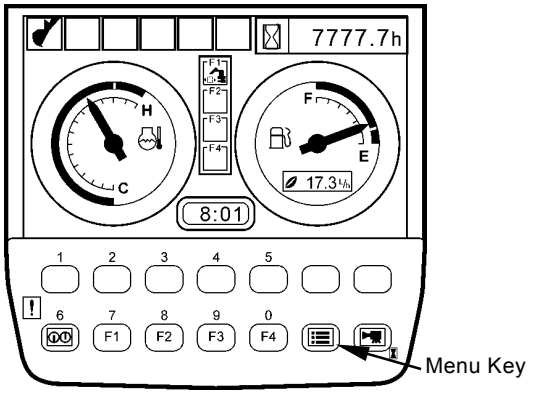


T1V5-05-01-134

Switching Image Display

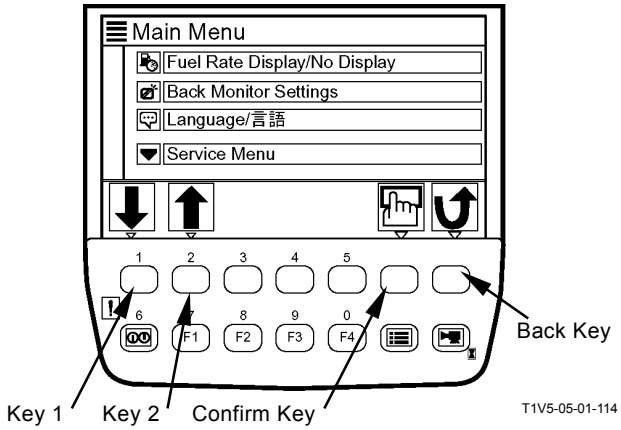
- From mirror image to normal image

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



Primary Screen T1V1-05-03-001

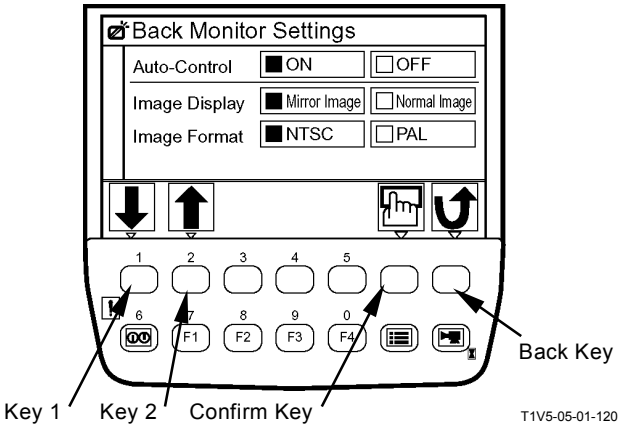
2. Select back monitor settings from main menu by using keys 1 and 2. Push the confirm key. Then, the back monitor settings screen appears.



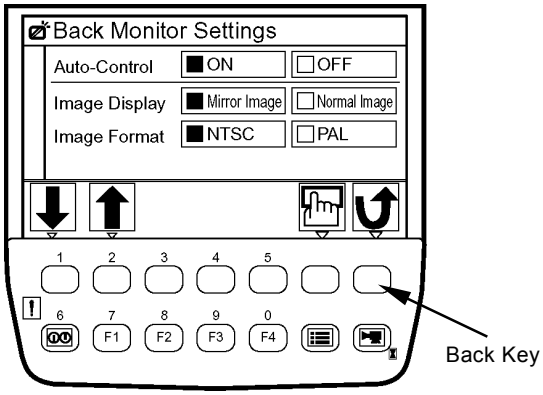
T1V5-05-01-114

3. Select mirror image by using keys 1 and 2. Push the confirm key. Then, the setting is switched to normal image.

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

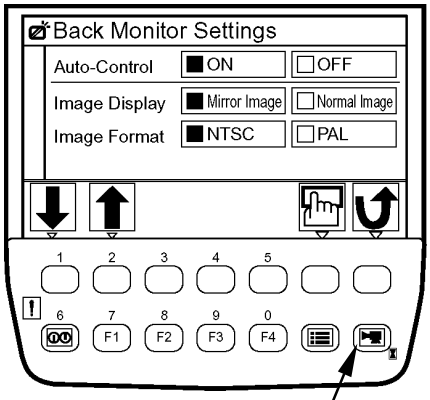


T1V5-05-01-120



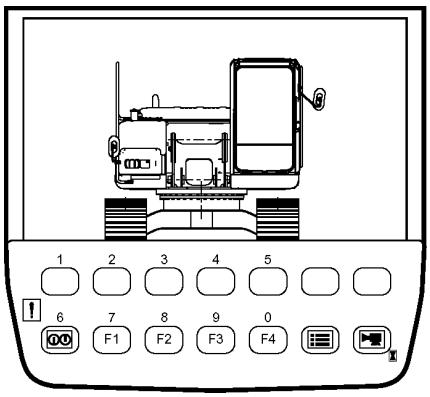
T1V5-05-01-120

4. Push the back monitor switching key, and normal image is displayed on the screen.



Back Monitor Switching Key

T1V5-05-01-120

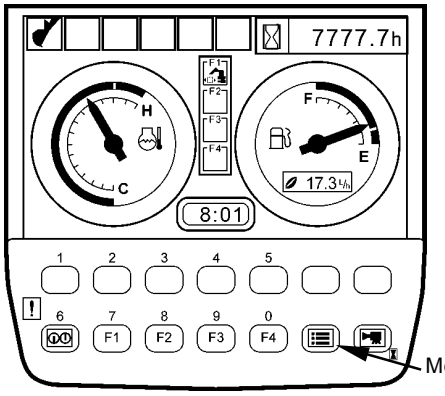


Normal Image

T1V1-05-01-126

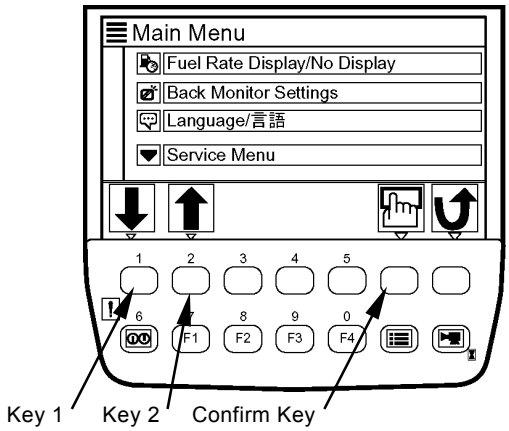
- From normal image to mirror image

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



Primary Screen T1V1-05-03-001

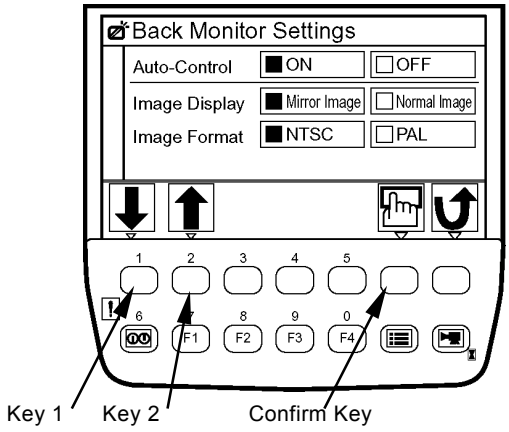
2. Select back monitor settings from main menu by using keys 1 and 2. Push the confirm key. Then, the back monitor settings screen appears.



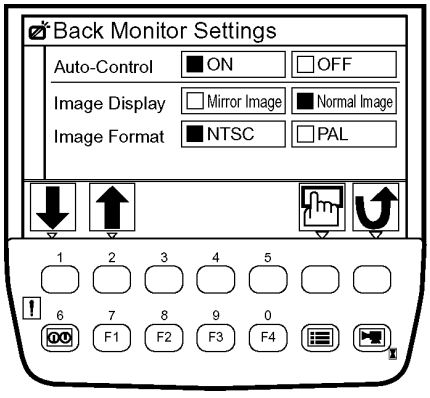
T1V5-05-01-114

3. Select normal image by using keys 1 and 2. Push the confirm key. Then, the setting is switched to mirror image.

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

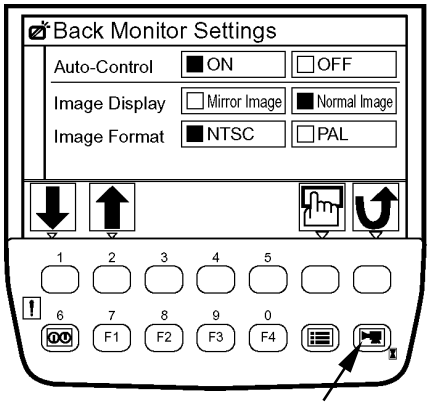


T1V5-05-01-120



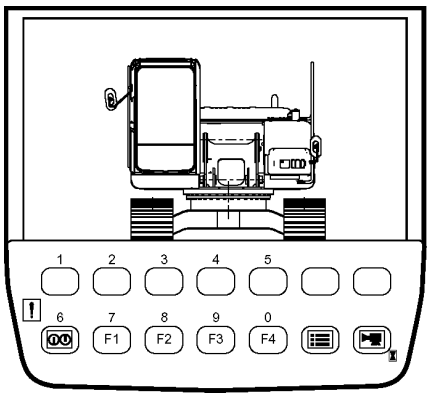
T1V5-05-01-135

4. Push the back monitor switching key, and mirror image is displayed on the screen.



Back Monitor Switching Key

T1V5-05-01-135



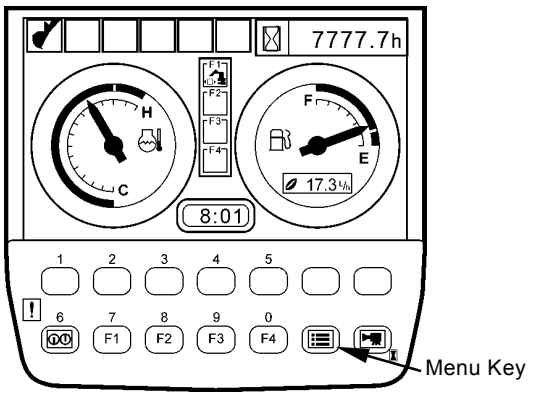
Mirror Image

T1V1-05-01-127

Switching Image Format

IMPORTANT: If changing the rear view camera to one with PAL image format, change the image format of the back monitor to PAL.

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



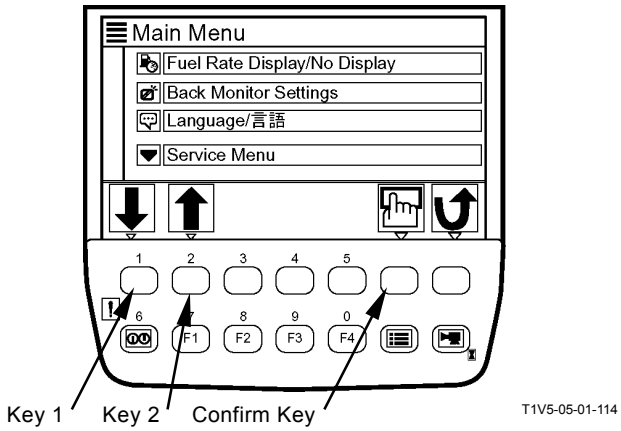
Primary Screen T1V1-05-03-001

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.

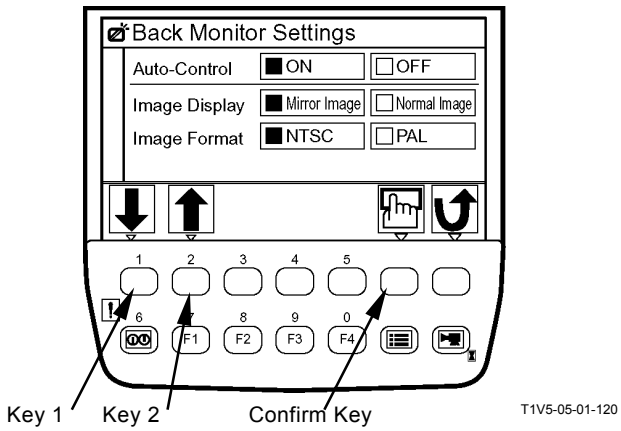
3. Select "PAL" for image format by using keys 1 and 2. Push the confirm key. Then, the setting of image format is switched to "PAL".

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

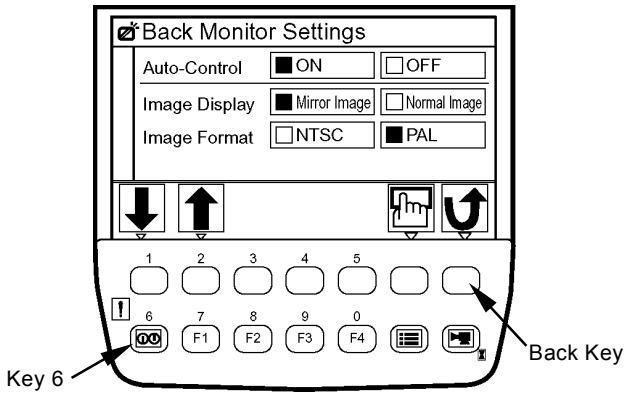
4. Push key 6, and return to the primary screen.



T1V5-05-01-114



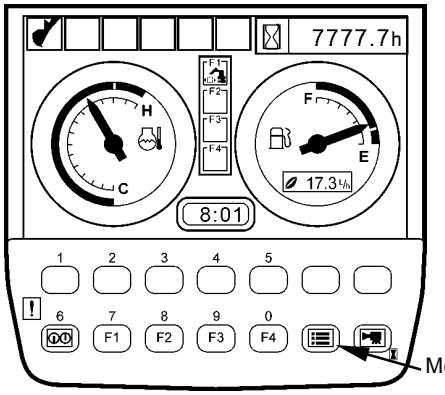
T1V5-05-01-120



T1V5-05-01-136

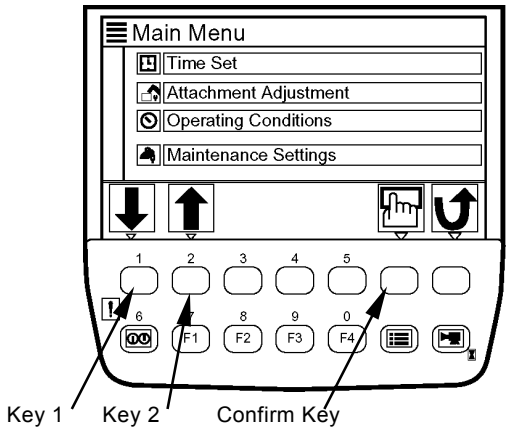
MAINTENANCE SETTINGS

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



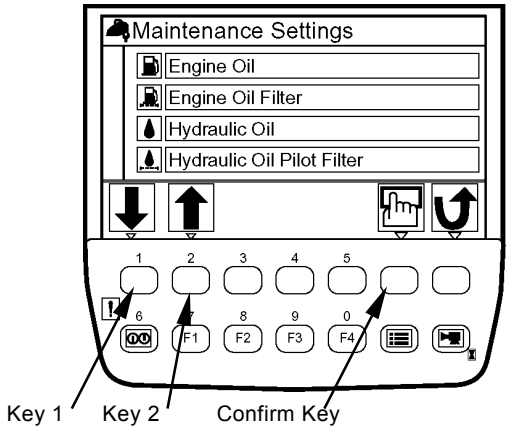
Primary Screen T1V1-05-03-001

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 settings screen appears.
(In the right example, Engine Oil is selected.)

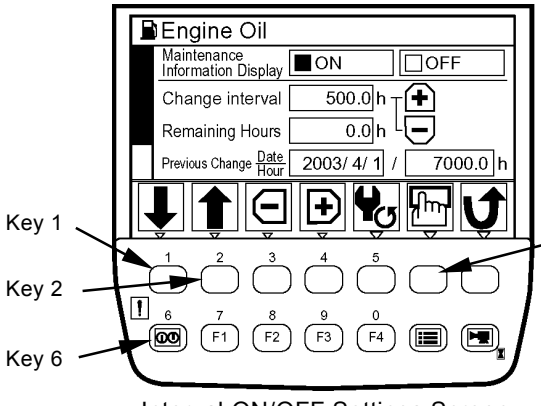


T1V5-05-01-049

Maintenance Information Display ON/OFF

1. Select ON or OFF for maintenance information display by using keys 1 and 2. Push the confirm key.
   - ON: When time comes to change, an information message is displayed on the screen.
   - OFF: No information message is displayed.

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

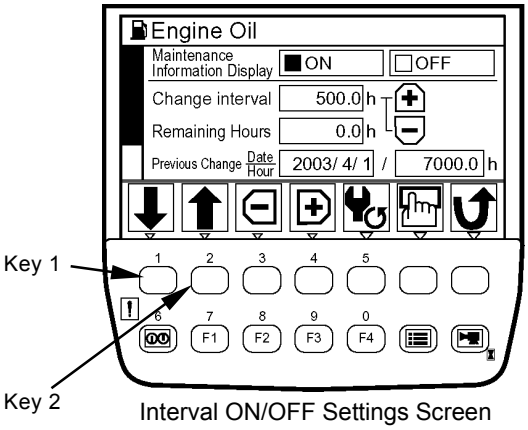


Interval ON/OFF Settings Screen T1V5-05-01-052

Change Interval Settings

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

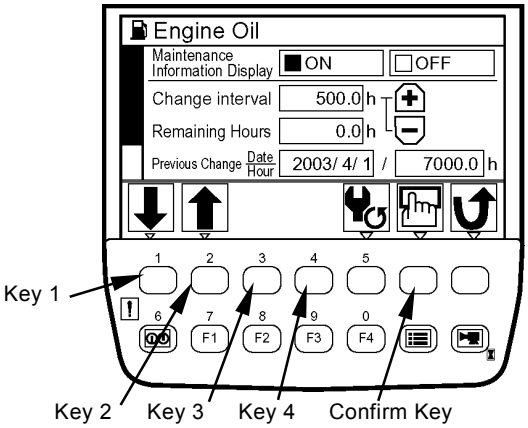
1. Select change interval by using keys 1 and 2.



Interval ON/OFF Settings Screen

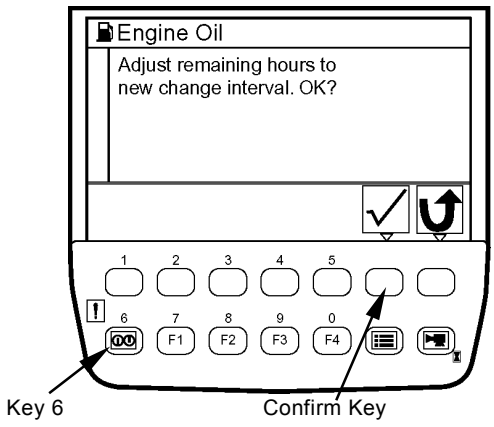
T1V5-05-01-052

2. Set time for change interval by using keys 3 and 4.
3. Select remaining hours by using keys 1 and 2, and push confirm key.

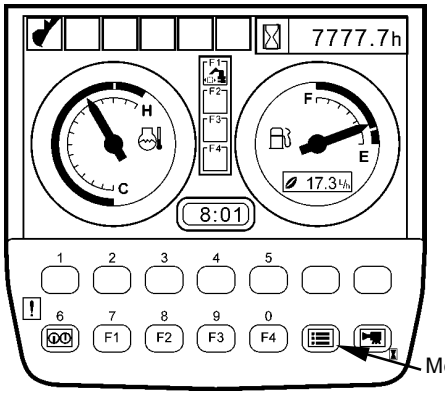


T1V5-05-01-138

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.



T1V5-05-01-139

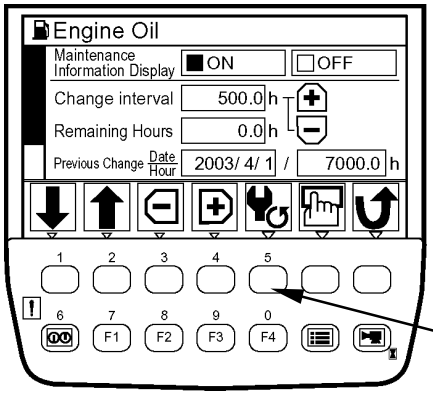


Primary Screen

T1V1-05-03-001

Resetting Data

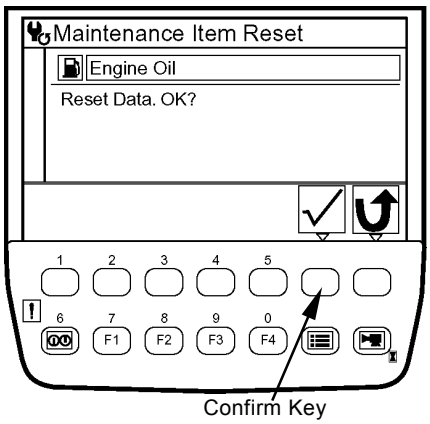
1. If data is reset, push key 5 on the Interval ON/OFF settings screen.



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

2. The message "Reset Data. OK?" appears. Then, push the confirm key.

3. The value of remaining hours is reset to that of change interval. Previous change date/hour is updated with current date and time.



T1V5-05-01-140

Screen Display when Maintenance Information Display is ON

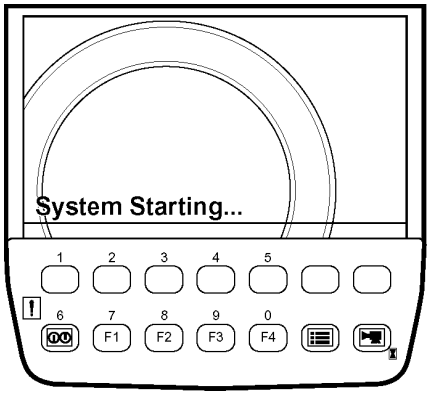
- When only one item applies
  1. If turning the key switch to the ON position, the starting screen appears. Then, the scheduled maintenance screen for the item whose change interval has expired appears for three to ten seconds. Finally the primary screen appears.
     (In the right example, Hydraulic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

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

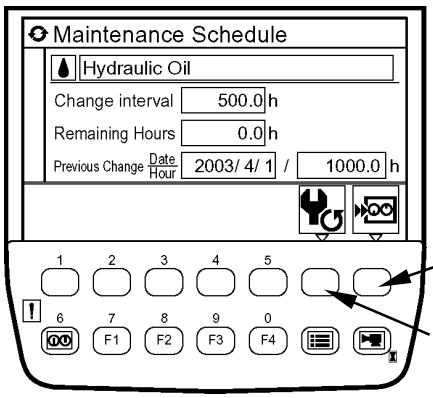
  2. If data is rest, push the reset key while the scheduled maintenance screen is displayed.
     The message "Reset Data. OK?" appears. Then, push the confirm key.
     The value of remaining hours is reset to that of change interval. Previous change date/hour is updated with current date and time.

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

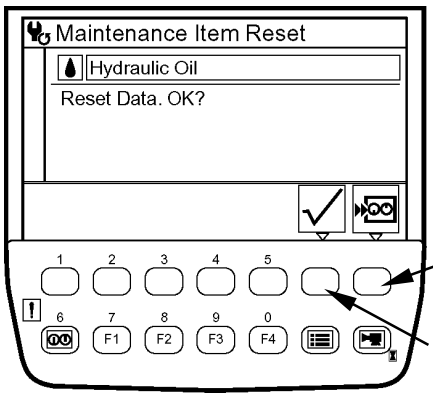
NOTE: When pushing the back key while reset screen is displayed, return to the maintenance information display screen.



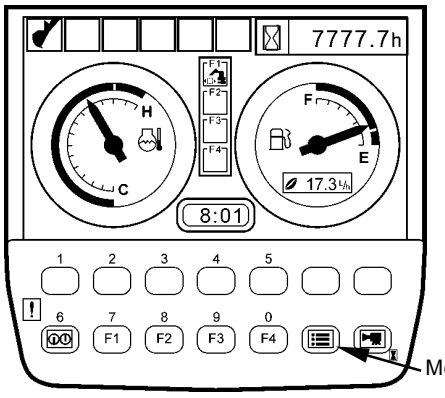
Starting Screen T1V1-05-01-115



Maintenance Information Display Screen T1V5-05-01-170



Reset Screen T1V5-05-01-171



Primary Screen T1V1-05-03-001

- When more than two items apply

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 three to ten seconds. Finally the primary screen appears.

NOTE: 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 three to ten seconds, after the password is input successfully and the confirm key is pushed. And then the primary screen appears.

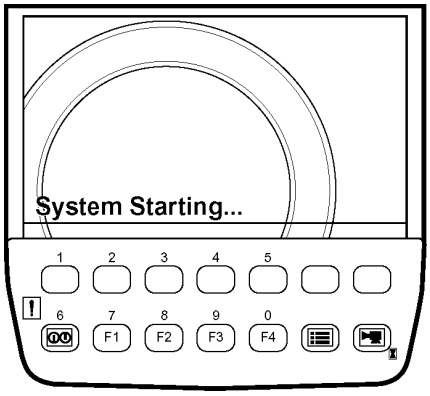
2. If data is reset, while the scheduled maintenance screen is displayed, select desired item by using keys 1 and 2. Push the confirm key. Then, the maintenance information display screen for the selected item appears.
   (In the right example, Hydraulic Oil is selected.)

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

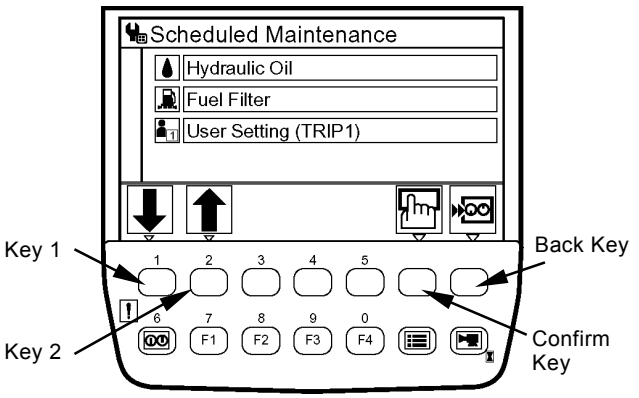
3. Push the reset key while the maintenance information display screen is displayed.
   The message "Reset Data. OK?" appears. Then, push the confirm key.
   The value of remaining hours is reset to that of change interval. previous change date/hour is updated with current date and time.

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

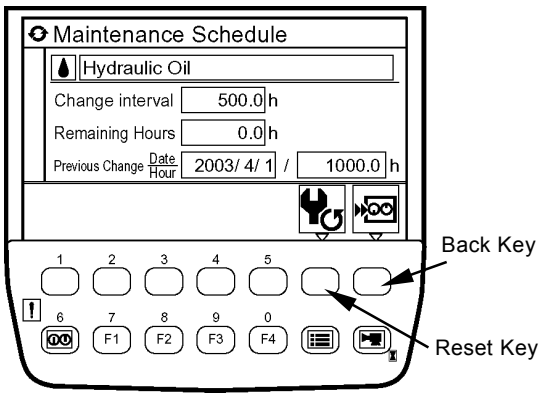
NOTE: When pushing the back key while the reset screen is displayed, return to the maintenance information display screen.



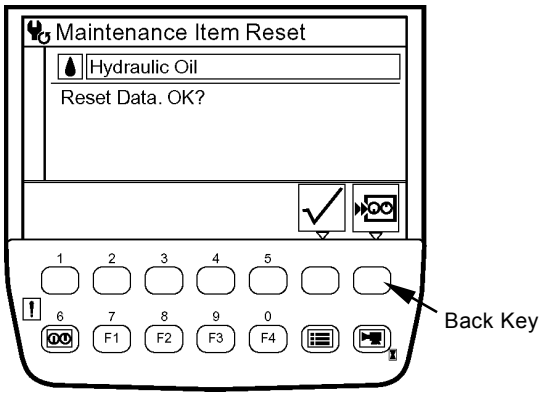
Starting Screen T1V1-05-01-115



Scheduled Maintenance Screen T1V5-05-01-169



Maintenance Information Display Screen T1V5-05-01-170



Reset Screen T1V5-05-01-171

LANGUAGE SETTINGS

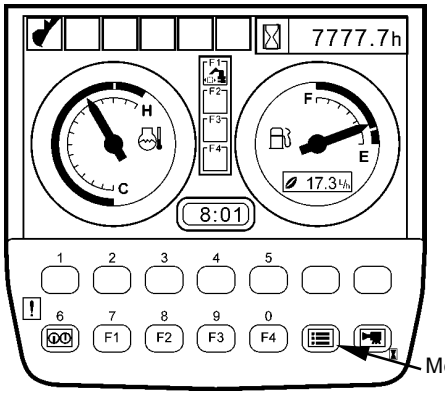
1. When the primary screen appeared, push the menu key and display main menu.

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

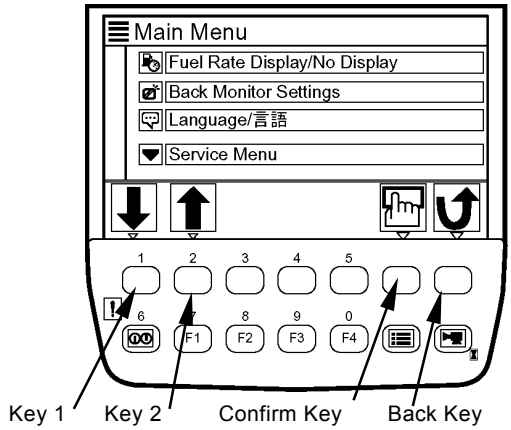
3. Select a desired language by using keys 1 and 2. Push the confirm key.

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 section)

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

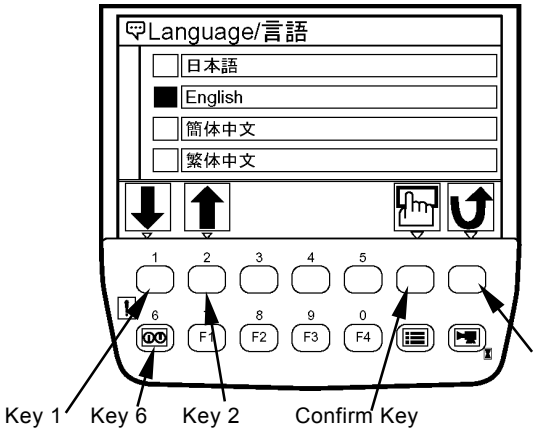


Primary Screen T1V1-05-03-001



T1V5-05-01-114

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



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 (Simplified)	簡体中文 T1V1-05-01-143
Chinese (Traditional)	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

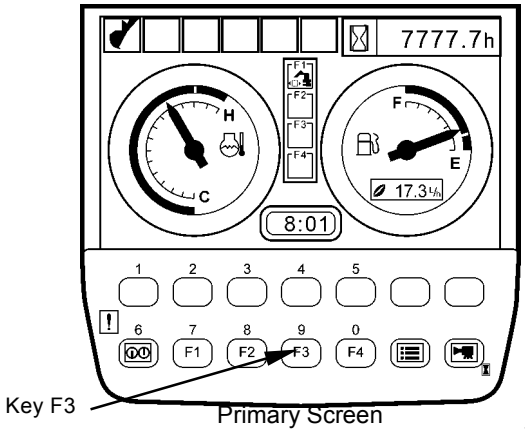
Display Languages 2

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
Dutch	Nederlands T1V1-05-01-157
Russian	Русский T1V1-05-01-158
Portuguese	Português T1V1-05-01-159
Finnish	Suomi T1V1-05-01-160
Swedish	Svensk T1V1-05-01-161
Norwegian	Norsk T1V1-05-01-162
Danish	Dansk T1V1-05-01-163

Mail (Optional)

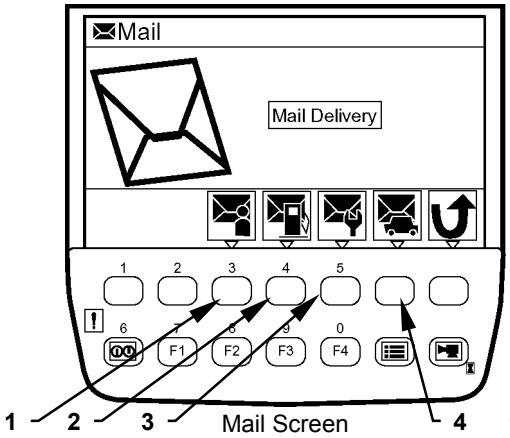
IMPORTANT: This function is available only to a machine equipped with a satellite terminal.
When using the mail function, make the mail function available by using Dr. ZX.

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



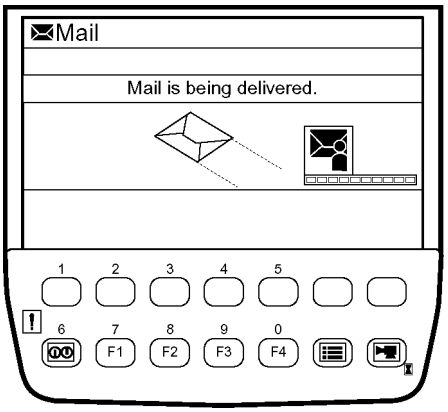
T1V1-05-03-001

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



T1V5-05-01-037

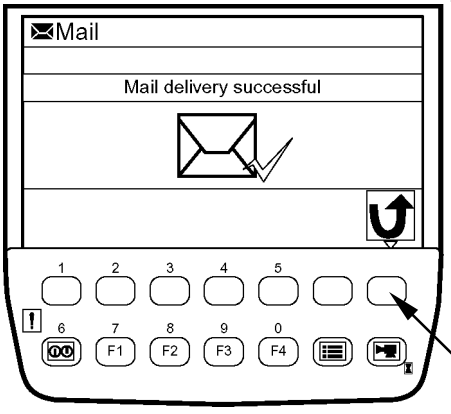
3. While mail information is sent to ICF, the message "Mail is being delivered." is displayed on the screen.



T1V5-05-01-038

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.

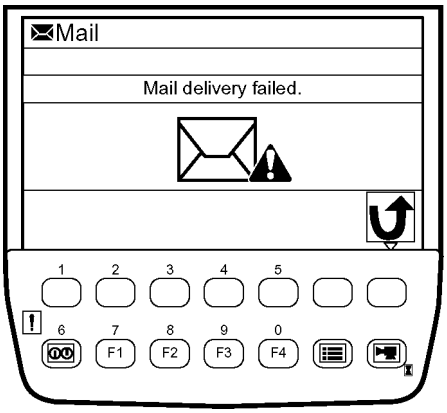
5. Then, a mail is sent from the satellite terminal to the central server via the satellite.



T1V5-05-01-039

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

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



T1V5-05-01-040

(Blank)

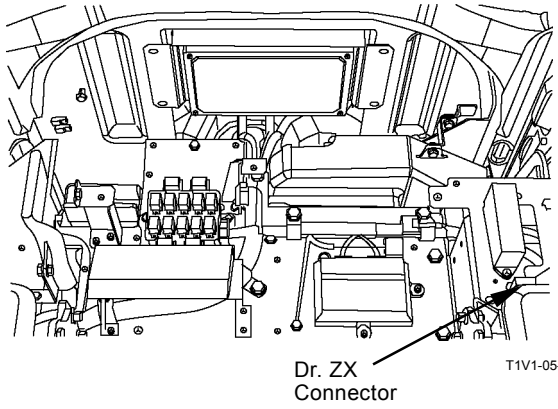
OUTLINE

Dr. ZX is used for diagnosis of electrical system including MC, ECM, 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-Diagnostic Result)

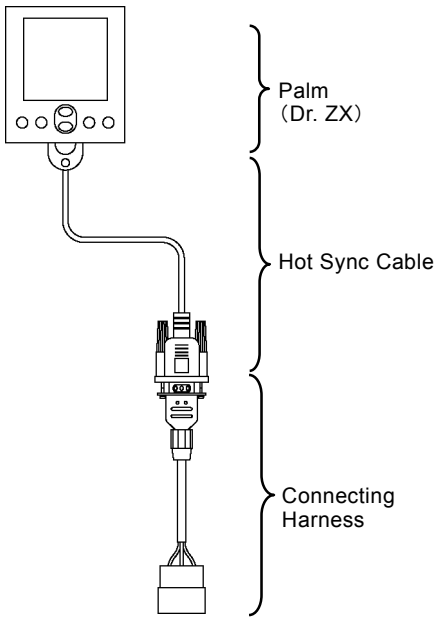
Dr. ZX displays the input status of sensors and switches connected to each controller and the output status to actuator including solenoid valve from controller with the machine operated in real time. (Controller Diagnosis)

Operation

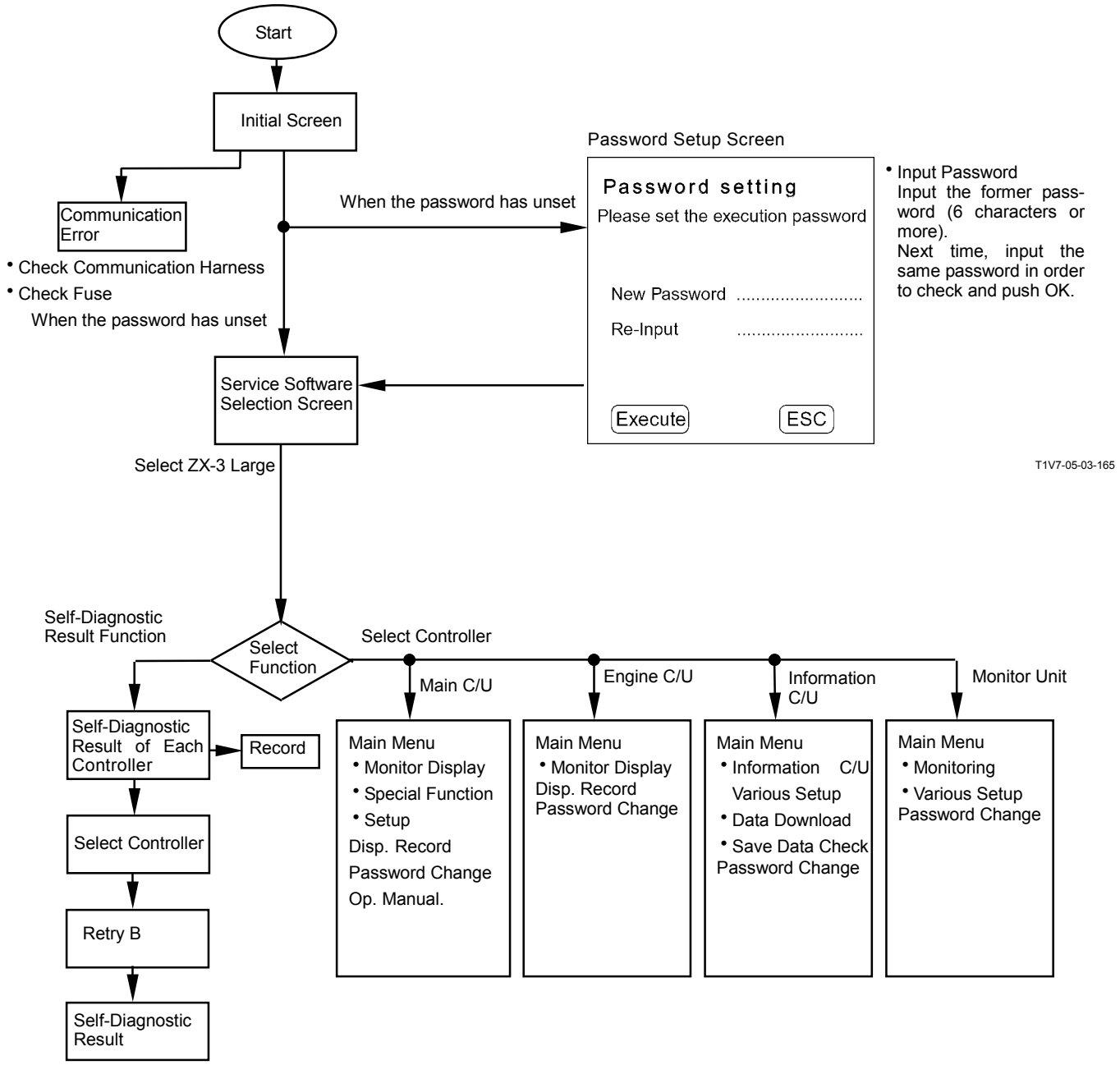
1. Connect Palm (Dr. ZX) to the diagnosing connector in the cab by using the Hot Sync cable and connecting harness.
2. Turn the key switch ON or start the engine.
3. When turning Palm ON, the following screen is displayed on the display of Palm.
   - Initial Screen:
     Select Dr. ZX icon.
   - Password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



T1V1-05-07-001

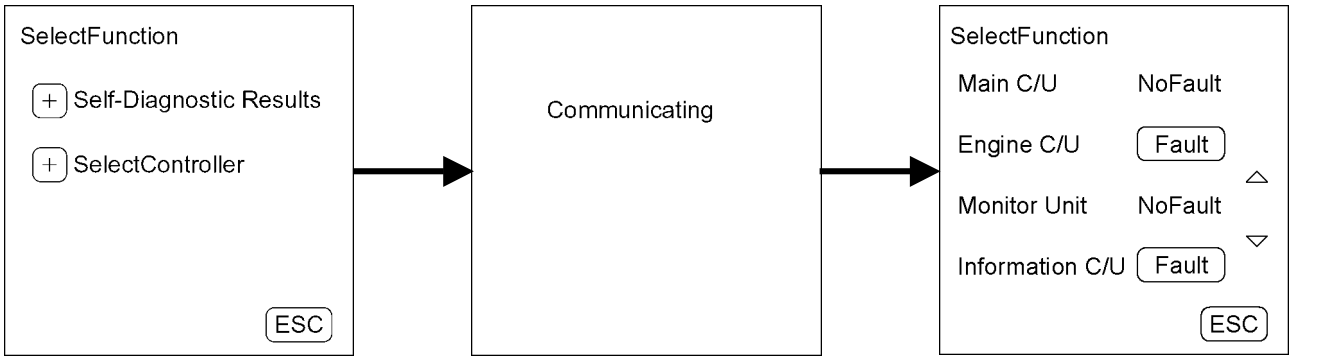


T1V1-05-07-002


Start
Initial Screen
Communication Error
• Check Communication Harness
• Check Fuse
When the password has unset
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 Large
T1V7-05-03-165
Self-Diagnostic Result Function
Select Function
Select Controller
Main C/U
Engine C/U
Information C/U
Monitor Unit
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
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 RESULTS

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

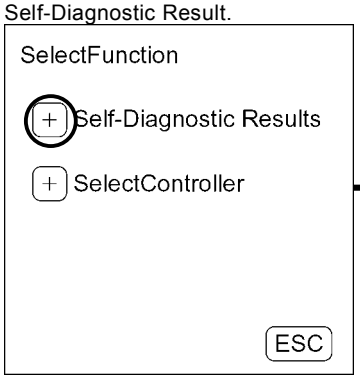
T1V7-05-03-002
Controller Self- Diagnosis Screen

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.

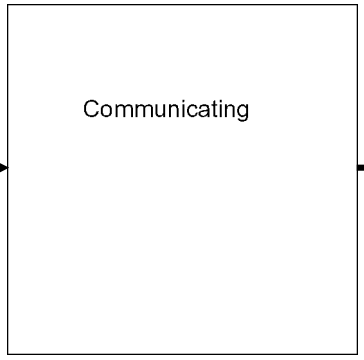
Self-Diagnosis

After starting Dr. ZX, push Self-Diagnostic Result.



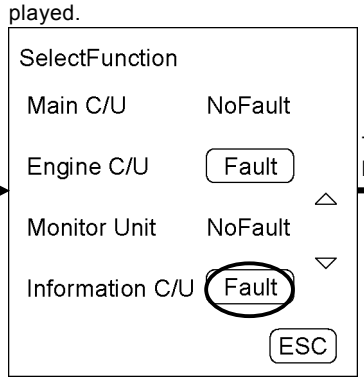
T1V7-05-03-001

Function Selection Screen



T1V7-05-03-008

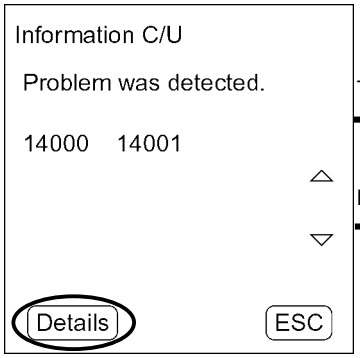
Push Fault of ICF Controller. In case of no faulty, No Fault is displayed.



T1V7-05-03-002

Controller Self- Diagnosis Screen

Push Details, and Details of the fault code and Corrective Action are displayed.
Push ESC and Retry B is displayed.



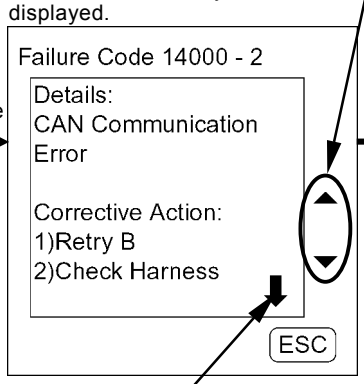
T1V7-05-03-003

Trouble

ESC

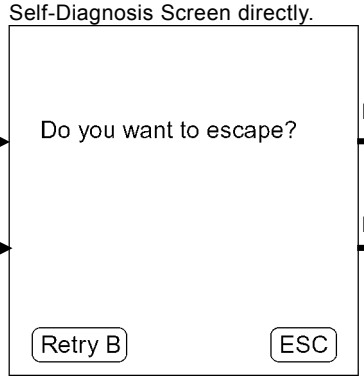
By changing the page, the forward and backward fault code is displayed.

Push ESC and Retry B Screen is displayed.



T1V7-05-03-005

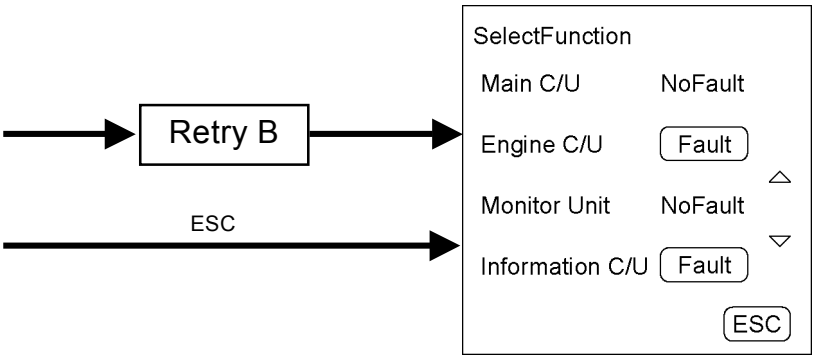
Push Retry B and return to Controller Self-Diagnosis Screen after executing Retry B.
Push ESC and return to Controller Self-Diagnosis Screen directly.



T1V7-05-03-007

Retry B Screen

If the message of Details is long, push the arrow and change the screen.

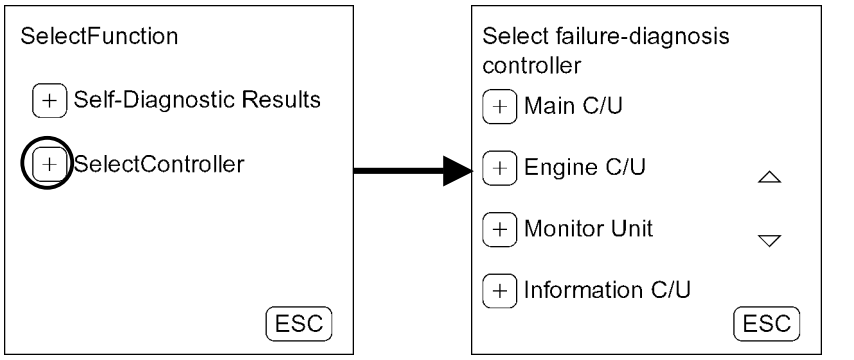


T1V7-05-03-002

Controller Self- Diagnosis Screen

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*

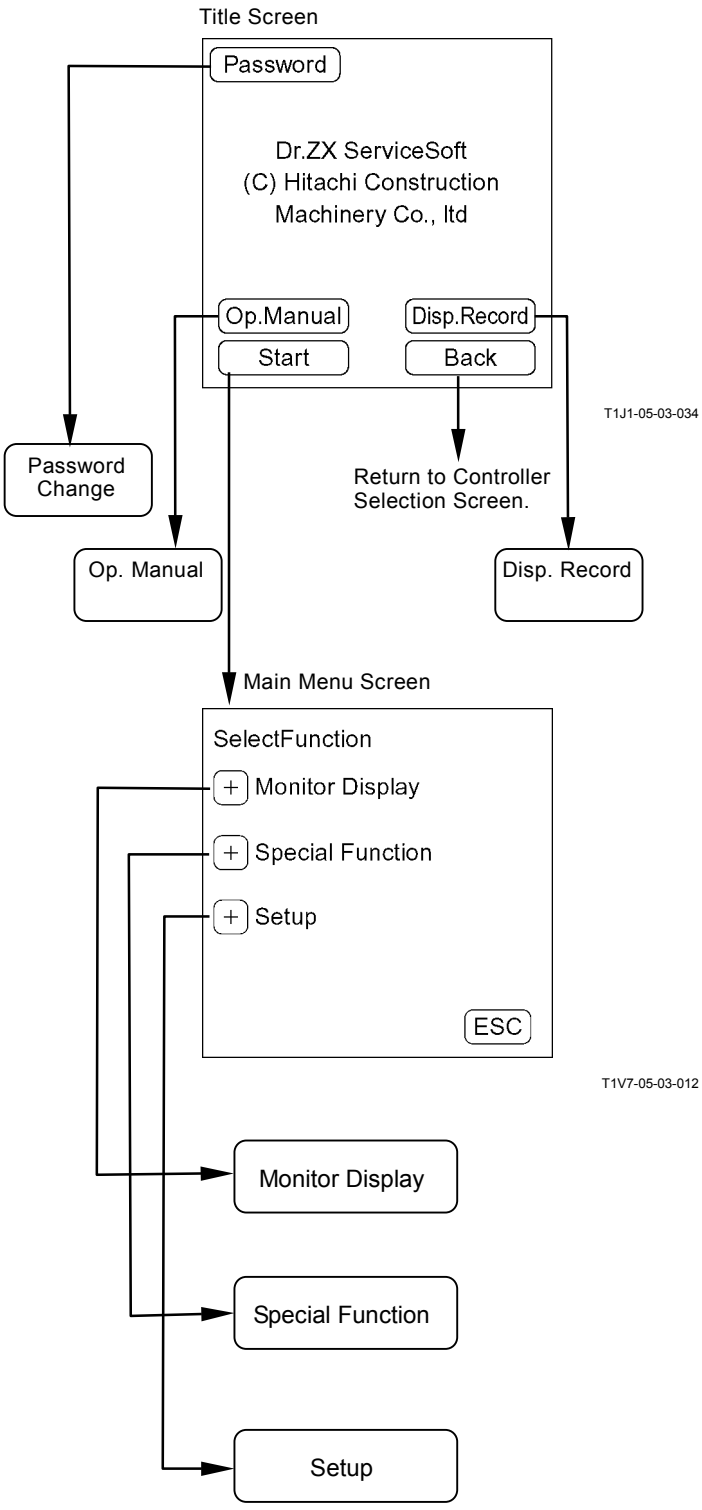
MAIN CONTROLLER

- Password:
  Changes the password input when setting.

- Operation Manual:
  Refer to the procedure of pump learning setup.

- Recorded Data:
  Displays data recorded in MC by one day by using Dr. ZX.

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



MAIN MENU MONITOR DISPLAY (MC)

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

List of Monitor Item

Item		Unit	Data
Selecting	Monitoring		
Requested Engine Speed	Req. Eng	min^{-1}	Input signal from engine control dial
Engine Torque	Engine Torque	%	Input signal from ECM
Actual Engine Speed	Actual Speed	min^{-1}	Input signal from ECM
Engine Speed Deviation	Eng Speed Deviat	min^{-1}	Input signal from ECM
Pump 1 Delivery Pressure	P1 Delivery Pres	MPa	Input signal from pump 1 delivery pressure sensor
Pump 1 Flow Control Pressure	PC1 Pressure	MPa	Input signal from pump 1 control pressure sensor
Pump 1 Regulator Pressure	P1 Reg. Pres.	MPa	Max. pressure when operating pump 1 (for 4-spool control valve)
Pump 1 Disired Displacement	P1 Disired Disp.	cm^3	Pump 1 flow control taget rate
Pump 1 Target flow Rate	P1 Set Flow Rate	L	Pump 1 flow control taget rate
Pump 2 Delivery Pressure	P2 Delivery Pres	MPa	Input signal from pump 2 delivery pressure sensor
Pump 2 Flow Control Pressure	PC2 Pressure	MPa	Input signal from pump 2 control pressure sensor
Pump 2 Regulator Pressure	P2 Reg. Pressure	MPa	Input signal from pump 2 regulator pressure sensor
Pump 2 Disired Displacement	P2 Disired Disp.	cm^3	Pump 2 flow control target rate
Pump 2 Target flow Rate	P2 Set Flow Rate	L	Pump 2 flow control target rate
Pump 1 Load Factor	P1 Load Factor	%	Load rate of pump 1
Pump 2 Load Factor	P2 Load Factor	%	Load rate of pump 2
EC Dial Angle	Dial Angle	V	Input signal from engine control sensor
Hydraulic Oil Temperature	Hyd Oil Temp.	°C	Input signal from hydraulic temperature sensor
Front Pilot Pressure	Fr Pilot Press	MPa	Max. pressure when operating boom, arm, bucket, swing, counterweight, aux.1 and/or aux.2
Travel Pilot Pressure	TR Pilot Press	MPa	Input signal from pressure sensors (travel left and right)
Boom Raise Pilot Pressure	Boom Raise	MPa	Input signal from pressure sensor (boom raise)
Boom Lowering Pilot Pressure	Boom Lower	MPa	Input signal from pressure sensor (boom lower)
Arm Roll-In (BH) Pilot Pressure	Arm Roll-In (BH)	MPa	Input signal from pressure sensor (arm roll-in)
Arm Roll-Out (BH) Pilot Pressure	Arm Roll-Out (BH)	MPa	Input signal from pressure sensor (arm roll-out)
Bucket Roll-In (BH) Pilot Pressure	Bucket Roll-In (BH)	MPa	Input signal from pressure sensor (bucket roll-in)
Bucket Roll-Out (BH) Pilot Pressure	Bucket Roll-Out (BH)	MPa	Input signal from pressure sensor (bucket roll-out)

Item		Unit	Data
Selecting	Monitoring		
Swing Pilot Pressure	SW Pilot Press	MPa	Input signal from pressure sensor (swing)
Left Travel Pilot Pressure	Left TR Press.	MPa	Input signal from pressure sensor (left travel)
Right Travel Pilot Pressure	Right TR Press.	MPa	Input signal from pressure sensor (right travel)
Att. Control Pilot Pressure	Att. Pilot Press.	MPa	Max. pressure when operating boom, arm, bucket, swing, counterweight, aux.1 and/or aux.2
C/W Removal Pilot Pressure	C/W Removal Press.	MPa	Input signal from pressure sensor (counterweight)
Arm Extend (LD) Pilot Pressure	Arm Extend (LD)	MPa	Input signal from pressure sensor (arm roll-out)
Arm Retract (LD) Pilot Pressure	Arm Retract (LD)	MPa	Input signal from pressure sensor (arm roll-in)
Bucket Tilt-Out (LD) Pilot Pressure	Bucket Tilt-Out (LD)	MPa	Input signal from pressure sensor (bucket tilt-out)
Bucket Tilt-Out (LD) Pilot Pressure	Bucket Tilt-In (LD)	MPa	Input signal from pressure sensor (bucket tilt-in)
Auxiliary 2 Pilot Pressure	AUX Pump 2	MPa	Input signal from pressure sensor (aux.2)
Auxiliary 1 Pilot Pressure	AUX Pump 1	MPa	Input signal from pressure sensor (aux.1)
Boom Bottom Pressure	Bm Bottom Press	MPa	Input signal from boom bottom pressure sensor
E/P SW	E/P SW	P, E	Power mode selection status
HP Mode SW	HP Mode SW	OFF, ON	Power mode selection status
Auto-Idle SW	AI SW	AI	Auto idle switch ON/OFF status
Travel Mode SW	Travel 2-Speed Chg Ovr SW	Lo, Hi	Travel mode switch selection status
Power Boost SW	Power Boost SW	OFF, ON	Power digging switch selection status
Key SW	Key SW	OFF, ON	Key switch ON/OFF status
Fan Reverse SW	Fan Dir. SW	OFF, ON	Fan rotation direction ON/OFF status
Test Mode SW	Fan Test Mode SW	OFF, ON	EN test mode switch ON/OFF status
Load Alarm On/Off SW	Load Alarm On/Off SW	OFF, ON	Overload test switch ON/OFF status
Coolant Level SW	Coolant L SW	OFF, ON	Coolant level ON/OFF status
Engine Oil Level SW	Eng Oil L SW	OFF, ON	Engine oil level switch ON/OFF status
Level Check SW	Level Check SW	OFF, ON	Coolant level switch ON/OFF status
Gate Lock SW	Gate Lock SW	OFF, ON	Pilot shut-off switch ON/OFF status
Boom Mode SW	Bm Mode SW	OFF, ON	Boom mode selector switch ON/OFF status
Blower Motor Relay Signal	Blower MOT Sig.	OFF, ON	Blower motor relay ON/OFF status
Pump Regulator Leaning SW	P Reg. Lean. SW	OFF, ON	Pump regulator pressure leaning switch ON/OFF status
Auto Lubrication Counting SW	Lub. Count. SW	OFF, ON	Auto lubrication limiter switch ON/OFF status

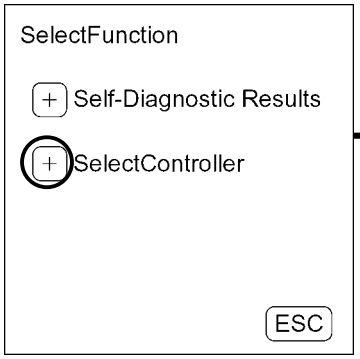
Item		Unit	Data
Selecting	Monitoring		
Picture Change Signal	Picture Change	BK Surveil, Trav. Operat	Rear watching selector switch ON/OFF status and traveling
Loader Bucket (O/C) Flow Change SW	Loader SW	OFF, ON	Loader bucket open/close oil flow switch ON/OFF status
Auxiliary Digital Input 1	AUX. Di 1	OFF, ON	Aux. switch ON/OFF status
Auxiliary Digital Input 2	AUX. Di 2	OFF, ON	Aux. switch ON/OFF status
Auto Lub. Count Time-Out Sel. SW	Lub. Time-Out Sel. SW	A, B	Auto lubrication error time change switch selection status
Power Boost Control Pressure	Pw Boost Ctrl Press	MPa	Control signal to solenoid valve unit (SG)
Travel Motor Control Pressure	Tr M Ctrl Pressure	MPa	Control signal to solenoid valve unit (SI)
Boom Mode Control Pressure	Bm Mode Cont. Press	MPa	Control signal to solenoid valve unit (SC)
Boom Flow Control Pressure	Bm Flow Cont. Press	MPa	Control signal to solenoid valve unit (SF)
Travel Alarm	Travel Alarm	Action, No Action	Travel alarm Action/No Action status
Swing Alarm	Swing Alarm	Action, No Action	Swing alarm Action/No Action status
Load Alarm	Load Alarm	Action, No Action	Load alarm Action/No Action status
Pump 1 Regulator Learning Condition	P1 Reg. Press. L Cond.	Learnable Low Eng Speed Gate Lock Awaked Signal Over Range Save Failed	Pump 1 learning status
Pump 2 Regulator Learning Condition	P2 Reg. Press. L Cond.	Learnable Low Eng Speed Gate Lock Awaked Signal Over Range Save Failed	Pump 2 learning status
Pump 1 & 2 Regulator Learning Condition	P1 & 2 Reg. Press. L St.	1 In, 1 Su, 1 Fa, 1 Le, 2 In, 2 Su, 2 Fa, 2 Le	Pump 1 and pump 2 learning status
Pump 1 Regulator Valve Current	Pump 1 CUR	mA	Control signal to pump 1 oil flow control valve
Pump 2 Regulator Valve Current	Pump 2 CUR	mA	Control signal to pump 2 oil flow control valve
Fan Pump Valve Current	Fan Pump CUR	mA	Control signal to fan pump oil flow control solenoid valve

Item		Unit	Data
Selecting	Monitoring		
Boom Flow Control Valve Current	Bm Flow C. Val. CUR	mA	Control signal to solenoid valve unit (SF)
Fan Reverse Valve 1 Current	Fan Rev. Val. 1 CUR	mA	Control signal to fan reversal solenoid Valve 1
Fan Reverse Valve 2 Current	Fan Rev. Val. 2 CUR	mA	Control signal to fan reversal solenoid Valve 2
Auxiliary Valve 1 Current	AUX. Valve 1 Current	mA	Control signal to aux. solenoid valve
Auxiliary Valve 2 Current	AUX. Valve 2 Current	mA	Control signal to aux. solenoid valve
Lubricating Mode	Lub. Mode	OFF, Auto, Manual	Auto-lubrication selection status, manual (optional)
Auto Lubricate Alarm	Auto Lub. Alarm	Normal, Abnormal	Auto-lubrication status
Lubrication Control Output	Lubrication Cont. Out.	SUS., Comp.	Grease pump status
Current ATT Type	Current ATT Type	BR, PU, CR, VI, Un, Non	Communication from monitor unit
Current ATT No.	Current ATT No.	1, 2, 3, 4, 5	Communication from monitor unit
ATT 1 Type	ATT 1 Type	BR, PU, CR, VI, Un, Non	Communication from monitor unit
ATT 1 No.	ATT 1 No.	1, 2, 3, 4, 5	Communication from monitor unit
ATT 2 Type	ATT 2 Type	BR, PU, CR, VI, Un, Non	Communication from monitor unit
ATT 2 No.	ATT 2 No.	1, 2, 3, 4, 5	Communication from monitor unit
ATT 3 Type	ATT 3 Type	BR, PU, CR, VI, Un, Non	Communication from monitor unit
ATT 3 No.	ATT 3 No.	1, 2, 3, 4, 5	Communication from monitor unit
ATT 4 Type	ATT 4 Type	BR, PU, CR, VI, Un, Non	Communication from monitor unit
ATT 4 No.	ATT 4 No.	1, 2, 3, 4, 5	Communication from monitor unit
ATT 5 Type	ATT 5 Type	BR, PU, CR, VI, Un, Non	Communication from monitor unit
ATT 5 No.	ATT 5 No.	1, 2, 3, 4, 5	Communication from monitor unit

NOTE: ATT: Attachment
BR: Hydraulic Breaker
PU: Secondary Crusher
CR: Hydraulic Crusher
VI: Vibrating Hammer
Un: Other (Special Machine)
Non: Non Selection

Monitor Display

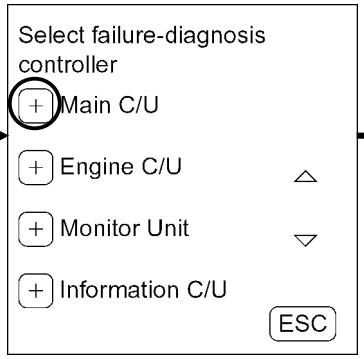
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

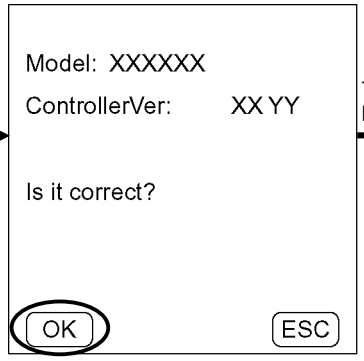
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.

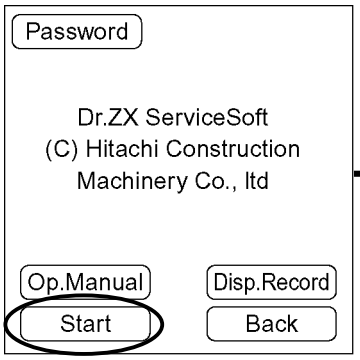


T1J1-05-03-010

Main Controller Screen

To the lower

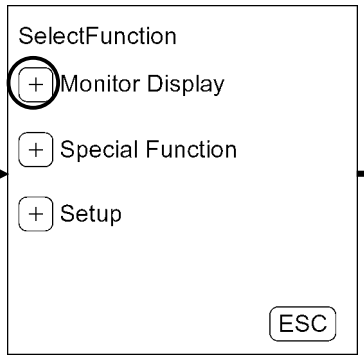
Push Start.



T1J1-05-03-034

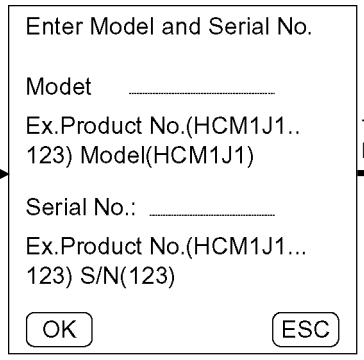
Title Screen

Push Monitor Display.



T1V7-05-03-012

Main Menu Screen

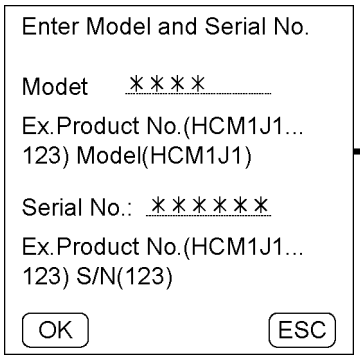


T1J1-05-03-011

Enter Model and Serial No. Screen

To the lower

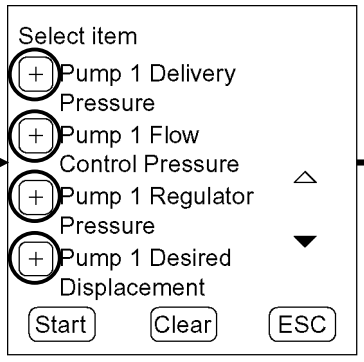
Input the model code and serial No. and push OK. Push ESC and return to Main Menu Screen.



T1J1-05-03-012

Enter Model and Serial No. Screen

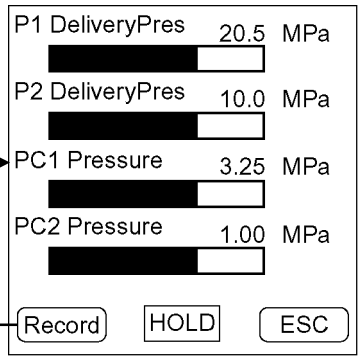
Push the item for Monitor Display and push OK. Refer to T5-3-8 as for the monitor item. Push ESC and return to Main Menu Screen.



T1J1-05-03-013

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.

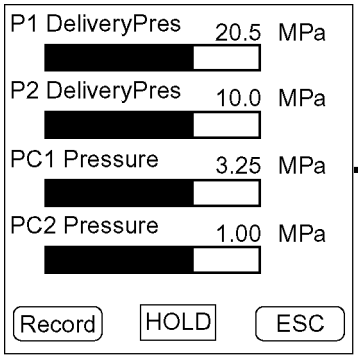


T1J1-05-03-014

Monitor Screen

To the next page

Push Record.

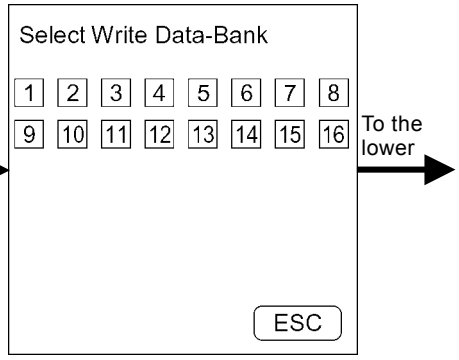


T1J1-05-03-014

Monitor Screen

T1V7-05-03-096

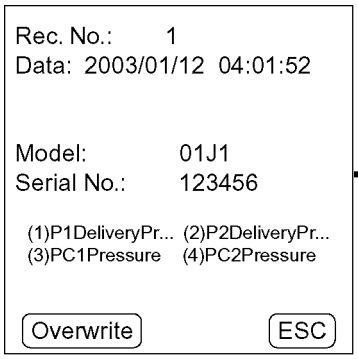
Push Rec. No. and the recording screen for Rec. No. is made.



T1V7-05-03-097

Select Write Data-Bank Screen

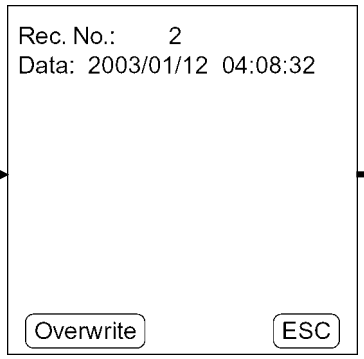
If Rec. No. has already been recorded and push Over Write, data is overwritten. Push ESC and return to Main Menu Screen.



T1J1-05-03-015

Recording Screen

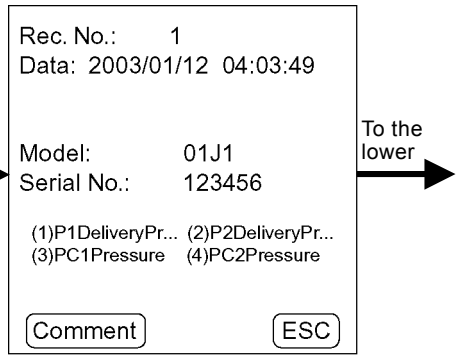
If Rec. No. has not been recorded yet and push Write, data is written to the recording screen. Push ESC and return to Main Menu Screen.



T1V7-05-03-100

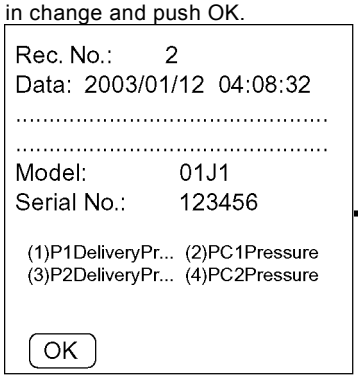
Recording Screen

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



T1J1-05-03-016

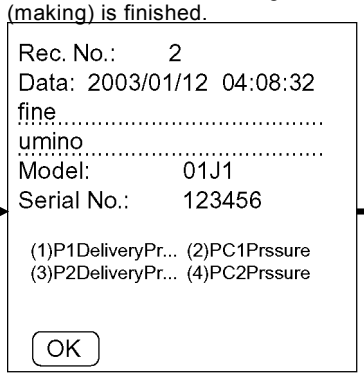
Input Weather and Person's name in change and push OK.



T1J1-05-03-017

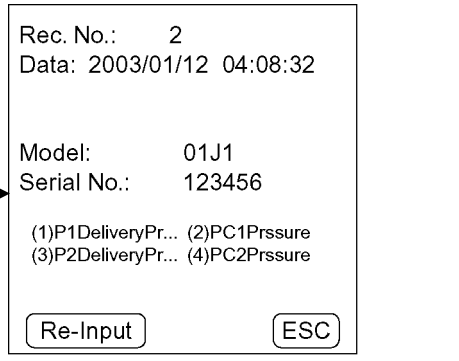
Recording Screen (Comment Input)

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



T1J1-05-03-018

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



T1J1-05-03-019

SPECIAL FUNCTIONS

Deactivation special functions

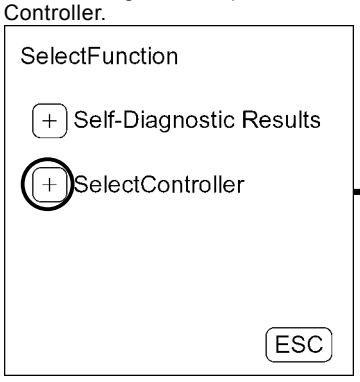
Special Function Item Table

Item	Content
WU Deactivation	Deactivate WU control
ECO Deactivation	Deactivate ECO control
Fan Deactivation	Deactivate fan pump control
HP Deactivation	Deactivate HP mode
Cut-off Deactivation	Deactivate cut-off control

NOTE: ECO deactivation is shown here as example.

Example: ECO Deactivation

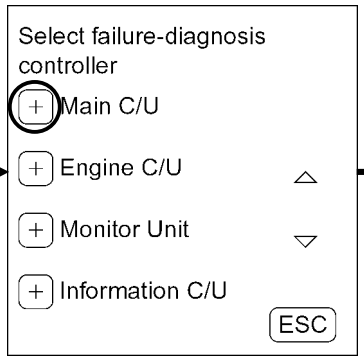
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

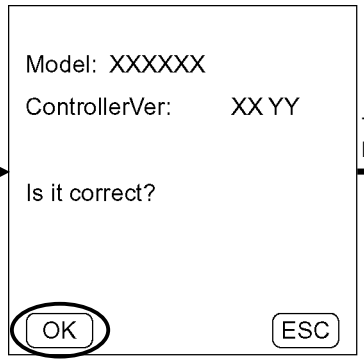
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.

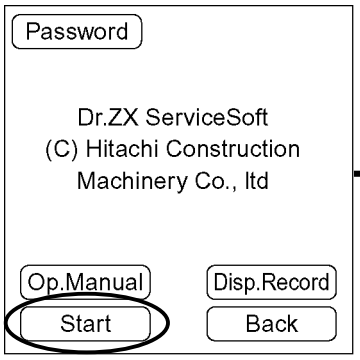


T1J1-05-03-010

Main Controller Screen

To the lower

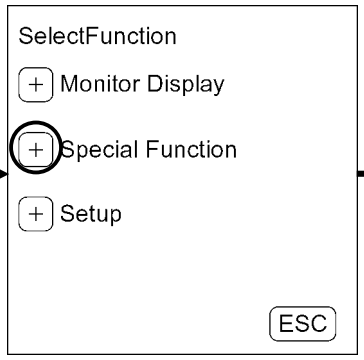
Push Start.



T1J1-05-03-034

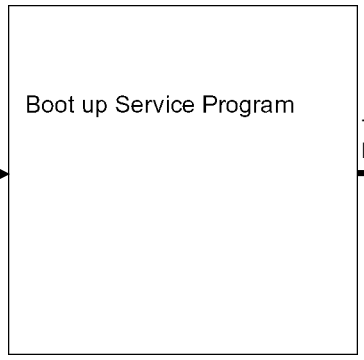
Title Screen

Push Special Function.



T1V7-05-03-012

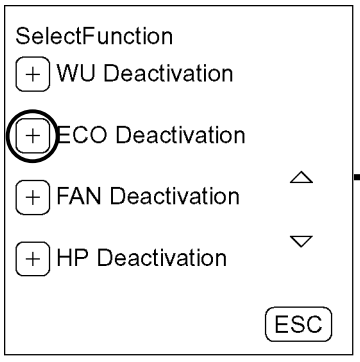
Main Menu Screen



T1V7-05-03-016

To the lower

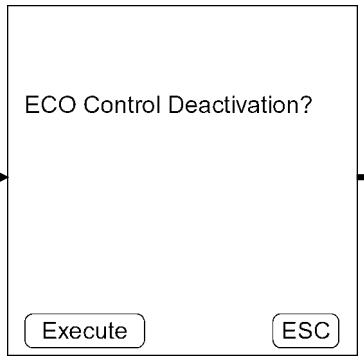
Push ECO Deactivation.
Push ESC and return to Main Menu Screen.



T1J1-05-03-020

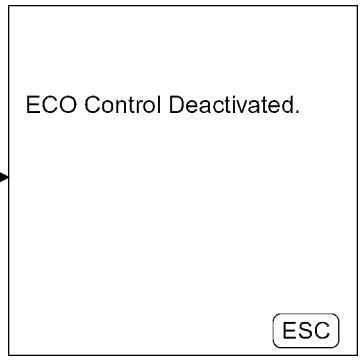
Deactivation Selection Screen

Push Execute.
Push ESC and return to Deactivation Selection Screen.



T1V7-05-03-020

Push ESC and return to Deactivation Selection Screen.



T1V7-05-03-021

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

SETUP

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

Parameter Change

Item	Unit	Data
Li Speed Adjustment	min^{-1}	Adjustment of minimum engine speed
WU Speed Adjustment	min^{-1}	Adjustment of warming up engine speed
AI Speed Adjustment	min^{-1}	Adjustment of auto-idle engine speed
E Speed Adjustment	min^{-1}	Adjustment of E mode engine speed
P Speed Adjustment	min^{-1}	Adjustment of P mode engine speed
HP Speed Adjustment	min^{-1}	Adjustment of HP mode engine speed
PQ Torque Control	N·m	Adjustment of P-Q curve
Pump P1 Torque Adjustment	N·m	Adjustment of Pump 1 P-Q curve
Pump P2 Torque Adjustment	N·m	Adjustment of Pump 2 P-Q curve
ATT Speed Increase Down Waiting Time	ms	Setting of time required for engine speed decrease
ATT Torque Reducing On/Off	ON, OFF	ON/OFF of torque down control when a front attachment is operated
ECO Mode On/Off	ON, OFF	ON/OFF of ECO Control
HP Mode On/Off	ON, OFF	ON/OFF of HP Control
Engine Burglar Proof On/Off	ON, OFF	ON/OFF of engine control theft prevention
Pump Burglar Proof On/Off	ON, OFF	ON/OFF of pump control theft prevention
Load Alarm Min Bottom Pressure	MPa	Setting of minimum boom cylinder bottom pressure over balance
Lubrication Interval Adj.	min	Adjustment of Auto-lubrication interval
Pump 1 Min. Displacement Adj.	cm^3	Adjustment of Pump 1 delivery flow rate
Pump 2 Min. Displacement Adj.	cm^3	Adjustment of Pump 2 delivery flow rate
Pump Cutoff Pressure Adj.	MPa	Adjustment of relief oil flow decrese control
P1 REG. Offset Adj.	MPa	Adjustment of Pump 1 delivery flow rate
P2 REG. Offset Adj.	MPa	Adjustment of Pump 2 delivery flow rate
Boom Flow Control CUR Adj.	mA	Adjustment of solenoid valve unit (SF)
ATT Mode Save On/Off	ON, OFF	ON/OFF of att mode memory

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	Unit	Data
ATT1		
ATT1 ATT Type	BR PU CR VI Un Non	Attachment selection
ATT1 ATT Number	1 2 3 4 5	Attachment setting number selection
ATT1 P1 Swash Angle Adjustment	L/min	Adjustment of lower limit of maximum pump 1 flow rate when using attachment
ATT1 P2 Swash Angle Adjustment	L/min	Adjustment of lower limit of maximum pump 2 flow rate when using attachment
ATT1 Engine Speed Adjustment	min^{-1}	Adjustment of engine speed when using attachment
ATT1 Relief Change (OPT)	ON, OFF	Secondary pilot relief valve ON/OFF selection
ATT1 2nd Relief Change (OPT)	ON, OFF	Selector valve ON/OFF selection
ATT1 Accumulator Change (OPT)	ON, OFF	Accumulator ON/OFF selection
ATT1 2-Speed Change (OPT)	ON, OFF	2-speed selection ON/OFF selection
ATT2		
ATT2 ATT Type	BR PU CR VI Un Non	Attachment selection
ATT2 ATT Number	1 2 3 4 5	Attachment setting number selection
ATT2 P1 Swash Angle Adjustment	L/min	Adjustment of lower limit of maximum pump 1 flow rate when using attachment
ATT2 P2 Swash Angle Adjustment	L/min	Adjustment of lower limit of maximum pump 2 flow rate when using attachment
ATT2 Engine Speed Adjustment	min^{-1}	Adjustment of engine speed when using attachment
ATT2 Relief Change (OPT)	ON, OFF	Secondary pilot relief valve ON/OFF selection
ATT2 2nd Relief Change (OPT)	ON, OFF	Selector valve ON/OFF selection
ATT2 Accumulator Change (OPT)	ON, OFF	Accumulator ON/OFF selection
ATT2 2-Speed Change (OPT)	ON, OFF	2-speed selection ON/OFF selection

NOTE: ATT: Attachment
BR: Hydraulic Breaker
PU: Secondary Crusher
CR: Hydraulic Crusher
VI: Vibrating Hammer
Un: Other (Special Machine)
Non: Non Selection

Item	Unit	Data
ATT3		
ATT3 ATT Type	BR PU CR VI Un Non	Attachment selection
ATT3 ATT Number	1 2 3 4 5	Attachment setting number selection
ATT3 P1 Swash Angle Adjustment	L/min	Adjustment of lower limit of maximum pump 1 flow rate when using attachment
ATT3 P2 Swash Angle Adjustment	L/min	Adjustment of lower limit of maximum pump 2 flow rate when using attachment
ATT3 Engine Speed Adjustment	min^{-1}	Adjustment of engine speed when using attachment
ATT3 Relief Change (OPT)	ON, OFF	Secondary pilot relief valve ON/OFF selection
ATT3 2nd Relief Change (OPT)	ON, OFF	Selector valve ON/OFF selection
ATT3 Accumulator Change (OPT)	ON, OFF	Accumulator ON/OFF selection
ATT3 2-Speed Change (OPT)	ON, OFF	2-speed selection ON/OFF selection
ATT4		
ATT4 ATT Type	BR PU CR VI Un Non	Attachment selection
ATT4 ATT Number	1 2 3 4 5	Attachment setting number selection
ATT4 P1 Swash Angle Adjustment	L/min	Adjustment of lower limit of maximum pump 1 flow rate when using attachment
ATT4 P2 Swash Angle Adjustment	L/min	Adjustment of lower limit of maximum pump 2 flow rate when using attachment
ATT4 Engine Speed Adjustment	min^{-1}	Adjustment of engine speed when using attachment
ATT4 Relief Change (OPT)	ON, OFF	Secondary pilot relief valve ON/OFF selection
ATT4 2nd Relief Change (OPT)	ON, OFF	Selector valve ON/OFF selection
ATT4 Accumulator Change (OPT)	ON, OFF	Accumulator ON/OFF selection
ATT4 2-Speed Change (OPT)	ON, OFF	2-speed selection ON/OFF selection

NOTE: ATT: Attachment
BR: Hydraulic Breaker
PU: Secondary Crusher
CR: Hydraulic Crusher
VI: Vibrating Hammer
Un: Other (Special Machine)
Non: Non Selection

Item	Unit	Data
ATT5		
ATT5 ATT Type	BR PU CR VI Un Non	Attachment selection
ATT5 ATT Number	1 2 3 4 5	Attachment setting number selection
ATT5 P1 Swash Angle Adjustment	L/min	Adjustment of lower limit of maximum pump 1 flow rate when using attachment
ATT5 P2 Swash Angle Adjustment	L/min	Adjustment of lower limit of maximum pump 2 flow rate when using attachment
ATT5 Engine Speed Adjustment	min^{-1}	Adjustment of engine speed when using attachment
ATT5 Relief Change (OPT)	ON, OFF	Secondary pilot relief valve ON/OFF selection
ATT5 2nd Relief Change (OPT)	ON, OFF	Selector valve ON/OFF selection
ATT5 Accumulator Change (OPT)	ON, OFF	Accumulator ON/OFF selection
ATT5 2-Speed Change (OPT)	ON, OFF	2-speed selection ON/OFF selection

NOTE: ATT: Attachment
BR: Hydraulic Breaker
PU: Secondary Crusher
CR: Hydraulic Crusher
VI: Vibrating Hammer
Un: Other (Special Machine)
Non: Non Selection

ADJUSTMENT DATA LIST

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
Li Speed Adjustment	10 min^{-1}	0 to 150 min^{-1}	0 min^{-1}	
WU Speed Adjustment	10 min^{-1}	0 to 150 min^{-1}	0 min^{-1}	
AI Speed Adjustment	10 min^{-1}	-180 to 500 min^{-1}	0 min^{-1}	
E Speed Adjustment	10 min^{-1}	-200 to 200 min^{-1}	0 min^{-1}	
P Speed Adjustment	10 min^{-1}	-200 to 100 min^{-1}	0 min^{-1}	
HP Speed Adjustment	10 min^{-1}	-200 to 0 min^{-1}	0 min^{-1}	
PQ Torque Control	10 N·m	-1000 to 120 N·m	0 N·m	
Pump 1 Torque Adjustment	10 N·m	-1000 to 0 N·m	0 N·m	
Pump 2 Torque Adjustment	10 N·m	-1000 to 0 N·m	0 N·m	
ATT Speed Increase Down Waiting Time	40 ms	0 to 3000 ms	3000 ms	
ATT Torque Reducing On/Off	—	—	OFF	
ECO Mode On/Off	—	—	ON	
HP Mode ON/ On/Off	—	—	ON	
Engine Burglar Proof On/Off	—	—	OFF	
Pump Burglar Proof On/Off	—	—	OFF	
Load Alarm Min Bottom Pressure	0.1 MPa	-10.0 to 10.0 MPa	0.0 MPa	
Lubrication Interval Adj.	1 min	6 to 253 min	50 min	
Pump 1 Min. Displacement Adj.	2.5 cm^3	0.0 to 140.0 cm^3	0.0 cm^3	
Pump 2 Min. Displacement Adj.	2.5 cm^3	0.0 to 140.0 cm^3	0.0 cm^3	
Pump Cutoff Pressure Adj.	0.1 MPa	-10.0 to 0.0 MPa	0.0 MPa	
P1 REG. Offset Adj.	0.006 MPa	-0.102 to 0.102 MPa	0.000 MPa	
P2 REG. Offset Adj.	0.006 MPa	-0.102 to 0.102 MPa	0.000 MPa	
Boom Flow Control CUR Adj.	5 mA	-640 to 0 mA	0 mA	
ATT Mode Save On/Off	—	—	OFF	

NOTE: 1 MPa=10.197 kgf/cm^2

ATTACHMENT ADJUSTMENT DATA LIST

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT 1				
ATT1 ATT Type	-	BR PU CR VI Un Non	BR	
ATT1 ATT Number	-	1 to 5	1	
ATT1 P1 Swash Angle Adjustment	0.5 L/min	100 to 367 L/min	367 L/min	
ATT1 P2 Swash Angle Adjustment	0.5 L/min	100 to 367 L/min	200 L/min	
ATT1 Engine Speed Adjustment	10 min^{-1}	-500 to 100 min^{-1}	0 min^{-1}	
ATT1 Relief Change (OPT)	-	ON/OFF	Unregistration	
ATT1 2nd Relief Change (OPT)	-	C/V or O/T	Unregistration	
ATT1 Accumulator Change (OPT)	-	ON/OFF	Unregistration	
ATT1 2-Speed Change (OPT)	-	ON/OFF	OFF	
ATT2				
ATT2 ATT Type	-	BR PU CR VI Un Non	BR	
ATT2 ATT Number	-	1 to 5	2	
ATT2 P1 Swash Angle Adjustment	0.5 L/min	100 to 367 L/min	367 L/min	
ATT2 P2 Swash Angle Adjustment	0.5 L/min	100 to 367 L/min	250 L/min	
ATT2 Engine Speed Adjustment	10 min^{-1}	-500 to 100 min^{-1}	0 min^{-1}	
ATT2 Relief Change (OPT)	-	ON/OFF	Unregistration	
ATT2 2nd Relief Change (OPT)	-	C/V or O/T	Unregistration	
ATT2 Accumulator Change (OPT)	-	ON/OFF	Unregistration	
ATT2 2-Speed Change (OPT)	-	ON/OFF	OFF	

NOTE: 1 MPa=10.197 kgf/cm^2

NOTE: ATT: Attachment
BR: Hydraulic Breaker
PU: Secondary Crusher
CR: Hydraulic Crusher
VI: Vibrating Hammer
Un: Other (Special Machine)
Non: Non Selection

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT3				
ATT3 ATT Type	-	BR PU CR VI Un Non	BR	
ATT3 ATT Number	-	1 to 5	3	
ATT3 P1 Swash Angle Adjustment	0.5 L/min	100 to 367 L/min	367 L/min	
ATT3 P2 Swash Angle Adjustment	0.5 L/min	100 to 367 L/min	280 L/min	
ATT3 Engine Speed Adjustment	10 min^{-1}	-500 to 100 min^{-1}	0 min^{-1}	
ATT3 Relief Change (OPT)	-	ON/OFF	Unregistration	
ATT3 2nd Relief Change (OPT)	-	C/V or O/T	Unregistration	
ATT3 Accumulator Change (OPT)	-	ON/OFF	Unregistration	
ATT3 2-Speed Change (OPT)	-	ON/OFF	OFF	
ATT4				
ATT4 ATT Type	-	BR PU CR VI Un Non	Unregistration	
ATT4 ATT Number	-	1 to 5	Unregistration	
ATT4 P1 Swash Angle Adjustment	0.5 L/min	100 to 367 L/min	367 L/min	
ATT4 P2 Swash Angle Adjustment	0.5 L/min	100 to 367 L/min	367 L/min	
ATT4 Engine Speed Adjustment	10 min^{-1}	-500 to 100	0 min^{-1}	
ATT4 Relief Change (OPT)	-	ON/OFF	Unregistration	
ATT4 2nd Relief Change (OPT)	-	C/V or O/T	Unregistration	
ATT4 Accumulator Change (OPT)	-	ON/OFF	Unregistration	
ATT4 2-Speed Change (OPT)	-	ON/OFF	OFF	

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT5				
ATT5 ATT Type	-	BR PU CR VI Un Non	Unregistration	
ATT5 ATT Number	-	1 to 5	Unregistration	
ATT5 P1 Swash Angle Adjustment	0.5 L/min	100 to 367 L/min	367 L/min	
ATT5 P2 Swash Angle Adjustment	0.5 L/min	100 to 367 L/min	367 L/min	
ATT5 Engine Speed Adjustment	10 min^{-1}	-500 to 100 min^{-1}	0 min^{-1}	
ATT5 Relief Change (OPT)	-	ON/OFF	Unregistration	
ATT5 2nd Relief Change (OPT)	-	C/V or O/T	Unregistration	
ATT5 Accumulator Change (OPT)	-	ON/OFF	Unregistration	
ATT5 2-Speed Change (OPT)	-	ON/OFF	OFF	

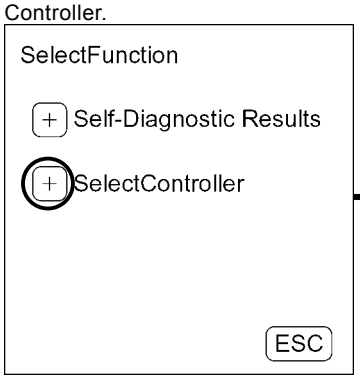
NOTE: 1 MPa=10.197 kgf/cm^2

NOTE: ATT: Attachment
BR: Hydraulic Breaker
PU: Secondary Crusher
CR: Primary Crusher
VI: Vibrating Hammer
Un: Other (Special Machine)
Non: Non Selection

Setup

- Parameter Change

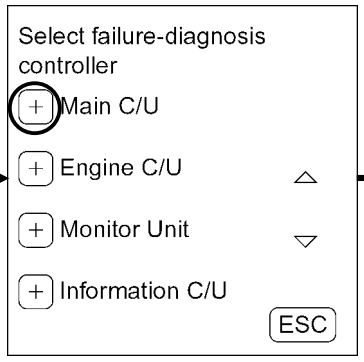
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

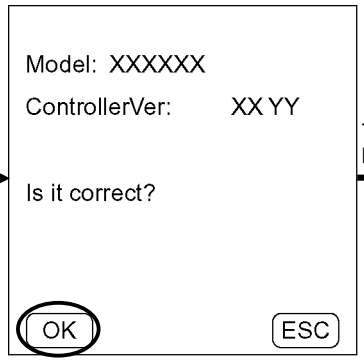
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.

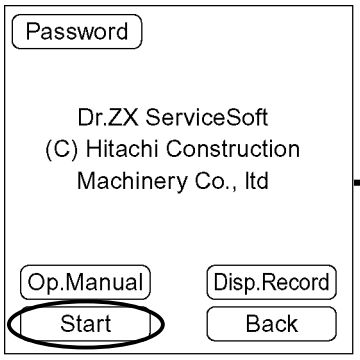


T1J1-05-03-010

Main Controller Screen

To the lower

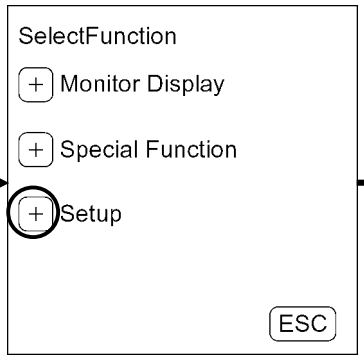
Push Start.



T1J1-05-03-034

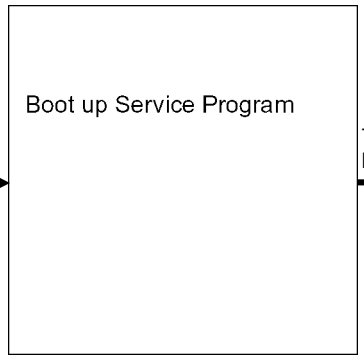
Title Screen

Push Setup.



T1V7-05-03-012

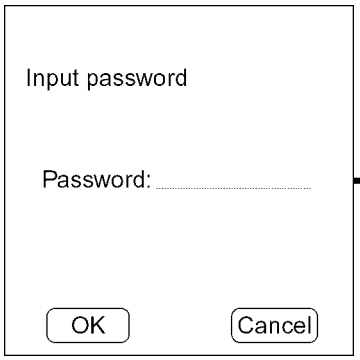
Main Menu Screen



T1V7-05-03-016

To the lower

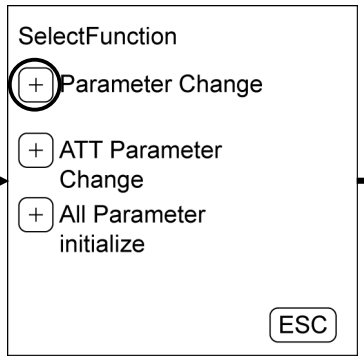
Input the password and push OK. Push Cancel and return to Main Menu Screen.



T1V7-05-03-022

Setup Password Input Screen

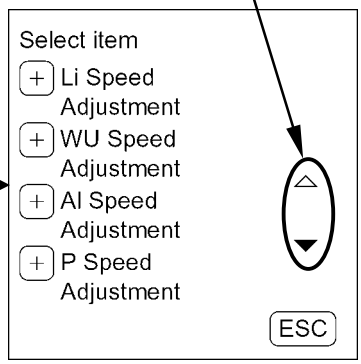
Push Parameter Change. Push ESC and return to Main Menu Screen.



T1J1-05-03-021

Setup Item Selection Screen

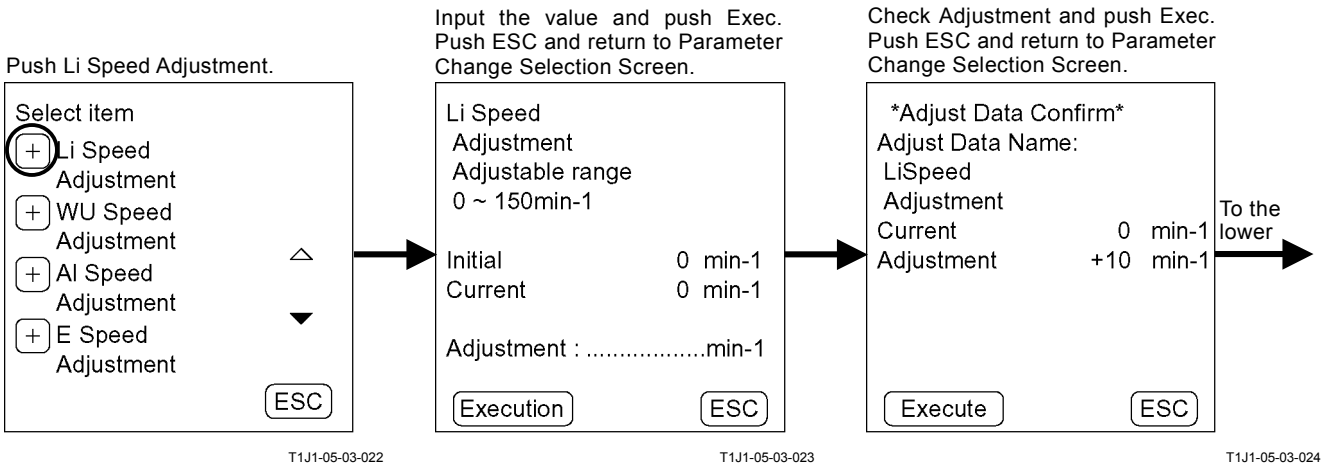
Refer to T5-3-16 as for the item of Parameter Change. Display the forward and backward item by pushing these marks.

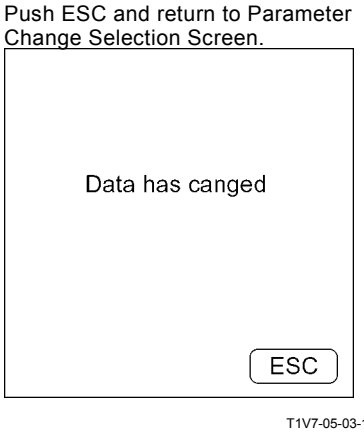


T1V7-05-03-105

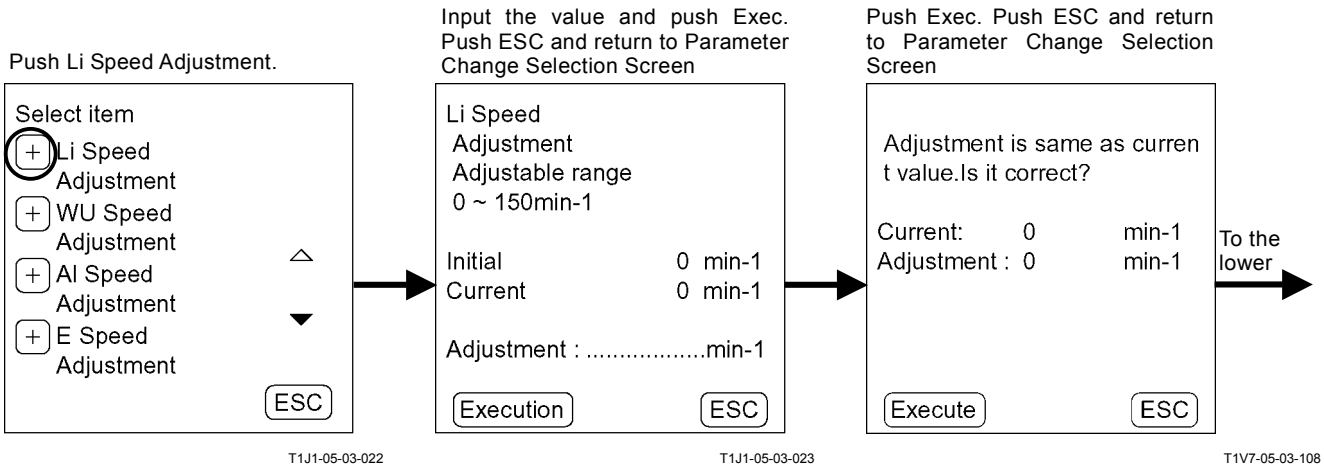
Parameter Change Selection Screen

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





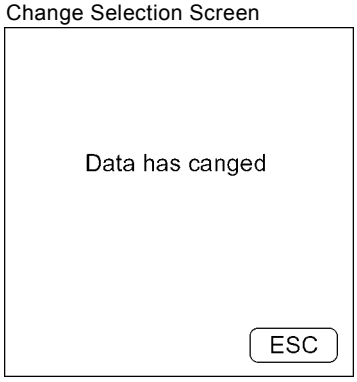
Input Value = Current Value



Parameter Change Selection Screen

Parameter Input Screen

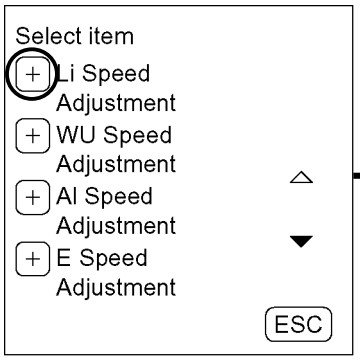
Push ESC and return to Parameter Change Selection Screen



T1V7-05-03-107

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

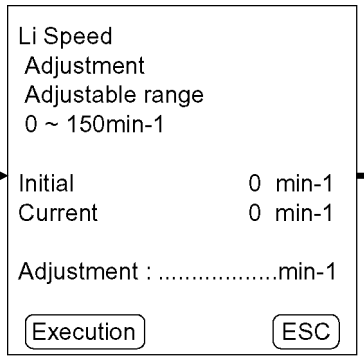
Push Li Speed Adjustment.



T1J1-05-03-022

Parameter Change Selection Screen

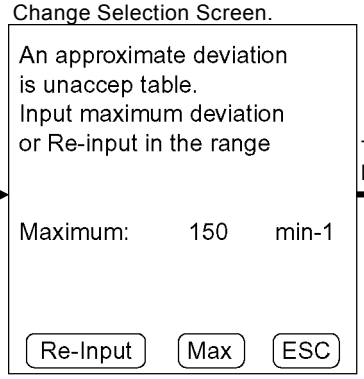
Input the value and push Exec. Push ESC and return to Parameter Change Selection Screen.



T1J1-05-03-023

Parameter Input Screen

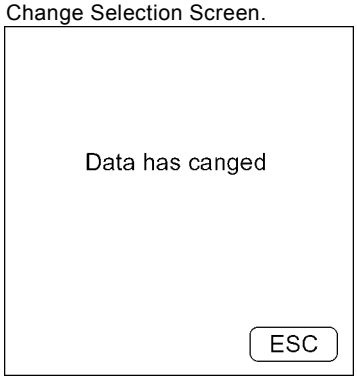
Push Re-Input and return to Parameter Input Screen. Push Max and the maximum value is input. Push ESC and return to Parameter Change Selection Screen.



T1J1-05-03-025

To the lower

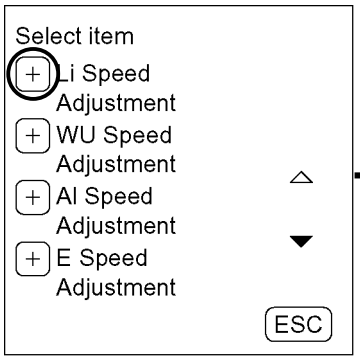
Push ESC and return to Parameter Change Selection Screen.



T1V7-05-03-107

When the input value cannot be divided

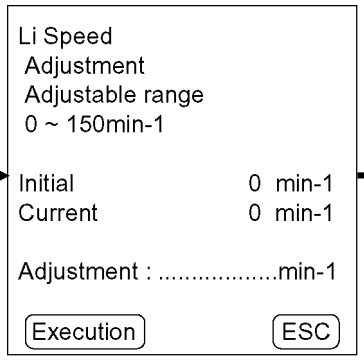
Push Li Speed Adjustment.



T1J1-05-03-022

Parameter Change Selection Screen

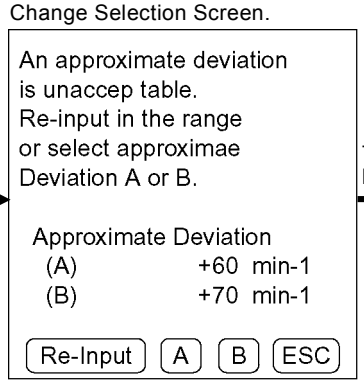
Input the value and push Exec. Push ESC and return to Parameter Change Selection Screen.



T1J1-05-03-023

Parameter Input Screen

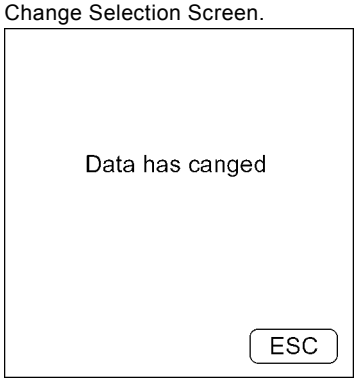
Push Re-Input and return to Parameter Input Screen. Push A or B and the value of A or B is input. Push ESC and return to Parameter Change Selection Screen.



To the lower

T1J1-05-03-026

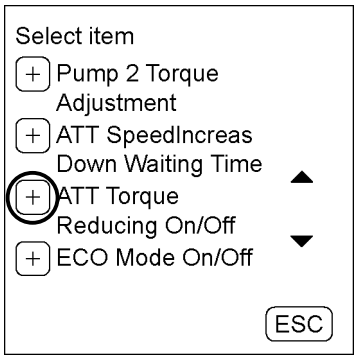
Push ESC and return to Parameter Change Selection Screen.



T1V7-05-03-107

Status Selection
Example: ATT Torque Reducing On/Off: Off

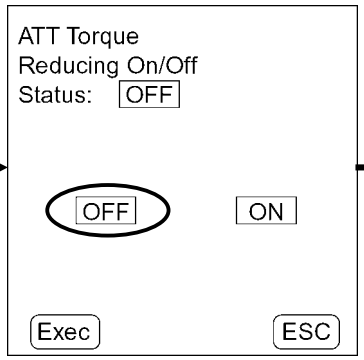
Push ATT Torque Reducing On/Off.



T1J1-05-03-027

Parameter Change Selection Screen

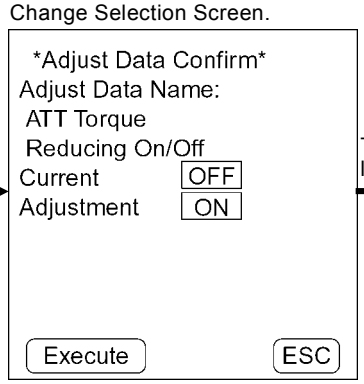
Push OFF and Push Exec. Push ESC and return to Parameter Change Selection Screen.



T1V7-05-03-111

Status Selection Screen

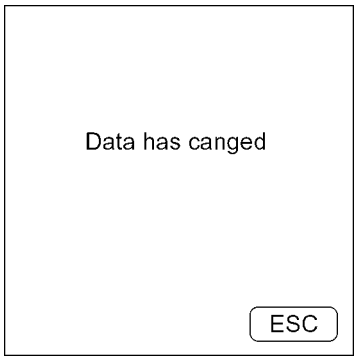
Check OFF and push Exec. Push ESC and return to Parameter Change Selection Screen.



T1V7-05-03-112

To the lower

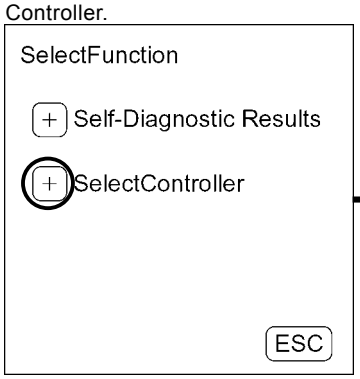
Push ESC and return to Parameter Change Selection Screen.



T1V7-05-03-107

- Attachment Parameter Change

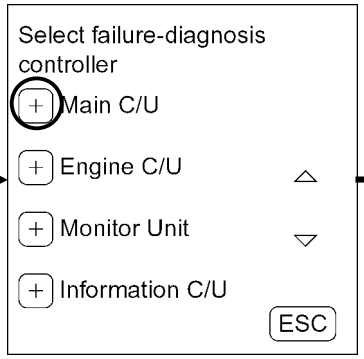
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

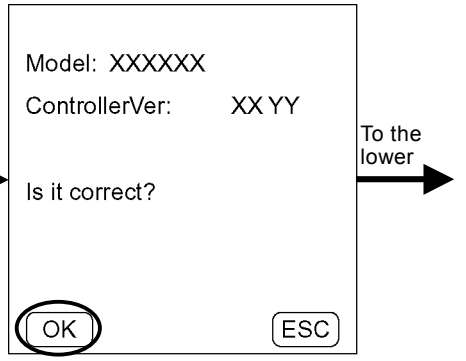
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

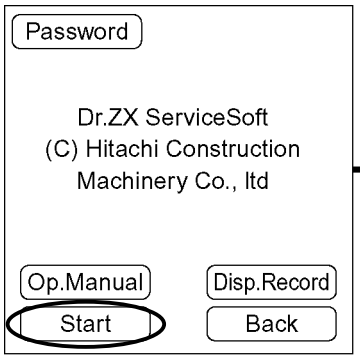
Push OK.



T1J1-05-03-010

Main Controller Screen

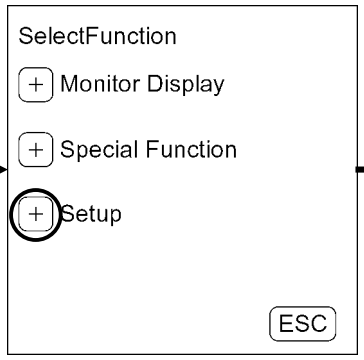
Push Start.



T1J1-05-03-034

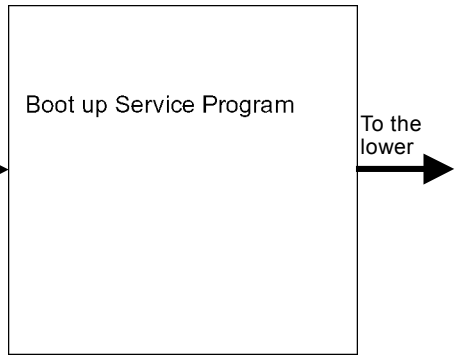
Title Screen

Push Setup.



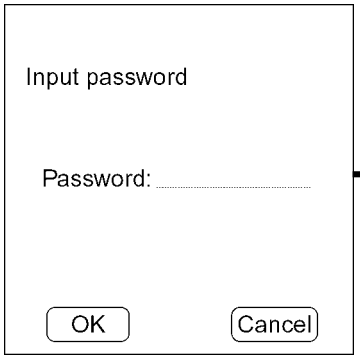
T1V7-05-03-012

Main Menu Screen



T1V7-05-03-016

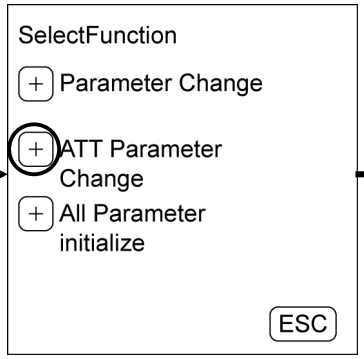
Input the password and push OK. Push Cancel and return to Main Menu Screen.



T1V7-05-03-022

Setup Password Input Screen

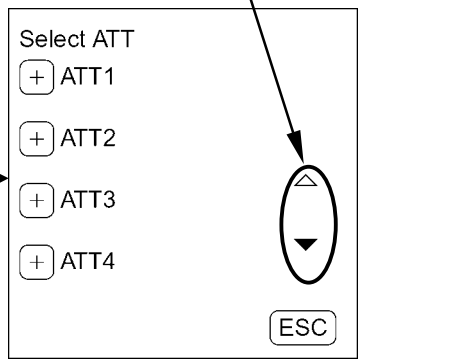
Push ATT Parameter Change. Push ESC and return to Main Menu Screen.



T1J1-05-03-021

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.

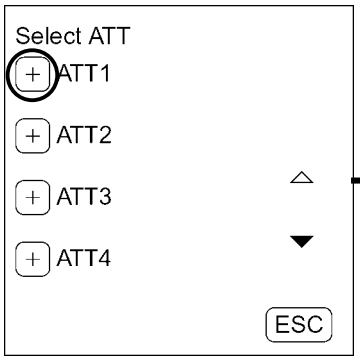


T1V7-05-03-114

Attachment Selection Screen

Attachment Parameter Input
Input Value = Normal Value

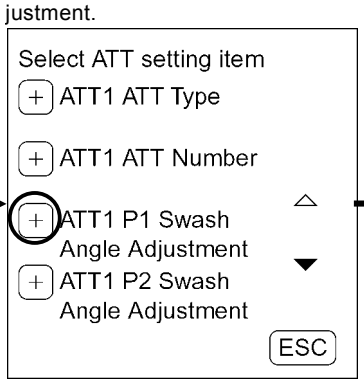
Push ATT1.



T1V7-05-03-114

Attachment Selection Screen

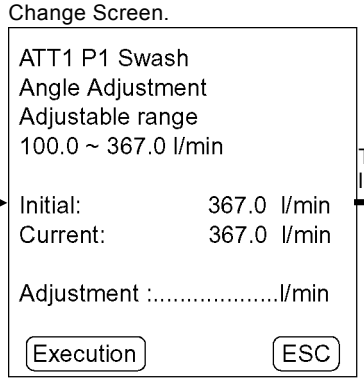
Push ATT1 P1 Swash Angle Adjustment.



T1V7-05-03-115

Parameter Change Screen

Input the value and push Exec. Push ESC and return to Parameter Change Screen.

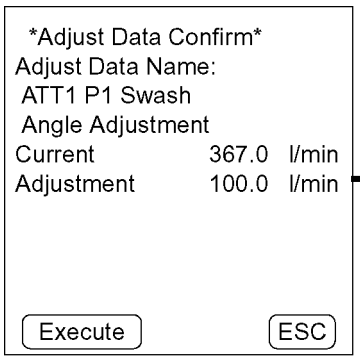


To the lower

T1J1-05-03-028

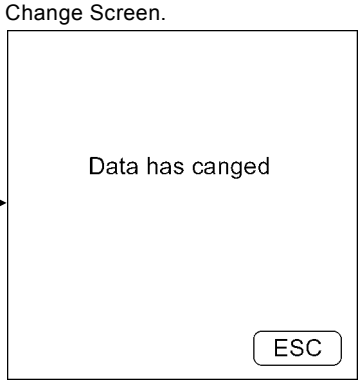
Parameter Input Screen

Check Adjustment and push Exec. Push ESC and return to Parameter Change Screen.



T1J1-05-03-029

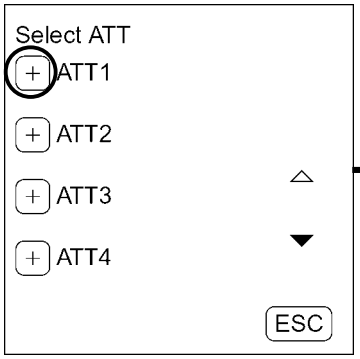
Push ESC and return to Parameter Change Screen.



T1V7-05-03-107

Input Value = Current Value

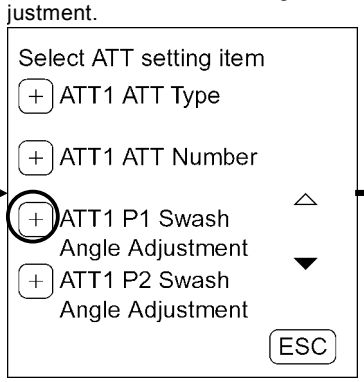
Push ATT1.



T1V7-05-03-114

Attachment Selection Screen

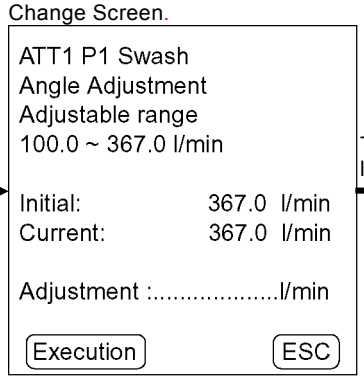
Push ATT1 P1 Swash Angle Adjustment.



T1V7-05-03-115

Parameter Change Screen

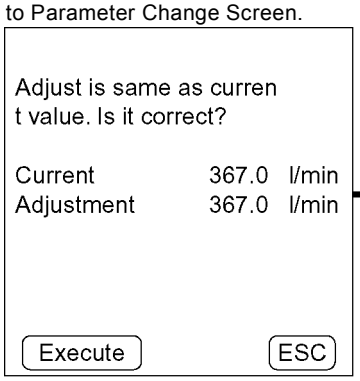
Input the value and push Exec. Push ESC and return to Parameter Change Screen.



T1J1-05-03-028

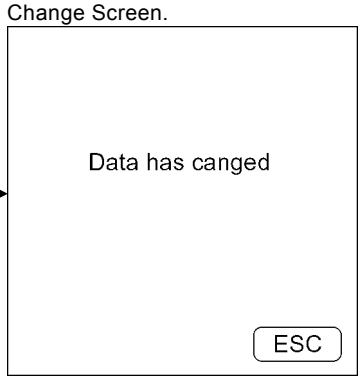
Parameter Input Screen

Push Exec. Push ESC and return to Parameter Change Screen.



T1J1-05-03-030

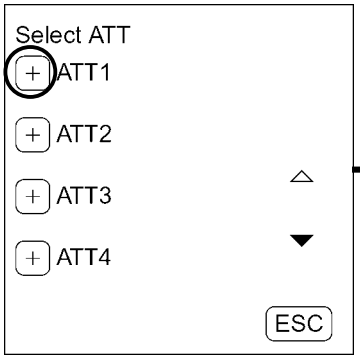
Push ESC and return to Parameter Change Screen.



T1V7-05-03-107

Input Value > Maximum Value

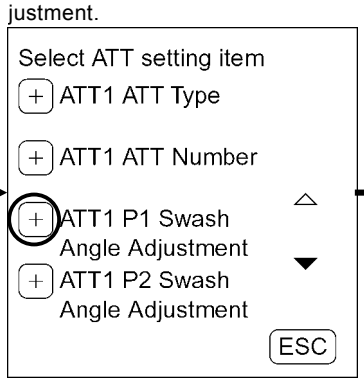
Push ATT1.



T1V7-05-03-114

Attachment Selection Screen

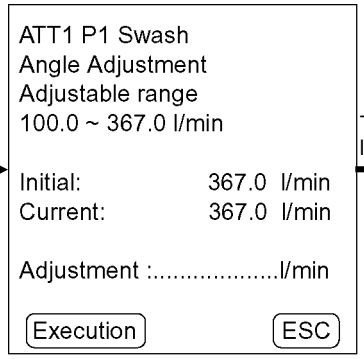
Push ATT1 P1 Swash Angle Adjustment.



T1V7-05-03-115

Parameter Change Screen

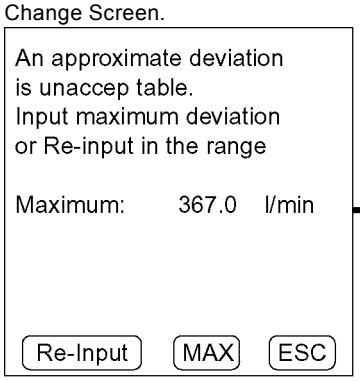
Input the value and push Exec. Push ESC and return to Parameter Change Screen.



T1J1-05-03-028

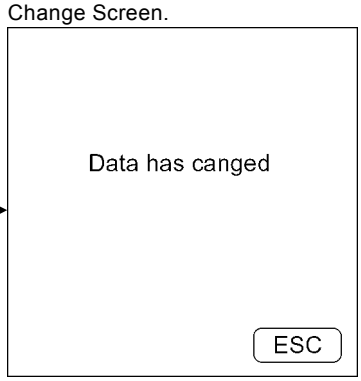
Parameter Input Screen

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.



T1J1-05-03-031

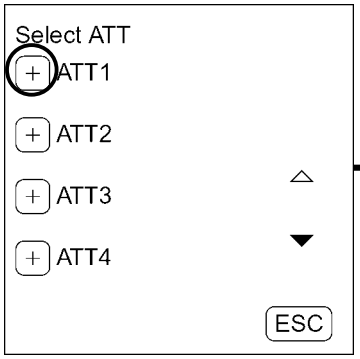
Push ESC and return to Parameter Change Screen.



T1V7-05-03-107

When the input value cannot be divided

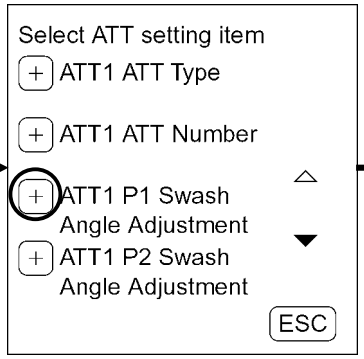
Push ATT1.



T1V7-05-03-114

Attachment Selection Screen

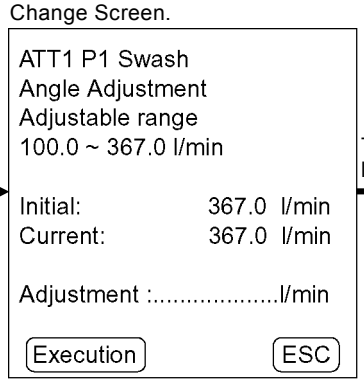
Push ATT1 P1 Swash Angle Adjustment.



T1V7-05-03-115

Parameter Change Screen

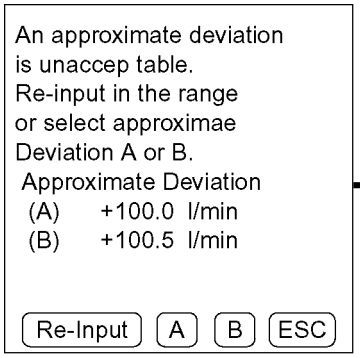
Input the value and push Exec. Push ESC and return to Parameter Change Screen.



T1J1-05-03-028

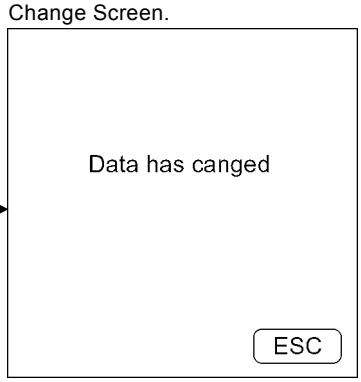
Parameter Input Screen

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.



T1J1-05-03-032

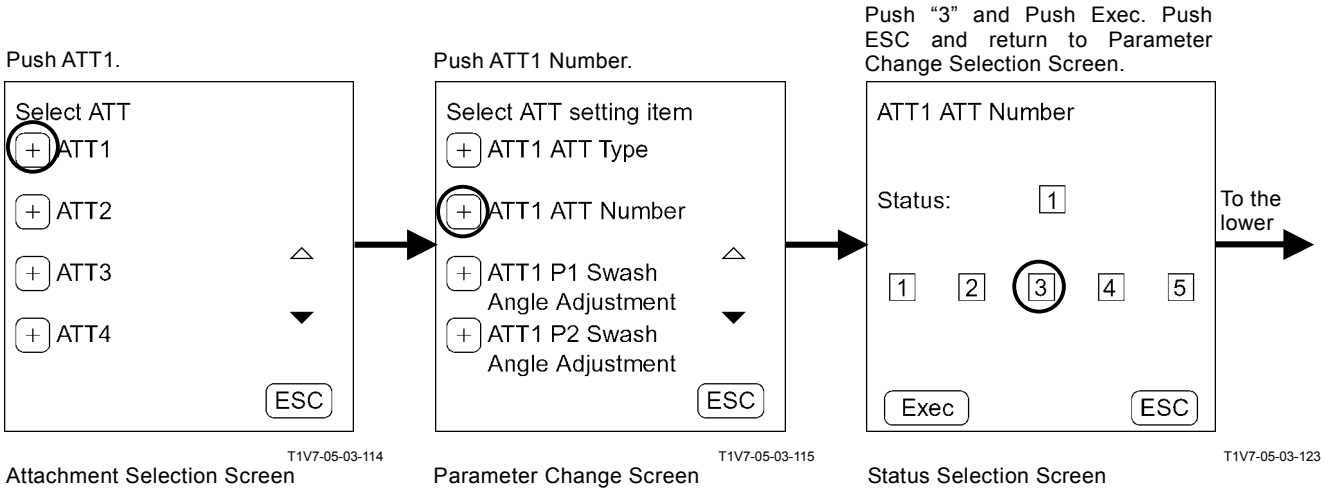
Push ESC and return to Parameter Change Screen.

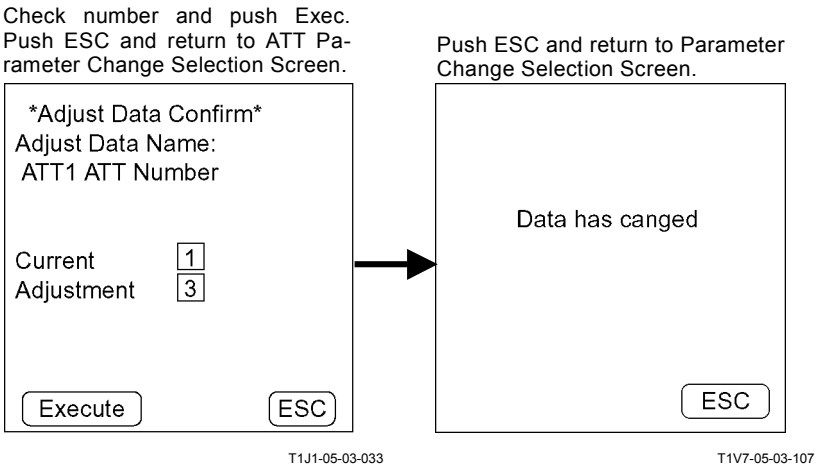


T1V7-05-03-107

Status Selection

Example: ATT1, ATT Number

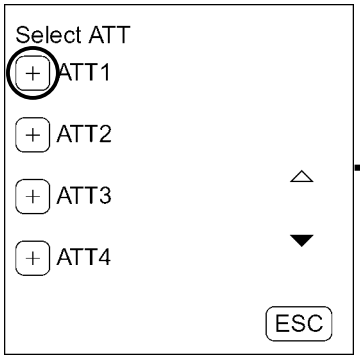




Attachment Setting

Example: Set Crusher 5 to Attachment 1

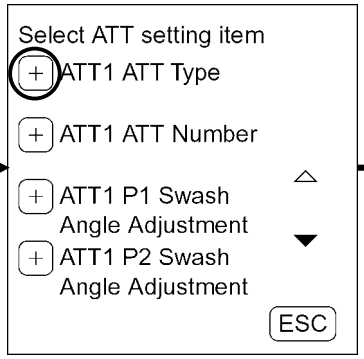
Push ATT1.



T1V7-05-03-114

Attachment Selection Screen

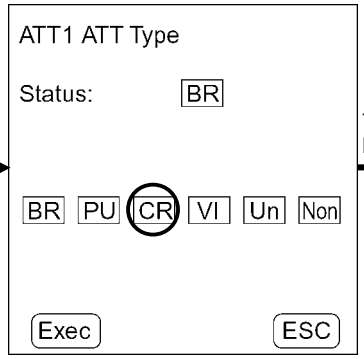
Push ATT1 Type.



T1V7-05-03-115

Parameter Change Screen

Push “CR” and Push Exec. Push ESC and return to Parameter Change Selection Screen.

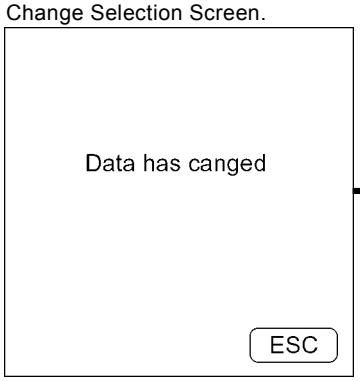


T1V7-05-03-121

Status Selection Screen

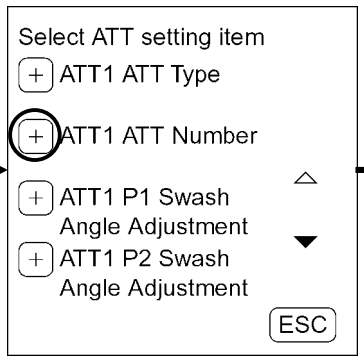
To the lower

Push ESC and return to Parameter Change Selection Screen.



T1V7-05-03-107

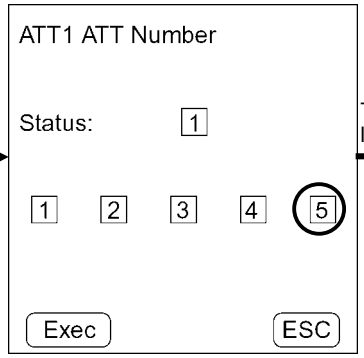
Push ATT1 Number.



T1V7-05-03-115

Parameter Change Screen

Push “5” and Push Exec. Push ESC and return to Parameter Change Selection Screen.

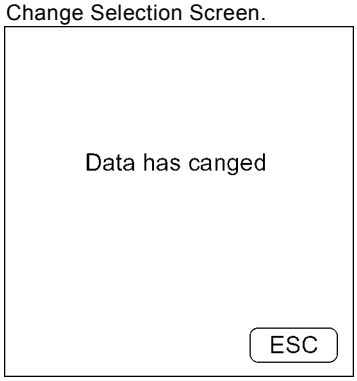


T1V7-05-03-123

Status Selection Screen

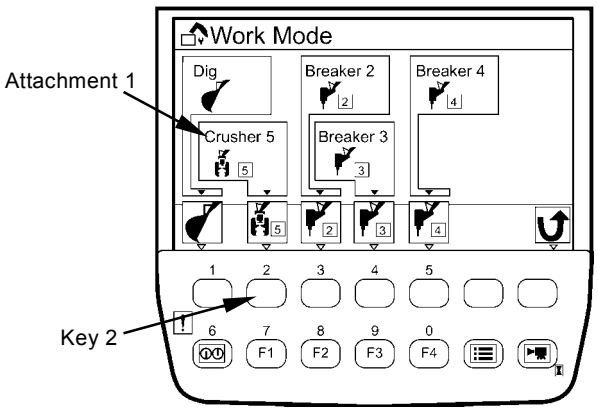
To the lower

Push ESC and return to Parameter Change Selection Screen.



T1V7-05-03-107

When the work mode screen (Attachment Selection Screen) of monitor unit is displayed, Crusher 5 is displayed at Attachment 1. When pushing key 2, Crusher 5 is selected and the Crusher 5 specification screen is displayed.



Attachment Selection Screen

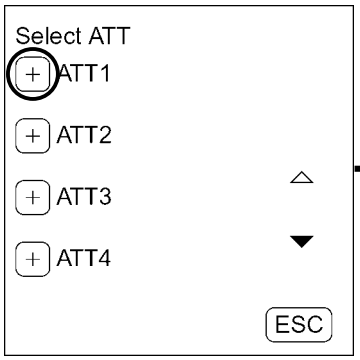
T1J1-05-03-002

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

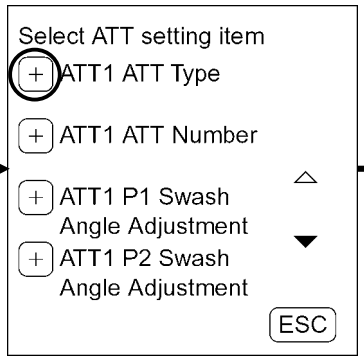
Push ATT1.



T1V7-05-03-114

Attachment Selection Screen

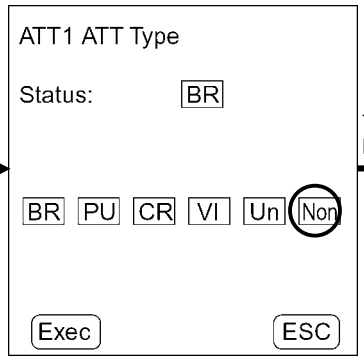
Push ATT1 Type.



T1V7-05-03-115

Parameter Change Screen

Push "Non" and Push Exec. Push ESC and return to Parameter Change Selection Screen.

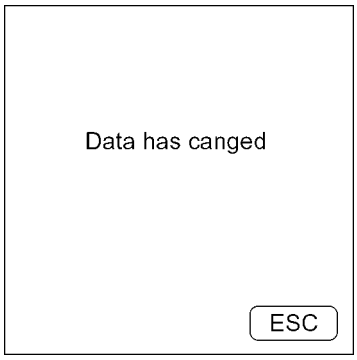


To the lower

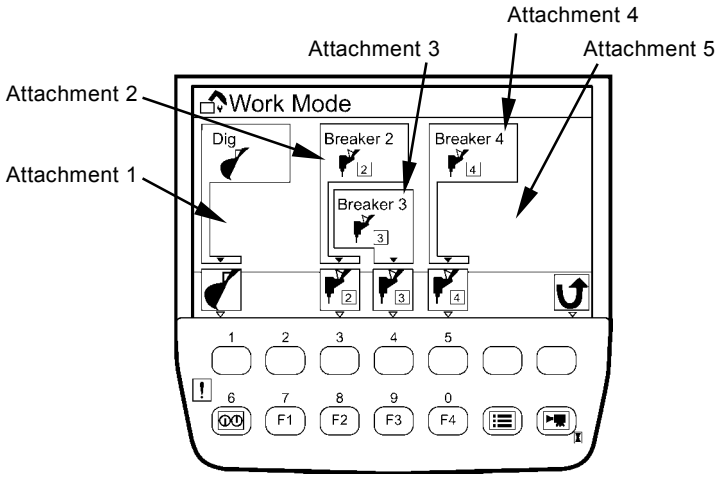
T1V7-05-03-121

Status Selection Screen

Push ESC.



T1V7-05-03-107



Attachment Selection Screen

T1J1-05-03-003

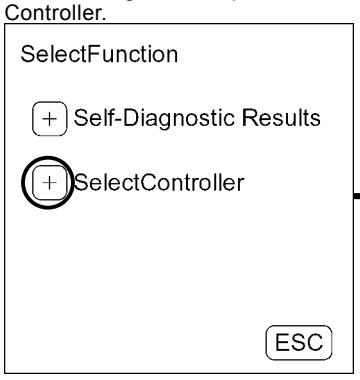
All Parameter Initialize

- If All Parameter Initialize is executed, pump learning value of MC is erased. The settings of Parameter Change and Attachment Parameter Change are initialized so that MC is returned as the factory setting.

IMPORTANT: Turn the key switch ON with the engine stopped, execute All Parameter Initialize.

IMPORTANT: Each setting of Parameter Change and Attachment Parameter Change may be set for each machine.
Before All Parameter Initialize is executed, record the current settings. Set the setting again after All Parameter Initialize is executed if necessary.

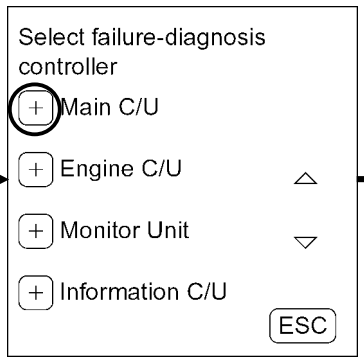
Turn the key switch ON.
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

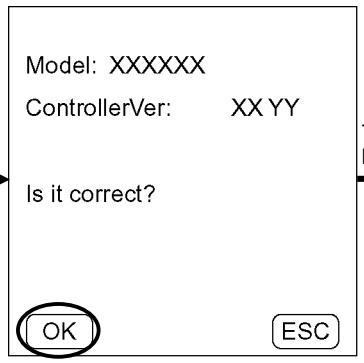
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.

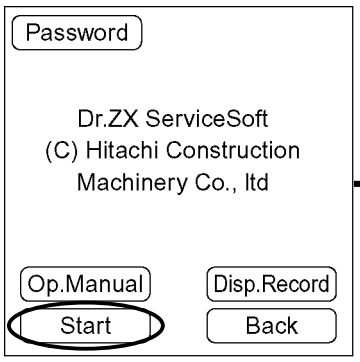


T1J1-05-03-010

Main Controller Screen

To the lower

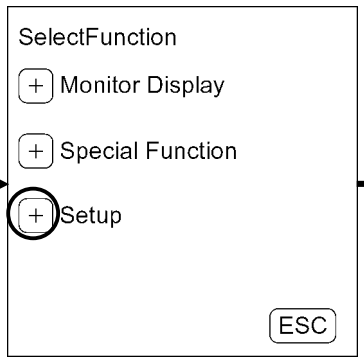
Push Start.



T1J1-05-03-034

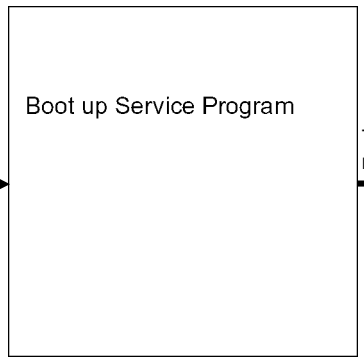
Title Screen

Push Setup.



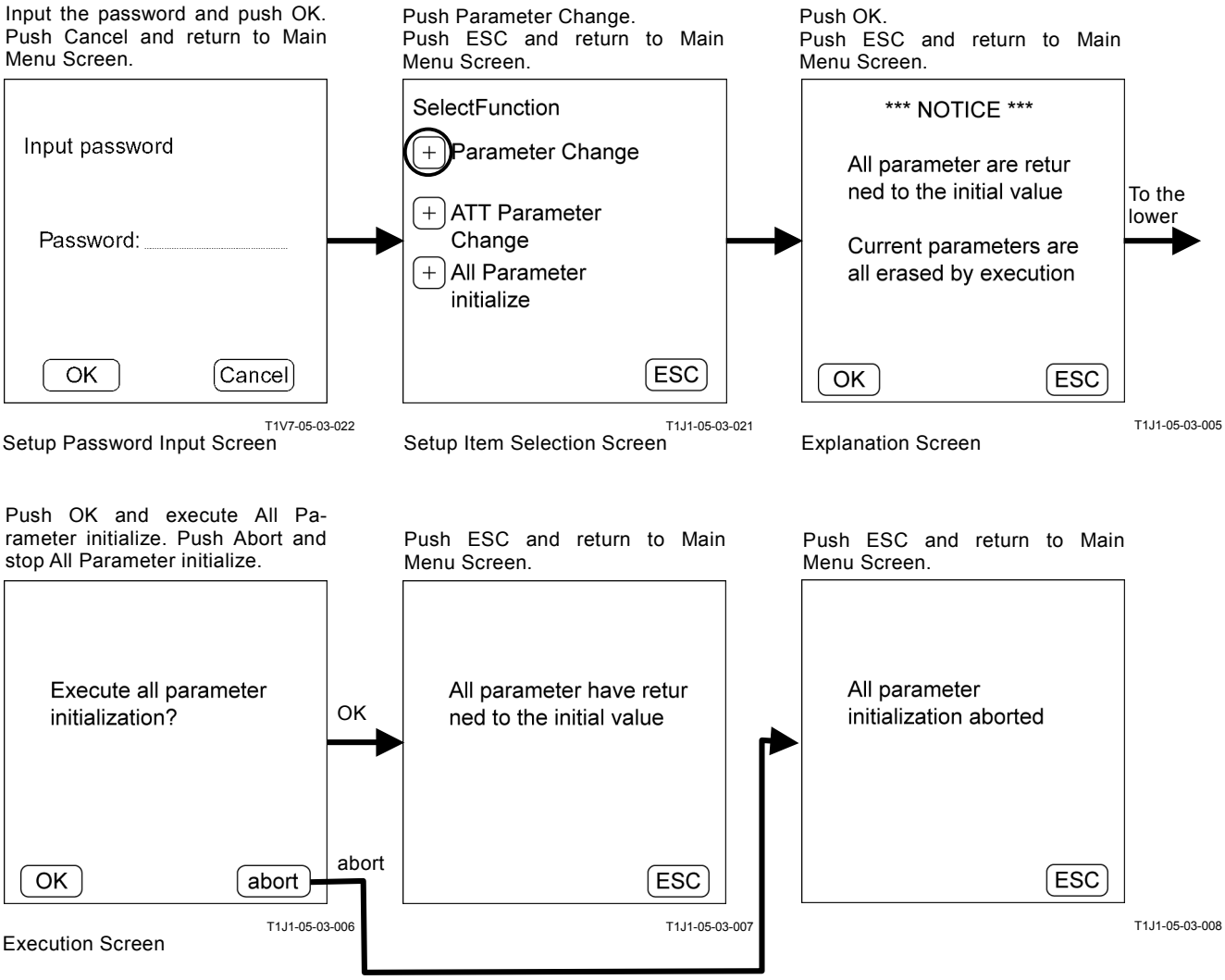
T1V7-05-03-012

Main Menu Screen



T1V7-05-03-016

To the next page

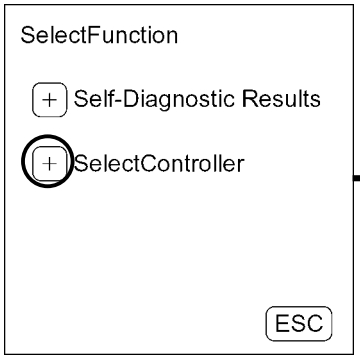


IMPORTANT: After all parameter initialize operation is completed, turn the key switch OFF over 3 seconds.

IMPORTANT: If All Parameter Initialize is executed, pump learning value is erased.
After All Parameter Initialize is executed, perform the pump learning. (Refer to the Adjustment group / OPERATIONAL PERFORMANCE TEST.)

Recorded Data Display

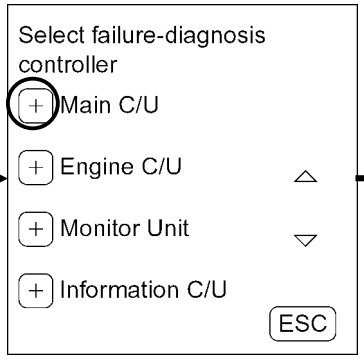
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

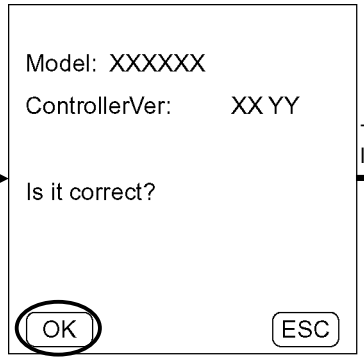
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.

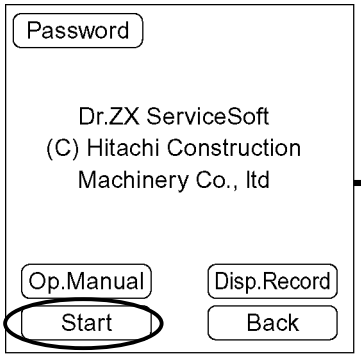


T1J1-05-03-010

Main Controller Screen

To the lower

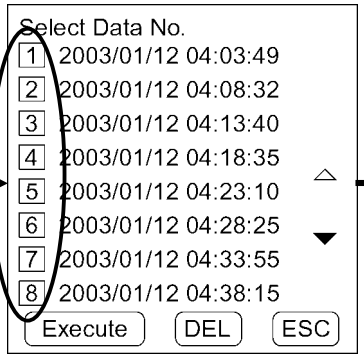
Push Disp. Record.



T1J1-05-03-034

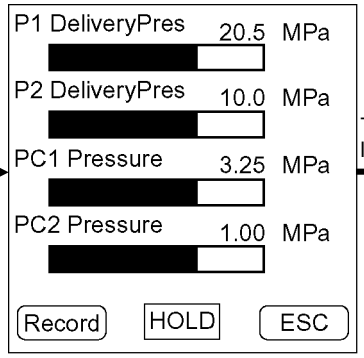
Title Screen

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

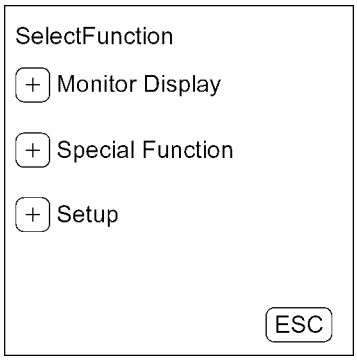
Push Hold and the monitor is stopped temporarily. Push Hold again and restart regeneration. Push ESC and Main Menu Screen is displayed.



T1J1-05-03-014

Recorded Data Regeneration Screen

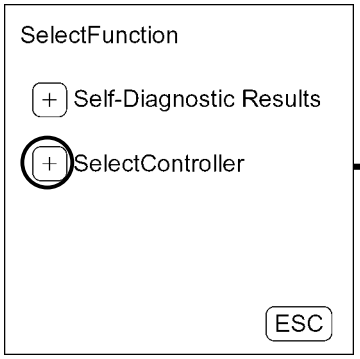
To the lower



T1V7-05-03-012

Password Change

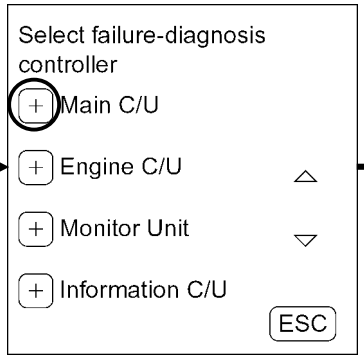
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

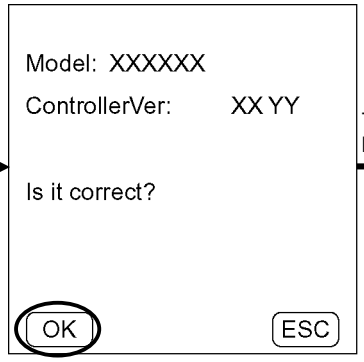
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1J1-05-03-010

Main Controller Screen

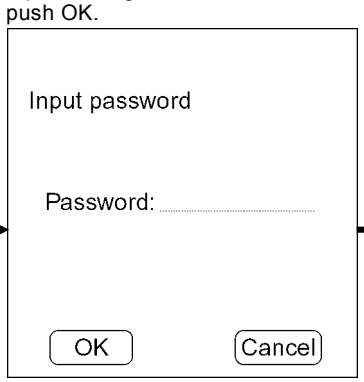
To the lower

Push Password.

T1J1-05-03-034

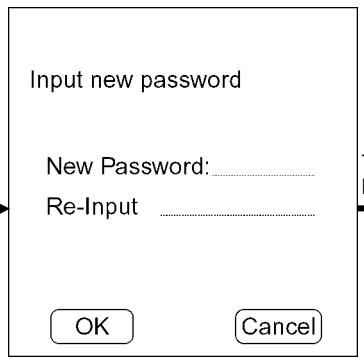
Title Screen

Input the registered Password and push OK.



T1V7-05-03-126

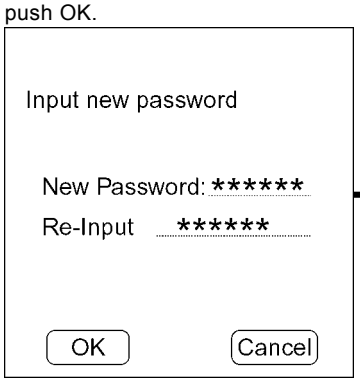
Input the new password and push OK.



T1V7-05-03-127

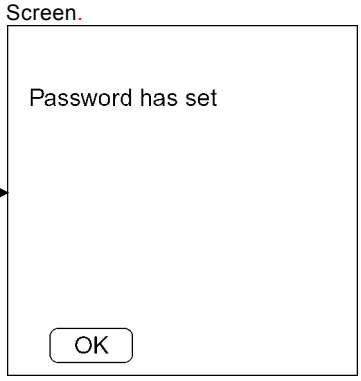
To the lower

Input the new password again and push OK.



T1V7-05-03-169

Push OK and return to Title Screen.



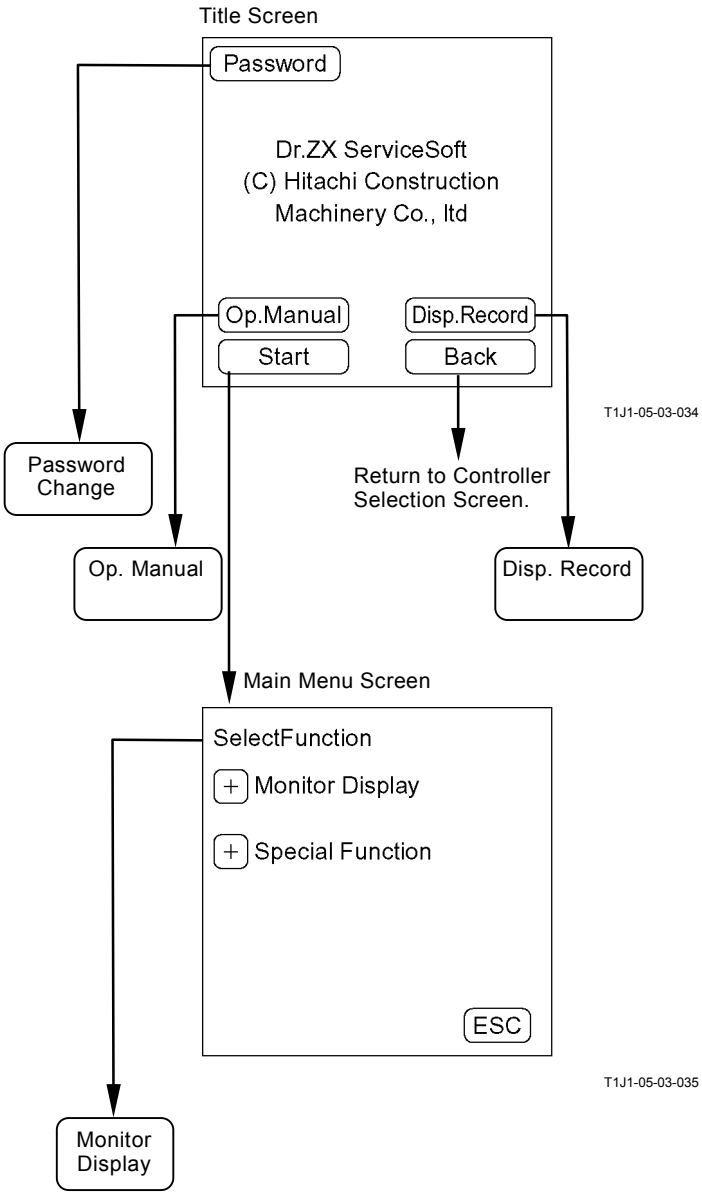
T1V7-05-03-128

ENGINE CONTROLLER

- Password
  The password can be changed.

- Recorded Data
  Displays data recorded in ECM by one day by using Dr. ZX.

- Start → Main Menu
  - Monitor Display
    Dr. ZX displays the input signals from sensors and the control signals of ECM.



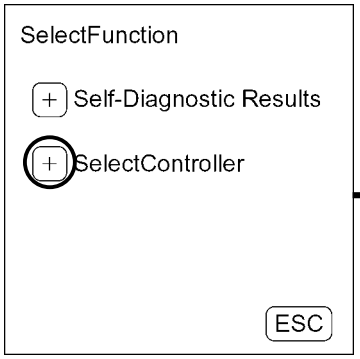
MAIN MENU MONITOR DISPLAY (ECM)

List of Monitor Item

Item		Unit	Data
Selecting	Monitoring		
Actual Accelerator Position	Act. Accelerator POS	%	Input signal from ECM
Engine Torque	Engine Torque	%	Input signal from ECM
Actual Engine Speed	Act. Eng Speed	min^{-1}	Input signal from crank speed sensor and cam angle sensor
Target Engine Speed	Tar. Eng Speed	min^{-1}	Input signal from engine control dial
Glow Signal	Glow Signal	OFF, ON	Glow relay ON/OFF status
Coolant Temperature	Coolant Temp.	°C	Input signal from coolant temperature sensor
Fuel Temperature	Fuel Temp.	°C	Input signal from fuel sensor
Engine Oil Pressure	Eng Oil Pressure	kPa	Input signal from engine oil pressure sensor
Fuel Flow	Fuel Flow	L/h	Input signal from ECM
Barometric Pressure	Barome. Press.	kPa	Input signal from atmospheric pressure sensor
Intake Air Temperature	Intake Air Temp.	°C	Input signal from intake-air temperature sensor
Boost Pressure	Boost Pressure	kPa	Input signal from boost pressure sensor
Boost Temperature	Boost Temp.	°C	Input signal from boost temperature sensor
Battery Voltage	Battery Volt	V	Input signal from ECM
Total Fuel Used	Total Used Fuel	L	Input signal from ECM

Monitor Display

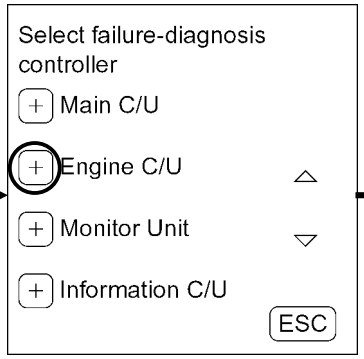
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

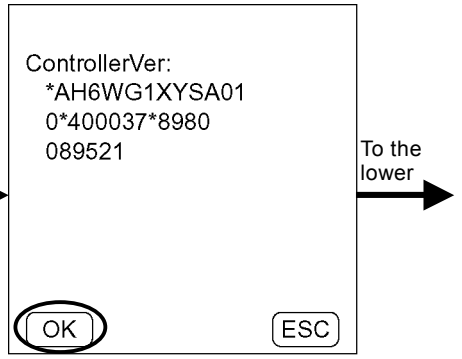
Push Engine C/U.



T1V7-05-03-009

Controller Selection Screen

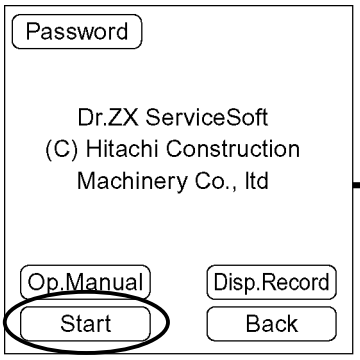
Push OK.



T1J1-05-03-036

Engine Controller Screen

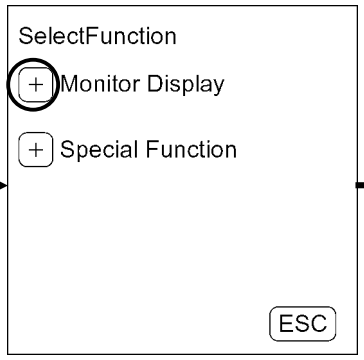
Push Start.



T1J1-05-03-034

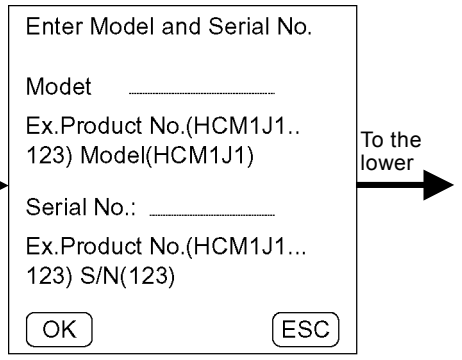
Title Screen

Push Monitor Display.



T1V7-05-03-130

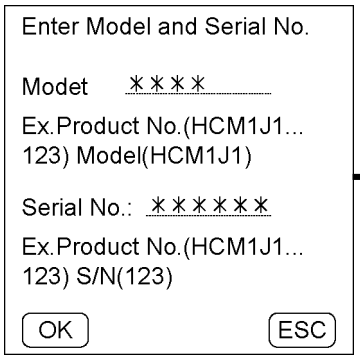
Main Menu Screen



T1J1-05-03-011

Enter Model and Serial No. Screen

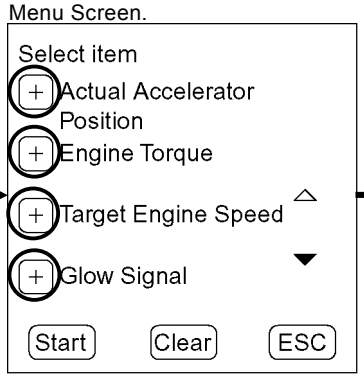
Input the model code and serial No. and push OK. Push ESC and return to Main Menu Screen.



T1J1-05-03-012

Enter Model and Serial No. Screen

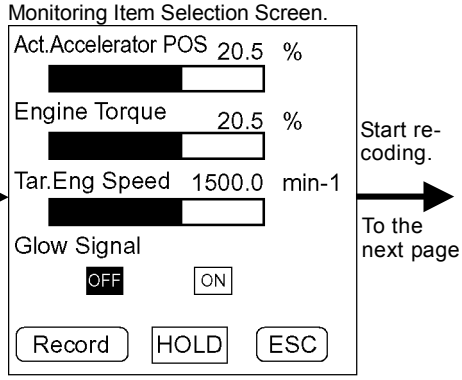
Push the item for Monitor Display and push OK. Refer to T5-3-41 as for the monitor item.
Push ESC and return to Main Menu Screen.



T1J1-05-03-037

Display Item Selection Screen

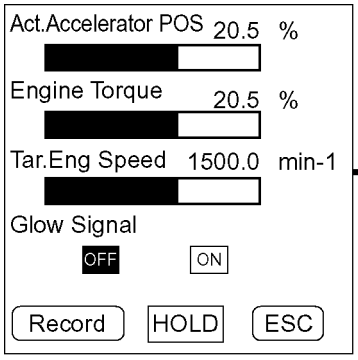
Push Hold and the monitor is stopped temporarily. When the monitor is started again, push Hold again. Push ESC and return to Monitoring Item Selection Screen.



T1J1-05-03-038

Monitor Screen

Push Record.

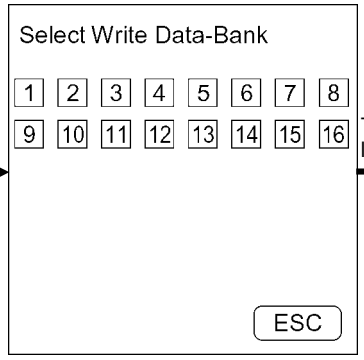


T1J1-05-03-038

Monitor Screen

T1V7-05-03-134

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

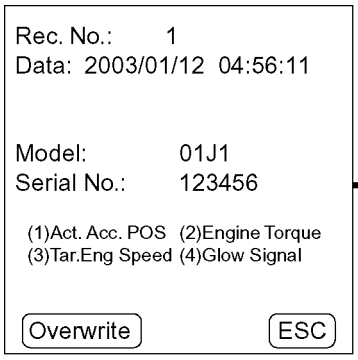


To the lower

T1V7-05-03-135

Select Write Data-Bank Screen

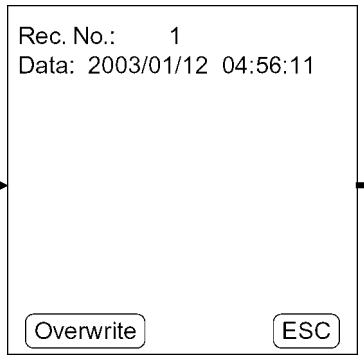
If Rec. No. has already been recorded and push Over Write, data is overwritten.
Push ESC and return to Main Menu Screen.



T1J1-05-03-039

Recording Screen

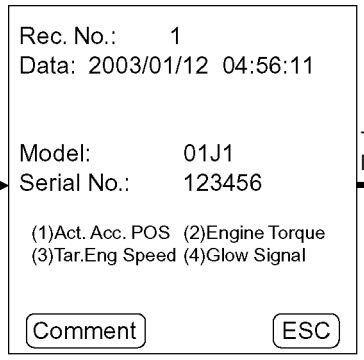
If Rec. No. has not been recorded yet and push Write, data is written to the recording screen.
Push ESC and return to Main Menu Screen.



T1V7-05-03-136

Recording Screen

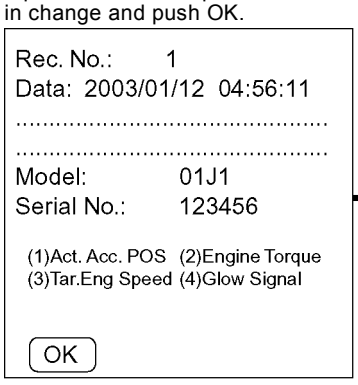
Push Comment.
Push ESC and return to Main Menu Screen.



To the lower

T1J1-05-03-040

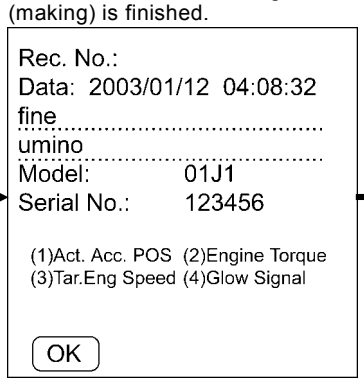
Input weather and person's name in change and push OK.



T1J1-05-03-041

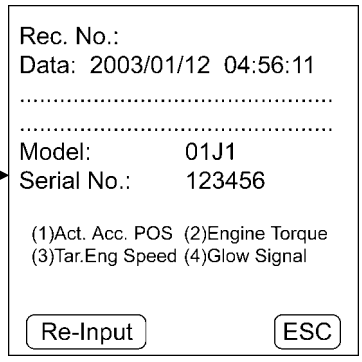
Recording Screen (Comment Input)

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



T1J1-05-03-042

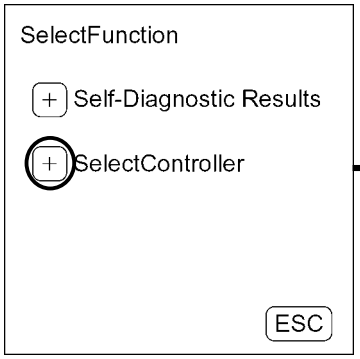
Push Re-Input and return to Recording Screen (Comment Input).
Push ESC and return to Main Menu Screen.



T1J1-05-03-043

RECORD DATA DISPLAY

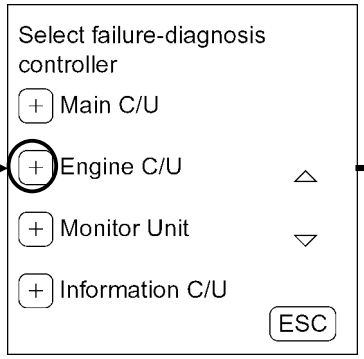
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

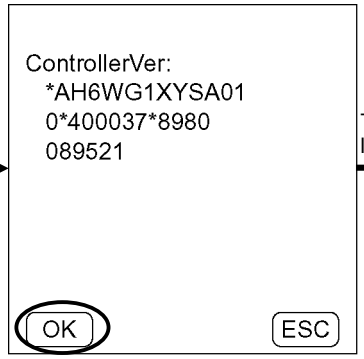
Push Engine C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.

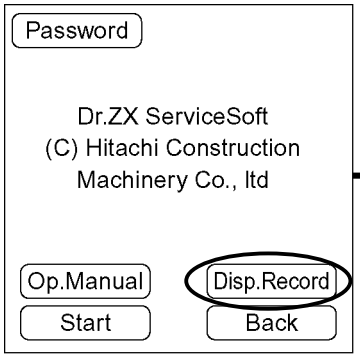


To the lower

T1J1-05-03-036

Engine Controller Screen

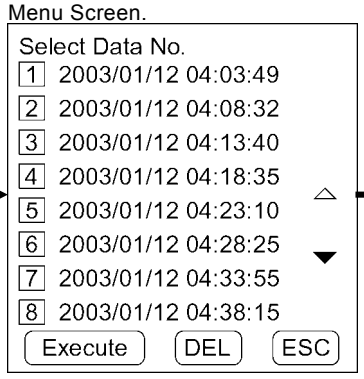
Push Disp. Record.



T1J1-05-03-034

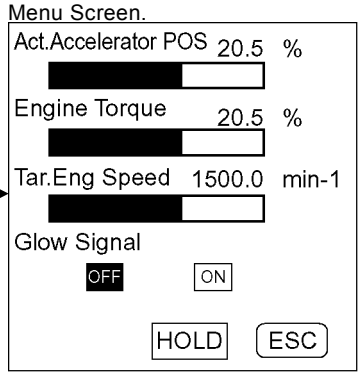
Title Screen

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 Hold again.
Push ESC and return to Main Menu Screen.

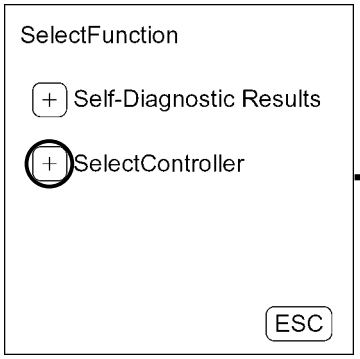


T1J1-05-03-044

Recorded Data Regeneration Screen

PASSWORD CHANGE

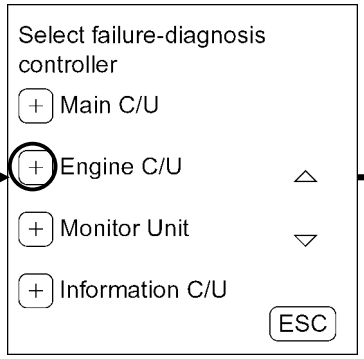
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

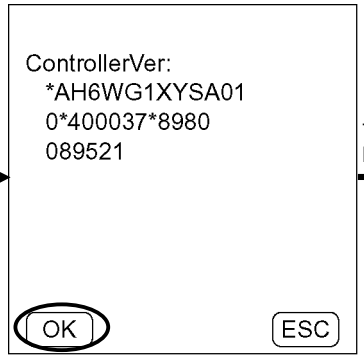
Push Engine C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.

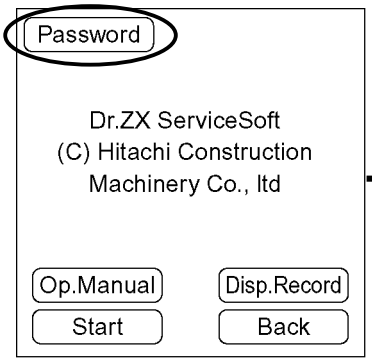


To the lower

T1J1-05-03-036

Engine Controller Screen

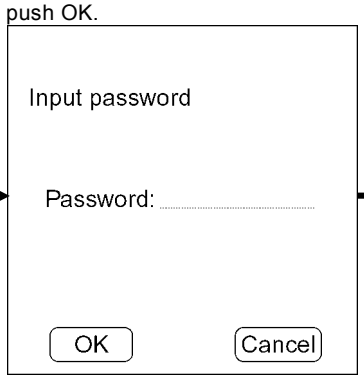
Push Password.



T1J1-05-03-034

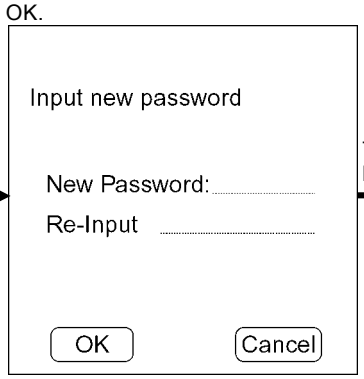
Title Screen

Input the registered password and push OK.



T1V7-05-03-126

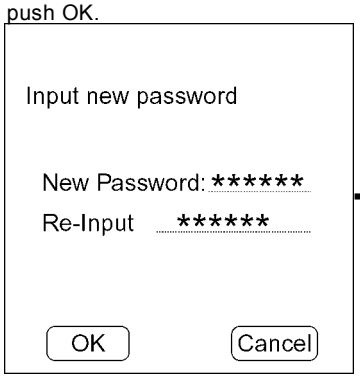
Input the new password and push OK.



To the lower

T1V7-05-03-127

Input the newpassword again and push OK.



T1V7-05-03-169

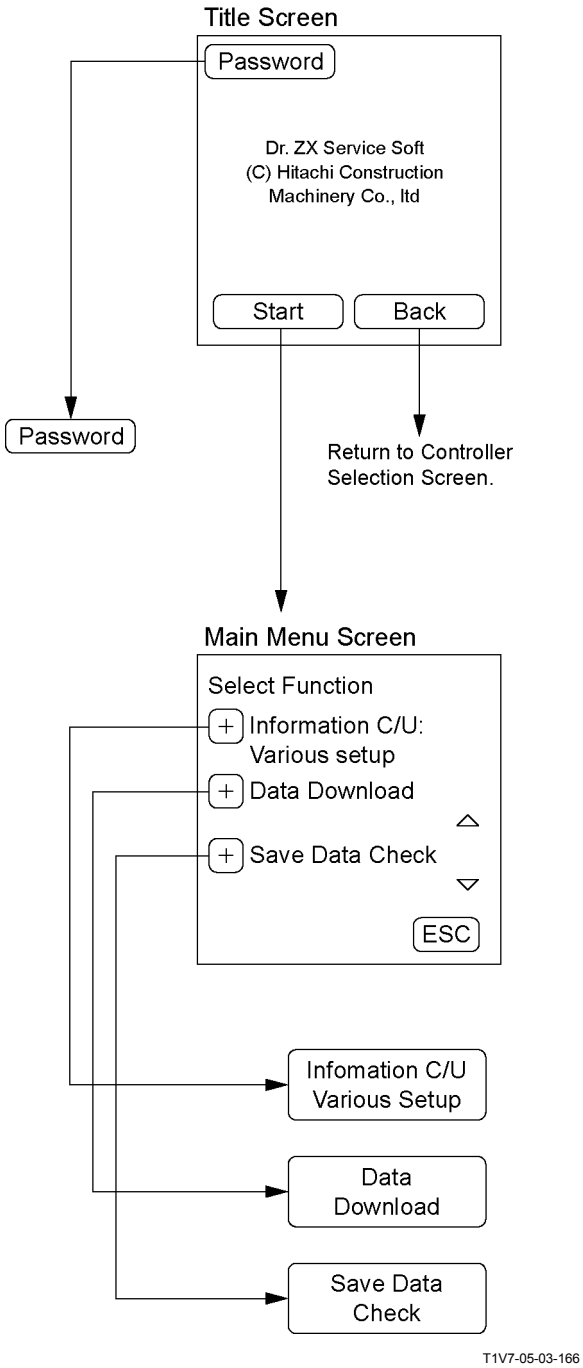
Push OK and return to Title Screen.

T1V7-05-03-128

ICF CONTROLLER

- 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.
  - 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.



T1V7-05-03-166

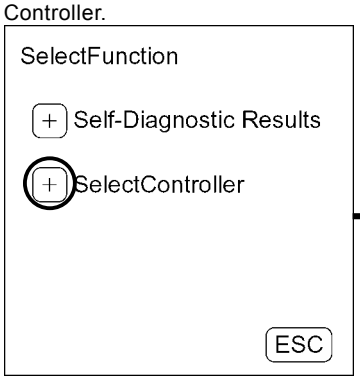
MAIN MENU
INFORMATION C/U VARIOUS SETUP

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

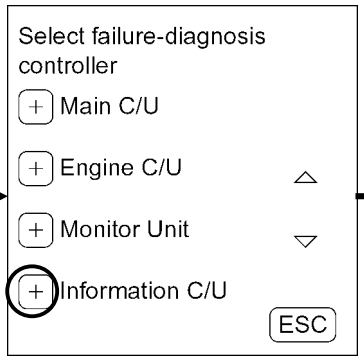
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

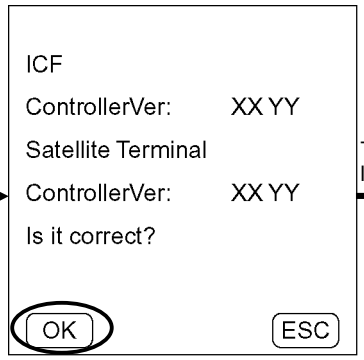
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-045

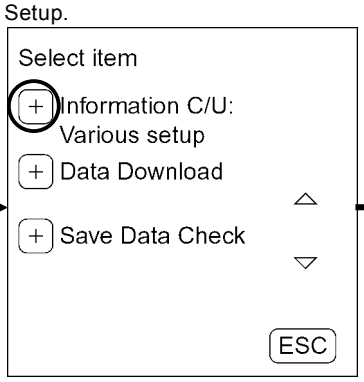
ICF Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

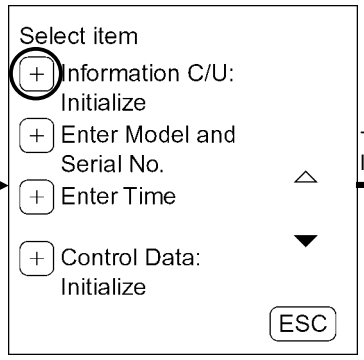
Push Information C/U: Various Setup.



T1V7-05-03-026

Main Menu Screen

Push Information C/U: Initialize.

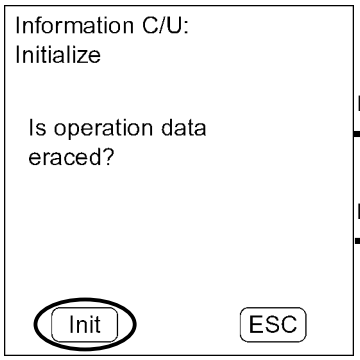


To the lower

T1V7-05-03-027

Information C/U: Various Setup Screen

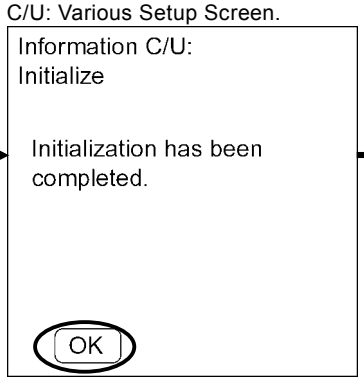
Push Init and the controller operating data is initialied. Push ESC and return to Information C/U: Various Setup Screen.



T1V7-05-03-028

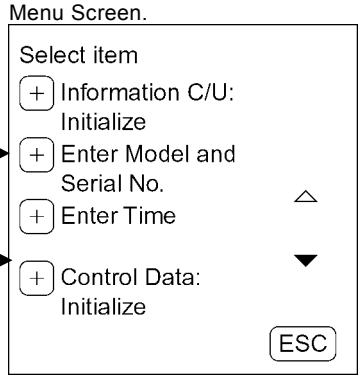
Information C/U: Initialize Screen

Push OK and return to Information C/U: Various Setup Screen.



T1V7-05-03-029

Push ESC and return to Main Menu Screen.

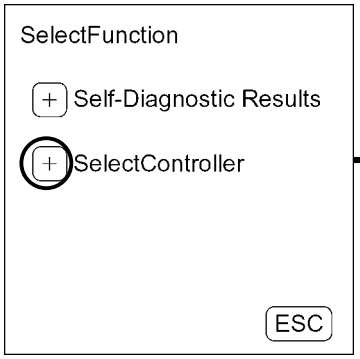


T1V7-05-03-027

Information C/U: Various Setup Screen

ENTER MODEL AND SERIAL No.

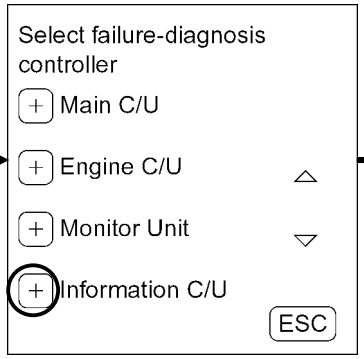
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

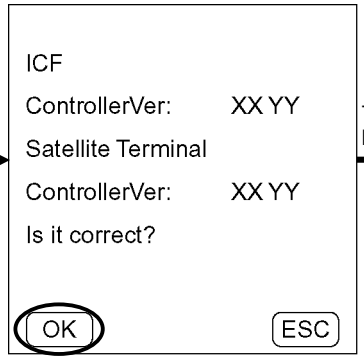
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-045

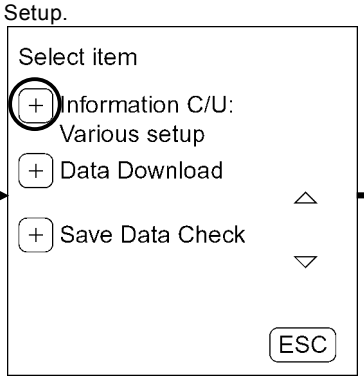
ICF Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

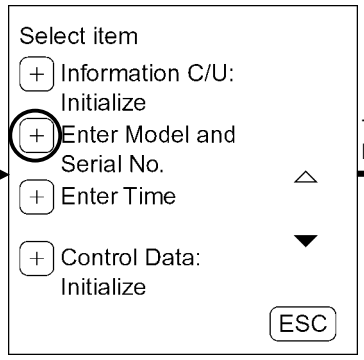
Push Information C/U: Various Setup.



T1V7-05-03-026

Main Menu Screen

Push Enter Model and Serial No.



To the lower

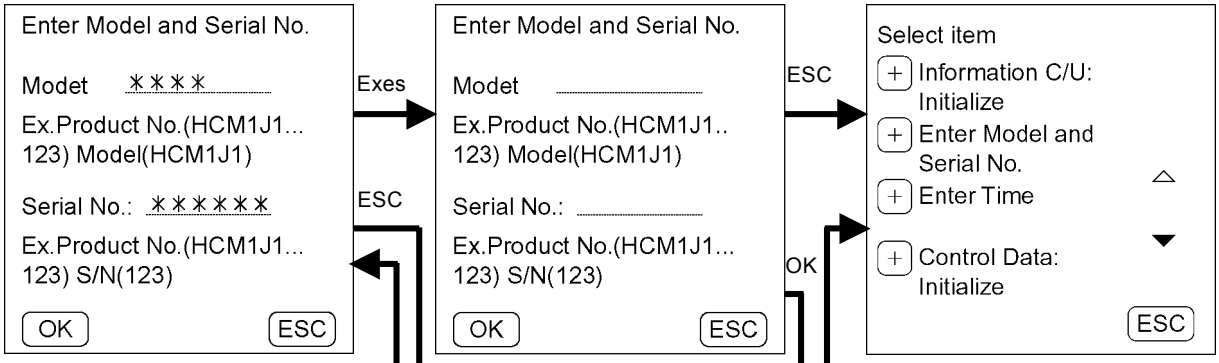
T1V7-05-03-027

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.

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.

Push ESC and return to Main Menu Screen.



T1J1-05-03-012

Enter Model and Serial No. Screen

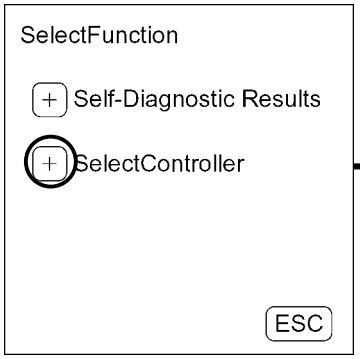
T1J1-05-03-011

T1V7-05-03-027

Information C/U: Various Setup Screen

ENTER DATE AND TIME

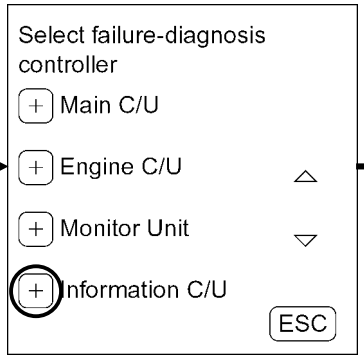
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

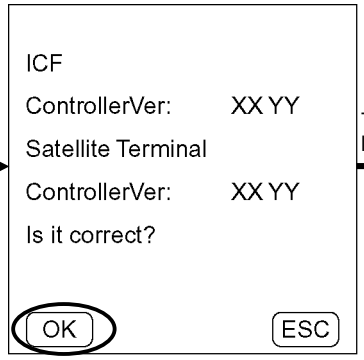
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-045

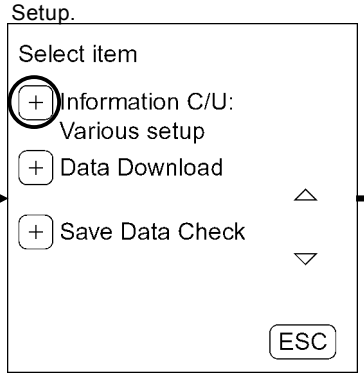
ICF Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

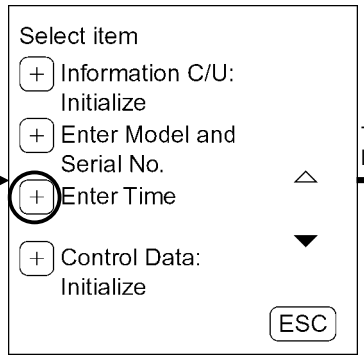
Push Information C/U: Various Setup.



T1V7-05-03-026

Main Menu Screen

Push Enter Date and Time.

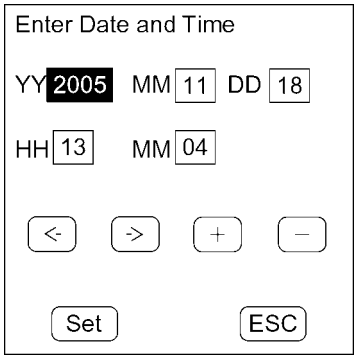


To the lower

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.

<- ->

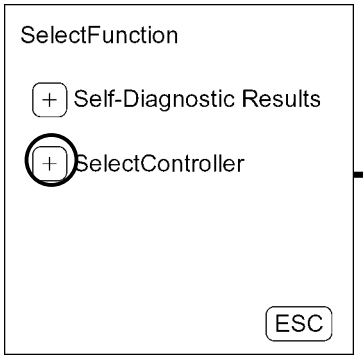
YY, MM, DD, HH and MM
Move the focused item.
No repeat input.

− +

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

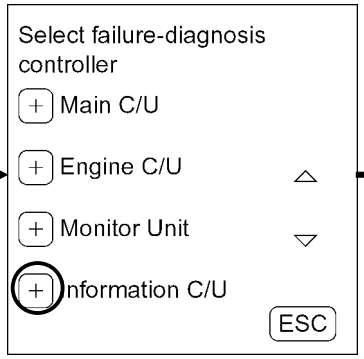
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

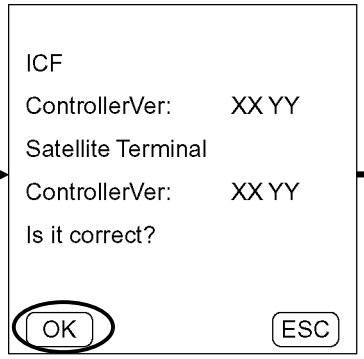
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.

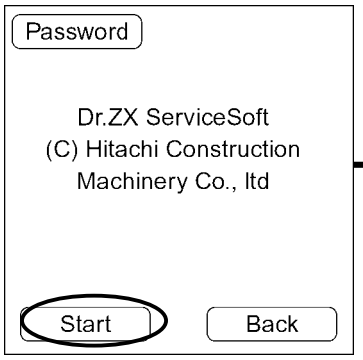


To the lower

T1J1-05-03-045

ICF Controller Screen

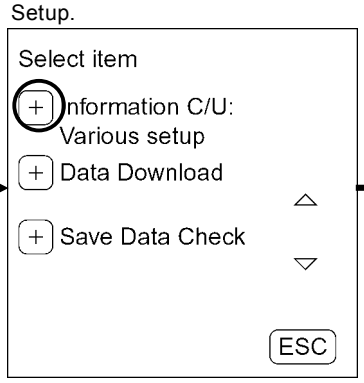
Push Start.



T1V7-05-03-025

Title Screen

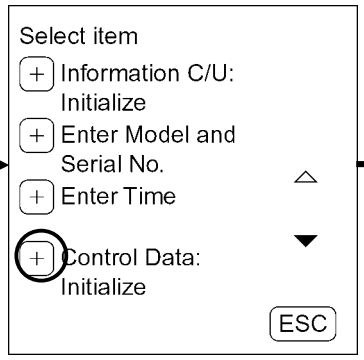
Push Information C/U: Various Setup.



T1V7-05-03-026

Main Menu Screen

Push Control Data: Initialize.

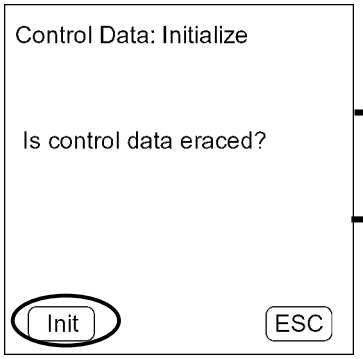


To the lower

T1V7-05-03-027

Information C/U: Various Setup Screen

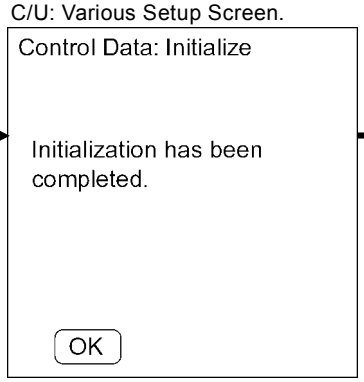
Push Init and the controller control data is initialied. Push ESC and return to Information C/U: Various Setup Screen.



T1V7-05-03-033

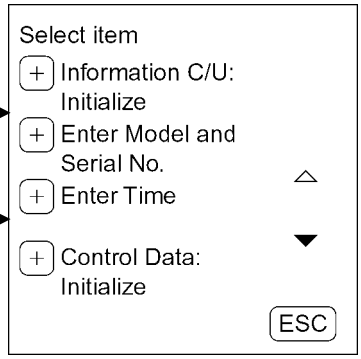
Control Data: Initialize Screen

Push OK and return to Information C/U: Various Setup Screen.



T1V7-05-03-034

Push ESC and return to Main Menu Screen.

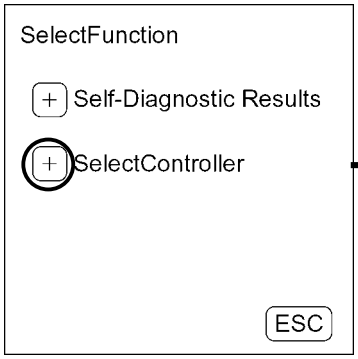


T1V7-05-03-027

Information C/U: Various Setup Screen

SATELLITE TERMINAL: INITIALIZE

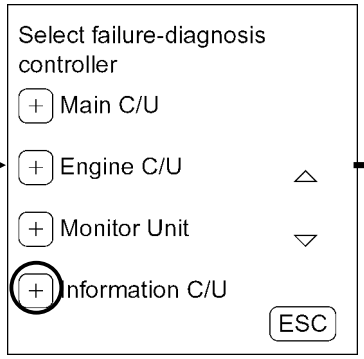
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

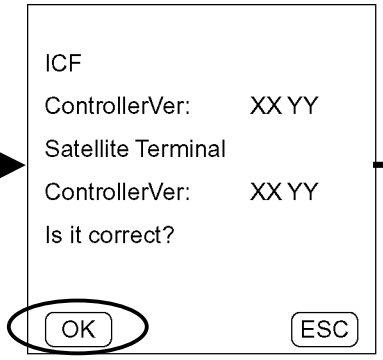
Push ICF Controller.



T1V7-05-03-009

Controller Selection Screen

Push OK.

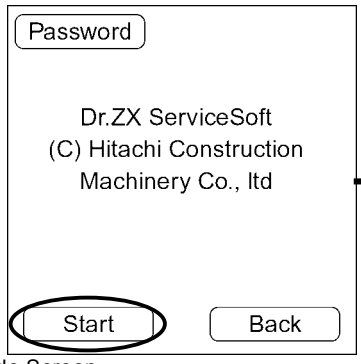


T1J1-05-03-045

ICF Controller Screen

To the lower

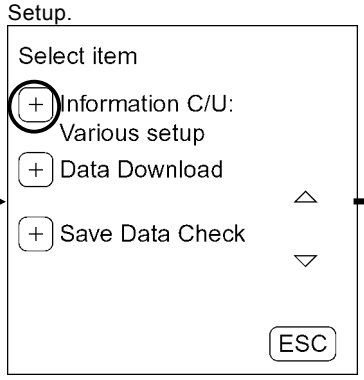
Push Start.



T1V7-05-03-025

Title Screen

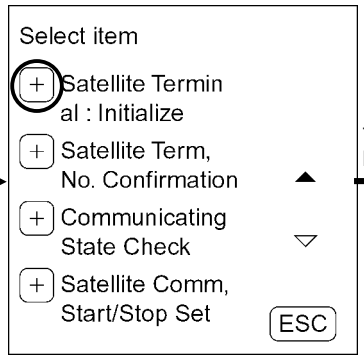
Push Information C/U: Various Setup.



T1V7-05-03-026

Main Menu Screen

Push ▼ and move to the next screen of Information C/U: Various Setup Screen. Push Satellite Terminal: Initialize.

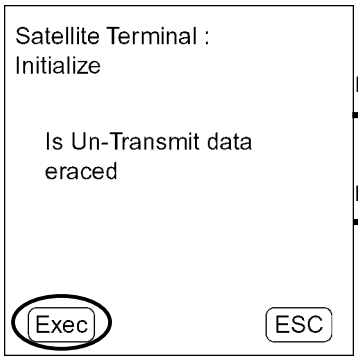


T1V7-05-03-035

Information C/U: Various Setup Screen

To the lower

Push Exec.
Push ESC and return to Information C/U: Various Setup Screen.

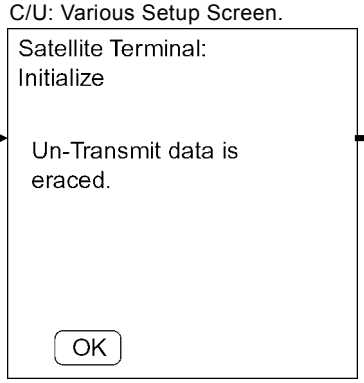


T1V7-05-03-036

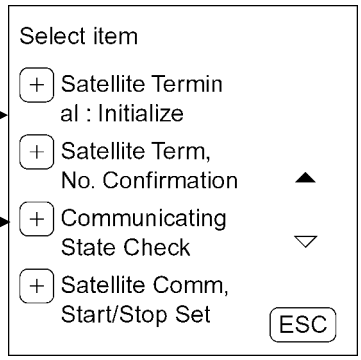
Init

ESC

Push OK and return to Information C/U: Various Setup Screen.



T1V7-05-03-145

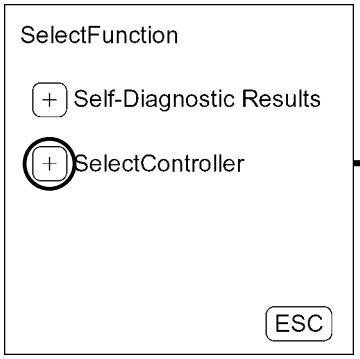


T1V7-05-03-035

Information C/U: Various Setup Screen

SATELLITE TERMINAL No. CONFIRMATION

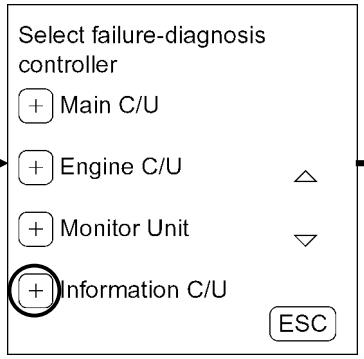
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

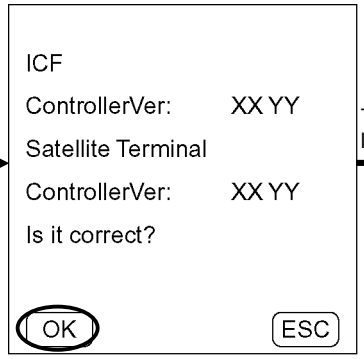
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-045

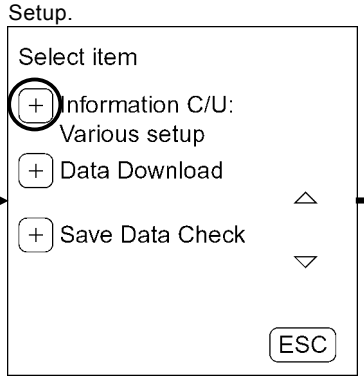
ICF Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

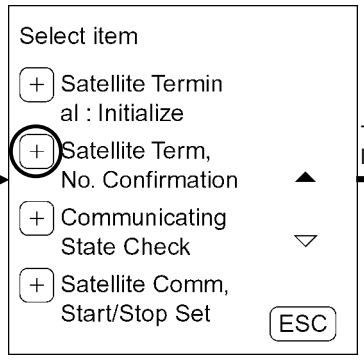
Push Information C/U: Various Setup.



T1V7-05-03-026

Main Menu Screen

Push ▼ and move to the next screen of Information C/U: Various Setup Screen. Push Satellite Terminal No. Confirmation.

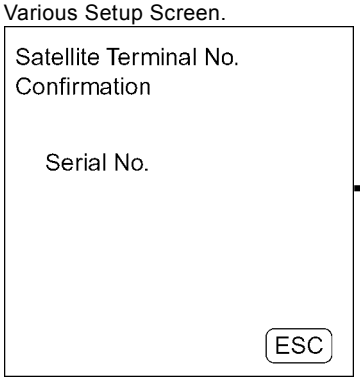


To the lower

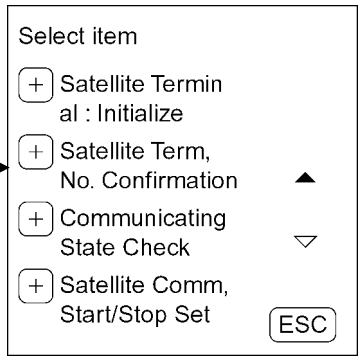
T1V7-05-03-035

Information C/U: Various Setup Screen

Confirm serial No. (12 digits). Push ESC and return to Information C/U: Various Setup Screen.



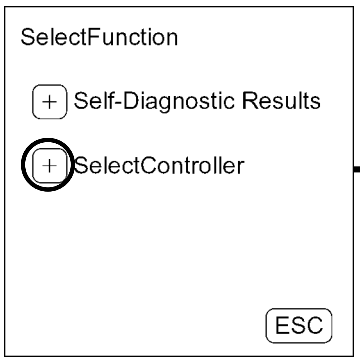
T1V7-05-03-037



T1V7-05-03-035

COMMUNICATING STATE CHECK

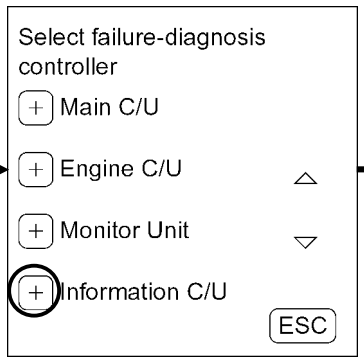
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

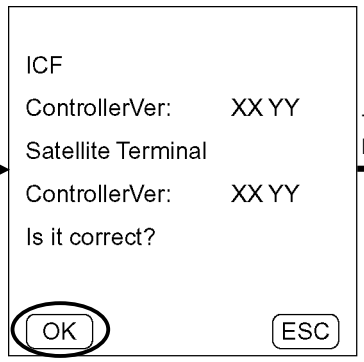
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-045

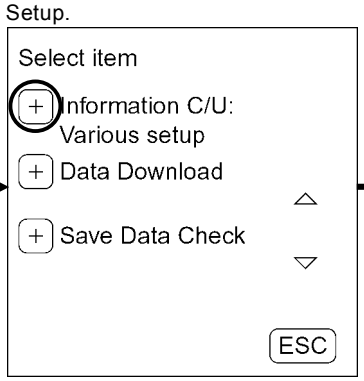
ICF Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

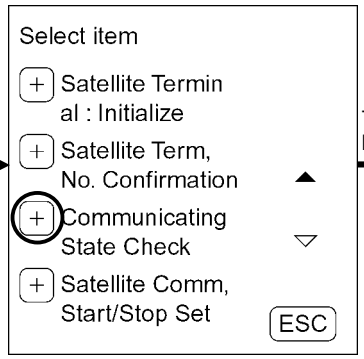
Push Information C/U: Various Setup.



T1V7-05-03-026

Main Menu Screen

Push ▼ and move to the next screen of Information C/U: Various Setup Screen. Push Communicating State Check.

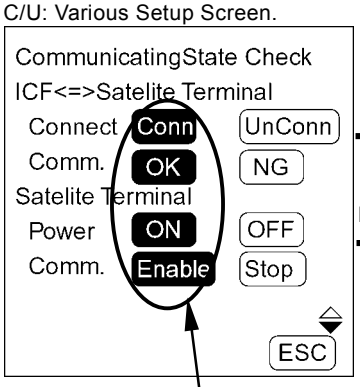


To the lower

T1V7-05-03-035

Information C/U: Various Setup Screen

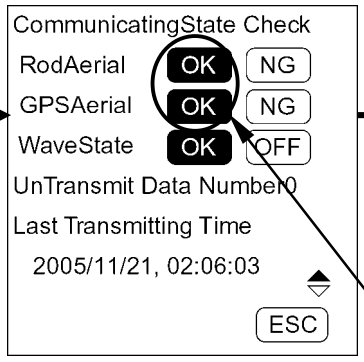
Check communicating state.
Unconn: Faulty harness
NG: Faulty harness for Comm.
OFF: Faulty harness, Faulty controller
Stop: Enter Satellite Comm. Start/Stop
Push ESC and return to Information C/U: Various Setup Screen.



T1V7-05-03-142

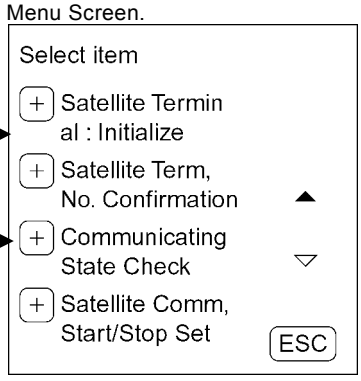
Check the enclosed state.

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.



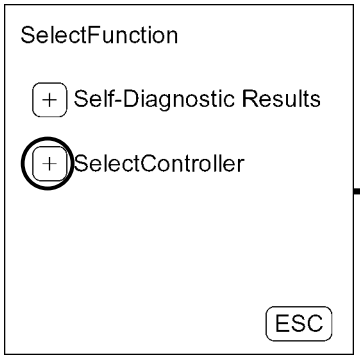
T1V7-05-03-035

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 SET

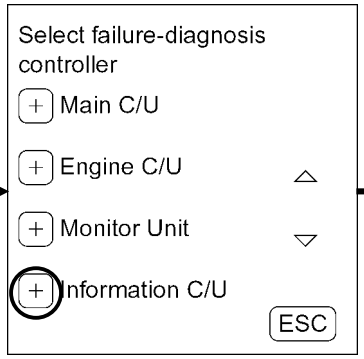
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

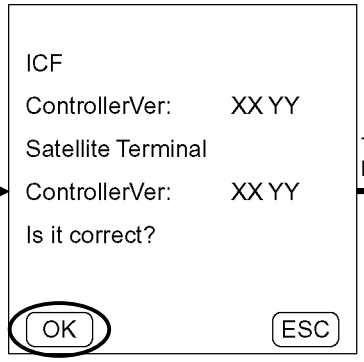
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-045

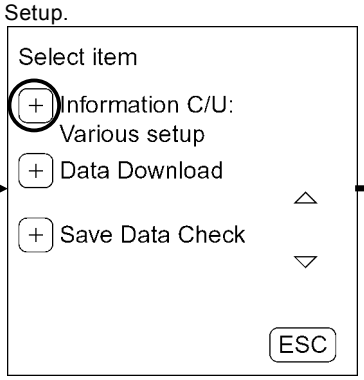
ICF Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

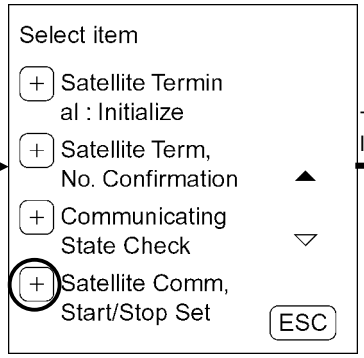
Push Information C/U: Various Setup.



T1V7-05-03-026

Main Menu Screen

Push ▼ and move to the next screen of Information C/U: Various Setup Screen. Push Enter Satellite Comm, Start/Stop.

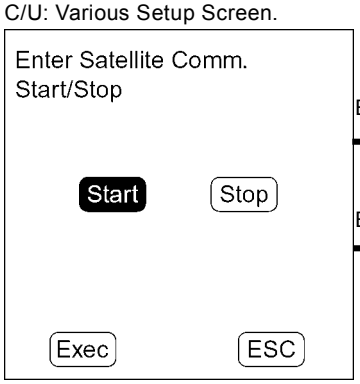


To the lower

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.

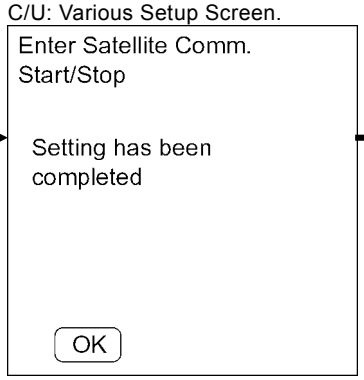


Exec

ESC

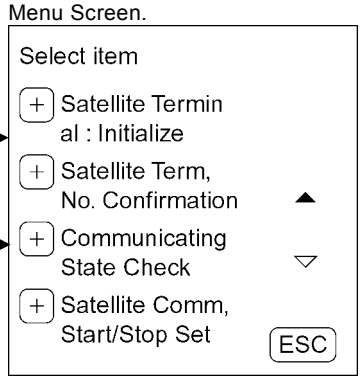
T1V7-05-03-146

Push OK and return to Information C/U: Various Setup Screen.



T1V7-05-03-147

Push ESC and return to Main Menu Screen.



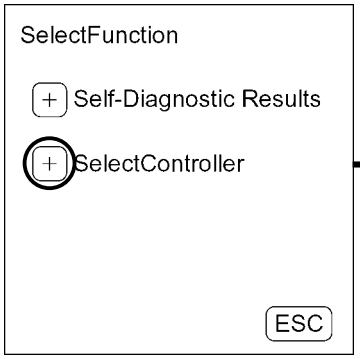
T1V7-05-03-035

Information C/U: Various Setup Screen

(Blank)

DATA DOWNLOAD

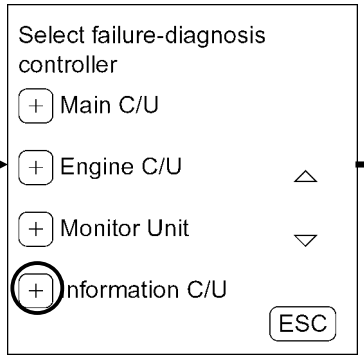
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

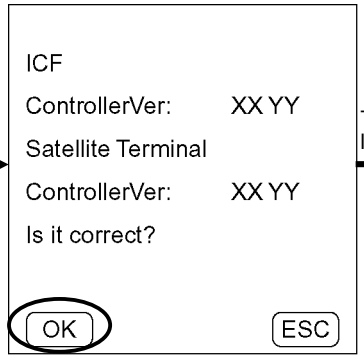
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-045

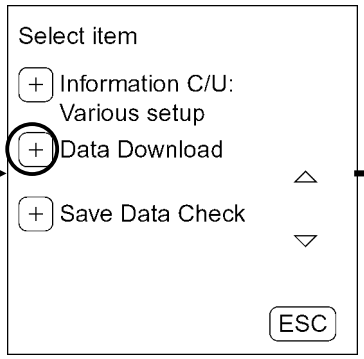
ICF Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

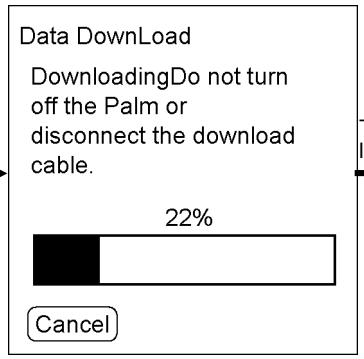
Push Data Download.



T1V7-05-03-026

Main Menu Screen

While downloading data, Download Screen is displayed.

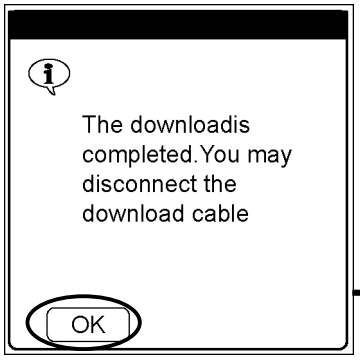


To the lower

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

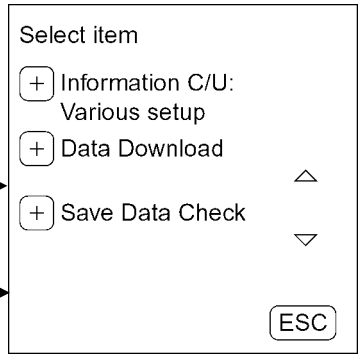
Normal End Screen

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.

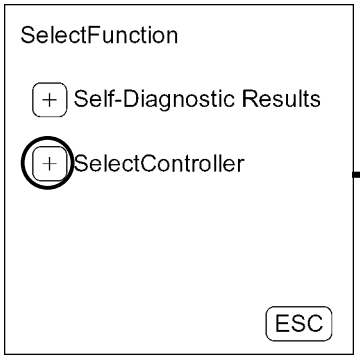


T1V7-05-03-026

Main Menu Screen

SAVE DATA CHECK

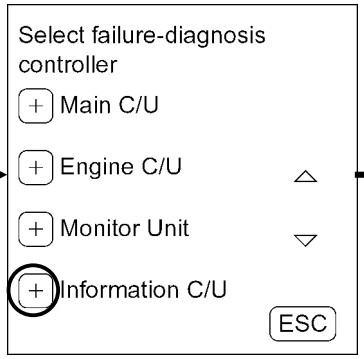
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

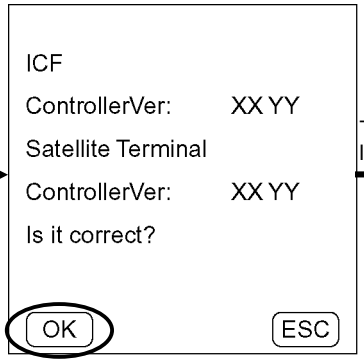
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-045

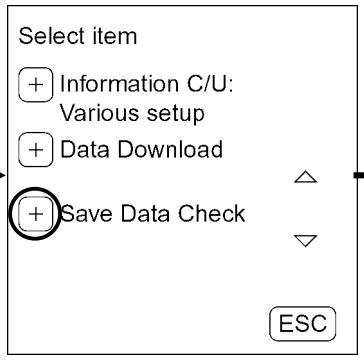
ICF Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

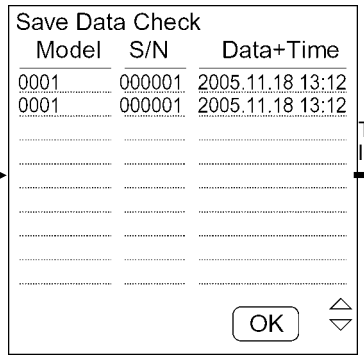
Push Save Data Check.



T1V7-05-03-026

Main Menu Screen

Data saved in ICF is displayed. Push OK and return to Main Menu Screen.



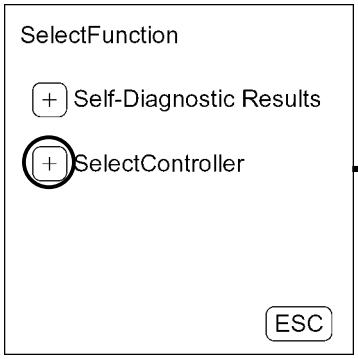
To the lower

T1V7-05-03-040

Save Data Check Screen

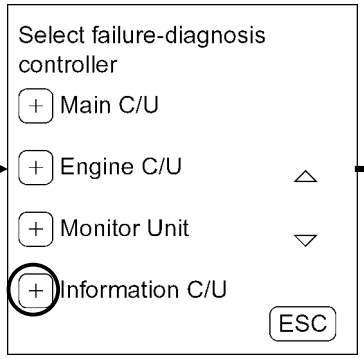
PASSWORD CHANGE

After starting Dr. ZX, push Select Controller.



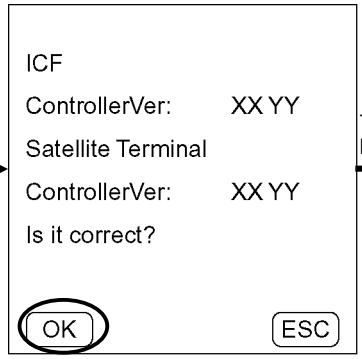
Function Selection Screen T1V7-05-03-001

Push Information C/U.



Controller Selection Screen T1V7-05-03-009

Push OK.



ICF Controller Screen T1J1-05-03-045

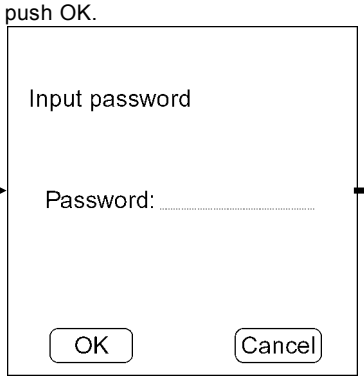
To the lower

Push Password.

T1V7-05-03-025

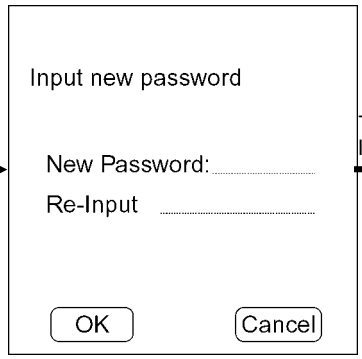
Title Screen

Input the registered password and push OK.



T1V7-05-03-126

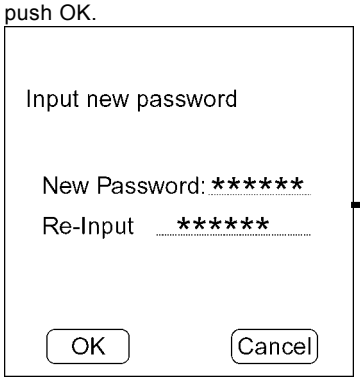
Input the new password and push OK.



T1V7-05-03-127

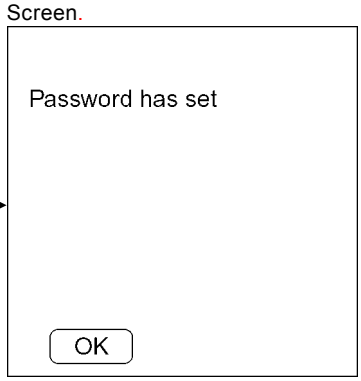
To the lower

Input the new password again and push OK.



T1V7-05-03-169

Push OK and return to Title Screen.

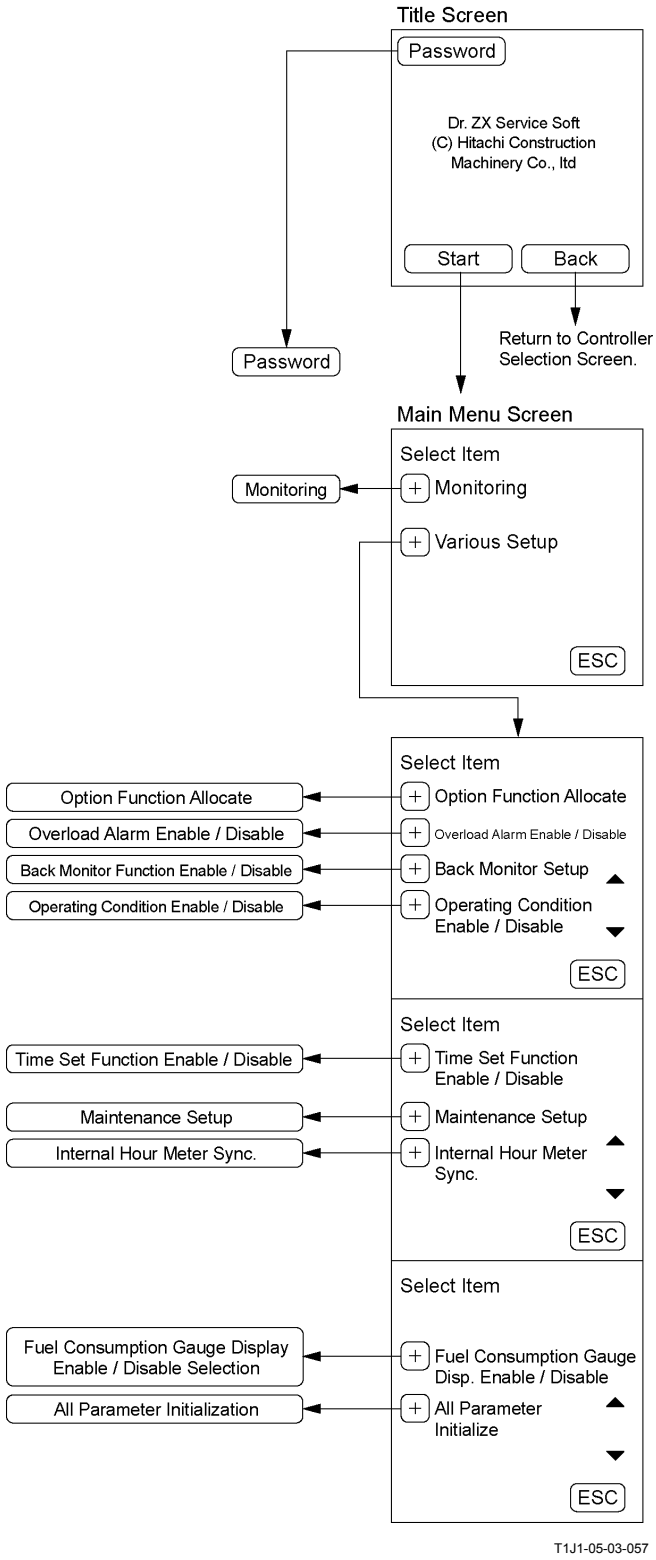


T1V7-05-03-128

MONITOR CONTROLLER

- Password Change
  The password can be changed.

- 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.



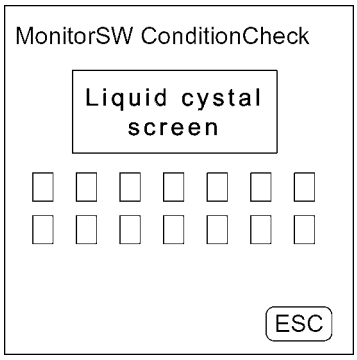
T1J1-05-03-057

MONITORING

List of Monitoring Item

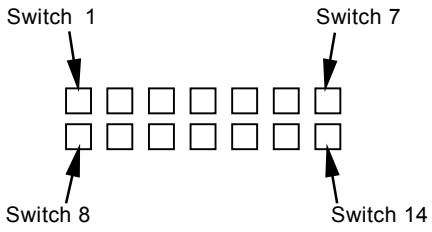
Item		Unit	Data
Selecting	Monitoring		
Monitor SW Status Check	*	**	Switch state of monitor unit
Coolant Temperature	Coolant Temp.	°C	Input signal from coolant temperature sensor
Fuel Level	Fuel Level	%	Input signal from fuel sensor
Security Signal	Security Signal	OFF, ON	Communication from monitor unit
Mail SW	Mail SW	OFF, Fuel, Forward, Repair, General	Operating state of mail

* Display when monitoring



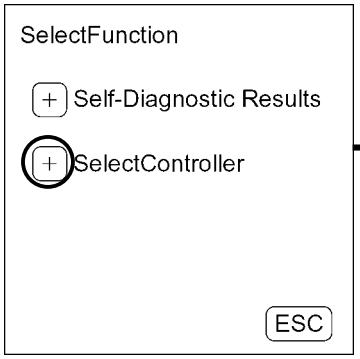
T1V7-05-03-044

** Unit



Monitor Switch Status Check

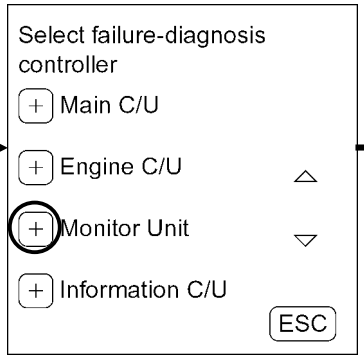
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

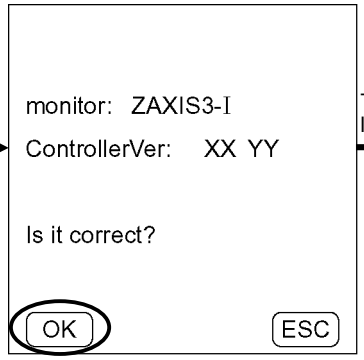
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1J1-05-03-046

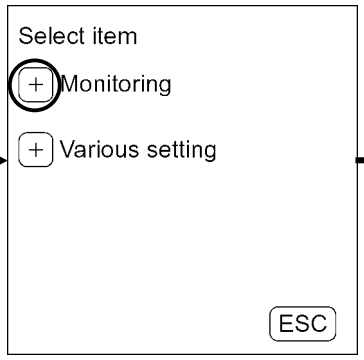
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

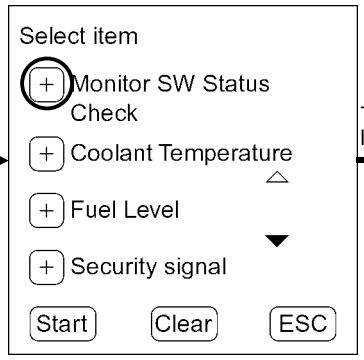
Push Monitoring.



T1V7-05-03-042

Main Menu Screen

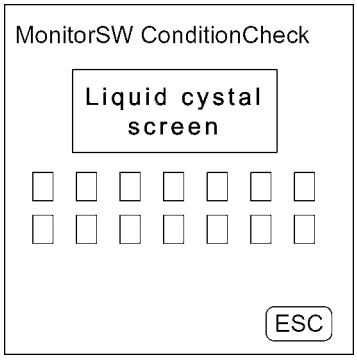
Push item for monitoring and push Start.
Push ESC and return to Main Menu Screen.



T1V7-05-03-043

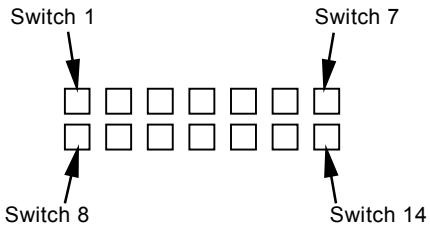
Monitoring Item Selection Screen

Push ESC and return to Main Menu Screen.



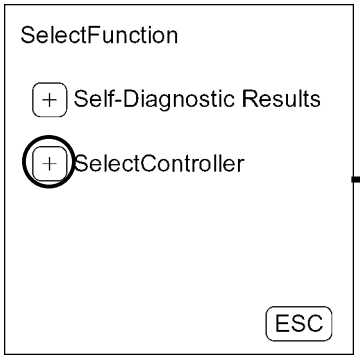
T1V7-05-03-044

Monitor Switch Condition Check Screen



Other Monitoring

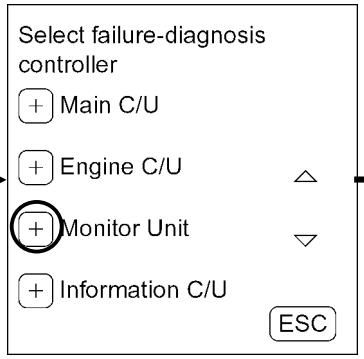
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

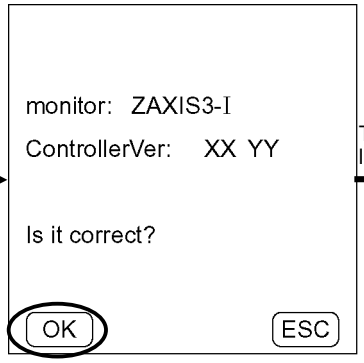
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.

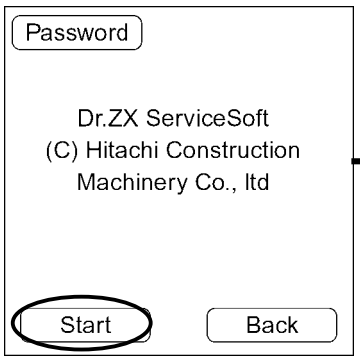


To the lower

T1J1-05-03-046

Monitor Controller Screen

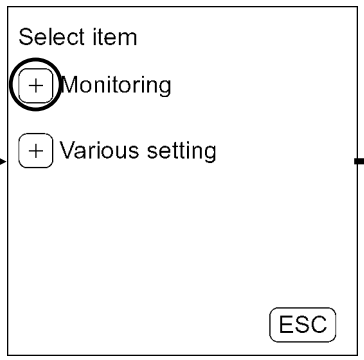
Push Start.



T1V7-05-03-025

Title Screen

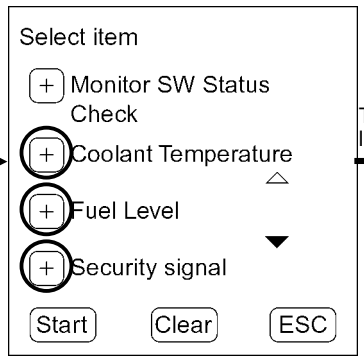
Push Monitoring.



T1V7-05-03-042

Main Menu Screen

Push item for monitoring and push Start. Refer to T5-3-63 as for the monitoring item.
Push ESC and return to Main Menu Screen.

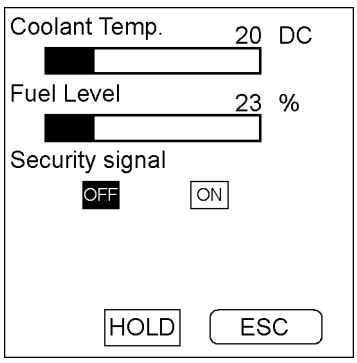


To the lower

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

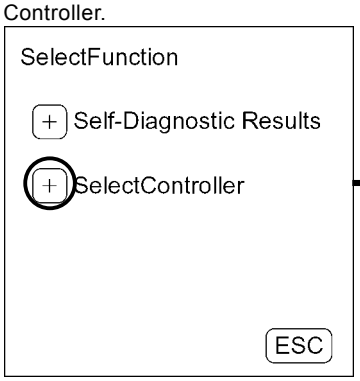
Item		Unit
Optional Function	M1 (Optional Function 1 Allocate)	Unset Work Mode Function Mail Function Auto Lubrication Function
	M2 (Optional Function 2 Allocate)	
	M3 (Optional Function 3 Allocate)	
	M4 (Optional Function 4 Allocate)	
	M5 (Optional Function 5 Allocate)	
	M6 (Optional Function 6 Allocate)	
	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
Inner Hour Meter Sync.		–
Fuel Consumption Gauge Display ON/OFF Selection		Disable/Enable

(Blank)

OPTION FUNCTION ALLOCATE

Example: Allocate ML Crane for Menu 7

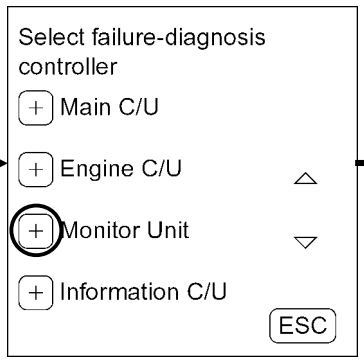
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

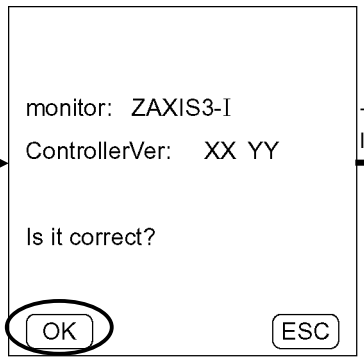
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-046

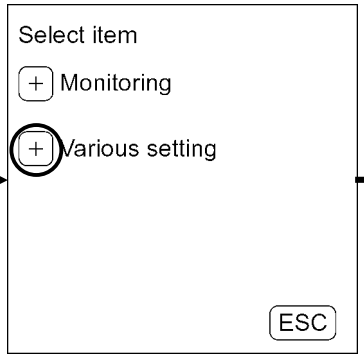
Monitor Controller Screen

Push Start.

T1V7-05-03-025

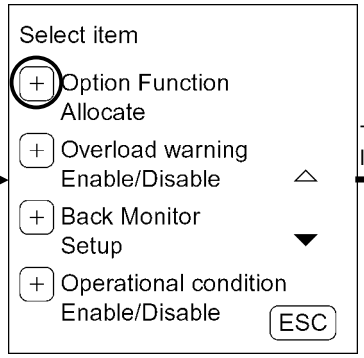
Title Screen

Push Various Setup.



T1V7-05-03-042

Main Menu Screen

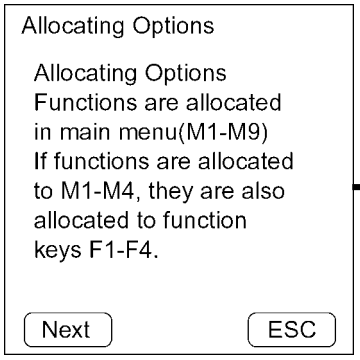


To the lower

T1V7-05-03-046

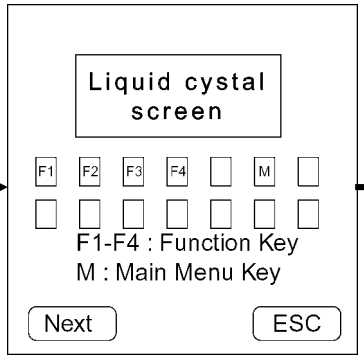
Various Setup Item Screen

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



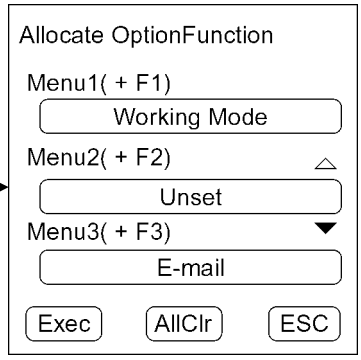
T1V7-05-03-047

Push Next.
Push Back and return to the former screen.



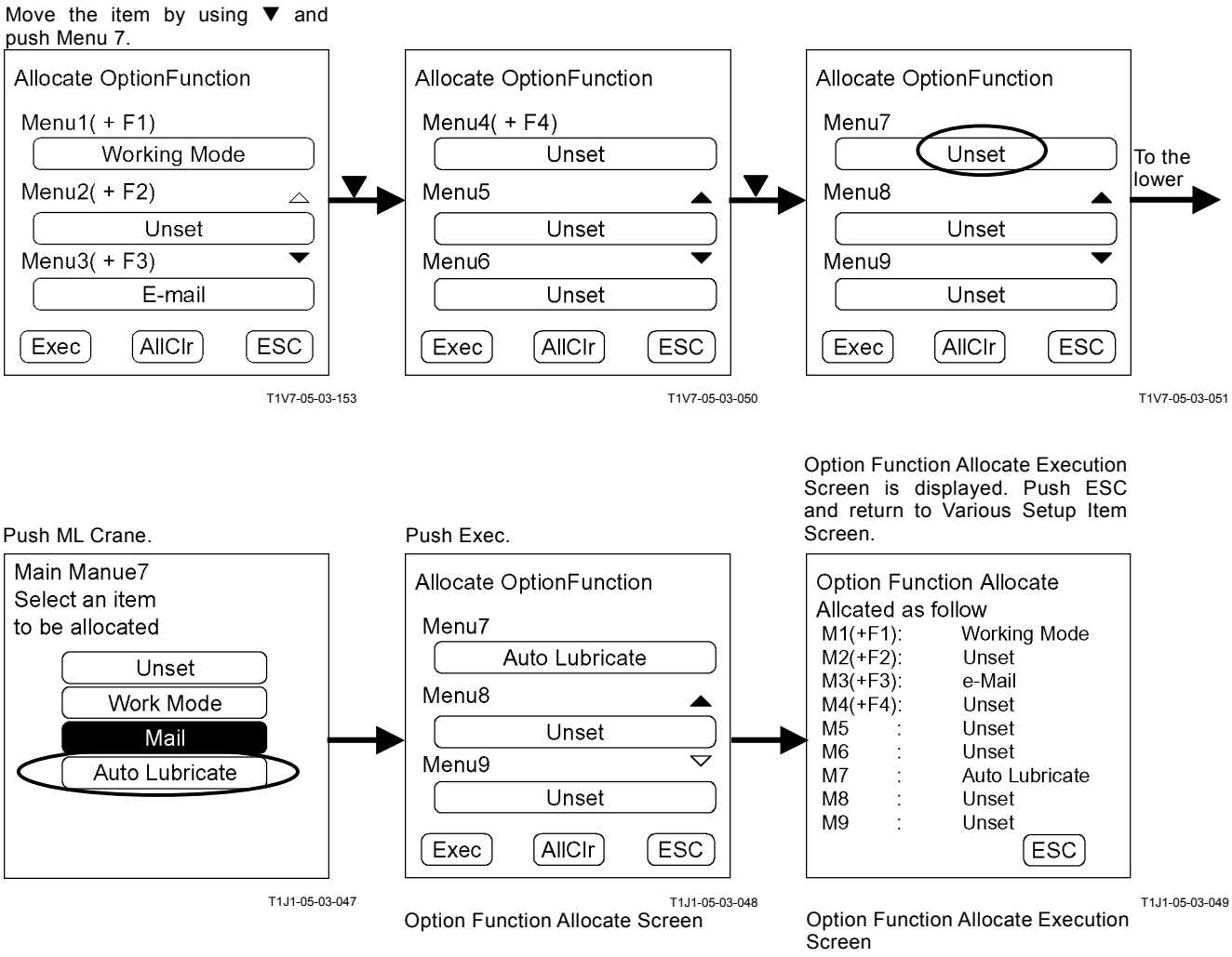
T1V7-05-03-048

Execusion: Refer to the next page.
All Clear: Unset all settings of menus 1 to 9.
ESC: Return to Various Setting Screen.



T1V7-05-03-153

Option Function Allocate Screen



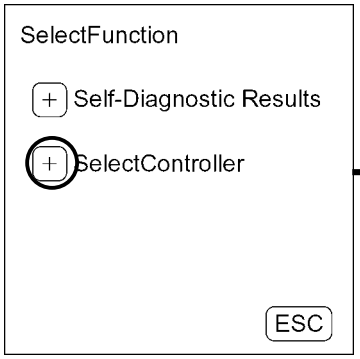
Function that can be selected: Unset
Work Mode
Auto Lubrication
Mail

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

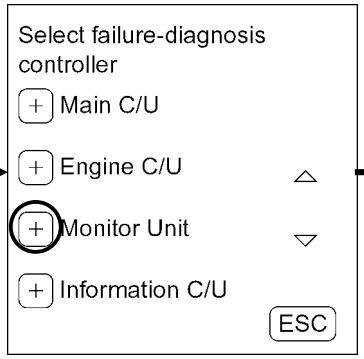
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

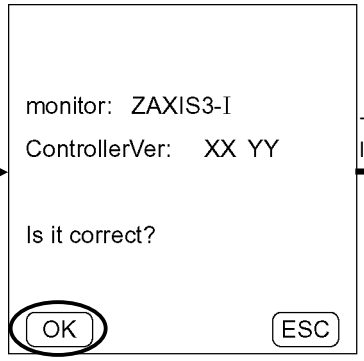
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1J1-05-03-046

Monitor Controller Screen

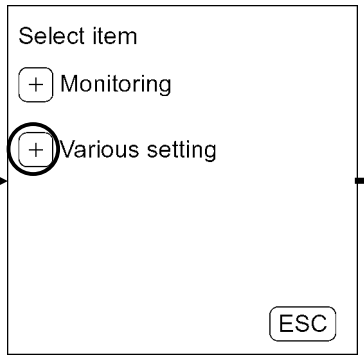
To the lower

Push Start.

T1V7-05-03-025

Title Screen

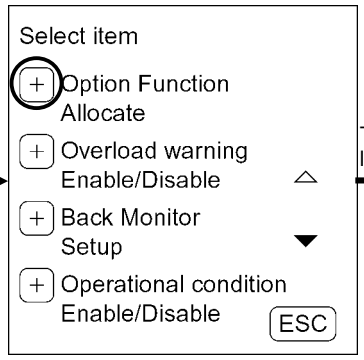
Push Various Setup.



T1V7-05-03-042

Main Menu Screen

Push Option Function Allocate.

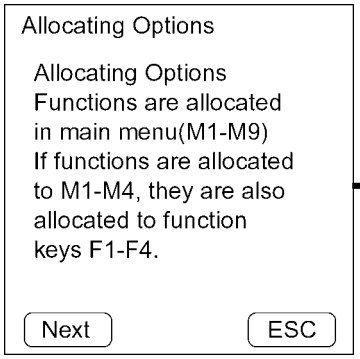


T1V7-05-03-046

Various Setup Item Screen

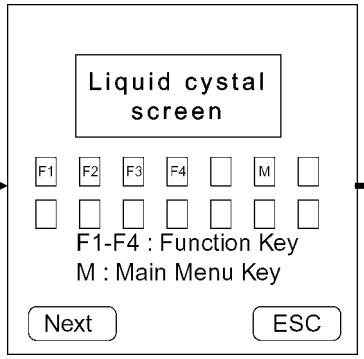
To the lower

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

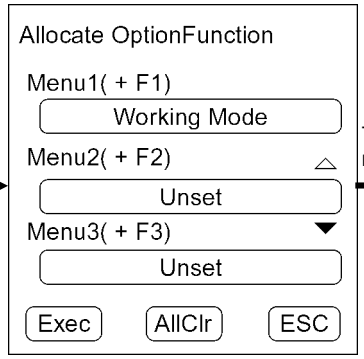


T1V7-05-03-047

Push Next.
Push ESC and return to the former screen.



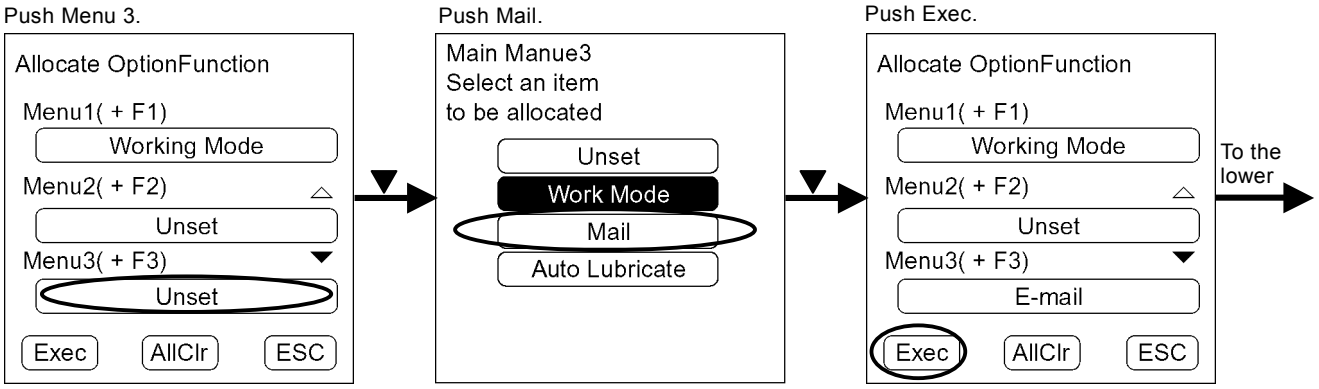
T1V7-05-03-048



T1V7-05-03-155

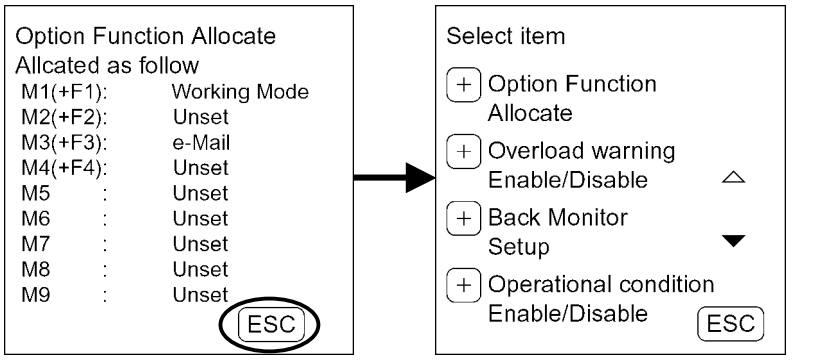
Option Function Allocate Screen

To the next page



Option Function Allocate Screen

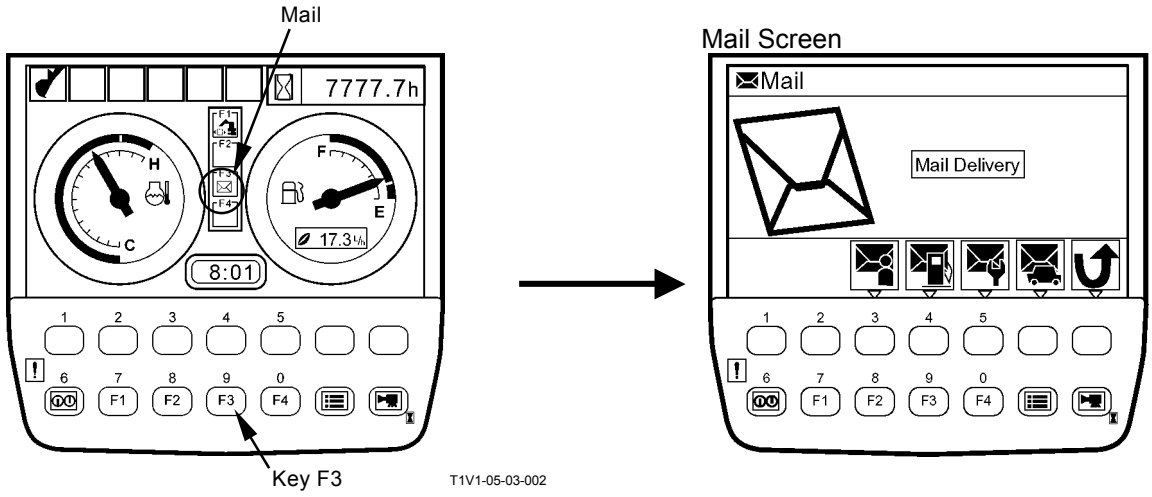
Option Function Allocate Execution Screen is displayed. Push ESC and return to Various Setup Item Screen.



Option Function Allocate Execution Screen

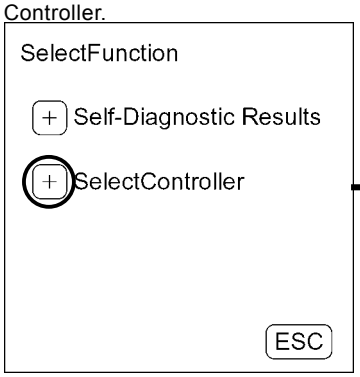
Various Setup Item Screen

Mail is displayed on the monitor unit screen.
When pushing key F3, Mail Screen is displayed.



Allocate Auto Lubricate for Menu 4

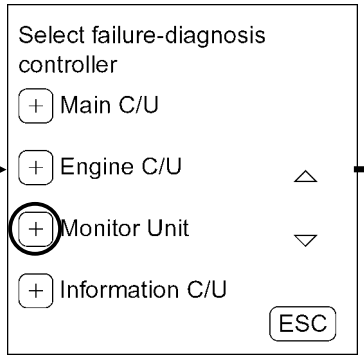
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

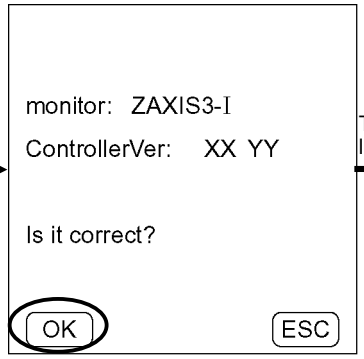
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.

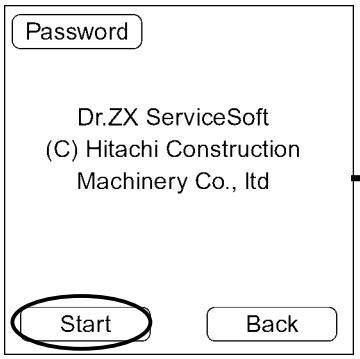


T1J1-05-03-046

Monitor Controller Screen

To the lower

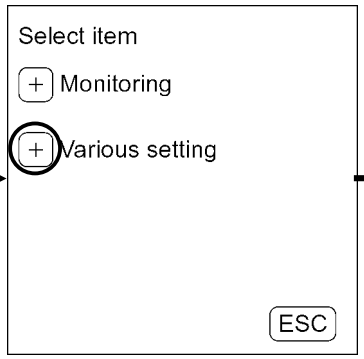
Push Start.



T1V7-05-03-025

Title Screen

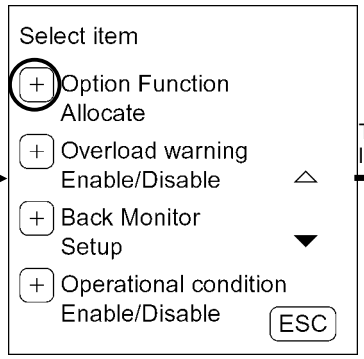
Push Various Setting.



T1V7-05-03-042

Main Menu Screen

Push Option Function Allocate.

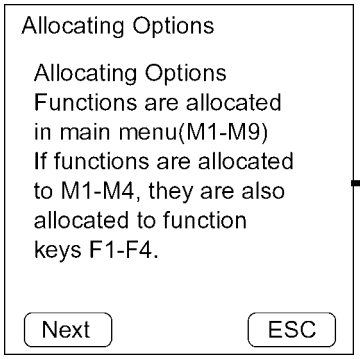


T1V7-05-03-046

Various Setup Item Screen

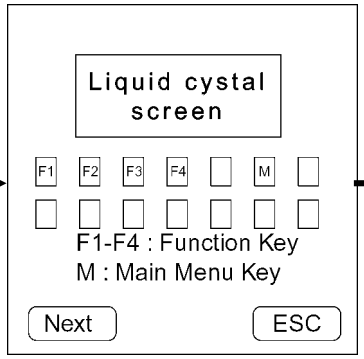
To the lower

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

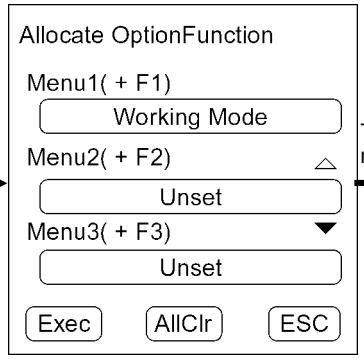


T1V7-05-03-047

Push Next.
Push Back and return to the former screen.



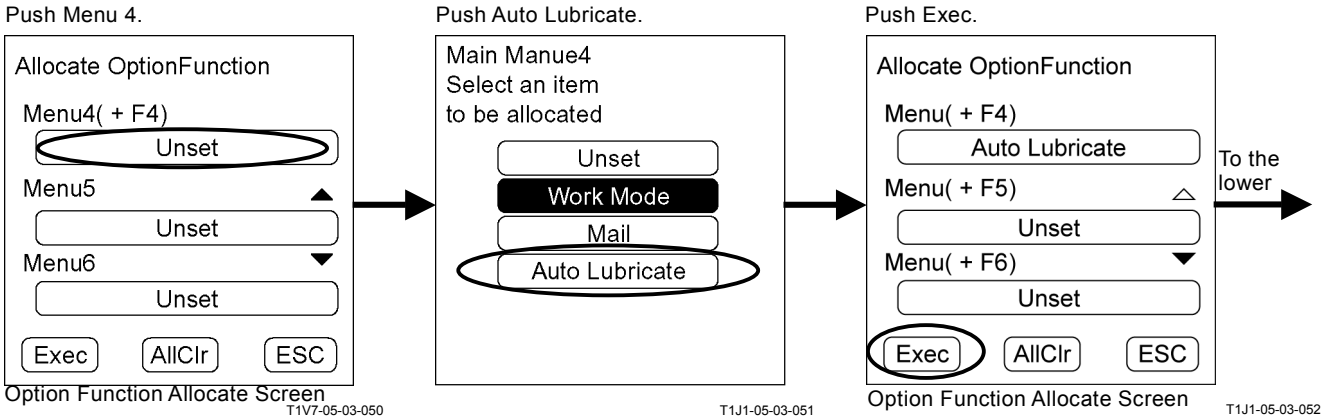
T1V7-05-03-048

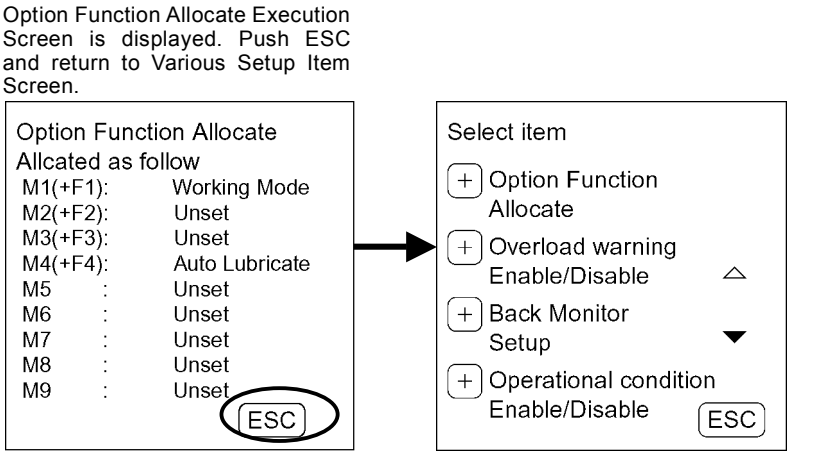


T1V7-05-03-155

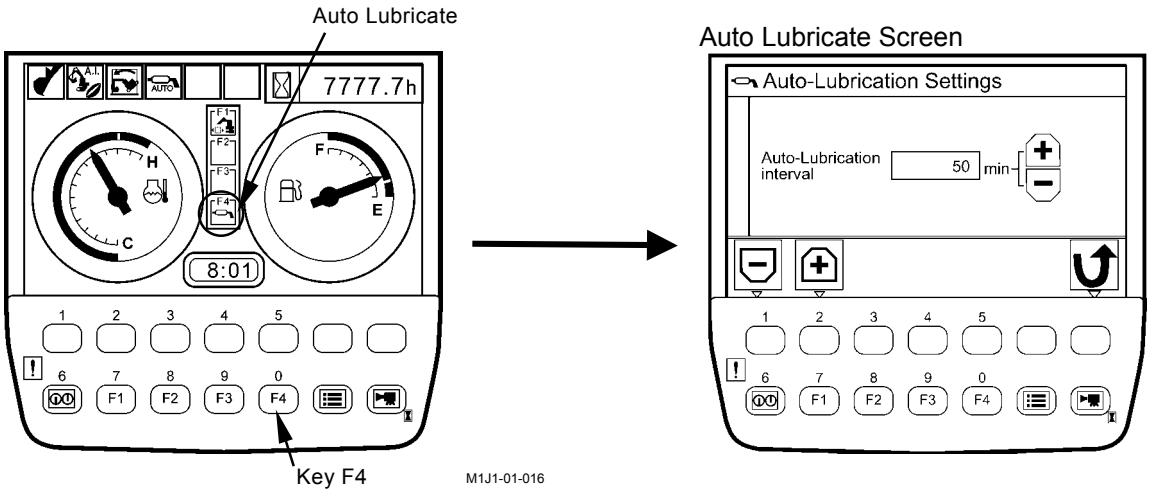
Option Function Allocate Screen

To the next page



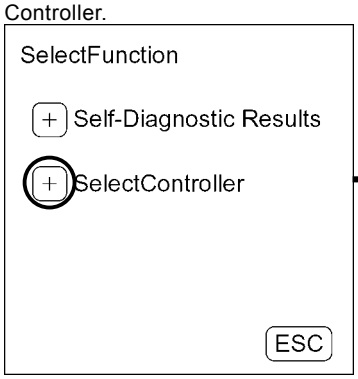


Auto Lubricate is displayed on the monitor unit screen. When pushing key F4, Auto Lubricate Screen is displayed



Make Mail for Menu 3 Disable

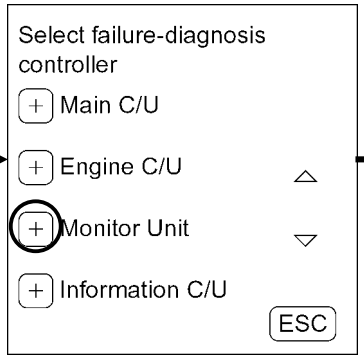
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

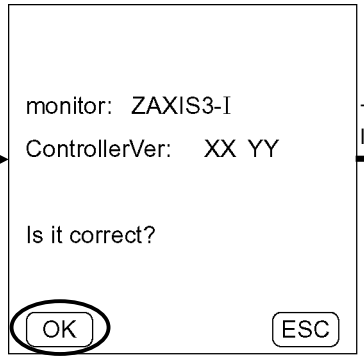
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-046

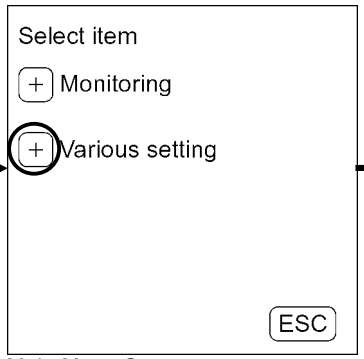
Monitor Controller Screen

Push Start.

Title Screen

T1V7-05-03-025

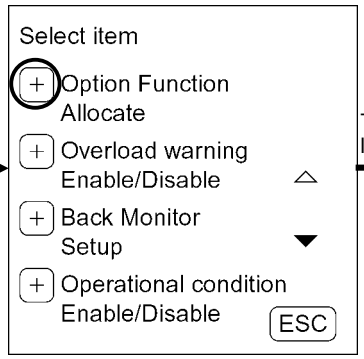
Push Various Setting.



Main Menu Screen

T1V7-05-03-042

Push Option Function Allocate.

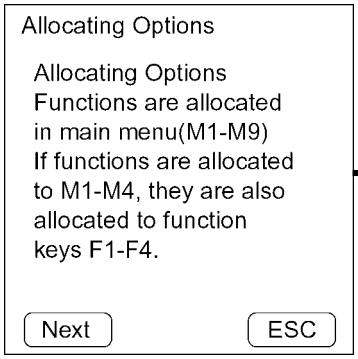


To the lower

Various Setup Item Screen

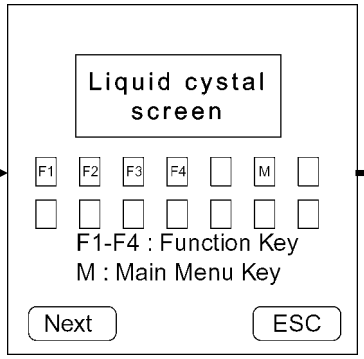
T1V7-05-03-046

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

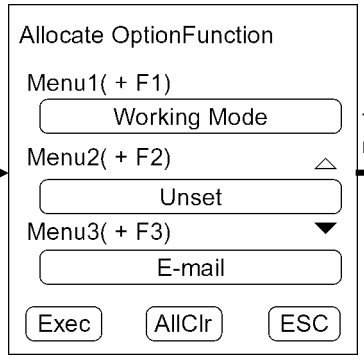


T1V7-05-03-047

Push Next.
Push Back and return to the former screen.



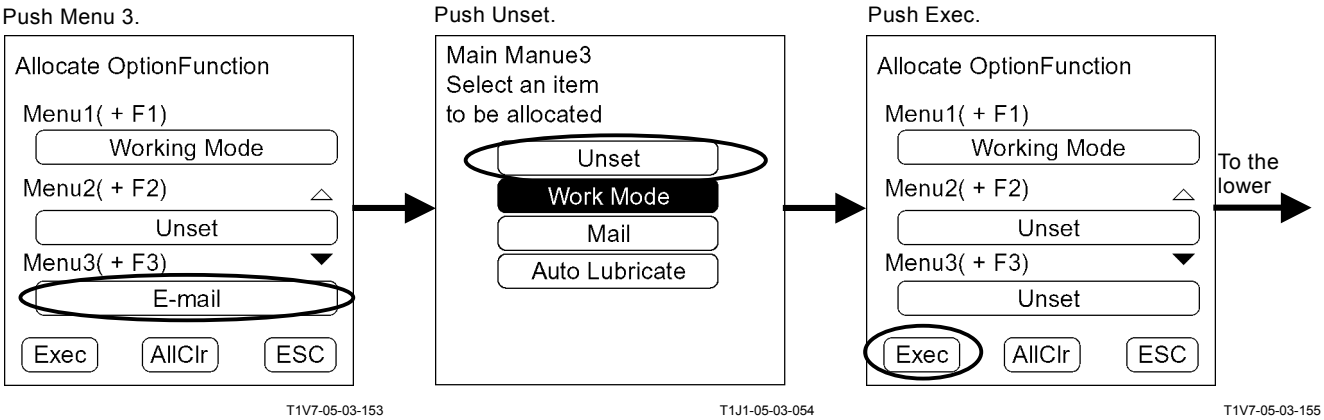
T1V7-05-03-048



To the next page

T1V7-05-03-153

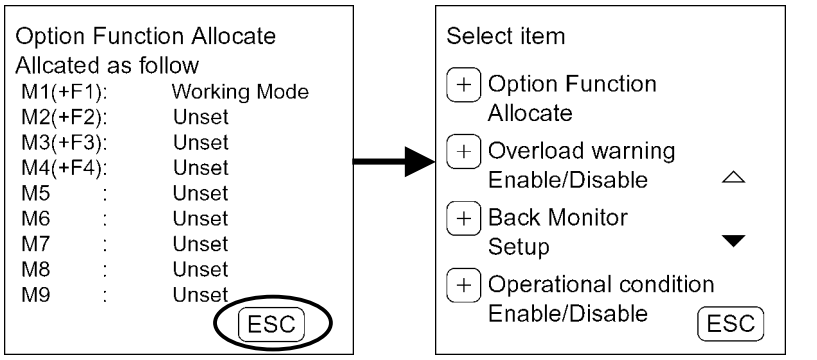
Option Function Allocate Screen



Option Function Allocate Screen

Option Function Allocate Screen

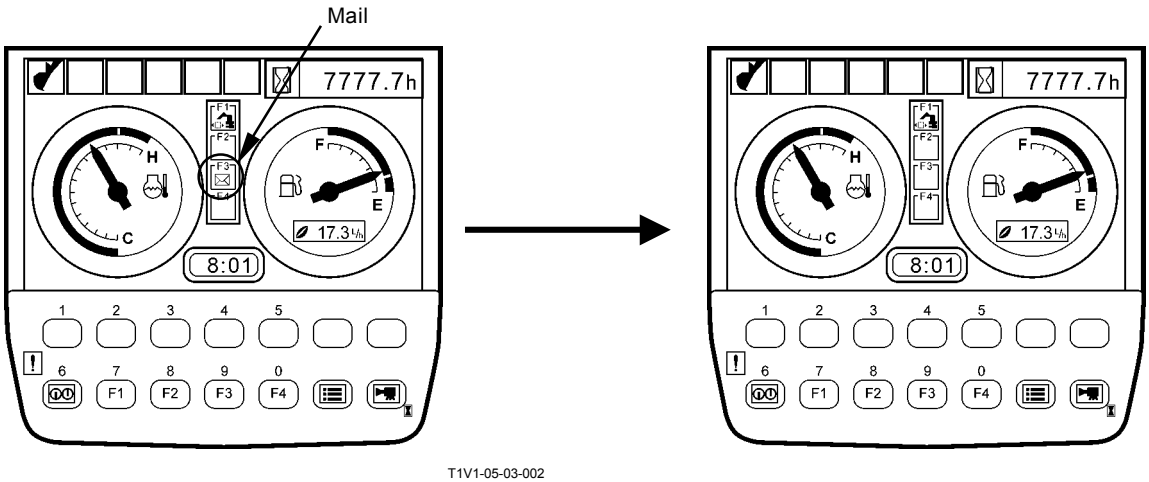
Option Function Allocate Execution Screen is displayed. Push ESC and return to Various Setup Item Screen.



Option Function Allocate Execution Screen

Various Setup Item Screen

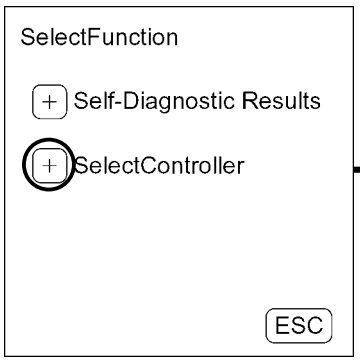
Mail is disappeared on the monitor unit screen.



OVERLOAD WARNING ENABLE / DISABLE SELECTION

Overload Warning: Enable

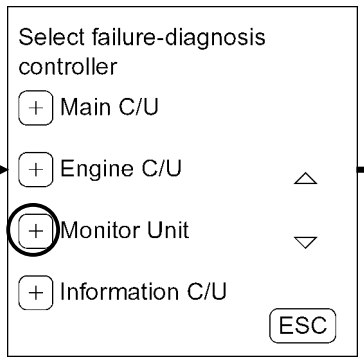
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

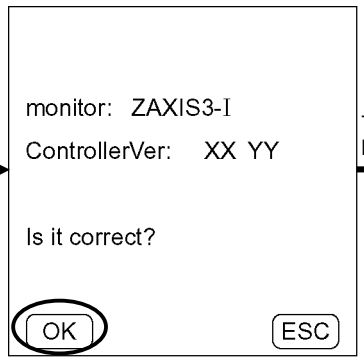
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-046

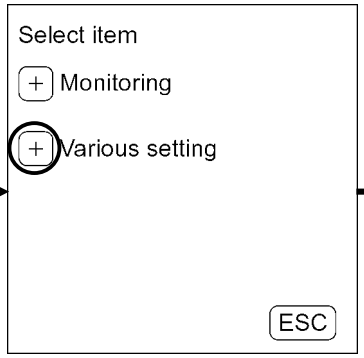
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

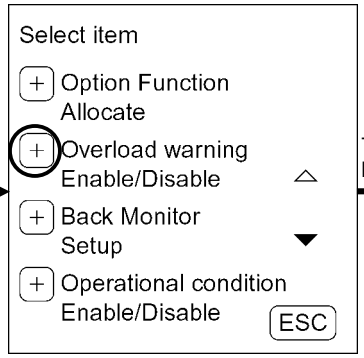
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Push Overload warning Enable/Disable.

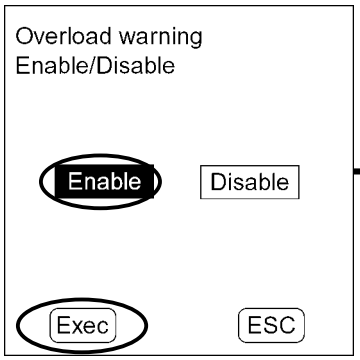


To the lower

T1V7-05-03-046

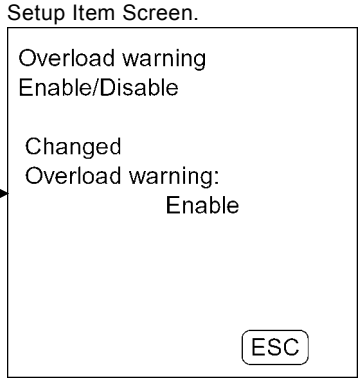
Various Setup Item Screen

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.

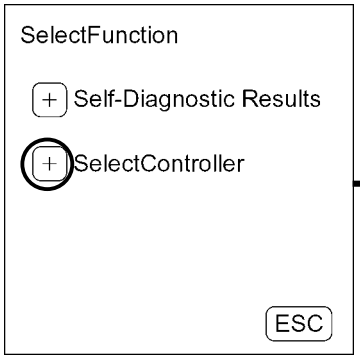


T1V7-05-03-162

NOTE: Push Enable, push ESC and return to Various Setup Item Screen, so that Overload Alarm Enable is not set.

Overload Warning: Disable

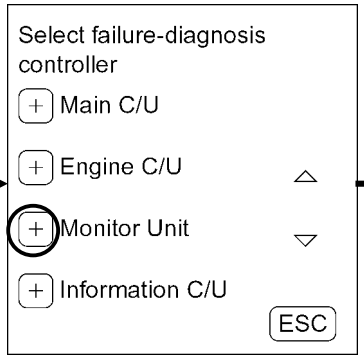
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

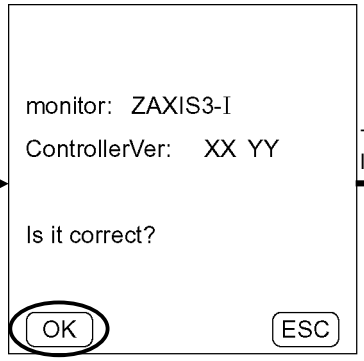
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1J1-05-03-046

Monitor Controller Screen

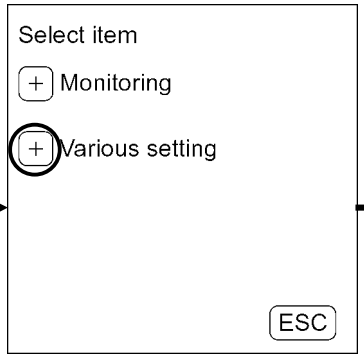
To the lower

Push Start.

T1V7-05-03-025

Title Screen

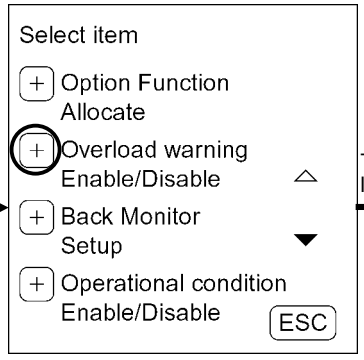
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Push Overload warning Enable/ Disable.

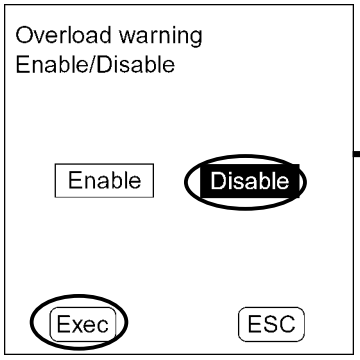


T1V7-05-03-046

Various Setup Item Screen

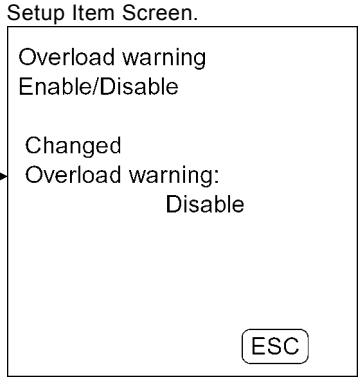
To the lower

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.



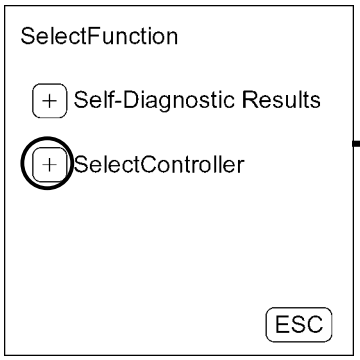
T1V7-05-03-164

NOTE: Push Disable, push ESC and return to Various Setup Item Screen, so that Overload Alarm Disable is not set

BACK MONITOR SETUP

Back Monitor Function: Enable

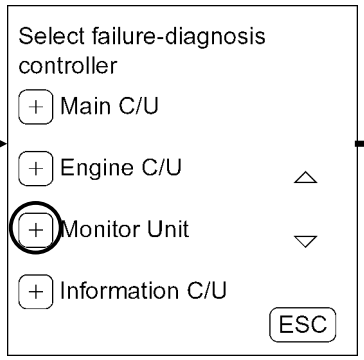
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

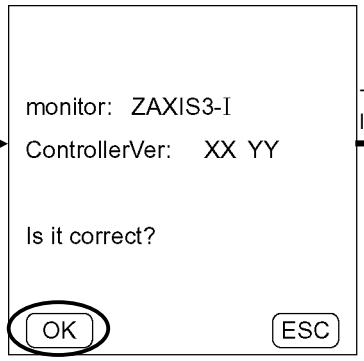
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

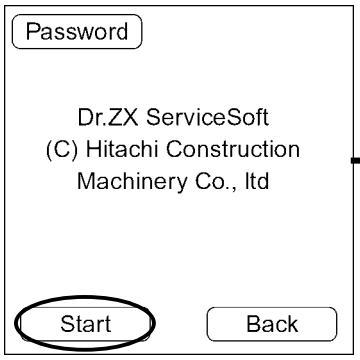
Push OK.



T1J1-05-03-046

Monitor Controller Screen

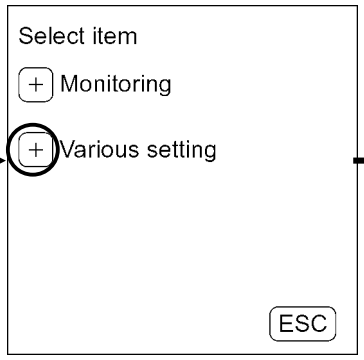
Push Start.



T1V7-05-03-025

Title Screen

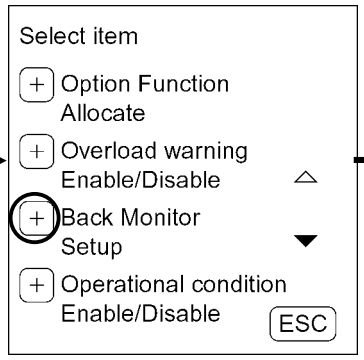
Push Various setting.



T1V7-05-03-042

Main Menu Screen

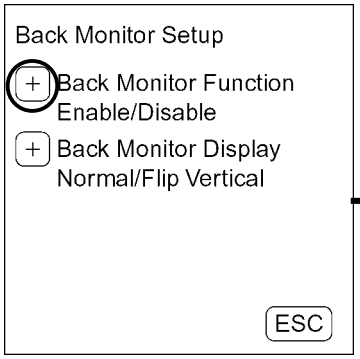
Push Back Monitor Setup.



T1V7-05-03-046

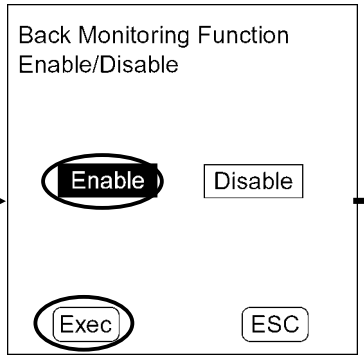
Various Setup Item Screen

Push Back Monitor Function Enable / Disable. Push ESC and return to the former screen.



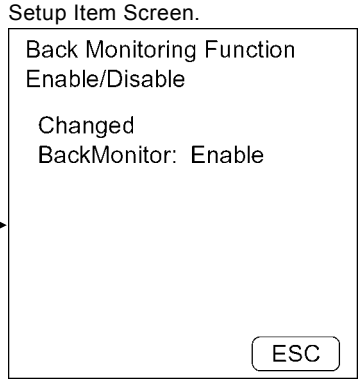
T1V7-05-03-052

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.

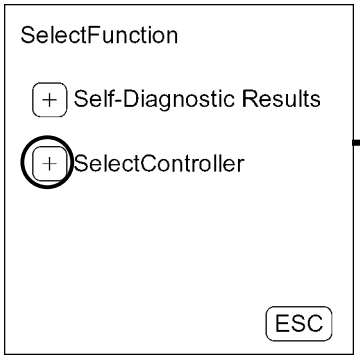


T1V7-05-03-054

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

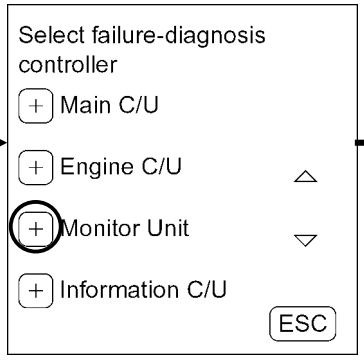
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

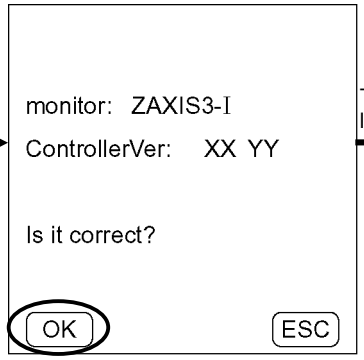
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-046

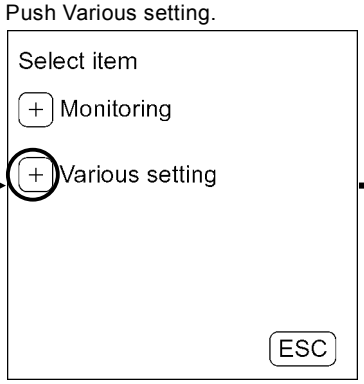
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

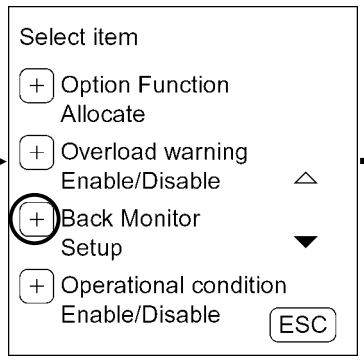
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Push Back Monitor Setup.

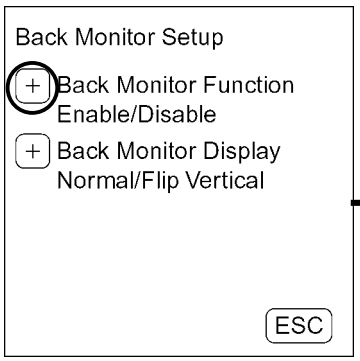


To the lower

T1V7-05-03-046

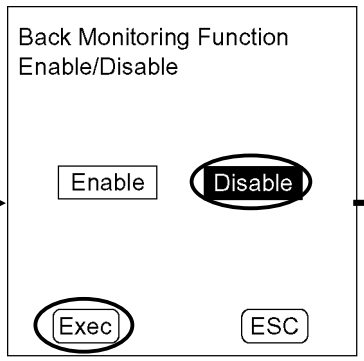
Various Setup Item Screen

Push Back Monitor Function Enable / Disable. Push ESC and return to the former screen.



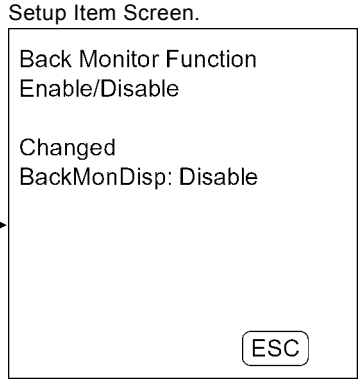
T1V7-05-03-052

Push Enable and push Exec. Push ESC and return to Various Setup Item Screen.



T1J1-05-03-055

Push ESC and return to Various Setup Item Screen.

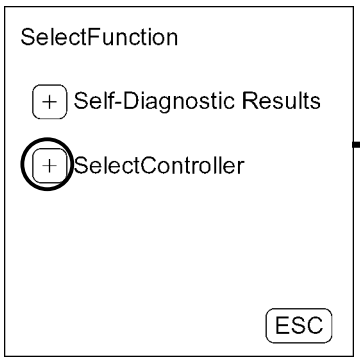


T1V7-05-03-057

NOTE: Push Disable, push ESC and return to Various Setup Item Screen, so that Back Monitor Function Disable is not set.

Back Monitor Display: Normal

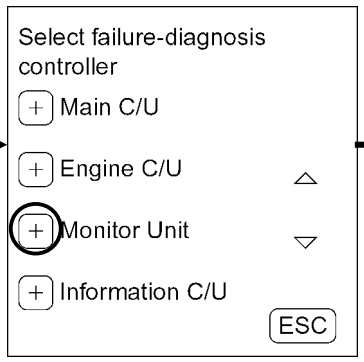
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

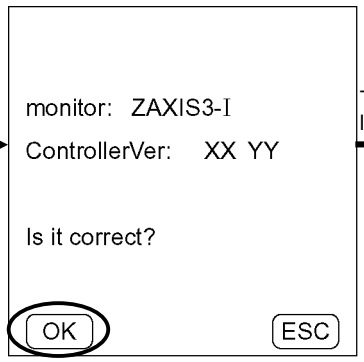
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

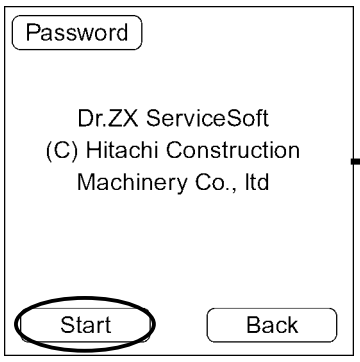
Push OK.



T1J1-05-03-046

Monitor Controller Screen

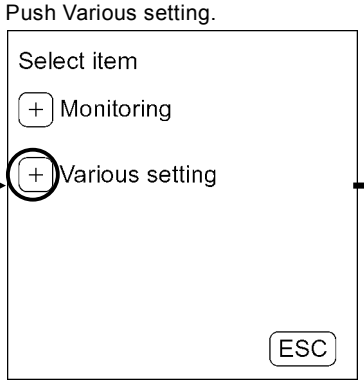
Push Start.



T1V7-05-03-025

Title Screen

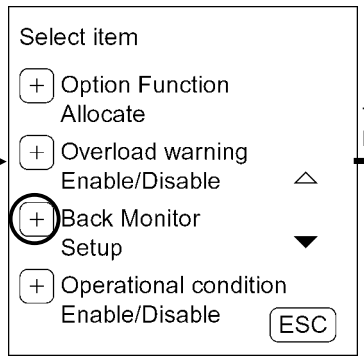
Push Various setting.



T1V7-05-03-042

Main Menu Screen

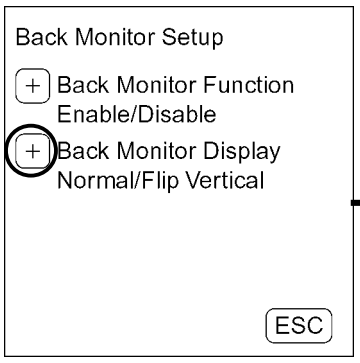
Push Back Monitor Setup.



T1V7-05-03-046

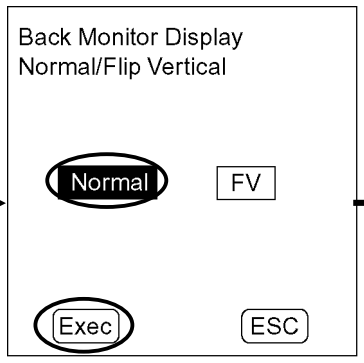
Various Setup Item Screen

Push Back Monitor Display Normal / Filip Vartical. Push ESC and return to the former screen.



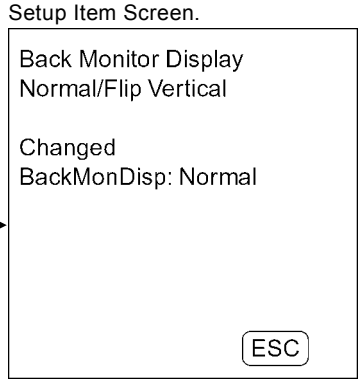
T1V7-05-03-052

Push Normal and push Exec. Push ESC and return to Various Setup Item Screen.



T1J1-05-03-056

Push ESC and return to Various Setup Item Screen.

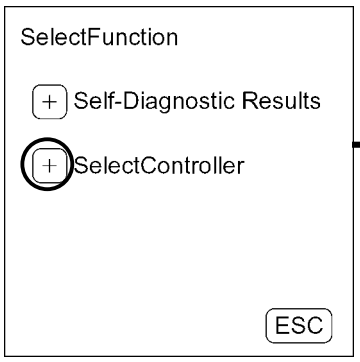


T1V7-05-03-058

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

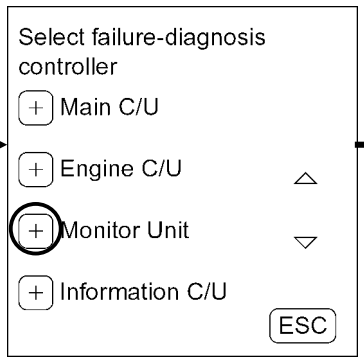
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

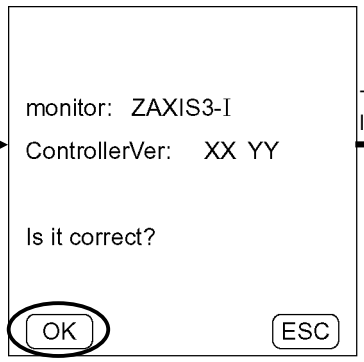
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1J1-05-03-046

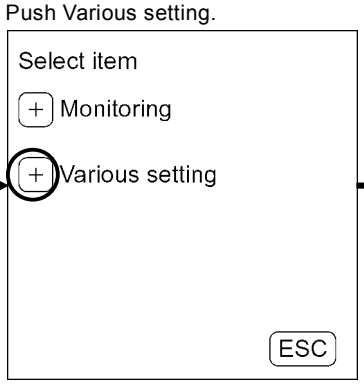
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

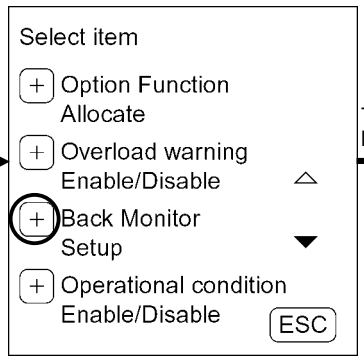
Push Various setting.



T1V7-05-03-042

Main Menu Screen

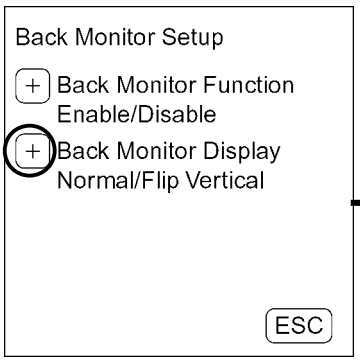
Push Back Monitor Setup.



T1V7-05-03-046

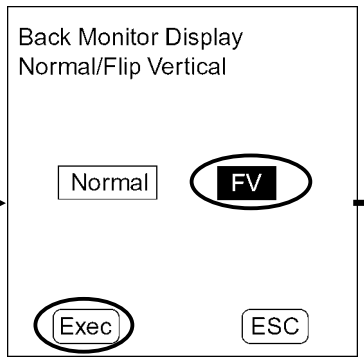
Various Setup Item Screen

Push Back Monitor Display Normal/Filip Vartical. Push ESC and return to the former screen.



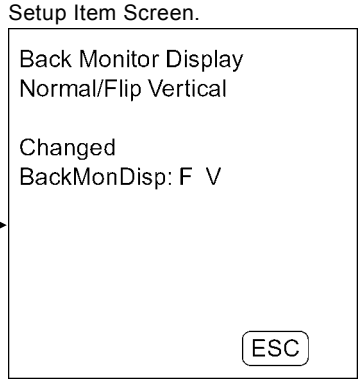
T1V7-05-03-052

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.



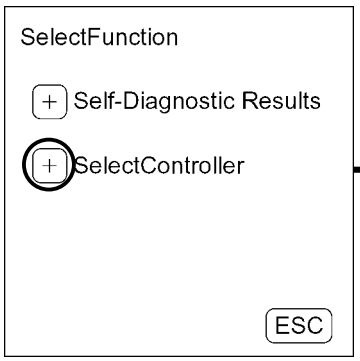
T1V7-05-03-056

NOTE: Push FV, push ESC and return to Various Setup Item Screen, so that Back Monitor Display Flip Vertical is not set.

OPERATIONAL CONDITION ENABLE / DISABLE SELECTION

Operational Condition: Enable

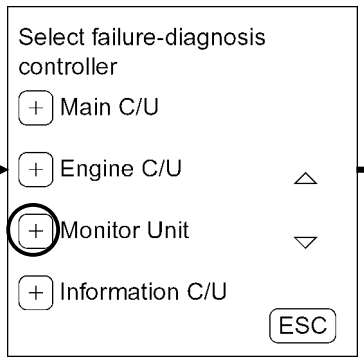
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

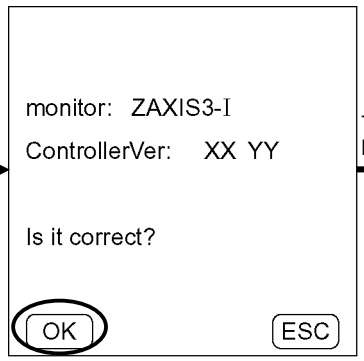
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-046

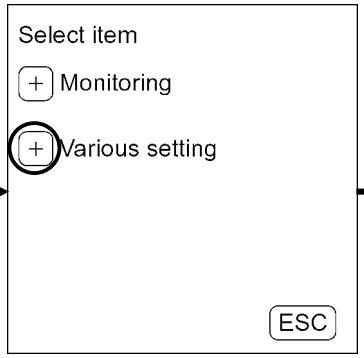
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

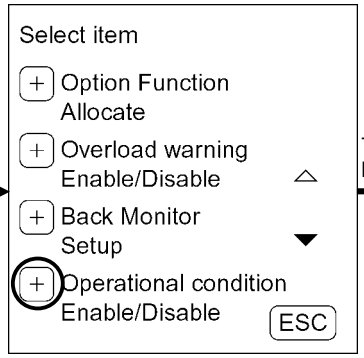
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Push Operational condition Enable/ Disable.

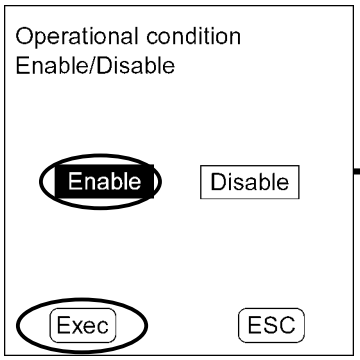


To the lower

T1V7-05-03-046

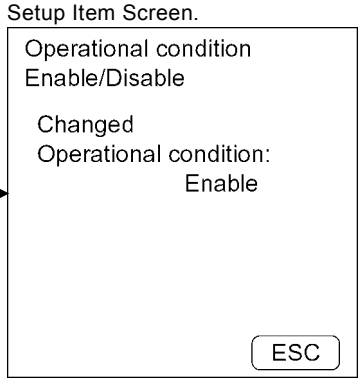
Various Setup Item Screen

Push 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.

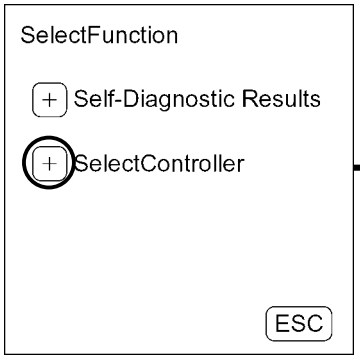


T1V7-05-03-060

NOTE: Push Enable, push ESC and return to Various Setup Item Screen, so that Operating Condition Enable is not set.

Operational Condition: Disable

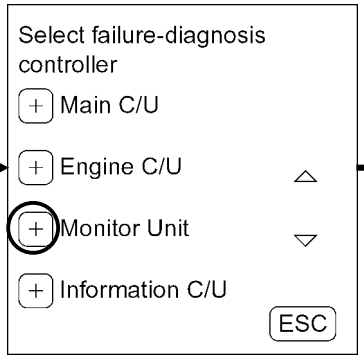
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

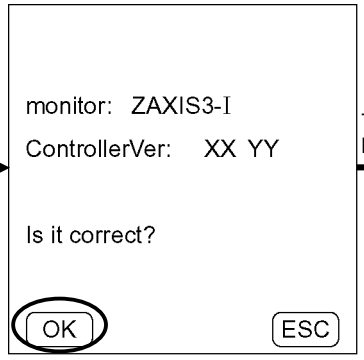
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-046

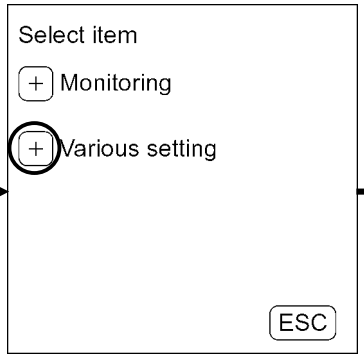
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

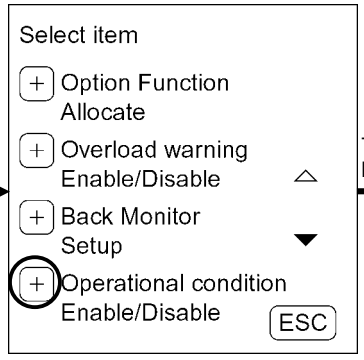
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Push Operational condition Enable/Disable.

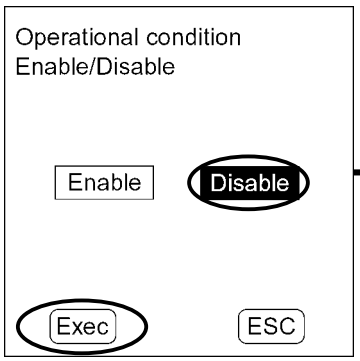


To the lower

T1V7-05-03-046

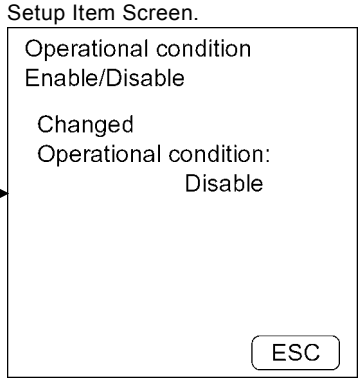
Various Setup Item Screen

Push Enable and push Exec. Push ESC and return to the former screen.



T1V7-05-03-061

Push ESC and return to Various Setup Item Screen.



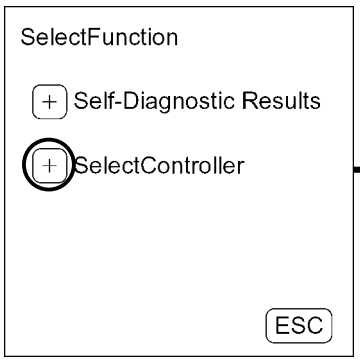
T1V7-05-03-062

NOTE: Push Disable, push ESC and return to Various Setup Item Screen, so that Operating Condition Disable is not set.

TIME SET FUNCTION ENABLE / DISABLE SELECTION

Time Set Function: Enable

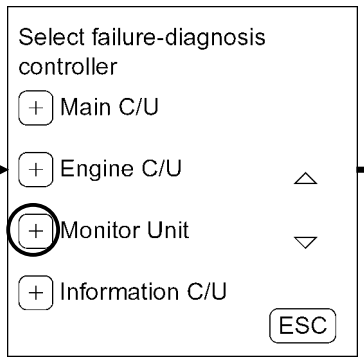
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

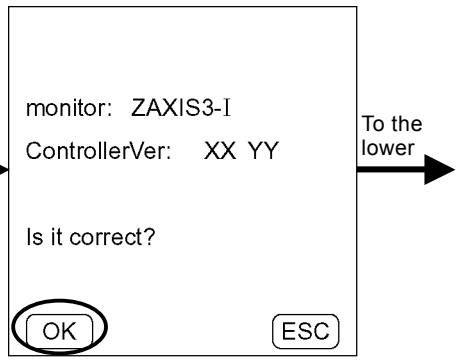
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1J1-05-03-046

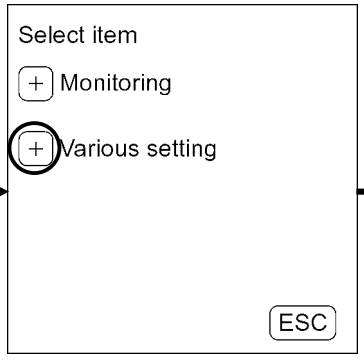
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

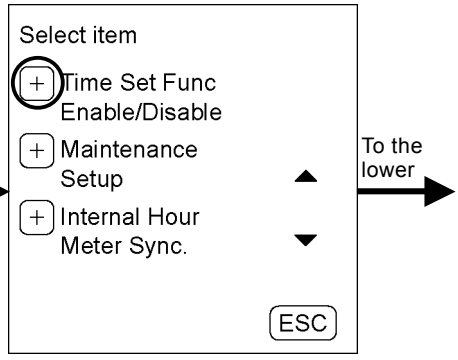
Push Various setting.



T1V7-05-03-042

Main Menu Screen

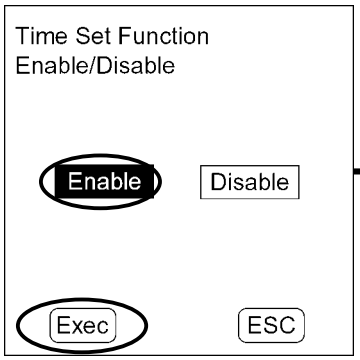
Move the item by using ▼ and push Time Set Func Enable/Disable.



T1V7-05-03-063

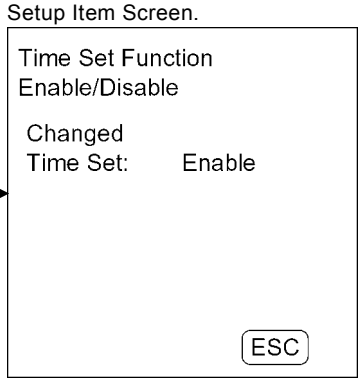
Various Setup Item Screen

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.

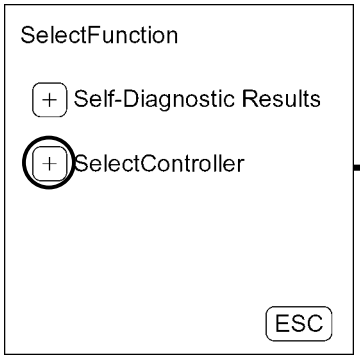


T1V7-05-03-066

NOTE: *Push Enable, push ESC and return to Various Setup Item Screen, so that Time Set Function Enable is not set.*

Time Set Function: Disable

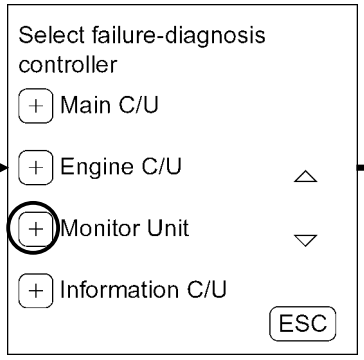
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

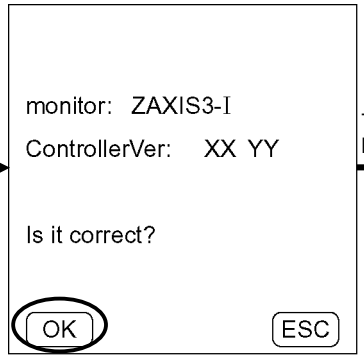
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-046

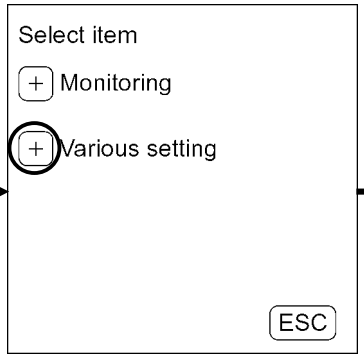
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

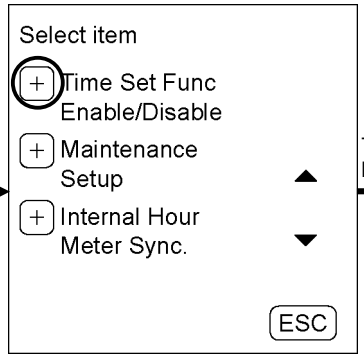
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Move the item by using ▼ and push Time Set Func Enable/Disable.

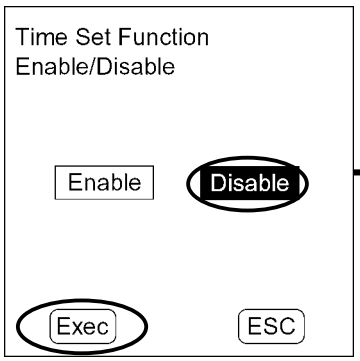


To the lower

T1V7-05-03-063

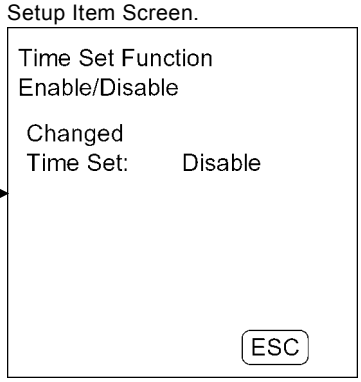
Various Setup Item Screen

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.



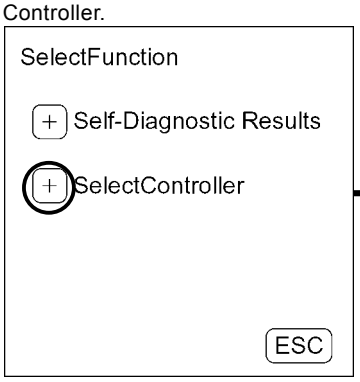
T1V7-05-03-068

NOTE: Push Disable, push ESC and return to Various Setup Item Screen, so that Time Set Function Disable is not set

MAINTENANCE SETUP MAINTENANCE OPERATION ALLOW / NOT ALLOW SELECTION

Maintenance Operation: Allow

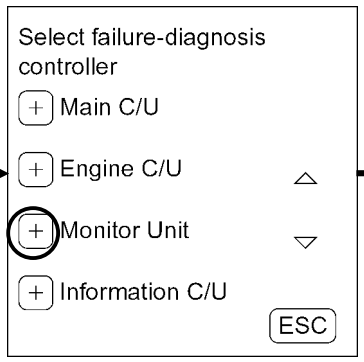
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

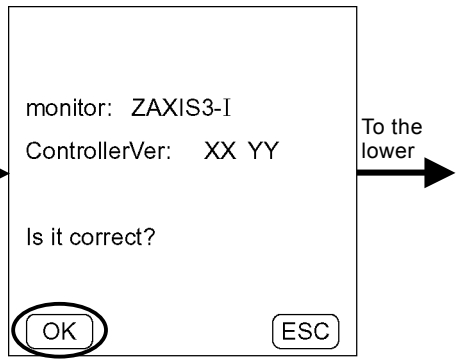
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1J1-05-03-046

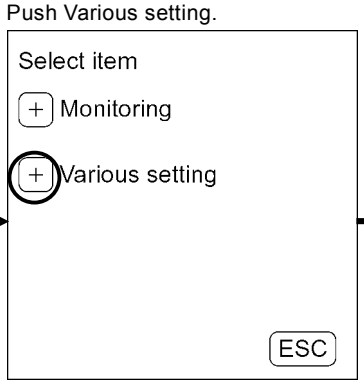
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

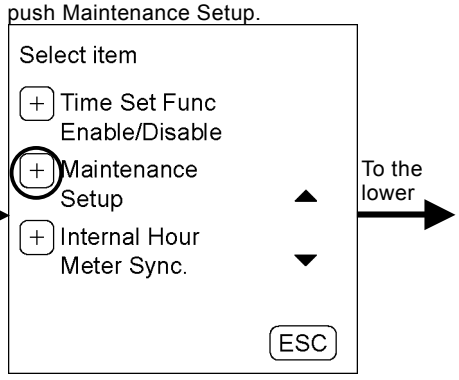
Push Various setting.



T1V7-05-03-042

Main Menu Screen

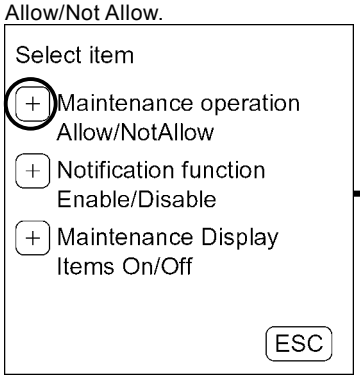
Move the item by using ▼ and push Maintenance Setup.



T1V7-05-03-063

Various Setup Item Screen

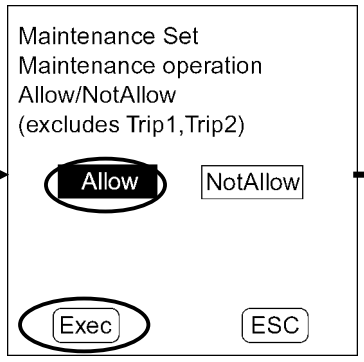
Push Maintenance operation Allow/Not Allow.



T1V7-05-03-069

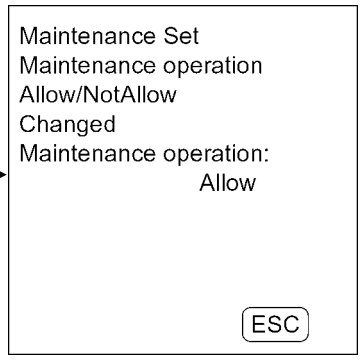
Maintenance Set Item Screen

Push Allow and push Exec. Push ESC and return to the former screen.



T1V7-05-03-070

Push ESC and return to Various Maintenance set Item Screen.

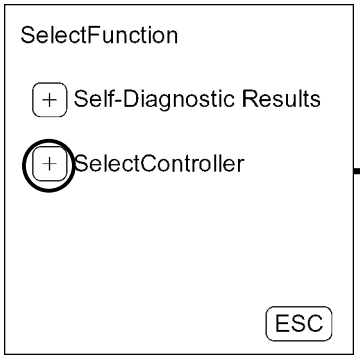


T1V7-05-03-071

NOTE: Push Allow, push ESC and return to Maintenance Set Item Screen, so that Maintenance Operation Allow is not set.

Maintenance Operation: Not Allow

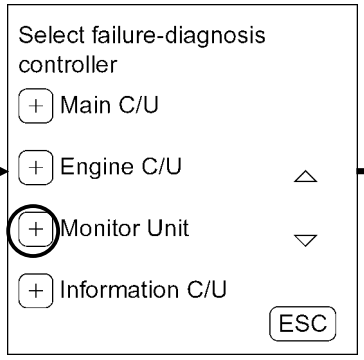
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

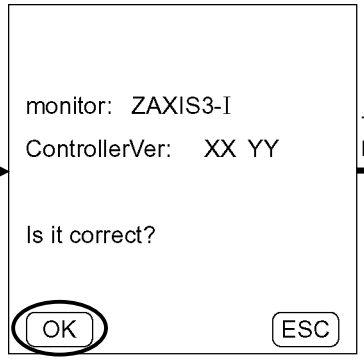
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1J1-05-03-046

Monitor Controller Screen

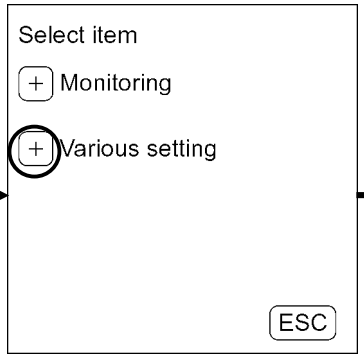
To the lower

Push Start.

T1V7-05-03-025

Title Screen

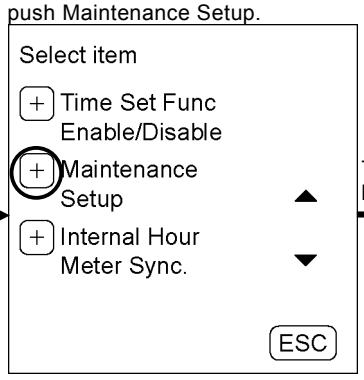
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Move the item by using ▼ and push Maintenance Setup.

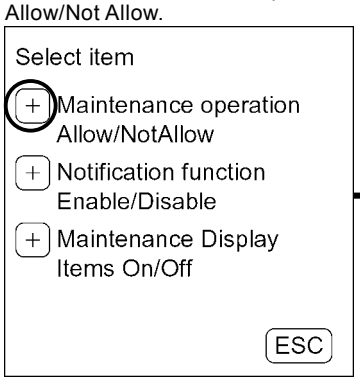


T1V7-05-03-063

Various Setup Item Screen

To the lower

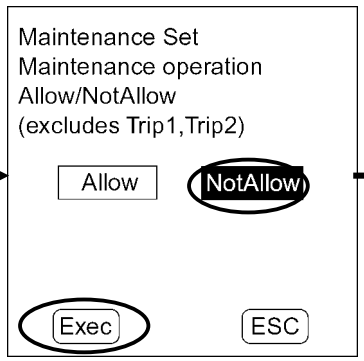
Push Maintenance operation Allow/Not Allow.



T1V7-05-03-069

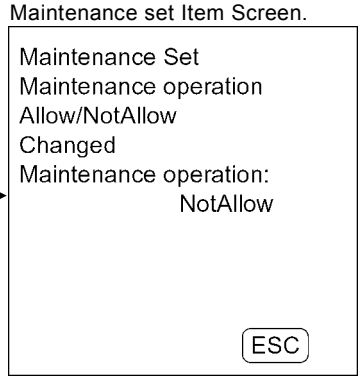
Maintenance Set Item Screen

Push Not Allow and push Exec. Push ESC and return to the former screen.



T1V7-05-03-072

Push ESC and return to Various Maintenance set Item Screen.



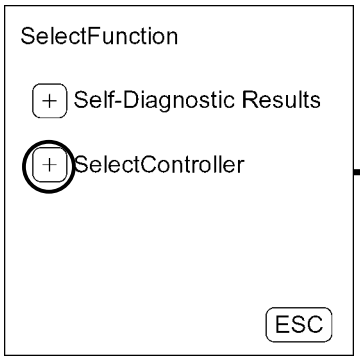
T1V7-05-03-073

NOTE: Push Not Allow, push ESC and return to Maintenance Set Item Screen, so that Maintenance Operation Not Allow is not set.

NOTIFICATION FUNCTION ENABLE / DISABLE SELECTION

Notification Function: Enable

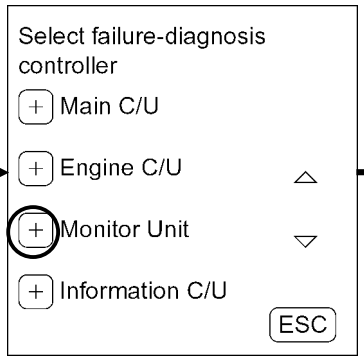
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

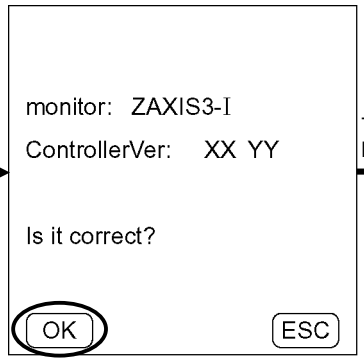
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-046

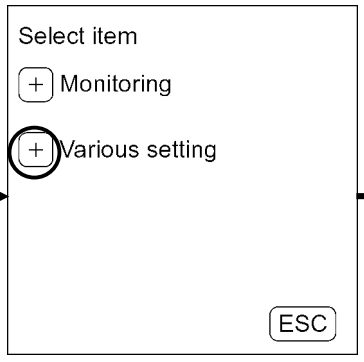
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

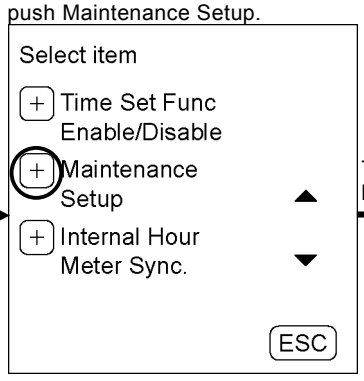
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Move the item by using ▼ and push Maintenance Setup.

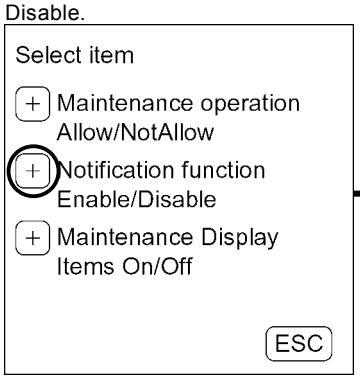


To the lower

T1V7-05-03-063

Various Setup Item Screen

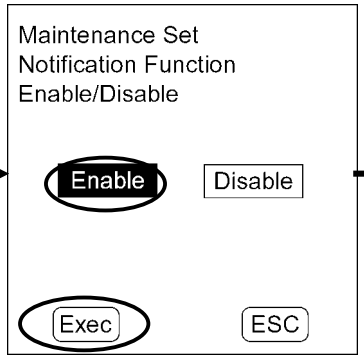
Push Notification function Enable/Disable.



T1V7-05-03-069

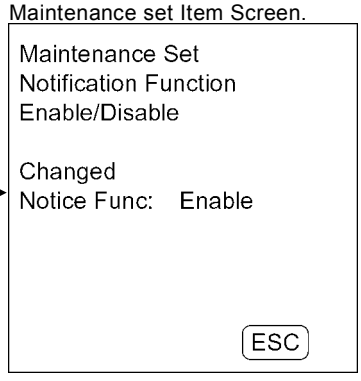
Maintenance Set Item Screen

Push Enable and push Exec. Push ESC and return to the former screen



T1V7-05-03-074

Push ESC and return to Various Maintenance set Item Screen.

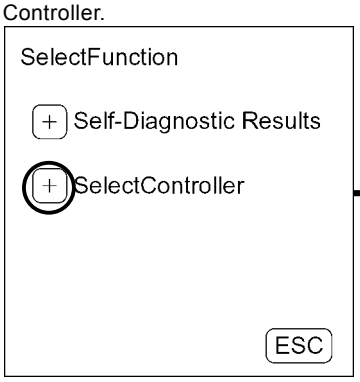


T1V7-05-03-075

NOTE: Push Enable, push ESC and return to Maintenance Set Item Screen, so that Notification Function Enable is not set.

Notification Function: Disable

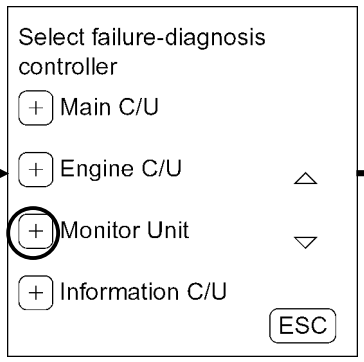
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

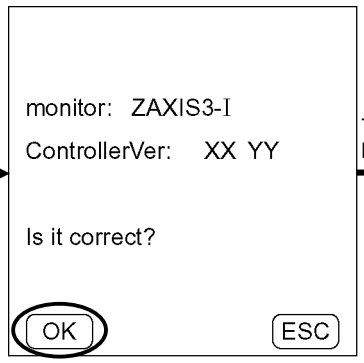
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-046

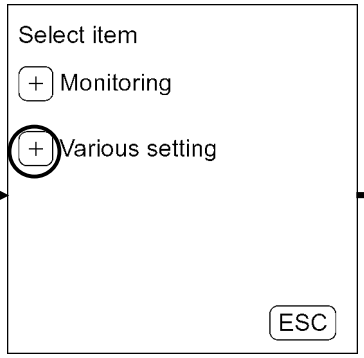
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

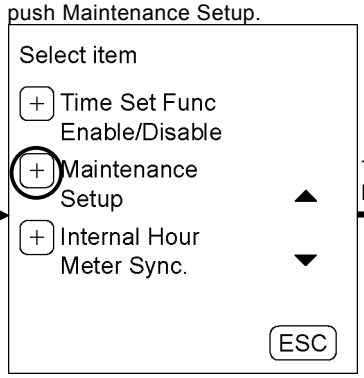
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Move the item by using ▼ and push Maintenance Setup.

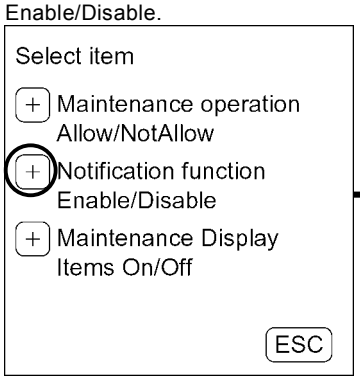


To the lower

T1V7-05-03-063

Various Setup Item Screen

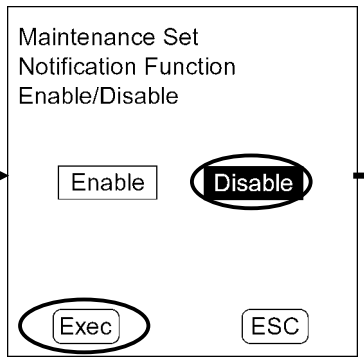
Push Notification function Enable/Disable.



T1V7-05-03-069

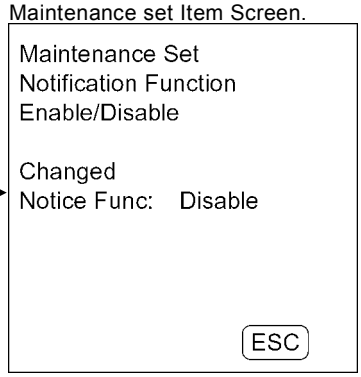
Maintenance Set Item Screen

Push Disable and push Exec. Push ESC and return to the former screen.



T1V7-05-03-076

Push ESC and return to Various Maintenance set Item Screen.



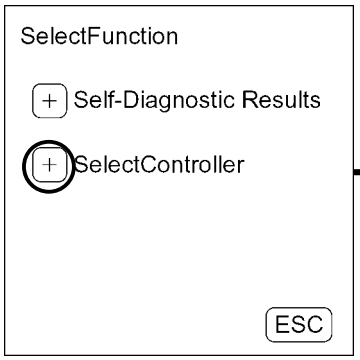
T1V7-05-03-077

NOTE: Push Disable, push ESC and return to Maintenance Set Item Screen, so that Notification Function Disable is not set.

MAINTENANCE DISPLAY ITEMS ON/OFF SELECTION

Maintenance Display Items: ON

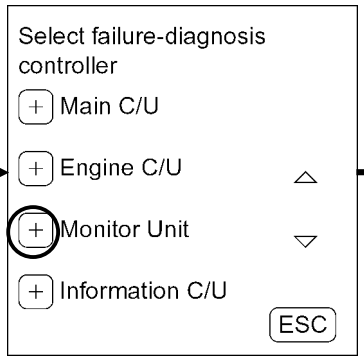
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

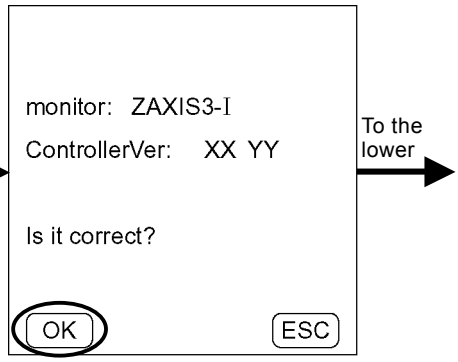
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1J1-05-03-046

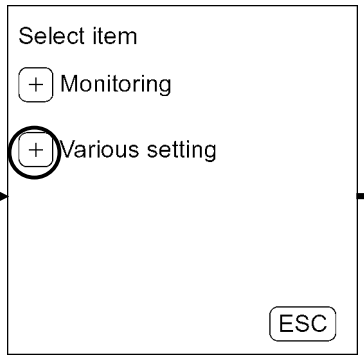
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

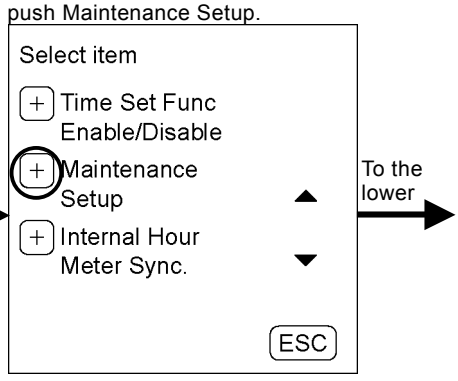
Push Various setting.



T1V7-05-03-042

Main Menu Screen

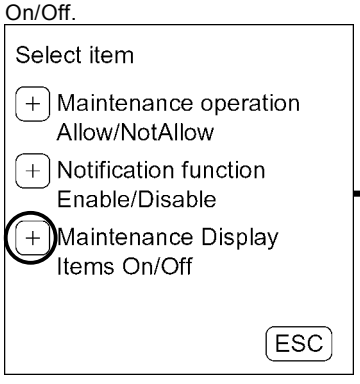
Move the item by using ▼ and push Maintenance Setup.



T1V7-05-03-063

Various Setup Item Screen

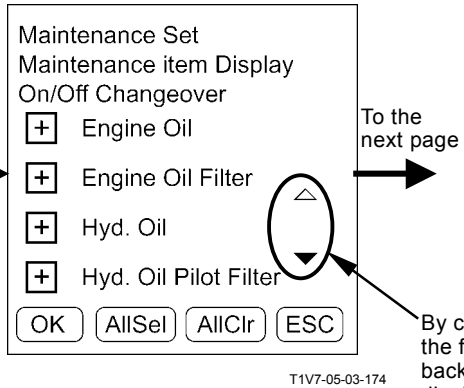
Push Maintenance Display Items On/Off.



T1V7-05-03-069

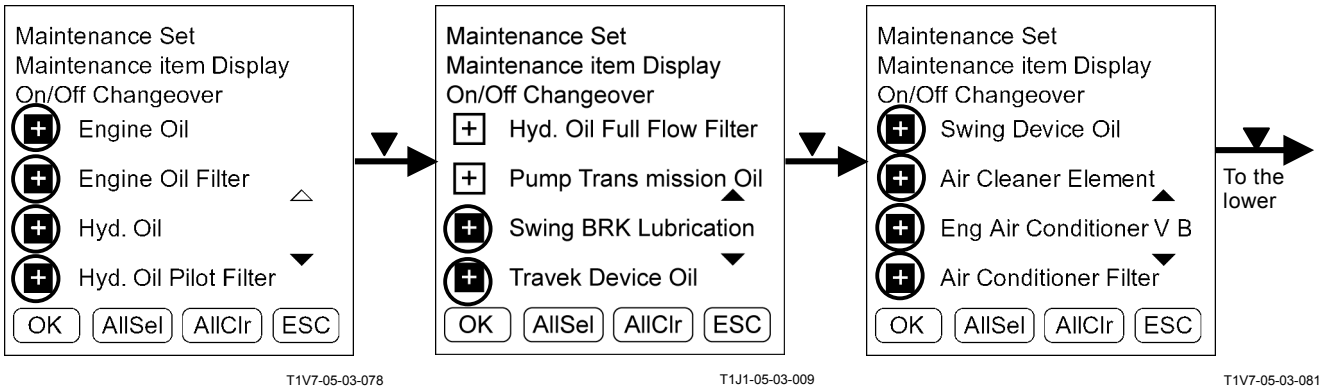
Maintenance Set Item Screen

Push ESC and return to the former screen



T1V7-05-03-174

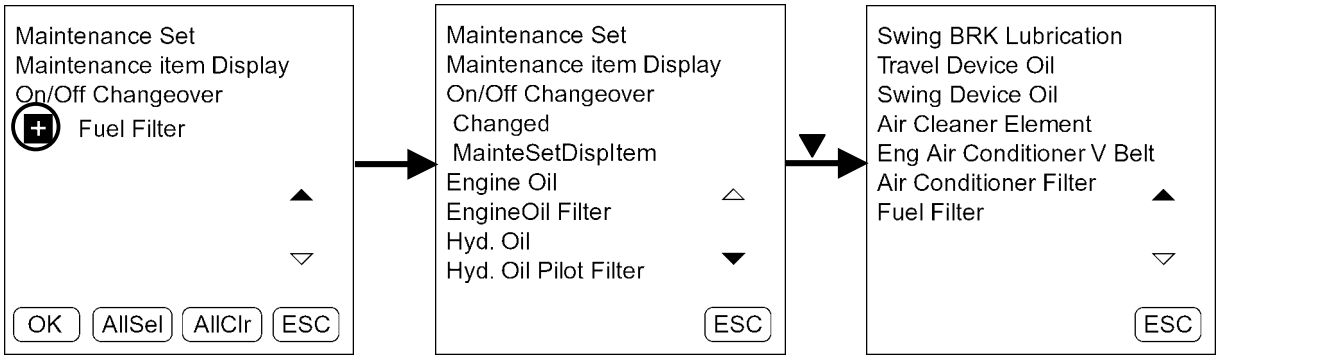
Push the displayed item and finally push OK. Push All Sel and select all the items.



T1V7-05-03-078 T1J1-05-03-009 T1V7-05-03-081

Display Item Selection Screen

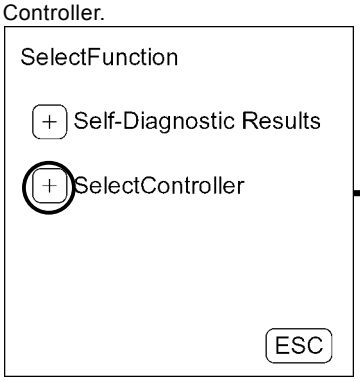
Push ESC and return to Maintenance Set Item Screen.



T1V7-05-03-082 T1V7-05-03-083 T1V7-05-03-084

Maintenance Display Items: OFF

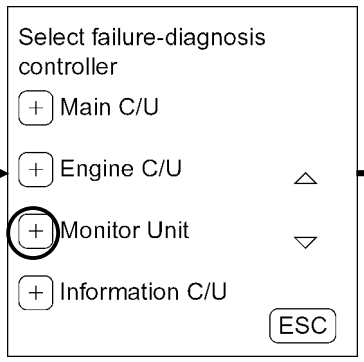
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

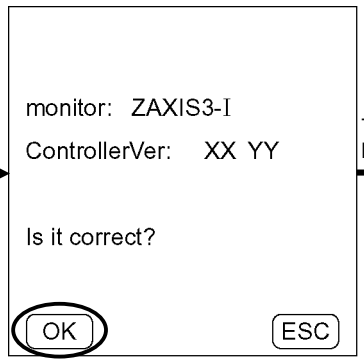
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-046

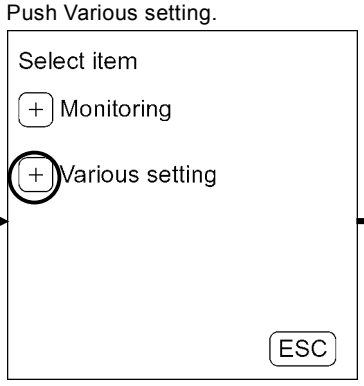
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

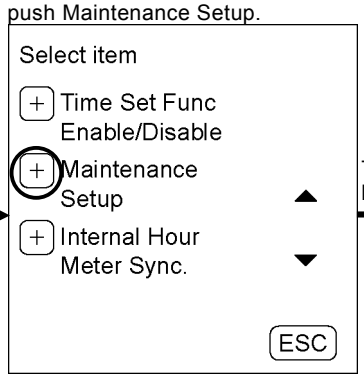
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Move the item by using ▼ and push Maintenance Setup.

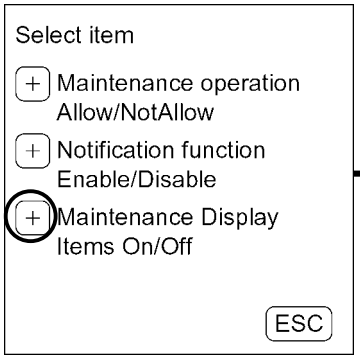


To the lower

T1V7-05-03-063

Various Setup Item Screen

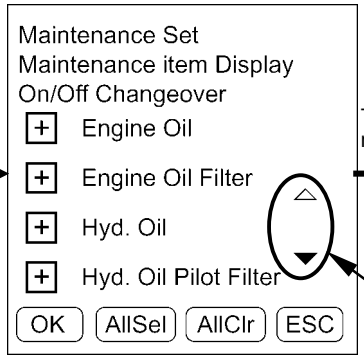
Push Maintenance Display Items On/Off.



T1V7-05-03-069

Maintenance Set Item Screen

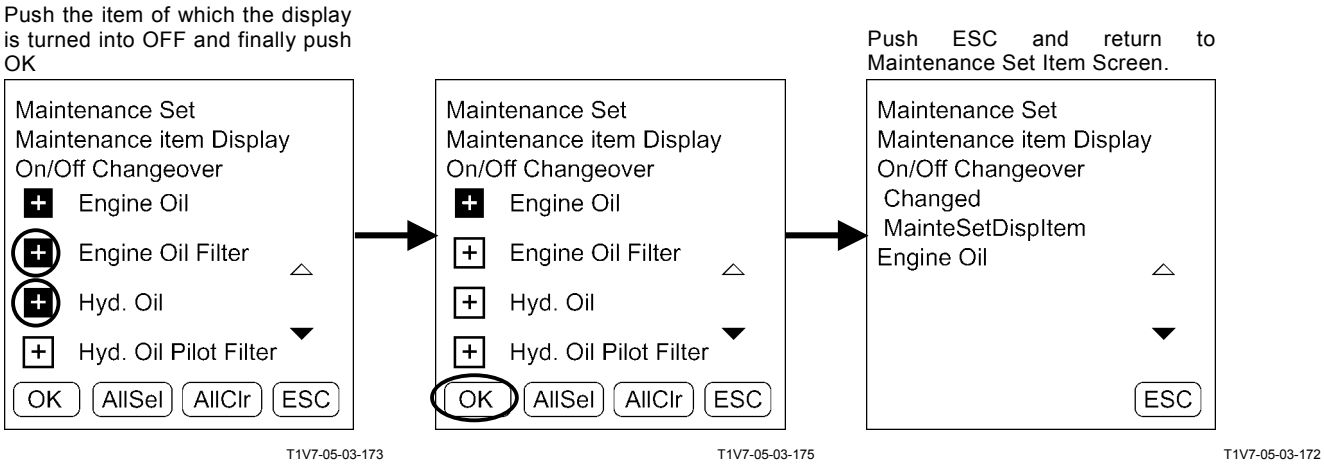
Push All Clr and all the selected Maintenance Display Items are turned into OFF.



To the next page

By changing the page, the forward and backward items are displayed.

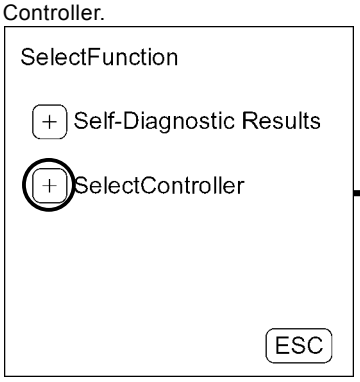
T1V7-05-03-174



Display Item Selection Screen

INTERNAL HOUR METER SYNCHRONI-ZATION

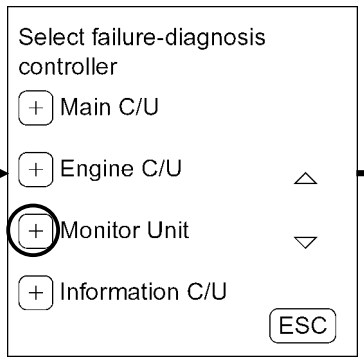
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

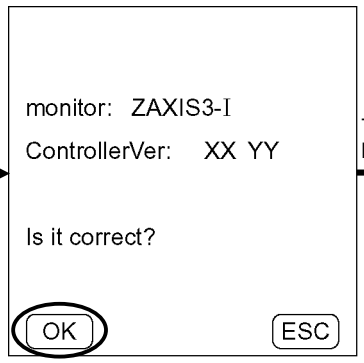
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-046

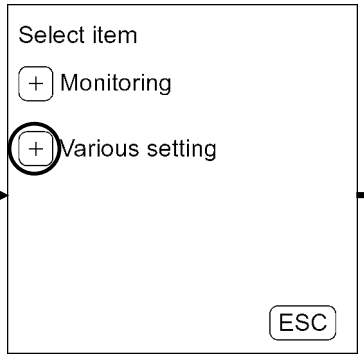
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

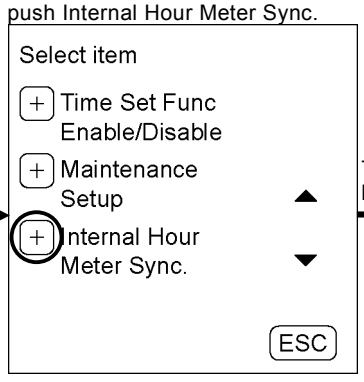
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Move the item by using ▼ and push Internal Hour Meter Sync.

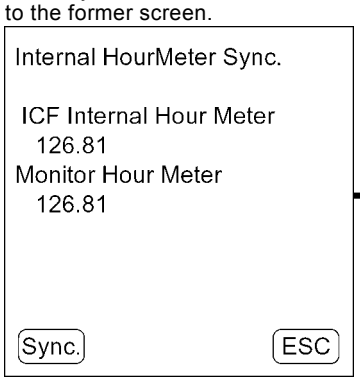


To the lower

T1V7-05-03-063

Various Setup Item Screen

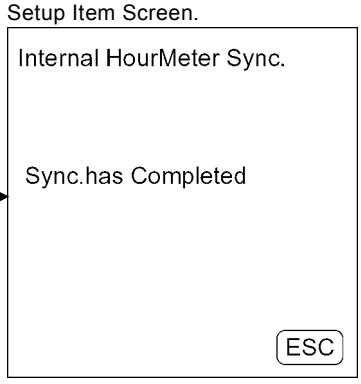
Push Sync. Push ESC and return to the former screen.



T1V7-05-03-085

Maintenance Set Item Screen

Push ESC and return to Various Setup Item Screen.

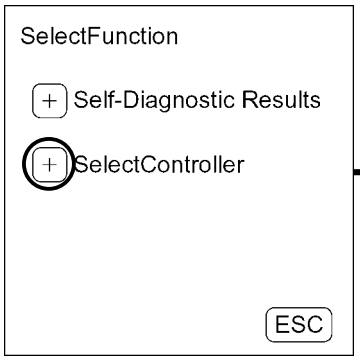


T1V7-05-03-086

FUEL COST METER DISPLAY ENABLE / DISABLE SELECTION

Fuel Cost Meter Display: Enable

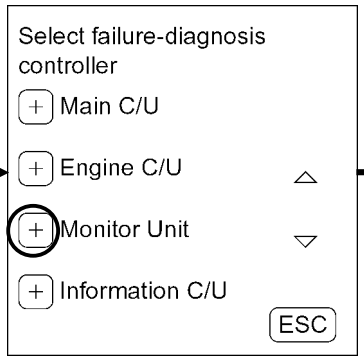
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

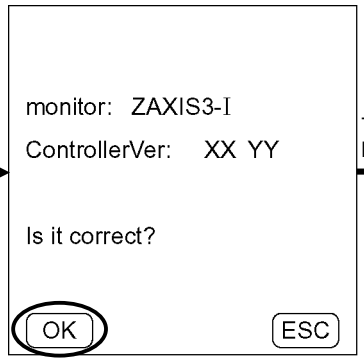
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1J1-05-03-046

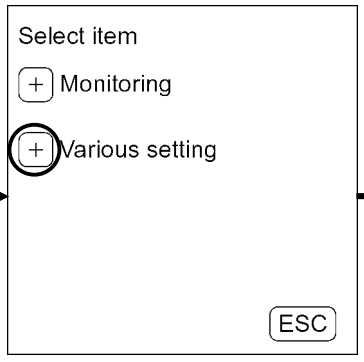
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

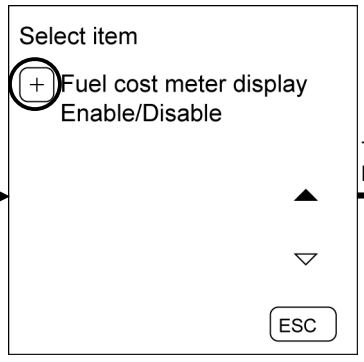
Push Various setting.



T1V7-05-03-042

Main Menu Screen

Move the item by using ▼ and push Fuel cost meter display Enable/Disable.

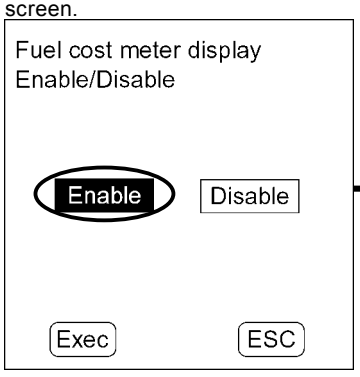


To the lower

T1J1-05-03-059

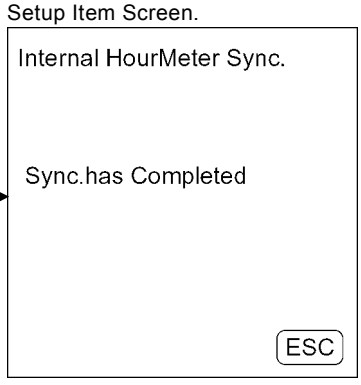
Various Setup Item Screen

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.

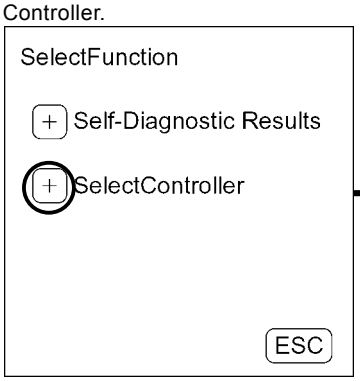


T1V7-05-03-086

NOTE: Push Enable, push ESC and return to Various Setup Item Screen, so that Fuel Consumption Gauge Display Enable is not set.

Fuel Cost Meter Display: Disable

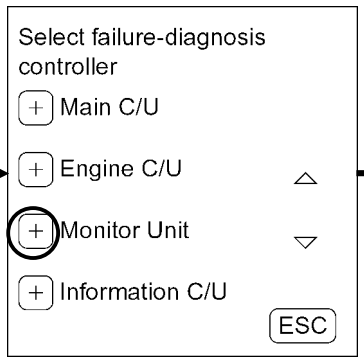
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

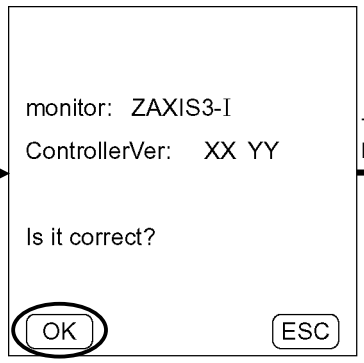
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1J1-05-03-046

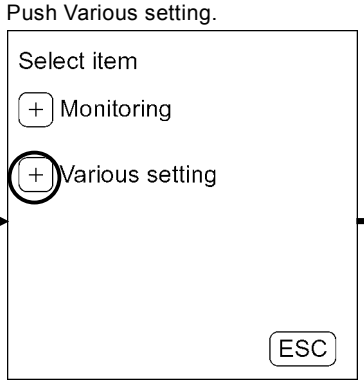
Monitor Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

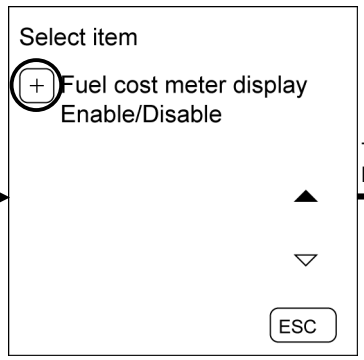
Push Various setting.



T1V7-05-03-042

Main Menu Screen

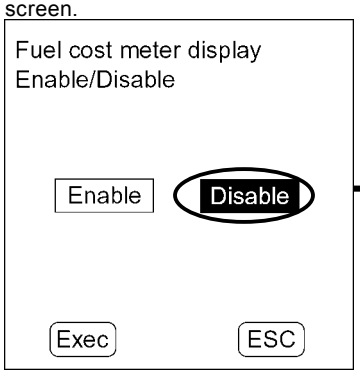
Move the item by using ▼ and push Fuel cost meter display Enable/Disable.



T1J1-05-03-059

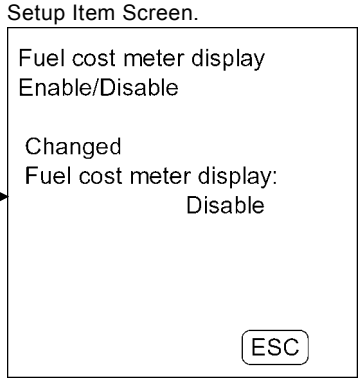
Various Setup Item Screen

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.

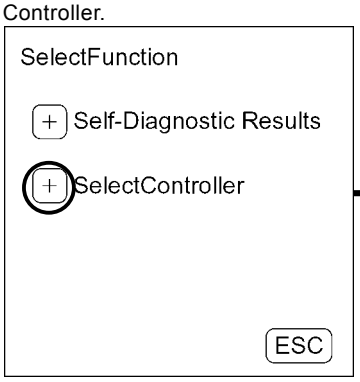


T1V7-05-03-091

NOTE: Push Disable, push ESC and return to Various Setup Item Screen, so that Fuel Consumption Gauge Display Enable is not set.

PASSWORD CHANGE

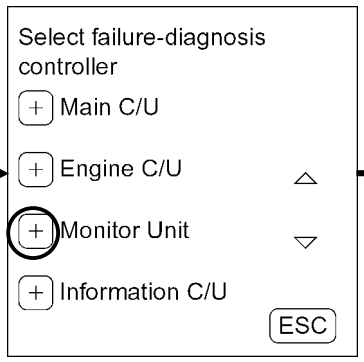
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

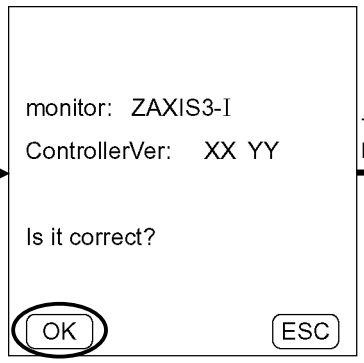
Push Monitor Unit.



T1V7-05-03-009

Controller Selection Screen

Push OK.



T1J1-05-03-046

Monitor Controller Screen

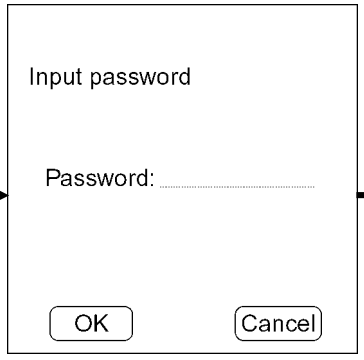
To the lower

Push Password.

T1V7-05-03-025

Title Screen

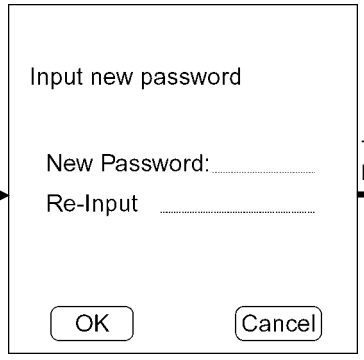
Input the registered password and push OK.



T1V7-05-03-126

Main Menu Screen

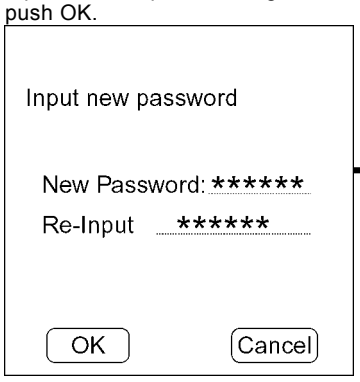
Input the new password and push OK.



T1V7-05-03-127

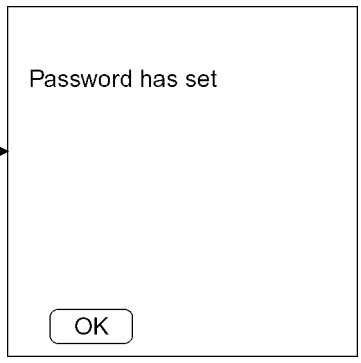
To the lower

Input the new password again and push OK.



T1V7-05-03-169

Push OK and return to Title Screen.



T1V7-05-03-128

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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 satellite communication terminal (optional) 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 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 Time		Hours when auto-idle switch is turned ON during a day (Hours are recorded by switch 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.)
	Hydraulic Crusher Operating Hours	Total operating hours selecting hydraulic 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 Time	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 Time 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 operating hours during daily operation
Attachment Operating Hours	Total attachment operating hours during daily operation
No Load Time	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 Time 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 and average load rate (average of pump 1 load rate and pump 2 load rate)
Engine Load Rate	Frequency information of engine speed 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 Time		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 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
	Hydraulic Crusher Operating Hours	Total operating hours selecting hydraulic 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 Time		Total machine's waiting hours

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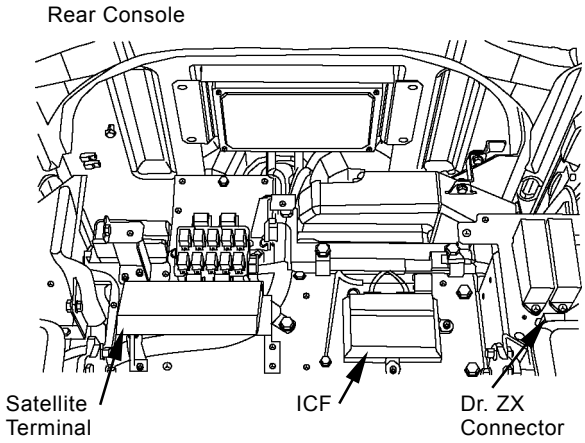
HOW TO DOWNLOAD AND UPLOAD DATA OF ICF

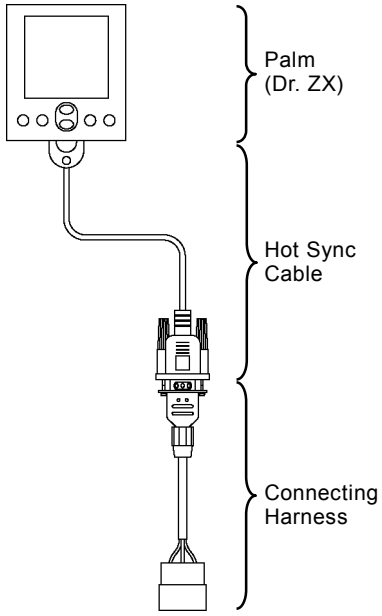
After the data saved in ICF is downloaded to Palm (Dr. ZX), is uploaded to the personal Computer, and is uploaded to the center server by using LAN, the data can be used as “e-Service”.

How to Download Data from Machine to Palm

1. Connect the Dr. ZX connectors in Palm and machine by using the Hot Sync cable and connecting harness.
2. Turn Palm ON and start downloading the data. (Refer to the next page.)



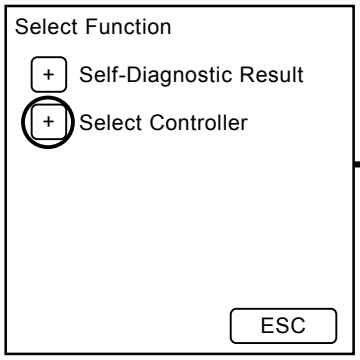
T1J1-04-06-001



T1V1-05-07-002

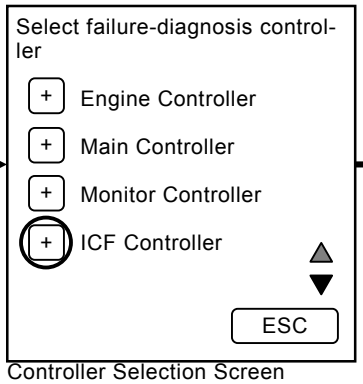
Data Download

After starting Dr. ZX, push Select Controller.



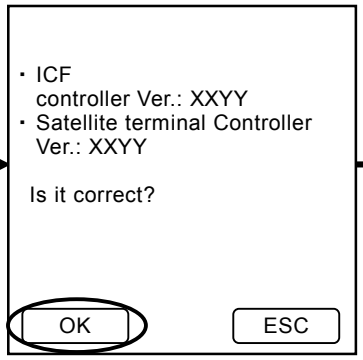
Function Selection Screen

Push ICF Controller.



Controller Selection Screen

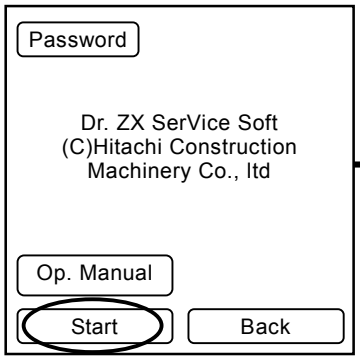
Push OK.



ICF Controller Screen

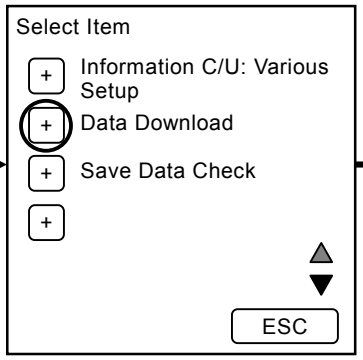
To the lower

Push Start.



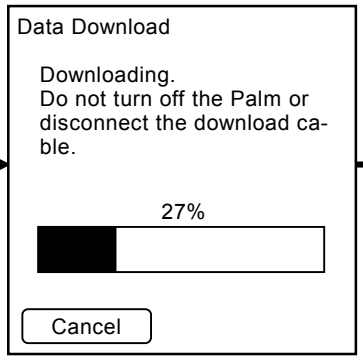
Title Screen

Push Date Download.



Main Menu Screen

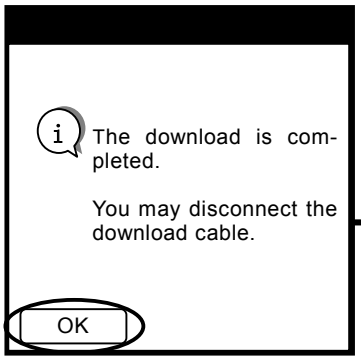
While downloading data, Download Screen is displayed.



Data Download Screen

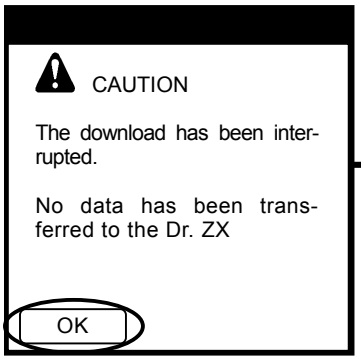
To the lower

When downloading is completed normally, Normal End Screen is displayed.
Push OK and return to Main Menu Screen.



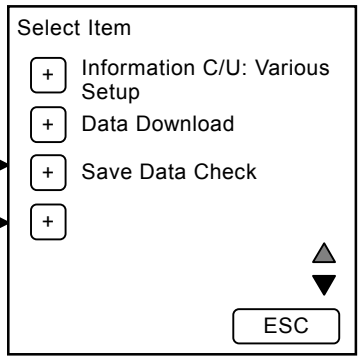
Normal End Screen

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.

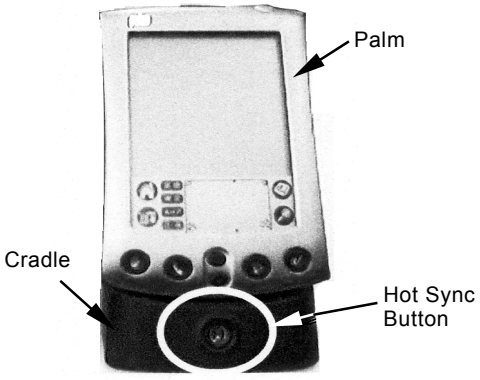


Main Menu Screen

How to Upload Data from Palm to Personal Computer

1. Set Palm 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 (or CLIE) Desktop software attached with Palm need to be installed.

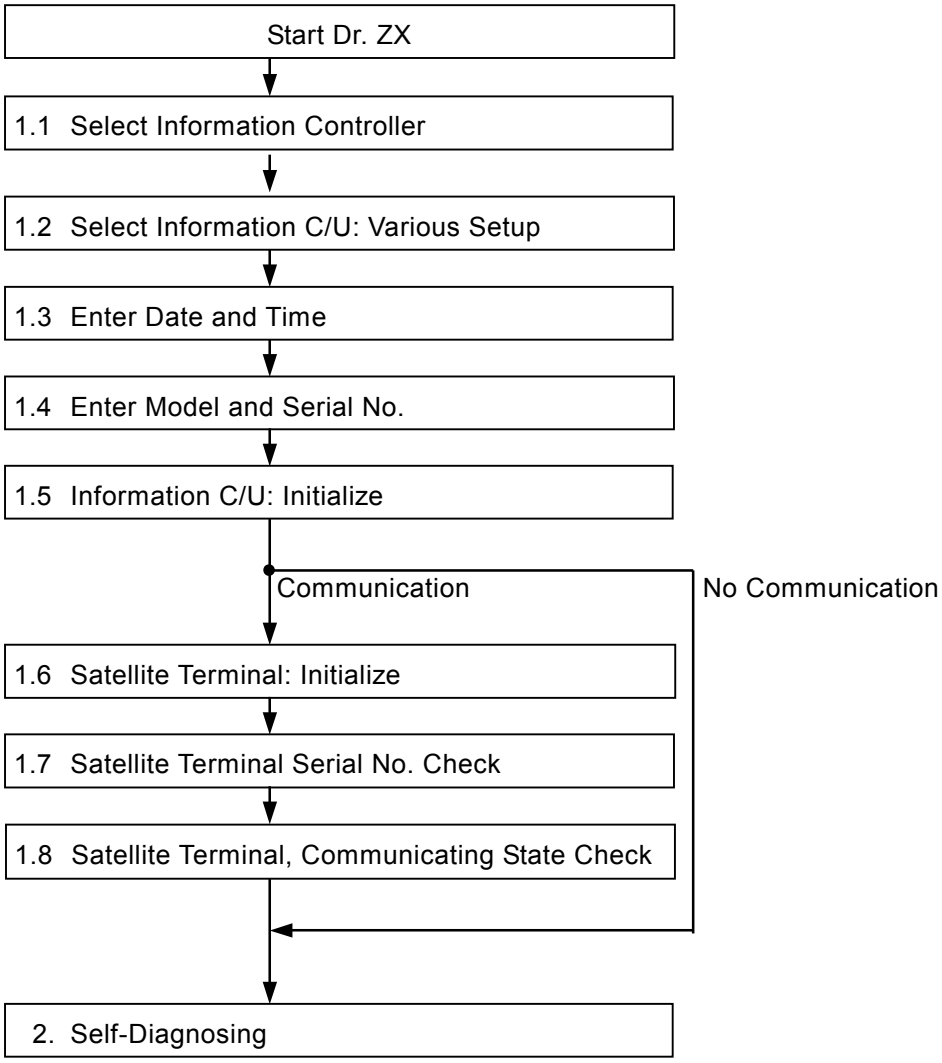


T178-05-07-033

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.

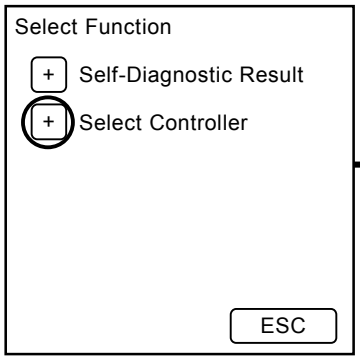
ICF Setup Procedures



1.1 Select Information Controller
1.2 Select Information C/U: Various Setup

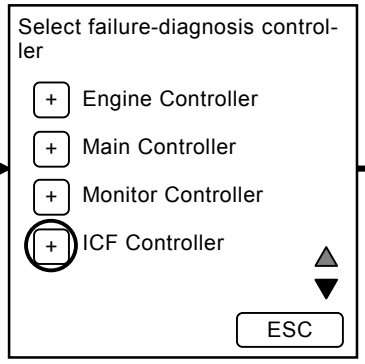
1.1 Select Information Controller

After starting Dr. ZX, push Select Controller.



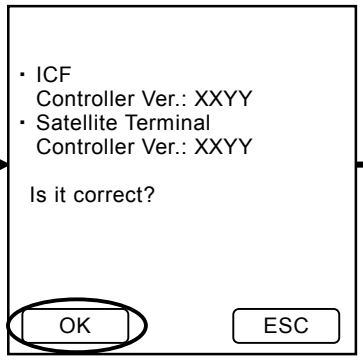
Function Selection Screen

Push ICF Controller.



Controller Selection Screen

Push OK.

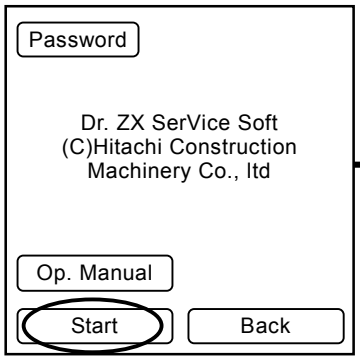


To the lower

ICF Controller Screen

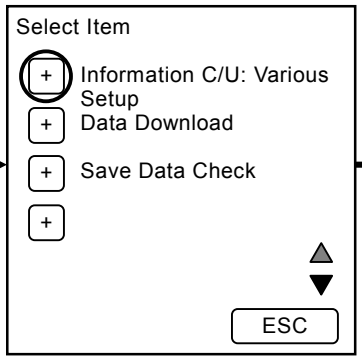
1.2 Select Information C/U: Various Setup

Push Start.

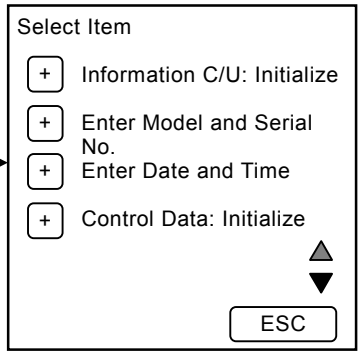


Title Screen

Push Information C/U: Various Setup.



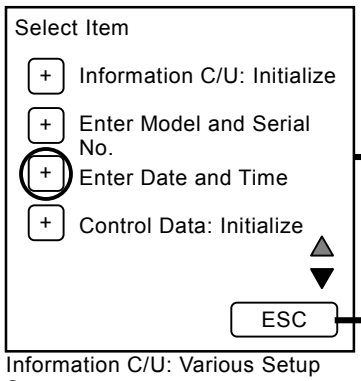
Main Menu Screen



Information C/U: Various Setup Screen

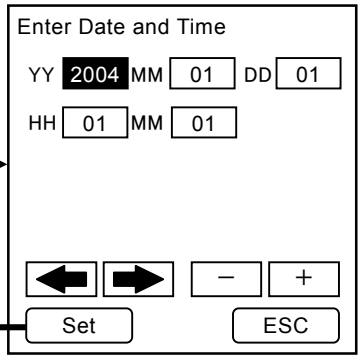
1.3 Enter Date and Time

Push Enter Date and Time.
Push ESC and return to Main Menu Screen.



Information C/U: Various Setup Screen

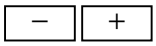
Push Set and the focused item is YY.
Push ESC and return to Information C/U: Various Setup Screen.



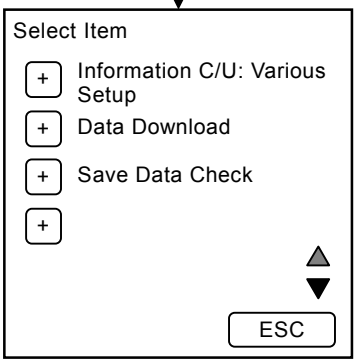
Enter Date and Time Screen

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.

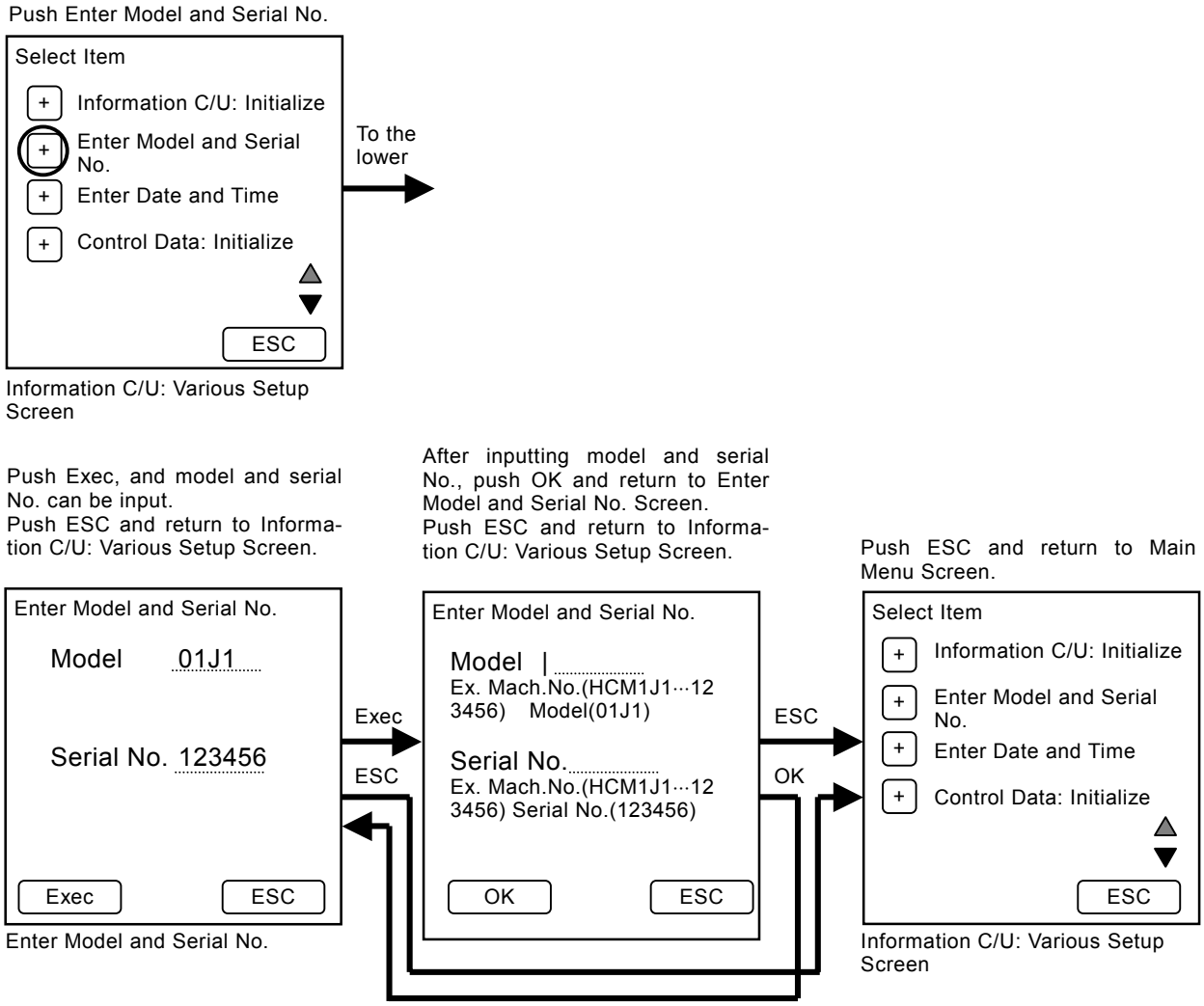


YY, MM, DD, HH and MM
Value of the focused item is increased or decreased one by one.
In case value is beyond maximum one: Change value into the minimum one
In case value is below minimum one: Change value into the maximum one
No repeat input.



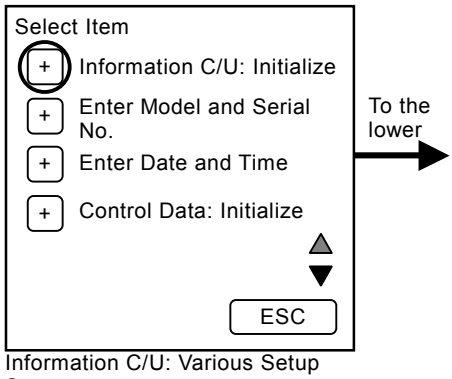
Main Menu Screen

1.4 Enter Model and Serial No.



1.5 Information C/U: Initialize

Push Information C/U: Initialize.

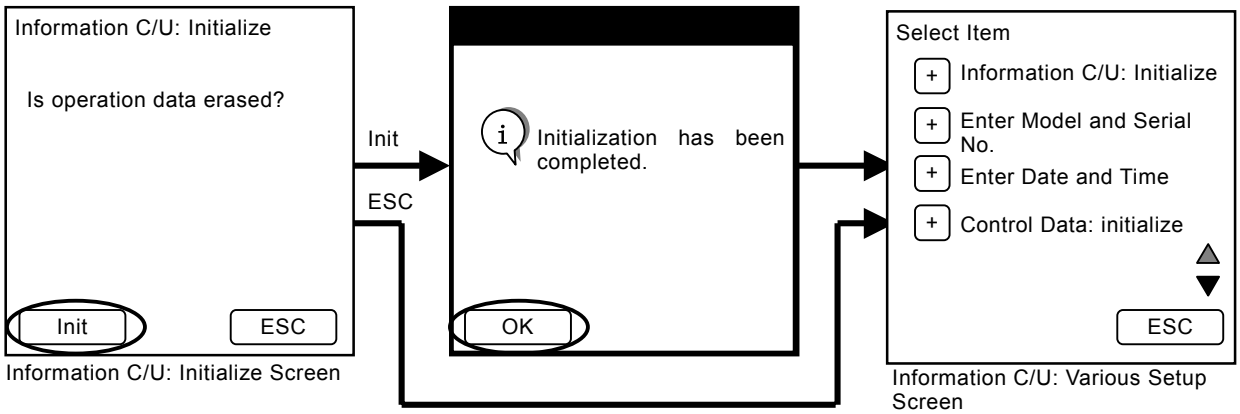


Information C/U: Various Setup Screen

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.

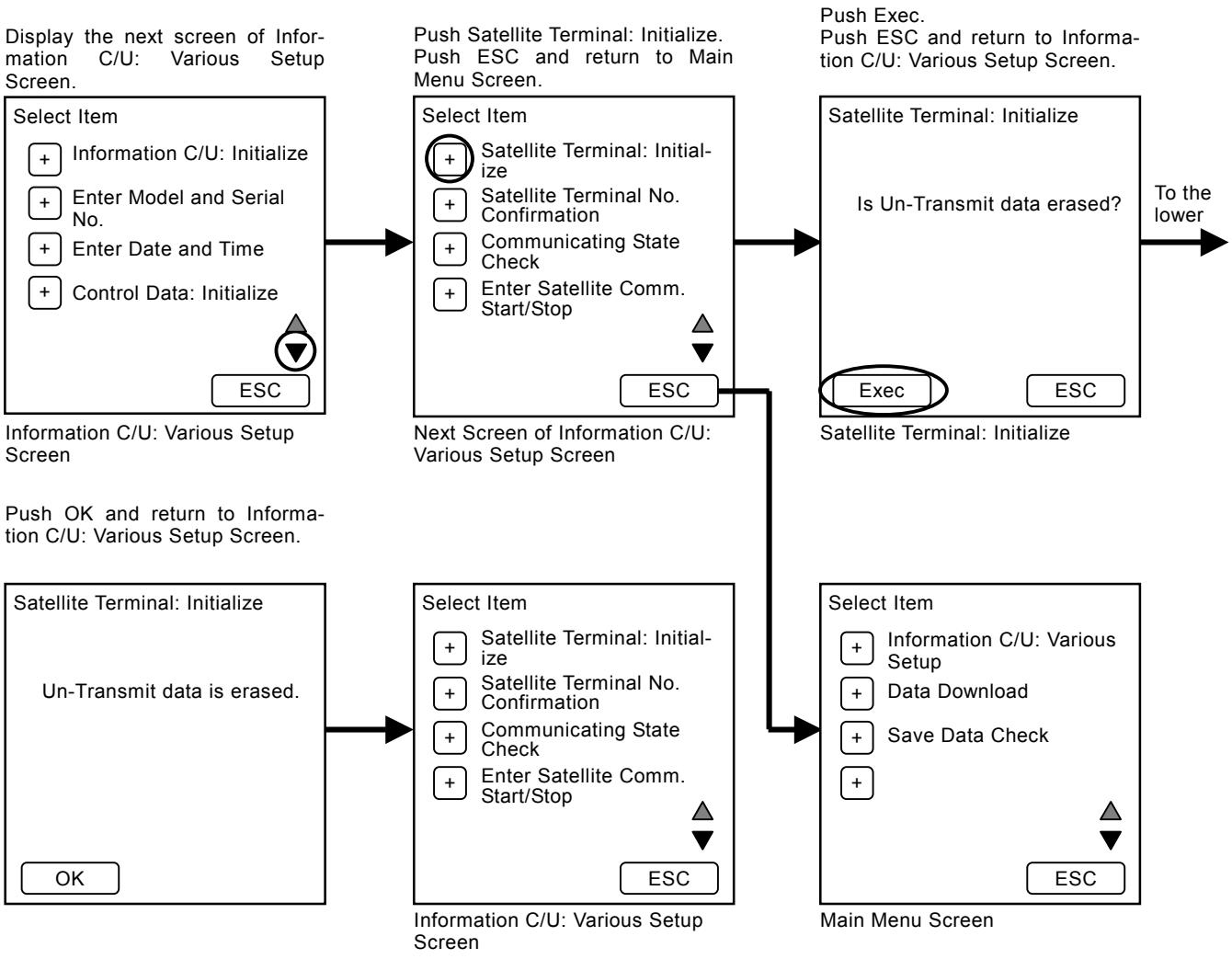
Push ESC and return to Main Menu Screen.



Information C/U: Initialize Screen

Information C/U: Various Setup Screen

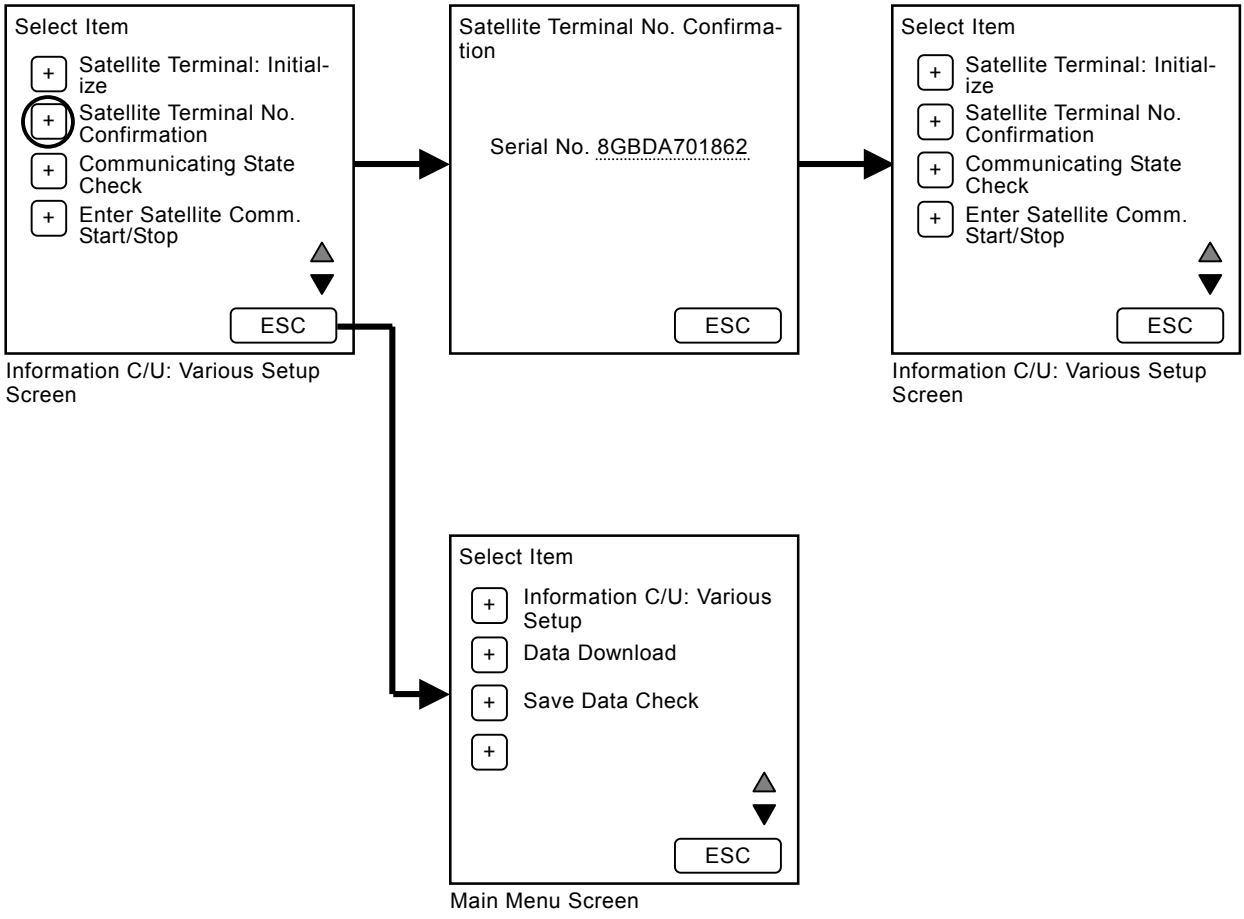
1.6 Satellite Terminal: Initialize



1.7 Satellite Terminal Serial No. Check

Push Satellite Terminal No. Confirmation.
Push ESC and return to Main Menu Screen.

Confirm serial no. (12 digits). Push ESC and return to Information C/U: Various Setup Screen.



Information C/U: Various Setup Screen

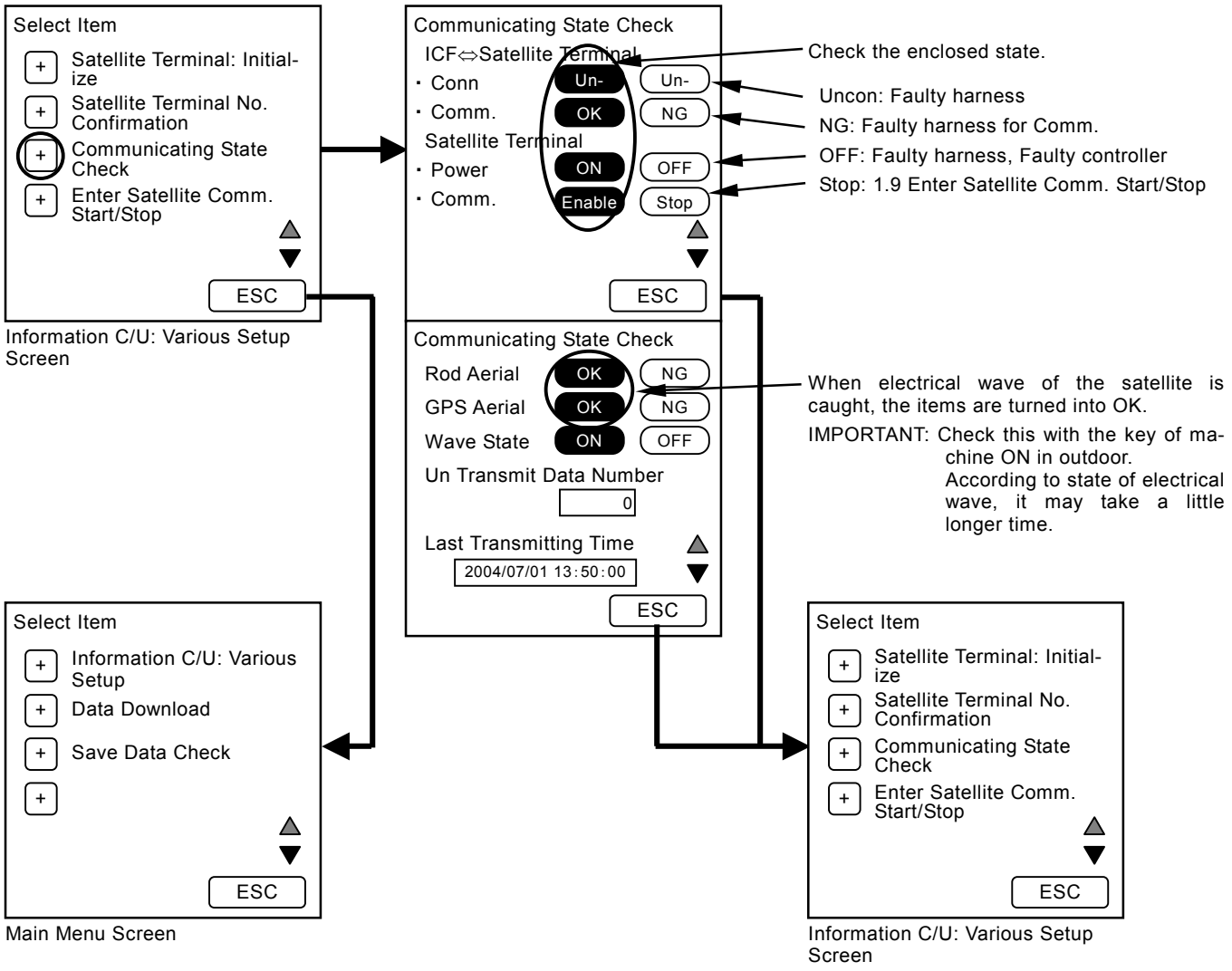
Information C/U: Various Setup Screen

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.



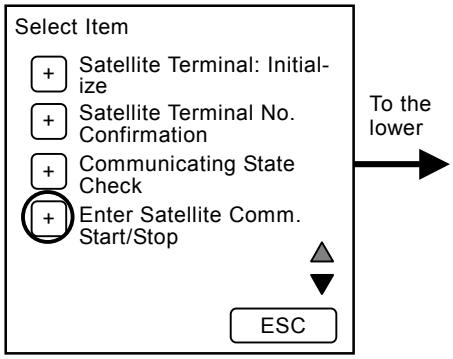
Information C/U: Various Setup Screen

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.

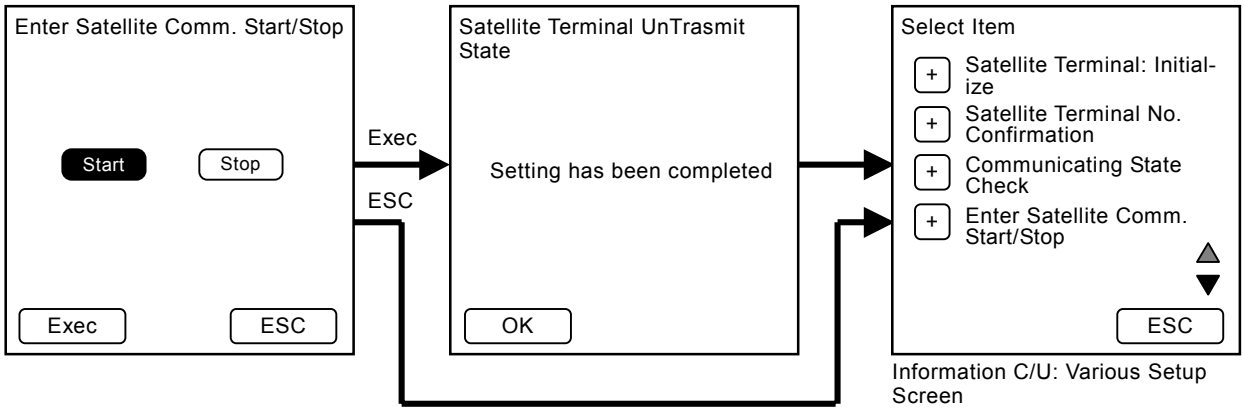


Information C/U: Various Setup Screen

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.

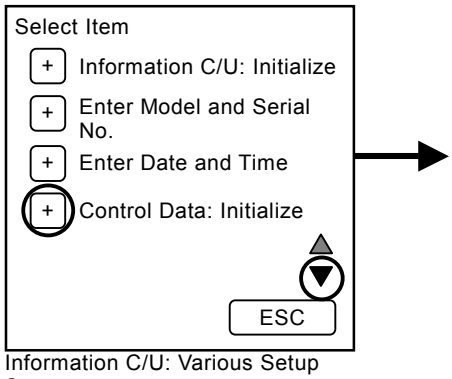
Push ESC and return to Main Menu Screen.



Information C/U: Various Setup Screen

1.10 Control Data: Initialize

Push Control Data: Initialize.

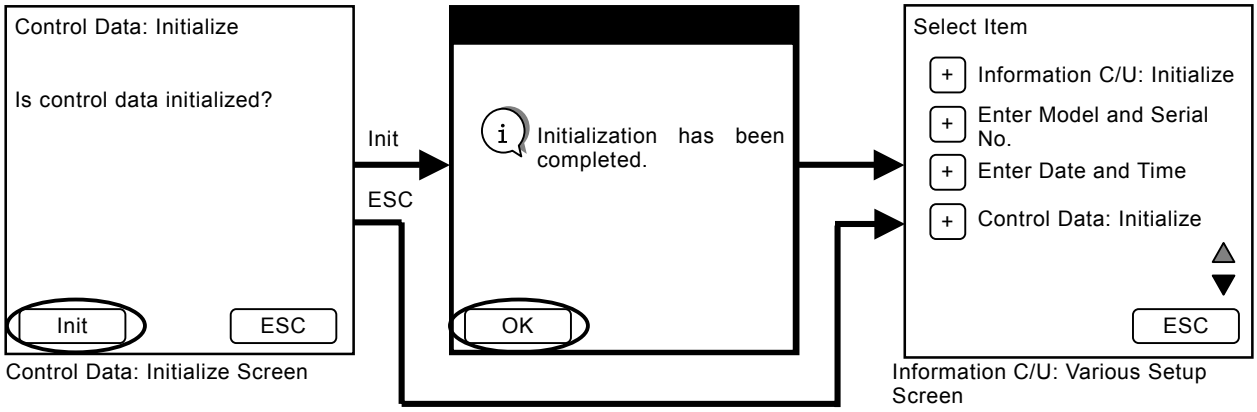


Information C/U: Various Setup Screen

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.



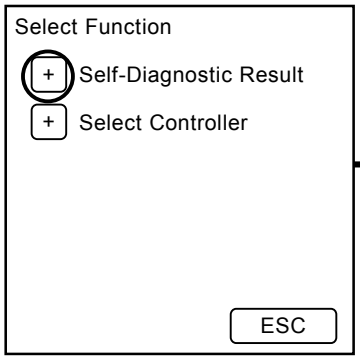
Control Data: Initialize Screen

Information C/U: Various Setup Screen

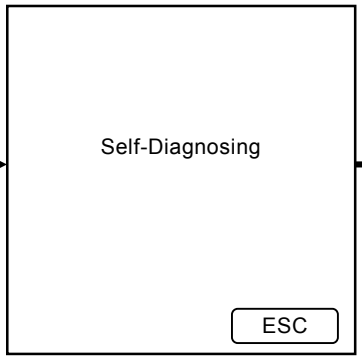
(Blank)

2. Self-Diagnosing

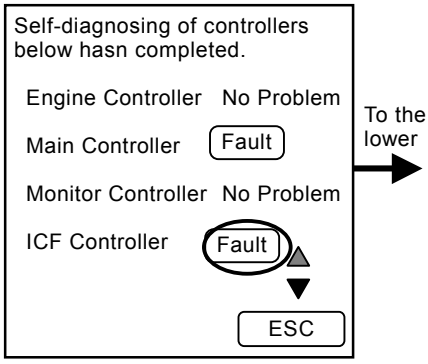
After starting Dr. ZX, push Self-Diagnostic Result.



Function Selection Screen



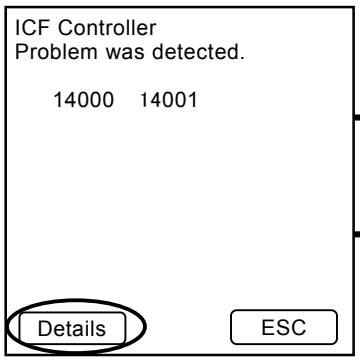
Push Fault of ICF Controller. If there is no trouble, No Problem is displayed.



Controller Self-Diagnosing Screen

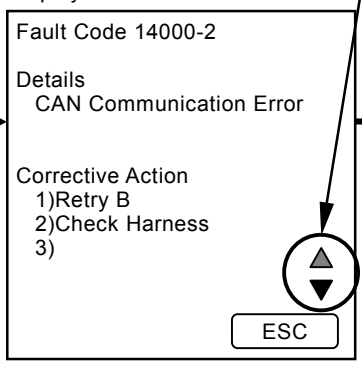
Change the page and the fault code in back and forth is displayed.

Push Details, and Details and Corrective Action are displayed. Push ESC and Retry B Screen is Displayed.

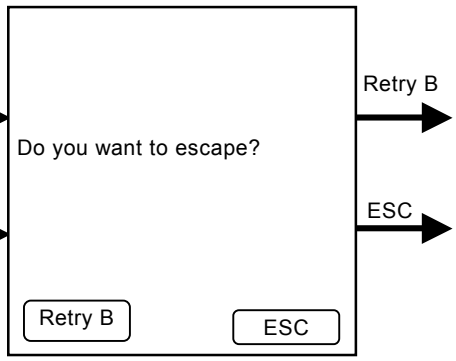


Fault Code Screen

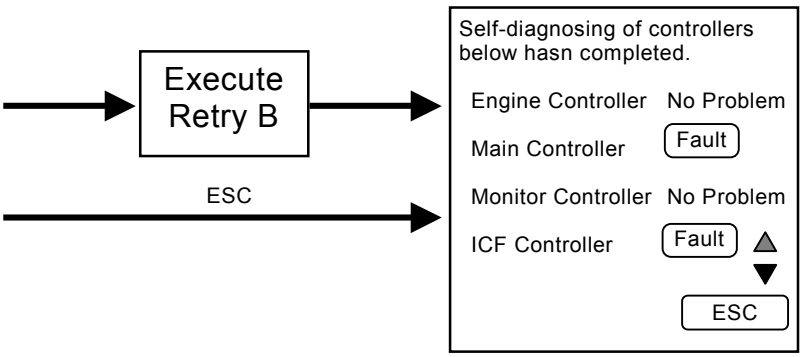
Push ESC and Retry B Screen is Displayed.



Push Retry B and return to Controller Self-Diagnosing Screen after controller self-diagnsing.
Push ESC and return to Controller Self-Diagnosing Screen.



Retry B Screen



Controller Self-Diagnosing Screen

LIST OF FAULT CODE

Fault Code	Details	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 (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	
14103-2	Satellite Communication Terminal: The satellite is not found.	
14104-2	Satellite Communication Terminal: Fail 1 of Remote Loup Back	
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

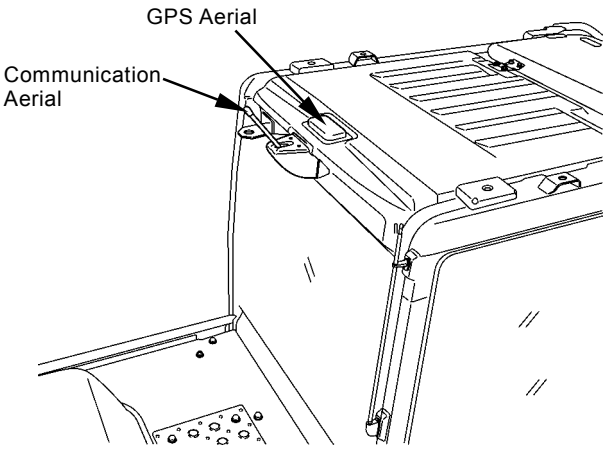
The satellite communication system is used for maintenance of the machine, “e-Service” by transmitting various data of the machine regularly via a low earth orbit satellite.

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.

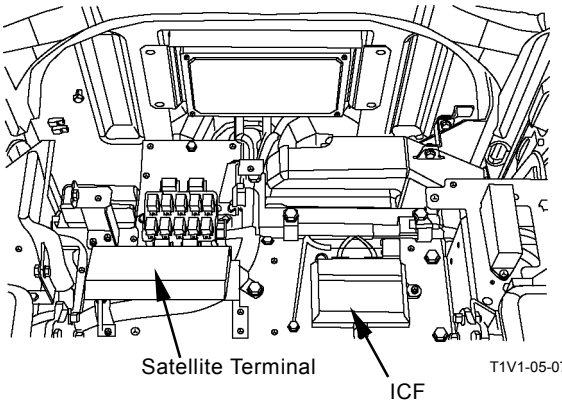
The satellite communication system consists of satellite communication terminal, GPS aerial and communication aerial. The mail function of monitor unit becomes effective.
The functions of each equipment are:

- 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

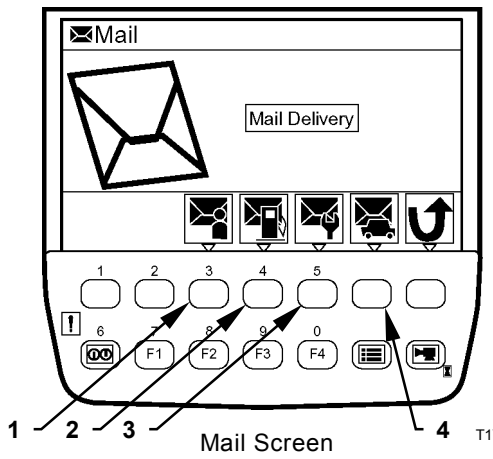


T1V1-05-07-003



T1V1-05-07-001

Monitor Unit



T1V5-05-01-037

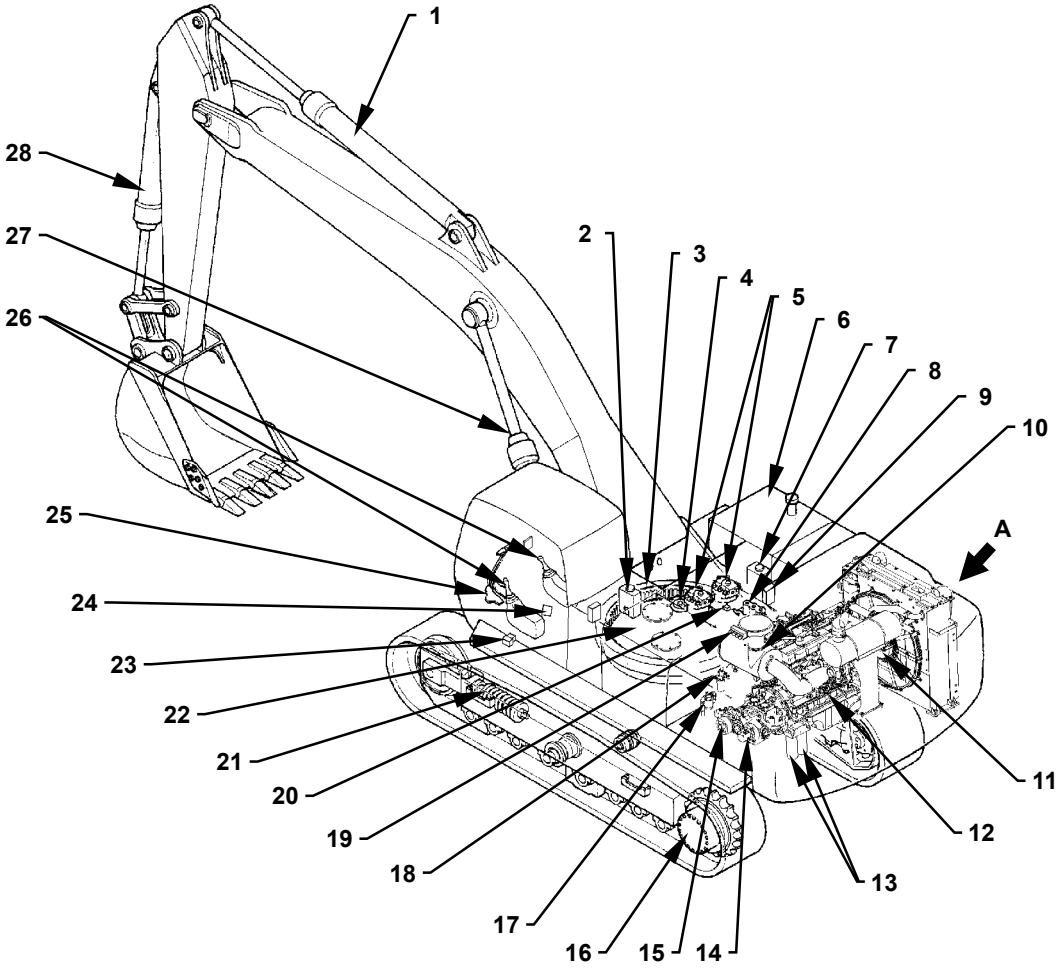
On the machine equipped with the satellite communication system, the data are sent according to the condition as follows:

Kinds of data sent from the machine by using satellite communication:

Items	Kinds of Data	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 lastly.
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)

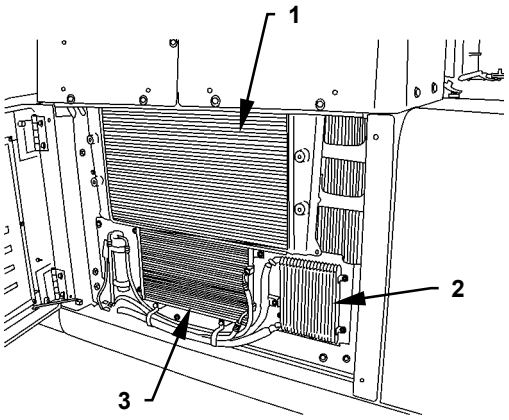
MAIN COMPONENT LAYOUT



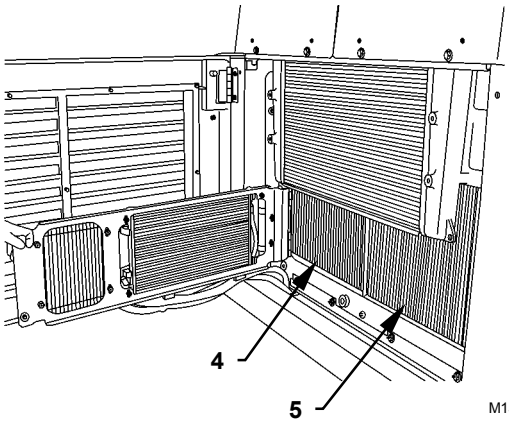
T1J1-01-02-002

1 - Arm Cylinder
2 - Washer Tank
3 - Swing Bearing
4 - Center Joint
5 - Swing Device
6 - Fuel Tank
7 - Reserve Tank
8 - Control Valve
9 - Signal Control Valve
10 - Air Cleaner
11 - Fan Motor
12 - Engine
13 - Engine Oil Filter
14 - Pump Device
15 - Fan Pump
16 - Travel Device
17 - Drain Filter
18 - Pilot Filter/ Pilot Relief Valve
19 - Solenoid Valve Unit
20 - Check Valve
21 - Track Adjuster
22 - Hydraulic Oil Tank
23 - Pilot Shut-Off Solenoid Valve
24 - Shockless Valve
25 - Travel Pilot Valve
26 - Front Attachment / Swing Pilot Valve
27 - Boom Cylinder
28 - Bucket Cylinder

View A (Around the Radiator)

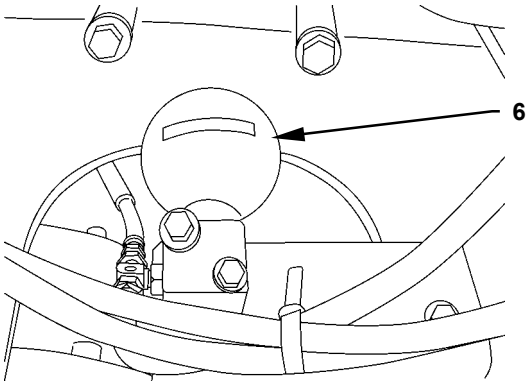


M1J1-07-032



M1J1-07-034

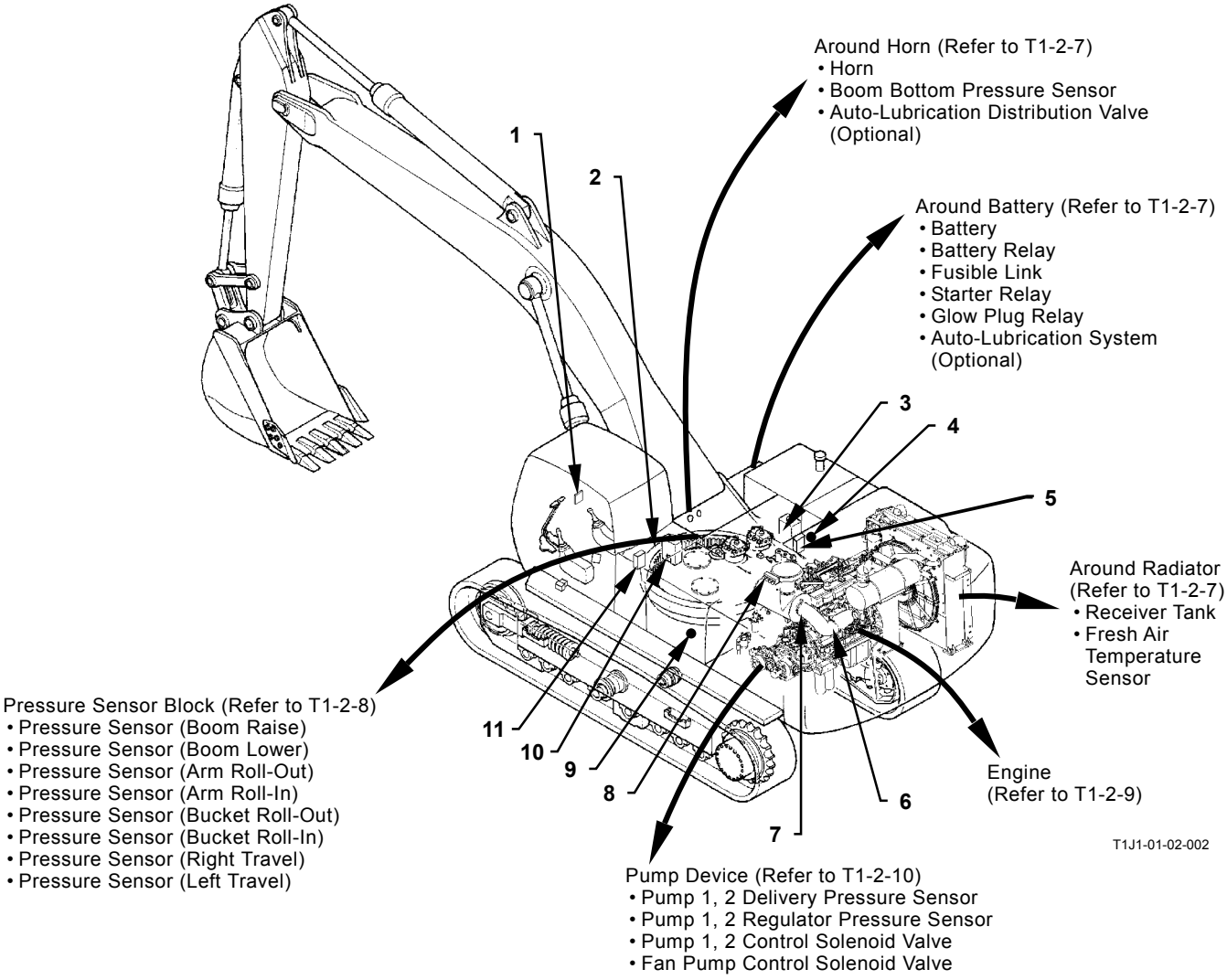
Lower of Control Valve



T1J1-01-02-009

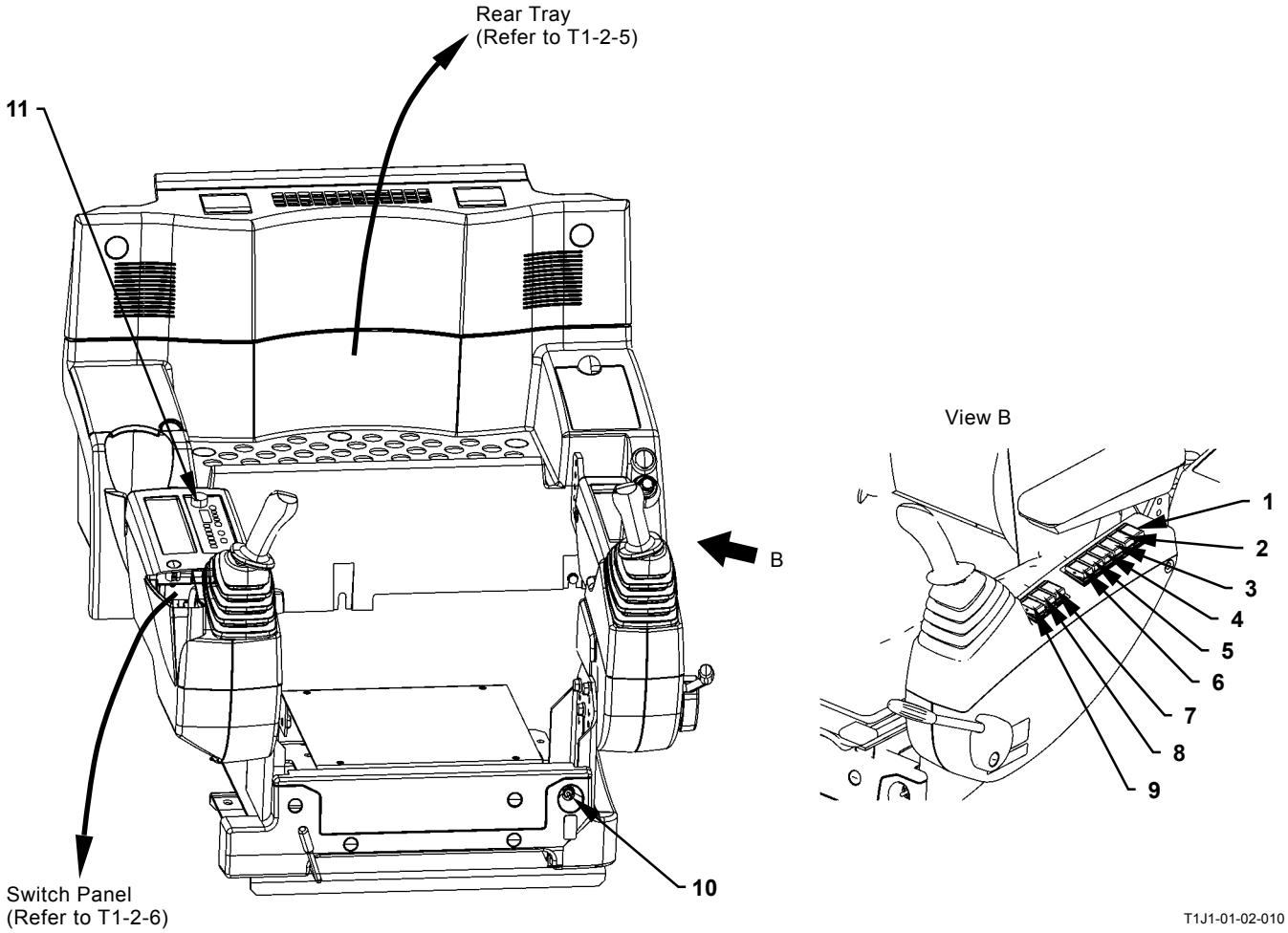
1 - Inter Cooler
2 - Fuel Cooler
3 - Air Conditioner Condenser
4 - Radiator
5 - Oil Cooler
6 - Accumulator

ELECTRICAL COMPONENT LAYOUT (Overview)



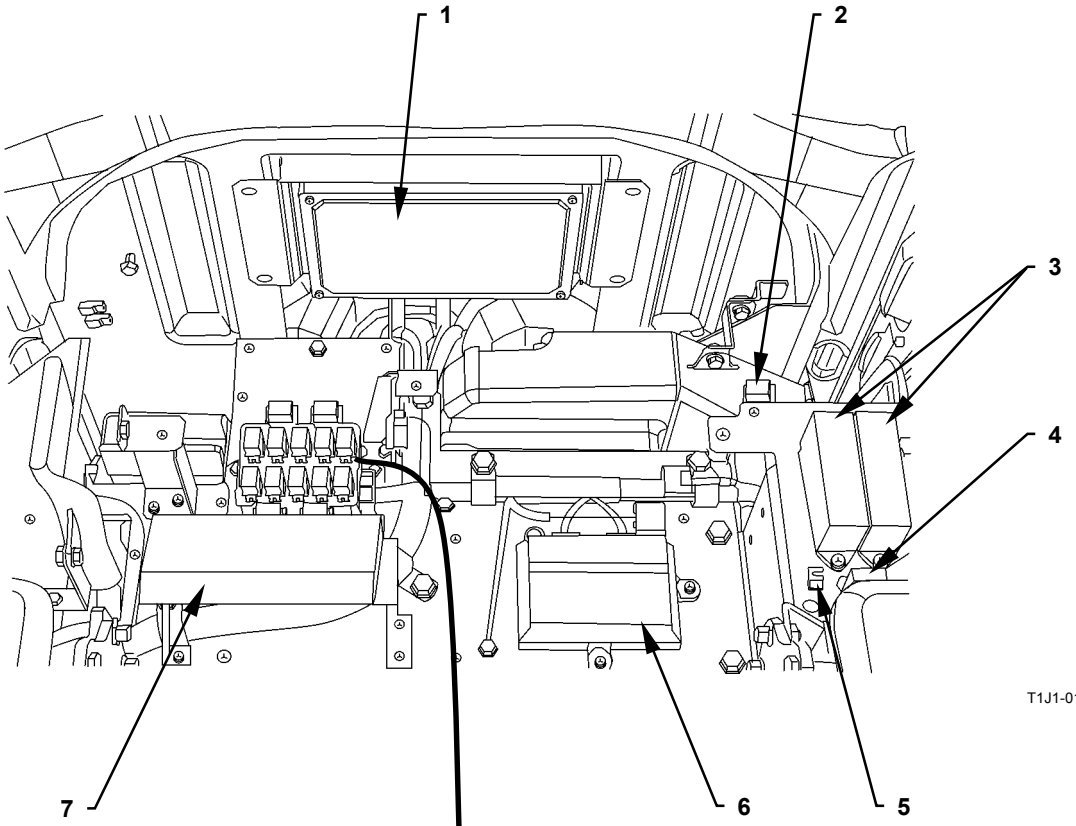
1 - Monitor Unit
2 - Atmosphere Pressure Sensor
3 - Coolant Level Switch
4 - Fuel Sensor
5 - Pressure Sensor (Swing) (Refer to T1-2-8)
6 - Intake Air Temperature Sensor
7 - Air Cleaner Restriction Switch
8 - Solenoid Valve Unit (Refer to T1-2-8)
9 - Hydraulic Oil Temperature Sensor
10 - Washer Motor
11 - ECM (Engine Controller)

Electrical Component Layout (In Cab)

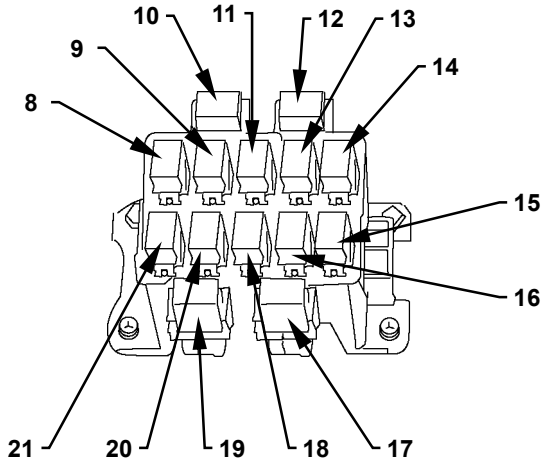


1 - Fan Rotation Direction Switch (Optional)
2 - Rotating Light Switch (Optional)
3 - Rear Light Switch (Optional)
4 - Auto-Lubrication Switch (Optional)
5 - Level Check Switch (Engine Oil Level / Coolant Level)
6 - Boom Mode Selector Switch
7 - Overload Alarm Switch (Optional)
8 - Seat Heat Switch (Optional)
9 - Travel Alarm Deactivation Switch (Optional)
10 - Engine Stop Switch
11 - Radio

Electrical Component Layout (Rear Tray)



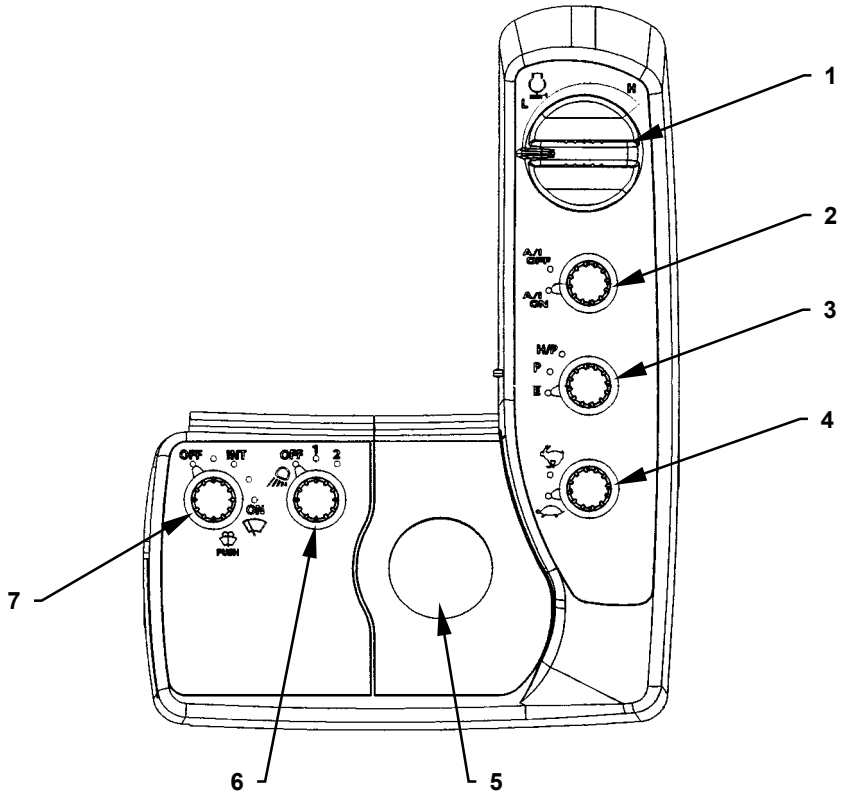
T1J1-01-02-003



T1V1-01-02-009

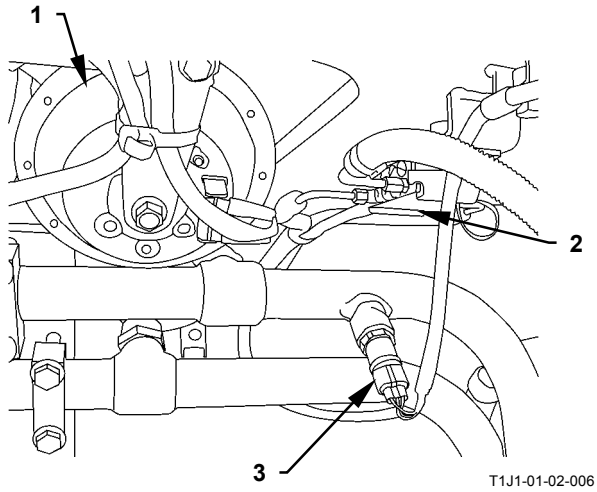
1 - MC (Main Controller)
2 - Overload Alarm Relay (Optional)
3 - Fuse Box
4 - Dr. ZX Connector (Use as Download Connector)
5 - Pump Learning Switch
6 - ICF (Information Controller)
7 - Satellite Communication Terminal (Optional)
8 - Security Relay (R5)
9 - Starter Cut Relay (R4)
10 - Hour Mater Relay (R12) (Optional)
11 - Security Horn Relay (R3)
12 - Auto-Lubrication Relay (R11) (Optional)
13 - Lock Relay (R2)
14 - Load Damp Relay (R1)
15 - Wiper Relay (R6)
16 - Light Relay 1 (R7)
17 - Light Relay 3 (R13) (Optional)
18 - Light Relay 2 (R8)
19 - ECM Main Relay (R14)
20 - Washer Relay (R9)
21 - Horn Relay (R10)

Electrical Component Layout (Switch Panel)



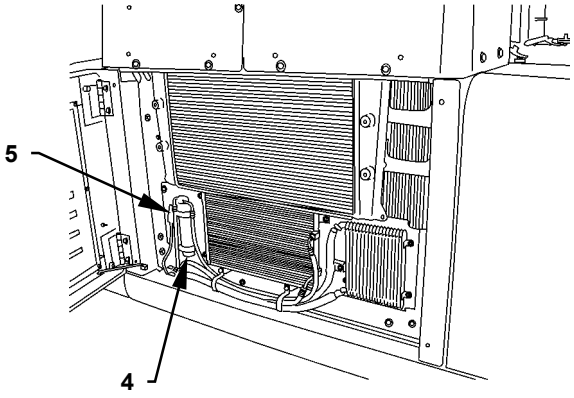
1 - Engine Control Dial
2 - Auto-Idle Switch
3 - Power Mode Switch
4 - Travel Mode Switch
5 - Key Switch
6 - Work Light Switch
7 - Wiper/Washer Switch

Around Horn



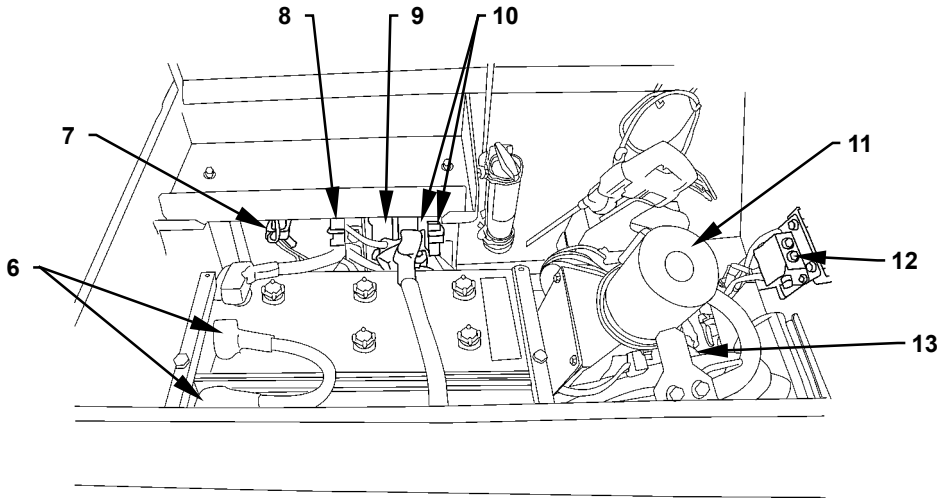
T1J1-01-02-006

Around Radiator



M1J1-07-032

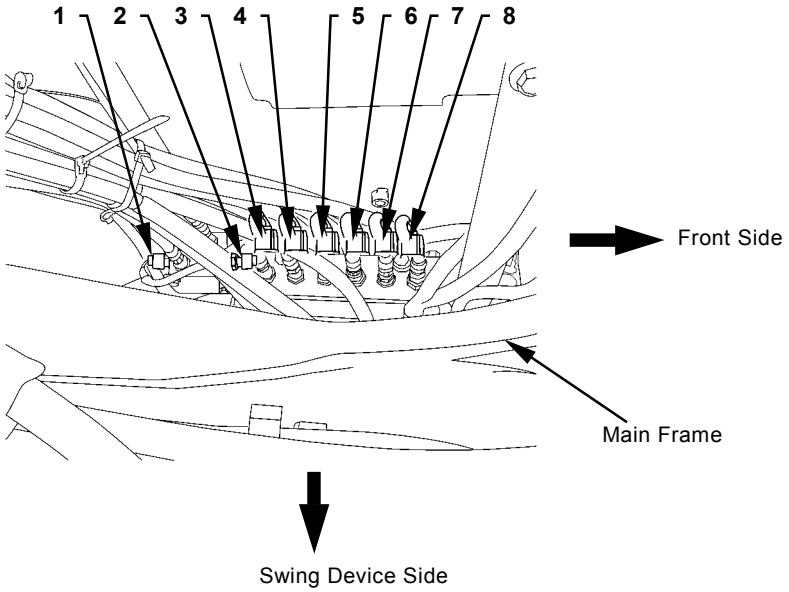
Around Battery



T1J1-01-02-005

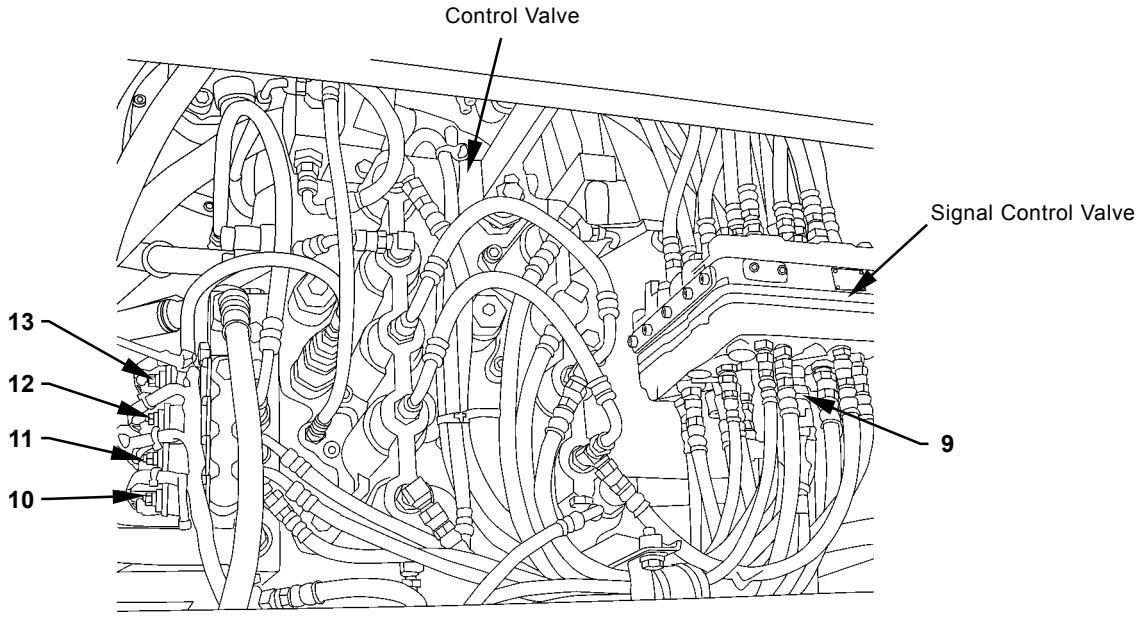
1 - Horn
2 - Distribution Valve (Optional)
3 - Boom Bottom Pressure Sensor
4 - Receiver Tank
5 - Fresh Air Temperature Sensor
6 - Battery
7 - Glow Plug Relay
8 - Starter Relay
9 - Battery Relay
10 - Fusible Link
11 - Auto-Lubrication Pump
12 - Fuel Filler System Switch (Optional)
13 - Fuel Filler Pump

Pressure Sensor Brock



T1J1-01-02-008

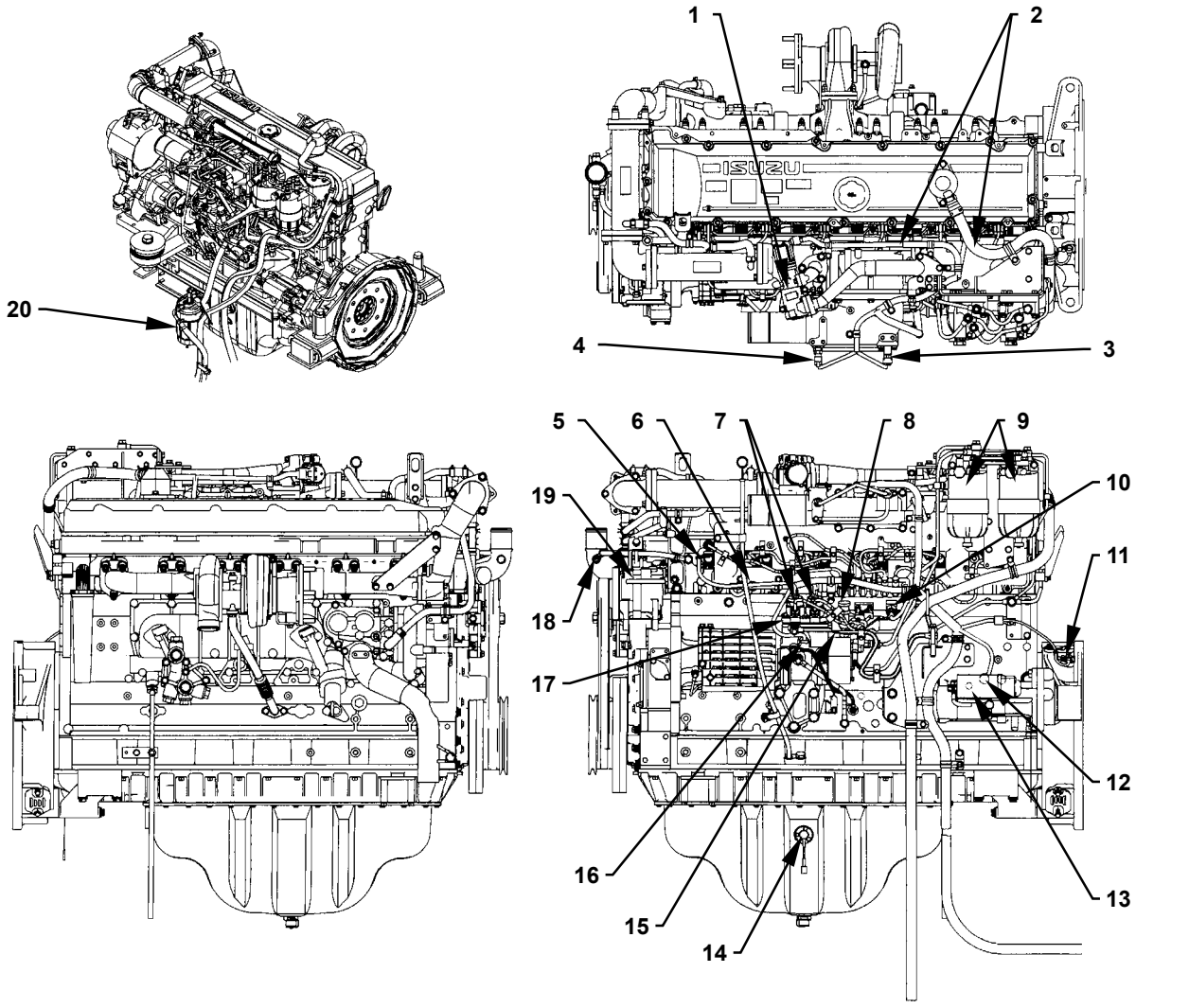
Solenoid Valve Unit



T1J1-01-02-007

1 - Pressure Sensor (Travel Right)
2 - Pressure Sensor (Travel Left)
3 - Pressure Sensor (Arm Roll-Out)
4 - Pressure Sensor (Arm Roll-In)
5 - Pressure Sensor (Bucket Roll-In)
6 - Pressure Sensor (Bucket Roll-Out)
7 - Pressure Sensor (Boom Raise)
8 - Pressure Sensor (Boom Lower)
9 - Pressure Sensor (Swing)
10 - Solenoid Valve Unit (SG)
11 - Solenoid Valve Unit (SI)
12 - Solenoid Valve Unit (SF)
13 - Solenoid Valve Unit (SC)

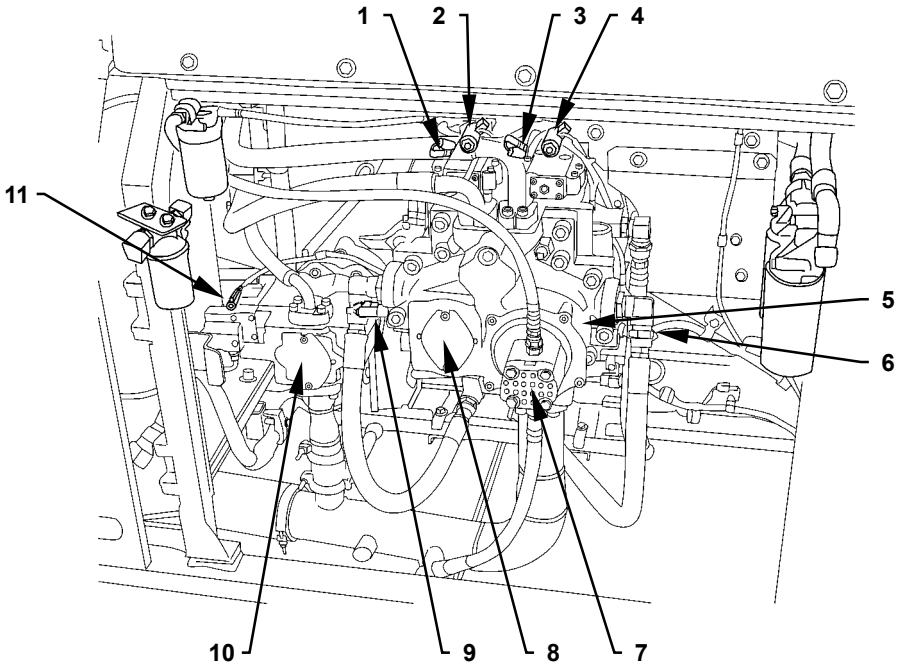
ENGINE



T1J1-01-02-011

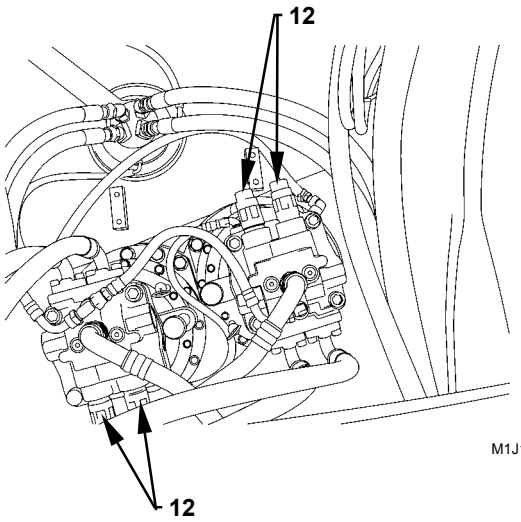
1 - EGR Valve	6 - Coolant Temperature Sensor	11 - Crank Revolution Sensor	16 - Cam Angle Sensor
2 - Injector Connector	7 - Suction Control Valve	12 - Engine Oil Pressure Sensor	17 - Supply Pump
3 - Boost Pressure Sensor	8 - Priming Pump	13 - Starter	18 - Overheat Switch
4 - Boost Temperature Sensor	9 - Fuel Main Filter	14 - Engine Oil Level Switch	19 - Alternator
5 - Glow Plug Connector Terminal	10 - Common Rail Pressure Sensor	15 - Fuel Temperature Sensor	20 - Fuel Pre Filter

PUMP DEVICE



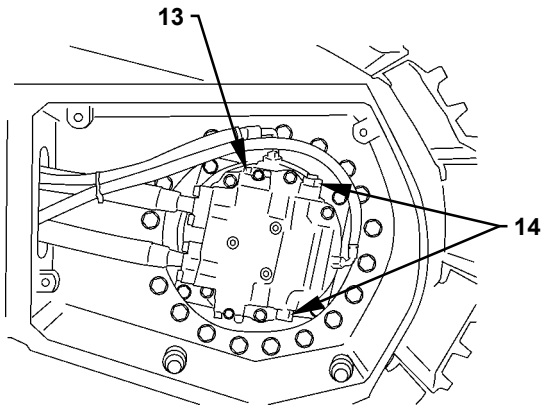
T1J1-01-02-004

SWING DEVICE



M1J1-07-053

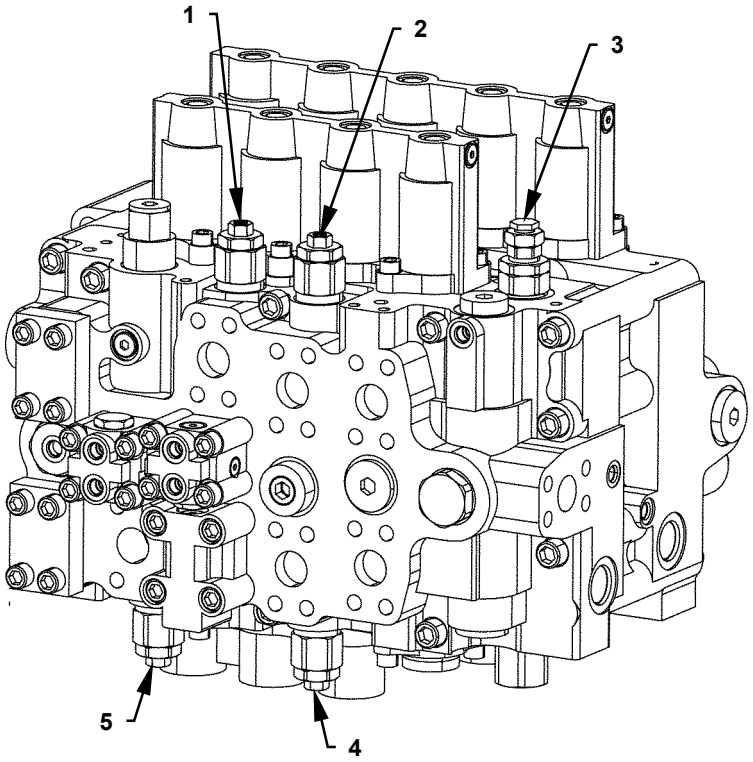
TRAVEL DEVICE



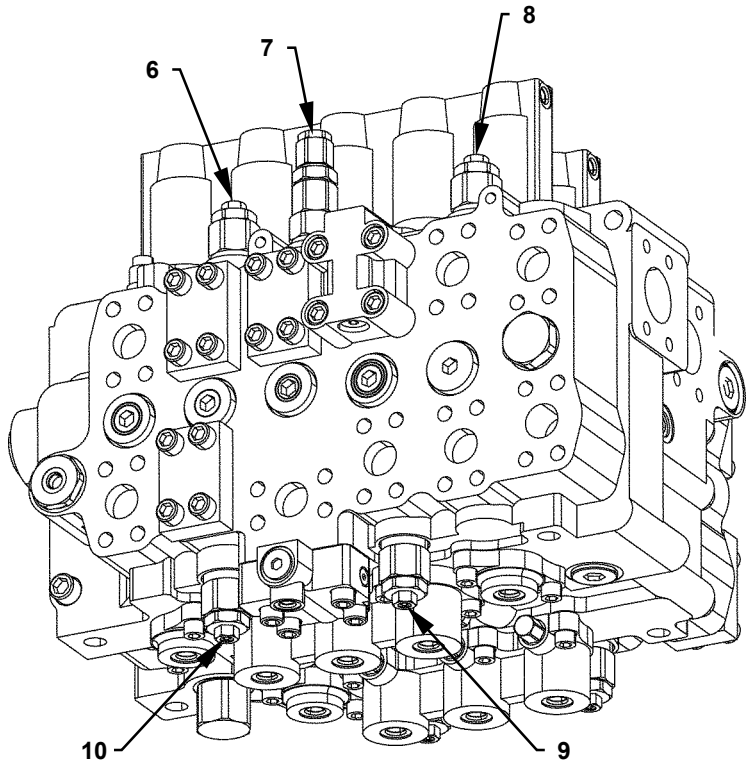
M1J1-07-048

1 - Pump 2 Regulator Pressure Sensor
2 - Pump 2 Control Solenoid Valve
3 - Pump 1 Regulator Pressure Sensor
4 - Pump 1 Control Solenoid Valve
5 - Pump 1
6 - Pump 1 Delivery Pressure Sensor
7 - Pilot Pump
8 - Pump 2
9 - Pump 2 Delivery Pressure Sensor
10 - Fan Pump
11 - Fan Pump Control Solenoid Valve
12 - Swing Relief Valve
13 - Counterbalance Valve
14 - Travel Relief Valve

CONTROL VALVE



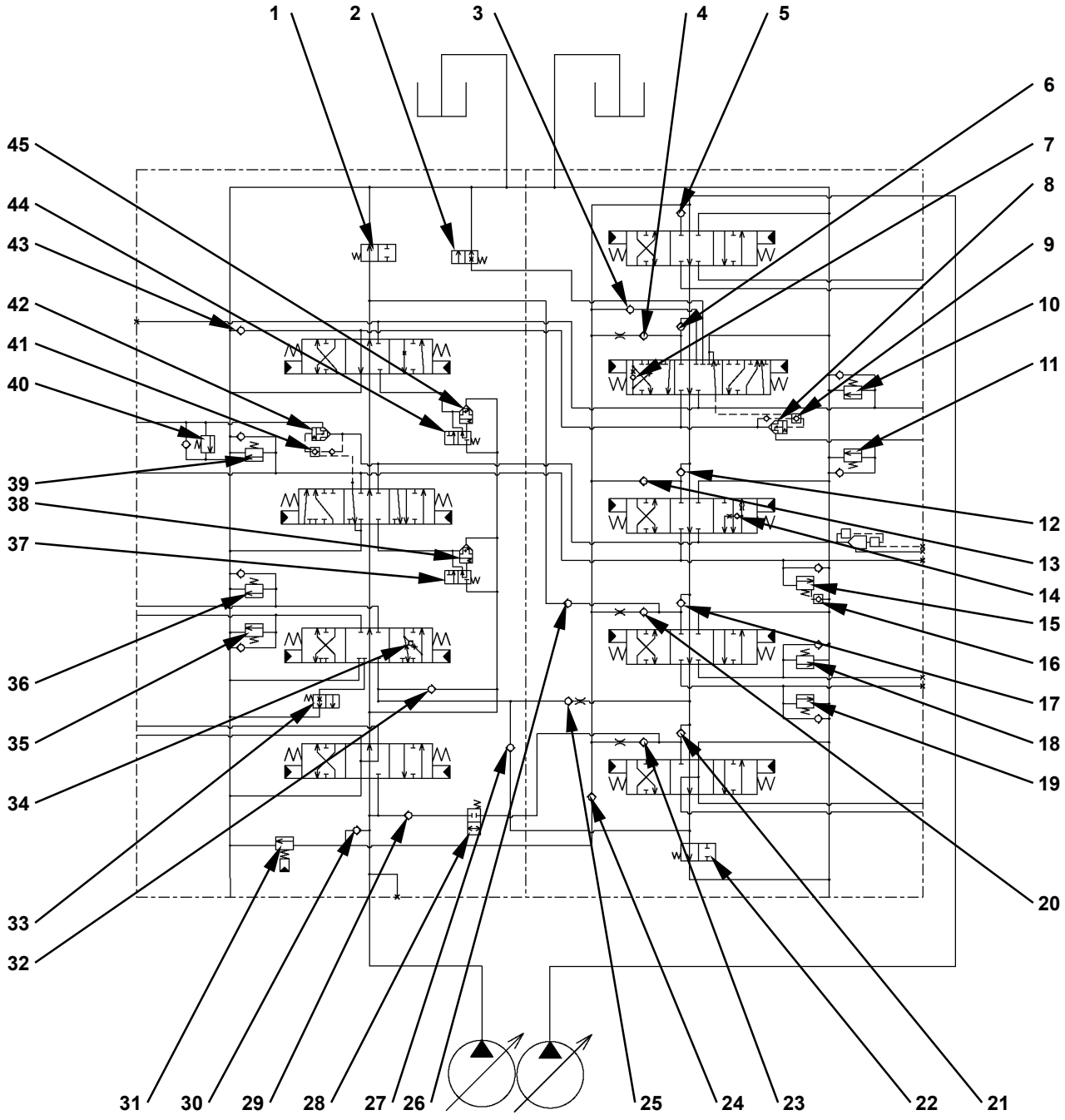
T1J1-03-03-003



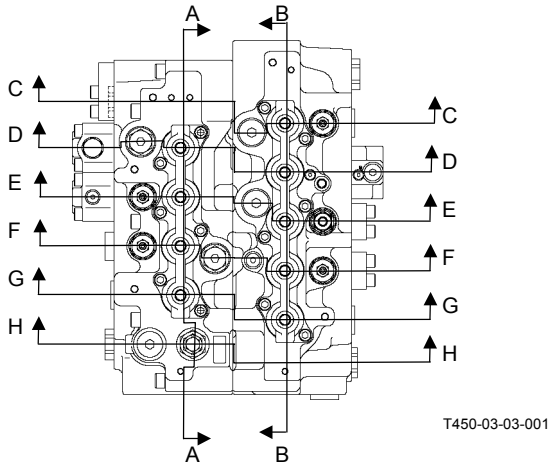
T1J1-03-03-004

1 - Overload Relief Valve (Boom Lower)
2 - Overload Relief Valve (Bucket Roll-Out)
3 - Main Relief Valve
4 - Overload Relief Valve (Bucket Roll-In)
5 - Overload Relief Valve (Boom Raise)
6 - Overload Relief Valve (Auxiliary)
7 - Overload Relief Valve (Boom Mode)
8 - Overload Relief Valve (Arm Roll-Out)
9 - Overload Relief Valve (Arm Roll-In)
10 - Overload Relief Valve (Auxiliary)

COMPONENTS IN CONTROL VALVE

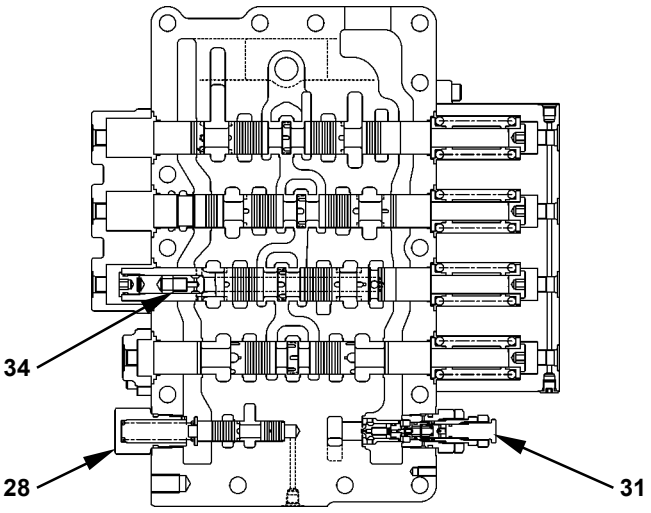


T450-03-03-025



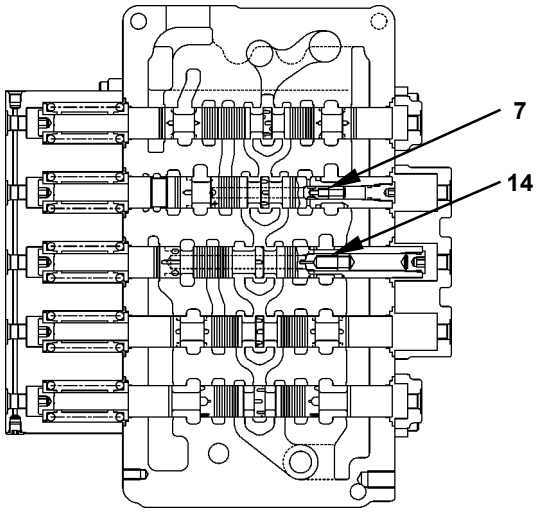
T450-03-03-001

Cross Section A-A



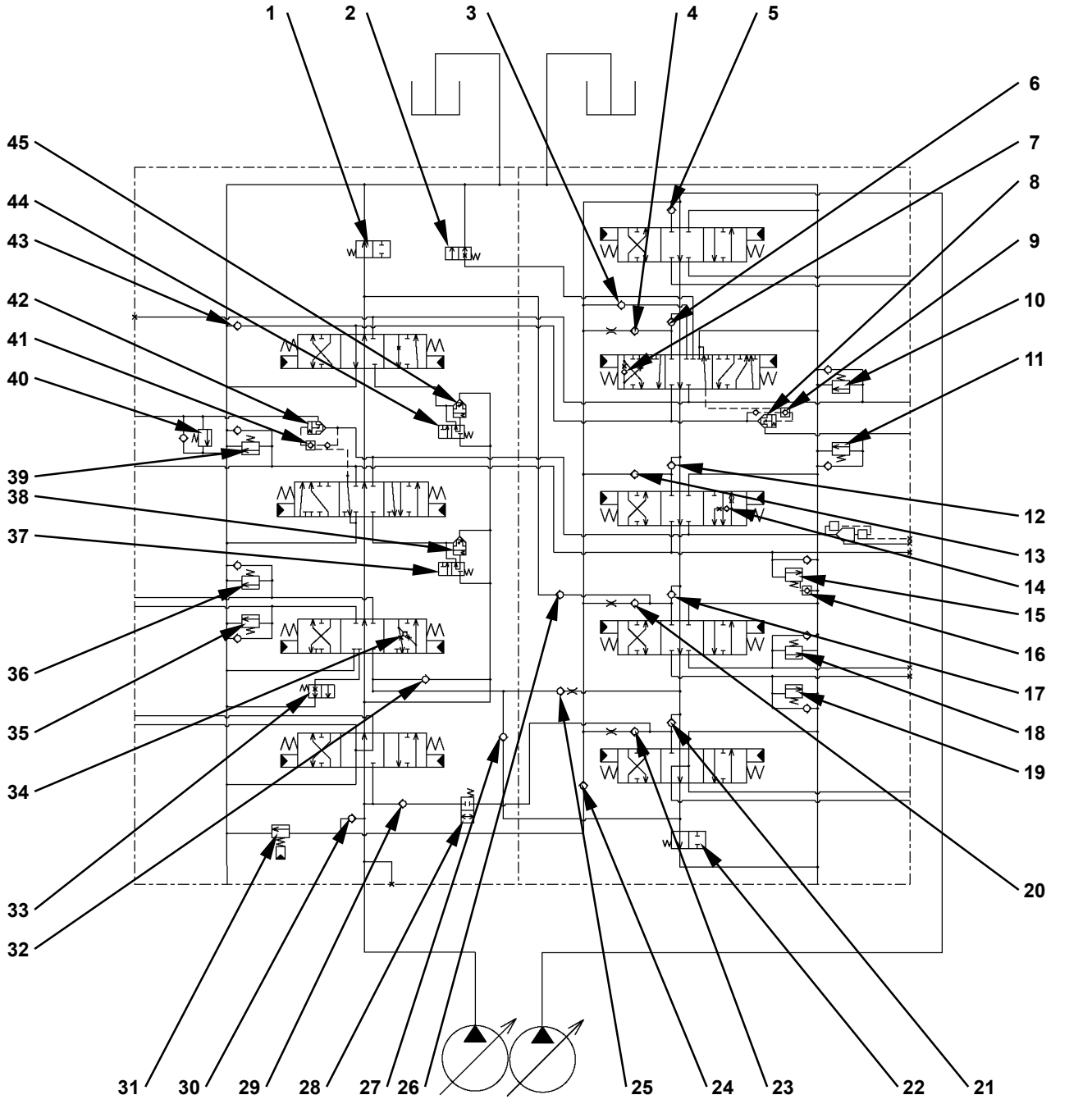
T450-03-03-011

Cross Section B-B



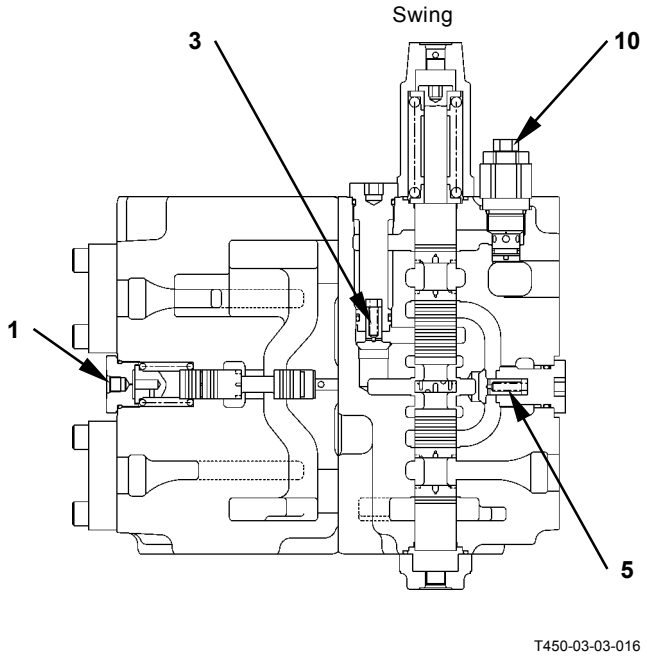
T450-03-03-010

1 - Bypass Shut-Out Valve
2 - Arm Regenerative Valve (Switch Valve)
3 - Check Valve (Arm 1 Roll-Out Parallel Circuit)
4 - Load Check Valve (Arm 1 Roll-In Parallel Circuit)
5 - Load Check Valve (Swing Tandem Circuit)
6 - Load Check Valve (Arm 1 Tandem Circuit)
7 - Arm Regenerative Valve (Check Valve)
8 - Arm Anti-Drift Valve (Check Valve)
9 - Arm Anti-Drift Valve (Switch Valve)
10 - Overload Relief Valve (Arm Roll-Out)
11 - Overload Relief Valve (Arm Roll-In)
12 - Load Check Valve (Boom 2 Tandem Circuit)
13 - Load Check Valve (Boom 2 Parallel Circuit)
14 - Boom Regenerative Valve
15 - Overload Relief Valve (Boom Mode)
16 - Boom Overload Relief Control Valve
17 - Load Check Valve (Auxiliary Tandem Circuit)
18 - Overload Relief Valve (Auxiliary)
19 - Overload Relief Valve (Auxiliary)
20 - Load Check Valve (Auxiliary Parallel Circuit)
21 - Load Check Valve (Left Travel Tandem Circuit)
22 - Bypass Shut-Out Valve
23 - Load Check Valve (Left Travel Parallel Circuit)
24 - Check Valve (Main Relief Pressure Flow Combining Circuit)
25 - Check Valve (Bucket Flow Combining Circuit)
26 - Check Valve (Auxiliary Flow Combining Circuit)
27 - Check Valve (Bucket Flow Combining Circuit)
28 - Flow Combiner Valve
29 - Check Valve (Flow Combiner Valve Circuit)
30 - Check Valve (Main Relief Pressure Flow Combining Circuit)
31 - Main Relief Valve
32 - Load Check Valve (Bucket Parallel Circuit)
33 - Bucket Regenerative Valve (Switch Valve)
34 - Bucket Regenerative Valve (Check Valve)
35 - Overload Relief Valve (Bucket Roll-Out)
36 - Overload Relief Valve (Bucket Roll-In)
37 - Boom Flow Rate Control Valve (Switch Valve)
38 - Boom Flow Control Valve (Poppet Valve)
39 - Overload Relief Valve (Boom Lower)
40 - Overload Relief Valve (Boom Raise)
41 - Boom Anti-Drift Valve (Switch Valve)
42 - Boom Anti-Drift Valve (Check Valve)
43 - Check Valve (Arm Make-Up Circuit)
44 - Arm Flow Rate Control Valve (Switch Valve)
45 - Arm Flow Rate Control Valve (Poppet Valve)

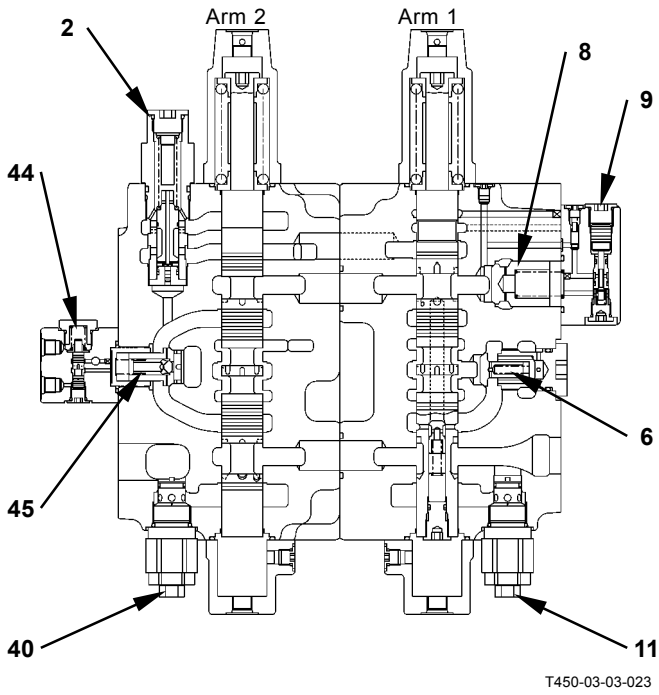


T450-03-03-025

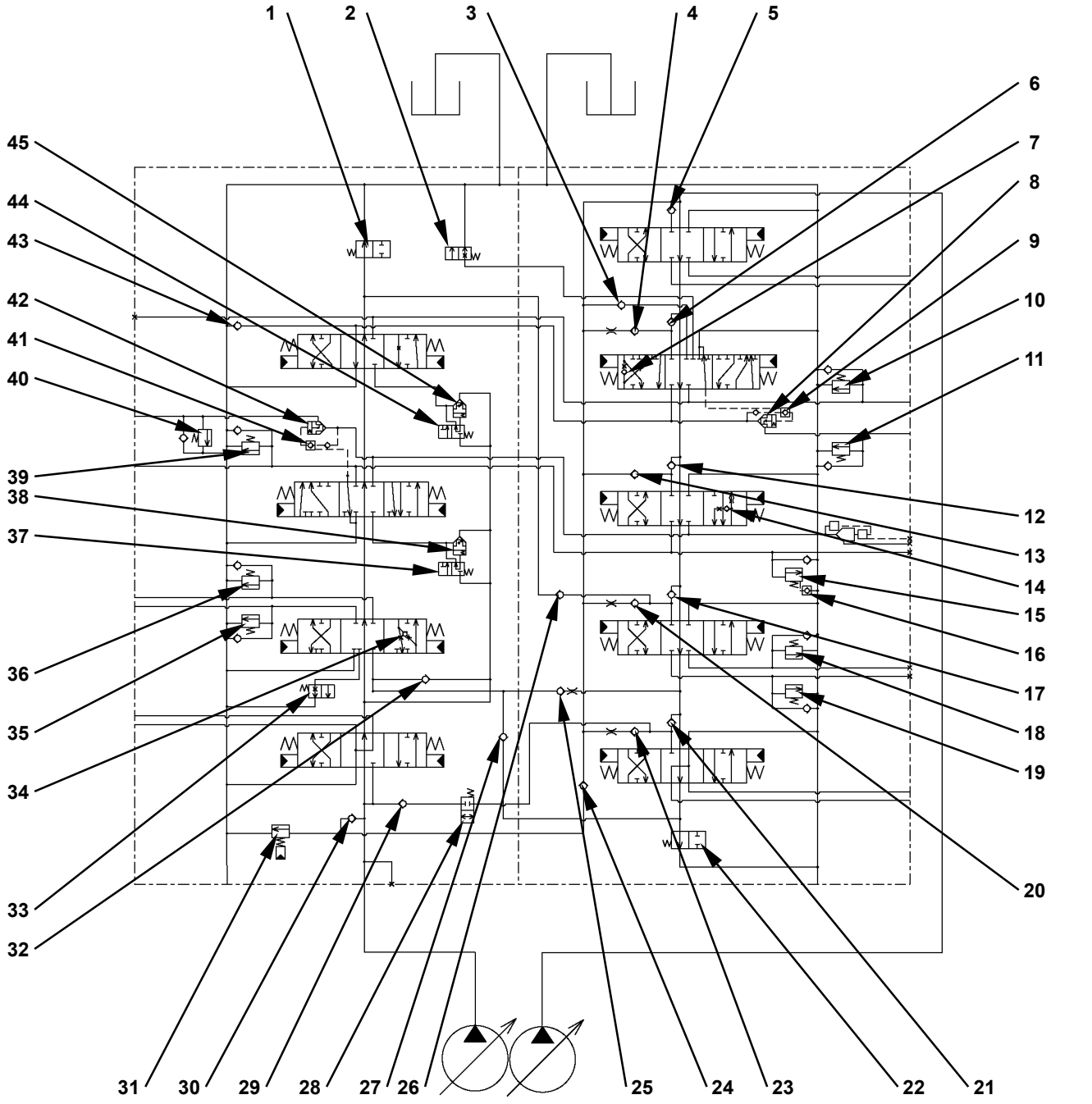
Cross Section C-C



Cross Section D-D

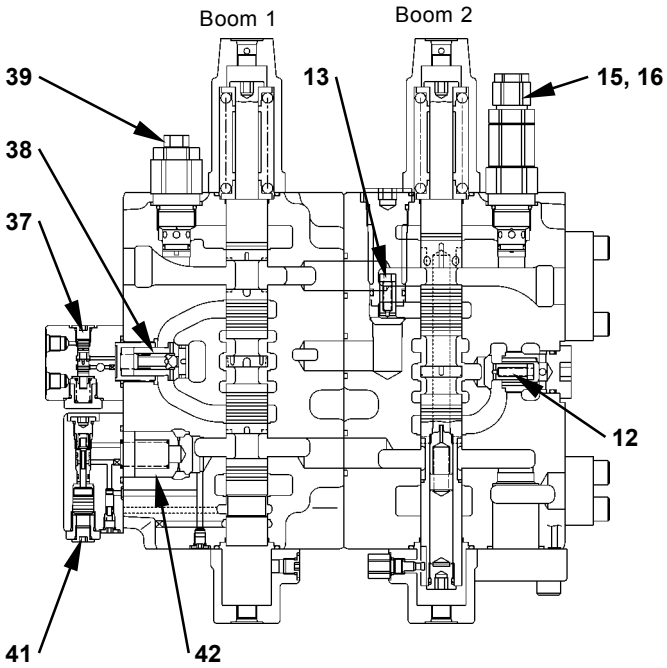


1 - Bypass Shut-Out Valve
2 - Arm Regenerative Valve (Switch Valve)
3 - Check Valve (Arm 1 Roll-Out Parallel Circuit)
4 - Load Check Valve (Arm 1 Roll-In Parallel Circuit)
5 - Load Check Valve (Swing Tandem Circuit)
6 - Load Check Valve (Arm 1 Tandem Circuit)
7 - Arm Regenerative Valve (Check Valve)
8 - Arm Anti-Drift Valve (Check Valve)
9 - Arm Anti-Drift Valve (Switch Valve)
10 - Overload Relief Valve (Arm Roll-Out)
11 - Overload Relief Valve (Arm Roll-In)
12 - Load Check Valve (Boom 2 Tandem Circuit)
13 - Load Check Valve (Boom 2 Parallel Circuit)
14 - Boom Regenerative Valve
15 - Overload Relief Valve (Boom Mode)
16 - Boom Overload Relief Control Valve
17 - Load Check Valve (Auxiliary Tandem Circuit)
18 - Overload Relief Valve (Auxiliary)
19 - Overload Relief Valve (Auxiliary)
20 - Load Check Valve (Auxiliary Parallel Circuit)
21 - Load Check Valve (Left Travel Tandem Circuit)
22 - Bypass Shut-Out Valve
23 - Load Check Valve (Left Travel Parallel Circuit)
24 - Check Valve (Main Relief Pressure Flow combining Circuit)
25 - Check Valve (Bucket Flow Combining Circuit)
26 - Check Valve (Auxiliary Flow Combining Circuit)
27 - Check Valve (Bucket Flow Combining Circuit)
28 - Flow Combiner Valve
29 - Check Valve (Flow Combiner Valve Circuit)
30 - Check Valve (Main Relief Pressure Flow Combining Circuit)
31 - Main Relief Valve
32 - Load Check Valve (Bucket Parallel Circuit)
33 - Bucket Regenerative Valve (Switch Valve)
34 - Bucket Regenerative Valve (Check Valve)
35 - Overload Relief Valve (Bucket Roll-Out)
36 - Overload Relief Valve (Bucket Roll-In)
37 - Boom Flow Rate Control Valve (Switch Valve)
38 - Boom Flow Control Valve (Poppet Valve)
39 - Overload Relief Valve (Boom Lower)
40 - Overload Relief Valve (Boom Raise)
41 - Boom Anti-Drift Valve (Switch Valve)
42 - Boom Anti-Drift Valve (Check Valve)
43 - Check Valve (Arm Make-Up Circuit)
44 - Arm Flow Rate Control Valve (Switch Valve)
45 - Arm Flow Rate Control Valve (Poppet Valve)



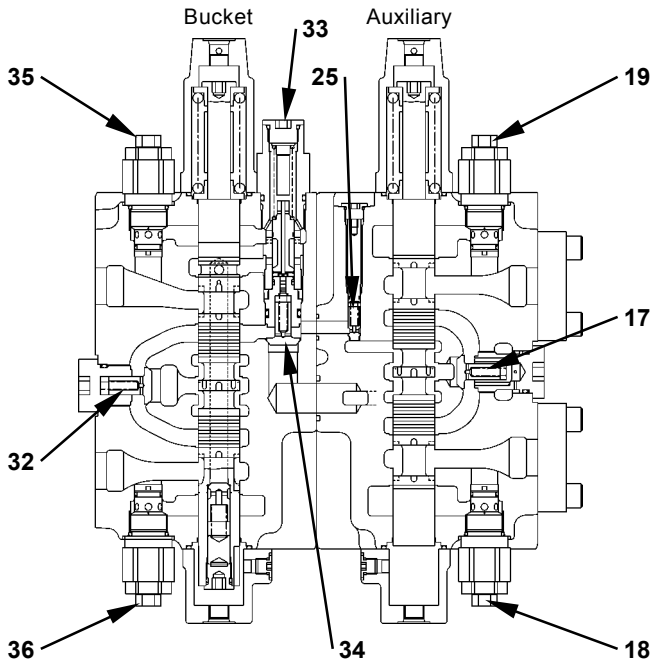
T450-03-03-025

Cross Section E-E



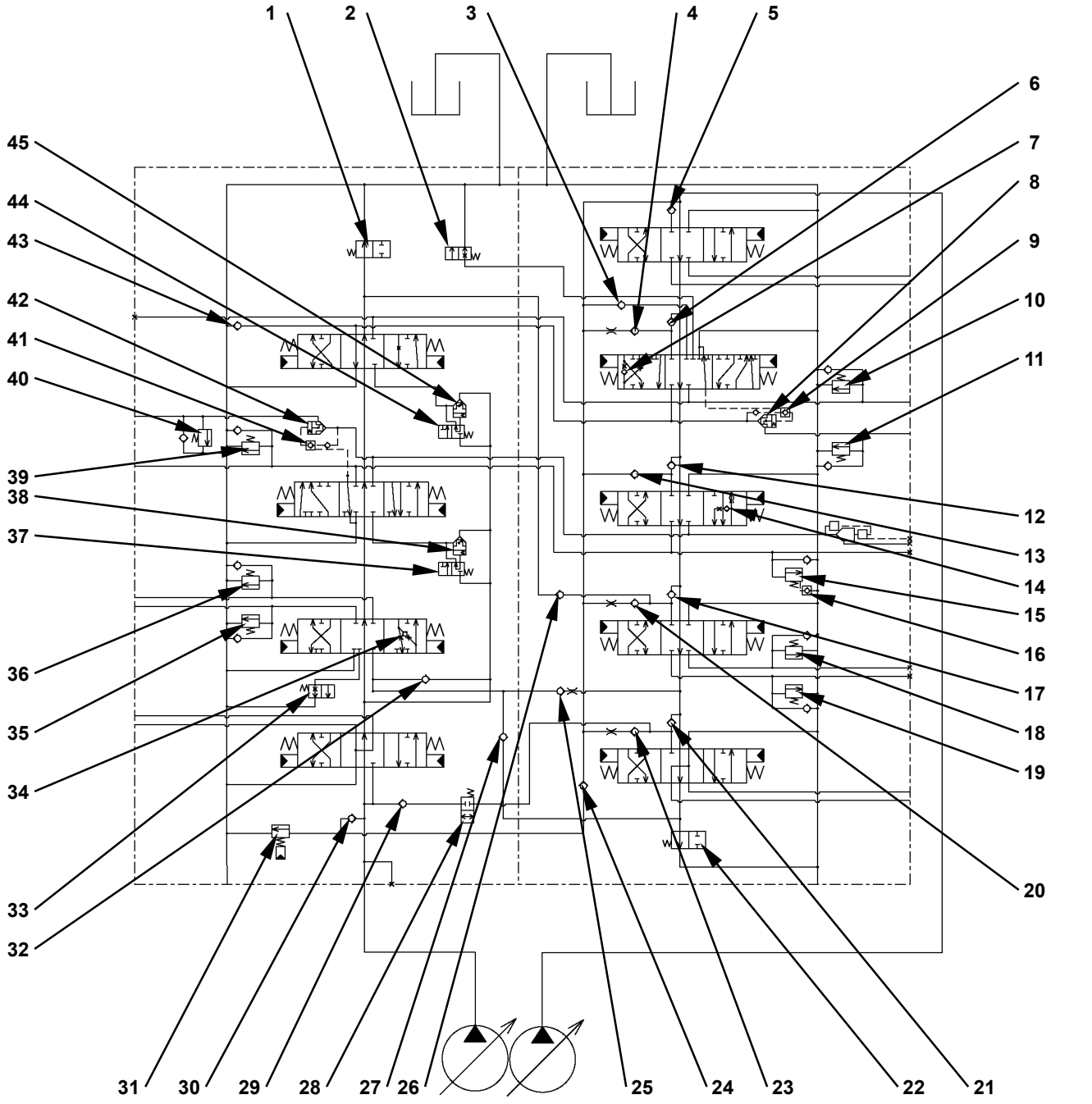
T450-03-03-015

Cross Section F-F



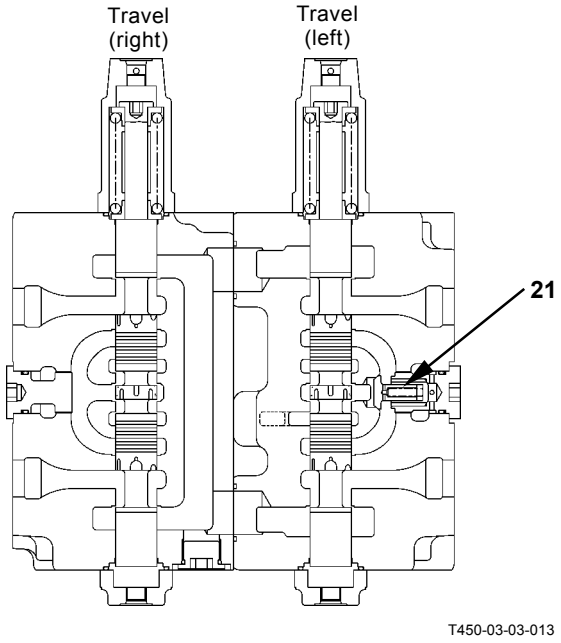
T450-03-03-014

1 - Bypass Shut-Out Valve
2 - Arm Regenerative Valve (Switch Valve)
3 - Check Valve (Arm 1 Roll-Out Parallel Circuit)
4 - Load Check Valve (Arm 1 Roll-In Parallel Circuit)
5 - Load Check Valve (Swing Tandem Circuit)
6 - Load Check Valve (Arm 1 Tandem Circuit)
7 - Arm Regenerative Valve (Check Valve)
8 - Arm Anti-Drift Valve (Check Valve)
9 - Arm Anti-Drift Valve (Switch Valve)
10 - Overload Relief Valve (Arm Roll-Out)
11 - Overload Relief Valve (Arm Roll-In)
12 - Load Check Valve (Boom 2 Tandem Circuit)
13 - Load Check Valve (Boom 2 Parallel Circuit)
14 - Boom Regenerative Valve
15 - Overload Relief Valve (Boom Mode)
16 - Boom Overload Relief Control Valve
17 - Load Check Valve (Auxiliary Tandem Circuit)
18 - Overload Relief Valve (Auxiliary)
19 - Overload Relief Valve (Auxiliary)
20 - Load Check Valve (Auxiliary Parallel Circuit)
21 - Load Check Valve (Left Travel Tandem Circuit)
22 - Bypass Shut-Out Valve
23 - Load Check Valve (Left Travel Parallel Circuit)
24 - Check Valve (Main Relief Pressure Flow Combining Circuit)
25 - Check Valve (Bucket Flow Combining Circuit)
26 - Check Valve (Auxiliary Flow Combining Circuit)
27 - Check Valve (Bucket Flow Combining Circuit)
28 - Flow Combiner Valve
29 - Check Valve (Flow Combiner Valve Circuit)
30 - Check Valve (Main Relief Pressure Flow Combining Circuit)
31 - Main Relief Valve
32 - Load Check Valve (Bucket Parallel Circuit)
33 - Bucket Regenerative Valve (Switch Valve)
34 - Bucket Regenerative Valve (Check Valve)
35 - Overload Relief Valve (Bucket Roll-Out)
36 - Overload Relief Valve (Bucket Roll-In)
37 - Boom Flow Rate Control Valve (Switch Valve)
38 - Boom Flow Control Valve (Poppet Valve)
39 - Overload Relief Valve (Boom Lower)
40 - Overload Relief Valve (Boom Raise)
41 - Boom Anti-Drift Valve (Switch Valve)
42 - Boom Anti-Drift Valve (Check Valve)
43 - Check Valve (Arm Make-Up Circuit)
44 - Arm Flow Rate Control Valve (Switch Valve)
45 - Arm Flow Rate Control Valve (Poppet Valve)

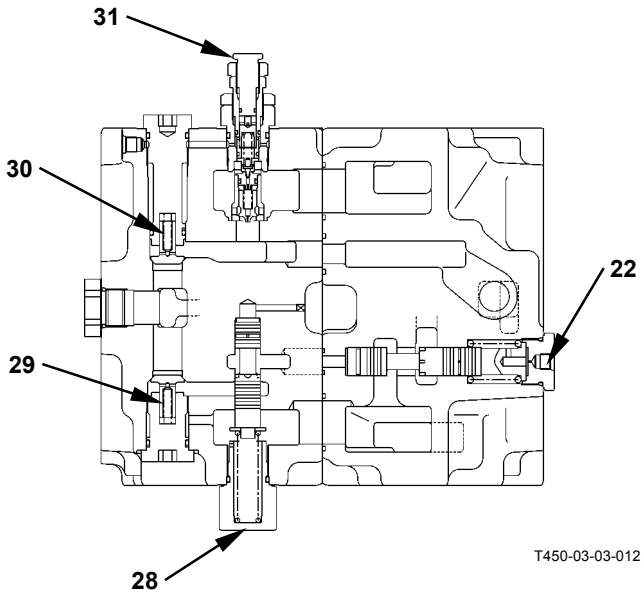


T450-03-03-025

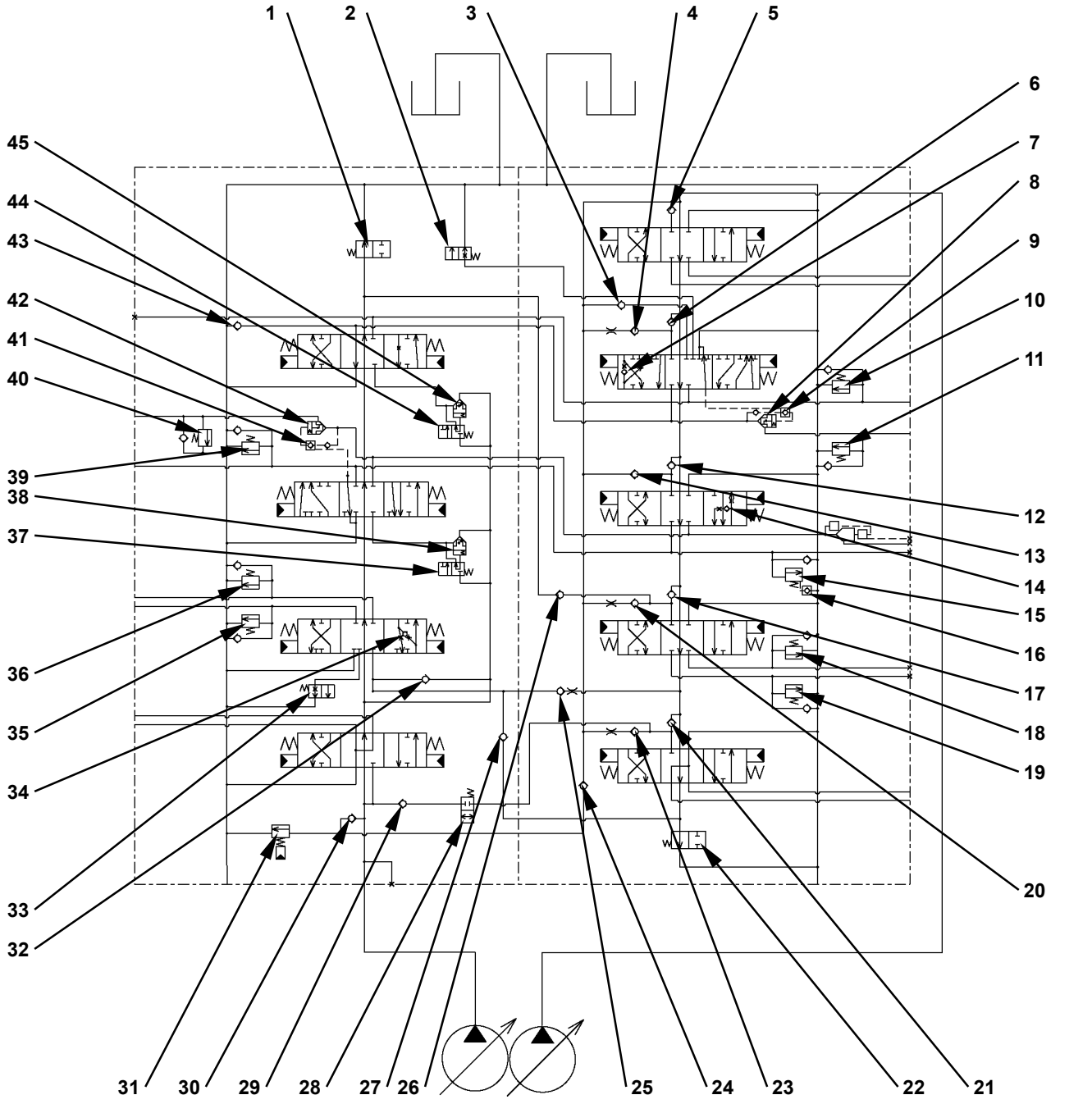
Cross Section G-G



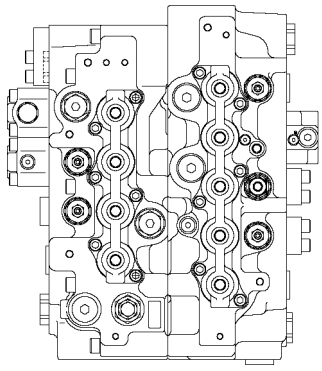
Cross Section H-H



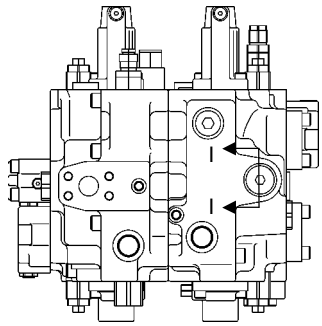
1 - Bypass Shut-Out Valve
2 - Arm Regenerative Valve (Switch Valve)
3 - Check Valve (Arm 1 Roll-Out Parallel Circuit)
4 - Load Check Valve (Arm 1 Roll-In Parallel Circuit)
5 - Load Check Valve (Swing Tandem Circuit)
6 - Load Check Valve (Arm 1 Tandem Circuit)
7 - Arm Regenerative Valve (Check Valve)
8 - Arm Anti-Drift Valve (Check Valve)
9 - Arm Anti-Drift Valve (Switch Valve)
10 - Overload Relief Valve (Arm Roll-Out)
11 - Overload Relief Valve (Arm Roll-In)
12 - Load Check Valve (Boom 2 Tandem Circuit)
13 - Load Check Valve (Boom 2 Parallel Circuit)
14 - Boom Regenerative Valve
15 - Overload Relief Valve (Boom Mode)
16 - Boom Overload Relief Control Valve}
17 - Load Check Valve (Auxiliary Tandem Circuit)
18 - Overload Relief Valve (Auxiliary)
19 - Overload Relief Valve (Auxiliary)
20 - Load Check Valve (Auxiliary Parallel Circuit)
21 - Load Check Valve (Left Travel Tandem Circuit)
22 - Bypass Shut-Out Valve
23 - Load Check Valve (Left Travel Parallel Circuit)
24 - Check Valve (Main Relief Pressure Flow Combining Circuit)
25 - Check Valve (Bucket Flow Combining Circuit)
26 - Check Valve (Auxiliary Flow Combining Circuit)
27 - Check Valve (Bucket Flow Combining Circuit)
28 - Flow Combiner Valve
29 - Check Valve (Flow Combiner Valve Circuit)
30 - Check Valve (Main Relief Pressure Flow Combining Circuit)
31 - Main Relief Valve
32 - Load Check Valve (Bucket Parallel Circuit)
33 - Bucket Regenerative Valve (Switch Valve)
34 - Bucket Regenerative Valve (Check Valve)
35 - Overload Relief Valve (Bucket Roll-Out)
36 - Overload Relief Valve (Bucket Roll-In)
37 - Boom Flow Rate Control Valve (Switch Valve)
38 - Boom Flow Control Valve (Poppet Valve)
39 - Overload Relief Valve (Boom Lower)
40 - Overload Relief Valve (Boom Raise)
41 - Boom Anti-Drift Valve (Switch Valve)
42 - Boom Anti-Drift Valve (Check Valve)
43 - Check Valve (Arm Make-Up Circuit)
44 - Arm Flow Rate Control Valve (Switch Valve)
45 - Arm Flow Rate Control Valve (Poppet Valve)



T450-03-03-025

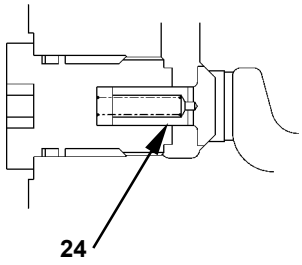


T450-03-03-001



T450-03-03-006

Cross Section I-I



T450-03-03-008

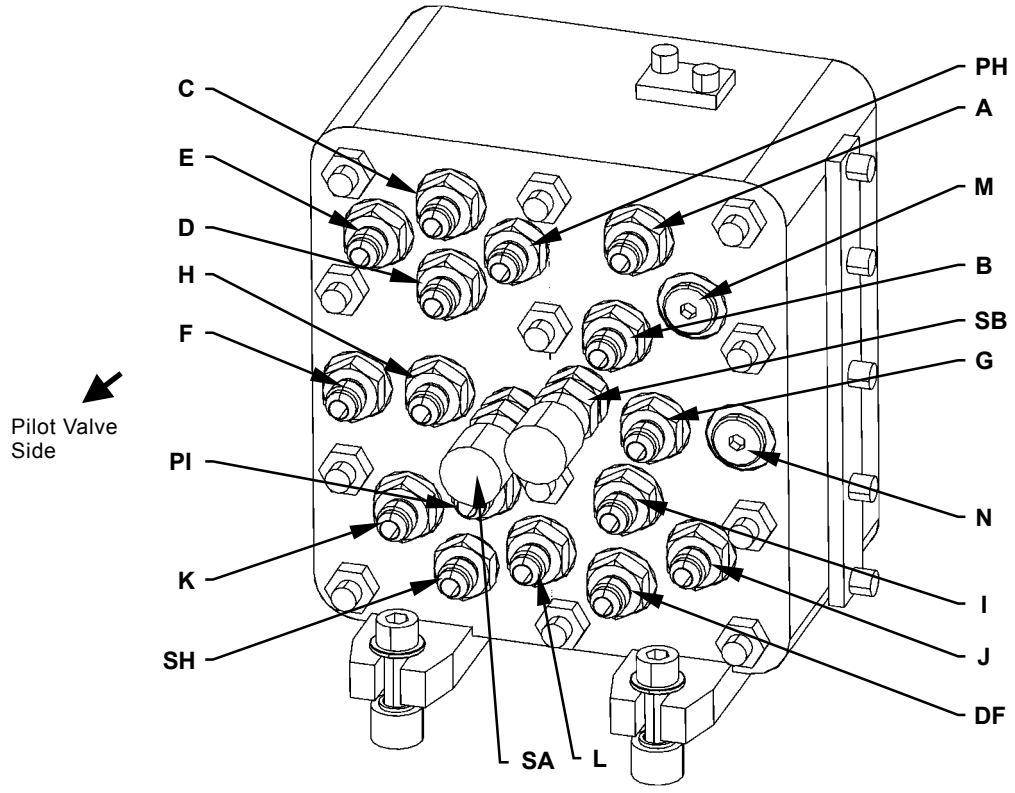
1 - Bypass Shut-Out Valve
2 - Arm Regenerative Valve (Switch Valve)
3 - Check Valve (Arm 1 Roll-Out Parallel Circuit)
4 - Load Check Valve (Arm 1 Roll-In Parallel Circuit)
5 - Load Check Valve (Swing Tandem Circuit)
6 - Load Check Valve (Arm 1 Tandem Circuit)
7 - Arm Regenerative Valve (Check Valve)
8 - Arm Anti-Drift Valve (Check Valve)
9 - Arm Anti-Drift Valve (Switch Valve)
10 - Overload Relief Valve (Arm Roll-Out)
11 - Overload Relief Valve (Arm Roll-In)
12 - Load Check Valve (Boom 2 Tandem Circuit)
13 - Load Check Valve (Boom 2 Parallel Circuit)
14 - Boom Regenerative Valve
15 - Overload Relief Valve (Boom Mode)
16 - Boom Overload Relief Control Valve}
17 - Load Check Valve (Auxiliary Tandem Circuit)
18 - Overload Relief Valve (Auxiliary)
19 - Overload Relief Valve (Auxiliary)
20 - Load Check Valve (Auxiliary Parallel Circuit)
21 - Load Check Valve (Left Travel Tandem Circuit)
22 - Bypass Shut-Out Valve
23 - Load Check Valve (Left Travel Parallel Circuit)
24 - Check Valve (Main Relief Pressure Flow Combining Circuit)
25 - Check Valve (Bucket Flow Combining Circuit)
26 - Check Valve (Auxiliary Flow Combining Circuit)
27 - Check Valve (Bucket Flow Combining Circuit)
28 - Flow Combiner Valve
29 - Check Valve (Flow Combiner Valve Circuit)
30 - Check Valve (Main Relief Pressure Flow Combining Circuit)
31 - Main Relief Valve
32 - Load Check Valve (Bucket Parallel Circuit)
33 - Bucket Regenerative Valve (Switch Valve)
34 - Bucket Regenerative Valve (Check Valve)
35 - Overload Relief Valve (Bucket Roll-Out)
36 - Overload Relief Valve (Bucket Roll-In)
37 - Boom Flow Rate Control Valve (Switch Valve)
38 - Boom Flow Control Valve (Poppet Valve)
39 - Overload Relief Valve (Boom Lower)
40 - Overload Relief Valve (Boom Raise)
41 - Boom Anti-Drift Valve (Switch Valve)
42 - Boom Anti-Drift Valve (Check Valve)
43 - Check Valve (Arm Make-Up Circuit)
44 - Arm Flow Rate Control Valve (Switch Valve)
45 - Arm Flow Rate Control Valve (Poppet Valve)

PILOT PORT

Pilot Valve Side

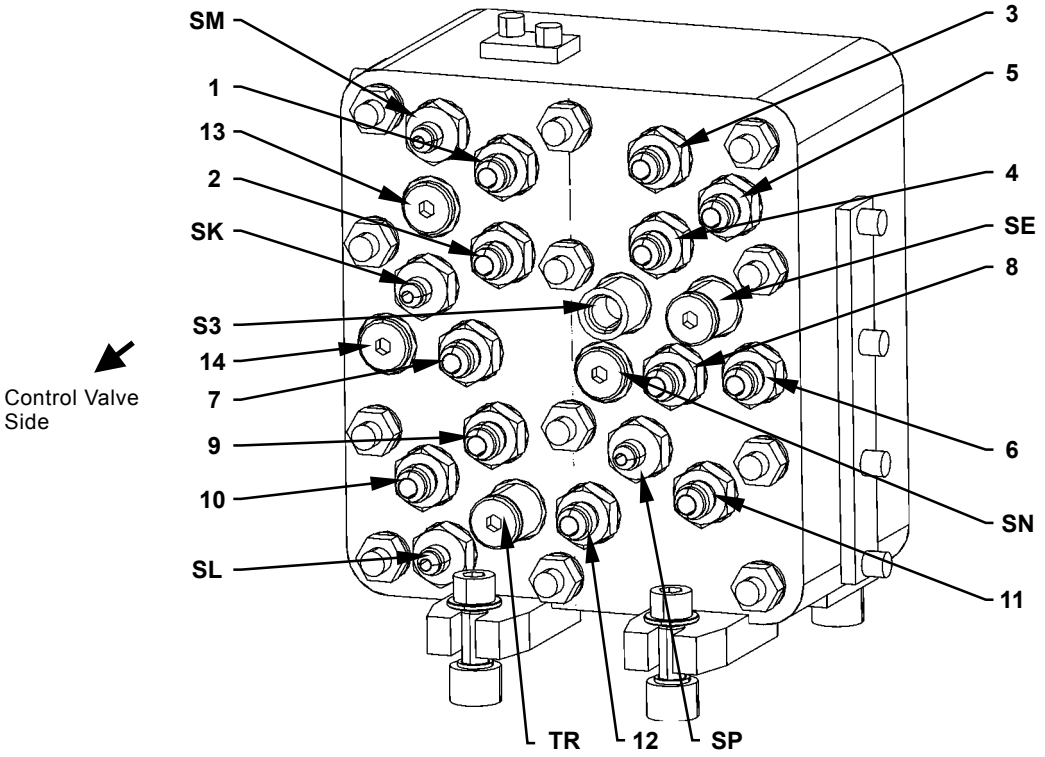
Port Name	Connecting to	Remark
Port A	Right Pilot Valve	Boom Raise Pilot Pressure
Port B	Right Pilot Valve	Boom Lower Pilot Pressure
Port C	Left Pilot Valve	Arm Roll-Out Pilot Pressure
Port D	Left Pilot Valve	Arm Roll-In Pilot Pressure
Port E	Left Pilot Valve	Left Swing Pilot Pressure
Port F	Left Pilot 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	-	Plug
Port SB	-	Plug
Port PI	Check Valve	Primary Pilot Pressure
Port PH	Pilot Shut-Off Solenoid Valve	Primary Pilot Pressure (Heat Circuit)
Port SH	Swing Parking Brake	Brake Release Pressure
Port DF	Hydraulic Oil Tank	Returning to Hydraulic Oil Tank

Pilot Valve Side



T1J1-03-06-002

Control Valve Side

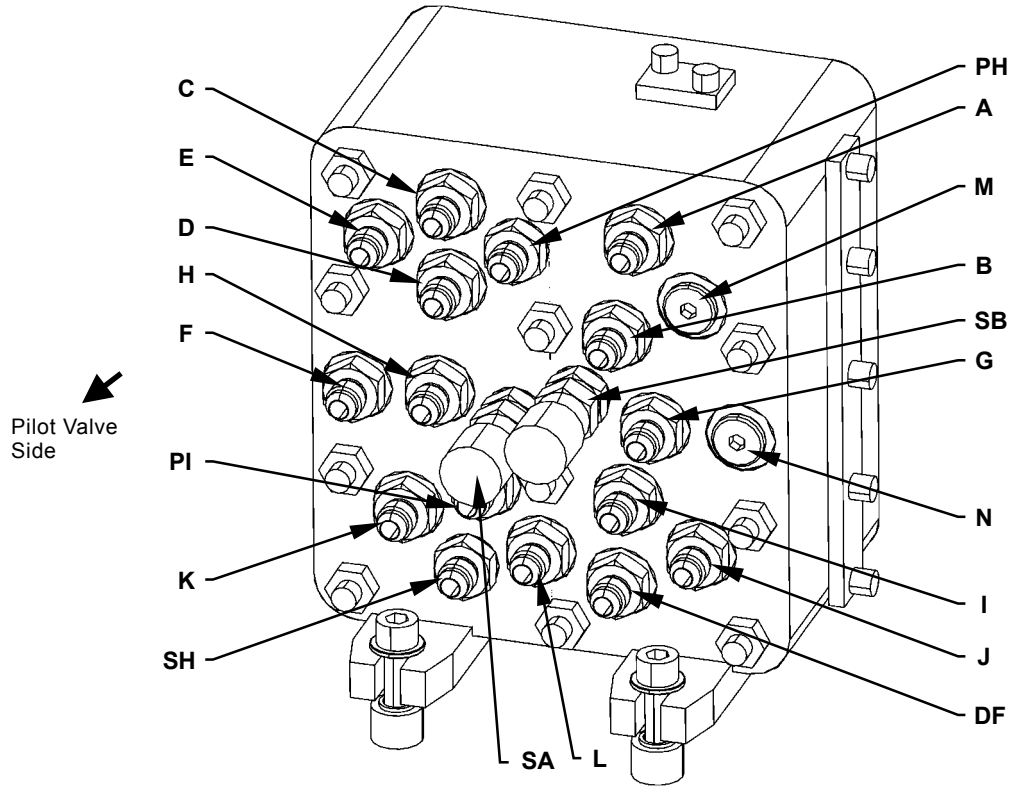


T1J1-03-06-003

Control Valve Side

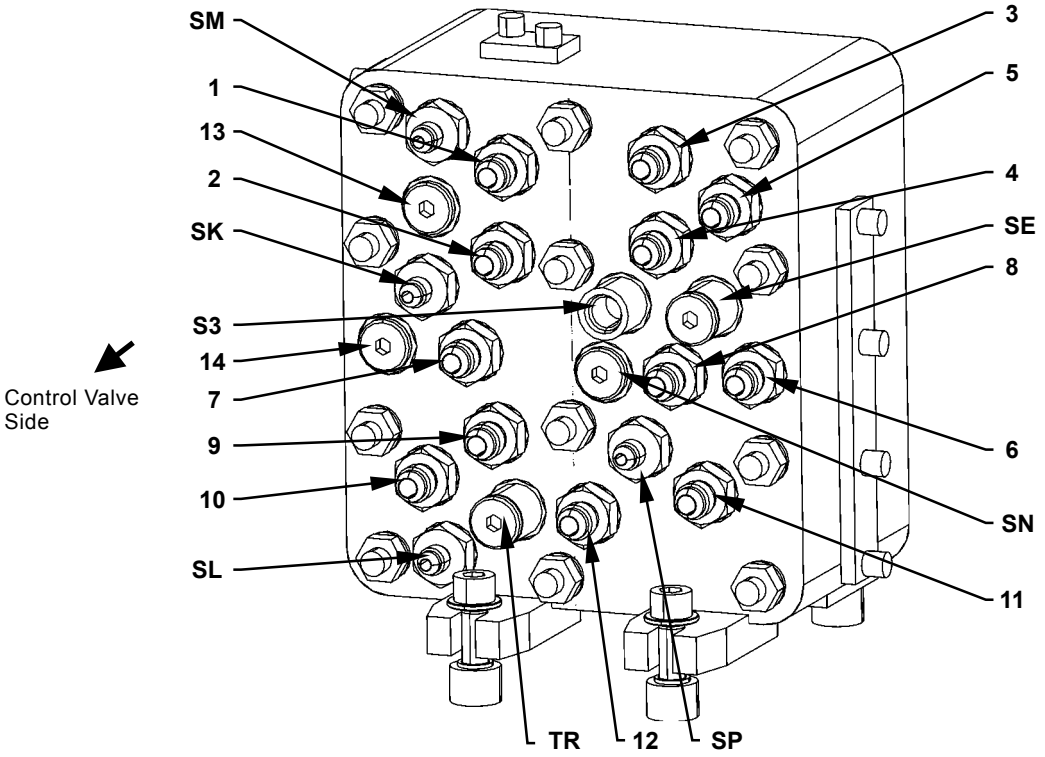
Port Name	Connecting to	Remark
Port 1	Control Valve	Boom Raise Pilot Pressure
Port 2	Control Valve	Boom Lower Pilot Pressure
Port 3	Control Valve	Arm Roll-Out Pilot Pressure
Port 4	Control Valve	Arm Roll-In Pilot Pressure
Port 5	Control Valve	Left Swing Pilot Pressure
Port 6	Control Valve	Right Swing 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 S3	-	Pressure Sensor (Swing)
Port SE	-	Plug
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	Arm Flow Rate Control Valve Control Pressure
Port TR	-	Plug

Pilot Valve Side



T1J1-03-06-002

Control Valve Side



T1J1-03-06-003

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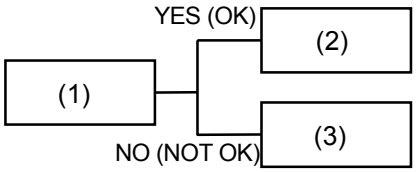
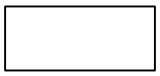
TROUBLESHOOTING A PROCEDURE

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

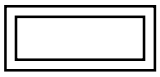


After completing the checking and/or measuring procedures in box (1), select YES (OK) or NO (NOT OK) and proceed to box (2) or (3).



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.

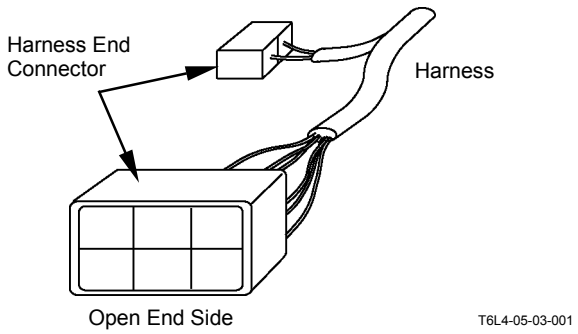
Refer to “Electrical System Inspection” group (group 8) for descriptions in the dotted-line box.



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.



MC FAULT CODE LIST

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 Converter	Faulty MC	• All Control
11003-3	Abnormal Sensor Voltage	Faulty MC	• All Control
11004-2	CAN Communication Error	Faulty MC Shorted Circuit in CAN Bus Line	• Engine Control • Work Mode Control • Attachment Mode Control • Horsepower (Speed Sensing) Control • Fan Pump Flow Rate Control • CAN Cycle Data Communication • Overheat Prevention Control
11101-3	EC Dial sensor Circuit High Input	Voltage: 4.75 V or higher	• Engine Control Dial Control
11101-4	EC Dial sensor Circuit Low Input	Voltage: Less than 0.25 V	• Engine Control Dial Control
11200-3	Pump 1 Delivery Pressure Sensor Circuit High Input	Voltage: 4.75 V or higher	• HP Mode Control • Horsepower Control • Relief Flow Rate Reducing Control (Relief Cut Off) • Auto-Power Lift Control
11200-4	Pump 1 Delivery Pressure Sensor Circuit Low Input	Voltage: Less than 0.25 V	• HP Mode Control • Horsepower Control • Relief Flow Rate Reducing Control (Relief Cut Off) • Auto-Power Lift Control
11202-3	Pump 2 Delivery Pressure Sensor Circuit High Input	Voltage: 4.75 V or higher	• HP Mode Control • Horsepower Control • Relief Flow Rate Reducing Control (Relief Cut Off)
11202-4	Pump 2 Delivery Pressure Sensor Circuit Low Input	Voltage: Less than 0.25 V	• HP Mode Control • Horsepower Control • Relief Flow Rate Reducing Control (Relief Cut Off)

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remedy	Reference Page
-	Retry Diagnostic Procedure B	• Replace MC	T5-6-37
-	Retry Diagnostic Procedure B	• Replace MC	T5-6-37
-	Retry Diagnostic Procedure B	• Replace MC	T5-6-37
• Engine speed is kept at backup speed (1200 min^{-1}).	Retry Diagnostic Procedure B	• Replace MC • Check Harness (Sensor Power) • Check Sensor to connected to MC	T5-6-38
• No Speed sensing • All abnormal signals via CAN communication • Engine speed is kept at slow idle speed.	Retry Diagnostic Procedure B	• Replace MC • Check CAN Harness	T5-6-39
• Target engine speed is kept at 1200 min^{-1}.	Retry Diagnostic Procedure B	• Check Harness • Replace Engine Control Dial	T5-6-60
• Target engine speed is kept at 1200 min^{-1}.	Retry Diagnostic Procedure B	• Check Harness • Replace Engine Control Dial	T5-6-60
• Increasing speed at HP mode is difficult. • Less flow rate at 19.6 MPa • Relief cut is not operated. • Auto-power lift does not function.	Retry Diagnostic Procedure B	• Check Harness • Replace Pump 1 Delivery Pressure Sensor	T5-6-61
• Increasing speed at HP mode is difficult. • Less flow rate at 19.6 MPa • Relief cut is not operated. • Auto-power lift does not function.	Retry Diagnostic Procedure B	• Check Harness • Replace Pump 1 Delivery Pressure Sensor	T5-6-61
• Increasing speed at HP mode is difficult. • Less flow rate at 19.6 MPa	Retry Diagnostic Procedure B	• Check Harness • Replace Pump 2 Delivery Pressure Sensor	T5-6-62
• Increasing speed at HP mode is difficult. • Less flow rate at 19.6 MPa	Retry Diagnostic Procedure B	• Check Harness • Replace Pump 2 Delivery Pressure Sensor	T5-6-62

Fault Code	Trouble	Cause	Influenced Control
11301-3	Swing Pilot Pressure Sensor Circuit High Input	Voltage: 4.75 V or higher	• Engine Control • Relief Flow Rate Reducing Control (Relief Cut Off) • Swing Horsepower Reducing Control • Boom Mode Selector Control
11301-4	Swing Pilot Pressure Sensor Circuit Low Input	Voltage: Less than 0.25 V	• Engine Control • Relief Flow Rate Reducing Control (Relief Cut Off) • Swing Horsepower Reducing Control • Boom Mode Selector Control
11302-3	Boom Raise Pilot Pressure Sensor Circuit High Input	Voltage: 4.75 V or higher	• Engine Control • HP Mode Control • Auto-Power Lift Control • Boom Mode Selector Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remedy	Reference Page
• Cut off override is not impossible. • A/I cannot be released by swing operation. • Flow rate of lever regulated pump control becomes maximum by swing operation. • Reducing operation of swing torque is impossible. • Boom mode selector control is impossible by swing operation. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Swing Pilot Pressure Sensor	T5-6-63
• Cut off override is not impossible. • A/I cannot be released by swing operation. • Flow rate of lever regulated pump control becomes maximum by swing operation. • Reducing operation of swing torque is impossible. • Boom mode selector control is impossible by swing operation. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Swing Pilot Pressure Sensor	T5-6-63
• Speed at HP mode does not increase by boom raise operation. • A/I cannot be released by boom raise operation. • Flow rate of lever regulated pump control becomes maximum by boom raise operation. • Boom mode selector control is impossible by boom raise operation. • Auto-power lift does not function by boom raise operation. • Boom flow rate control valve control is not operated. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Boom Raise Pilot Pressure Sensor	T5-6-64

Fault Code	Trouble	Cause	Influenced Control
11302-4	Boom Raise Pilot Pressure Sensor Circuit Low Input	Voltage: Less than 0.25 V	• Engine Control • HP Mode Control • Auto-Power Lift Control • Boom Mode Selector Control
11303-3	Arm Roll-in Pilot Pressure Sensor Circuit High Input	Voltage: 4.75 V or higher	• Engine Control • HP Mode Control • Boom Mode Selector Control • Boom Flow Rate Control Valve Control • Auto-Power Lift Control
11303-4	Arm Roll-in Pilot Pressure Sensor Circuit Low Input	Voltage: Less than 0.25 V	• Engine Control • HP Mode Control • Boom Mode Selector Control • Boom Flow Rate Control Valve Control • Auto-Power Lift Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remedy	Reference Page
• Speed at HP mode does not increase by boom raise operation. • A/I cannot be released by boom raise operation. • Flow rate of lever regulated pump control becomes maximum by boom raise operation. • Boom mode selector control is impossible by boom raise operation. • Auto-power lift does not function by boom raise operation. • Boom flow rate control valve control is not operated. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Boom Raise Pilot Pressure Sensor	T5-6-64
• Speed at HP mode does not increase by arm roll-in operation. • A/I cannot be released by arm roll-in operation. • Flow rate of lever regulated pump control becomes maximum by arm roll-in operation. • Boom mode selector control is impossible by arm roll-in operation. • Auto-power lift does not function by arm roll-in operation. • Boom flow rate control valve control is not operated. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Arm Roll-In Pilot Pressure Sensor	T5-6-65
• Speed at HP mode does not increase by arm roll-in operation. • A/I cannot be released by arm roll-in operation. • Flow rate of lever regulated pump control becomes maximum by arm roll-in operation. • Boom mode selector control is impossible by arm roll-in operation. • Auto-power lift does not function by arm roll-in operation. • Boom flow rate control valve control is not operated. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Arm Roll-In Pilot Pressure Sensor	T5-6-65

Fault Code	Trouble	Cause	Influenced Control
11400-3	Pump 2 Regulator Valve FB High Current	Current: Higher than 920 mA	• All Pump Controls
11400-4	Pump 2 Regulator Valve FB Low Current	Current: Less than 56 mA	• All Pump Controls
11402-3	Boom Flow Control Valve FB High Current	Current: Higher than 920 mA	• All Pump Controls
11402-4	Boom Flow Control Valve FB Low Current	Current: Less than 56 mA	• All Pump Controls
11404-3	Power Boost P/S Valve FB High Current	Current: Higher than 920 mA	• Counterweight Removal and Installation Control • Pressure Increase Selection Control When Traveling • Power Digging Control • Auto-Power Lift Control
11404-4	Power Boost P/S Valve FB Low Current	Current: Less than 56 mA	• Counterweight Removal and Installation Control • Pressure Increase Selection Control When Traveling • Power Digging Control • Auto-Power Lift Control
11405-3	Travel Swash Angle P/S Valve FB High Current	Current: Higher than 920 mA	• Travel Motor Swash Angle Selection Control
11405-4	Travel Swash Angle P/S Valve FB Low Current	Current: Less than 56 mA	• Travel Motor Swash Angle Selection Control
11410-3	Pump 1 Regulator Valve FB High Current	Current: Higher than 920 mA	• All Pump Controls
11410-4	Pump 1 Regulator Valve FB Low Current	Current: Less than 56 mA	• All Pump Controls
11412-3	Hyd. Fan P/S Valve FB High Current	Current: Higher than 920 mA	• Fan Pump Flow Rate Control
11412-4	Hyd. Fan P/S Valve FB Low Current	Current: Less than 56 mA	• Fan Pump Flow Rate Control
11802-3	Boom Bottom Pressure Sensor Circuit High Input	Voltage: 4.5 V or higher	• Overload Alarm Control
11802-4	Boom Bottom Pressure Sensor Circuit Low Input	Voltage: Less than 0.25 V	• Overload Alarm Control
11901-3	Hyd. Oil Temp Sensor Circuit High Input	Intake air temperature: 21 °C or higher (higher than 20 °C) Voltage: 4.10 V or higher This condition is continued beyond 30 seconds.	• Engine Control • Overheat Prevention Control • Fan Pump Flow Rate Control
11901-4	Hyd. Oil Temp Sensor Circuit Low Input	Voltage: Less than 0.23 V This condition is continued beyond 30 seconds.	• Engine Control • Overheat Prevention Control • Fan Pump Flow Rate Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remedy	Reference Page
• Pump 2 control is impossible.	Retry Diagnostic Procedure B	• Check Harness	T5-6-66
• Pump 2 control is impossible.	Retry Diagnostic Procedure B	• Check Harness	T5-6-66
• Boom flow rate control valve control is not operated.	Retry Diagnostic Procedure B	• Check Harness	T5-6-67
• Boom flow rate control valve control is not operated.	Retry Diagnostic Procedure B	• Check Harness	T5-6-67
• Increasing pressure selection is impossible.	Retry Diagnostic Procedure B	• Check Harness	T5-6-68
• Increasing pressure selection is impossible.	Retry Diagnostic Procedure B	• Check Harness	T5-6-68
• Travel mode selection is impossible.	Retry Diagnostic Procedure B	• Check Harness	T5-6-69
• Travel mode selection is impossible.	Retry Diagnostic Procedure B	• Check Harness	T5-6-69
• Pump 1 control is impossible.	Retry Diagnostic Procedure B	• Check Harness	T5-6-70
• Pump 1 control is impossible.	Retry Diagnostic Procedure B	• Check Harness	T5-6-70
• Fan control is impossible.	Retry Diagnostic Procedure B	• Check Harness	T5-6-71
• Fan control is impossible.	Retry Diagnostic Procedure B	• Check Harness	T5-6-71
-	Retry Diagnostic Procedure B	• Check Harness • Replace Boom Bottom Pressure Sensor	T5-6-72
-	Retry Diagnostic Procedure B	• Check Harness • Replace Boom Bottom Pressure Sensor	T5-6-72
• Overheat prevention control of hydraulic oil is impossible. • Maximum fan speed • Drive torque of pump is reduced.	Retry Diagnostic Procedure B	• Check Harness • Replace Hydraulic Oil Temperature Sensor	T5-6-73
• Overheat prevention control of hydraulic oil is impossible. • Maximum fan speed • Drive torque of pump is reduced.	Retry Diagnostic Procedure B	• Check Harness • Replace Hydraulic Oil Temperature Sensor	T5-6-73

Fault Code	Trouble	Cause	Influenced Control
11910-2	Actual Engine Speed Receive Error	Faulty Harness	-
11911-2	Security Signal receive Error	Faulty Harness	-
11914-2	Radiator Water Temp Receive Error	Faulty Harness	・Overheat Prevention Control ・Fan Pump Flow Rate Control
11918-2	Work Mode Receive Error	Faulty Harness	・Work Mode Control ・Attachment Mode Control
11920-2	Fuel Flaw Receive Error	Faulty Harness	-
11976-3	Auxiliary Valve 2 FB High Current	Current: Higher than 920 mA	-
11976-4	Auxiliary Valve 2 FB Low Current	Current: Less than 56 mA	-
11977-3	Auxiliary Valve 1 FB High Current	Current: Higher than 920 mA	-
11977-4	Auxiliary Valve 1 FB Low Current	Current: Less than 56 mA	-
11980-3	ATT Relief Change Valve FB High Current	Current: Higher than 920 mA	-
11980-4	ATT Relief Change Valve FB Low Current	Current: Less than 56 mA	-
11981-3	Fan Reverse Valve 2 FB High Current	Current: Higher than 920 mA	-
11981-4	Fan Reverse Valve 2 FB Low Current	Current: Less than 56 mA	-
11982-3	Fan Reverse Valve 1 FB High Current	Current: Higher than 920 mA	-
11982-4	Fan Reverse Valve 1 FB Low Current	Current: Less than 56 mA	-
11983-2	Intake Air Temperature Receive Error	Faulty Harness	・Fan Pump Flow Rate Control
11984-2	Boost Temperature Receive Error	Faulty Harness	・Fan Pump Flow Rate Control
11989-3	Boom Mode Control Valve FB High Current	Current: Higher than 920 mA	・Boom Mode Selector Control
11989-4	Boom Mode Control Valve FB Low Current	Current: Less than 56 mA	・Boom Mode Selector Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remedy	Reference Page
• Stop speed sensing. • Pump learning is impossible.	Retry Diagnostic Procedure B	• Check Harness	T5-6-75
• When engine control security and pump control security are turned ON, security is activated.	Retry Diagnostic Procedure B	• Check Harness	T5-6-75
• Maximum fan speed • Drive torque of pump is reduced.	Retry Diagnostic Procedure B	• Check Harness	T5-6-75
• The value received last time is effective.	Retry Diagnostic Procedure B	• Check Harness	T5-6-75
• The value received last time is effective.	Retry Diagnostic Procedure B	• Check Harness	T5-6-75
-	Retry Diagnostic Procedure B	• Check Harness	-
-	Retry Diagnostic Procedure B	• Check Harness	-
-	Retry Diagnostic Procedure B	• Check Harness	-
-	Retry Diagnostic Procedure B	• Check Harness	-
• Attachment relief selection is impossible.	Retry Diagnostic Procedure B	• Check Harness	-
• Attachment relief selection is impossible.	Retry Diagnostic Procedure B	• Check Harness	-
• Fan reverse is impossible.	Retry Diagnostic Procedure B	• Check Harness	-
• Fan reverse is impossible.	Retry Diagnostic Procedure B	• Check Harness	-
• Fan reverse is impossible.	Retry Diagnostic Procedure B	• Check Harness	-
• Fan reverse is impossible.	Retry Diagnostic Procedure B	• Check Harness	-
• Maximum fan speed (with blower motor relay ON)	Retry Diagnostic Procedure B	• Check Harness	T5-6-75
• Maximum fan speed	Retry Diagnostic Procedure B	• Check Harness	T5-6-75
• Boom mode selector control is impossible.	Retry Diagnostic Procedure B	• Check Harness	T5-6-79
• Boom mode selector control is impossible.	Retry Diagnostic Procedure B	• Check Harness	T5-6-79

Fault Code	Trouble	Cause	Influenced Control
11991-3	Right Travel Pilot Pressure Sensor Circuit High Input	Voltage: 4.75 V or higher	• Travel Speed Increase Control • Relief Flow Rate Reducing Control (Relief Cut Off) • Swing Horsepower Reducing Control • Pressure Increase Selection Control When Traveling • Rear Monitoring Display Selection Control • Travel Alarm Control • Engine Control
11991-4	Right Travel Pilot Pressure Sensor Circuit Low Input	Voltage: Less than 0.25 V	• Travel Speed Increase Control • Relief Flow Rate Reducing Control (Relief Cut Off) • Swing Horsepower Reducing Control • Pressure Increase Selection Control When Traveling • Rear Monitoring Display Selection Control • Travel Alarm Control • Engine Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remedy	Reference Page
• Increasing travel speed is impossible by right travel operation. • A/I cannot be released by right travel operation. • Cut off override is impossible by right travel operation. • Boom mode selector control is impossible by right travel operation. • Pressure increase when traveling is impossible by right travel operation. • Rear monitoring display selection is impossible by right travel operation. • Travel alarm outputs. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Right Travel Pilot Pressure Sensor	T5-6-80
• Increasing travel speed is impossible by right travel operation. • A/I cannot be released by right travel operation. • Cut off override is impossible by right travel operation. • Boom mode selector control is impossible by right travel operation. • Pressure increase when traveling is impossible by right travel operation. • Rear monitoring display selection is impossible by right travel operation. • Travel alarm outputs. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Right Travel Pilot Pressure Sensor	T5-6-80

Fault Code	Trouble	Cause	Influenced Control
11992-3	Pump 2 Regulator Pressure Sensor Circuit High Input	Voltage: 4.75 V or higher	• Pump 2 Flow Rate Control • Pump 2 Regulator Pressure Learning
11992-4	Pump 2 Regulator Pressure Sensor Circuit Low Input	Voltage: Less than 0.25 V	• Pump 2 Flow Rate Control • Pump 2 Regulator Pressure Learning
11993-3	Left Travel Pilot Pressure Sensor Circuit High Input	Voltage: 4.75 V or higher	• Travel Speed Increase Control • Relief Flow Rate Reducing Control (Relief Cut Off) • Swing Horsepower Reducing Control • Pressure Increase Selection Control When Traveling • Rear Monitoring Display Selection Control • Travel Alarm Control • Engine Control
11993-4	Left Travel Pilot Pressure Sensor Circuit Low Input	Voltage: Less than 0.25 V	• Travel Speed Increase Control • Relief Flow Rate Reducing Control (Relief Cut Off) • Swing Horsepower Reducing Control • Pressure Increase Selection Control When Traveling • Rear Monitoring Display Selection Control • Travel Alarm Control • Engine Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remedy	Reference Page
• No secondary pressure feedback of pump 2 proportional solenoid valve (bad response) • Pump learning is impossible.	Retry Diagnostic Procedure B	• Check Harness • Replace Pump 2 Regulator Pressure Sensor	T5-6-81
• No secondary pressure feedback of pump 2 proportional solenoid valve (bad response) • Pump learning is impossible.	Retry Diagnostic Procedure B	• Check Harness • Replace Pump 2 Regulator Pressure Sensor	T5-6-81
• Increasing travel speed is impossible by left travel operation. • A/I cannot be released by left travel operation. • Cut off override is impossible by left travel operation. • Boom mode selector control is impossible by left travel operation. • Pressure increase when traveling is impossible by left travel operation. • Rear monitoring display selection is impossible by left travel operation. • Travel alarm outputs. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness	T5-6-82
• Increasing travel speed is impossible by left travel operation. • A/I cannot be released by left travel operation. • Cut off override is impossible by left travel operation. • Boom mode selector control is impossible by left travel operation. • Pressure increase when traveling is impossible by left travel operation. • Rear monitoring display selection is impossible by left travel operation. • Travel alarm outputs. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness	T5-6-82

Fault Code	Trouble	Cause	Influenced Control
11994-3	Pump 1 Regulator Pressure Sensor Circuit High Input	Voltage: 4.75 V or higher	• Pump 1 Flow Rate Control • Pump 1 Regulator Pressure Learning
11994-4	Pump 1 Regulator Pressure Sensor Circuit Low Input	Voltage: Less than 0.25 V	• Pump 1 Flow Rate Control • Pump 1 Regulator Pressure Learning
11995-3	Arm Roll-Out Pilot Pressure Sensor Circuit High Input	Voltage: 4.75 V or higher	• Boom Mode Selector Control • Boom Flow Rate Control Valve Control • Engine Control
11995-4	Arm Roll-Out Pilot Pressure Sensor Circuit Low Input	Voltage: Less than 0.25 V	• Boom Mode Selector Control • Boom Flow Rate Control Valve Control • Engine Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remedy	Reference Page
• No secondary pressure feedback of pump 1 proportional solenoid valve (bad response) • Pump learning is impossible.	Retry Diagnostic Procedure B	• Check Harness • Replace Pump 1 Regulator Pressure Sensor	T5-6-83
• No secondary pressure feedback of pump 1 proportional solenoid valve (bad response) • Pump learning is impossible.	Retry Diagnostic Procedure B	• Check Harness • Replace Pump 1 Regulator Pressure Sensor	T5-6-83
• A/I cannot be released by arm roll-out operation. • Flow rate of lever regulated pump control becomes maximum by arm roll-out operation. • Boom mode selector control is impossible by arm roll-out operation. • Boom flow rate control valve control is not operated. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Arm Roll-Out Pilot Pressure Sensor	T5-6-84
• A/I cannot be released by arm roll-out operation. • Flow rate of lever regulated pump control becomes maximum by arm roll-out operation. • Boom mode selector control is impossible by arm roll-out operation. • Boom flow rate control valve control is not operated. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Arm Roll-Out Pilot Pressure Sensor	T5-6-84

Fault Code	Trouble	Cause	Influenced Control
11997-3	Bucket Roll-Out Pilot Pressure Sensor Circuit High Input	Voltage: 4.75 V or higher	• Boom Mode Selector Control • Boom Flow Rate Control Valve Control • Engine Control
11997-4	Bucket Roll-Out Pilot Pressure Sensor Circuit Low Input	Voltage: Less than 0.25 V	• Boom Mode Selector Control • Boom Flow Rate Control Valve Control • Engine Control
11998-3	Boom Lowering Pilot Pressure Sensor Circuit High Input	Voltage: 4.75 V or higher	• Boom Mode Selector Control • Boom Flow Rate Control Valve Control • Engine Control
11998-4	Boom Lowering Pilot Pressure Sensor Circuit Low Input	Voltage: Less than 0.25 V	• Boom Mode Selector Control • Boom Flow Rate Control Valve Control • Engine Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remedy	Reference Page
• A/I cannot be released by bucket roll-out operation. • Flow rate of lever regulated pump control becomes maximum by bucket roll-out operation. • Boom mode selector control is impossible by bucket roll-out operation. • Boom flow rate control valve control is not operated. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Bucket Roll-Out Pilot Pressure Sensor	T5-6-85
• A/I cannot be released by bucket roll-out operation. • Flow rate of lever regulated pump control becomes maximum by bucket roll-out operation. • Boom mode selector control is impossible by bucket roll-out operation. • Boom flow rate control valve control is not operated. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Bucket Roll-Out Pilot Pressure Sensor	T5-6-85
• Speed at HP mode does not increase by boom lower operation. • A/I cannot be released by boom lower operation. • Boom mode selector control is impossible by boom lower operation. • Boom flow rate control valve control is not operated. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Boom Lower Pilot Pressure Sensor	T5-6-86
• Speed at HP mode does not increase by boom lower operation. • A/I cannot be released by boom lower operation. • Boom mode selector control is impossible by boom lower operation. • Boom flow rate control valve control is not operated. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Boom Lower Pilot Pressure Sensor	T5-6-86

Fault Code	Trouble	Cause	Influenced Control
11999-3	Bucket Roll-In Pilot Pressure Sensor Circuit High Input	Voltage: 4.75 V or higher	• Boom Mode Selector Control • Boom Flow Rate Control Valve Control • Engine Control
11999-4	Bucket Roll-In Pilot Pressure Sensor Circuit Low Input	Voltage: Less than 0.25 V	• Boom Mode Selector Control • Boom Flow Rate Control Valve Control • Engine Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remedy	Reference Page
• A/I cannot be released by bucket roll-in operation. • Flow rate of lever regulated pump control becomes maximum by bucket roll-in operation. • Boom mode selector control is impossible by bucket roll-in operation. • Boom flow rate control valve control is not operated. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Bucket Roll-In Pilot Pressure Sensor	T5-6-87
• A/I cannot be released by bucket roll-in operation. • Flow rate of lever regulated pump control becomes maximum by bucket roll-in operation. • Boom mode selector control is impossible by bucket roll-in operation. • Boom flow rate control valve control is not operated. • Engine speed is lower than speed at E mode.	Retry Diagnostic Procedure B	• Check Harness • Replace Bucket Roll-In Pilot Pressure Sensor	T5-6-87

ECM FAULT CODE LIST

Fault Code	Trouble	Cause
91-2	Accelerator Sensor 1-2 Comparison Fault	• Difference in opening angle between accelerator sensors 1-2 is 45 % or more.
100-3	Engine Oil Pressure Sensor Fault (Low Voltage Fault)	Voltage: Less than 0.1 V
100-4	Engine Oil Pressure Sensor Fault (High Voltage Fault)	Voltage: More than 4.85 V
102-3	Boost Pressure Sensor Fault (Low Voltage Fault)	Voltage: Less than 0.1 V
102-4	Boost Pressure Sensor Fault (High Voltage Fault)	Voltage: More than 4.9 V
105-3	Boost Temperature Sensor Fault (High Voltage Fault)	Voltage: More than 4.94 V
105-4	Boost Temperature Sensor Fault (Low Voltage Fault)	Voltage: Less than 0.1 V
108-3	Barometric Pressure Sensor Fault (Low Voltage Fault)	Voltage: Less than 0.5 V
108-4	Barometric Pressure Sensor Fault (High Voltage Fault)	Voltage: More than 3.8 V

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Back-up	Fault Code (Tech 2)	Reference Page on Engine Trouble-shooting Manual
• 1 system fault: No back-up • 2 system fault: Accelerator opening angle is controlled to 0 %.	• 1 system fault: No back-up • 2 system fault: Accelerator opening angle is controlled to 0 %.	P1271	1E-474
• Operationality is not affected.	• No back-up	P0522	1E-365
• Operationality is not affected.	• No back-up	P0523	1E-371
• Operationality is affected	• Boost pressure default setting (200 kPa) • Boost pressure correction/ EGR stopped	P0237	1E-305
• Black smoke emission	• Boost pressure default setting (200 kPa) • Boost pressure correction/ EGR stopped	P0238	1E-312
• Operationality is affected.	• No back-up	P1113	1E-437
• Operationality is affected.	• No back-up	P1112	1E-429
• Black smoke emitted at high altitude • Output shortage at low altitude	• Barometric pressure default setting 80 kPa (equivalent to altitude 2500 m)	P0107	1E-204
• Black smoke emitted at high altitude • Output shortage at low altitude	• Barometric pressure default setting 80 kPa (equivalent to altitude 2500 m)	P0108	1E-211

Fault Code	Trouble	Cause
110-3	Engine Coolant Temperature Sensor Fault (High Voltage Fault)	Voltage: More than 4.85 V
110-4	Engine Coolant Temperature Sensor Fault (Low Voltage Fault)	Voltage: Less than 0.1 V
157-0	Common Rail Pressure Fault (First Stage)	Rail pressure: More than 150 MPa
157-0	Common Rail Pressure Fault (Second Stage)	Common rail pressure fault (first stage) + rail pressure: More than 155 MPa or higher
157-2	Common Rail Pressure Fault (Excessive Pressure Feed in Pump)	Actual rail pressure higher than target rail pressure for 10 MPa or more holds 8 seconds or more. Or actual rail pressure higher than target rail pressure for 10 MPa or more holds 8 seconds or more, during indication of no pressure feed.
157-3	Common Rail Pressure Sensor Fault (High Voltage Fault)	Voltage: More than 4.5 V
157-3	Common Rail Pressure Sensor Fault (Low Voltage Fault)	Voltage: Less than 0.7 V.

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Back-up	Fault Code (Tech 2)	Reference Page on Engine Trouble-shooting Manual
• At normal temperature: Black smoke emission at starting, greater engine combustion noise are possible. • During idling at atmospheric temperature: Rough idling, engine stall, white smoke emission	• Coolant temperature default setting. (at starting: -20 °C, at running: 80 °C)	P0118	1E-238
• Start ability deteriorates at low temperature • Black smoke emission is possible • Output lowering depending on conditions	• Coolant temperature default setting. (at starting: -20 °C, at running: 80 °C)	P0117	1E-232
• Intense engine vibration • Rough idling • Output lowering • Blow up fault • Black smoke emission • Excessive output	• Limited injection amount 3 (Multi-injection stopped) • Target rail pressure: Upper limit (80 MPa)	P0088	1E-183
• Intense engine vibration • Rough idling • Output lowering • Blow up fault • Black smoke emission • Excessive output	• Limited injection amount 3 (Multi-injection stopped) • Target rail pressure: Upper limit (80 MPa)	P0088	1E-183
• Intense engine vibration • Rough idling • Output lowering • Blow up fault • Black smoke emission • Excessive output	• Limited injection amount 3 (Multi-injection stopped) • Target rail pressure: Upper limit (80 MPa)	P0089	1E-188
• Output lowering • Black smoke emission • Engine stall is possible.	• Actual rail pressure default setting (80 MPa) • Rail pressure feedback control stopped • Limited injection amount 2 (Multi-injection stopped)	P0193	1E-266
• Engine blow up	• Actual rail pressure default setting (80 MPa) • Rail pressure feedback control stopped • Limited injection amount 2 (Multi-injection stopped)	P0192	1E-260

Fault Code	Trouble	Cause
172-3	Intake Air Temperature Sensor Fault (High Voltage Fault)	Voltage: More than 4.95 V
172-4	Intake Air Temperature Sensor Fault (Low Voltage Fault)	Voltage: Less than 0.1 V.
174-3	Fuel Temperature Sensor Fault (High Voltage Fault)	Voltage: More than 4.85 V
174-4	Fuel Temperature Sensor Fault (Low Voltage Fault)	Voltage: Less than 0.1 V.
190-0	Overrun	Engine Speed: More than 1970 min^{-1}
628-2	ROM Fault	ROM is faulty. Re-flash failure
633-7	Pressure Limiter Open	Pressure limiter is opened.
636-2	G Sensor Fault (No Signal)	The crank signal exists but no G sensor signal.
636-2	G Sensor Fault (Signal Fault)	Number of pulse for G sensor signal is mismatched.
636-7	Cam Sensor out of Phase	Correct G sensor pulse does not exist in crank gap position.

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Back-up	Fault Code (Tech 2)	Reference Page on Engine Trouble-shooting Manual
• White smoke emission is possible when starting at low temperature.	• Intake air temperature default setting (at starting: -10 °C, at running: 25 °C)	P0113	1E-224
• White smoke emission is possible when starting at low temperature.	• Intake air temperature default setting (at starting: -10 °C, at running: 25 °C)	P0112	1E-218
• Not in particular	• Fuel temperature default setting (at starting: -20 °C, at running: 70 °C)	P0183	1E-252
• Operationality is affected.	• Fuel temperature default setting (at starting: -20 °C, at running: 70 °C)	P0182	1E-246
• Output lowering	• Limited injection amount 1 (Limitation is lifted if the speed decreases.)	P0219	1E-303
• Engine stopped	• Engine stopped	P0601	1E-379
• Output lowering • Hunting	• Limited injection amount 1	P1095	1E-420
• Symptom does not change during engine running. • After engine stalls, engine will not start.	• Engine running based on crank when crank is normal • After engine stops: Unable to identify cylinder (unable to restart)	P0340	1E-331
• Symptom does not change during engine running. • After engine stalls, engine will not start.	• Engine running based on crank when crank is normal • After engine stops: Unable to identify cylinder (unable to restart)	P0341	1E-337
• Symptom does not change during engine running. • After engine stalls, engine will not start.	• Engine running based on crank when crank is normal • After engine stops: Unable to identify cylinder (unable to restart)	P1345	1E-500

Fault Code	Trouble	Cause
639-2	CAN Bus Fault	Bus-off is detected.
639-3	CAN Timeout Fault	CAN data reception does not complete at a set time.
651-3	Open Circuit in Injection Nozzle #1 Drive System	No injector 1 monitor input signal exists.
652-3	Open Circuit in Injection Nozzle #2 Drive System	No injector 2 monitor input signal exists.
653-3	Open Circuit in Injection Nozzle #3 Drive System	No injector 3 monitor input signal exists.
654-3	Open Circuit in Injection Nozzle #4 Drive System	No injector 4 monitor input signal exists.
655-3	Open Circuit in Injection Nozzle #5 Drive System	No injector 5 monitor input signal exists.
656-3	Open Circuit in Injection Nozzle #6 Drive System	No injector 6 monitor input signal exists.
723-2	Crank Sensor Fault (No Signal)	G sensor signal exists but no crank signal.
723-2	Crank Sensor Fault (Signal Fault)	Number of pulse for crank signal is mismatched.
987-3	Check Engine Lamp Fault	No check engine lamp monitor signal exists.

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Back-up	Fault Code (Tech 2)	Reference Page on Engine Trouble-shooting Manual
Vary depending on setting	Switched to drive control by accelerator sensor input voltage	U2104	1E-529
Vary depending on setting	Switched to drive control by accelerator sensor input voltage	U2106	1E-534
• Intense engine vibration • Rough idling • Output lowering • Blow up fault	• Injection for cylinder #5	P0201	1E-273
• Intense engine vibration • Rough idling • Output lowering • Blow up fault	• Injection for cylinder #3	P0202	1E-278
• Intense engine vibration • Rough idling • Output lowering • Blow up fault	• Injection for cylinder #6	P0203	1E-283
• Intense engine vibration • Rough idling • Output lowering • Blow up fault	• Injection for cylinder #2	P0204	1E-288
• Intense engine vibration • Rough idling • Output lowering • Blow up fault	• Injection for cylinder #4	P0205	1E-293
• Intense engine vibration • Rough idling • Output lowering • Blow up fault	• Common 1 stop (#1, #2, #3 cylinders stopped)	P0206	1E-298
• Output lowering • White smoke emission • Intense engine vibration is possible. • Engine stall is possible (restart is possible when G sensor is normal.)	• Control based on G sensor when G sensor is normal	P0335	1E-319
• Output lowering • White smoke emission • Intense engine vibration is possible. • Engine stall is possible (restart is possible when G sensor is normal.)	• Control based on G sensor when G sensor is normal	P0336	1E-325
• Operationality is not affected.	• No back-up	P0650	1E-397

Fault Code	Trouble	Cause
1077-2	CPU Fault	Sub-CPU detects main CPU fault in 100 msec after key switch ON. (Sub-CPU resets CPU.)
1079-2	Voltage Fault in 5 V Power Supply 1	5 V 1 power supply voltage: 5.5 V or more, 4.5 V or less
1080-2	Voltage Fault in 5 V Power Supply 2	5 V 2 power supply voltage: 5.5 V or more, 4.5 V or less
1239-1	No Pump Pressure Feed (First Stage)	Actual rail pressure lower than target rail pressure for 10 MPa or more holds 8 seconds or more. Or pressure feed indication is limit +1 °C or less, and actual rail pressure lower than target rail pressure for 10 MPa or more holds 8 seconds or more.
1240-1	No Pump Pressure Feed (Second Stage)	Actual rail pressure lower than target rail pressure for 10 MPa or more holds 8 seconds or more, when judgment of “No pump pressure feed (first stage)” is completed. Or pressure feed indication is limit +1 °C or less, and actual rail pressure lower than target rail pressure for 10 MPa or more holds 8 seconds or more.
1347-0	PCV1 Open Circuit or Ground Short	PCV1 monitor signal is fixed to Low side.
1347-4	PCV1+B Short Circuit	PCV1 monitor signal is fixed to High side.
1348-0	PCV2 Open Circuit or Ground Short	PCV2 monitor signal is fixed to Low side.
1348-4	PCV2+B Short Circuit	PCV2 monitor signal is fixed to High side.
1485-2	Main Relay System Fault	Main relay voltage is 1 V or less. In spite of relay OFF command, relay is connected.
10001-3	EGR Position Sensor Fault (Brushless Specification)	EGR position output signal is abnormal.
10002-2	EGR Valve Control Fault	Difference between target valve lift and actual position is more than 20 %.

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Back-up	Fault Code (Tech 2)	Reference Page on Engine Trouble-shooting Manual
Output lowering	• Limited injection amount 2 (Multi-injection stopped) • Sub-CPU stops control.	P0606	1E-383
Accelerator opening angle is controlled to 0 %.	Same to accelerator sensor fault	P1631	1E-514
• Black smoke emitted at high altitude • Output lowest at low altitude	• Same to barometric pres-sure and intake air temperature sensor fault	P1632	1E-517
• Intense engine vibration • Rough idling • Output lowering • Blow up fault	• Limited injection amount 3 (Multi-injection stopped) • Target rail pressure upper limit (80 MPa)	P1094	1E-411
• Intense engine vibration • Rough idling • Output lowering • Blow up fault • Black smoke emission • Engine stall	• Limited injection amount 3 (Multi-injection stopped) • Target rail pressure upper limit (80 MPa)	P1093	1E-402
• Intense engine vibration • Rough idling • Output lowering • Blow up fault • Black smoke emission	• Limited injection amount 3 (Multi-injection stopped) • Target rail pressure upper limit (80 MPa)	P0091	1E-193
• Intense engine vibration • Rough idling • Output lowering • Blow up fault • Black smoke emission	• PCV1 stop	P0092	1E-199
• Intense engine vibration • Rough idling • Output lowering • Blow up fault • Black smoke emission	• Limited injection amount 3 (Multi-injection stopped) • Target rail pressure upper limit (80 MPa)	P1291	1E-193
• Intense engine vibration • Rough idling • Output lowering • Blow up fault • Black smoke emission	• PCV2 stop	P1292	1E-199
Engine does not start.	No back-up	P1625	1E-505
• Operationality is not affected.	• Instruction to fully close EGR valve	P0487	1E-353
• Operationality is not affected.	• Instruction to fully close EGR valve	P0488	1E-359

Fault Code	Trouble	Cause
10003-2	Injection Nozzle Common 1 Drive System Fault	No injector 1, 2, 3 monitor input signal exists.
10004-2	Injection Nozzle Common 2 Drive System Fault	No injector 4, 5, 6 monitor input signal exists.
10005-1	Charge Circuit Fault (Bank 1)	When charge circuit bank 1 voltage inside ECM is low.
10006-1	Charge Circuit Fault (Bank 2)	When charge circuit bank 2 voltage inside ECM is low.
10007-2	CPU Monitoring IC Fault	RUN-SUB pulse does not change for 20 msec or more.
10008-2	A/D Conversion Fault	A/D conversion failure
10009-2	Voltage Fault in 5 V Power Supply 3	5 V 3 power supply voltage: 5.5 V or more, 4.5 V or less
10010-2	Voltage Fault in 5 V Power Supply 4	5 V 4 power supply voltage: 5.5 V or more, 4.5 V or less
10011-2	Voltage Fault in 5 V Power Supply 5	5 V 5 power supply voltage: 5.5 V or more, 4.5 V or less
10013-2	EEPROM Fault	EEPROM is faulty.

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Back-up	Fault Code (Tech 2)	Reference Page on Engine Trouble-shooting Manual
• Intense engine vibration • Rough idling • Output lowering • Blow up fault • Engine stall is possible.	• Common 1 stop (#1, #2, #3 cylinders stopped)	P1261	1E-454
• Intense engine vibration • Rough idling • Output lowering • Blow up fault • Engine stall is possible.	• Common 2 stop (#4, #5, #6 cylinders stopped)	P1262	1E-464
• Intense engine vibration • Rough idling • Output lowering • Blow up fault • Engine stall is possible.	• Common 1 stop (#1, #2, #3 cylinders stopped)	P0611	1E-385
• Intense engine vibration • Rough idling • Output lowering • Blow up fault • Engine stall is possible.	• Common 2 stop (#4, #5, #6 cylinders stopped)	P0612	1E-388
• Output lowering	• Limited injection amount 1	P0606	1E-383
• Output lowering • Black smoke emission	• Analog sensor system default processing • Limited injection amount 3 (Multi-injection stopped) • Target rail pressure upper limit (80 MPa)	P1630	1E-512
• Deterioration of start ability • Black smoke emission is possible. • Operationality is affected.	• Same to oil pressure, coolant temperature, and combustion temperature sensor fault	P1633	1E-520
• Operationality is affected.	• Same to boost pressure sensor fault	P1634	1E-523
• Engine blow up • Output lowering • Black smoke emission • Engine stall is possible.	• Same to rail pressure sensor fault and EGR position sensor fault	P1635	1E-526
• Operationality is not affected.	• No back-up	P0603	1E-381

ICF FAULT CODE LIST

Fault Code	Trouble	Cause	Remedy	Reference Page
14000-2	Abnormal CAN Communication	Data cannot be received due to the noise on the CAN bus line.	Check for CAN communication bus line.	T5-6-89
14001-2	Flash Memory: Read / Write Error	In case the internal memory is abnormal when the key is turned ON	After initializing the information C/U by using Dr. ZX, retry in the troubleshooting. If the error code is displayed after retry, ICF may be broken. Replace ICF. *NOTE: When initializing the information C/U, all stored data is deleted.*	T5-6-89
14002-2	External RAM: Read / Write Error	In case the internal memory is abnormal when the key is turned ON	After initializing the information C/U by using Dr. ZX, retry in the troubleshooting. If the error code is displayed after retry, ICF may be broken. Replace ICF. *NOTE: When initializing the information C/U, all stored data is deleted.*	T5-6-89
14003-2	EEPROM: Sum Check Error	In case the internal memory is abnormal when the key is turned ON	Retry in the troubleshooting by using Dr.ZX. If the error code is displayed after retry, ICF may be broken. Replace ICF.	T5-6-89
14006-2	Satellite Communication Terminal: Communication Error	In case communication to the satellite terminal cannot be done over 30 seconds.	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 satellite terminal is broken.	T5-6-93
14008-2	Abnormal Internal RAM	In case the internal memory is abnormal when the key is turned ON	Retry in the troubleshooting by using Dr.ZX. If the error code is displayed after retry, ICF may be broken. Replace ICF.	T5-6-93

SATELLITE TERMINAL FAULT CODE LIST (OPTIONAL)

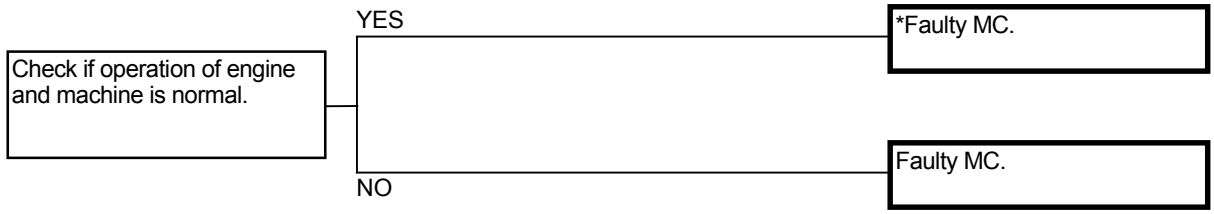
Fault Code	Trouble	Cause	Remedy	Reference Page
14100-2	Abnormal EEPROM	In case the internal memory is abnormal.	Replace the controller.	T5-6-94
14101-2	Abnormal IB/OB Queue	In case the internal memory is abnormal.	Replace the controller.	T5-6-94
14102-2	Abnormal Local Loup Back	In case the data cannot receive from the satellite,	Check the transmitting and receiving antenna of satellite.	T5-6-94
14103-2	The satellite is not found.	In case the satellite is not found.	Check the transmitting and receiving antenna of satellite.	T5-6-94
14104-2	Fail 1 of Remote Loup Back	In case communication to the satellite terminal cannot be done.	Replace the controller.	T5-6-94
14105-2	Fail 2 of Remote Loup Back	In case communication to the satellite terminal cannot be done,	Replace the controller.	T5-6-94
14106-2	Sending and receiving data are mismatched.	In case sending and receiving data are unmatched.	Replace the controller.	T5-6-94

MONITOR UNIT FAULT CODE LIST

Fault Code	Trouble	Cause	Remedy	Reference Page
13303-2	Abnormal Thermistor Temperature	Thermistor temperature is 85 °C (185 °F) or higher.	Cool the monitor unit and so on until temperature inside the monitor unit is less than 85 °C (185 °F).	T5-6-95
13304-2	Abnormal REG Input H Level	During REG input H level	(Refer to the Troubleshooting flow chart.)	T5-6-96
13306-2	Abnormal EEPROM	When failure reading EEPROM occurs	If this fault code is displayed after retarial, replace the monitor unit.	T5-6-97
13308-2	Abnormal CAN Communication	Bus off occurs beyond five times.	Refer to “CAN Harness Check” on page T5-6-40 to 59.	T5-6-97
13310-2	Shorted circuit in Coolant Temperature Sensor	The state, input 105±30 Ω or less, is kept over 60 seconds.	Check coolant temperature sensor and harness.	T5-6-98
13311-2	Shorted circuit in Fuel Level Sensor	The state, input 3±1 Ω or less, is kept over 60 seconds.	Check fuel level sensor and harness.	T5-6-99
13311-4	Open circuit in Fuel Level Sensor	The state, input 135±20 Ω or less, is kept over 60 seconds.	Check fuel level sensor and harness.	T5-6-99

MC FAULT CODE 11000 to 11002

Fault Code	Trouble	Cause
11000-2	Abnormal EEPROM	Faulty MC
11001-2	Abnormal RAM	Faulty MC
11002-2	Abnormal A/D Converter	Faulty MC

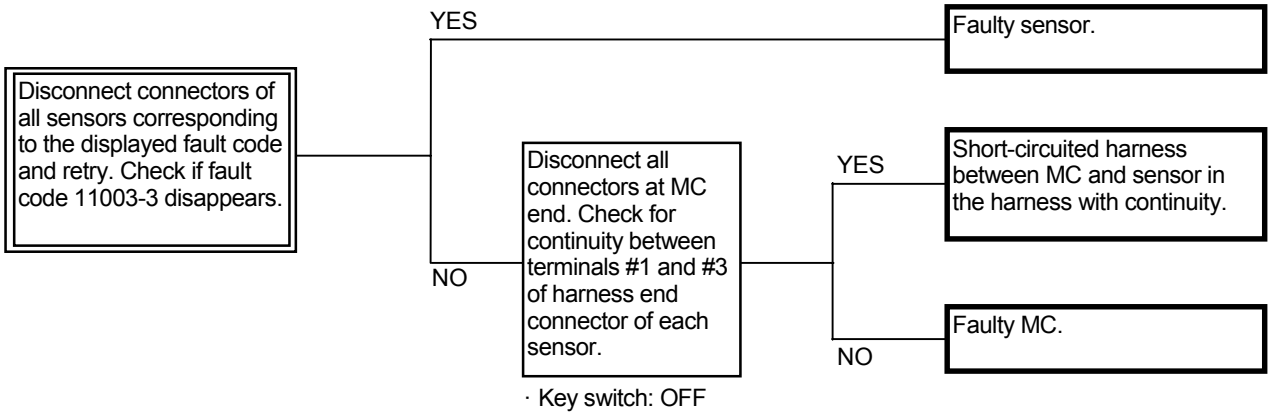


* When the fault code is displayed in the result of retrial and if operation of engine and machine is normal, the machine can be used.

MC FAULT CODE 11003

Fault Code	Trouble	Cause
11003-3	Abnormal Sensor Voltage	Faulty MC

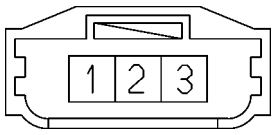
IMPORTANT: If fault code 11003-3 (Abnormal sensor voltage) is displayed with other fault codes together, perform the diagnosing for fault code 11003-3 first.



· Key switch: OFF

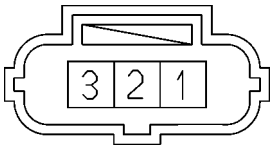
Connector (Harness end of connector viewed from the open side)

- Pressure Sensor (Right Travel)
- Pressure Sensor (Left Travel)
- Pressure Sensor (Swing)
- Pressure Sensor (Boom Raise)
- Pressure Sensor (Boom Lower)
- Pressure Sensor (Arm Roll-In)
- Pressure Sensor (Arm Roll-Out)
- Pressure Sensor (Bucket Roll-In)
- Pressure Sensor (Bucket Roll-Out)
- Pressure Sensor (Counterweight) (Optional)
- Pressure Sensor (Attachment) (Optional)
- Pump 1 Regulator Pressure Sensor
- Pump 2 Regulator Pressure Sensor



T1J1-05-06-001

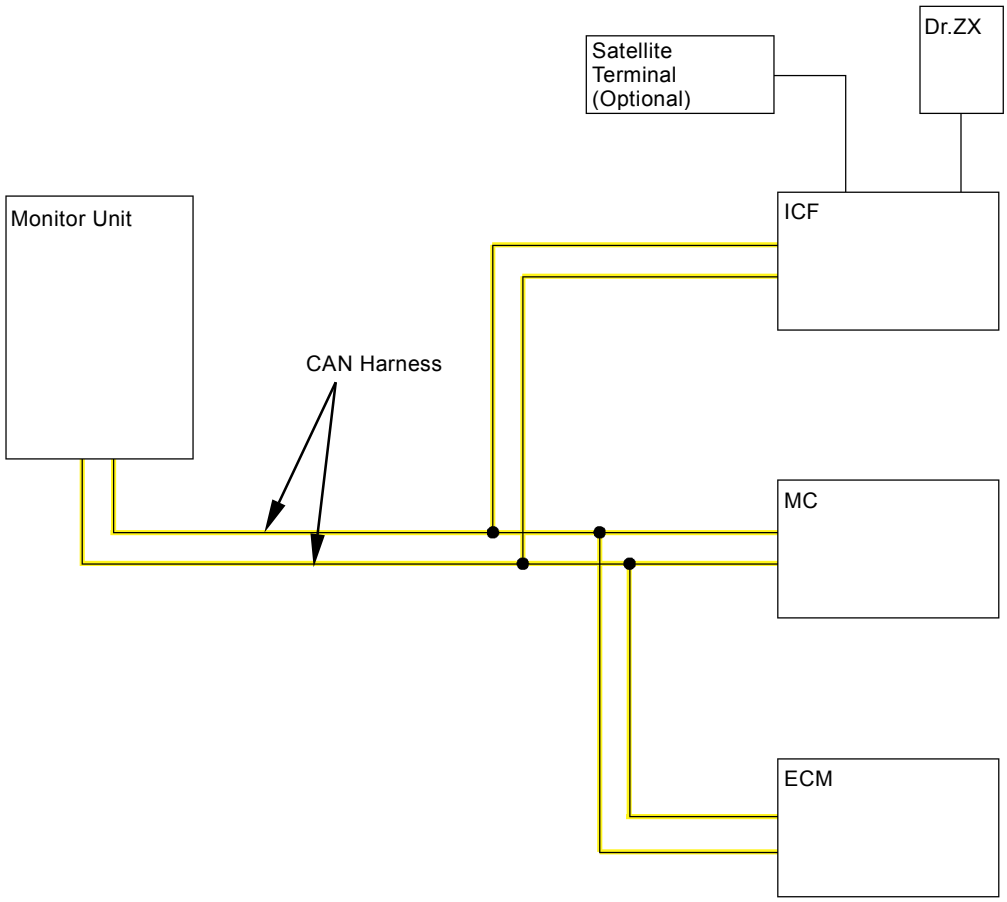
- Pump 1 Delivery Pressure Sensor
- Pump 2 Delivery Pressure Sensor



T1J1-05-06-002

MC FAULT CODE 11004

Fault Code	Trouble	Cause
11004-2	Abnormal CAN Communication	Faulty MC

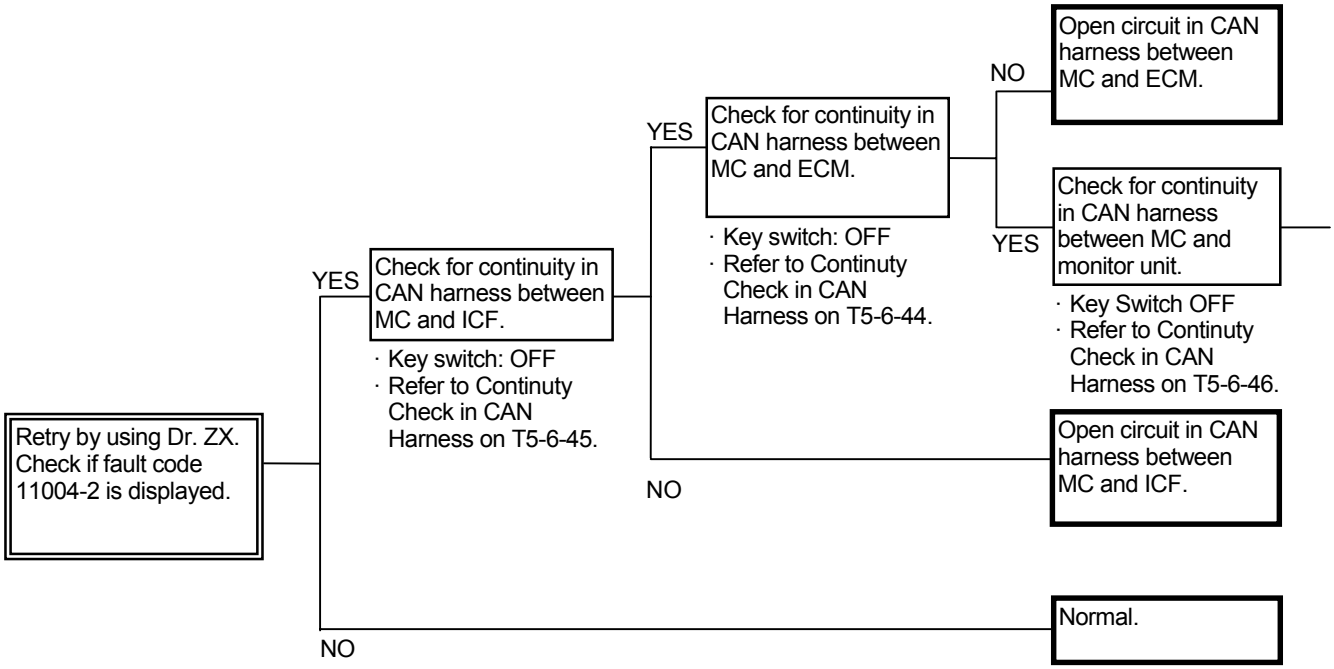


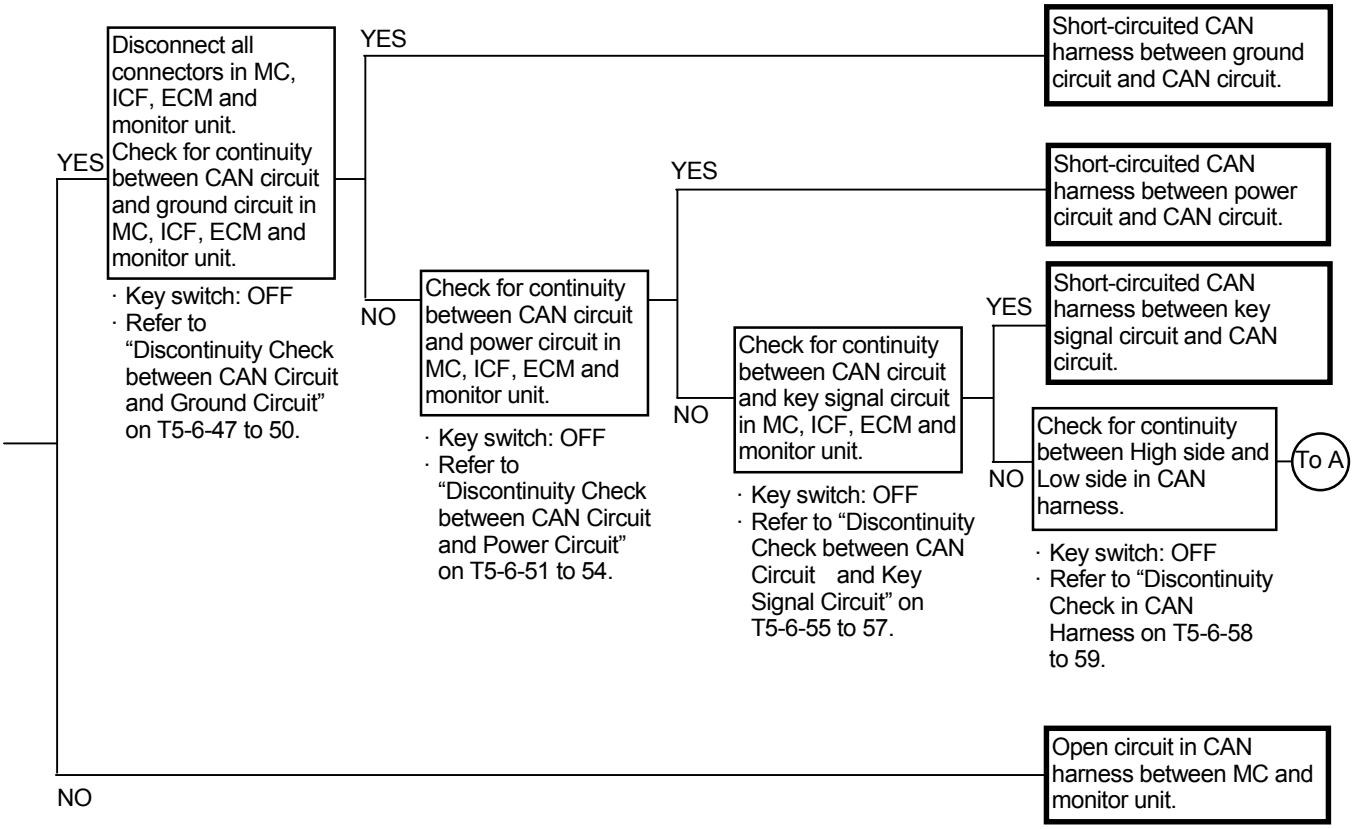
T1J1-02-01-004

- Check CAN harness between each controller.
  (Refer to “CAN Harness Check (T5-6-40 to 59)”).

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 T5-6-47 to 50.
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 T5-6-51 to 54.
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 T5-6-55 to 57.
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 T5-6-58 to 59.
To A
YES
NO
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

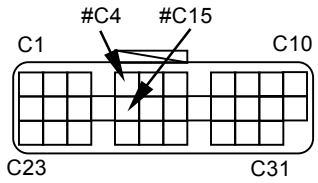
NO → Connect connector in ECM. Check if fault code 11004-2 is displayed.
· Key switch: ON

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

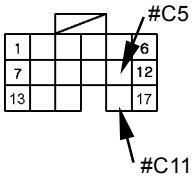
NO →

Connector

MC
Connector MC-C
(Harness end)

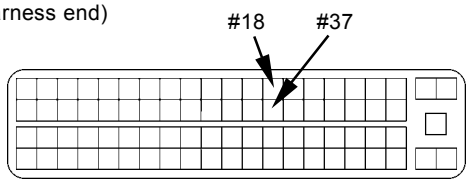


ICF
Connector ICF-C
(Harness end)



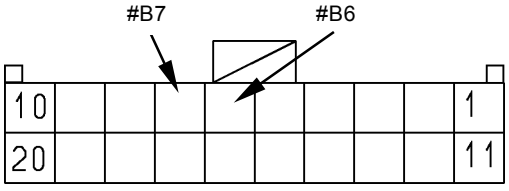
T1V1-05-04-002

ECM
Connector
(Harness end)

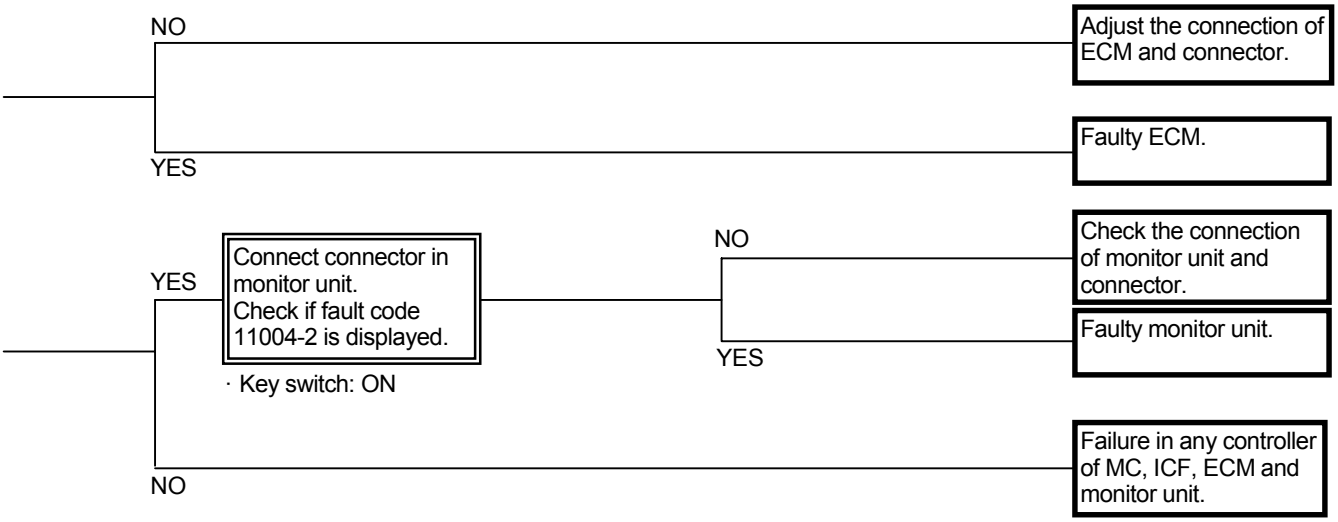


T1GR-05-04-002

Monitor Unit
Connector Monitor-B Connector
(Harness end)



T183-05-04-013


NO
Adjust the connection of ECM and connector.
Faulty ECM.
YES
NO
Check the connection of monitor unit and connector.
Faulty monitor unit.
YES
YES
Connect connector in monitor unit.
Check if fault code 11004-2 is displayed.
· Key switch: ON
Failure in any controller of MC, ICF, ECM and monitor unit.
NO

Continuity Check in CAN Harness

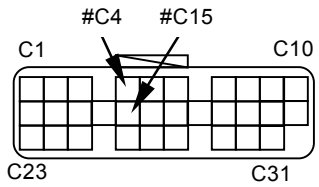
IMPORTANT: Before continuity check, turn the key switch OFF.

- 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 connector in ECM.

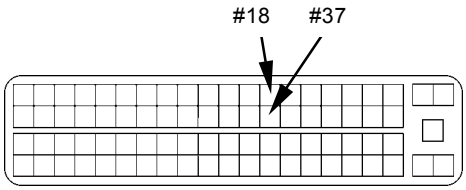
  CAN Harness (Low Side)
  Check for continuity between terminal #C15 of harness end of connector MC-C in MC and terminal #37 of harness end of connector in ECM.

Connector

MC
Connector MC-C
(Harness end)



ECM
Connector
(Harness end)



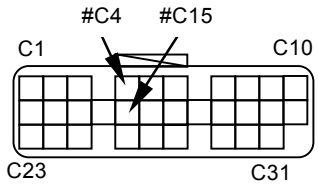
T1GR-05-04-002

- 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 connector ICF-C in ICF.

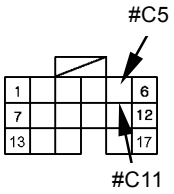
  CAN Harness (Low Side)
  Check for continuity between terminal #C15 of harness end of connector MC-C in MC and terminal #C11 of harness end of connector ICF-C in ICF.

Connector

MC
Connector MC-C
(Harness end)



ICF
Connector ICF-C
(Harness end)



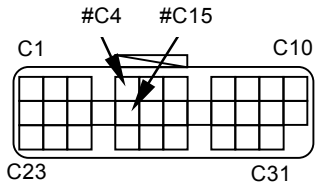
T1V1-05-04-002

- 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 connector monitor-B in the monitor unit.

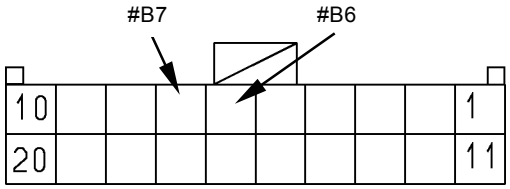
  CAN Harness (Low Side)
  Check for continuity between terminal #C15 of harness end of connector MC-C in MC and terminal #B6 of harness end of connector monitor-B in the monitor unit.

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 connector in MC-A.

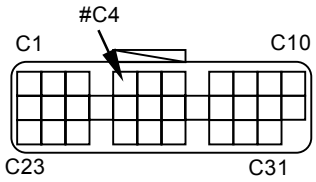
  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #A13 of harness end of connector in MC-A.

  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B8 of harness end of connector in MC-B.

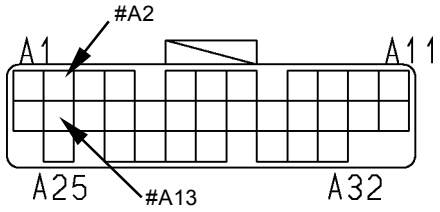
  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B18 of harness end of connector in MC-B.

Connector

Connector MC-C
(Harness end)

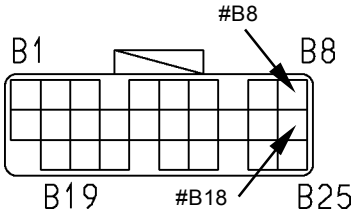


Connector MC-A
(Harness end)



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 #C15 of harness end of connector MC-C and terminal #A2 of harness end of connector in MC-A.

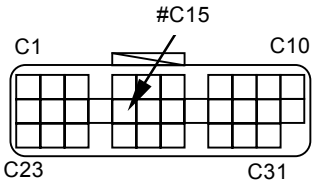
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #A13 of harness end of connector in MC-A.

Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B8 of harness end of connector in MC-B.

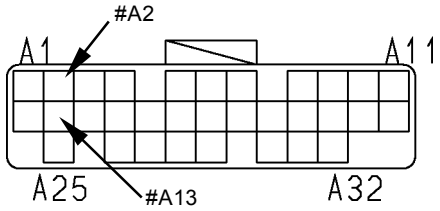
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B18 of harness end of connector in MC-B.

Connector

Connector MC-C
(Harness end)

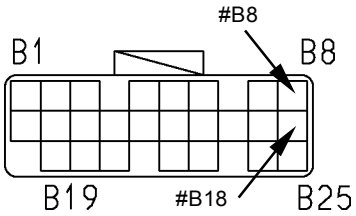


Connector MC-A
(Harness end)



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.

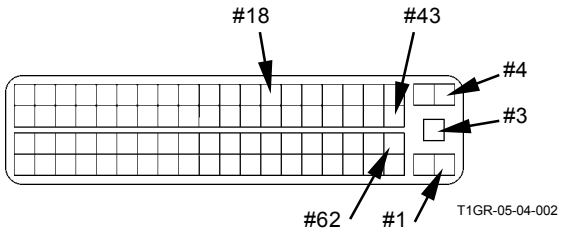
  Check for continuity between terminals #18 and #3 of harness end of connector.

  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.

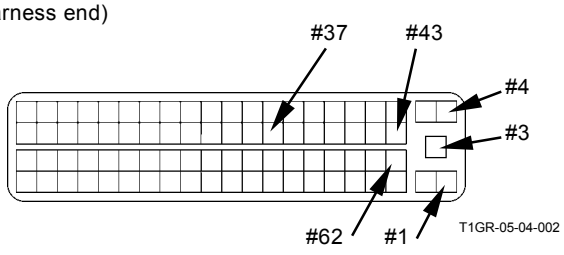
  Check for continuity between terminals #37 and #3 of harness end of connector.

  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)

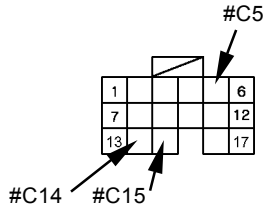


- ICF

  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)

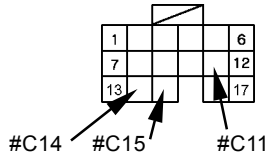


T1V1-05-04-002

  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)

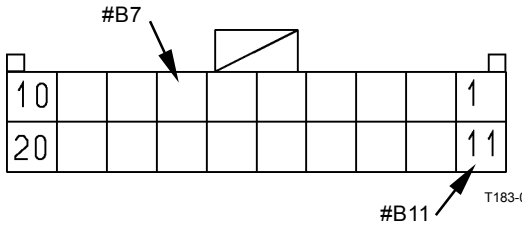


T1V1-05-04-002

- 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.

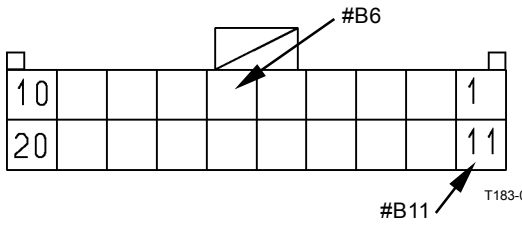
Monitor Unit
Connector Monitor-B
(Harness end)



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.

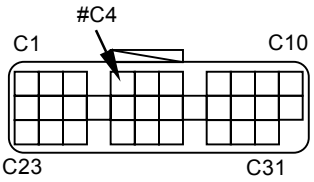
  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #A12 of harness end connector MC-A.

  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B7 of harness end connector MC-B.

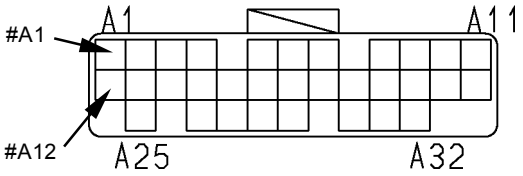
  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B17 of harness end connector MC-B.

Connector

Connector MC-C
(Harness end)

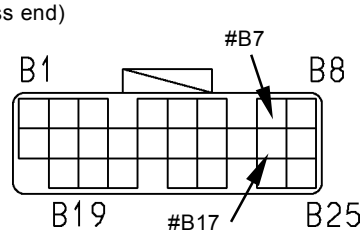


Connector MC-A
(Harness end)



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 #A1 of harness end connector MC-A.

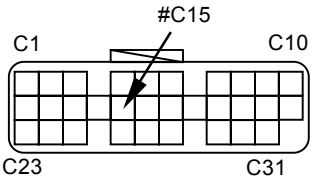
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #A12 of harness end connector MC-A.

Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B7 of harness end connector MC-B.

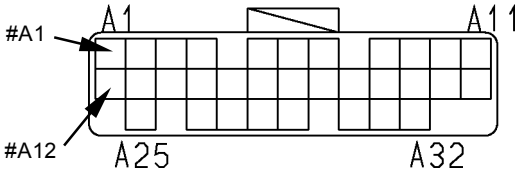
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B17 of harness end connector MC-B.

Connector

Connector MC-C
(Harness end)

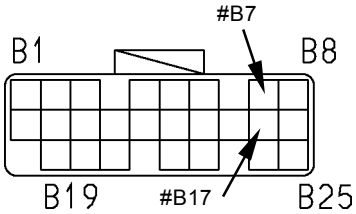


Connector MC-A
(Harness end)



T183-05-04-008

Connector MC-B
(Harness end)



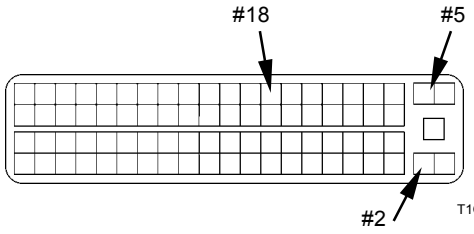
T183-05-04-021

- 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)

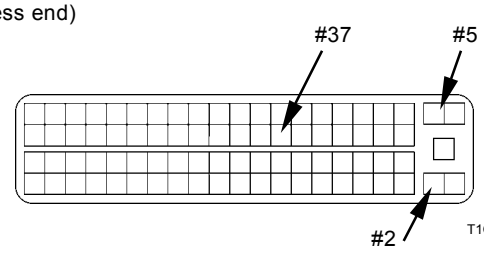


T1GR-05-04-002

  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)



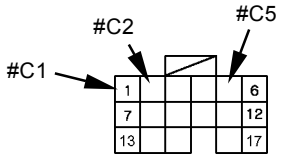
T1GR-05-04-002

- 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)

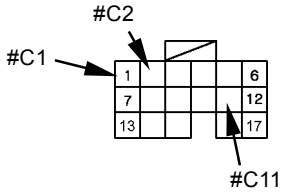


T1V1-05-04-002

  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.

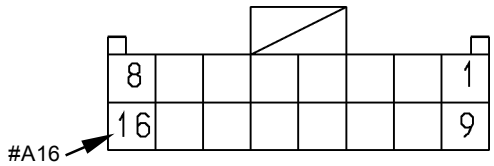
ICF
Connector ICF-C
(Harness end)



T1V1-05-04-002

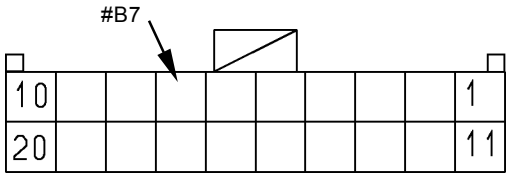
- Monitor Unit
  Between CAN Circuit (High Side) and Power Circuit
  Check for continuity between terminal #B7 of harness end of connector monitor-B in the monitor unit and terminal #A16 of harness end of connector monitor-A in the monitor unit.

Monitor Unit
Connector Monitor-A
(Harness end)



T183-05-05-001

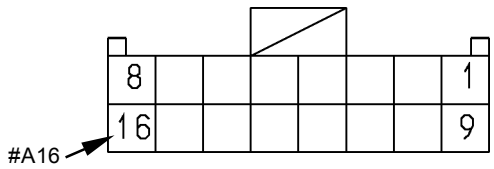
Monitor Unit
Connector Monitor-B
(Harness end)



T183-05-04-013

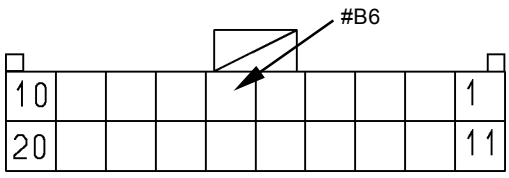
Between CAN Circuit (Low Side) and Power Circuit
Check for continuity between terminal #B6 of harness end of connector monitor-B in the monitor unit and terminal #A16 of harness end of connector monitor-A in the monitor unit.

Monitor Unit
Connector Monitor-A
(Harness end)



T183-05-05-001

Monitor Unit
Connector Monitor-B
(Harness end)



T183-05-04-013

Discontinuity Check 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.

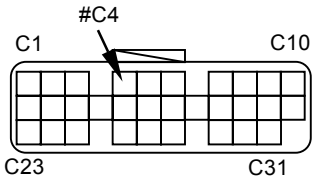
- MC

  Between CAN Circuit (High Side) and Key Signal Circuit

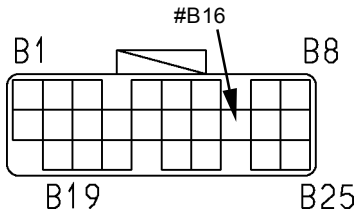
  Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B16 of harness end of connector MC-B.

Connector

Connector MC-C
(Harness end)



Connector MC-B
(Harness end)



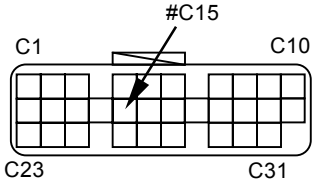
T183-05-04-021

Between CAN Circuit (Low Side) and Key Signal Circuit

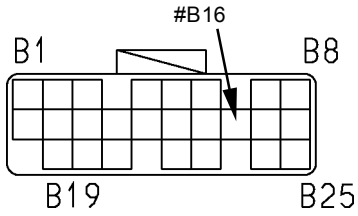
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B16 of harness end of connector MC-B.

Connector

Connector MC-C
(Harness end)



Connector MC-B
(Harness end)



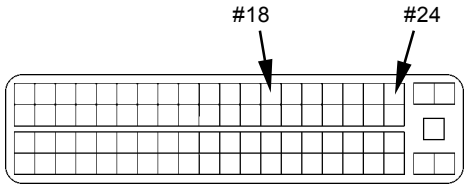
T183-05-04-021

• 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)

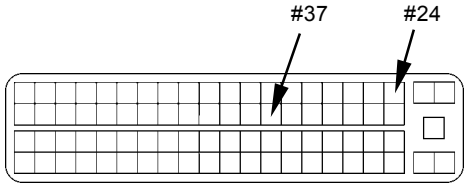


T1GR-05-04-002

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)



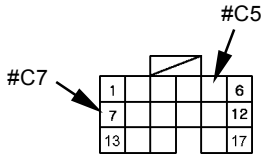
T1GR-05-04-002

• 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)

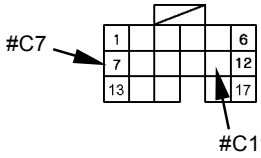


T1V1-05-04-002

Between CAN Circuit (Low Side) and Key Signal Circuit

Check for continuity between terminals #C11 and #C7 of harness end of connector ICF-C.

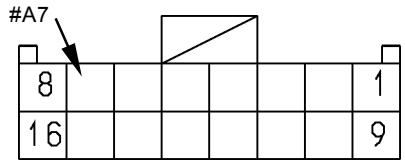
ICF
Connector ICF-C
(Harness end)



T1V1-05-04-002

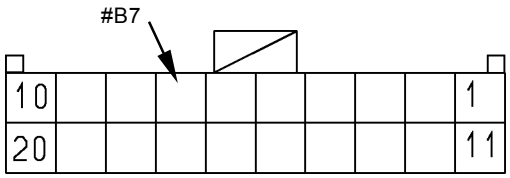
- Monitor Unit
  Between CAN Circuit (High Side) and Power Circuit
  Check for continuity between terminal #B7 of harness end of connector monitor-B in the monitor unit and terminal #A7 of harness end of connector monitor-A in the monitor unit.

Monitor Unit
Connector Monitor-A
(Harness end)



T183-05-05-001

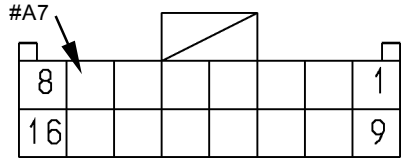
Monitor Unit
Connector Monitor-B
(Harness end)



T183-05-04-013

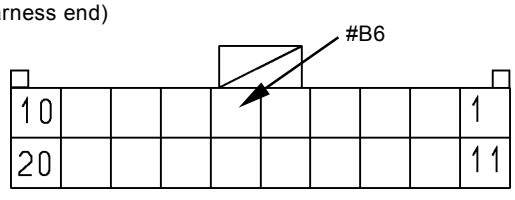
Between CAN Circuit (Low Side) and Power Circuit
Check for continuity between terminal #B6 of harness end of connector monitor-B in the monitor unit and terminal #A7 of harness end of connector monitor-A in the monitor unit.

Monitor Unit
Connector Monitor-A
(Harness end)



T183-05-05-001

Monitor Unit
Connector Monitor-B
(Harness end)



T183-05-04-013

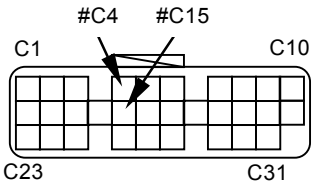
Discontinuity Check in CAN Harness

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.

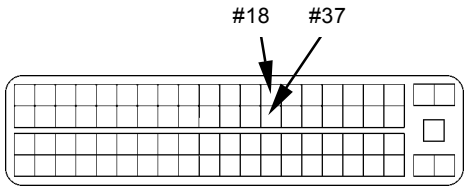
- Connector MC-C
  Check for continuity between terminals #C4 and #C15 of harness end of connector MC-C in MC.

MC
Connector MC-C
(Harness end)



- Connector ECM
  Check for continuity between terminals #18 and #37 of harness end of connector in ECM.

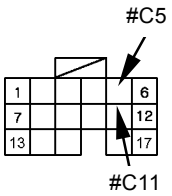
ECM
Connector
(Harness end)



T1GR-05-04-002

- Connector ICF-C
  Check for continuity between terminals #C5 and #C11 of harness end of connector ICF-C in ICF.

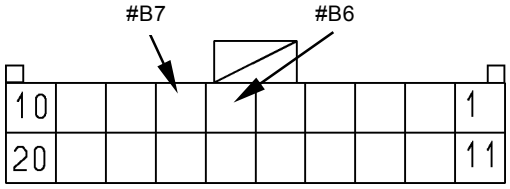
ICF
Connector ICF-C
(Harness end)



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.

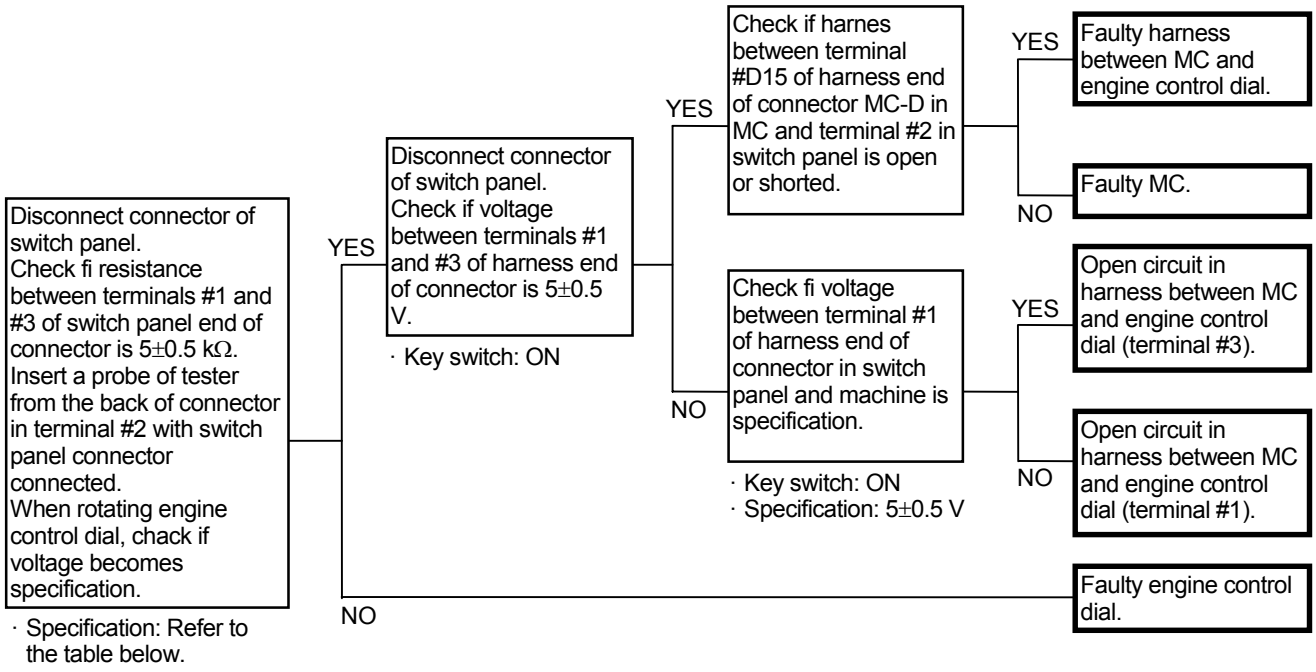
Monitor Unit
Connector Monitor-B
(Harness end)



T183-05-04-013

MC FAULT CODE 11101

Fault Code	Trouble	Cause
11101-3	Abnormal Engine Control Dial Sensor High Voltage	Voltage: 4.75 V or higher
11101-4	Abnormal Engine Control Dial Sensor Low Voltage	Voltage: Less than 0.25 V

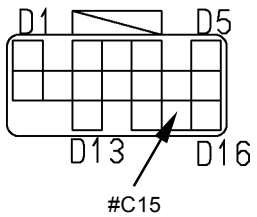


Specification of Engine Control Dial

Slow Idle	0.3 to 1.0 V
Fast Idle	4.0 to 4.7 V

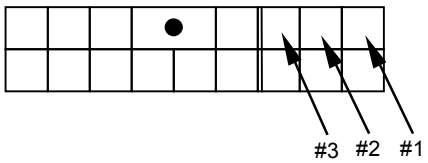
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-D



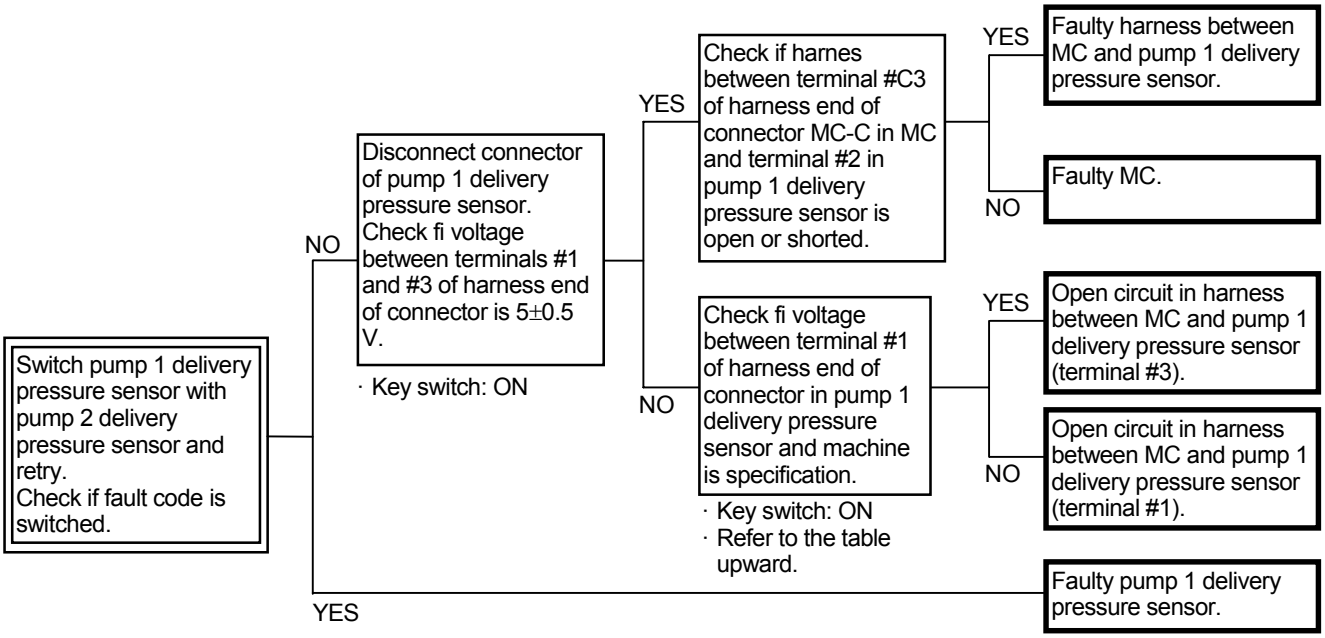
T183-05-04-009

Switch Panel

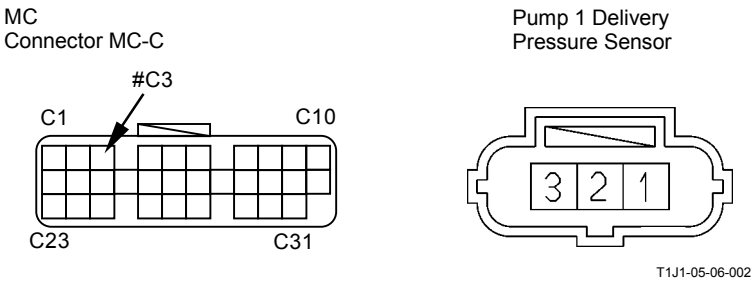


MC FAULT CODE 11200

Fault Code	Trouble	Cause
11200-3	Abnormal Pump 1 Delivery Pressure Sensor High Voltage	Voltage: 4.75 V or higher
11200-4	Abnormal Pump 1 Delivery Pressure Sensor Low Voltage	Voltage: Less than 0.25 V

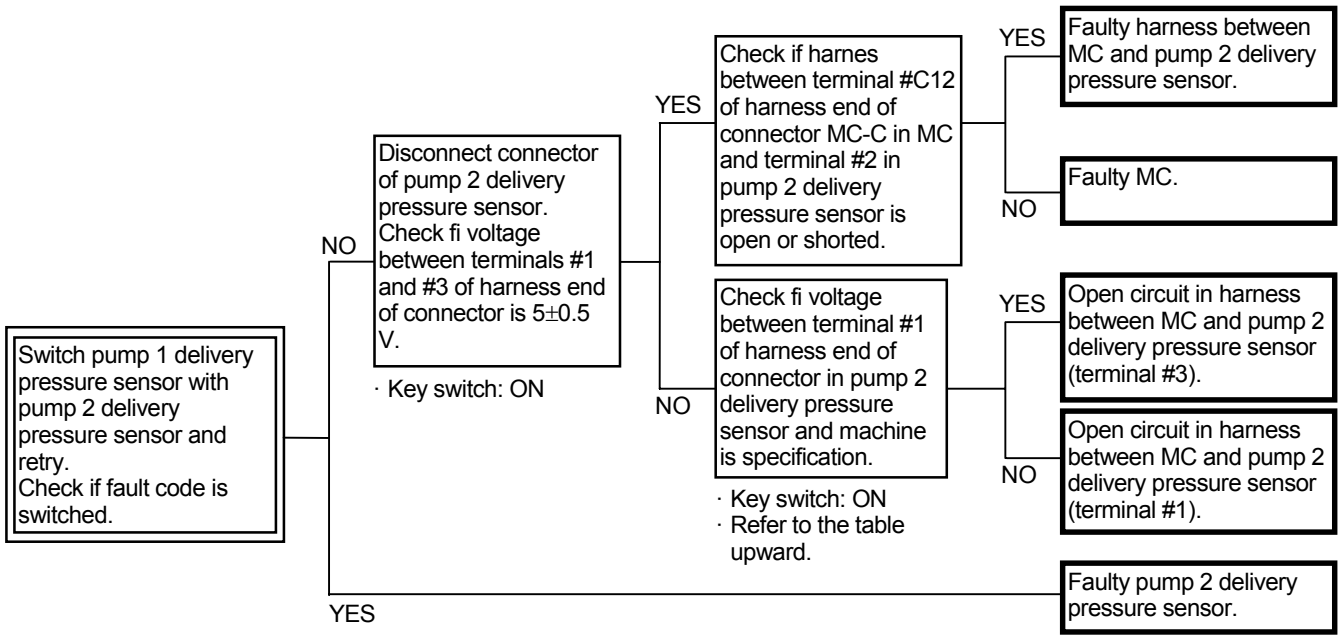


Connector (Harness end of connector viewed from the open side)

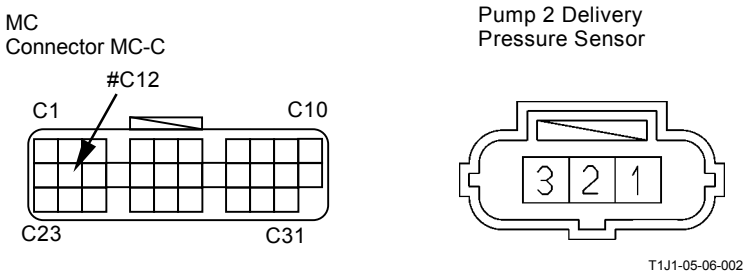


MC FAULT CODE 11202

Fault Code	Trouble	Cause
11202-3	Abnormal Pump 2 Delivery Pressure Sensor High Voltage	Voltage: 4.75 V or higher
11202-4	Abnormal Pump 2 Delivery Pressure Sensor Low Voltage	Voltage: Less than 0.25 V

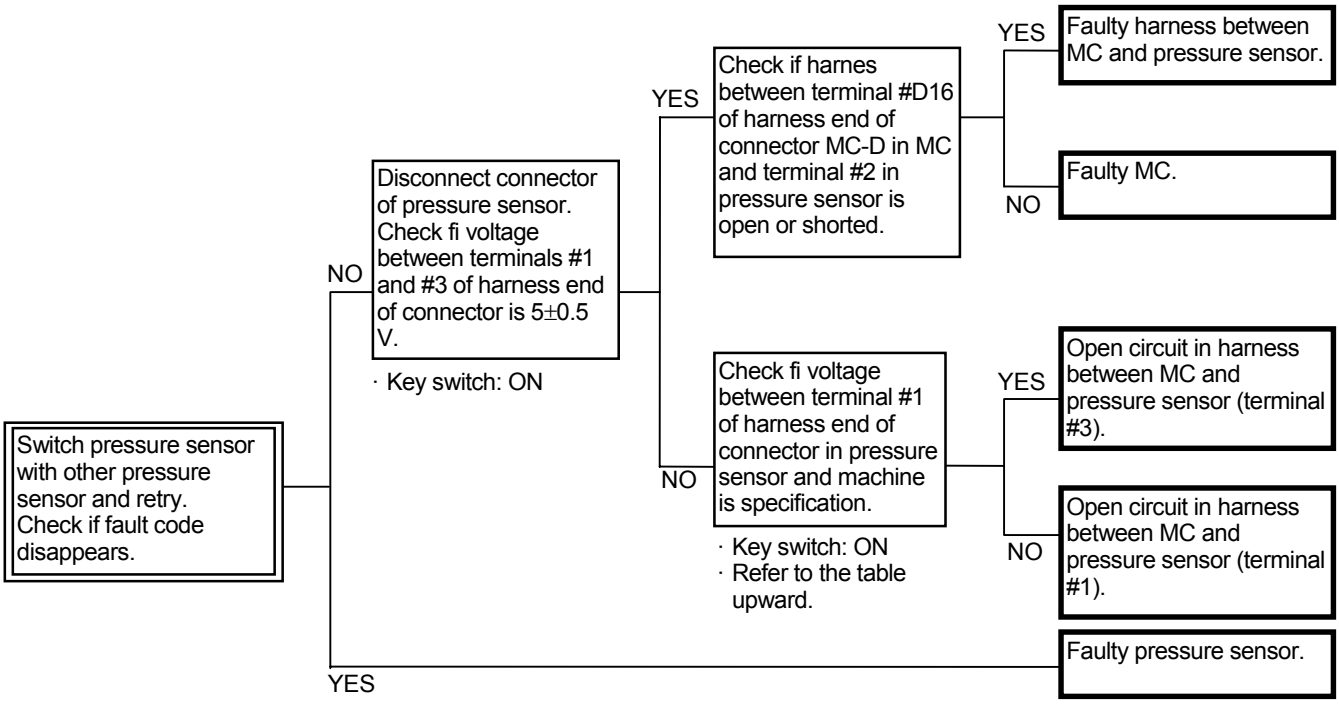


Connector (Harness end of connector viewed from the open side)



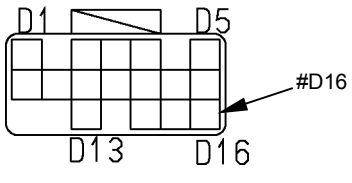
MC FAULT CODE 11301

Fault Code	Trouble	Cause
11301-3	Abnormal Swing Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher
11301-4	Abnormal Swing Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V



Connector (Harness end of connector viewed from the open side)

MC
Connector MC-D



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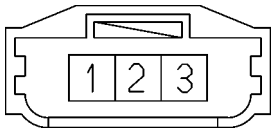
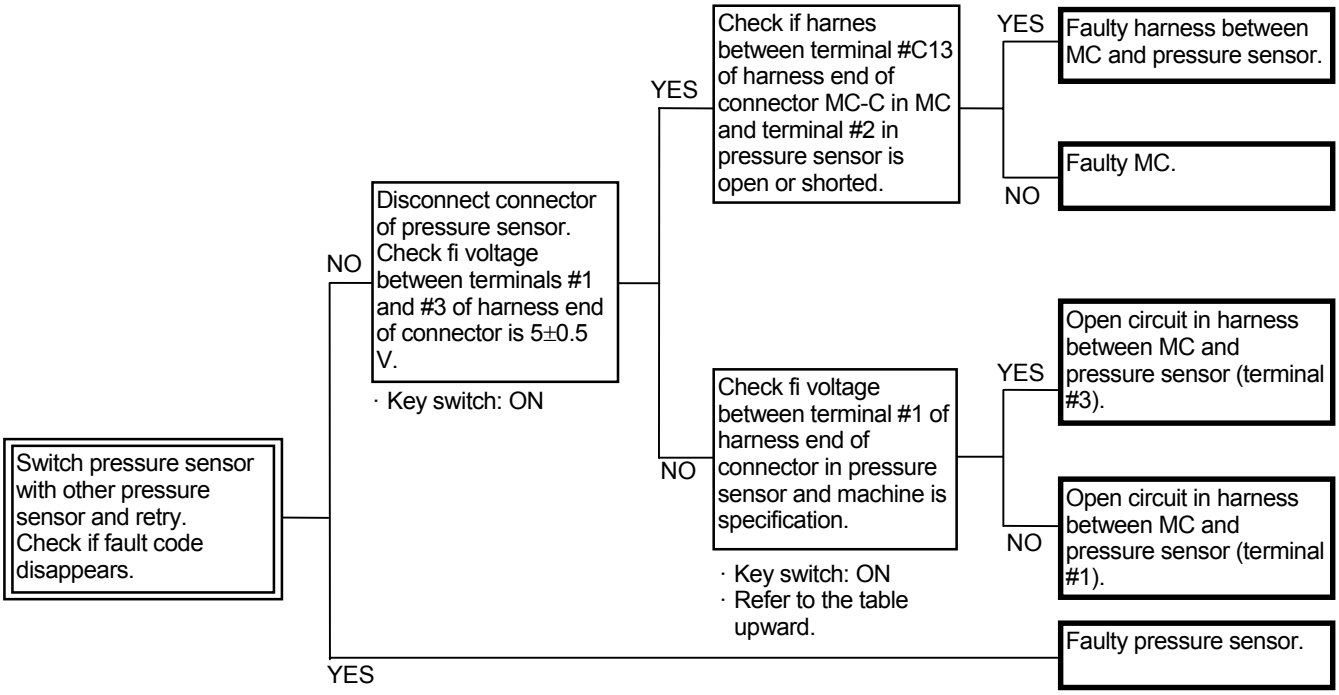
Pilot Pressure Sensor
(Swing)



T1J1-05-06-001

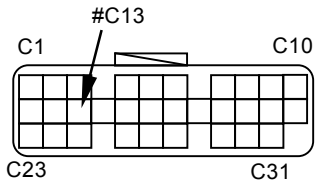
MC FAULT CODE 11302

Fault Code	Trouble	Cause
11302-3	Abnormal Boom Raise Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher
11302-4	Abnormal Boom Raise Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V

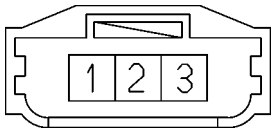


Connector (Harness end of connector viewed from the open side)

MC
Connector MC-C



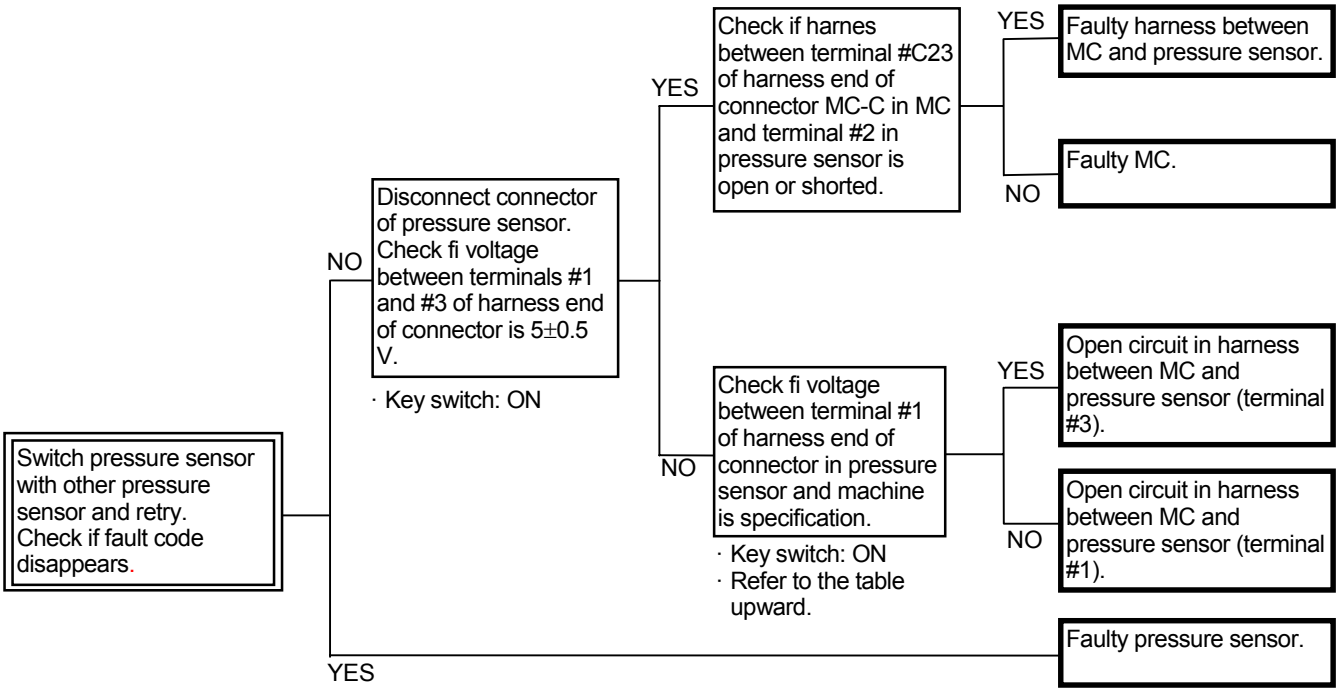
Pilot Pressure Sensor (Boom Raise)



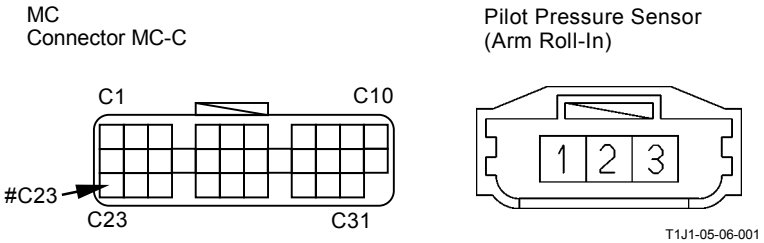
T1J1-05-06-001

MC FAULT CODE 11303

Fault Code	Trouble	Cause
11303-3	Abnormal Arm Roll-In Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher
11303-4	Abnormal Arm Roll-In Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V



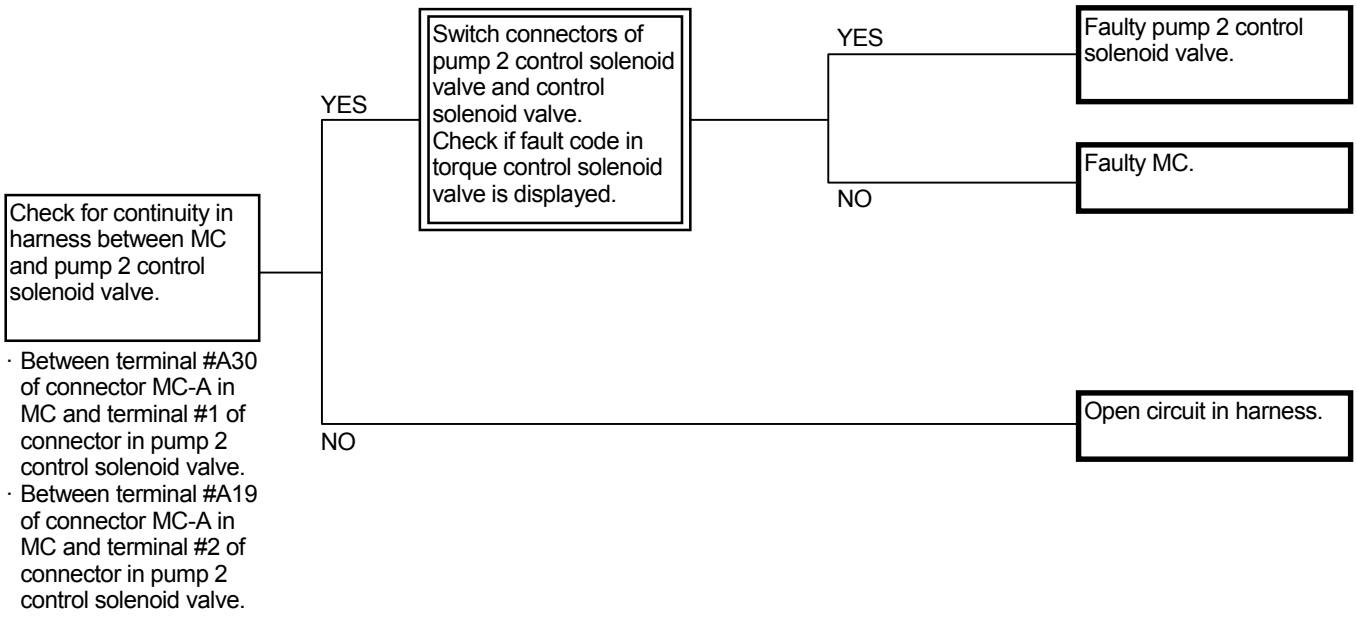
Connector (Harness end of connector viewed from the open side)



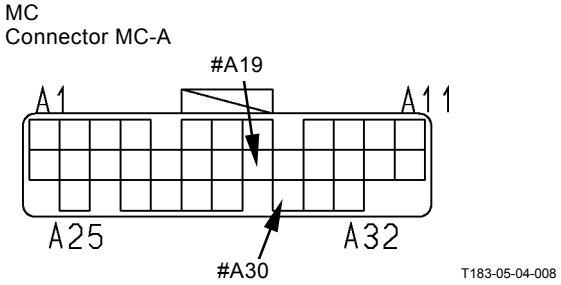
MC FAULT CODE 11400

Fault Code	Trouble	Cause
11400-3	Abnormal Feedback High Current of Pump 2 Control Solenoid Valve	Current: Higher than 920 mA
11400-4	Abnormal Feedback Low Current of Pump 2 Control Solenoid Valve	Current: Less than 56 mA

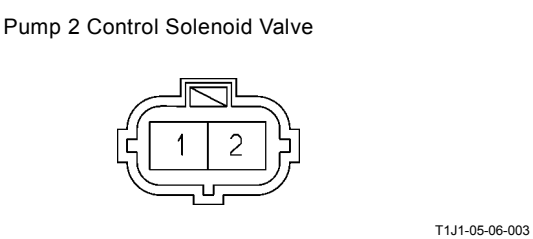
IMPORTANT: In case switching the connector in solenoid valve and performing the diagnosing, check for continuity in the solenoid before switching. When the connector is switched and the engine starts with the solenoid shorted, normal solenoid valve and MC may be damaged.
Reference value:
Pump control solenoid valve: 17.5 Ω at 20 °C
4-spool solenoid valve unit: 18.5 Ω at 20 °C



Connector (Harness end of connector viewed from the open side)



T183-05-04-008

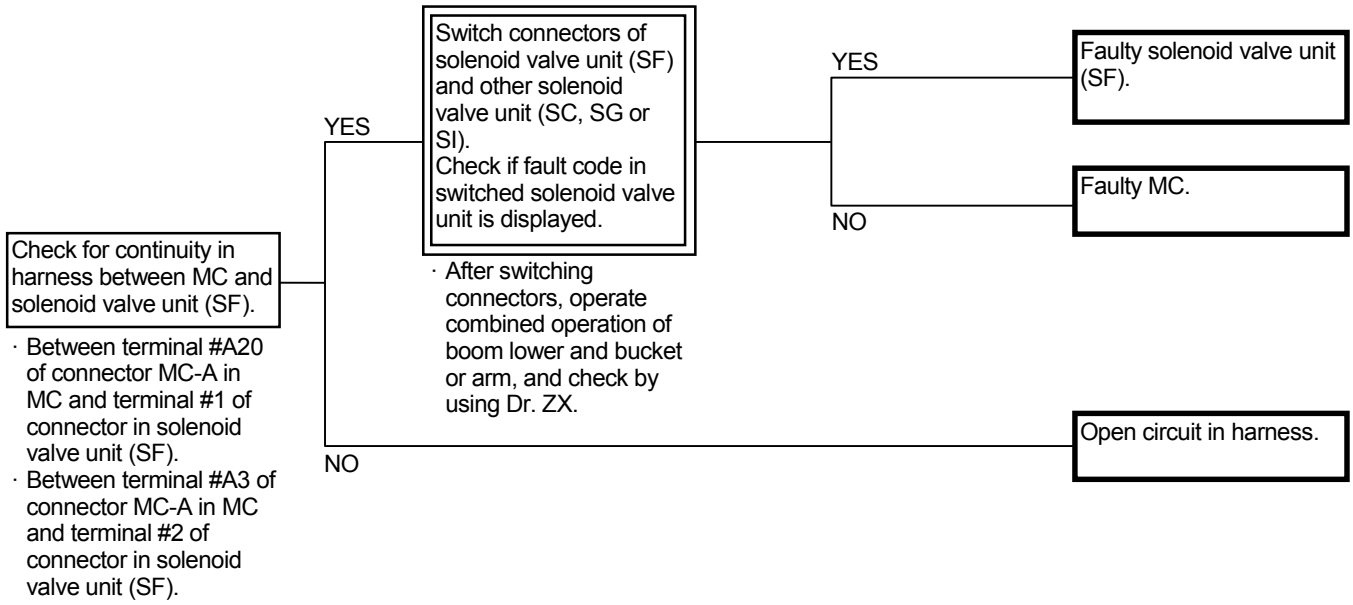


T1J1-05-06-003

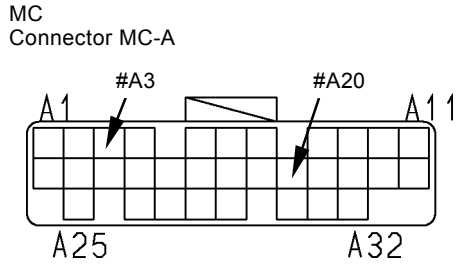
MC FAULT CODE 11402

Fault Code	Trouble	Cause
11402-3	Abnormal Feedback High Current of Solenoid Valve Unit (SF) (Boom Flow Rate Control Valve Control)	Current: Higher than 920 mA
11402-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SF) (Boom Flow Rate Control Valve Control)	Current: Less than 56 mA

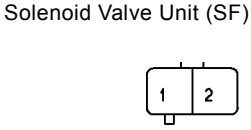
IMPORTANT: In case switching the connector in solenoid valve and performing the diagnosing, check for continuity in the solenoid before switching. When the connector is switched and the engine starts with the solenoid shorted, normal solenoid valve and MC may be damaged.
Reference value:
Pump control solenoid valve: 17.5 Ω at 20 °C
4-spool solenoid valve unit: 18.5 Ω at 20 °C



Connector (Harness end of connector viewed from the open side)



T183-05-04-008

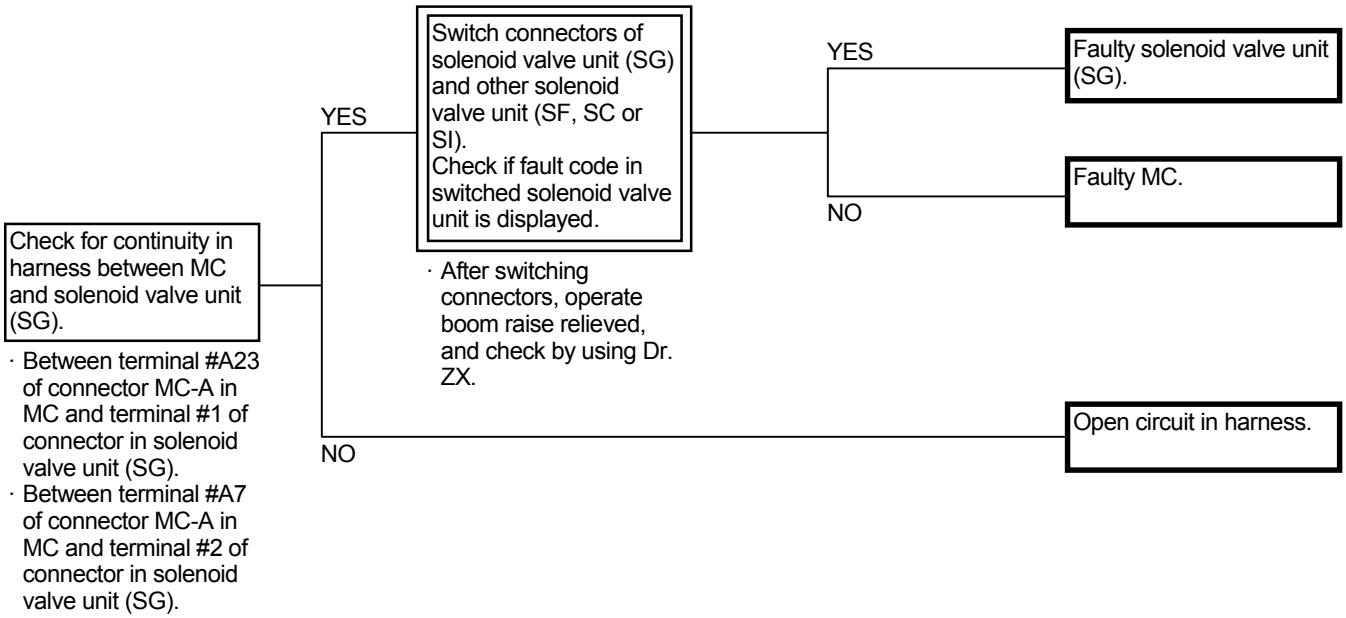


T1V1-05-04-003

MC FAULT CODE 11404

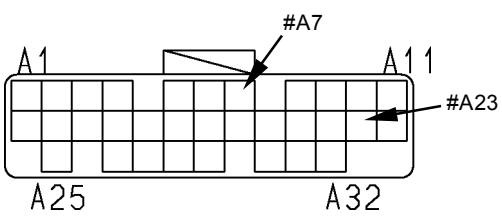
Fault Code	Trouble	Cause
11404-3	Abnormal Feedback High Current of Solenoid Valve Unit (SG) (Main Relief Pressure Control)	Current: Higher than 920 mA
11404-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SG) (Main Relief Pressure Control)	Current: Less than 56 mA

IMPORTANT: In case switching the connector in solenoid valve and performing the diagnosing, check for continuity in the solenoid before switching. When the connector is switched and the engine starts with the solenoid shorted, normal solenoid valve and MC may be damaged.
Reference value:
Pump control solenoid valve: 17.5 Ω at 20 °C
4-spool solenoid valve unit: 18.5 Ω at 20 °C



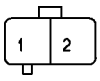
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-A



T183-05-04-008

Solenoid Valve Unit (SG)

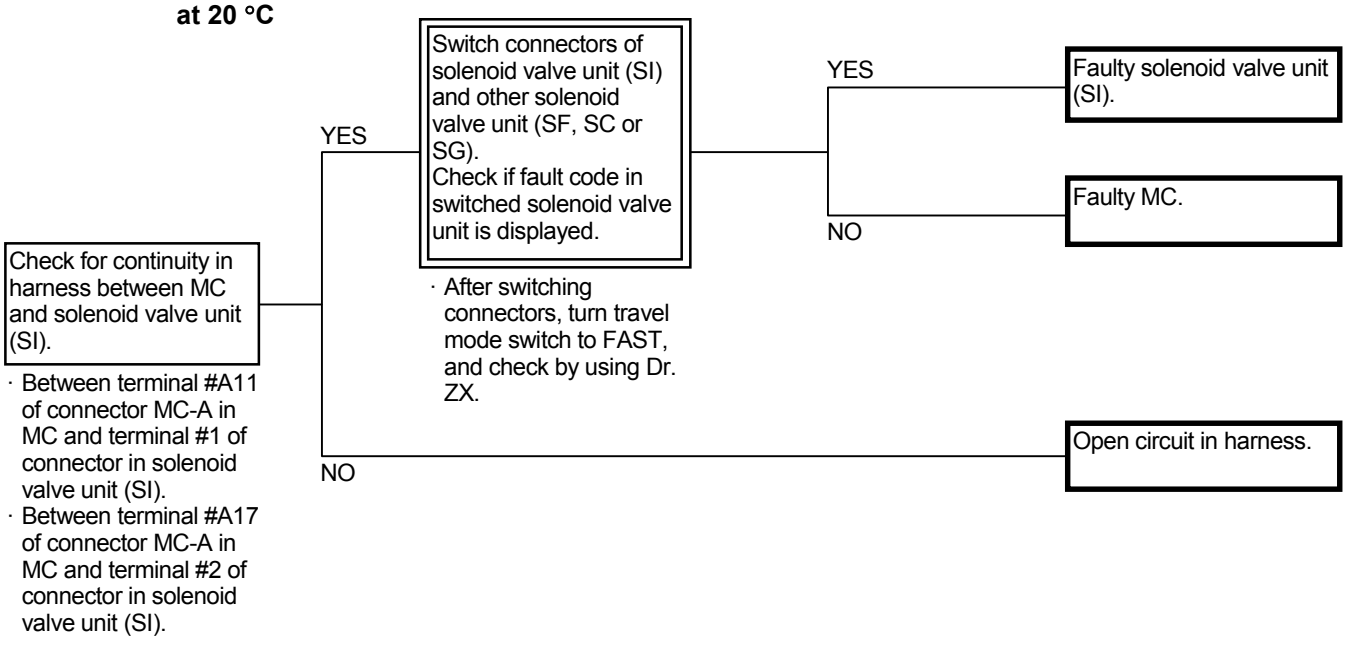


T1V1-05-04-003

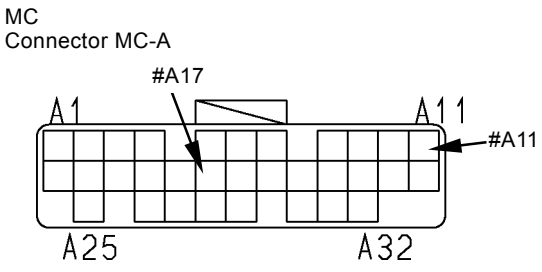
MC FAULT CODE 11405

Fault Code	Trouble	Cause
11405-3	Abnormal Feedback High Current of Solenoid Valve Unit (SI) (Travel Motor Displacement Angle Control)	Current: Higher than 920 mA
11405-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SI) (Travel Motor Displacement Angle Control)	Current: Less than 56 mA

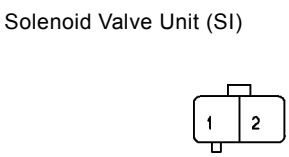
IMPORTANT: In case switching the connector in solenoid valve and performing the diagnosing, check for continuity in the solenoid before switching. When the connector is switched and the engine starts with the solenoid shorted, normal solenoid valve and MC may be damaged.
Reference value:
Pump control solenoid valve: 17.5 Ω at 20 °C
4-spool solenoid valve unit: 18.5 Ω at 20 °C



Connector (Harness end of connector viewed from the open side)



T183-05-04-008

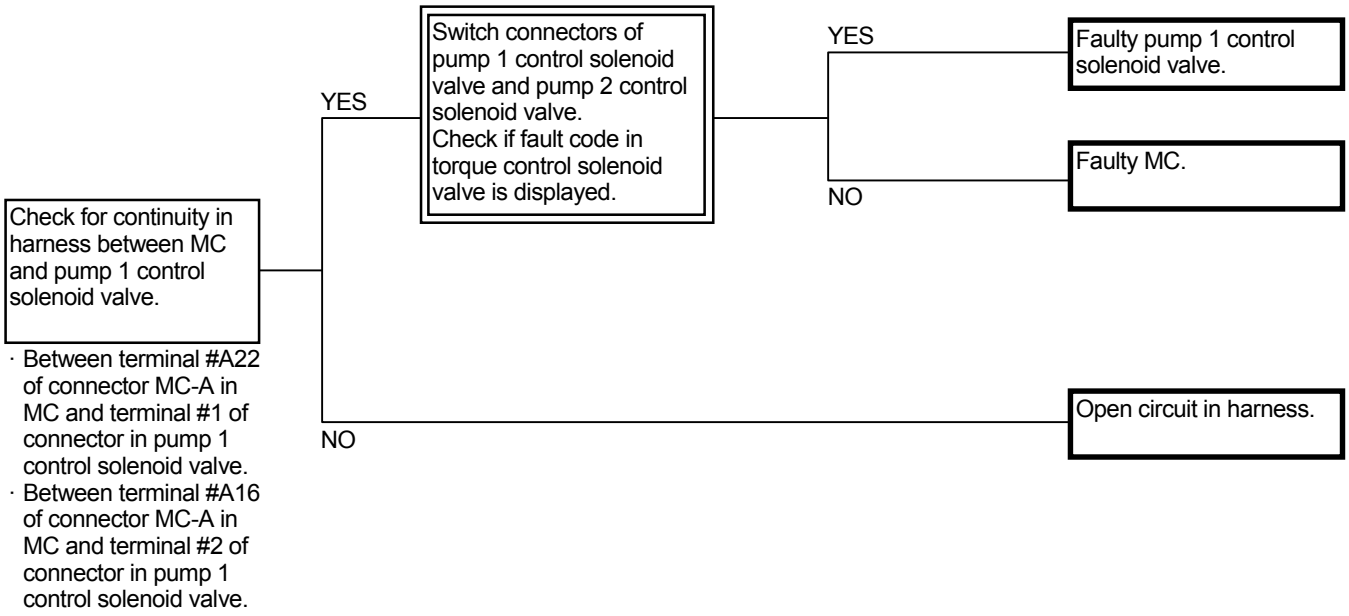


T1V1-05-04-003

MC FAULT CODE 11410

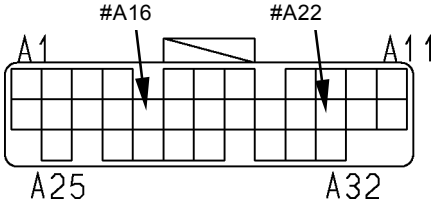
Fault Code	Trouble	Cause
11410-3	Abnormal Feedback High Current of Pump 1 Control Solenoid Valve	Current: Higher than 920 mA
11410-4	Abnormal Feedback Low Current of Pump 1 Control Solenoid Valve	Current: Less than 56 mA

IMPORTANT: In case switching the connector in solenoid valve and performing the diagnosing, check for continuity in the solenoid before switching. When the connector is switched and the engine starts with the solenoid shorted, normal solenoid valve and MC may be damaged.
Reference value:
Pump control solenoid valve: 17.5 Ω at 20 °C
4-spool solenoid valve unit: 18.5 Ω at 20 °C



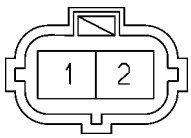
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-A



T183-05-04-008

Pump 1 Control Solenoid Valve

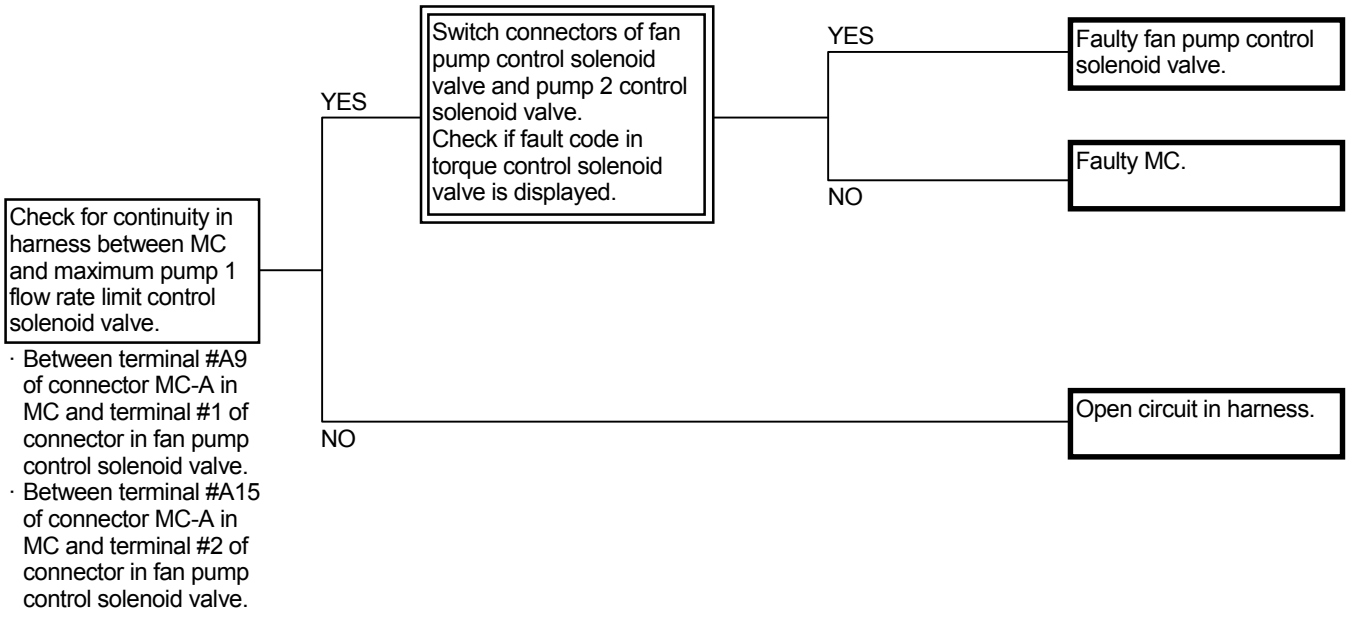


T1J1-05-06-003

MC FAULT CODE 11412

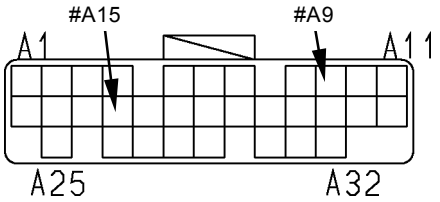
Fault Code	Trouble	Cause
11412-3	Abnormal Feedback High Current of Fan Pump Control Solenoid Valve	Current: Higher than 920 mA
11412-4	Abnormal Feedback Low Current of Fan Pump Control Solenoid Valve	Current: Less than 56 mA

IMPORTANT: In case switching the connector in solenoid valve and performing the diagnosing, check for continuity in the solenoid before switching. When the connector is switched and the engine starts with the solenoid shorted, normal solenoid valve and MC may be damaged.
Reference value:
Pump control solenoid valve: 17.5 Ω at 20 °C
4-spool solenoid valve unit: 18.5 Ω at 20 °C



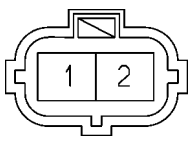
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-A



T183-05-04-008

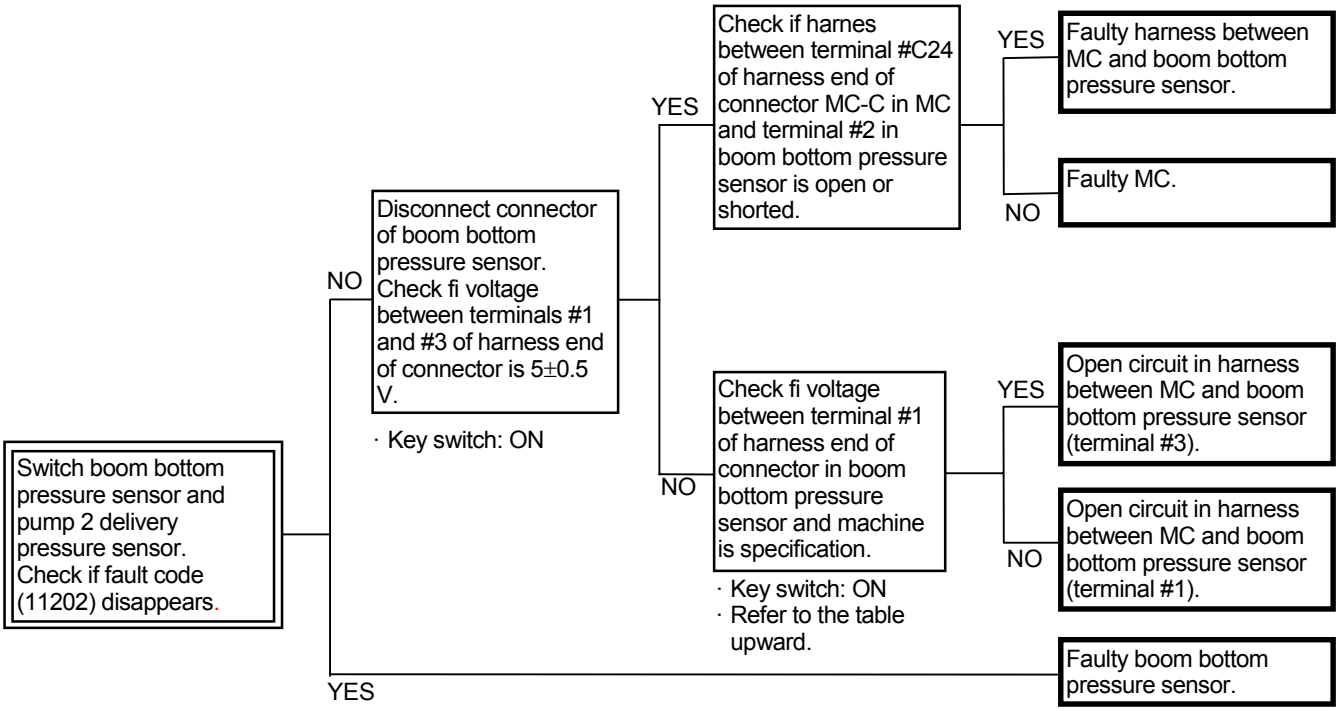
Fan Pump Control Solenoid Valve



T1J1-05-06-003

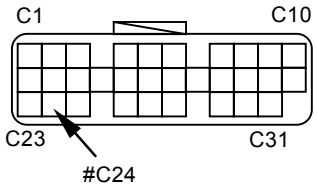
MC FAULT CODE 11802

Fault Code	Trouble	Cause
11802-3	Abnormal Boom Bottom Pressure Sensor High Voltage	Voltage: 4.5 V or higher
11802-4	Abnormal Boom Bottom Pressure Sensor Low Voltage	Voltage: Less than 0.25 V

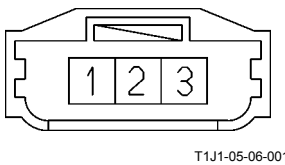


Connector (Harness end of connector viewed from the open side)

MC
Connector MC-C

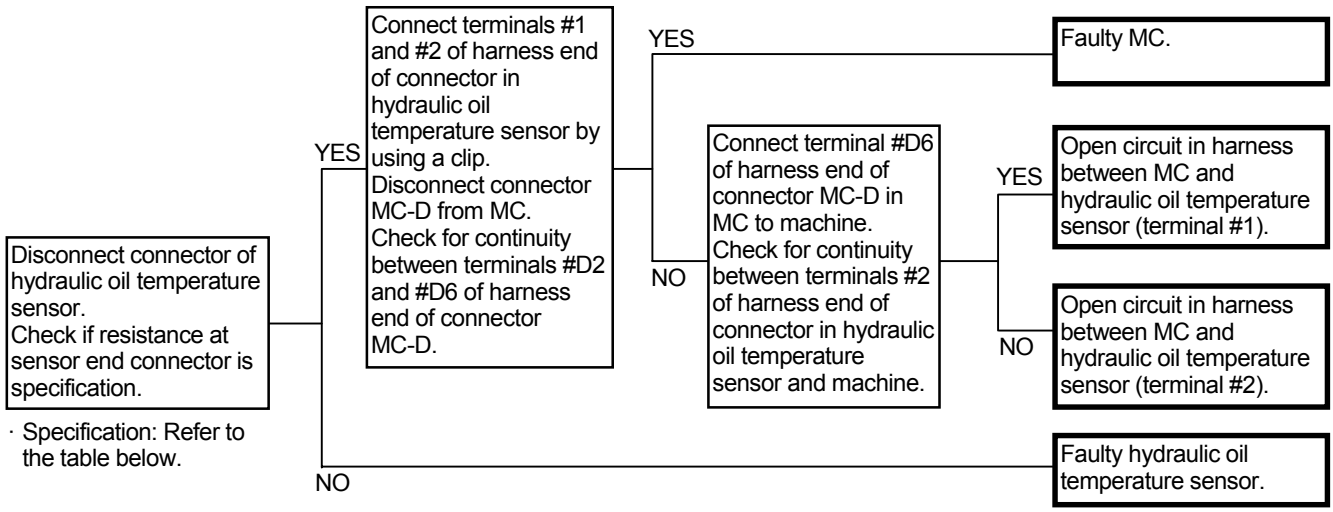


Boom Bottom Pressure Sensor



MC FAULT CODE 11901

Fault Code	Trouble	Cause
11901-3	Hydraulic Oil Temperature Sensor High Voltage	Intake Air Temp.: 21 °C or higher Voltage: 4.10 V or higher The above condition holds 30 seconds or more.
11901-4	Hydraulic Oil Temperature Sensor Low Voltage	Voltage: Less than 0.23 V The above condition holds 30 seconds or more.

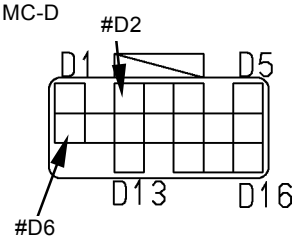


Specification of Hydraulic Oil Temperature Sensor

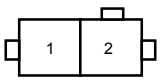
Hydraulic Oil Temperature (°C)	Resistance (kΩ)
-20	16.2±1.6
0	(5.88)
20	2.45±0.24
40	(1.14)
60	(0.534)
80	0.322

Connector (Harness end of connector viewed from the open side)

MC
Connector MC-D



Hydraulic Oil Temperature Sensor

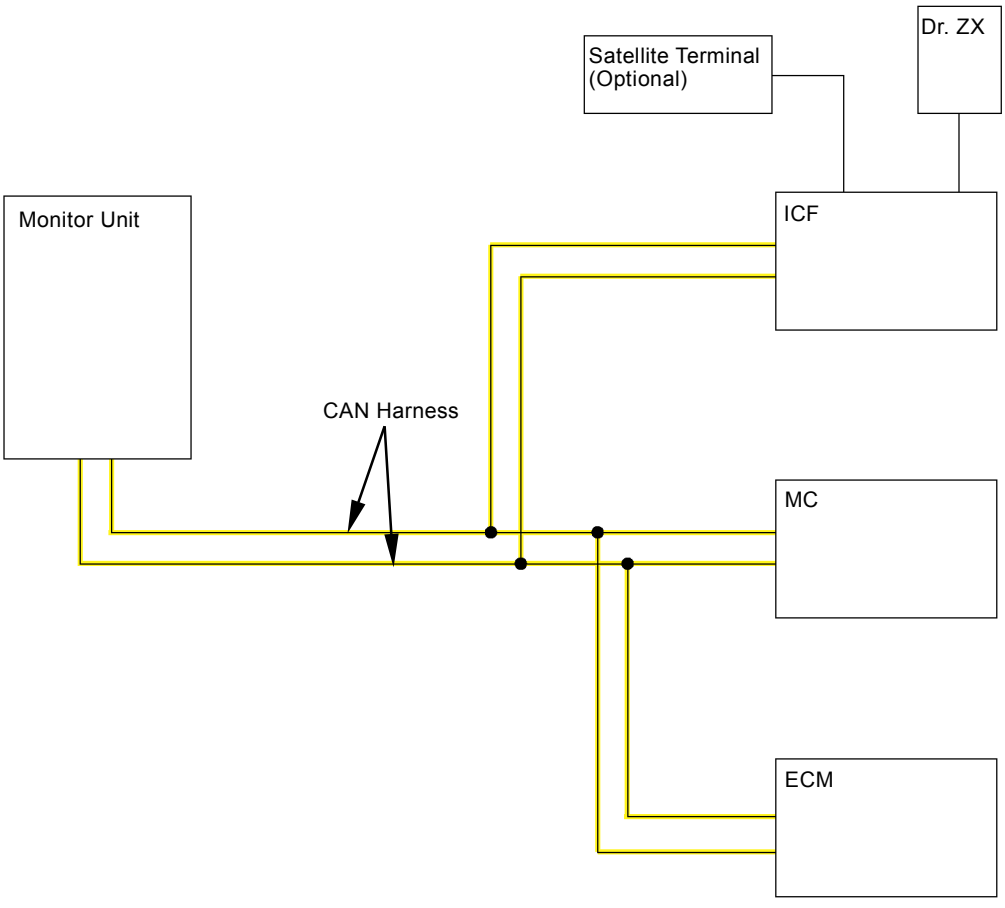


T183-05-04-009

(Blank)

MC FAULT CODES 11910,11911, 11914, 11918, 11920, 11983, 11984

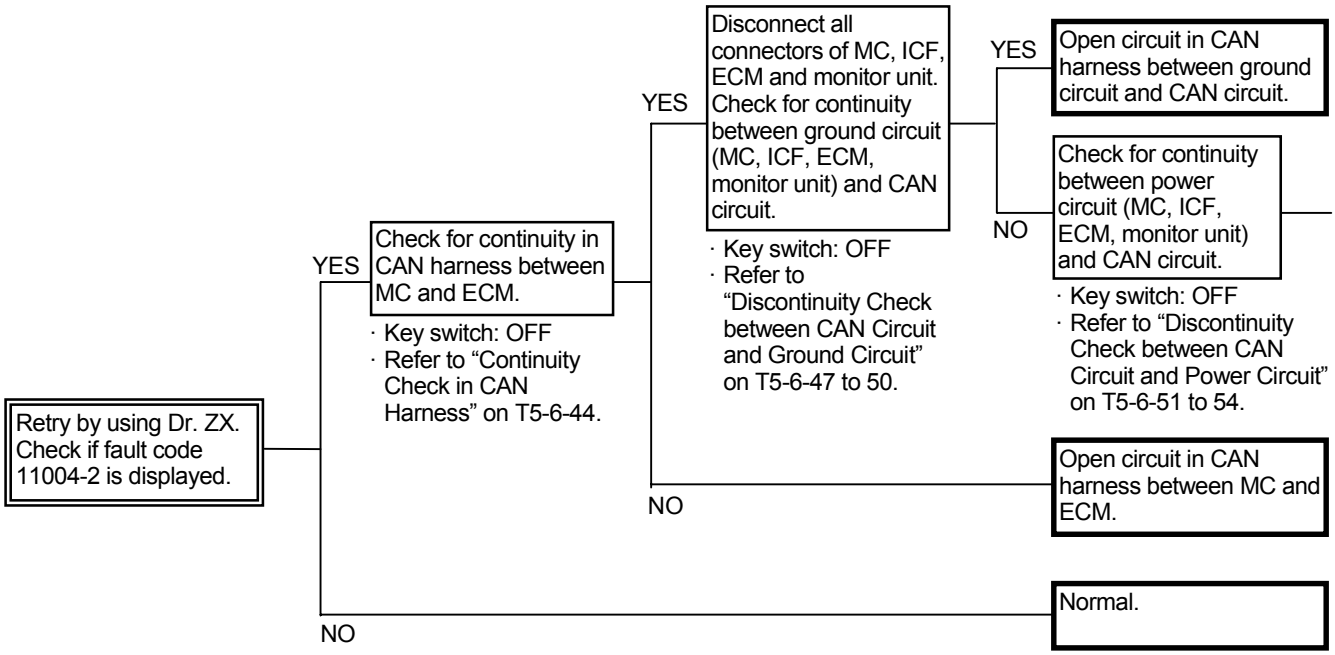
Fault Code	Trouble	Cause
11910-2	Actual Engine Speed Receive Error Sent from ECM	Faulty CAN Harness
11911-2	Security Signal Receive Error Sent from monitor unit	Faulty CAN Harness
11914-2	Radiator Water Temperature Receive Error Sent from ECM	Faulty CAN Harness
11918-2	Work Mode Receive Error Sent from monitor unit	Faulty CAN Harness
11920-2	Fuel Flow Receive Error Sent from ECM	Faulty CAN Harness
11983-2	Intake Air Temperature Receive Error Sent from ECM	Faulty CAN Harness
11984-2	Boost Temperature Receive Error Sent from ECM	Faulty CAN Harness



T1J1-02-01-004

MC FAULT CODES 11910, 11911, 11914, 11918, 11920, 11983, 11984 (CAN HARNESS CHECK)

- 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.

Check for continuity between key signal circuit (MC, ICF, ECM, monitor unit) and CAN circuit.

NO

· Key switch: OFF
· Refer to "Discontinuity Check between CAN Circuit and Key Signal Circuit" on T5-6-55 to 57.

YES

Shorted circuit in CAN harness.

Check for continuity between High side and Low side in CAN harness.

NO

· Key switch: OFF
· Refer to "Discontinuity Check in CAN Harness" on T5-6-58-to 59.

Connect all connectors except connector MC-C in MC.
Check if resistance between terminals #C4 and #C5 of harness end of connector MC-C is within 60±10 Ω.

NO

· Key switch: OFF

YES

To A

Disconnect connector in ECM.
Connect MC-C connector in MC.
Check if resistance between terminals #18 and #37 of harness end of connector in ECM is within 120±10 Ω.

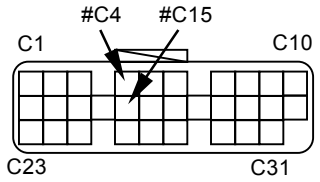
NO

To B

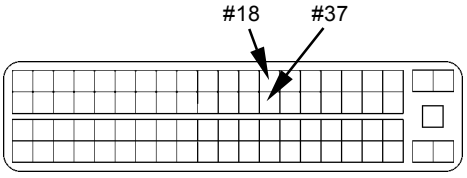
· Key switch: OFF

Connector

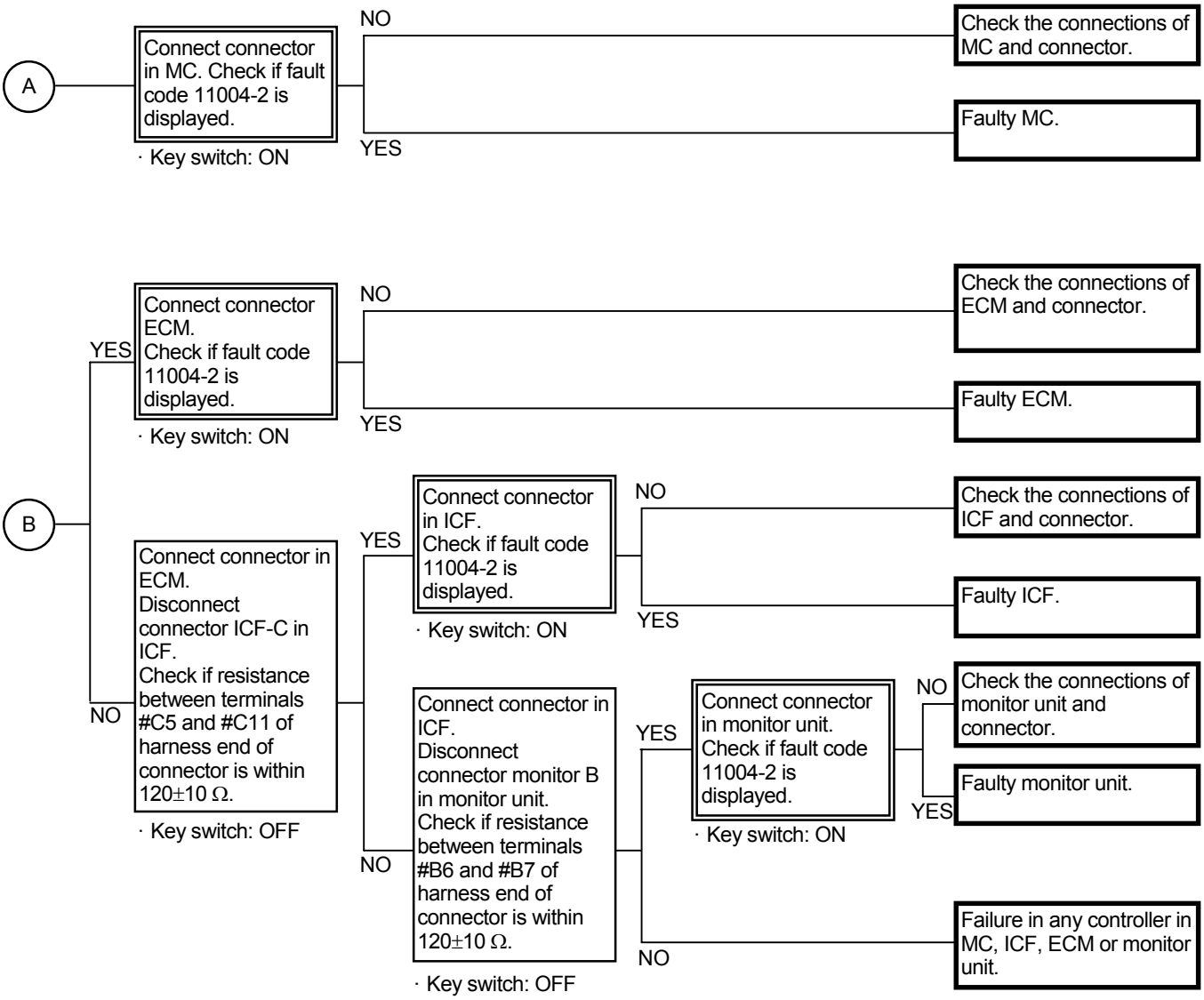
MC
Connector MC-C
(Harness end)



Monitor Unit
Connector Monitor-B
(Harness end)

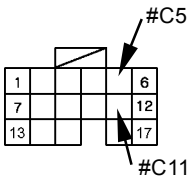


T1GR-05-04-002



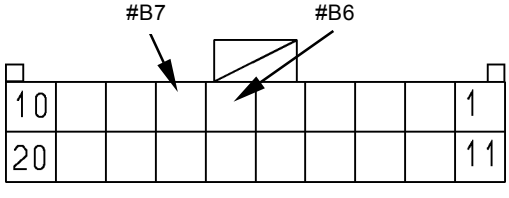
Connector

ICF
Connector ICF-C
(Harness end)



T1V1-05-04-002

ECM
Connector
(Harness end)

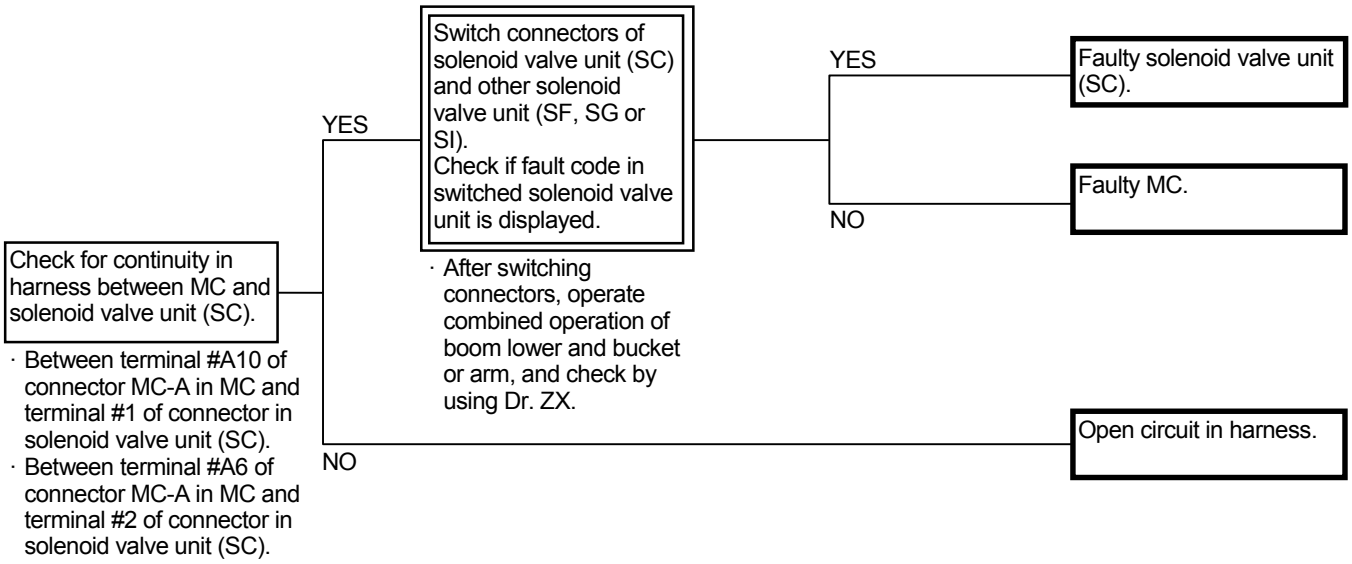


T183-05-04-013

MC FAULT CODE 11989

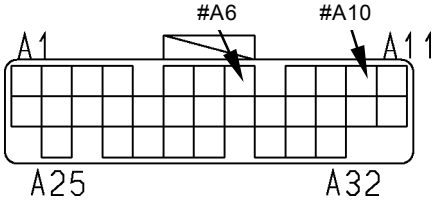
Fault Code	Trouble	Cause
11989-3	Abnormal Feedback High Current of Solenoid Valve Unit (SC) (Boom Mode Control)	Current: Higher than 920 mA
11989-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SC) (Boom Mode Control)	Current: Less than 56 mA

IMPORTANT: In case switching the connector in solenoid valve and performing the diagnosing, check for continuity in the solenoid before switching. When the connector is switched and the engine starts with the solenoid shorted, normal solenoid valve and MC may be damaged.
Reference value:
Pump control solenoid valve: 17.5 Ω at 20 °C
4-spool solenoid valve unit: 18.5 Ω at 20 °C



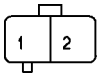
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-A



T183-05-04-008

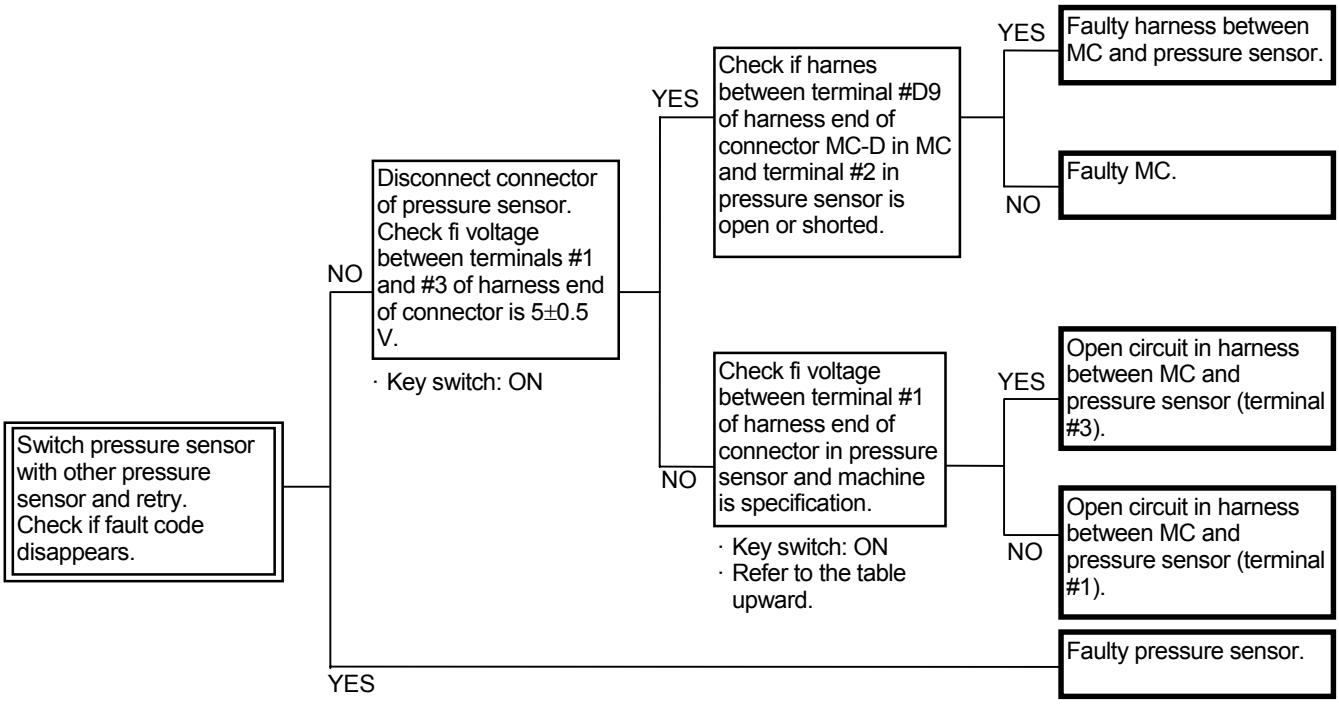
Solenoid Valve Unit (SC)



T1V1-05-04-003

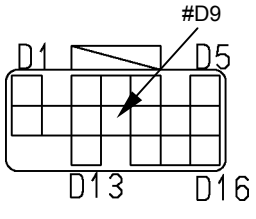
MC FAULT CODE 11991

Fault Code	Trouble	Cause
11991-3	Abnormal Travel Right Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher
11991-4	Abnormal Travel Right Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V



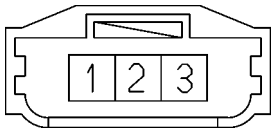
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-D



T183-05-04-009

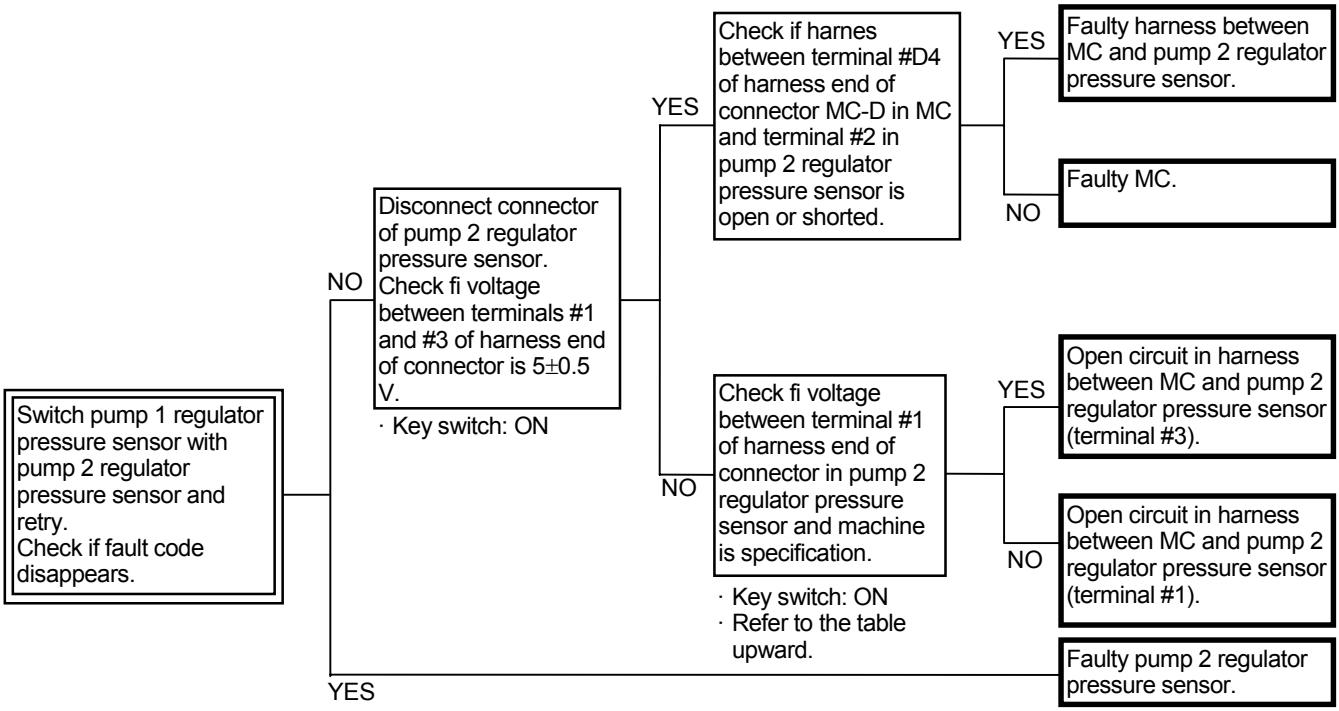
Pilot Pressure Sensor
(Travel Right)



T1J1-05-06-001

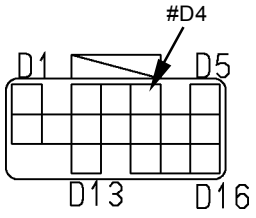
MC FAULT CODE 11992

Fault Code	Trouble	Cause
11992-3	Abnormal Pump 2 Regulator Pressure Sensor High Voltage	Voltage: 4.75 V or higher
11992-4	Abnormal Pump 2 Regulator Pressure Sensor Low Voltage	Voltage: Less than 0.25 V



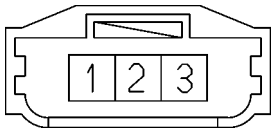
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-D



T183-05-04-009

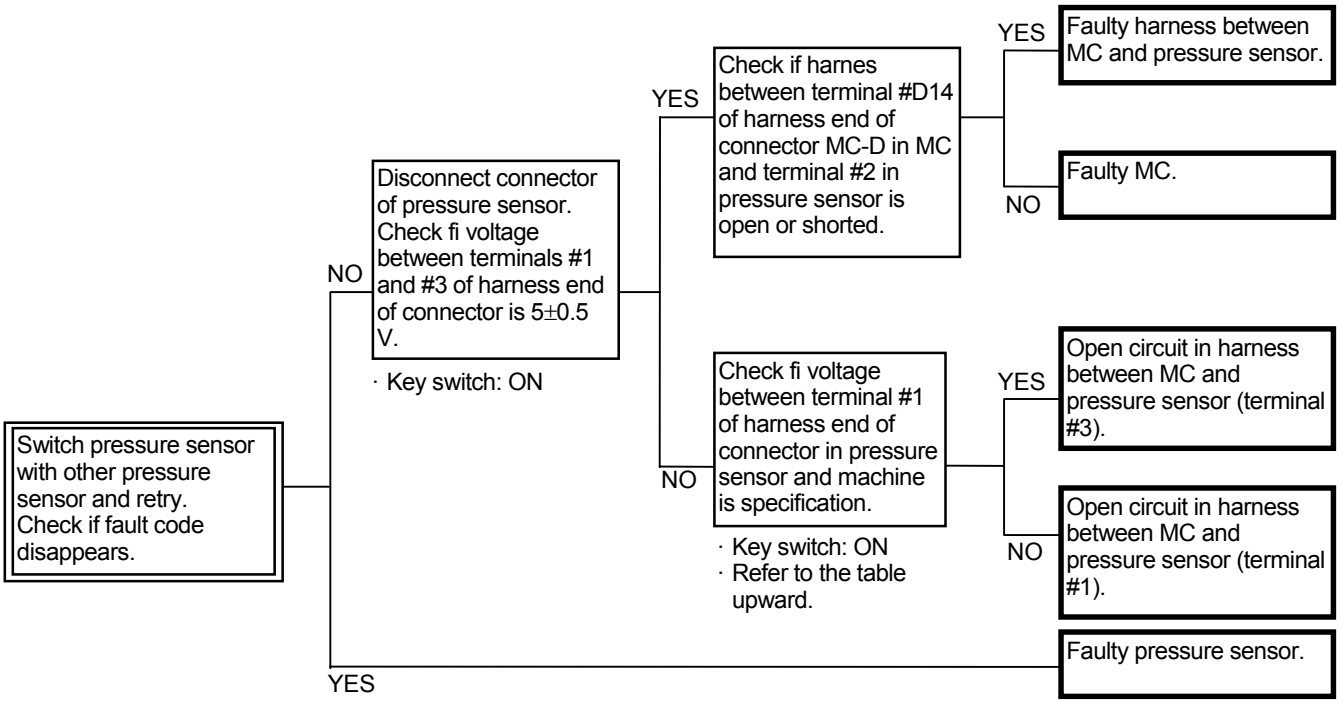
Pump 2 Regulator Pressure Sensor



T1J1-05-06-001

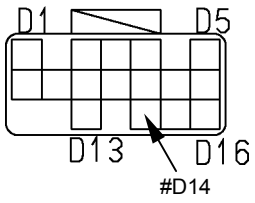
MC FAULT CODE 11993

Fault Code	Trouble	Cause
11993-3	Abnormal Travel Left Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher
11993-4	Abnormal Travel Left Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V



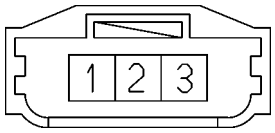
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-D



T183-05-04-009

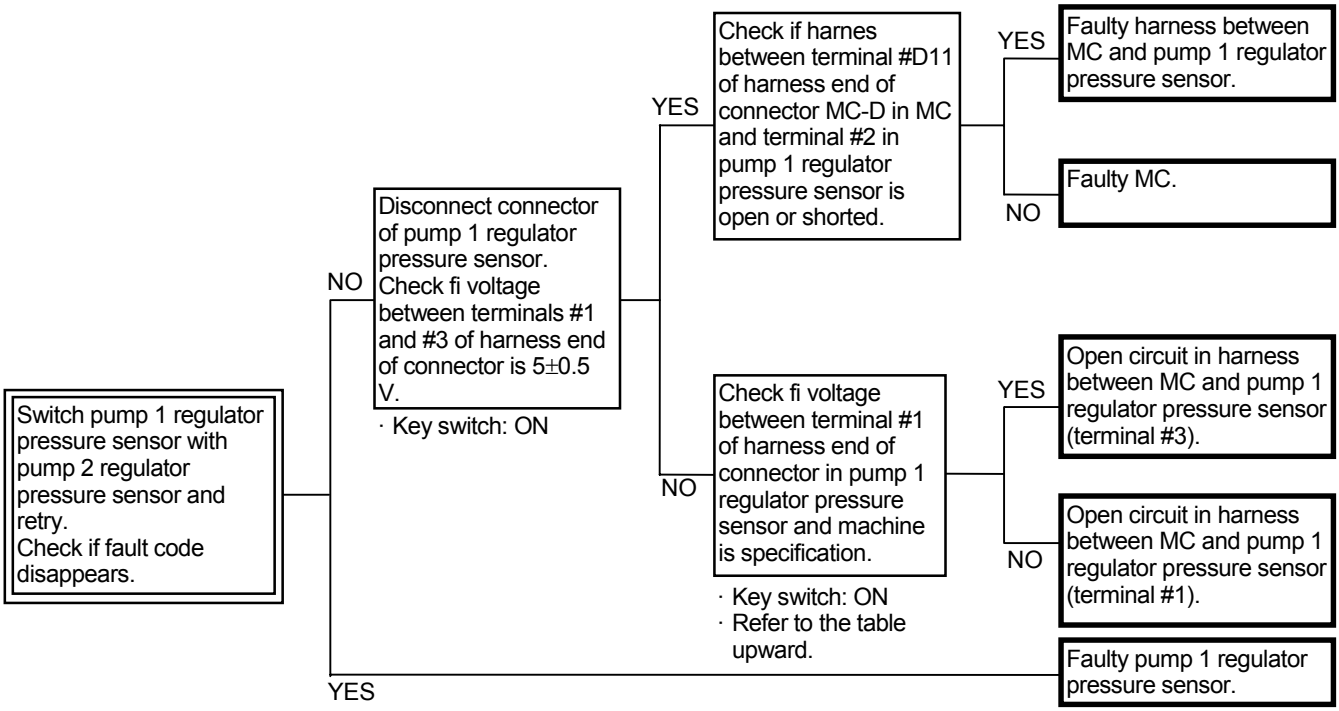
Pilot Pressure Sensor
(Travel Left)



T1J1-05-06-001

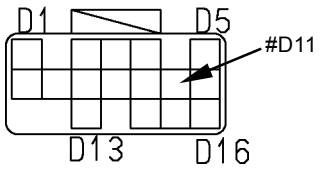
MC FAULT CODE 11994

Fault Code	Trouble	Cause
11994-3	Abnormal Pump 1 Regulator Pressure Sensor High Voltage	Voltage: 4.75 V or higher
11994-4	Abnormal Pump 1 Regulator Pressure Sensor Low Voltage	Voltage: Less than 0.25 V



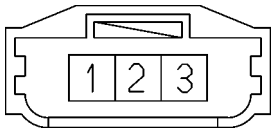
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-D



T183-05-04-009

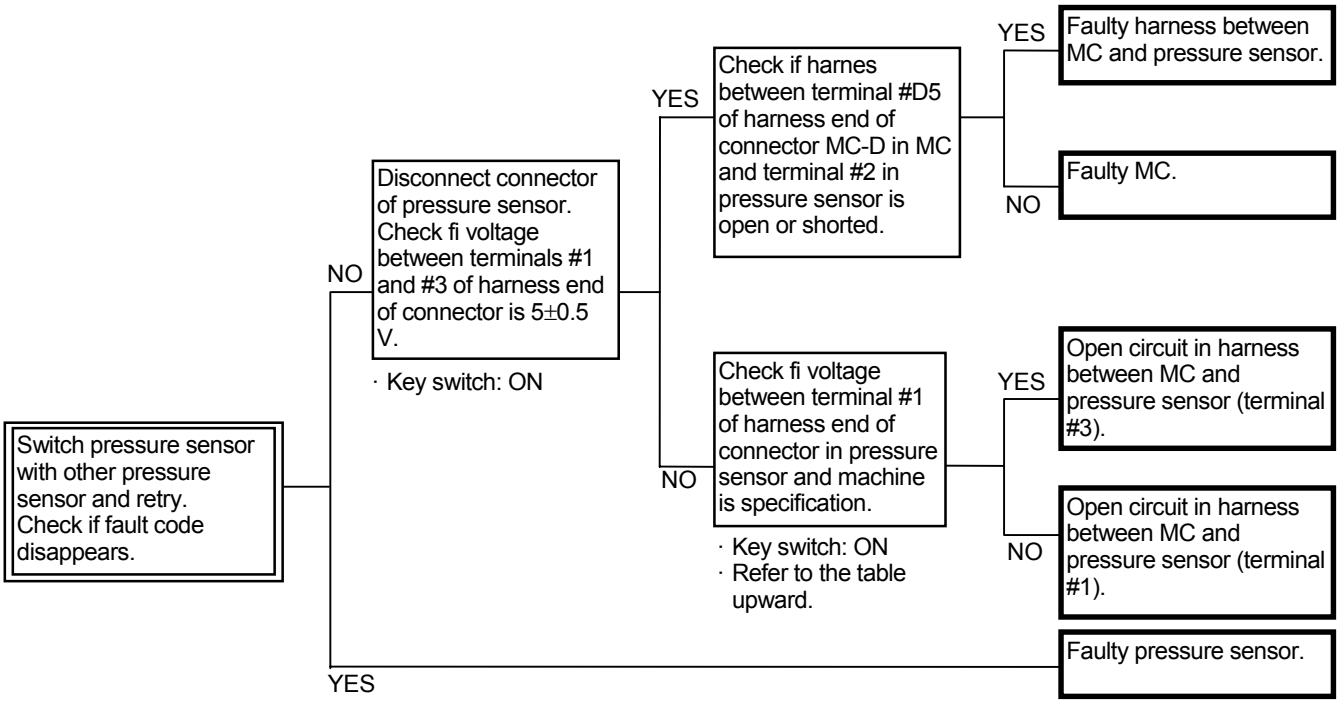
Pump 1 Regulator Pressure Sensor



T1J1-05-06-001

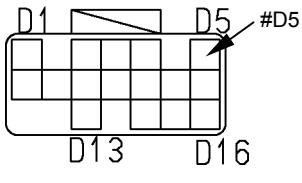
MC FAULT CODE 11995

Fault Code	Trouble	Cause
11995-3	Abnormal Arm Roll-Out Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher
11995-4	Abnormal Arm Roll-Out Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V



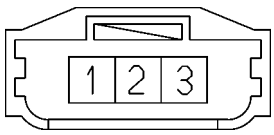
Connector (Harness end of connector viewed from the open side)

MC
Connector MC-D



T183-05-04-009

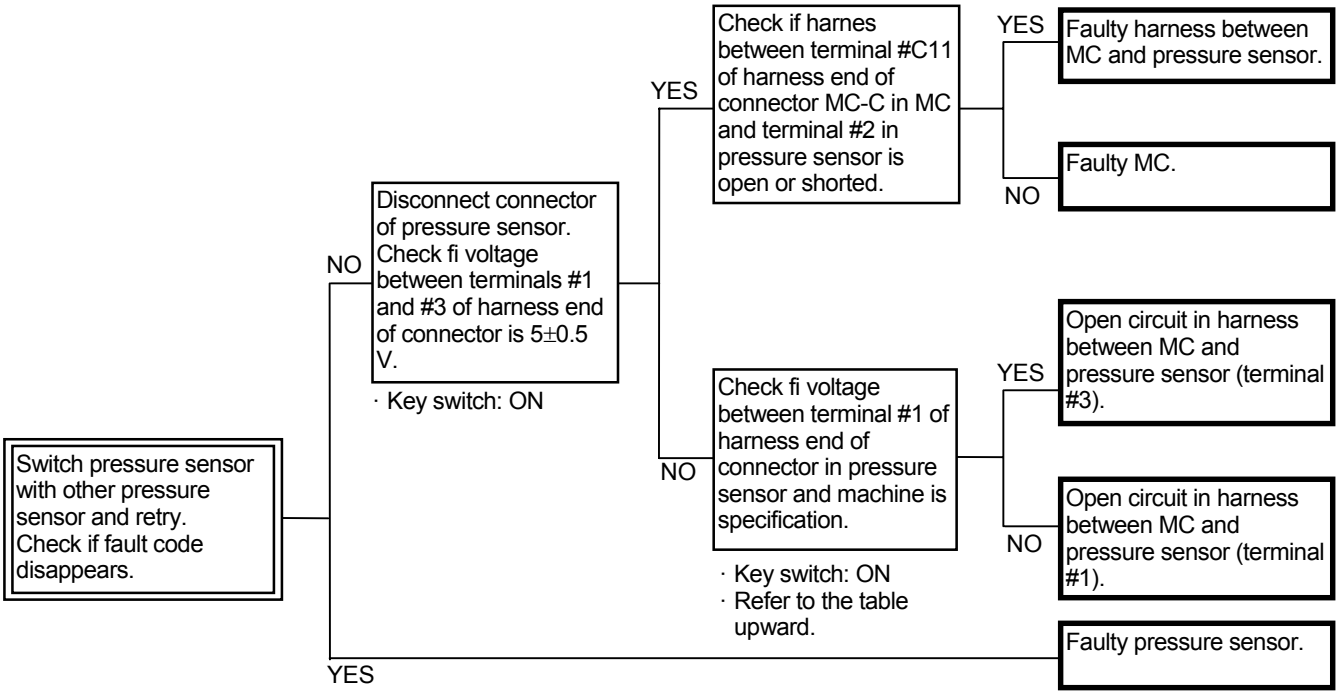
Pilot Pressure Sensor
(Arm Roll-Out)



T1J1-05-06-001

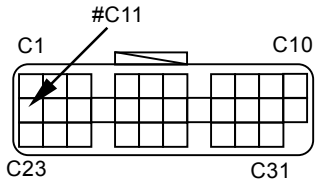
MC FAULT CODE 11997

Fault Code	Trouble	Cause
11997-3	Abnormal Bucket Roll-Out Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher
11997-4	Abnormal Bucket Roll-Out Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V

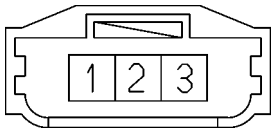


Connector (Harness end of connector viewed from the open side)

MC
Connector MC-C



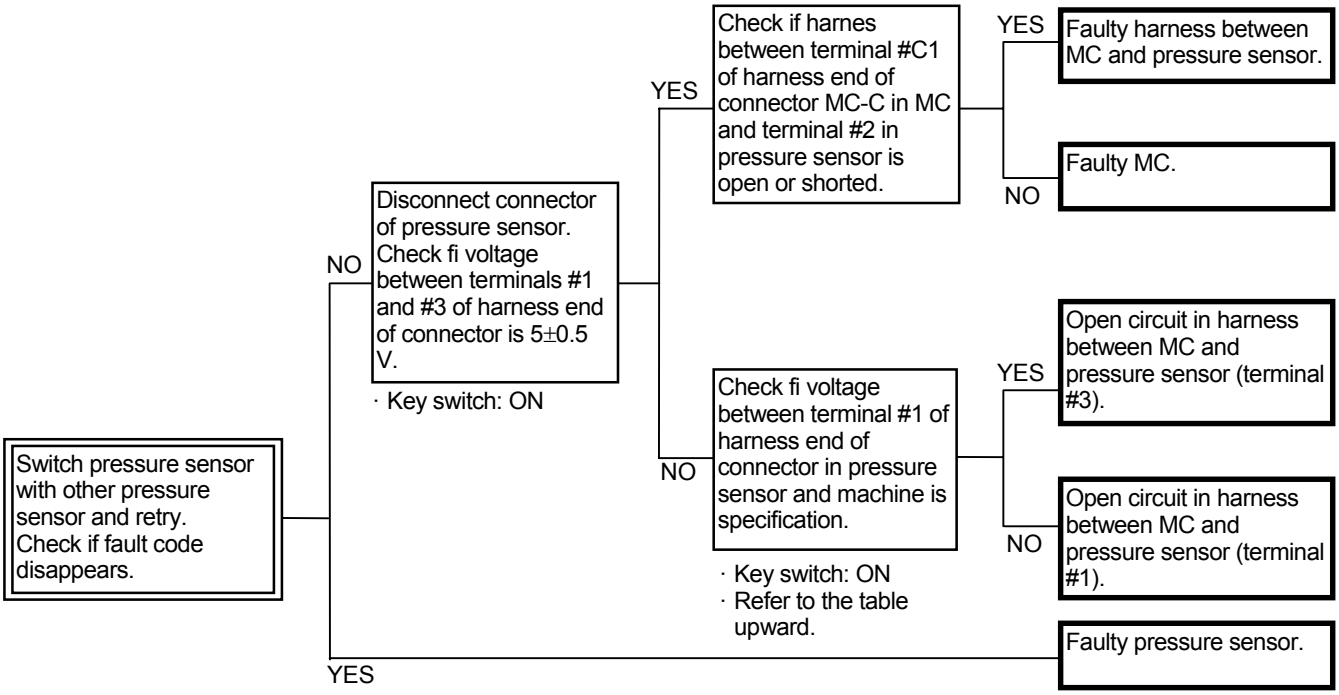
Pilot Pressure Sensor (Bucket Roll-Out)



T1J1-05-06-001

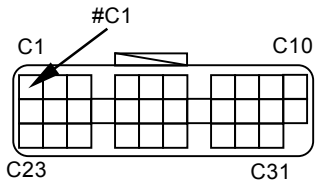
MC FAULT CODE 11998

Fault Code	Trouble	Cause
11998-3	Abnormal Boom Lower Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher
11998-4	Abnormal Boom Lower Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V

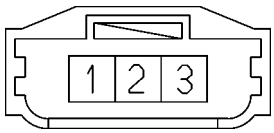


Connector (Harness end of connector viewed from the open side)

MC
Connector MC-C



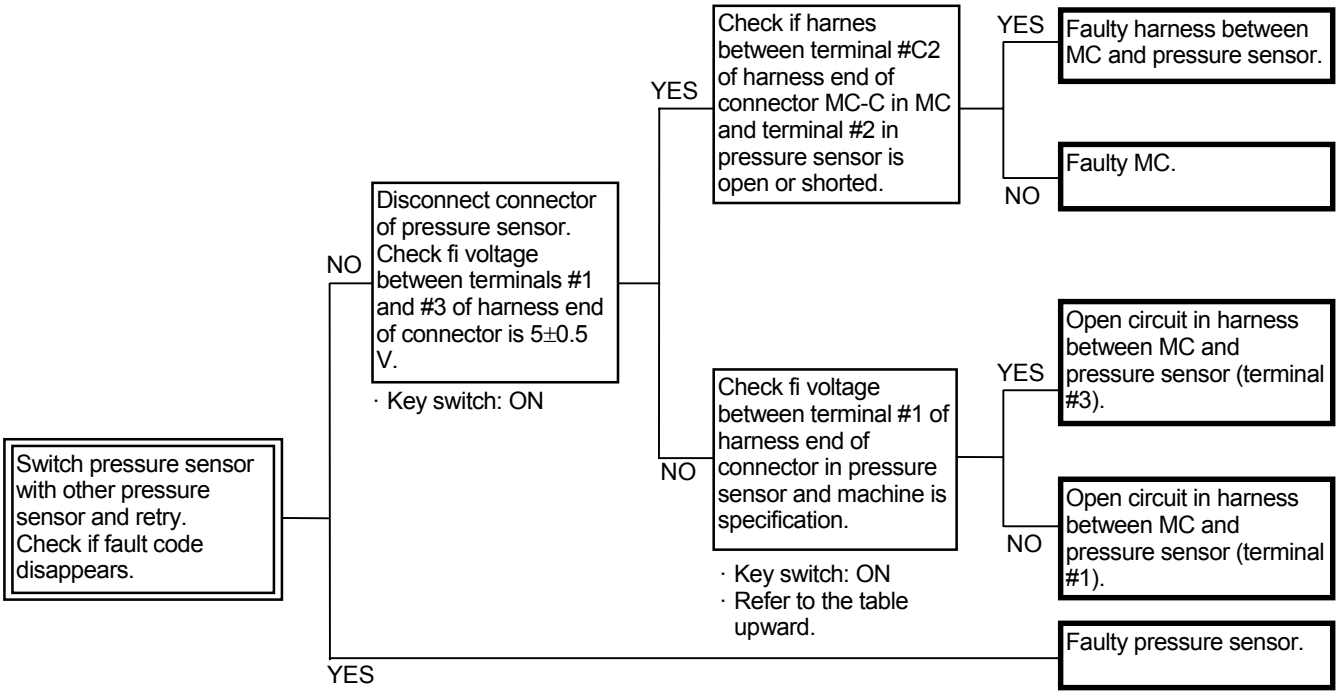
Pilot Pressure Sensor (Boom Lower)



T1J1-05-06-001

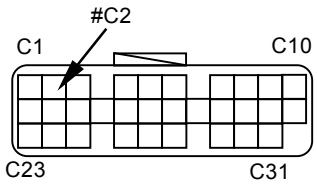
MC FAULT CODE 11999

Fault Code	Trouble	Cause
11999-3	Abnormal Bucket Roll-In Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher
11999-4	Abnormal Bucket Roll-In Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V

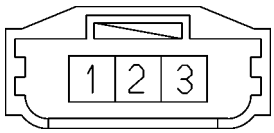


Connector (Harness end of connector viewed from the open side)

MC
Connector MC-C



Pilot Pressure Sensor (Bucket Roll-In)



T1J1-05-06-001

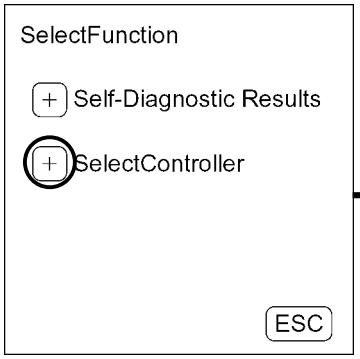
(Blank)

ICF 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 retry, check the following item. • Check the CAN communication line (harness).
14001-2	Flash Memory: Read / Write Error	Execute retry B in self-diagnosing and execute the following item. • Execute “Information C/U: Initialize”.
14002-2	External RAM: Read / Write Error	
14003-2	EEPROM: Sum Check Error	Execute retry B in self-diagnosing. If this error code is displayed after retry, 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

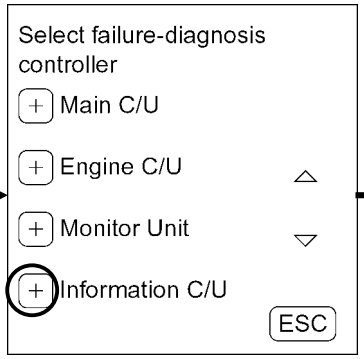
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

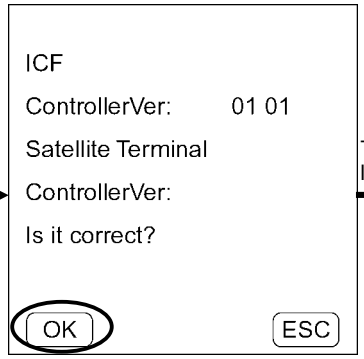
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1V7-05-03-024

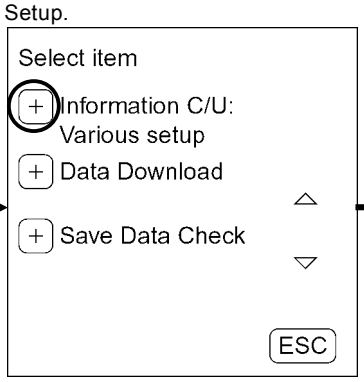
ICF Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

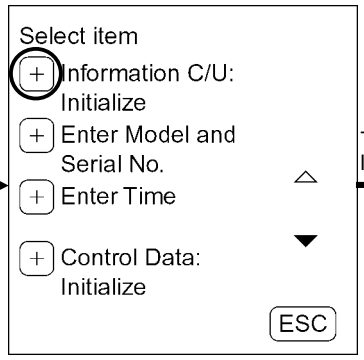
Push Information C/U: Various Setup.



T1V7-05-03-026

Main Menu Screen

Push Information C/U: Initialize.

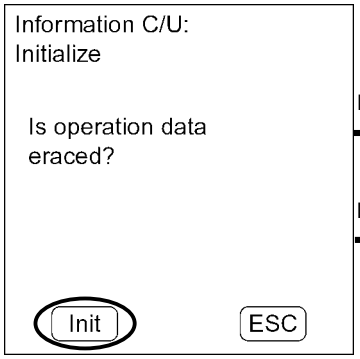


To the lower

T1V7-05-03-027

Information C/U: Various Setup Screen

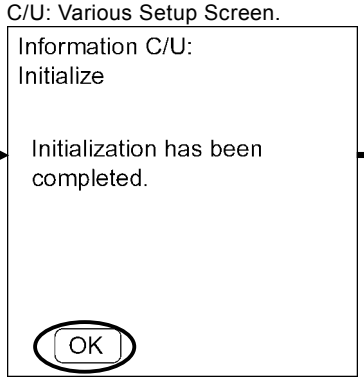
Push Init and the controller operating data is initialied. Push ESC and return to Information C/U: Various Setup Screen.



T1V7-05-03-028

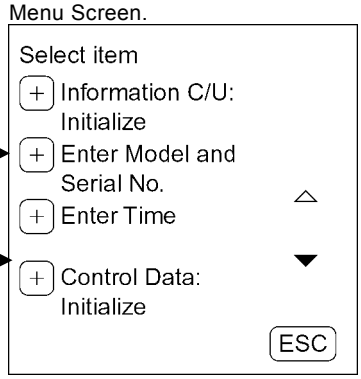
Information C/U: Initialize Screen

Push OK and return to Information C/U: Various Setup Screen.



T1V7-05-03-029

Push ESC and return to Main Menu Screen.

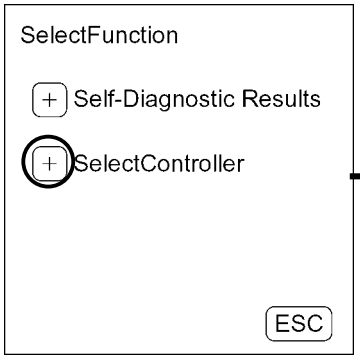


T1V7-05-03-027

Information C/U: Various Setup Screen

CONTROL DATA: INITIALIZE

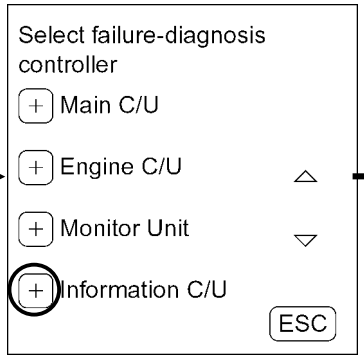
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

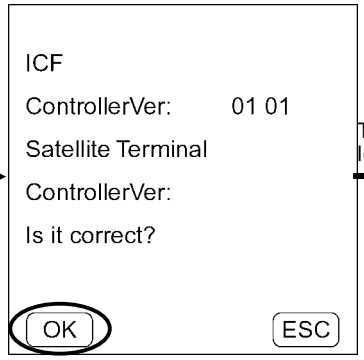
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.

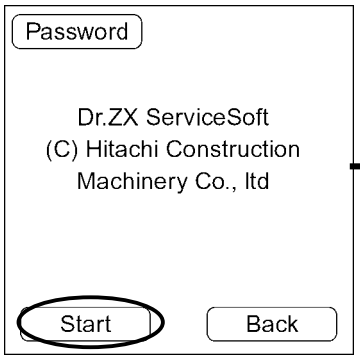


To the lower

T1V7-05-03-024

ICF Controller Screen

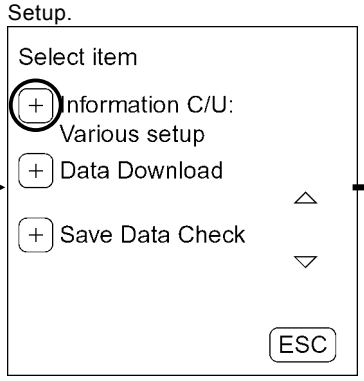
Push Start.



T1V7-05-03-025

Title Screen

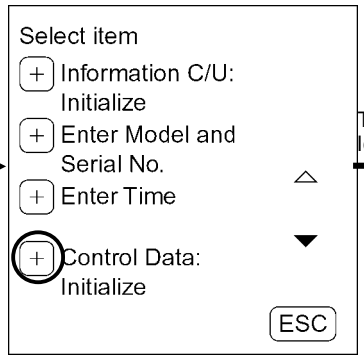
Push Information C/U: Various Setup.



T1V7-05-03-026

Main Menu Screen

Push Control Data: Initialize.

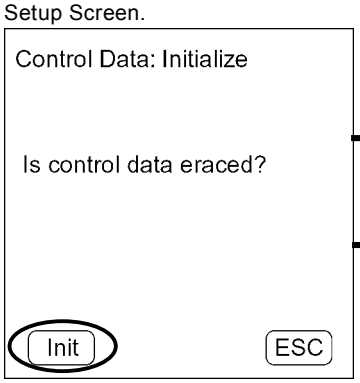


To the lower

T1V7-05-03-027

Information C/U: Various Setup Screen

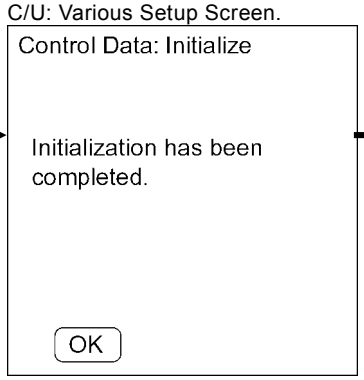
Push Init and the controller control data is initialied. Push ESC and return to Information C/U: Various Setup Screen.



T1V7-05-03-033

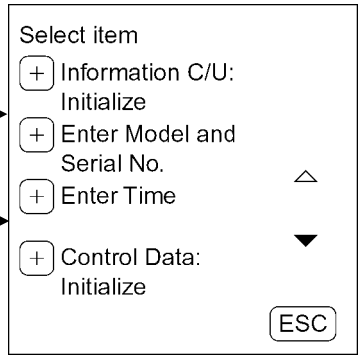
Control Data: Initialize Screen

Push OK and return to Information C/U: Various Setup Screen.



T1V7-05-03-034

Push ESC and return to Main Menu Screen.

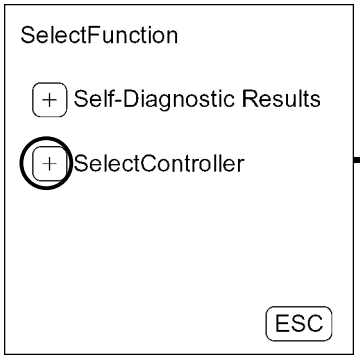


T1V7-05-03-027

Information C/U: Various Setup Screen

ENTER MODEL AND SERIAL No.

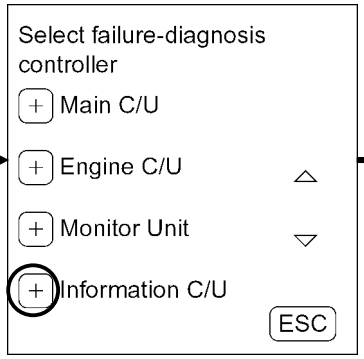
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

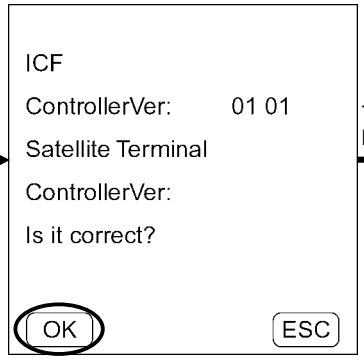
Push Information C/U.



T1V7-05-03-009

Controller Selection Screen

Push OK.



To the lower

T1V7-05-03-024

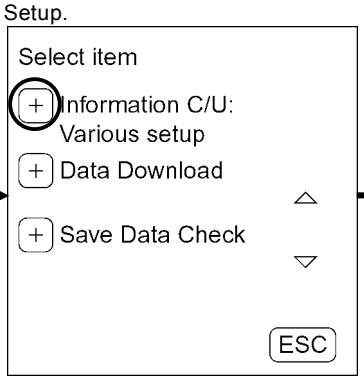
ICF Controller Screen

Push Start.

T1V7-05-03-025

Title Screen

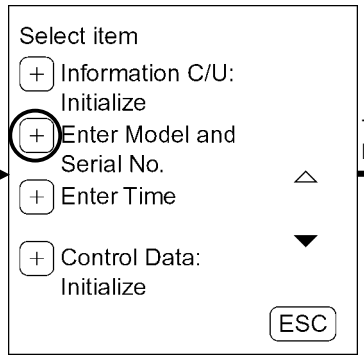
Push Information C/U: Various Setup.



T1V7-05-03-026

Main Menu Screen

Push Enter Model and Serial No.



To the lower

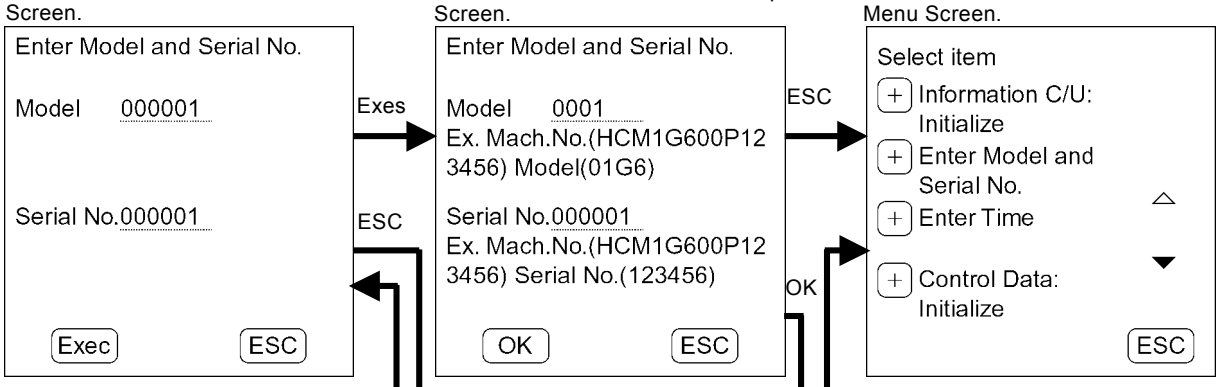
T1V7-05-03-027

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.

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.

Push ESC and return to Main Menu Screen.



T1V7-05-03-030

Enter Model and Serial No. Screen

T1V7-05-03-031

T1V7-05-03-027

Information C/U: Various Setup Screen

ICF FAULT CODES 14006, 14008

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 retry, 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 retry, replace the controller.

Fault Code 14006-2

• Check the communication line

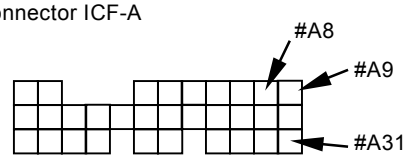
1. Check for continuity between terminal #A8 of harness end of connector ICF-A in ICF and terminal #10 of harness end of connector A in satellite terminal.
2. Check for continuity between terminal #A9 of harness end of connector ICF-A in ICF and terminal #20 of harness end of connector A in satellite 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

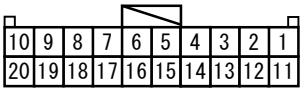
1. Check the battery power
   Check voltage between terminal #2 of harness end of connector A in satellite terminal and machine is 24 V.
2. Check the main power
   With the key switch ON, check voltage between terminal #1 of harness end of connector A in satellite terminal and machine is 24 V.
3. Check 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)

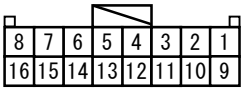
ICF
Connector ICF-A



Satellite
Connector A



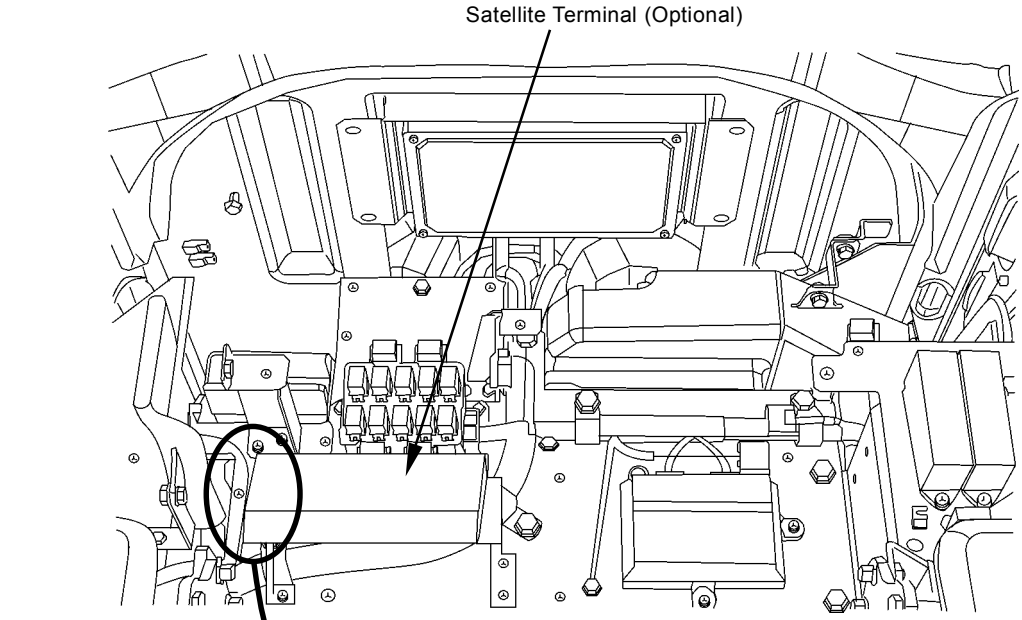
Satellite
Connector B



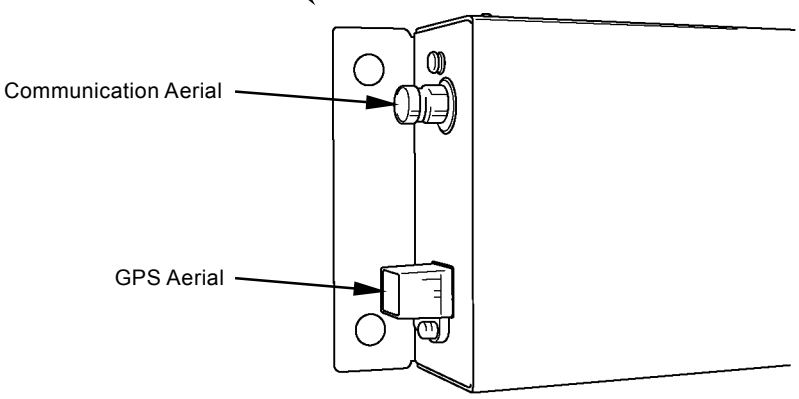
SATELLITE TERMINAL (OPTIONAL) FAULT CODES 14100 to 14106

Fault Code	Trouble	Remedy
14100-2	Abnormal EEPROM	Execute retry B in self-diagnosing. If this error code is displayed after retry, replace the controller.
14101-2	Abnormal IB/OB Queue	
14102-2	Abnormal Local Loup Back	Check the communication aerial of satellite terminal.
14103-2	The satellite is not found.	
14104-2	Fail 1 of Remote Loup Back	Execute retry B in self-diagnosing. If this error code is displayed after retry, replace the controller.
14105-2	Fail 2 of Remote Loup Back	
14106-2	Sending and receiving data are mismatched.	

Fault Codes 14102-2, 14103-2



T1J1-01-02-003

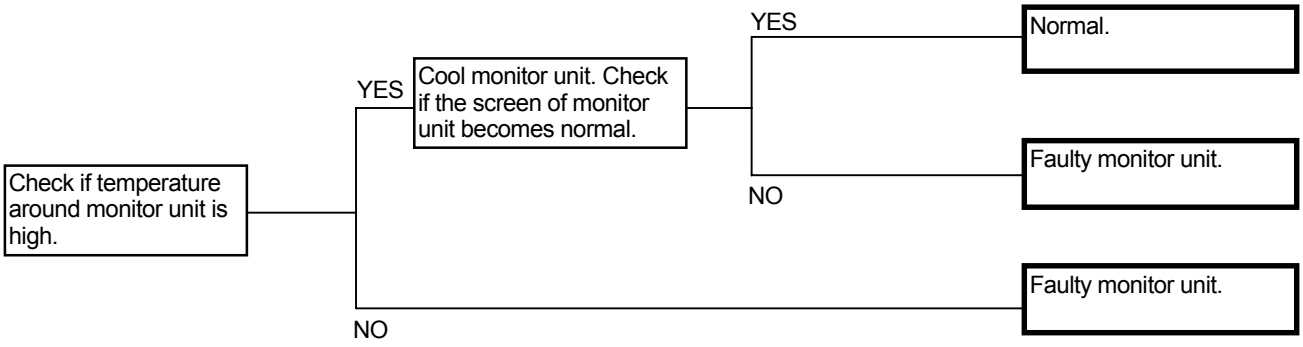


T1V1-05-06-004

MONITOR UNIT FAULT CODE 13303

Fault Code	Trouble	Remedy
13303-2	Abnormal Thermistor Temperature	Cool the monitor unit until temperature inside the monitor unit becomes less than 85 °C.

The screen of monitor unit becomes dark.

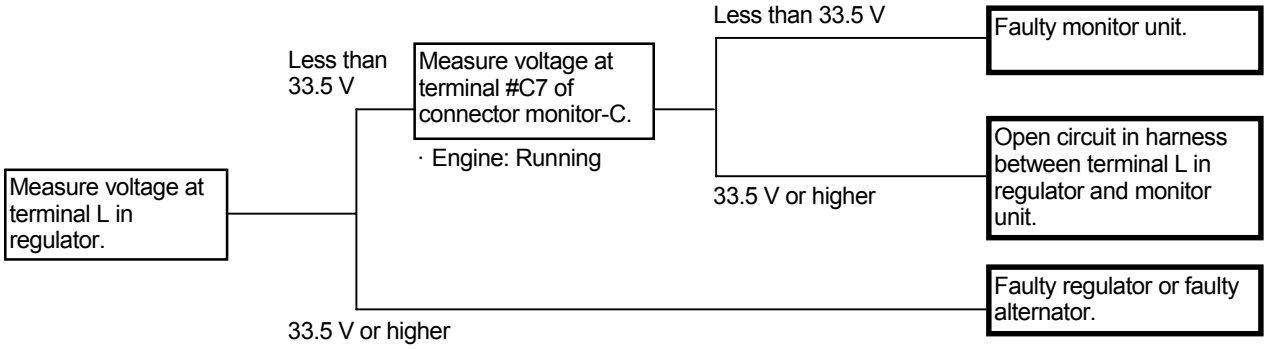


MONITOR UNIT FAULT CODE 13304

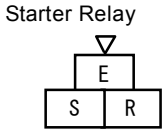
Fault Code	Trouble	Remedy
13304-2	Abnormal REG Input H Level	Refer to the following.

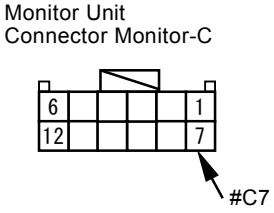
- Check the wiring connections first.

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. Check for continuity at terminal R in starter relay and terminal L in regulator.



Connector (Harness end of connector viewed from the open end)



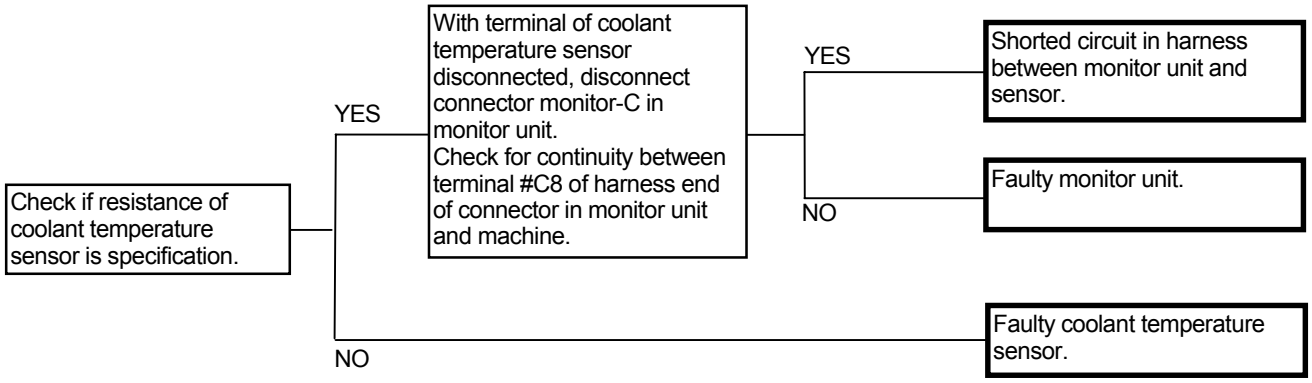


MONITOR UNIT FAULT CODES 13306, 13308

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” (T5-6-44 to 59).

MONITOR UNIT FAULT CODE 13310

Fault Code	Trouble	Remedy
13310-3	Shorted Circuit in Coolant Temperature Sensor	Check the coolant temperature sensor and harness.

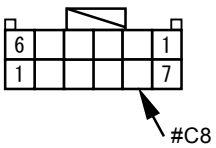


Coolant Temperature Sensor

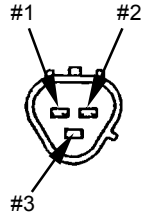
Coolant Temperature (°C)	Resistance (kΩ)
25	7.6
40	4.0±0.35
50	2.7±0.216
80	0.98
95	0.60
105	0.45
120	0.30

Connector (Harness end of connector viewed from the open end)

Monitor Unit
Connector Monitor-C



Coolant Temperature Sensor



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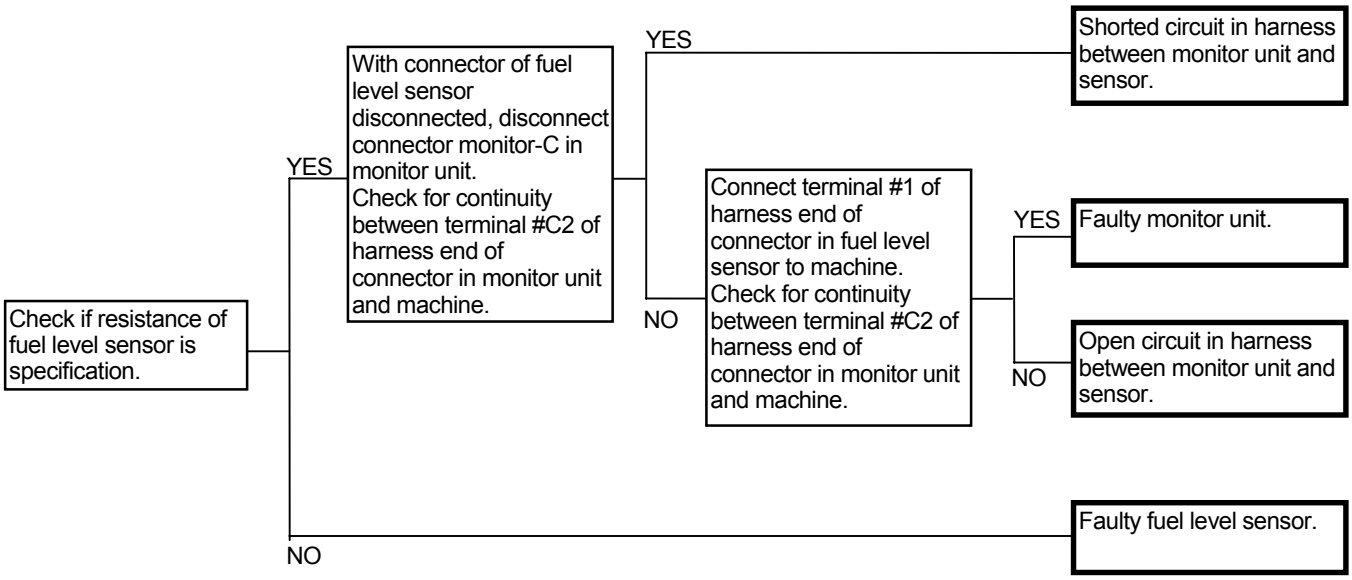
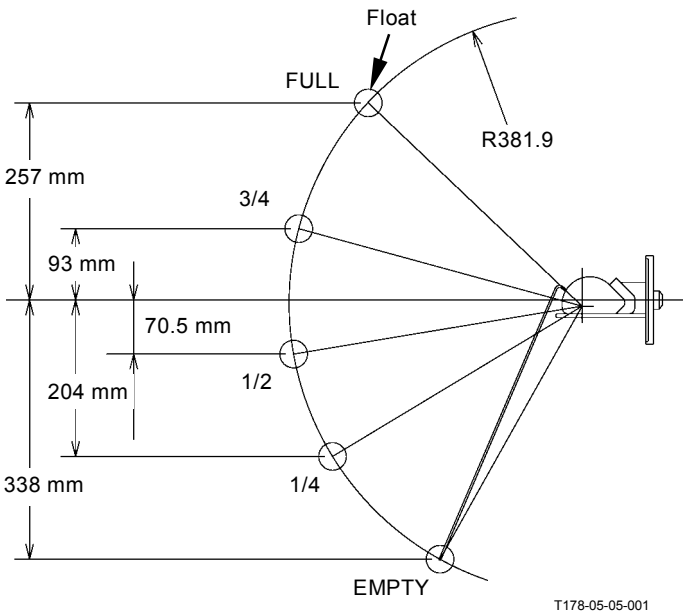
MONITOR UNIT FAULT CODE 13311

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.



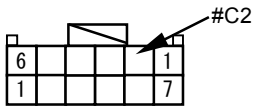
Fuel Level Sensor



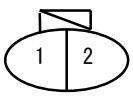
Float Position	Resistance (Ω)
Upper Limit (FULL)	10^{+0}_{-4}
3/4	26
1/2	38±5
1/4	53
Alarm Level	85±3
Lower Limit (EMPTY)	90^{+10}_{-0}

Connector (Harness end of connector viewed from the open end)

Monitor Unit
Connector Moniter-C

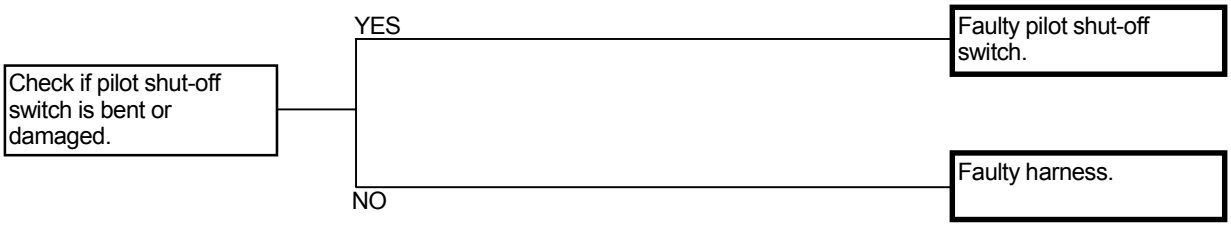


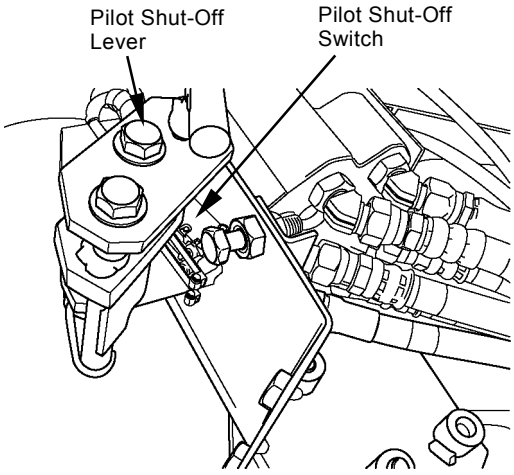
Fuel Sensor



PILOT SHUT-OFF LEVER ALARM

Pilot shut-off lever alarm is displayed on the monitor unit screen.



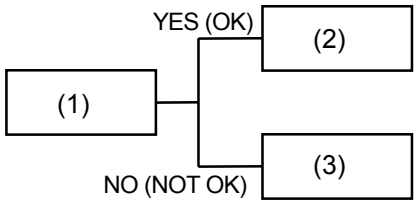


T1V1-05-06-005

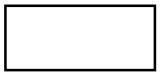
TROUBLESHOOTING B PROCEDURE

Apply troubleshooting B procedure when no fault code is displayed on the service menu in monitor unit (built-in diagnosing system) and Dr.ZX although the machine operation is abnormal.
When the fault code is displayed, refer to Troubleshooting A and start the troubleshooting.
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



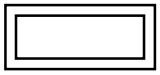
- After checking or measuring item (1), select either YES (OK) or NO (NOT OK) and proceed to item (2) or (3), as appropriate.



· 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 in monitor unit (built-in diagnosing system) or 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.

Parts		Engine Control Dial	Pump 1 Delivery Pressure Sensor	Pump 2 Delivery Pressure Sensor
Function		• Instructs engine target speed.	• Monitors pump delivery pressure to control HP mode, horsepower relief flow rate reducing and auto-power lift controls.	• Monitors pump delivery pressure to control HP mode, horsepower, swing horsepower reducing and attachment mode controls.
Symptoms in control system when trouble occurs.		• Engine speed does not change even if engine control dial is turned. • If discontinuity or shorted circuit occurs in engine control dial, target speed of 1200 min^{-1} is used as back-up value.	• If pump delivery pressure sensor output is 0.25 V or 4.75 V, following symptoms will be presented by back-up mode function.	• If pump delivery pressure sensor output is 0.25 V or 4.75 V, following symptoms will be presented by back-up mode function.
Symptoms in machine operation when trouble occurs.		• Engine speed is kept unchanged from 1200 min^{-1}. (Auto-idle system functions. Engine can be stopped by key switch.)	• HP mode is inoperable. (Even if operating arm roll-in and boom raise with power mode switch in HP mode position, engine speed does not increase.) • As delivery pressure and flow rate of pump 1 are limited, operating speed is slow and power is weak except swing operation. • Engine easily stalls. • Under swing combined operations, swing power is weak. • During boom raise single operation, pressure does not increase (power is weak).	• HP mode is inoperable. (Even if operating arm roll-in and boom raise with power mode switch in HP mode position, engine speed does not increase.) • As delivery pressure and flow rate of pump 2 are limited, operation speed is slow and power is weak except bucket operation. • Engine easily stalls.
Evaluation	By MC Fault Code	Fault code 11101 is displayed.	Fault code 11200 is displayed.	Fault code 11202 is displayed.
	By Monitor Function	Monitor Item: Requested Engine Speed, EC Dial Angle (Displayed by built-in diagnosing system)	Monitor Item: Pump 1 Delivery Pressure (Displayed by built-in diagnosing system)	Monitor Item: Pump 2 Delivery Pressure (Displayed by built-in diagnosing system)
	Using Test Harness	-	-	-
	Others	-	-	-
NOTE		-	• Judge if pressure sensor is faulty or harness is disconnected by switching with pump 2 delivery pressure sensor.	• Judge if pressure sensor is faulty or harness is disconnected by switching with pump 1 delivery pressure sensor.
Descriptions of Control (Operational Principle Section in T/M)		T2-1	T2-1	T2-1

Pressure Sensor (Boom Raise)	Pressure Sensor (Boom Lower)	Pressure Sensor (Arm Roll-Out)
• Monitors boom raise pilot pressure. (HP mode control, auto-power lift control and boom mode selector control)	• Monitors boom lower pilot pressure. (Boom mode selector control and boom mode flow rate control valve control)	• Monitors arm roll-out pilot pressure. (Boom mode selector control and boom mode flow rate control valve control)
• Abnormal low voltage: No signals arrive to MC. • Abnormal high voltage: As the sensor is detected as fully operated, the sensor is controlled.	• Abnormal low voltage: No signals arrive to MC. • Abnormal high voltage: As the sensor is detected as fully operated, the sensor is controlled.	• Abnormal low voltage: No signals arrive to MC. • Abnormal high voltage: As the sensor is detected as fully operated, the sensor is controlled.
• Engine speed becomes below E mode speed (1580 min^{-1}). Abnormal high voltage: • Even if lever is in neutral with auto-idle switch ON, engine speed does not decrease. Abnormal low voltage: • Even if boom is raised with auto-idle switch ON, engine speed does not increase. • Even if boom is raised with power mode switch in HP mode position, engine speed does not increase. • During boom raise single operation, pressure does not increase (power is weak). • Even if boom is raised with boom mode selector switch ON, boom mode selector control is inoperable. (Machine vibrations are many.)	• Engine speed becomes below E mode speed (1580 min^{-1}). Abnormal high voltage: • Even if lever is in neutral with auto-idle switch ON, engine speed does not decrease. Abnormal low voltage: • Even if boom is lowered with auto-idle switch ON, engine speed does not increase. • During combined operation of boom lower and arm or bucket, speed of arm or bucket is slow. • Even if boom is lowered with boom mode selector switch ON, boom mode selector control is inoperable. (Machine vibrations are many.)	• Engine speed becomes below E mode speed (1580 min^{-1}). Abnormal high voltage: • Even if lever is in neutral with auto-idle switch ON, engine speed does not decrease. Abnormal low voltage: • Even if arm is rolled out with auto-idle switch ON, engine speed does not increase. • During combined operation of boom lower and arm roll-out, speed of arm roll-out is slow. • Even if arm is rolled out with boom mode selector switch ON, boom mode selector control is inoperable. (Machine vibrations are many.)
Fault Code 11302 is displayed.	Fault Code 11998 is displayed.	Fault Code 11995 is displayed.
Monitor Item: Boom Raise Pilot Pressure (Displayed by built-in diagnosing system)	Monitor Item: Boom Lowering Pilot Pressure	Monitor Item: Arm Roll-Out (BH) Pilot Pressure
-	-	-
-	-	-
• Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with another pressure sensor.	• Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with another pressure sensor.	• Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with another pressure sensor.
T2-1	T2-1	T2-1

Parts		Pressure Sensor (Arm Roll-In)	Pressure Sensor (Bucket Roll-Out)	Pressure Sensor (Bucket Roll-In)
Function		• Monitors arm roll-in pilot pressure. (HP mode control, boom mode selector control and boom mode flow rate control valve control)	• Monitors bucket roll-out pilot pressure. (Boom mode selector control and boom mode flow rate control valve control)	• Monitors bucket roll-in pilot pressure. (Boom mode selector control and boom mode flow rate control valve control)
Symptoms in control system when trouble occurs.		• Abnormal low voltage: No signals arrive to MC. • Abnormal high voltage: As the sensor is detected as fully operated, the sensor is controlled.	• Abnormal low voltage: No signals arrive to MC. • Abnormal high voltage: As the sensor is detected as fully operated, the sensor is controlled.	• Abnormal low voltage: No signals arrive to MC. • Abnormal high voltage: As the sensor is detected as fully operated, the sensor is controlled.
Symptoms in machine operation when trouble occurs.		• Engine speed becomes below E mode speed (1580 min^{-1}). Abnormal high voltage: • Even if lever is in neutral with auto-idle switch ON, engine speed does not decrease. Abnormal low voltage: • Even if arm is rolled in with auto-idle switch ON, engine speed does not increase. • Even if arm is rolled in with power mode switch in HP mode position, engine speed does not increase. • Even if arm is rolled in with boom mode selector switch ON, boom mode selector control is inoperable. (Machine vibrations are many.)	• Engine speed becomes below E mode speed (1580 min^{-1}). Abnormal high voltage: • Even if lever is in neutral with auto-idle switch ON, engine speed does not decrease. Abnormal low voltage: • Even if bucket is rolled out with auto-idle switch ON, engine speed does not increase. • During combined operation of boom lower and bucket roll-out, speed of bucket roll-out is slow. • Even if bucket is rolled out with boom mode selector switch ON, boom mode selector control is inoperable. (Machine vibrations are many.)	• Engine speed becomes below E mode speed (1580 min^{-1}). Abnormal high voltage: • Even if lever is in neutral with auto-idle switch ON, engine speed does not decrease. Abnormal low voltage: • Even if bucket is rolled in with auto-idle switch ON, engine speed does not increase. • During combined operation of boom lower and bucket roll-in, speed of bucket roll-in is slow. • Even if bucket is rolled in with boom mode selector switch ON, boom mode selector control is inoperable. (Machine vibrations are many.)
Evaluation	By MC Fault Code	Fault Code 11303 is displayed.	Fault Code 11997 is displayed.	Fault Code 11999 is displayed.
	By Monitor Function	Monitor Item: Arm Roll-In (BH) Pilot Pressure (Displayed by built-in diagnosing system)	Monitor Item: Bucket Roll-Out (BH) Pilot Pressure	Monitor Item: Bucket Roll-In (BH) Pilot Pressure
	Using Test Harness	-	-	-
	Others	-	-	-
NOTE		• Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with another pressure sensor.	• Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with another pressure sensor.	• Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with another pressure sensor.
Descriptions of Control (Operational Principle Section in T/M)		T2-1	T2-1	T2-1

Pressure Sensor (Swing)	Pressure Sensor (Right Travel)	Pressure Sensor (Left Travel)
• Monitors swing pilot pressure. (Relief flow rate reducing control (relief cut off), swing horsepower reducing control and boom mode flow rate control valve control)	• Monitors right travel pilot pressure. (Travel speed increase control, relief flow rate reducing control (relief cut off), pressure increase selection control when traveling and travel alarm control (optional))	• Monitors left travel pilot pressure. (Travel speed increase control, relief flow rate reducing control (relief cut off), pressure increase selection control when traveling and travel alarm control (optional))
• Abnormal low voltage: No signals arrive to MC. • Abnormal high voltage: As the sensor is detected as fully operated, the sensor is controlled.	• Abnormal low voltage: No signals arrive to MC. • Abnormal high voltage: As the sensor is detected as fully operated, the sensor is controlled.	• Abnormal low voltage: No signals arrive to MC. • Abnormal high voltage: As the sensor is detected as fully operated, the sensor is controlled.
• Engine speed becomes below E mode speed (1580 min^{-1}). Abnormal high voltage: • Even if lever is in neutral with auto-idle switch ON, engine speed does not decrease. Abnormal low voltage: • Even if swing is operated with auto-idle switch ON, engine speed does not increase. • Even if swing is operated at full stroke, swing speed is slow. • During combined operation of swing and bucket, bucket speed is slow. • Even if swing is operated with boom mode selector switch ON, boom mode selector control is inoperable. (Machine vibrations are many.)	• Engine speed becomes below E mode speed (1580 min^{-1}). • Travel alarm (optional) outputs. Abnormal high voltage: • Even if lever is in neutral with auto-idle switch ON, engine speed does not decrease. Abnormal low voltage: • Even if right travel is operated with auto-idle switch ON, engine speed does not increase. • Even if right travel is operated, engine speed does not increase. • Even if right travel is operated, pressure does not increase.	• Engine speed becomes below E mode speed (1580 min^{-1}). • Travel alarm (optional) outputs. Abnormal high voltage: • Even if lever is in neutral with auto-idle switch ON, engine speed does not decrease. Abnormal low voltage: • Even if left travel is operated with auto-idle switch ON, engine speed does not increase. • Even if left travel is operated, engine speed does not increase. • Even if left travel is operated, pressure does not increase.
Fault Code 11301 is displayed.	Fault Code 11991 is displayed.	Fault Code 11993 is displayed.
Monitor Item: Swing Pilot Pressure (Displayed by built-in diagnosing system)	Monitor Item: Right Travel Pilot Pressure	Monitor Item: Left Travel Pilot Pressure
-	-	-
-	-	-
• Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with another pressure sensor.	• Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with another pressure sensor.	• Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with another pressure sensor.
T2-1	T2-1	T2-1

Parts		Pressure Sensor (Attachment) (Optional)	Pressure Sensor (Counterweight Removal) (Optional)	Boom Bottom Pressure Sensor
Function		• Monitors attachment pilot pressure. (Attachment mode control)	• Monitors counterweight removal pilot pressure for counterweight lifting lever. (Pump control in counterweight removal)	• Monitors boom cylinder bottom pressure. (Overload alarm control (optional))
Symptoms in control system when trouble occurs.		• Abnormal low voltage: No signals arrive to MC. • Abnormal high voltage: As the sensor is detected as fully operated, the sensor is controlled.	• No signals arrive to MC.	• No signals arrive to MC.
Symptoms in machine operation when trouble occurs.		Abnormal high voltage: • Even if lever is in neutral with auto-idle switch ON, engine speed does not decrease. Abnormal low voltage: • Even if attachment is operated with auto-idle switch ON, engine speed does not increase. • Even if attachment is operated, pump 2 flow rate is kept unchanged.	• Even if lever is operated, pressure does not increase and flow rate does not decrease.	• Condition is always overloaded. • Overload alarm is displayed on the monitor unit. • Overload alarm sounds.
Evaluation	By MC Fault Code	-	-	Fault Code 11802 is displayed.
	By Monitor Function	Monitor Item: Att. Control Pilot Pressure (Displayed by built-in diagnosing system)	Monitor Item: C/W Removal Pilot Pressure Monitor pressure change while lifting counterweight.	Monitor Item: Boom Bottom Pressure
	Using Test Harness	-	-	-
	Others	-	-	-
NOTE		• Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with another pressure sensor.	• Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with another pressure sensor.	-
Descriptions of Control (Operational Principle Section in T/M)		T2-1	T2-1	T2-1

Pump 1 Regulator Pressure Sensor	Pump 2 Regulator Pressure Sensor	Hydraulic Oil Temperature Sensor
• Monitors swash angle control pressure of main pump 1.	• Monitors swash angle control pressure of main pump 2.	• Monitors hydraulic oil temperature. (Overheat prevention control and fan pump flow rate control)
• No signals arrive to MC. (Pump control is inoperable.)	• No signals arrive to MC. (Pump control is inoperable.)	• No signals arrive to MC.
• Machine mistracks. • Engine is overloaded. • Work speed is lowered.	• Machine mistracks. • Engine is overloaded. • Work speed is lowered.	• Fan pump is fixed at maximum swash angle (fan rotation speed becomes maximum). • Main pump drive torque decreases.
Fault Code 11994 is displayed.	Fault Code 11992 is displayed.	Fault code 11901 is displayed.
Monitor Item: Pump 1 Regulator Pressure (Displayed by built-in diagnosing system)	Monitor Item: Pump 2 Regulator Pressure (Displayed by built-in diagnosing system)	Monitor Item: Hydraulic Oil Temperature (Displayed by built-in diagnosing system)
-	-	-
-	-	-
• Judge if sensor is faulty or harness is faulty by switching with pump 2 sensor.	• Judge if sensor is faulty or harness is faulty by switching with pump 1 sensor.	-
T2-1	T2-1	T2-1

Parts		Solenoid Valve Unit (SG)	Solenoid Valve Unit (SI)	Solenoid Valve Unit (SF)
Function		• Temporarily increases relief pressure of main relief valve when operating power digging and travel.	• Controls travel mode selection.	• Shifts boom flow rate control valve (switch valve) during combined operation of boom lower and arm or bucket. (Boom flow rate control valve control)
Symptoms in control system when trouble occurs.		• If solenoid valve unit (SG) is not activated, pressure at port SG becomes 0 MPa.	• As swash angle of travel motor cannot be changed, travel motor is fixed at large swash angle position (slow speed).	• If solenoid valve unit (SF) is not activated, pressure at port SF becomes 0 MPa.
Symptoms in machine operation when trouble occurs.		Solenoid valve unit (SG) is closed: • Relief pressure stays at normal 31.4 MPa (325 kfg/cm^2). Even if power digging switch is pushed, relief pressure does not increase. Power does not increase. Solenoid valve unit (SG) is open: • Pressure always increases. Every operation makes power increase.	• Even if travel mode switch is turned to FAST position, fast travel mode cannot be selected.	• Arm speed is slow when operating boom lower and arm. • Bucket speed is slow when operating boom lower and bucket.
Evaluation	By MC Fault Code	Fault code 11404 is displayed.	Fault code 11405 is displayed.	Fault code 11402 is displayed.
	By Monitor Function	Monitor Item: Power Boost Control Pressure (Displayed by built-in diagnosing system)	Monitor Item: Travel Motor Control Pressure (Displayed by built-in diagnosing system)	Monitor Item: Boom Flow Control Pressure
	Using Test Harness	-	-	-
	Others	-	-	-
NOTE		• Judge if solenoid valve is broken or harness is disconnected by switching with another solenoid valve unit harness.	• Judge if solenoid valve is broken or harness is disconnected by switching with another solenoid valve unit harness.	• Judge if solenoid valve is broken or harness is disconnected by switching with another solenoid valve unit harness.
Descriptions of Control (Operational Principle Section in T/M)		T2-1	T2-1	T2-1

Solenoid Valve Unit (SC)	Pump 1 Control Solenoid Valve	Pump 2 Control Solenoid Valve
• Controls boom mode selector control. Reduces boom overload relief pressure to 11.8 MPa (120 kgf/cm^2) at 110 L/min.	• Changes pump 1 swash angle.	• Changes pump 2 swash angle.
• Boom overload relief pressure is not reduced.	• Pump control is inoperable.	• Pump control is inoperable.
• Even if boom mode selector switch is turned ON, boom lower power and vibration cannot be controlled.	• If harness is disconnected and solenoid valve is faulty, flow rate of pump 1 becomes minimum.	• If harness is disconnected and solenoid valve is faulty, flow rate of pump 2 becomes minimum.
Fault code 11989 is displayed.	Fault code 11410 is displayed.	Fault code 11400 is displayed.
Monitor Item: Boom Mode Control Pressure	Monitor Item: Pump 1 Regulator Valve Current	Monitor Item: Pump 2 Regulator Valve Current
• Install lamp harness (ST 7130). Check output signals from MC and harness condition.	-	-
-	-	-
• Judge if solenoid valve is broken or harness is disconnected by switching with another solenoid valve unit harness.	• Judge if solenoid valve is broken or harness is disconnected by switching with another solenoid valve harness. (Switch harness of delivery pressure sensor and regulator pressure sensor.)	• Judge if solenoid valve is broken or harness is disconnected by switching with another solenoid valve harness. (Switch harness of delivery pressure sensor and regulator pressure sensor.)
T2-1	T2-1	T2-1

Parts		Fan Pump Control Solenoid Valve	Pilot Shut-Off Solenoid Valve	MC
Function		• Controls delivery flow rate of fan pump. (Fan pump flow rate control)	• Opens and closes the pilot circuit.	• Controls engine, pump and valve operation.
Symptoms in control system when trouble occurs.		• Fan pump flow rate control is not operated.	Solenoid valve is closed: • All actuators are not operated. (Pilot pressure oil is not supplied to pilot valve.) Solenoid valve is open: • Pilot pressure oil is always supplied to pilot valve. • When lever is operated with pilot shut-off lever in LOCK position, actuator is operated. • Pilot pressure oil is not supplied to heat circuit in signal control valve. (Actuator controllability becomes bad.)	• Depending on trouble situations, control system malfunction may differ. (The following symptoms in machine operation indicates that MC logic circuit has failed.)
Symptoms in machine operation when trouble occurs.		Solenoid valve is closed: • Fan pump is fixed at maximum swash angle (maximum flow rate). • As fan pump overload increases, delivery flow rates of pumps 1, 2 decrease. Every operation speed becomes slow. Solenoid valve is open: • Fan pump is fixed at minimum swash angle (minimum flow rate). • Overheating easily occurs. • Hydraulic oil temperature easily increases. • Air conditioner does not work easily.	Solenoid valve is closed: • All actuators are not operated. (Pilot pressure oil is not supplied to pilot valve.) Solenoid valve is open: • Pilot pressure oil is always supplied to pilot valve. • When lever is operated with pilot shut-off lever in LOCK position, actuator is operated. • Pilot pressure oil is not supplied to heat circuit in signal control valve. (Actuator controllability becomes bad.)	• Even though engine starts, speed stays slow. • As pump displacement is held at minimum, all actuator speeds are slow.
Evaluation	By MC Fault Code	Fault code 11412 is displayed.	-	-
	By Monitor Function	Monitor Item: Fan Pump Valve Current	-	-
	Using Test Harness	-	-	-
	Others	-	-	-
NOTE		-	-	• Before suspecting a failure in MC, check the fuses in control system. If any sensor in 5 V system is short-circuited, fault code 11003 is displayed.
Descriptions of Control (Operational Principle Section in T/M)		T2-1	T2-5	T2-1

Power Digging Switch	Travel Mode Switch	Auto-Idle Switch
• Activates power digging control. ON: 0 V→Increasing Pressure OFF: 5 V→ Not increasing Pressure	• Changes travel mode. Fast Mode: 0 V Slow Mode: 5 V	• Activates auto-idle control. ON: 0 V → Auto-idle is operable. OFF: 5 V → Inoperable
• Open Circuit: Pressure does not increase. • Shorted Circuit: Pressure increases for 8 seconds after turning key switch ON, and stops increasing.	• Open circuit in switch: Travel speed remains unchanged in slow mode (5 V). • Shorted circuit in switch: Travel speed remains unchanged in fast mode (0 V).	• Open circuit: Auto-idle system is inoperable. • Shorted circuit: Even if auto-idle switch is OFF, auto-idle control is always performed.
• Power digging control does not operate if open circuit or shorted circuit occurs.	• Even if travel mode switch is turned to FAST position, fast travel mode cannot be selected. • Even if travel mode selector is turned to SLOW position, slow travel mode cannot be selected.	• Open circuit: Auto-idle system is inoperable. • Shorted circuit: Even if auto-idle switch is OFF, auto-idle control is always performed.
-	-	-
Monitor Item: Power Boost SW (Displayed by built-in diagnosing system)	Monitor Item: Travel Mode SW (Displayed by built-in diagnosing system)	Monitor Item: Auto-Idle SW
-	-	-
-	-	-
-	-	-
T2-1	T2-1	T2-1

Parts		Power Mode Switch (HP Mode)	Power Mode Switch (E Mode)	Power Mode Switch (P Mode)
Function		• Activates HP mode control. ON: 0 V → HP mode is operable. OFF: 5 V → Normal.	• Selects E mode. ON: 0 V → E mode OFF: 5 V → Normal	• Selects P mode. ON: 0 V OFF: 0 V (If E mode and HP mode are not selected, MC judges as P mode is selected.)
Symptoms in control system when trouble occurs.		• Open circuit: Even if HP mode is selected, HP mode is inoperable. • Shorted circuit: Even if HP mode switch is turned OFF, HP mode is not deactivated.	• Open circuit: Even if E mode is selected, engine speed does not decrease. • Shorted circuit: Engine speed does not increase to the maximum. Auto-idle control is inoperable.	• Open circuit: P mode • Shorted circuit: E mode or HP mode
Symptoms in machine operation when trouble occurs.		• Open circuit: Even if HP mode is selected, HP mode is inoperable. • Shorted circuit: Even if HP mode switch is turned OFF, HP mode is not deactivated.	• Open circuit: Even if E mode is selected, engine speed does not decrease. • Shorted circuit: Engine speed does not increase to the maximum. Auto-idle control is inoperable.	• Open circuit: P mode • Shorted circuit: E mode or HP mode
Evaluation	By MC Fault Code	-	-	-
	By Monitor Function	Monitor Item: HP Mode SW	Monitor Item: E/P SW	Monitor Item: E/P SW
	Using Test Harness	-	-	-
	Others	-	-	-
NOTE		-	-	-
Descriptions of Control (Operational Principle Section in T/M)		T2-1	T2-1	T2-1

Pilot Shut-Off Switch	Boom Mode Selector Switch	Auto Lubrication Switch (Optional)
• Activates pilot shut-off solenoid valve. (Turns pilot shut-off relay ON.)	• Reduces overload relief pressure at the boom cylinder rod side.	• Activates auto lubrication. ON: 0 V → Auto lubrication control is operable. OFF: 5 V → Inoperable
• Open circuit: Pilot shut-off switch is always turned OFF. • Pilot shut-off solenoid valve is not shifted. • Even if lever is operated with pilot shut-off lever in UNLOCK position, all actuator are not operated. • Shorted circuit: Pilot shut-off switch is always turned ON. • Engine does not start. If shorted circuit occurs while starting engine, operate lever with pilot shut-off lever in LOCK position so that actuator is operated.	• Open circuit: Boom mode selector control is not performed. • Shorted circuit: Overload relief pressure at the boom cylinder rod side remains low constantly so that machine cannot be raised off ground with front attachment	• No signals arrive to MC.
Open circuit: • Pilot shut-off switch is always turned OFF. • Pilot shut-off solenoid valve is not shifted. • Even if lever is operated with pilot shut-off lever in UNLOCK position, all actuator are not operated. Shorted circuit: • Pilot shut-off switch is always turned ON. • Engine does not start. If shorted circuit occurs while starting engine, operate lever with pilot shut-off lever in LOCK position so that actuator is operated.	• Open circuit: Boom mode selector control is not performed. • Shorted circuit: Overload relief pressure at the boom cylinder rod side remains low constantly so that machine cannot be raised off ground with front attachment	• Open circuit, shorted circuit: Auto lubrication is operable.
-	-	-
Monitor Item: Gate Lock SW	Monitor Item: Boom Mode SW	Monitor Item: Lubricating Mode
-	-	-
-	-	-
-	-	-
T2-5	T2-1	T2-1

Parts		Learning Switch	Flow Combiner Valve	Boom Overload Relief Control Valve
Function		• Starts pump learning ON: 0 V → Learning OFF: 5 V → Normal control	• Supplies oil to both right and left travel spools from pump 1 during combined operation of travel and front/swing.	• Reduces pressure in boom lower circuit.
Symptoms in control system when trouble occurs.		• Pump learning is not performed.	• 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.	• If valve is bound at fully closed, when boom lower is operated with boom mode selector switch ON, machine can be raised off ground with front attachment. • If spool is bound at fully open, when boom lower is operated with boom mode selector switch OFF, machine cannot be raised off ground with front attachment. (Power is weak.)
Symptoms in machine operation when trouble occurs.		• If problem is caused by open circuit or discontinuity of switch, machine operates normally. (Only learning cannot be performed.) • If shorted circuit occurs, learning mode operation starts when key switch is turned ON. Therefore, engine will stall at 2 second or 20 seconds after engine starts.	• While traveling, when front/swing lever is operated, machine mistracks to the left.	• If valve is bound at fully closed, when boom lower is operated with boom mode selector switch ON, machine can be raised off ground with front attachment. • If spool is bound at fully open, when boom lower is operated with boom mode selector switch OFF, machine cannot be raised off ground with front attachment. (Power is weak.)
Evaluation	By MC Fault Code	-	-	-
	By Monitor Function	Monitor Item: Pump 1 Regulator Learning Condition, Pump 2 Regulator Learning Condition	-	-
	Using Test Harness	-	-	-
	Others	-	-	-
NOTE		-	-	-
Descriptions of Control (Operational Principle Section in T/M)		T2-1	T3-3	T3-3

Boom Flow Rate Control Valve	Arm Flow Rate Control Valve	Bypass Shut-Out Valve (4-Spool Side)
• Restricts boom lower circuit when operating boom lower and arm or boom lower and bucket, so that other actuator speed increases.	• Restricts arm roll-in circuit during combined operation of boom raise and arm roll-in, so that boom raise speed increases.	• Supplies pressure oil from pump 1 to auxiliary spool when auxiliary spool is operated.
• If control valve is bound at fully closed, boom raise speed is slow. • If control valve is bound at fully open, arm speed is slow during combined operation of boom lower and arm. • If control valve is bound at fully open, bucket speed is slow during combined operation of boom lower and bucket.	• If control valve is bound at fully closed, arm roll-out speed is slow. • If control valve is bound at fully open, boom raise speed is slow during combined operation of boom raise and arm roll-in.	• 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 positioned in neutral. • When all control levers are in neutral, pump 1 pressure is higher than pump 2 pressure according to the spool bound conditions.
• If control valve is bound at fully closed, boom raise speed is slow. • If control valve is bound at fully open, arm speed is slow during combined operation of boom lower and arm. • If control valve is bound at fully open, bucket speed is slow during combined operation of boom lower and bucket.	• If control valve is bound at fully closed, boom raise speed is slow. • If control valve is bound at fully open, boom raise speed is slow during combined operation of boom raise and arm roll-in.	• 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 positioned in neutral. • When all control levers are in neutral, pump 1 pressure is higher than pump 2 pressure according to the spool bound conditions.
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
T2-1, T3-3	T2-4	T3-3

Parts		Boom Regenerative Valve	Arm Regenerative Valve	Bucket Regenerative Valve
Function		• Routes return oil from boom cylinder bottom side to rod side and prevents boom cylinder hesitation.	• Routes return oil from arm cylinder rod side to bottom side and prevents arm cylinder hesitation if rod side pressure in arm cylinder is higher.	• Routes return oil from bucket cylinder rod side to bottom side and prevents bucket cylinder hesitation.
Symptoms in control system when trouble occurs.		• 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 the switch valve is kept closed, arm is weak when heavy load is applied. • If the switch valve is kept open, arm speed is slow.	• If the switch valve is kept closed, bucket is weak when heavy load is applied. • If the switch valve is kept open, bucket speed is slow.
Symptoms in machine operation when trouble occurs.		• 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 the switch valve is kept closed, arm is weak when heavy load is applied. • If the switch valve is kept open, arm speed is slow.	• If the switch valve is kept closed, bucket is weak when heavy load is applied. • If the switch valve is kept open, bucket speed is slow.
Evaluation	By MC Fault Code	-	-	-
	By Monitor Function	-	-	-
	Using Test Harness	-	-	-
	Others	-	-	-
NOTE		-	-	-
Descriptions of Control (Operational Principle Section in T/M)		T3-3	T3-3	T3-3

Boom Anti-Drift Valve	Arm Anti-Drift Valve	Flow Combiner Valve Control Spool
• 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.	• 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.	• Be shifted by right travel pilot pressure and supplies control pressure to flow combiner valve in control valve.
• If switch valve is bound, check valve does not open.	• If switch valve is bound, check valve does not open.	• If spool is bound at fully open, when boom, arm, bucket or swing and travel 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 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.	• 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.	• If spool is bound at fully open, when boom, arm, bucket or swing and travel 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.)
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
T 3-3	T3-3	T3-6

Parts		Swing Parking Brake Release Spool	Arm Flow Rate Control Valve Control Spool	Proximity Switch (Auto Lubrication System)
Function		• Be shifted by boom, arm, bucket, swing or auxiliary pilot pressure and supplies swing parking brake release pressure.	• Shifts arm flow rate control valve (switch valve) during combined operation of boom raise and arm roll-in.	• Sets lubricating time and its interval. (Auto lubrication control)
Symptoms in control system when trouble occurs.		• If spool is bound at fully open, swing parking brake is kept released. (Machine vibrates while traveling.) • If spool is bound at fully closed, swing parking brake is kept applied. (Dragging is felt.)	• If spool is bound at fully closed, boom raise speed is slow during combined operation of boom raise and arm roll-in. • If spool is bound at fully open, arm roll-out speed is slow during combined operation of boom raise and arm roll-out.	• No signals arrive to MC.
Symptoms in machine operation when trouble occurs.		• If spool is bound at fully open, swing parking brake is kept released. (Machine vibrates while traveling.) • If spool is bound at fully closed, swing parking brake is kept applied. (Dragging is felt.)	• If spool is bound at fully open, arm speed decreases during single arm operation. (Arm flow rate control is always operable.) • 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 inoperable.)	• Auto lubrication is not operated correctly.
Evaluation	By MC Fault Code	-	-	-
	By Monitor Function	-	-	Monitor Item: Auto Lubrication Counting SW
	Using Test Harness	-	-	-
	Others	-	-	-
NOTE		-	-	-
Descriptions of Control (Operational Principle Section in T/M)		T3-3	T2-4, T3-6	T2-1

(Blank)

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 with P mode or HP mode, engine speed is slow.
MC (Main Controller)			●
ECM		●	○
ICF		○	
Monitor Unit	○		
Pump 1 Delivery Pressure Sensor			
Pump 2 Delivery Pressure Sensor			
Pump 1 Regulator Pressure Sensor			
Pump 2 Regulator Pressure Sensor			
Starter Cut Relay (R4)	●		
ECM Main Relay (R14)			
Pressure Sensor (Boom Raise)			
Pressure Sensor (Arm Roll-In)			
Pressure Sensor (Attachment)			
Pilot Shut-Off Switch	●		
Engine Stop Switch		●	
Key Switch	●		
Engine Control Dial			
Auto-Idle Switch			
Power Mode Switch			○
Battery Relay	●		
Starter Relay	●		
Engine Electrical Equipment	●	○	
Engine Unit		●	●
Remarks	Check batteries.	Check fuel system (Filters and piping).	

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.	Faulty HP mode.	Faulty E mode.	Faulty auto-idle system.
●	●	●	●
●	○	○	○
	●	●	
	●	●	
		●	
		●	
	●		
	●		
●	○		●
			●
	●	●	○
●			
Open circuit in CAN harness (Connector is disconnected.)			Check pilot pressure sensor.

● : 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 Engine speed does not increase even if attachment is operated in attachment mode.
MC (Main Controller)		●
ECM	●	○
ICF		
Monitor Unit		○
Pump 1 Delivery Pressure Sensor		
Pump 2 Delivery Pressure Sensor		
Pump 1 Regulator Pressure Sensor		
Pump 2 Regulator Pressure Sensor		
Starter Cut Relay (R4)		
ECM Main Relay (R14)	●	
Pressure Sensor (Boom Raise)		
Pressure Sensor (Arm Roll-In)		
Pressure Sensor (Attachment)		●
Pilot Shut-Off Switch		
Engine Stop Switch		
Key Switch	●	
Engine Control Dial		
Auto-Idle Switch		
Power Mode Switch		
Battery Relay		
Starter Relay 2		
Engine Electrical Equipment		
Engine Unit		●
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.

Trouble Symptom / Parts	E-10 When attachment mode is selected, engine speed does not decrease.	E-11 Engine stalls during operation under adverse condition such as at high altitude.	E-12 Engine is difficult to start at low temperature.
MC (Main Controller)	●	●	
ECM	○	○	●
ICF			
Monitor Unit	○		
Pump 1 Delivery Pressure Sensor		○	
Pump 2 Delivery Pressure Sensor		○	
Pump 1 Regulator Pressure Sensor		○	
Pump 2 Regulator Pressure Sensor		○	
Pump 1 Control Solenoid Valve		○	
Pump 2 Control Solenoid Valve		○	
Glow Plug Relay			●
Engine Electrical Equipment			●
Engine Unit	●		
Pump Regulator		●	
Remarks			Check fuel system for clogging.

All Actuator System Troubleshooting

Trouble Symptom / Parts	A-1 All actuators are not operated.	A-2 All actuator speeds are slow.	A-3 Left travel is inoperable during single travel operation. Single swing operation speed becomes slow. Arm speed is slightly slow during arm level crowding.
MC (Main Controller)		●	●
ECM		○	
Monitor Unit	○		
Pilot Shut-Off Relay (R2)	●		
Security Relay (R5)	○		
Main Relief Valve		●	
Main Pump		○	●
Main Pump Regulator		○	●
Pilot Pump		●	
Pilot Relief Valve		●	
Pilot Shut-Off Switch	○		
Pilot Shut-Off Solenoid Valve	●		
Pump 1 Control Solenoid Valve		○	
Pump 2 Control Solenoid Valve		○	●
Pump 1 Regulator Pressure Sensor		○	
Pump 2 Regulator Pressure Sensor		○	●
Pump 1 Delivery Pressure Sensor		○	
Pump 2 Delivery Pressure Sensor		○	●
Remarks		Refer to F-1.	

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
Right travel is inoperable during single travel operation. Single bucket operation speed becomes slow. Boom is not raised properly during arm level crowding.
●
●
●
●
●
●

● : 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	A-5 Actuator does not stop even if control lever is turned to neutral.	A-6 Actuator speed is faster than normal. Machine mistracks when travel lever is operated at half stroke. Precise control cannot be performed.	A-7 Fan rotation speed remains unchanged at maximum.
MC (Main Controller)		●	●
ECM			○
Monitor Unit			
Main Pump			
Main Pump Regulator			
Fan Pump			●
Fan Pump Regulator			●
Pump 1 Delivery Pressure Sensor		●	
Pump 2 Delivery Pressure Sensor		●	
Pump 1 Regulator Pressure Sensor		●	
Pump 2 Regulator Pressure Sensor		●	
Pump 1 Control Solenoid Valve		●	
Pump 2 Control Solenoid Valve		●	
Fan Pump Control Solenoid Valve			●
Pressure Sensor (Attachment)			
Engine Control Dial			○
Air Conditioner Switch (Blower Motor Relay)			
Hydraulic Oil Temperature Sensor			○
Intake Air Temperature Sensor			○
Boost Temperature Sensor			○
Coolant Temperature Sensor			○
Spool	●		
Fan Motor			
Fan Valve			
Pilot Valve	●		
Oil Cooler Bypass Check Valve			
Low-Pressure Relief Valve			
Pilot Pump			
Remarks			Refer to A-2.

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.

A-8	A-9	A-10	A-11
Overheating occurs. Fan rotation speed is slow.	Flow rate of pump2 is not reduced to specification when operating attachment.	Attachment operating speed is too slow.	Overheating easily occurs when operating breaker.
●	●	●	●
	●	●	●
●			
●			
			●
	●		
			●
	●		
●			
	●		●
		●	
●			
●			
		●	
●			○
●			○
		○	
		Refer to A-2 or A-3.	Refer to A-4 or A-8.

● : 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.

Front Attachment System Troubleshooting

Trouble Symptom / Parts	F-1 All front attachment actuator power is weak.	F-2 Even if power digging switch is pushed, power does not increase. Boom raise power is weak when digging.	F-3 Some cylinder is inoperable or speeds are slow.
MC		●	
Pressure Sensor (Boom Raise)			
Pressure Sensor (Boom Lower)			
Pressure Sensor (Arm Roll-Out)			
Pressure Sensor (Arm Roll-In)			
Pressure Sensor (Bucket Roll-Out)			
Pressure Sensor (Bucket Roll-In)			
Pressure Sensor (Swing)			
Pressure Sensor (Attachment)			
Solenoid Valve Unit (SG)		●	
Solenoid Valve Unit (SF)			
Solenoid Valve Unit (SC)			
Power Mode Switch		●	
Boom Mode Selector Switch			
Pump 1 Delivery Pressure Sensor			
Pump 2 Delivery Pressure Sensor			
Pump 1 Regulator Pressure Sensor			
Pump 2 Regulator Pressure Sensor			
Pump 1 Control Solenoid Valve			
Pump 2 Control Solenoid Valve			
Spool			●
Main Relief Valve	●	●	
Overload Relief Valve		○	●
Boom Overload Relief Control Valve			
Load Check Valve			
Anti-Drift Valve			
Boom Flow Rate Control Valve			
Arm Flow Rate Control Valve			
Boom Regenerative Valve			
Arm Regenerative Valve			
Bucket Regenerative Valve			
Shockless Valve (Signal Control Valve)			○
Arm Flow Rate Control Valve Control Spool			
Shuttle Valve			●
Pilot Valve			●
Shockless Valve			○
Cylinder			
Remarks	Refer to A-1 or A-2.		Refer to A-3.

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
Arm speed or bucket speed is slow during combined operation of boom lower and arm or boom lower and bucket.	Boom raise speed is slow during arm crowding operation (during combined operation of boom raise and arm roll-in) Arm moves jerky.	Even if boom mode selector switch is pushed, machine is raised off ground.	When boom raise or arm roll-out is operated, boom or arm starts to move after slightly moving downward.
		●	
●			
○			
○			
○			
○			
●			
		●	
		●	
	●		●
		●	
		●	
			●
●			
	●		
○			
	●		
	○		
	●		
	○		
○	○		
	○		
			●
Refer to A-3.			

● : 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.

Trouble Symptom / Parts	F-8 Front attachment drifts remarkably.	F-9 Front attachment speed is slow during combined operation of front attachment and swing.
MC (Main Controller)		●
Pressure Sensor (Boom Raise)		○
Pressure Sensor (Boom Lower)		○
Pressure Sensor (Arm Roll-Out)		○
Pressure Sensor (Arm Roll-In)		○
Pressure Sensor (Bucket Roll-Out)		○
Pressure Sensor (Bucket Roll-In)		○
Pressure Sensor (Swing)		●
Pressure Sensor (Auxiliary)		○
Solenoid Valve Unit (SG)		
Solenoid Valve Unit (SF)		
Solenoid Valve Unit (SC)		
Power Mode Switch		
Boom Mode Selector Switch		
Pump 1 Delivery Pressure Sensor		●
Pump 2 Delivery Pressure Sensor		○
Pump 1 Regulator Pressure Sensor		●
Pump 2 Regulator Pressure Sensor		○
Pump 1 Control Solenoid Valve		●
Pump 2 Control Solenoid Valve		○
Spool	●	
Main Relief Valve		
Overload Relief Valve		
Boom Overload Relief Control Valve		
Load Check Valve		
Anti-Drift Valve	●	
Boom Flow Rate Control Valve		
Arm Flow Rate Control Valve		
Boom Regenerative Valve		
Arm Regenerative Valve		
Bucket Regenerative Valve		
Shockless Valve (Signal Control Valve)		
Arm Flow Rate Control Valve Control Spool		
Shuttle Valve		
Pilot Valve		
Shockless Valve		
Cylinder	●	
Remarks		

(Blank)

Swing/Travel System Troubleshooting

Trouble Symptom / Parts	S-1 Swing is slow or unmoving.	S-2 Swing is fast. When swing is operated fully, swing speed is slow.	T-1 Both right and left tracks do not rotate or rotate slowly.
MC (Main Controller)		●	○
Pressure Sensor (Swing)		●	
Pressure Sensor (Right Travel)			○
Pressure Sensor (Left Travel)			○
Solenoid Valve Unit (SI)			○
Pump 1 Delivery Pressure Sensor		○	
Pump 2 Delivery Pressure Sensor		○	
Pump 1 Regulator Pressure Sensor		○	
Pump 2 Regulator Pressure Sensor		○	
Pump 1 Control Solenoid Valve		○	
Pump 2 Control Solenoid Valve		○	
Main Pump			
Main Pump Regulator			
Pilot Pump			●
Pilot Relief Valve			●
Spool	●		○
Main Relief Valve			●
Load Check Valve			
Flow Combiner Valve			
Pilot Valve	●		○
Swing Device	●		
Travel Device			○
Center Joint			
Flow Combiner Valve Control Spool			
Swing Parking Brake Release Spool	●		
Shuttle Valve	●		
Travel Mode Switch			
Remarks	Refer to A-1 or A-2.		Refer to A-1, F-2 or T-4.

● : 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.

T-2	T-3	T-4
One side track does not rotate or rotates slowly. Machine mistracks.	Machine mistracks during combined operation of travel and front attachment.	Fast travel is inoperable. Travel mode does not change from slow mode to fast mode.
○		●
○		
○		
○		●
		○
		○
○		○
●		○
		○
		○
○		
○		
○		
○		
○	●	
	●	
●		
●		●
●		●
	●	
○		
		●
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.

Other System Troubleshooting

Trouble Symptom / Parts	O-1 Wiper is inoperable or not retracted.	O-2 Counterweight removal / installation device is not operated or power is weak.	O-3 Counterweight removal / installation speed is fast. Precise operation cannot be performed.
MC		●	●
Monitor Unit	●		
Wiper Relay (R6)	●		
Auto Lubrication Relay (R11)			
Pressure Sensor (Counterweight)		●	●
Solenoid Valve Unit (SG)		●	
Pump 1 Delivery Pressure Sensor			○
Pump 2 Delivery Pressure Sensor			○
Pump 1 Regulator Pressure Sensor			○
Pump 2 Regulator Pressure Sensor			○
Pump 1 Control Solenoid Valve			○
Pump 2 Control Solenoid Valve			○
Fan Pump Control Solenoid Valve			
Auto Lubrication Device			
Engine Oil Level Switch			
Coolant Level Switch			
Wiper/Washer Switch	●		
Level Check Switch			
Auto Lubrication Switch			
Key Switch			
Wiper Motor	●		
Air Conditioner			
Main Pump			○
Main Pump Regulator			○
Fan Pump			
Pilot Pump		○	
Pilot Relief Valve		○	
Main Relief Valve		○	
Pilot Valve			○
Counterweight Removal Device		●	●
Distribution Valve			
Remarks		Refer to A-1, F-1 or F-2.	

● : 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.

O-4	O-5	O-6
Auto lubrication is faulty.	Level check is faulty.	Air conditioner malfunction
●	●	○
○	●	
●		
		●
●		
	○	
	○	
	●	
●		
		●
		●
●		
		Refer to T5-7-96.

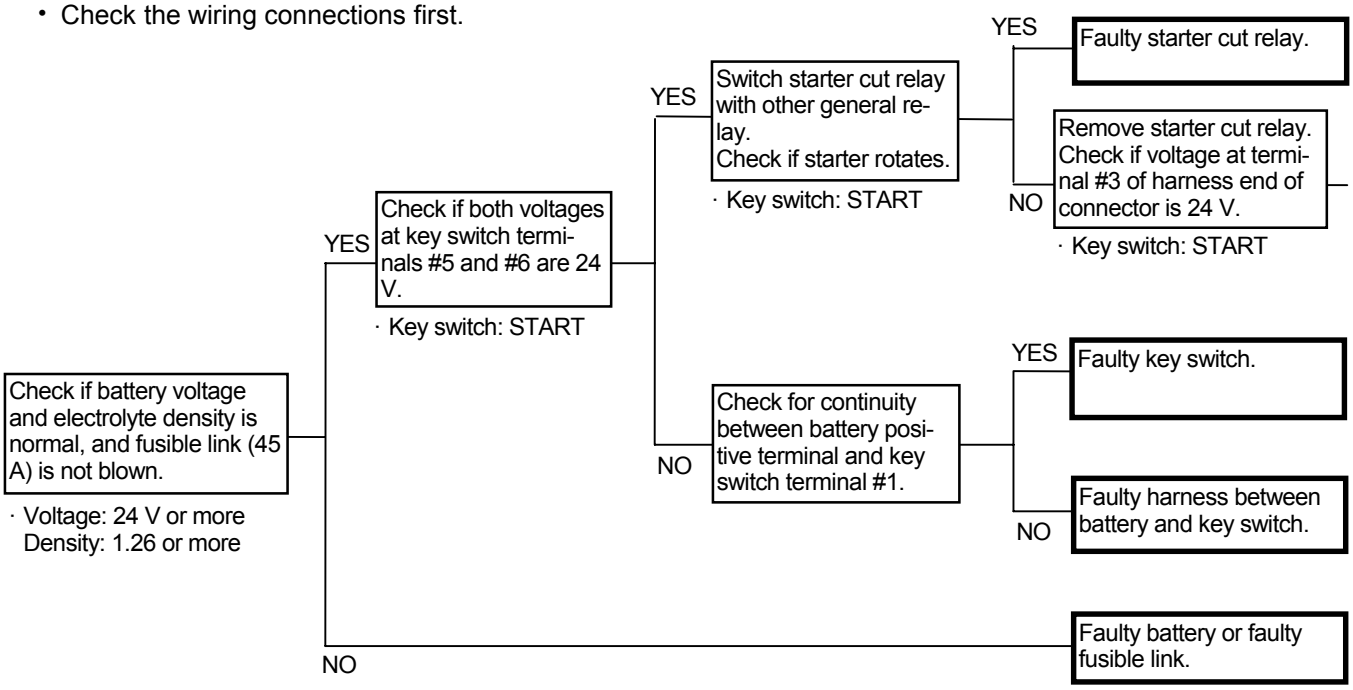
NOTE: The trouble symptoms in this table are described provided that each trouble occurs independently
In case more than one trouble occurs at the same time, find out all faulty components while checking all suspected components in each trouble symptom.

ENGINE SYSTEM TROUBLESHOOTING

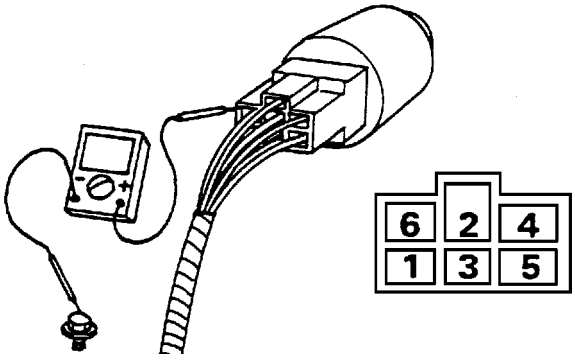
E-1 Starter does not rotate.

IMPORTANT: As electric current from the key switch is not routed to starter relay with the pilot shut-off lever in UNLOCK 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.

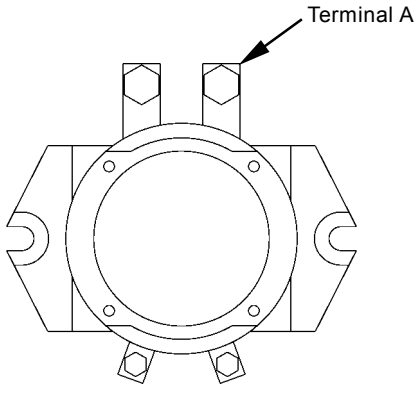


Key Switch:

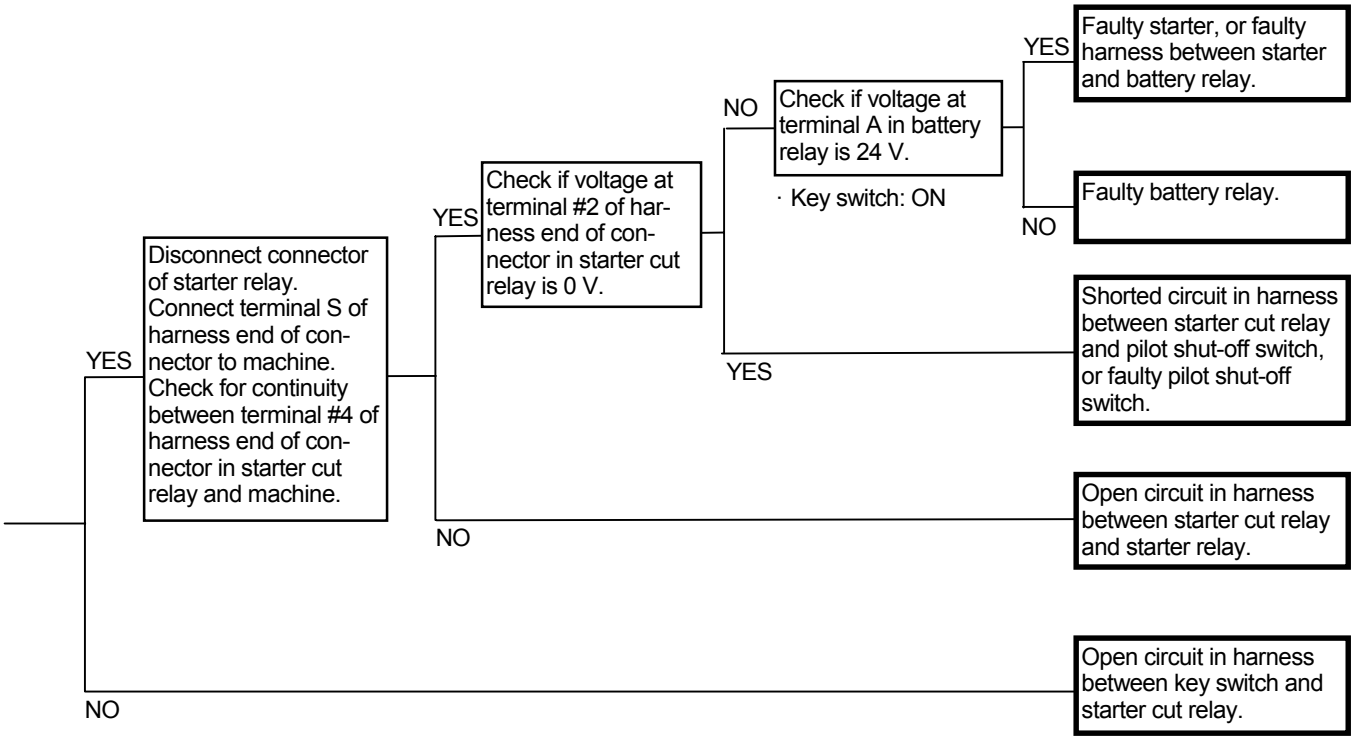


T105-07-04-002

Battery Relay:



T178-05-04-001

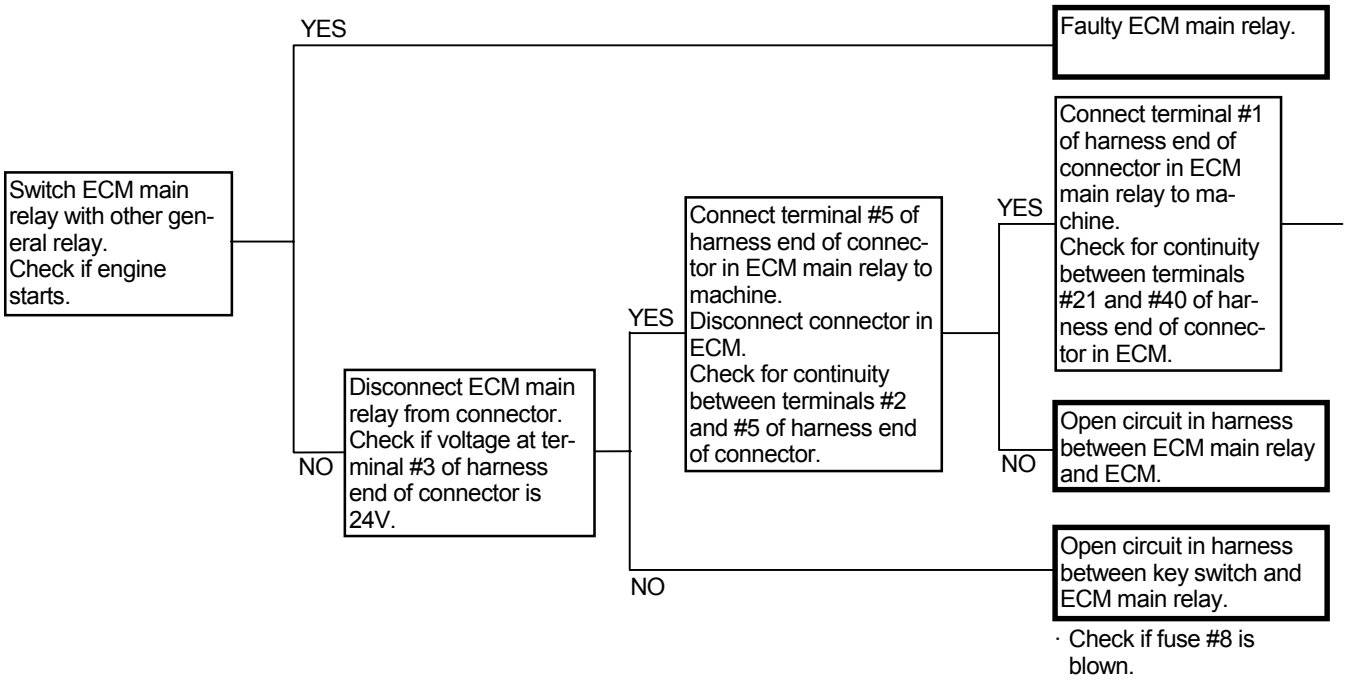


Connector (Harness end of connector viewed from the open side)

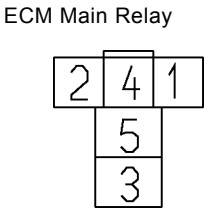
T183-05-04-003

E-2 Even if starter rotates, engine does not start.

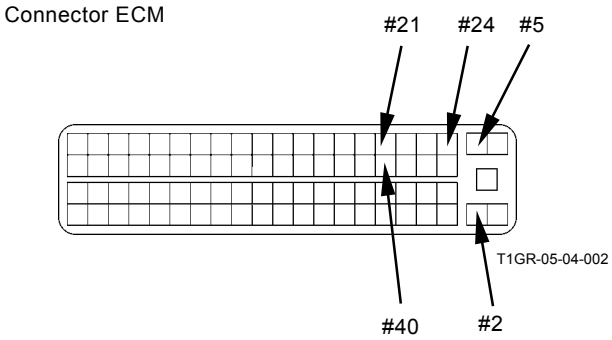
- Check the wiring connections first.



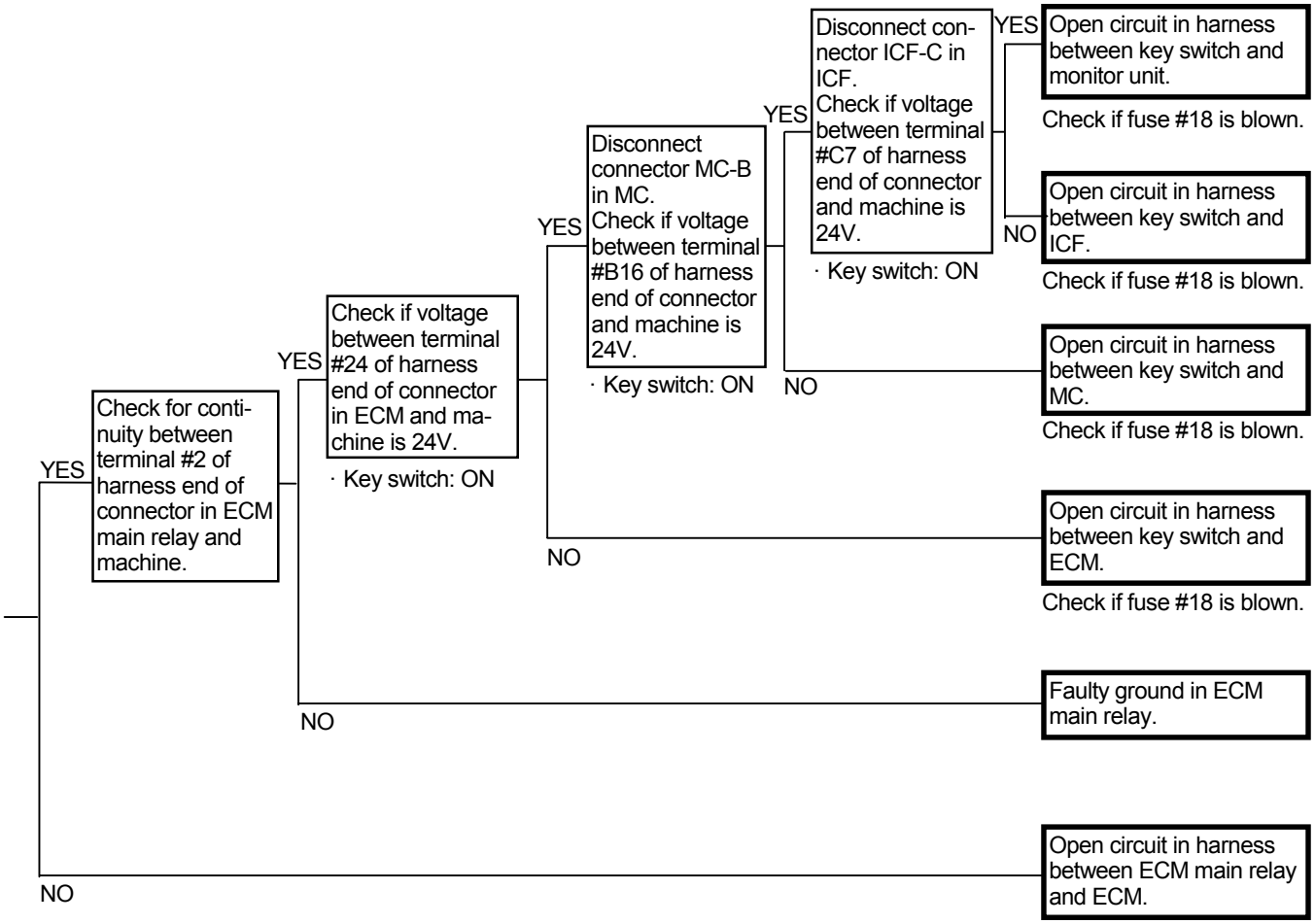
Connector (Harness end of connector viewed from the open side)



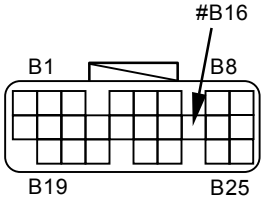
T183-05-04-003



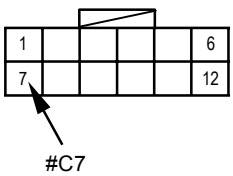
T1GR-05-04-002



Connector MC-B



Connector ICF-C

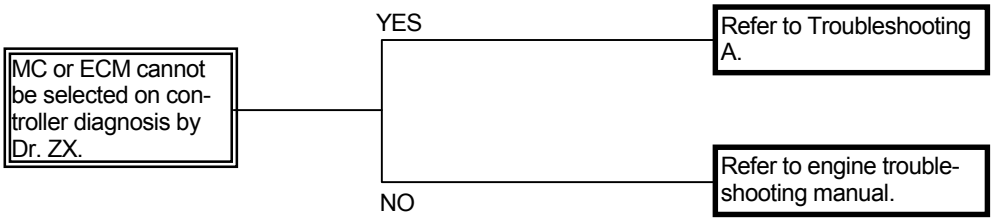


T1GR-05-04-002

E-3 When engine control dial is fully rotated, engine stalls.
When engine control dial is fully rotated, engine speed becomes slow.

- Check the wiring connections first.

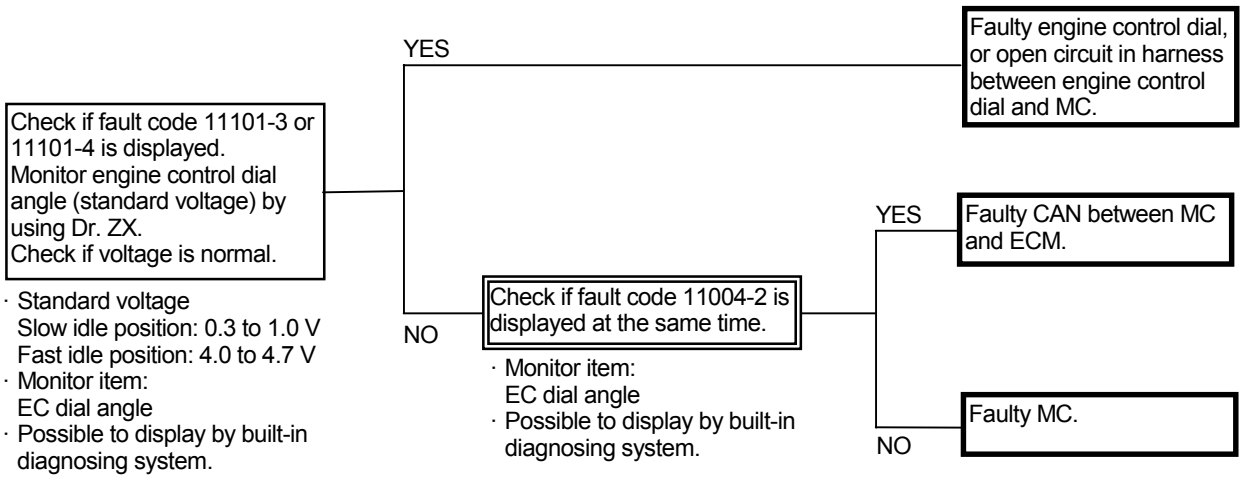
Related Fault Code		Trouble	Reference Page
MC	11003	Abnormal Sensor Voltage	T5-6-38
	11004	CAN Communication Error	T5-6-39



E-4 Even if engine control dial is rotated, engine speed remains unchanged.

Related Fault Code		Trouble	Reference Page
MC	11004	CAN Communication Error	T5-6-39
	11101	Abnormal Engine Control Dial	T5-6-60

- If the CAN harness between ECM and MC is open, the symptom occurs that engine speed increases or decreases.
- Check the wiring connections first.

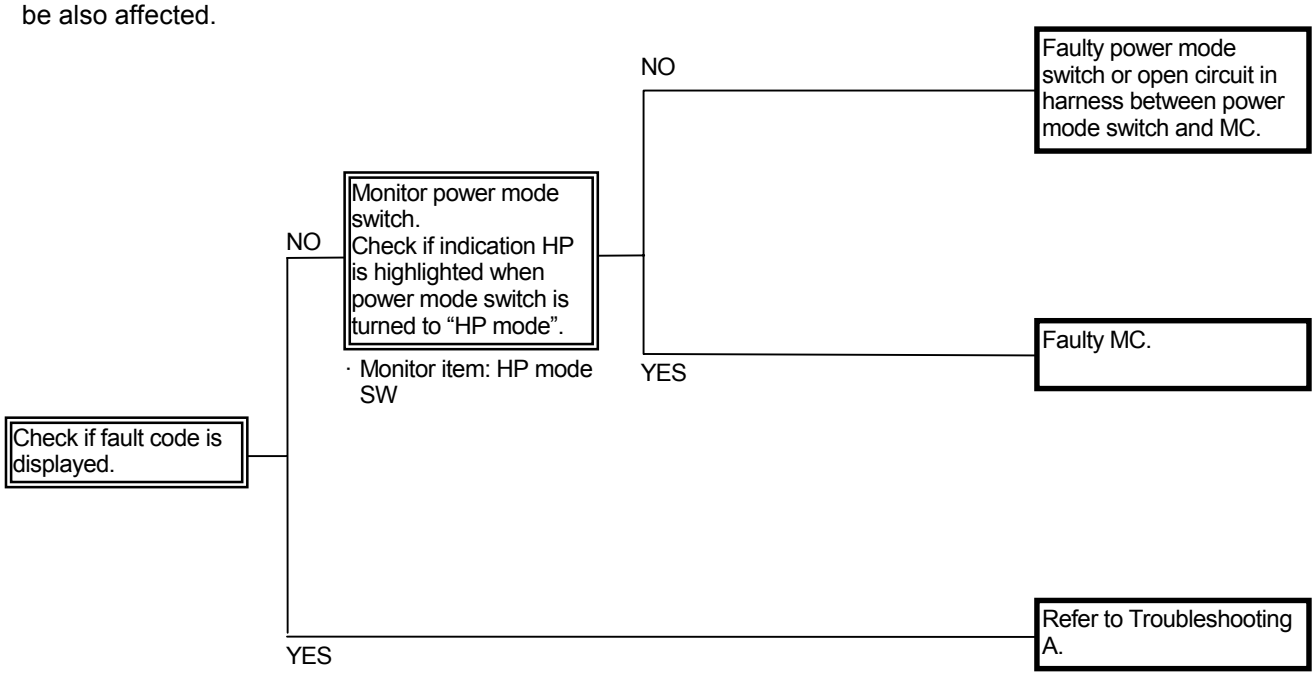


E-5 Faulty HP mode

- Even if power mode switch is turned to the HP mode position, HP mode is inoperable. (General mode normally operates.)

Related Fault Code		Trouble	Reference Page
MC	11004	CAN Communication Error	T5-6-39
	11200	Abnormal Pump 1 Delivery Pressure Sensor	T5-6-61
	11202	Abnormal Pump 2 Delivery Pressure Sensor	T5-6-62
	11302	Abnormal Boom Raise Pilot Pressure Sensor	T5-6-64
	11303	Abnormal Arm Roll-In Pilot Pressure Sensor	T5-6-65

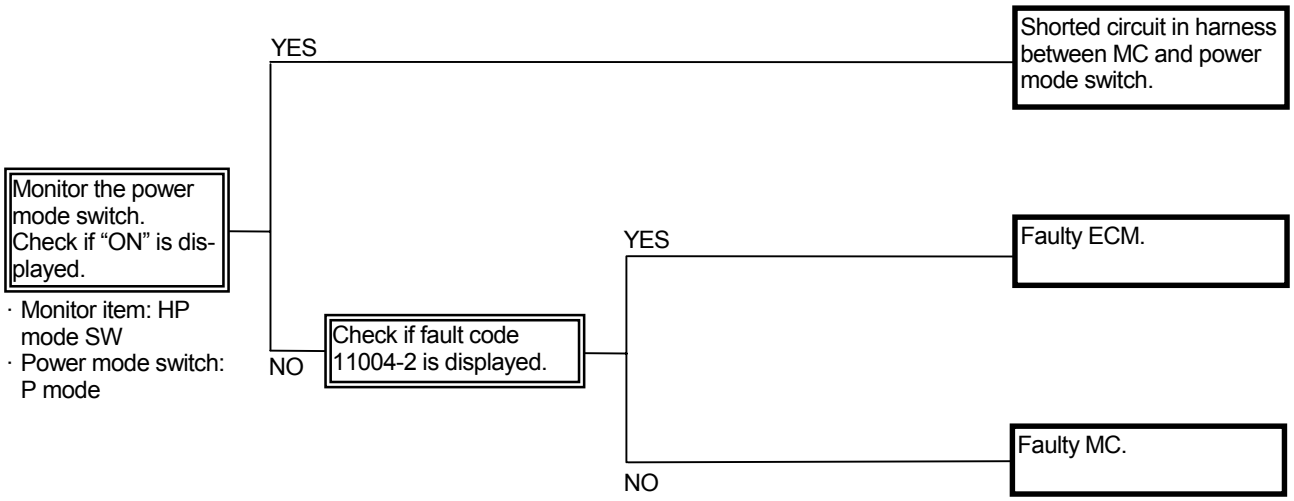
- The sensors detect the conditions necessary to operate HP mode. Therefore, if any of these sensors fails, HP mode becomes inoperable.
- Pressure sensors (arm roll-in and boom raise) and pump 1 and 2 delivery pressure sensors are also engaged in the HP mode control. However, if these sensors fail, other 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 operable.

Related Fault Code		Trouble	Reference Page
MC	11004	CAN Communication Error	T5-6-39

• 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.

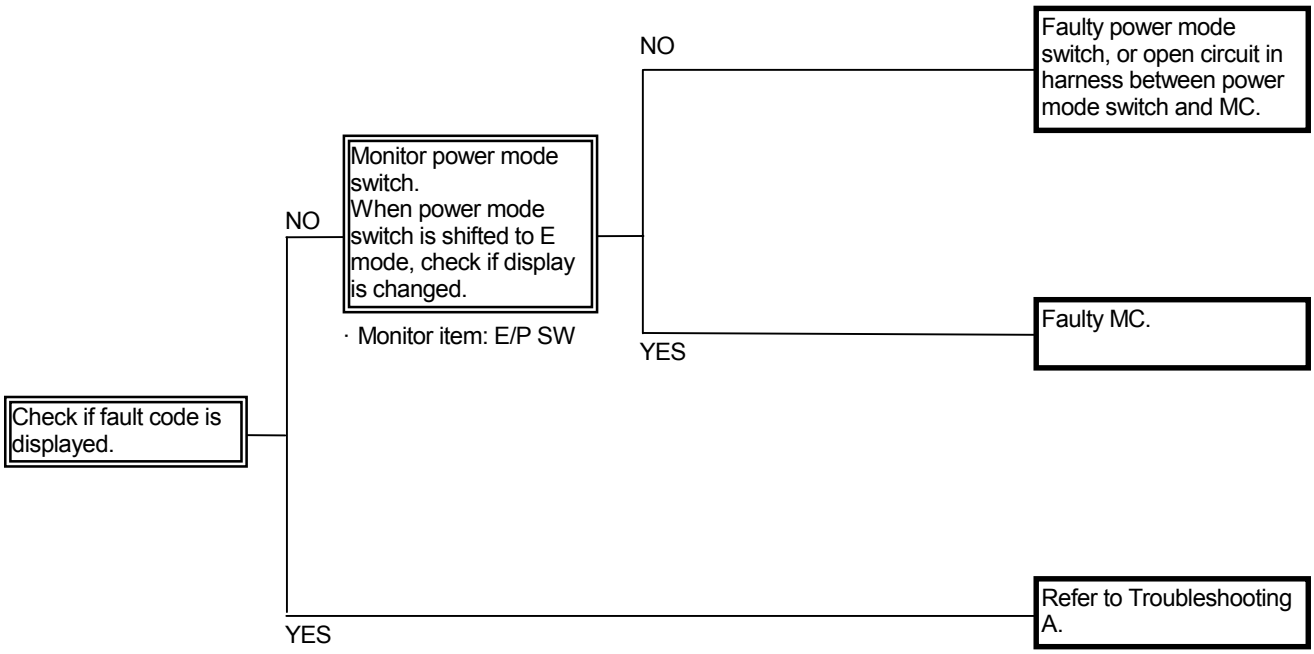


E-6 Faulty E mode

- Even if power mode switch is turned to the E mode position, engine speed remains unchanged. (Engine speed does not decrease.)

Related Fault Code		Trouble	Reference Page
MC	11004	CAN Communication Error	T5-6-39
	11200	Abnormal Pump 1 Delivery Pressure Sensor	T5-6-61
	11202	Abnormal Pump 2 Delivery Pressure Sensor	T5-6-62
	11992	Abnormal Pump 2 Regulator Pressure Sensor	T5-6-81
	11994	Abnormal Pump 1 Regulator Pressure Sensor	T5-6-83

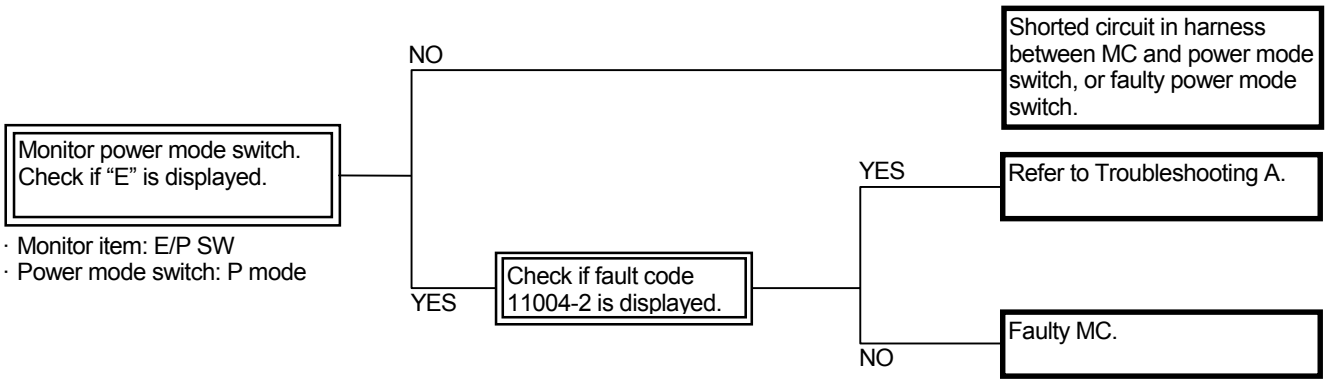
- In case trouble symptoms E-1 to E-5 and E-7 are recognized, perform the troubleshooting of these troubles first.
- The sensors detect the conditions necessary to operate E mode. Therefore, if any of these sensors fails, E mode becomes inoperable.
- Pump 1, 2 regulator pressure sensors and pump 1, 2 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.

Related Fault Code		Trouble	Reference Page
MC	11004	CAN Communication Error	T5-6-39

- Required engine speed from the engine control dial must be beyond 1580 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.

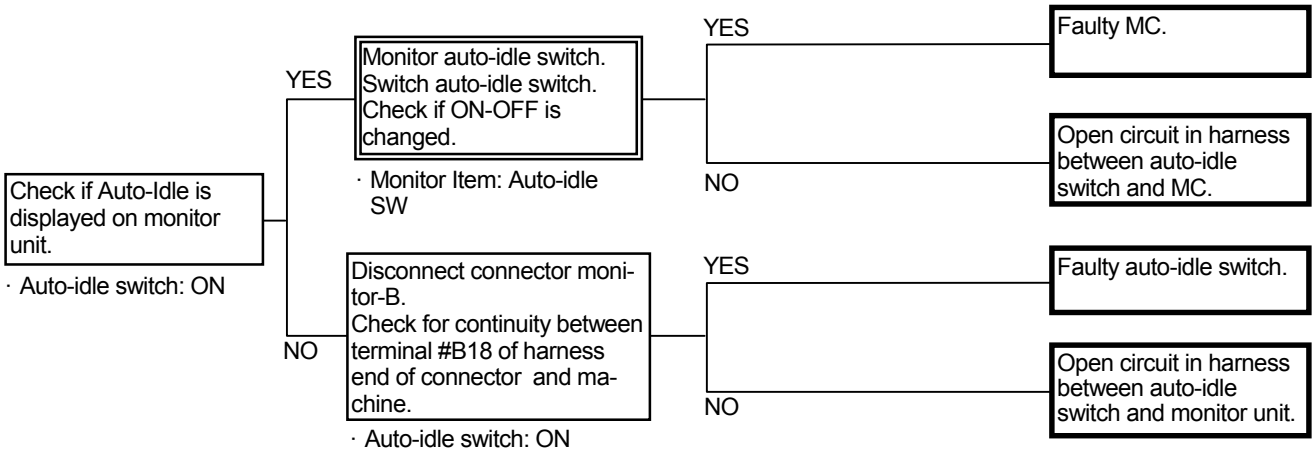


E-7 Faulty auto-idle system

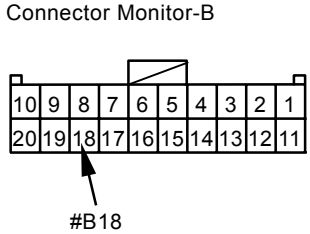
- Even if control lever is turned to neutral, auto-idle system is inoperable.

Related Fault Code		Trouble	Reference Page
MC	11004	CAN Communication Error	T5-6-39
	11301	Abnormal Swing Pilot Pressure Sensor	T5-6-63
	11302	Abnormal Boom Raise Pilot Pressure Sensor	T5-6-64
	11303	Abnormal Arm Roll-In Pilot Pressure Sensor	T5-6-65
	11991	Abnormal Right Travel Pilot Pressure Sensor	T5-6-80
	11993	Abnormal Left Travel Pilot Pressure Sensor	T5-6-82
	11995	Abnormal Arm Roll-Out Pilot Pressure Sensor	T5-6-84
	11997	Abnormal Bucket Roll-Out Pilot Pressure Sensor	T5-6-85
	11998	Abnormal Boom Lower Pilot Pressure Sensor	T5-6-86
	11999	Abnormal Bucket Roll-In Pilot Pressure Sensor	T5-6-87
ECM	639	Abnormal CAN	T5-6-28, 29

- In case trouble symptoms E1 to E6 are recognized, perform the troubleshooting of these troubles first.
- Even if failure in each pilot pressure sensor 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.

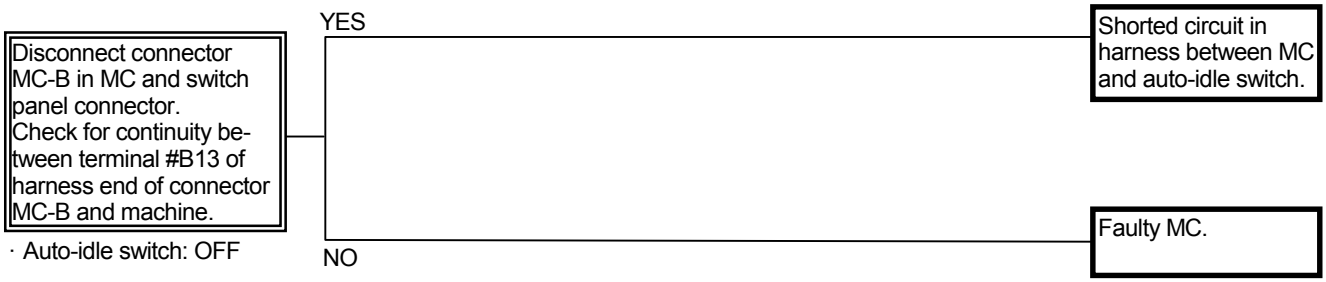


Connector (Harness end of connector viewed from the open side)



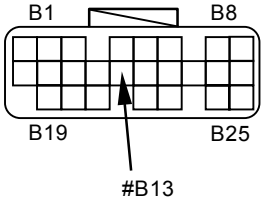
- Even if auto-idle switch is turned OFF, auto-idle is operable.

Related Fault Code		Trouble	Reference Page
MC	11004	CAN Communication Error	T5-6-39



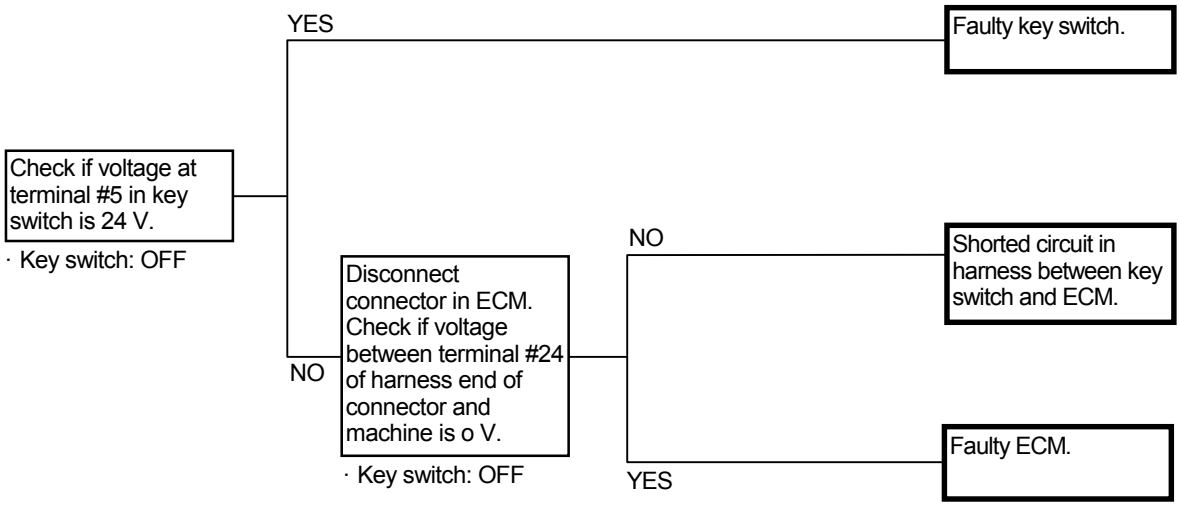
Connector (Harness end of connector viewed from the open side)

Connector MC-B

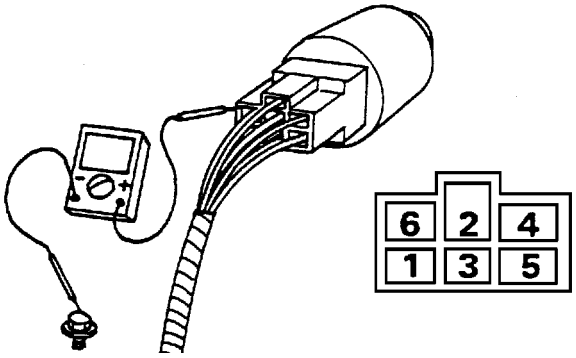


E-8 Even if key switch is turned OFF, engine does not stop. (In case engine does not stop, stop engine by pulling engine stop handle located under seat stand. Then, begin inspection.)

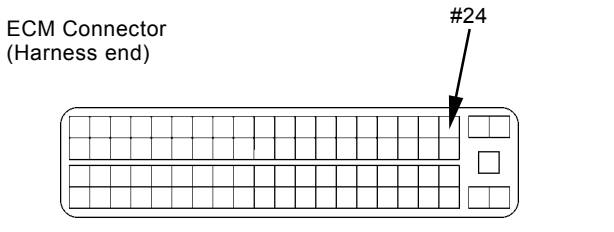
- Probably the symptoms such as “Engine speed is slower than specification in all operating ranges” or “Even if engine control dial is rotated, engine speed remains unchanged” may come up. Perform troubleshooting for these symptoms.



Key Switch:



T105-07-04-002

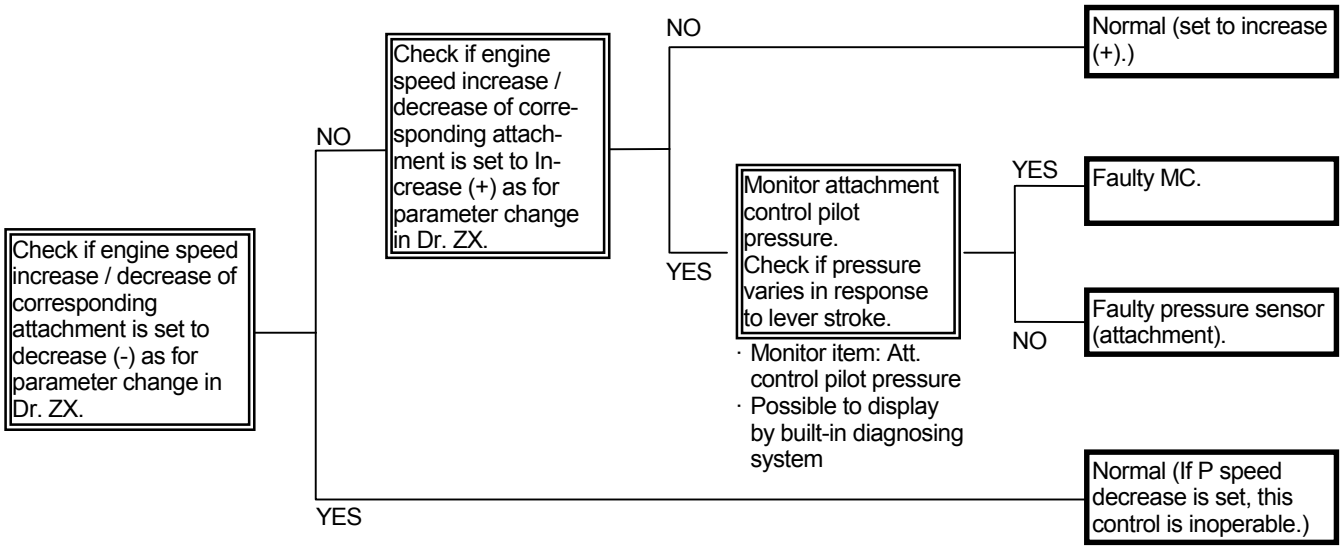


T1GR-05-04-002

E-9 Engine speed does not increase even if attachment is operated in attachment mode.

Related Fault Code		Trouble	Reference Page
MC	11004	CAN Communication Error	T5-6-39

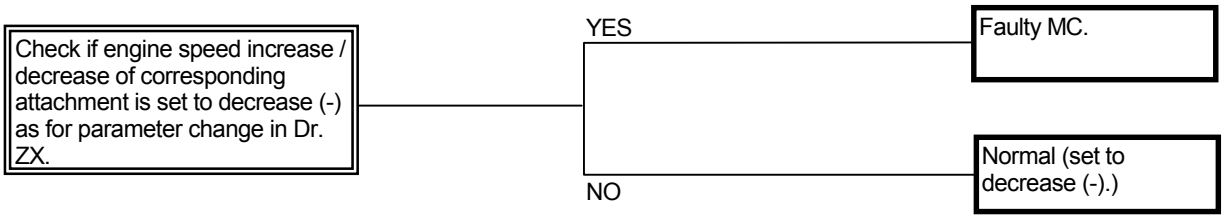
- In case trouble symptoms E-1 to E-11 are recognized, perform the troubleshooting of these troubles first.
- Even if the failure in pressure sensor (attachment) and power mode switch may have relevance to the malfunction of attachment operation speed increase control. However, if these sensor and switches 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-10 When attachment mode is selected, engine speed does not decrease.

Related Fault Code		Trouble	Reference Page
MC	11004	CAN Communication Error	T5-6-39

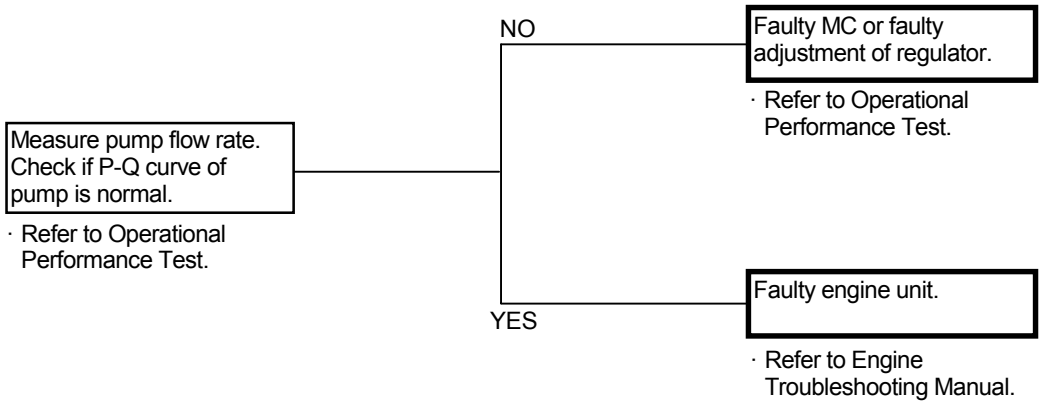
- In case trouble symptoms E-1 to E-11 are recognized, perform the troubleshooting of these troubles first.
- Refer to the pages for Attachment Operation Speed Limit Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- Check the wiring connections first.



E-11 Engine stalls during operation under adverse condition such as at high altitude.

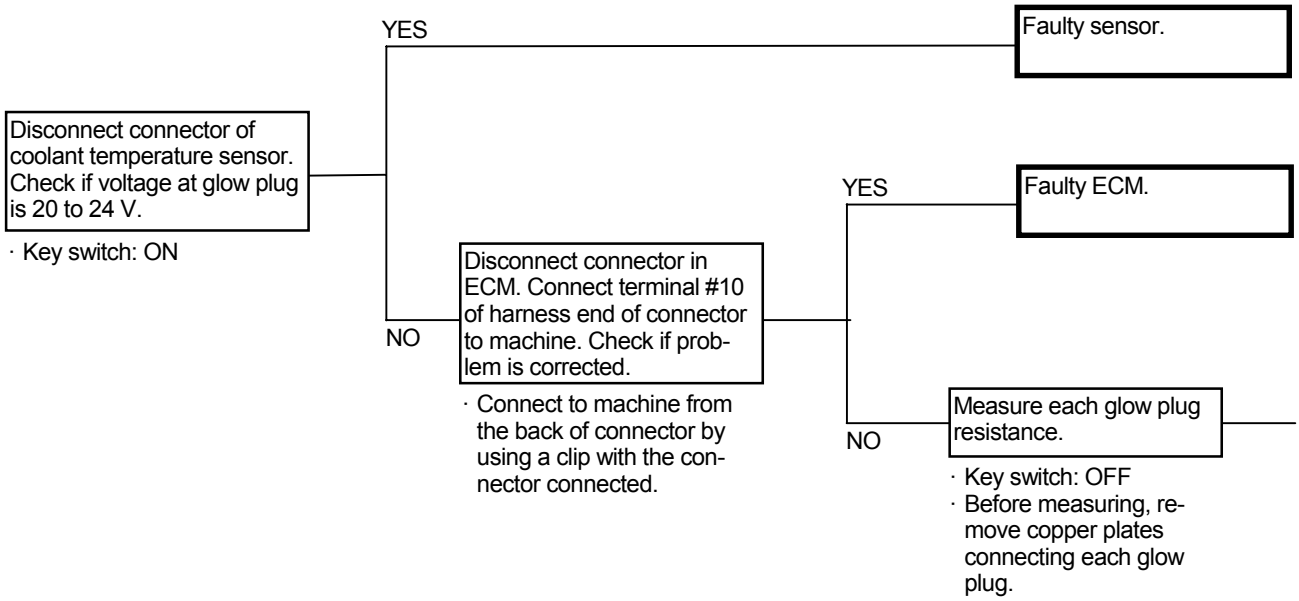
Related Fault Code		Trouble	Reference Page
MC	11004	CAN Communication Error	T5-6-39
	11200	Pump 1 Delivery Pressure Sensor	T5-6-61
	11202	Pump 2 Delivery Pressure Sensor	T5-6-62
	11400	Pump 2 Control Solenoid Valve Circuit	T5-6-66
	11410	Pump 1 Control Solenoid Valve Circuit	T5-6-70
	11992	Pump 2 Regulator Pressure Sensor	T5-6-81
	11994	Pump 1 Regulator Pressure Sensor	T5-6-83

- If speed sensing control is inoperable, the engine will stall under adverse operating conditions.
- As pump control solenoid valve, pump regulator pressure sensor and regulator are 2 used for each, both may not become faulty at the same time. Or, if one is faulty, machine mistracks.
- Check the wiring connections first.



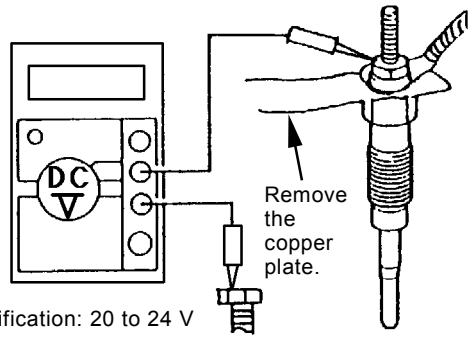
E-12 Engine is difficult to start at low temperature. (During cold weather or in cold districts, engine is difficult to start or does not start even if pre-heated.)

- 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

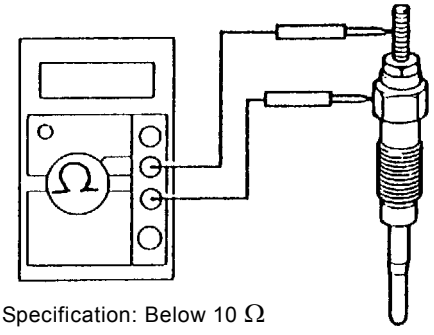
Voltage Check



Specification: 20 to 24 V

T105-07-04-006

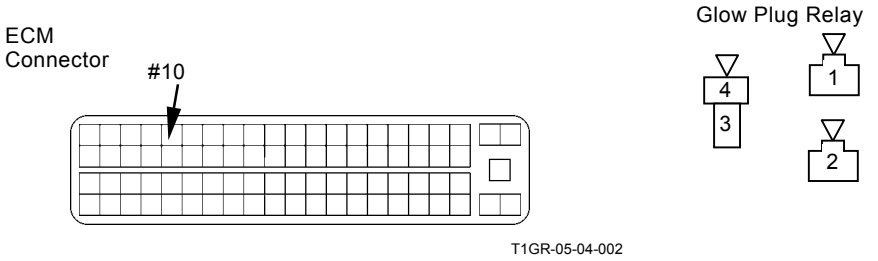
Resistance Check



Specification: Below 10 Ω

T105-07-04-007

Connector (Harness end of connector viewed from the open end side)



T1GR-05-04-002

∞ Ω

Faulty glow plug.

Below 10 Ω

Disconnect connector in glow plug relay.
Check if voltages at terminals #1 and #3 of harness end of connector in glow plug relay are 20 to 24 V.

· Key switch: ON

YES

Connect connector in glow plug 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

NO

Faulty glow plug relay, or faulty harness between glow plug relay and glow plug.

YES

Open circuit in harness between glow plug relay and ECM.

NO

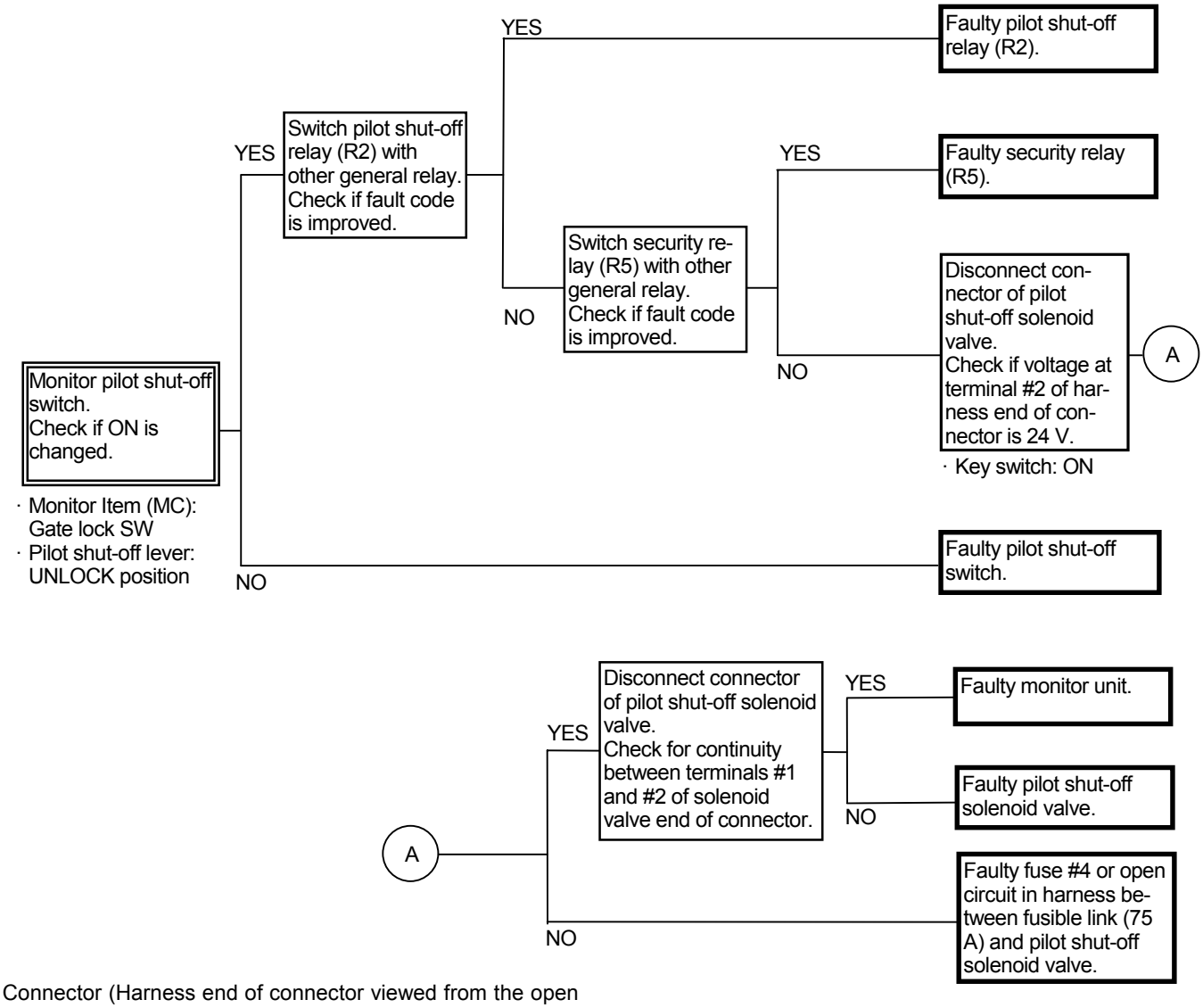
If terminal #1 is 0 V, open circuit in harness between glow plug relay and battery. If terminal #3 is 0 V, open circuit in harness between glow plug relay and terminal M in key switch.

· Check if fuse #16 is blown.

ALL ACTUATOR SYSTEM TROUBLE-SHOOTING

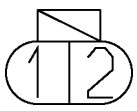
A-1 All actuators are not operated.

- Check the wiring connections first.



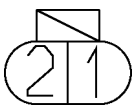
Connector (Harness end of connector viewed from the open side)

Pilot Shut-Off Solenoid Valve



T183-05-04-010

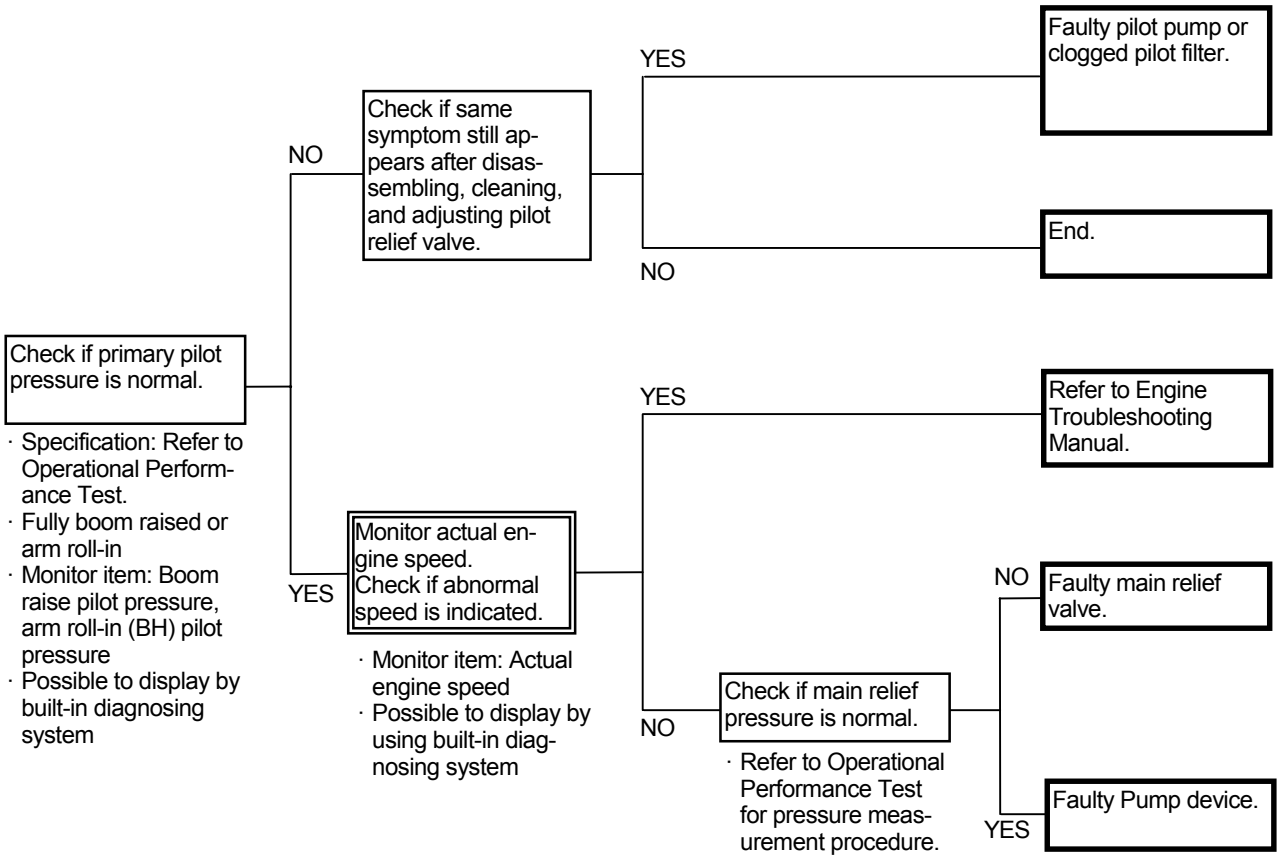
Pilot Shut-Off Solenoid Valve (Solenoid Valve End)



T1J1-05-07-006

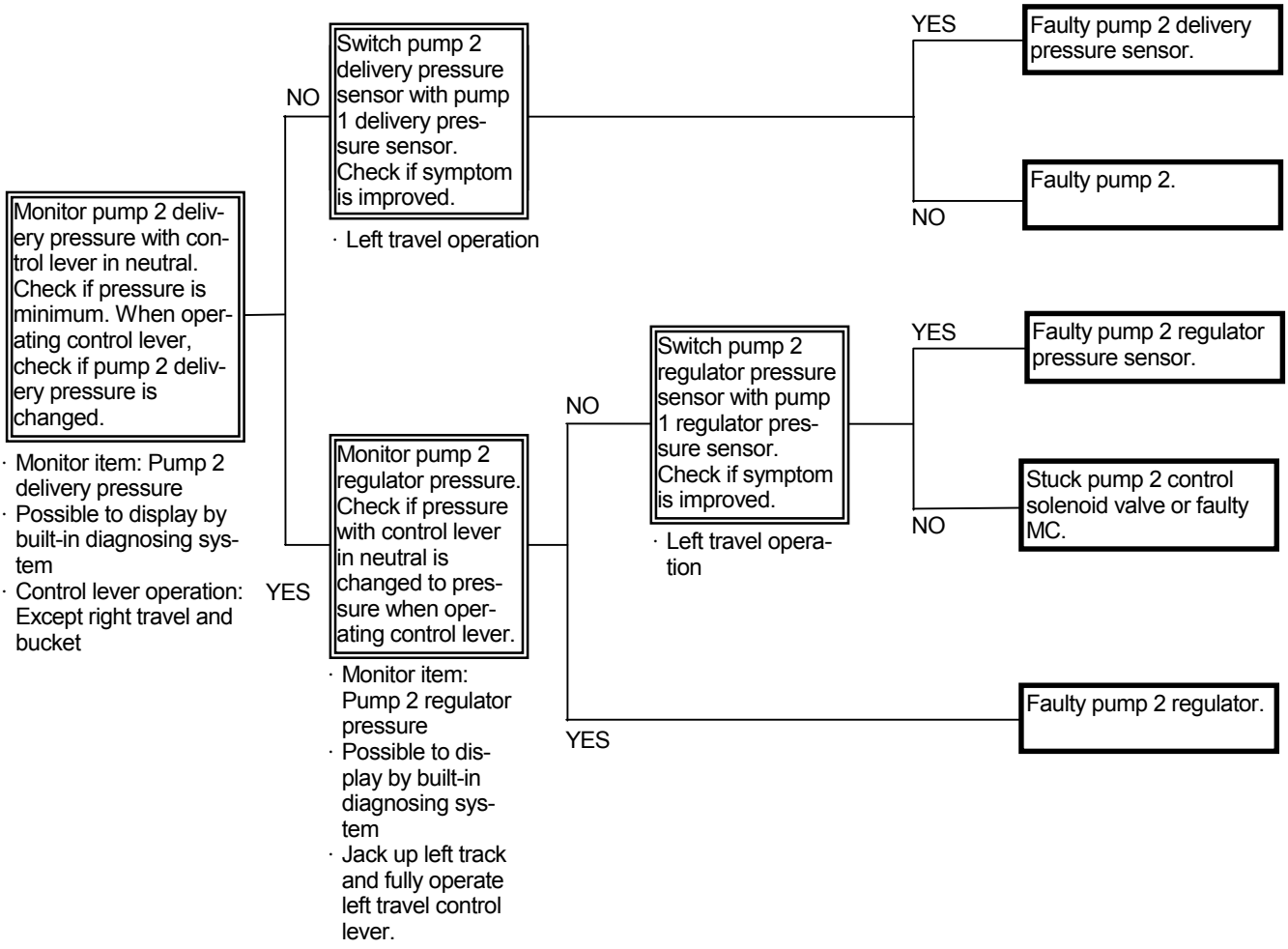
A-2 All actuator speeds are slow.

- Reduction in pump 1 and 2 flow rate due to some reasons or faulty pilot system may cause this trouble.
- Although speed is satisfactory, in case power is weak, refer to the troubleshooting faulty relief valve (F-1).
- As for the machine equipped with the counter-weight removal / installation device (optional), check the pilot pressure (counterweight).
- Check the wiring connections first.



A-3 Left travel is inoperable during single travel operation. Single swing operation speed is slow. Arm is slightly slow during arm level crowding. (All problems occur at the same time.)

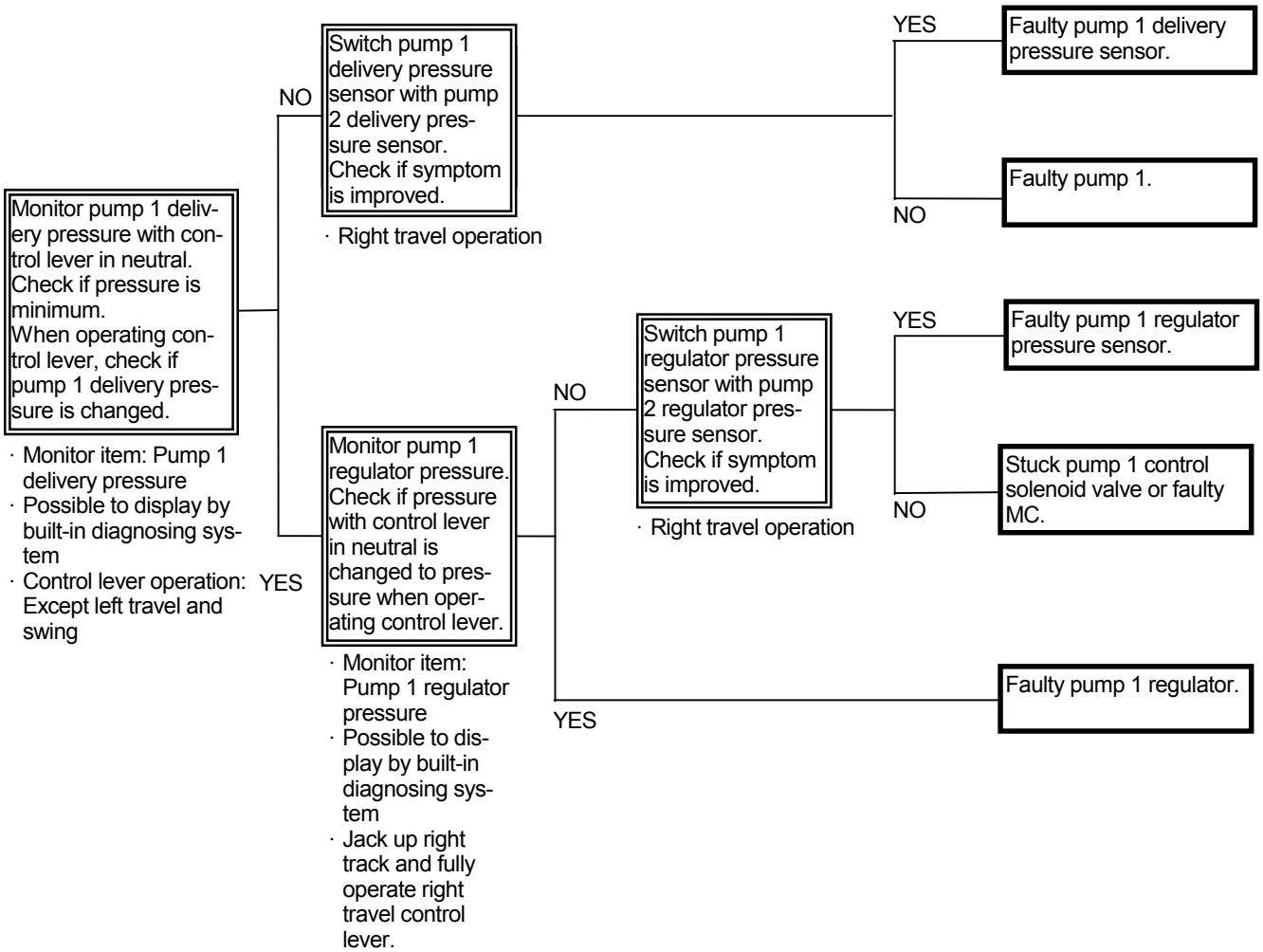
- The pump 2 flow rate is minimized due to some reasons. Accordingly, the left travel and swing motors, which are driven by pressure oil from pump 2, moves very slow.
- Pressure oil from pump 1 is also routed to the arm and boom cylinders so that the arm and boom can move at a slightly slow speed in 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.
- If swing operation speed is normal, monitor swing pilot pressure and, check if the pressure is 0 MPa while swing control lever is in neutral.
- Check the wiring connections first.
- Refer to the SYSTEM / Hydraulic System group in the T/M (Operational Principle).



A-4 Right travel is inoperable during single travel operation. Single bucket operation speed is slow. Boom is not raised properly during arm level crowding. (All problems occur at the same time.)

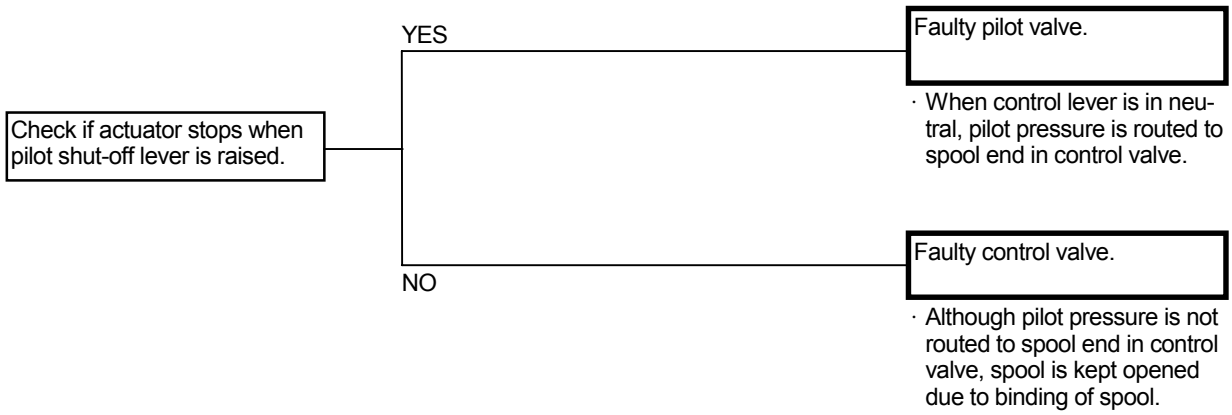
- The pump 1 flow rate is minimized due to some reasons. Accordingly, the right travel motor and bucket cylinder, which are actuated by pressure oil from pump 1, moves very slow.
- Pressure oil from pump 2 is also routed to the arm and boom cylinders so that the arm and boom can move at a slightly slow 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.

- Check the wiring connections first.
- Refer to the SYSTEM / Hydraulic System group in the T/M (Operational Principle).



A-5 Actuator does not stop even if control lever is returned to neutral.

- Bound spool in the pilot valve or bound main spool in the control valve is suspected.

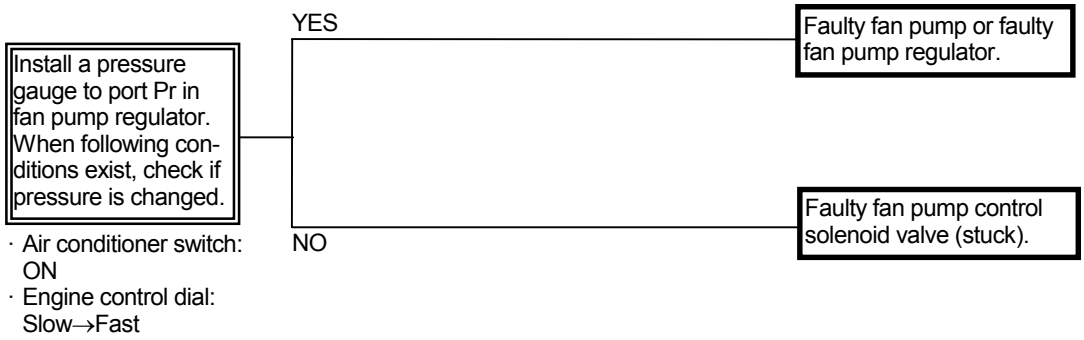


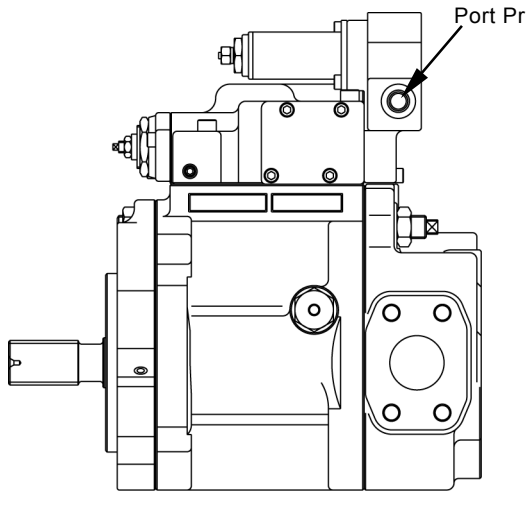
A-6 Actuator speed is faster than normal. Machine mistracks when travel lever is operated at half stroke. Precise control cannot be performed.

- The pump 1 or 2 flow rate is maximized due to some reasons.
- If the fault code is not displayed, the pump device is displayed, the pump device is faulty.
- If the fault code is displayed, refer to Troubleshooting A.

A-7 Fan rotation speed remains unchanged at maximum.

- Check if the fault code is not displayed first.
- If the sensor corresponding to fan pump flow rate control is abnormal, fan rotation speed becomes maximum.
- If all actuator speeds are slow, refer to A-2.



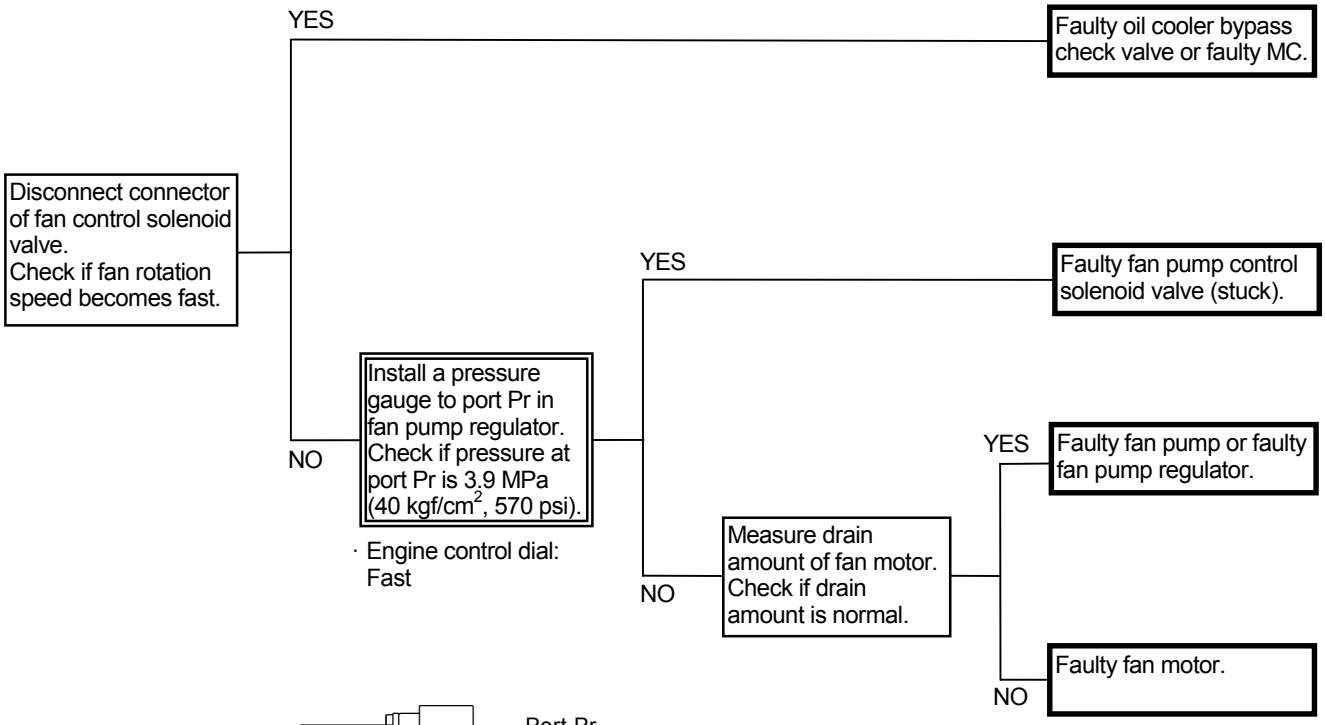


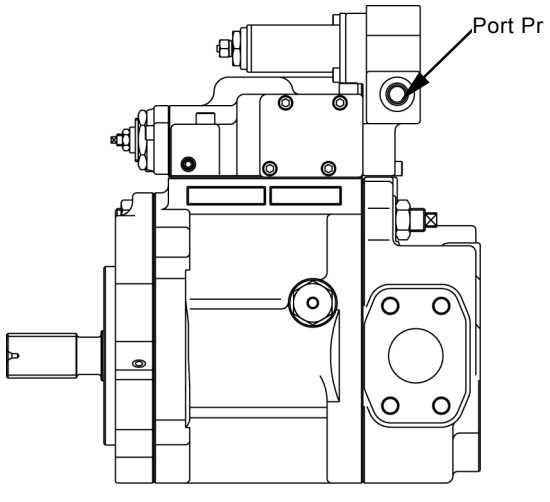
T1J1-05-07-001

A-8 Overheating occurs.
Fan rotation speed is slow.

Related Fault Code		Trouble	Reference Page
MC	11004	CAN Communication Error	T5-6-39
	11412	Abnormal Fan Pump Control Solenoid Valve	T5-6-71
	11901	Abnormal Hydraulic Oil Temperature Sensor	T5-6-73
ECM	110	Abnormal Coolant Temperature Sensor	T5-6-24, 25

- Check the wiring connections first.



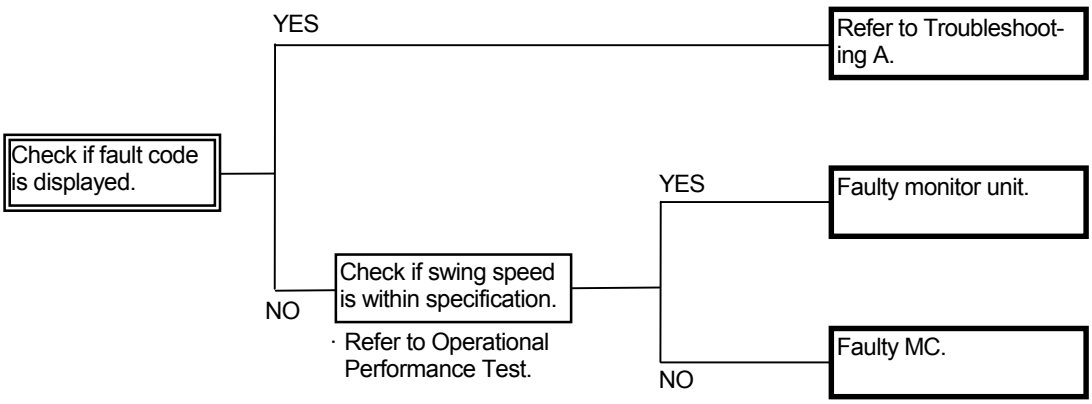


T1J1-05-07-001

A-9 Flow rate of pump 2 is not reduced to specification when operating attachment.

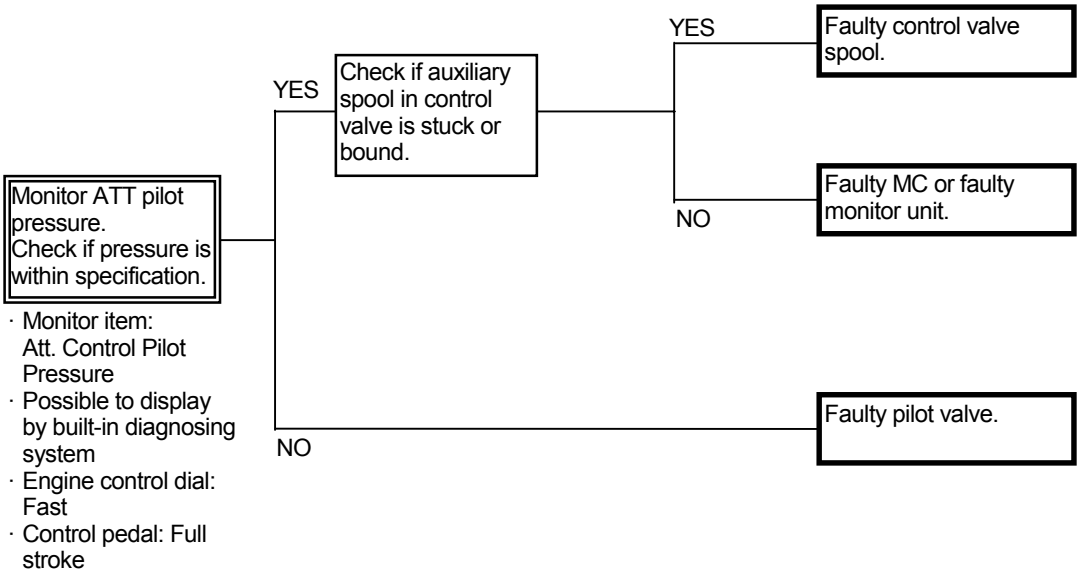
Related Fault Code		Trouble	Reference Page
MC	11004	CAN Communication Error	T5-6-39
	11400	Abnormal Pump 2 Control Solenoid Valve	T5-6-66
	11918	Work Mode Receive Error	T5-6-75, 76
	11992	Abnormal Pump 2 Regulator Pressure Sensor	T5-6-81

- Although the attachment is operated with work mode in digging, pump 2 flow rate remains kept minimum.
- Check the wiring connections first.



A-10 Attachment operating speed is too slow.

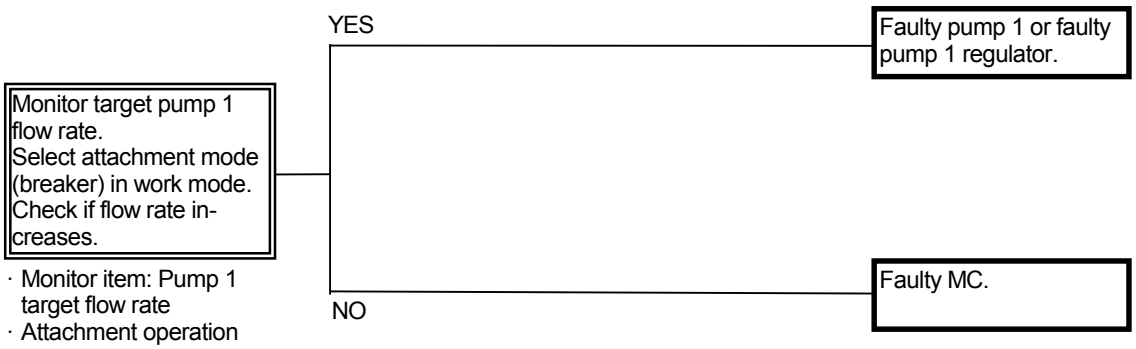
- If all actuator speeds are slow or operating speed at pump 2 side (5-spool side) is slow, refer to A-2 or A-3.
- Although the attachment is operated with work mode in digging, pump 2 flow rate remains kept minimum.
- Check the wiring connections first.



A-11 Overheating occurs easily when operating breaker.

Related Fault Code		Trouble	Reference Page
MC	11410	Abnormal Pump 1 Control Solenoid Valve	T5-6-70
	11918	Work Mode Receive Error	T5-6-75, 76
	11994	Abnormal Pump 1 Regulator Pressure Sensor	T5-6-83

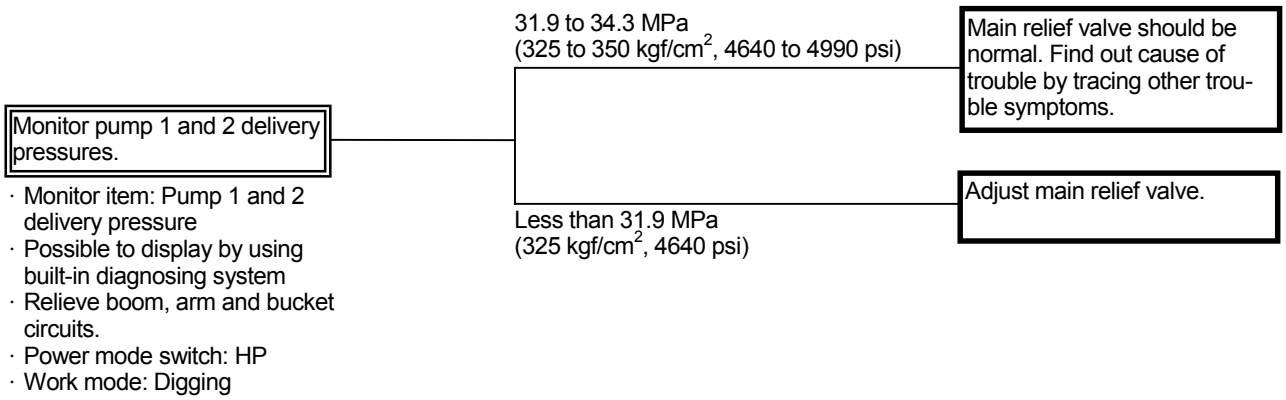
- Refer to Attachment Mode Control in the Control System group/ SYSTEM in T/M (Operational Principle).
- If overheating occurs when operating except the breaker, refer to A-8.
- If operating speed at pump 1 side (4-spool side) is slow, refer to A-4.
- Check the wiring connections first.



FRONT ATTACHMENT SYSTEM TROUBLESHOOTING

F-1 All front attachment actuator power is weak.

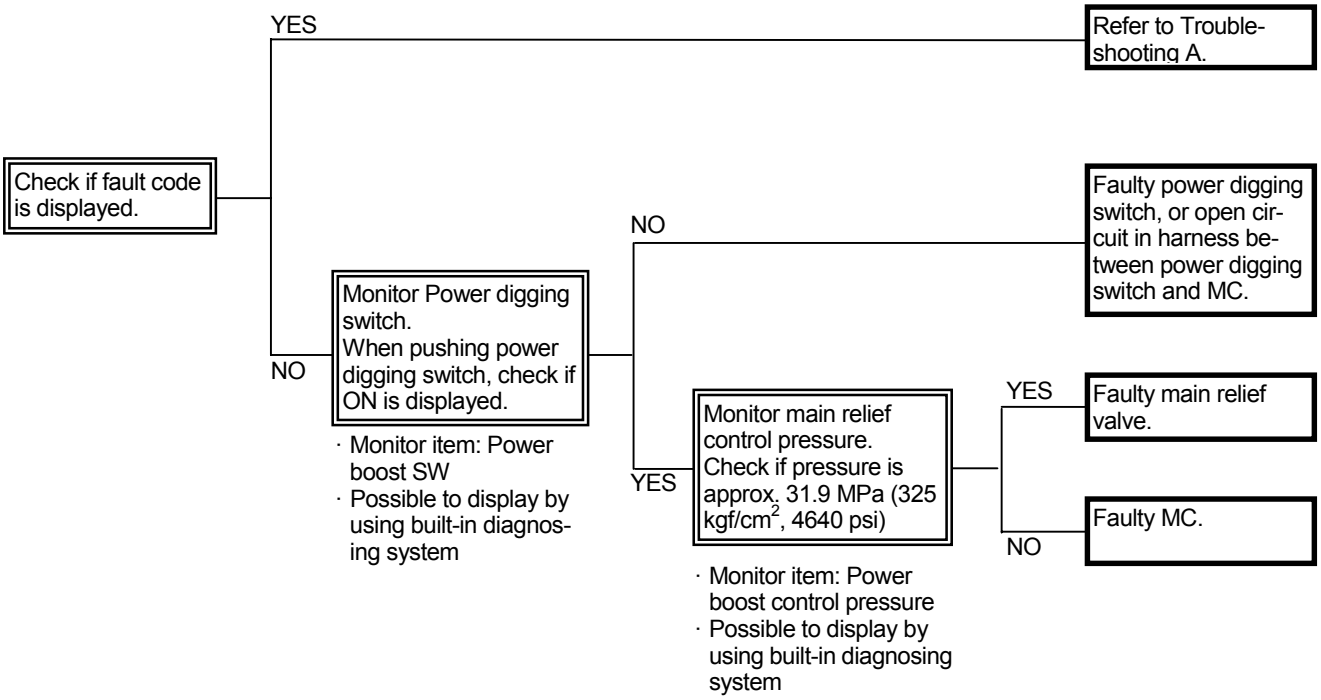
- In case operating speeds are extremely slow, pump control may be malfunctioning (A-1 and/or A-2). Faulty pilot system may also cause this trouble.



F-2 Even if power digging switch is pushed, power does not increase.
Boom raise power is week when digging.

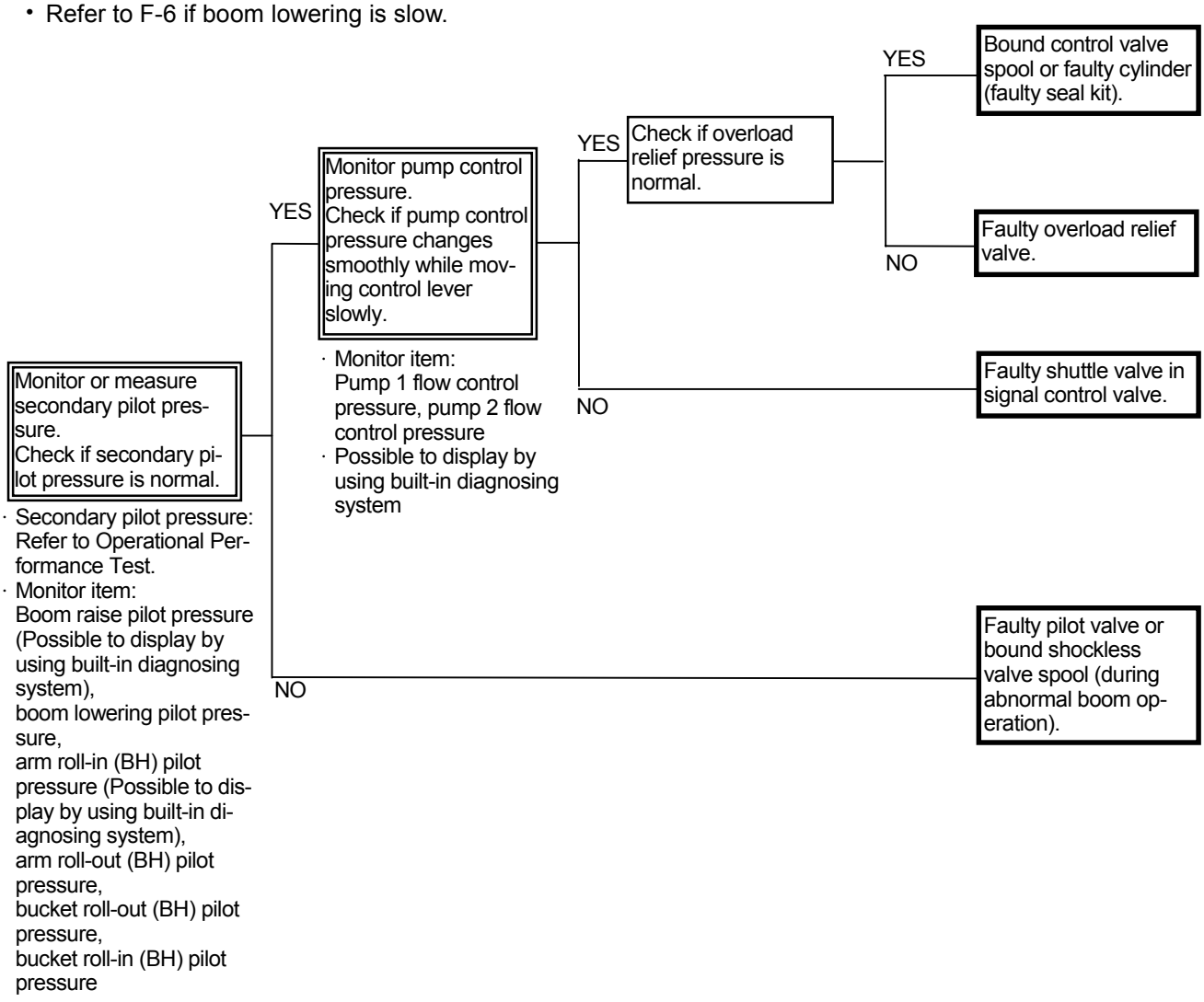
Related Fault Code		Trouble	Reference Page
MC	11302	Abnormal Boom Raise Pilot Pressure Sensor	T5-6-64
	11404	Abnormal Solenoid Valve Unit (SG)	T5-6-68

- Refer to the pages for the SYSTEM / Power Digging Control group in T/M (Operational Principle).



F-3 Some cylinders are inoperable or speeds are slow.

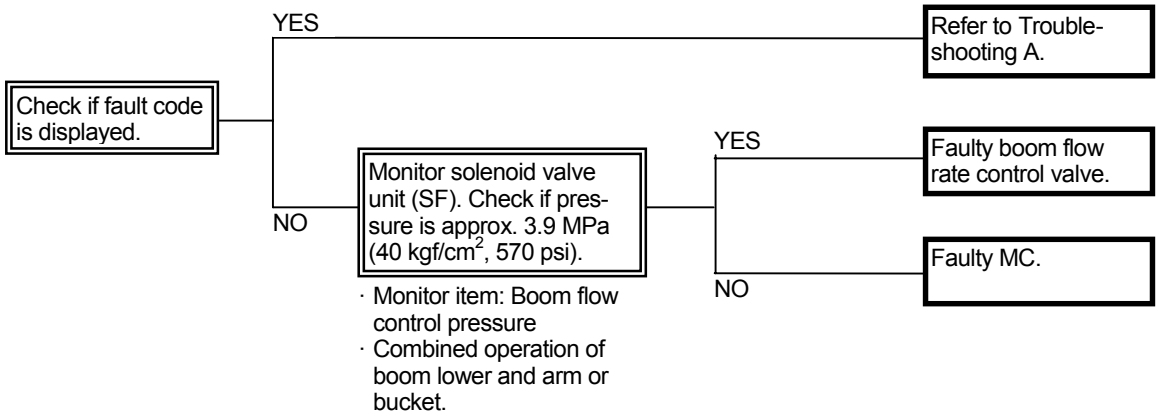
- When other actuators (travel and swing motors) operate normally, the pilot pump (primary pilot pressure) is considered to be normal.
- Refer to F-6 if boom lowering is slow.



F-4 Arm speed or bucket speed is slow during combined operation of boom lower and arm or boom lower and bucket.

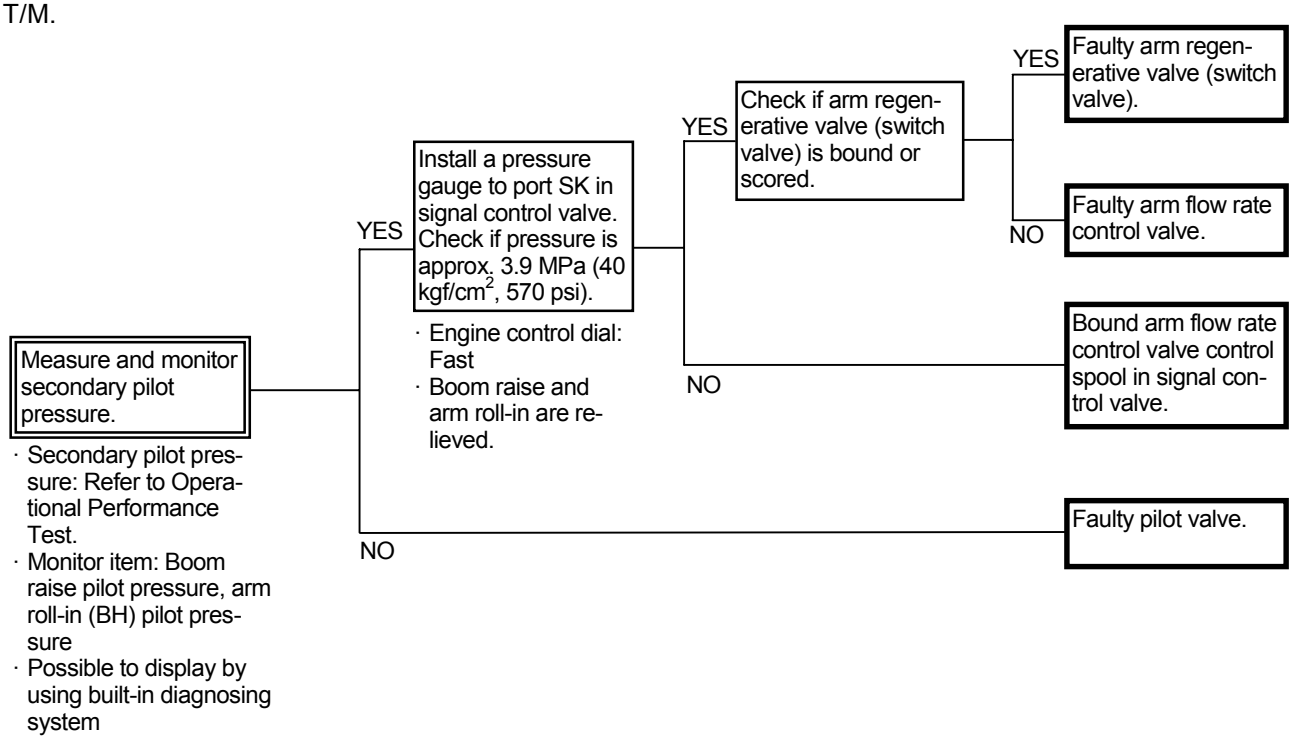
Related Fault Code		Trouble	Reference Page
MC	11303	Abnormal Arm Roll-In Pilot Pressure Sensor	T5-6-65
	11402	Abnormal Solenoid Valve Unit (SF)	T5-6-67
	11995	Abnormal Arm Roll-Out Pilot Pressure Sensor	T5-6-84
	11997	Abnormal Bucket Roll-Out Pilot Pressure Sensor	T5-6-85
	11998	Abnormal Boom Lower Pilot Pressure Sensor	T5-6-86
	11999	Abnormal Bucket Roll-In Pilot Pressure Sensor	T5-6-87

- Refer to the pages for Boom Flow Rate Control Valve Control in SYSTEM in Control System group in T/M (Operational Principle).
- If arm or bucket speed during single operation is slow, refer to A-3.

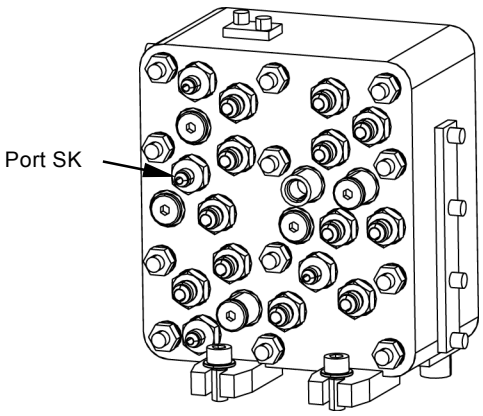


F-5 Boom raise speed is slow during arm crowding operation (during combined operation of boom raise and arm roll-in) Arm moves jerky.

- Refer to the SYSTEM / Hydraulic System group in T/M.



Signal Control Valve
(Control Valve Side)

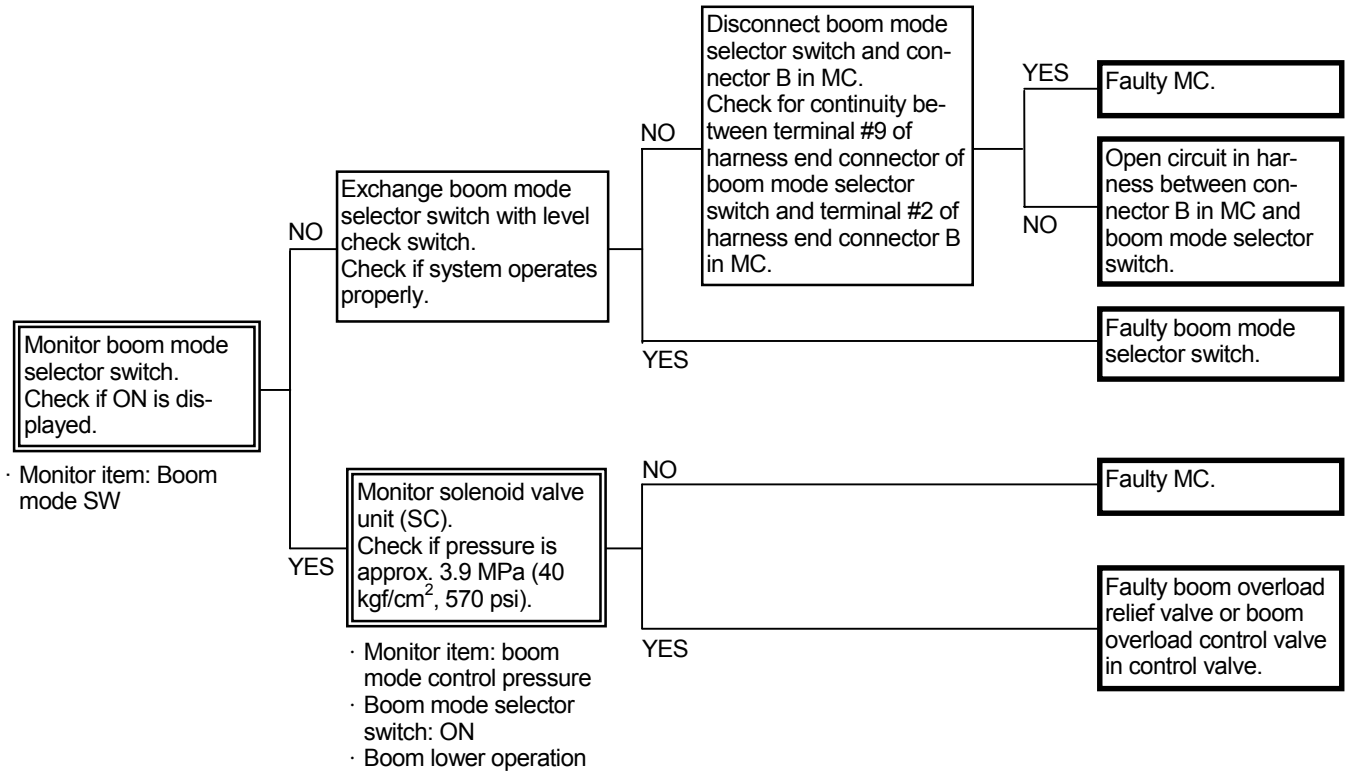


T1J1-05-07-002

F-6 Even if the boom mode selector switch is pushed, machine is raised off ground.

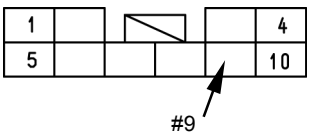
Related Fault Code		Trouble	Reference Page
MC	11989	Abnormal Solenoid Valve Unit (SC)	T5-6-79

- Refer to the pages for Boom Mode Selector Control in SYSTEM / Control System group in T/M (Operational Principle).
- Check the wiring connections first.



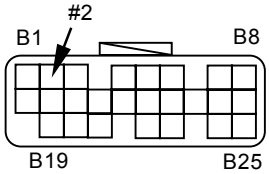
Connector (Harness end connector viewed from the open end side)

Boom Mode Selector Switch

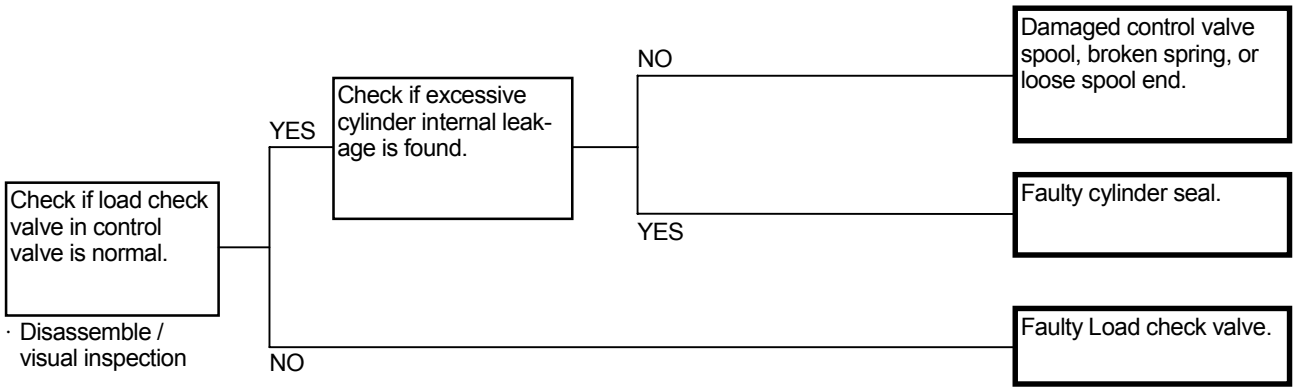


T1J1-05-07-003

MC Connector B

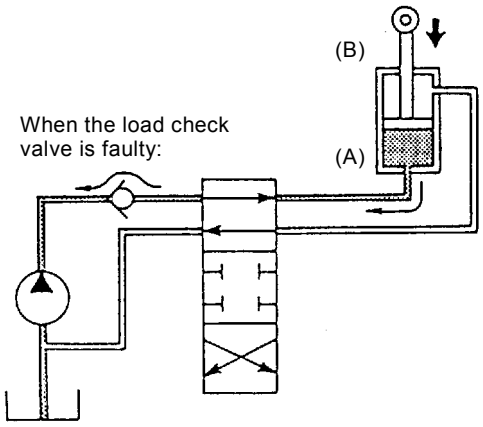


F-7 When boom raise or arm roll-out is operated, boom or arm starts to move after moving slightly downward.



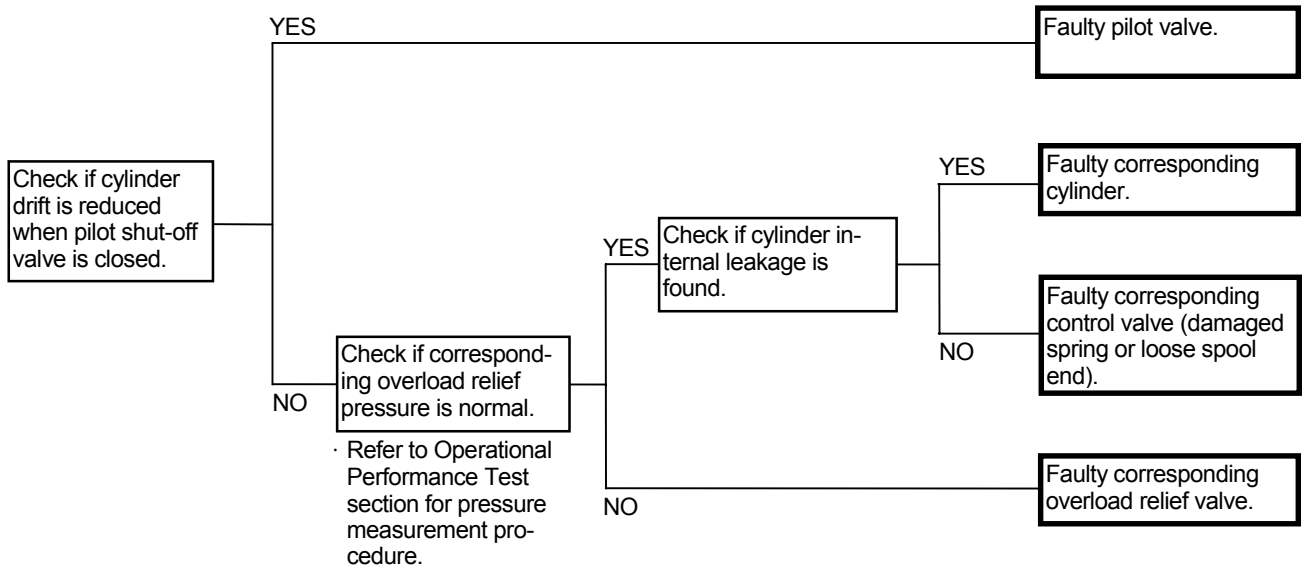
NOTE: 1. During the initial stage of operation, oil pressure and flow rate from the pump is low. Therefore, if the load check valve is malfunctioning, the oil in the bottom side of the boom cylinder flows back into the circuit through the load check valve. Therefore, the boom cylinder is temporarily 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, when cylinder force is reduced, the cylinder drift increases in this case.



T105-07-04-012

F-8 Front attachment drifts remarkably.

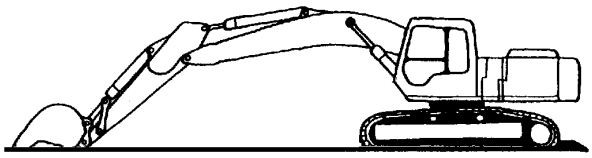


- Boom Cylinder Internal Leakage Check

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. Disconnect 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 disconnected 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 disconnected pipe ends but the boom cylinders are retracted, oil leaks in the control valve.

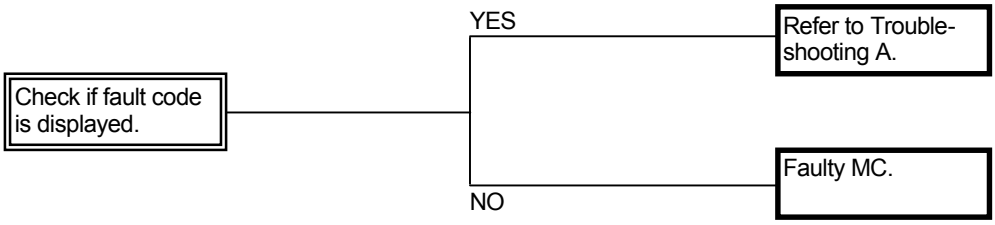


T105-07-04-009

F-9 Front attachment speed is slow during combined operation of front attachment and swing.

Related Fault Code		Trouble	Reference Page
MC	11200	Abnormal Pump 1 Delivery Pressure Sensor	T5-6-61
	11301	Abnormal Swing Pilot Pressure Sensor	T5-6-63
	11410	Abnormal Pump 1 Control Solenoid Valve	T5-6-70
	11994	Abnormal Pump 1 Regulator Pressure Sensor	T5-6-83

- If other operations except the front/swing are normal, the pressure sensor (swing) may be faulty.
- Refer to the pages for Swing Horse Power Reducing Control in SYSTEM / Control System group in T/M (Operational Principle).
- Check the wiring connection first.



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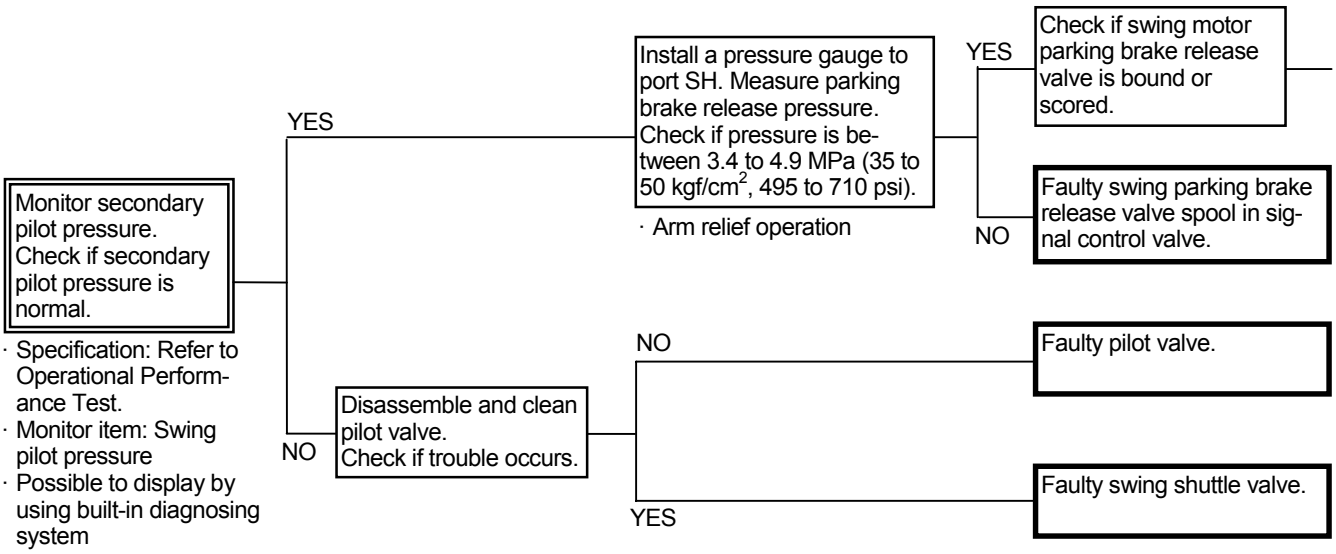
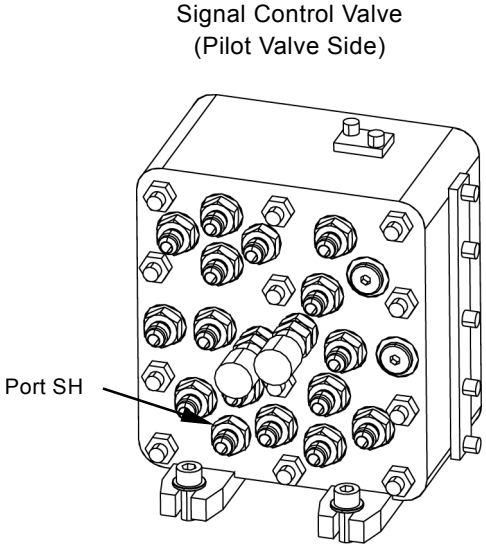
SWING SYSTEM TROUBLESHOOTING

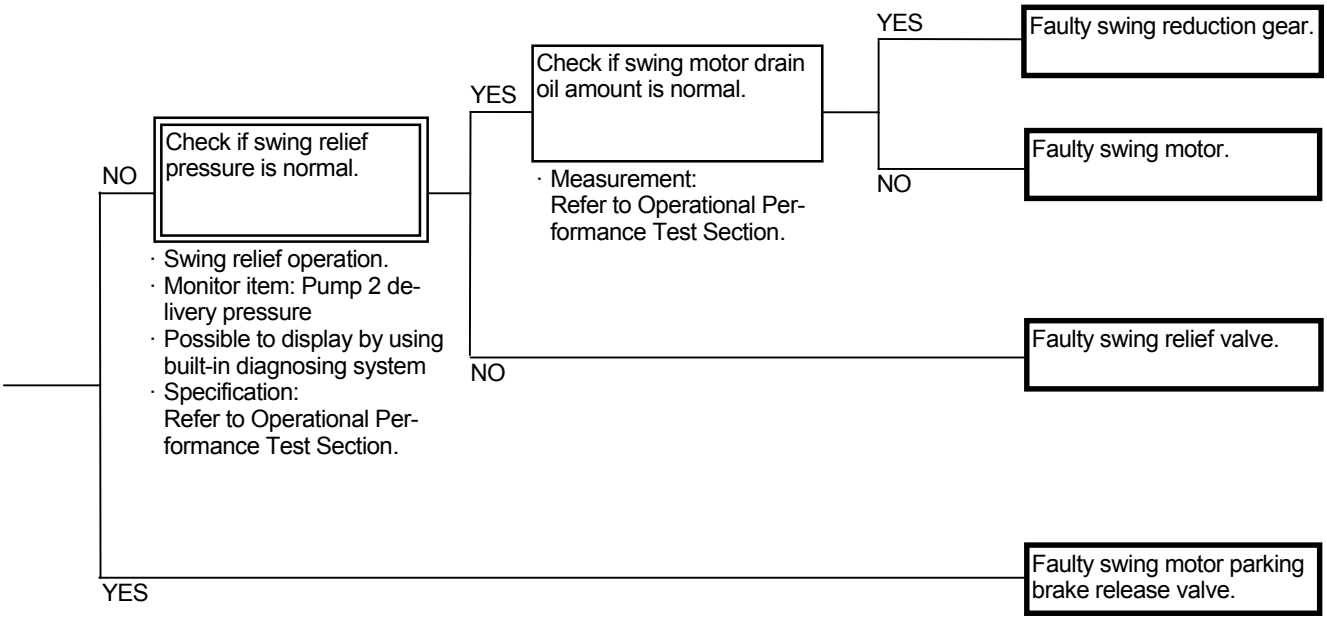
S-1 Swing is slow or unmoving.

- 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 the pilot valve.
- In case the left travel speed is also slow, refer to A-2.





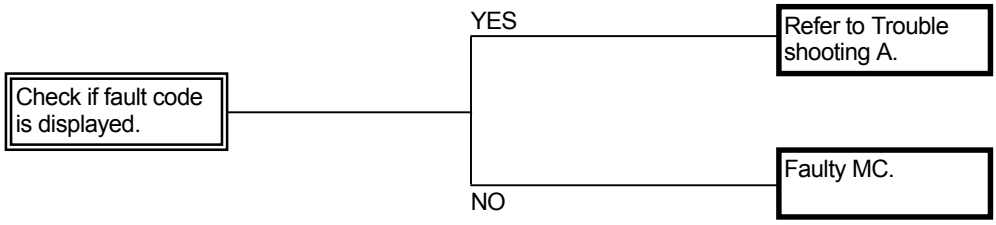
T1J1-05-07-005


Check if swing relief pressure is normal.
· Swing relief operation.
· Monitor item: Pump 2 delivery pressure
· Possible to display by using built-in diagnosing system
· Specification:
Refer to Operational Performance Test Section.
NO
YES
Check if swing motor drain oil amount is normal.
· Measurement:
Refer to Operational Performance Test Section.
YES
NO
Faulty swing reduction gear.
Faulty swing motor.
Faulty swing relief valve.
Faulty swing motor parking brake release valve.

S-2 Swing is fast.
When swing is operated fully, swing speed is slow.

Related Fault Code		Trouble	Reference Page
MC	11301	Abnormal Swing Pilot Pressure Sensor	T5-6-63

- Refer to F-9 “Front attachment speed is slow during combined operation of front attachment and swing”.
- If swing speed is fast, the swing horsepower reducing control may be abnormal. If swing speed is slow when swing is operated fully, the relief flow rate decrease control may be faulty. The cause is malfunction of the pressure sensor (swing).
- Refer to the pages for Swing Horsepower Reducing Control and Relief flow Rate Reducing Control in SYSTEM / Control System group in T/M (Operational Principle).



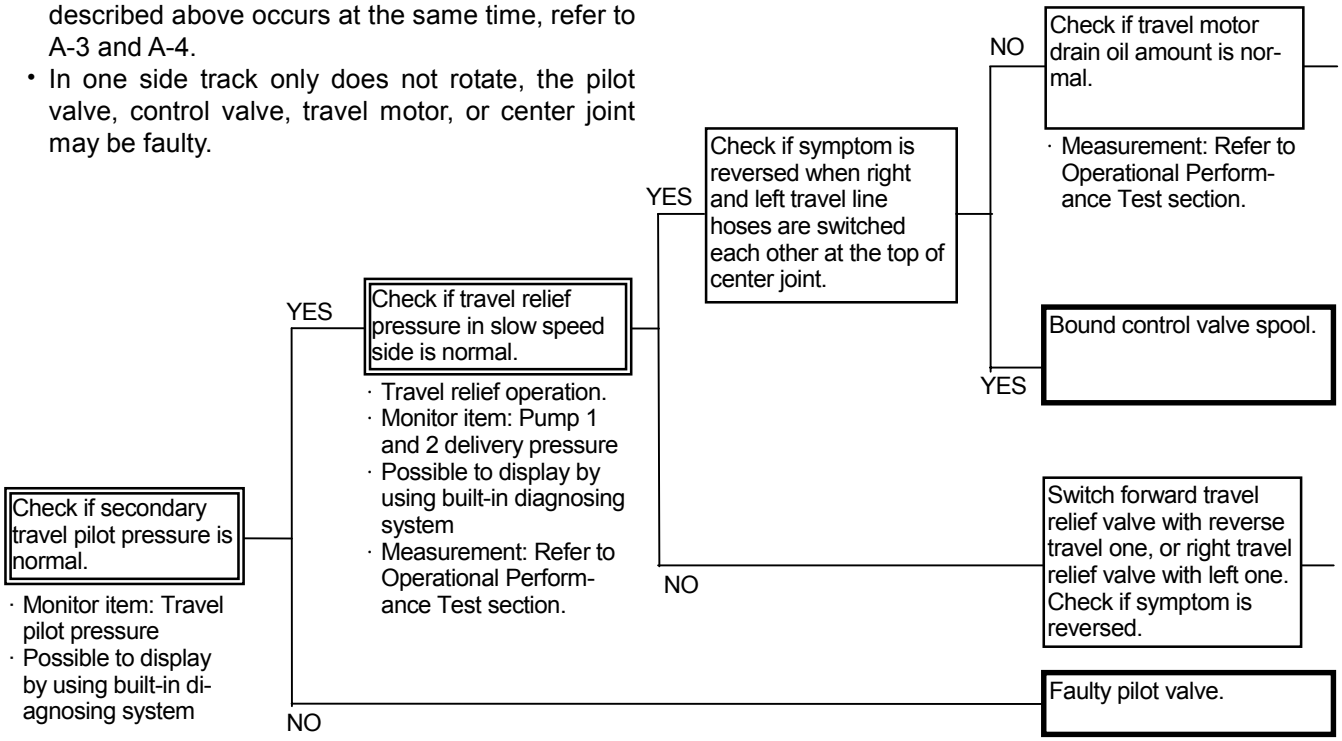
TRAVEL SYSTEM TROUBLESHOOTING

T-1 Both right and left tracks do not rotate or rotate slowly.

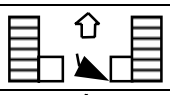
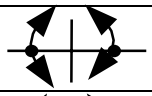
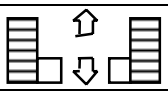
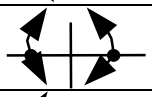
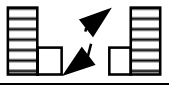
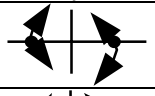
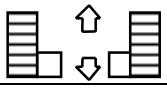
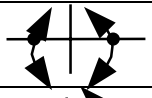
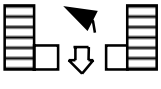
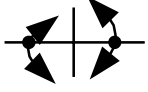
- Both right and left pilot valves, travel motors, and/or control valve spools are unlikely to be faulty at the same time.
- In case both travel systems do not operate, the pilot system, which is applied to both side travel motors, may be faulty. If the primary pilot pressure is lower than specification, the front attachment operating speed becomes slow as well. Refer to A-1.
- In case the fast travel mode cannot be selected, refer to T-4.
- If the power is insufficient, it seems that pressure is not built up, check pressure sensor (travel) circuit, and refer to F-2.

T-2 One side track does not rotate or rotates slowly. Machine mistracks.

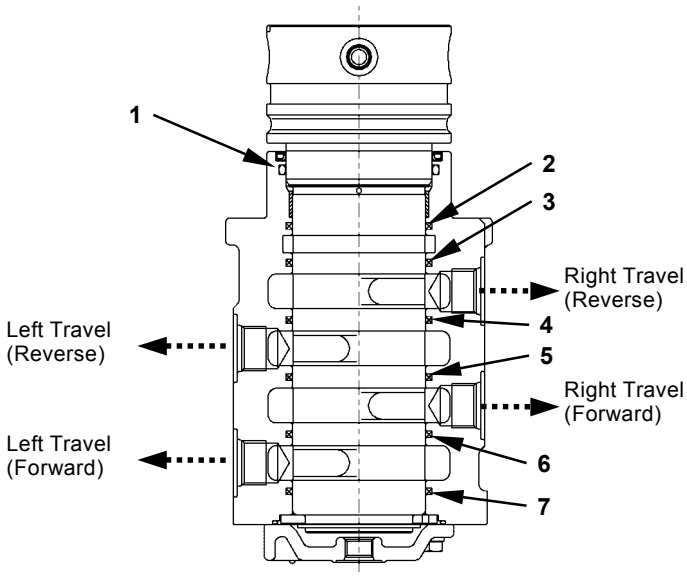
- Check that both side track sags are equally adjusted.
- Faulty pump control will cause the machine to mistrack. In this case, other trouble symptoms such as slow bucket or swing single operation speed, or slow arm roll-in and boom raise speed in level crowd operation will occur at the same time. If 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	Pi (Travel Speed Change) Oil Leak	←
3		
4		
5		
6		
7	 and External oil leak	 and External Leak

Seal Location



T16J-03-07-001

NO → Faulty travel motor.

YES → Disassemble and clean travel motor counterbalance valve. Check if same symptom occurs.

YES → Disassemble and clean travel motor swash angle control mechanism. Check if any abnormality is found.

NO → Faulty counterbalance valve.

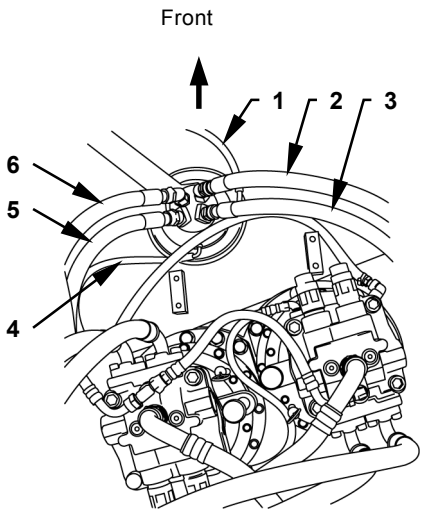
YES → NO → Faulty travel reduction gear.

YES → Faulty travel motor swash angle control mechanism.

NO → Faulty center joint.

YES → Faulty travel relief valve.

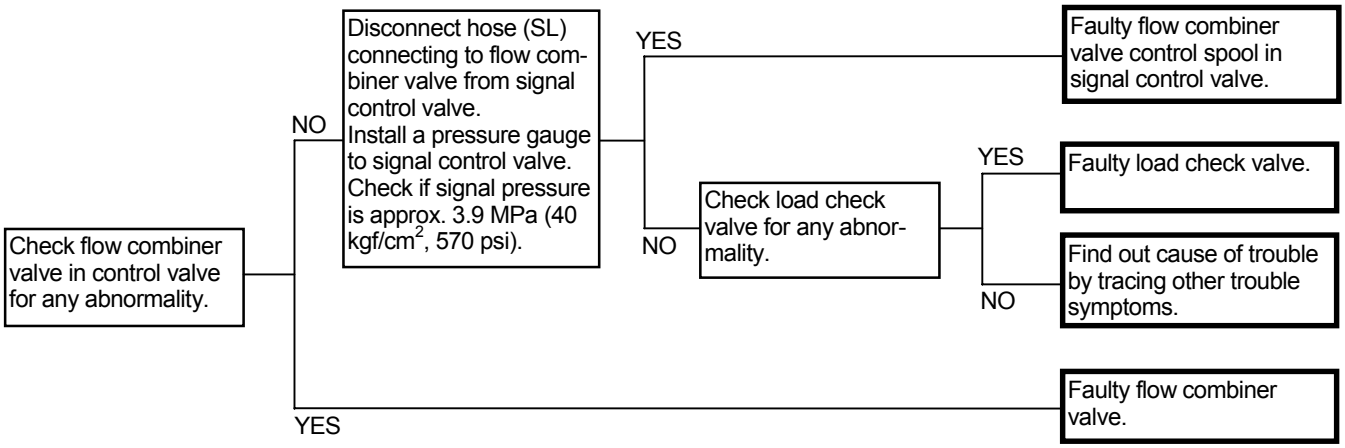
Arrangement of Pipe Line



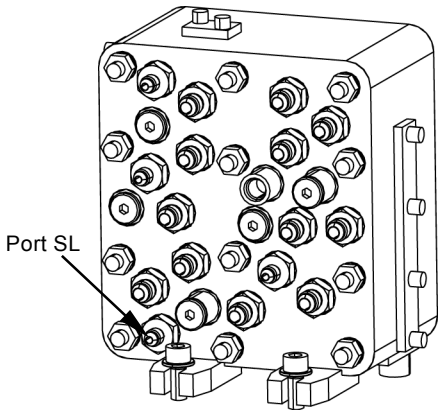
T1J1-05-07-004

1 - Drain
2 - Right Travel (Forward)
3 - Right Travel (Reverse)
4 - Pilot (Travel Speed Change)
5 - Left Travel (Reverse)
6 - Left Travel (Forward)

T-3 Machine mistracks during combined operation of travel and front attachment.



Signal Control Valve
(Control Valve Side)

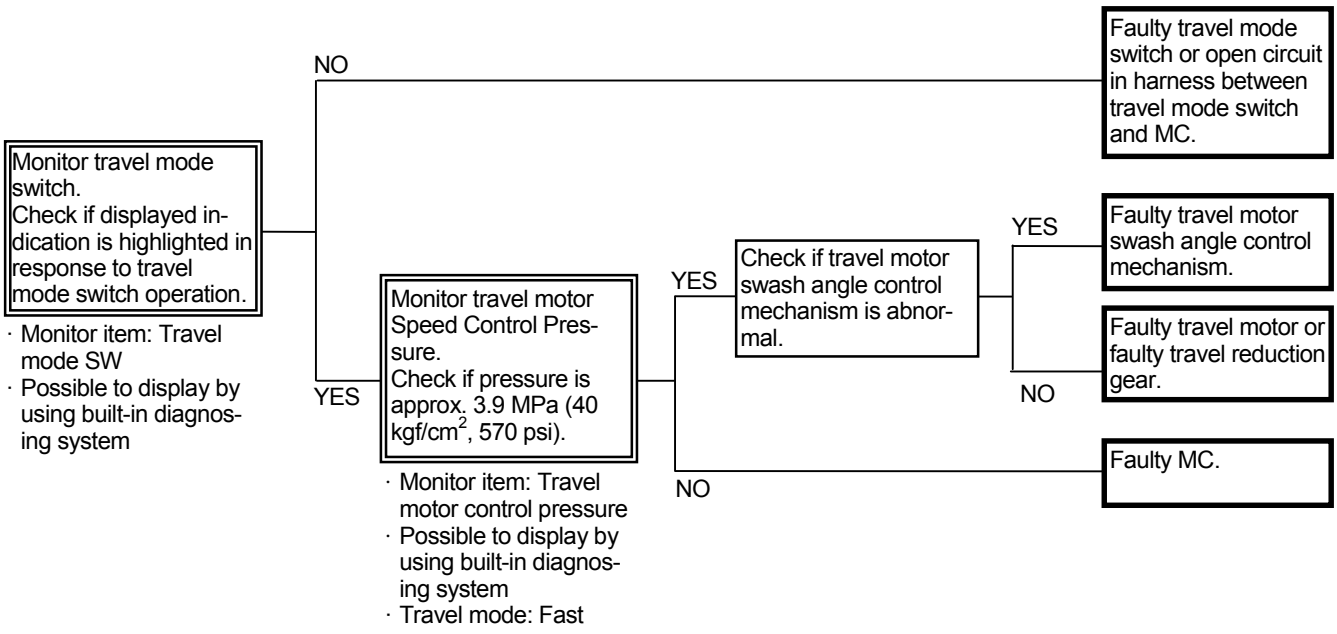


T1J1-05-07-002

T-4 Fast travel is inoperable.
Travel mode does not change from slow mode to fast mode.

Related Fault Code		Trouble	Reference Page
MC	11405	Abnormal Solenoid Valve Unit (SI)	T5-6-69
	11991	Abnormal Right Travel Pilot Pressure Sensor	T5-6-80
	11993	Abnormal Left Travel Pilot Pressure Sensor	T5-6-82

- Refer to the pages for Travel Motor Swash Angle Control in SYSTEM / Control section in the T/M (Operational Principle).
- Check the wiring connections first.

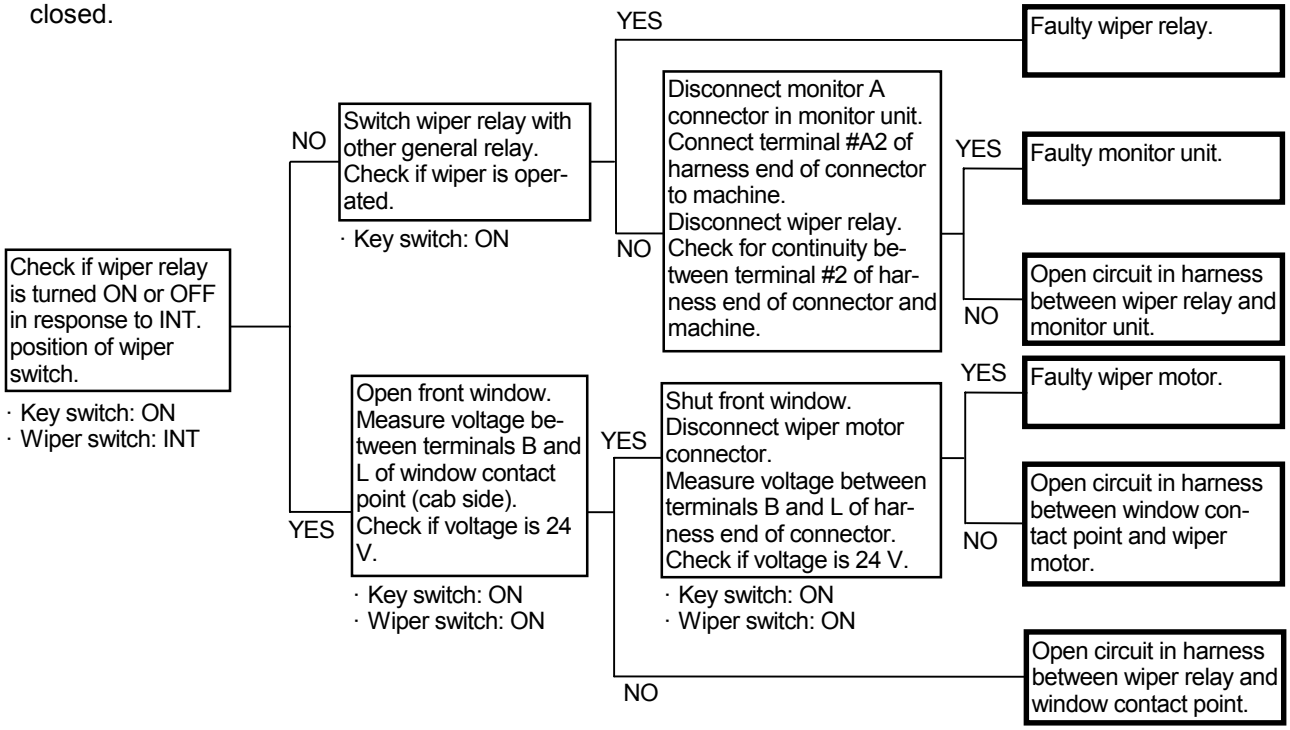


OTHER SYSTEM TROUBLESHOOTING

O-1 Wiper is inoperable or not retracted.

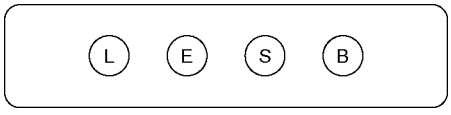
Checking Instructions

- The wiper is driven by electric power routed via the relay circuit controlled by the monitor assembly. In case the wiper is inoperable, first check the wiper motor and links for any abnormality by using an auxiliary electric power and the test harness.
- If the front window is open, the wiper does not operate. Check that the front window is securely closed.



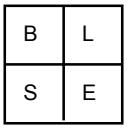
INT. Position	Set Time
Slow	8 second
Middle	6 second
Fast	3 second

Window Contact Point
(Cab Side)

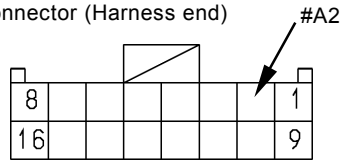


T1V1-05-07-005

Connector
Wiper Motor (Harness end)

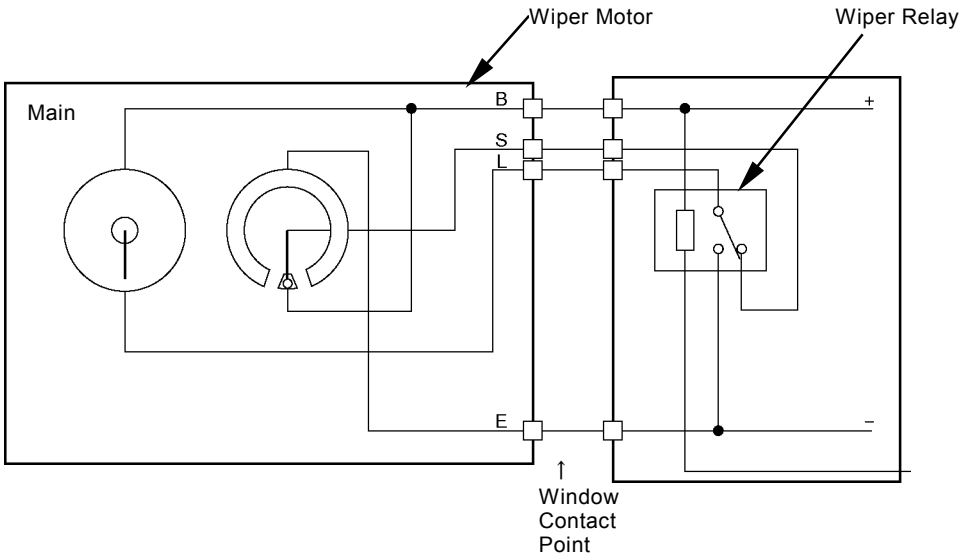


Monitor Unit
Monitor A Connector (Harness end)



T183-05-05-001

Wiper Drive Circuit

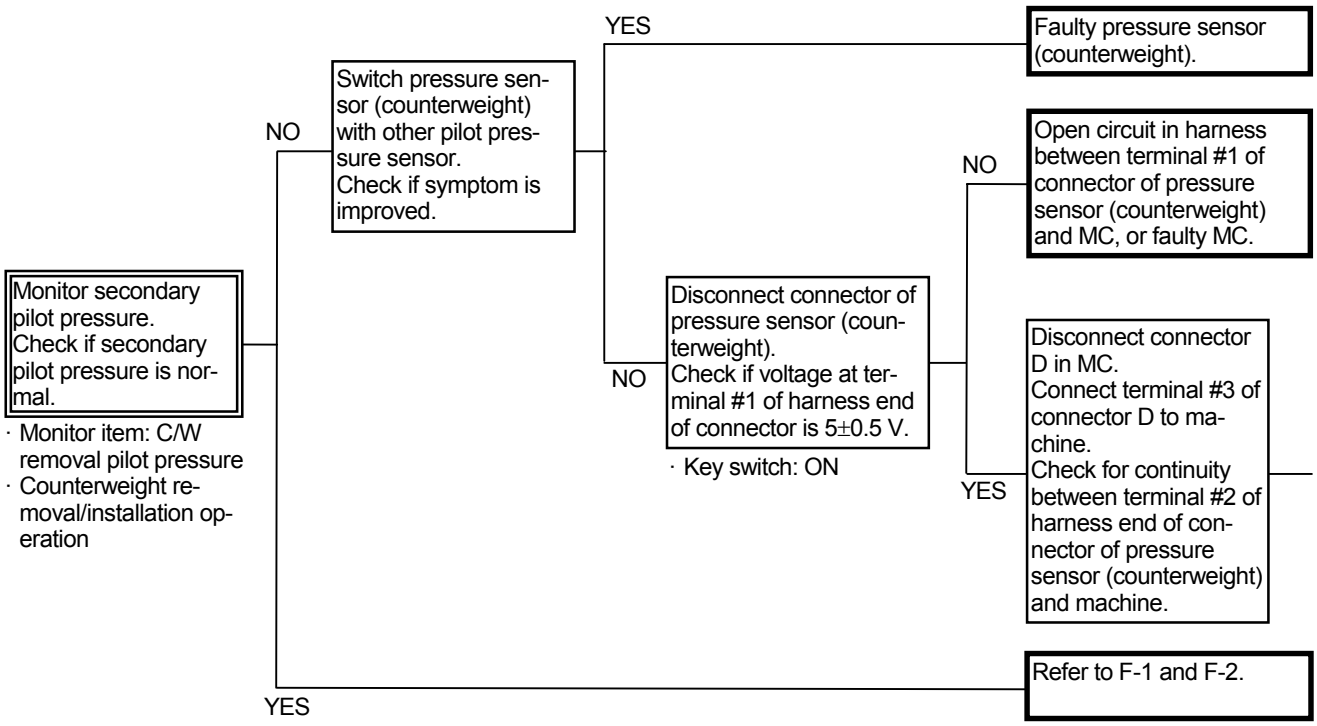


T1V1-05-07-004

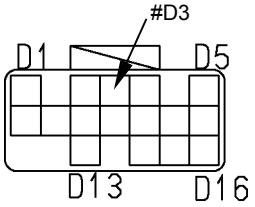
O-2 Counterweight removal/installation device is not operated or power is weak.

Related Fault Code		Trouble	Reference Page
MC	11404	Abnormal Solenoid Valve unit (SG)	T5-6-68

- Refer to the page for Pump Control for Counterweight Removal and Installation in Control System group/ SYSTEM in T/M (Operational Principle).
- If other actuator is not operated or slow, the pilot system may be faulty. Refer to A-1.
- If power is weak, refer to F-1 and F-2.
- Check the wiring connections first.

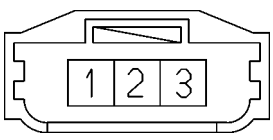


MC
Connector MC-D

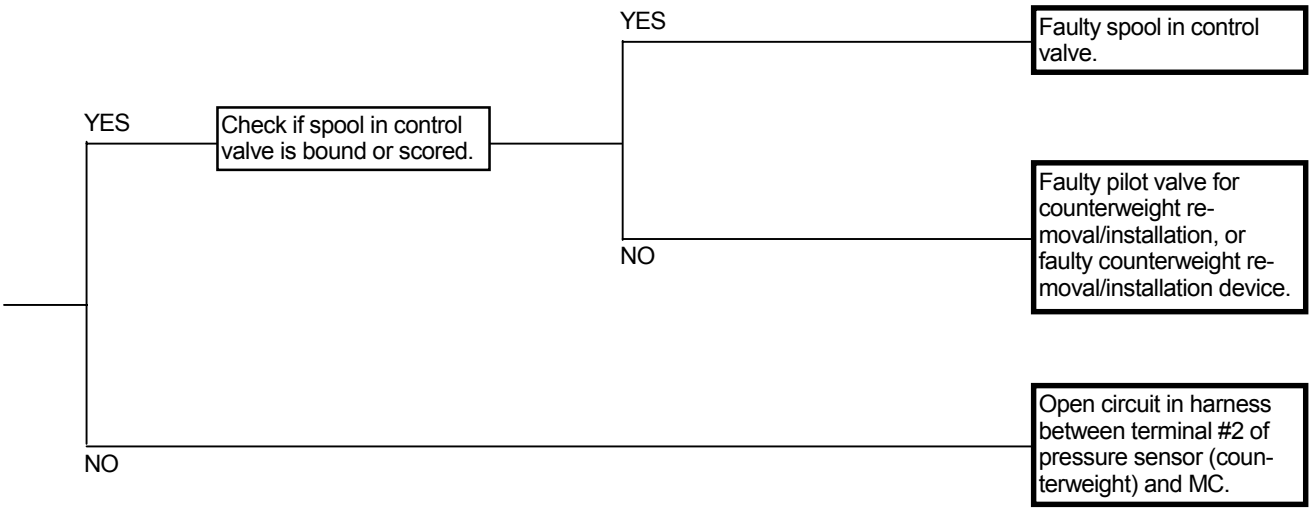


T183-05-04-009

Pilot Pressure Sensor
(Counterweight)



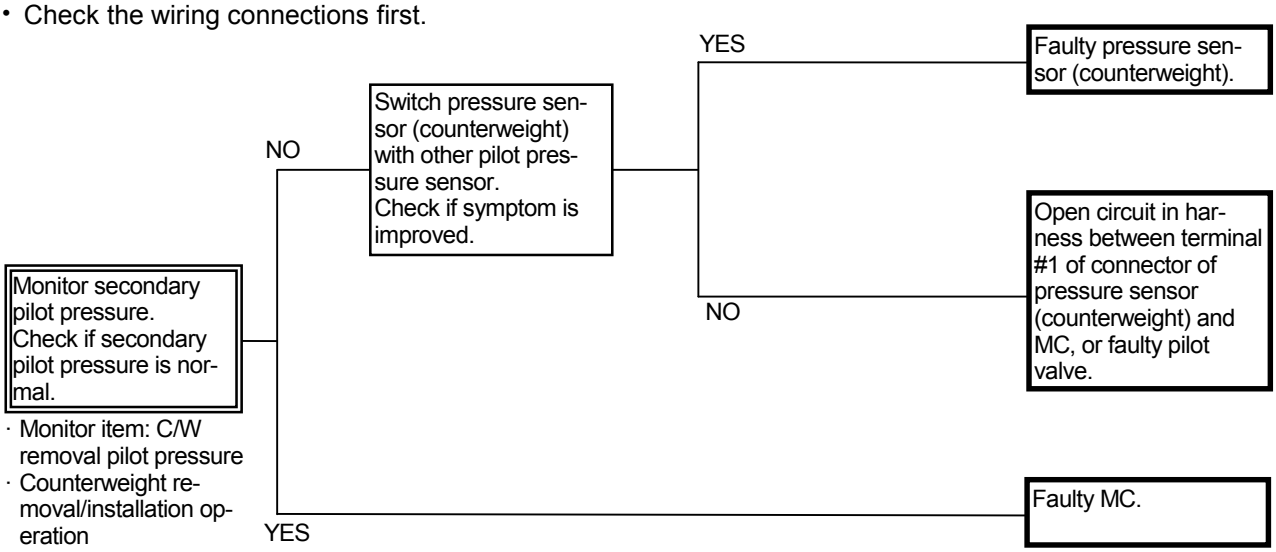
T1J1-05-06-001


YES
Check if spool in control valve is bound or scored.
YES
Faulty spool in control valve.
NO
Faulty pilot valve for counterweight removal/installation, or faulty counterweight removal/installation device.
NO
Open circuit in harness between terminal #2 of pressure sensor (counterweight) and MC.

O-3 Counterweight removal/installation speed is fast. Precise operation cannot be performed.

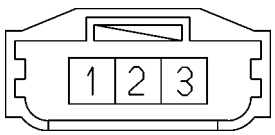
Related Fault Code		Trouble	Reference Page
MC	11200	Abnormal Pump 1 Delivery Pressure Sensor	T5-6-61
	11202	Abnormal Pump 2 Delivery Pressure Sensor	T5-6-62
	11400	Abnormal Pump 2 Control Solenoid Valve	T5-6-66
	11410	Abnormal Pump 1 Control Solenoid Valve	T5-6-70
	11992	Abnormal Pump 2 Regulator Pressure Sensor	T5-6-81
	11994	Abnormal Pump 1 Regulator Pressure Sensor	T5-6-83

- Refer to the page for Pump Control for Counterweight Removal and Installation in Control System group / SYSTEM in T/M (Operational Principle).
- When operating counterweight removal / installation, flow rates of pumps 1 and 2 are minimum. Therefore, if other actuator speed is fast, the pump control may be faulty. Refer to A-6.
- Check the wiring connections first.



Connector (Harness end of connector viewed from the open side)

Pilot Pressure Sensor (Counterweight)

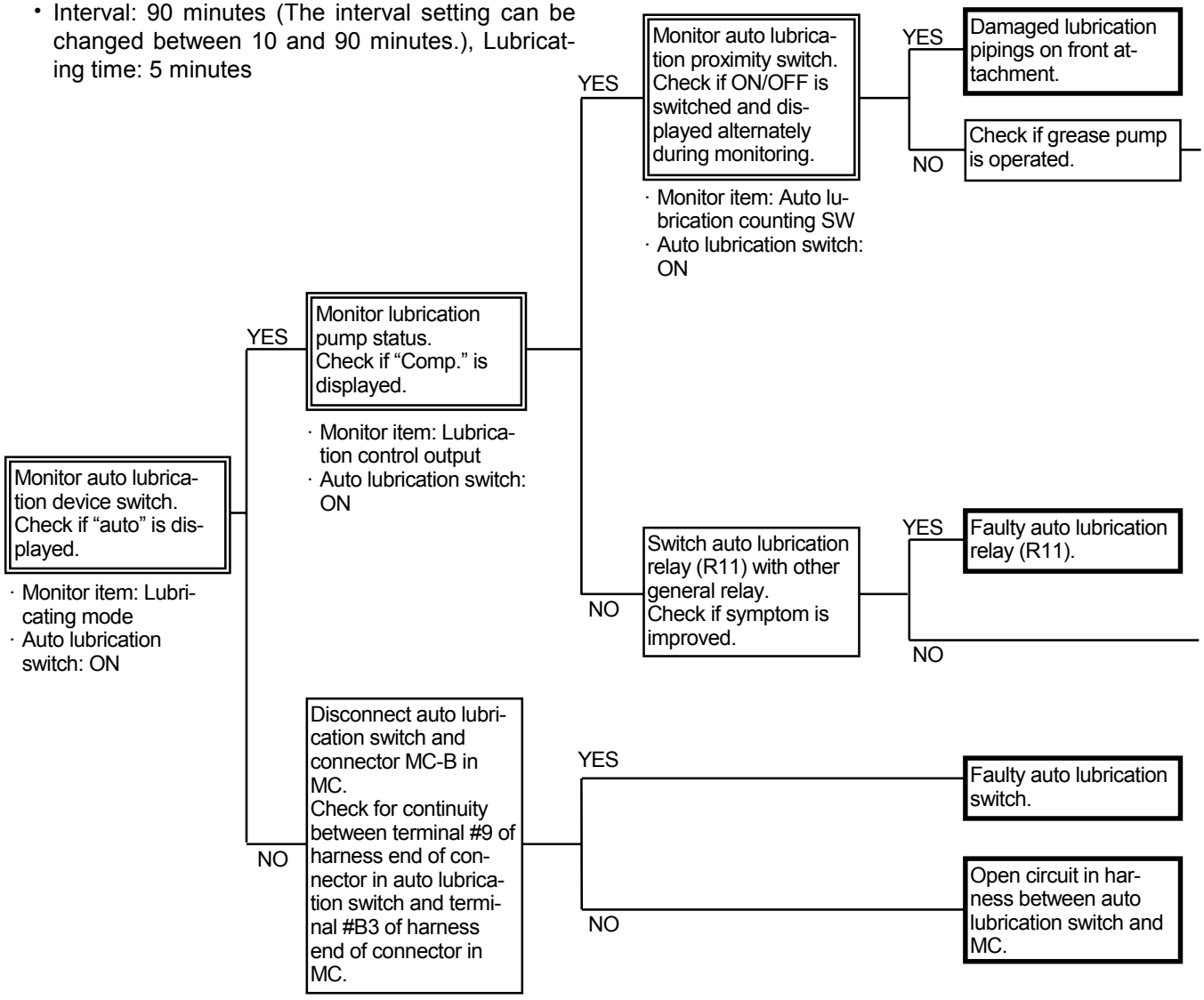


T1J1-05-06-001

(Blank)

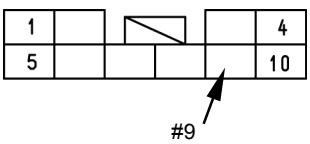
O-4 Auto lubrication is faulty.

- Even if the auto lubrication switch is turned ON, auto lubrication is not operated.
  - Check the wiring connections first.
  - Interval: 90 minutes (The interval setting can be changed between 10 and 90 minutes.), Lubricating time: 5 minutes



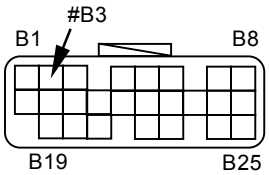
Connector (Harness end of connector viewed from the open side)

Auto Lubrication Switch



T1J1-05-07-003

MC
Connector B



YES

Damaged lubrication pipings between grease pump and distribution valve on upperstructure (attached proximity switch), or faulty distribution valve on upperstructure, or no grease.

NO

Disconnect connector in grease pump.
Check if voltage at terminal #2 of harness end of connector is 24 V.

· Key switch: ON
· Auto lubrication switch: ON

YES

Disconnect proximity switch.
Check if voltage at terminal #3 of harness end of connector is 24 V.

· Key switch: ON
· Auto lubrication switch: ON

YES

Faulty proximity switch, or open circuit in harness between proximity switch and ground.

NO

Open circuit in harness between auto lubrication relay (R11) and proximity switch.

NO

Open circuit in harness between auto lubrication relay (R11) and grease pump, or damaged lubrication pipings on upperstructure.

Disconnect auto lubrication relay (R11).
Check for continuity between terminal #2 of harness end connector in auto lubrication relay (R11) and terminal #B24 of harness end connector in MC.

YES

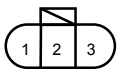
Faulty fuse #30, or open circuit in harness between fuse #30 and auto lubrication relay (R11).

NO

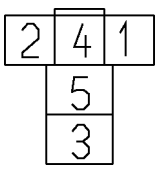
Open circuit in harness between auto lubrication relay (R11) and MC.

Connector (Harness end of connector viewed from the open side)

Grease Pump
Proximity Switch

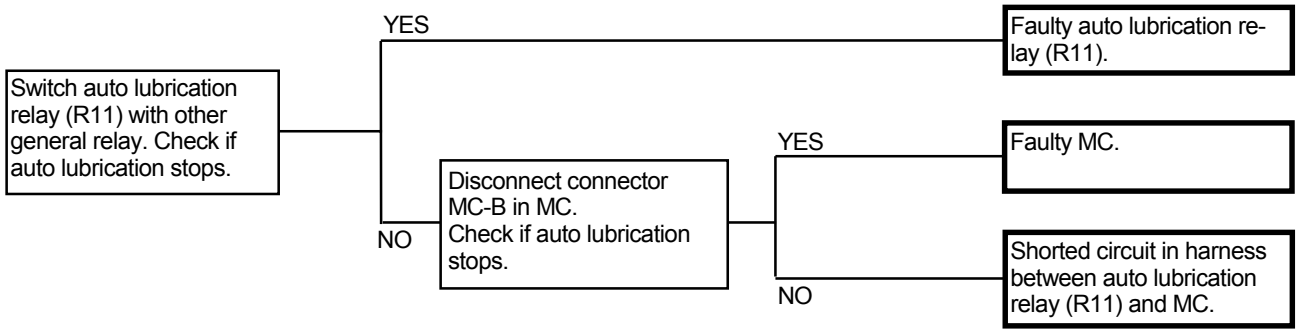


Auto Lubrication Relay (R11)



T183-05-04-003

- Even if auto lubrication time is over, auto lubrication does not stop.
- Even if auto lubrication switch is turned OFF, auto lubrication does not stop.
  - Interval: 60 minutes (The interval setting can be changed between 10 and 90 minutes.), Lubricating time: 5 minutes



- At the same time when the auto lubrication device stops, auto lubrication alarm is displayed.
  - There is a possibility that no grease or faulty proximity switch.
    In this case, check the following:

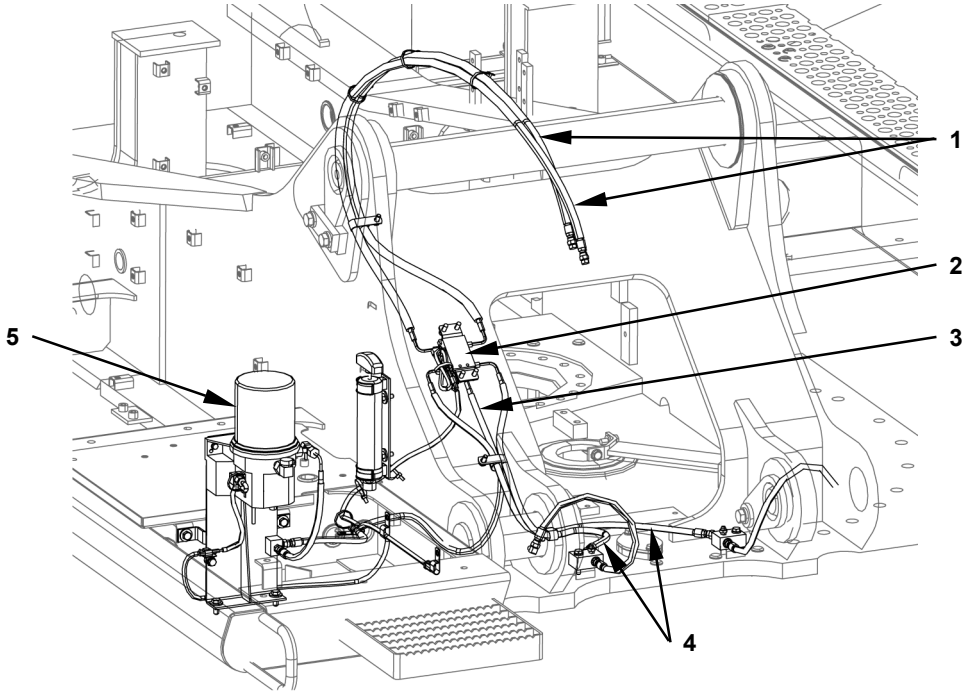
1. Grease amount in the cartridge
2. Air mixed into the circuit
3. Plug at the cartridge
4. Failure of the proximity switch

Procedure to fill up grease to lubrication pipe (air bleed procedure)

- Filling up grease to lubrication pipe at upperstructure side
  1. Disconnect lubrication hoses (1, 4). Attach a plug to the disconnected hoses.
  2. Remove the adapter at the distribution valve (2) side in hose (3) between grease pump (5) and distribution valve (2).
  3. Install the nipple to the port where the adapter in distribution valve (2) was removed.
  4. Apply grease through the nipple on the upper of grease pump (5) by using a grease gun.
  5. Start grease pump (5). Release any pressure between grease pump (5) and distribution valve (2).
     Air bleeding time: Approx. 4 to 5 minutes
     - Turn the key switch ON.
     - Turn the auto lubrication switch ON.
     - Check if grease comes out of the disconnected hose.
     - Turn the auto lubrication switch OFF.
     - Turn the key switch OFF.

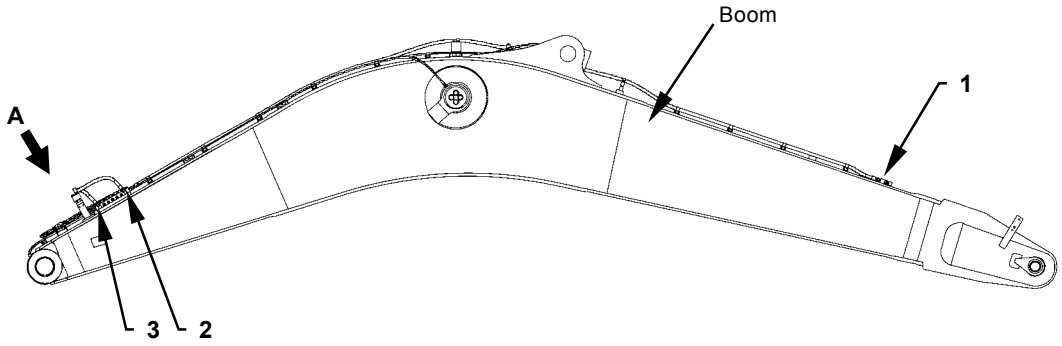
  NOTE: If the auto lubrication alarm is displayed on the monitor unit, turn the key switch OFF and perform step 5 again.

  6. Remove the plug from the end of lubrication hoses (1, 4).
  7. Apply grease through the nipple attached with distribution valve (2) by using a grease gun.
  8. Check if grease comes out of the end of lubrication hoses (1, 4).
  9. Install the plug to the end of removed lubrication hoses (1, 4).
  10. Remove the nipple from distribution valve (2). Install the adapter and hose (3).



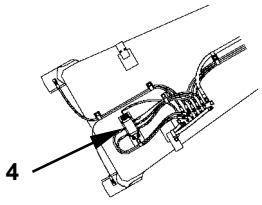
T1J1-05-07-007

- Filling up grease to boom lubrication pipe
  1. Remove elbows (2, 3).
  2. Install the nipple (J75482) to the port where elbows (2, 3) were removed.
  3. Apply grease through the nipple by using a grease gun.
  4. When filling up grease to the port (2) side:
     Check if grease comes out of adapter (1) in the boom end and check for any leakage of grease from the lubrication pipe.
  5. When filling up grease to the port (3) side:
     Check if grease is supplied to each pin and check for any leakage of grease from distribution valve (4) and the lubrication pipe.
  6. Remove the nipple. Install elbows (2, 3).



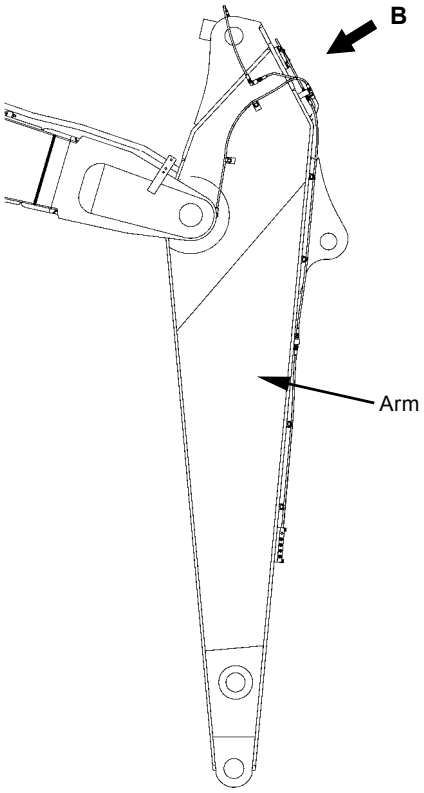
T1J1-05-07-008

View A



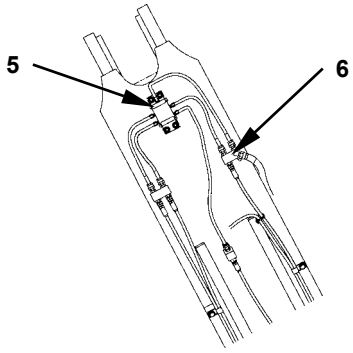
T1J1-05-07-009

- Filling up grease to arm lubrication pipe
  1. Remove adapter (6).
  2. Install the nipple (J75482) to the port where adapter (6) was removed.
  3. Apply grease through the nipple by using a grease gun.
  4. Check if grease is supplied to each pin and check for any leakage of grease from distribution valve (5) and the lubrication pipe.
  5. Remove the nipple. Install adapter (6).



T1J1-05-07-010

View B

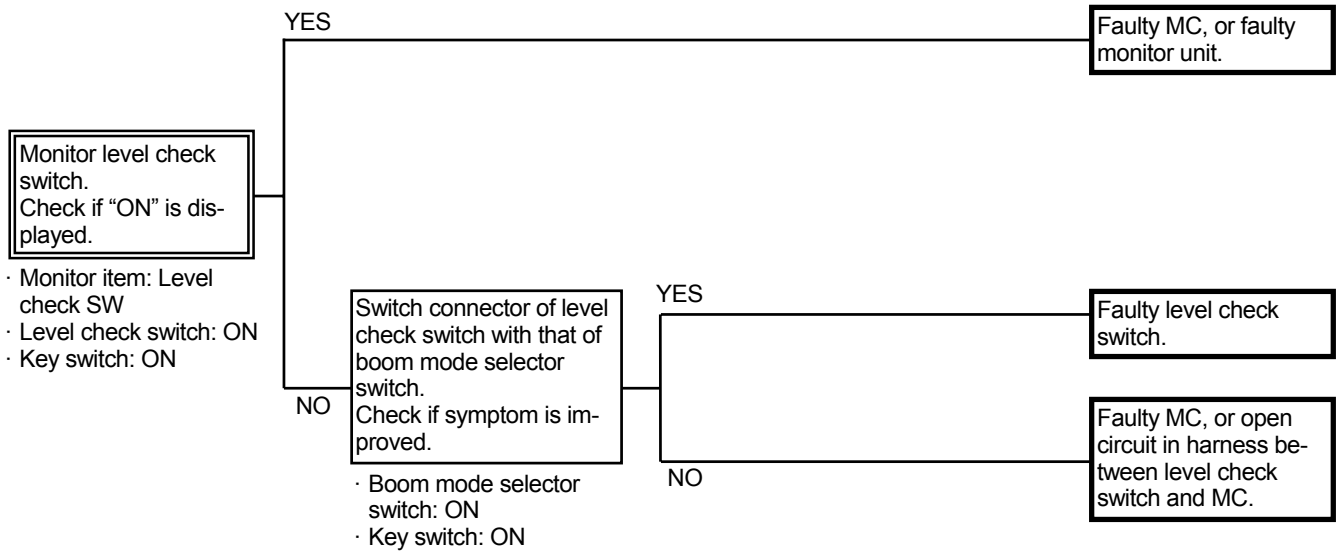


T1J1-05-07-011

O-5 Level check is faulty.

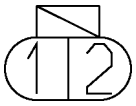
- Even if the level check switch is turned ON, the alarm (green or red) is not displayed on the monitor unit.

Related Fault Code		Trouble	Reference Page
MC	11004	Can Communication Error	T5-6-39
Monitor Unit	13308	Can Communication Error	T5-6-97



Connector (Harness end of connector viewed from the open side)

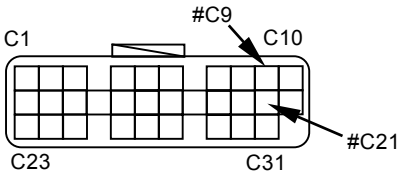
Coolant Level Switch



T183-05-04-010

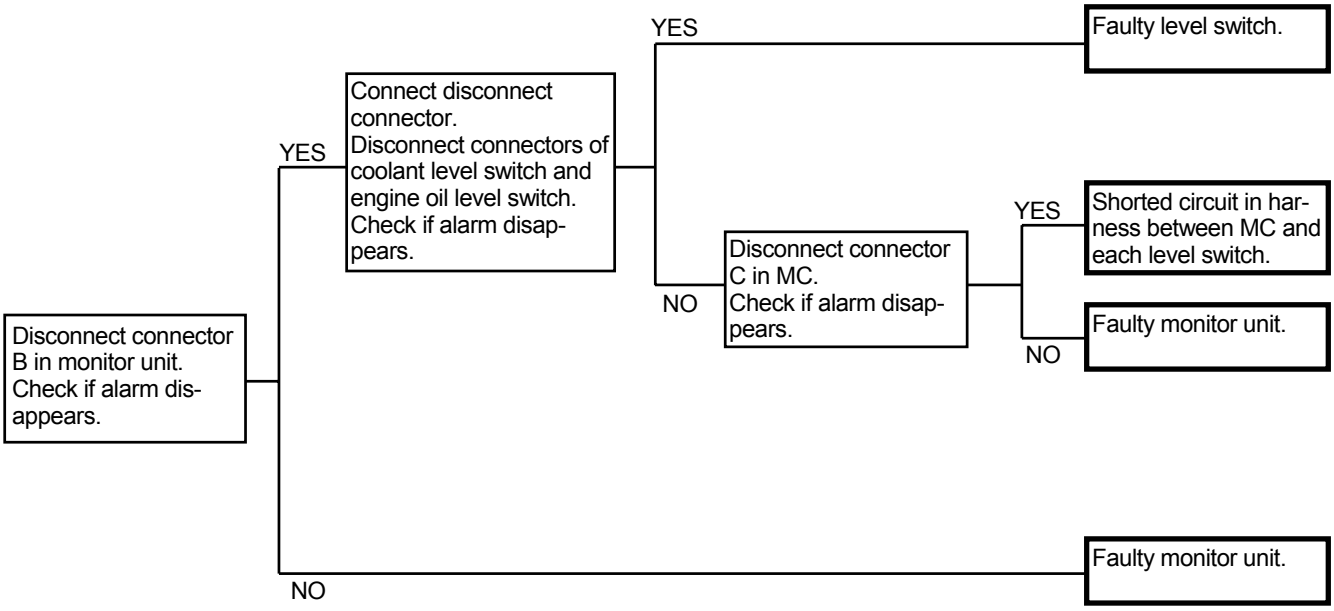
Engine Oil Level Switch

MC
MC-C Connector C



- Even if the level check switch is turned OFF, the alarm (green or red) is displayed on the monitor unit.

Related Fault Code		Trouble	Reference Page
MC	11004	Can Communication Error	T5-6-39
Monitor Unit	13308	Can Communication Error	T5-6-97



O-6 Malfunction of Air Conditioner

The air conditioner has a self-diagnosis function. The self-diagnosis functions to:

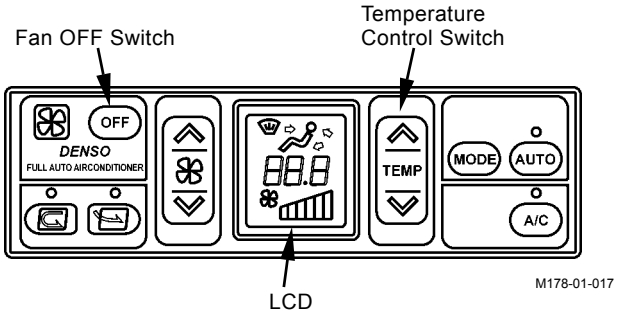
- Display Fault Codes
- Change Displayed Fault Codes
- Delete Fault Code
- End Fault Code Display

- Display Fault Code
  1. Press the fan OFF switch to turn the fan OFF.
  2. Press and hold both the upper and lower sides of the temperature control switch on the air conditioner control panel at the same time for more than 3 seconds with the key switch ON.

NOTE: After operation has been performed, the buzzer will sound.

  3. If any fault codes are found, the LCD displays the fault codes as「E○○」.

NOTE: If more than one fault code is found, the lower number fault code will be displayed first.

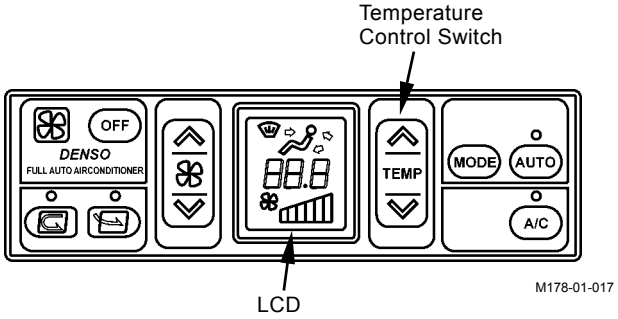


Fault Code List

Location in Trouble	Fault Code	Cause	Symptom
Abnormal circulation air sensor	E11	Broken circuit in air circulation sensor	Y value (air flow-in temperature) cannot be adjusted in response to the set-temperature.
	E12	Short-circuited circulation air sensor	
Abnormal fresh air sensor	E13	Broken circuit in fresh air sensor	Operation is controlled under such circumstance as no fresh air sensor is provided.
	E14	Short-circuited fresh air sensor	
Abnormal solar radiation sensor	E18	Short-circuited solar radiation sensor	Operation is controlled under such circumstance as no solar radiation sensor is provided.
Abnormal evaporator sensor	E21	Broken circuit in evaporator sensor	Operation is controlled under such circumstance as the evaporator temperature is set to 10 °C (50 °F).
	E22	Short-circuited evaporator sensor	
Abnormal damper	E43	Abnormal air vent damper	Corresponding damper servo becomes inoperable.
	E44	Abnormal air mix damper	
	E45	Abnormal circulation/fresh air damper	
Water temperature sensor	E15	Broken circuit in water temperature sensor	Operation is controlled under such circumstance as the water temperature is set to 60 °C (140 °F). (Warm-up control is not performed.)
	E16	Short-circuited water temperature sensor	
Abnormal refrigerant	E51	Abnormal high/low refrigerant pressure	The compressor clutch is disengaged. (The compressor stops.)

- Change Displayed Fault Code
  When displaying more than one fault code, press either the upper or bottom side of the temperature control switch key. The following fault code is displayed.

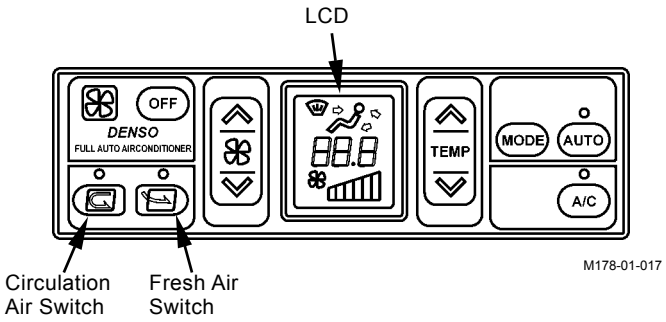
NOTE: Each time the displayed fault code is changed, the buzzer sounds. In case only one fault code exists, the displayed fault code remains unchanged.



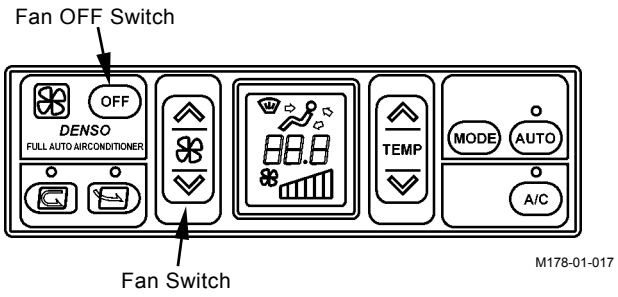
- Delete Fault Code
  1. Press and hold both the circulation air switch and the fresh air switch for more than 3 seconds at the same time to delete the fault code.

NOTE: After the fault code is deleted, the buzzer will sound.

  2. After the fault code has been deleted, the LCD displays「EOO」.



- End Fault Code Display
  Press the fan OFF switch, or press the upper side of the fan switch key. The self-diagnostic mode is complete.



※ Please fill in all sections and return this AIR CONDITIONER TROUBLE REPORT to the related post / 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

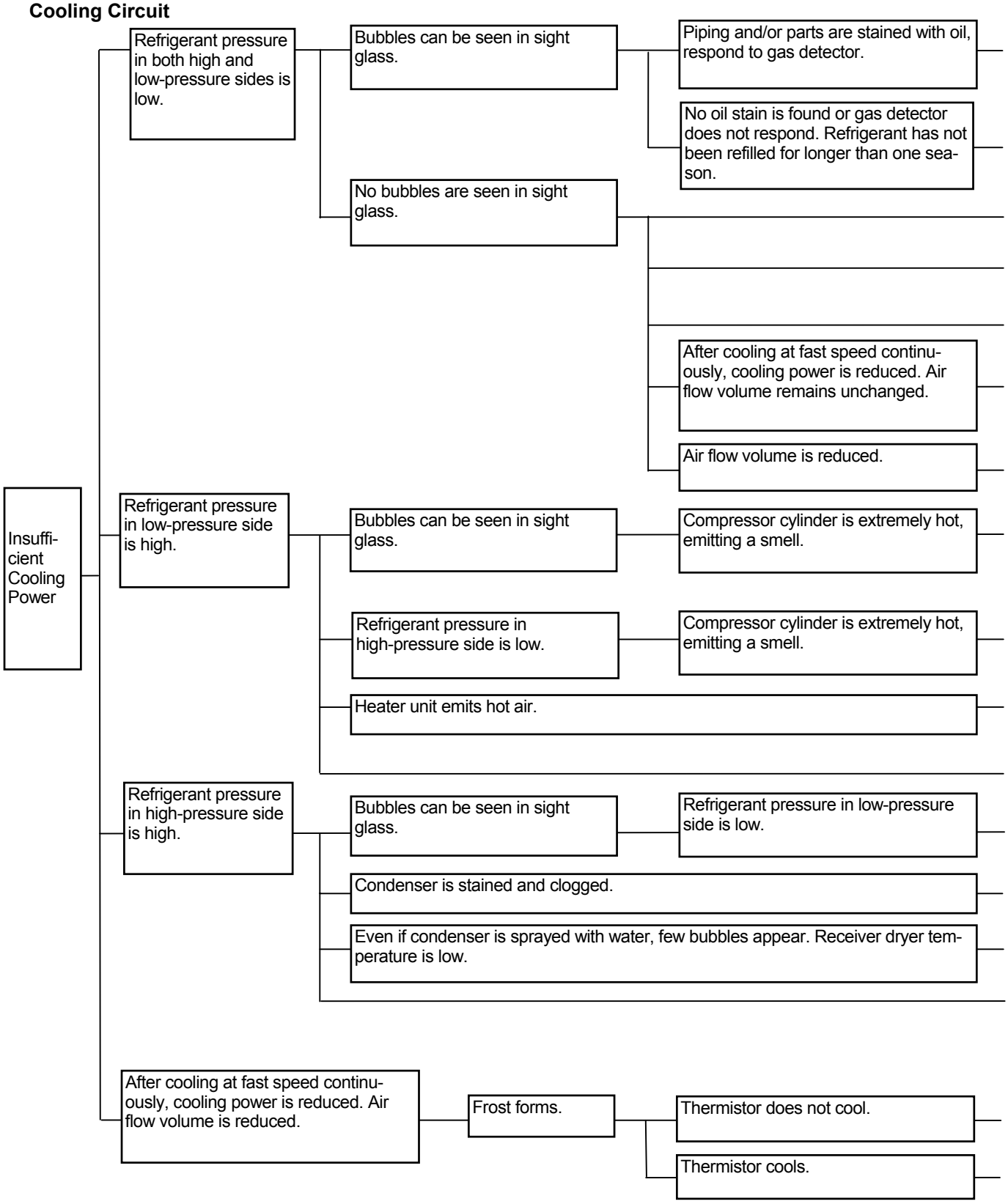
(3) Which parts have been replaced ?

1

2

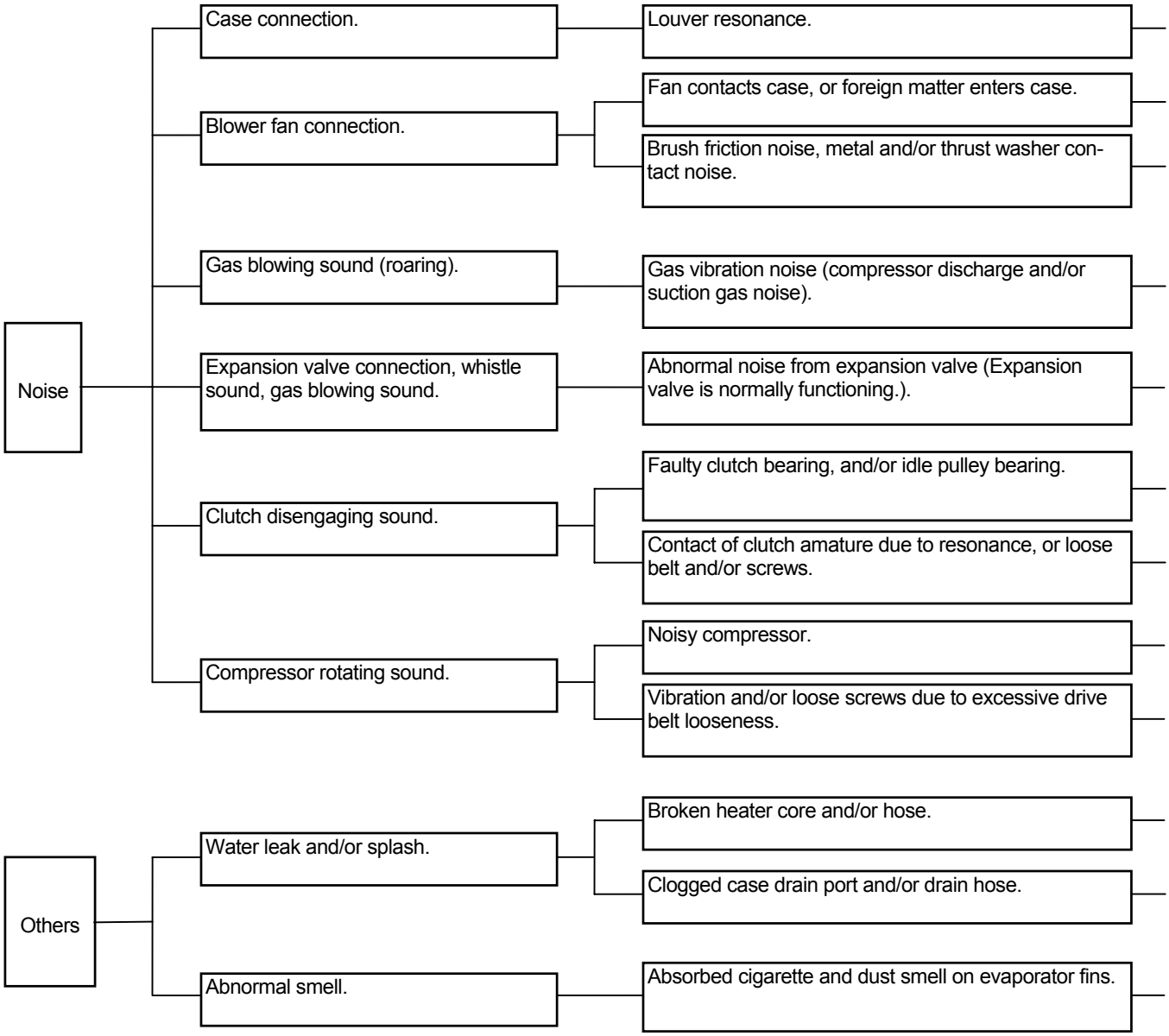
* Before replacing the control amplifier, be sure to check that the connectors are correctly connected while repeatedly disconnecting and reconnecting connectors.

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.

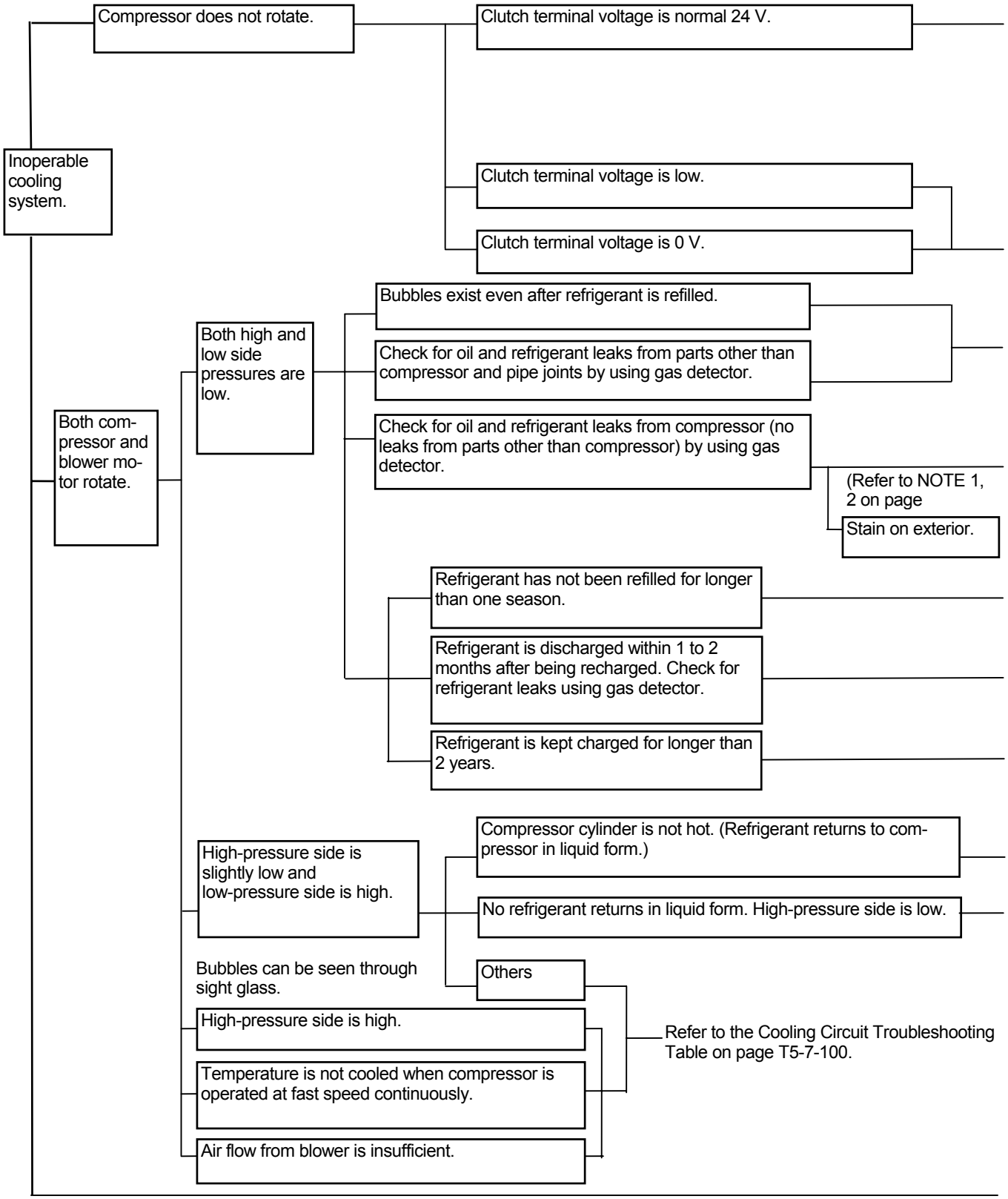
Re-adjust drive belt.

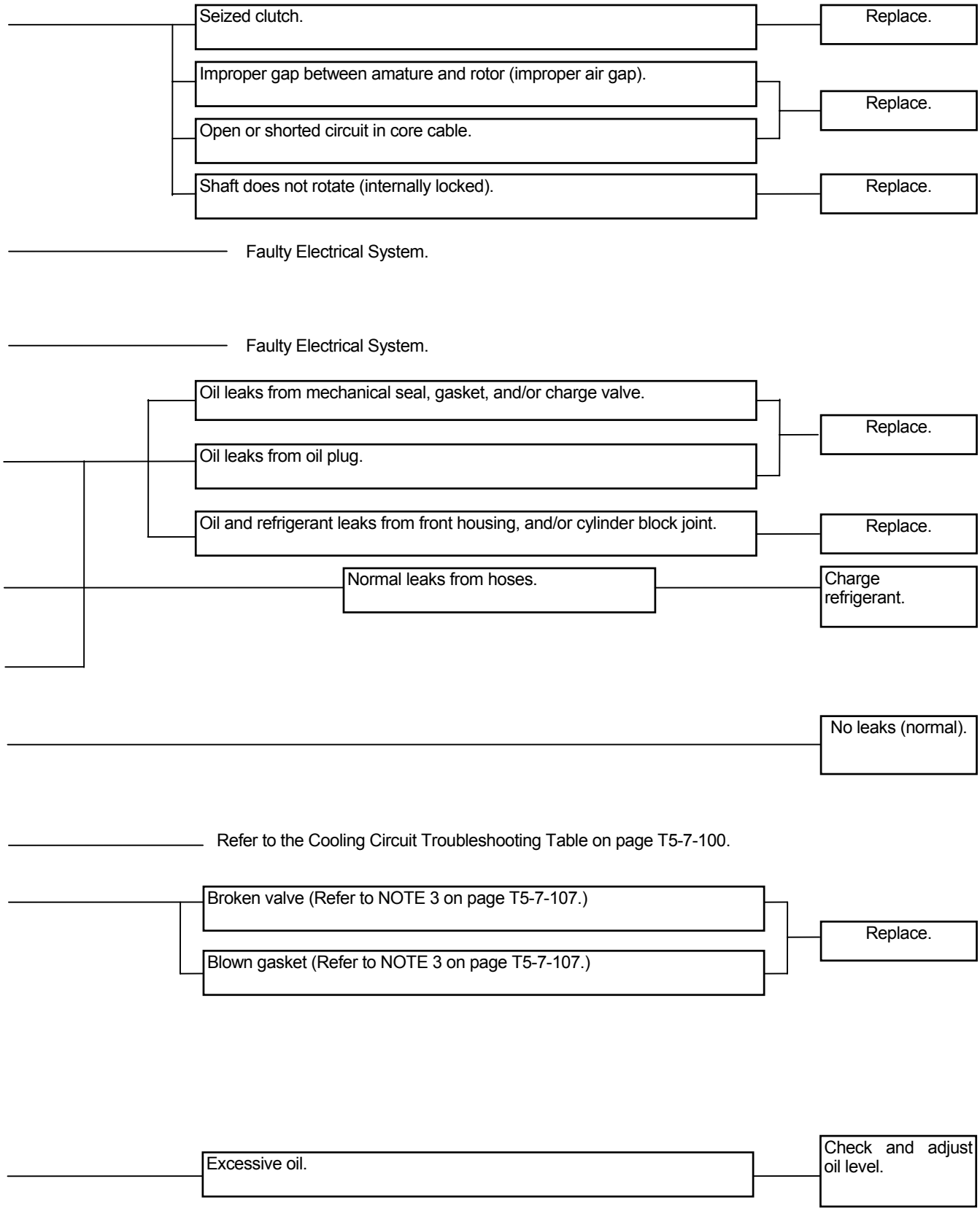
Replace.

Clean.

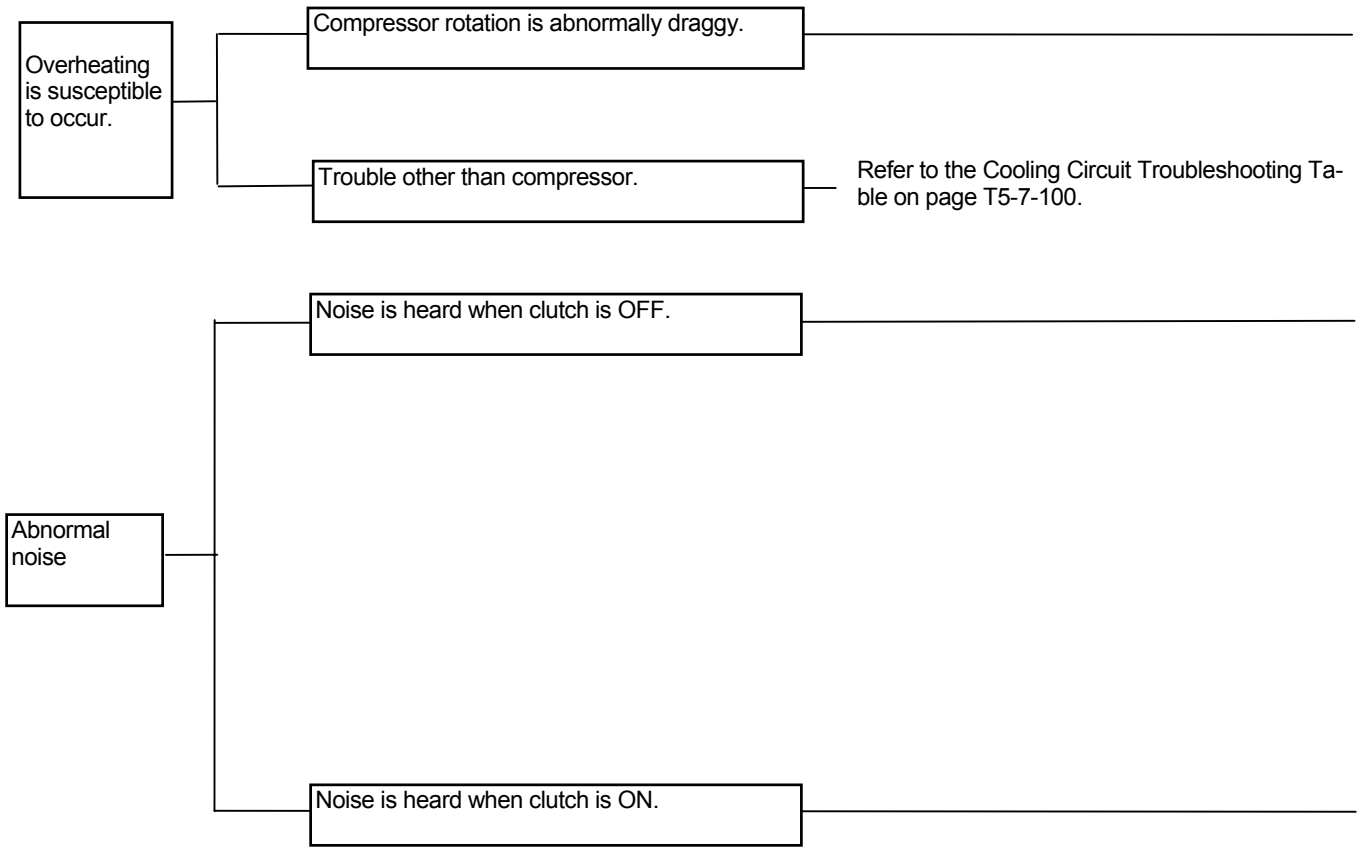
Clean evaporator. When humidity is high, open door. While rotating fan at approx. 1500 min^{-1} in L mode for more than 10 minutes, flush smell out by condensed water.

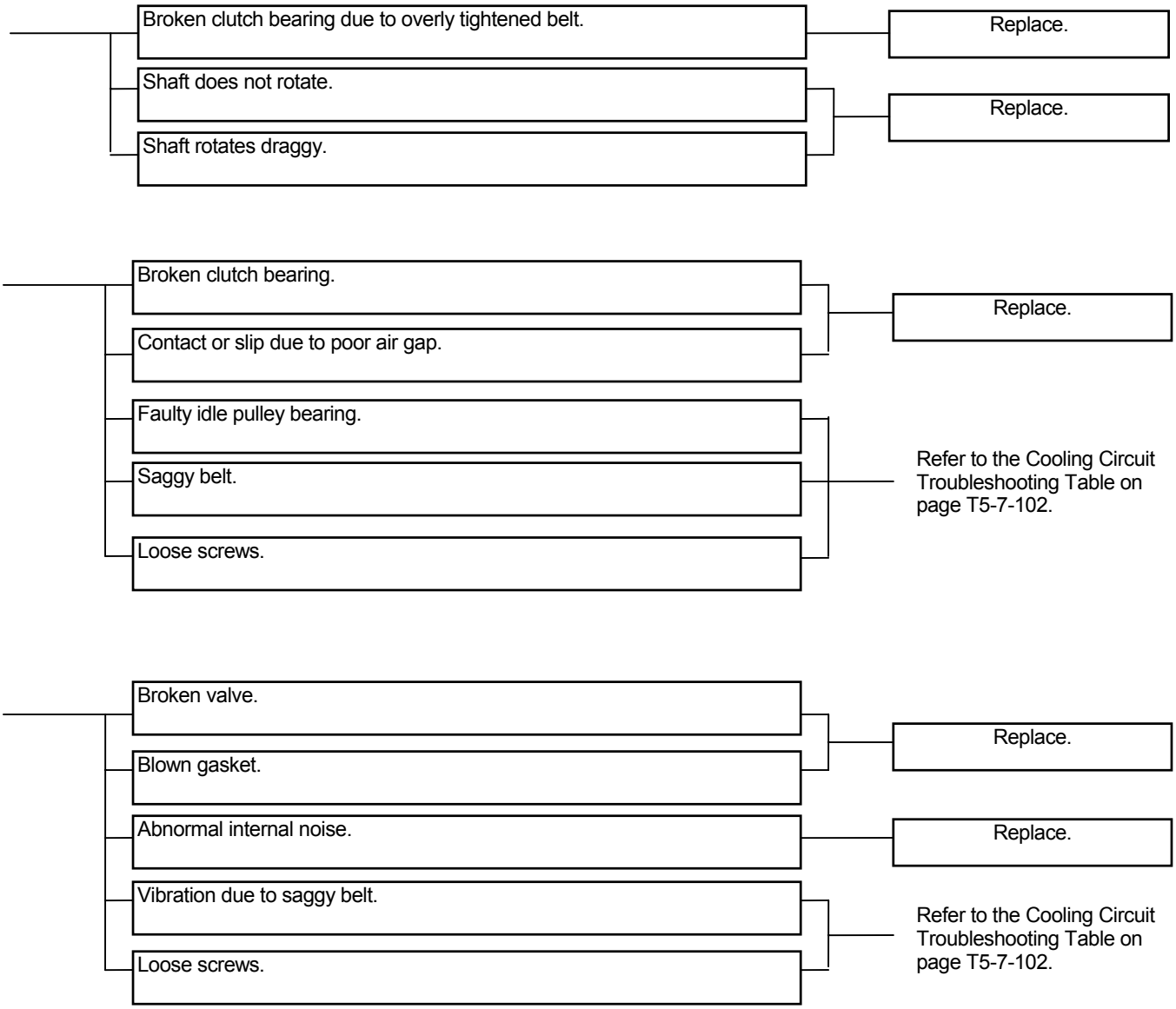
Compressor


Compressor does not rotate.
Clutch terminal voltage is normal 24 V.
Inoperable cooling system.
Clutch terminal voltage is low.
Clutch terminal voltage is 0 V.
Bubbles exist even after refrigerant is refilled.
Both high and low side pressures are low.
Check for oil and refrigerant leaks from parts other than compressor and pipe joints by using gas detector.
Both compressor and blower motor rotate.
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
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.
Compressor cylinder is not hot. (Refrigerant returns to compressor in liquid form.)
High-pressure side is slightly low and low-pressure side is high.
No refrigerant returns in liquid form. High-pressure side is low.
Bubbles can be seen through sight glass.
Others
High-pressure side is high.
Refer to the Cooling Circuit Troubleshooting Table on page T5-7-100.
Temperature is not cooled when compressor is operated at fast speed continuously.
Air flow from blower is insufficient.


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 T5-7-100.
Broken valve (Refer to NOTE 3 on page T5-7-107.)
Replace.
Blown gasket (Refer to NOTE 3 on page T5-7-107.)
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 T5-7-100.
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.*

WORK AFTER REPLACING COMPONENTS

The following work is required after replacing compressor, high pressure hose, low pressure hose, condenser, receiver tank, liquid hose and air conditioner unit.
The same work is required when gas leakage is found.

1. Add compressor oil
   Oil amount: 180 cm^3 (0.19 qt)

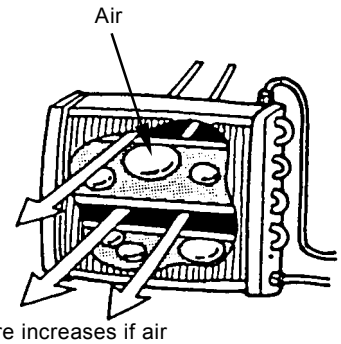
2. Charge air conditioner with refrigerant
   - Purging
   - Charge air conditioner with refrigerant
   - Warm up operation
   - Inspection

CHARGE AIR CONDITIONER WITH REFRIGERANT

Necessity of Purging

Make sure to purge the air conditioner circuit with a vacuum before charging with refrigerant (R134a) because the following problems can arise if air or other gases remain in the A/C circuit.

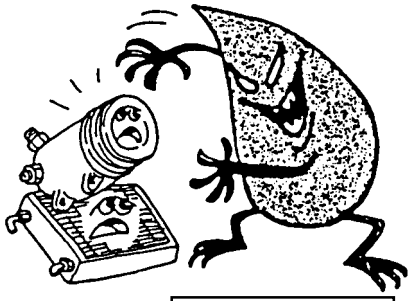
1. Pressure rise in the high pressure side:
   If air remains in the air conditioner circuit, this disturbs the heat exchange between refrigerant and air in the condenser, causing pressure to rise in the high pressure side (compressor side). Usually, refrigerant gas is easily liquefied, however, air cannot be liquefied and remains as a gas in the condenser because the temperature at which air liquefies is extremely low. That is, liquidation of the refrigerant gas in the condenser decreases by the amount of air in the circuit, and the gas pressure in the high pressure side increases accordingly.



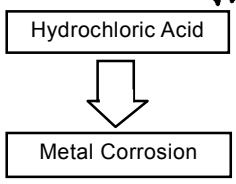
Pressure increases if air remains in the air conditioner circuit.

W115-02-10-001

2. Metal corrosion:
   If air remains in the air conditioner circuit, a chemical reaction between refrigerant and moisture in the air takes place, and as a result, hydrochloric acid, that corrodes metals such as aluminum, copper and iron, is produced.

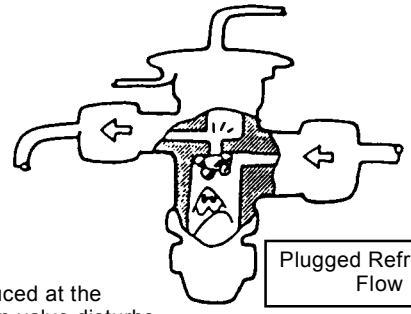


Hydrochloric acid corrodes metals if moisture exists.

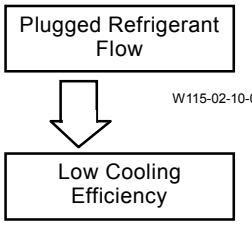


W115-02-10-002

3. Plugging of the expansion valve by moisture:
   When high pressure refrigerant gas passes through the expansion valve, gas pressure decreases and temperature drops. Moisture included in high pressure refrigerant gas in the air conditioner circuit freezes at the expansion valve orifice, plugging refrigerant flow. Operation of the air conditioner becomes unstable and cooling efficiency lowers.



Ice produced at the expansion valve disturbs refrigerant flow, lowering cooling efficiency.



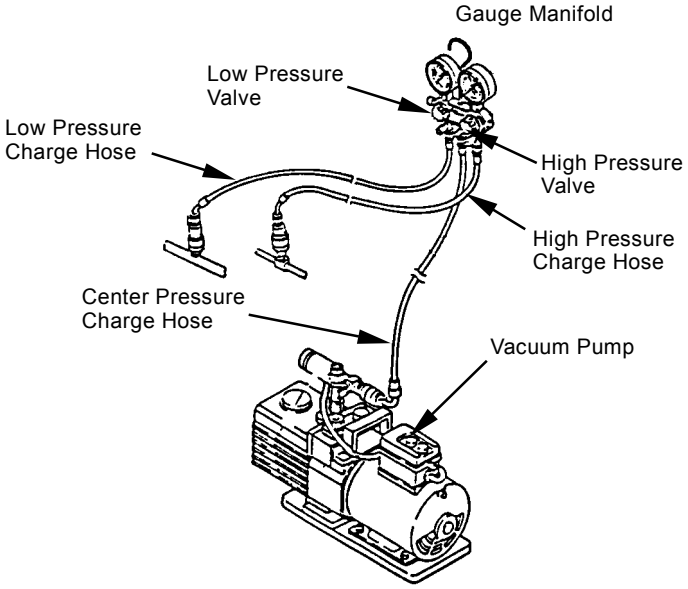
W115-02-10-003

Purging Procedure

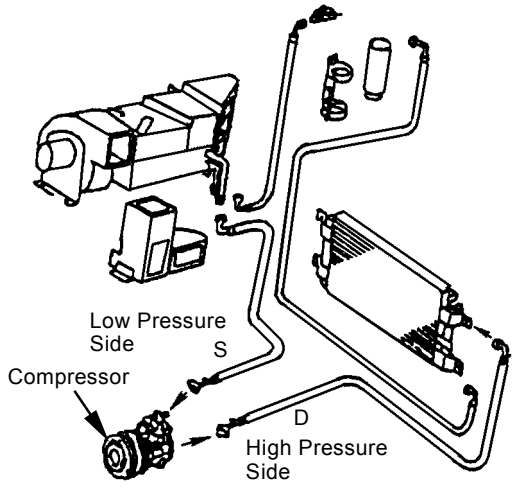
IMPORTANT: Never mistake the charge hose connections.

1. Close the high and low pressure valves on the gauge manifold (Parts Number 4360564).
   Connect the high-pressure-side charge hose and the low-pressure-side charge hoses to the high-pressure-side charge valve (“D” marked) and to the low-pressure-side charge valve (“S” marked) located on the compressor, respectively.
   Connect the charge hose located on the center of the manifold bottom to the vacuum pump (Parts Number 4360565).

NOTE: Vacuum Pump Joint Adapter (Parts Number 4360566).



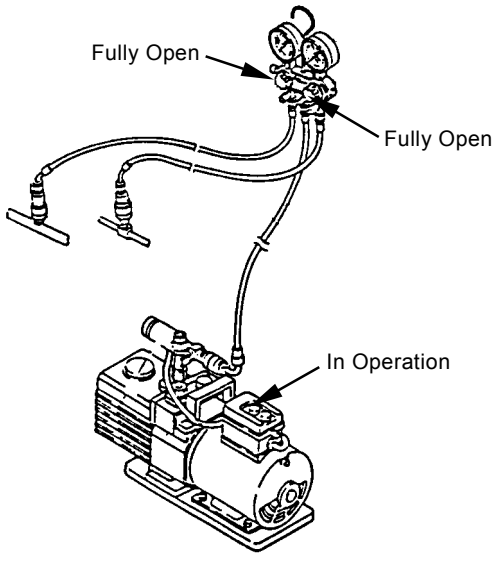
W115-02-10-005



T142-02-05-018

IMPORTANT: Remove refrigrant remained in the air conditioner circuit and operate the vacumu pump.

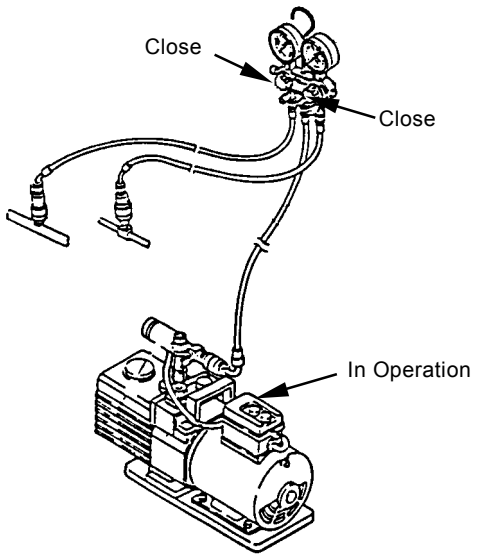
2. Open the high pressure and low pressure valves in the gauge manifold. Perform purging for 10 minutes or more by operating the vacuum pump.



W115-02-10-005

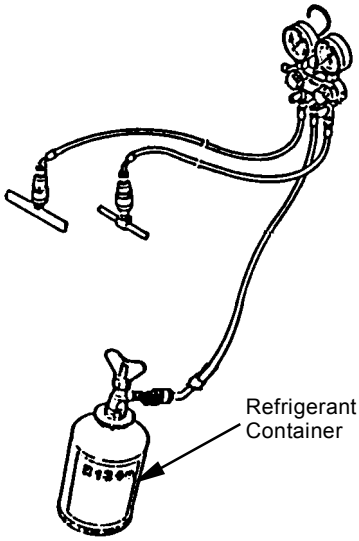
IMPORTANT: If the pointer returns to 0, retighten the line connections and perform purging again.

3. When the low pressure gauge reading falls below -100 kPa (-755 mmHg), stop the vacuum pump and close the high and low pressure valves. Wait for approximately five minutes and confirm that the pointer does not return to 0.



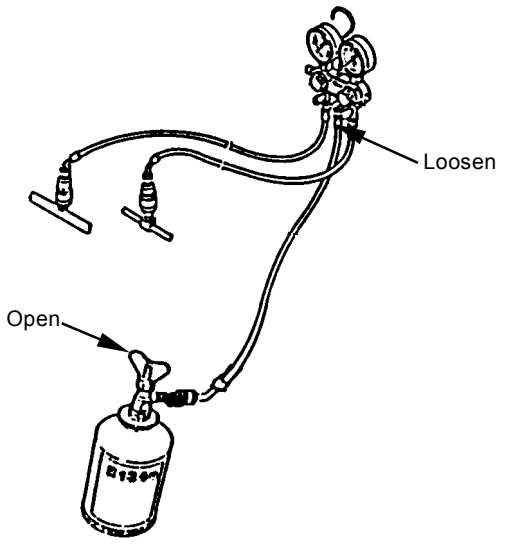
W115-02-10-005

4. With the high pressure and low pressure valves of the gauge manifold closed, connect the charge hose to the refrigerant container (Parts Number 4347644).



W115-02-10-007

5. Loosen the charge hose connection to the gauge manifold and open the refrigerant container valve to purge air in the charge hose with the refrigerant pressure.

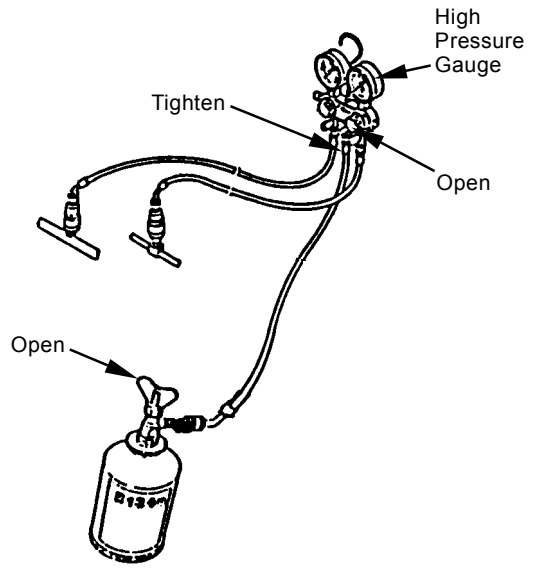


W115-02-10-007

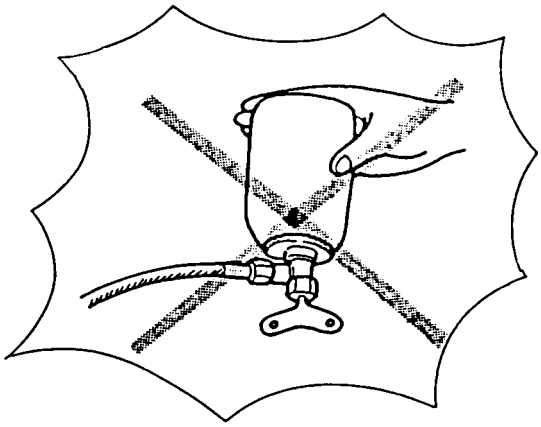
IMPORTANT: Always stop the engine when charging the air conditioner with refrigerant. Do not position the refrigerant container upside down during charging operation. When changing the refrigerant container during charging operation, purge air from the charge hose, as shown in step 10. Charge the low pressure side hose first.

6. Fully tighten the charge hose connection to the gauge manifold. Open the high pressure valve and refrigerant container valve to charge with refrigerant (R134a).
   Close the high pressure valve and refrigerant container valve when the high pressure gauge reading reaches 98 kPa (1 kgf/cm^2, 14 psi).

NOTE: Use warm water of 40 °C (104 °F) or less to warm the refrigerant container to aid in charging operation.



W115-02-10-007



W115-02-10-008

IMPORTANT: Use the leak tester for R134a.

7. After charging, check the line connections for gas leaks by using leak tester (Parts Number 4360567).

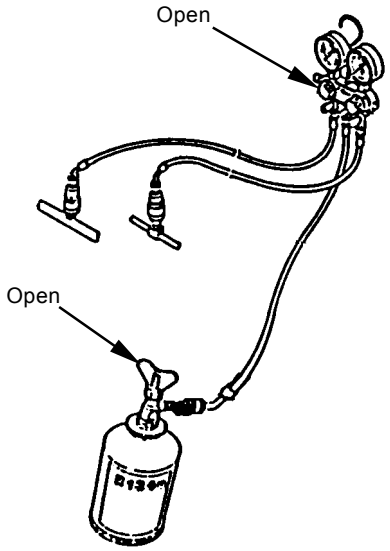
8. Confirm that the high pressure and low pressure valves in the gauge manifold and the refrigerant container valve are closed.
   Start the engine and operate the air conditioner.

   Operating Conditions of the Air Conditioner:
   Engine Speed : Slow Idle
   Cab Window : Fully Open
   Cooler Switch : ON
   Airflow Volume : Maximum
   Thermo Switch : Maximum

IMPORTANT: Do not open the high pressure valve in the gauge manifold.

9. Open the low pressure valve in the gauge manifold and the refrigerant container valve to charge with refrigerant until the bubbles seen in the receiver tank sight glass disappear.

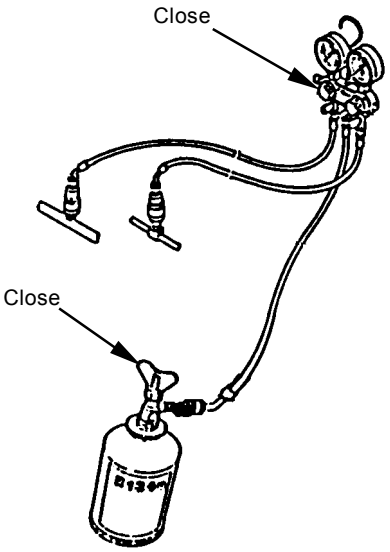
NOTE: The required refrigerant quantity is 1150 g±50 g (2.53±0.01 lb).



W115-02-10-007

10. If the refrigerant container becomes empty during the charging work, replace it with a new refrigerant container as follows:
    - Close the high pressure and low pressure valves on the manifold gauge.
    - Replace the empty container with a new one.
    - Tighten, then slightly loosen the refrigerant container joint.
    - Slightly open the low pressure valve on the manifold gauge.
    - When the refrigerant container joint starts to leak, immediately tighten the refrigerant container joint and close the low pressure valve on the manifold gauge.

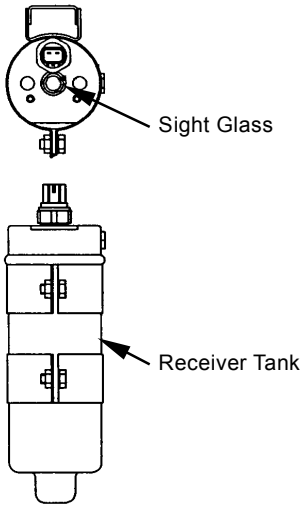
11. After charging, close the low pressure valve in the gauge manifold and the refrigerant container valve. Stop the engine.



W115-02-10-007

IMPORTANT: If the air conditioner is operated with very low refrigerant, a bad load will be exerted on the compressor. If the air conditioner is overcharged with refrigerant, cooling efficiency will lower and abnormal high pressure will arise in the air conditioner circuit, causing danger.

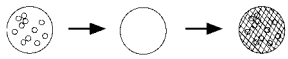
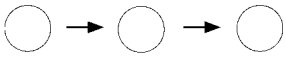
12. Start the engine and operate the air-conditioner again.
    Observe the sight glass of the receiver tank and check refrigerant quantity.
    Operating Conditions of the Air Conditioner:
    Engine Speed : Slow Idle
    Cab Window : Fully Open
    Cooler Switch : ON
    Airflow Volume : Maximum
    Thermo Switch : Maximum



W115-02-10-009

NOTE: As the bubbles in the sight glass vary depending on the ambient temperature, check refrigerant quantity confirming the changes in pressure .
Checking procedures: Stop the air conditioner and wait until refrigerant returns to the balanced pressure. Then, start the air conditioner again.

Relation between Refrigerant Quantity and Refrigerant Flow in Sight Glass:

Refrigerant Quantity	Refrigerant Flow in Sight Glass (approx. 1 min. after air conditioner switch is turned ON)	Explanation for Refrigerant Flow in Sight Glass
Adequate	(immediately after) (approx. 1 mm after)  W115-02-10-016	Immediately after the air conditioner is turned ON, few bubbles are seen. Then the flow becomes transparent and shows thin milk white color.
Overcharged	 W115-02-10-017	No bubbles are seen after the air conditioner is turned ON.
Not Enough	 W115-02-10-018	Bubbles are seen continuously after the air conditioner is turned ON.

W115-02-10-019

Bubbles exist: Bubbles are seen in refrigerant flow as both liquid refrigerant and refrigerant gas exist, being mixed.

W115-02-10-020

Transparent: Refrigerant flow is transparent as only liquid refrigerant exists.

115-02-10-021

Milk white: Refrigerant flow shows thin milk white as oil and refrigerant are separated.

CAUTION: Wait until the high-pressure-side pressure drops to less than 980 kPa (10 kgf/cm^2, 142 psi) before attempting to disconnect the high-pressure-side charge hose. Otherwise, refrigerant and compressor oil may spout.

13. After checking refrigerant quantity, disconnect the low-pressure-side charge hose first. Wait for the high-pressure-side pressure to drop to less than 980 kPa (10 kgf/cm^2, 142 psi). Disconnect the high-pressure-side charge hose.

NOTE: Do not discharge refrigerant in the charge hose in order not to discharge refrigerant into the atmosphere for the environmental protection.

Warm-up Operation

After charting the air conditioner, carry out warm-up operation five minute to lubricate system with compressor oil.

Operating Conditions of the Air Conditioner:
Engine Speed : Slow Idle
Cab Window : Fully Open
Cooler Switch : ON
Airflow Volume : Maximum
Thermo Switch : Maximum

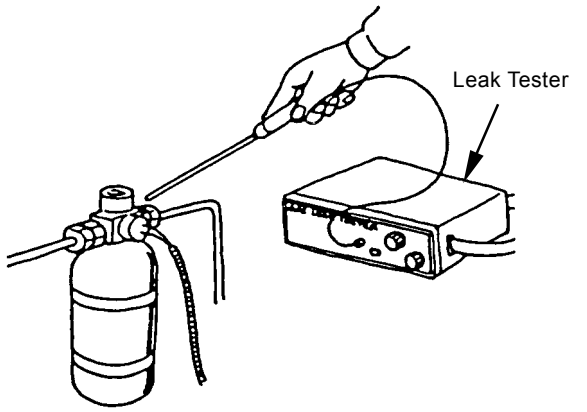
Inspection

After warm-up operation, carry out gas leak check and performance check.

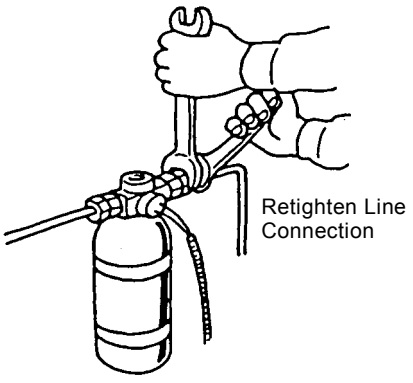
CAUTION: Refrigerant will produce poisonous material if exposed to heat of 1000 °C (1800 °F) or more. Never bring refrigerant close to a fire.

1. Check the air conditioner for gas leaks by using a leak tester.
   - Perform checking under well-ventilated conditions.
   - Thoroughly wipe off dust from the charge hose connections of the compressor.
   - Pay special attention to check the line connections.
   - If any gas leaks are found, retighten the line connections.

2. Performance Check
   Carry out performance check of the air conditioner after checking each air conditioner component.
   - Check each component for abnormalities.
   - Carry out ON-OFF check of the compressor clutch.
   - Check compressor fan belt tension.
   - Check coolant level in the radiator.
   - Operate the air conditioner and check the performance.



W115-02-10-013



W115-02-10-014

3. The checklist before the summer season is as follows:
   - Check each air conditioner component for abnormalities.
   - Check the line connections for oil leaks.
   - Check refrigerant quantity.
   - Check the engine cooling circuit.
   - Check belts for wear. Replace if necessary.

4. Off-Season Maintenance
   - During off-season, operate the idler pulley and compressor at least once a month for a short time in order to check for any abnormal sounds.
   - Do not remove the compressor belts during off-season. Operate the compressor occasionally at slow speed for 5 to 10 minutes with the belt slightly loosened in order to lubricate the machine parts.

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.

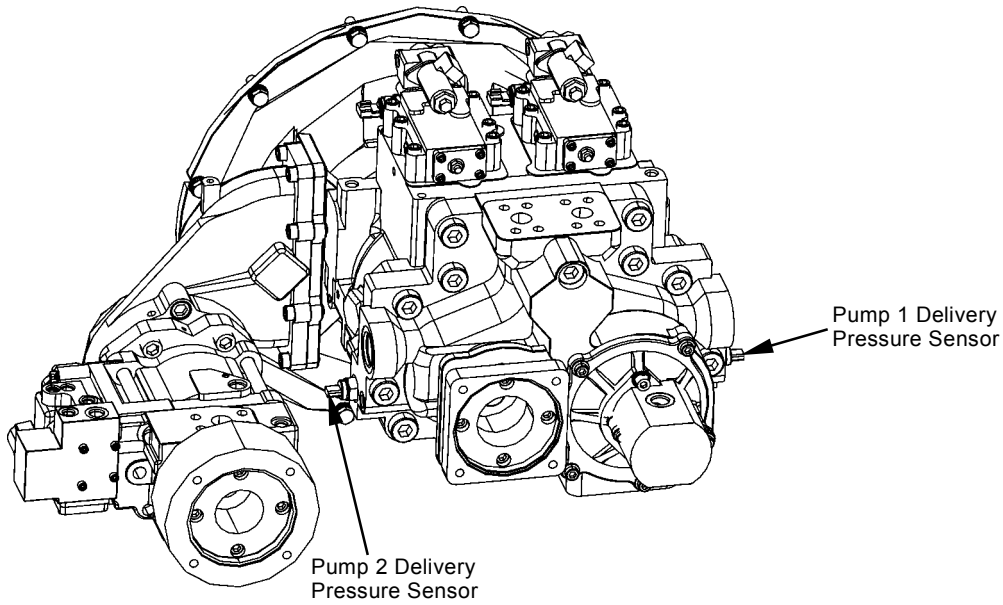
Many sensors and solenoid valves used on this machine are identical. Therefore, using this switch-check method, faulty part / component, and/or harness can be easily found.

Example: Abnormal pump 1 delivery pressure sensor (Fault code: 11200)

Check Method:
1. Switch connector of two delivery pressure sensors.
2. Retry troubleshooting.

Result:
In case the pump 2 delivery pressure sensor is abnormal (fault code 11202), the pump 1 delivery pressure sensor is considered to be faulty.

In case the pump 1 delivery pressure sensor is abnormal (fault code 11200), the pump 1 delivery pressure sensor harness is considered to be faulty.



T1J1-05-07-012

Applicability of Switch-Check Method

Fault Code	Trouble	Applicability
11000-2	Abnormal EEPROM	Not Applicable
11001-2	Abnormal RAM	
11002-2	Abnormal A/D Converter	
11003-3	Abnormal Sensor Voltage	
11004-2	CAN Communication Error	Not Applicable
11101-3	EC Dial sensor Circuit High Input	Not Applicable
11101-4	EC Dial sensor Circuit Low Input	
11200-3	Pump 1Delivery Pressure Sensor Circuit High Input	Applicable (Harness / Sensor)
11200-4	Pump 1 Delivery Pressure Sensor Circuit Low Input	
11202-3	Pump 2 Delivery Pressure Sensor Circuit High Input	
11202-4	Pump 2 Delivery Pressure Sensor Circuit Low Input	
11301-3	Swing Pilot Pressure Sensor Circuit High Input	Applicable (Harness / Sensor)
11301-4	Swing Pilot Pressure Sensor Circuit Low Input	
11302-3	Boom Raise Pilot Pressure Sensor Circuit High Input	
11302-4	Boom Raise Pilot Pressure Sensor Circuit Low Input	
11303-3	Arm Roll-in Pilot Pressure Sensor Circuit High Input	
11303-4	Arm Roll-in Pilot Pressure Sensor Circuit Low Input	
11400-3	Pump 2 Regulator Valve FB High Current	Applicable (Harness / Solenoid Valve)
11400-4	Pump 2 Regulator Valve FB Low Current	
11402-3	Boom Flow Control Valve FB High Current	Applicable (Harness / Solenoid Valve)
11402-4	Boom Flow Control Valve FB Low Current	
11404-3	Power Boost P/S Valve FB High Current	
11404-4	Power Boost P/S Valve FB Low Current	
11405-3	Travel Swash Angle P/S Valve FB High Current	
11405-4	Travel Swash Angle P/S Valve FB Low Current	

Fault Code	Trouble	Applicability
11410-3	Pump 1 Regulator Valve FB High Current	Applicable (Harness / Solenoid Valve)
11410-4	Pump 1 Regulator Valve FB Low Current	
11412-3	Hyd. Fan P/S Valve FB High Current	
11412-4	Hyd. Fan P/S Valve FB Low Current	
11802-3	Boom Bottom Pressure Sensor Circuit High Input	Not Applicable
11802-4	Boom Bottom Pressure Sensor Circuit Low Input	
11901-3	Hyd. Oil Temp Sensor Circuit High Input	Not Applicable
11901-4	Hyd. Oil Temp Sensor Circuit Low Input	
11910-2	Actual Engine Speed Receive Error	Not Applicable
11911-2	Security Signal Receive Error	
11914-2	Radiator Water Temp Receive Error	
11918-2	Work Mode Receive Error	
11920-2	Fuel Flaw Receive Error	
11976-3	Auxiliary Valve 2 FB High Current	Applicable (Harness / Solenoid Valve)
11976-4	Auxiliary Valve 2 FB Low Current	
11977-3	Auxiliary Valve 1 FB High Current	
11977-4	Auxiliary Valve 1 FB Low Current	
11980-3	ATT Relief Change Valve FB High Current	Not Applicable
11980-4	ATT Relief Change Valve FB Low Current	
11981-3	Fan Reverse Valve 2 FB High Current	Not Applicable
11981-4	Fan Reverse Valve 2 FB Low Current	
11982-3	Fan Reverse Valve 1 FB High Current	
11982-4	Fan Reverse Valve 1 FB Low Current	
11983-2	Intake Air Temperature Receive Error	Not Applicable
11984-2	Boost Temperature Receive Error	Not Applicable
11989-3	Boom Mode Control Valve FB High Current	Applicable (Harness / Solenoid Valve)
11989-4	Boom Mode Control Valve FB Low Current	

Fault Code	Trouble	Applicability
11991-3	Right Travel Pilot Pressure Sensor Circuit High Input	Applicable (Harness / Sensor)
11991-4	Right Travel Pilot Pressure Sensor Circuit Low Input	
11992-3	Pump 2 Regulator Pressure Sensor Circuit High Input	Applicable (Harness / Sensor)
11992-4	Pump 2 Regulator Pressure Sensor Circuit Low Input	
11993-3	Left Travel Pilot Pressure Sensor Circuit High Input	Applicable (Harness / Sensor)
11993-4	Left Travel Pilot Pressure Sensor Circuit Low Input	
11994-3	Pump 1 Regulator Pressure Sensor Circuit High Input	Applicable (Harness / Sensor)
11994-4	Pump 1 Regulator Pressure Sensor Circuit Low Input	
11995-3	Arm Roll-Out Pilot Pressure Sensor Circuit High Input	Applicable (Harness / Sensor)
11995-4	Arm Roll-Out Pilot Pressure Sensor Circuit Low Input	
11997-3	Bucket Roll-Out Pilot Pressure Sensor Circuit High Input	
11997-4	Bucket Roll-Out Pilot Pressure Sensor Circuit Low Input	
11998-3	Boom Lowering Pilot Pressure Sensor Circuit High Input	
11998-4	Boom Lowering Pilot Pressure Sensor Circuit Low Input	
11999-3	Bucket Roll-In Pilot Pressure Sensor Circuit High Input	
11999-4	Bucket Roll-In Pilot Pressure Sensor Circuit Low Input	

(Blank)

PRECAUTIONS FOR INSPECTION AND MAINTENANCE

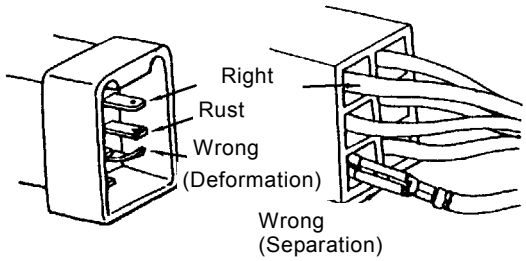
1. Disconnect the power source.
   Remove the harness from the negative terminal side in battery first when taking wire harnesses and connectors off for repair or replacement work. Failure to do so can result in damage to the wire harnesses, fuses and fusible links and, in some cases, cause fire due 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:
- *Code BW indicates a black base wire with white fine-line marking.*
- *Initials "O" and "Or" both stand for the color orange.*
- *Wires with longitudinal stripes printed on them are not color coded. Do not confuse them with color coded wires.*

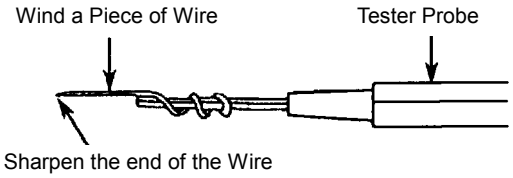
3. Precautions for connecting and disconnecting terminal connectors.
   - When disconnecting the harnesses, grasp them by their connectors. Do not pull on the wire itself. Release the lock first before attempting to separate connectors, if a lock is provided. (Refer to “Instructions for Disconnecting Connector” on page T5-8-3.)
   - 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.
   - 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.
   - When connecting terminal connectors provided with a lock, insert them together until the lock “clicks.”
   - 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.
   - 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.
   - 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.
   - 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.

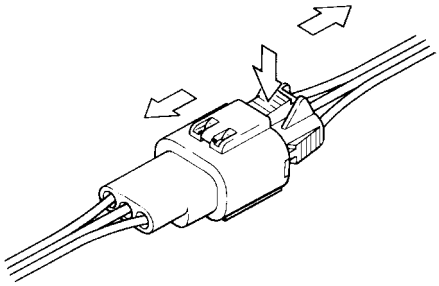


T107-07-06-003

INSTRUCTIONS FOR DISCONNECTING CONNECTORS

- Push to Unlock and Separate Type
  (Most of connectors are “Push, Unlock and Separate Type”.)

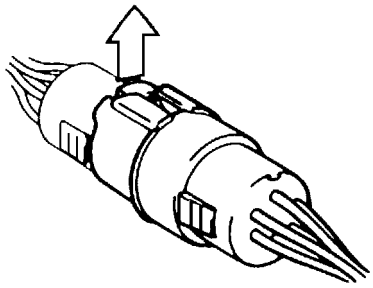
NOTE: 1. *Connectors will not be easily separated even if the lock is pushed while being pulled. Push the lock first before pulling the connectors.*
2. *The lock is located on female side con nector (harness end side).*



T107-04-05-002

- Raise Lock, Pull and Separate Type

Locations of This Type Connector
Starter Relay

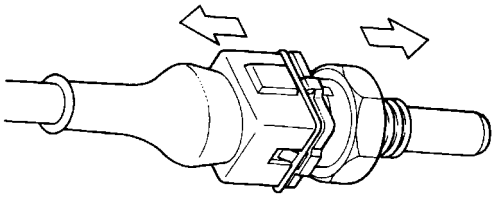


T107-04-05-003

- Pull and Separate Type

IMPORTANT: Before pulling and separating, release the wire lock in the hydraulic oil temperature sensor by using a pair of pincers.

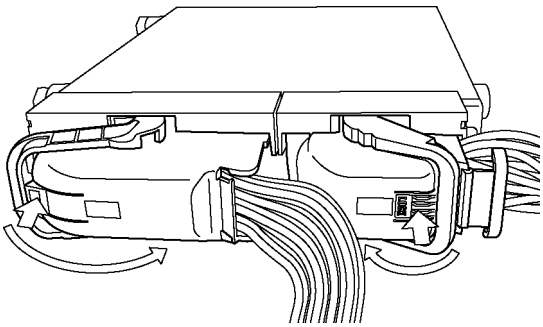
Locations of This Type Connector
Hydraulic Oil Temperature Sensor
Dr. ZX



T107-04-05-004

- Push Lock and Switch Lever Type

Locations of This Type Connector
Cab Harness to Main Harness
ECM



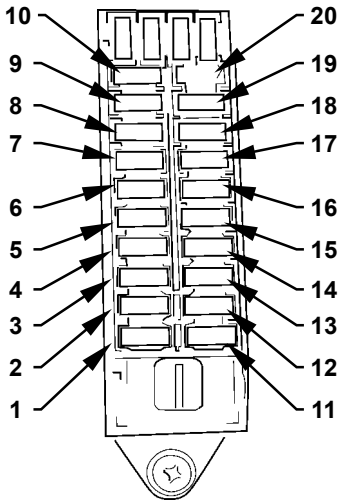
T1J1-05-08-003

FUSE INSPECTION

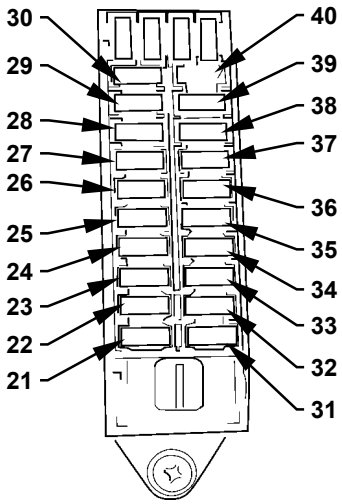
Cracks in a fuse are so fine that it is very difficult or impossible to find by visual inspection. Use a tester in order to correctly inspect fuse continuity by following the instructions described below.

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



M178-07-034

Fuse No.	Capacity	Connected to	Fuse No.	Capacity	Connected to
1	20 A	Light Relay 2	21	10 A	Seat Heater (Optional)
2	10 A	Wiper Relay, Washer Relay, Wiper Motor	22	10 A	Light Relay 3 (Optional)
3	20 A	Heater (Air Conditioner Unit)	23	10 A	Rear Light (Optional)
4	10 A	Pilot Shut-Off Relay, Pilot Shut-Off Solenoid Valve, MC Solenoid Valve Power	24	10 A	Auxiliary Power (Optional)
5	5 A	Optional 1, Attachment Power, Travel Alarm (Optional)	25	5 A	Immobilizer (Optional)
6	10 A	Optional 2	26	5 A	Quick Hitch (Optional)
7	10 A	Electronic Grease Gun	27	5 A	Auxiliary 3
8	30 A	ECM Main Relay	28	-	-
9	5 A	Radio (Backup Power), Security Horn, Security Horn Relay	29	20 A	Light Relay 1, Fan Rotation Direction Switch (Optional), Auto Lubrication Switch, Travel Alarm Deactivation Switch (Optional), Level Check Switch, Boom Mode Selector Switch
10	5 A	MC/ICF Main Power	30	10 A	Auto Lubrication Relay
11	10 A	Horn Relay	31	10 A	Seat Heater (Optional)
12	5 A	Cab Light, Radio Power	32	10 A	Front Work Light (Optional)
13	10 A	Cigarette Lighter	33	10 A	Indicator (Optional)
14	15 A	Suction Control Valve (Engine)	34	10 A	Auxiliary 2
15	10 A	Auxiliary	35	-	-
16	5 A	Glow Plug Relay	36	-	-
17	5 A	Air Conditioner Unit	37	-	-
18	5 A	Engine Stop Switch, Monitor Unit/MC/ICF/ECM Power ON Signal	38	-	-
19	5 A	Monitor Unit Power	39	-	-
20	10 A	Optional 3	40	-	-

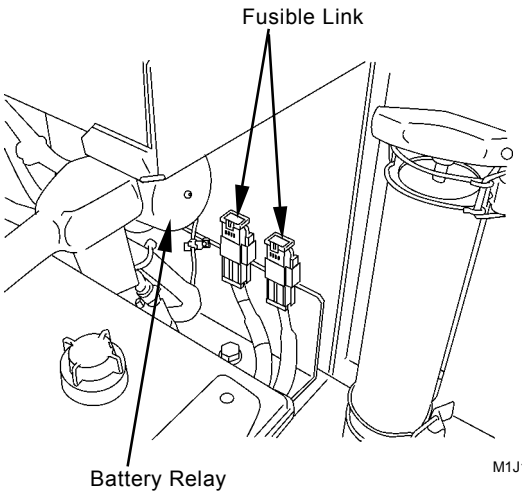
FUSIBLE LINK INSPECTION AND REPLACEMENT

Inspection

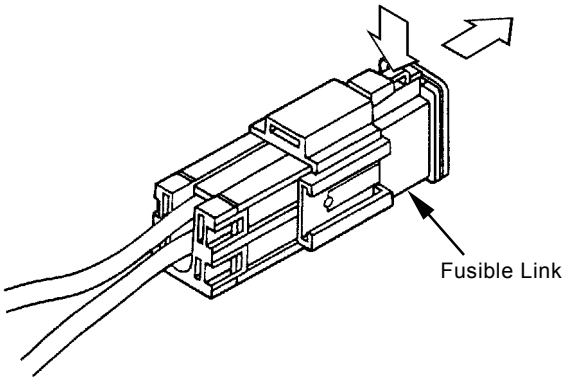
1. Visually check if fusible links have blown.

Replacement

1. Remove the negative cable from the battery.
2. Push (to unlock) and pull to disconnect fusible link connector. Replace the fusible link.
3. Reconnect the negative cable to the battery.



M1J1-07-015



T111-04-05-015

BATTERY VOLTAGE CHECK

1. Turn the key switch OFF. Check voltage between the battery positive terminal and the vehicle.

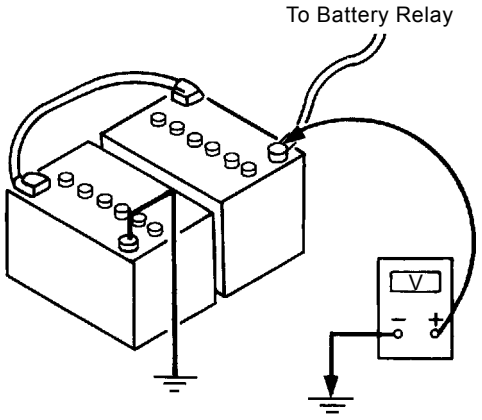
   Normal Voltage: 24 V

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.



T162-05-06-005

HOW TO TROUBLESHOOT ALTERNATOR MALFUNCTIONS

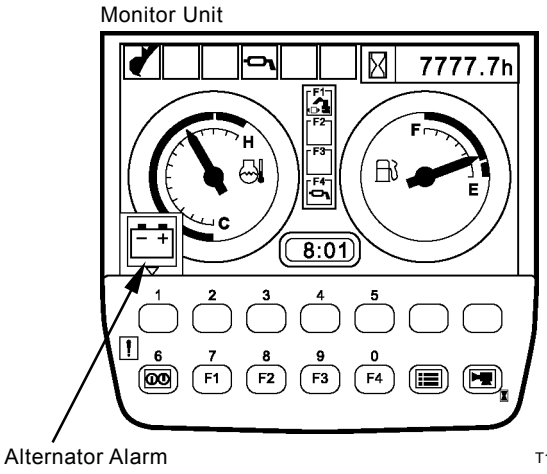
In general, the alternator alarm remains off when the alternator is generating power.
If the alternator alarm is displayed while the engine is running, the alternator might be defective.

How to check the circuit

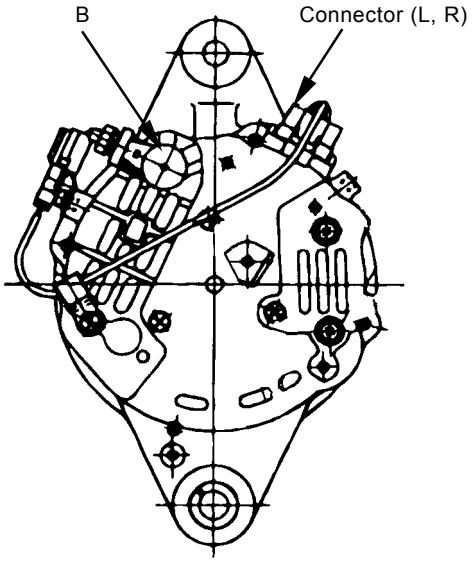
1. Stop the engine. Turn the key switch to the ON position. Confirm that the alternator alarm comes on.

2. Measure the voltage between the B and the vehicle frame. 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 the alternator circuit might be the cause of the malfunction. When the voltage is 0 V, the wiring between the 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 and measure the voltage generated while as the alternator rotates.
   As described above, measure the voltage between terminals B and the vehicle frame. If the 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.



T1J1-05-01-007



T16J-05-06-001

CONTINUITY CHECK

Single-line continuity check

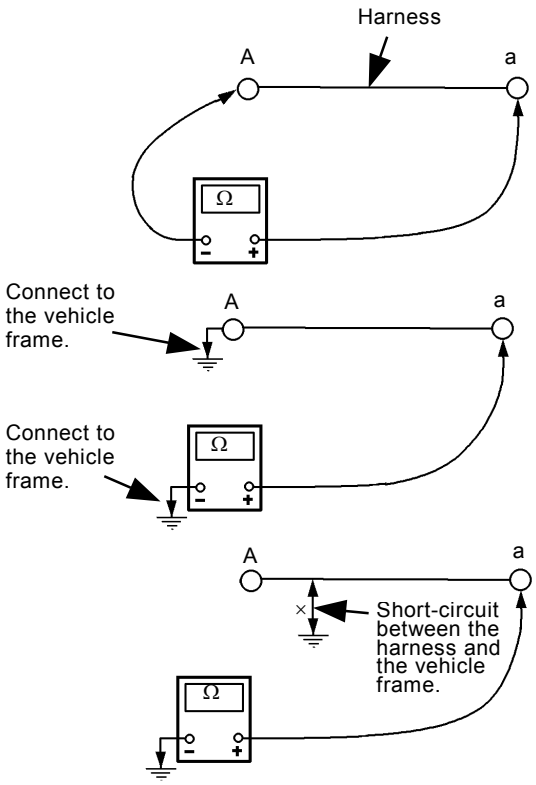
Disconnect both end connectors of the harness and check continuity between both ends:
If the ohm-meter reading is: 0 Ω = Continuity
∞ Ω = Discontinuity

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

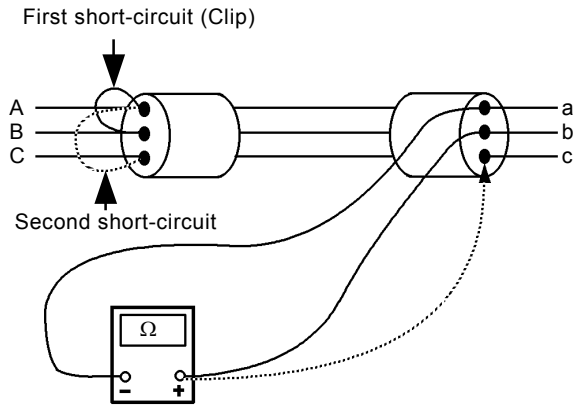
Disconnect both end connectors of the harness and check continuity between one end connector of the harness and the vehicle frame:
If the ohm-meter reading is:
0 Ω = Short circuit is present.
∞ Ω = No short circuit is present.



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).



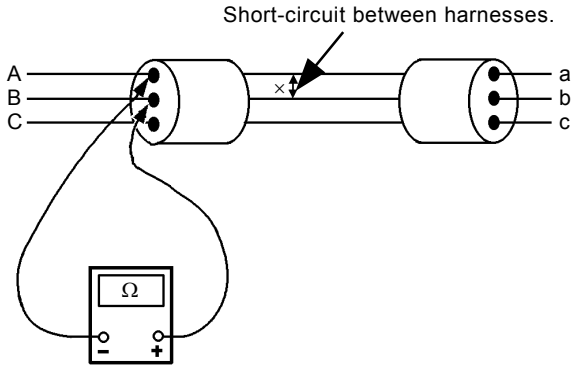
T107-07-05-004

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

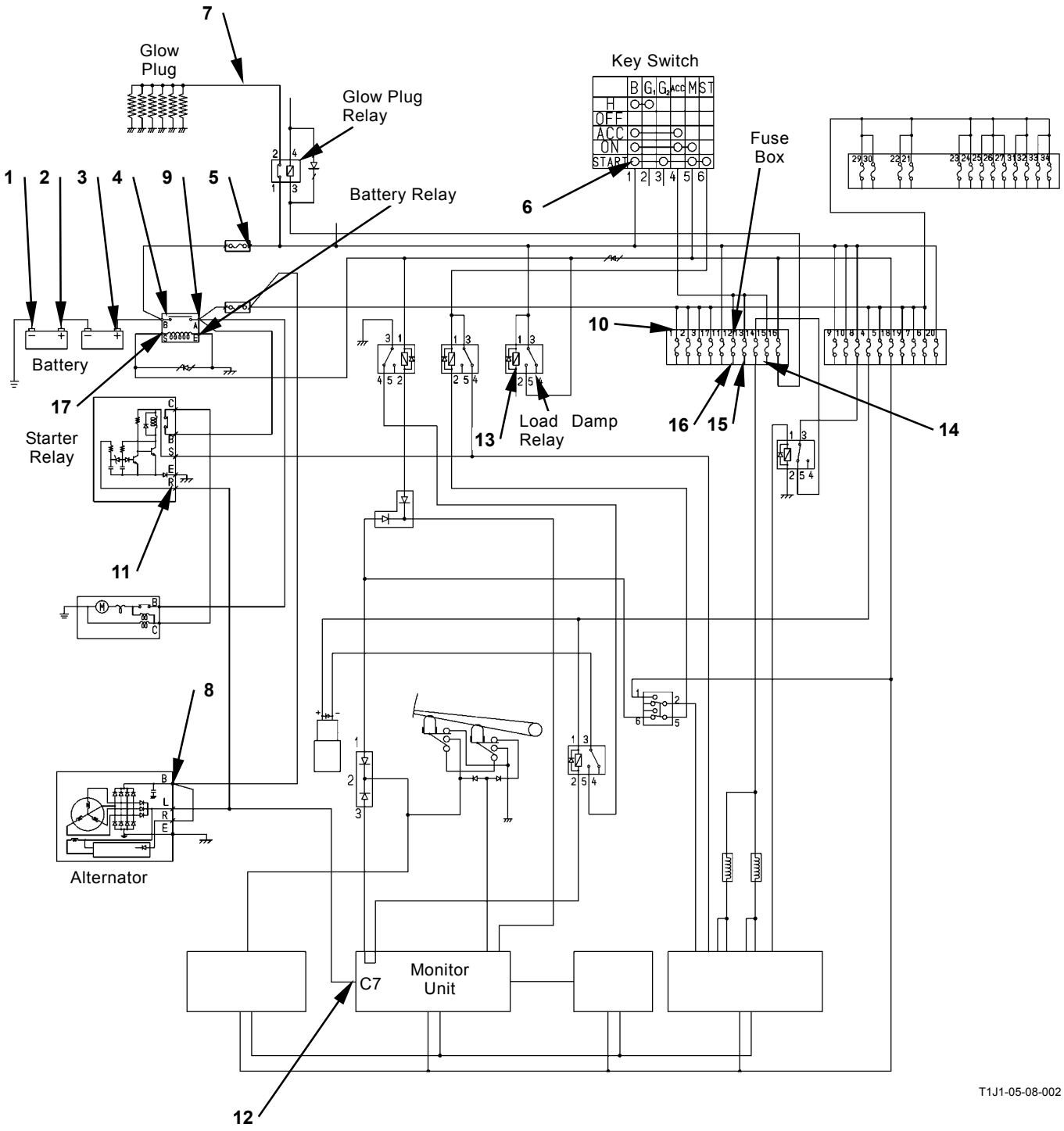
VOLTAGE AND CURRENT MEASUREMENT

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.

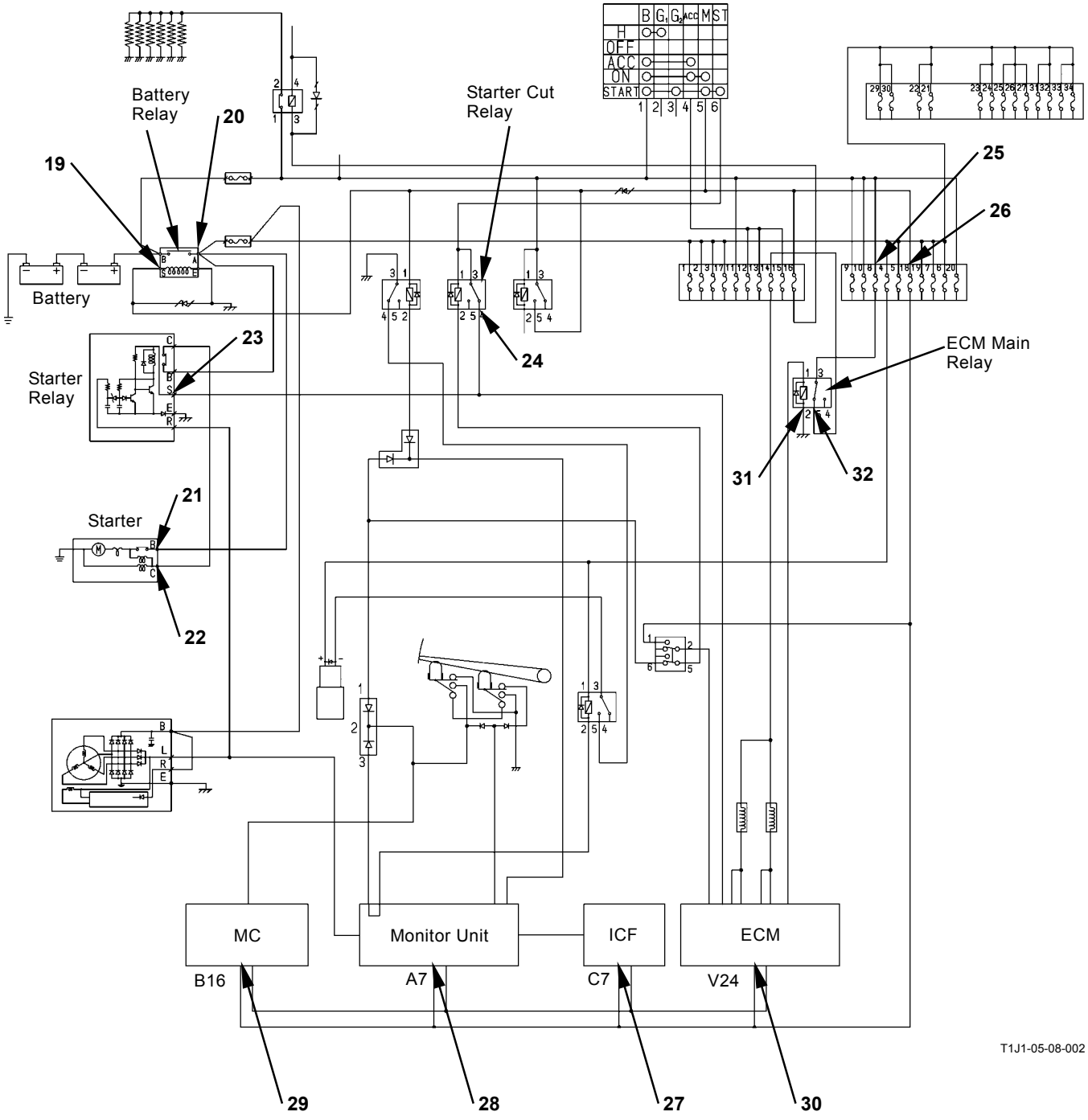
24-Volt Circuit
Start checking the circuit in order up to the location to be measured from either power source or actuator side. Thereby, the faulty location in the circuit will be found.
Black Probe (Negative) of Tester:
To ground to the vehicle frame
Red Probe (Positive) of Tester:
To touch the location 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 (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 (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

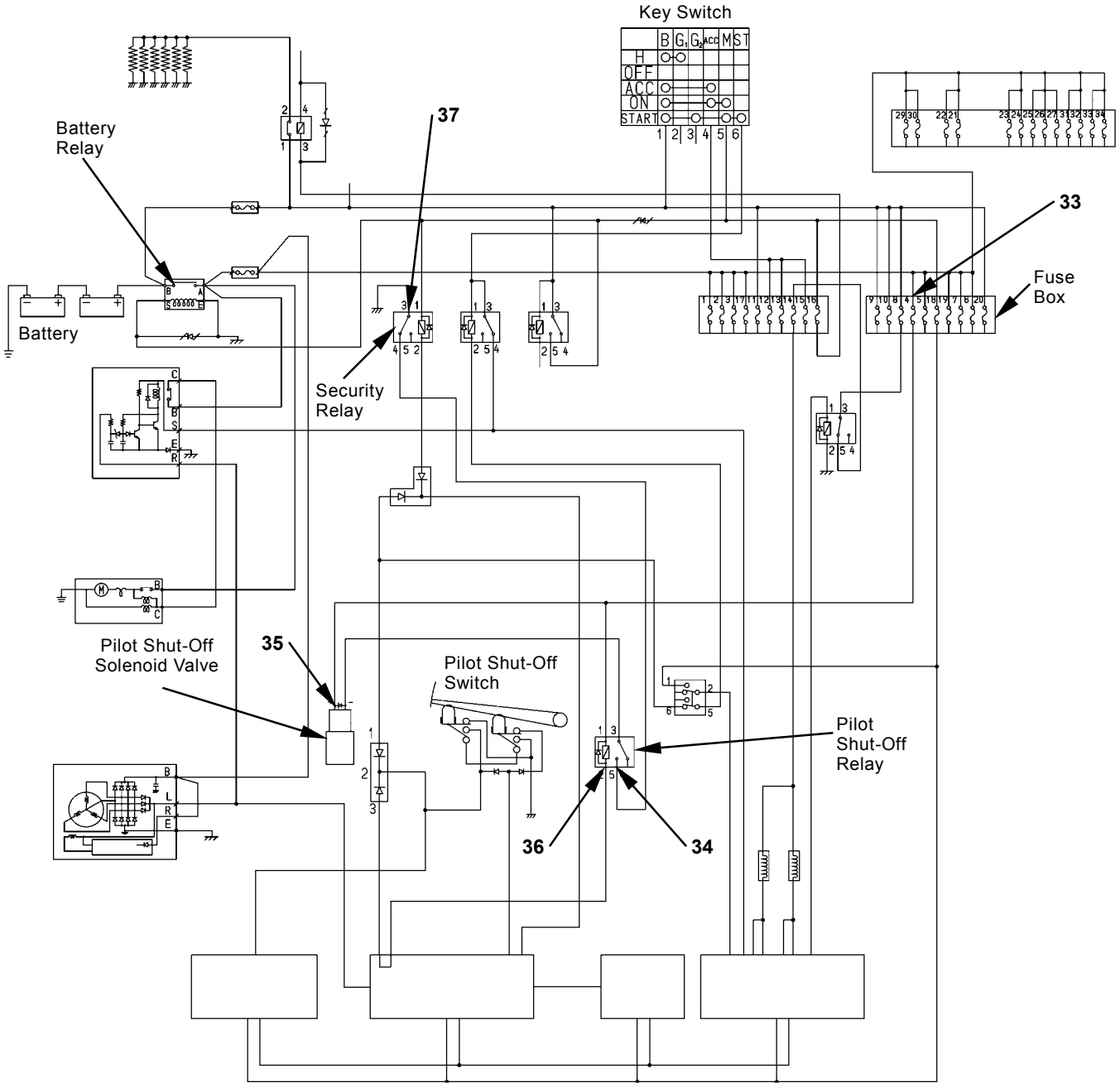
*NOTE: *: Before measurement, disconnect the negative cable from the battery.*


7
Glow Plug
Glow Plug Relay
Key Switch
Fuse Box
1
2
3
4
9
5
6
Battery Relay
Battery
17
10
Starter Relay
13
Load
Damp
Relay
16
15
14
11
8
Alternator
Monitor Unit
C7
12
T1J1-05-08-002

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 (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


Battery Relay
20
19
Starter Cut Relay
25
26
Battery
24
23
Starter Relay
ECM Main Relay
31
32
21
Starter
22
MC
Monitor Unit
ICF
ECM
B16
A7
C7
V24
29
28
27
30
T1J1-05-08-002

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



T1J1-05-08-002

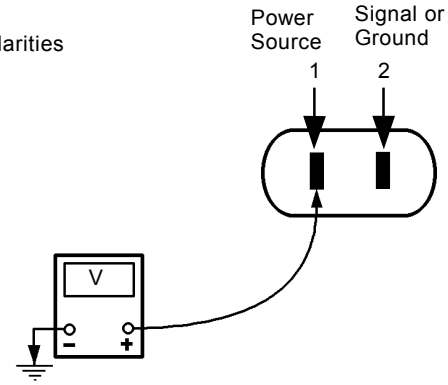
5 Voltage Circuit

- **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

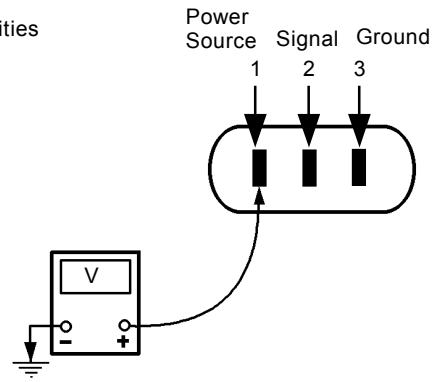
  Evaluation:
  If the measuring voltage is within 5±0.5 volts, the circuit up to terminal #1 is normal.

Two Polarities



T107-07-05-006

Three Polarities



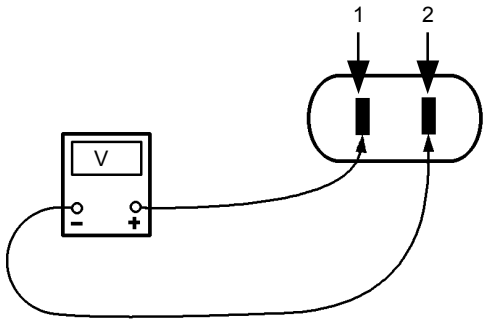
T107-07-05-007

- **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

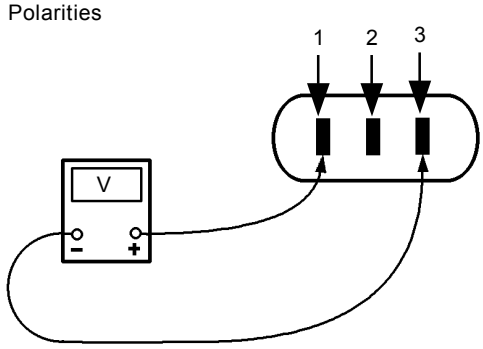
  Evaluation:
  If the measured voltage is within 5±0.5 volt, the circuit up to terminal #1 or the ground terminal (terminal #2 or #3) is normal.

Two Polarities



T107-07-05-008

Three Polarities



T107-07-05-009

CHECK BY FALSE SIGNAL

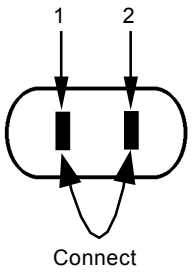
Turn the key switch OFF. Disconnect the sensor connector. Turn the key switch ON. Connect terminal #1 (power source) of machine harness end connector to terminal #2 (signal). (Power voltage is used as a false signal.) Check this state by using the monitor function of Dr. ZX. When the maximum value is 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 menu of monitor (the built-in diagnosing system).

Two Polarities

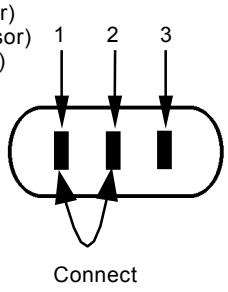
(Hydraulic Oil Temperature Sensor)
(Fuel Sensor)



T107-07-05-010

Three Polarities

(Pressure Sensor)
(Pump Delivery Pressure Sensor)
(Pump Regulator Pressure Sensor)
(Boom Bottom Pressure Sensor)

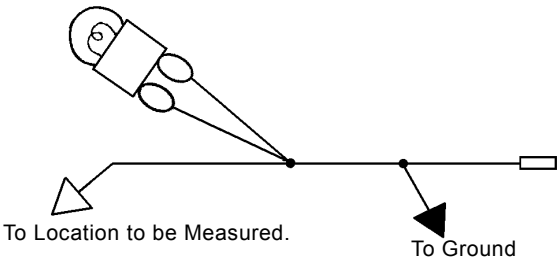


T107-07-05-011

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.



Parts Number 4283594 (ST 7126)

T107-07-05-012

MEMO

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THE ATTACHED DIAGRAM LIST

(The following diagrams are attached to this manual.)

1. ZAXIS450-3/500LC-3/520LCH-3 ELECTRICAL CIRCUIT DIAGRAM
   ZAXIS450-3/500LC-3/520LCH-3 CONNECTORS
2. ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 CAB HARNESS
   ZAXIS450-3/500LC-3/520LCH-3 MAIN HARNESS
3. ZAXIS450-3/500LC-3/520LCH-3 ENGINE HARNESS
   ZAXIS450-3/500LC-3/520LCH-3 CONTROL VALVE HARNESS
4. ZAXIS450-3/500LC-3/520LCH-3 PUMP HARNESS
   ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 MONITOR HARNESS
5. ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 AIR CONDITIONER HARNESS
   ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 FUSE BOX 2 HARNESS
6. ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 PILOT SHUT-OFF SOLENOID VALVE HARNESS
   ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 CAB SWITCH HARNESS
   (BOOM MODE SELECTOR SWITCH, LEVEL CHECK SWITCH, SEAT HEAT SWITCH (OPTIONAL))
7. ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 OVERLOAD ALARM HARNESS (OPTIONAL)
   ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 OVERLOAD ALARM SUB HARNESS (OPTIONAL)
8. ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 BREAKER HOUR METER HARNESS
   (CAB HARNESS SIDE) (OPTIONAL)
   ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 BREAKER HOUR METER HARNESS
   (CONSOLE SIDE) (OPTIONAL)
9. ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 ATT. SENSOR HARNESS (OPTIONAL)
   ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 SEAT HEATER HARNESS (OPTIONAL)
10. ZAXIS450-3/500LC-3/520LCH-3 AUTO-LUBRICATION HARNESS 1 (MACHINE SIDE) (OPTIONAL)
    ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 AUTO-LUBRICATION HARNESS 1
    (CAB SWITCH HARNESS SIDE) (OPTIONAL)
11. ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 AUTO-LUBRICATION HARNESS 2
    (CAB SWITCH HARNESS SIDE) (OPTIONAL)
    ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 CAB SWITCH HARNESS
    (TRAVEL ALARM DEACTIVATION SWITCH) (OPTIONAL)
12. ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 CAB SWITCH HARNESS
    (FAN ROTATION DIRECTION SWITCH) (OPTIONAL)
    ZAXIS450-3/500LC-3/520LCH-3/650LC-3/850-3 REAR VIEW CAMERA RELAY HARNESS
13. ZAXIS450-3/500LC-3/520LCH-3 HYDRAULIC CIRCUIT DIAGRAM (BACKHOE)
    ZAXIS450-3/500LC-3/520LCH-3 HYDRAULIC CIRCUIT DIAGRAM
    (BREAKER/CRUSHER/TWO SPEED FLOW COMBINER) (OPTIONAL)
14. ZAXIS450-3/500LC-3/520LCH-3 HYDRAULIC CIRCUIT DIAGRAM (HOSE-RUPTURE) (OPTIONAL)
    ZAXIS450-3/500LC-3/520LCH-3 HYDRAULIC CIRCUIT DIAGRAM (WITH COUNTERWEIGHT REMOVAL
    AND INSTALLATION DEVICE) (OPTIONAL)