Technical Manual

Troubleshooting

ZAXIS

330-3 class

330-3·330LC-3

350H-3·350LCH-3

350LCK-3

350LC-3·350LCN-3

Hydraulic Excavator

Service Manual consists of the following separate Part No;

Technical Manual (Operational Principle)
Technical Manual (Troubleshooting)
Workshop Manual

: Vol. No.TT1V7-E : Vol. No.W1V7-E

: Vol. No.TO1V7-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.

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ADDITIONAL REFERENCES

- Please refer to the materials listed below in addition to this manual.
 - · The Operator's Manual
 - · The Parts Catalog

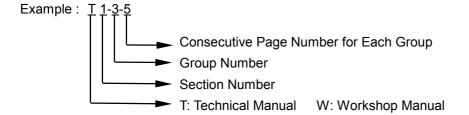
- Operation Manual of the Engine
- · Parts Catalog of the Engine
- · Hitachi Training Material

MANUAL COMPOSITION

- This manual consists of three portions: the Technical cal 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:



INTRODUCTION

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.

• A 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.

• PNOTE:

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.

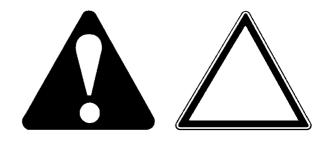
Example: 24.5 MPa (250 kgf/cm², 3560 psi)

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.

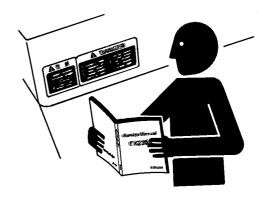


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FOLLOW SAFETY INSTRUCTIONS

- 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.

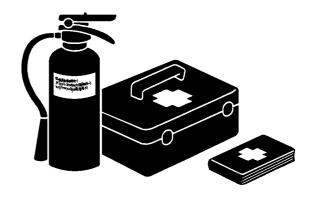


SA-003

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.

005-E01A-0438



PROTECT AGAINST NOISE

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

006-E01A-0434

SA-434

INSPECT MACHINE

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



007-E01A-0435

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.



008-E01A-0439

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.



SA-462

009-E01A-0462

ENSURE SAFETY BEFORE RISING FROM OR LEAVING OPERATOR'S SEAT

- Before rising from the operator's seat to open/close either side window or to adjust the seat position, be sure to first lower the front attachment to the ground and then move the pilot control shut-off lever to the LOCK position. Failure to do so may allow the machine to unexpectedly move when a body part unintentionally comes in contact with a control lever, possibly resulting in serious personal injury or death.
 - Before leaving the machine, be sure to first lower the front attachment to the ground and then move the pilot control shut-off lever to the LOCK position. Turn the key switch OFF to stop the engine.
 - Before leaving the machine, close all windows, doors, and access covers and lock them up.

FASTEN YOUR SEAT BELT

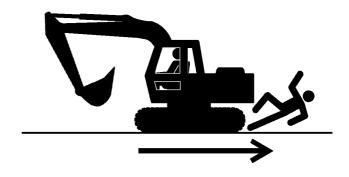
- If the machine should overturn, the operator may become injured and/or thrown from the cab. Additionally the operator may be crushed by the overturning machine, resulting in serious injury or death.
 - Prior to operating the machine, thoroughly examine webbing, buckle and attaching hardware. If any item is damaged or worn, replace the seat belt or component before operating the machine.
 - Be sure to remain seated with the seat belt securely fastened at all times when the machine is in operation to minimize the chance of injury from an accident.
 - We recommend that the seat belt be replaced every three years regardless of its apparent condition.





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-42

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.

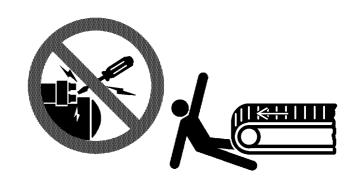


SA-293

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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.

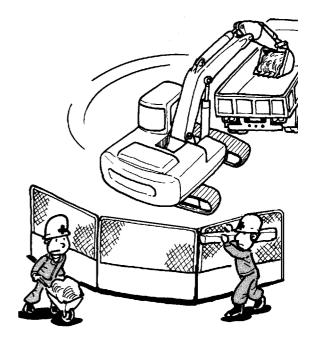
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SA-379

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

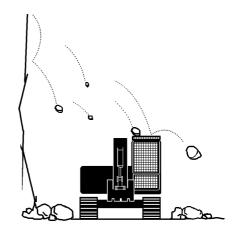
- When working at the edge of an excavation or on a road shoulder, the machine could tip over, possibly resulting in serious injury or death.
 - Investigate the configuration and ground conditions of the job site beforehand to prevent the machine from falling and to prevent the ground, stockpiles, or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



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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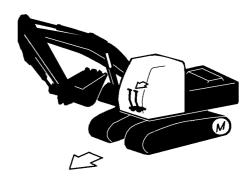


SA-481

CONFIRM DIRECTION OF MACHINE TO BE DRIVEN

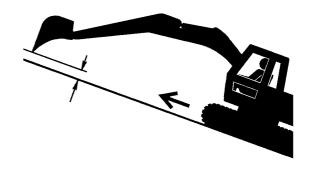
- Incorrect travel pedal/lever operation may result in serious injury death.
 - Before driving the machine, confirm the position of the undercarriage in relation to the operator's position. If the travel motors are located in front of the cab, the machine will move in reverse when travel pedals/levers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

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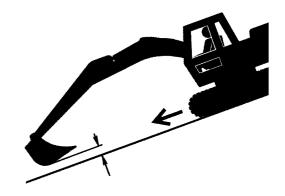


DRIVE MACHINE SAFELY

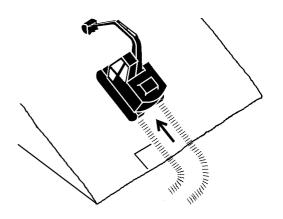
- Before driving the machine, always confirm that the travel levers/pedals direction corresponds to the direction you wish to drive.
 - Be sure to detour around any obstructions.
 - Avoid traveling over obstructions. Soil, fragments of rocks, and/or metal pieces may scatter around the machine. Don't 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.



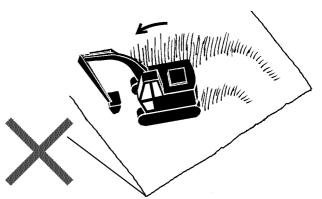
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SA-658



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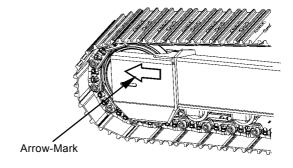


DRIVE MACHINE SAFELY

- 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.

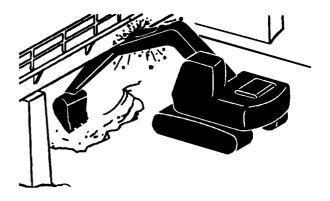


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- Use wood plates in order not to damage the road surface. Be careful of steering when operating on asphalt roads in summer.
- When crossing train tracks, use wood plates in order not to damage them.
- Do not make contact with electric wires or bridges.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



AVOID INJURY FROM ROLLAWAY ACCIDENTS

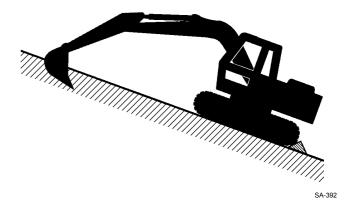
• Death or serious injury may result if you attempt to mount or stop a moving machine.

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.







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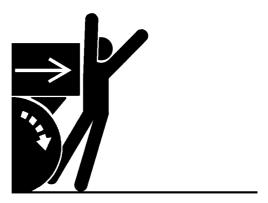
AVOID INJURY FROM BACK-OVER AND SWING ACCIDENTS

 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.

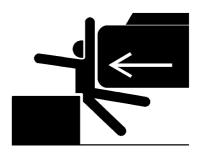
To avoid back-over and swing accidents:

- 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



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 ANY-ONE

• 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.

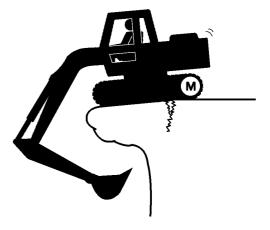


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SA-487

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

AVOID TIPPING

DO NOT ATTEMPT TO JUMP CLEAR OF TIPPING MACHINE---SERIOUS OR FATAL CRUSHING INJURIES WILL RESULT

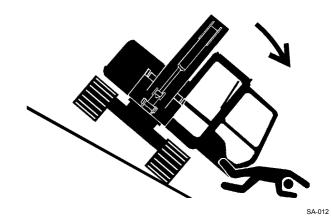
MACHINE WILL TIP OVER FASTER THAN YOU CAN JUMP FREE

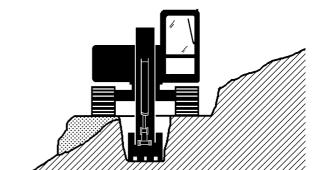
FASTEN YOUR SEAT BELT

 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.





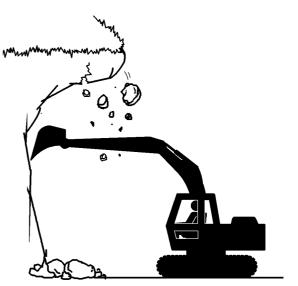
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025-E03B-0463

NEVER UNDERCUT A HIGH BANK

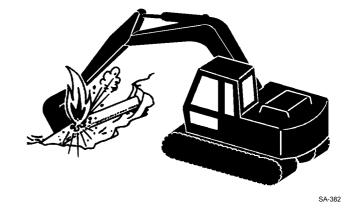
 The edges could collapse or a land slide could occur causing serious injury or death.

026-E01A-0519



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.



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





C A 20

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.

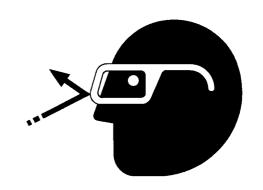
032-E01A-0132



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-F01A-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

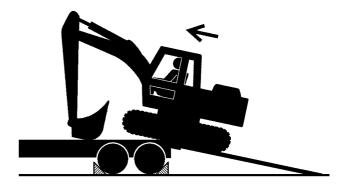


TRANSPORT SAFELY

- 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.





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



- 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.



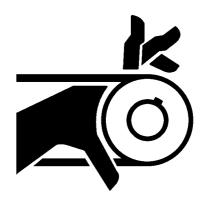
SA-527

519-E01A-0527

STAY CLEAR OF MOVING PARTS

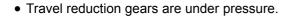
- Entanglement in moving parts can cause serious injury.
 - To prevent accidents, care should be taken to ensure that hands, feet, clothing, jewelry and hair do not become entangled when working around rotating parts.

502-E01A-0026



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.



- 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.



SA-344

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



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.

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

SA-039

505-E01B-0498

REPLACE RUBBER HOSES PERIODI-CALLY

- 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

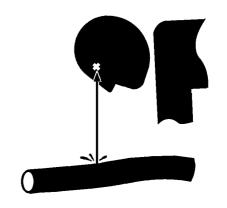
AVOID HIGH-PRESSURE FLUIDS

- 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



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.

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.

SA-818

523-E01A-0818

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

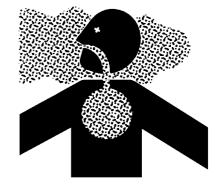
AVOID APPLYING HEAT TO LINES CONTAINING FLAMMABLE FLUIDS

- 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.
 - 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

SAFETY

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

SAFETY

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.

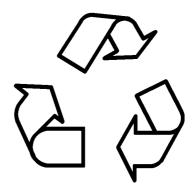


SA-309

515-E01A-0309

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



S517-E01A-0435

SA-435

	SAFETY	
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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.

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OPERATIONAL PERFORMANCE TEST / Introduction

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.
- 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.
- 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.

OPERATIONAL PERFORMANCE TEST / Introduction

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

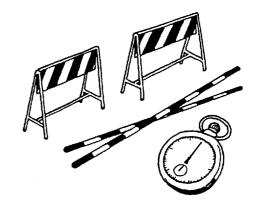
- 1. Select a hard and flat surface.
- 2. Secure enough space to allow the machine to run straight more than 20 m (65 ft 7 in), and to make a full swing with the front attachment extended.
- 3. If required, rope off the test area and provide signboards to keep unauthorized personnel away.

PRECAUTIONS

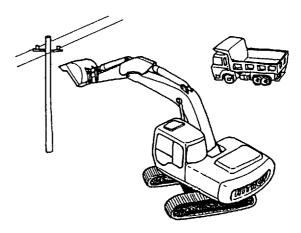
- Before starting to test, agree upon the signals to be employed for communication among coworkers. Once the test is started, be sure to communicate with each other using these signals, and to follow them without fail.
- 2. Operate the machine carefully and always give first priority to safety.
- While 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.
- 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.

MAKE PRECISE MEASUREMENT

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



T105-06-01-003



ZX330-3 CLASS OPERATIONAL PERFORMANCE STANDARD TABLE

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

The following switch positions shall be selected and the hydraulic oil temperature shall be maintained as indicated below as the preconditions of performance tests unless otherwise instructed in each performance test procedure: Engine Control Dial: Fast Idle Power Mode Switch: P Mode Auto-Idle Switch: OFF Work Mode: Digging Mode

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

NOTE: 1 mm=0.03937 in

PERFORMANCE TEST DESIGNATION	ZX330-3 class (Performance Standard)	Remarks	Reference Page
ENGINE SPEED min ⁻¹			T4-3-1
Slow Idle Speed	800±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (wirh ECO deactivated)	1800±50	↑	
Fast Idle Speed (Heater control: OFF)	1700±50	Lever in neutral, Pilot shut-off lever: UNLOCK position, Value indicated on Dr. ZX	
Fast Idle Speed (Heater control: ON)	1900±50	Pilot shut-off lever: LOCK position, Coolant temperature: 5 °C or lower, Value indicated on Dr. ZX	
Fast Idle Speed (Relief operation)	1750±50	Boom raise relief operation, Value indicated on Dr. ZX	
Fast Idle Speed (E mode)	1600±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (HP mode)	1900±50	Relief operation of boom rasie and arm roll-in, Value indicated on Dr. ZX.	
Auto-Idle Speed	1200±50	Value indicated on Dr. ZX.	
Warming-Up Speed	1400±100	<u> </u>	
ENGINE COMPRESSION PRESSURE	3.04±0.2	Engine speed: 200min ⁻¹	T4-3-3
MPa (kgf/cm ² , psi)	(31±2, 442±29)		
VALVE CLEARANCE (IN, EX)	0.4	With the engine cold	T4-3-4
(Rated output) mL/h	30 or less	Hour meter: 2000 hours or less	T4-3-10

NOTE: 1 mm=0.03937 in

		Ø NOIE: 1 m	1m=0.03937 In
PERFORMANCE TEST DESIGNATION	ZX330-3 class (Performance Standard)	Remarks	Reference Page
TRAVEL SPEED sec/10 m			T4-4-1
Fast Speed	6.6±0.6		
Slow Speed	(11.3±1.0)		
TRACK REVOLUTION SPEED sec/3 rev	,		T4-4-2
Fast Speed	32.6±2.0	LC: 34.8±2.0	
Slow Speed	32.6±2.0	LC: 34.8±2.0	
MISTRACK mm/20 m (With fast and slow travel speed modes)	200 or less		T4-4-3
TRAVEL MOTOR LEAKAGE mm/5 min	0		T4-4-4
SWING SPEED sec/3 rev	17.3±1.0	Bucket: empty	T4-4-5
SWING FUNCTION DRIFT CHECK mm /180°	1565 or less	Bucket: empty	T4-4-6
SWING MOTOR LEAKAGE mm/5 min	0	Bucket: loaded	T4-4-8
MAXIMUM SWINGABLE SLANT ANGLE deg.	22.5° or more	Bucket: loaded	T4-4-10
SWING BEARING PLAY mm	0.2 to 1.25	Allowable limit: 2.0 to 3.05	T4-4-11
HYDRAULIC CYLINDER CYCLE TIME (Mono Boom)		3.20 m arm 1.4 m³ (PCSA heaped) bucket, bucket: empty	T4-4-12
Boom Raise	3.3±0.3	. ,	
Boom Lower	2.2±0.3		
Arm Roll-In	3.5±0.3		
Arm Roll-Out	3.7±0.3		
Bucket Roll-In	3.6±0.3		
Bucket Roll-Out	2.4±0.3		
HYDRAULIC CYLINDER CYCLE TIME (2-Piece Boom)		3.20 m arm 1.4 m³ (PCSA heaped) bucket,	T4-4-12
Doom Doing		bucket: empty	
Boom Raise Boom Lower	4.5±0.3 3.0±0.3		
Arm Roll-In	3.0±0.3 3.9±0.3		
Arm Roll-Out	3.9±0.3 3.0±0.3		
Bucket Roll-In	3.0±0.3 3.6±0.3		
Bucket Roll-Out	3.0±0.3 2.4±0.3		
Positioning Lower	7.3±0.3		
Positioning Raise	4.5±0.3		
	1 3 2 0 . 0	1	L

PERFORMANCE TEST DESIGNATIO	N	ZX330-3 class (Performance Standard)	Remarks	Reference Page
DIG FUNCTION DRIFT CHECK			3.20 m arm	T4-4-14
(Mono Boom) mm/5	min		1.4 m ³ (PCSA heaped) bucket	
Boom Cylinder				
(Maximum Reach Position)		20 or less	Bucket: loaded	
(Arm Roll-In position)		5 or less	Bucket: empty	
Arm Cylinder				
(Maximum Reach Position)		30 or less	Bucket: loaded	
(Arm Roll-In position)		15 or less	Bucket: empty	
Bucket Cylinder				
(Maximum Reach Position)		20 or less	Bucket: loaded	
(Arm Roll-In position)		10 or less	Bucket: empty	
Bucket Bottom				
(Maximum Reach Position)		150 or less	Bucket: loaded	
(Arm Roll-In position)		110 or less	Bucket: empty	
DIG FUNCTION DRIFT CHECK			3.20 m arm	T4-4-14
(2-Piece Boom) mm/5	min		1.4 m ³ (PCSA heaped) bucket	
Boom Cylinder				
(Maximum Reach Position)		20 or less	Bucket: loaded	
(Arm Roll-In position)		5 or less	Bucket: empty	
Arm Cylinder				
(Maximum Reach Position)		30 or less	Bucket: loaded	
(Arm Roll-In position)		15 or less	Bucket: empty	
Bucket Cylinder				
(Maximum Reach Position)		20 or less	Bucket: loaded	
(Arm Roll-In position)		10 or less	Bucket: empty	
Positioning Cylinder				
(Maximum Reach Position)		40 or less	Bucket: loaded	
(Arm Roll-In position)		30 or less	Bucket: empty	
Bucket Bottom				
(Maximum Reach Position)		200 or less	Bucket: loaded	
(Arm Roll-In position)		150 or less	Bucket: empty	

NOTE: 1 mm=0.03937 in

Ø NOTE: 1 mm=0			m=0.03937 in
PERFORMANCE TEST DESIGNATION	ZX330-3 class (Performance Standard)	Remarks	Reference Page
CONTROL LEVER OPERATING FORCE N (kgf, lbf)		HITACHI lever pattern	T4-4-16
Boom Lever	16 (1.6, 3.6) or less		
Arm Lever (ISO Lever Pattern: Swing Lever)	13 (1.3, 2.9) or less		
Bucket Lever	13 (1.3, 2.9) or less		
Swing Lever (ISO Lever Pattern: Arm Lever) Travel Lever	16 (1.6, 3.6) or less 28 (2.8, 6.3) or less		
CONTROL LEVER STROKE mm		HITACHI lever pattern	T4-4-17
Boom Lever	97±10	рамон	
Arm Lever (ISO Lever Pattern: Swing Lever)	82±10		
Bucket Lever	82±10		
Swing Lever (ISO Lever Pattern: Arm Lever)	97±10		
Travel Lever	120±10		
BOOM RAISE/SWING sec		3.20 m arm 1.4 m³ (PCSA heaped) bucket, bucket: empty	T4-4-18
Mono Boom	4.0±0.4		
2-Piece Boom	3.9±0.4		
Bucket Teeth Height: H (Mono Boom) mm (2-Piece Boom)	7200 or more 6000 or more		
BOOM RAISE/ARM ROLL-IN/SWING sec	(5.5±0.5)	3.20 m arm 1.4 m³ (PCSA heaped) bucket	T4-4-19
HYDRAULIC SYSTEM			
PRIMARY PILOT PRESSURE MPa (kgf/cm², psi)			T4-5-1
Engine: Fast Idle	$\begin{array}{c} 4.0^{+1.0}_{-0.5} \\ (40^{+10}_{-5}, 580^{+142}_{-71}) \end{array}$	Value indicated on Dr. ZX	
Engine: Slow Idle	3.8 ^{+1.0} ₋₀ (39 ⁺¹⁰ ₋₀ , 550 ⁺¹⁴² ₋₀)	Value indicated on Dr. ZX	
SECONDARY PILOT PRESSURE MPa (kgf/cm², psi)			T4-5-3
(Engine: Fast Idle (noraml) and Slow Idle)	3.4 to 4.0 (34 to 40, 483 to 570)	Value indicated on Dr. ZX (Lever: Full stroke)	
SOLENOID VALVE SET PRESSURE MPa (kgf/cm², psi)	Value Indicated On Dr. ZX±0.2 (2, 28)		T4-5-4
MAIN PUMP DELIVERY PRESSURE MPa (kgf/cm², psi)	0.8 ^{+1.2} _{-0.5} (8 ⁺¹² ₋₅ , 115 ⁺¹⁷⁵ ₋₇₁)	In neutral, Value indicated on Dr. ZX	T4-5-6

NOTE: 1 mm=0.03937 in

		Ø NOTE: 1 m	m=0.03937 in
PERFORMANCE TEST DESIGNATION	ZX330-3 class (Performance Standard)	Remarks	Reference Page
MAIN RELIEF VALVE PRESSURE			T4-5-8
MPa (kgf/cm ² , psi)			
Boom, Arm, Bucket (Relief operation for	34.3 ^{+2.0} _{-0.5}	Value indicated on Dr. ZX	
each)	(350 ⁺²⁰ -5,		
	4980 ⁺²⁸⁴ -71)		
Relief operation of Positioning	35.5 ^{+2.0} -0.5	Value indicated on Dr. ZX	
(2-piece boom only)	(362 ⁺²⁰ ₋₅ ,		
•	5160 ⁺²⁸⁴ ₋₇₁)		
Power Digging	36.3 ^{+2.0} _{-1.0}	Value indicated on Dr. ZX	
1 Ower Digging	30.3 _{-1.0}	value indicated on Bi. 27	
	(370 ⁺²⁰ ₋₁₀ ,		
2	5260 ⁺²⁸⁴ ₋₁₄₂)		T. T. 10
RELIEF PRESSURE MPa (kgf/cm², psi)	33.3 ^{+2.3} -0.5	Value indicated on Dr. ZX	T4-5-10
(Relief operation for Swing)	(340 ⁺²³ -5,		
	4840 ⁺³³⁴ ₋₇₃)		
OVERLOAD RELIEF PRESSURE		(Reference values at 50	T4-5-12
MPa (kgf/cm ² , psi)		L/min)	
Boom Lower, Arm Roll-In, Bucket Roll-In	37.3 ^{+1.0} ₋₀		
	(380 ⁺¹⁰ ₋₀ ,		
	5400 ⁺¹⁴² ₋₀)		
Boom Raise, Arm Roll-Out, Bucket	39.2 ^{+1.0} ₋₀		
Roll-Out	(400 ⁺¹⁰ ₋₀ ,		
	5690 ⁺¹⁴² -0)		
MAIN PUMP FLOW RATE (L/min)	-	Refer to pages T4-2-10, 11.	T4-5-14
SWING MOTOR DRAINAGE (L/min)			T4-5-20
With constant speed	0.2 to 0.3		
With the motor relieved	(2 to 5)		
TRAVEL MOTOR DRAINAGE (L/min)			T4-5-22
With the track jacked up	Less than 10	Allowable limit: 10	
With the motor relieved	Less than 15	Allowable limit: 15	

MAIN PUMP P-Q DIAGRAM

P-Q Control (Torque Control)

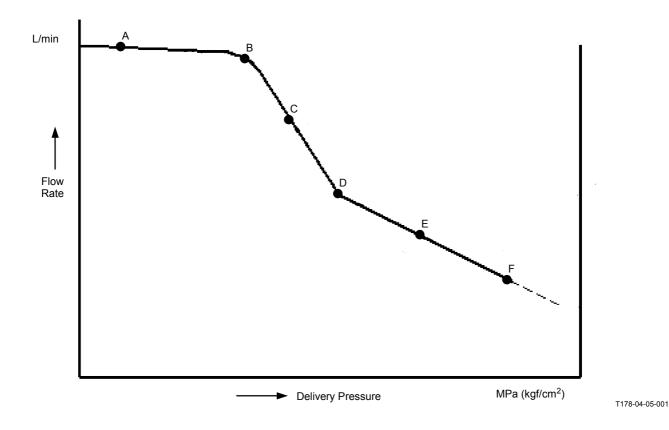
(REFERENCE: Measured at Test Stand)

• Rated Pump Speed: 1900 min⁻¹ (rpm) Hydraulic Oil Temperature: 50±5 °C (122±41 °F)

NOTE: Refer to T4-5-14.

* POII	its on P-Q Line	
	Delivery Pressure	Flow Rate
	MPa (kgf/cm ² , psi)	L/min (gpm)
Α	4.9 (50, 710)	288±3 (76±0.8)
В	18.6 (190, 2700)	[285] ([75])
С	20.6 (210, 2995)	260±6 (69±1.6)
D	23.5 (240, 3420)	[220] ([58])
Е	29.4 (300, 4275)	180±6 (47±1.6)
F	34.3 (350, 4980)	150±6 (40±1.6)

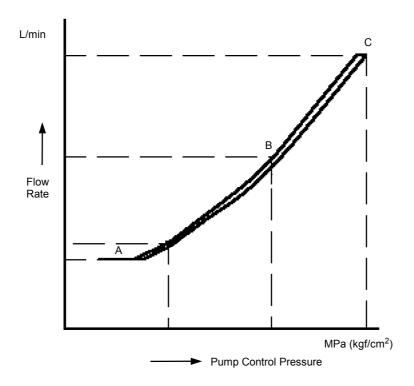
The value indicated in parentheses is only a reference value.



- P-Q Control by Pump Control Pilot Pressure Signal
- * (REFERENCE: Measured at Test Stand)
 - Rated Pump Speed: 1900 min⁻¹ (rpm) Hydraulic Oil Temperature: 50±5 °C (122±41 °F)

NOTE: Refer to T4-5-16.

• P	Points on P-Q Line					
	Pump Control Pressure	Flow Rate				
	Pump Control Pressure MPa (kgf/cm², psi)	L/min (gpm)				
Α	1.67±0.05	02+2 (25+0.9)				
	(17±0.5, 242±7)	93±3 (25±0.8)				
В	1.96 (20, 284)	[140] ([37])				
С	$2.94^{+0.05}_{00000000000000000000000000000000000$	288±3 (76±0.8)				



T178-04-05-002

SENSOR ACTIVATING RANGE

1. Checking Method

• Hydraulic Oil Temperature: 50 ± 5 °C (122±41 °F)

• Unless specified:

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

· Monitor each sensor by using Dr. ZX.

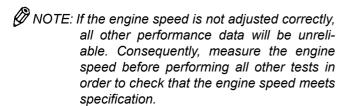
2. Sensor Activating Range

Sensor	Operation	Specification
Engine Control Dial	Fast Idle	0.3 to 1.0 V
Engine Control Diai	Slow Idle	4.0 to 4.7 V
	Control Lever: Neutral	0 to 0.1 MPa
Pressure Sensor	Pilot Shut-Off Lever: LOCK	(0 to 1.0 kgf/cm ² , 0 to 14.5 psi)
riessule Selisoi	Control Lever: Full Stroke	3.3 to 3.9 MPa
	Pilot Shut-Off Lever: UNLOCK	(34 to 40 kgf/cm ² , 480 to 570 psi)
Pump Control	Control Lever: Neutral	0 to 1 MPa
Pressure Sensor		(0 to 10 kgf/cm ² , 0 to 145 psi)
	Control Lever: Full Stroke	2.9 to 3.9 MPa
		(30 to 40 kgf/cm ² , 420 to 570 psi)

ENGINE SPEED

Summary

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



Preparation:

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

Measurement:

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

Evaluation:

Refer to Operational Performance Standard in Group T4-2.

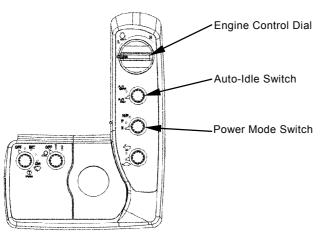
Remedy:

Refer to Troubleshooting B in Group T5-4.

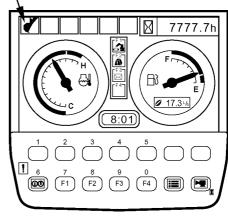
NOTE: ECO stands for the auto engine speed reduction system by 100 min⁻¹.

	Engine	Power		100	
Item	Control Dial	Mode Switch	Auto-Idle Switch	Work Mode	Test Conditions
Slow Idle	Min. Speed	Р	OFF	Digging Mode	
Fast Idle (With ECO deac- tivated)	Max. Speed	Р	OFF	Digging Mode	Check in the Dr. ZX special functions with ECO deactivated. Measure engine speed with the lever in neutral.
Fast Idle (Heater control: OFF)	Max. Speed	Р	OFF	Digging Mode	Move the pilot shut-off lever to the UNLOCK position. Meas- ure engine speed with the lever in neutral.
Fast Idle (Heater control: ON)	Max. Speed	Р	OFF	Digging Mode	Move the pilot shut-off lever to the LOCK position. Engine speed can be measured only when coolant temperature is 5 °C (41 °F) or lower.
Fast Idle (Relief operation)	Max. Speed	Р	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	Р	ON	Digging Mode	Check engine speed 4 seconds after returning all control levers to neutral.
Warming Up	Min. Speed	Р	OFF	Digging Mode	Engine speed can be measured only when oil temperature is 0 °C (32 °F) or lower.

Switch Panel:



Monitor Unit: Digging Mode



T1V1-05-01-007

T1V1-04-03-001

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.

20 N·m (2.0 kgf·m, 14.8 lbf·ft)

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

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

Measurement:

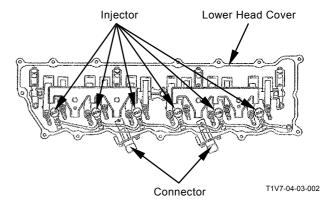
- 1. Turn the starter and measure compression pressure of each cylinder.
- 2. Repeat the measurement three times and calculate the mean values.

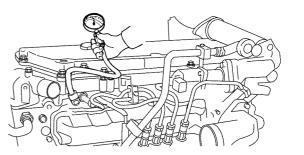
Evaluation:

Refer to Operational Performance Standard in Group T4-2

Remedy:

Refer to the engine shop manual.





T1V1-04-03-005

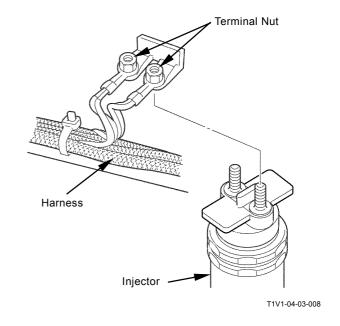
VALVE CLEARANCE

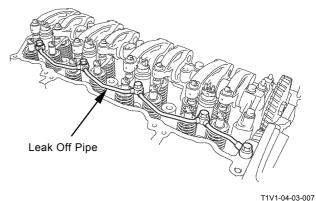
Summarv:

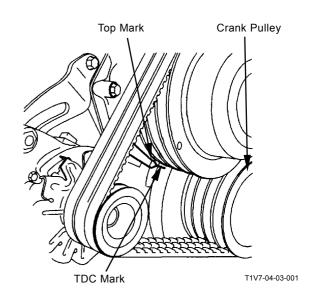
- 1. Perform the measurement when the engine is cold
- 2. Before starting any work, clean the head cover mounting area and avoid contamination in the engine.

Preparation:

- 1. Remove the head cover.
- 2. Remove the terminal nut which secures the harness to the injector.
 - : 2 N·m (0.2 kgf·m, 1.5 lbf·ft)
- 3. Remove the harness assembly from the injector.
- 4. Remove the leak off pipe.
 - : 12 N·m (1.2 kgf·m, 8.9 lbf·ft)
- Rotate the crank pulley. Align the top dead center (TDC) mark on crank pulley with the top mark located on timing gear case.
- NOTE: When rotating the crank pulley, remove the fan guard. Then, rotate the fan while holding the fan belt. If it is difficult to rotate, remove all glow plugs and release compression pressure.
 - 6. Check if piston No.1 (or piston No.4) is now positioned at the TDC in the compression stroke.
- NOTE: Move push rods for the intake and exhaust valves on the No.1 cylinder up and down by hand. If any clearances on the both ends of the push rods are found, piston No.1 is positioned at TDC in the compression stroke. (If the exhaust valve of cylinder No.1 is pushed down, piston No.4 is positioned at TDC in the compression stroke.
 - 7. Start measurement from the cylinder (No.1 or No.6) positioned at TDC in the compression stroke.

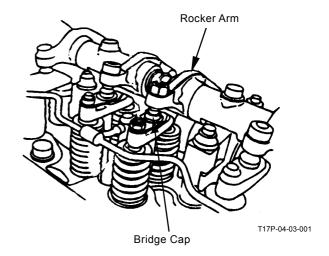






Measurement:

- 1. Insert a thickness gauge into the clearance between rocker arm and bridge cap end and measure the valve clearance.
- NOTE: The cylinders are aligned from No.1 to No.6 in that order, as viewed from the fan side. Injection Order: 1-5-3-6-2-4
 - When measurement is started from No.1 cylinder, perform the same measurement to all valves indicated with the mark "O" in the table below. (When measurement is started from No.6 cylinder, perform the measurement in the valves shown with mark "x".)



Cylinder No.	No	5.1	No	0.2	No	0.3	No	0.4	No	5.5	No	0.6
Valve locations	ı	Е	I	Е	I	Е	I	Е	I	Е	I	Ε
When the measurement is started from No.1 cylinder	0	0	0			0	0			0		
When the measurement is started from No.6 cylinder				×	×			×	×		×	×

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

Evaluation:

Refer to Operational Performance Standard in Group T4-2.

Adjustment:

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

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

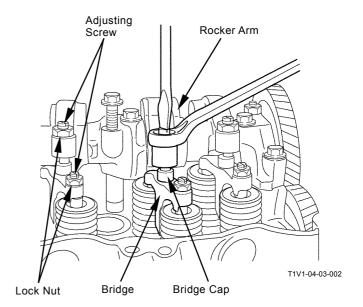
- 1. Loosen the lock nuts (12 used) and adjusting screws (12 used), which secure the bridge and rocker arm.
- 2. Insert a thickness gauge into the clearance between rocker arm and bridge cap.
- 3. Tighten the adjusting screw of rocker arm until condition for the thickness gauge is proper.
- 4. Tighten the lock nut of rocker arm.

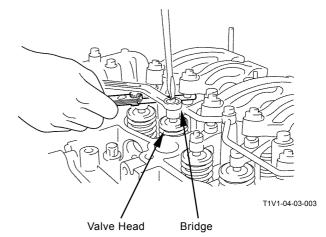
: 22 N·m (2.2 kgf·m, 16.2 lbf·ft)

- 5. Tighten the adjusting screw of bridge until the bridge comes in contact with the valve head.
- 6. Tighten the lock nut of bridge.

: 22 N·m (2.2 kgf·m, 16.2 lbf·ft)

7. Check the valve clearance after the lock nuts are tightened.





LUBRICANT CONSUMPTION

Measuring Method

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

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

- 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.

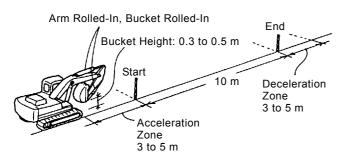
TRAVEL SPEED

Summary:

Measure the time required for the excavator to travel a 20 m (65.6 ft) test track and check the performance of travel device systems (from main pump to travel motor).

Preparation:

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



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Measurement:

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

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

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

Evaluation:

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

Remedy:

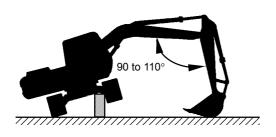
TRACK REVOLUTION SPEED

Summary:

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

Preparation:

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



M104-07-067



CAUTION: Securely support raised machine by using the blocks.

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

Measurement:

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

Travel	Engine	Power	Auto-Idle	Work
Mode	Control	Mode	Switch	Mode
Switch	Dial	Switch	SWILCIT	
Slow	Fast Idle	P Mode	OFF	Digging
Mode	rast luie	r woue	OFF	Mode
Fast Mode	Fast Idle	P Mode	OFF	Digging Mode

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

Evaluation:

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

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

Remedy:

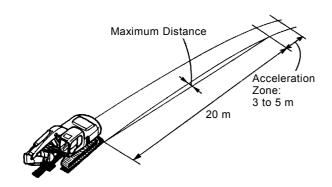
MISTRACK CHECK

Summary:

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

Preparation:

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



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

Measurement:

 Measure both slow and fast travel speeds of the machine.

2. Select the following switch positions:

			J		
	Travel	Engine	Power	Auto-Idle	Work
	Mode	Control	Mode	Switch	Mode
	Switch	Dial	Switch	SWILCH	
_	Slow	Fast Idle	P Mode	OFF	Digging
	Mode	rast luie	r woue	OFF	Mode
	Fast	Foot Idlo	P Mode	OFF	Digging
	Mode	Fast Idle	r wode	OFF	Mode

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

Evaluation:

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

Remedy:

TRAVEL PARKING LEAKAGE

Summary:

Measure the parking brake function on a specified slope.

Preparation:

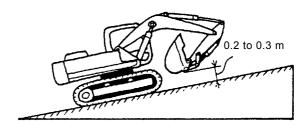
- 1. The surface of test slope shall be even with a gradient of 20 % (11.31°).
- 2. With the arm and bucket fully extended, hold the bucket 0.2 to 0.3 m (8 to 12 in) above the ground.
- 3. Maintain the hydraulic oil temperature at 50 ± 5 °C (122 ±41 °F).

Measurement:

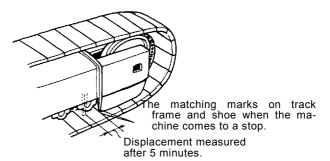
- 1. Measure the travel parking brake slip amount while parked.
- 2. Climb the slope and place the travel levers in neutral.
- 3. Stop the engine.
- 4. After the machine stops, put the matching marks on a track link or shoe, and the track side frame.
- 5. After 5 minutes, measure the distance between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

Evaluation:

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



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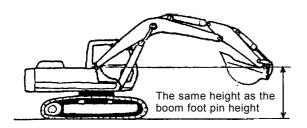
SWING SPEED

Summary:

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

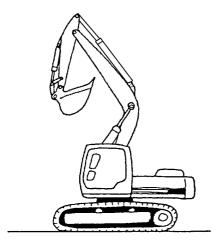
Preparation:

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



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



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



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

Measurement:

1. Select the following switch positions:

Engine Con-	Power Mode	Auto-Idle	Work Mode
trol Dial	Switch	Switch	WOIK MOde
Fast Idle	P Mode	OFF	Digging Mode

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

Evaluation:

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

Remedy:

SWING FUNCTION DRIFT CHECK

Summary:

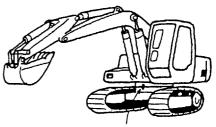
- Measure the swing drift on swing bearing outer circumference when stopping after a 180° full-speed swing and check the performance of swing brake valve.
- 2. The mechanical brake for seing parking brake is equipped for the swing motor.

Preparation:

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

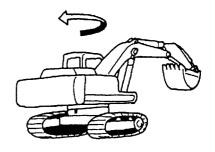


CAUTION: Prevent personal injury. Always make sure that the area is clear and that co-workers are out of the swing area before starting the measurement.



Put the matching marks on swing bearing outer circumference and track frame.

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Before start the measurement, swing the upperstructure 180°

Measurement:

1. Select the following switch positions:

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

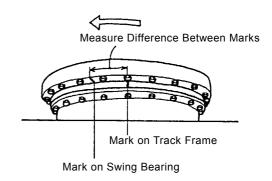
- Operate the swing control lever fully and return it to the neutral position when the mark on upperstructure aligns with that on track frame after swinging 180°.
- 3. Measure the distance between the two marks.
- 4. Align the marks again and swing 180°. Then test in the opposite direction.
- 5. Repeat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



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

Remedy:

Refer to the Troubleshooting B in Group T5-4.



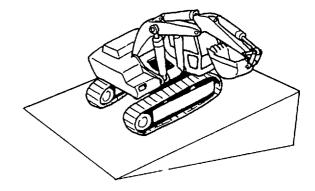
SWING MOTOR LEAKAGE

Summary:

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

Preparation:

- 1. Check lubrication of the swing gear and swing bearing.
- Load bucket fully. In lieu of loading the bucket, weight (W) of the following specification can be used.
 - Weight=2100 kg (4630 lb)
- 3. With the arm fully retracted and the bucket fully extended, position the arm top pin height to be level with the boom foot pin.
- 4. Park the machine on a smooth slope with a gradient of 26.8 % (15°).
- 5. Climb a slope and swing the upperstructure to position it 90° to the slope. Put the matching marks on the outer circumference of swing bearing (upperstructure side) and track frame by using the tape.
- 6. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).



Measurement:

1. Select the following switch position:

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

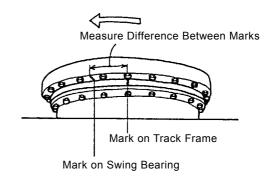
- 2. Maintain the engine at slow idle. After five minutes, measure difference between the marks along bearing outer circumference and track frame.
- 3. Perform the measurement in both right and left swing directions.
- 4. Repeat the measurement three times in each direction and calculate the average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



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

Remedy:

Refer to the Troubleshooting B in Group T5-4.



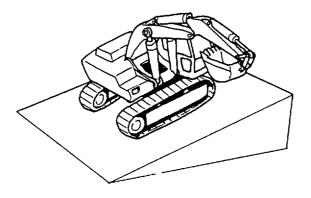
MAXIMUM SWINGABLE SLANT ANGLE

Summary:

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

Preparation:

- 1. Check lubrication of the swing gear and bearing.
- Load the bucket fully. In lieu of loading the bucket, weight (W) of the following specification can be used.
 - Weight=2100 kg (4630 lb)
- 3. With the arm fully retracted and the bucket fully extended, hold the arm top pin to the position flush with the boom foot pin height.
- 4. Climb a slope and swing the upperstructure 90° to the slope.
- 5. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).



T105-06-03-011

Measurement:

1. Select the following switch positions:

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

- 2. Operate the swing lever to full stroke and swing the upperstructure to the uphill side.
- 3. If the machine can swing, measure the cab floor slant angle.
- 4. Increase the slope angle and repeat steps 2. and3. Check both clockwise and counterclockwise.
- 5. Repeat the measurement three times.

Evaluation:

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

Remedy:

	OPERATIONAL PERFORMANCE TEST / Excavator Test
(Blank)	

SWING BEARING PLAY

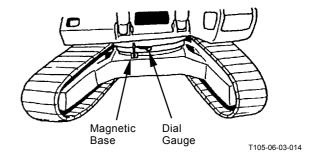
Summary:

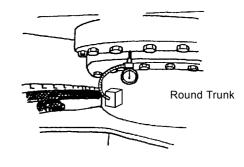
Measure the swing bearing play using a dial gauge and check the wear of bearing races and balls.

Preparation:

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

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





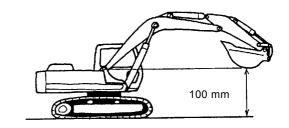
Measurement:

- 1. With the arm fully retracted and the bucket fully extended, hold the bucket 100 mm above the ground. Record dial gauge reading (h₁).
- 2. Lower the bucket to the ground and raise the front idler 0.5 m (20 in) by using the front attachment. Record dial gauge reading (h₂).
- 3. Calculate bearing play (H) from this data (h_1 and h_2) as follows: $H=h_2-h_1$

Evaluation:

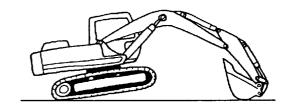
Refer to the Operational Performance Standard in Group T4-2.

Measurement: (h1)



T105-06-03-007

Measurement: (h2)



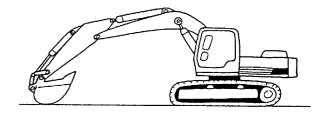
HYDRAULIC CYLINDER CYCLE TIME

Summary:

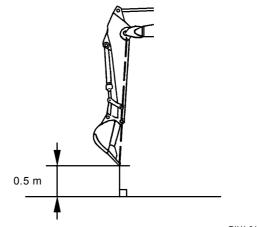
1. Measure the cycle time of boom, arm and bucket cylinders and check the performance of front attachment systems (from main pump to each cyliner).

Preparation:

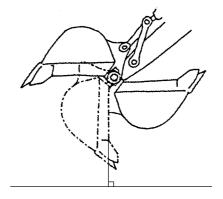
- 1. Mmeasure at the position as follows.
- Measurement of the cycle time of boom cylinders:
 With the arm fully retracted and the bucket fully extended, lower the bucket to the ground.
- Measurement of the cycle time of arm cylinder: Retract the bucket cylinder so that the arm and bucket teeth are vertical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



T105-06-03-018



T1V1-04-05-005



T105-06-03-018

Measurement:

1. Select the following switch positions:

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

- Measure the cylinder cycle times as follows: (Cylinder full stroke includes cylinder cushioning zone.)
 - · Boom cylinder:

Operate the boom control lever to full stroke. Measure the time to raise and lower the boom.

- Arm cylinder:
 - Operate the arm control lever to full stroke. Measure the time to roll in and roll out the arm.
- · Bucket cylinder:
 - Operate the bucket control lever to full stroke. Measure the time to roll in and roll out the bucket.
- 3. Repeat each measurement three times and calculate the average values.

Evaluation:

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

Remedy:

Refer to the Troubleshooting B in Group T5-4.

DIG FUNCTION DRIFT CHECK

• Maximum Reach Position

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.
- When testing the dig function drift just after cylinder replacement, slowly operate each cylinder for ten minutes to its stroke end and bleed air.

Preparation:

- Load the bucket fully. In lieu of loading the bucket, weight (W) of the following specification can be used.
 - Weight=2100 kg (4630 lb)
- 2. Position the arm cylinder with the rod 50 mm (2 in) extended from the fully retracted position.
- 3. With the arm fully retracted and the bucket fully extended, hold the bucket so that height of the bucket pin is the same as the boom foot pin.
- 4. Position the bucket cylinder with the rod 50 mm (2 in) retracted from the fully extended position.
- 5. Maintain the hydraulic oil temperature at 50 ± 5 °C (122 ±41 °F).

Measurement:

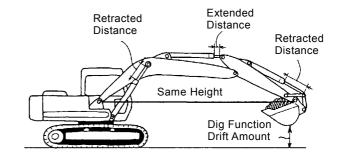
- 1. Stop the engine.
- Five minutes after the engine has been stopped, measure the change in position of bottom of the bucket, as well as the boom, arm and bucket cylinders.
- 3. Repeat the measurement three times and calculate the average values.

Evalution

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

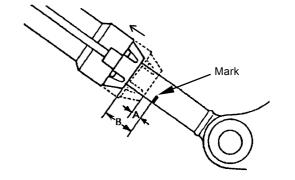
Remedy:

Refer to the Troubleshooting B in Group T5-4.



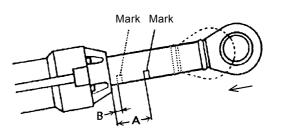
T105-06-03-021

Arm Cylinder Extension



T110-06-03-001

Boom and Bucket Cylinder Retraction



• Arm Roll-In Position

Summary:

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

Preparation:

- 1. The bucket must be empty.
- 2. With the arm fully extended and the bucket fully extended, lower the boom until the arm tip is 1 m (40 in) above the ground.
- 3. position the bucket cylinder with the rod 50 mm (2 in) retracted from the fully extended position.
- 4. Maintain the hydraulic oil temperature at 50 ± 5 °C (122 ±41 °F).

Measurement:

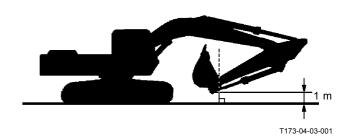
- 1. Stop the engine.
- 2. Five minutes after the engine has been stopped, measure the change in position of bottom of the arm tip, as well as the boom, arm and bucket cylinders.
- 3. Repeat the measuemrent three times and calculate the average values.

Evalution:

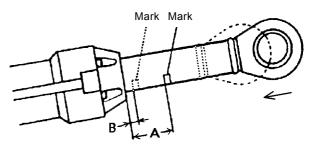
Refer to the Operational Performance Standard in Group T4-2.

Remedy:

Refer to the Troubleshooting B in Group T5-4.



Cylinder Retraction



CONTROL LEVER OPERATING FORCE

Summary:

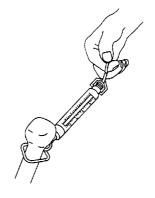
- 1. Measure a play and operating condition of each control lever.
- 2. Measure the maximum operating force of front attachment control lever.
- 3. Measure the operating force at the grip center of each control lever.

Preparation:

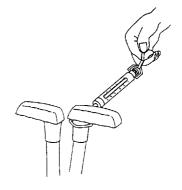
Maintain the hydraulic oil temperature at 50 \pm 5 °C (122 \pm 41 °F).



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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Measurement:

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

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

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

Evalution:

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

CONTROL LEVER STROKE

Summary:

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

Preparation:

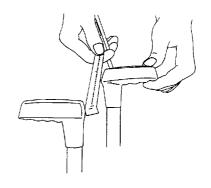
Maintain the hydraulic oil temperature at 50 ± 5 °C (122 ±41 °F).

Measurement:

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

Evalution:

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



	OPERATIONAL PERFORMANCE TEST / Excavator Test
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COMBINED OPERATION OF BOOM RAISE / SWING FUNCTION CHECK

Summary:

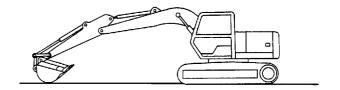
- 1. Check boom raise and swing movement and speeds while operating both functions simultaneously.
- 2. Make sure that the cylinders do not hesitate while operating the cylinder with the engine running at fast idle.

Preparation:

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



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



Measurement:

1. Select the following switch positions:

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

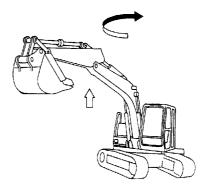
- 2. Raise the boom and roll the swing in full stroke at the same time.
- 3. When the upperstructure rotates 90°, release the control levers to stop both functions. Measure the time required to swing 90° and height (H) of the bucket teeth. (The bucket must be empty.)
- 4. Repeat the measurement three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

Evalution:

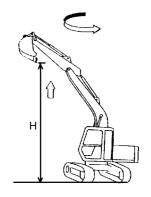
Refer to the Operational Performance Standard in Group T4-2.

Remedy:

Refer to the Troubleshooting B in Group T5-4.



T107-06-03-010



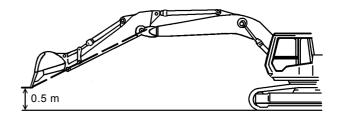
COMBINED OPERATION OF BOOM RAISE / ARM ROLL-IN FUNCTION CHECK

Summary:

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

Preparation:

- 1. With the arm fully retracted and the bucket fully extended, adjust the boom cylinder so that the bucket tooth tip height is 0.5 m (1 ft 8 in) above the ground. (The bucket must be empty.)
- 2. Maintain the hydraulic oil temperature at 50 \pm 5 $^{\circ}\text{C}$ (122±41 $^{\circ}\text{F}$).



T107-06-03-006

Measurement:

1. Select the switch positions as follows.

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

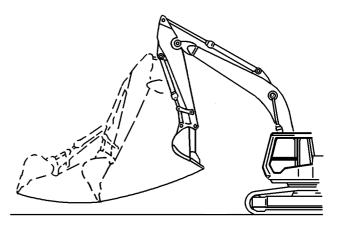
- 2. Raise the boom and roll the arm in full stroke at the same time.
- 3. Measure the time required for the arm to reach the stroke end.
- 4. Repeat the measurement three times and calculate the average value.

Evaluation:

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

Remedy:

Refer to Troubleshooting B in Group T5-4.



T107-06-03-008

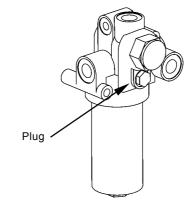
PRIMARY PILOT PRESSURE

Preparation:

- 1. Stop the engine.
- 2. Push the air bleed valve on top of the hydraulic oil tank and release any remaining pressure.
- 3. Remove the plug from the pilot filter. Install adapter (ST 6069) and pressure gauge (ST 6942) to the pressure check port.

→ : 14 mm

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



T178-03-07-001

Measurement:

1. Select the following switch positions:

3				
Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode	
Fast Idle	P Mode	OFF	Digging Mode	
Slow Idle	P Mode	OFF	Digging Mode	

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

Evaluation:

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

Primary Pilot Pressure Adjustment Procedure

Adjustment:

Adjust the relief valve set pressure if necessary.

1. Remove plug (1) from the relief valve.

5 : 22 mm

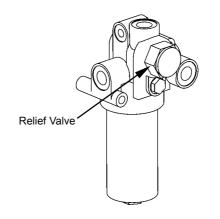
2. Install the estimated number of shims (2).

3. After adjustment, tighten plug (1). : 25⁺² N·m (2.5^{+0.2} kgf·m, 18.4^{+1.5} lbf·ft)

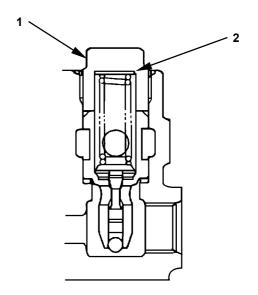
4. After adjustment, check the set pressure.

NOTE: Standard Change in Pressure (Reference)

Shim Thickness	Change in Relief Pressure		
(mm)	kPa (kgf/cm², psi)		
0.25	78	(0.8, 11.3)	
0.5	157	(1.6, 22.8)	
1.0	304	(3.1, 44.2)	



T178-03-07-001



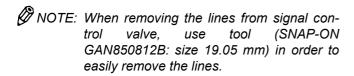
T111-06-04-004

SECONDARY PILOT PRESSURE

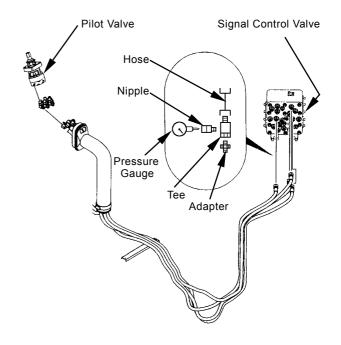
Preparation:

- 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



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



T1F3-04-05-008

Measurement:

1. Select the following switch positions:

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

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

Evaluation:

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

Remedy:

Refer to the Troubleshooting B in Group T5-4.

SOLENOID VALVE SET PRESSURE

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

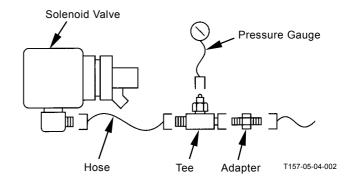
Preparation:

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

: 17 mm, 19 mm, 22 mm

Connect Dr. ZX and select the monitoring function

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



Measurement:

1. Select the following switch positions:

<u> </u>				
Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode	
Fast Idle	P Mode	OFF	Digging Mode	
Slow Idle	P Mode	OFF	Digging Mode	

2. Operate as instructed below for each measuring solenoid valve:

Solenoid Valve SG: Turn the power digging switch ON and OFF.

Solenoid Valve SI: Travel: Stop

Solenoid Valve SF: Relief combined operation of

boom raise and arm roll-in.

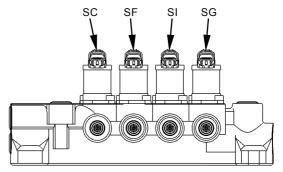
Solenoid Valve SC: Combined operation of swing

and arm roll-in.

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

Evaluation:

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



T1V1-03-07-007

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).

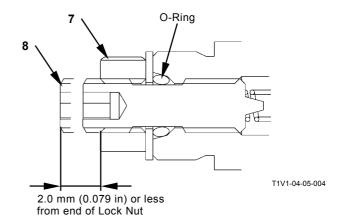
: 10 mm : 3 mm

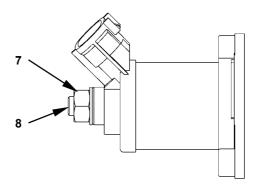
: 3 N·m (0.3 kgf·m, 2.2 lbf·ft)

3. After adjustment, check the set pressure.

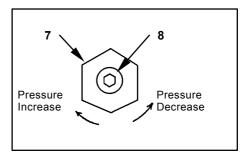
NOTE: Standard Change in Pressure (Reference)

y NOTE. Standard Change In Fressure (Neierence)					
Screw	Turns	1/4	1/2	3/4	1
Change in	kPa	69	137	206	275
Change in Pressure	(kgf/cm ²)	(0.7)	(1.4)	(2.1)	(2.8)
Pressure	(psi)	(10)	(20)	(30)	(40)





T1V1-04-05-003



W107-02-05-129

MAIN PUMP DELIVERY PRESSURE

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

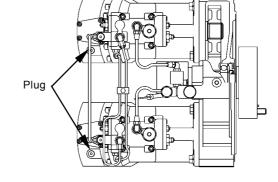
Preparation:

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

: 6 mm

Connect Dr. ZX and select the monitoring function.

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



T1V7-04-05-001

Measurement:

1. Select the following switch positions:

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

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

Evaluation:

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

Remedy:

Refer to the Troubleshooting B in Group T5-4.

MAIN RELIEF SET PRESSURE

Summary:

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

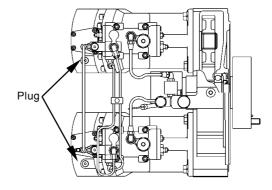
Preparation:

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

: 6 mm

Connect Dr. ZX and select the monitoring function.

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



T1V7-04-05-001

Measurement:

1. Select the following switch positions:

•	Power Mode		Work Mode
Control Dial	Switch	Switch	
Fast Idle	P Mode	OFF	Digging Mode

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

Evaluation:

Refer to the Performance Standard in Group T4-2.

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

If relief pressure of a particular function is lower, the probable cause is other than main relief valve.

Main Relief Pressure Adjustment Procedure

Adjustment:

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

High-Pressure Side of Main Relief Pressure Adjustment Procedure

1. Loosen lock nut (1). Lightly tighten plug (3) until plug (3) comes into contact with the end of piston (2). Tighten lock nut (1).

→ : 27 mm

: Plug (3): 19.5 N·m (2 kgf·m, 14.5 lbf·ft)

: Lock Nut (1): 68 to 78 N·m

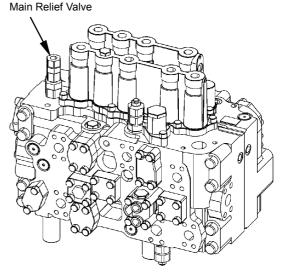
(7 to 8 kgf·m, 51 to 58 lbf·ft) or less

2. Loosen lock nut (4). Turn plug (5) and adjust pressure until until the specified value is obtained.

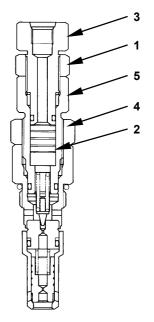
: 27 mm, 32 mm : Lock Nut (4):

78 to 88 N·m

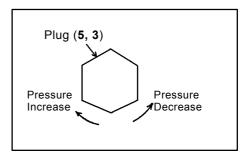
(8 to 9 kgf·m, 58 to 65 lbf·ft) or less



T1V7-04-05-002



T157-05-04-009



W107-02-05-127

Low-Pressure Side of Main Relief Pressure Adjustment Procedure

1. Loosen lock nut (1). Turn plug (3) counterclockwise until the specified value is obtained. Tighten lock nut (1).

: 27 mm : Lock Nut (1):

59 to 68 N·m

(6 to 7 kgf·m, 43 to 51 lbf·ft) or less

2. After adjustment, check the set pressures.

NOTE: Standard Change in Pressure (Reference)

Plug Turns	1/4	1/2	3/4	1
Change in Relief MPa	7.1	14.2	21.3	28.4
Pressure: Plug (5) (kgf/cm ²)	72.5	145	217.5	290
(High-Pressure Side) (psi)	1030	2060	3090	4120
Change in Relief MPa	5.3	10.7	16.0	21.3
Pressure: Plug (3) (kgf/cm²)	54	109	163	217
(Low-Pressure Side) (psi)	770	1550	2320	3090

RELIEF PRESSURE (WHEN RELIEVING SWING)

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

1. Loosen lock nut (2).

:24 mm, 32 mm

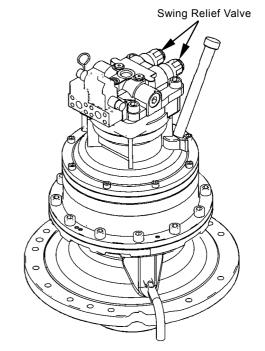
2. Turn adjusting screw (1) in order to adjust pressure.

3. Tighten lock nut (2).

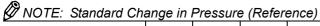
24 mm, 32 mm

: 177 N·m (18 kgf·m, 130 lbf·ft)

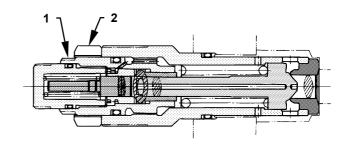
4. Check the set pressure.



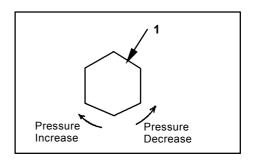
T1V1-03-02-003



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



T107-02-04-020

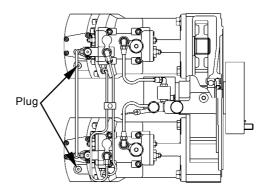


T157-05-04-023

OVERLOAD RELIEF VALVE SET PRES-SURE

Summary:

- 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:



T1V7-04-05-001

Preparation:

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

: 6 mm

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

Measurement:

1. Select the following switch positions:

3 1					
Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode		
Fast Idle	P 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 on the pressure gauge at this time.
- 4. Perform the measurement for the bucket, arm and boom in that order.
- 5. Repeat the measurement three times and calculate the average value for each.

Evaluation:

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

Refer to the Performance Standard in Group T4-2.

Overload Relief Valve Pressure Adjustment Procedure

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

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

1. Loosen lock nut (1).

: 17 mm

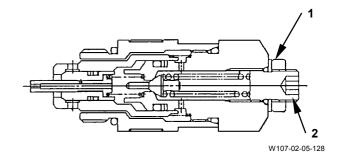
2. Turn adjusting screw (2) in order to adjust pres-

: 6 mm

3. Tighten lock nut (1).

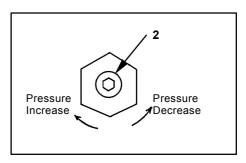
→ : 17 mm

4. Check the set pressure.



NOTE: Standard Change in Pressure (Reference)

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



W107-02-05-129

MAIN PUMP FLOW RATE MEASUREMENT

•P-Q Control (Torque Control)

Summary:

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

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

Preparation:

 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.

 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 hose (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. Install a pressure gauge to the main pump to be measured. (Refer to "Main Relief Set Pressure".)
 : 6 mm
- Disconnect pipe (14) from the regulator. Connect hose (ST 6339) (13) to the disconnected pipe (14) hole on regulator to be measured. Install plug (ST 6212) to the disconnected pipe (14) hole on regulator not to be measured.

: 17 mm

- Remove the vacuum pump. Loosen plug (12) on top of the pump casing. Bleed air from the casing until oil only comes out.
- Fully open the loading valve of the hydraulic tester.
- 9. Start the engine. Check the pressure gauge connection for any oil leaks. Install Dr. ZX and select the monitor function.

Measurement:

- Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).
- 2. Measure the maximum flow rate.

3. Select each switch position as follows:

Engine	Power Mode	Auto-Idle	Work Mode
Control Dial	Switch	Switch	
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 T4-2-6) Slowly restrict the loading valve of hydraulic tester while relieving pressure in the arm roll-in circuit. Measure the flow rates and engine speeds at each pressure point specified in the P-Q curve.
- 5. Repeat each measurement three times and calculate the average values.

Evaluation:

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

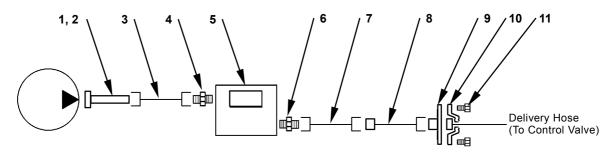
 $Qc = (Ns \times Q)/Ne$

Qc : Converted Flow Rate Q : Measured Flow Rate

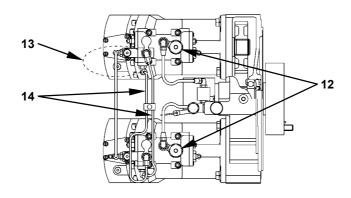
Ns: Specified Engine Speed: 1900 min⁻¹

Ne : Measured Engine Speed: Values indicated on Dr. ZX 2. Standard Flow Rate Refer to Operational Performance Standard in Group T4-2.

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



T173-04-04-002



T1V7-04-05-003

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 - Plug

14 - Pipe (2 Used)

13 - Hose (ST 6339)

Pilot Characteristics

Summary:

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

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

Preparation:

- 1. While referring to steps 1 to 4 on page T4-5-18, connect a hydraulic tester to the main pump to be measured.
- 2. Disconnect the hose from regulator port Pi of the pump to be measured. Connect plug (ST 6213) to the disconnected hose.

: 6 mm, 19 mm

 Install adapters (15) (3 used) to reducing valve (16). Remove plug M from the pilot filter. Install adapter (13) and hose (14) to the pilot filter. Connect hose (14) to regulator port P1 on reducing valve (16).

: 19 mm

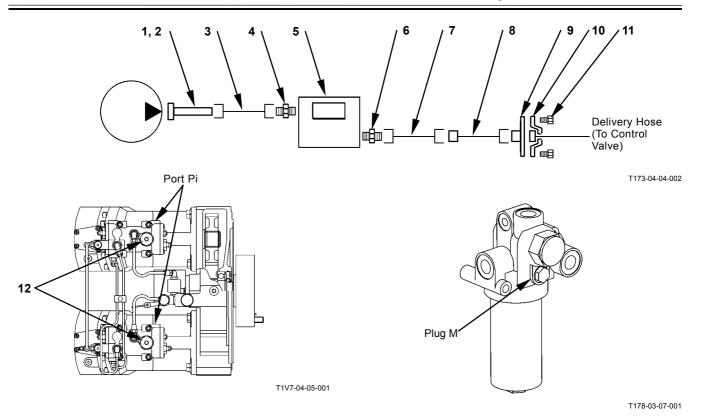
4. Install tee (17) to port P2 of reducing valve (16). Connect pressure gauge (18) and hose (14) to tee (17). Connect hose (14) to the regulator.

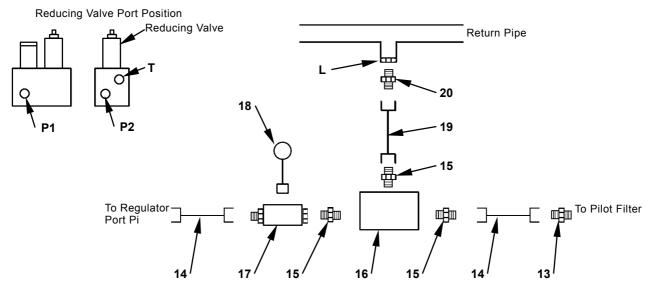
: 19 mm

5. Connect hose (19) and adapter (20) to port T of reducing valve (16). Remove plug L from the return pipe. Connect hose (19).

: 19 mm, 22 mm

- 6. Disconnect the vacuum pump. Loosen plug (12) from top of the pump casing. Bleed air from the pump casing until oil only comes out.
- 7. Fully open the loading valve of hydraulic tester.
- 8. Start the engine. Check the line connections for any oil leaks.





T178-04-04-004

- Pipe E (ST 6144)
- 7 Joint (ST6330)
- 12 Plug M

(ST 6069)

- 13 Adapter UNF7/16 × PF1/4

- Pipe B (ST 6143)
- Test Hose (ST 6320)

PF1/4 (ST 6451)

- 3 Test Hose (ST 6145)
- 9 Flange (ST 6118)

18 - Pressure Gauge (ST 6931)

Adapter PF1 × UNF1-7/8

- 14 Hose UNF7/16 × UNF7/16 (4334309)
- 19 Hose UNF7/16 × UNF7/16 (4334309)20 - Adapter PF3/8 × UNF7/16

17 - Tee UNF7/16 × UNF7/16×

- (ST 6146) Hydraulic Tester (ST 6299)
- 10 Split Flange (ST 6130)
- 15 Adapter PF3/8 × UNF7/16 (4200465)
- 11 Bolt (ST 6409) (4 used)
- 16 Reducing Valve (4325439)
- (4200465)

6 - Adapter PF1 × UNF1-7/8 (ST 6146)

Measurement:

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

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

- 4. Adjust the reducing valve set pressure to each pressure point specified along the main pump P-Q curve. (Pilot Characteristics) (Refer to T4-2-7.) Measure the flow rates and engine speeds at the pressure points specified in the P-Q curve.
- 5. Repeat each measurement three times and calculate the average values.

Evaluation:

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

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

Qc : Converted Flow Rate Q : Measured Flow Rate

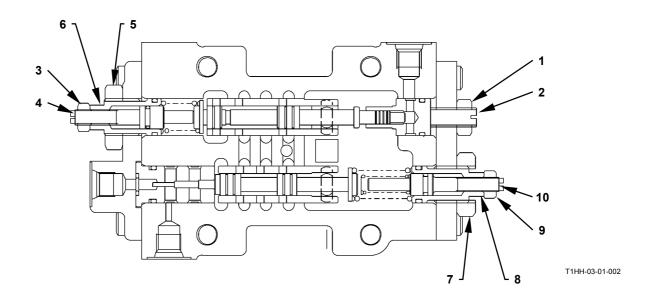
Ns: Specified Engine Speed: 1900 min⁻¹

Ne : Measured Engine Speed Values indicated on Dr. ZX

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.

Regulator Adjustment



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

		<u> </u>
Adjustment Item	Adjustment Procedure	Remarks
1. Minimum Flow Rate	Loosen lock nut (1) and turn adjusting screw (2). Rotating adjusting screw (2) 1/4 a turn clockwise increases the minimum pump flow rate by 9.10 cm³/rev. (0.6 in³/rev). : 17 mm : 19.6 N·m (2 kgf·m, 14.4 lbf·ft)	 Do not turn adjusting screw (2) more than two turns. Securely tighten lock nut (1) after adjustment.
2. Maximum Flow Rate	Loosen lock nut (3) and turn adjusting screw (4). Rotating adjusting screw (4) 1/4 a turn clockwise decreases the maximum pump flow rate by 11.1 cm³/rev. (0.7 in³/rev). 13 mm 19.8 N·m (1 kgf·m, 7.2 lbf·ft)	 Do not turn adjusting screw (4) more than two turns. Do not increase the maximum flow rate. In other words, do not turn adjusting screw (4) counterclockwise. Securely tighten lock nut (3) after adjustment.

Adjustment Item	Adjustment Procedure	Remarks
3. Pilot Pressure Characteristics	Loosen lock nut (5) and turn adjusting screw (6). Rotating adjusting screw (6) 1/4 a turn clockwise decreases the flow rate by 19.0 cm³/rev. (1.2 in³/rev). : 30 mm : 29.4 N·m (3 kgf·m, 21.7 lbf·ft)	1) Do not turn adjusting screw (6) more than one turn. 2) When adjusting screw (6) is turned clockwise, the maximum flow rate will also be decreased. In order to maintain the maximum flow rate unchanged, turn adjusting screw (4) counterclockwise twice as much as adjusting screw (6) is turned. This ratio of 2 (adjusting screw (4) counterclockwise turn) to 1 (adjusting screw (6) clockwise turn) is to counterbalance. 3) Securely tighten lock nut (5) after adjustment.
4. P-Q Control (Torque Adjustment) Q Pd Pd	A: Loosen lock nut (7) and turn adjusting screw (8). Rotating adjusting screw (8) 1/4 a turn clockwise increases the maximum pump flow rate by 22.0 cm³/rev. (1.3 in³/rev.). B: Loosen lock nut (9) and turn adjusting screw (10). Rotating adjusting screw (10) 1/4 a turn clockwise increases the maximum pump flow rate by 4.13 cm³/rev. (0.3 in³/rev).	1) Do not turn the adjusting screws more than one turn. 2) Rotate the adjusting screws watching the engine performance. 3) Securely tighten lock nut (7) or (9) after adjustment.

SWING MOTOR DRAINAGE

Summary:

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



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

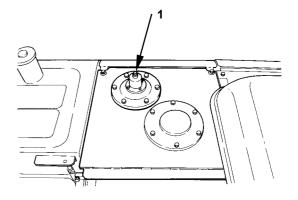
Also, take care not to fall off the machine while the measurement.

Preparation:

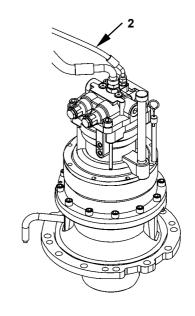
- Maintain hydraulic oil temperature at 50±5 °C (122±41 °F). Rotate the swing motor in order to warm inside of the motor.
- 2. Stop the engine. Push air bleed valve (1) on top of the hydraulic oil tank and release any remaining pressure.
- 3. Disconnect drain hose (2) of the swing motor at the hydraulic oil tank end. Install plug (ST 6213) to the disconnected end on the hydraulic oil tank.

→ : 22 mm

: 39 N·m (4 kgf·m, 29 lbf·ft)



T157-05-04-014



T178-04-04-005

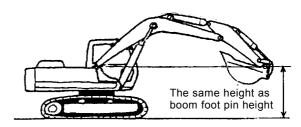
Preconditions for Measurement:

1. Select the following switch positions:

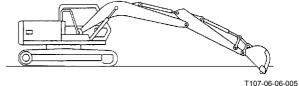
The control with the control of the				
Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode	
Oontroi Diai	OWITOIT	OWIGH		
Fast Idle	P Mode	OFF	Digging Mode	

Measurement:

- 1. Amount of Oil Drained While Swinging the Upperstructure
 - (1) Fully retract the arm cylinder. Fully extend the bucket cylinder. Hold the boom so that the arm tip pin height is the same as the boom foot pin height. The bucket must be empty.
 - (2) Start the engine. Operate and hold the swing lever full stroke. After the swing speed reaches a constant maximum speed, start draining oil measurement when drain oil starts coming out of the drain hose end.
 - (3) Repeat the measurement at least three times in both clockwise and counterclockwise directions, and calculate the average values.
 - (4) The measuring time should be more than 45 seconds.
- 2. Amount of Oil Drained While Relieving Swing Motor Circuit
 - (1) Thrust the bucket teeth into the ground so that the upperstructure does not rotate.
 - (2) Start the engine. Operate and hold the swing lever full stroke. Start draining oil measurement when drain oil starts coming out of the drain hose end.
 - (3) Repeat the measurement at least three times in both clockwise and counterclockwise directions, and calculate the average values.
 - (4) The measuring time should be more than 45 seconds.



T105-06-03-013



Evaluation:

Refer to the Performance Standard in Group T4-2.

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

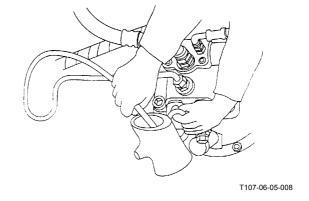
First measure amount of drain oil by using a calibrated container. Then, convert the measured drain oil into the per-minute value by using the formula below:

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

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:

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

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

Also, take care not to fall off the machine while the measurement.



- 1. Main hydraulic oil temperature at 50 ± 5 °C (122 ±41 °F). Rotate the travel motor and warm inside of the motor.
- 2. Stop the engine. Push air bleed valve (1) on top of the hydraulic oil tank and release any remaining pressure.
- 3. Disconnect drain hose (2) in the travel motor at the travel motor end. Install plug (ST 6637) to the disconnected end. Connect the drain hose (3/4-16UN) to the travel motor.

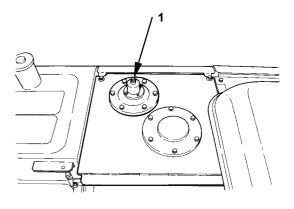
: 27 mm

: 78 N·m (8.0 kgf·m, 58 lbf·ft)

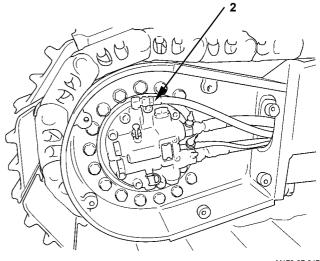


1. Select the following switch positions:

	<u> </u>					
Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode			
Fast Idle	P Mode	OFF	Digging Mode			



T157-05-04-014



Measurement:



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

- (1) Start the engine. Jack up the track to be measured.
- (2) Rotate the track to be measured. Start drain oil measurement when drain oil starts coming out of the drain hose end.
- (3) Repeat the measurement at least three times in both forward and reverse directions, and calculate the average values.
- (4) The measuring time should be more than 45 seconds.



Refer to the Performance Standard in Group T4-2.

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

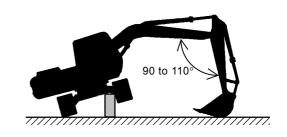
First measure amount of drain oil using a calibrated container. Then, convert the measured drain oil into the per-minute value using the formula below:

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

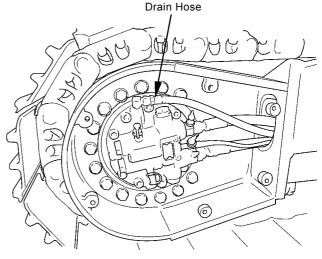
Where:

 ΔQ : Amount of drain oil per minute (L/min)

t : Measured time (seconds) q : Total amount of drain oil (L)



M104-07-067



M178-07-047

MEMO

MEMO

SECTION 5 TROUBLESHOOTING



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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, e-Shovel, Component Layout, Troubleshooting A (base machine diagnosis by using fault codes), Troubleshooting B (base machine diagnosis starting with inspection of abnormal operational status) and Electrical System Inspection.

- Monitor Unit
 Refer to this group as for the display screen and operating procedures of monitor unit.
- Dr. ZX
 This group contains the operating procedures for Dr. ZX.
- e-Shovel
 This group contains as follows.
 Download data from ICF and Upload
 Procedures when starting satellite communication, when installing the satellite communication controller and when replacing ICF
 Explanation for the satellite communication system
- · Component Layout

 Troubleshooting A (base machine diagnosis by using fault codes)

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

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

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

 Troubleshooting B (base machine diagnosis starting with inspection of abnormal operational status)

Refer to these procedures when no fault codes are displayed after diagnosing the machine with Dr. ZX (or the service menu of monitor unit).

Ex.) Although the engine control dial is turned, engine speed does not change.

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

Ex.) Fuse Check

DIAGNOSING PROCEDURE

These six basic steps are essential for efficient troubleshooting:

1. Study the System

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

2. Ask the operator

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

- (a) How is the machine being used? (Find out if the machine is being operated correctly)
- (b) When was the trouble noticed, and what types of work the machine doing at that time?
- (c) What are the details of the trouble? Is the trouble getting worse, or did it appear suddenly for the first time?
- (d) Did the machine have any other troubles previously? If so, which parts were repaired before?

3. Inspect the machine

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

Also, check the electrical system, including the batteries, as troubles in the electrical system such as low battery voltage, loose connections and blown fuses will result in malfunction of the controllers, causing total operational failure of the machine.

If troubleshooting is started without checking for blown fuses, a wrong diagnosis may result, wasting time. Check for blown fuses before troubleshooting. Even if a fuse looks normal by visual inspection, a fine crack is difficult to find. Always use a tester when checking the fuses.



T107-07-01-001



T107-07-01-002



T107-07-01-003

4. Operate the machine yourself

Try to identify the trouble by operating the machine yourself.

If the trouble cannot be confirmed, stop the engine and obtain further details of the malfunction from the operator.

Also, check for any incomplete connections of the wire harnesses correponding to the trouble.

5. Perform troubleshooting



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

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

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

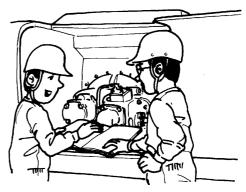
NOTE: Note that the fault codes displayed do not necessarily indicate machine trouble. The controller stores even temporary electrical malfunctions, such as a drop in battery output voltage or disconnections of the switches, sensors, etc., for inspections. For this reason, the "RETRIAL" is required to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



T107-07-01-005



T107-07-01-006



T107-07-01-007

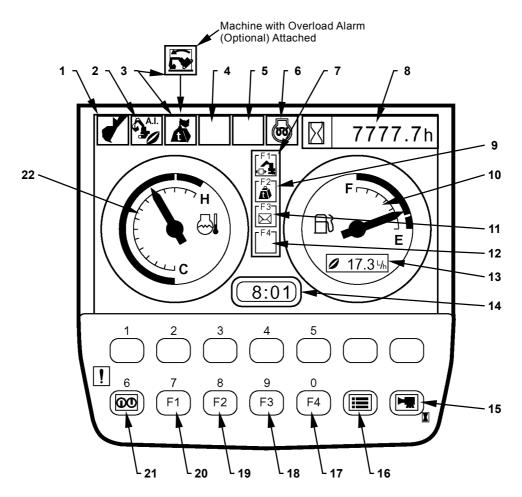
6. Trace possible causes

Before reaching a conclusion, check the most likely causes again. Try to identify the actual cause of the trouble.

Based on your conclusion, make a plan for appropriate repairs to avoid consequent malfunctions.

(Blank)

OUTLINE Primary Screen



T1V1-05-01-094

- 1 Work Mode Display
- 2 Auto-Idle Display
- 3 ML Crane Display or Overload Alarm Display (Optional)
- 4 Auxiliary
- 5 Auxiliary
- 6 Glow Display

- 7 Work Mode Display
- 8 Hour Meter
- 9 ML Crane Display (Optional)
- 10 Fuel Gauge
- 11 Mail Display (Optional)
- 12 Auxiliary

- 13 Fuel Consumption Gauge
- 14 Clock
- 15 Back-Screen Selection
- 16 Menu
- 17 Auxiliary Selection
- 18 Mail Selection (Optional)
- 19 ML Crane Selection (Optional)
- 20 Work Mode Selection
- 21 Return to Primary Screen
- 22 Coolant Temperature Gauge

· Display of Meters

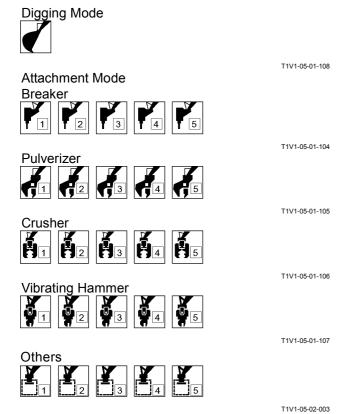
Data to be displayed on each meter are received from other controllers (MC, ICF and ECM) by using CAN, and are displayed on the monitor unit.

Items to be displayed

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

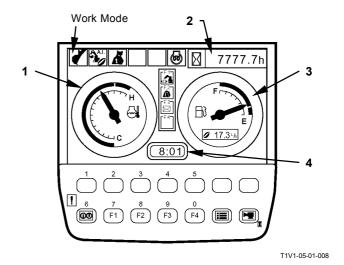
• Work Mode Display

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



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

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



• Auto-Idle Display(1)

When selecting auto-idle from the switch panel, the data according to the signals received from MC by using CAN is displayed.

When the key is turned ON, the data blinks for 10 seconds.

ML Crane or Overload Alarm Display (2) (optional)
 ML Crane



T1V1-05-02-001

When ML crane mode switch or travel suspended load mode switch is turned ON on the ML crane display, the data will be displayed.

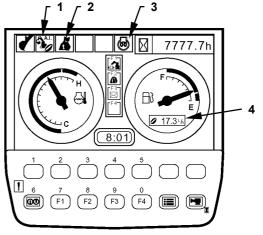
Overload Alarm Display



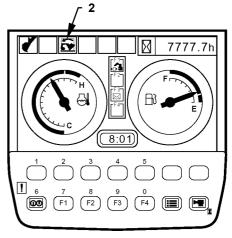
T1V1-05-02-002

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

- Glow Display (3)
 While ECM is supplying current to the glow plug, the date is displayed according to the signal from ECM.
- Fuel Consumption Gauge Display (4)
 Fuel consumption is displayed according to the signal from ECM, which is received through MC by using CAN.

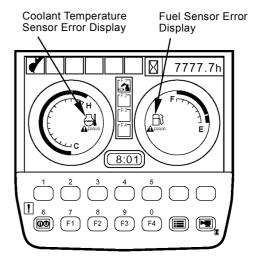


T1V1-05-01-008

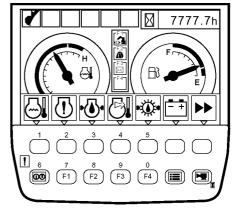


T1V1-05-01-128

- 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.
- 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.

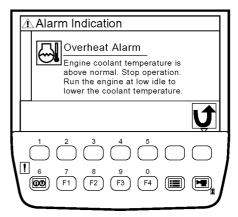


T1V1-05-02-005



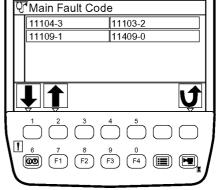
Alarm Display

T1V1-05-01-096



Remedy Display against Alarm T1V5-05-01-013

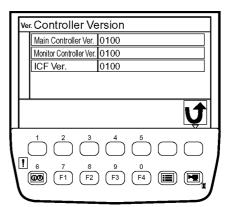
Troubleshooting
 This screen displays fault codes according to the signals received from ICF by using CAN.



Fault Code Display

T1V5-05-01-097

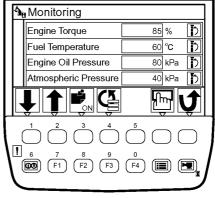
Controller Version
 This screen displays the version of controller.



Controller Version Display

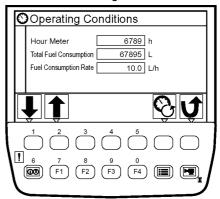
T1V5-05-01-122

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 Screen

T1V5-05-01-025

Operating Conditions

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

• Pump 2 Flow Rate Adjustment

(Only machines equipped with optional parts)

When using the attachments, fine adjust flow rate of pump 2 by keys 1 and 2 operation.

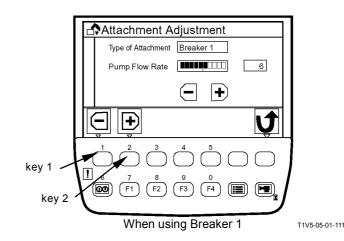
The signals from the monitoring unit are sent to MC by using CAN.

When breaker 1 or 2 is used, MC adjusts flow rate of pump 2 while controlling maximum pump 2 flow rate limit control solenoid valve. When using pulverizer 1 or crusher 1, MC adjusts flow rate of pressure oil that flows from Pump 2 to pulverizer or crusher while controlling the auxiliary flow rate control solenoid valve. (Refer to "Control Systems.")

NOTE: When the 2-speed selector circuit is OFF, flow rate of pump 2 can be adjusted while controlling the maximum pump 2 flow rate

limit control solenoid valve. When the 2-speed selector circuit is ON, flow rate of pressure oil that flows from pump 2 to the attachments can be adjusted while controlling the auxiliary flow rate control solenoid valve.

The table blow is the setting of various factors at the time of shipment from the factory.



Attachment Adjustment

Type of Attachment Pulverizer 1

Priority Level

Type of Attachment Adjustment

Type of Attachment Adjustment

Type of Attachment Pulverizer 1

Priority Level

Type of Attachment Pulverizer 1

Figure 1

Republic 1

Republic 2

Republic 2

Republic 3

Republic 4

Repub

When using Pulverizer 1

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

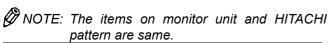
NOTE: The items on monitor unit and HITACHI pattern are same.

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

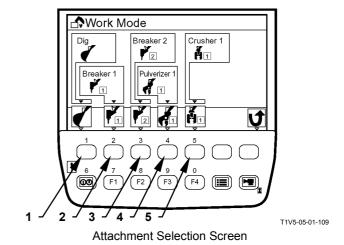
 Attachment Selection (Only machines equipped with optional parts)
 On this screen. Select digging mode and attachment mode set by Dr. ZX.

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

- 1 Digging
- 2 Breaker 1
- 3 Breaker 2
- 4 Pulverizer 1
- 5 Crusher 1



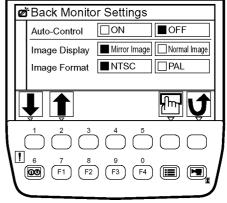
Monitor Unit	HITACHI pattern
Breaker1	Hydraulic Breaker1
Breaker2	Hydraulic Breaker2
Pulverizer1	Secondary Crusher1
Crusher1	Primary Crusher1



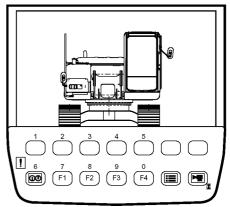
Back Monitor Settings
 By key operation, image display ON and OFF of
 Auto-Control for switching image of the back monitor
 while traveling pilot time and display format on the
 screen of the rear view camera can be set.

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.

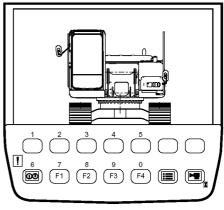


T1V5-05-01-134



T1V1-05-01-126

Normal Image Screen



T1V1-05-01-127

• 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

Hvdraulic Oil

Hydraulic Oil Pilot Filter

Hydraulic Oil Full-Flow Filter

Pump Transmission Oil

Travel Device Oil

Swing Device Oil

Swing Bearing Grease

Air Cleaner Filter

Engine/Air Conditioner V-belt

Fuel Filter

Air Conditioner Filter

Language Settings

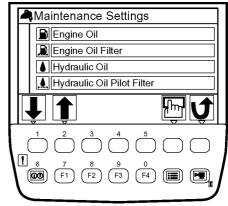
Select a language to be used in screens from among preset languages, according to work environment.

Mail

(Optional Function)

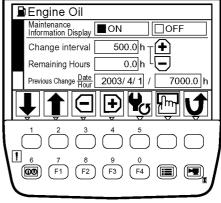
Send requests such as general, fuel replenishment, service maintenance, and forwarding requests in the mail switch screen.

Contents of mails are registered in ICF, and are sent to the central server by a satellite terminal.



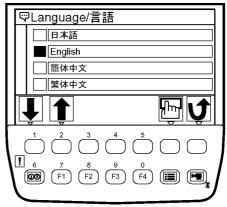
Maintenance Setting Screen

T1V5-05-01-049



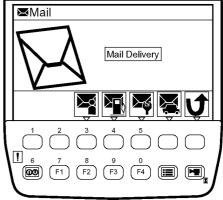
Interval ON/OFF Setting Screen

T1V5-05-01-052



Language Settings Screen

T1V1-05-01-137



Mail Switch Screen

T1V5-05-01-037

 Overload Alarm (Only machines equipped with optional parts)

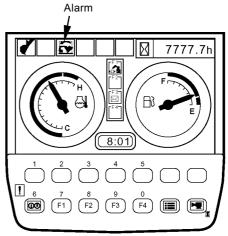
IMPORTANT: When using overload alarm, make overload alarm available by using Dr. ZX.

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

- 1. If load of the suspended load becomes overloaded, the boom bottom pressure sensor (optional) sends a signal to MC.
- If the overload alarm ON/OFF switch (optional) is turned ON, the monitor unit displays an alarm message and rings a buzzer according to the signal from MC by using CAN.
- If overload of the suspended load is dissolved, the alarm message disappears and the buzzer stops ringing.

NOTE: Even if the work is done while displaying a screen except the primary screen, when an overload condition is reached, the screen of monitor unit is switched to the primary screen, an alarm message is displayed, and a buzzer is rung.

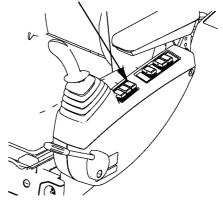
Even after the overload alarm is dissolved, the monitor unit keeps on displaying the primary screen without returning to the screen while the work is done.



T1V1-05-01-128

Primary Screen

Overload Alarm ON/OFF Switch (Optional)



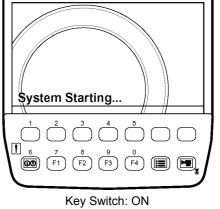
T1V1-05-02-004

HOW TO USE SCREENS

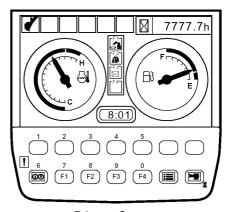
Displaying Primary Screen

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

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



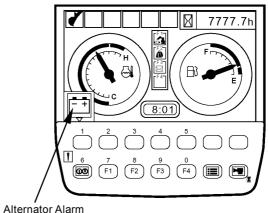
T1V1-05-01-115



Primary Screen

T1V1-05-01-123

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

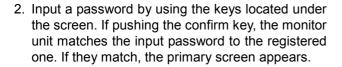


T1V1-05-01-117

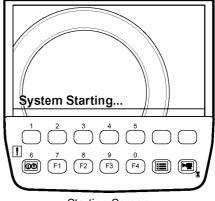
Displaying Primary Screen by Password Input (Optional)

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

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

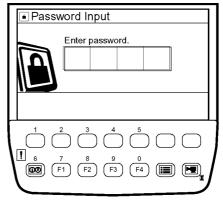


NOTE: When inputting the password again, the entered characters can be erased by pushing the Erase key.



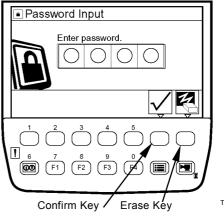
Starting Screen

T1V1-05-01-115

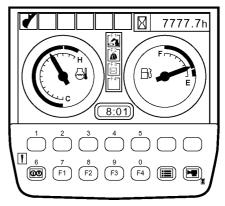


Password Input Screen

T1V5-05-01-093



T1V5-05-01-002



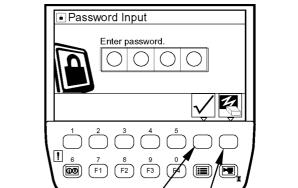
Primary Screen

T1V1-05-01-123

(Blank)

In Case of Inputting an Incorrect Password

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



Confirm Key /

Password Input Screen

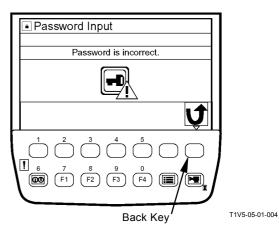
■ Password Input

Enter password.

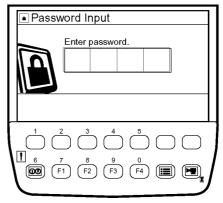
T1V5-05-01-002

T1V5-05-01-093

- 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.



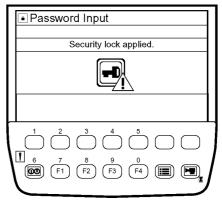
Erase Key



T1V5-05-01-093

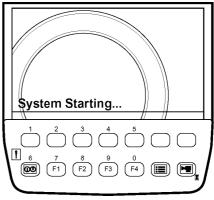
 If inputting an incorrect password three times, a screen appears informing that the security lock has been applied, and a buzzer rings for thirty seconds. During that time, the buzzer does not stop ringing even if turning of the key switch ON/OFF.

- 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.
- 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.



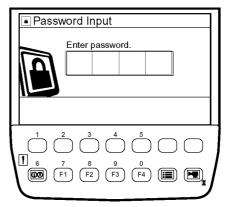
Security Lock Screen

T1V5-05-01-005



Starting Screen

T1V1-05-01-115



Password Input Screen

T1V5-05-01-093

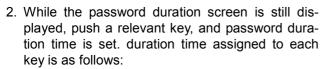
Extending Password Duration Time

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 ma-

chine, a password need not be input within that time-frame.

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



key 1: 0 minute

key 2: 30 minutes

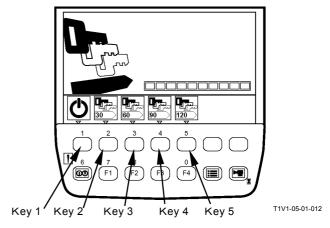
key 3: 60 minutes

key 4: 90 minutes

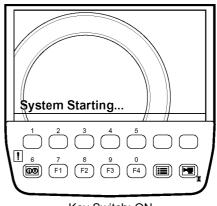
key 5: 120 minutes

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

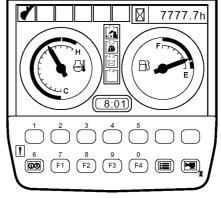
3. If turning the key switch to the ON position within password duration time, the monitor unit displays the primary screen after the starting screen.



Password Duration Screen (Key Switch: OFF)



Key Switch: ON T1V1-05-01-115



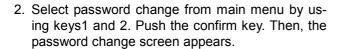
Primary Screen

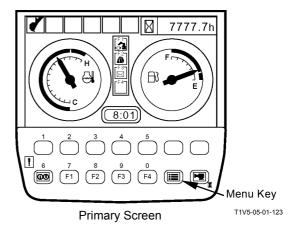
T1V1-05-01-123

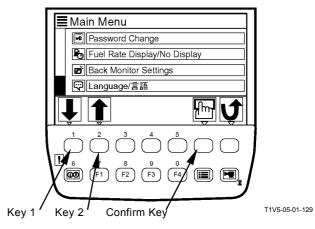
(Blank)

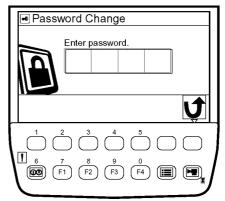
Password Change (Optional)

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



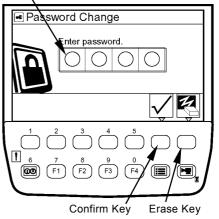






T1V5-05-01-041

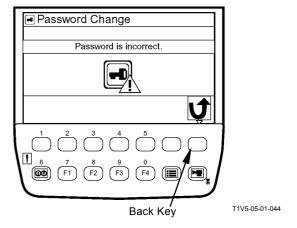
- 3. Input the registered password and push the confirm key.
- 4. If inputting the password again, the entered characters can be erased. By pushing the erase key.



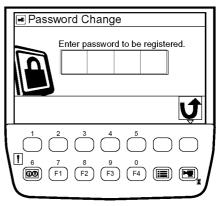
Registered Password

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.

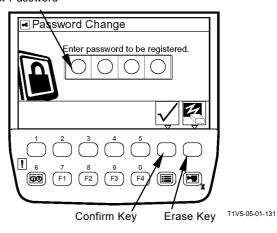


- 5. The message "Enter password to be registered." appears. Then, input a new password with three or four digits and push the confirm key.
- 6. If inputting the password again, push the erase key.

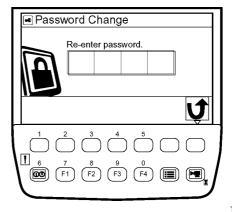


T1V5-05-01-130

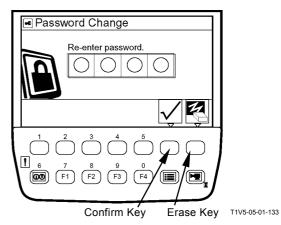
A New Password



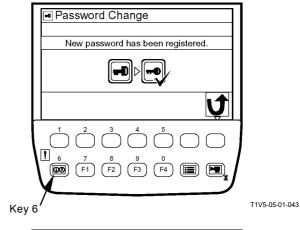
- 7. The message "Re-enter password." appears. Then, input a new password again and push the confirm key.
- 8. If inputting the password again, push the erase key in order to erase the entered characters.



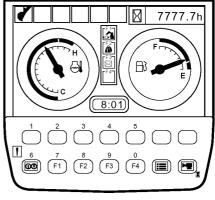
T1V5-05-01-132



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

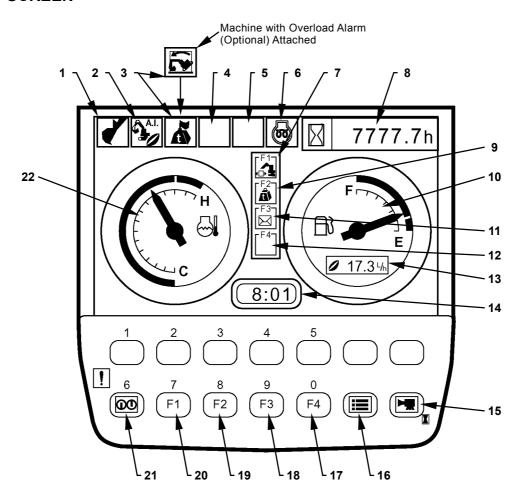


10. Push key 6 and the primary screen appears.



Primary Screen

PRIMARY SCREEN



- 1 Work Mode Display
- 2 Auto-Idle Display
- 3 ML Crane Display or Overload Alarm Display (Optional)
- 4 Auxiliary
- 5 Auxiliary
- 6 Glow Display

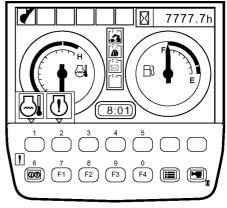
- 7 Work Mode Display
- 8 Hour Meter
- 9 ML Crane Display (Optional)
- 10 Fuel Gauge
- 11 Mail Display (Optional)
- 12 Auxiliary

- 13 Fuel Consumption Gauge
- 14 Clock
- 15 Screen Selection
- 16 Menu
- 17 Auxiliary Selection
- 18 Mail Selection (Optional)
- 19 ML Crane Selection (Optional)
- 20 Work Mode Selection
- 21 Return to Primary Screen
- 22 Coolant Temperature Gauge

SCREEN DISPLAY WHEN AN ALARM IS ISSUED

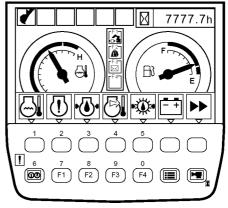
When an alarm is issued, the alarm marks are displayed at the bottom of screen.

• When the number of alarms is two or less

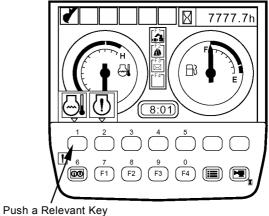


T1V1-05-01-095

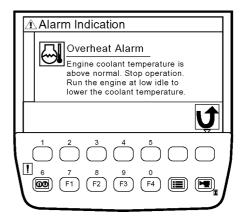
• When the number of alarms is three or more



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



T1V1-05-01-095



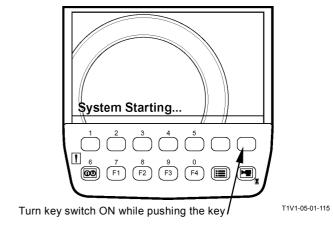
CONTENTS OF ALARMS

Display	Contents of Alarms	Remedy
	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.
M178-01-036	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 electroinic system. Inspect the alternator and battery system.
M178-01-034	Remaining Fuel Alarm	Volume of remaining oil is becoming less. Refuel oil earlier.
M1CC-01-039	Hydraulic Oil Filter Alarm	The hydraulic oil filter is clogged. Clean or replace the hydraulic oil filter.
M183-01-067	Air Filter 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.
	Pilot Shut-Off Lever Alarm	Fault in the pilot shut-off lever system. Please contact our authorized distributor or dealer.
T1V1-05-01-103		

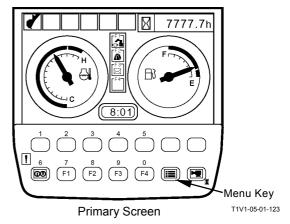
(Blank)

TROUBLESHOOTING

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.

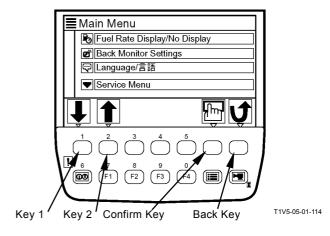


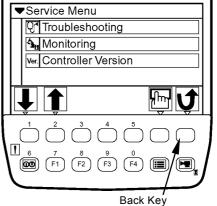
2. When the primary screen appears, push the menu key and display main menu.



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.





- 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.
- Select abnormal of a faulty controller by using keys 1 and 2. Push the confirm key. Then, failure code screen appears.

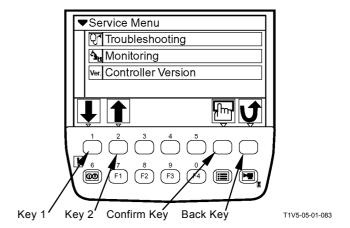
For details of trouble analyses, refer to "Trouble-shooting A."

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.

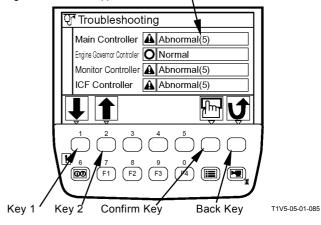
When returning to the previous page, push key 2.

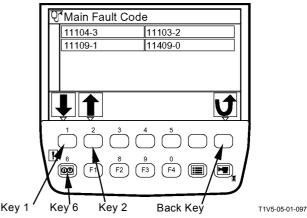
NOTE: When pushing the back key, return to the previous screen.

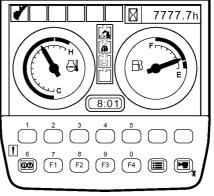
7. Push key 6, and the primary screen appears.



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



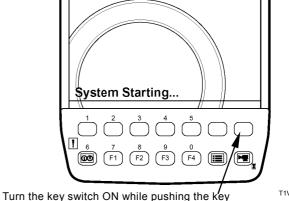




Primary Screen

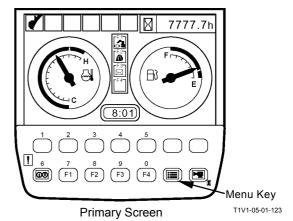
CONTROLLER VERSION

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.



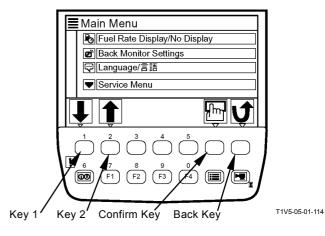
T1V1-05-01-115

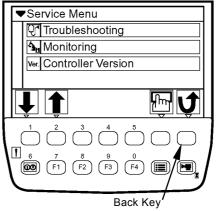
2. When primary screen appeared, push menu key to display main menu.



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.

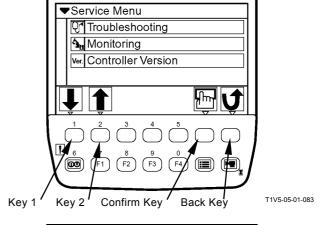


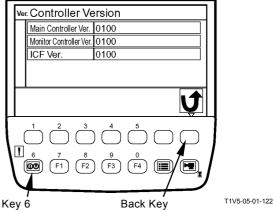


4. Select controller version by using keys 1 and 2. Push the confirm key. Then, the controller version screen appears.

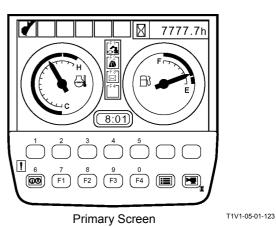
NOTE: The version of ECM is not displayed.

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



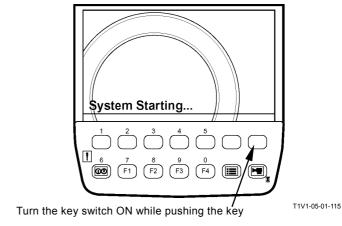


5. Push key 6, and the primary screen appears.

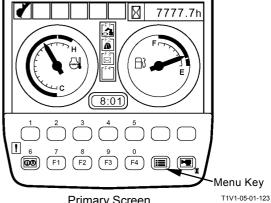


MONITORING

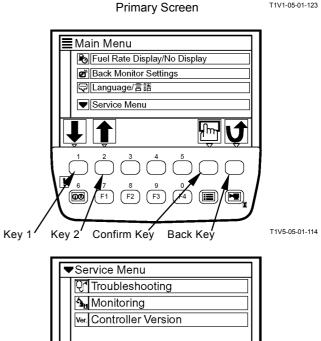
Displaying Service menu
 Turn the key switch to the ON position while pushing the key at upper right of the monitor unit.
 Therefore, the service menu is added to main menu.

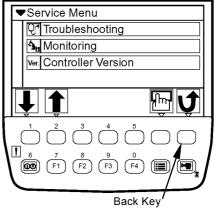


2. When the primary screen appeared, push the menu key and display main menu.



- 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.

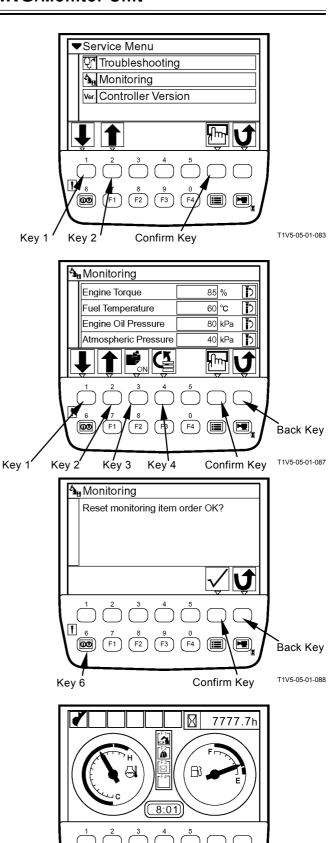




 Select monitoring by using keys 1 and 2. Push the confirm key. Then, the monitoring screen appears. For items to be monitored, refer to the next section.

- 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

A List of Items to be Monitored

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

Key 1

DISPLAYING OPERATING CONDITIONS

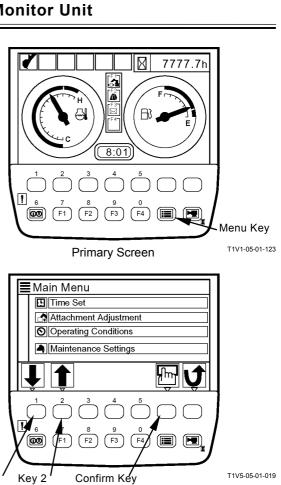
- 1. When the primary screen appeared, push the menu key and display main menu.
- 2. Select operating conditions from main menu by using keys 1 and 2. Push the confirm key. Then, the operating conditions screen appears.
- Push the reset key, and a screen appears to confirm if it's OK to reset data.If it's OK to reset data, push the confirm key.
- NOTE: When pushing the back key, return to the previous screen.

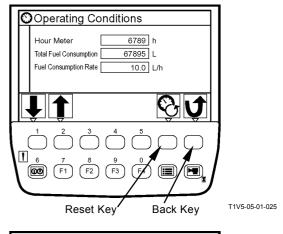
IMPORTANT: Total fuel consumption and fuel consumption rate depend on the operating environment and the operation method of machine.

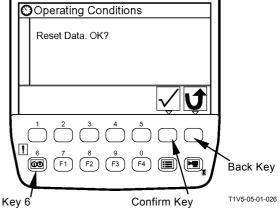
The values shown on the screen are just for reference.

There could arise ± 20% of differences between actual fuel consumption and fuel consumption which is displayed by the monitor unit.

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



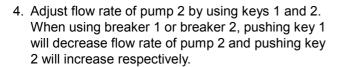




PUMP 2 FLOW RATE ADJUSTMENT (Only Machines Equipped with Optional Parts)

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.

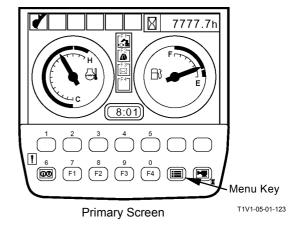


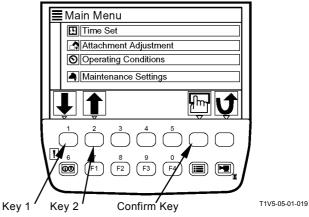
When using the pulverizer or crusher, pushing key 1 will increase flow rate of boom raise, arm roll-out, swing or travel circuit sides.

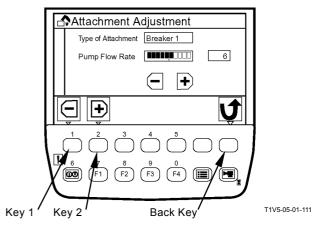
Pushing key 2 will increase flow rate of attachment side.

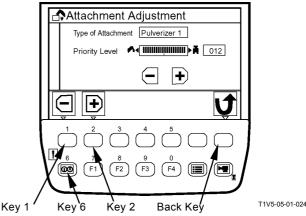
NOTE: When pushing the back key, return to the previous screen.

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









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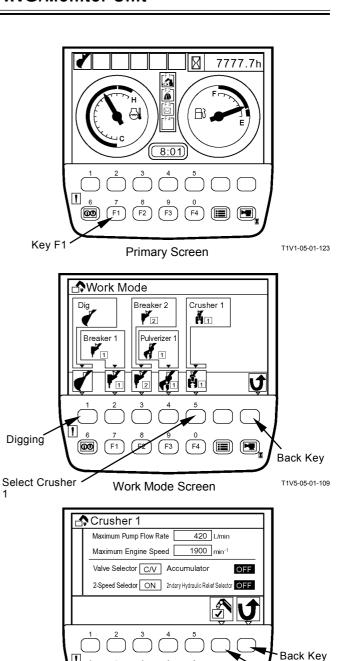
ATTACHMENT SELECTION (Only Machines Equipped with Optional Parts)

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, Crusher 1 is selected.)
- NOTE: When selecting Digging, return to the primary screen.
 - 3. On the attachment specification screen, confirm if specification of the installed attachment agrees with that displayed on the screen.
- NOTE: When pushing the back key, return to the previous screen.
 - 4. Push confirm the key, and the primary screen appears.

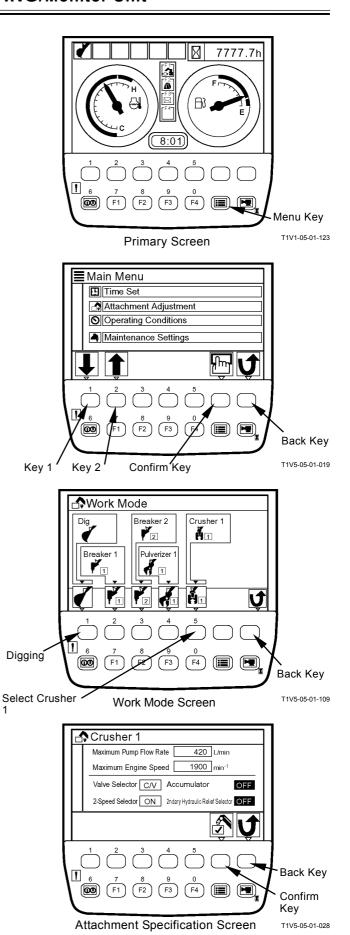


Confirm Key T1V5-05-01-028

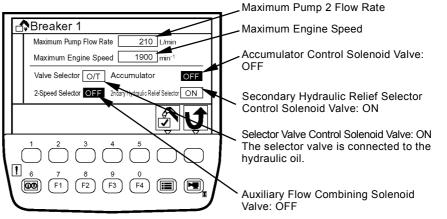
Attachment Specification Screen

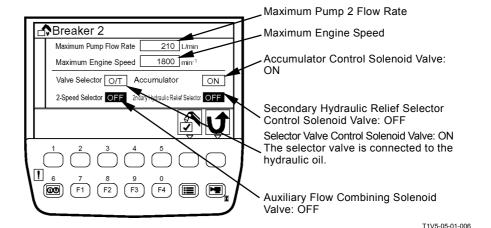
Selecting an Attachment from Main Menu

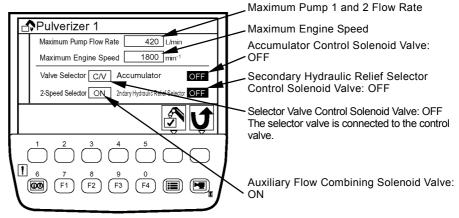
- 1. When the primary screen appears, push the menu key and display main menu.
- Select work mode from main menu by using keys 1 and 2. Push confirm key. Then, the work mode screen appears.
- 3. Push the relevant key under an attachment mark to be used in order to select the attachment. (In the right example, Crusher 1 is selected.)
- NOTE: When selecting digging, return to main menu.
 - 4. On the attachment specification screen, confirm if specification of the installed attachment agrees with that displayed on the screen.
 - If they do not match, perform the setting of attachment by using Dr. ZX.
 - For details of the attachment specification screen, refer to T5-2-38 and 39.
- NOTE: When pushing the back key, return to the previous screen.
 - 5. Push the confirm key, and the primary screen appears.



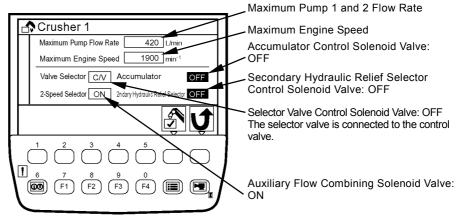
Attachment Specification Screen







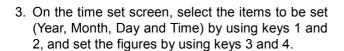
T1V5-05-01-011



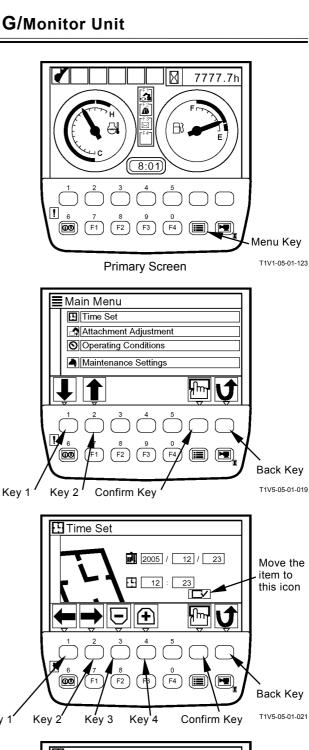
TIME SET

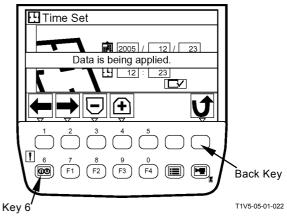
1. When the primary screen appears, push the menu key and display main menu.

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



- 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.





Kev 1

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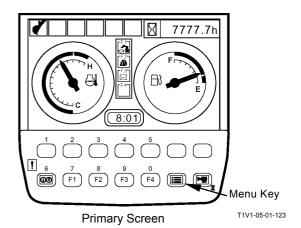
FUEL RATE DISPLAY/NO DISPLAY

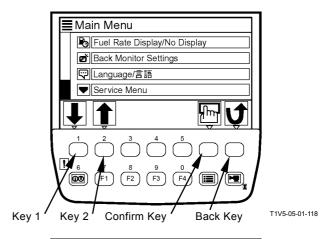
Fuel Rate Display

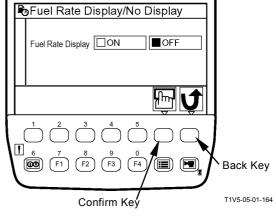
1. When the primary screen appears, push the menu key and display main menu.

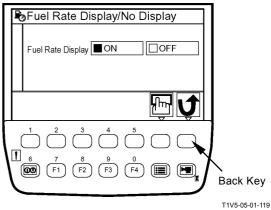
 Select fuel rate display/no display from main menu by using keys 1 and 2. Push the confirm key. Then, the fuel rate display/no display screen appears.

- 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.

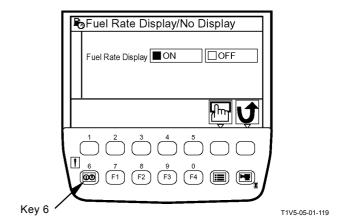


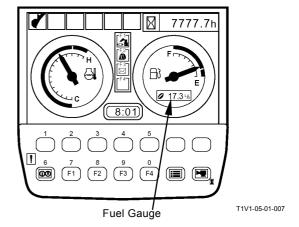






4. Push key 6, and the fuel gauge will be added to primary screen.

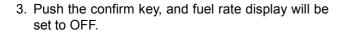




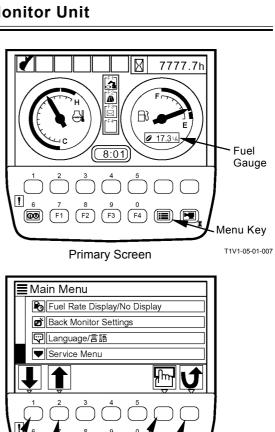
Fuel Rate No Display

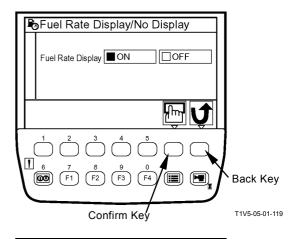
1. When the primary screen appears, push the menu key and display main menu.

 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.



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





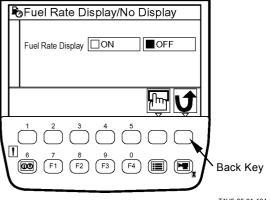
Back Key

T1V5-05-01-118

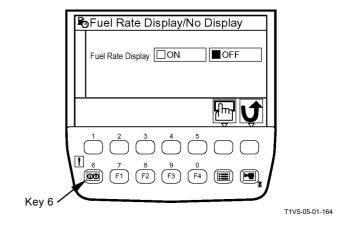
Key 2

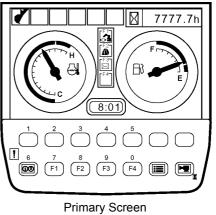
Key 1

Confirm Key



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





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 situa-

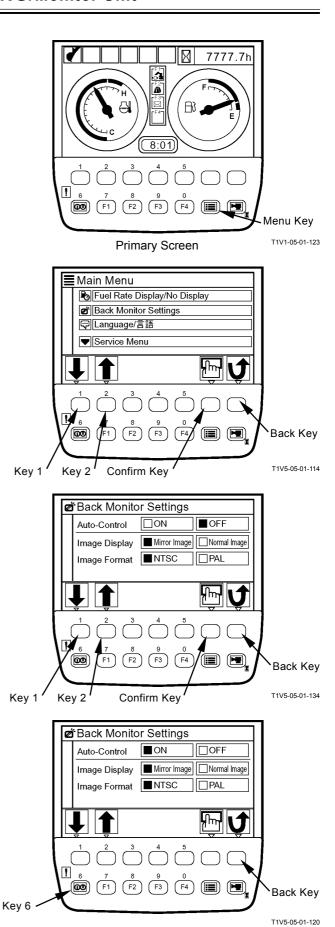
tion.

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.
- 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 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.
 - 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.



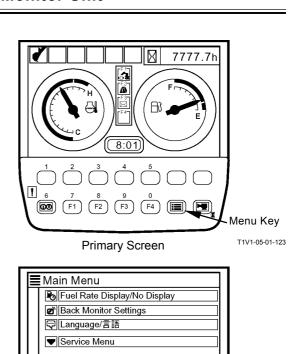
Auto-Control: OFF

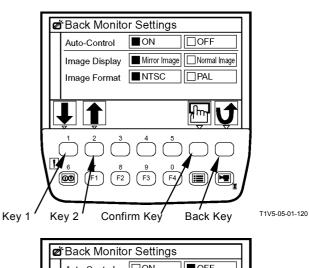
Set automatic switching function of images between monitor unit and back monitor when traveling to OFF.

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

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 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.





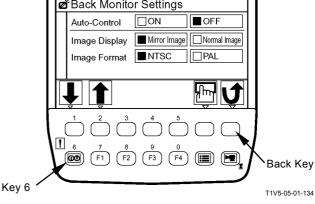
Confirm Kev

Key 1

Key 2

T1V5-05-01-118

Back Key

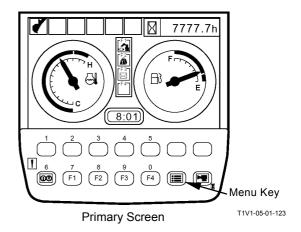


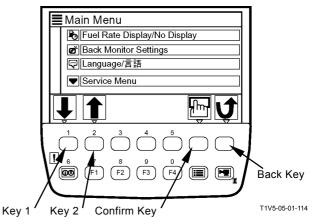
Switching Image Display

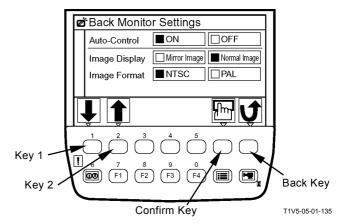
- From mirror image to normal image
 - 1. When the primary screen appears, push the menu key and display main menu.

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.

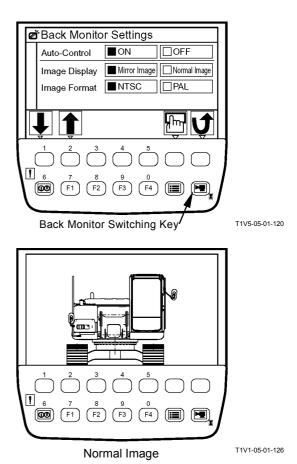
- 3. Select mirror image by using keys 1 and 2. Push the confirm key. Then, the setting is switched to normal image.
- NOTE: When pushing the back key, return to the previous screen.







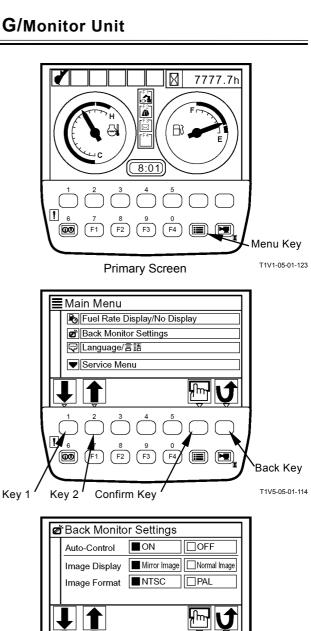
4. Push the back monitor switching key, and normal image is displayed on the screen.

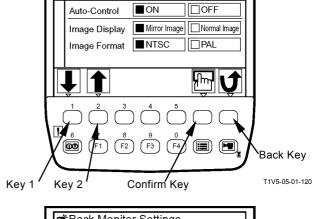


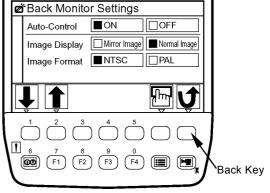
- From normal image to mirror image
 - 1. When the primary screen appears, push the menu key and display main menu.

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.

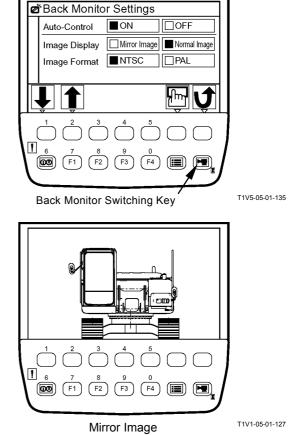
- 3. Select normal image by using keys 1 and 2. Push the confirm key. Then, the setting is switched to mirror image.
- NOTE: When pushing the back key, return to the previous screen.







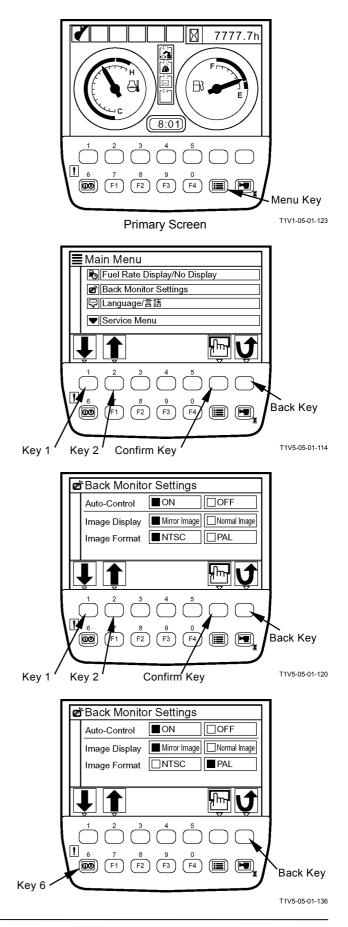
4. Push the back monitor switching key, and mirror image is displayed on the screen.



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.
- 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.
- Select "PAL" for image format by using keys 1 and
 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.



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MAINTENANCE SETTINGS

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

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

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.)

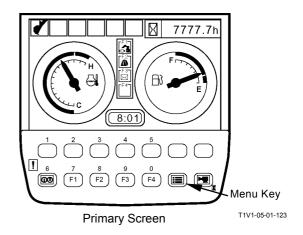
Maintenance Information Display ON/OFF

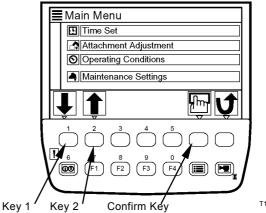
1. Select ON or OFF for maintenance information display by using keys 1 and 2. Push the confirm key.

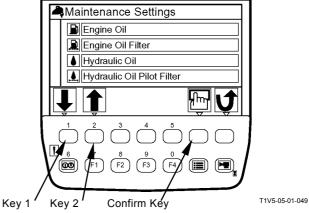
ON: When time comes to change, a information message is displayed on the screen.

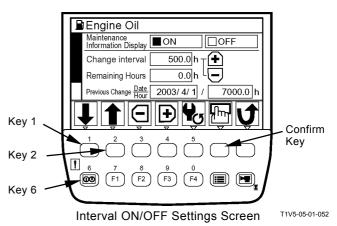
OFF: No information message is displayed.

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





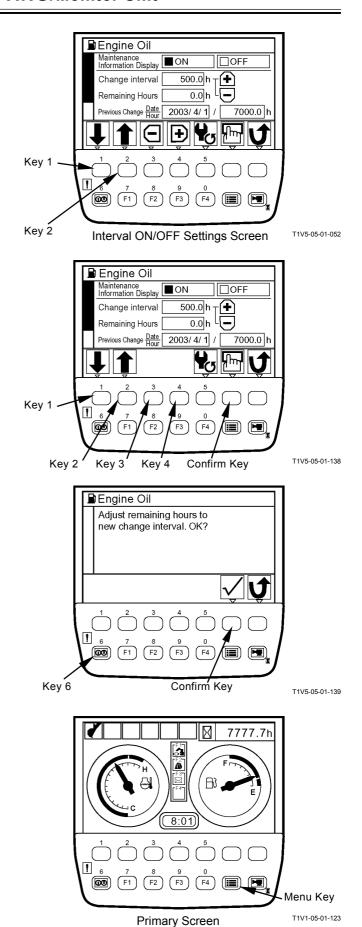




Change Interval Settings

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

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

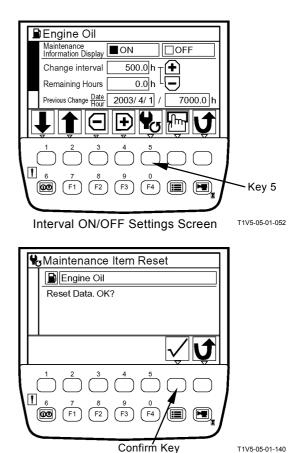


Resetting Data

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

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

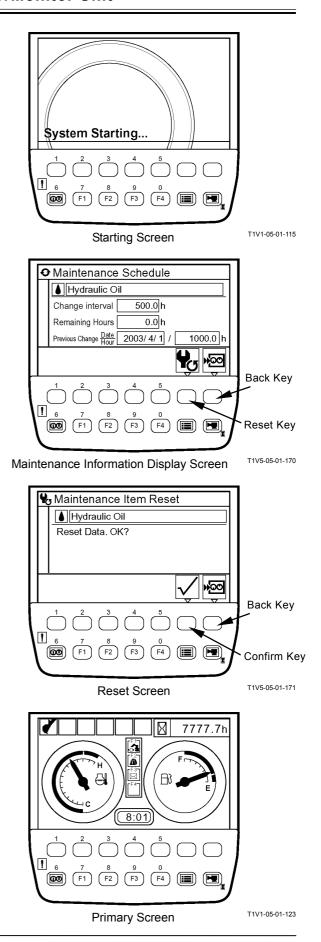
The value of remaining hours is reset to that of change interval. Previous change date/hour is updated with current date and time.



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Screen Display when Maintenance Information Display is ON

- When only one item applies
 - 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.



- When more than two items apply
 - 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.
 - 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.

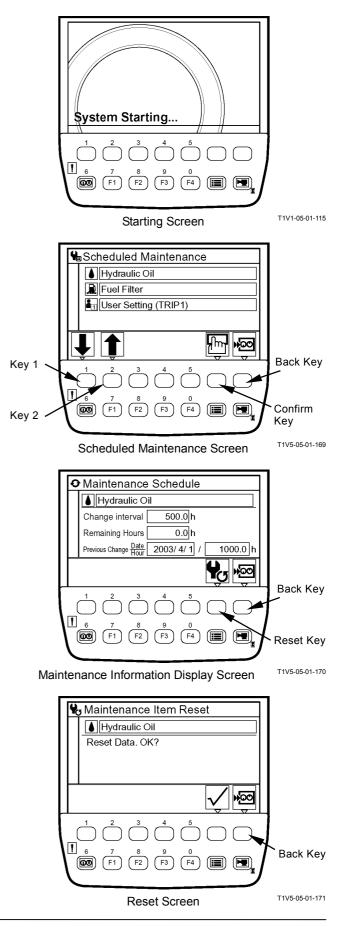
(In the right example, Hydraulic Oil is selected.)

- 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.

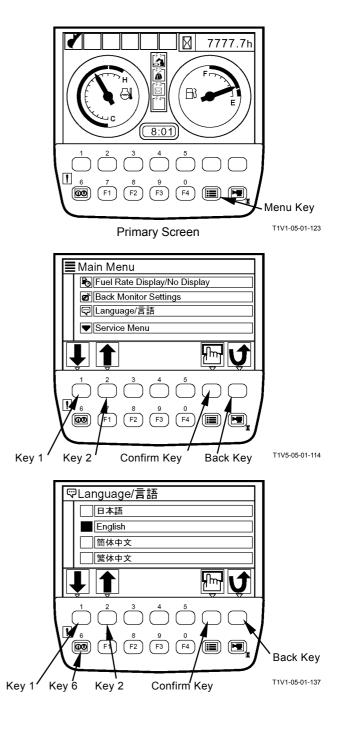
- NOTE: When pushing the back key while the maintenance information display screen is displayed, return to the scheduled maintenance screen.
- NOTE: When pushing the back key while the reset screen is displayed, return to the maintenance information display screen.



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



Language	Screen Display	
Japanese	日本語	T1V1-05-01-141
English	English	
Chinese	簡体中文	T1V1-05-01-142
Taiwanese	繁体中文	T1V1-05-01-143
Korean	한국어	T1V1-05-01-144
Indonesian	Bahasa Indonesia	T1V1-05-01-145
Thai	ภาษาไทย	T1V1-05-01-146
Vietnamese	Tiếng Việt	T1V1-05-01-147
Myanmarese	မြန်မာဘာသာ	T1V1-05-01-148
Arabic	للغة العربية	T1V1-05-01-149
Persian	اللغة الفارسية	T1V1-05-01-150
Turkish	Türkçe	T1V1-05-01-151
		T1V1-05-01-152
Display Languages Language	Screen Display	
English	English	
Liigiisii	_	T1V1-05-01-142
Spanish	Español	T1V1-05-01-153
Italian	Italiano	T1V1-05-01-154
French	Français	T1V1-05-01-155
German	Deutsch	
Netherlandish	Nederlands	
Netherlandish Russian	Nederlands Русский	T1V1-05-01-157
		T1V1-05-01-157
Russian	Русский	T1V1-05-01-158 T1V1-05-01-159
Russian Portugese	Русский Português	T1V1-05-01-157 T1V1-05-01-158 T1V1-05-01-159 T1V1-05-01-160
Russian Portugese Finlandish	Русский Português Suomi	T1V1-05-01-156 T1V1-05-01-157 T1V1-05-01-158 T1V1-05-01-160 T1V1-05-01-161 T1V1-05-01-161

MAIL (Optional)

IMPORTANT: This function is available only to a

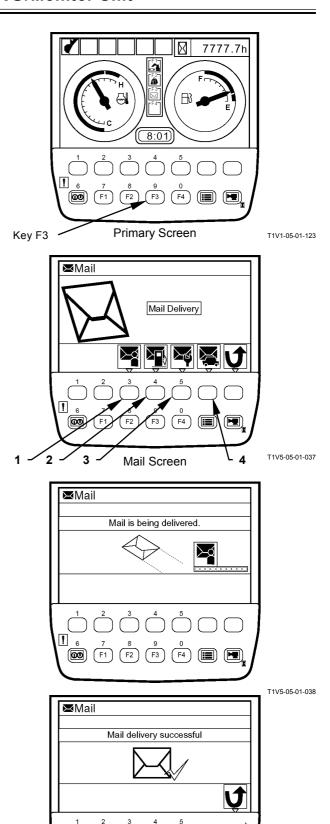
machine equipped with a satellite

terminal.

When using the mail function, make the mail function avaiable by using

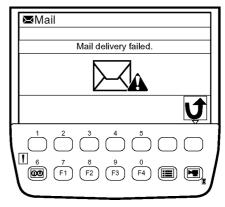
Dr. ZX.

- 1. When the primary screen appears, push key F3 and display mail screen.
- 2. If pushing a relevant request key, mail information is sent to ICF.
 - 1 General Request
 - 2 Fuel Replenishment Request
 - 3 Service Maintenance Request
 - 4 Forwarding Request
- 3. While mail information is sent to ICF, the message "Mail is being delivered." is displayed on the screen.
- 4. When ICF completes receives mail information, the message "Mail delivery successful." is displayed on the screen.
 - When pushing the back key, return to the mail screen.
- 5. Then, a mail is sent from the satellite terminal to the central server via the satellite.
- NOTE: Depending on machine's operating environment or position of the satellite on its orbit, the mail may not be sent.



Back Key T1V5-05-01-039

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



T1V5-05-01-040

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OUTLINE

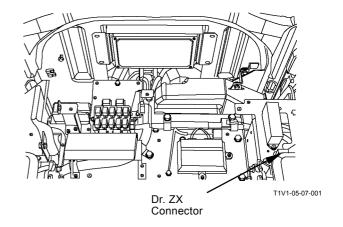
Dr. ZX is used for diagnosis of electrical system including MC, EMC, ICF and monitor unit.

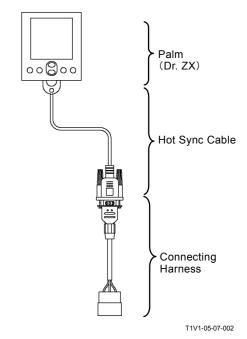
Dr. ZX is connected to ICF and failure of each controller and each sensor is displayed as a fault code. (Self-Fiagnostic Result)

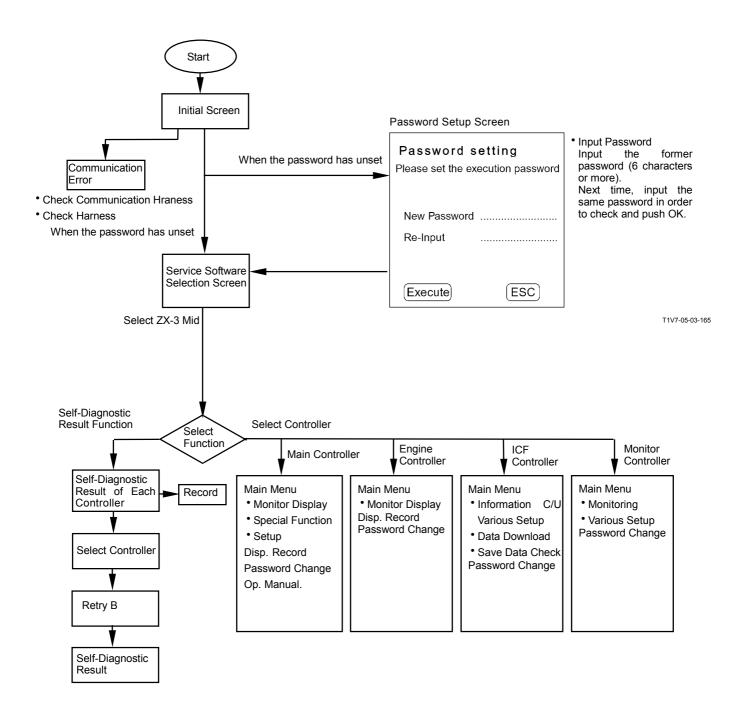
Dr. ZX displays the input status of sensors and switches connected to each controller and the output status to actuator including solenoid valve from controller with the machine operated in real time. (Controller Diagnosis)

Operation

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



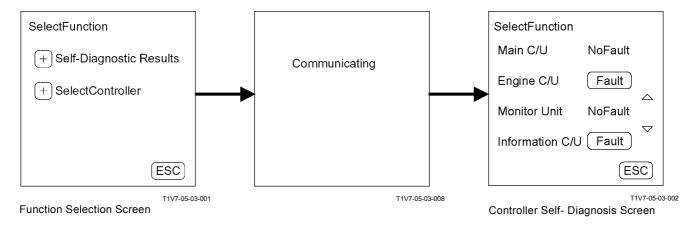




Self-Diagnostic Result

The self-diagnostic result of each controller is displayed.

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



NOTE: Main C/U: MC
Engine C/U: ECM

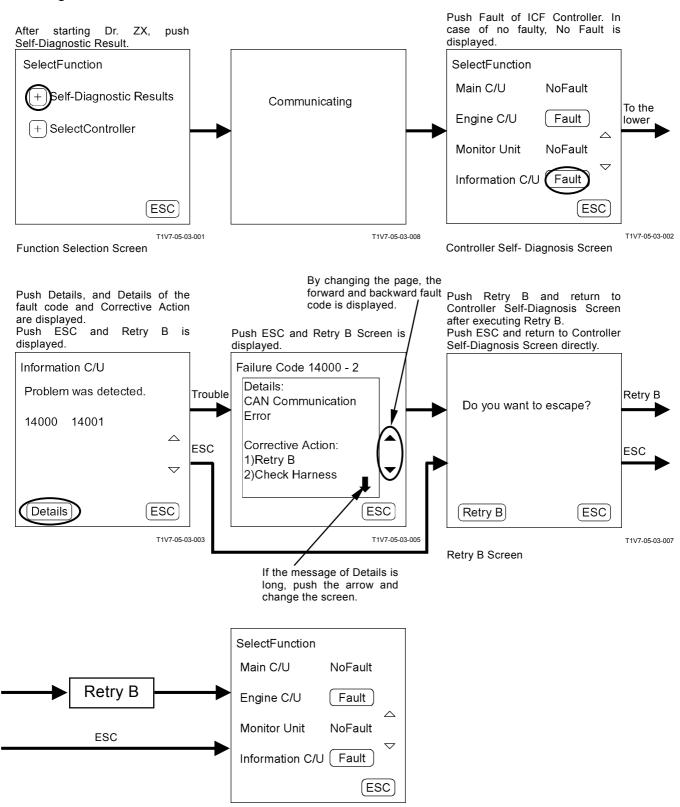
Monitor Unit: Monitor Unit

Information C/U: ICF

NOTE: Self-diagnosis of ICF controller is done on

the next page.

Self-Diagnosis

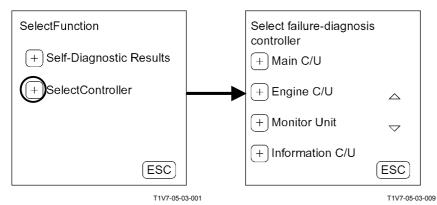


Controller Self- Diagnosis Screen

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

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

Makes Special Function disable.
• Setup

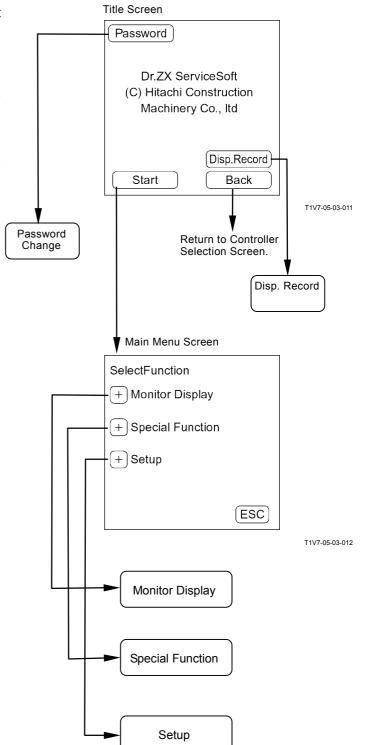
Adjusts engine speed, pump delivery flow rate, solenoid valve output pressure and so on.

Recorded Data

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

Password Change

Changes the password input when setting.



MAIN MENU MONITOR DISPLAY

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

List of Monitor Item

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

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

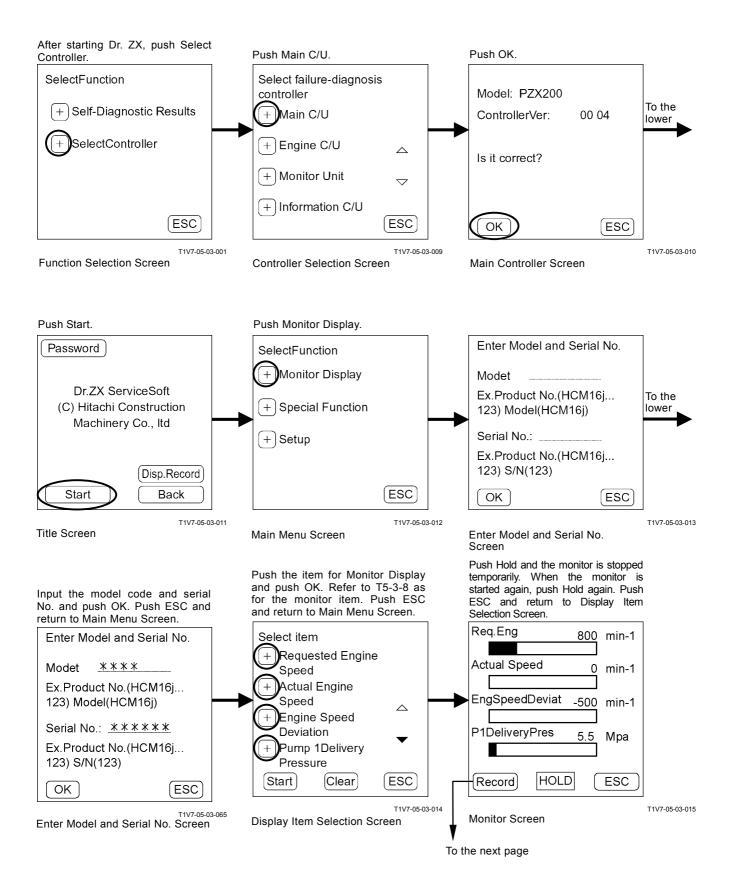
Item		Data	Unit
Selecting	Monitoring		
Boom Dampener Switch 1	Boom Damping	Boom dampener switch 1 ON/OFF	ON, OFF
(Optional)	SW1	status	
Boom Dampener Switch 2	Boom Damping	Boom dampener switch 2 ON/OFF	ON, OFF
(Optional)	SW2	status	
Low Vibration Switch	Low Vibration SW	Low vibration switch ON/OFF status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

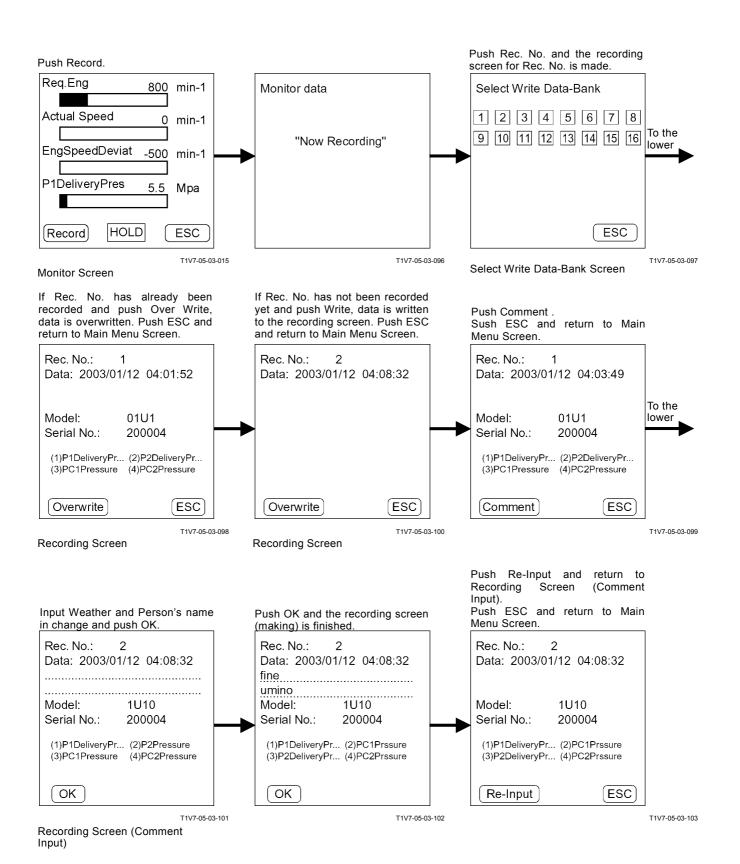
Item		Data	Unit
Selecting	Monitoring		
Travel Alarm	Travel Alarm	Travel alarm Action/No Action status	Action, No Action
Swing Alarm	Swing Alarm	Swing alarm Action/No Action status	Action, No Action
Load Alarm			Action, No Action
Auto Air Bleeding	Auto-Air Bleeder	Auto air bleeding ON/OFF status	ON, OFF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

BK: Digging PU: Secondary Crusher

NOTE: ATT: Attachment
BR: Hydraulic Breaker
CR: Primary Crusher
VI: Vibrating Hammer

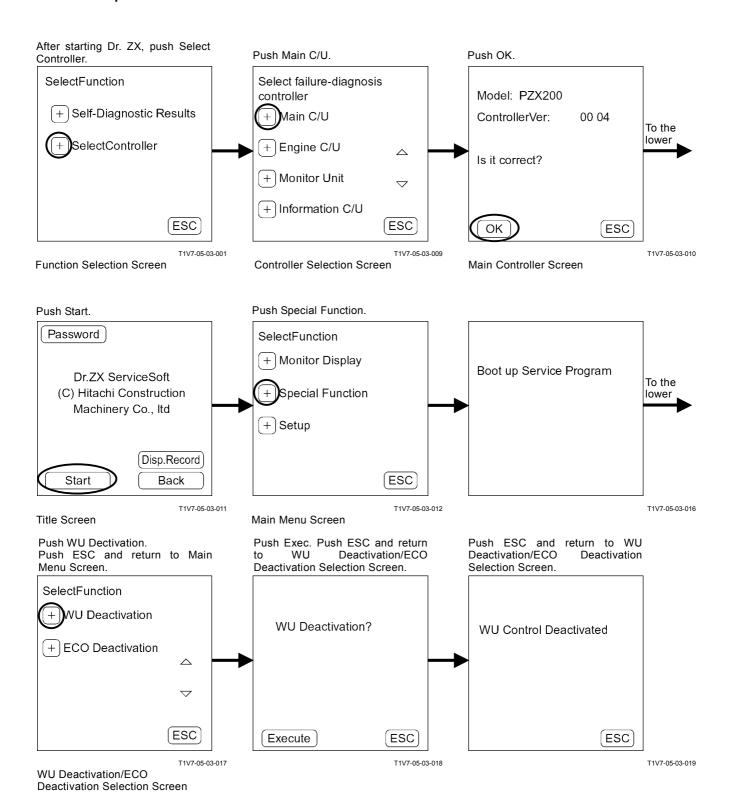
Monitor Display





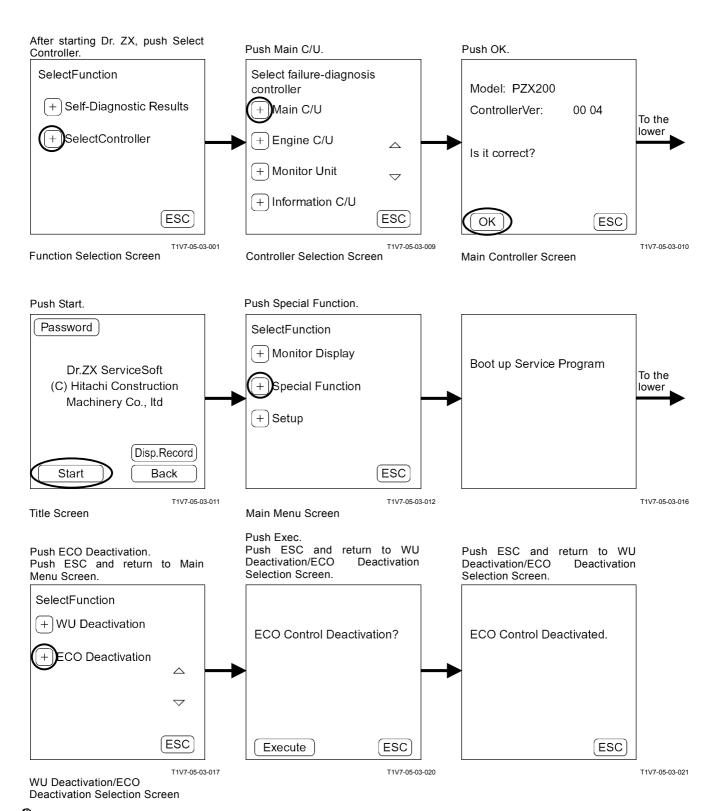
SPECIAL FUNCTION

Auto Warm-Up Control: Deactivation



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

ECO Control: Deactivation



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

SETTING

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

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

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

Attachment Parameter Change

Item	Data	Unit
ATT1		
ATT1 ATT Type	Attachment selection	BR PU CR VI Others Non
ATT1 ATT No.	Attachment setting number selection	12345
ATT1 P1 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 1 flow rate when using attachment	L/min
ATT1 P2 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 2 flow rate when using attachment	L/min
ATT1 Engine Speed Increase/Decrease	Adjustment of engine speed when using attachment	min ⁻¹
ATT1 Secondary Pilot Relief Pressure Selection	Secondary pilot relief valve ON/OFF selection	ON, OFF
ATT1 Selector Valve Selection	Selector valve ON/OFF selection	ON, OFF
ATT1 Accumulator Selection	Accumulator ON/OFF selection	ON, OFF
ATT1 2-Speed Selection	2-speed selection ON/OFF selection	ON, OFF
ATT2		
ATT2 ATT Type	Attachment selection	BR PU CR VI Others Non
ATT2 ATT No.	Attachment setting number selection	12345
ATT2 P1 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 1 flow rate when using attachment	L/min
ATT2 P2 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 2 flow rate when using attachment	L/min
ATT2 Engine Speed Increase/Decrease	Adjustment of engine speed when using attachment	min ⁻¹
ATT2 Secondary Pilot Relief Pressure Selection	Secondary pilot relief valve ON/OFF selection	ON, OFF
ATT2 Selector Valve Selection	Selector valve ON/OFF selection	ON, OFF
ATT2 Accumulator Selection	Accumulator ON/OFF selection	ON, OFF
ATT2 2-Speed Selection	2-speed selection ON/OFF selection	ON, OFF

NOTE: ATT: Attachment

BR: Hydraulic Breaker PU: Secondary Crusher CR: Primary Crusher VI: Vibrating Hammer

Item	Data	Unit
ATT3		
ATT3 ATT Type	Attachment selection BR Other	
ATT3 ATT No.	Attachment setting number selection	12345
ATT3 P1 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 1 flow rate when using attachment	L/min
ATT3 P2 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 2 flow rate when using attachment	L/min
ATT3 Engine Speed Increase/Decrease	Adjustment of engine speed when using attachment	min ⁻¹
ATT3 Secondary Pilot Relief Pressure Selection	Secondary pilot relief valve ON/OFF selection	ON, OFF
ATT3 Selector Valve Selection	Selector valve ON/OFF selection	ON, OFF
ATT3 Accumulator Selection	Accumulator ON/OFF selection	ON, OFF
ATT3 2-Speed Selection	2-speed selection ON/OFF selection	ON, OFF
ATT4		
ATT4 ATT Type	Attachment selection	BR PU CR VI Others Non
ATT4 ATT No.	Attachment setting number selection	12345
ATT4 P1 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 1 flow rate when using attachment	L/min
ATT4 P2 Max Swash Angle Adjustment	Adjustment of lower limit of maximum pump 2 flow rate when using attachment	L/min
ATT4 Engine Speed Increase/Decrease	Adjustment of engine speed when using attachment	min ⁻¹
ATT4 Secondary Pilot Relief Pressure Selection	Secondary pilot relief valve ON/OFF selection	ON, OFF
ATT4 Selector Valve Selection	Selector valve ON/OFF selection	ON, OFF
ATT4 Accumulator Selection	Accumulator ON/OFF selection	ON, OFF
ATT4 2-Speed Selection	2-speed selection ON/OFF selection	ON, OFF

NOTE: ATT: Attachment

BR: Hydraulic Breaker PU: Secondary Crusher CR: Primary Crusher VI: Vibrating Hammer

Item	Data	Unit
ATT5	ATT5	
ATT5 ATT Type	Attachment selection	BR PU CR VI
		Others Non
ATT5 ATT No.	Attachment setting number selection	12345
ATT5 P1 Max Swash Angle	Adjustment of lower limit of maximum pump 1 flow rate	L/min
Adjustment	when using attachment	
ATT5 P2 Max Swash Angle	Adjustment of lower limit of maximum pump 2 flow rate	L/min
Adjustment	when using attachment	
ATT5 Engine Speed	Adjustment of engine speed when using attachment	min ⁻¹
Increase/Decrease		
ATT5 Secondary Pilot Relief	Secondary pilot relief valve ON/OFF selection	ON, OFF
Pressure Selection		
ATT5 Selector Valve	Selector valve ON/OFF selection	ON, OFF
Selection		
ATT5 Accumulator	Accumulator ON/OFF selection	ON, OFF
Selection		
ATT5 2-Speed Selection	2-speed selection ON/OFF selection	ON, OFF

NOTE: ATT: Attachment
BR: Hydraulic Breaker

BR: Hydraulic Breaker PU: Secondary Crusher

CR: Primary Crusher VI: Vibrating Hammer

ADJUSTMENT DATA LIST

ZX200-3 class

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

NOTE: 1 MPa=10.197 kgf/cm² 1 kgf/cm²=0.098 MPa

^{*} ML specification is only available in Japanese domestic market.

ZX240-3 class

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

NOTE: 1 MPa=10.197 kgf/cm² 1 kgf/cm²=0.098 MPa

^{*} ML specification is only available in Japanese domestic market.

ZX270-3 class

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

NOTE: 1 MPa=10.197 kgf/cm² 1 kgf/cm²=0.098 MPa

^{*} ML specification is only available in Japanese domestic market.

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ATTACHMENT ADJUSTMENT DATA LIST

ZX200-3 class

	Min.	Adjustable Range		
Adjustment Data	Adjustment Value	Range	Standard Adjustment	Remarks
ATT1				
ATT1 ATT Type/No.	-	0 to 5	Breaker 1	
ATT1 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212	212 L/min	
ATT1 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212	212 L/min	
ATT1 Engine Speed Increase/Decrease	10 min ⁻¹	-500 to 200	0 min ⁻¹	
ATT1 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT1 Selector Valve Selection	-	C/V or 0/T	0/T	
ATT1 Accumulator Selection	-	ON/OFF	OFF	
ATT1 2-Speed Selection	-	ON/OFF	OFF	
ATT2 ATT Ture (No.		04- 5	Deceler 0	
ATT2 ATT Type/No.	-	0 to 5	Breaker 2	_
ATT2 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212	212 L/min	
ATT2 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212	212 L/min	
ATT2 Engine Speed Increase/Decrease	10 min ⁻¹	-500 to 200	0 min ⁻¹	
ATT2 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT2 Selector Valve Selection	-	C/V or 0/T	0/T	
ATT2 Accumulator Selection	-	ON/OFF	ON	
ATT2 2-Speed Selection	-	ON/OFF	OFF	
ATT3				
ATT3 ATT Type/No.	-	0 to 5	Secondary Crusher 1	
ATT3 P1 Max Swash Angle Adjustment	0.5 L/min	106 to 212	212 L/min	
ATT3 P2 Max Swash Angle Adjustment	0.5 L/min	106 to 212	212 L/min	
ATT3 Engine Speed Increase/Decrease	10 min ⁻¹	-500 to 200	200 min ⁻¹	
ATT3 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT3 Selector Valve Selection	-	C/V or 0/T	0/T	
ATT3 Accumulator Selection	-	ON/OFF	OFF	
ATT3 2-Speed Selection	-	ON/OFF	ON	

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

NOTE: 1 MPa=10.197 kgf/cm² 1 kgf/cm²=0.098 MPa

NOTE: ATT: Attachment ATT: Attachment BR: Hydraulic Breaker BK: Digging

PU: Secondary Crusher

CR: Primary Crusher VI: Vibrating Hammer

ZX240-3 class

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

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

NOTE: 1 MPa=10.197 kgf/cm² 1 kgf/cm²=0.098 MPa

NOTE: ATT: Attachment BK: Digging

BR: Hydraulic Breaker CR: Primary Crusher VI: Vibrating Hammer PU: Secondary Crusher

ZX270-3 class

ZX2/U-3 Class	Min.	Adjustable Range	Standard	Remarks
Adjustment Data	Adjustment Value	Range	Adjustment	
ATT1				
ATT1 ATT Type/No.	-	0 to 5	Breaker 1	
ATT1 P1 Max Swash Angle Adjustment	0.5 L/min	118 to 236	236 L/min	
ATT1 P2 Max Swash Angle Adjustment	0.5 L/min	118 to 236	236 L/min	
ATT1 Engine Speed Increase/Decrease	10 min ⁻¹	-500 to 100	0 min ⁻¹	
ATT1 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT1 Selector Valve Selection	-	C/V or 0/T	0/T	
ATT1 Accumulator Selection	-	ON/OFF	OFF	
ATT1 2-Speed Selection	-	ON/OFF	OFF	
ATT2				
ATT2 ATT Type/No.	-	0 to 5	Breaker 2	
ATT2 P1 Max Swash Angle Adjustment	0.5 L/min	118 to 236	236 L/min	
ATT2 P2 Max Swash Angle Adjustment	0.5 L/min	118 to 236	236 L/min	
ATT2 Engine Speed Increase/Decrease	10 min ⁻¹	-500 to 100	0 min ⁻¹	
ATT2 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT2 Selector Valve Selection	-	C/V or 0/T	0/T	
ATT2 Accumulator Selection	-	ON/OFF	ON	
ATT2 2-Speed Selection	-	ON/OFF OFF		
ATT3				
ATT3 ATT Type/No.	-	0 to 5	Secondary Crusher 1	
ATT3 P1 Max Swash Angle Adjustment	0.5 L/min	118 to 236	236 L/min	
ATT3 P2 Max Swash Angle Adjustment	0.5 L/min	118 to 236	236 L/min	
ATT3 Engine Speed Increase/Decrease	10 min ⁻¹	-500 to 100	100 min ⁻¹	
ATT3 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT3 Selector Valve Selection	-	C/V or 0/T	C/V	
ATT3 Accumulator Selection	-	ON/OFF	OFF	
ATT3 2-Speed Selection	-	ON/OFF	ON	

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

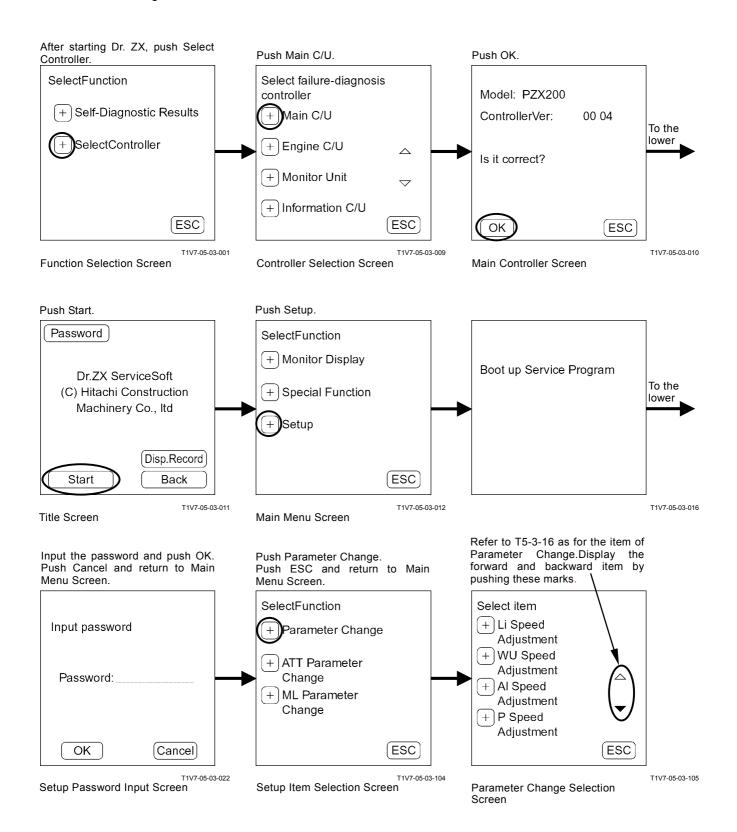
NOTE: 1 MPa=10.197 kgf/cm² 1 kgf/cm²=0.098 MPa

NOTE: ATT: Attachment BK: Digging BR: Hydraulic Breaker PU: Secondary Crusher

CR: Primary Crusher
VI: Vibrating Hammer

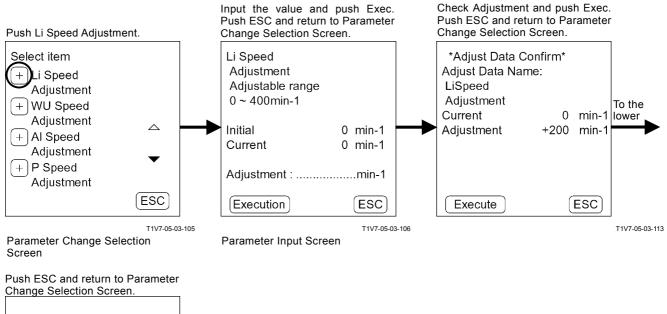
Setting

· Parameter Change



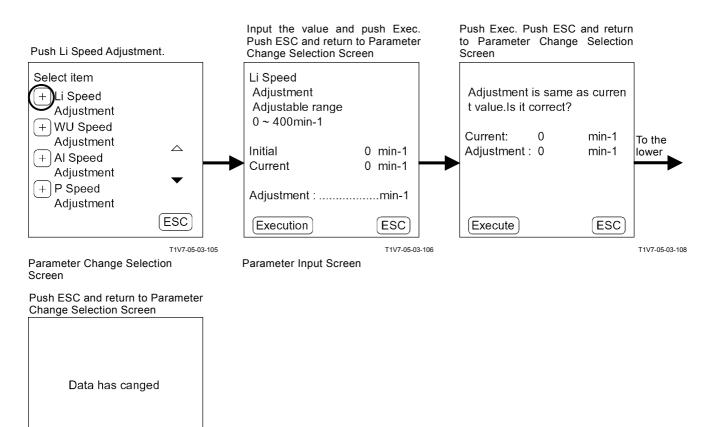
Parameter Input

Example: Li Speed Adjustment Input Value = Normal Value



Data has canged

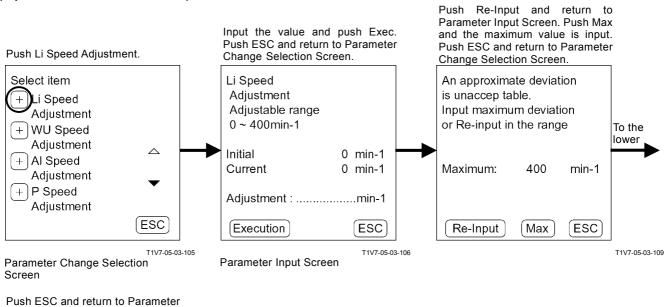
Input Value = Current Value



T1V7-05-03-107

ESC

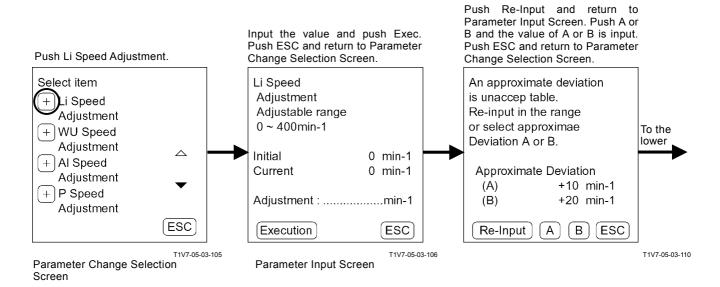
Input Value > Maximum Value (Input Value < Minimum Value)



Push ESC and return to Parameter Change Selection Screen.

Data has canged

When the input value cannot be divided

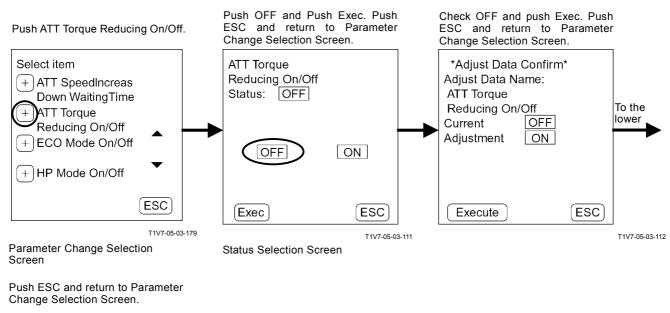


Push ESC and return to Parameter Change Selection Screen.



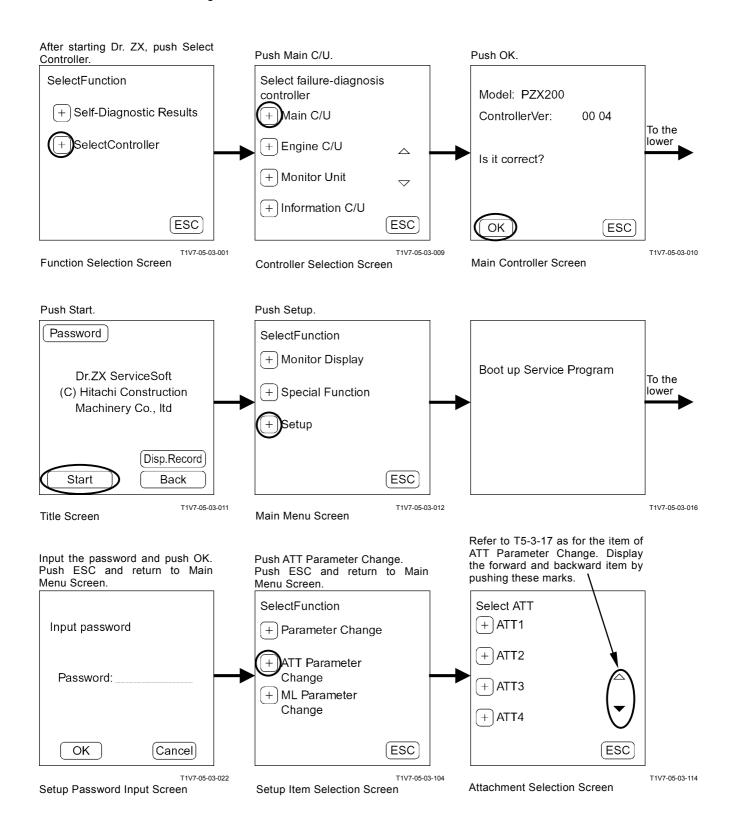
Status Selection

Example: ATT Torque Reducing On/Off: Off

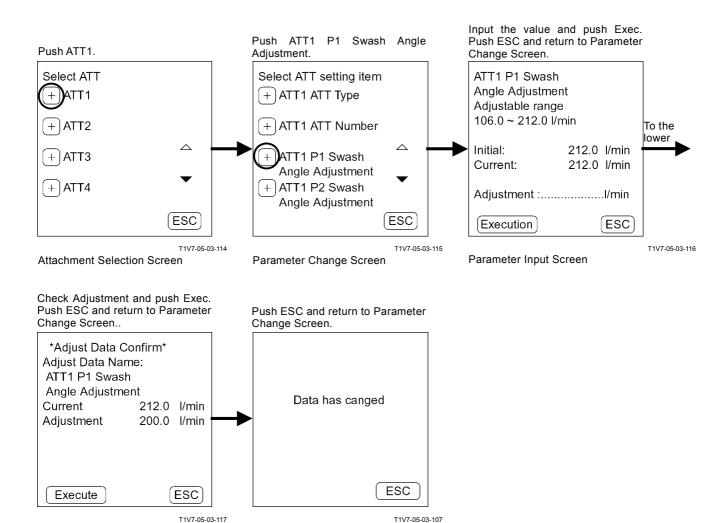




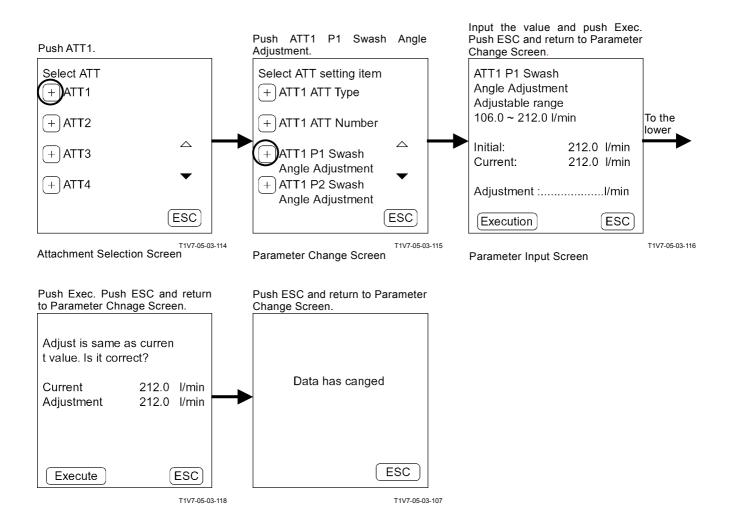
• Attachment Parameter Change



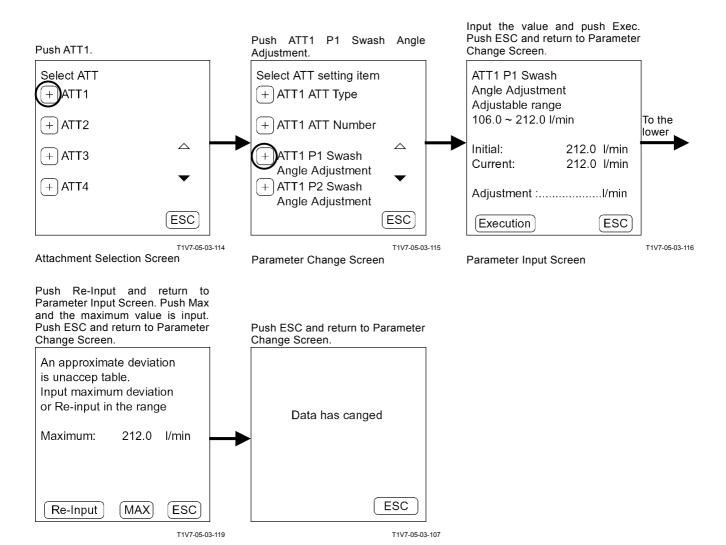
Attachment Parameter Input Input Value = Normal Value



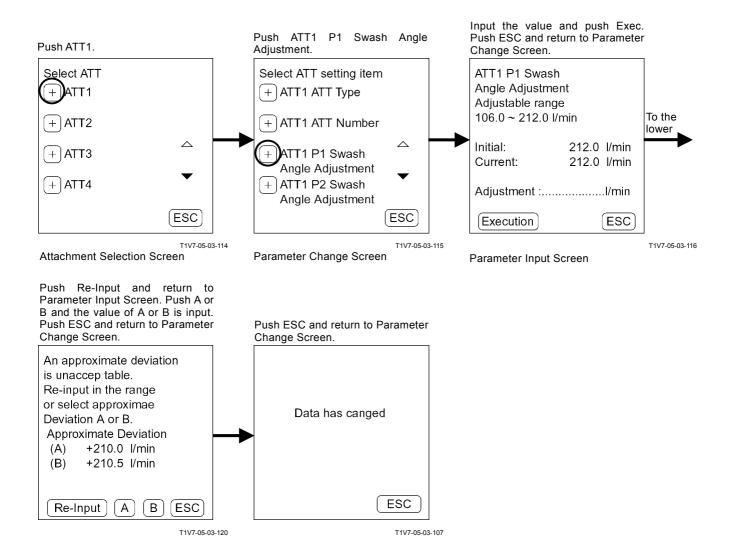
Input Value = Current Value



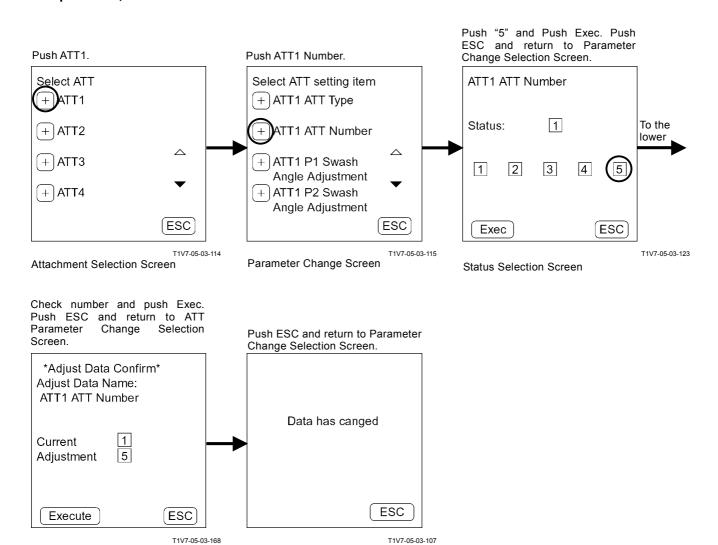
Input Value > Maximum Value (Input Value < Minimum Value)



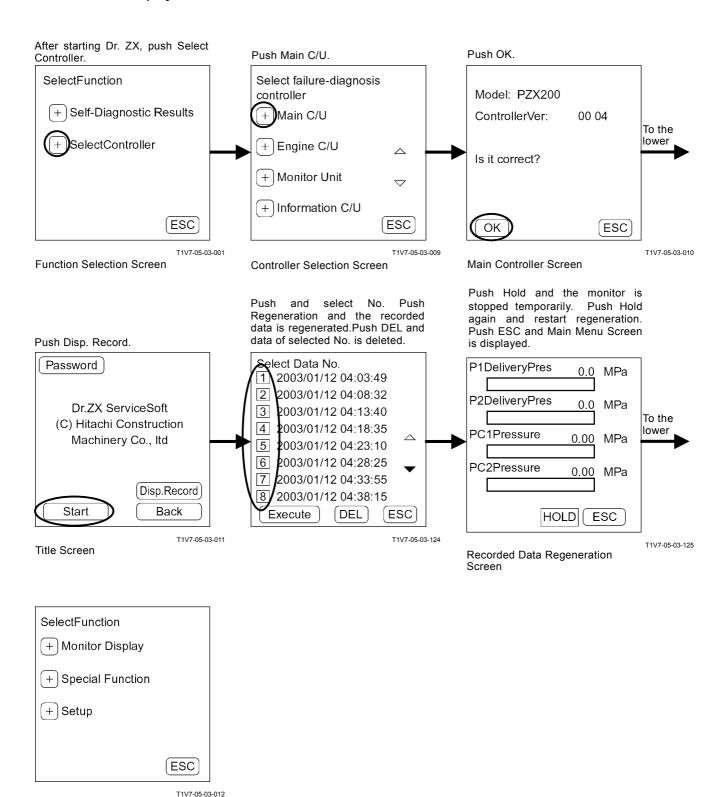
When the input value cannot be divided



Status Selection Example: ATT1, ATT No.

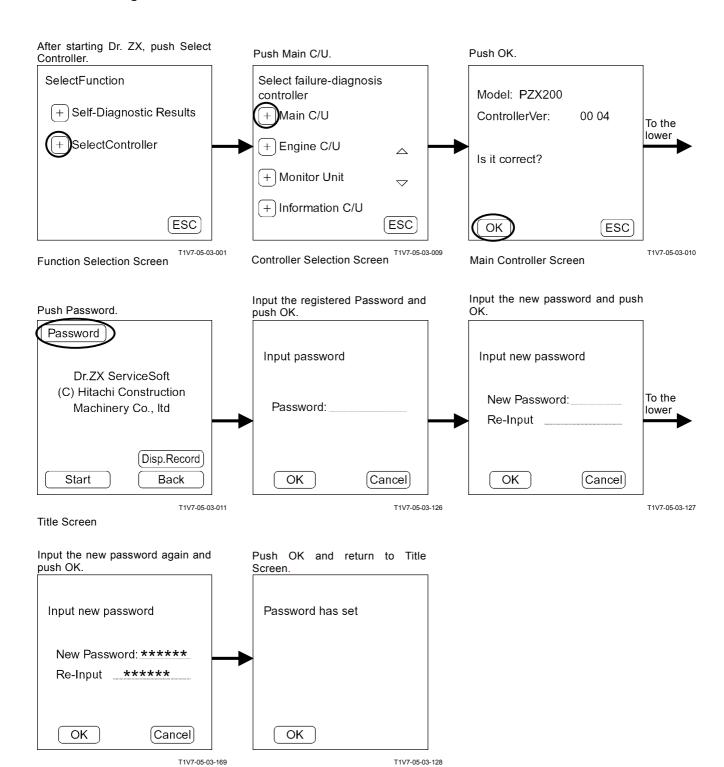


Recorded Data Display



Main Menu Screen

Password Change



Monitor Unit

Kev 2

.₩ork Mode

Breaker 1

Breaker 2

2

Pulverizer 4

Crusher 1

Ä 🗆

(F4)

Work Mode Screen

ATTACHMENT SETTING

When the attachment is set by Dr. ZX, the attachment specification screen can be selected and displayed on the work mode screen of monitor unit.

(Push key 2 and select Breaker 1 in this group.)

NOTE: Refer to the monitor unit group as for the display on work mode screen of monitor unit.

When pushing key 6 and displaying the primary screen, the attachment mode which is selected on display the

work mode is displayed.

Work Mode Display Attachment Mode

Breaker



T1V1-05-01-104



T1V1-05-01-105

Crusher



T1V1-05-01-106

210 L/min Maximum Pump Flow Rate 1900 min⁻¹ Maximum Engine Speed Valve Selector O/T Accumulator OFF 2-Speed Selector OFF 2ndary Hydraulic Relief Selector ON Key 6

☆Breaker 1

Attachment Specification Screen (Breaker 1)

Vibrating Hammer



T1V1-05-01-107

Others



T1V1-05-02-003

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

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

7777.7h Work Mode 8:01

T1V1-05-03-006

T1V5-05-01-109

T1V5-05-01-001

Primary Screen

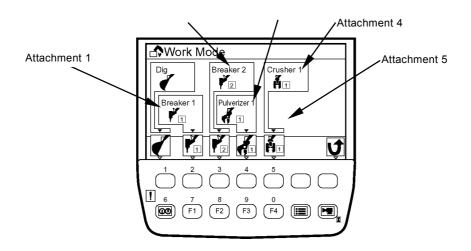
Five kinds attachment can be selected from Breaker 1 to 5, pulverizer 1 to 5, crusher 1 to 5, vibrating hammer 1 to 5 and others 1 to 5. (Refer to T5-3-17, 18.)

NOTE: Attachment setting at the time of shipping

from the factory

Attachment 1: Breaker 1 Attachment 2: Breaker 2 Attachment 3: Pulverizer 1 Attachment 4: Crusher 1 Attachment 5: Non-setting

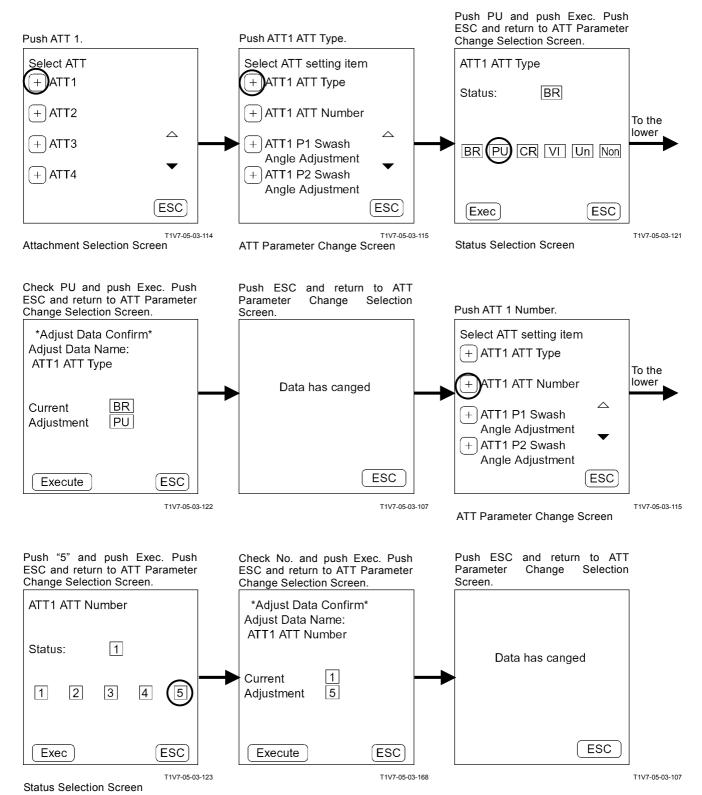
Attachment 2 Attachment 3



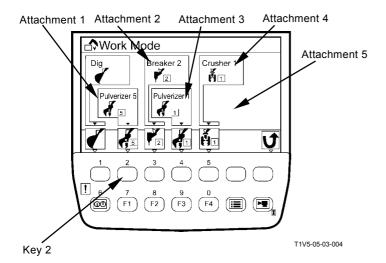
T1V5-05-01-109

Attachment Setting

Example: Set Pulverizer 5 to Attachment 1



When the work mode screen of monitor unit is displayed, Pulverizer 5 is displayed at Attachment 1. When pushing key 2, Pulverizer 5 is selected and the Pulverizer 5 specification screen is displayed.

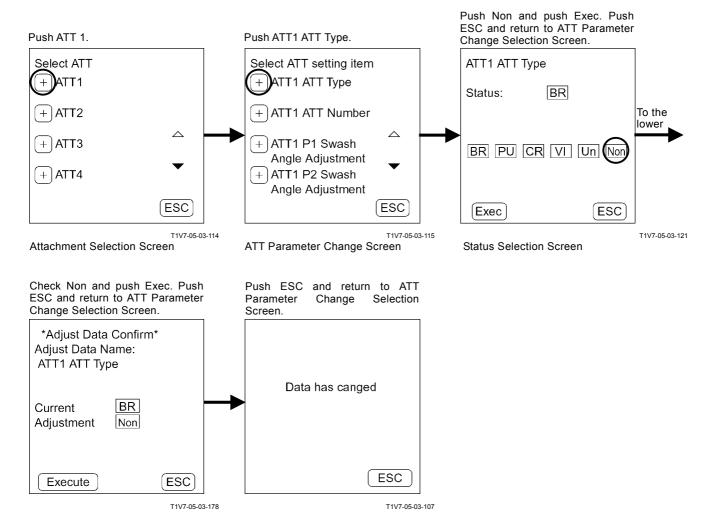


Attachment Non-Setting

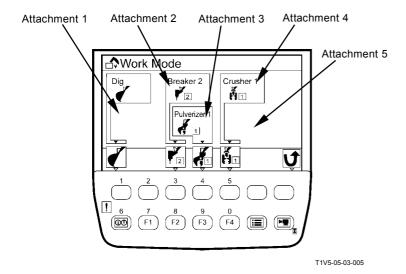
IMPORTANT: When the attachment is

"non-setting", the attachment cannot be selected on the monitor unit.

Example: Set Attachment to Non-Setting



When the work mode of monitor unit is displayed, attachment 1 display disappears.



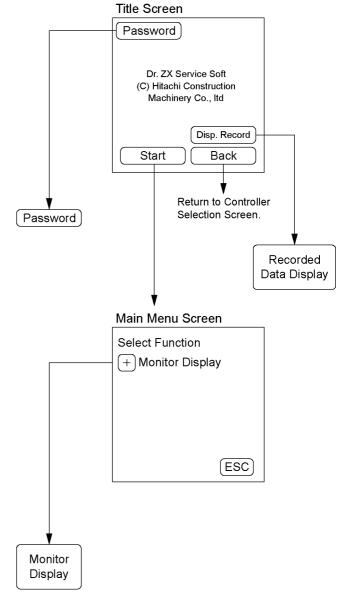
ENGINE CONTROLLER

Main Menu

- Monitor Display
 Dr. ZX displays the input signals from sensors and the control signals of ECM.
- Recorded Data Display
 Data recorded in ECM is displayed by one day by using Dr. ZX.

Password Change

The password can be changed.

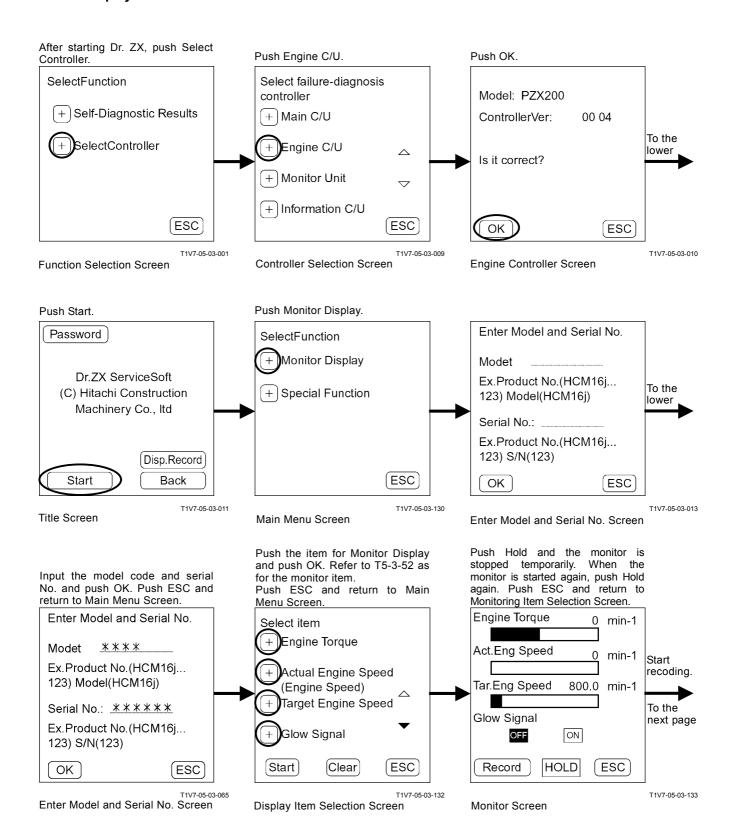


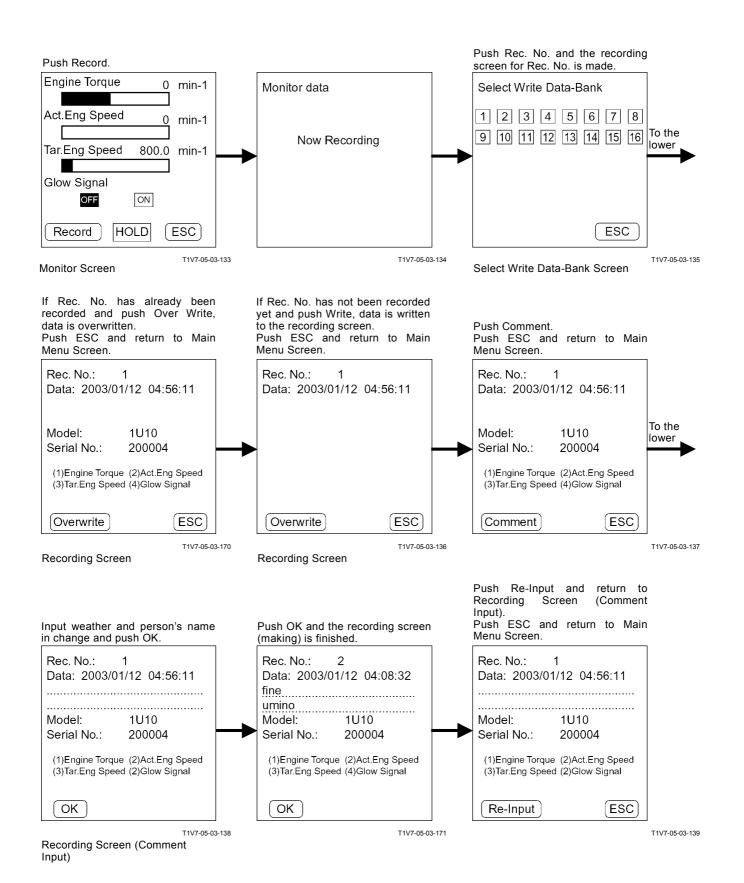
MAIN MENU MONITOR DISPLAY

List of Monitor Item

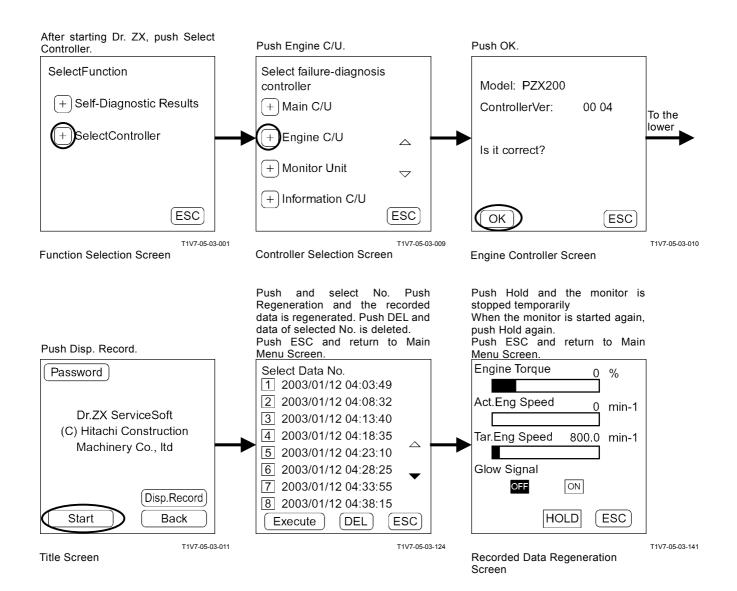
Item		Unit	Data	
Selecting	Monitoring	Offic	Dala	
Engine Torque	Engine Torque	%	Input signal from ECM	
Actual Engine Speed (Engine Speed)	Actual Engine Speed	min ⁻¹	Input signal from crank speed sensor and cam angle sensor	
Target Engine Speed	Target Engine Speed	min ⁻¹	Input signal from engine control dial	
Glow Signal	Glow Signal	OFF, ON	Glow relay ON/OFF status	
Coolant Temperature (Engine Coolant Temperature)		°C	Input signal from coolant temperature sensor	
Fuel Temperature	Fuel Temperature	°C	Input signal from fuel sensor	
Engine Oil Pressure	Engine Oil Pressure	kPa	Input signal from engine oil pressure sensor	
Fuel Flow Rate	Fuel Flow	L/h	Input signal from ECM	
Atmospheric Pressure	Barometric Pressure	kPa	Input signal from atmospheric pressure sensor	
Suction Temperature (Intake Air Temperature)	Intake Air Temperature	°C	Input signal from intake-air temperature sensor	
Boost Pressure	Boost Pressure	kPa	Input signal from boost pressure sensor	
Boost Temperature	Boost Temperature	°C	Input signal from boost temperature sensor	
Battery Voltage	Battery Voltage	V	Input signal from ECM	
Total Amount of Fuel Use	Total Used Fuel	L	Input signal from ECM	

Monitor Display

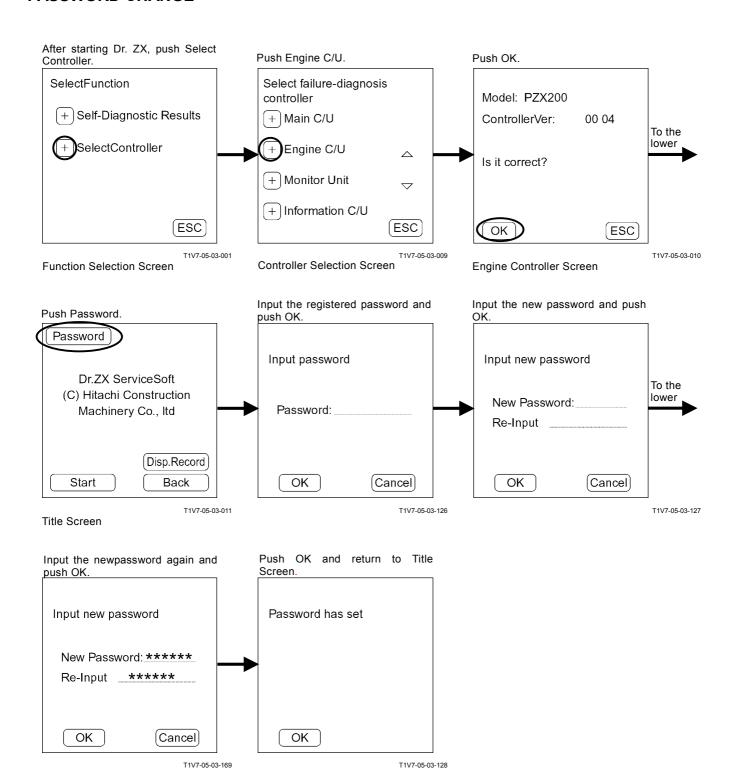




RECORED DATA DISPLAY



PASSWORD CHANGE



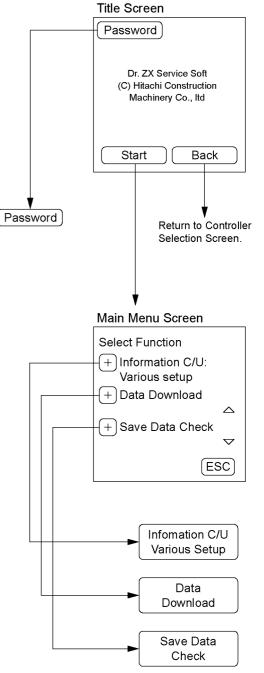
ICF CONTROLLER

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.

Password Change

The password can be changed.

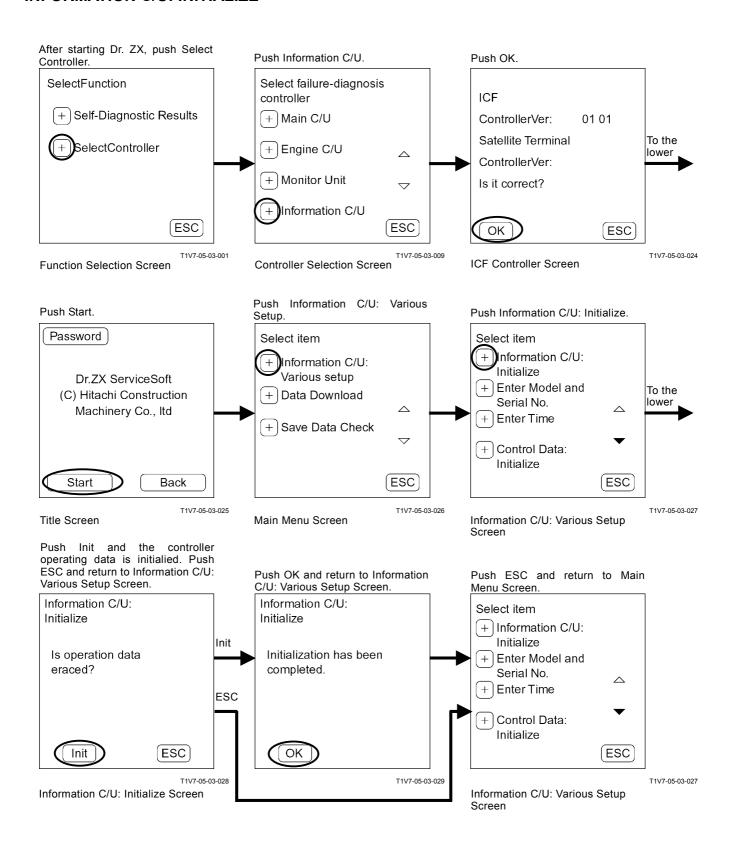


MAIN MENU INFORMATION C/U VARIOUS SETUP

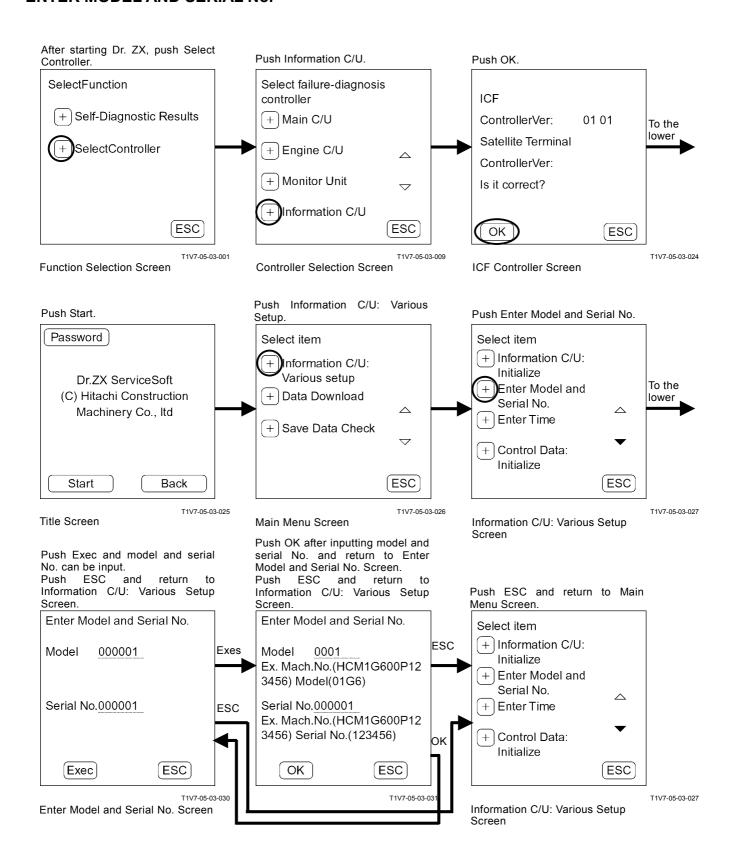
List of Controller Data Setting Item

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		YY	2000 to 2100
	Date	MM	1 to 12
		DD	1 to 31
	Time	HH	0 to 23
	Time	MM	0 to 59
Control Data: Initialize			Initialize/ESC
Satellite Terminal: Initialize			DEL/ESC
Satelite Terminal No. Confirmatio	n		12 digits: 0 to 9, A to Z
Communicating State Check	ICF < = > Satellite	Connect	Conn/UnConn
	Terminal	Comm.	OK/NG
	Satellite Terminal	Power	ON/OFF
	Satellite Terrillial	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			

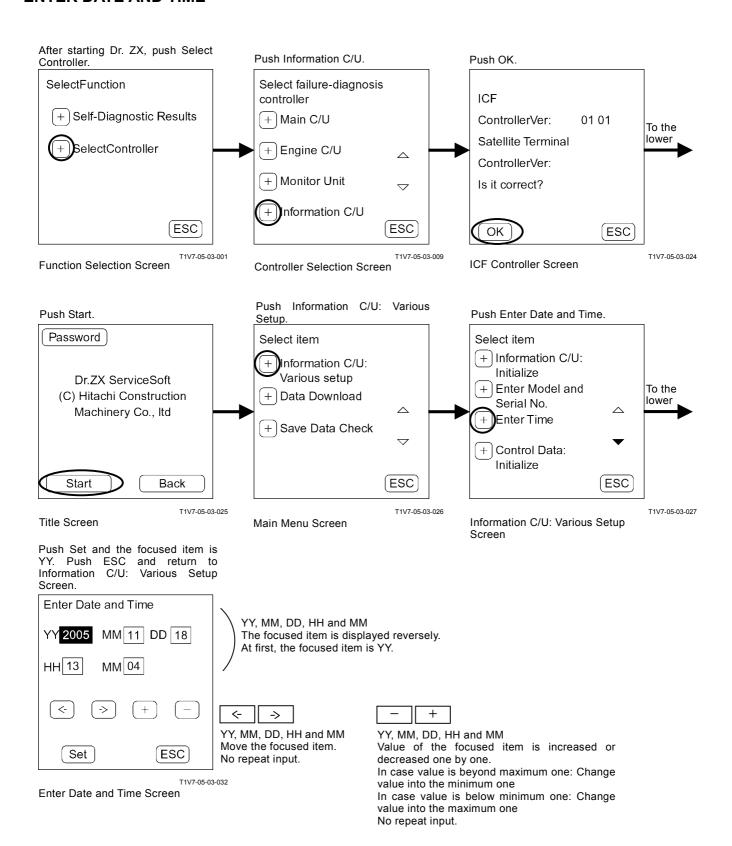
INFORMATION C/U: INITIALIZE



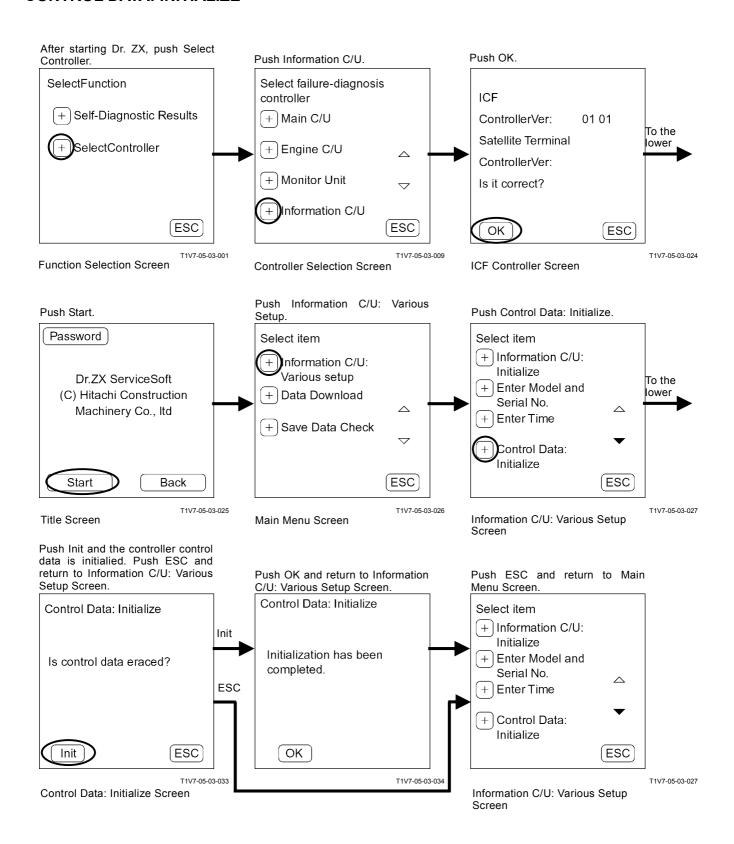
ENTER MODEL AND SERIAL No.



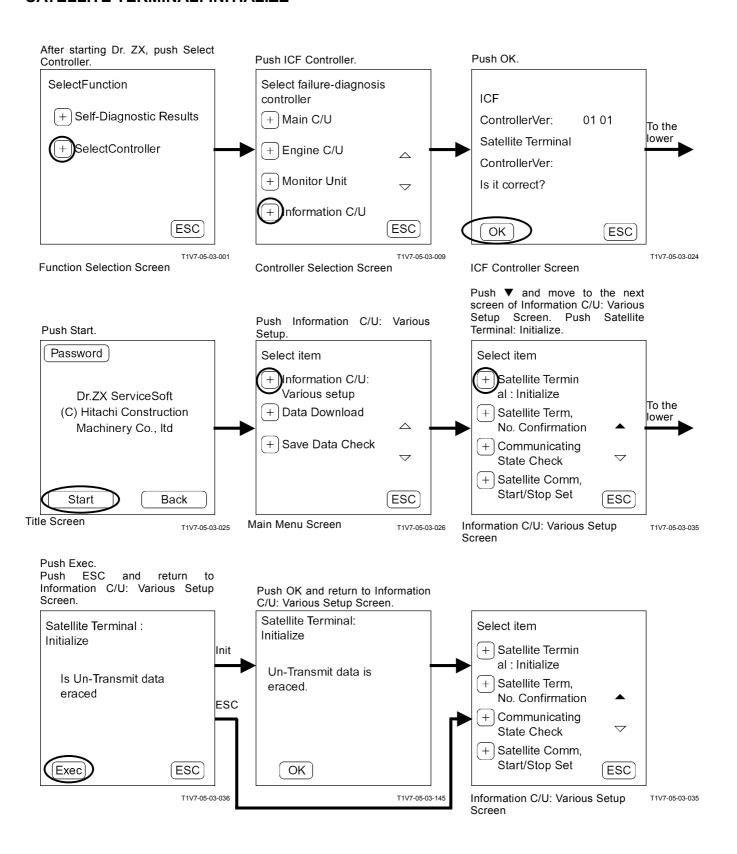
ENTER DATE AND TIME



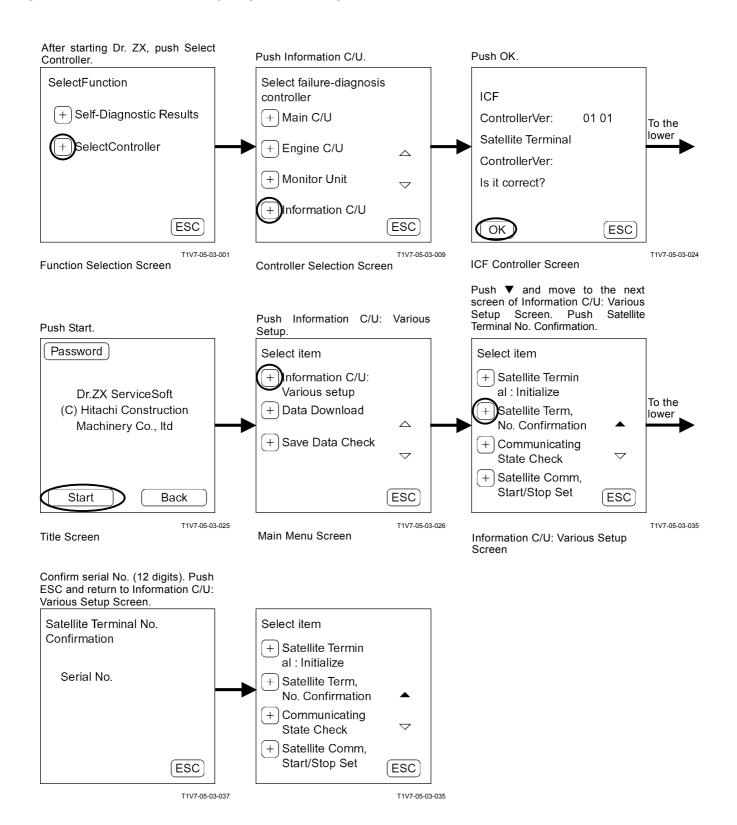
CONTROL DATA: INITIALIZE



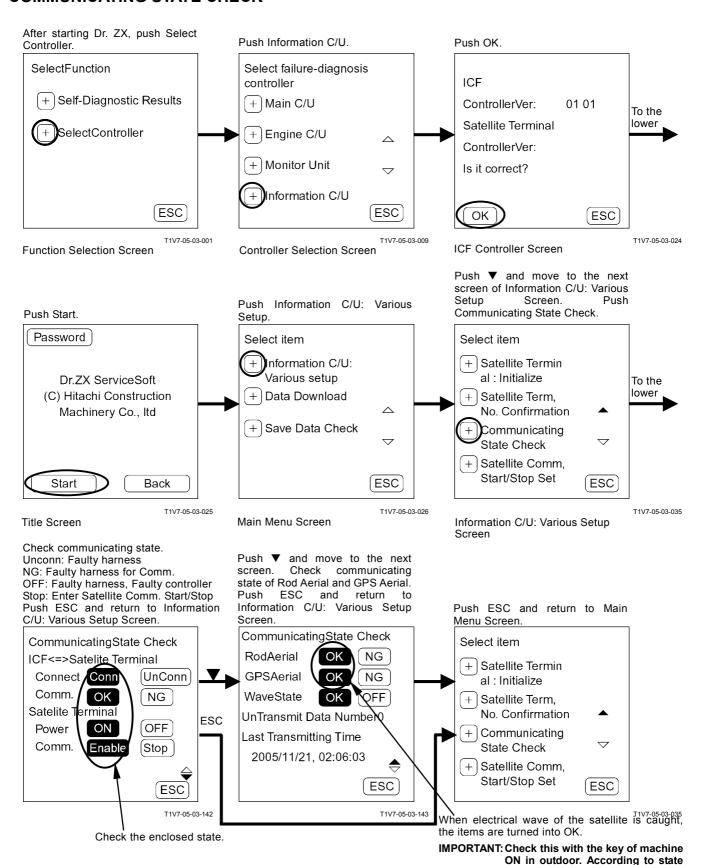
SATELLITE TERMINAL: INITIALIZE



SATELLITE TERMINAL No. CONFIRMATION



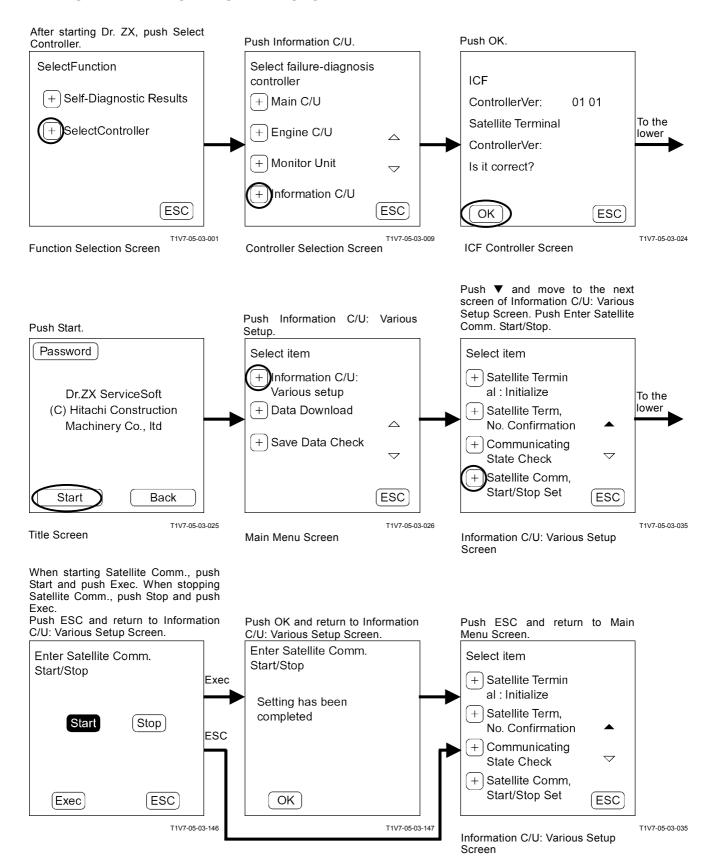
COMMUNICATING STATE CHECK



of electrical wave, it may take a

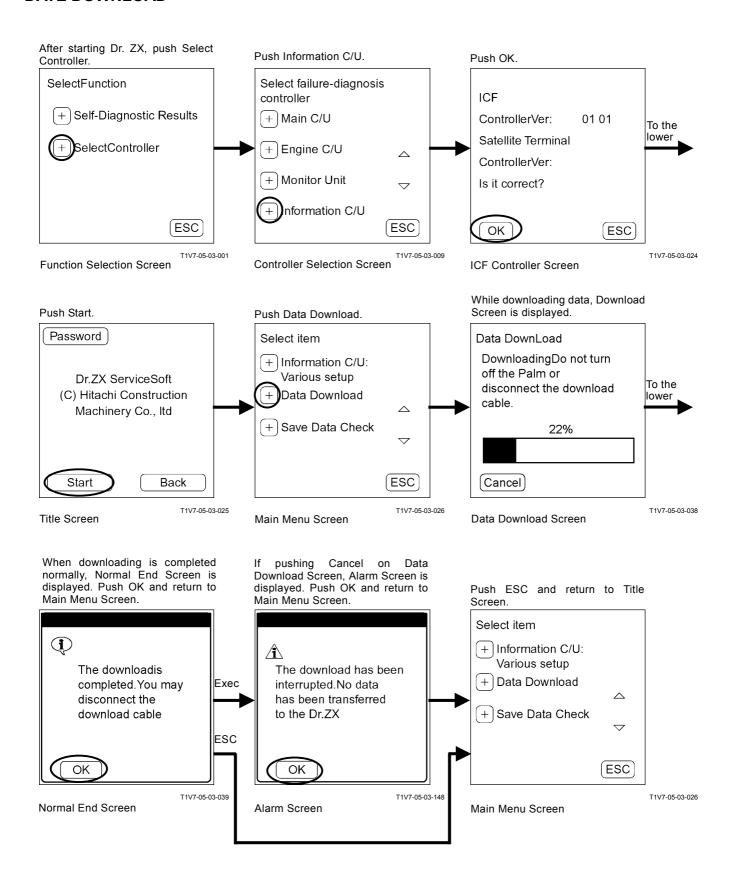
little longer time.

ENTER SATELLITE COMM. START / STOP

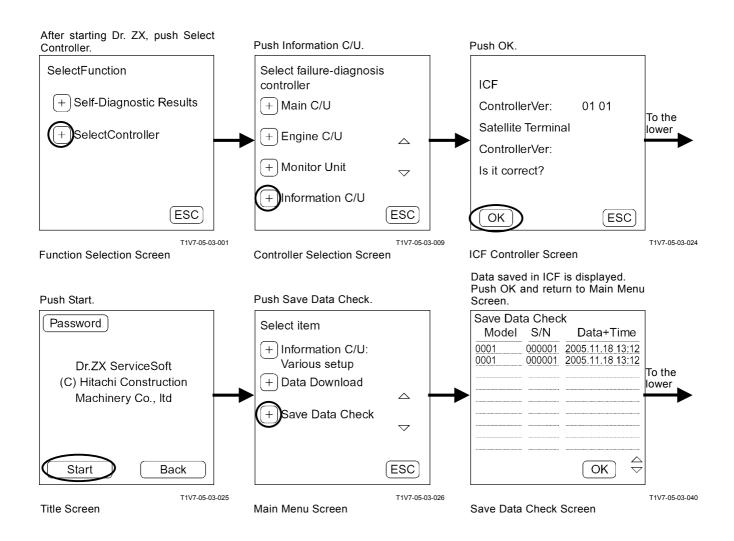


(Blank)

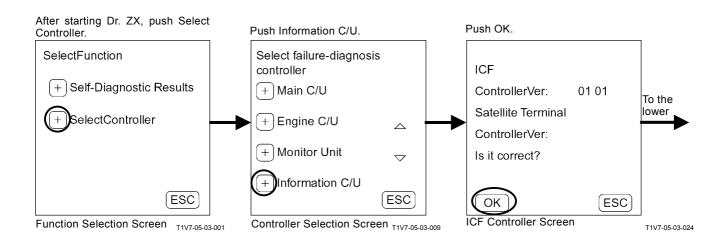
DATE DOWNLOAD

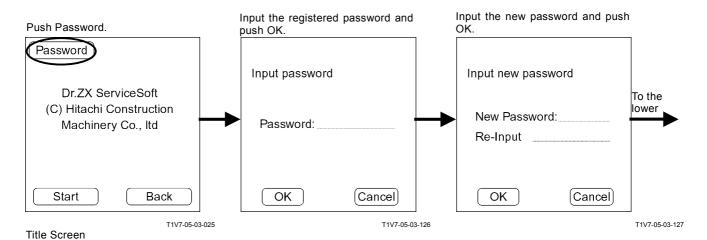


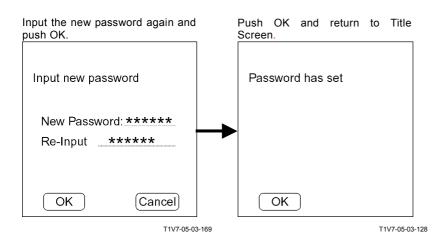
SAVE DATA CHECK



PASSWORD CHANGE







MONITOR CONTROLLER

Main Menu

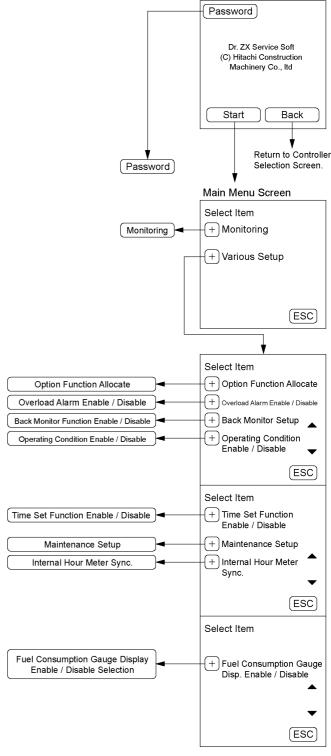
Monitoring

Dr. ZX displays the control signals of each controller and the input signals from each sensor.

· Various Settings

Dr. ZX can set optional function setting, back monitor setting, operating condition enable/ disable, time set function enable / disable, maintenance setting, inner hour meter synchronization and fuel consumption gauge display ON/OFF selection.

Password Change
The password can be changed.



Title Screen

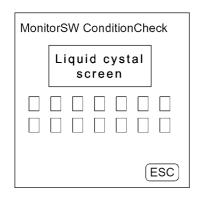
T1V7-05-03-167

MONITORING

List of Monitoring Item

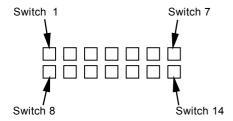
Item		Unit	Data
Selecting	Monitoring	Offic	Data
Monitor Switch	*	**	Switch state of monitor unit
Condition Check			
Radiator Coolant	Coolant	°C	Input signal from coolant temperature sensor
Temperature	Temperature		
Fuel Level	Fuel Level	%	Input signal from fuel sensor
Security Signal	Security Signal	OFF, ON	Communication from monitor unit
ML Crane Switch	ML Crane Status	OFF, ON	ML crane mode ON/OFF status
Travel ML Crane	Travel ML Crane	OFF, ON	Travel ML crane mode ON/OFF status
Switch	Switch		
Mail Switch	Mail Switch	OFF, Fuel,	Operating state of mail
		Forwarding,	
		Repair,	
		General	

* Display when monitoring

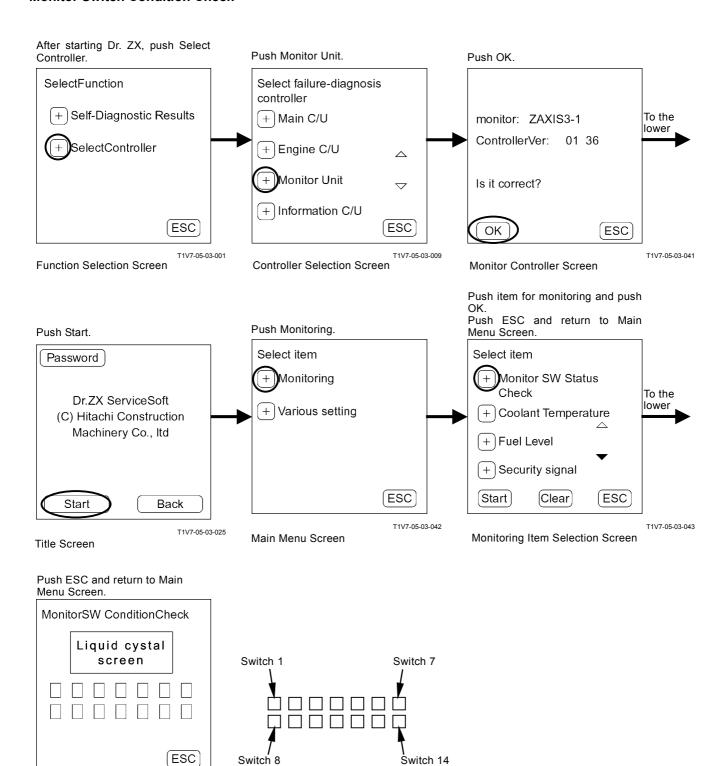


T1V7-05-03-044

** Unit



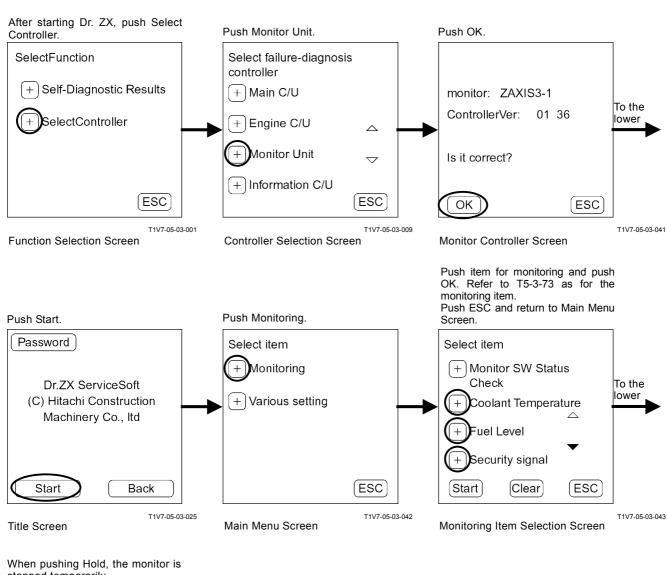
Monitor Switch Condition Check



Monitor Switch Condition Check Screen

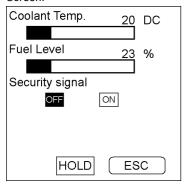
T1V7-05-03-044

Other Monitoring



stopped temporarily.

When re-starting the monitor, push Hold again. Push ESC and return to Monitoring Item Selection Screen.



T1V7-05-03-045

Monitoring Screen

VARIOUS SETTINGS

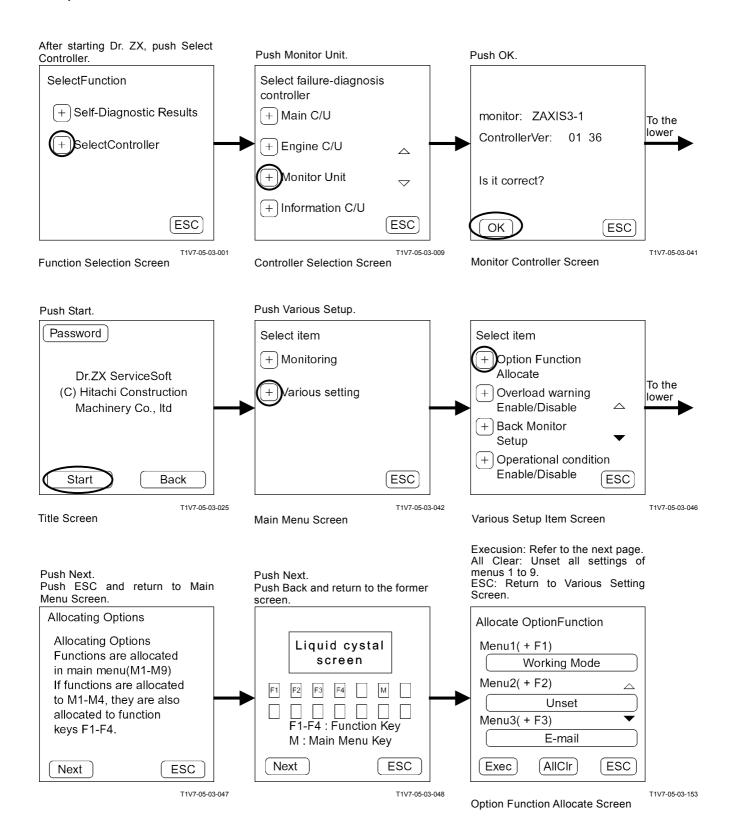
List of Various Setup Item

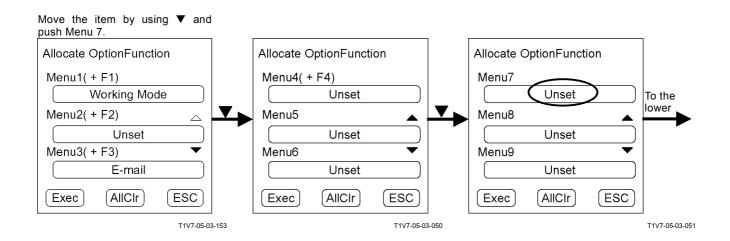
	Item	Unit
Optional Function	M1 (Optional Function 1 Allocate)	
	M2 (Optional Function 2 Allocate)	Unset
	M3 (Optional Function 3 Allocate)	Work Mode Function
	M4 (Optional Function 4 Allocate)	ML Crane Function
	M5 (Optional Function 5 Allocate)	Mail Function
	M6 (Optional Function 6 Allocate)	Auto Lubrication Function
	M7 (Optional Function 7 Allocate)	Collision Prevention Function
	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 Syr	nc.	-
Fuel Consumption Ga	auge Display ON/OFF Selection	Disable/Enable

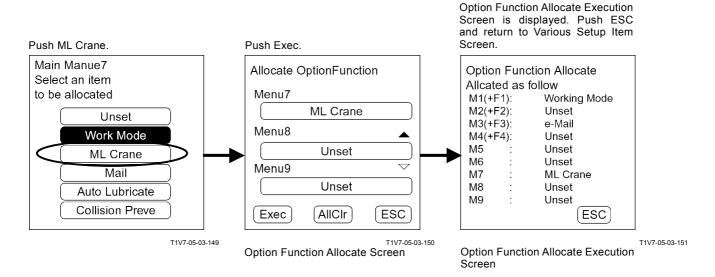
(Blank)

OPTIONAL FUNCTION ALLOCATION

Example: Allocate ML Crane for Menu 7







Function that can be selected: Unset

Work Mode ML Crane

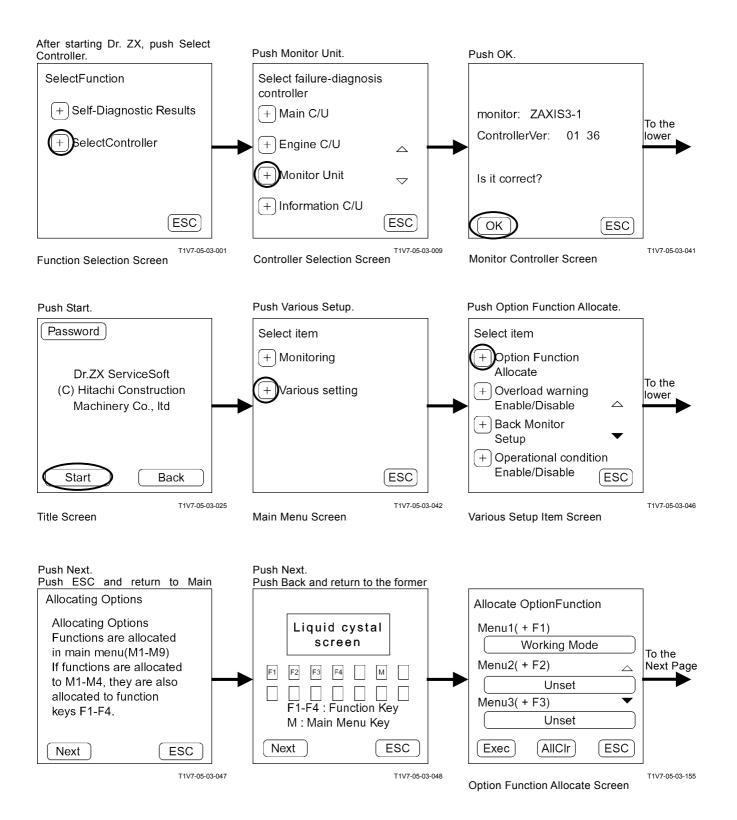
Collision Prevention Auto Lubrication

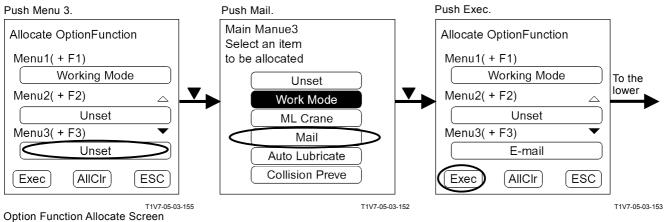
Mail

If the functions that can be selected are too much to be settled in one page, the next page can be displayed by using a page change button.

IMPORTANT: The function that has already been allocated cannot be selected.

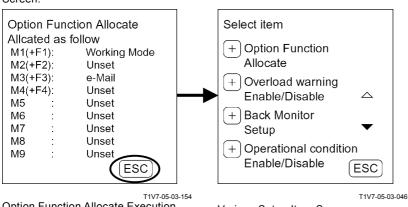
Allocate Mail for Menu 3





Option Function Allocate Screen

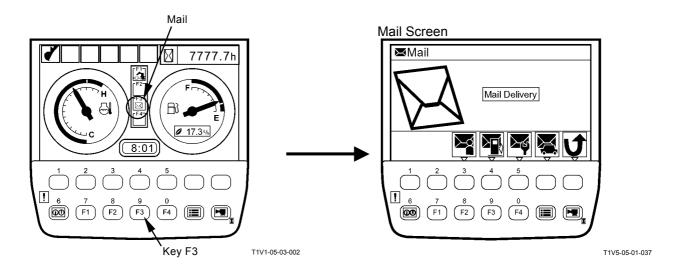
Option Function Allocate Execution Screen is displayed. Push ESC and return to Various Setup Item Screen.



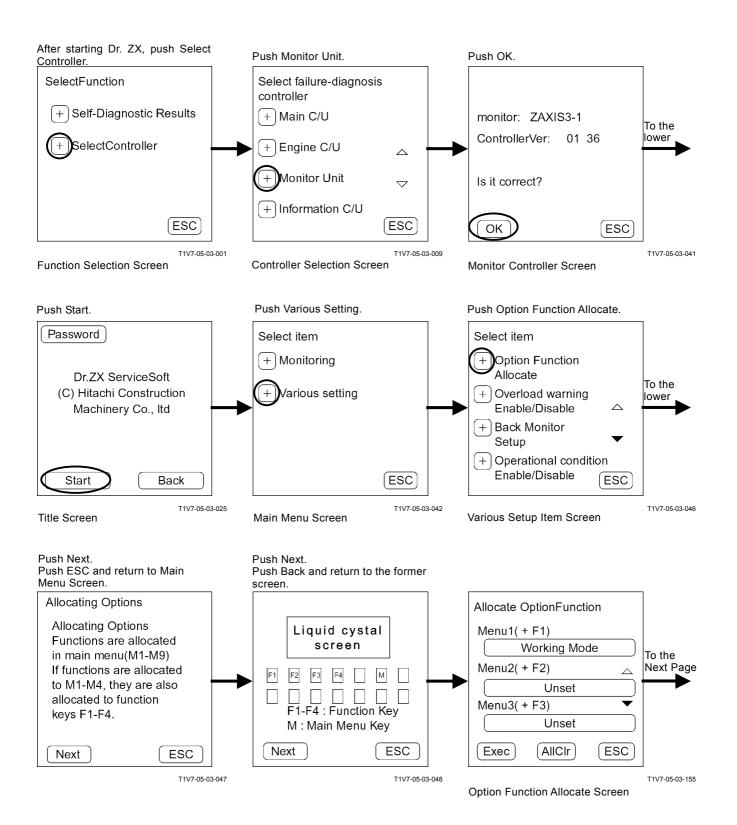
Option Function Allocate Execution Screen

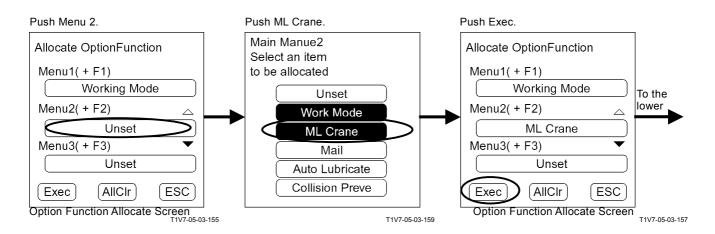
Various Setup Item Screen

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

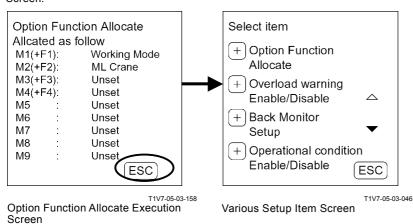


Allocate ML Crane for Menu 2

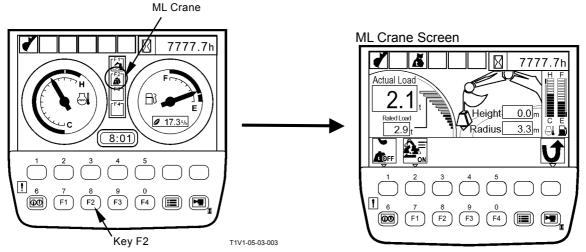




Option Function Allocate Execution Screen is displayed. Push ESC and return to Various Setup Item Screen

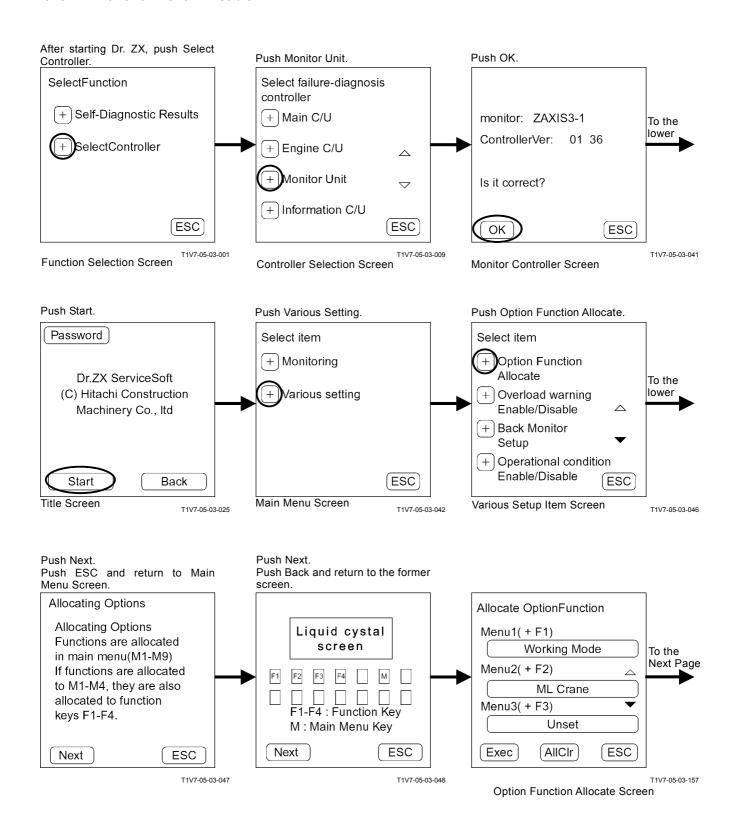


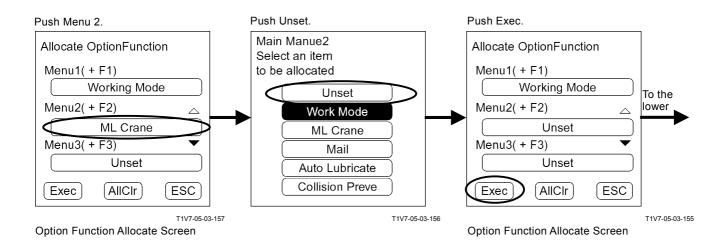
ML Crane is displayed on the monitor unit screen. When pushing key F2, ML Crane Screen is displayed



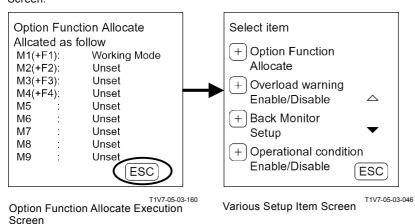
T1V5-05-01-029

Make ML Crane for Menu 2 Disable

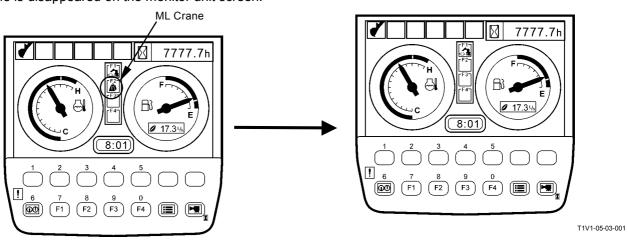




Option Function Allocate Execution Screen is displayed. Push ESC and return to Various Setup Item Screen.



ML Crane is disappeared on the monitor unit screen.

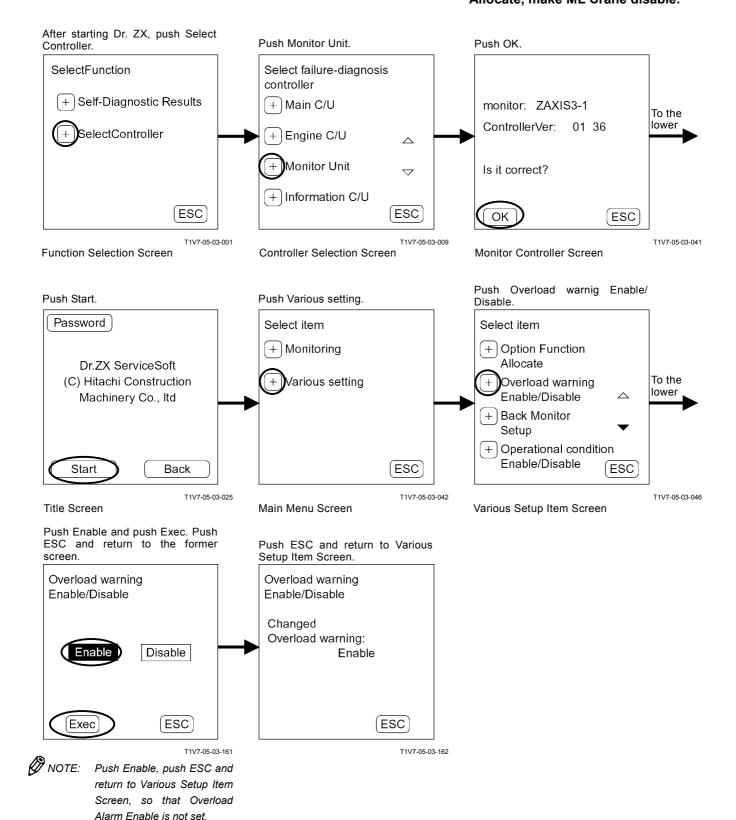


T1V1-05-03-003

OVERLOAD ALARM ENABLE / DISABLE SELECTION

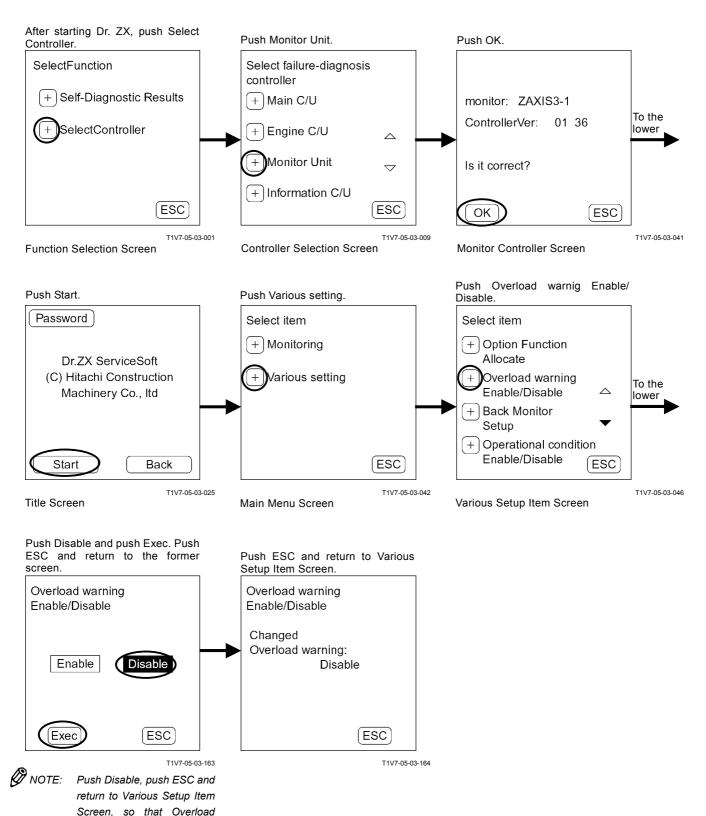
Overload Alarm: Enable

IMPORTANT: In case ML Crane is set to any one of Menu 1 to 9 of Option Function Allocate, make ML Crane disable.



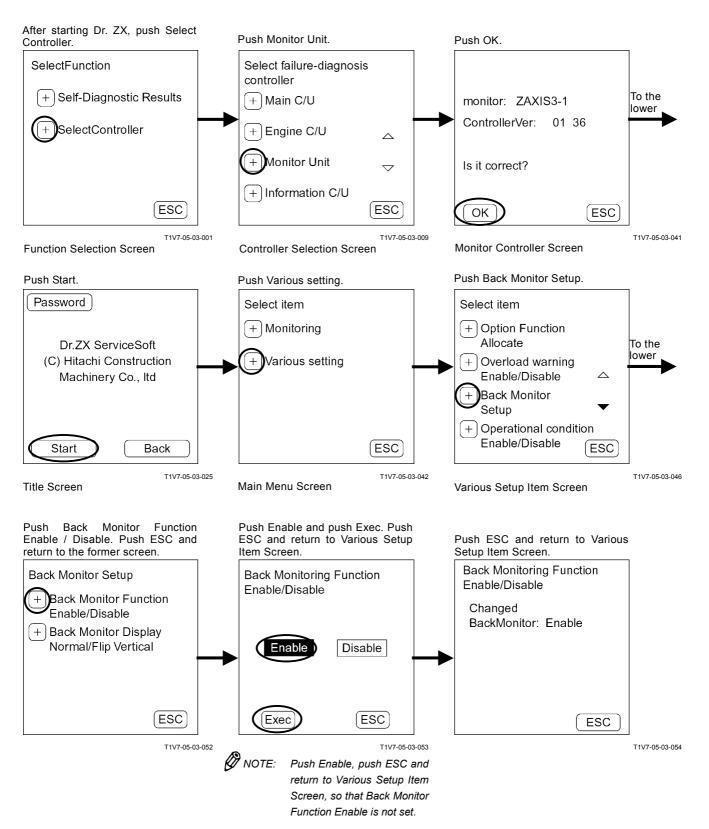
Overload Alarm: Disable

Alarm Disable is not set

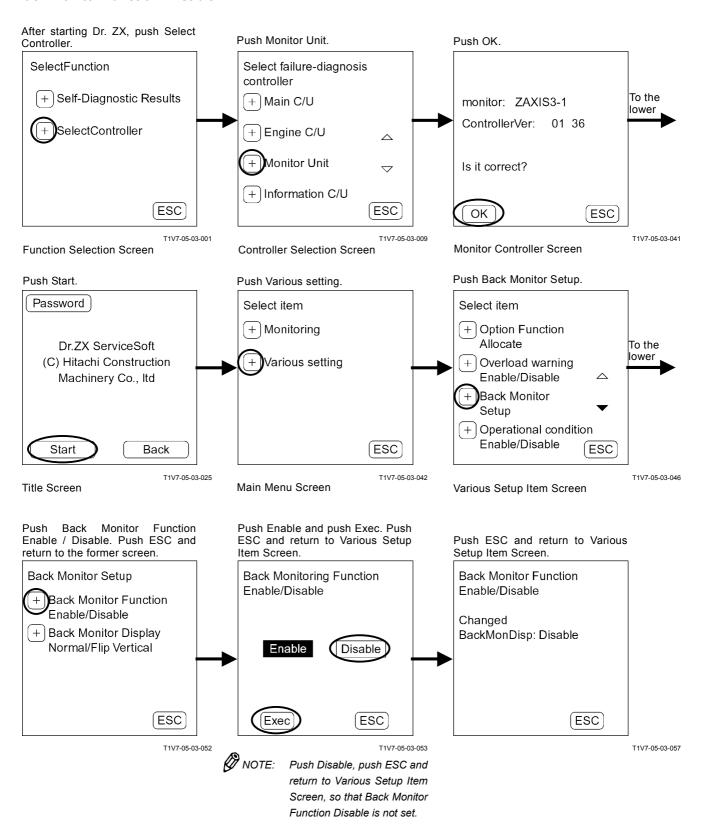


BACK MONITOR SETTING

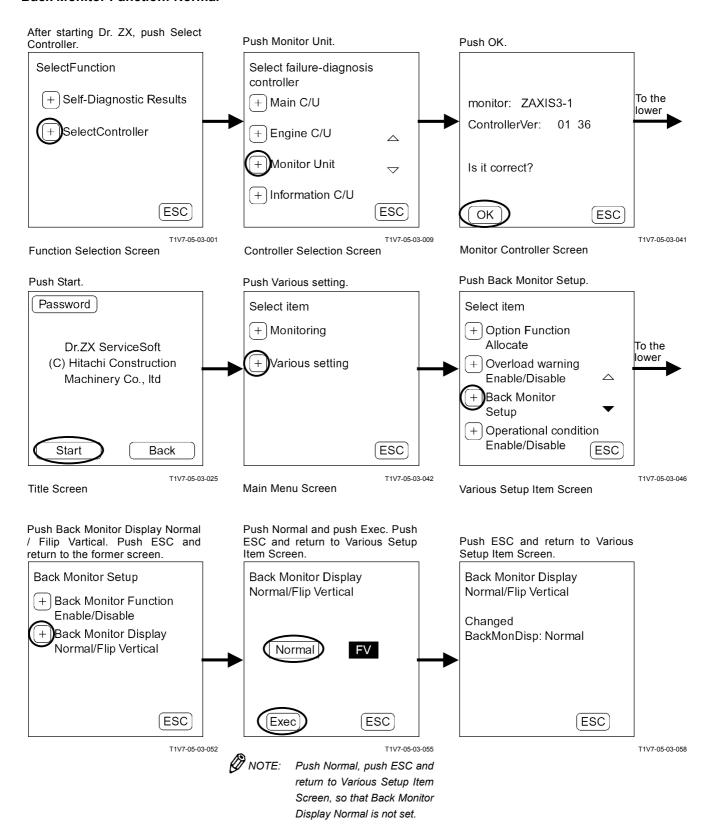
Back Monitor Function: Enable



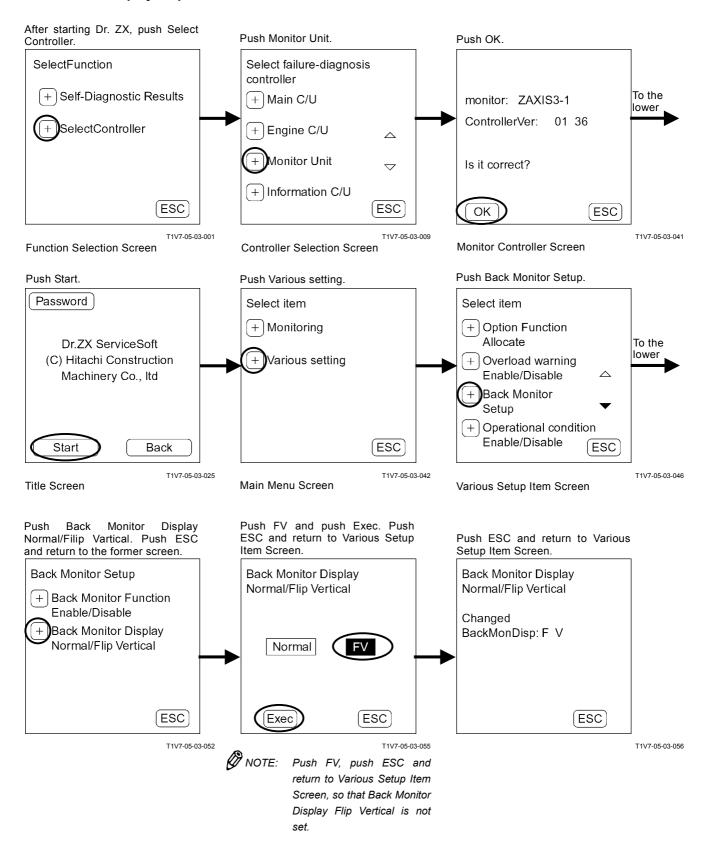
Back Monitor Function: Disable



Back Monitor Function: Normal

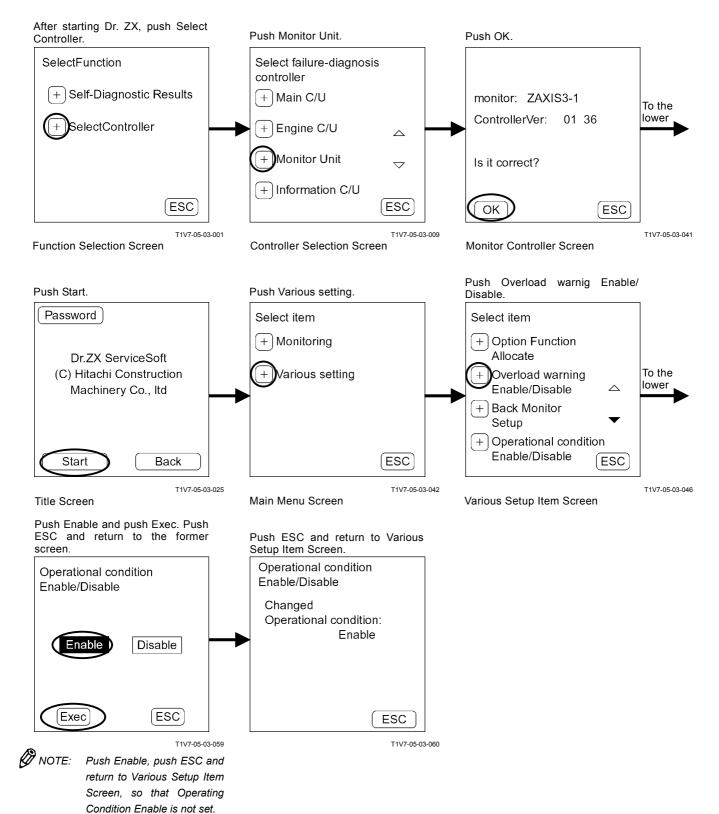


Back Monitor Display: Flip Vertical



OPERATING CONDITION ENABLE / DISABLE SELECTION





Operating Condition: Disable After starting Dr. ZX, push Select Push Monitor Unit. Push OK. Controller. SelectFunction Select failure-diagnosis controller + Self-Diagnostic Results + Main C/U monitor: ZAXIS3-1 To the ControllerVer: 01 36 lower SelectController + Engine C/U Monitor Unit Is it correct? + Information C/U ESC ESC OK ESC T1V7-05-03-001 T1V7-05-03-009 T1V7-05-03-041 **Function Selection Screen** Controller Selection Screen Monitor Controller Screen Push Overload warnig Enable/ Push Start. Push Various setting. Disable. Password Select item Select item + Option Function + Monitoring Allocate Dr.ZX ServiceSoft To the (C) Hitachi Construction Various setting Overload warning lower Machinery Co., Itd Enable/Disable \triangle + Back Monitor Setup + Operational condition Enable/Disable ESC ESC Start Back T1V7-05-03-025 T1V7-05-03-042 T1V7-05-03-046 Title Screen Main Menu Screen Various Setup Item Screen Push Enable and push Exec. Push ESC and return to the former Push ESC and return to Various screen. Setup Item Screen. Operational condition Operational condition Enable/Disable Enable/Disable Changed Operational condition: Disable Enable Disable Exec ESC ESC

T5-3-91

T1V7-05-03-062

T1V7-05-03-061

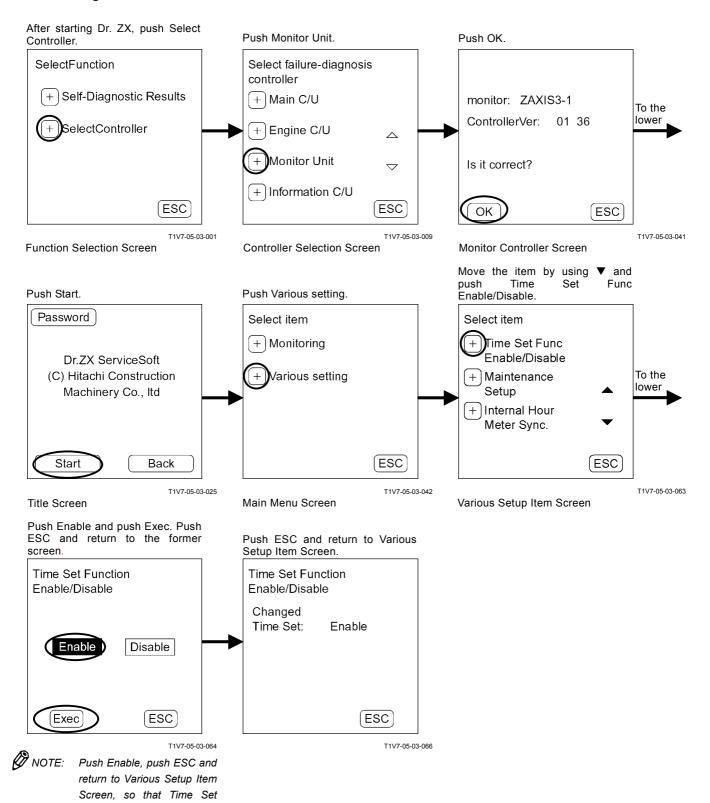
Push Disable, push ESC and return to Various Setup Item Screen, so that Operating Condition Disable is not set.

NOTE:

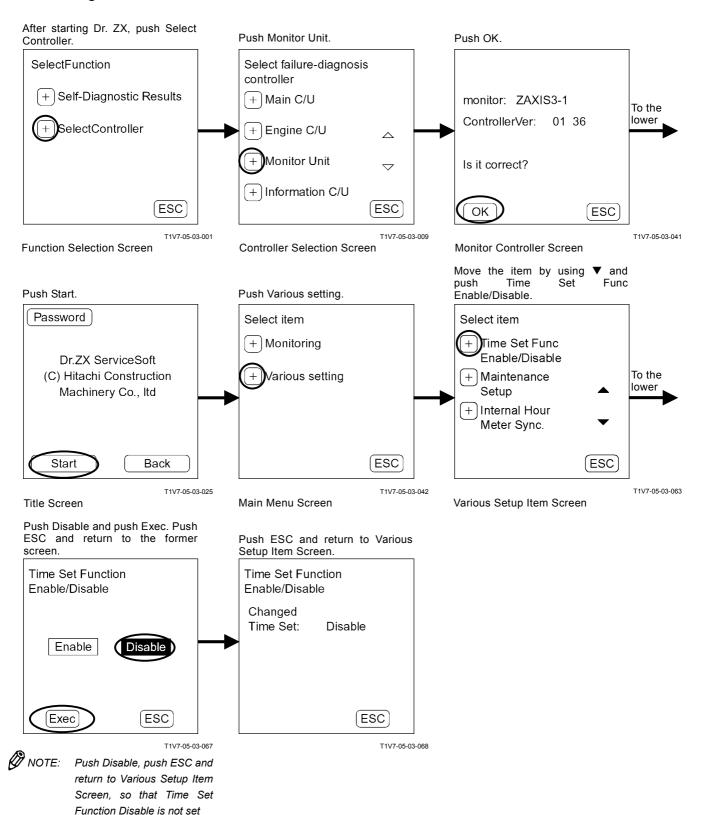
TIME SETTING FUNCTION ENABLE / DISABLE SELECTION

Time Setting Function: Enable

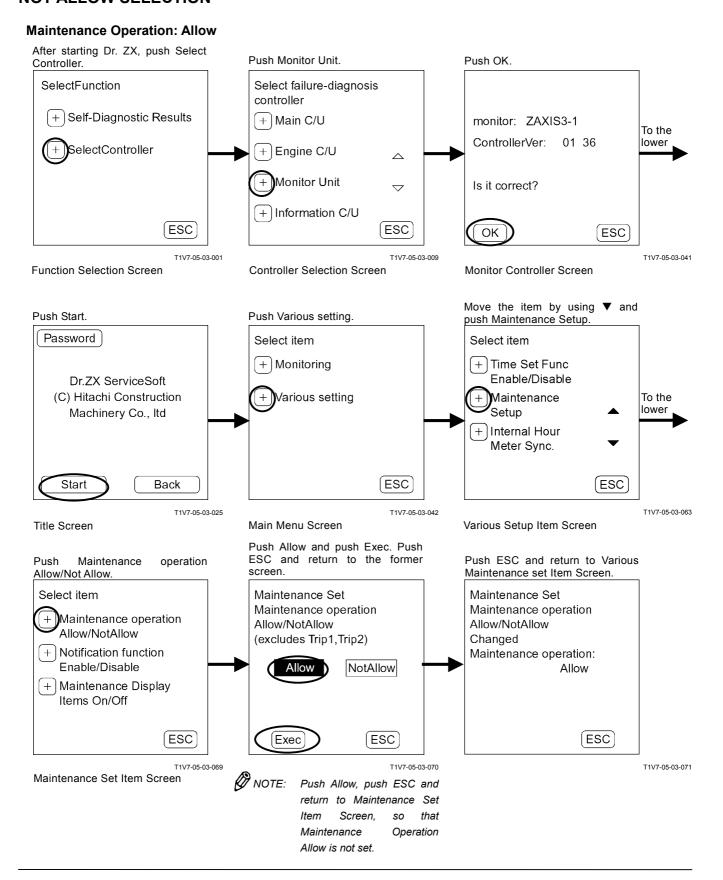
Function Enable is not set.

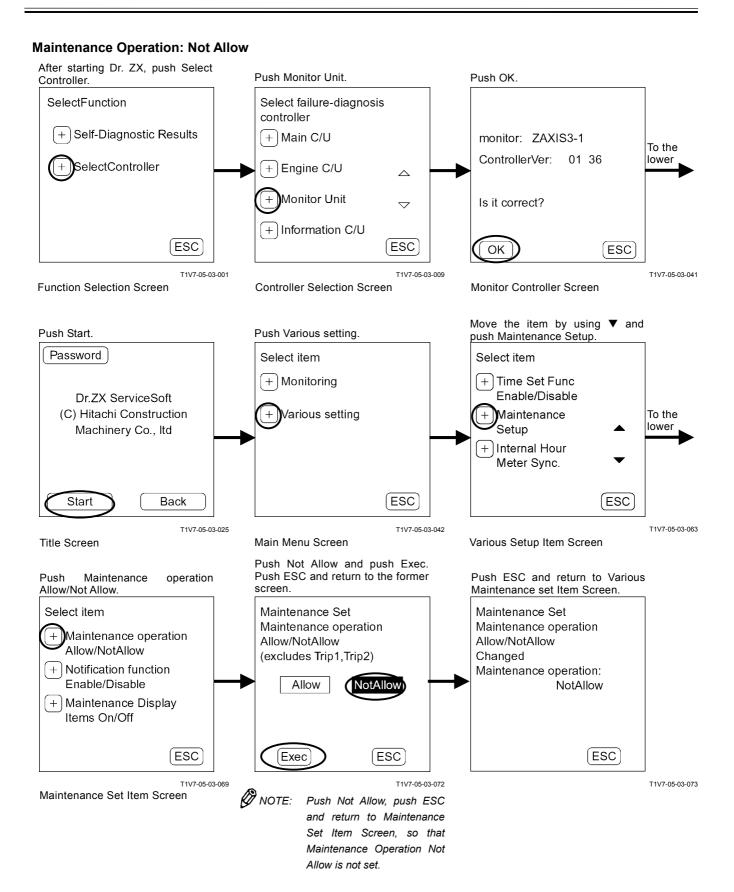


Time Setting Function: Disable

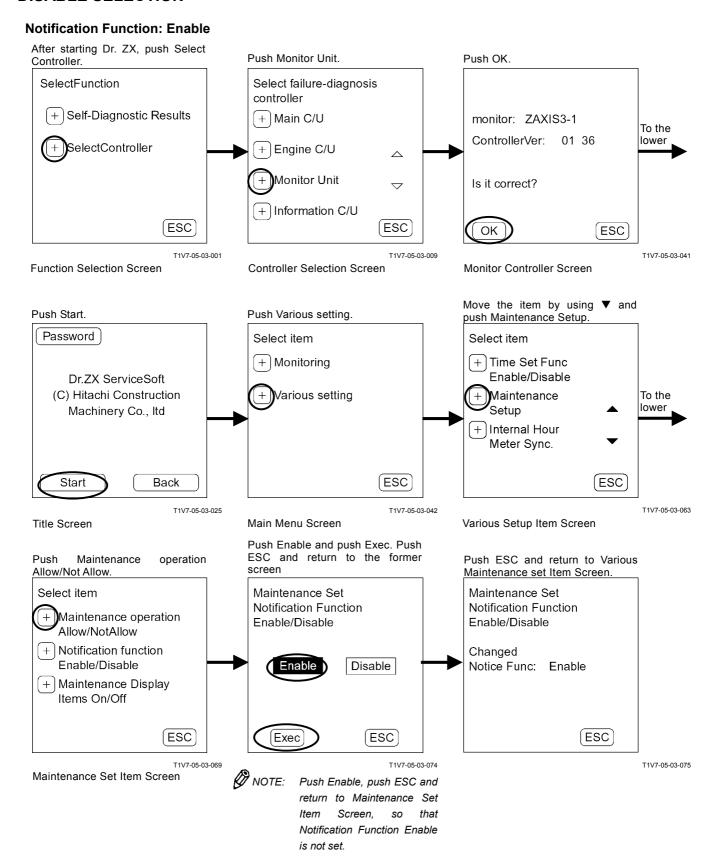


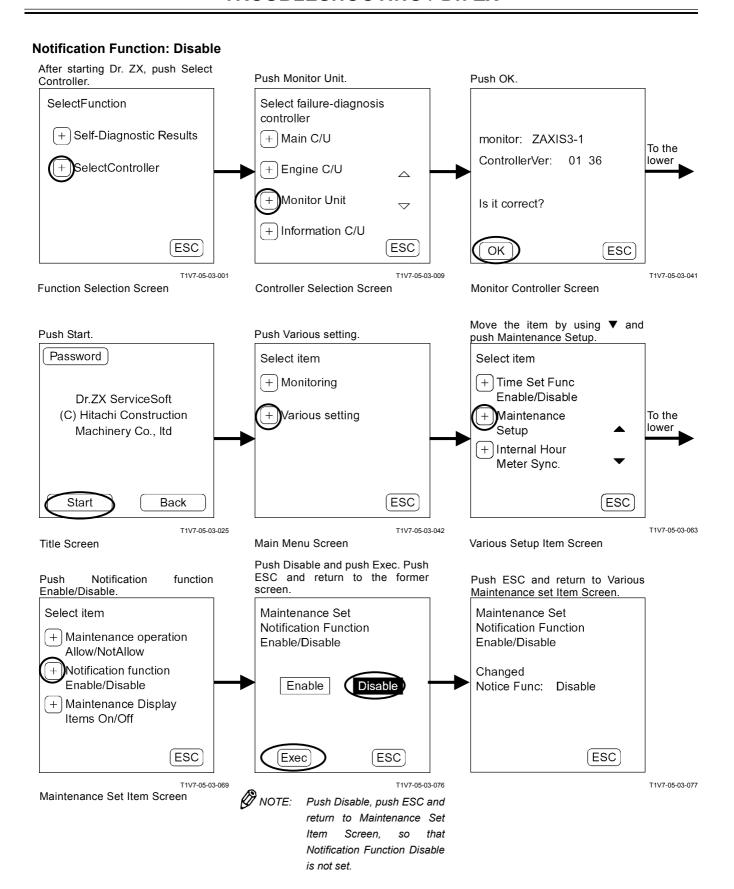
MAINTENANCE SETTING MAINTENANCE OPERATION ALLOW / NOT ALLOW SELECTION



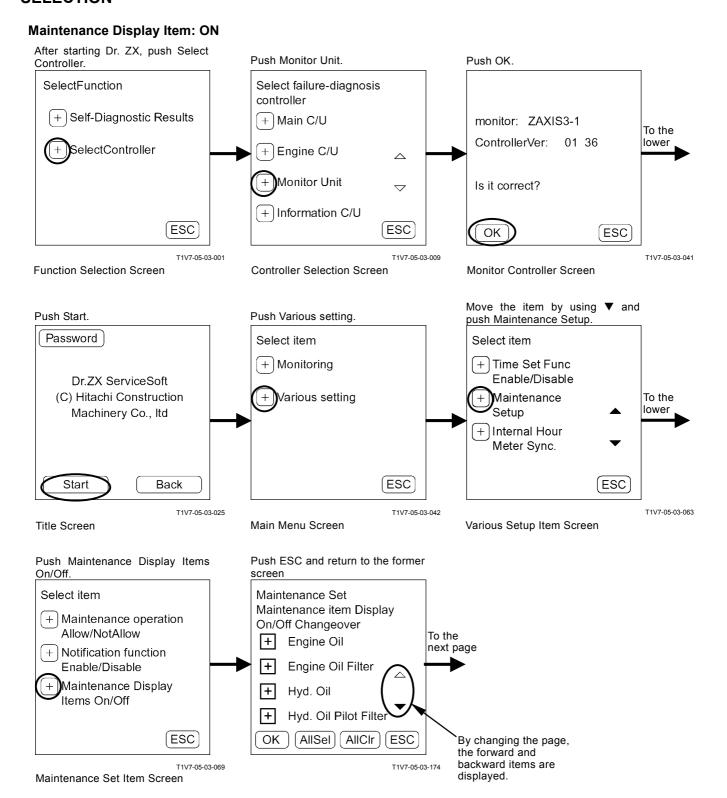


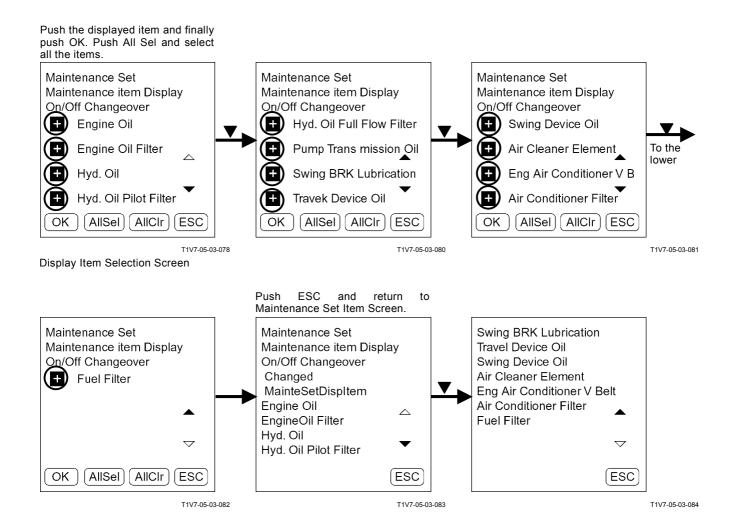
NOTIFICATION FUNCTION ENABLE / DISABLE SELECTION

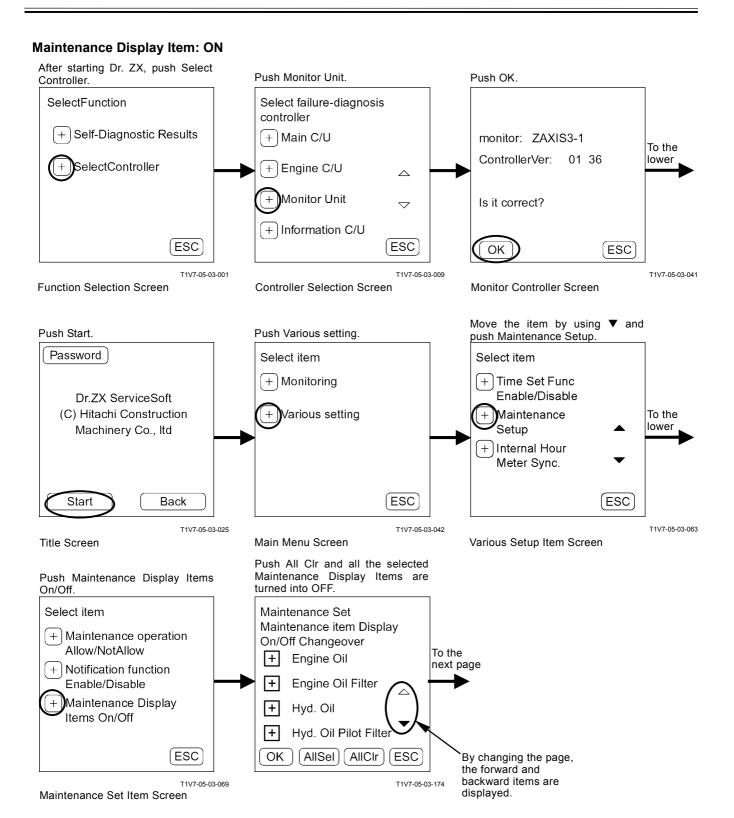


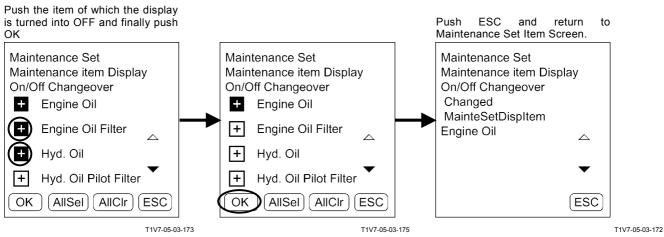


MAINTENANCE DISPLAY ITEM ON/OFF SELECTION

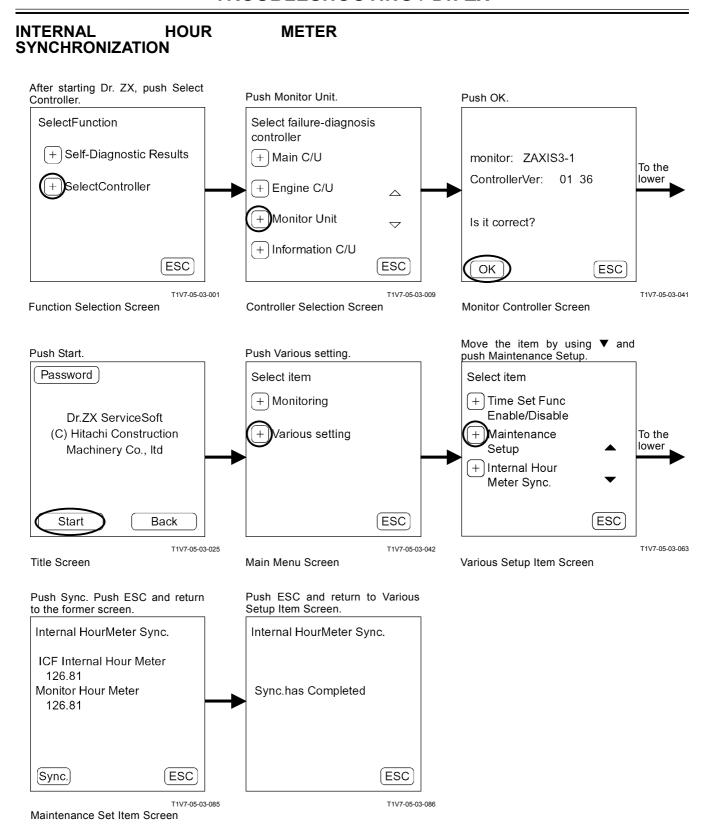




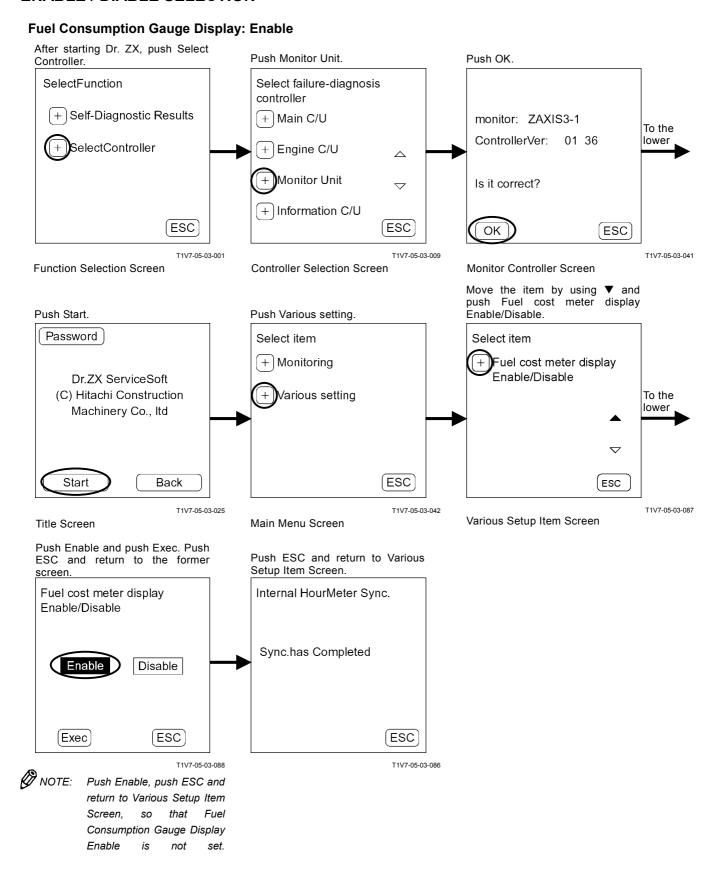


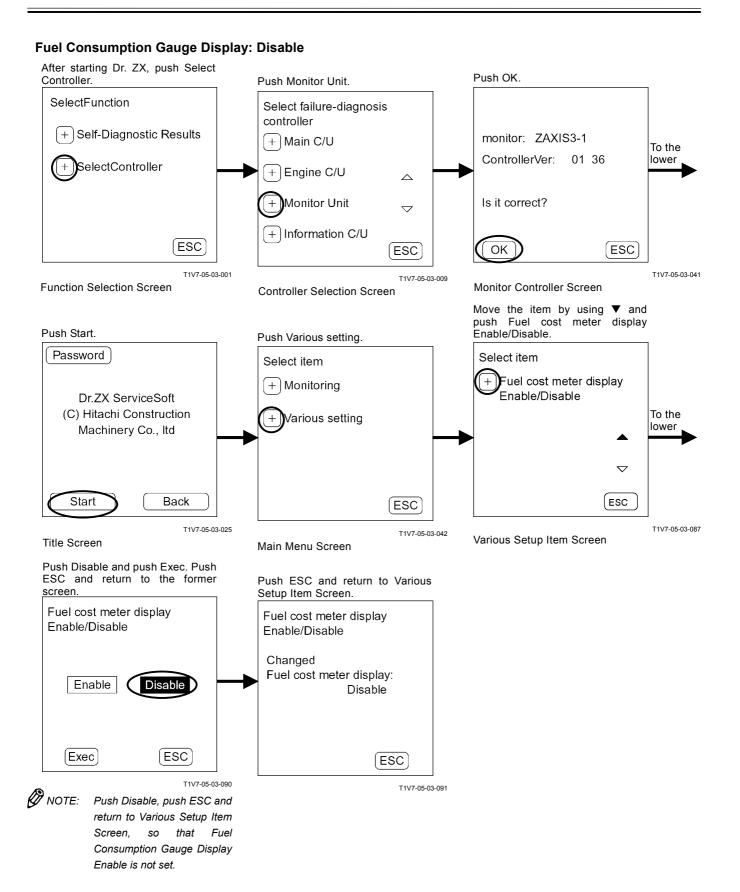


Display Item Selection Screen

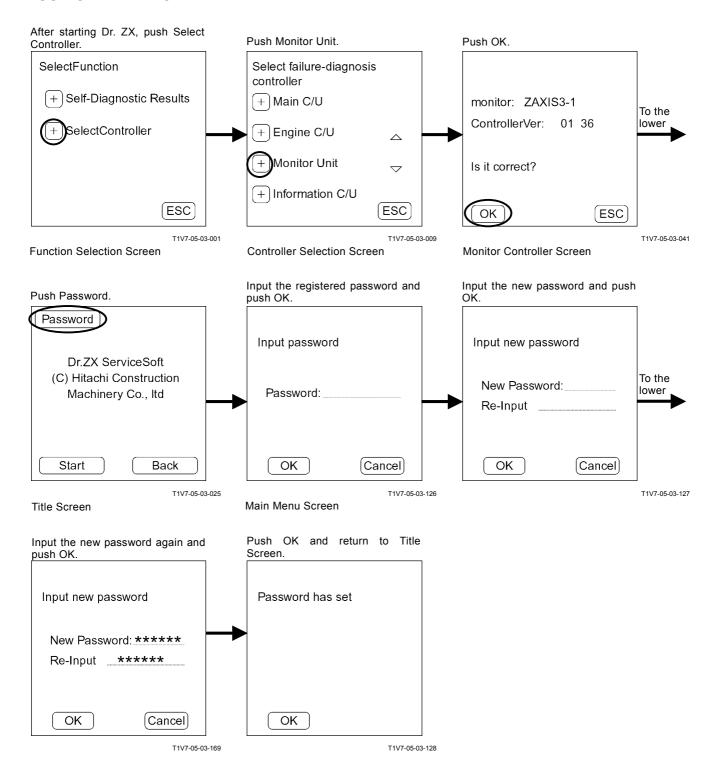


FUEL CONSUMPTION GAUGE DISPLAY ENABLE / DIABLE SELECTION





PASSWORD CHANGE



T5-3-105

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T5-3-106

OUTLINE

ICF (Information Controller) saves the input signals from various sensors and switches of the machine as data

Various input signals are recorded as "list of daily report data", "list of frequency distribution data", "list of total operating hours", "list of alarm" and "list of failure" in ICF.

The recorded data is downloaded to the personal computer and is uploaded to the center server via LAN, so that the data can be used as "e-Service".

The machine equipped with the optional satellite communication terminal sends the data to center server by using satellite communication. (As for the satellite communication system, refer to T5-4-24.

LIST OF DAILY REPORT DATA

Data which can be downloaded by Palm

Item		Details	
Date		Date of daily report data	
Start: Time		Time when key switch is first turned ON during a day	
Start. Time		(Time is recorded by key switch ON signal.)	
Stop: Time		Time when key switch is last turned OFF during a day	
Otop: Time		(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.)	
		The value of fuel used during a day	
Fuel Usage Amount		(Value is calculated and recorded by accumulated fuel usage amount	
		from ECM.)	
Machine Hour Meter		Hour meter cumulative hours	
-	1	(Hours are recorded by hour meter from monitor unit.)	
	HP Mode Hours	Total engine operating hours selecting HP mode during a day	
		(Hours are recorded by power mode switch information from MC.)	
Engine Operating	P Mode Hours	Total engine operating hours selecting P mode during a day	
Hours		(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	
-	le	(Hours are recorded by switch from MC.)	
Travel Oranation	` ,	Total operating hours of travel mode (Hi) during a day	
		(Hours are recorded by travel mode switch information from MC.)	
Hours		Total operating hours of travel mode (Lo) during a day	
	Traveling Hours	(Hours are recorded by travel mode switch information from MC.)	
Swing Operating Hou	rs	Total swing operating hours during a day	
		(Hours are recorded by swing pressure sensor information from MC.)	
D: : 0		Total operating hours selecting front attachment during a day	
Digging Operating Ho		(Hours are recorded by front attachment pressure sensor information	
· · · · · · · · · · · · · · · · · · ·		from MC.)	
		Total operating hours selecting breaker during a day	
Attachment Operating Hours	Hours	(Hours are recorded by attachment information from MC.)	
	_	Total operating hours selecting secondary crusher during a day	
		(Hours are recorded by attachment information from MC.)	
		Total operating hours selecting primary crusher during a day	
		(Hours are recorded by attachment information from MC.)	
	_	Total operating hours selecting vibrating hammer during a day	
	Operating Hours	(Hours are recorded by attachment information from MC.)	
		Total operating hours selecting bucket during a day	
	Hours or Others	(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 and swig 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	
	Frequency distribution of average delivery pressure from pumps during digging 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	
•	Frequency information on temperature in which intake air temperature is pulled from coolant temperature	
Hydraulic Oil Temperature – Intake Air Temperature	Frequency information on temperature in which intake air temperature is pulled from hydraulic oil temperature	
Pump Load Rate	Frequency information of engine speed andaverage load rate (average of pump 1 load rate and pump 2 load rate)	
Engine Load Rate	Frequency information of engine spood and engine torque	
Radiator Coolant Temperature/Intake Air Temperature	Frequency information of coolant temperature and intake air temperature	
·	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		
- · · · · · ·	HP Mode Hours	Total engine operating hours selecting HP mode		
Engine Operating Hour	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	Fast Idle (Hi) Traveling Hours	Total operating hours of travel mode (Hi)		
Hour	Slow Idle (Lo) Traveling Hours	Total operating hours of travel mode (Lo)		
Swing Operating Hour		Total swing operating hours during		
Front Attachment Operating Hour		Total front attachment and swig operating hours		
	Breaker Operating Hours	Total operating hours selecting breaker during daily operation		
		Total operating hours selecting secondary crusher during daily operation		
	Primary Crusher Operating Hours	Total operating hours selecting primary crusher during daily operation		
	_	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		

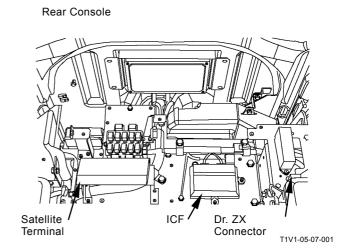
(Blank)

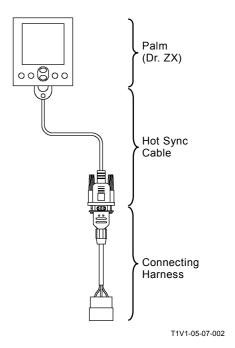
HOW TO DOWNLOAD AND UPLOAD DATA OF ICF

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

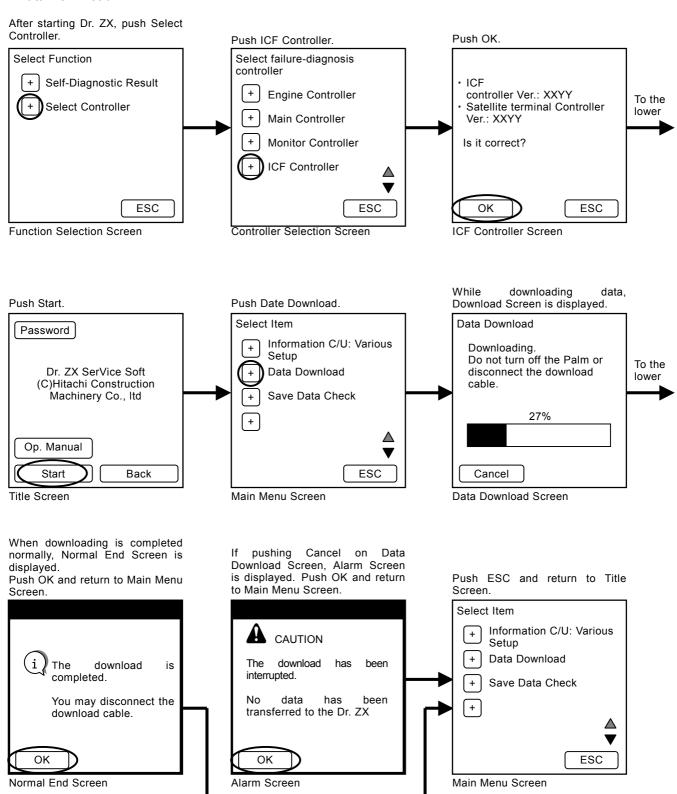
How to Download Data from Machine to Palm

- 1. Connect the Dr. ZX connectors in Palm 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.)





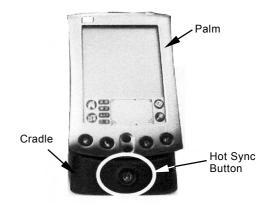
Data Download



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 Desktop software attached with Palm need to be installed.

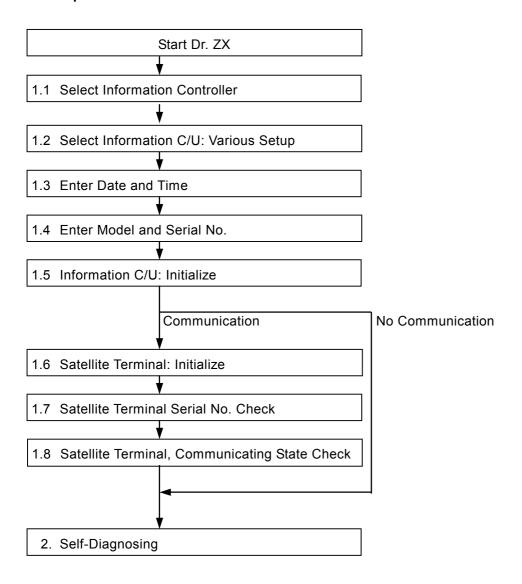


T178-05-07-033

VARIOUS SETUP OF ICF AND SATELLITE COMMUNICATION TERMINAL BY USING Dr. ZX

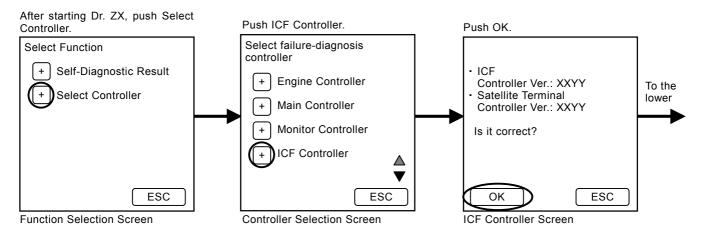
Before starting satellite communication, installing the satellite communication terminal and replacing ICF, perform the following procedures by using Dr. ZX.

ICF Setup Procedures

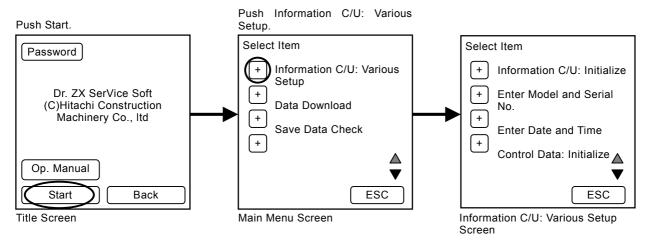


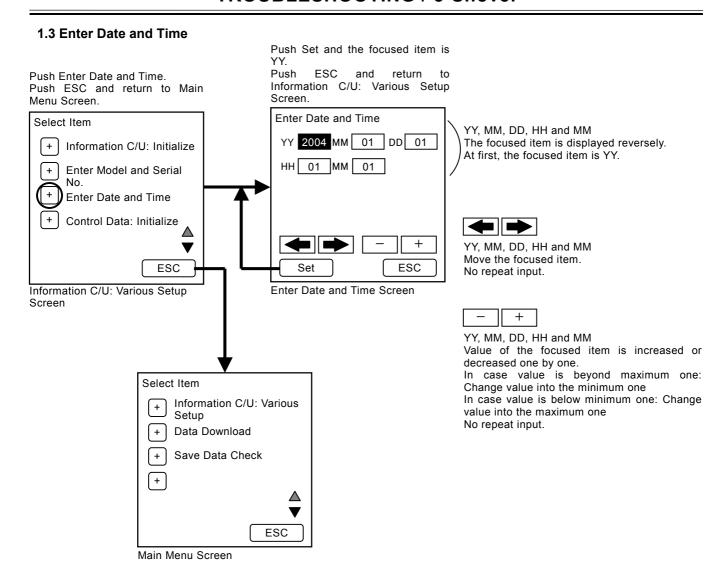
- 1.1 Select Information Controller
- 1.2 Select Information C/U: Various Setup

1.1 Select Information Controller



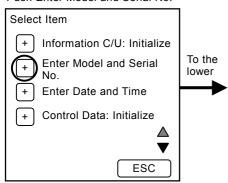
1.2 Select Information C/U: Various Setup



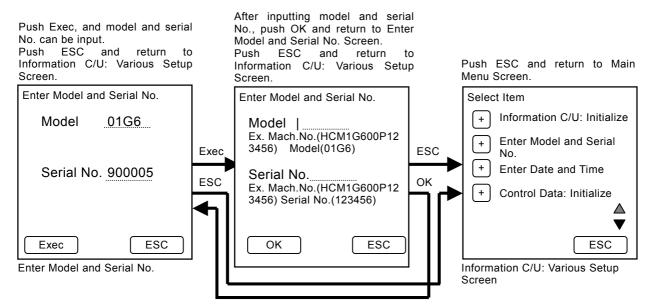


1.4 Enter Model and Serial No.

Push Enter Model and Serial No.

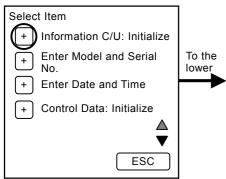


Information C/U: Various Setup Screen

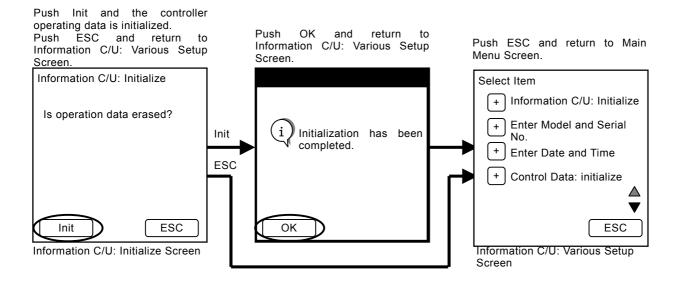


1.5 Information C/U: Initialize

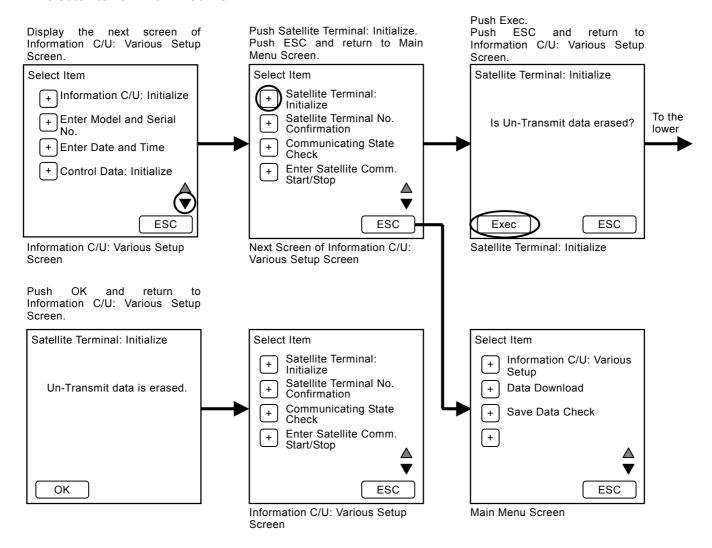
Push Information C/U: Initialize.



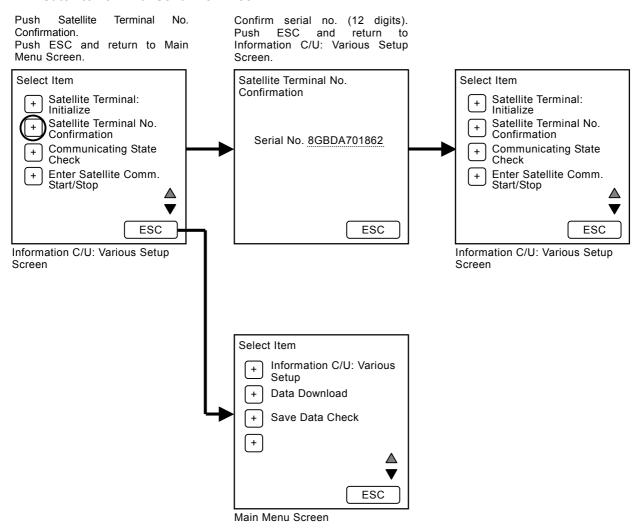
Information C/U: Various Setup Screen



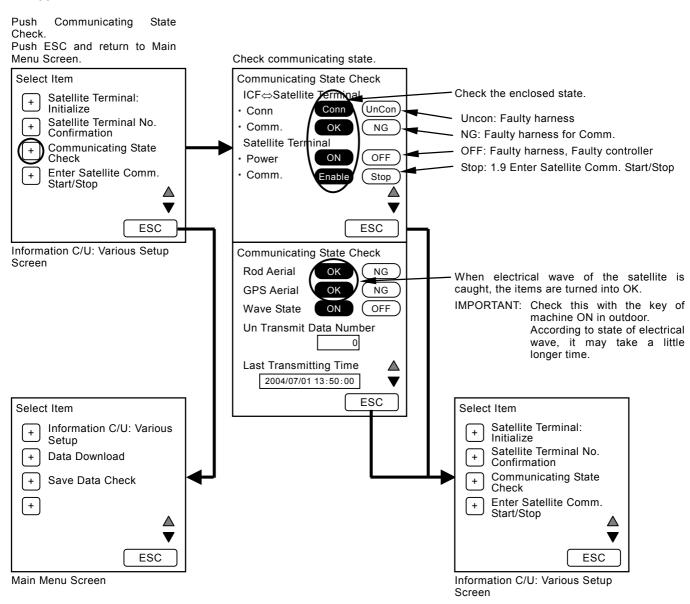
1.6 Satellite Terminal: Initialize



1.7 Satellite Terminal Serial No. Check

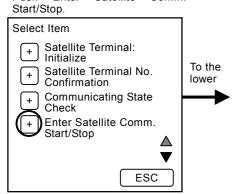


1.8 Satellite Terminal, Communicating State Check

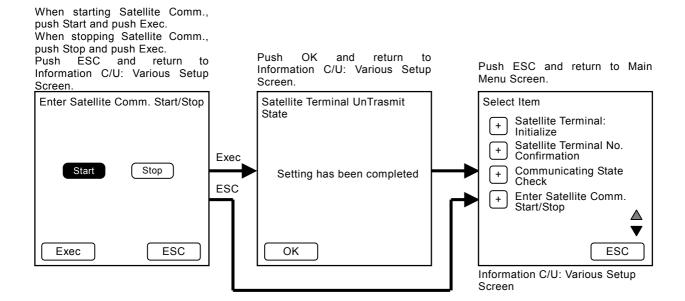


1.9 Enter Satellite Comm. Start/Stop

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

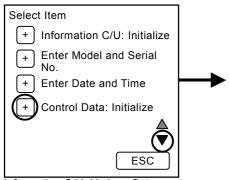


Information C/U: Various Setup Screen

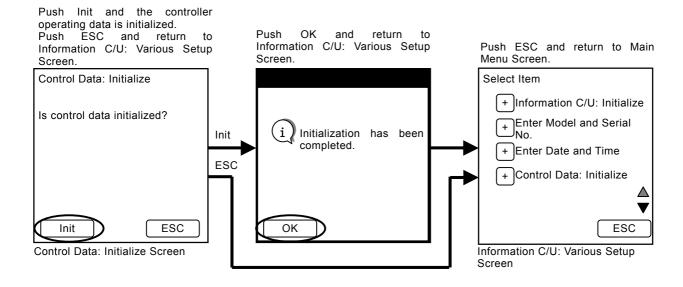


1.10 Control Data: Initialize

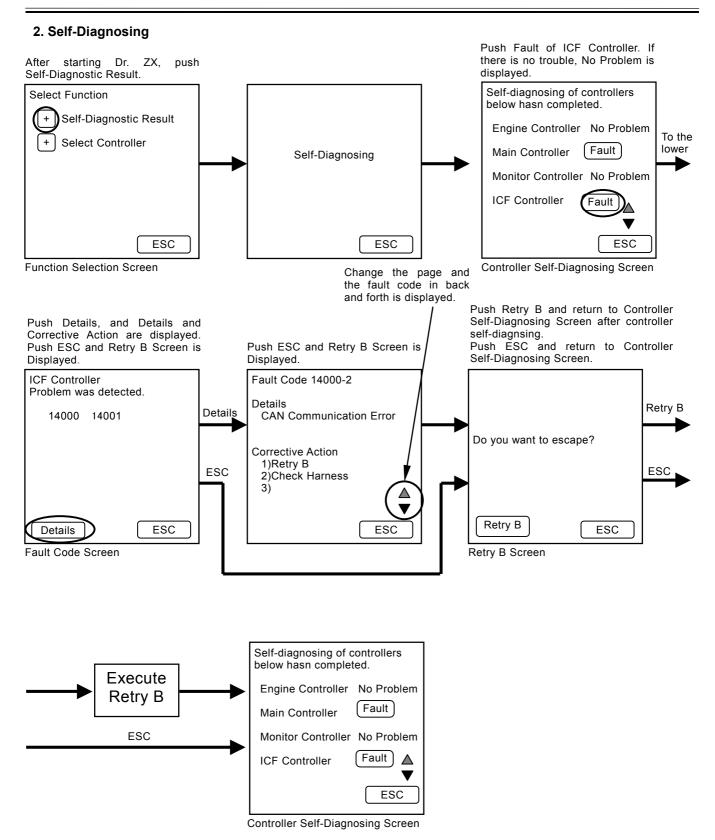
Push Control Data: Initialize.



Information C/U: Various Setup Screen



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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
14100-2	Satellite Communication Terminal: Abnormal EEPROM	controller.
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" transmitting various data of the machine regularly via a low earth orbit satellite.

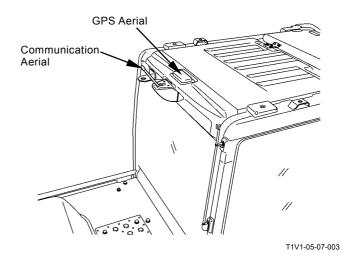
NOTE: Depending on the circumstances of the machine (ex. in the constructions, in the tunnel, affected by the surrounding building and affected of noise), the data transfer rate may become slower, or the communication might not be established.

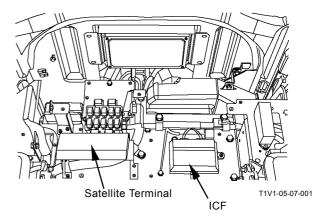
The satellite communication system using a low earth orbit satellite transmits digital data through the radio wave. If there is excessively noise or use of electrical equipment which causes noise near the machine, they cause reduces data transfer rate or communication might not be established at worst.

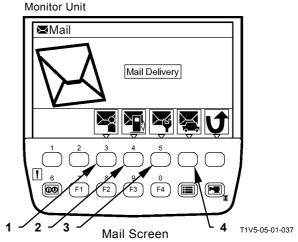
The satellite communication system consists of satellite communication terminal, GPS aerial and communication aerial. The mail function of monitor unit becomes effective.

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 kev corresponding to requirement.
- 1. General Requirement
- 2. Fuel Replenishing Requirement
- 3. Service Maintenance Requirement
- 4. Forwarding Requirement







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

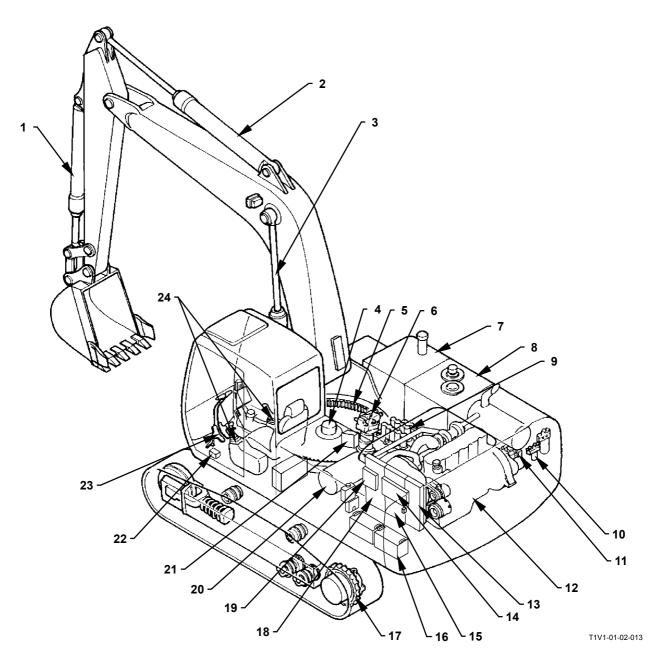
Kinds of data sent from the machine by using satellite communication:

Items	Kinds of Data	Condition
Periodical	Daily Report Data, Latest Location	The data are sent once a day. In order to
Transmission	Information, Fuel Level	avoid congested traffic in the
		communication line, the data is sent
		randomly between 0:00 and 02:00.
Transmitting Data at	Latest Location Information	The data is sent only when the machine
Engine Start		is moved more than 5 km from the place
		where it is recorded lastly.
Emergency	Alarm and Error Information	The transmission starts immediately
Transmission		when the alarm and error occurs.
Hour Meter 100 Hours	Frequency Distribution Information	The data is sent when the hour meter
Transmission		exceeds every 100 hours.
Transmission by Mail	General Requirement, Fuel Replenishing	The transmission starts when the key on
	Requirement, Service Maintenance	monitor unit corresponding to
	Requirement and Forwarding	requirement is pushed.
	Requirement	

(Blank)

TROUBLESHOOTING / Component Layout

MAIN COMPONENTS



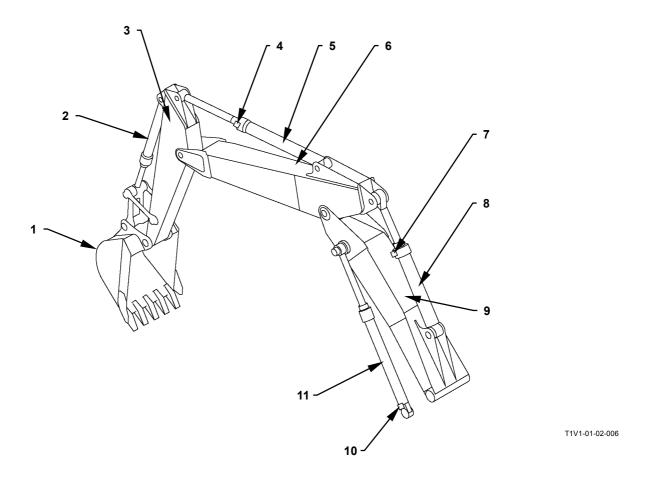
- 1 Bucket Cylinder
- 2 Arm Cylinder
- Boom Cylinder
- Center Joint
- 5 Swing Bearing
- 6 Swing Device
- 7 Fuel Tank
- 8 Hydraulic Oil Tank
- 9 Control Valve
- 10 Pilot Filter/ Pilot Relief Valve
- 11 Pump Device
- 12 Engine

- 13 Intercooler
- 14 Air Conditioner Condenser
- 15 Radiator
- 16 Battery
- 17 Travel Device
- 18 Oil Cooler

- 19 Fuel Cooler
- 20 Air Cleaner
- 21 Signal Control Valve22 Pilot Shut-Off Solenoid Valve
- 23 Travel Pilot Valve
- 24 Front Attachment / Swing Pilot Valve

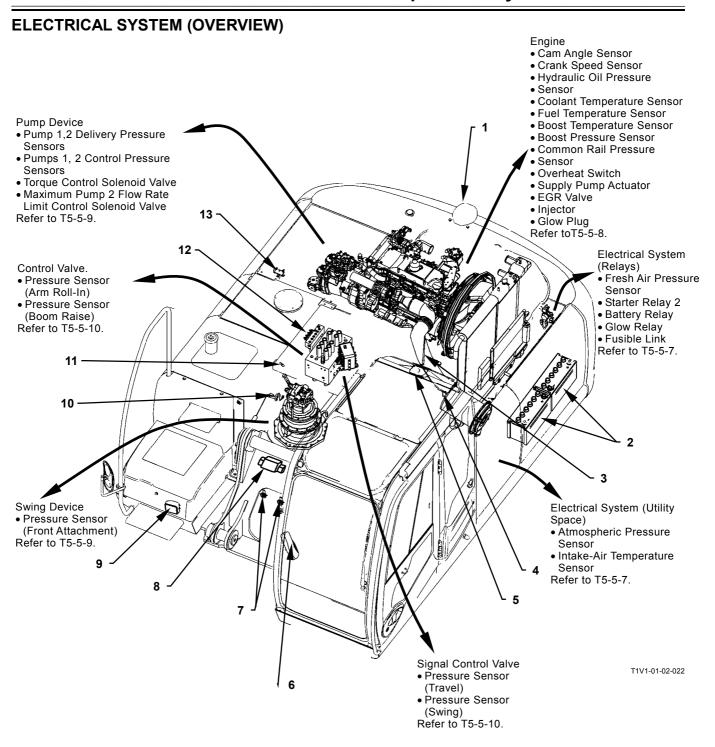
TROUBLESHOOTING / Component Layout

Front Attachment (2-Piece Boom)



- 1 Bucket
- 2 Bucket Cylinder
- 3 Arm

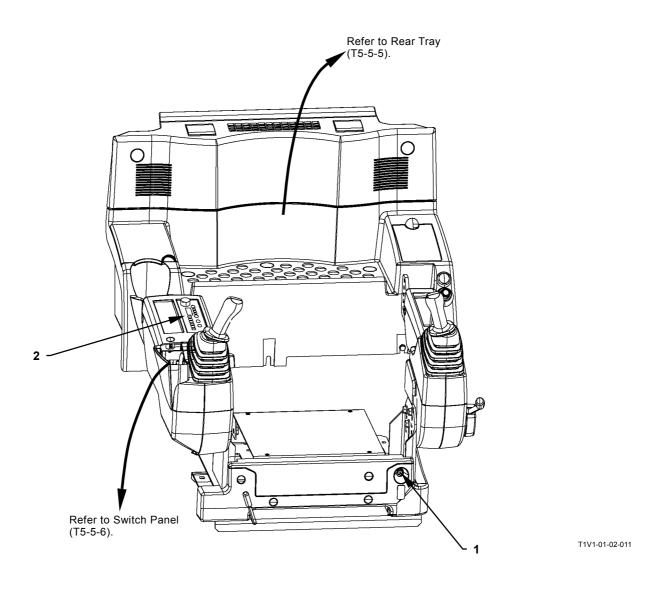
- 4 Hose Rupture Valve (Arm Cylinder)
- 5 Arm Cylinder 6 Upper Boom
- 7 Hose Rupture Valve (Positioning Cylinder)
- 8 Positioning Cylinder 9 Bottom Boom
- 10 Hose Rupture Valve (Boom Cylinder)
- 11 Boom Cylinder



- 1 Rear View Camera
- 2 Battery
- 3 Communication Aerial
- 4 Air Filter Restriction Switch
- 5 GPS (Global Positioning System) Aerial
- 6 Monitor Unit
- 7 Horn

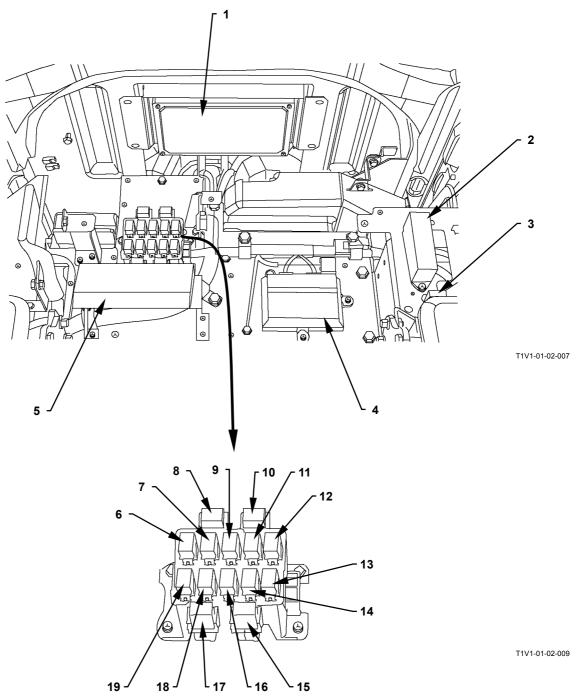
- 8 Positioning Control Valve (2-Piece Boom Machine Only)
- 9 Working Light
- 10 Fuel Sensor
- 11 Hydraulic Oil Temperature Sensor
- 12 Solenoid Valve Unit
- 13 Solenoid Pump

Electrical System (In Cab)



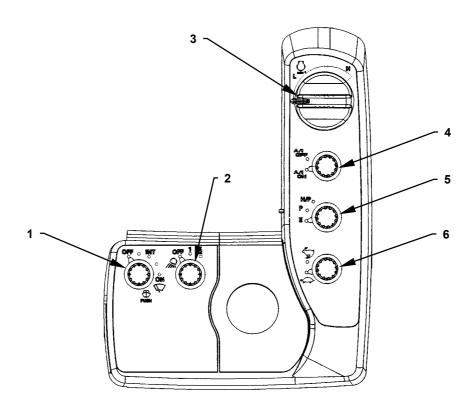
1 - Engine Stop Switch 2 - Radio

Electrical System (Rear Tray)



- 1 MC (Main Controller)
- 2 Fuse Box
- 3 Dr. ZX Connector (Download Connector Using Combinedly)
- 4 ICF (Information Controller)
- 5 Satellite Communication Terminal (Optional)
- 6 Starter Relay 2 (R5)
- 7 Starter Cut Relay (R4)
- 8 OFF Relay (Air Conditioner) (R12)
- 9 Security Horn Relay (R3)
- 10 Air Conditioner Relay (R11)
- 11 Pilot Shut-Off Relay (R12)
- 12 Load Damp Relay (R1)
- 13 Wiper Relay (R6)
- 14 Light Relay 1 (R7)
- 15 MAX HI Relay (Air Conditioner) (R13)
- 16 Light Relay 2 (R8)
- 17 ECM (Engine Control Module) Main Relay (R14)
- 18 Washer Relay (R9)
- 19 Horn Relay (R10)

Electrical System (Switch Panel)

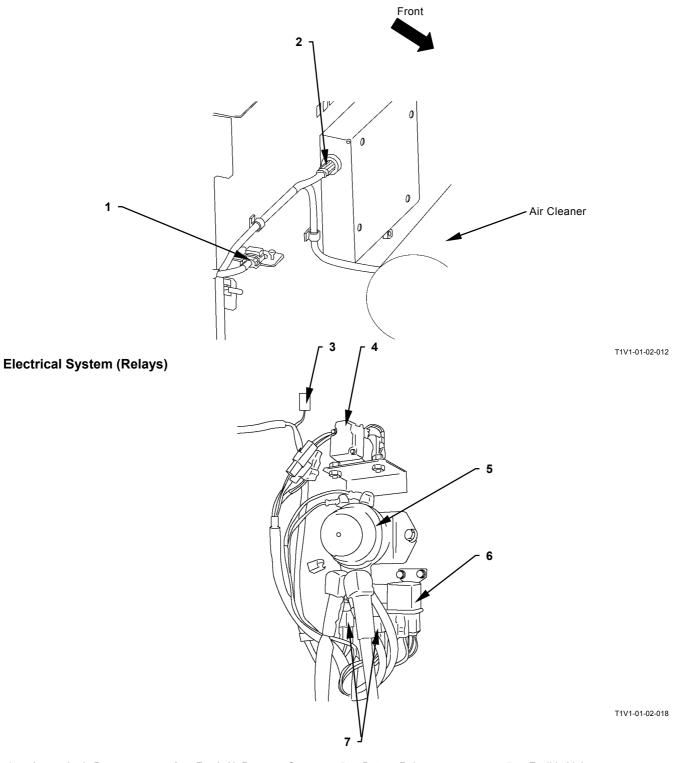


T1V1-04-02-001

- 1 Wiper / Washer Switch
 2 Working Light Switch
 3 Engine Control Dial
 4 Auto-Idle Switch

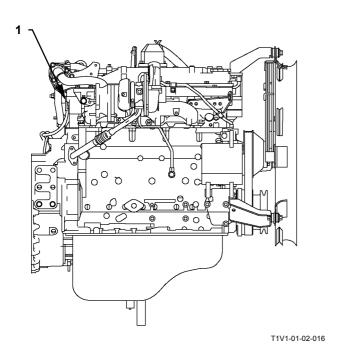
- 5 Power Mode Switch
- 6 Travel Mode Switch

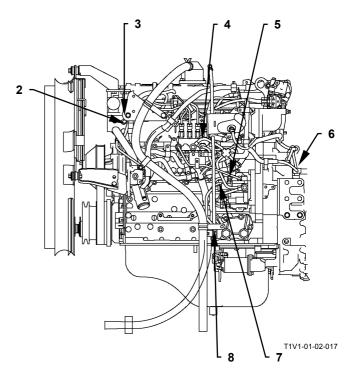
Electrical System (Utility Space)

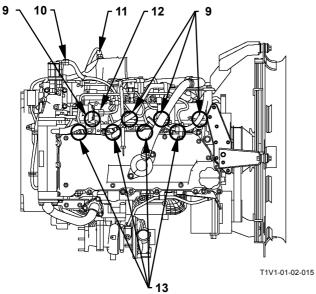


- 1 Atmospheric Pressure Sensor
- 2 Intake-Air Temperature Sensor
- 3 Fresh Air Pressure Sensor
- 4 Starter Relay 2
- 5 Battery Relay
- 6 Glow Relay
- 7 Fusible Link

ENGINE

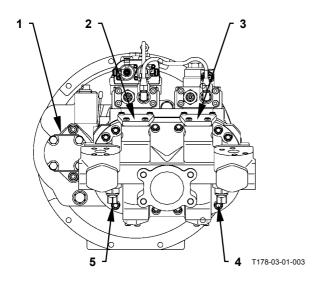


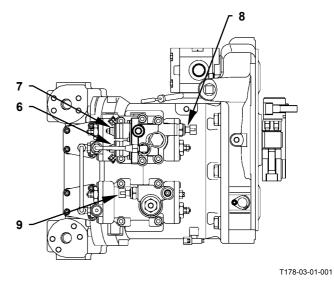




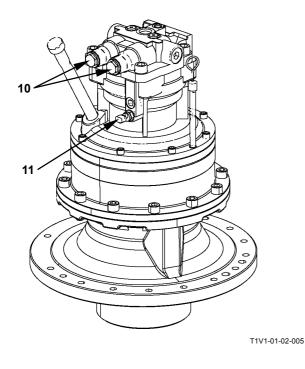
- 1 Cam Angle Sensor
- 2 Overheat Switch
- 3 Coolant temperature sensor
- 4 Common Rail Pressure Sensor
- 5 Fuel Temperature Sensor
- 6 Crank Speed Sensor
- 7 Supply Pump Actuator
- 8 Hydraulic Oil Pressure Sensor
- 9 Injector
- 10 EGR (Exhaust Gas Recirculation) Valve
- 11 Boost Temperature Sensor
- 12 Boost Pressure Sensor
- 13 Glow Plug

PUMP DEVICE

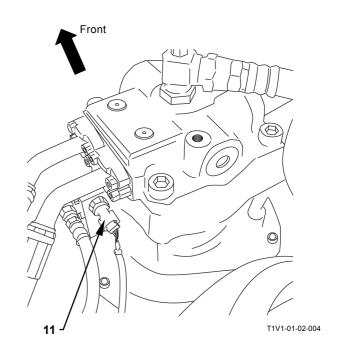




SWING DEVICE ZX200-3 class, ZX240-3 class

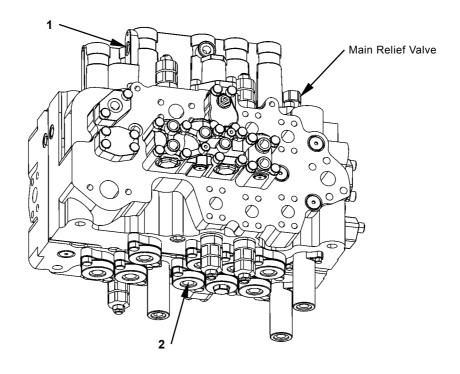


ZX270-3 class



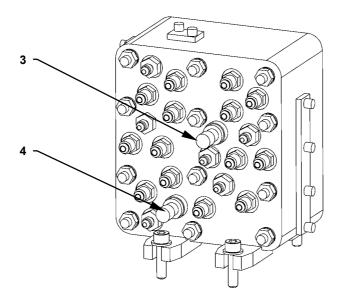
- 1 Pilot Pump
- 2 Pump 2
- 3 Pump 1
- 4 Pump 1 Delivery Pressure Sensor
- 5 Pump 2 Delivery Pressure Sensor
- 6 Torque Control Solenoid Valve
- 7 Maximum Pump 2 Flow Rate Limit Control Solenoid Valve
- 8 Pump 2 Control Pressure Sensor
- 9 Pump 1 Control Pressure Sensor
- 10 Swing Relief Valve
- 11 Pressure Sensor (Front Attachment)

CONTROL VALVE



T1V1-03-03-073

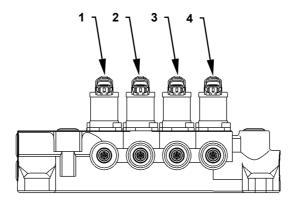
SIGNAL CONTROL VALVE



T1V1-01-02-014

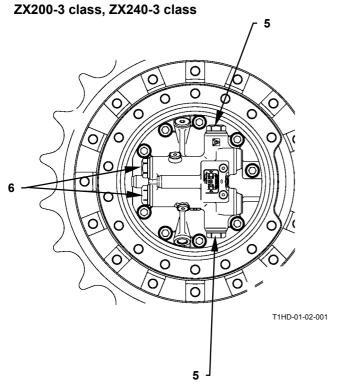
- 1 Pressure Sensor (Arm Roll-In)
- Raise)
- 2 Pressure Sensor (Boom 3 Pressure Sensor (Swing) 4 Pressure Sensor (Travel)

SOLENOID VALVE UNIT

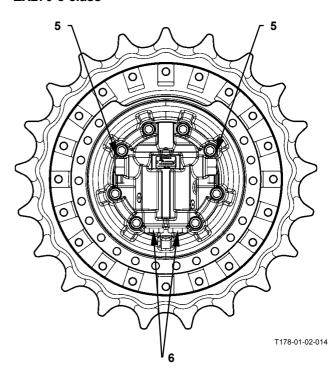


T1V1-03-07-007

TRAVEL DEVICE

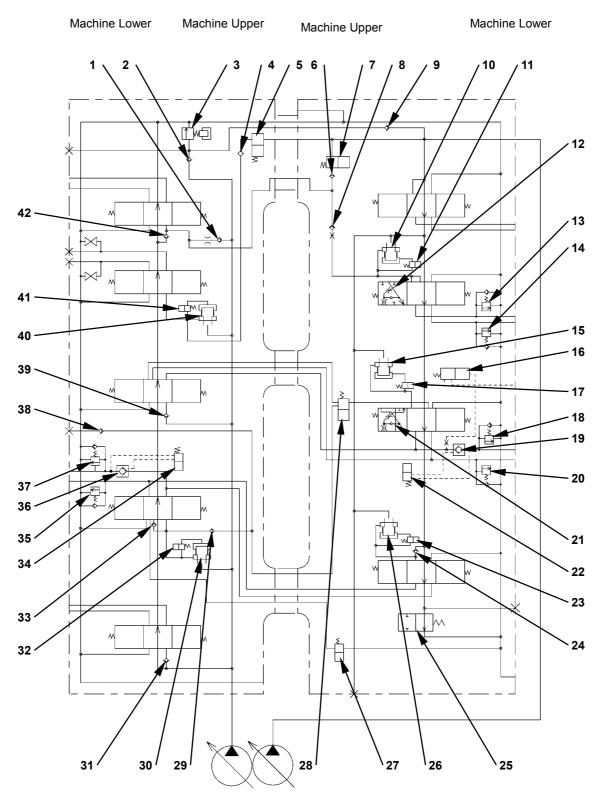


ZX270-3 class

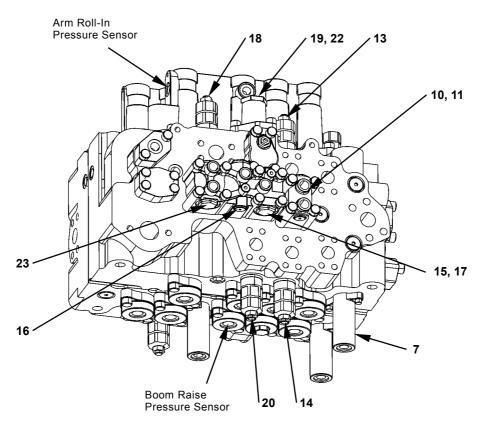


- 1 Solenoid Valve Unit SC
- 2 Solenoid Valve Unit SF
- 3 Solenoid Valve Unit SI
- 4 Solenoid Valve Unit SG
- 5 Counterbalance Valve
- 6 Travel Relief Valve

Layout of Control Valve



4-Spool Section



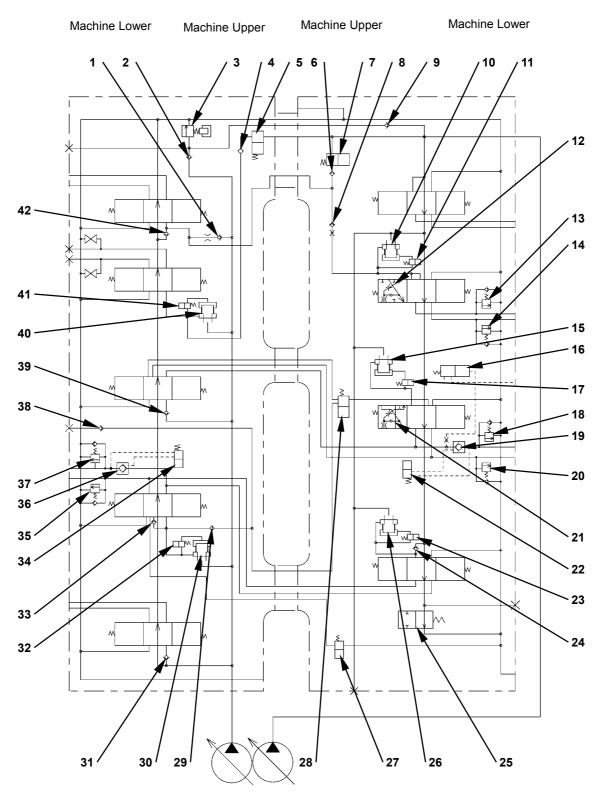
- Load Check Valve (Left Travel Parallel Circuit)
- 2 Check Valve (Main Relief Circuit)
- 3 Main Relief Valve
- 4 Check Valve (Auxiliary Combining Valve Circuit)
- 5 Auxiliary Flow Combiner Valve
- 6 Check Valve (Flow Combiner Valve Circuit)
- 7 Flow Combiner Valve
- 8 Load Check Valve (Orifice) (Bucket)
- 9 Check Valve (Main Relief Circuit)
- 10 Bucket Flow Rate Control Valve (Poppet Valve)
- 11 Bucket Flow Rate Control Valve (Switch Valve)

- 12 Bucket Regenerative Valve
- 13 Overload Relief Valve (Bucket: Rod Side)
- 14 Overload Relief Valve (Bucket: Bottom Side)
- 15 Boom Flow Control Valve (Poppet Valve)
- 16 Boom Lower Meter-In Cut Valve
- 17 Boom Flow Rate Control Valve (Switch Valve)
- 18 Overload Relief Valve (Boom: Bottom Side)
- 19 Boom Anti-Drift Valve (Check Valve)
- 20 Overload Relief Valve (Boom: Rod Side)
- 21 Boom Regenerative Valve
- 22 Boom Anti-Drift Valve (Switch Valve)

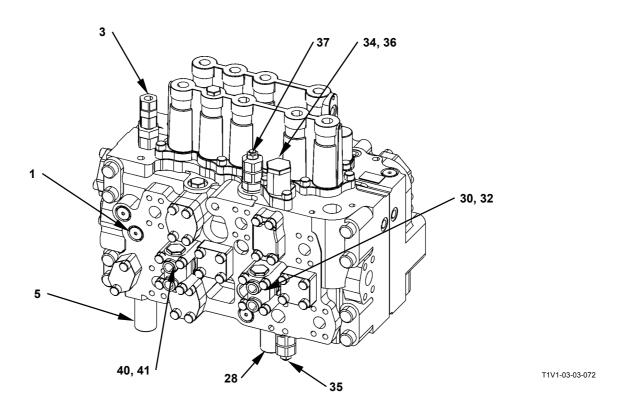
- 23 Arm 2 Flow Rate Control Valve (Switch Valve)
- 24 Load Check Valve (Arm 2 Tandem Circuit)
- 25 Bypass Shut-Out Valve
- 26 Arm 2 Flow Rate Control Valve (Poppet Valve)
- 27 Arm Regenerative Valve
- 28 Digging Regenerative Valve
- 29 Load Check Valve (Digging Regenerative Circuit)
- 30 Arm 1 Flow Rate Control Valve (Poppet Valve)
- 31 Load Check Valve (Swing Circuit)
- 32 Arm 1 Flow Rate Control Valve (Switch Valve)
- 33 Load Check Valve (Arm Regenerative Circuit)

34 - Arm Anti-Drift Valve (Switch Valve)

- 35 Overload Relief Valve (Arm: Bottom Side)
- 36 Arm Anti-Drift Valve (Check Valve)
- 37 Overload Relief Valve (Arm: Rod Side)
- 38 Check Valve (Digging Regenerative Circuit)
- 39 Load Check Valve (Boom 2 Parallel Circuit)
- 40 Auxiliary Flow Rate Control Valve (Poppet Valve)
- 41 Auxiliary Flow Rate Control
- Valve (Switch Valve)
- 42 Load Check Valve (Left Travel Tandem Circuit)



5-Spool Section

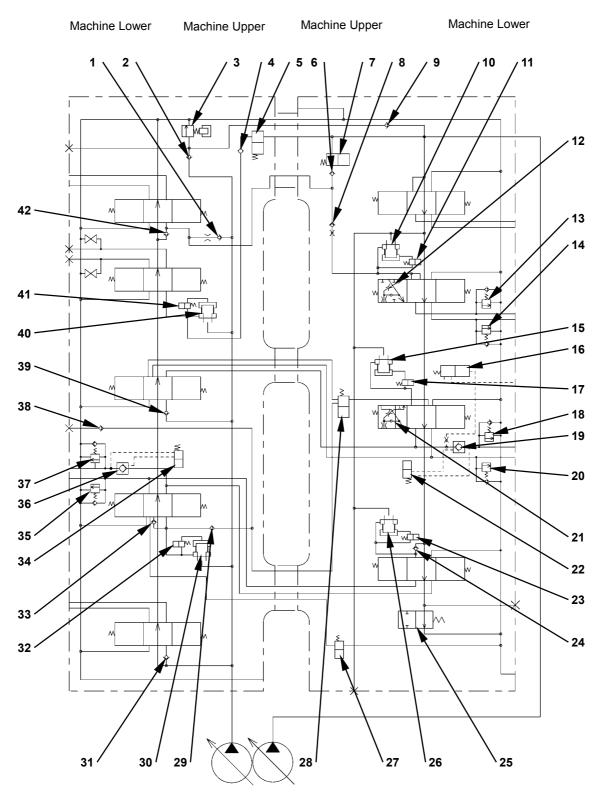


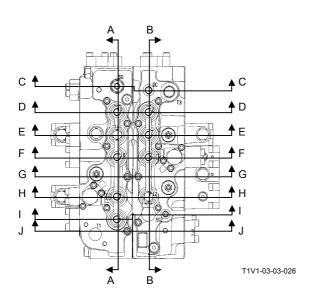
- 1 Load Check Valve (Left Travel Parallel Circuit)
- 2 Check Valve (Main Relief Circuit)
- 3 Main Relief Valve
- 4 Check Valve (Auxiliary Combining Valve Circuit)
- 5 Auxiliary Flow Combiner
- 6 Check Valve (Flow Combiner Valve Circuit)
- 7 Flow Combiner Valve
- 8 Load Check Valve (Orifice) (Bucket)
- 9 Check Valve (Main Relief Circuit)
- 10 Bucket Flow Rate Control Valve (Poppet
- 11 Bucket Flow Rate Control Valve (Switch Valve)

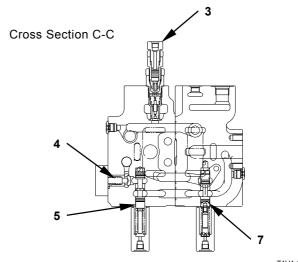
- 12 Bucket Regenerative Valve
- 13 Overload Relief Valve (Bucket: Rod Side)
- 14 Overload Relief Valve (Bucket: Bottom Side)
- 15 Boom Flow Control Valve (Poppet Valve)
- 16 Boom Lower Meter-In Cut Valve
- 17 Boom Flow Rate Control Valve (Switch Valve)
- 18 Overload Relief Valve (Boom: Bottom Side)
- 19 Boom Anti-Drift Valve (Check Valve)
- 20 Overload Relief Valve (Boom: Rod Side)
- 21 Boom Regenerative Valve
- 22 Boom Anti-Drift Valve (Switch Valve)

- 23 Arm 2 Flow Rate Control Valve (Switch Valve)
- 24 Load Check Valve (Arm 2 Tandem Circuit)
- 25 Bypass Shut-Out Valve
- 26 Arm 2 Flow Rate Control Valve (Poppet Valve)
- 27 Arm Regenerative Valve
- 28 Digging Regenerative Valve
- 29 Load Check Valve (Digging Regenerative Circuit)
- 30 Arm 1 Flow Rate Control Valve (Poppet Valve)
- 31 Load Check Valve (Swing Circuit)
- 32 Arm 1 Flow Rate Control Valve (Switch Valve)
- 33 Load Check Valve (Arm Regenerative Circuit)

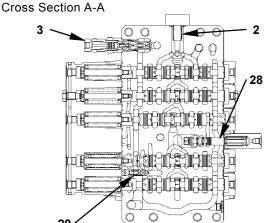
- 34 Arm Anti-Drift Valve (Switch Valve)
- 35 Overload Relief Valve (Arm: Bottom Side)
- 36 Arm Anti-Drift Valve (Check Valve)
- 37 Overload Relief Valve (Arm: Rod Side)
- 38 Check Valve (Digging Regenerative Circuit)
- 39 Load Check Valve (Boom2 Parallel Circuit)
- 40 Auxiliary Flow Rate Control Valve (Poppet Valve)
- 41 Auxiliary Flow Rate Control Valve (Switch Valve)
- 42 Load Check Valve (Left Travel Tandem Circuit)







T1V1-03-03-003



Cross Section B-B

12

21

27

T1V1-03-03-002

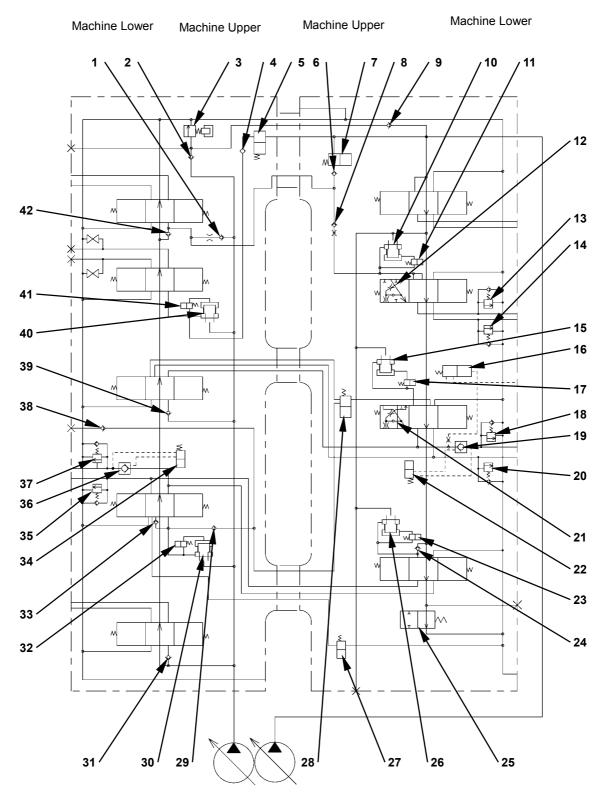
- 1 Load Check Valve (Left Travel Parallel Circuit)
- 2 Check Valve (Main Relief Circuit)
- 3 Main Relief Valve
- 4 Check Valve (Auxiliary Combining Valve Circuit)
- 5 Auxiliary Flow Combiner Valve
- 6 Check Valve (Flow Combiner Valve Circuit)
- 7 Flow Combiner Valve
- 8 Load Check Valve (Orifice) (Bucket)
- 9 Check Valve (Main Relief Circuit)
- 10 Bucket Flow Rate Control Valve (Poppet Valve)
- 11 Bucket Flow Rate Control Valve (Switch Valve)

12 - Bucket Regenerative Valve

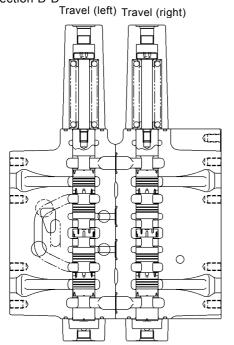
- 13 Overload Relief Valve (Bucket: Rod Side)
- 14 Overload Relief Valve (Bucket: Bottom Side)
- 15 Boom Flow Control Valve (Poppet Valve)
- 16 Boom Lower Meter-In Cut Valve
- 17 Boom Flow Rate Control Valve (Switch Valve)
- 18 Overload Relief Valve (Boom: Bottom Side)
- 19 Boom Anti-Drift Valve (Check
- 20 Overload Relief Valve (Boom: Rod Side)
- 21 Boom Regenerative Valve
- 22 Boom Anti-Drift Valve (Switch Valve)

- 23 Arm 2 Flow Rate Control Valve (Switch Valve)
- 24 Load Check Valve (Arm 2 Tandem Circuit)
- 25 Bypass Shut-Out Valve
- 26 Arm 2 Flow Rate Control Valve (Poppet Valve)
- 27 Arm Regenerative Valve
- 28 Digging Regenerative
- 29 Load Check Valve (Digging Regenerative Circuit)
- 30 Arm 1 Flow Rate Control Valve (Poppet Valve)
- 31 Load Check Valve (Świng Circuit)
- 32 Arm 1 Flow Rate Control Valve (Switch Valve)
- 33 Load Check Valve (Arm Regenerative Circuit)

- 34 Arm Anti-Drift Valve (Switch Valve)
- 35 Overload Relief Valve (Arm: Bottom Side)
- 36 Arm Anti-Drift Valve (Check Valve)
- 37 Overload Relief Valve (Arm: Rod Side)
- 38 Check Valve (Digging Regenerative Circuit)
- 39 Load Check Valve (Boom 2 Parallel Circuit)
- 40 Auxiliary Flow Rate Control Valve (Poppet Valve)
- 41 Auxiliary Flow Rate Control Valve (Switch Valve)
- 42 Load Check Valve (Left Travel Tandem Circuit)



Cross Section D-D



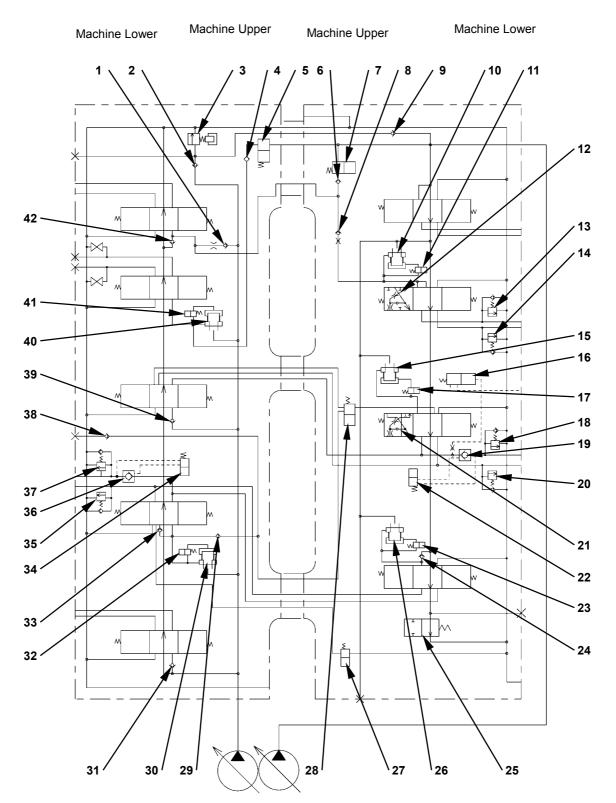
- 1 Load Check Valve (Left Travel Parallel Circuit)
- 2 Check Valve (Main Relief Circuit)
- 3 Main Relief Valve
- 4 Check Valve (Auxiliary Combining Valve Circuit)
- 5 Auxiliary Flow Combiner Valve
- 6 Check Valve (Flow Combiner Valve Circuit)
- 7 Flow Combiner Valve
- 8 Load Check Valve (Orifice) (Bucket)
- 9 Check Valve (Main Relief Circuit)
- 10 Bucket Flow Rate Control Valve (Poppet Valve)
- 11 Bucket Flow Rate Control Valve (Switch Valve)

12 - Bucket Regenerative Valve

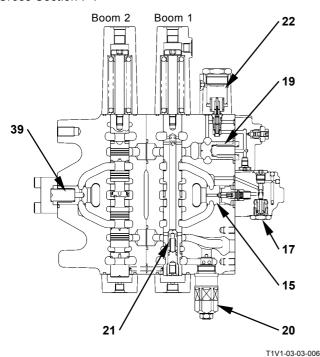
- 13 Overload Relief Valve (Bucket: Rod Side)
- 14 Overload Relief Valve (Bucket: Bottom Side)
- 15 Boom Flow Control Valve (Poppet Valve)
- 16 Boom Lower Meter-In Cut
- 17 Boom Flow Rate Control Valve (Switch Valve)
- 18 Overload Relief Valve (Boom: Bottom Side)
- 19 Boom Anti-Drift Valve (Check Valve)
- 20 Overload Relief Valve (Boom: Rod Side)
- 21 Boom Regenerative Valve
- 22 Boom Anti-Drift Valve (Switch Valve)

- 23 Arm 2 Flow Rate Control Valve (Switch Valve)
- 24 Load Check Valve (Arm 2 Tandem Circuit)
- 25 Bypass Shut-Out Valve
- 26 Arm 2 Flow Rate Control Valve (Poppet Valve)
- 27 Arm Regenerative Valve
- 28 Digging Regenerative Valve
- 29 Load Check Valve (Digging Regenerative Circuit)
- 30 Arm 1 Flow Rate Control Valve (Poppet Valve)
- 31 Load Check Valve (Swing Circuit)
- 32 Arm 1 Flow Rate Control Valve (Switch Valve)
- 33 Load Check Valve (Arm Regenerative Circuit)

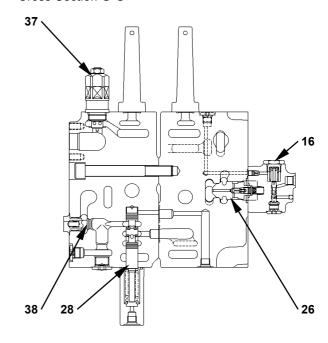
- 34 Arm Anti-Drift Valve (Switch Valve)
- 35 Overload Relief Valve (Arm: Bottom Side)
- 36 Arm Anti-Drift Valve (Check Valve)
- 37 Overload Relief Valve (Arm: Rod Side)
- 38 Check Valve (Digging Regenerative Circuit)
- 39 Load Check Valve (Boom2 Parallel Circuit)
- 40 Auxiliary Flow Rate Control Valve (Poppet Valve)
- 41 Auxiliary Flow Rate Control Valve (Switch Valve)
- 42 Load Check Valve (Left Travel Tandem Circuit)



Cross Section F-F



Cross Section G-G

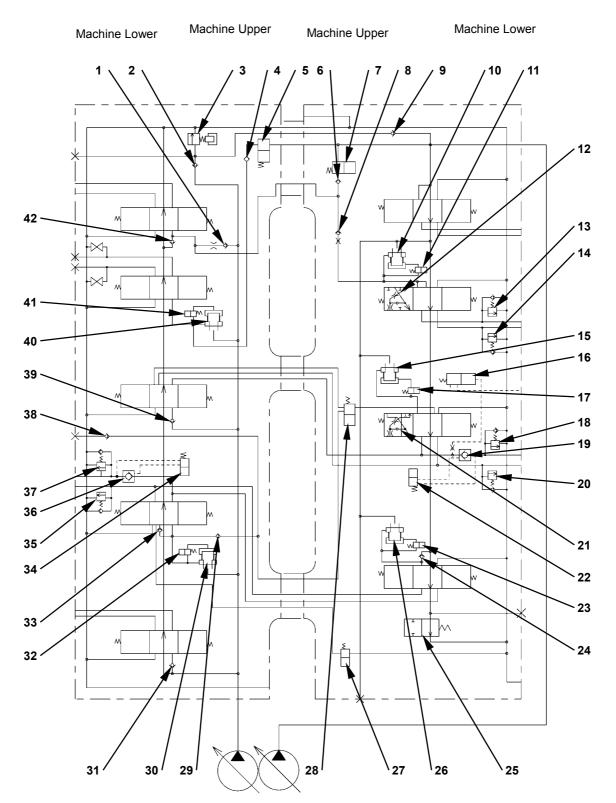


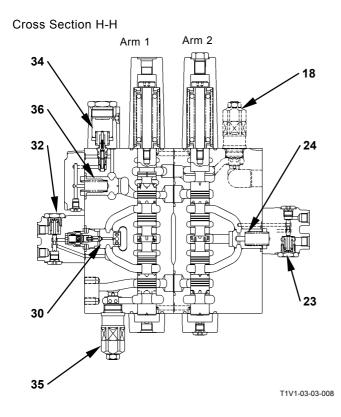
- Load Check Valve (Left Travel Parallel Circuit)
- 2 Check Valve (Main Relief Circuit)
- 3 Main Relief Valve
- 4 Check Valve (Auxiliary Combining Valve Circuit)
- 5 Auxiliary Flow Combiner Valve
- 6 Check Valve (Flow Combiner Valve Circuit)
- 7 Flow Combiner Valve
- 8 Load Check Valve (Orifice) (Bucket)
- 9 Check Valve (Main Relief Circuit)
- 10 Bucket Flow Rate Control Valve (Poppet Valve)
- 11 Bucket Flow Rate Control Valve (Switch Valve)

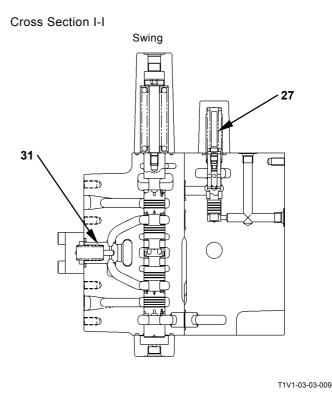
- 12 Bucket Regenerative Valve
- 13 Overload Relief Valve (Bucket: Rod Side)
- 14 Overload Relief Valve (Bucket: Bottom Side)
- 15 Boom Flow Control Valve (Poppet Valve)
- 16 Boom Lower Meter-In Cut Valve
- 17 Boom Flow Rate Control Valve (Switch Valve)
- 18 Overload Relief Valve (Boom: Bottom Side)
- 19 Boom Anti-Drift Valve (Check Valve)
- 20 Overload Relief Valve (Boom: Rod Side)
- 21 Boom Regenerative Valve
- 22 Boom Anti-Drift Valve (Switch Valve)

- 23 Arm 2 Flow Rate Control Valve (Switch Valve)
- 24 Load Check Valve (Arm 2 Tandem Circuit)
- 25 Bypass Shut-Out Valve
- 26 Arm 2 Flow Rate Control Valve (Poppet Valve)
- 27 Arm Regenerative Valve
- 28 Digging Regenerative Valve
- 29 Load Check Valve (Digging Regenerative Circuit)
- 30 Arm 1 Flow Rate Control Valve (Poppet Valve)
- 31 Load Check Valve (Swing Circuit)
- 32 Arm 1 Flow Rate Control Valve (Switch Valve)
- 33 Load Check Valve (Arm Regenerative Circuit)

- 34 Arm Anti-Drift Valve (Switch Valve)
- 35 Overload Relief Valve (Arm: Bottom Side)
- 36 Arm Anti-Drift Valve (Check Valve)
- 37 Overload Relief Valve (Arm: Rod Side)
- 38 Check Valve (Digging Regenerative Circuit)
- 39 Load Check Valve (Boom 2 Parallel Circuit)
- 40 Auxiliary Flow Rate Control Valve (Poppet Valve)
- 41 Auxiliary Flow Rate Control Valve (Switch Valve)
- 42 Load Check Valve (Left Travel Tandem Circuit)





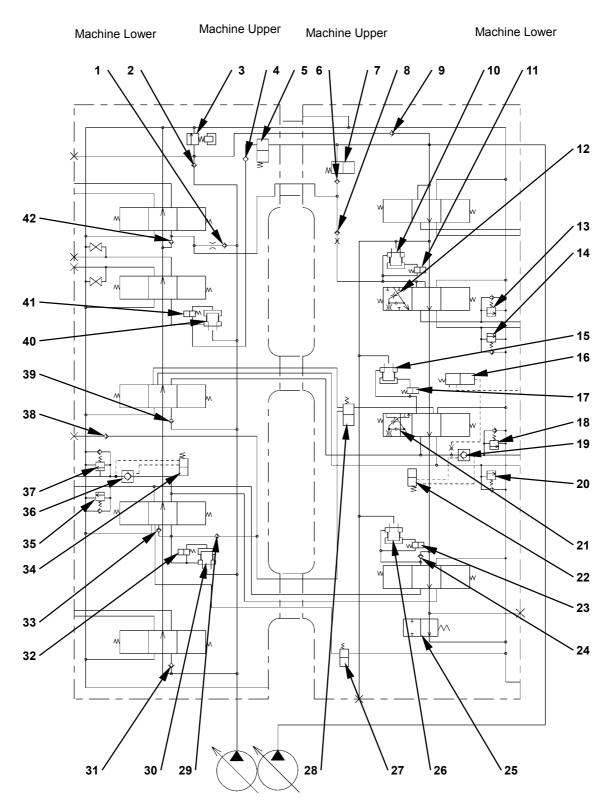


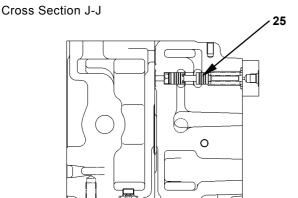
- 1 Load Check Valve (Left Travel Parallel Circuit)
- 2 Check Valve (Main Relief Circuit)
- 3 Main Relief Valve
- 4 Check Valve (Auxiliary Combining Valve Circuit)
- 5 Auxiliary Flow Combiner Valve
- 6 Check Valve (Flow Combiner Valve Circuit)
- 7 Flow Combiner Valve
- 8 Load Check Valve (Orifice) (Bucket)
- 9 Check Valve (Main Relief Circuit)
- 10 Bucket Flow Rate Control Valve (Poppet Valve)
- 11 Bucket Flow Rate Control Valve (Switch Valve)

- 12 Bucket Regenerative Valve
- 13 Overload Relief Valve (Bucket: Rod Side)
- 14 Overload Relief Valve (Bucket: Bottom Side)
- 15 Boom Flow Control Valve (Poppet Valve)
- 16 Boom Lower Meter-In Cut Valve
- 17 Boom Flow Rate Control Valve (Switch Valve)
- 18 Overload Relief Valve (Boom: Bottom Side)
- 19 Boom Anti-Drift Valve (Check Valve)
- 20 Overload Relief Valve (Boom: Rod Side)
- 21 Boom Regenerative Valve
- 22 Boom Anti-Drift Valve (Switch Valve)

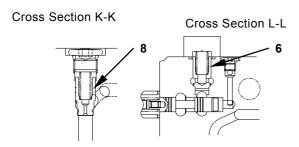
- 23 Arm 2 Flow Rate Control Valve (Switch Valve)
- 24 Load Check Valve (Arm 2 Tandem Circuit)
- 25 Bypass Shut-Out Valve
- 26 Arm 2 Flow Rate Control Valve (Poppet Valve)
- 27 Arm Regenerative Valve
- 28 Digging Regenerative Valve
- 29 Load Check Valve (Digging Regenerative Circuit)
- 30 Arm 1 Flow Rate Control Valve (Poppet Valve)
- 31 Load Check Valve (Swing Circuit)
- 32 Arm 1 Flow Rate Control Valve (Switch Valve)
- 33 Load Check Valve (Arm Regenerative Circuit)

- 34 Arm Anti-Drift Valve (Switch Valve)
- 35 Overload Relief Valve (Arm: Bottom Side)
- 36 Arm Anti-Drift Valve (Check Valve)
- 37 Overload Relief Valve (Arm: Rod Side)
- 38 Check Valve (Digging Regenerative Circuit)
- 39 Load Check Valve (Boom 2 Parallel Circuit)
- 40 Auxiliary Flow Rate Control Valve (Poppet Valve)
- 41 Auxiliary Flow Rate Control Valve (Switch Valve)
- 42 Load Check Valve (Left Travel Tandem Circuit)

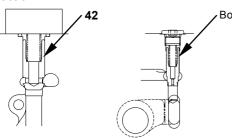








Cross Section M-M

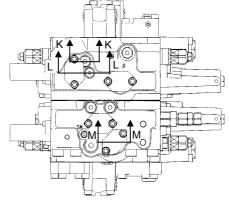


- Load Check Valve (Left Travel Parallel Circuit)
- Check Valve (Main Relief Circuit)
- Main Relief Valve
- Check Valve (Auxiliary Combining Valve Circuit)
- Auxiliary Flow Combiner Valve
- Check Valve (Flow Combiner Valve Circuit)
- Flow Combiner Valve
- 8 Load Check Valve (Orifice) (Bucket)
- Check Valve (Main Relief Circuit)
- 10 Bucket Flow Rate Control Valve (Poppet Valve)
- 11 Bucket Flow Rate Control Valve (Switch Valve)

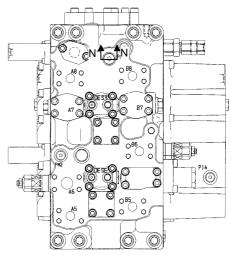
T1V1-03-03-022 23 - Bucket Regenerative Valve

Cross Section N-N

- 24 Overload Relief Valve
- (Bucket: Rod Side)
- Overload Relief Valve (Bucket: Bottom Side)
- 26 Boom Flow Control Valve (Poppet Valve)
- Boom Lower Meter-In Cut Valve
- 28 Boom Flow Control Valve (Switch Valve)
- Overload Relief Valve (Boom: Bottom Side)
- 30 Boom Anti-Drift Valve (Check Valve)
- 31 Overload Relief Valve (Boom: Rod Side)
- 32 Boom Regenerative Valve
- 33 Boom Anti-Drift Valve (Switch Valve)



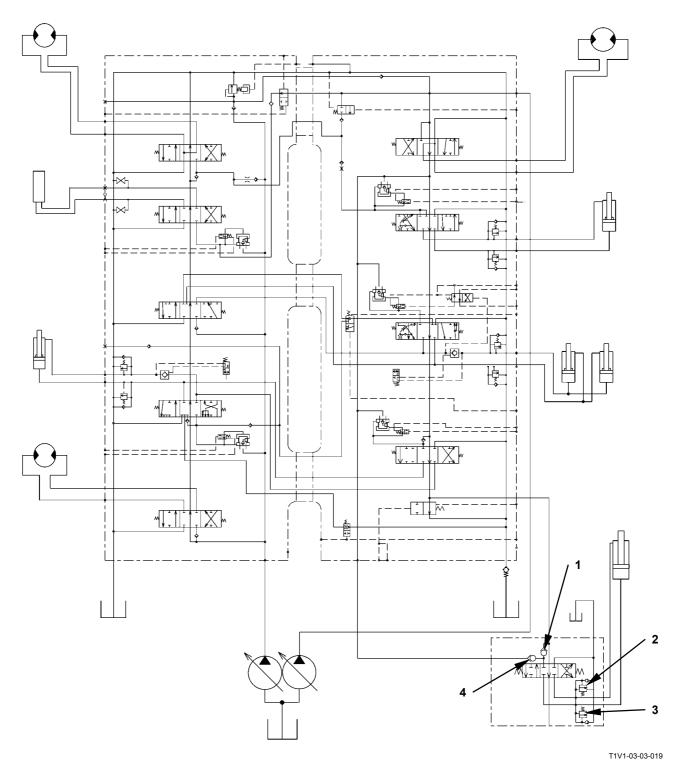
T1V1-03-03-027

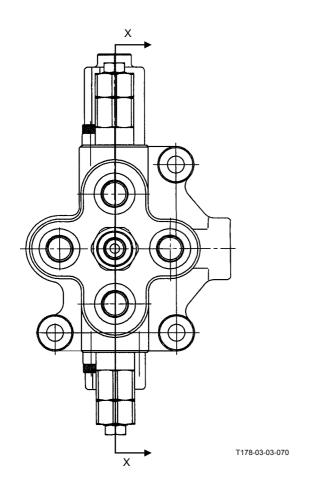


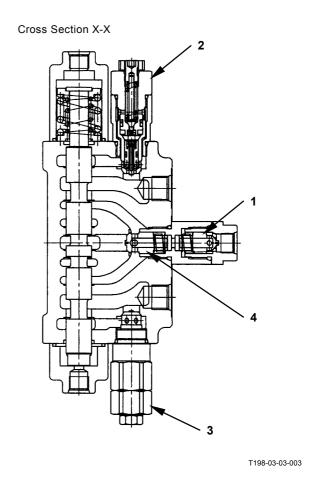
- 34 Arm 2 Flow Rate Control Valve (Switch Valve)
- 35 Load Check Valve (Arm 2 Tandem Circuit)
- 36 Bypass Shut-Out Valve
- 37 Arm 2 Flow Rate Control Valve (Poppet Valve)
- 38 Arm Regenerative Valve
- 39 Digging Generative Valve
- 40 Load Check Valve (Digging Regenerative Circuit)
- 41 Arm 1 Flow Rate Control Valve (Poppet Valve)
- 42 Load Check Valve (Swing Circuit)
- 43 Arm 1 Flow Rate Control Valve (Switch Valve)
- 44 Load Check Valve (Arm Regenerative Circuit)

- 43 Arm Anti-Drift Valve (Switch Valve)
- 44 Overload Relief Valve (Arm: Bottom Side)
- 45 Arm Anti-Drift Valve (Check Valve)
- 46 Overload Relief Valve (Arm: Rod Side)
- 47 Check Valve (Digging Regenerative Circuit)
- 48 Load Check Valve (Boom 2 Parallel Circuit)
- 49 Auxiliary Flow Rate Control Valve (Poppet Valve)
- 50 Auxiliary Flow Rate Control Valve (Switch Valve)
- 51 Load Check Valve (Left Travel Tandem Circuit)

Layout of Positioning Control Valve (2-Piece Boom)

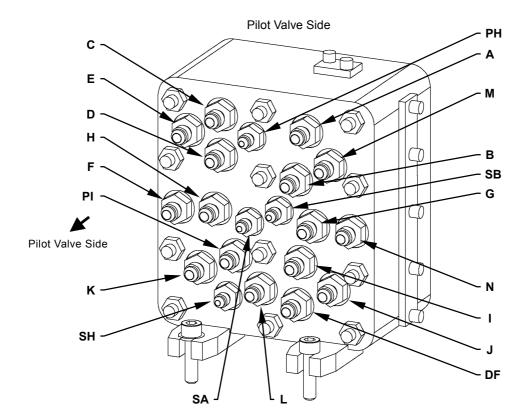






- 1 Load Check Valve (Positioning Tandem Circuit)
- 2 Overload Relief Valve (Positioning: Rod Side)
- 3 Overload Relief Valve (Positioning: Bottom Side)
- 4 Load Check Valve (Positioning Parallel Circuit)

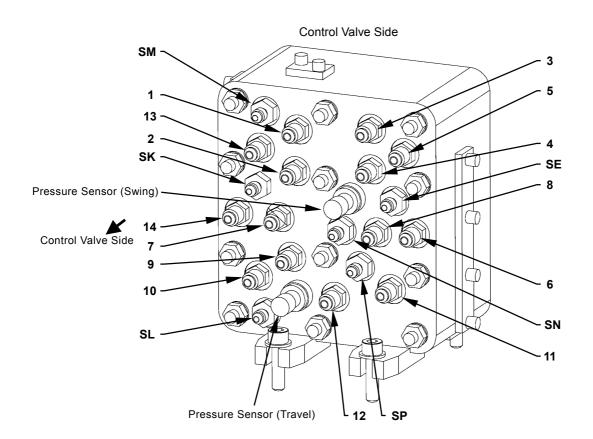
PILOT PORT (Signal Control Valve)



T178-03-06-016

Pilot Valve Side

Port Name	Connecting to	Remark	
Port A	Right Pilot Valve	Boom Raise Pilot Pressure	
Port B	Right Pilot Valve	Boom Lower Pilot Pressure	
Port C	Left Pilot Valve	Arm Roll-Out Pilot Pressure	
Port D	Left Pilot Valve	Arm Roll-In Pilot Pressure	
Port E	Left Pilot Valve	Left Swing Pilot Pressure	
Port F	Left Pilot Valve	Right Swing Pilot Pressure	
Port G	Right Pilot Valve	Bucket Roll-In Pilot Pressure	
Port H	Right Pilot Valve	Bucket Roll-Out Pilot Pressure	
Port I	Travel Pilot Valve	Left Travel Forward Pilot Pressure	
Port J	Travel Pilot Valve	Left Travel Reverse Pilot Pressure	
Port K	Travel Pilot Valve	Right Travel Forward Pilot Pressure	
Port L	Travel Pilot Valve	Right Travel Reverse Pilot Pressure	
Port M	Auxiliary Pilot Valve	Auxiliary Open Pilot Pressure	
Port N	Auxiliary Pilot Valve	Auxiliary Close Pilot Pressure	
Port SA	Pump 1 Regulator	Pump 1 Control Pressure	
Port SB	Pump 2 Regulator	Pump 2 Control Pressure	
Port PI	Pilot Shut-Off Valve	Primary Pilot Pressure	
Port PH	-	Plug	
Port SH	Swing Parking Brake	Brake Release Pressure	
Port DF	Hydraulic Oil Tank	Returning to Hydraulic Oil Tank	



T178-03-06-015

Control Valve Side

Port Name	Connecting to	Remark
Port 1	Control Valve	Boom Raise Pilot Pressure
Port 2	Control Valve	Boom Lower Pilot Pressure
Port 3	Control Valve	Arm Roll-Out Pilot Pressure
Port 4	Control Valve	Arm Roll-In Pilot Pressure
Port 5	Control Valve	Left Swing Pilot Pressure
Port 6	Control Valve	Right Swing Pilot Pressure
Port 7	Control Valve	Bucket Roll-In Pilot Pressure
Port 8	Control Valve	Bucket Roll-Out Pilot Pressure
Port 9	Control Valve	Left Travel Forward Pilot Pressure
Port 10	Control Valve	Left Travel Reverse Pilot Pressure
Port 11	Control Valve	Right Travel Forward Pilot Pressure
Port 12	Control Valve	Right Travel Reverse Pilot Pressure
Port 13	Control Valve	Auxiliary Open Pilot Pressure
Port 14	Control Valve	Auxiliary Close Pilot Pressure
Port SE	Control Valve	Arm 1 Flow Rate Control Valve Control Pressure
Port SM	Hydraulic Oil Tank	Returning to Hydraulic Oil Tank
Port SN	-	Plug
Port SP	Hydraulic Oil Tank	Returning to Hydraulic Oil Tank
Port SL	Control Valve	Flow Combiner Valve Control Pressure
Port SK	Control Valve	Bucket Flow Rate Control Valve Control Pressure

2-Piece Boom Specification Machine

Port SP	Positioning Pilot Valve	Secondary Pilot Pressure

Machine with Front Attachment (Secondary Crushers 1 to 5 and Hydraulic Crushers 1 to 5) attached.

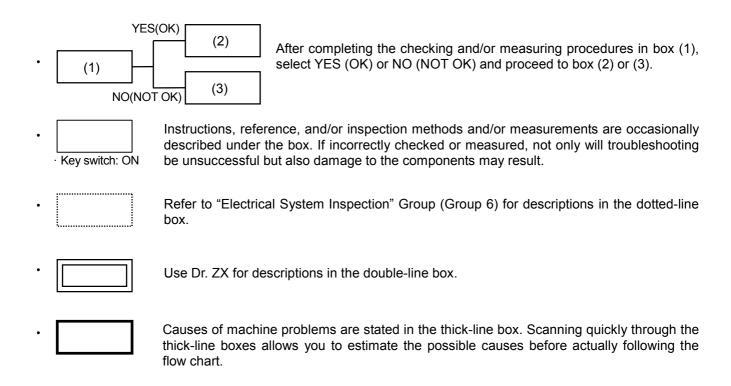
Auxiliary Flow Rate Combiner Solenoid Valve	Auxiliary	Flow	Rate	Combiner	Valve	Control
	Pressure					
Auxiliary Flow Rate Combiner Control Valve	Auxiliary	Flow	Rate	Combiner	Valve	Control
	Pressure					
Auxiliary Flow Rate Combiner Solenoid Valve	Pump 1 C	Control I	Pressu	re e		
	Auxiliary Flow Rate Combiner Control Valve	Auxiliary Flow Rate Combiner Control Valve Auxiliary Pressure	Auxiliary Flow Rate Combiner Control Valve Auxiliary Flow Pressure	Auxiliary Flow Rate Combiner Control Valve Auxiliary Flow Rate Pressure	Auxiliary Flow Rate Combiner Control Valve Auxiliary Flow Rate Combiner Pressure Auxiliary Flow Rate Combiner Pressure	Auxiliary Flow Rate Combiner Control Valve Pressure Pressure Auxiliary Flow Rate Combiner Valve Pressure

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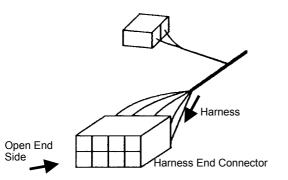
TROUBLESHOOTING A PROCEDURE

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



NOTE: Harness end connector viewed from the open end side by the all connectors image shown in this section.



T158-05-03-001

FAULT CODE LIST MC

Controller Hardware Failure

Controller	Haluwale Lallule		
Fault	Trouble	Cause	Influenced Control
Code			
11000-2	Abnormal EEPROM	Faulty MC	All Control
11001-2	Abnormal RAM	Faulty MC	All Control
11002-2	Abnormal A/D Conversion	Faulty MC	All Control
11003-3	Abnormal Sensor Voltage	Faulty MC	All Control
11004-2	Abnormal CAN Communication	Faulty MC	Heater Control Speed Sensing Control Attachment Operation Speed Increase Control Attachment Operation Speed Limit Control Attachment Pump Torque Decrease Control Pump 1 Flow Rate Limit Control Pump 2 Flow Rate Limit Control Attachment Flow Rate Control (Optional) Attachment Valve Selection (Optional) CAN Cycle Data Communication

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
-	Retrial B	Replace MC
-	Retrial B	Replace MC
-	Retrial B	Replace MC
Although the engine control dial is operated, engine speed does not change.	Retrial B	Check sensor connected to MC Check Harness Replace MC
 Machine movement is slow. The work mode alarm is displayed on the monitor unit. 	Retrial B	Check CAN Harness Replace MC
T1V1-05-01-102		

Engine Failure

Engine Fa	liure		
Fault Code	Trouble	Cause	Influenced Control
11100-2	Abnormal Engine Speed	Engine Speed: Less than 4000 min ⁻¹	Speed Sensing Control
11101-3	Abnormal Engine Control Dial Sensor High Voltage	Voltage: 4.78 V or higher	Engine Control Dial Control
11101-4	Abnormal Engine Control Dial Sensor Low Voltage	Voltage: Less than 0.22 V	Engine Control Dial Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
Machine movement is slow. (During speed sensing, torque is reduced.)	Retrial B	Check Harness
 Trouble condition with the key ON: Engine speed is kept at idle speed. Trouble condition with the key ON: engine speed is kept at speed immediately before trouble. 	Retrial B	Check Harness Replace Engine Control Dial
 Trouble condition with the key ON: Engine speed is kept at idle speed. Trouble condition with the key ON: engine speed is kept at speed immediately before trouble. 	Retrial B	Check Harness Replace Engine Control Dial

Pump Fail			·
Fault Code	Trouble	Cause	Influenced Control
11200-3	Abnormal Pump 1 Delivery Pressure Sensor High Voltage	Voltage: 4.5 V or higher	 HP Mode Control Travel HP Mode Control E Mode Control Travel Torque-Up Control Arm Regenerative Control Digging Regenerative Control Auto-Power Lift Control Travel Motor Swash Angle Control
11200-4	Abnormal Pump 1 Delivery Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	HP Mode Control Travel HP Mode Control E Mode Control Travel Torque-Up Control Arm Regenerative Control Digging Regenerative Control Auto-Power Lift Control Travel Motor Swash Angle Control
11202-3	Abnormal Pump 2 Delivery Pressure Sensor High Voltage	Voltage: 4.5 V or higher	 HP Mode Control Travel HP Mode Control E Mode Control Travel Torque-Up Control Arm Regenerative Control Digging Regenerative Control Travel Motor Swash Angle Control
11202-4	Abnormal Pump 2 Delivery Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	 HP Mode Control Travel HP Mode Control E Mode Control Travel Torque-Up Control Arm Regenerative Control Digging Regenerative Control Travel Motor Swash Angle Control
11206-3	Abnormal Pump 1 Pump Control Pressure Sensor High Voltage	Voltage: 4.75 V or higher	E Mode ControlHeater ControlTravel Motor Swash Angle Control
11206-4	Abnormal Pump 1 Pump Control Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	E Mode Control Heater Control Travel Motor Swash Angle Control
11208-3	Abnormal Pump 2 Pump Control Pressure Sensor High Voltage	Voltage: 4.75 V or higher	E Mode ControlHeater ControlTravel Motor Swash Angle Control
11208-4	Abnormal Pump 2 Pump Control Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	E Mode Control Heater Control Travel Motor Swash Angle Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
 Combined operation of arm roll-in and boom raise or combined operation of arm-roll-in and swing: Arm speed is slow. Single operation of boom raise: Lifting force is weak. Travel: Slow speed 	Retrial B	Check Harness Replace Pump 1 Delivery Pressure Sensor
 Combined operation of arm roll-in and boom raise or combined operation of arm-roll-in and swing: Arm speed is slow. Single operation of boom raise: Lifting force is weak. Travel: Slow speed 	Retrial B	Check Harness Replace Pump 1 Delivery Pressure Sensor
 Combined operation of arm roll-in and boom raise or combined operation of arm-roll-in and swing: Arm speed is slow. Travel: Slow speed 	Retrial B	Check Harness Replace Pump 2 Delivery Pressure Sensor
 Combined operation of arm roll-in and boom raise or combined operation of arm-roll-in and swing: Arm speed is slow. Travel: Slow speed 	Retrial B	Check Harness Replace Pump 2 Delivery Pressure Sensor
 Although speed operating in E mode returns to P speed, returning speed becomes low due to this failure. Travel: Slow speed 	Retrial B	Check Harness Replace Pump 1 Control Pressure Sensor
 Although speed operating in E mode returns to P speed, returning speed becomes low due to this failure. Travel: Slow speed 	Retrial B	Check Harness Replace Pump 1 Control Pressure Sensor
 Although speed operating in E mode returns to P speed, returning speed becomes low due to this failure. Travel: Slow speed 	Retrial B	Check Harness Replace Pump 2 Control Pressure Sensor
 Although speed operating in E mode returns to P speed, returning speed becomes low due to this failure. Travel: Slow speed 	Retrial B	Check Harness Replace Pump 2 Control Pressure Sensor

Fault Code	Trouble	Cause	Influenced Control
11301-3	Abnormal Swing Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	Arm Regenerative Control Attachment Flow Rate Control Swing Alarm Control
11301-4	Abnormal Swing Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	Arm Regenerative Control Attachment Flow Rate Control Swing Alarm Control
11302-3	Abnormal Boom Raise Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	HP Mode Control Arm Regenerative Control Digging Regenerative Control Auto-Power Lift Control Attachment Flow Rate Control
11302-4	Abnormal Boom Raise Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	HP Mode Control Arm Regenerative Control Digging Regenerative Control Auto-Power Lift Control Attachment Flow Rate Control
11303-3	Abnormal Arm Roll-In Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	HP Mode Control Arm Regenerative Control Digging Regenerative Control Auto-Power Lift Control
11303-4	Abnormal Arm Roll-In Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	HP Mode Control Arm Regenerative Control Digging Regenerative Control Auto-Power Lift Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
Combined operation of arm-roll-in and swing: Arm speed is slow. In case of the machine equipped with the swing alarm (optional) and when swing alarm is effective, swing alarm continues to ring.	Retrial B	Check Harness Replace Swing Pilot Pressure Sensor
 Combined operation of arm-roll-in and swing: Arm speed is slow. In case of the machine equipped with the swing alarm (optional) and when swing alarm is effective, swing alarm continues to ring. 	Retrial B	Check Harness Replace Swing Pilot Pressure Sensor
 During HP control, boom raise speed does not increase. Combined operation of arm roll-in and boom raise: Arm speed is slow. 	Retrial B	Check Harness Replace Boom Raise Pilot Pressure Sensor
 During HP control, boom raise speed does not increase. Combined operation of arm roll-in and boom raise: Arm speed is slow. 	Retrial B	Check Harness Replace Boom Raise Pilot Pressure Sensor
 During HP control, arm roll-in speed does not increase. Combined operation of arm roll-in and swing: Arm speed is slow. 	Retrial B	Check Harness Replace Arm Roll-In Pilot Pressure Sensor
 During HP control, arm roll-in speed does not increase. Combined operation of arm roll-in and swing: Arm speed is slow. 	Retrial B	Check Harness Replace Arm Roll-In Pilot Pressure Sensor

Fault	Trouble	Causo	Influenced Control
Code	Houble	Cause	inilidenced Control
11304-3	Abnormal Travel Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	Auto-Idle Control Idle Speed-Up Control ECO Control Travel HP Mode Control Heater Control Travel Torque-Up Control Pump 1 Flow Rate Limit Control Pump 2 Flow Rate Limit Control Travel Motor Swash Angle Control Attachment Flow Rate Control Travel Alarm Control
11304-4	Abnormal Travel Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	Auto-Idle Control Idle Speed-Up Control ECO Control Travel HP Mode Control Heater Control Travel Torque-Up Control Pump 1 Flow Rate Limit Control Pump 2 Flow Rate Limit Control Travel Motor Swash Angle Control Attachment Flow Rate Control Travel Alarm Control
11307-3	Abnormal Front Attachment Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	Auto-Idle Control Idle Speed-Up Control ECO Control Travel HP Mode Control Heater Control Travel Motor Swash Angle Control
11307-4	Abnormal Front Attachment Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	Auto-Idle Control Idle Speed-Up Control ECO Control Travel HP Mode Control Heater Control Travel Motor Swash Angle Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
 When traveling at idle speed, engine speed does not increase to the specification. When traveling, speed does not return from auto idle speed. When traveling, speed does not return from ECO speed. Travel: Slow speed When operating ATT, the machine mistracks. In case of the machine equipped with the travel alarm (optional), travel alarm continues to ring. 	Retrial B	Check Harness Replace Travel Pilot Pressure Sensor
 When traveling at idle speed, engine speed does not increase to the specification. When traveling, speed does not return from auto idle speed. When traveling, speed does not return from ECO speed. Travel: Slow speed When operating ATT, the machine mistracks. In case of the machine equipped with the travel alarm (optional), travel alarm continues to ring. 	Retrial B	Check Harness Replace Travel Pilot Pressure Sensor
 When operating the front attachment at idle speed, engine speed does not increase to the specification. When operating the front attachment, speed does not return from auto idle speed. When operating the front attachment, speed does not return from ECO speed. Although the front attachment is operated, travel becomes fast. 	Retrial B	Check Harness Replace Front Pilot Pressure Sensor
 When operating the front attachment at idle speed, engine speed does not increase to the specification. When operating the front attachment, speed does not return from auto idle speed. When operating the front attachment, speed does not return from ECO speed. Although the front attachment is operated, travel becomes fast. 	Retrial B	Check Harness Replace Front Pilot Pressure Sensor

Proportion	nal Solenoid Valve Failure		
Fault Code	Trouble	Cause	Influenced Control
11400-2	Abnormal Current Feedback of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Both of Higher than 920mA or Less than 60 mA	Pump 2 Flow Rate Limit Control
11400-3	Abnormal Feedback High Current of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Higher than 920mA	Pump 2 Flow Rate Limit Control
11400-4	Abnormal Feedback Low Current of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Less than 56 mA	Pump 2 Flow Rate Limit Control
11401-2	Abnormal Current Feedback of Torque Control Solenoid Valve	Current: Both of Higher than 920mA or Less than 60 mA	Speed Sensing ControlTravel Torque-Up ControlAttachment Pump Torque Decrease Control
11401-3	Abnormal Feedback High Current of Torque Control Solenoid Valve	920 mA	Speed Sensing ControlTravel Torque-Up ControlAttachment Pump Torque Decrease Control
11401-4	Abnormal Feedback Low Current of Torque Control Solenoid Valve	Current: Less than 56 mA	Speed Sensing ControlTravel Torque-Up ControlAttachment Pump Torque Decrease Control
11402-2	Abnormal Current Feedback of Solenoid Valve Unit (SF) (Digging Regeneration)	Current: Both of Higher than 920mA or Less than 60 mA	Digging Regenerative Control
11402-3	Abnormal Feedback High Current of Solenoid Valve Unit (SF) (Digging Regeneration)	Current: Higher than 920mA	Digging Regenerative Control
11402-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SF) (Digging Regeneration)	Current: Less than 56 mA	Digging Regenerative Control
11403-2	Abnormal Current Feedback of Solenoid Valve Unit (SC) (Arm Regeneration)	Current: Both of Higher than 920mA or Less than 60 mA	Arm Regenerative Control
11403-3	Abnormal Feedback High Current of Solenoid Valve Unit (SC) (Arm Regeneration)	Current: Higher than 920mA	Arm Regenerative Control
11403-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SC) (Arm Regeneration)	Current: Less than 56 mA	Arm Regenerative Control
11404-2	Abnormal Current Feedback of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Both of Higher than 920mA or Less than 60 mA	Power Digging Control Auto-Power Lift Control
11404-3	Abnormal Feedback High Current of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Higher than 920mA	Power Digging Control Auto-Power Lift Control
11404-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Less than 56 mA	Power Digging Control Auto-Power Lift Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
In case ATT flow rate is limited, it cannot be limited.	Retrial B	Check Harness
Actual Operation of Proportional Valve during High Current: • Travel mistakes. • Boom raise operation is slow. • Arm operation is slow. • Swing operation is slow.	Retrial B	Check Harness
Actual Operation of Proportional Valve during Low Current: • In case ATT flow rate is limited, it cannot be limited.	Retrial B	Check Harness
Machine overall operation is slow.	Retrial B	Check Harness
Actual Operation of Proportional Valve during High Current: • The engine is stalled at Li speed. • Engine Speed: Middle to Fast: Engine Stall or Large Lug Down	Retrial B	Check Harness
Actual Operation of Proportional Valve during Low Current: • Machine overall operation is slow.	Retrial B	Check Harness
During digging, arm speed is slow. (As deceleration rate is low, this state is not easy to find.)	Retrial B	Check Harness
Actual Operation of Proportional Valve during High Current: Combined operation of boom rasie and arm roll-in during lift-ing/precision: The boom raise operation is not smooth.	Retrial B	Check Harness
Actual Operation of Proportional Valve during Low Current: • During digging, arm speed is slow. (As deceleration rate is low, this state is not easy to find.)	Retrial B	Check Harness
Combined operation of boom raise and arm roll-in with the front attachment over ground, the boom is not raised smoothly and the arm roll-in full-speed is slow.	Retrial B	Check Harness
Actual Operation of Proportional Valve during High Current: Digging force (arm) becomes weak.	Retrial B	Check Harness
Actual Operation of Proportional Valve during Low Current: Combined operation of boom raise and arm roll-in with the front attachment over ground, the boom is not raised smoothly and the arm roll-in full-speed is slow.	Retrial B	Check Harness
Pressure increasing is impossible.	Retrial B	Check Harness
Actual Operation of Proportional Valve during High Current: • Pressure always increases.	Retrial B	Check Harness
Actual Operation of Proportional Valve during Low Current: • Pressure increasing is impossible.	Retrial B	Check Harness

Fault Code	Trouble	Cause	Influenced Control
11405-2	Abnormal Current Feedback of Solenoid Valve Unit (SI) (Travel Motor Fast Speed Selection)	Current: Both of Higher than 920mA or Less than 60 mA	Travel Motor Swash Angle Selection Control
11405-3	Abnormal Feedback High Current of Solenoid Valve Unit (SI) (Travel Motor Fast Speed Selection)	Current: Higher than 920mA	Travel Motor Swash Angle Selection Control
11405-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SI) (Travel Motor Fast Speed Selection)	Current: Less than 56 mA	Travel Motor Swash Angle Selection Control
11410-2	Abnormal Current Feedback of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve (Optional)	Current: Both of Higher than 920mA or Less than 60 mA	Pump 1 Flow Rate Limit ControlTravel Pump Flow Rate
11410-3	Abnormal Feedback High Current of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve (Optional)	Current: Higher than 920mA	Pump 1 Flow Rate Limit ControlTravel Pump Flow Rate
11410-4	Abnormal Feedback Low Current of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve (Optional)	Current: Less than 56 mA	Pump 1 Flow Rate Limit ControlTravel Pump Flow Rate

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
Travel motor is always slow.	Retrial B	Check Harness
Operation of Proportional Valve during High Current: • Travel motor is always slow.	Retrial B	Check Harness
Operation of Proportional Valve during Low Current: • Travel motor is always slow.	Retrial B	Check Harness
In case ATT flow rate is limited, it cannot be limited.	Retrial B	Check Harness
 Actual Operation of Proportional Valve during High Current: Travel mistacks. Boom raise operation is slow. Arm operations (roll-in, roll-out) are slow. Bucket roll-in and Dump operations are slow. 	Retrial B	Check Harness
Operation of Proportional Valve during Low Current: • In case ATT flow rate is limited, it cannot be limited.	Retrial B	Check Harness

CAN Data	Reception Failure		
Fault Code	Trouble	Cause	Influenced Control
11910-2	Actual Engine Speed Received from ECM	Faulty Harness	Speed Sensing Control Send to ICF
11918-2	Work Mode Received from Monitor Unit	Faulty Harness	Attachment Operation Speed Increase Control Attachment Operation Speed Limit Control Attachment Pump Torque Decrease Control Pump 1 Flow Rate Limit Control Pump 2 Flow Rate Limit Control Attachment Flow Rate Control Attachment Flow Rate Control Attachment Valve Selection (Optional)
11911-2	Security Signal Received from ECM	Faulty Harness	Theft Prevention Engine Speed, Engine Torque
11920-2	Fuel Flow Rate Received from ECM	Faulty Harness	Fuel Flow Rate
11914-2	Radiator Coolant Temperature Received from ECM	Faulty Harness	Heater Control

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
Machine operation speed is slow. (During speed sensing,	Retrial B	Check Harness
torque is decreased.)		
During e-service, the engine is stalled.		
Digging Mode: Lock	Retrial B	Check Harness
In case flow rate is decreased and speed decreases during		
ATT, stop this control, or Digging is not changed into ATT mode.		
Work Mode Alarm is displayed on the monitor unit.		
• •		
T1V1-05-01-102		
In case theft prevention is turned ON by Dr. ZX, engine	Retrial B	Check Harness
speed is kept at Minimum speed and pump torque is kept		
Minimum.		
When the monitor setting is displayed fuel consumption at	Retrial B	Check Harness
moment, engine display at moment is "".		
Heater Control: Ineffective	Retrial B	Check Harness

Other Faile	Other Failures				
Fault Code	Trouble	Cause	Influenced Control		
11901-3	Hydraulic Oil Temperature Sensor High Voltage	Voltage: 4.52 V or higher	Auto-Warming Up ControlArm Regenerative ControlDigging Regenerative Control		
11901-4	Hydraulic Oil Temperature Sensor Low Voltage	Voltage: Less than 0.23 V	Auto-Warming Up ControlArm Regenerative ControlDigging Regenerative Control		
11905-3	Abnormal Boom Bottom Pressure Sensor High Voltage (Optional)	Voltage: 4.5 V or higher	Overload Alarm		
11905-4	Abnormal Boom Bottom Pressure Sensor Low Voltage (Optional)	Voltage: Less than 0.25 V	Overload Alarm		

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
When temperature is low (hydraulic oil temperature is less than 0 $^{\circ}$ C), the auto-warming up control is inoperable.	Retrial B	Check Harness
When temperature is low (hydraulic oil temperature is less than 0 $^{\circ}$ C), the auto-warming up control is inoperable.	Retrial B	Check Harness
When overload alarm is used. • Overload alarm buzzer rings. • The overload alarm is displayed on the monitor unit.	Retrial B	Check Harness Replace Boom Bottom Pressure Sensor
When overload alarm is used. • Overload alarm buzzer rings. • The overload alarm is displayed on the monitor unit.	Retrial B	Check Harness Replace Boom Bottom Pressure Sensor
T1V1-05-02-002		

ECM Sensor Sy	vstem vstem	
Fault	Trouble	Cause
Code		
636-2	Abnormal Cam Angle Sensor (No Signal)	Although the crank signal is present, the cam signal is not present.
636-2	Abnormal Cam Angle Sensor (Abnormal Signal)	The pulse of cam signal is not matched.
723-2	Abnormal Crank Speed Sensor (No Signal)	Although the cam signal is present, the crank signal is not present.
723-2	Abnormal Crank Speed Sensor (Abnormal Signal)	The pulse of crank signal is not matched.
636-7	Phase Mismatch of Cam Angle Sensor	The right cam pulse is not present at the gap in the crank.
172-3	Abnormal Intake-Air Temperature Sensor (Abnormal High Voltage)	Voltage at the intake-air temperature sensor is beyond 4.95 V in 3 minutes after the engine starts.
172-4	Abnormal Intake-Air Temperature Sensor (Abnormal Low Voltage)	Voltage at the intake-air temperature sensor is below 0.1 V.
110-3	Abnormal Coolant Temperature Sensor (Abnormal High Voltage)	Voltage at the coolant temperature sensor is beyond 4.85 V.
110-4	Abnormal Coolant Temperature Sensor (Abnormal Low Voltage)	Voltage at the coolant temperature sensor is below 0.1 V
102-4	Abnormal Boost Pressure Sensor (Abnormal High Voltage)	Voltage at the boost pressure sensor is beyond 4.9 V.
102-3	Abnormal Boost Pressure Sensor (Abnormal Low Voltage)	Voltage at the boost pressure sensor is below 0.1 V
10001-3	Abnormal EGR Position (Brushless spec.)	The condition which the output signal of EGR position cannot be present in.
108-4	Abnormal Atmospheric Pressure Sensor (Abnormal High Voltage)	Voltage at the atmospheric pressure sensor is beyond 3.8 V.
108-3	Abnormal Atmospheric Pressure Sensor (Abnormal Low Voltage)	Voltage at the atmospheric pressure sensor is below 0.5 V.
174-3	Abnormal Fuel Temperature Sensor (Abnormal High Voltage)	Voltage at the fuel temperature sensor is beyond 4.85 V in 3 minutes after the engine starts.
174-4	Abnormal Fuel Temperature Sensor (Abnormal Low Voltage)	Voltage at the fuel temperature sensor is below 0.1 V.

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
 While the engine runs, there is nothing abnormal with machine operation. 	While the engine runs, operate according to standard of the crank sensor. When the en-	P0340
 After the engine is stalled, the re-start is impossible. 	gine stops, the start is impossible (in order to prevent the engine from damaging).	P0341
The output power may decrease, white smoke may occur and vibration may occur.	Operate according to standard of the cam sensor.	P0335
 The engine may be stalled. (If the cam senor is normal, the engine can re-start.) 		P0336
 While the engine runs, there is nothing abnormal with machine operation. After the engine is stalled, the re-start is impossible. 	The timing chain and the belt does not turn smoothly but turn in reverse.	P1345
Nothing special	When starting: -10 °C (14 °F) (Start the engine although what state.)	P0113
	When operating: 25 °C (77 °F) (Operate normally.)	P0112
Normal temperature: When starting, dark smoke may occur and engine combustion sound may be	When starting: -20 °C (-4 °F) (Start the engine although what state.)	P0118
become loud. While warming up with fresh air in low temperature: Rough idle, engine stall or while smoke may be occur.	When operating: 80 °C (176 °F) (Operate normally.)	P0117
Dark smoke occurs.	Boost pressure cannot be corrected.	P0238
		P0237
There is influence to exhaust gas.	As the sensor input is not certain, it cannot be controlled. Exhaust gas becomes bad. Operate the engine with EGR valve fully open.	P0487
Dark smoke occurs at high altitude.	Atmospheric pressure 80 kPa (0.8 kgf/cm ² , 12 psi) (2000 m above the sea)	P0108
		O0107
Nothing special	When starting: -20 °C (-4 °F) (Start the engine although what state.)	P0183
	When operating: 70 °C (158 °F) (Operate normally.)	P0182

	<u> </u>	
Fault	Trouble	Cause
Code		
157-3	Abnormal Common Rail Pressure Sensor (Abnormal High Voltage)	Voltage at the common rail pressure sensor is beyond 4.5 V.
157-3	Abnormal Common Rail Pressure Sensor (Abnormal Low Voltage)	Voltage at the common rail pressure sensor is below 0.7 V.
100-4	Abnormal Engine Oil Pressure Sensor (Abnormal High Voltage)	Voltage at the engine oil pressure sensor is beyond 4.85 V.
100-3	Abnormal Engine Oil Pressure Sensor (Abnormal Low Voltage)	Voltage at the engine oil pressure sensor is below 0.1 V.
105-3	Abnormal Boost Temperature Sensor (Abnormal High Voltage)	Voltage at the boost temperature sensor is beyond 4.95 V over 5 minutes after the engine starts or when coolant temperature is beyond 50 °C (122 °F).
105-4	Abnormal Boost Temperature Sensor (Abnormal Low Voltage)	Voltage at the boost temperature sensor is below 0.1 V.

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
The engine may be stalled. The output power decreases.	The supply pump can not be controlled.	P0193
		P0192
nere is no influence when operating the ma-Nothing special ine.		P0523
		P0522
There is no influence when operating the machine.	Nothing special	P1113
		P1112

Fault Code	Trouble	Influence to Eng Performance			eratir urren		Remark	
		(Presumption		Α	В	С	D	
636-2	Abnormal Cam Angle Sensor (No Signal)		during	0			0	
636-2	Abnormal Cam Angle Sensor (Abnormal Signal)	After stopping, re-start is impossil	the ble.	0			0	
723-2	Abnormal Crank Speed Sensor (No Signal)	No output p decrease	power	0				
723-2	Abnormal Crank Speed Sensor (Abnormal Signal)			0				
636-7	Phase Mismatch of Cam Angle Sensor	No influence of operationg After stopping, re-start is impossil	the ble.	0			0	
172-3	Sensor (Abnormal High Voltage)	No output p decrease	power	0				
172-4	Abnormal Intake-Air Temperature Sensor (Abnormal Low Voltage)			0				
110-3	Abnormal Coolant Temperature Sensor (Abnormal High Voltage)	No output p decrease	power	0				
110-4	Abnormal Coolant Temperature Sensor (Abnormal Low Voltage)			0				
102-4	Abnormal Boost Pressure Sensor (Abnormal High Voltage)	No output p decrease	power	0				
102-3	Abnormal Boost Pressure Sensor (Abnormal Low Voltage)			0				
10001-3	Abnormal EGR Position (Brushless spec.)	change	power	0				
108-4	Abnormal Atmospheric Pressure Sensor (Abnormal High Voltage)	No output p decrease	power	0				
108-3	Abnormal Atmospheric Pressure Sensor (Abnormal Low Voltage)			0				
174-3	Abnormal Fuel Temperature Sensor (Abnormal High Voltage)	decrease	power	0				
174-4	Abnormal Fuel Temperature Sensor (Abnormal Low Voltage)			0				
157-3	Abnormal Common Rail Pressure Sensor (Abnormal High Voltage)	Output pdecrease: 70%	power			0		
157-4	Abnormal Common Rail Pressure Sensor (Abnormal Low Voltage)					0		
100-4	Abnormal Engine Oil Pressure Sensor (Abnormal High Voltage)	No output p change	power	0				
100-3	Abnormal Engine Oil Pressure Sensor (Abnormal Low Voltage)			0				

Fault Code	Trouble	Influence to Engine Performance (Presumption)	Operating Rank (Current State)		Remark	
105-3	Abnormal Boost Temperature Sensor (Abnormal High Voltage)	No output power change	0			
105-4	Abnormal Boost Temperature Sensor (Abnormal Low Voltage)	•	0			

Operating Rank

- A: Diggings operable.
- B: Machine can travel with boom raised. (Steering is impossible.)
- C: The engine only runs. (Travel, digging and operation with light load are impossible.)
- D: The engine cannot stop / start.

IMPORTANT: When fault code 723-2 (abnormal crank speed sensor) is displayed and the engine does not start, the cam angle sensor is faulty although fault codes 636-2 (abnormal cam angle sensor) and 636-7 (phase mismatch of cam angle sensor) are not displayed.

External Device System

evice System	
Trouble	Cause
Abnormal EGR valve control	Difference between the target valve lift and actual position isbeyond 20%.
•	The suctioncontrol valve drive current is beyond 2400 mA or below 50 mA. Or, difference between the tartget current and actual current is 1000 mA or more.
Open circuit in injection nozzle #1 drive system	No input signal of injector 1 monitor.
Open circuit in injection nozzle #2 drive system	No input signal of injector 2 monitor.
Open circuit in injection nozzle #3 drive system	No input signal of injector 3 monitor.
Open circuit in injection nozzle #4 drive system	No input signal of injector 4 monitor.
Open circuit in injection nozzle #5 drive system	No input signal of injector 5 monitor.
Open circuit in injection nozzle #6 drive system	No input signal of injector 6 monitor.
	Trouble Abnormal EGR valve control Open circuit in suction control valve drive system, Shorted circuit in + B or GND Open circuit in injection nozzle #1 drive system Open circuit in injection nozzle #2 drive system Open circuit in injection nozzle #3 drive system Open circuit in injection nozzle #4 drive system Open circuit in injection nozzle #5 drive system Open circuit in injection nozzle #5 drive system

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
There is influence to exhaust gas.	EGR cannot be controlled. As exhaust gas becomes bad, EGR stops.	P0488
The engine may be stalled and the rotation speed increases automatically and abnormally according to open or shorted circuitc ondition. Dark smoke occurs. Output power is too large.		
Vibration of the engine is large, Rough idle, output power decrease, faulty increasing of		P0201
rotation speed, output power decrease	#2 injector cannot be controlled. → Stop drive pulse output of #2 injector.	P0202
	#3 injector cannot be controlled. → Stop drive pulse output of #3 injector.	P0203
	#4 injector cannot be controlled. → Stop drive pulse output of #4 injector.	P0204
	#5 injector cannot be controlled. → Stop drive pulse output of #5 injector.	P0205
	#6 injector cannot be controlled. → Stop drive pulse output of #6 injector.	P0206

Fuel System

Fuel Syste	m	
Fault Code	Trouble	Cause
157-0	Abnormal common rail pressure (First stage)	Common rail pressure is beyond 185 Mpa.
157-0	Abnormal commo rail pressure (Second stage)	The first stage "Abnormal common rail presure" is approveand commonrail pressure is beyond 190 Mpa.
157-2	Abnormal commonrail pressure (Pump over-pressure)	When DUTY to the suction control valve is 40 % or more, or target pressure to the suction control valve is 90 mm ³ /sec or less, actual rail pressure is 40 MPa (410 kgf/cm ² , 5820 psi) higher than the target rail pressure.
633-7	Pressure limiter open	The pressure limiter is open.
1240-1	No pressure to pump (Fuel leakage)	When DUTY to the suction control valve is 33 % or less, or pressure to the suction control valve is 28000 mm ³ /sec or more and 1200 min ⁻¹ , actual rail pressure is 50 MPa (510 kgf/cm ² , 7270 psi) lower than the target rail pressure.
1239-1	No pressure to pump (Fuel leakage)	When pressure to the suction control valve is 900 min ⁻¹ , actual rail pressure is 15Mpa (150 kgf/cm ² , 2180 psi) or less.

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed, dark smoke may occur, output power may be too large.	1	P0088
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed, dark smoke may occur, output power may be too large.	1,	P0088
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed, dark smoke may occur, output power may be too large.	damage	P0089
Output power decrease	Rial pressure is beyond the allowable pressure.	P1095
	Fuel leakage is too much. Difference between target rail pressure and actual rail pressure is larger than the specification. (Large deflection)	P1093
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed, dark smoke may occur, output power may be too large.	Actual rail pressure does not increase to the	P0087

Fault	Trouble	Influence to Engine Performance		eratir (Cur	ng Ra rent)		Remark
Code		(Presumption)	Α	В	С	D	
10002-2	Abnormal EGR valve control	No output power change	0				
1347-0	Open circuit in suction control valve drive system, Shorted circuit in + B or GND	Output power decrease: 50%		0			
651-3	Open circuit in injection nozzle # 1 drive system	Output power decrease: 15%		0			
652-3	Open circuit in injection nozzle # 2 drive system	(Five cylinders drive.)		0			
653-3	Open circuit in injection nozzle # 3 drive system			0			
654-3	Open circuit in injection nozzle # 4 drive system			0			
655-3	Open circuit in injection nozzle # 5 drive system			0			
656-3	Open circuit in injection nozzle # 6 drive system			0			
		Influence to Engine	Ор	eratir	_	ank	
Fault Code	Trouble	Performance		(Cur	rent)		Remark
Code		(Presumption)	Α	В	С	D	
157-0	Abnormal common rail pressure (First stage)	Output power decrease: 50%		0			
157-0	Abnormal commo rail pressure (Second stage)	Output power decrease: 50%		0			
157-2	Abnormal commonrail pressure (Pump over-pressure)	Output power decrease: 50%		0			
633-7	Pressure limiter open	Output power decrease: 50%		0			
1240-1	No pressure to pump (Fuel leakage)	Output power		0			_
1239-1	No pressure to pump (Fuel leakage)	decrease: 50%		0			

Operating Rank

- A: Diggings operable.
- B: Machine can travel with boom raised. (Steering is impossible.)
- C: The engine only runs. (Travel, digging and operation with light load are impossible.)
- D: The engine cannot stop / start.

(Blank)

Fault Code	Trouble	Cause
110-0	Overheating	Coolant temperature is beyond 120 °C (248 °F) when operating the engine.
190-0	Overrunning	In case the engine speed is beyond 2500 min ⁻¹
Fault Code	Trouble	Cause
987-3	Abnormal check engine lamp	No monitor signal of the check engine lamp
1485-2	Abnormal main relay system	Voltage in the main relay system is 1 V or less with the main relay coil output ON.
		Although the main relay coil output is turned OFF, the main relay is kept ON.

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
There is no influence when operating the machine.	Nothing special (The history of overheating is recorded.)	P1173
Engine speed of the excavator may not increase 2500 min ⁻¹ or more.	Mistake of gear change, etc.	P0219
Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
There is no influence when operating the machine.	Nothing special	P0650
The engine cannot start.	Nothing	
Electrical power is kept supplying to the machine.	Nothing	P1625

Fault Code	Trouble	Influence to Engine		eratin (Cur			
		Performance (Presumption)	А	В	С	D	Remark
110-0	Overheating	No output power change	0				
190-0	Overrunning	No output power change	0				

Fault	Trouble	Influence to Engine Performance			g Ranke rent)	Remark
Code		(Presumption)	Α	В	C D	
987-3	Abnormal check engine lamp	No output power change	0			
1485-2	Abnormal main relay system	The engine stops.			0	
		Nothing (The engine cannot re-start according to battery voltage.)	0		0	

Operating Rank

- Diggings operable.
- Machine can travel with boom raised. (Steering is impossible.)
- C: The engine only runs. (Travel, digging and operation with light load are impossible.)

 D: The engine cannot stop / start.

(Blank)

Internal Circuit System

Internal Cir	cuit System	
Fault Code	Trouble	Cause
10005-1	Abnormal Charge Circuit (Bank 1)	In case volate at bank 1 of charge circuit in ECM is low
10006-1	Abnormal Charge Circuit (Bank 2)	In case volate at bank 2 of charge circuit in ECM is low
10008-2	Abnormal A/D Conversion	A/D conversion cannot be done.
10007-2	Abnormal CPU	Within 100 msec after the key switch is turned ON, failure of main CPU is detected by sub CPU. (Sub CPU resets CPU.)
1077-2	Abnormal IC for CPU watching	No change of RUN-SUB pulse in 20 msec
628-2	Abnormal ROM	ROM is broken.
10013-2	Abnormal EEPROM	EEPROM is broken.
1079-2	Abnormal 5 V Power Source 1 Voltage	When battery volate is between 16 V and 32 V, voltage of IGKEY power source is 5.5 V or more or 4.5 V or less.
1080-2	Abnormal 5 V Power Source 2 Voltage	When battery volate is between 16 V and 32 V, voltage of IGKEY power source is 5.5 V or more or 4.5 V or less.
10009-2	Abnormal 5 V Power Source 3 Voltage	When battery volate is between 16 V and 32 V, voltage of IGKEY power source is 5.5 V or more or 4.5 V or less.
10010-2	Abnormal 5 V Power Source 4 Voltage	When battery volate is between 16 V and 32 V, voltage of IGKEY power source is 5.5 V or more or 4.5 V or less.
10011-2	Abnormal 5 V Power Source 5 Voltage	When battery volate is between 16 V and 32 V, voltage of IGKEY power source is 5.5 V or more or 4.5 V or less.
10003-2	Abnormal Injection Nozzle Common 1 Drive System	No monitor siganals of injectors 1, 3, 5
10004-2	,	No monitor siganals of injectors 2, 4, 6

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty	→ Stop output of drive signal at broken common	P0611
increasing of rotation speed may occur, the engine may be stalled.	side (Protect the engine from damage)	P0612
Output power decrease, dark smoke occur.	All analogue sensor cannot be used.	P1630
Output power decrease	CPU is broken.	P0606
The engine cannot start.		P0606
Output power decrease	Sub CPU is broken.	P0601
The engine stops.	Data of ROM cannot be read.	P1603
There is no influence when operating the machine.	Data cannot be written to EEPROM.	P1631
Same as Abnormal accelerator Sensor	←	P1632
Same as Abnomal atmospheric and in-take temperaturecsensors	←	P1633
Same as Abnomal coolant temperature, fuel temperature and hydraulic oil pressure sensors	←	P1634
Same as Abnomal boost pressure and boost temperature sensors	←	P1635
Same as Abnomal rail pressure and EGR position sensors	←	P1261
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed may occur, the engine may be stalled.	→ Stop output of drive signal at broken common	P1262

Fault Code	Trouble	Influence to Engine Performance	Operating Rank (Current)				Remark
		(Presumption)	Α	В	С	D	
10005-1	Abnormal Charge Circuit (Bank 1)	Output power		\circ	0		
10006-1	Abnormal Charge Circuit (Bank 2)	decrease: 60% (Three cylinders drive.)		0	0		
10008-2	Abnormal A/D Conversion	Output power decrease: 50%		0			
10007-2	Abnormal CPU	Output power decrease: 50%		0			
		The engine cannot start.				0	
1077-2	Abnormal IC for CPU watching	Output power decrease: 50%		0			
628-2	Abnormal ROM	The engine stops.				0	
10013-2	Abnormal EEPROM	No output power decrease	0				
1079-2	Abnormal 5 V Power Source 1 Voltage	Idle Speed Operation	0				
1080-2	Abnormal 5 V Power Source 2 Voltage	No output power decrease	0				
10009-2	Abnormal 5 V Power Source 3 Voltage	No output power change	0				
10010-2	Abnormal 5 V Power Source 4 Voltage	No output power decrease	0				
10011-2	Abnormal 5 V Power Source 5 Voltage	Output power decrease: 50%		0	0		
10003-2	Abnormal Injection Nozzle Common 1 Drive System	Output power decrease: 60%		0	0		
10004-2	Abnormal Injection Nozzle Common 2 Drive System	(Three cylinders drive.)		0	0		

Operating Rank

- A: Diggings operable.
- B: Machine can travel with boom raised. (Steering is impossible.)
- C: The engine only runs. (Travel, digging and operation with light load are impossible.)
- D: The engine cannot stop / start.

(Blank)

Communication System

Fault Code	Trouble	Cause
639-2	Abnormal CAN Bus Line	Detect the bus line off.
639-3		In case the CAN data reception is not approved in prescribedtime

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
Speed is turnd into idle speed.	CAN communication is operable.	U2104
		U2106

Fault Code	Trouble	Influence to Engine Performance			ng Rarent)		Remark
		(Presumption)	Α	В	С	D	
639-2	Abnormal CAN Bus Line	Idle speed	0				
639-3	Abnormal CAN Time Out		0				

(Blank)

ICF

	T	
Fault Code	Trouble	Cause
14000-2	Abnormal CAN Communication	Data cannot be received due to the noise on the CAN bus line.
14001-2	ICF: Flash Memory: Read / Write Error	In case the internal memory is abnormal when the key is turned ON
14002-2	ICF: External RAM: Read / Write Error	In case the internal memory is abnormal when the key is turned ON
14003-2	ICF: EEPROM: Sum Check Error	In case the internal memory is abnormal when the key is turned ON
14006-2	ICF: Satellite Communication Terminal: Communication Error	In casse communication to the satellite terminal cannot be done over 30 seconds.
14008-2	ICF: Abnormal Internal RAM	In case the internal memory is abnormal when the key is turned ON

Fault Code	Remedy		
14000-2	Check for CAN communication bus line.		
14001-2	After initializing the information C/U by using Dr. ZX, re-try in the troubleshooting. If the error code is displayed after re-try, ICF may be broken. Replace ICF. NOTE: When initialising the information C/U, all stored data is deleted.		
14002-2	After initializing the information C/U by using Dr. ZX, re-try in the troubleshooting. If the error code is displayed after re-try, ICF may be broken. Replace ICF. NOTE: When initialising the information C/U, all stored data is deleted.		
14003-2	As ICF may be broken, replace ICF.		
14006-2	Check for the items below. 1. Check if the communication line is abnormal. 2. Check if the electrical power source of communication terminal is abnormal. • Electrical power source • Fuses 3. Check if the satellilte terminal is broken.		
14008-2	Re-try in the troubleshooting by using Dr.ZX. If the error code is displayed after re-try, ICF may be broken.		

Satellite Terminal

- Cutomito 10	· · · · · · · · · · · · · · · · · · ·		
Fault Code	Trouble	Cause	
14100-2	Satellite Communication Terminal: Abnormal EEPROM	Data cannot be received due to the noise on the CAN bus line.	
14101-2	Satellite Communication Terminal: Abnormal IB/OB Queue	In case the internal memory is abnormal when the key is turned ON	
14102-2	Satellite Communication Terminal: Abnormal Local Loup Back	In case the internal memory is abnormal when the key is turned ON	
14103-2	Satellite Communication Terminal: The satellite is not found.	In case the internal memory is abnormal when the key is turned ON	
14104-2	Satellite Communication Terminal: Fail 1 of Remote Loup Back	In casse communication to the satellite terminal cannot be done over 30 seconds.	
14105-2	Satellite Communication Terminal: Fail 2 of Remote Loup Back	In case the internal memory is abnormal when the key is turned ON	
14106-2	Satellite Communication Terminal: Sending and receiving data are mistached.	In case sending and receiving data are unmatched.	

Fault Code	Remedy
14100-2	Replace the controller.
14101-2	Replace the controller.
14102-2	Replace the controller.
14103-2	Replace the controller.
14104-2	Replace the controller.
14105-2	Replace the controller.
14106-2	Replace the controller.

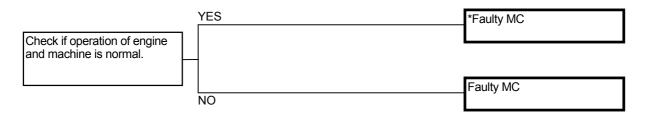
Monitor Unit

Fault Code	Trouble	Cause	
13303-2	Abnormal Thermister Temperature	Thermister temperature is 85 °C (185 °F) or higher.	
13304-2	Abnormal REG Input H Level	During REG input H level	
13305-2	Abnormal Manual Glow EXT Output	In case Glow EXT input is not matched with Glow EXT output	
13306-2	Abnormal EEPROM	When failure reading EEPROM occurs	
13308-2	Abnormal CAN Communication	Bus off occurs beyond five times.	
13310-2	Shorted circuit in Coolant	The state, input 105 \pm 30 Ω or less, is kept over 60 seconds.	
	Temperature Sensor		
13311-2	Shorted circuit in Fuel Leverl Sensor	The state, input $3\pm1~\Omega$ or less, is kept over 60 seconds.	
13311-4	Open circuit in Fuel Leverl Sensor	The state, input 135 \pm 20 Ω or less, is kept over 60 seconds.	

Fault Code	Remedy
13303-2	Cool the monitor unit and so on until temperature inside the monitor unit is less than 85 °C (185 °F).
13304-2	(Refer to the Troubleshooting flow chart.)
13306-2	If this fault code is displayed after retarial, replace the monitor unit.
13308-2	Refer to "Check CAN Harness" on page T5-6-52.
13310-3	Check coolant temperature sensor and harness.
13311-3	Check fuel level sensor and harness.
13311-4	Check fuel level sensor and harness.

CONTROLLER HARDWARE FAILURE MC FAULT CODE 11000 to 11002

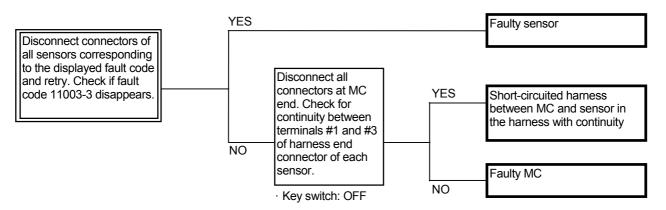
Fault Code	Trouble	Cause	Influenced Control
11000-2	Abnormal EEPROM	Faulty MC	All Control
11001-2	Abnormal RAM	Faulty MC	All Control
11002-2	Abnormal A/D Conversion	Faulty MC	All Control



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

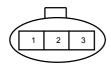
MC FAULT CODE 11003

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

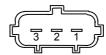


Connector (Harness end of connector viewed from the open side)

- Pressure Sensor (Travel)
- Pressure Sensor (Front Attachment)
- Pressure Sensor (Swing)
- Pressure Sensor (Boom Raise)
- Pressure Sensor (Arm Roll-In)
- Pressure Sensor (Auxiliary) (Optional)
- Pump 1 Control Pressure Sensor
- Pump 2 Control Pressure Sensor

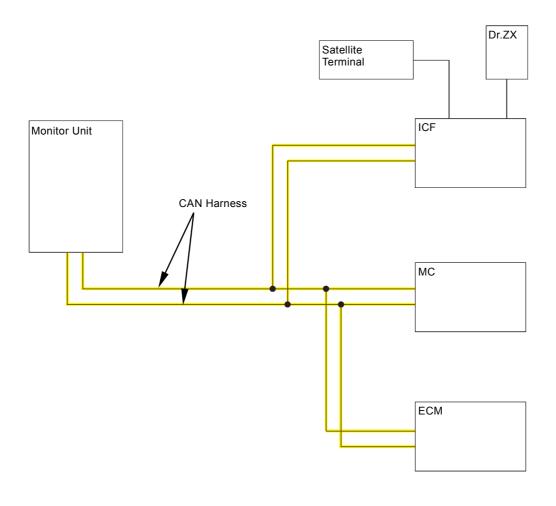


- Pump 1 Delivery Pressure Sensor:
- Pump 2 Delivery Pressure Sensor



MC FAULT CODE 11004

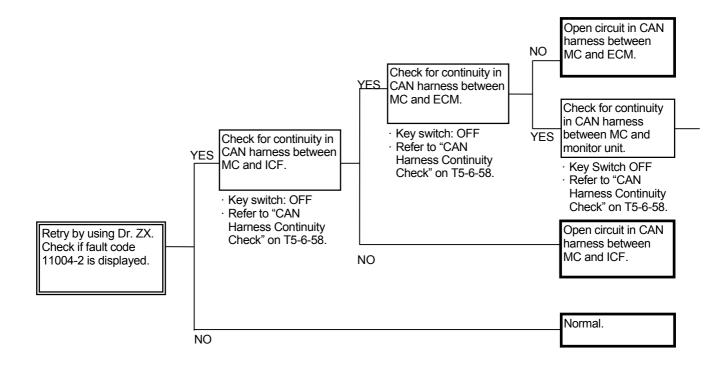
Fault Code	Trouble		Cause	Influenced Control
11004-2	Abnormal Communication	CAN	Faulty MC	Heater Control Speed Sensing Control Attachment Operation Speed Increase Control Attachment Operation Speed Limit Control Attachment Pump Torque Decrease Control Pump 1 Flow Rate Limit Control Pump 2 Flow Rate Limit Control Attachment Flow Rate Control (Optional) Attachment Valve Selection (Optional) CAN Cycle Data Communication

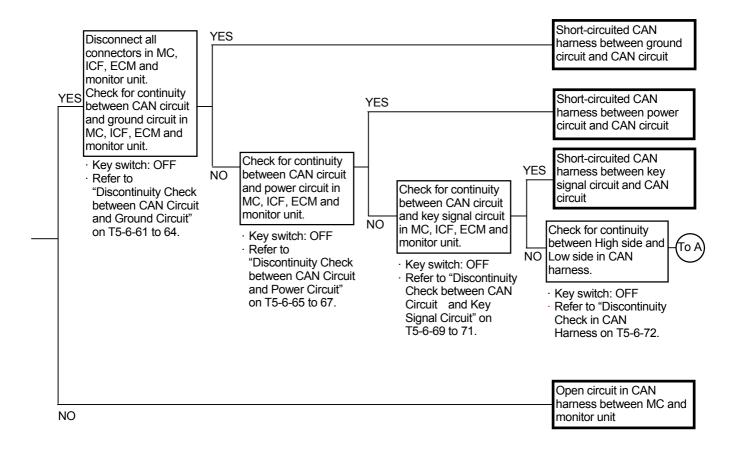


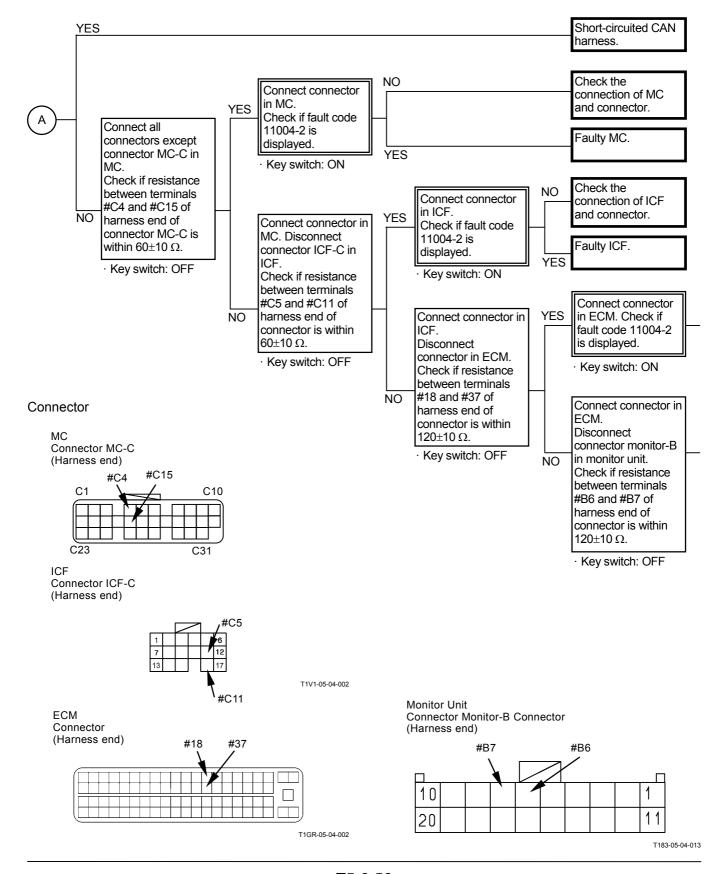
T1V1-02-01-050

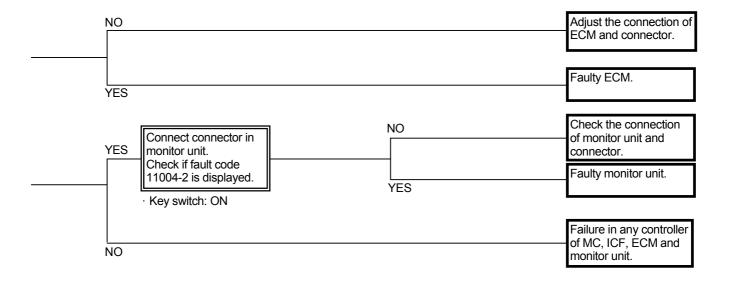
CAN HARNESS CHECK

· Check the wiring connections first.









Continuity Check in CAN Harness

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

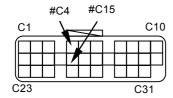
Between MC and ECM
 CAN Harness (High Side)
 Check for continuity between terminal #C4 of
 harness end of connector MC-C in MC and
 terminal #18 of harness end of connector in ECM.

CAN Harness (Low Side)

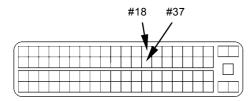
Check for continuity between terminal #C15 of harness end of connector MC-C in MC and terminal #37 of harness end of connector in ECM.

Connector

MC Connector MC-C (Harness end)



ECM Connector (Harness end)



· Between MC and ICF

CAN Harness (High Side)

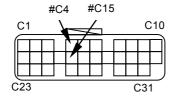
Check for continuity between terminal #C4 of harness end of connector MC-C in MC and terminal #C5 of harness end of connetor ICF-C in ICF.

CAN Harness (Low Side)

Check for continuity between terminal #C15 of harness end of connector MC-C in MC and terminal #C11 of harness end of connetor ICF-C in ICF.

Connector

MC Connector MC-C (Harness end)



ICF Connector ICF-C (Harness end)



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 Between MC and Monitor Unit CAN Harness (High Side)

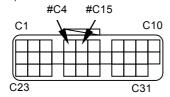
Check for continuity between terminal #C4 of harness end of connector MC-C in MC and terminal #B7 of harness end of connetor monitor-B in the monitor unit.

CAN Harness (Low Side)

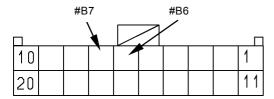
Check for continuity between terminal #C15 of harness end of connector MC-C in MC and terminal #B6 of harness end of connetor monitor-B in the monitor unit.

Connector

MC Connector MC-C (Harness end)



Monitor Unit Connector Monitor-B (Harness end)



Discontinuity Check between CAN Circuit and Ground Circuit

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

- In case of continuity, the circuit between CAN circuit and ground circuit is shorted.
- In case of discontinuity, the circuit is normal.

• MC

Between CAN Circuit (High Side) and Ground Circuit

Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #A2 of harness end of connetor in MC-A.

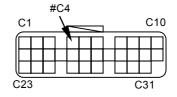
Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #A13 of harness end of connector in MC-A.

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

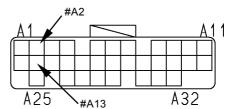
Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B18 of harness end of connector in MC-B.

Connector

Connector MC-C (Harness end)

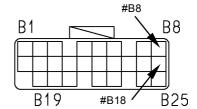


Connector MC-A (Harness end)



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Connector MC-B (Harness end)



Between CAN Circuit (Low Side) and Ground Circuit

Check for continuity between terminal #C5 of harness end of connector MC-C and terminal #A2 of harness end of connetor in MC-A.

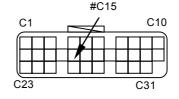
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #A13 of harness end of connector in MC-A.

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

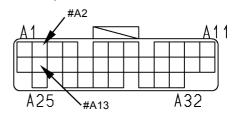
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B18 of harness end of connector in MC-B.

Connector

Connector MC-C (Harness end)

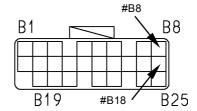


Connector MC-A (Harness end)



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Connector MC-B (Harness end)



• 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.

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.

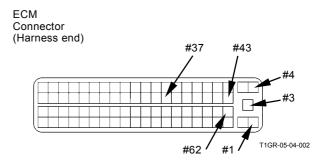
Check for continuity between terminals #37 and #43 of harness end of connector.

Check for continuity between terminals #37 and #62 of harness end of connector.

ECM Connector (Harness end)

#18 #43 #43 #3

#62 #4 Tigr-05-04-002



· 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.

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.

· Monitor Unit

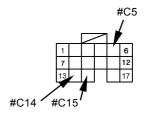
Between CAN Circuit (High Side) and Ground Circuit

Check for continuity between terminals #B7 and #B11 of harness end of connector in the monitor unit.

Between CAN Circuit (Low Side) and Ground Circuit

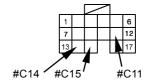
Check for continuity between terminals #B6 and #B11 of harness end of connector in the monitor unit.

ICF Connector ICF-C (Harness end)



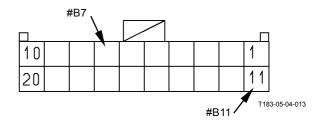
T1V1-05-04-002

ICF Connector ICF-C (Harness end)

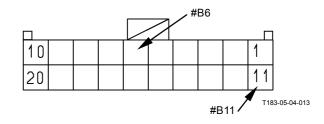


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Monitor Unit Connector Monitor-B (Harness end)



Monitor Unit Connector Monitor-B (Harness end)



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.

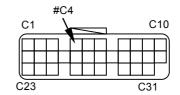
Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #A12 of harness end connector MC-A.

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

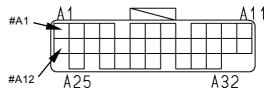
Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B17 of harness end connector MC-B.

Connector

Connector MC-C (Harness end)

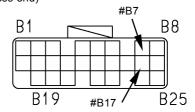


Connector MC-A (Harness end)



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Connector MC-B (Harness end)



Between CAN Circuit (Low Side) and Power Circuit

Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #A2 of harness end connector MC-A.

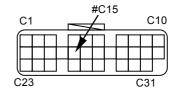
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #A12 of harness end connector MC-A.

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

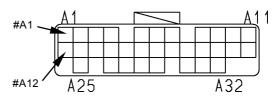
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B17 of harness end connector MC-B.

Connector

Connector MC-C (Harness end)

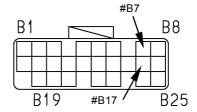


Connector MC-A (Harness end)



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Connector MC-B (Harness end)



• ECM

Between CAN Circuit (High Side) and Power Circuit

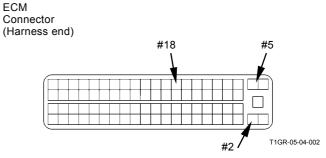
Check for continuity between terminals #18 and #2 of harness end of connector.

Check for continuity between terminals #18 and #5 of harness end of connector.

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) #37 #5

· ICF

Between CAN Circuit (High Side) and Power Circuit

Check for continuity between terminals #C5 and #C1 of harness end of connector ICF-C.

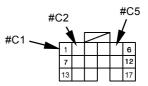
Check for continuity between terminals #C5 and #C2 of harness end of connector ICF-C.

Between CAN Circuit (Low Side) and Power Circuit

Check for continuity between terminals #C11 and #C1 of harness end of connector ICF-C.

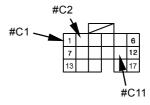
Check for continuity between terminals #C11 and #C2 of harness end of connector ICF-C.

ICF Connector ICF-C (Harness end)



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ICF Connector ICF-C (Harness end)



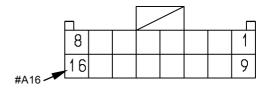
T1V1-05-04-002

· Monitor Unit

Between CAN Circuit (High Side) and Power Circuit

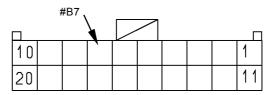
Check for continuity between terminal #B7 of harness endo of connector in the monitor unit and terminal #A16 of harness endo of connector monitor-A in the monitor unit.

Monitor Unit Connector Monitor-A (Harness end)



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Monitor Unit Connector Monitor-B (Harness end)

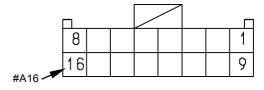


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Between CAN Circuit (Low Side) and Power Circuit

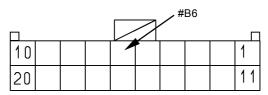
Check for continuity between terminal #B6 of harness endo of connector in the monitor unit and terminal #A16 of harness endo of connector monitor-A in the monitor unit.

Monitor Unit Connector Monitor-A (Harness end)



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Monitor Unit Connector Monitor-B (Harness end)



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

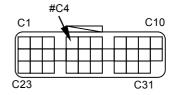
Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B16 of harness end of connector MC-B.

Between CAN Circuit (Low Side) and Key Signal Circuit

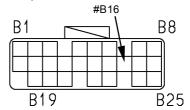
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B16 of harness end of connector MC-B.

Connector

Connector MC-C (Harness end)



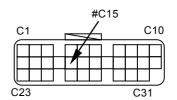
Connector MC-B (Harness end)



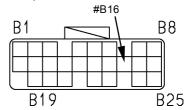
T183-05-04-021

Connector

Connector MC-C (Harness end)



Connector MC-B (Harness end)

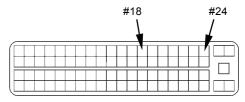


• ECM

Between CAN Circuit (High Side) and Key Signal Circuit

Check for continuity between terminals #18 and #24 of harness end of connector.

ECM Connector (Harness end)

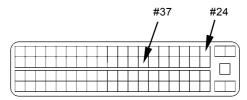


T1GR-05-04-002

Between CAN Circuit (Low Side) and Key Signal Circuit

Check for continuity between terminals #37 and #24 of harness end of connector.

ECM Connector (Harness end)



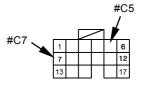
T1GR-05-04-002

ICF

Between CAN Circuit (High Side) and Key Signal Circuit

Check for continuity between terminals #C5 and #C7 of harness end of connector ICF-C.

ICF Connector ICF-C (Harness end)

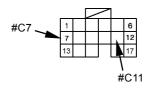


T1V1-05-04-002

Between CAN Circuit (Low Side) and Key Signal Circuit

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

ICF Connector ICF-C (Harness end)



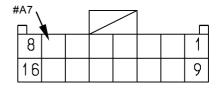
T1V1-05-04-002

· Monitor Unit

Between CAN Circuit (High Side) and Power Circuit

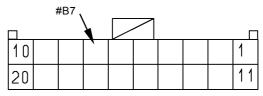
Check for continuity between terminal #B7 of harness end of connector in the monitor unit and terminal #A7 of harness end of connector monitor-A in the monitor unit.

Monitor Unit Connector Monitor-A (Harness end)



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Monitor Unit Connector Monitor-B (Harness end)

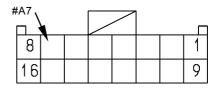


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Between CAN Circuit (Low Side) and Power Circuit

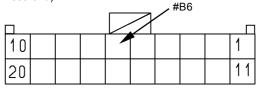
Check for continuity between terminal #B6 of harness end of connector in the monitor unit and terminal #A7 of harness end of connector monitor-A in the monitor unit.

Monitor Unit Connector Monitor-A (Harness end)



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Monitor Unit Connector Monitor-B (Harness end)

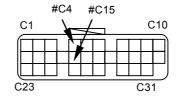


Discontinuity Check in CAN Harness

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

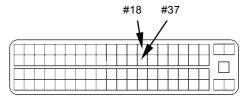
- In case of continuity, the circuit between CAN (high side) circuit and CAN (low side) circuit is shorted.
- In case of discontinuity, the circuit is normal.
- Connector MC-C
 Check for continuity between terminals #C4 and #C15 of harness end of connector MC-C in MC.

MC Connector MC-C (Harness end)



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

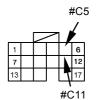
ECM Connector (Harness end)



T1GR-05-04-002

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

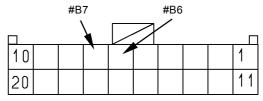
ICF Connector ICF-C (Harness end)



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Connector Monitor-B in Monitor Unit
 Check forcontinuity between terminals #B6 and #B7 of harness end of connector monitor-B in the monitor unit.

Monitor Unit Connector Monitor-B (Harness end)



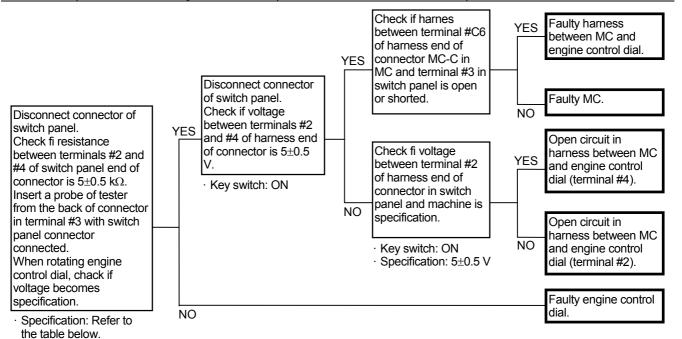
ENGINE FAILURE MC FAULT CODE 11100

Fault Code	Trouble	Cause	Influenced Control
11100-2	Abnormal Engine Speed	Engine Speed: 4000 min ⁻¹ or faster	Speed Sensing Control

ECM sends by using CAN bus line.
 The actual engine speed is abnormal.
 Perform self-diagnosis of ECM.

MC FAULT CODE 11101

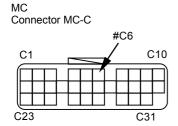
Fault Code	Trouble	Cause	Influenced Control
11101-3	Abnormal Engine Control Dial	Voltage: 4.78 V or higher	Engine Control Dial Control
	Sensor High Voltage		
11101-4	Abnormal Engine Control Dial	Voltage: Less than 0.22 V	Engine Control Dial Control
	Sensor Low Voltage		_



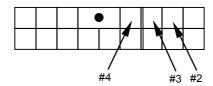
Specification of Engine Control Dial

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)



Switch Panel

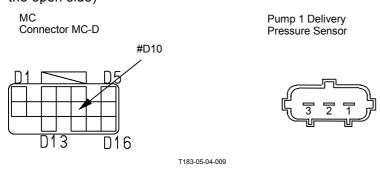


PUMP FAILURE MC FAULT CODE 11200

Fault Code Trouble Cause Influenced Control HP Mode Control Travel HP Mode Control Travel HP Mode Control Travel Torque-Up Control Atto-Power Lift Control Travel HP Mode Control Digging Regenerative Control Travel Motor Swash Angle Selection Control Travel HP Mode Control HP Mode Control Travel Motor Swash Angle Selection Control Travel HP Mode Control Travel Motor Swash Angle Selection Control Travel HP Mode Control				
Pressure Sensor High Voltage Pressure Sensor High Voltage Travel HP Mode Control E Mode Control Travel Torque-Up Control Digging Regenerative Control Auto-Power Lift Control Travel Motor Swash Angle Selection Control Travel Motor Swash Angle Selection Control Travel HP Mode Control Travel Motor Swash Angle Selection Control Travel HP Mode Control Travel HP Mode Control Travel HP Mode Control Travel HP Mode Control Travel Torque-Up Control Travel Torque-Up Control Auto-Power Lift Control Travel Motor Swash Angle Selection Control Trav				
Travel Torque-Up Control Arm Regenerative Control Digging Regenerative Control Travel Motor Swash Angle Selection Control Travel Motor Swash Angle Selection Control Travel HP Mode Control Travel Gontrol Travel Torque-Up Control Travel HP Mode Control Travel Motor Swash Angle Selection Control Travel HP Mode Control Travel H	11200-3		Voltage: 4.5 V or higher	
Abnormal Pump 1 Delivery Voltage: Less than 0.25 V Pressure Sensor Low Voltage Abnormal Pump 1 Delivery Voltage: Less than 0.25 V Pressure Sensor Low Voltage Abnormal Pump 1 Delivery Voltage: Less than 0.25 V Pressure Sensor Low Voltage Abnormal Pump 1 Delivery Voltage: Less than 0.25 V Pressure Sensor Low Voltage Abnormal Pump 1 Delivery Voltage: Less than 0.25 V Pressure Sensor Low Voltage Abnormal Pump 1 Delivery Voltage: Less than 0.25 V Pressure Sensor Low Voltage Abnormal Pump 1 Delivery Voltage: Less than 0.25 V Pressure Sensor Low Voltage Abnormal Pump 1 Delivery Voltage: Less than 0.25 V Pressure Sensor Low Voltage Abnormal Pump 1 Delivery Voltage: Less than 0.25 V Pravel HP Mode Control Travel HP Mode Control Arm Regenerative Control Arm Regenerative Control Travel HP Mode Control Travel				E Mode Control
Digging Regenerative Control Auto-Power Lift Control Travel Motor Swash Angle Selection Control HP Mode Control Travel HP Mode Control Travel HP Mode Control Travel Torque-Up Control Travel Torque-Up Control Arm Regenerative Control Digging Regenerative Control Travel Motor Swash Angle Selection Control				 Travel Torque-Up Control
Auto-Power Lift Control Travel Motor Swash Angle Selection Control HP Mode Control Travel HP Mode Control Travel HP Mode Control Travel Torque-Up Control Auto-Power Lift Control Travel HP Mode Control Travel Torque-Up Control Arm Regenerative Control Digging Regenerative Control Travel Motor Swash Angle Selection Cont				•
11200-4 Abnormal Pump 1 Delivery Pressure Sensor Low Voltage: Less than 0.25 V Pressure Sensor Low Voltage 11200-4 Abnormal Pump 1 Delivery Pressure Sensor Low Voltage 11200-4 Pressure Sensor Low Voltage 11200-4 Abnormal Pump 1 Delivery Pressure Sensor Low Voltage: Less than 0.25 V Pressure Sensor Low Voltage 11200-4 Pressure Sensor Low Voltage 11200-4 Pressure Sensor Low Voltage: Less than 0.25 V Pressure Sensor Low Voltage: L				
Selection Control 11200-4 Abnormal Pump 1 Delivery Pressure Sensor Low Voltage Voltage: Less than 0.25 V Pressure Sensor Low Voltage Pressure Sensor Low Volt				
11200-4 Abnormal Pump 1 Delivery Pressure Sensor Low Voltage • HP Mode Control • Travel HP Mode Control • E Mode Control • Travel Torque-Up Control • Arm Regenerative Control • Digging Regenerative Control • Auto-Power Lift Control • Travel Motor Swash Angle • Selection Control • Travel Motor Swash Angle • Selection Control • Travel Motor Swash Angle • Travel HP Mode Control • Travel HP Mode				S .
Pressure Sensor Low Voltage Travel HP Mode Control E Mode Control Travel Torque-Up Control Arm Regenerative Control Digging Regenerative Control Auto-Power Lift Control Travel Motor Swash Angle Selection Control Faulty harness between MC and pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor. Faulty MC. Faulty MC. NO Faulty MC. NO	44000 4	Aborement Demon 4 Delivers	\\\ \ \\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
E Mode Control Travel Torque-Up Control Arm Regenerative Control Digging Regenerative Control Auto-Power Lift Control Travel Motor Swash Angle Selection Control Travel Motor Swash Angle Selection Control Check if harnes between MC and pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor is Check if harnes between MC and pump 1 delivery pressure sensor. Faulty MC. Faulty MC. NO Faulty MC. NO	11200-4		Voltage: Less than 0.25 V	
Travel Torque-Up Control Arm Regenerative Control Digging Regenerative Control Auto-Power Lift Control Travel Motor Swash Angle Selection Control Travel Motor Swash Angle Selection Control YES Check if harnes between terminal #D10 of harness end of connector MC-D in MC and terminal #2 in pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor.		Fressure Sensor Low Voltage		
Paulty harness between MC and pump 1 delivery pressure sensor. Arm Regenerative Control Digging Regenerative Control Auto-Power Lift Control Travel Motor Swash Angle Selection Control YES Check if harnes between MC and pump 1 delivery pressure sensor. Paulty harness between MC and pump 1 delivery pressure sensor. Faulty MC. Faulty MC. Faulty MC. Faulty MC.				
Disconnect connector of pump 1 delivery pressure sensor. Disconsect functions of horizontal pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor is connector is connected to the pump 1 delivery pressure sensor is connected to the pump 1 del				
Pisconnect connector of pump 1 delivery pressure sensor. Travel Motor Swash Angle Selection Control YES Check if harnes between MC and pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor is Check if harnes between MC and pump 1 delivery pressure sensor. Faulty harness between MC and pump 1 delivery pressure sensor. Faulty MC. Faulty MC.				
Check if harnes between MC and pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor is Disconnect connector of pump 1 delivery pressure sensor is				
Check if harnes between MC and pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor. Check if harnes between MC and pump 1 delivery pressure sensor. Faulty harness between MC and pump 1 delivery pressure sensor. Faulty MC. Faulty MC.				9
Check if harnes between terminal #D10 of harness end of connector MC-D in MC and terminal #2 in pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor is Check if harnes between terminal #D10 of harness end of connector MC-D in MC and terminal #2 in pump 1 delivery pressure sensor is				Selection Control
Disconnect connector of pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor. Disconnect connector of pump 1 delivery pressure sensor. Check if harnes between terminal #D10 of harness end of connector MC-D in MC and terminal #2 in pump 1 delivery pressure sensor is Faulty MC. Faulty MC.			[a	YES Faulty harness between
Disconnect connector of pump 1 delivery pressure sensor. Check fivelters				MC and pump 1 delivery
Disconnect connector of pump 1 delivery pressure sensor. Check five there.				pressure sensor.
of pump 1 delivery pressure sensor. Check fivelters		Disconnect connect		; 🖳
pressure sensor. Check fivetters.				Faulty MC.
Lo Check fi voltage		pressure sensor.		·
between terminals #1		NO Check fi voltage	open or shorted.	
and #3 of harness end				Open circuit in harness
of connector is 5±0.5 Check fi voltage between MC and pump 1			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
Switch pump 1 delivery V. between terminal #1 delivery pressure sensor (terminal #3)	Switch nump 1			delivery pressure sensor
Switch pump 1 delivery	pressure senso	r with Key switch: ON		(terminai #3).
pump 2 delivery pressure Open circuit in harness			delivery pressure	Open circuit in harness
pressure sensor and retry. Sensor and machine		rand		
Check if fault code is September 1		ode is	<u> </u>	delivery pressure serisor
switched. • Refer to the table	switched.			(terriman #1).
upward. Faulty pump 1 delivery			upward.	Faulty pump 1 delivery

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

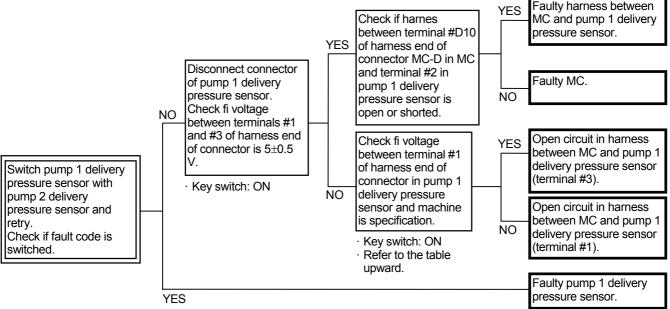
YES



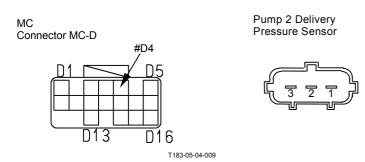
pressure sensor.

MC FAULT CODE 11202

Fault Code	Trouble	Cause	Influenced Control	
11202-3	Abnormal Pump 2 Delivery Pressure Sensor High Voltage	Voltage: 4.5 V or higher	 HP Mode Control Travel HP Mode Control E Mode Control Travel Torque-Up Control Arm Regenerative Control Digging Regenerative Control Travel Motor Swash Angle Selection Control 	
11202-4	Abnormal Pump 2 Delivery Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	 HP Mode Control Travel HP Mode Control E Mode Control Travel Torque-Up Control Arm Regenerative Control Digging Regenerative Control Travel Motor Swash Angle Selection Control 	
Check if harnes between MC and pump 1 delivery pressure sensor.				

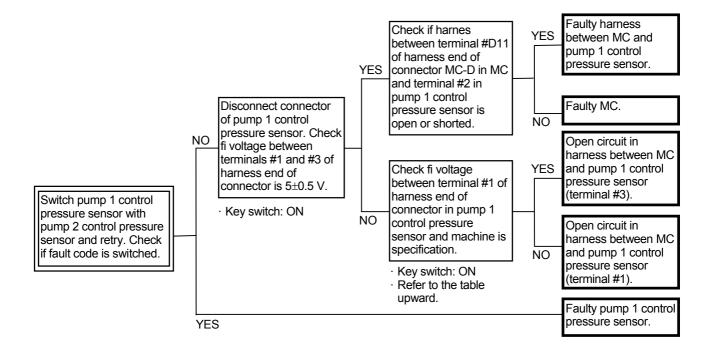


Connector (Harness end of connector viewed from the open side)



MC FAULT CODE 11206

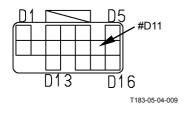
Fault Code	Trouble	Cause	Influenced Control
11206-3	Abnoraml Pump 1 Control Pressure Sensor High Voltage	Voltage: 4.75 V or higher	 E Mode Control Heater Control Travel Motor Swash Angle Selection Control
11206-4	Abnormal Pump 1 Control Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	 E Mode Control Heater Control Travel Motor Swash Angle Selection Control

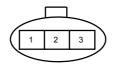


Connector (Harness end of connector viewed from the open side)



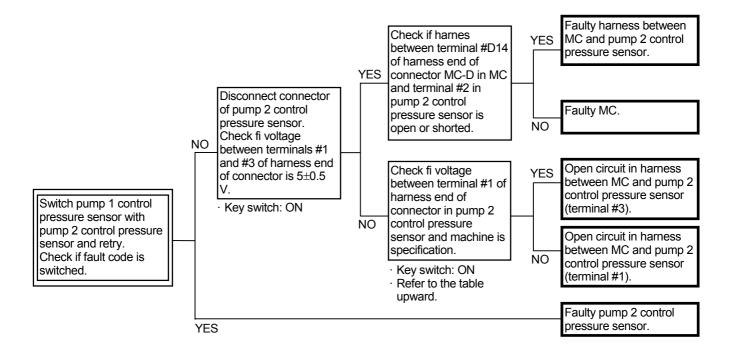
Pump 1 Control Pressure Sensor

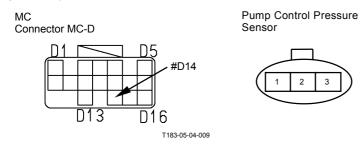




MC FAULT CODE 11208

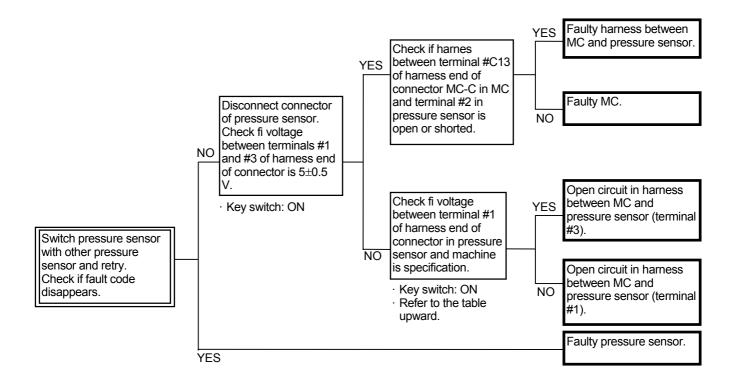
Fault Code	It Code Trouble Cause Influence	Influenced Control	
11208-3	Abnormal Pump 2 Control Pressure Sensor High Voltage	Voltage: 4.75 V or higher	 E Mode Control Heater Control Travel Motor Swash Angle Selection Control
11208-4	Abnormal Pump 2 Control Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	 E Mode Control Heater Control Travel Motor Swash Angle Selection Control

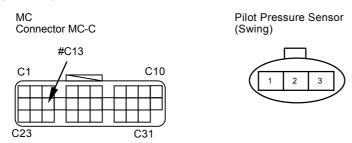




PILOT FAILURE MC FAULT CODE 11301

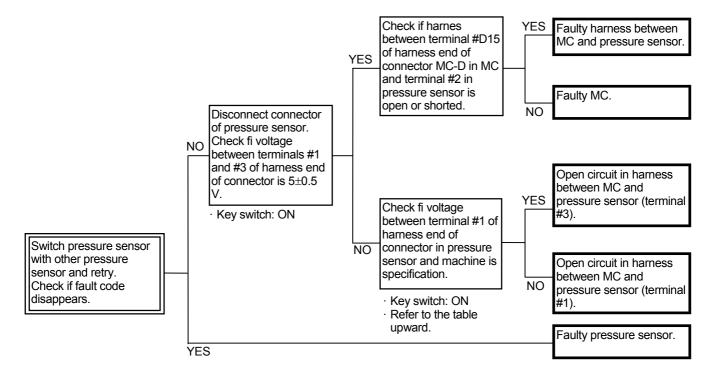
Fault Code	Trouble	Cause	Influenced Control
11301-3	Abnormal Swing Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	 Arm Regenerative Control Attachment Flow Rate Control Swing Alarm Control
11301-4	Abnormal Swing Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	 Arm Regenerative Control Attachment Flow Rate Control Swing Alarm Control

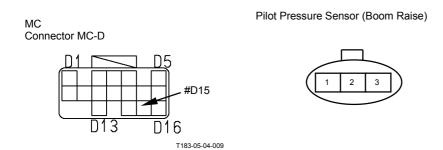




MC FAULT CODE 11302

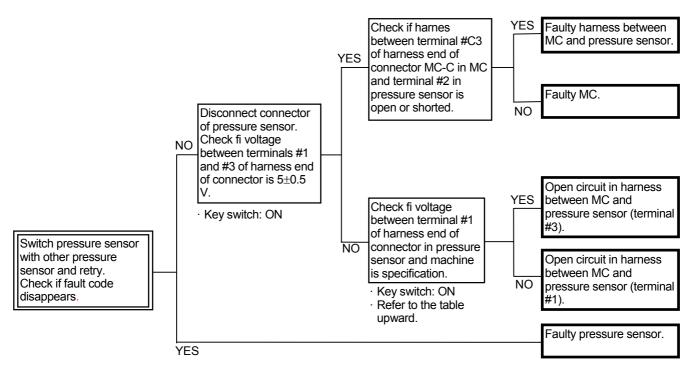
		_	
Fault Code	Trouble	Cause	Influenced Control
11302-3	Abnormal Boom Raise	Voltage: 4.75 V or higher	HP Mode Control
	Pilot Pressure Sensor		 Arm Regenerative Control
	High Voltage		 Digging Regenerative Control
			Auto-Power Lift Control
			Attachment Flow Rate Control
11302-4	Abnormal Boom Raise	Voltage: Less than 0.25 V	HP Mode Control
	Pilot Pressure Sensor		 Arm Regenerative Control
	Low Voltage		 Digging Regenerative Control
			Auto-Power Lift Control
			Attachment Flow Rate Control

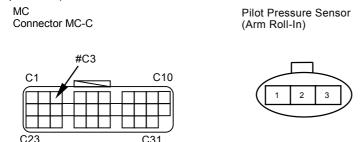




MC FAULT CODE 11303

Fault Code	Trouble	Cause	Influenced Control
11303-3	03-3 Abnormal Arm Roll-In Voltage: 4.75 V or higher	HP Mode Control	
	Pilot Pressure Sensor		 Arm Regenerative Control
	High Voltage		 Digging Regenerative Control
			Auto-Power Lift Control
11303-4	Abnormal Arm Roll-In	Voltage: Less than 0.25 V	HP Mode Control
	Pilot Pressure Sensor		 Arm Regenerative Control
	Low Voltage		 Digging Regenerative Control
			Auto-Power Lift Control

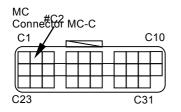




MC FAULT CODE 11304

ault Code	Trouble	Cause	Influenced Control
11304-3		Voltage: 4.75 V or higher	Auto-Idle Control Idle Speed-Up Control ECO Control Travel HP Mode Control Heater Control Travel Torque-Up Control Pump 1 Flow Rate Limit Contr Pump 2 Flow Rate Limit Contr Travel Motor Swash Ang Control Attachment Flow Rate Control Travel Alarm Control
11304-4	Abnormal Travel Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	Auto-Idle Control Idle Speed-Up Control ECO Control Travel HP Mode Control Heater Control Travel Torque-Up Control Pump 1 Flow Rate Limit Control Pump 2 Flow Rate Limit Control Travel Motor Swash Ang Control Attachment Flow Rate Control Travel Alarm Control
Switch pressu with other pres		chains #1 check if voltage between terminal harness end of	Faulty MC. NO Paulty MC. NO Open circuit in harness between MC and pressure sensor (terminal) #1 of #3).

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



sensor and retry.

disappears.

Check if fault code

Pilot Pressure Sensor (Travel)

specification.

Key switch: ON

· Refer to the table upward.

pressure sensor (terminal #1).

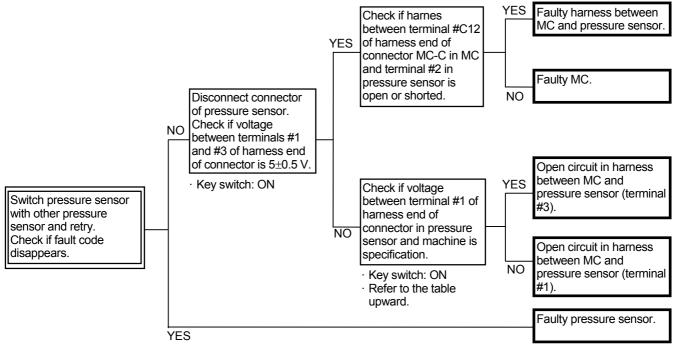
Faulty pressure sensor.

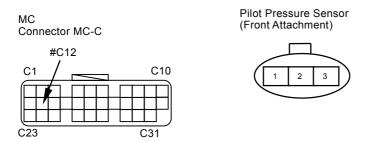
between MC and

NO

MC FAULT CODE 11307

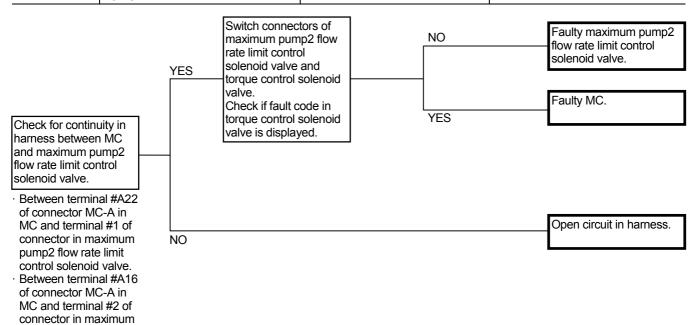
Fault Code	Trouble	Cause	Influenced Control
11307-3	Abnormal Front Attachment Pilot Pressure Sensor High Voltage		Auto-Idle Control Idle Speed-Up Control ECO Control Travel HP Mode Control Heater Control Travel Motor Swash Angle Control
11307-4	Replace Front Pilot Pressure Sensor	Voltage: Less than 0.25 V	 Auto-Idle Control Idle Speed-Up Control ECO Control Travel HP Mode Control Heater Control Travel Motor Swash Angle Control





PROPORTIONAL SOLENOID VALVE FAILURE MC FAULT CODE 11400

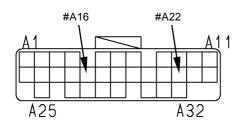
Fault Code	Trouble	Cause	Influenced Control
11400-2	Abnormal Current Feedback of	Current: Both of Higher than	Pump 2 Flow Rate Limit Control
	Maximum Pump 2 Flow Rate	920 mA or Less than 60 mA	
	Limit Control Solenoid Valve		
11400-3	Abnormal Feedback High	Current: Higher than 920 mA	Pump 2 Flow Rate Limit Control
	Current of Maximum Pump 2		
	Flow Rate Limit Control Solenoid		
	Valve		
11400-4	Abnormal Feedback Low	Current: Less than 56 mA	Pump 2 Flow Rate Limit Control
	Current of Maximum Pump 2		
	Flow Rate Limit Control Solenoid		
	Valve		



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

MC Connector MC-A

pump2 flow rate limit control solenoid valve



Maximum Pump 2 Flow Rate Limit Control Solenoid Valve

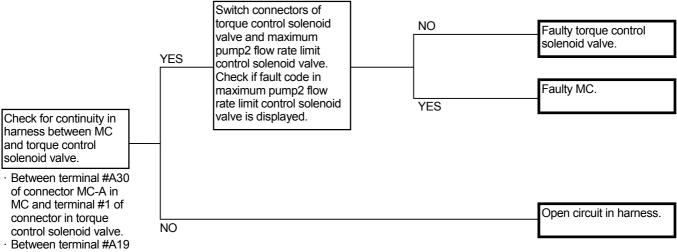
T183-05-04-008



T1V1-05-04-003

MC FAULT CODE 11401

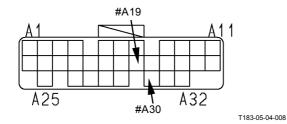
Fault Code	Trouble	Cause	Influenced Control
11401-2	Abnormal Current Feedback of	Current: Both of Higher than	Speed Sensing Control
	Torque Control Solenoid Valve	920mA or Less than 60 mA	 Travel Torque-Up Control
			Attachment Pump Torque
			Decrease Control
11401-3	Abnormal Feedback High	Current: Higher than 920mA	Speed Sensing Control
	Current of Torque Control		 Travel Torque-Up Control
	Solenoid Valve		Attachment Pump Torque
			Decrease Control
11401-4	Abnormal Feedback Low	Current: Less than 56 mA	Speed Sensing Control
	Current of Torque Control		Travel Torque-Up Control
	Solenoid Valve		 Attachment Pump Torque
			Decrease Control



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

MC Connector MC-A

of connector MC-A in MC and terminal #2 of connector in torque control solenoid valve



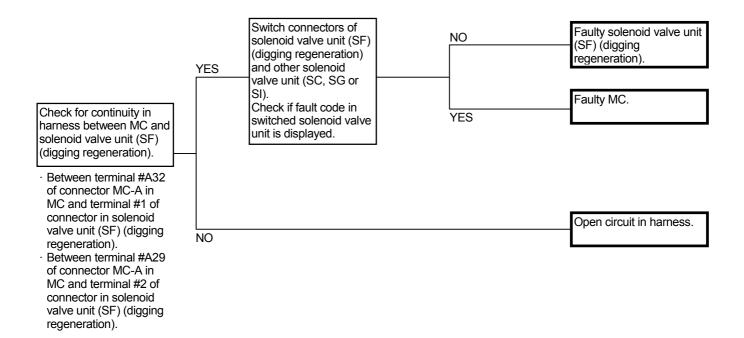
Torque Control Solenoid Valve

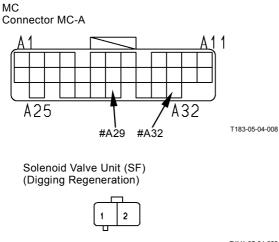


T1V1-05-04-003

MC FAULT CODE 11402

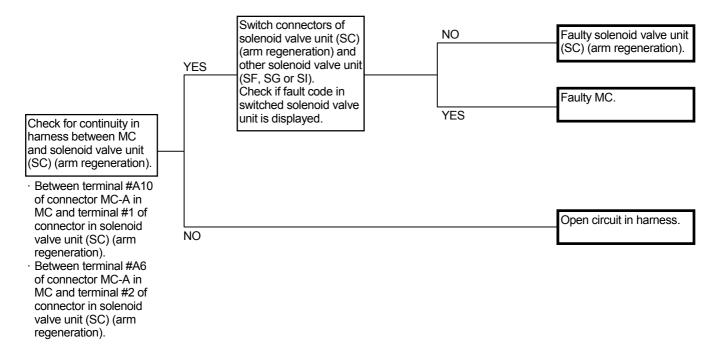
Fault Code	Trouble	Cause	Influenced Control
11402-2	Abnormal Current Feedback of	Current: Both of Higher than	Digging Regenerative Control
	Solenoid Valve Unit (SF)	920mA or Less than 60 mA	
	(Digging Regeneration)		
11402-3	Abnormal Feedback High	Current: Higher than 920mA	Digging Regenerative Control
	Current of Solenoid Valve Unit		
	(SF) (Digging Regeneration)		
11402-4	Abnormal Feedback Low	Current: Less than 56 mA	Digging Regenerative Control
	Current of Solenoid Valve Unit		
	(SF) (Digging Regeneration)		

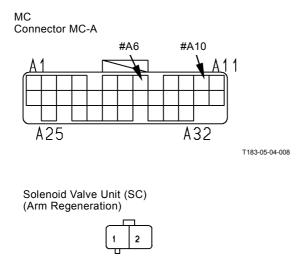




MC FAULT CODE 11403

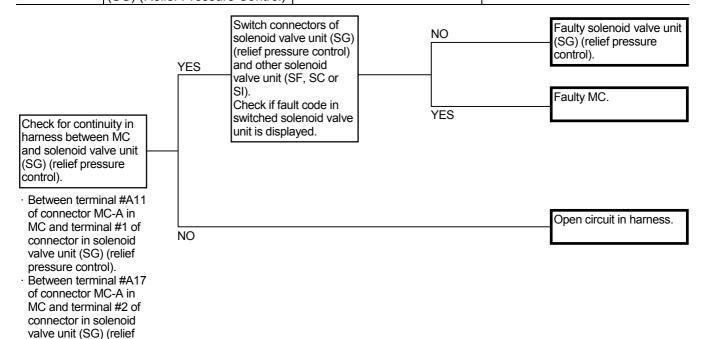
Fault Code	Trouble	Cause	Influenced Control
11403-2	Abnormal Current Feedback of	Current: Both of Higher than	Arm Regenerative Control
	Solenoid Valve Unit (SC) (Arm	920mA or Less than 60 mA	
	Regeneration)		
11403-3	Abnormal Feedback High	Current: Higher than 920mA	Arm Regenerative Control
	Current of Solenoid Valve Unit		
	(SC) (Arm Regeneration)		
11403-4	Abnormal Feedback Low	Current: Less than 56 mA	Arm Regenerative Control
	Current of Solenoid Valve Unit		_
	(SC) (Arm Regeneration)		





MC FAULT CODE 11404

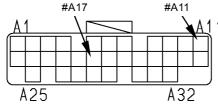
	Fault Code	Trouble			Cause	Influenced Control
-	11404-2			ack of	Current: Both of Higher than	
					920mA or Less than 60 mA	Auto-Power Lift Control
		(Relief Pressure Control))		
	11404-3	Abnormal	Feedback	High	Current: Higher than 920mA	Power Digging Control
		Current of Solenoid Valve Unit		e Unit		 Auto-Power Lift Control
		(SG) (Relief Pressure Control)		ntrol)		
	11404-4	Abnormal	Feedback	Low	Current: Less than 56 mA	 Power Digging Control
		Current of Solenoid Valve Unit				 Auto-Power Lift Control
		(SG) (Relie	ef Pressure Co	ntrol)		



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



pressure control).



T183-05-04-008

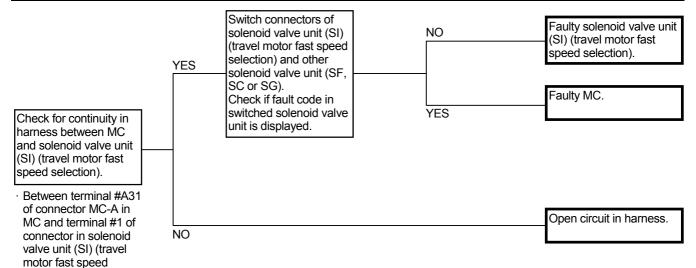
Solenoid Valve Unit (SG) (Relief Pressure Control)



T1V1-05-04-003

MC FAULT CODE 11405

Fault Code	Trouble	Cause	Influenced Control
11405-2	Abnormal Current Feedback of	Current: Both of Higher than	Travel Motor Swash Angle
	Solenoid Valve Unit (SI)	920mA or Less than 60 mA	Selection Control
	(Travel Motor Fast Speed		
	Selection)		
11405-3	Abnormal Feedback High	Current: Higher than 920mA	Travel Motor Swash Angle
	Current of Solenoid Valve Unit		Selection Control
	(SI) (Travel Motor Fast Speed		
	Selection)		
11405-4	Abnormal Feedback Low	Current: Less than 56 mA	Travel Motor Swash Angle
	Current of Solenoid Valve Unit		Selection Control
	(SI) (Travel Motor Fast Speed		
	Selection)		

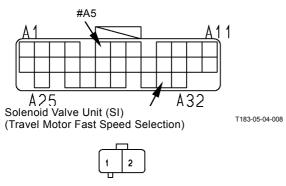


Connector (Harness end of connector viewed from the open side)

MC Connector MC-A

selection).

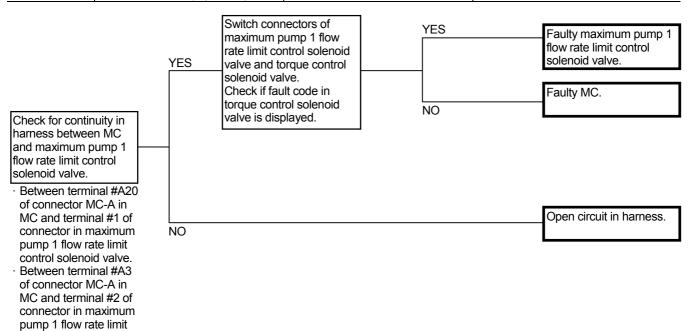
Between terminal #A5 of connector MC-A in MC and terminal #2 of connector in solenoid valve unit (SI) (travel motor fast speed selection).



T1V1-05-04-003

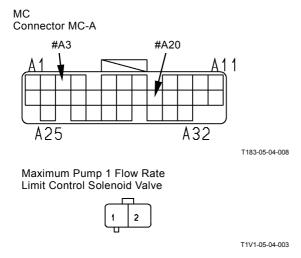
MC FAULT CODE 11410

Fault Code	Trouble	Cause	Influenced Control
11410-2	Abnormal Current Feedback of	Current: Both of Higher than	Pump 1 Flow Rate Limit Control
	Maximum Pump 1 Flow Rate	920mA or Less than 60 mA	 Travel Pump Flow Rate
	Limit Control Solenoid Valve		
	(Optional)		
11410-3	Abnormal Feedback High	Current: Higher than 920mA	Pump 1 Flow Rate Limit Control
	Current of Maximum Pump 1		 Travel Pump Flow Rate
	Flow Rate Limit Control		
	Solenoid Valve (Optional)		
11410-4	Abnormal Feedback Low	Current: Less than 56 mA	Pump 1 Flow Rate Limit Control
	Current of Maximum Pump 1		Travel Pump Flow Rate
	Flow Rate Limit Control		
	Solenoid Valve (Optional)		



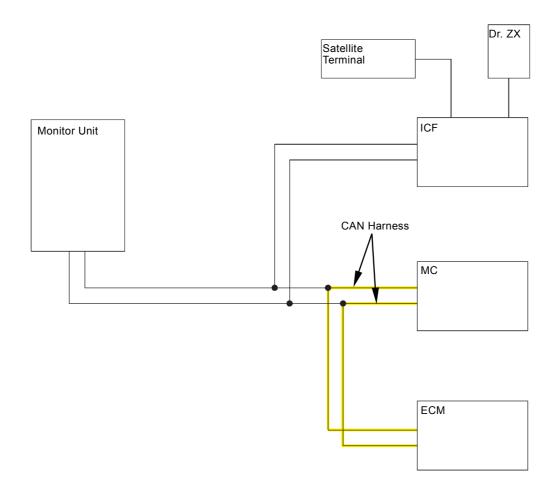
Connector (Harness end of connector viewed from the open side)

control solenoid valve.



CAN DATA RECEPTION FAILURE MC FAULT CODE 11910

Fault Code	Trouble	Cause	Influenced Control
11910-2	Actual Engine Speed	Faulty CAN Harness	Speed Sensing Control
	Received from ECM		Send to ICF

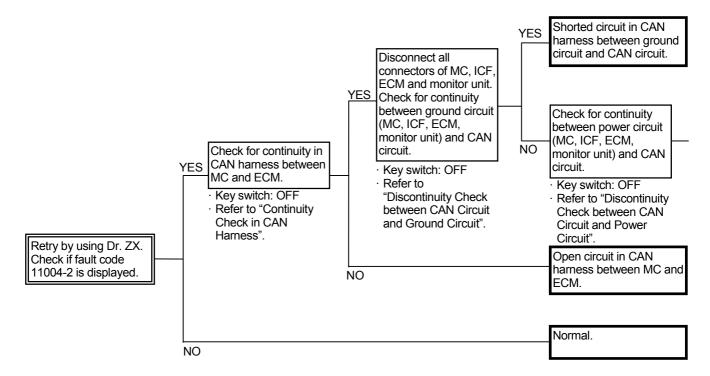


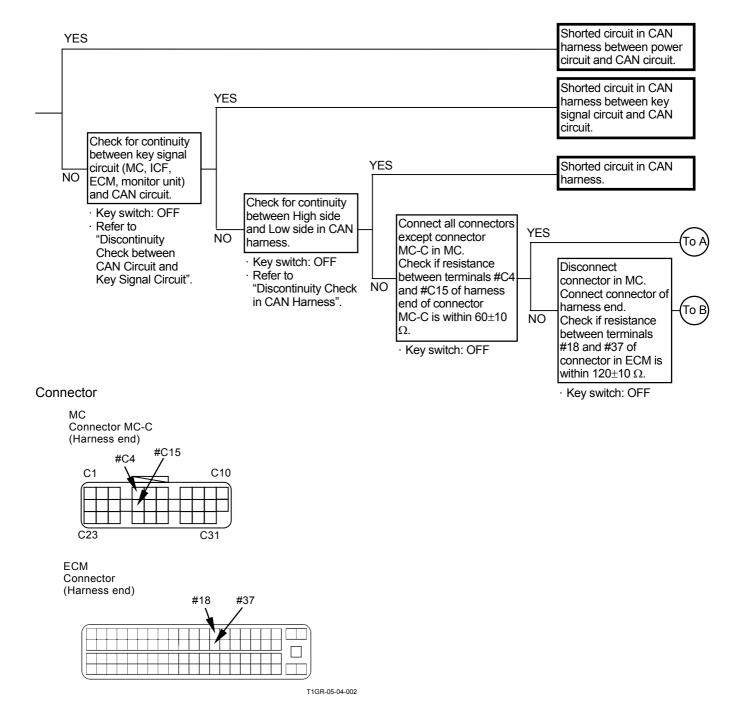
T1V1-02-01-051

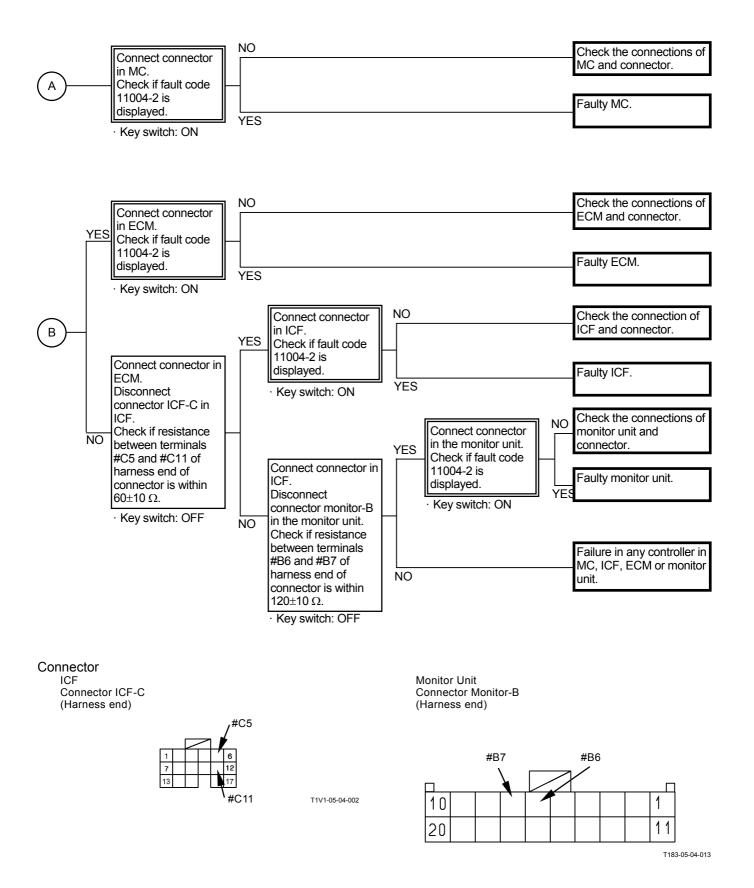
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CAN HARNESS CHECK MC FAULT CODE 11910

· Check the wiring connections first.

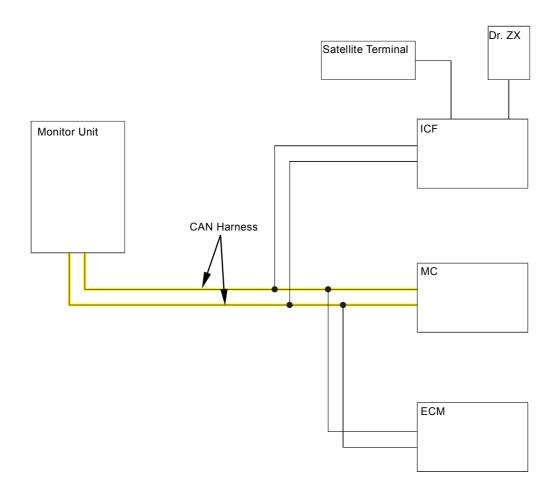






MC FAULT CODE 11918

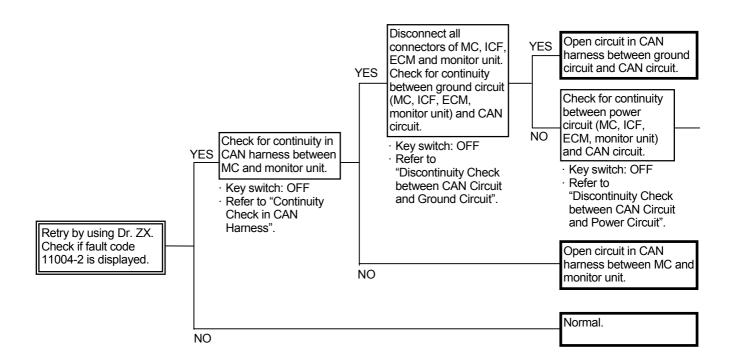
Fault Code	Trouble	Cause	Influenced Control		
11918-2	Work Mode	Faulty CAN Harness	Attachment Operation Speed Increase		
	Received from Monitor Unit		Control		
			Attachment Operation Speed Limit Control		
			Attachment Pump Torque Decrease		
			Control		
			Pump 1 Flow Rate Limit Control		
			Pump 2 Flow Rate Limit Control		
			Attachment Flow Rate Control		
			Attachment Valve Selection Control		

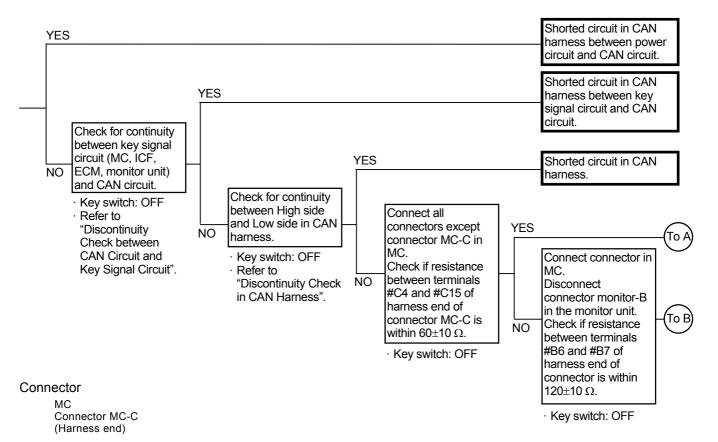


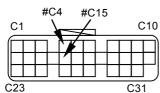
T1V1-02-01-052

CAN HARNESS CHECK MC FAULT CODE 11918

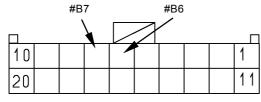
· Check the wiring connections first.

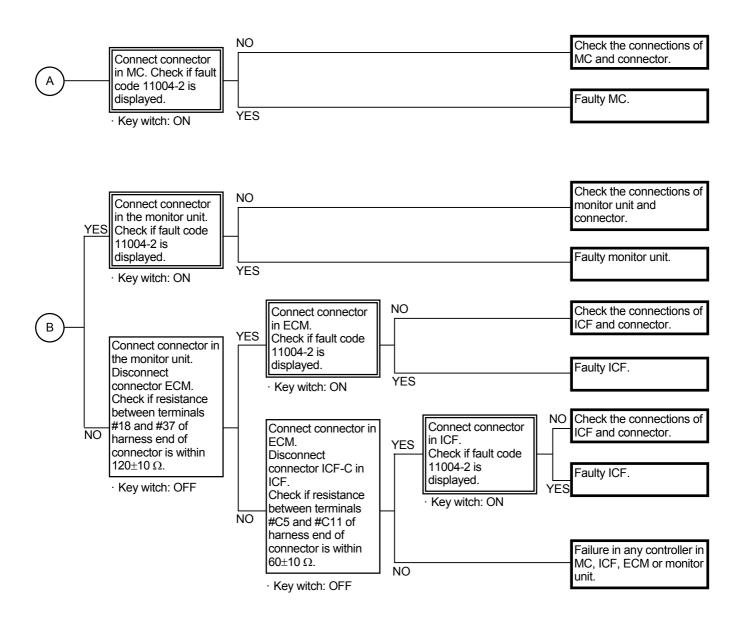






Monitor Unit Connector Monitor-B (Harness end)



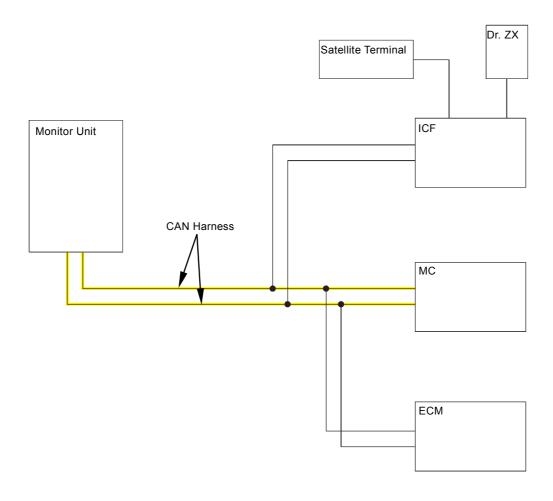


Connector



MC FAULT CODE 11911

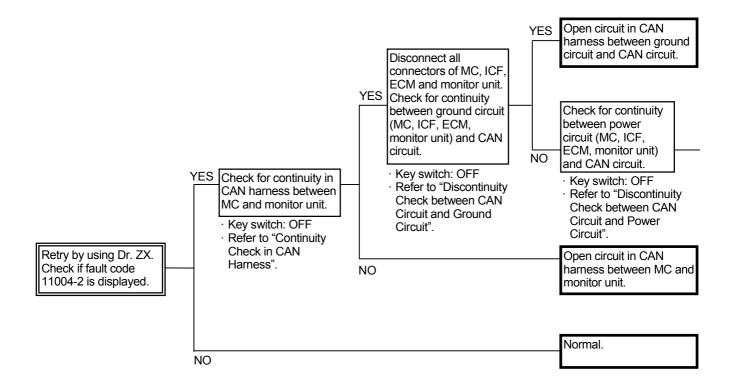
Fault Code	Trouble	Cause	Influenced Control		
11911-2	Security Signal	Faulty CAN Harness	Theft Prevention Engine Speed,		
	Received from Monitor Unit		Engine Torque		

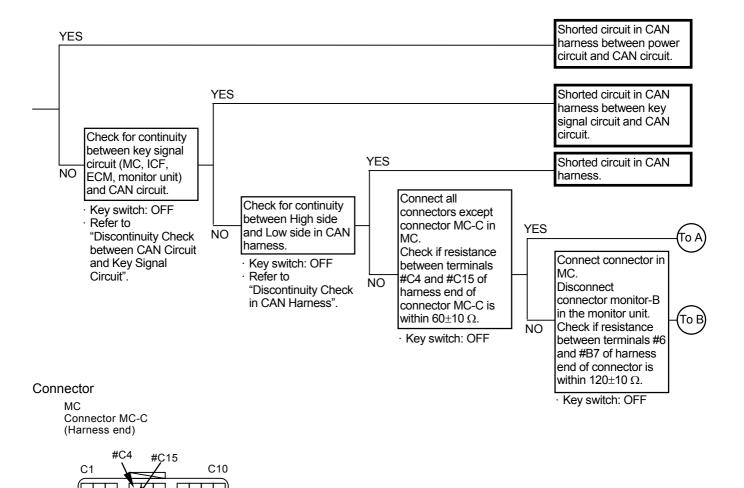


T1V1-02-01-052

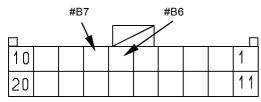
CAN HARNESS CHECK MC FAULT CODE 11911

· Check the wiring connections first.

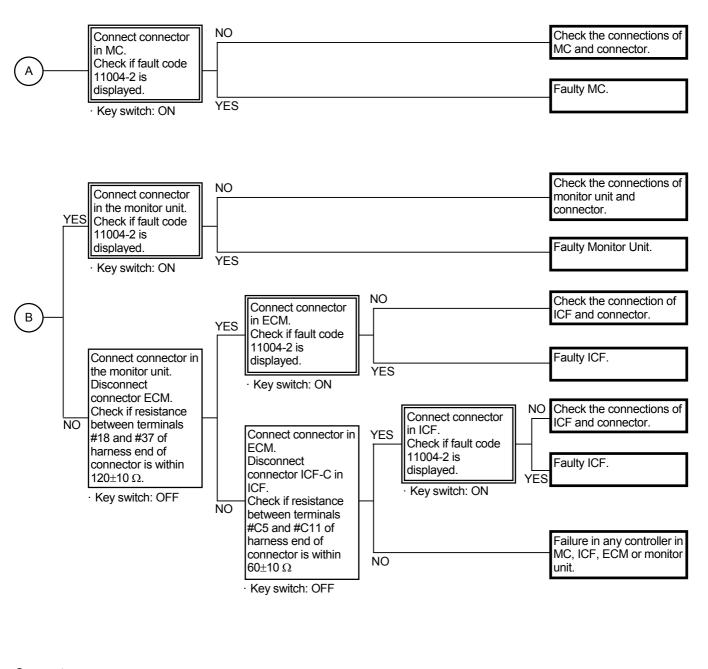


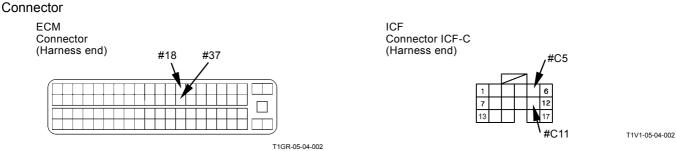


Monitor Unit Connector Monitor-B (Harness end)



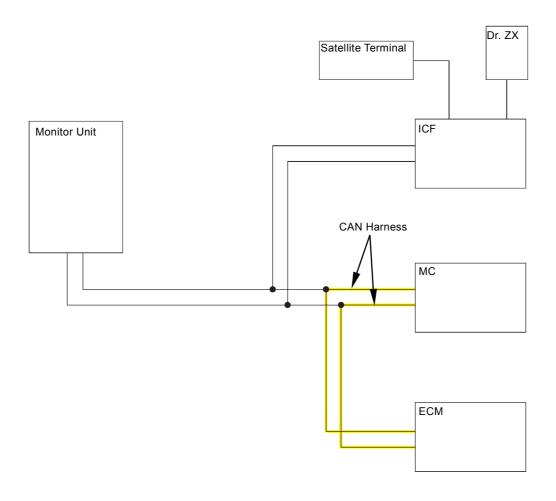
T183-05-04-013





MC FAULT CODE 11920

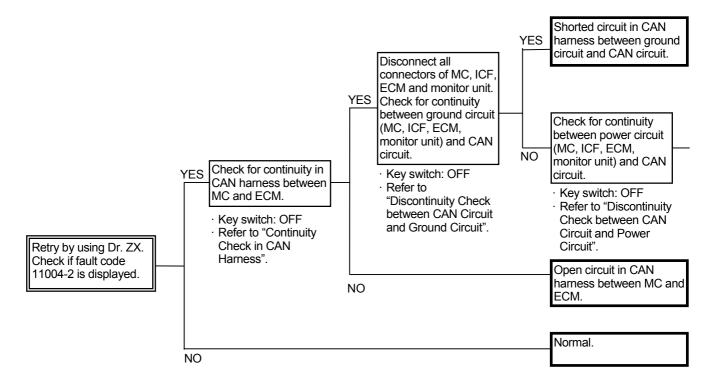
Fault Code	Trouble	Cause	Influenced Control	
11920-2	Fuel Flow Rate Received from	Faulty CAN Harness	Fuel Flow Rate	
	ECM	-		

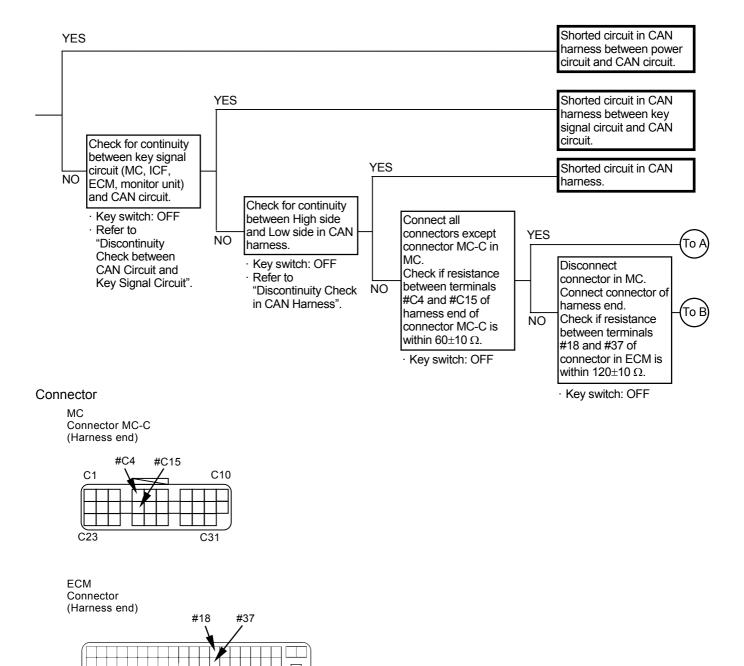


T1V1-02-01-051

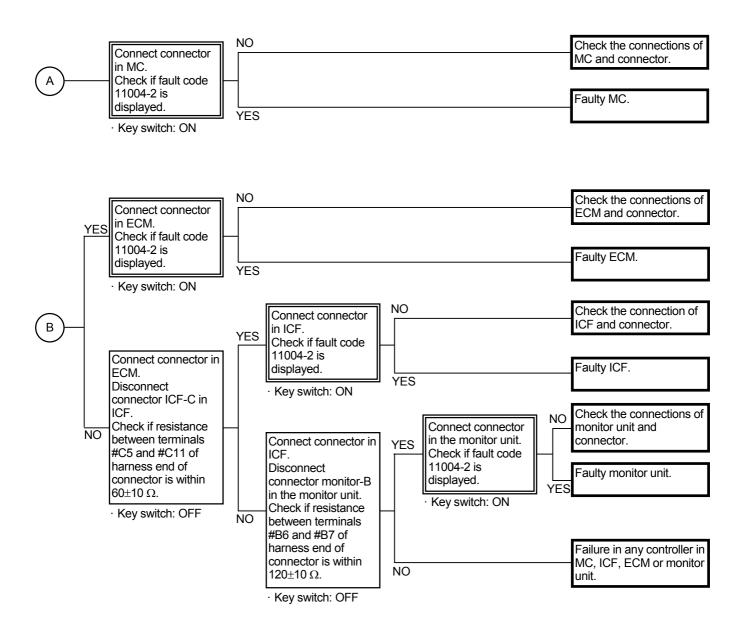
CAN HARNESS CHECK MC FAULT CODE 11920

· Check the wiring connections first.

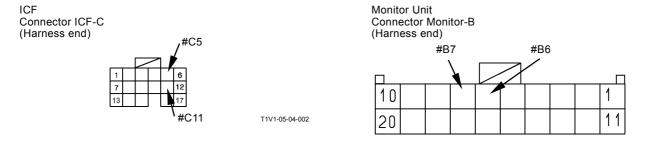




T1GR-05-04-002



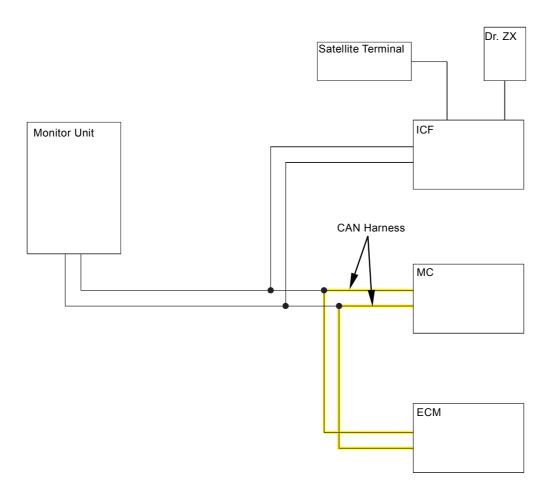
Connector



T183-05-04-013

MC FAULT CODE 11914

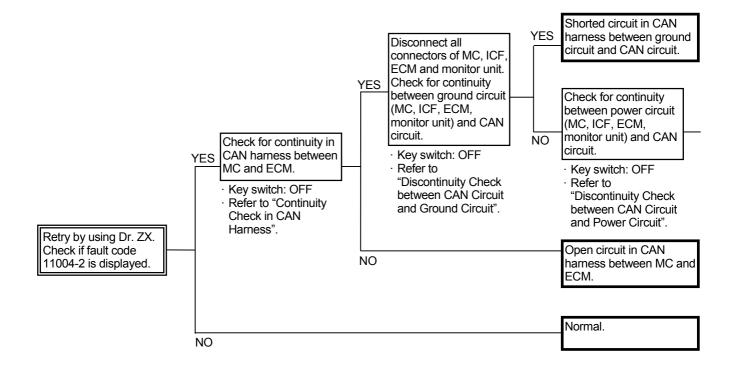
Fault Code	Trouble			Cause	Influenced Control
11914-2	Radiator Coolant Temperature		Temperature	Faulty Harness	Heater Control
	Received	from ECN	Л		

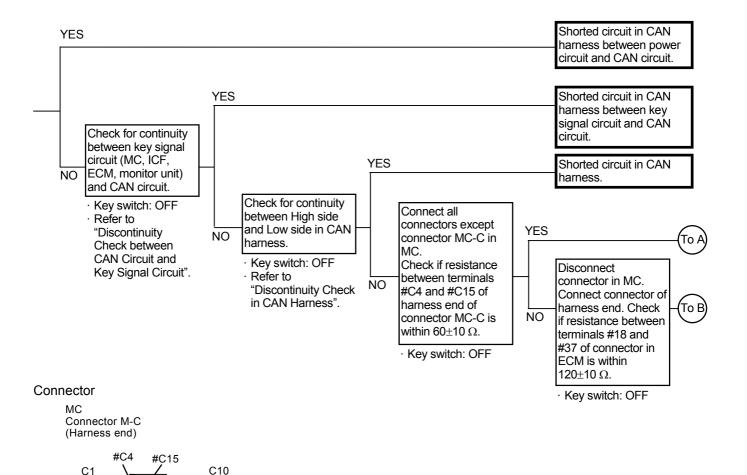


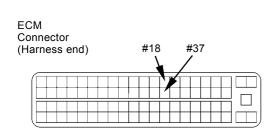
T1V1-02-01-051

CAN HARNESS CHECK MC FAULT CODE 11914

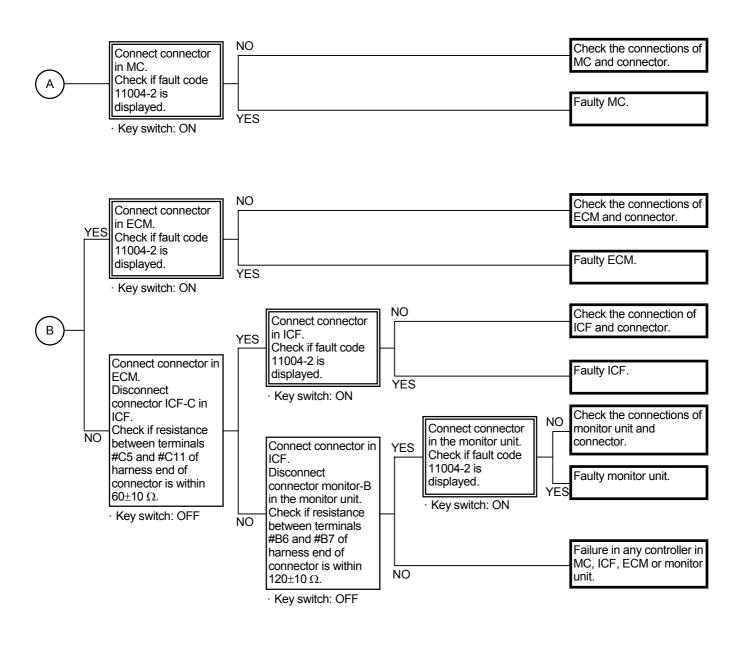
· Check the wiring connections first.

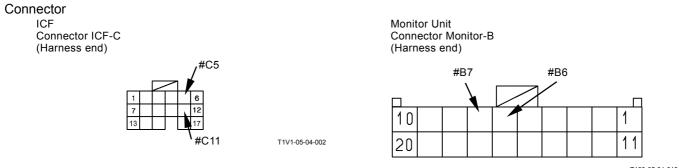






T1GR-05-04-002

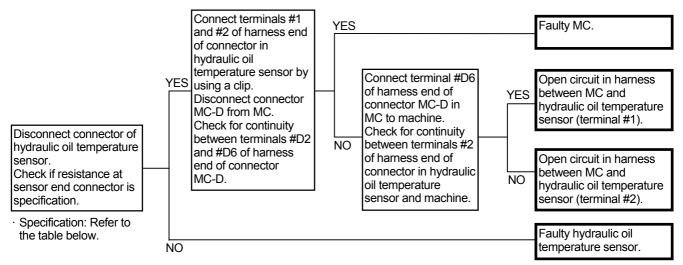




T183-05-04-013

OTHER FAILURES MC FAULT CODE 11901

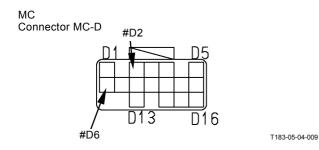
Fault Code	Trouble			Cause	Influenced Control
11901-3	Hydraulic Oil Temperature		Temperature	Voltage: 4.52 V or higher	Auto-Warming Up Control
	Sensor High	Voltag	ge		Arm Regenerative Control
					Digging Regenerative Control
11901-4	Hydraulic	Oil	Temperature	Voltage: Less than 0.23 V	Auto-Warming Up Control
	Sensor Low Voltage				Arm Regenerative Control
	_				 Digging Regenerative Control



Specification of Hydraulic Oil Temperature Sensor

Resistance
$(k\Omega)$
16.2±1.6
(5.88)
2.45±0.24
(1.14)
(0.534)
0.322

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



Hydraulic Oil Temperature Sensor



ECM, SENSOR SYSTEM ECM FAULT CODES 100, 102, 105, 108, 110, 157, 172

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
100-3	Abnormal Engine Oil Pressure Sensor (Abnormal Low Voltage)	P0522	1E-403
100-4	Abnormal Engine Oil Pressure Sensor (Abnormal High Voltage)	P0523	1E-409
102-3	Abnormal Boost Pressure Sensor (Abnormal Low Voltage)	P0237	1E-341
102-4	Abnormal Boost Pressure Sensor (Abnormal High Voltage)	P0238	1E-348
105-3	Abnormal Boost Temperature Sensor (Abnormal High Voltage)	P1113	1E-460
105-4	Abnormal Boost Temperature Sensor (Abnormal Low Voltage)	P1112	1E-452
108-3	Abnormal Atmospheric Pressure Sensor (Abnormal Low Voltage)	P0107	1E-231
108-4	Abnormal Atmospheric Pressure Sensor (Abnormal High Voltage)	P0108	1E-238
110-3	Abnormal Coolant Temperature Sensor (Abnormal High Voltage)	P0118	1E-266
110-4	Abnormal Coolant Temperature Sensor (Abnormal Low Voltage)	P0117	1E-259
157-3	Abnormal Common Rail Pressure Sensor (Abnormal High Voltage)	P0193	1E-294
157-4	Abnormal Common Rail Pressure Sensor (Abnormal Low Voltage)	P0192	1E-288
172-3	Abnormal Intake-Air Temperature Sensor (Abnormal High Voltage)	P0113	1E-251
172-4	Abnormal Intake-Air Temperature Sensor (Abnormal Low Voltage)	P0112	1E-245

ECM FAULT CODES 174, 636, 723, 10001

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
174-3	Abnormal Fuel Temperature Sensor (Abnormal High Voltage)	P0183	1E-280
174-4	Abnormal Fuel Temperature Sensor (Abnormal Low Voltage)	P0182	1E-274
636-2	Abnormal Cam Angle Sensor (No Signal)	P0340	1E-368
636-2	Abnormal Cam Angle Sensor (Abnormal Signal)	P0341	1E-375
636-7	Phase Mismatch of Cam Angle Sensor	P1345	1E-524
723-2	Abnormal Crank Speed Sensor (No Signal)	P0335	1E-355
723-2	Abnormal Crank Speed Sensor (Abnormal Signal)	P0336	1E-362
10001-3	Abnormal EGR Position (Brushless spec.)	P0487	1E-391

IMPORTANT: When fault code 723-2 (abnormal crank speed sensor) is displayed and the engine does not start, the cam angle sensor is faulty although fault codes 636-2 (abnormal cam angle sensor) and 636-7 (phase mismatch of cam angle sensor) are not displayed.

ECM, EXTERNAL DEVICE SYSTEM ECM FAULT CODES 651, 652, 653, 654, 655, 656, 1347, 10002

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
651-3	Open Circuit in Injection Nozzle #1 Drive System	P0201	1E-301
652-3	Open Circuit in Injection Nozzle #2 Drive System	P0202	1E-308
653-3	Open Circuit in Injection Nozzle #3 Drive System	P0203	1E-315
654-3	Open Circuit in Injection Nozzle #4 Drive System	P0204	1E-322
655-3	Open Circuit in Injection Nozzle #5 Drive System	P0205	1E-329
656-3	Open Circuit in Injection Nozzle #6 Drive System	P0206	1E-334
1347-0	Open Circuit in Suction Control Valve Drive System, Shorted Circuit in + B or GND		1E-225
10002-2	Abnormal EGR Valve Control	P0488	1E-397

ECM, FUEL SYSTEM ECM FAULT CODES 157, 633, 1239, 1240

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
157-0	Abnormal Common Rail Pressure (First Stage)	P0088	1E-215
157-0	Abnormal Common Rail Pressure (Second Stage)	P0088	1E-215
157-2	Abnormal Common Rail Pressure (Pump Over-Pressure)	P0089	1E-220
633-7	Pressure Limiter Open	P1095	1E-443
1239-1	No Pressure to Pump (Fuel Leakage)	P0087	1E-207
1240-1	No Pressure to Pump (Fuel Leakage)	P1093	1E-434

ECM, ENGINE PROTECTION ECM FAULT CODES 110, 190

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
110-0	Overheating	P1173	1E-466
190-0	Overrunning	P0219	1E-339

ECM, ENGINE PROTECTION ECM FAULT CODES 987, 1485

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
987-3	Abnormal Check Engine Lamp	P0650	1E-429
1485-2	Abnormal Main Relay System (None)	P1625	1E-529

ECM, INTERNAL CIRCUIT SYSTEM ECM FAULT CODES 628, 1077, 1079, 1080, 10003, 10004, 10005

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
628-2	Abnormal ROM	P0601	1E-417
1077-2	Abnormal IC for CPU Watching	P0606	1E-421
1079-2	Abnormal 5 V Power Source 1 Voltage	P1631	1E-538
1080-2	Abnormal 5 V Power Source 2 Voltage	P1632	1E-541
10003-2	Abnormal Injection Nozzle Common 1 Drive System	P1261	1E-476
10004-2	Abnormal Injection Nozzle Common 2 Drive System	P0262	1E-487
10005-1	Abnormal Charge Circuit (Bank 1)	P0611	1E-423

ECM FAULT CODES 10006, 10007, 10008, 10009, 10010, 10011, 10013

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
10006-1	Abnormal Charge Circuit (Bank 2)	P0612	1E-426
10007-2	Abnormal CPU	P0606	1E-421
10008-2	Abnormal A/D Conversion	P1630	1E-536
10009-2	Abnormal 5 V Power Source 3 Voltage	P1633	1E-544
10010-2	Abnormal 5 V Power Source 4 Voltage	P1634	1E-547
10011-2	Abnormal 5 V Power Source 5 Voltage	P1635	1E-550
10013-2	Abnormal EEPROM	P0603	1E-419

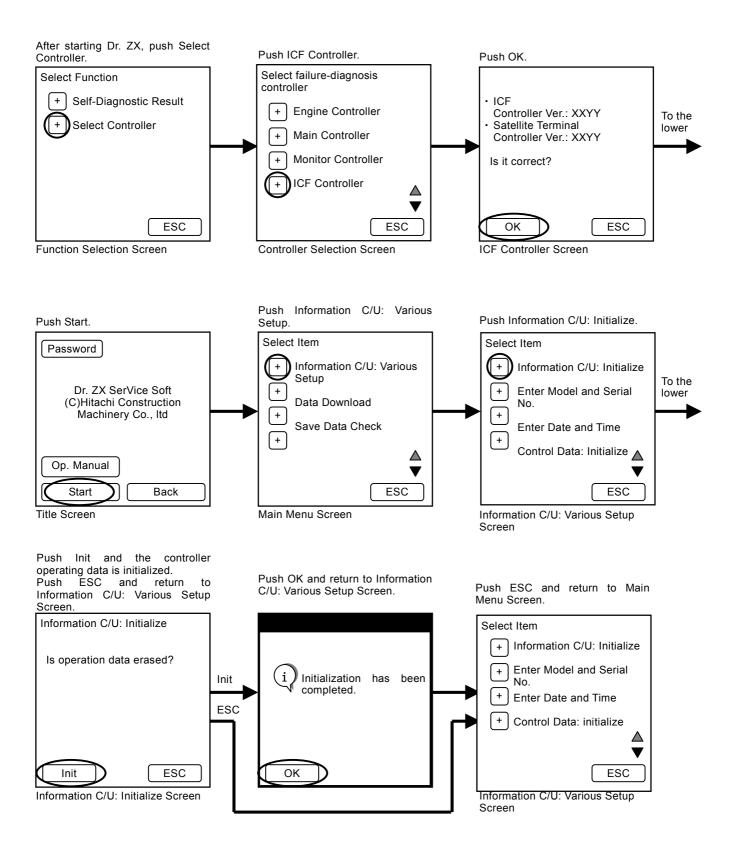
ECM, COMMUNICATION SYSETEM ECM FAULT CODE 639

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
639-2	Abnormal CAN Bus Line	U2104	1E-553
639-3	Abnormal CAN Time Out	U2106	1E-558

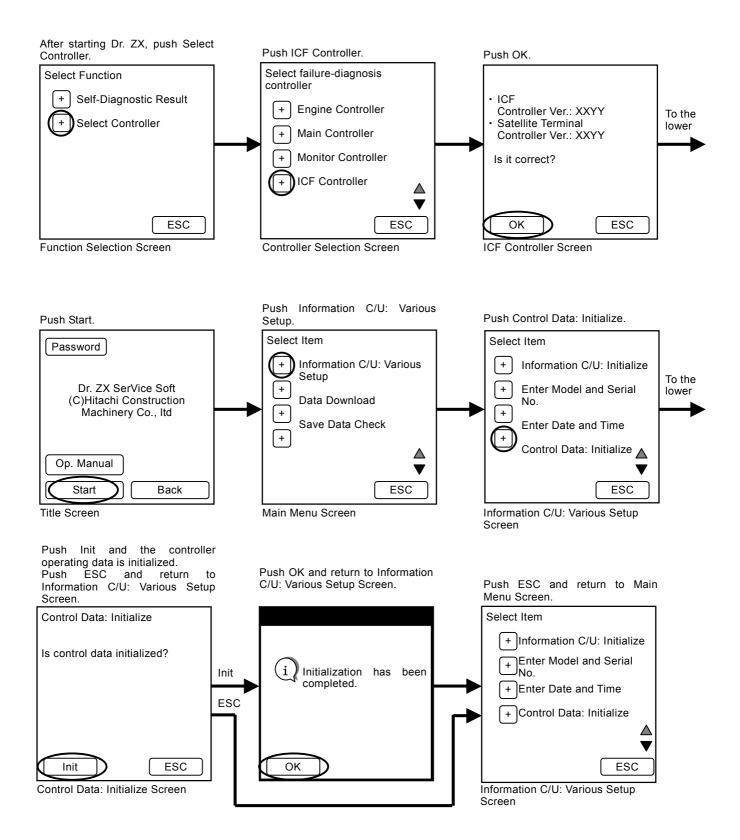
ICF, SATELLITE TERMINAL FAULT CODES 14000 to 14003

Fault Code	Trouble	Remedy
14000-2	Abnormal CAN Communication	Execute retry B in self-diagnosing.
		If this error code is displayed after re-try, check the following
		item.
		Check the CAN communication line (harness).
14001-2	ICF: Flash Memory: Read / Write Error	Execute retry B in self-diagnosing and execute the following
14002-2	ICF: External RAM: Read / Write Error	item.
		Execute "Information C/U: Initialize".
14003-2	ICF: EEPROM: Sum Check Error	Execute retry B in self-diagnosing.
		If this error code is displayed after re-try, check the following
		item.
		Execute "Control Data: Initialize".
		 Execute "Enter Model and Serial No.".
		Then, execute self-diagnosing and execute retry B.

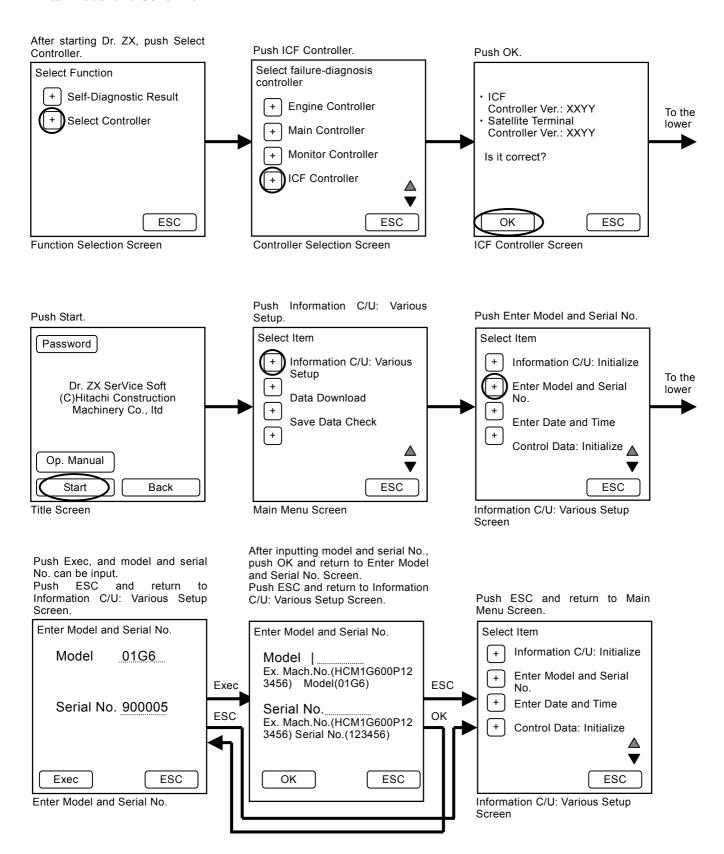
Information C/U: Initialize



Control Data: Initialize



Enter Model and Serial No.



ICF, SATELLITE TERMINAL FAULT CODES 14006, 14008, 14100 to 14106

Fault Code	Trouble	Remedy
14006-2	ICF: Satellite Communication	Execute retry B in self-diagnosing.
	Terminal: Communication Error	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		Check the communication aerial of satellite terminal. (Refer
	Abnormal Local Loup Back	to T5-6-128.)
14103-2	Satellite Communication Terminal:	
	The satellite is not found.	
14104-2		Execute retry B in self-diagnosing.
44405.0	Fail 1 of Remote Loup Back	If this error code is displayed after re-try, replace the
14105-2	Satellite Communication Terminal:	controller.
111000	Fail 2 of Remote Loup Back	
14106-2	Satellite Communication Terminal:	
	Sending and receiving data are	
	mismatched.	

Fault Code 14006-2

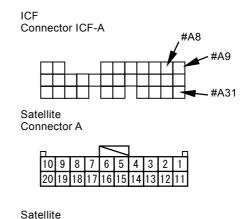
- · Check the communication line
- Check for continuity between terminal #A8 of harness end of connector ICF-A in ICF and terminal #10 of harness end of connector A in satellite terminal.
- 2. Check for continuity between terminal #A9 of harness end of connector ICF-A in ICF and terminal #20 of harness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

With the key switch ON, check voltage between terminal #1 of harness end of connector A in satellite terminal and machine is 24 V.

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)

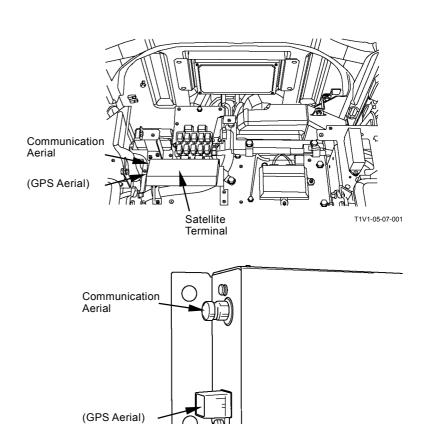


Connector B

8 7 6 5 4 3 2 1

16 15 14 13 12 11 10 9

Fault Codes 14102-2, 14103-2

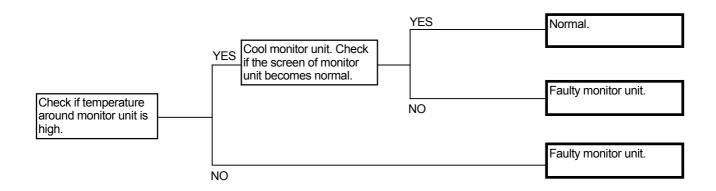


T1V1-05-06-004

MONITOR UNIT FAULT CODE 13303

Fault Code	Trouble	Remedy
13303-2	·	Cool the monitor unit until temperature inside the monitor unit becomes less than 85 $^{\circ}$ C.

The screen of monitor unit becomes dark.

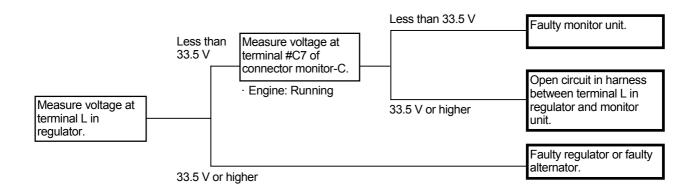


MONITOR UNIT FAULT CODE 13304

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

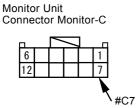
[·] Check the wiring connections first.

NOTE: As terminal L in the regulator is a waterproof type connector, it is difficult to measure voltage. Measure voltage at terminal R in starter relay 2. Check for continuity at terminal R in starter relay 2 and terminal L in regulator.



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



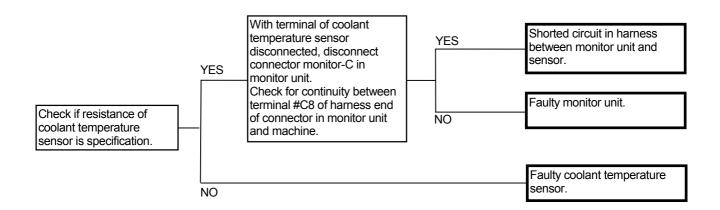


MONITOR UNIT FAULT CODES 13306, 13308

Fault Code	Trouble	Remedy
13306-2	Abnormal EEPROM	If this error code is displayed after re-try, replace the monitor unit.
13308-2	Abnormal CAN Communication	Refer to "Check CAN Harness" (T5-6-54).

MONITOR UNIT FAULT CODE 13310

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

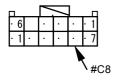


Coolant Temperature Sensor

colarit remperature comes				
Coolant Temperature	Resistance			
(° C)	$(k\Omega)$			
25	7.6±0.76			
40	4.0±0.35			
50	2.7±0.22			
80	0.92±0.07			
95	0.56±0.04			
105	0.42±0.03			
120	0.28±0.01			

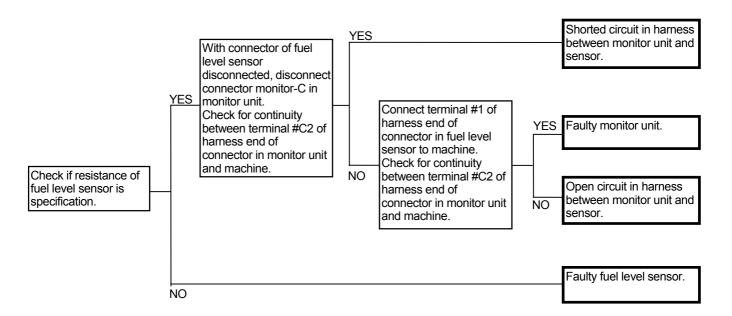
Connector (Harness end of connector viewed from the open end)

Monitor Unit Connector Monitor-C

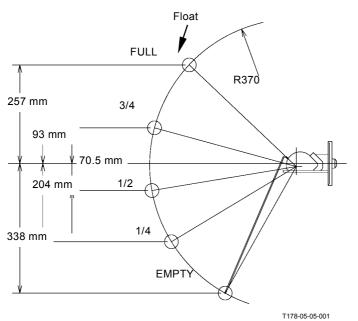


MONITOR UNIT FAULT CODE 13311

Fault Code	Trouble	Remedy
13311-3	Shorted Circuit in Fuel Level Sensor	Check the fuel level sensor and harness.
13311-4	Open Circuit in Fuel Level Sensor	Check the fuel level sensor and harness.



Fuel Level Sensor



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)

Connector Moniter-C

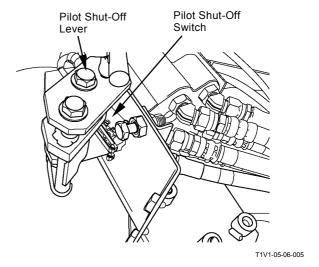
Monitor Unit

Fuel Sensor

PILOT SHUT-OFF LEVER ALARM

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





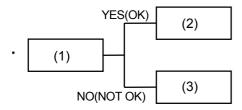
TROUBLESHOOTING B PROCEDURE

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

On the front section pages of this group are the tables indicating the relationship between machine trouble symptoms and related parts which may cause such trouble if failed.

Start the troubleshooting with more probable causes selected by referring to these tables.

• How to Read the Troubleshoting Flow Charts



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

· Key switch: ON

Special instructions or reference item are indicated in the spaces under the box.
 Incorrect measuring or checking methods will render troubleshooting impossible, and may damage components as well.



• Explanation of how to use test harness kit required. Refer to "Electrical System Inspection" Group (Group 8) in this section.



 Use the service menu (built-in diagnosing system/monitoring function) in monitor unit 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 Control Pressure Sensor	Pump 1 Delivery Pressure Sensor
Function		Instructs engine target speed.	Monitors pump control pressure in order to control travel motor swash angle controls.	Monitors pump delivery pressure in order to control HP mode, auto-acceleration, slow speed torque increase, auto power lift and travel motor swash angle 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 1400 min-1 is used as backup value.	No signals arrive to MC.	If pump delivery pressure sensor output is 0 V or 5 V, following symptoms will be presented by backup mode function.
Symptoms in machine operation when trouble occurs.		Engine speed is kept unchanged from 1400 min-1. (Auto-idle system functions. Engine can be stopped by key switch.) If trouble occurs during operation, engine speed is kept unchanged from that before breakdown.	Travel speed is kept in slow mode and does not allow to automatically change to fast mode.	HP mode is inoperable. At P and HP mode, auto-acceleration control is inoperable. Machine mistakes occasionally when traveling at slow idle speed. Boom raise power is weak during digging operation. Travel speed is kept in slow mode and does not allow to automatically change to fast mode.
	By MC Fault Code	11101-3, 11101-4	11206-3, 11206-4, 11208-3, 11208-4	11200-3, 11200-4
Evaluation	By Monitor Function	Monitor Item: Engine target speed, Dial angle (Displayed by service menu and monitoring in monitor unit)	Monitor Item: Pump 1 pump control pressure, Pump 2 pump control pressure (Displayed by service menu and monitoring in monitor unit)	Monitor Item: Pump 1 pressure (Displayed by service menu and monitoring in monitor unit)
	Using Test Harness	-	-	-
	Others	-	-	-
NOTE		-	Evaluation by Dr. ZX Shorted circuit: 0.25 V or less Open circuit: 4.75 V or more	-
Descriptions of Control (Operational Principle Section in T/M)		T2-2	T2-2	T2-2

Pump 2 Delivery Pressure Sensor	Pump 3 Delivery Pressure Sensor (Optional)	Pressure Sensor (Travel)
 Monitors pump delivery pressure in order to control HP mode, auto-acceleration, slow speed torque increase, arm flow rate, arm regeneration and travel motor swash angle controls. 	Monitors pump delivery pressure in order to control pump 3 torque decrease con- trols.	 Monitors travel pilot pressure in order to control auto-idle, auto-acceleration, idle speed-up, engine speed automatic in- crease at travel (ZX270-3 class only), slow speed torque increase and travel motor swash angle controls.
 If pump delivery pressure sensor output is 0 V or 5 V, following symptoms will be presented by backup mode function. 	Engine stalls if pump torque is increased.	No signals arrive to MC.
 HP mode is inoperable. At P and HP mode, auto-acceleration control is inoperable. Machine mistakes occasionally when traveling at slow idle speed. Swing power is weak during a combined operation. During shorted circuit, swing is given priority. Arm is slow when combined operation of arm roll-in and swing is made. Travel speed is kept in slow mode and does not allow to change to fast mode 	Engine stalls if pump torque is increased.	 Engine speed does not increase even if auto-idle switch is turned ON. Engine speed does not increase even if auto-acceleration switch is turned ON. Occasionally, engine speed hunts while traveling at slow idle. If there is a difference in delivery flow rate between pumps 1 and 2, machine may mistake when traveling at minimum speed. (Not remarkable) Fast travel mode cannot be selected even if travel mode switch is turned to the FAST position. ZX270-3 class only: Travel speed is not increased. (Not remarkable)
11202-3, 11202-4	-	11304-3, 11304-4
Monitor Item: Pump 2 pressure (Displayed by service menu and monitoring in monitor unit)	-	Monitor Item: Travel control pressure (Displayed by service menu and monitoring in monitor unit) Monitor pressure change while traveling machine.
-	-	-
-	-	-
-	-	 Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor.
T2-2	T2-2	T2-2

	Parts	Pressure Sensor (Front Attachment)	Pressure Sensor (Swing)	Pressure Sensor (Boom Raise)
Function		Monitors front attachment pilot pressure in order to con- trol auto-idle, and idle speed-up, and engine speed automatic increase at travel (ZX270-3 class only) controls.	Monitors swing pilot pressure in order to control arm flow rate and arm regeneration controls.	Monitors boom raise pilot pressure in order to control HP mode, auto-acceleration, arm regeneration and auto-power lift controls.
Symptoms system who occurs.		No signals arrive to MC.	No signals arrive to MC.	No signals arrive to MC.
Symptoms in machine operation when trouble occurs.		 Engine speed does not increase even if any front attachment is operated with auto-idle switch ON. Occasionally, engine speed hunts while operating front attachment at slow idle. ZX270 class only: Travel speed is not increased. (Not remarkable) 	As arm regenerative function is inoperable during combined operation of swing/arm roll-in, initial arm moving speed is slow. (Not remarkable) During arm level crowding operation, arm speed is slightly slow.	Even if boom is raised with HP mode switch ON, engine speed does not increase. Even if boom is raised with auto-acceleration switch ON, engine speed does not increase. As arm regenerative system does not work, arm roll-in speed becomes slightly slower than normal during combined operation of boom raise and arm roll-in. (Not remarkable) Arm roll-in and boom raise speeds become slightly slower at the beginning stage of arm level crowd operation. Boom raise power is weak. (Not remarkable)
	By MC Fault Code	11307-3, 11307-4	11301-3, 11301-4	11302-3, 11302-4
By Monitor Function		Monitor Item: Front attachment operation (Displayed by service menu and monitoring in monitor unit) Monitor pressure change while operating front attachment.	Monitor Item: Swing control pressure (Displayed by service menu and monitoring in monitor unit) Monitor pressure change while swinging upperstructure.	Monitor Item: Boom raise pilot pressure (Displayed by service menu and monitoring in monitor unit) Monitor pressure change while raising boom.
	Using Test Harness	-	-	-
	Others	-	-	-
N	ОТЕ	 Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor. 	 Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor. 	 Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor.
Descriptions (Operational Section in T	l Principle	T2-2	T2-2	T2-2

Pressure Sensor (Arm Roll-In)	Pressure Sensor (Auxiliary) (Optional)	Torque Control Solenoid Valve
 Monitors arm roll-in pilot pressure in or- der to control HP mode, auto-acceleration, arm flow rate, and arm regeneration controls. 	 Monitors attachment pilot pressure when attachment is installed in order to control attachment operation speed increase, pump 1 flow rate limit, pump 2 flow rate limit and auxiliary flow rate controls. 	 Supplies control pressure to pumps 1 and 2 in order to control speed sensing and slow speed torque increase controls.
No signals arrive to MC.	No signals arrive to MC.	If torque control solenoid valve is not activated, output pressure from solenoid valve is 0 MPa (0 kgf/cm2).
 Even if arm is rolled-in with HP mode switch ON, engine speed does not increase. Even if arm is rolled-in with auto-acceleration switch ON, engine speed does not increase. As arm flow rate control does not work, swing speed becomes slightly slower during combined operation of swing and arm roll-in. (Not remarkable) Arm speed is slow during arm level crowd operation. 	Engine speed does not increase when attachment is operated. Operation speed increases when attachment is operated.	Even if speed sensing system does not work, upper limit power is restricted so that machine is operable. Machine may occasionally mistake when traveling at slow idle speed.
11303-3, 11303-4	-	11401-2, 11401-3, 11401-4
Monitor Item: Arm roll-In pilot pressure (Displayed by service menu and monitoring in monitor unit) Monitor pressure change while rolling arm in.	Monitor Item: ATT control pressure (Displayed by service menu and monitoring in monitor unit) Monitor pressure change while operating attachment.	Monitor Item: Pump torque proportional so- lenoid valve output
-	-	-
-	-	-
 Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor. 	 Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor. 	-
with other pressure sensor.		

	Parts			
		Solenoid Valve Unit (SG)	Solenoid Valve Unit (SF)	Solenoid Valve Unit (SC)
Function		 Temporarily increases main relief valve pressure when operating machine either in power digging and auto-power lift control. 	 Routes return oil from boom cylinder rod side to arm cyl- inder bottom side during dig- ging operation and increases arm speed. 	Routes return oil from arm cylinder rod side to bottom side when rolling arm in and increases arm speed.
Symptoms in control system when trouble occurs.		If solenoid valve unit (SG) is not activated, pressure at port SG becomes 0 MPa (0 kgf/cm2).	If solenoid valve unit (SF) is not activated, pressure at port SF becomes 0 MPa (0 kgf/cm2).	If solenoid valve unit (SC) is not activated, pressure at port SC becomes 0 MPa (0 kgf/cm2). Arm regenerative valve will not operate at this time.
Symptoms in machine operation when trouble occurs.		Solenoid valve unit (SG) is closed: Relief pressure stays at normal 34 MPa (350 kfg/cm2). 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 the force increase.	Solenoid valve unit (SF) is closed: • Arm roll-in speed becomes slow during digging operation. Solenoid valve unit (SF) is open: • Arm speed becomes fast during combined operation of boom raise and arm.	Solenoid valve unit (SC) is closed: • Arm speed becomes slow during arm level crowd operation. Solenoid valve unit (SC) is open: • Arm speed becomes fast as arm regeneration is operated.
Evaluation	By MC Fault Code	11404-2, 11404-3, 11404-4	11404-2, 11404-3, 11404-4	11404-2, 11404-3, 11404-4
	By Monitor Function	Monitor Item: Power digging control pressure	Monitor Item: Digging regenerative valve	Monitor Item: Arm regenerative proportional solenoid valve output
	Using Test Harness	Install lamp harness (ST 7226). Check output signals from MC and harness condition.	Install lamp harness (ST 7226). Check output signals from MC and harness condition.	Install lamp harness (ST 7226). Check output signals from MC and harness condition.
	Others	-	-	-
NOTE		 Proportional solenoid valve is used as an ON/OFF valve. When power digging switch is pushed or released and lamp comes ON, harness is normal. If lamp goes OFF, it may be due to open harness. 	-	-
Descriptions of Control (Operational Principle Section in T/M)		T2-2	T2-2	T2-2

Solenoid Valve Unit (SI)	Max. Pump 1 Flow Rate Limit Sole- noid Valve (Optional)	Max. Pump 2 Flow Rate Limit Solenoid Valve
	(1 ,	Little Goldfiold valve
When pump delivery pressure is low in fast travel mode, travel motor swash angle is reduced and increases travel speed.	Limits maximum pump 1 flow rate when operating attachment.	Limits maximum pump 2 flow rate when operating attachment.
Fast travel mode cannot be selected.	 If max. pump 1 flow rate limit solenoid valve is not activated, pressure at output port becomes 0 MPa (0 kgf/cm2). 	 If max. pump 2 flow rate limit solenoid valve is not activated, pressure at output port becomes 0 MPa (0 kgf/cm2).
Solenoid valve unit (SI) is closed: • Even if travel mode switch is turned to FAST position, fast travel mode cannot be selected.	Max. pump 1 flow rate limit solenoid valve is closed: When operating attachment, operating speed does not decrease.	Max. pump 2 flow late limit solenoid valve is closed: When operating attachment, operating speed does not decrease.
Solenoid valve unit (SI) is open: • Travel speed is always fast.	Max. pump 1 flow rate limit solenoid valve is open: Right travel, bucket, arm and boom speeds become slow as maximum flow rate of pump 1 decreases. Machine mistracks to the right when traveling.	Max. pump 2 flow rate limit solenoid valve is open: Left travel, arm, boom and swing speeds become slow as maximum flow rate of pump 2 decreases. Machine mistracks to the left when traveling.
11405-2, 11405-3, 11405-4	11410-2, 11410-3, 11410-4	11400-2, 11400-3, 11400-4
_		
 Install lamp harness (ST 7226). Check output signals from MC and harness condition. 	-	-
-	-	-
-	-	-
T2-2	T2-2	T2-2

	Parts	Auxiliary Flow Rate Control Solenoid Valve (Optional)	Auxiliary Flow Combining Solenoid Valve (Optional)	Hydraulic Oil Temperature Sensor
Function		Restricts oil flow to auxiliary spool during combined op- eration and improves oper- ability.	 activates during auxiliary op- eration and shifts spool in auxiliary flow combining valve. 	Monitors hydraulic oil tem- perature in order to control auto-warming up and arm regenerative controls.
Symptoms in control system when trouble occurs.		If auxiliary flow rate control solenoid valve is not acti- vated, pressure at output port becomes 0 MPa (0 kgf/cm2).	If auxiliary flow combining solenoid valve is not acti- vated, pressure at output port becomes 0 MPa (0 kgf/cm2) when operating attachment.	If discontinuity occurs, system operates as if hydraulic oil temperature is 40 °C (Dr. ZX or monitor does not indicate 40 °C in diagnosis operation).
Symptoms in machine operation when trouble occurs.		If valve is bound fully closed, attachment speed becomes slow during single operation. If valve is bound fully open, boom does not raise during 3-combined operation of boom raise.	Speed does not increase during single operation of at- tachment.	Even if oil temperature is lower than 0 °C, auto-warming up control does not operate so that engine runs at idle speed. When oil temperature is lower than 10 °C, arm regenerative control is inoperable.
	By MC Fault Code	-	-	11901-3, 11901-4
Evaluation	By Monitor Function	-	-	Monitor Item: Hydraulic oil
	Using Test Harness	-	-	-
	Others	-	-	-
NOTE		-	-	-
Descriptions of Control (Operational Principle Section in T/M)		T2-2	T2-2	T2-2

Power Digging Switch	Travel Mode Switch	MC
 Activates power digging control. ON: 0V→Increasing Pressure OFF: 5V→ Not Increasing Pressure 	Changes travel mode. Fast mode: 0V Slow mode: 5V	Controls engine, pump and valve operation.
 Open circuit: Pressure does not increase. Shorted circuit: Pressure increases for 8 seconds after turning key switch and stops increasing. 	Open circuit in switch: Travel speed remains unchanged in slow mode (5V). Shorted circuit in switch: Travel speed remains unchanged in fast mode (0 V).	Depending on trouble situations, control system malfunction may differ. (The fol- lowing symptoms in machine operation indicates that MC logic circuit has failed.)
Power digging control does not operate if open circuit or shorted circuit occurs.	Even if travel mode switch is turned to the FAST position, fast travel mode cannot be selected. Even if travel mode switch is turned to the SLOW position, travel mode is turned to the FAST position.	Even if key switch is turned ON, step motor does not move to the START position so that engine cannot start. Even though engine starts, speed stays slow. As pump displacement is kept at minimum, all actuator speeds become slow.
<u>-</u>	-	11000-2, 11001-2, 11002-2, 11003-3
Monitor Item: Power Digging Switch	Monitor Item: Travel Mode	-
-	-	-
-	-	-
-	-	Before suspecting a failure in MC, check fuses in control system. If any sensor in 5 V system is shorted circuit, fault codes of all sensor is displayed.
T2-2	T2-2	T2-2

	Parts	Auto-Idle Switch	Power Mode Switch (HP Mode)	Power Mode Switch (E Mode)
Function		 Activates auto-idle control. ON: 0 V → Auto-idle control is operable. OFF: 5 V → Inoperable. 	 Activates HP mode control. ON: 0 V → HP mode control is operable. OFF: 5 V → Inoperable. 	Selects E mode. ON: 0 V → E mode OFF: 5 V → Normal
Symptoms in control system when trouble occurs.		Open circuit: Auto-idle system is inoperable. Shorted circuit: Even if auto-idle switch is OFF, auto-idle control is always activated.	Open circuit: Even if HP mode is selected, HP mode is inoperable. Shorted circuit: Even if HP mode switch is turned OFF, HP mode system is not deactivated. Attachment speed increase control (optional) becomes inoperable.	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.
Symptoms in machine operation when trouble occurs.		Open circuit: Auto-idle system is inoperable. Shorted circuit: Even if auto-idle switch is OFF, auto-idle control is always activated.	Open circuit: Even if HP mode is selected, HP mode is inoperable. Shorted circuit: Even if HP mode switch is turned OFF, HP mode system is not deactivated. Attachment speed increase control (optional) becomes inoperable.	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.
	By MC Fault Code	-	-	-
Evaluation	By Monitor Function	-	Monitor Item: E/P/HP Mode Switch	Monitor Item: E/P/HP Mode Switch
	Using Test Harness	-	-	-
	Others	-	-	-
NOTE		-	-	-
Descriptions of Control (Operational Principle Section in T/M)		T2-2	T2-2	T2-2

Arm 2 Flow Rate Control Valve	Flow Combiner Valve	Arm 1 Flow Rate Control Valve
 Be shifted by pilot pressure from sole- noid valve unit (SC). Ensures boom raise speed. 	Supplies hydraulic oil to both right and left travel spools from pump 1 during combined operation of travel and front/swing.	Be shifted by pilot pressure from arm flow rate control valve in signal control valve. Ensures swing power.
If spool is bound or spring is broken, orifice does not change.	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 spool is bound or spring is broken, orifice does not change.
If fully opened: Boom raise speed is slow. If fully closed: Arm roll-in speed is slow during arm level crowd operation.	While traveling and when front/swing lever is operated, machine mistracks to the left.	If fully opened: swing power is lack. If fully closed: Arm roll-in speed is slow during arm level crowd operation.
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-	-	-
-	-	-
-	-	-
-	-	-
T3-3	Т3-3	T3-3

	Parts	Bucket Flow Rate Control Valve	Auxiliary Flow Rate Control Valve	Boom Regenerative Valve
Function		Restricts oil flow to bucket during 3-combined operation of bucket, arm roll-in and boom raise, and allows boom to raise.	Be shifted by pilot pressure from auxiliary flow rate con- trol solenoid valve.	Routes return oil from boom cylinder bottom side to rod side and prevents boom cyl- inder hesitation.
Symptoms in control system when trouble occurs.		If switch valve is bound with switch valve activated, bucket circuit is always re- stricted.	If spool is bound or spring is broken, orifice does not change.	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.
Symptoms in machine operation when trouble occurs.		If poppet valve is bound at fully closed position or if switch valve is bound when poppet valve is fully closed, bucket speed becomes slow. If poppet valve is bound at fully open position or if switch valve is bound when poppet valve is fully open, boom does not raise during 3-combined operation of bucket, arm roll-in and boom raise.	If bound at fully closed position, attachment speed becomes slow. If bound at fully open position, boom does not raise during 3-combined operation of swing, arm roll-in and boom raise.	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.
	By MC Fault Code	-	-	-
Evaluation	By Monitor Function	-	-	-
	Using Test Harness	-	-	-
	Others	-	-	-
NOTE		-	-	-
Descriptions of Control (Operational Principle Section in T/M)		T3-3	Т3-3	T3-3

Arm Regenerative Valve	Bucket Regenerative Valve	Arm Anti-Drift Valve
 Be shifted by pilot pressure from sole- noid valve unit (SC). Routes return oil from arm cylinder rod side to bottom side and increases arm speed. 	 Routes return oil from bucket cylinder rod side to bottom side and prevents bucket cylinder hesitation. 	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.
Arm regenerative function is inoperable.	If check valve is kept closed, bucket is not smoothly rolled in. If check valve is kept open, bucket power is weak.	If switch valve is bound, check valve does not open.
 Arm speed is extremely slow during arm level crowd operation while arm regenerative valve is kept closed. The lever operated first is given priority during combined operation of arm roll-in and swing while arm regenerative valve is kept open. 	If check valve is kept closed, bucket is not smoothly rolled in. If check valve is kept open, bucket power is weak.	If check valve is kept closed, 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.
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-	-	-
T3-3	T3-3	T3-3
		<u> </u>

Parts		Boom Anti-Drift Valve	Auxiliary Flow Combining Valve	Bypass Shut-Out Valve
Function		Forcibly open check valve in boom lower return circuit and allows boom to move only when boom is lowered. Pre- vents boom from drifting due to oil leaks in control valve.	 Be shifted by pilot pressure from auxiliary flow combining solenoid valve. Supplies pressure oil from pump 1 to auxiliary spool. 	Supplies pressure oil from pump 1 to auxiliary spool when auxiliary spool is oper- ated.
Symptoms in control system when trouble occurs.		If switch valve is bound, check valve does not open.	If switch valve is kept closed, operating speed does not increase during single auxiliary operation.	If spool is bound at fully open, single attachment operation speed becomes slow. If spool is bound at fully closed, main relief valve continues to relieve with all control levers in neutral. When all control levers are in neutral, pump 1 pressure is higher than pump 2 pressure by depending on spool bound condition.
Symptoms in machine operation when trouble occurs.		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 switch valve is kept closed, operating speed does not increase during single auxiliary operation.	If spool is bound at fully open, single attachment operation speed becomes slow. If spool is bound at fully closed, main relief valve continues to relieve with all control levers in neutral. When all control levers are in neutral, pump 1 pressure is higher than pump 2 pressure by depending on spool bound condition.
	By MC Fault Code	-	-	-
Evaluation	By Monitor Function	-	-	-
	Using Test Harness	-	-	-
	Others	-	-	-
NOTE		-	-	-
Descriptions of Control (Operational Principle Section in T/M)		T3-3	T3-3	T3-3

Pump 1 Flow Rate Control Valve	Pump 2 Flow Rate Control Valve	Flow Combiner Valve Control Spool
 Supplies flow rate control pressure Pi to pump 1 regulator in response to lever stroke when boom (raise/lower), arm (roll-out/in), bucket (roll-out/in), right travel or auxiliary is operated. 	 Supplies flow rate control pressure Pi to pump 2 regulator in response to lever stroke when boom (raise/lower), arm (roll-out/in), swing (right/left), left travel or auxiliary is operated. 	Be shifted by right travel pilot pres- sure and supplies control pressure to flow combiner valve in control valve.
 If spool is bound at fully open, even if control lever is in neutral, pump 1 swash angle is tilted to maximum. (When traveling with travel levers held in half stroke, machine mistracks to the left.) If spool is bound at fully open, pump 1 control pressure sensor monitors the maximum pressure. If spool is bound at fully closed, even if control lever is operated, pump 1 swash angle is tilted to minimum. (Right travel is inoperable during single travel operation. Bucket speed becomes very slow.) If spool is bound at fully open, pump 1 control pressure sensor cannot monitor the pump control pressure. (Right travel does not run fast with right track jacked-up.) 	 If spool is bound at fully open, even if control lever is in neutral, pump 2 swash angle is tilted to maximum. (When traveling with travel levers held in half stroke, machine mistracks to the right.) If spool is bound at fully open, pump 2 control pressure sensor monitors the maximum pressure. If spool is bound at fully closed, even if control lever is operated, pump 2 swash angle is tilted to minimum. (Left travel is inoperable during single travel operation. Swing speed becomes very slow.) If spool is bound at fully open, pump 2 control pressure sensor cannot monitor the pump control pressure. (Left travel does not run fast with left track jacked-up.) 	If spool is bound at fully open, when boom, arm, bucket or swing is operated, flow combiner valve is shifted. If spool is bound at fully closed, when combined operation of travel and front/swing is made, machine mistracks to the left. (Left travel speed becomes slow.)
 spool is bound at fully open, even if control lever is in neutral, pump 1 swash angle is tilted to maximum. (When traveling with travel levers held in half stroke, machine mistracks to the left.) If spool is bound at fully open, pump 1 control pressure sensor monitors the maximum pressure. If spool is bound at fully closed, even if control lever is operated, pump 1 swash angle is tilted to minimum. (Right travel is inoperable during single travel operation. Bucket speed becomes very slow.) If spool is bound at fully open, pump 1 control pressure sensor cannot monitor the pump control pressure. (Right travel does not run fast with right track jacked-up.) 	 If spool is bound at fully open, even if control lever is in neutral, pump 2 swash angle is tilted to maximum. (When traveling with travel levers held in half stroke, machine mistracks to the right.) If spool is bound at fully open, pump 2 control pressure sensor monitors the maximum pressure. If spool is bound at fully closed, even if control lever is operated, pump 2 swash angle is tilted to minimum. (Left travel is inoperable during single travel operation. Swing speed becomes very slow.) If spool is bound at fully open, pump 2 control pressure sensor cannot monitor the pump control pressure. (Left travel does not run fast with left track jacked-up.) 	If spool is bound at fully open, when boom, arm, bucket or swing is operated, flow combiner valve is shifted. If spool is bound at fully closed, when combined operation of travel and front/swing is made, machine mistracks to the left. (Left travel speed becomes slow.)
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-	-	-
-	-	-
T3-6	T3-6	T3-6

Parts		Swing Parking Brake Release Spool	Bucket Flow Rate Control Valve Control Spool
Function		 Be shifted by boom, arm, bucket or swing pilot pressure and supplies swing parking brake release pressure. 	Be shifted by arm roll-in pilot pressure and supplies boom raise pilot pressure to bucket flow rate control valve as control pressure.
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 open, pressure sensor (front attachment) is always turned into ON. Thus, engine speed does not decrease when control lever is in neutral during auto-idle/acceleration control. If spool is bound at fully closed, swing parking brake is kept applied. (Dragging is felt.) If spool is bound at fully closed, pressure sensor (front attachment) is always turned into OFF. Thus, engine speed does not increase when control lever is operated during auto-idle/acceleration control.	If spool is bound at fully open, bucket speed becomes slow during combined operation of boom raise and bucket. (Bucket flow rate control is inoperable.) If spool is bound at fully closed, boom does not raise during 3-combined operation of bucket, arm roll-in and boom raise.
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 open, pressure sensor (front attachment) is always turned into ON. Thus, engine speed does not decrease when control lever is in neutral during auto-idle/acceleration control. If spool is bound at fully closed, swing parking brake is kept applied. (Dragging is felt.) If spool is bound at fully closed, pressure sensor (front attachment) is always turned into OFF. Thus, engine speed does not increase when control lever is operated during auto-idle/acceleration control.	If spool is bound at fully open, bucket speed becomes slow during combined operation of boom raise and bucket. (Bucket flow rate control is inoperable.) If spool is bound at fully closed, boom does not raise during 3-combined operation of bucket, arm roll-in and boom raise.
	By MC Fault Code	-	-
Evaluation	By Monitor Function	-	-
	Using Test Harness	-	-
	Others	-	-
NOTE		-	-
Descriptions of Control (Operational Principle Section in T/M)		Т3-3	Т3-6

Arm Flow Rate Control Valve Control Spool	Digging Regenerative Valve	Boom Flow Rate Control Valve	Boom Lower Meter-In Cut Valve
 Be shifted by arm roll-in pilot pressure and supplies to arm flow rate control valve 1 on 5-spool side in control valve as control pressure. 	Be shifted by pilot pressure from solenoid valve unit (SF). Routes return oil from boom cylinder rod side to arm cyl- inder bottom side and in- creases arm speed.	Be shifted by pilot pressure from boom lower meter-in cut valve. Controls flow rate to boom 1 spool during combined operation and improves combined operation.	Be shifted by return oil from boom cylinder bottom side. Shifts boom flow rate control valve by boom lower pilot pressure.
 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.) 	 If valve is kept closed, arm roll-in speed does not increase during digging operation. If valve is kept open, arm speed becomes fast during combined operation of boom raise and arm. If valve is at fully open, becomes fast during combined operation. If valve is at fully open, becomes fast during combined operation. If valve is at fully open, becomes fast during combined operation. If valve is at fully open, becomes fast during combined operation. 		 If valve is kept closed, as boom flow rate control valve is not shifted, boom lower speed becomes fast during combined operation. If valve is kept open, as boom flow rate control valve is shifted, pressure oil from pump 1 does not flow to boom 1 spool. Therefore, machine cannot be raised off ground with front attachment.
 If 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.) 	If valve is kept closed, arm roll-in speed does not increase during digging operation. If valve is kept open, arm speed becomes fast during combined operation of boom raise and arm.	If valve is at fully open, boom lower speed becomes fast during combined operation. If valve is at fully closed, machine cannot be raised off ground with front attachment.	If valve is kept closed, as boom flow rate control valve is not shifted, boom lower speed becomes fast during combined operation. If valve is kept open, as boom flow rate control valve is shifted, pressure oil from pump 1 does not flow to boom 1 spool. Therefore, machine cannot be raised off ground with front attachment.
-	-	-	-
-	-	-	-
-	-	-	-
	-	-	-
-	-	-	-
T3-6	Т3-3	Т3-3	T3-3
	•	•	

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 E-1 E-2 E-3 Starter does not rotate Even if starter rotates, engine When engine control dial is Trouble does not start. fully rotated, engine stalls. Symptom When engine control dial is fully rotated, engine speed becomes slow. **Parts** MC ECM 0 ICF 0 Monitor Unit 0 Pump 1 Delivery Pressure Sensor Pump 2 Delivery Pressure Sensor Pump 1 Control Pressure Sensor Pump 2 Control Pressure Sensor Pressure Sensor (Travel) Pressure Sensor (Front Attachment) Pressure Sensor (Swing) Pressure Sensor (Boom Raise) Pressure Sensor (Arm Roll-In) Pressure Sensor (Auxiliary) N Sensor Hyd. Oil Temperature Sensor Coolant Temperature Sensor Key Switch • **Engine Control Dial** Auto-Idle Switch Power Mode Switch Travel Mode Switch Torque Control Solenoid Valve Starter Cut Relay ullet**ECM Main Relay Battery Relay** • Glow Relay **Engine Electrical Equipment Engine Unit** • Pump Regulator Swing Parking Brake Release Spool (Signal Control Valve) Check batteries Remarks

NOTE: The trouble symptoms in this table are described provided that each trouble occurs independently.

In case more than one trouble occurs at the same time, find out all faulty components while checking all suspected components in each trouble symptom.

E-4	E-5	E-6	E-7
Even if engine control dial is rotated, engine speed remains unchanged.	Engine speed does not increase when engine starts.	Faulty HP mode.	Faulty Travel HP mode.
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	0	0	0
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		•	
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		•	
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•			

- 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.

	E-8	E-9	E-10
Trouble	Even if key switch is turned	Faulty auto-idle system.	Faulty E mode.
Symptom	OFF, engine does not stop.		
Cymptom			
Parts			
Faits			
MC	0	•	•
ECM		0	0
ICF			
Monitor Unit			
Pump 1 Delivery Pressure			_
Sensor			•
Pump 2 Delivery Pressure Sensor			•
Pump 1 Control Pressure Sensor			•
Pump 2 Control Pressure Sensor			•
Pressure Sensor (Travel)		0	
Pressure Sensor (Front Attachment)		0	
Pressure Sensor (Swing)			
Pressure Sensor (Boom Raise)			
Pressure Sensor (Arm Roll-In)			
Pressure Sensor (Auxiliary)			
Hyd. Oil Temperature Sensor			
Coolant Temperature Sensor			
Key Switch	0		
Engine Control Dial			
Auto-Idle Switch		•	
Power Mode Switch		0	•
Travel Mode Switch			
Torque Control Solenoid Valve			
Starter Cut Relay			
ECM Main Relay			
Battery Relay			
Glow Relay			
Engine Electrical Equipment			
Engine Unit			
Pump Regulator			
Swing Parking Brake Release Spool (Signal Control Valve)		•	
Remarks			

NOTE: The trouble symptoms in this table are described provided that each trouble occurs independently.

In case more than one trouble occurs at the same time, find out all faulty components while checking all suspected components in each trouble symptom.

E-11	E-12	E-13	E-14
When traveling or operating front attachment with engine running at slow idle, engine hunts.	Engine speed does not increase even if attachment is operated in attachment mode.	When attachment mode is selected, engine speed does not decrease.	Engine stops within several
nane.			
•	•	•	
	0	0	
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	0	0	
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•			•

	E-15	E-16
Trouble	Engine stalls during operation	Engine is difficult to start at low
Symptom	under adverse condition such	temperature.
Symptom	as at high altitude.	
Parts		
Taits		
MC	•	
ECM	0	•
ICF		
Monitor Unit		
Pump 1 Delivery Pressure Sensor		
Pump 2 Delivery Pressure Sensor		
Pump 1 Control Pressure Sensor		
Pump 2 Control Pressure Sensor		
Pressure Sensor (Travel)		
Pressure Sensor (Front Attachment)		
Pressure Sensor (Swing)		
Pressure Sensor (Boom Raise)		
Pressure Sensor (Arm Roll-In)		
Pressure Sensor (Auxiliary)		
Hyd. Oil Temperature Sensor		
Coolant Temperature Sensor		•
Key Switch		
Engine Control Dial		
Auto-Idle Switch		
Power Mode Switch		
Travel Mode Switch		
Torque Control Solenoid Valve	•	
Starter Cut Relay		
ECM Main Relay		
Battery Relay		
Glow Relay		•
Engine Electrical Equipment		•
Engine Unit		
Pump Regulator	•	
Swing Parking Brake Release Spool (Signal Control Valve)		
	Check batteries.	
Remarks		

(Blank)

All Actuator System Tro	A-1	A-2	A-3
Trouble Symptom	All actuator speeds are slow.	All actuators are not operated.	Left travel is inoperable during single travel operation. Single swing operation speed becomes slow. Arm speed is slightly slow during arm level crowding.
Parts			
MC	•		
ECM	0		
Monitor Unit		0	
Torque Control Solenoid Valve	•		
Pilot Shut-Off Solenoid Valve		•	
Pump 2 Delivery Pressure Sensor			
Pressure Sensor (Swing)			
Pressure Sensor (Arm Roll-In)			
Pilot Shut-Off Lever		•	
Pilot Shut-Off Relay		•	
Security Relay		•	
Spool			
Main Relief Valve	0		
Arm 1 Flow Rate Control Valve			
Main Pump	•		•
Regulator	0		•
Pilot Pump	•		
Pilot Valve			
Pilot Relief Valve	•		
Pump 1 Flow Rate Control Valve (Signal Control Valve)			
Pump 2 Flow Rate Control Valve (Signal Control Valve)			•
Arm Flow Rate Control Valve Control Spool (Signal Control Valve)			
Remarks			

NOTE: The trouble symptoms in this table are described provided that each trouble occurs independently. In case more than one trouble occurs at the same time, find out all faulty components while checking all suspected components in each trouble symptom.

- : Related, required to check
- O: Related. However, in case this component fails, other trouble symptom will be more noticeable so that this component will not be the direct cause of the trouble concerned.

A-4	A-5	A-6	A-7
Right travel is inoperable during single travel operation. Single		Occasionally, swing or arm roll-in speed becomes slow	Actuator speed is faster than normal.
bucket operation speed be- comes slow. Boom is not raised properly during arm level		during combined operation of swing and arm roll-in.	Machine mistracks when travel lever is operated at half stroke. Precise control cannot be per-
crowding.			formed.
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	F-1	F-2	F-3
Trouble Symptom	All front attachment actuator power is weak.	Even if power digging switch is pushed, power does not increase. Boom raise power is weak when digging.	Some cylinder are inoperable or speeds are slow.
Parts			
MC		•	
Solenoid Valve Unit (SG)		•	
Solenoid Valve Unit (SF)			
Solenoid Valve Unit (SC)			
Pump 1 Delivery Pressure Sensor			
Pump 2 Delivery Pressure Sensor			
Pressure Sensor (Swing)			
Pressure Sensor (Boom Raise)			
Pressure Sensor (Arm Roll-In)			
Power Digging Switch		•	
Spool			•
Main Relief Valve	•	•	
Overload Relief Valve		•	•
Load Check Valve			
Digging Regenerative Valve			
Boom Regenerative Valve			
Arm Regenerative Valve			
Bucket Regenerative Valve			
Boom Flow Rate Control Valve			
Arm 1 Flow Rate Control Valve			
Arm 2 Flow Rate Control Valve			
Bucket Flow Rate Control Valve			
Boom Lower Meter-In Cut Valve			
Boom Anti-Drift Valve			
Arm Anti-Drift Valve			
Emergency Valve			
Shockless Valve (Signal Control Valve)			•
Shuttle Valve (Signal Control Valve)			•
Bucket Flow Rate Control Valve Control Spool (Signal Control Valve)			
Arm Flow Rate Control Valve Control Spool (Signal Control Valve)			
Pilot Valve			•
Cylinder			
Remarks			

NOTE: The trouble symptoms in this table are described provided that each trouble occurs independently.

In case more than one trouble occurs at the same time, find out all faulty components while checking all suspected components in each trouble symptom.

			ponents in each trot	иріе symptom.
F-4	F-5	F-6	F-7	F-8
Arm speed is slow during	Arm roll-in speed is slow	Bucket is slow during	When starting to move	When starting to move
combined operation.	when digging.	bucket roll-in single op-	during combined opera-	during combined opera-
During combined opera-	which digging.	eration. Bucket does not	tion, arm does not	tion, boom does not
tion of boson rain and		eration. Bucket does not	tion, and does not	tion, boom does not
tion of boom raise and		move smoothly during	smoothly move. Arm	smoothly move. Boom
arm roll-in, boom raise		bucket roll-in single op-	starts to move slow	starts to move slow
speed is slow. Arm		eration.	slightly during arm roll-in	slightly during boom
speed is slow during arm			single operation. These	lower single operation.
level crowding.			troubles often occur	
3			when temperature is low.	
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^{• :} 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 de-

scribed provided that each trouble occurs independently.

In case more than one trouble occurs at the same time, find out all faulty components while checking all suspected components in each trouble symptom.

Front Attachment System Troubleshooting

	F-9	F-10	F-11	F-12
Trouble Symptom	When boom raise or arm roll-out is operated, boom or arm starts to move after slightly moving downward.	Front attachment drifts remarkably.	Boom lower is faster than other actuators during combined operation.	Machine cannot be raised of ground.
MC				
Solenoid Valve Unit (SG)				
Solenoid Valve Unit (SF)				
Solenoid Valve Unit (SC)				
Pump 1 Delivery Pressure Sensor				
Pump 2 Delivery Pressure Sensor				
Pressure Sensor (Swing)				
Pressure Sensor (Boom Raise)				
Pressure Sensor (Arm Roll-In)				
Power Digging Switch				
Spool		•		
Main Relief Valve				
Overload Relief Valve		•		
Load Check Valve	•			
Digging Regenerative Valve				
Boom Regenerative Valve				
Arm Regenerative Valve				
Bucket Regenerative Valve				
Boom Flow Rate Control Valve			•	•
Arm 1 Flow Rate Control Valve				
Arm 2 Flow Rate Control Valve				
Bucket Flow Rate Control Valve				
Boom Lower Meter-In Cut Valve			•	•
Boom Anti-Drift Valve	•	•		
Arm Anti-Drift Valve	•	•		
Emergency Valve		0		
Shockless Valve (Signal Control Valve)				
Shuttle Valve (Signal Control Valve)				
Bucket Flow Rate Control Valve Control Spool (Signal Control Valve)				
Arm Flow Rate Control Valve Control Spool (Signal Control Valve)		•		
Pilot Valve				
Cylinder		•		
Remarks				

^{• :} Related, required to check

O: 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.

Swing/Travel/Other System Tr	S-1	S-2	T-1	T-2
Trouble Symptom Parts	Swing is slow or unmoving.	Swing is slow (weak in power) during combined operation of swing and arm roll-in. Swing does not start smoothly. Swing power is weak.	Both right and left tracks do not rotate or rotate slowly.	One side track does not rotate or rotates slowly. Machine mistracks.
Taits				
MC (Main Controller)		•		
Torque Control Solenoid Valve				
Solenoid Valve Unit (SC)				
Solenoid Valve Unit (SI)				
Pump 1 Delivery Pressure Sensor				
Pump 2 Delivery Pressure Sensor		0		
Pump 1 Control Pressure Sensor				
Pump 2 Control Pressure Sensor				
Pressure Sensor (Travel)				
Pressure Sensor (Swing)		0		
Pressure Sensor (Arm Roll-In)		0		
Travel Mode Switch				
Pump Device				
Spool				•
Load Check Valve				
Arm 1 Flow Rate Control Valve		•		
Flow Combiner Valve				
Swing Parking Brake Release Spool (Signal Control Valve)	•			
Pump 1 Flow Rate Control Valve (Signal Control Valve)				0
Pump 2 Flow Rate Control Valve (Signal Control Valve)	•			0
Flow Combiner Valve Control Spool (Signal Control Valve)				
Arm Flow Rate Control Valve Control Spool (Signal Control Valve)		•		
Shuttle Valve (Signal Control Valve)	0			0
Swing Device	•			
Travel Device				•
Center Joint				•
Pilot Valve	•			•
Remarks			Refer to T-5.	In case either bucket or swing is also slow, refer to A-3 or A-4.

NOTE: The trouble symptoms in this table are described provided that each trouble occurs independently.

In case more than one trouble occurs at the same time, find out all faulty components while checking all suspected components in each trouble symptom.

Т 2	T 4	T.E	O-1	O-2
T-3 Machine mistracks during	T-4 Occasionally, machine	T-5 Fast travel is inoperable.	Wiper is inoperable or not	
combined operation of	mistracks when traveling	Travel mode does not	retracted.	Air Conditioner
travel and front attach-	with engine running at slow speed.	change from slow mode		
ment.	slow speed.	to fast mode.		
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^{• :} Related, required to check

 $[\]ensuremath{\mathsf{O}}$: Related. However, in case this component fails, other trouble symptom will be more noticeable so that this component will not be the direct cause of the trouble concerned.

ENGINE SYSTEM TROUBLESHOOTING

E-1 Starter does not rotate. Related MC Fault Code: None

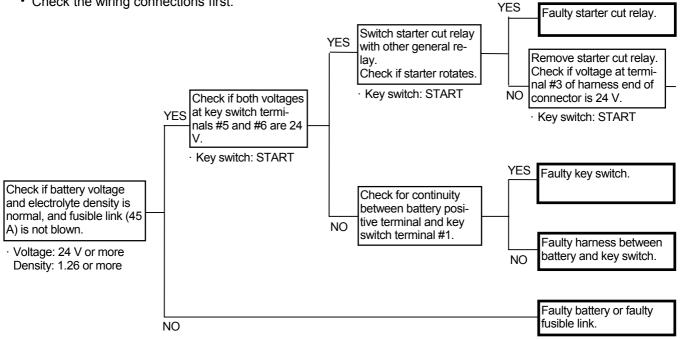
IMPORTANT: As electric current from the key

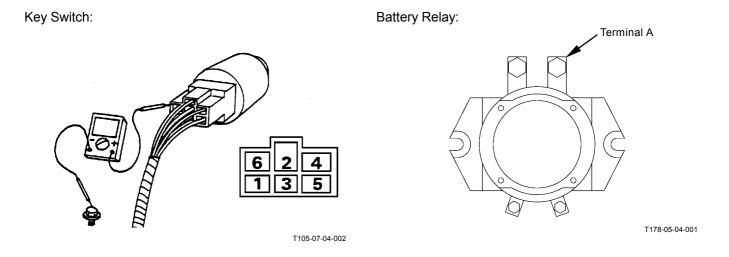
switch is not routed to starter relay 2 with the pilot shut-off lever in ON position, the starter does not rotate. (Refer to "Elec-

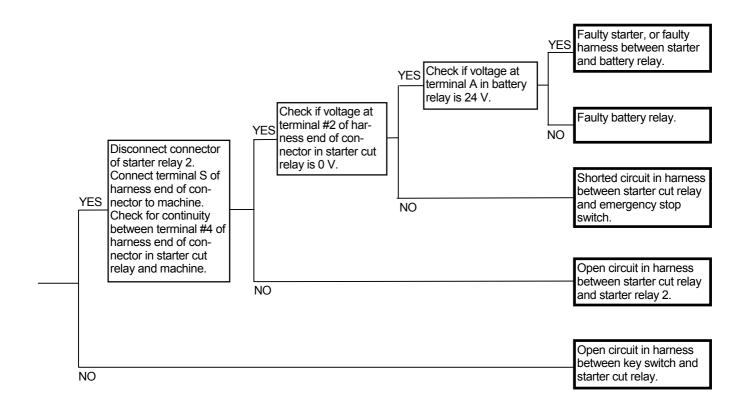
trical System".)

 This trouble has nothing to do with the electronic control system such as MC.

· Check the wiring connections first.







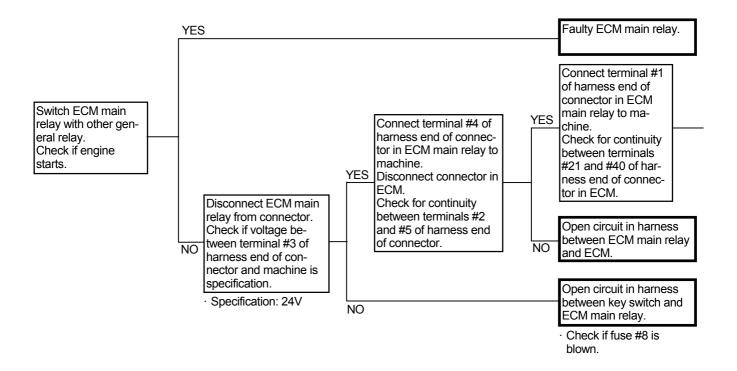
Connector (Harness end of connector viewed from the open side)



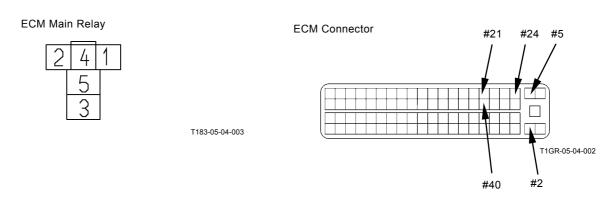
E-2 Even if starter rotates, engine does not start.

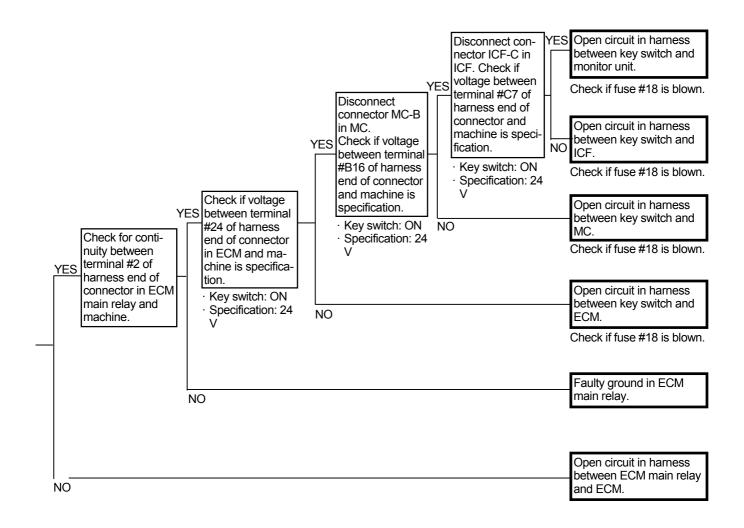
Related MC Fault Code: None

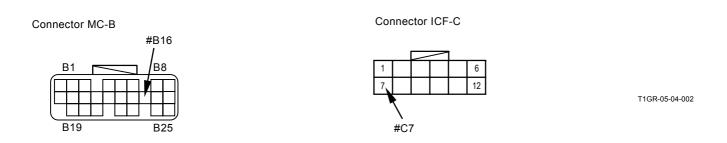
· Check the wiring connections first.



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





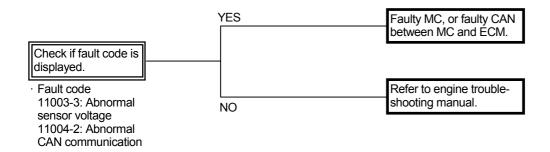


E-3 When engine control dial is fully rotated, engine stalls.

When engine control dial is fully rotated, engine speed becomes slow.

Related MC Fault Code: 11003-3, 11004-2

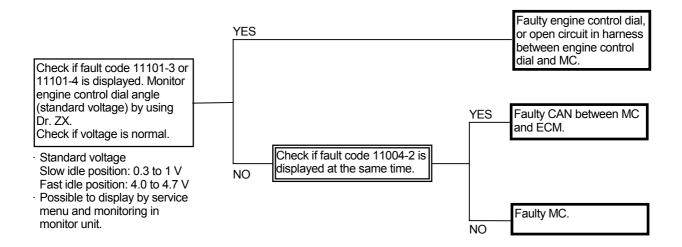
• Check the wiring connections first.



E-4 Even if engine control dial is rotated, engine speed remains unchanged.

Related MC Fault Code: 11004-2, 11101-3, 11101-4

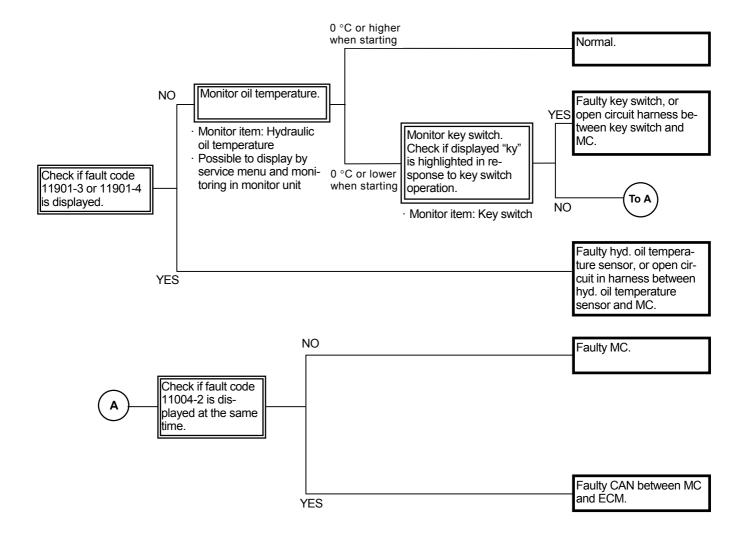
· Check the wiring connections first.



E-5 Engine speed does not increase when engine starts.

Related MC Fault Code: 11004-2, 11901-3, 11901-4

- Refer to the pages for the Auto Warming Up Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- · Check the wiring connections first.

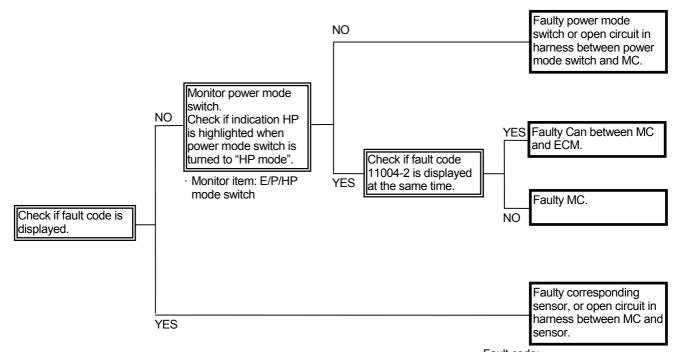


E-6 Faulty HP mode

 Even if power mode switch is turned to the HP mode position, HP mode is inoperable. (General mode normally operates.)

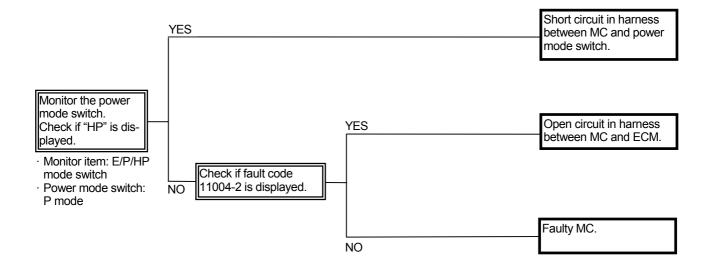
Related MC Fault Codes: 11004-2, 11200-3, 11200-4, 11202-3, 11202-4, 11302-3, 11302-4, 11303-3, 11303-4

- The sensors detect the conditions necessary to operate HP mode. Therefore, if any of these sensors fails, HP mode becomes 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.



Fault code:
11200-3 11200-4: Pump 1 delivery pressure sensor
11202-3, 11202-4: Pump 2 delivery pressure sensor
11302-3, 11302-4: Pilot pressure sensor (boom raise)
11303-3, 11303-4: Pilot pressure sensor (arm roll-in)

- Even if the power mode switch is not turned to HP mode, HP mode is operable.
 - Boom raise and arm roll-in must be operated when the average delivery pressures of pump 1 and 2 are high, if HP mode control is performed. The sensors related to this condition may not be faulty at the same time.

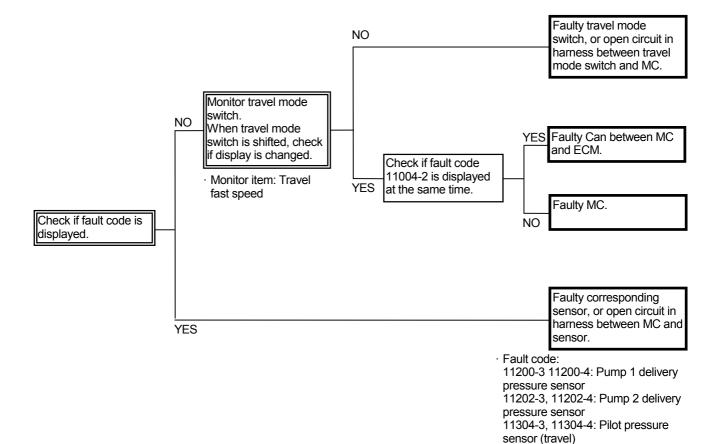


E-7 Faulty Travel HP mode

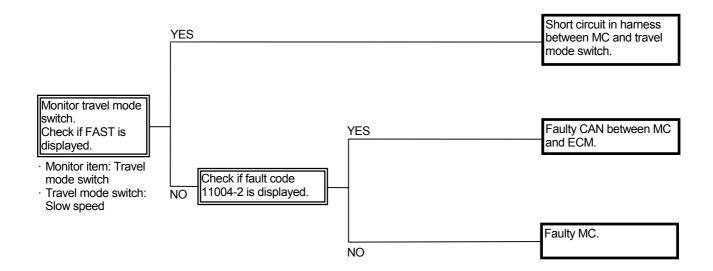
 Even if the travel mode switch is turned to FAST during single travel operation, travel HP mode is inoperable.

Related MC Fault Code: 11004-2, 11200-3, 11200-4, 11202-3, 11202-4, 11304-3, 11304-4

- The sensors detect the conditions necessary to operate travel HP mode. Therefore, if any of these sensors fails, travel HP mode becomes inoperable.
- Pressure sensor (travel) and pump 1 and 2 delivery pressure sensors are also engaged in the HP mode control. However, if these sensors fails, other operating functions will be also affected.
- Refer to the pages for Travel HP Mode Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- · Check the wiring connections first.



- Even if the travel mode switch is not turned to FAST, travel mode becomes fast idle.
 - Travel must be operated when the average delivery pressures of pump 1 and 2 are high, if travel HP mode control is performed. The sensors related to this condition may not be faulty at the same time.



E-8 Even if key switch is turned OFF, engine does not stop. (In case engine does not stop, stop engine by pulling engine stop handle located under seat stand. Then, begin inspection.)

Related MC Fault Codes: 11101-3, 11101-4

 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.

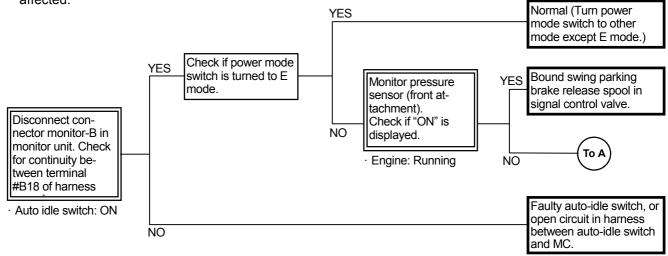
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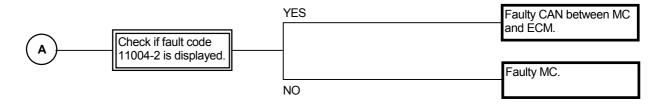
E-9 Faulty auto-idle system

 Even if control lever is turned to neutral, auto-idle system is inoperable.

Related MC Fault Code: 11004-2, 11304-3, 11304-4, 11307-3, 11307-4

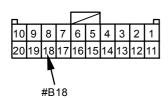
- In case trouble symptoms E1 to E8 are recognized, perform the troubleshooting of these troubles first.
- Even if failure in pressure sensors (travel and front attachment) may have relevance to malfunction of the auto-idle control. However, if these sensors fail, other operating functions will also be affected.
- Refer to the pages for Auto-Idle Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- · Check the wiring connections first.



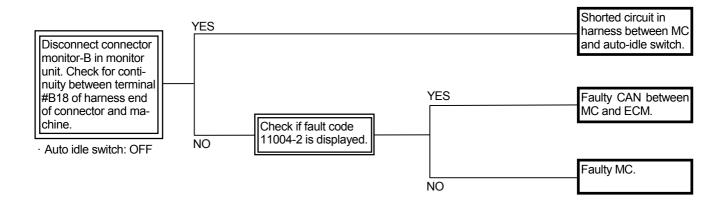


Connector (Harness end of connector viewed from the open side)

Connector Monitor-B

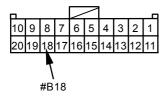


• Even if auto-idle switch is turned OFF, auto-idle is operable.



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

Connector Monitor-B

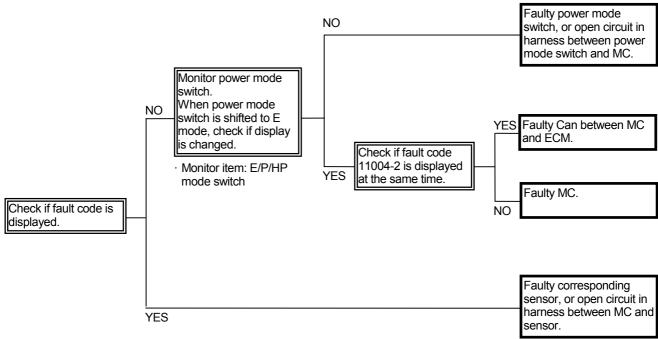


E-10 Faulty E mode

 Even if power mode switch is turned to the E mode position, engine speed remains unchanged. (Engine speed does not decrease.)

Related MC Fault Code: 11004-2, 11200-3, 11200-4, 11202-3, 11202-4, 11206-3, 11206-4, 11208-3, 11208-4

- In case trouble symptoms E-1 to E-9 are recognized, perform the troubleshooting of these troubles first.
- The sensors detect the conditions necessary to operate E mode. Therefore, if any of these sensors fails, E mode becomes inoperable.
- Pump 1, 2 control pressure sensors and pump 1, 2 delivery pressure sensors are also engaged in the E mode control. However, if these sensors fail, other operating functions will be also affected.
- Refer to the pages for E Mode Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- · Check the wiring connections first.



· Fault code:

11206-3 11206-4: Pump 1 control pressure sensor

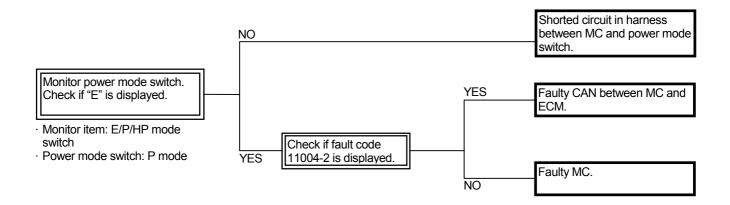
11208-3, 11208-4: Pump 2 control pressure sensor

11200-3 11200-4: Pump 1 delivery

pressure sensor 11202-3, 11202-4: Pump 2 delivery

pressure sensor

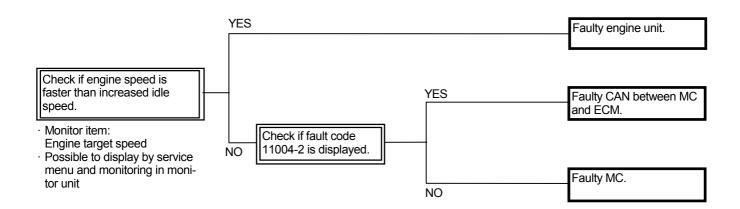
- Even if power mode switch is not turned to E mode, engine speed decreases.
 - Required engine speed from the engine control dial must be beyond 1800 min⁻¹ when the pump control pressures of pump 1 and 2 are low or the average delivery pressures of pump 1 and 2 are high, if E mode control is performed. The sensors related to this condition may not be faulty at the same time.



E-11 When traveling or operating front attachment with engine running at slow idle, engine hunts.

Related MC Fault Code: 11004-2, 11304-3, 11304-4, 11307-3, 11307-4

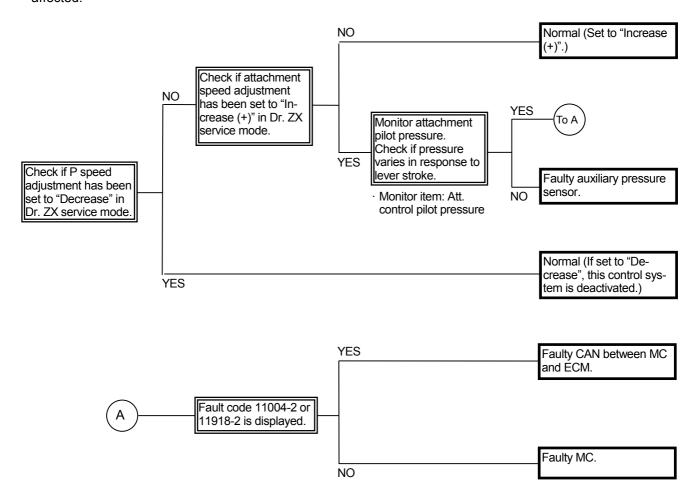
- Even if the failure in pressure sensors (travel and front attachment) may have relevance to malfunction of the engine speed increase control. However, if these sensors fail, other operating functions will also be affected. (Refer to the relationship between machine trouble symptoms and related parts on page T5-5-2.)
- Refer to the pages for Idle Speed-Up Control in the SYSTEM / Control System group in the T/M (Operational Principle).



E-12 Engine speed does not increase even if attachment is operated in attachment mode.

Related MC Fault Code: 11004-2, 11918-2

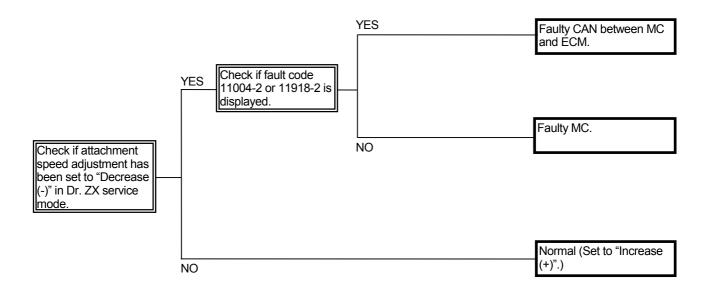
- In case trouble symptoms E-1 to E-11 are recognized, perform the troubleshooting of these troubles first.
- Even ifh the failure in pressure sensor (auxiliary) and power mode switch may have relevance to the malfunction of attachment operation speed increase control. However, if these sensor and switches fail, other operating functions will also be affected.
- Refer to the pages for Attachment Operation Speed Increase Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- · Check the wiring connections first.



E-13 When attachment mode is selected, engine speed does not decrease.

Related MC Fault Code: 11004-2, 11918-2

- In case trouble symptoms E-1 to E-11 are recognized, perform the troubleshooting of these troubles beforehand.
- Refer to the pages for Attachment Operation Speed Limit Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- · Check the wireing connections first.



E-14 Engine stalls within several seconds after engine has started.

Related MC Fault Code: None

• Refer to the Engine Troubleshooting Manual.

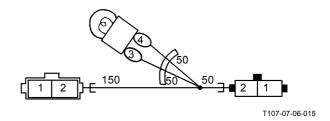
E-15 Engine stalls during operation under adverse condition such as at high altitude.

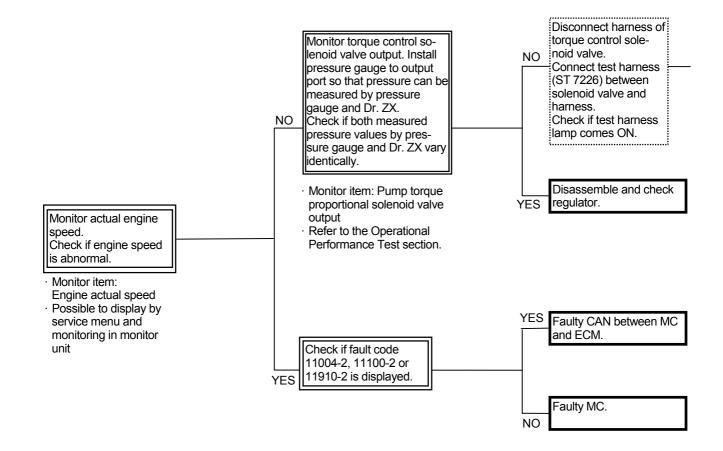
Related MC Fault Code: 11004-2, 11100-2, 11910-2, 11401-2, 11401-3, 11401-4

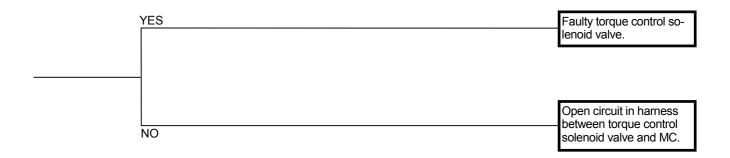
- If speed sensing control is inoperable, the engine will stall under adverse operating conditions.
- · Check the wiring connections first.

Test Harness (ST 7226)

When operating corresponding control lever and switch: ON



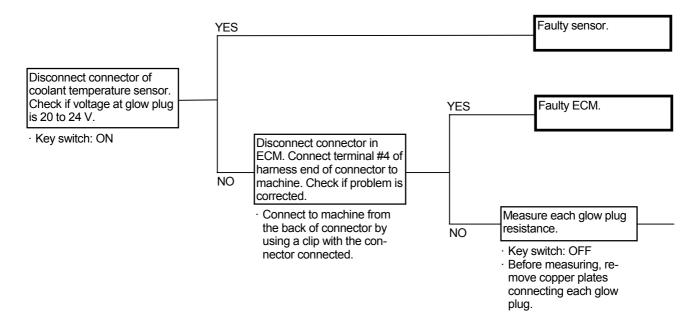




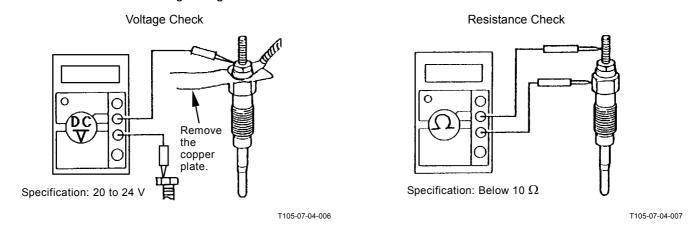
E-16 Engine is difficult to start at low temperature. (During cold weather or in cold districts, engine is difficult to start or does not start even if pre-heated.)

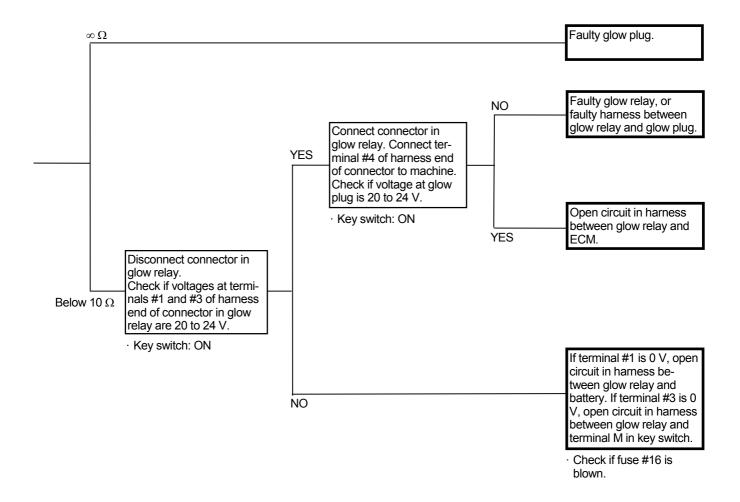
Related MC Fault Code: None

- Check if electricity is routed to the glow plugs.
 Check the glow plugs for any abnormality.
- The pre-heat system operates only when coolant temperature is below 10 °C (50 °F). When coolant temperature is higher than 10 °C (50 °F), the pre-heat system does not operate.
- · Check the battery.
- · Check the wiring connections first.



• Measurement of Glow Plug Voltage and Resistance



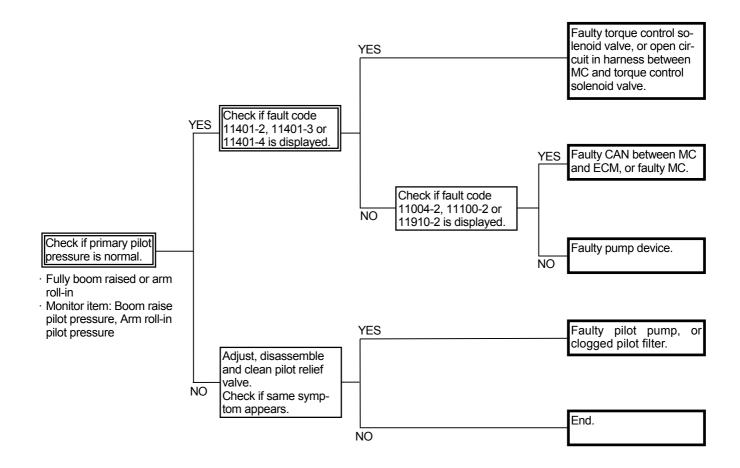


ALL ACTUATOR SYSTEM TROUBLE-SHOOTING

A-1 All actuator speeds are slow.

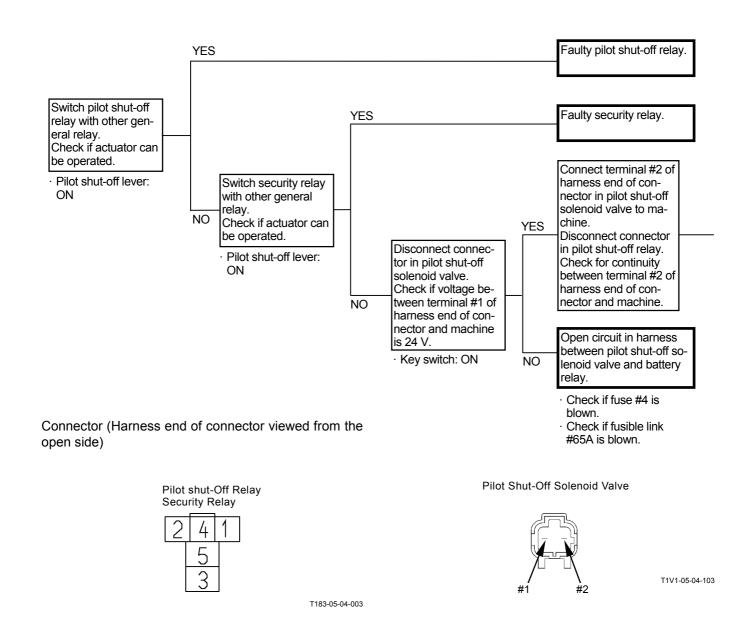
Related MC Fault Code: 11004-2, 11100-2, 11910-2, 11401-2, 11401-3, 11401-4

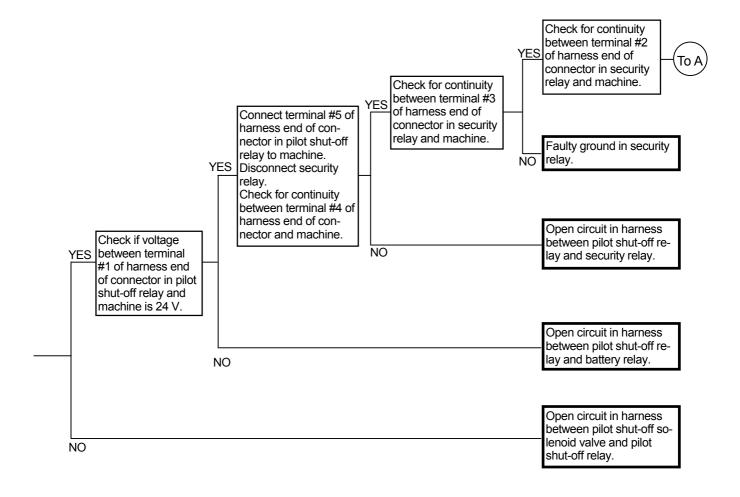
- Reduction in pump 1 and 2 flow rate due to some reasons or faulty pilot system (A-2) may cause this trouble.
- · Check fuse of the torque control solenoid valve.
- Even if speed is satisfactory, in case power is weak, refer to the troubleshooting for faulty main relief valve (F-1).
- · Check the wiring connections first.

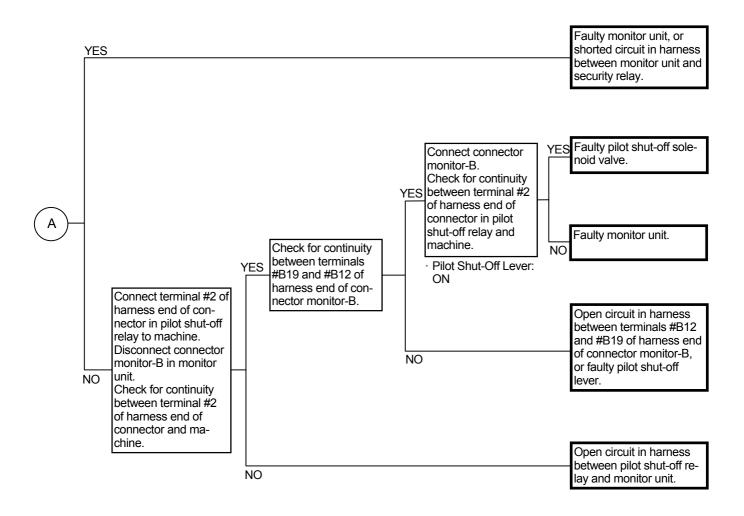


A-2 All actuator are not operated.

- · The pilot shut-off circuit may be faulty.
- · Check the wiring connections first.
- When the key switch is turned to the START position with the pilot shut-off lever in the ON position, the starter does not rotate.
- When the key switch is turned to the START position with the emergency switch and the pilot shut-off lever in the ON position, the starter rotates.
- Refer to the pages for the Electrical System group / SYSTEM in the T/M (Operational Principle).







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



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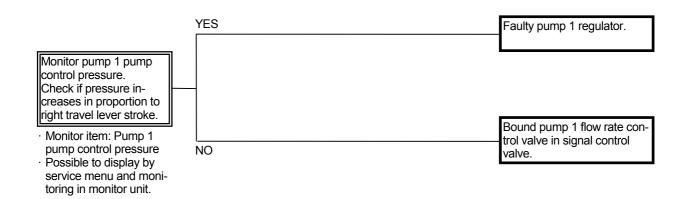
A-3 Left travel is inoperable during single travel operation. Single swing operation speed becomes slow. Arm speed is slightly slow during arm level crowding. (All problems occur at the same time.)

- The pump 2 flow rate is minimized (approx. 20 L/min) due to some reasons. Accordingly, the left travel and swing motors, which are driven by pressure oil from pump 2, moves very slow.
- Pressure oil from pump 1 is also routed to the arm and boom cylinders so that the arm and boom can move at a slightly slow speed in single operation. However, in level crowd operation, pressure oil is routed to the boom prior to the arm so that arm speed becomes very slow.
- Refer to the SYSTEM / Hydraulic System group in the T/M (Operational Principle).



A-4 Right travel is inoperable during single travel operation. Single bucket operation speed becomes slow. Boom is not raised properly during arm level crowding. (All problems occur at the same time.)

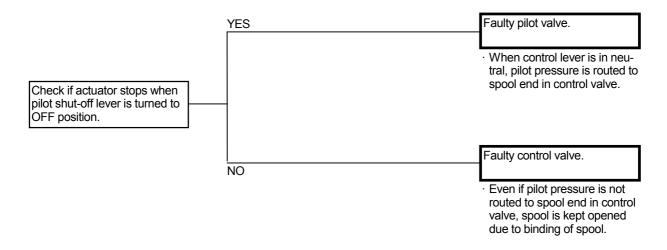
- The pump 1 flow rate is minimized (approx. 20 L/min) due to some reasons. Accordingly, the right travel motor and bucket cylinder, which are actuated by pressure oil from pump 1, moves very slow.
- Pressure oil from pump 2 is also routed to the arm and boom cylinders so that the arm and boom can move at a slightly slow speed in single operation. However, in level crowd operation, pressure oil is routed to the arm prior to the boom so that boom is scarcely raised.
- Refer to the SYSTEM / Hydraulic System group in the T/M (Operational Principle).



A-5 Actuator does not stop even if control lever is turned to neutral.

Related MC Fault Code: None

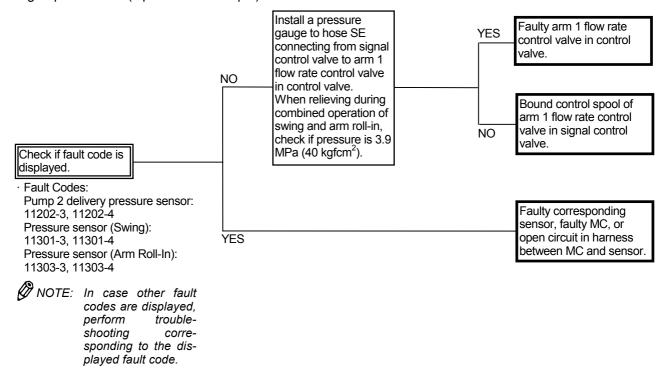
• Bound spool in the pilot valve or bound main spool in the control valve is suspected.



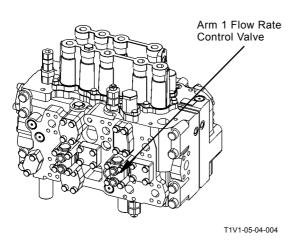
A-6 Occasionally, swing or arm roll-in speed becomes slow during combined operation of swing and arm roll-in.

Related MC Fault Code: 11202-3, 11202-4, 11301-3, 11301-4, 11303-3, 11303-4

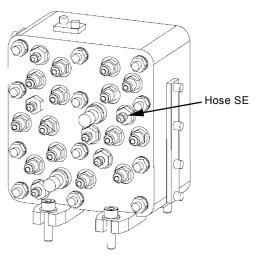
- The arm 1 flow rate control valve may be faulty.
- Refer to the pages for the SYSTEM / Control System group in the T/M (Operational Principle).



Control valve



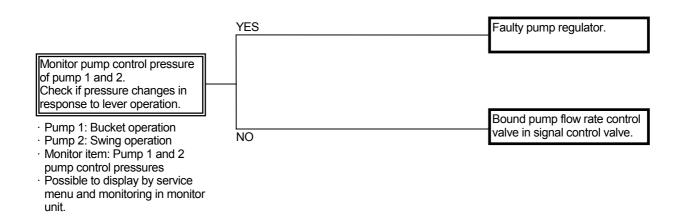
Signal Control Valve (Control Valve Side)



T178-03-06-015

A-7 Actuator speed is faster than normal Machine mistracks when travel lever is operated at half stroke. Precise control cannot be performed.

- The pump 1 or 2 flow rate is maximized due to some reasons.
 - Therefore, the maximum flow rate is supplied and actuator speed is faster though the control lever does not reach the full stroke.
- Pressure oil from pump 1 makes right travel perform, and pressure oil from pump 2 makes left travel during single travel operation. When the travel lever is operated at half stroke, different flow rates between pump 1 and 2 occur and the machine mistracks.
- Refer to the SYSTEM / Hydraulic System group in the T/M (Operational Principle).



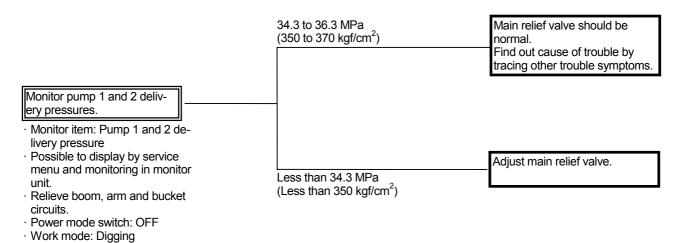
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FRONT ATTACHMENT SYSTEM TROUBLESHOOTING

F-1 All front attachment actuator power is weak.

Related MC Fault Code: None

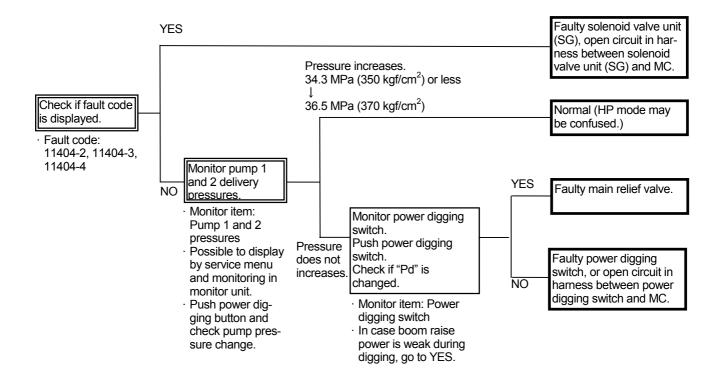
 In case operating speeds are extremely slow, pump control may be malfunctioning (A-3 and/or A-4). Faulty pilot system may also cause this trouble.



F-2 Even if power digging switch is pushed, power does not increase. Boom raise power is weak when digging.

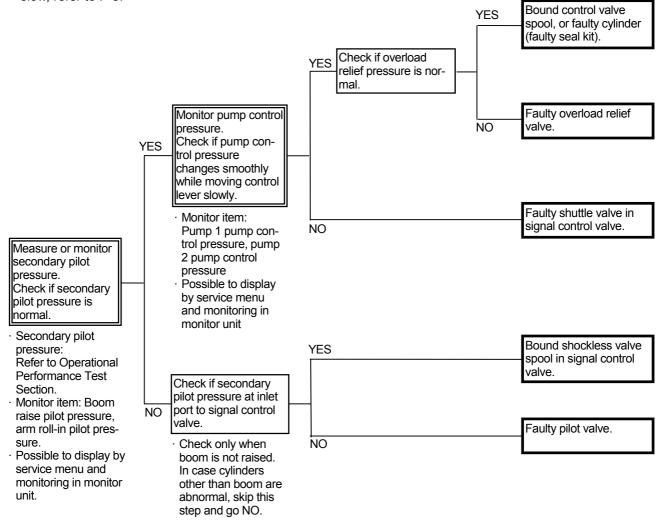
Related MC fault Code: 11404-2, 11404-3, 11404-4

- Refer to the pages for the SYSTEM / Power Digging Control and Auto-Power Lift Control group in the T/M (Operational Principle).
- · Check the wiring connections first.



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.
- In case single bucket operation speed is slow, refer to F-6.
- In case single arm roll-in operation speed is slow, refer to F-7.
- In case single boom lower operation speed is slow, refer to F-8.

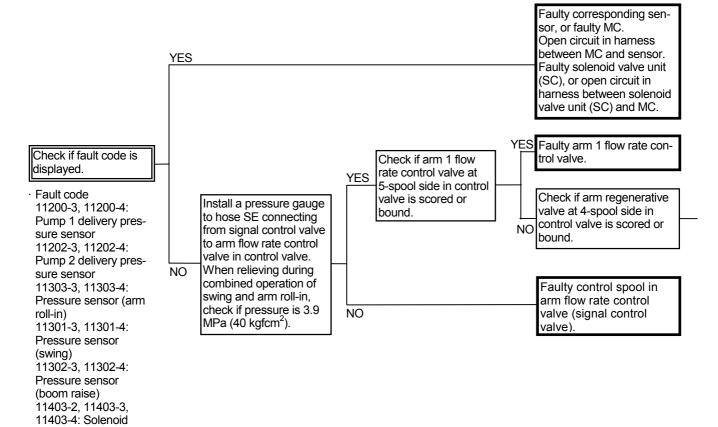


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F-4 Arm speed is slow during combined operation. During combined operation of boom raise and arm roll-in, boom raise speed is slow. Arm speed is slow during arm level crowding.

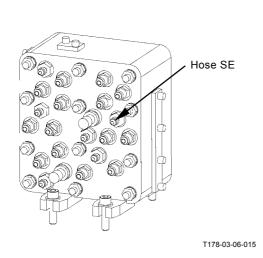
Related MC Fault Codes: 11200-3, 11200-4, 11202-3, 11202-4, 11303-3, 11303-4, 11301-3, 11301-4, 11302-3, 11302-4, 11403-2, 11403-3, 11403-4

Refer to the pages for the SYSTEM / Arm Regenerative Control group in the T/M (Operational Principle).

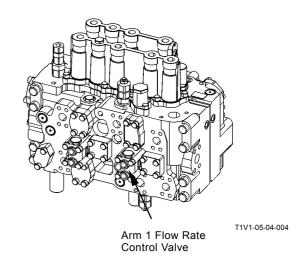


Signal Control Valve (Control Valve Side)

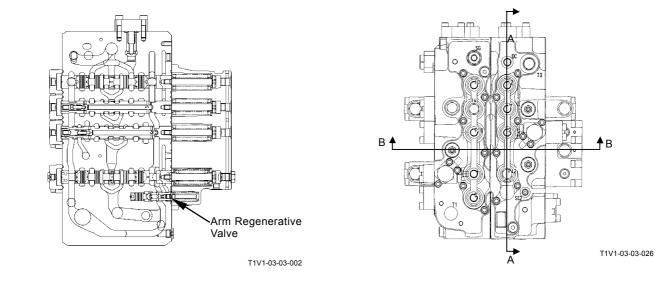
valve unit (SC)

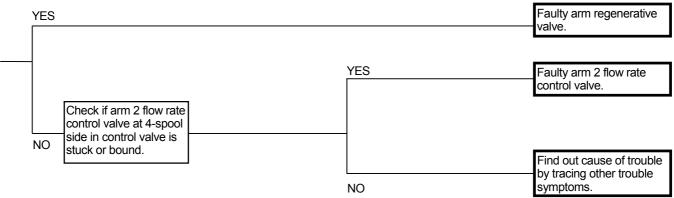


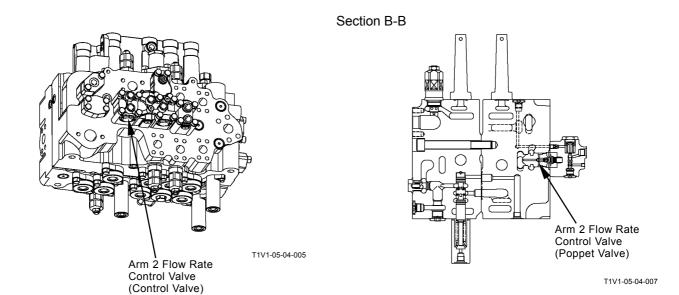
Control Valve



Section A-A



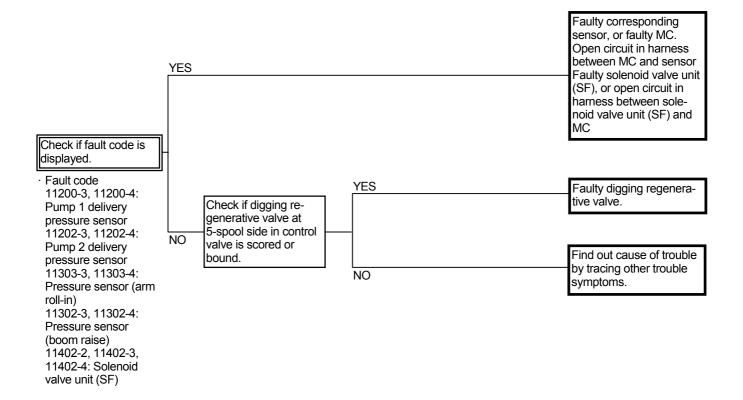




F-5 Arm roll-in speed is slow when digging.

Related MC Fault Codes: 11200-3, 11200-4, 11202-3, 11202-4, 11301-3, 11301-4, 11302-3, 11302-4, 11402-2, 11402-3, 11402-4

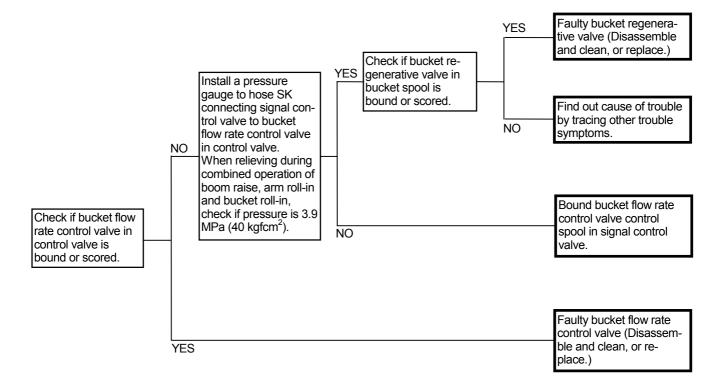
 Refer to the pages for the SYSTEM / Control System group / Digging Regenerative Control in the T/M (Operational Principle).



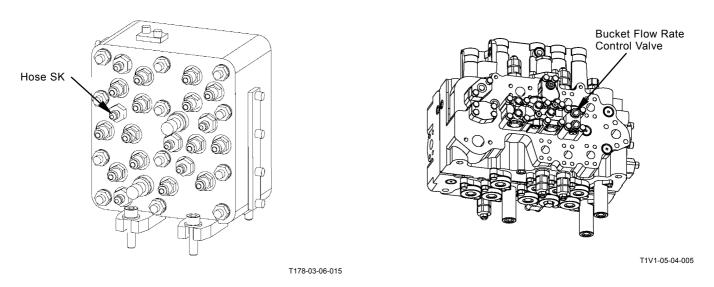
F-6 Bucket is slow during bucket roll-in single operation. Bucket does not move smoothly during bucket roll-in single operation.

Related MC Fault Code: None

- Bucket flow rate control valve or bucket regenerative valve may be faulty.
- Refer to the COMPONENT OPERATION / Control Valve group in the T/M (Operational Principle).



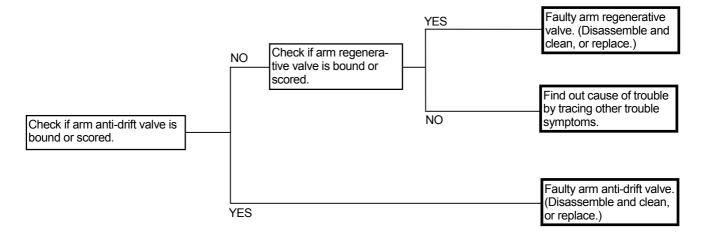
Signal Control Valve (Control Valve Side)



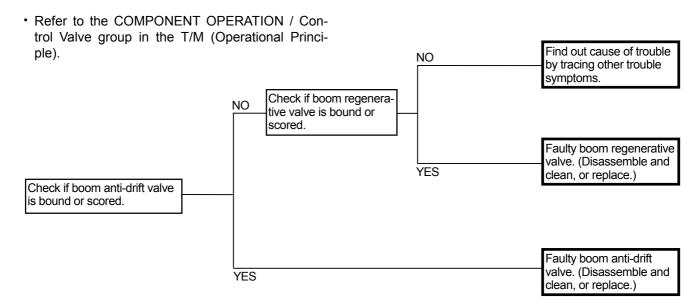
F-7 When starting to move during combined operation, arm does not smoothly move. Arm starts to move slightly slow during arm roll-in single operation. These troubles often occur when temperature is low.

Related MC Fault Code: None

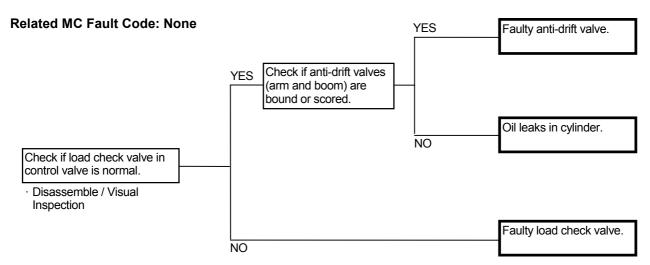
 Refer to the COMPONENT OPERATION / Control Valve group in the T/M (Operational Principle).



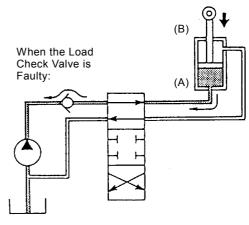
F-8 When starting to move during combined operation, boom does not move smoothly. Boom starts to move slow slightly during boom lower single operation.



F-9 When boom raise or arm roll-out is operated, boom or arm starts to move after moving slightly downward.



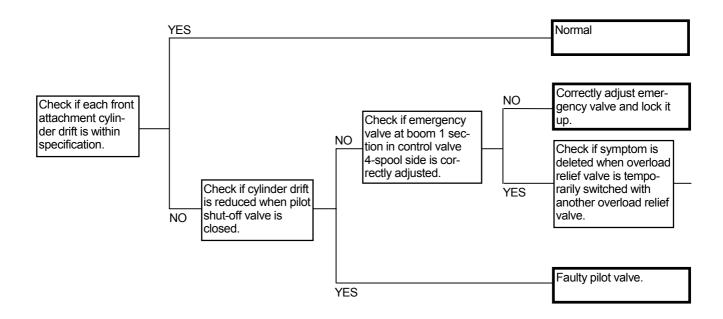
- NOTE: 1. During the initial stage of operation, oil pressure and flow rate from the pump is low. Therefore, if the load check valve is malfunctioning, the oil in the bottom side of the boom cylinder flows back into the circuit through the load check valve, causing the boom cylinder to temporarily retract.
 - 2. Since oil pressure and flow rate from the pump is low, if oil leaks from bottom side (A) to rod side (B) due to faulty boom cylinder piston or cylinder barrel, the boom cylinder is temporarily retracted during the initial stage of operation. In addition, cylinder force is reduced, increasing the cylinder drift in this case.



T105-07-04-012

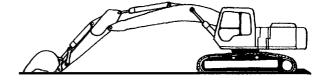
F-10 Front attachment drifts remarkably.

Related MC Fault Code: None

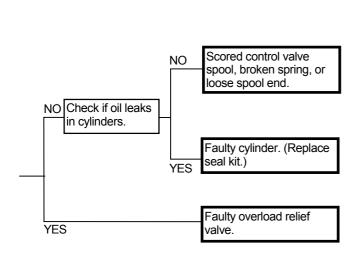


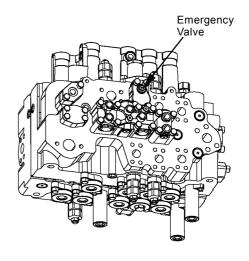
• Boom Cylinder Internal Leakage Check

- 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 to 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.

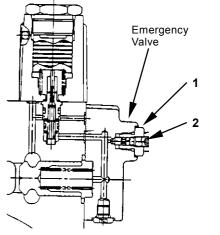


T105-07-04-009





T1V1-05-04-005



T178-05-04-003

Adjustment Procedure: Loosen (1) and tighten (2).

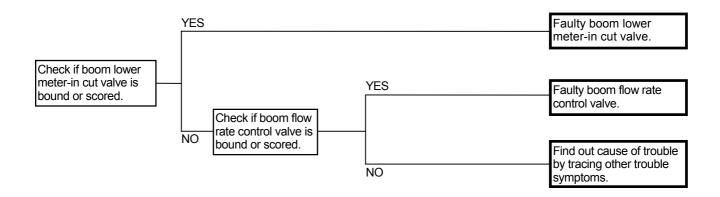
Tightening Torque:

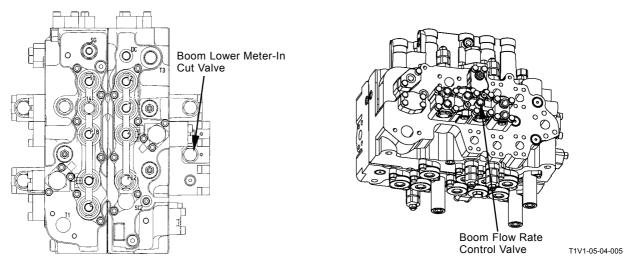
(1)- 13 N·m (1.3 kgf·m)

(2)- 7 N·m (0.7 kgf·m)

F-11 Boom lower is faster than other actuators during combined operation.

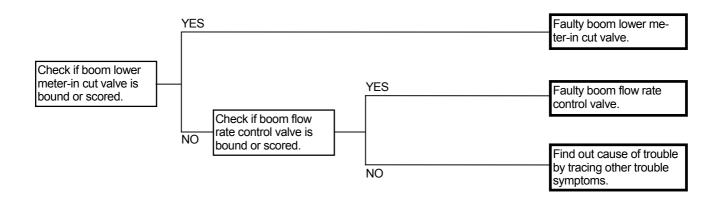
- Boom lower meter-in cut valve or boom flow rate control valve may be faulty.
- Refer to the pages for the SYSTEM / Hydraulic System group and the COMPONENT OPERA-TION / Control Valve group in the T/M (Operational Principle).
- In case boom lower single operation is slow, refer to F-8.

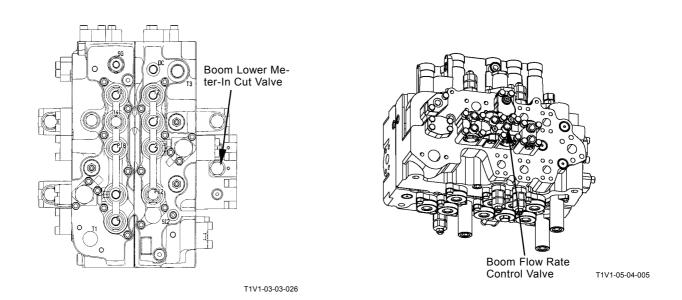




F-12 Machine cannot be raised off ground.

- Boom lower meter-in cut valve or boom flow rate control valve may be faulty.
- Refer to the pages for the SYSTEM / Hydraulic System group and the COMPONENT OPERA-TION / Control Valve group in the T/M (Operational Principle).
- In case boom lower single operation is slow, refer to F-8.

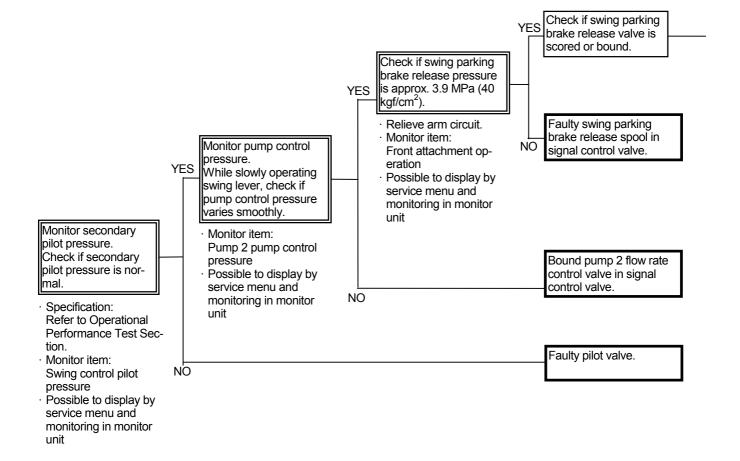


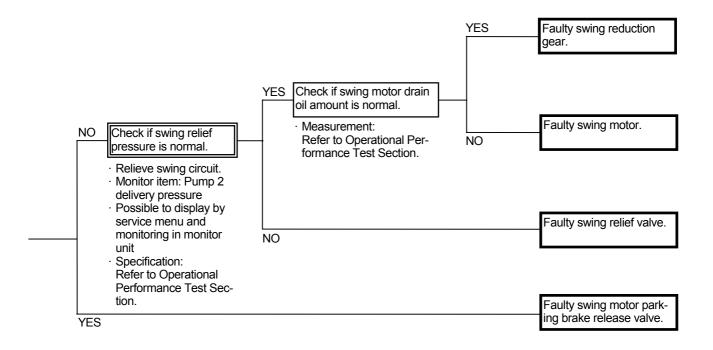


SWING SYSTEM TROUBLESHOOTING

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 pilot valve.
- In case left travel speed is also slow, refer to A-3.

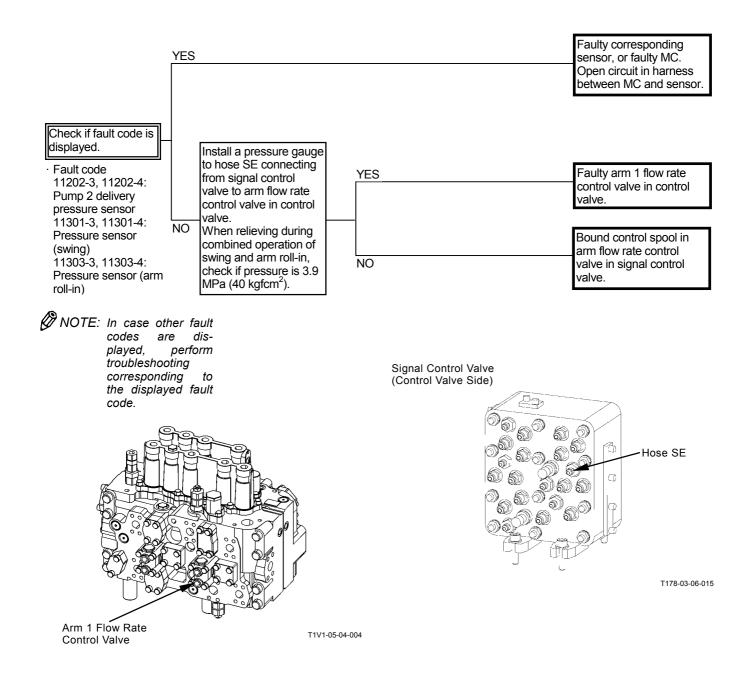




S-2 Swing is slow (weak in power) during combined operation of swing and arm roll-in.Swing does not start smoothly.Swing power is weak.

Related MC Fault Codes: 11202-3, 11202-4, 11301-3, 11301-4, 11303-3, 11303-4

- Refer to the pages for the SYSTEM / Hydraulic System group / Valve Control Circuit in the T/M (Operational Principle).
- · Check the wiring connections first.



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TRAVEL SYSTEM TROUBLESHOOTING

T-1 Both right and left tracks do not rotate or rotate slowly.

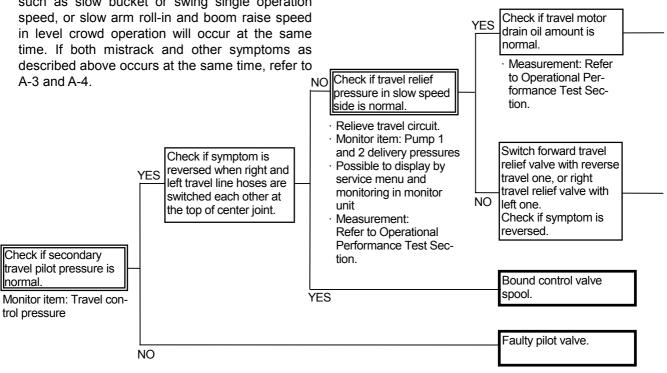
- Both right and left pilot valves, travel motors, and/or control valve spools are unlikely to be faulty at the same time.
- In case both travel systems do not operate, the pilot system, which is applied to both side travel motors, may be faulty. If primary pilot pressure is lower than specification, front attachment operating speed becomes slow as well. Refer to A-1.
- In case the fast travel mode cannot be selected, refer to T-5.

T-2 One side track does not rotate or rotates slowly. Machine mistracks.

Related MC Fault Code: None

- · Check that both side track sags are equally adjusted.
- · Faulty pump control will cause the machine to mistrack. In this case, other trouble symptoms such as slow bucket or swing single operation

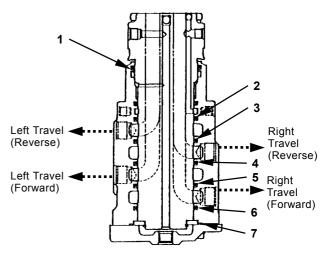
· In one side track only does not rotate, the pilot valve, control valve, travel motor, or center joint may be faulty.



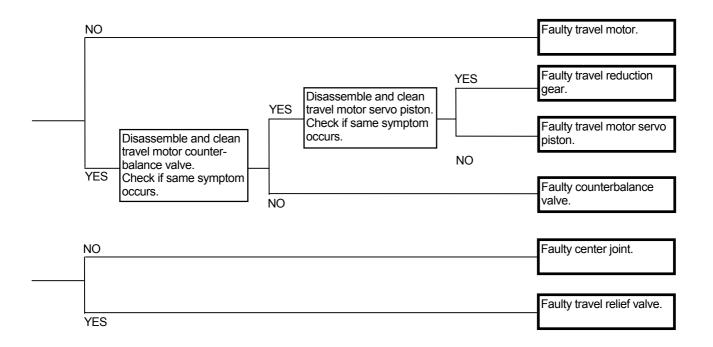
Relationship between Faulty Seal Location and Mistrack Direction

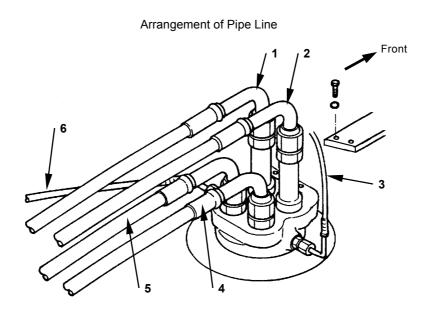
and	and Mistrack Direction					
Seal No.	When traveling	When pivot turn				
INO.	straight:	is performed:				
1	External Oil Leak	←				
2		4 }				
3		< >				
4		(}				
5		\ \ \ \ \ \ \ \ \ \ \ \ \ \				
6						
7	External Oil Leak	←				





T105-07-04-015



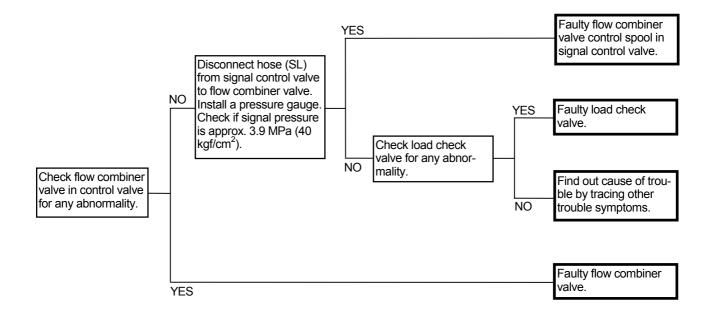


W157-03-03-003

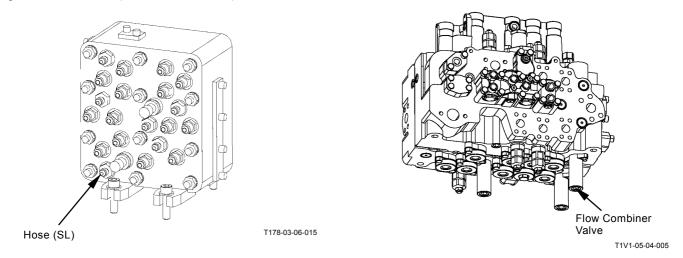
- 1 Left Travel (Forward)
- 2 Right Travel (Forward)
- 3 Pilot
- 4 Right Travel (Reverse)
- 5 Left Travel (Reverse)
- 6 Drain

T-3 Machine mistracks during combined operation of travel and front attachment.

Related Fault Code: None



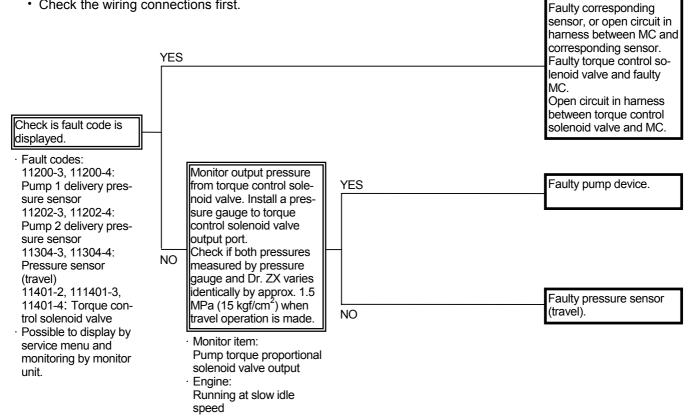
Signal Control Valve (Control Valve Side)



T-4 Occasionally, machine mistracks when traveling with engine running at slow speed.

Related MC Fault Codes: 11200-3, 11200-4, 11202-3, 11202-4, 11304-3, 11304-4, 11401-2, 11401-3, 11401-4

- · Refer to the pages for the SYSTEM / Control System group / Travel Torque-Up Control in the
- T/M (Operational Principle). · Check the wiring connections first.



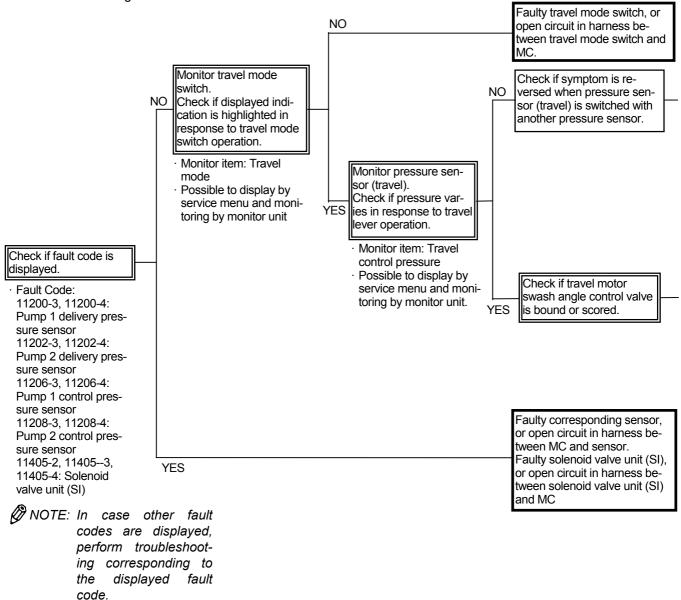
T-5 Fast travel is inoperable.

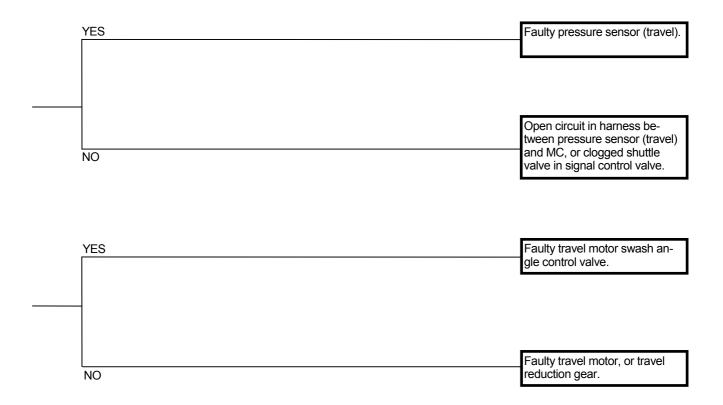
Travel mode does not change from slow mode to fast mode.

Related MC Fault Codes: 11200-3, 11200-4, 11202-3, 11202-4, 11206-3, 11206-4, 11208-3, 11208-4, 11405-2, 11405-3, 11405-4

- Refer to the pages for the SYSTEM / Control section / Travel Motor Swash Angle Control in the T/M (Operational Principle).
- · Check the wiring connections first.

 If the maximum speed cannot reach at the fast mode, the engine speed automatic increase control at travel may be faulty. Refer to "E-6 Faulty HP Mode".





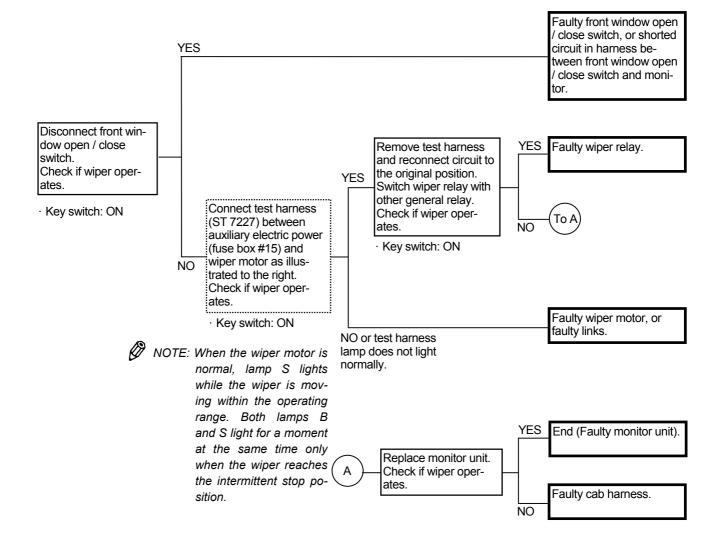
OTHER SYSTEM TROUBLESHOOTING

O-1 Wiper is inoperable or not retracted.

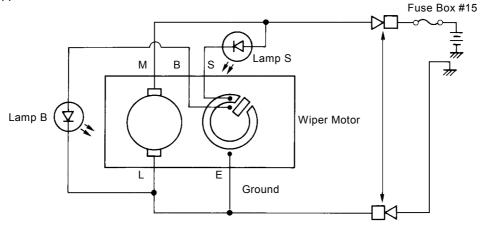
Related MC Fault Code: None

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.

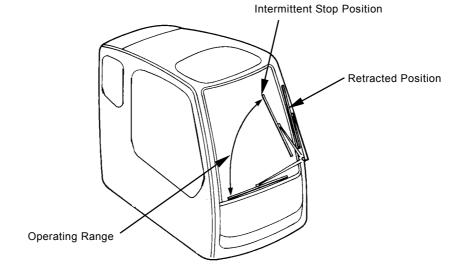


Test Harness Application Circuit



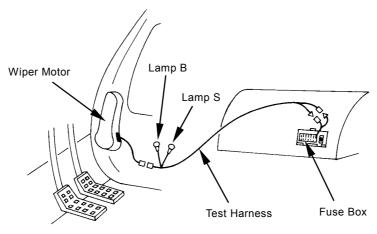
T178-05-04-004

Wiper Operating Range



T178-05-04-005

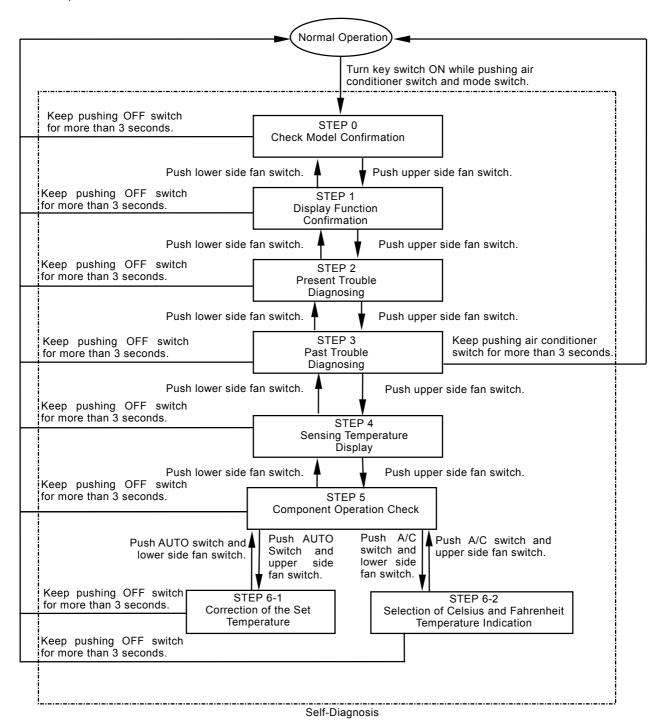
Test Harness Connection Method



T157-07-04-004

O-2 Air Conditioner Malfunction

The air conditioner operation system has a self-diagnosing function. This system performs the diagnosis by 8-steps as shown in the flow chart below: Check Model Confirmation, Display Function Confirmation, Present Trouble Diagnosing, Past Trouble Diagnosing, Sensing Temperature Display, and Component Operation Check, Correction of the Set Temperature and Selection of Celsius and Fahrenheit Temperature Indication.



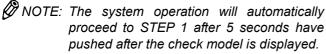
Self-Diagnostic System Activation

Turn the key switch ON while pushing the air conditioner switch and mode switch on air conditioner control panel.

STEP 0 Check Model Confirmation

The liquid crystal display (LCD) indicates the machine model name this system can diagnose.

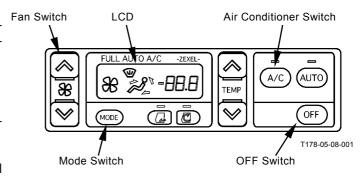
- The LCD will indicate "Sd" as the check model name.
- Select next step in order to be performed by operating the switch as described below.
 - Upper side fan switch: To proceed to Step 1
 - Keep pressing OFF switch for more than 3 seconds: To return to normal operation





Turn all indicators ON in order to check indicator bulbs.

- The LCD panel and all switch indicators light.
- Select the next step in order to be performed by operating the switches as follows:
 - Push the upper side of fan switch: To proceed to "STEP 2."
 - Push the lower side of fan switch: To return to "STEP 0."
 - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed)



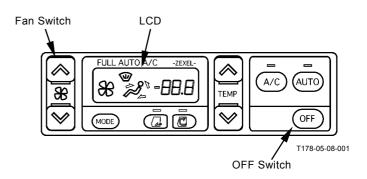
STEP 2 Present Trouble Diagnosing

The LCD indicates the fault codes for present abnormalities of the mix door, mode encoder, and/or sensors.

In case any abnormalities are present, the LCD indicates the fault codes. If more than one fault code is detected, the following fault code is displayed after flashing (0.5 seconds) twice.

ter naering (e.e eecertae) twice:				
	Fault Code			
	Open Circuit	Shorted Circuit		
Mix Door	21	-21		
Mode Encoder	22			
In-Cab Ambient	23	-23		
Temperature				
Sensor				
Outdoor Ambient	24	-24		
Temperature				
Sensor				
Coolant Tem-	25	-25		
perature Sensor				
Solar Radiation	26 [*]	-26		
Sensor				

- *: When solar radiation is shaded, the solar radiation sensor indicates the fault code of open circuit.
- Select the next step in order to be performed by operating the switches as follows:
 - Push the upper side of fan switch: To proceed to "STEP 3."
 - Push the lower side of fan switch: To return to "STEP 1."
 - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed)



STEP 3 Past Trouble Diagnosing

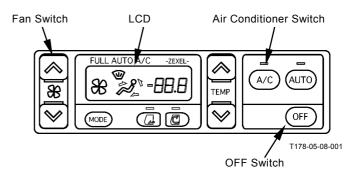
The LCD indicates the fault codes for past abnormalities of the mix door, mode encoder, and/or sensors.

The past stored fault codes are deleted.

 In case any abnormalities occurred in the past, the LCD indicates the fault codes. If more than one fault code is detected, the following fault code is displayed after flashing (0.5 seconds) twice.

1 - 7	5 (1 1 1 1 1 1 1)	
	Fault	Code
	Open circuit	Shorted Circuit
Mix Door	21	-21
Mode Encoder	22	
In-Cab Ambient		
Temperature	23	-23
Sensor		
Outdoor Ambient		
Temperature	24	-24
Sensor		
Coolant Tem-	25	-25
perature Sensor	25	-25
Solar Radiation		-26
Sensor		

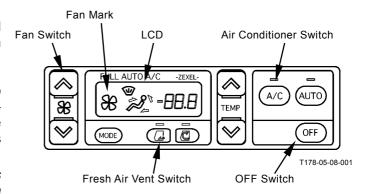
- When the air conditioner switch is kept pushing for more than 3 seconds, the failure records are deleted. After this operation, the air conditioner switch indicator flashes 5 times. Then, the self-diagnosing system is deactivated. (Normal functions are resumed.)
- Select the next step in order to be performed by operating the switches as follows:
 - Push the upper side of fan switch: To proceed to "STEP 4."
 - Push the lower side of fan switch: To return to "STEP 2."
 - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed)



STEP 4 Sensing Temperature Display

The LCD indicates the sensing temperature detected by each temperature sensor (excluding the insulation sensor).

- The sensing temperature detected by the in-cab ambient temperature sensor, outdoor ambient temperature sensor and coolant temperature sensor are displayed on the LCD in real time. (Figures less than the decimal point are not displayed.)
- **MOTE: The coolant temperature sensor indicates "H" when coolant temperature is more than 21 ℃ (70 ℉) and "L" when coolant temperature is less than 21 ℃ (70 ℉).
- Sensing temperature detected by each sensor is automatically displayed on the LCD and is cycled at an interval of 3 seconds with the timer. The timer is turned ON or OFF by operating the fresh air vent switch.
- Referring to the fan mark can check which sensing temperature is displayed.
- Select the next step in order to be performed by operating the switches as follows:
 - Push the upper side of fan switch: To proceed to "STEP 5."
 - Push the lower side of fan switch: To return to "STEP 3."
 - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed)



STEP 5 Component Operation Check

Each component operation is checked by performing pattern operation.

- Each time the fresh air vent switch is pushed, the component to be checked is selected in order.
 Check which component has been selected by referring to No. indicated on the LCD. (Refer to table 1.)
- Operating pattern of the selected component is shifted at an interval of 10 seconds. Operating pattern is cycled. (Refer to table 1.)
- NOTE: The components other than selected operate under the standard conditions (shown by marks* in table 1).
- Select the next step in order to be performed by operating the switches as follows:
 - Push the AUTO switch and upper side of fan switch: To proceed to "STEP 6-1".
 - Push the A/C switch and upper side of fan switch: To proceed to "STEP 6-2".
 - Push the lower side of fan switch: To return to "STEP 4."
 - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed)

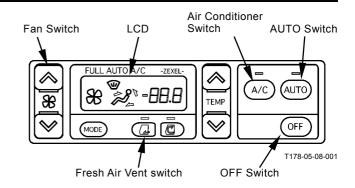


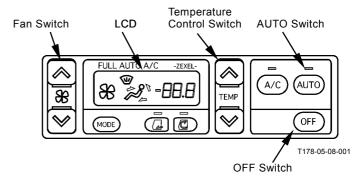
Table 1

Component	Indication on LCD	Operation Pattern	Remarks
Air Mix Damper	51	Controls opening extent of air mix damper: 0% (fully closed) → 50%*→ 100% (fully opened)	0%, 50%, 100%: "C", "5" and "H" are indicated next to the decimal point respectively.
Fan	52	Controls air flow volume: Lo \rightarrow M(Lo) \rightarrow M(Hi) \rightarrow Hi	Indicators corresponding to air flow volume light.
Air Vent Location	53	Selects air vent: Front*→ Front/Rear → Front/Foot → Foot	Indicator corresponding to selected air vent lights.
Fresh/Circula-tio n Air Vent Selec- tion	54	Select Ventilation Mode: Circulation* → Fresh	Indicator corresponding to selected mode light.
Air Conditioner	55	Turns air conditioner switch: ON* → OFF	ON: Indicator lights. OFF: Indicator is extinguished.

STEP 6-1 Correction of the Set Temperature

Fine correction of the set temperature.

- Each time when the top or bottom of temperature control switch is pushed, temperature correction, displayed on the LCD window, can be changed.
- Actually controlled temperature is the normally set temperature plus the set temperature correction.
 For instance, when the normally set temperature is 25°C (77 °F) and set temperature correction is -1°C (-34 °F), the actually controlled temperature becomes 24°C (75 °F).
- Select the next step in order to be performed by operating the switches as follows:
 - Push the AUTO switch and lower side of fan switch: To return to "STEP 5."
 - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed)

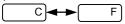


STEP 6-2 Selection of Celsius and Fahrenheit Temperature Indication

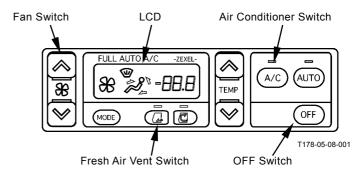
Selection of Celsius and Fahrenheit Temperature Indication.

- Each time when the fresh air vent switch is pushed, Celsius or Fahrenheit temperature may be displayed alternately.
- Temperature is displayed at the top of LCD window as follows.

(C: Celsius, F: Fahrenheit)



- Select the next step in order to be performed by operating the switches as follows:
 - Push the Air Conditioner Switch and lower side of fan switch: To return to "STEP 5."
 - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed)



% Please fill in all sections and return this AIR CONDITIONER TROUBLE REPORT to Hitachi Tsuchiura Works Quality Assurance Dept. after experiencing a problem with your machine's air conditioning system.

< AIR CONDITIONER TROUBLE REPORT >

File No

Model Operation Ty Delivery Date 2) When Date		Manua	l		(Serial I	N.	`	Checked by:
Delivery Date 2) When		Manua	l			NO.)	
2) When	е			Semi-Auto	Ful	I-Auto		
,				Year	Month			
Date								
		Year		Month	Day	Ор	erating I	Hour (h)
Time		Morning		Daytim	ne	Evening	3	Night
Frequency		Every D	ay	Once a	a Week	Once a	Month	Times per
3) Where	•							
Job Site Add	lress		State		Count	у		Town
Access Road	d Conditio	n	Paved		Not Pa	aved (Gravel	Sar	nd Soil)
How (Oper	ating Con	ditions)						
Weather				Fine	С	loudy	Rai	n Snow
Atmospheric		ture		Very Hot	H	ot	Col	d Very Cold
Operating Co	onditions			Parking	Tr	raveling	Wo	rking
	Temperature Control		Paint blar full-auto o		red indicato	rs. / Fill	in set-temperature whe	
	A/C			ON	peration		OFI	F
Control	Air Induction		Re-Circul	ation		Fre	sh Air Circulation	
Panel AUTO Fill following items when or		ON	0	FF	Not	Available		
		ving item	s when c	perated in m	anual mode	e or when ma	nual co	ntrol type unit is used.
	Vent Position		Front	Front / Re	ar Foo	Fro	ont / Rear and Foot	
Ì	Fan			First	Second	Third	Fourt	h Fifth Sixth

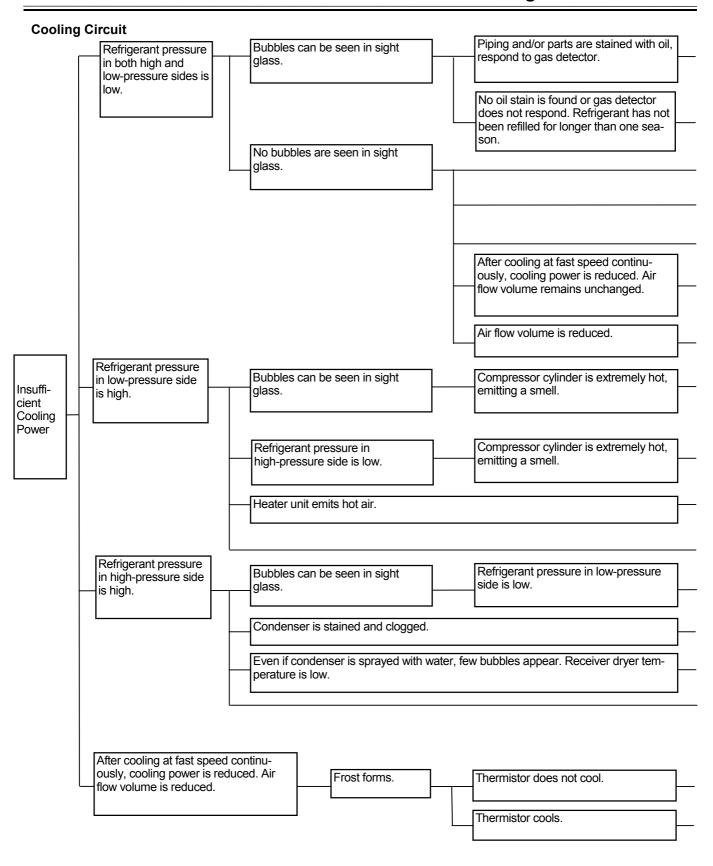
Га		FIISL	<u> </u>
(5) How (Problem	Symptom)		
Abnormal Comp	ressor Operation		
Symptom	Not turned ON		
	Not turned OFF		
	Others		
Uncontrollable a	ir temperature		
Symptom	No cool air		
	No warm air		
	Others		
Uncontrollable a			
Symptom	Air flows in Hi mode on	ly	
	No air flows		
	Small air volume		
	Others		
Uncontrollable v			
Symptom	Vent hole isn't selected		
	Others		
Abnormal panel			
Faulty Indica-	Vent Hole		
tor	A/C		
	AUTO		
	Fresh Air Circulation		
	Fan OFF		
		Hi)	
	Temperature Control		
Symptom	Stays OFF		
	Stays ON		
	Blinks		
	Others		

<Check Result>

(1) Is problem reproducible?
Reproducible
Not reproducible
(2) Pressure (To be measured at gauge manifold)
Low Pressure
High Pressure
(3) Which parts have been replaced?
1
2

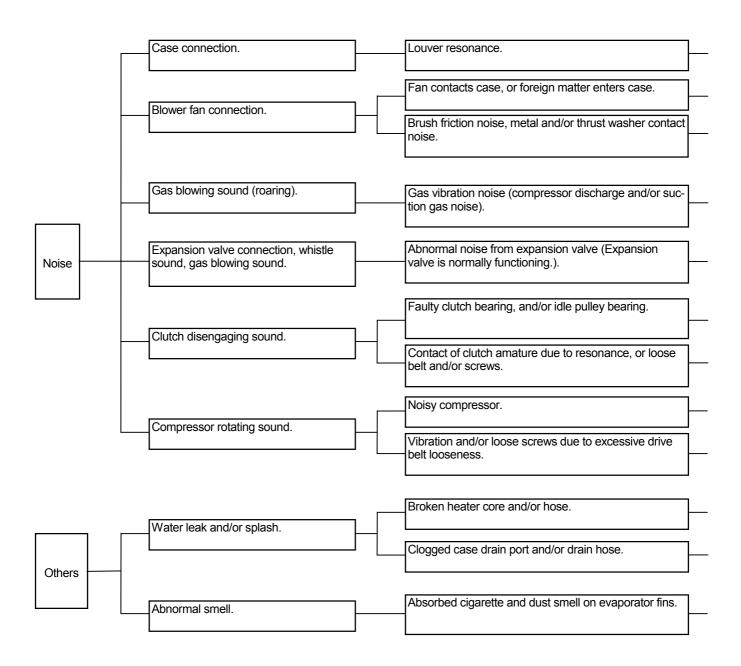
^{*} Before replacing the control amplifier, be sure to check that the connectors are correctly connected while repeatedly disconnecting and reconnecting connectors.

Refrigerant Quantity	850±50 g
Compressor Oil Quantity	210 cm ³



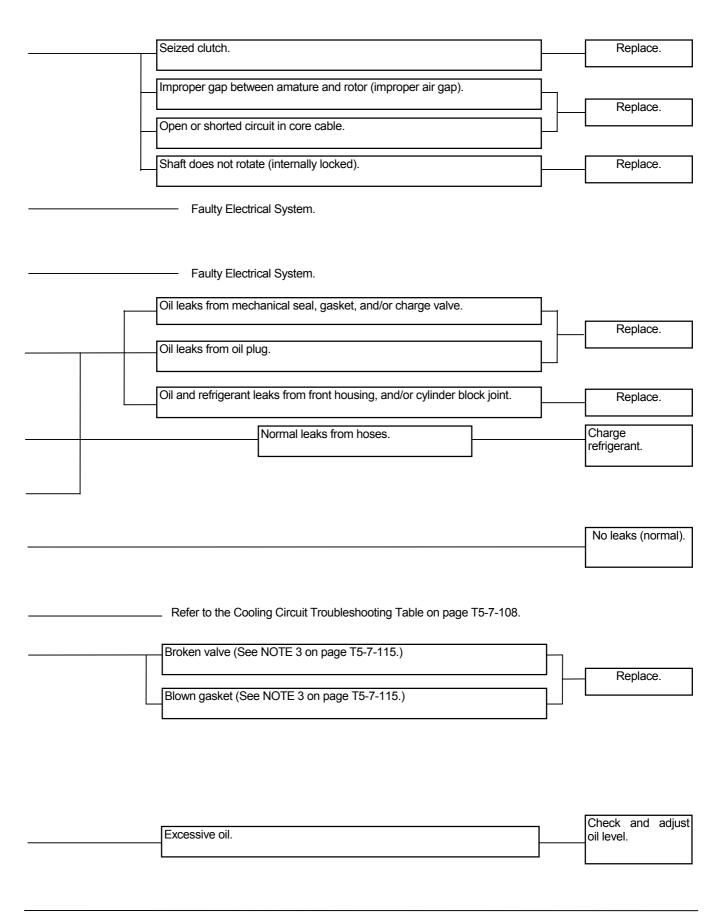
Gas leaks from pipe joints and/or parts.	Re-tighten or replace parts.
Normal leakage of refrigerant from hoses.	Refill refrigerant.
 Improper adjustment (excessive restriction) of expansion valve.	Readjust or replace expansion valve.
 Clogged expansion valve.	Remove clog, or replace receiver and/or expansion 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.)

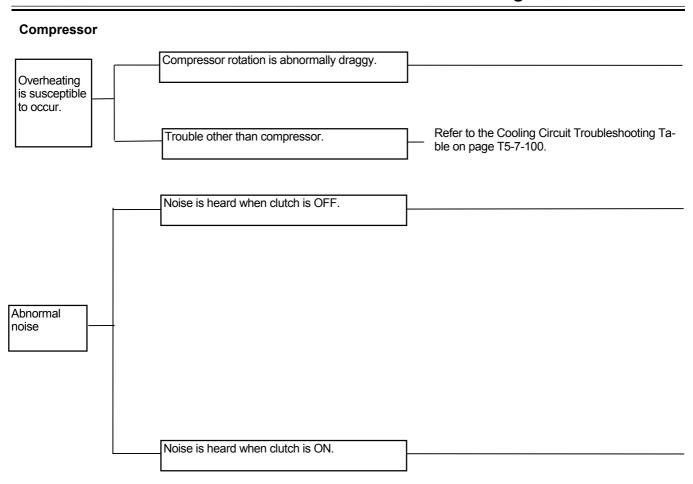
Cooling Circuit

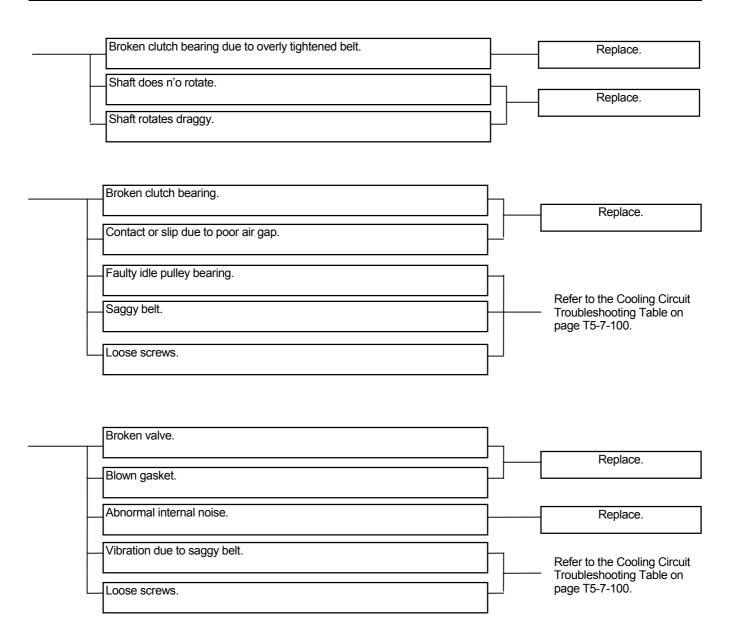


Repair or replace.
Remove foreign matter. Readjust fan motor location.
Slight noise is unavoidable. Replace if loud.
No functional problem exists. Provide silencer if intolerable.
Replace expansion valve if whistle sound is heard. Gas flow noise can be slightly heard.
Replace.
Repair or replace clutch. 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 Clutch terminal voltage is low. cooling system. Clutch terminal voltage is 0 V. Bubbles exist even after refrigerant is refilled. Both high and low side Check for oil and refrigerant leaks from parts other than compressor and pipe joints by using gas detector. pressures are low. Both com-Check for oil and refrigerant leaks from compressor (no pressor and leaks from parts other than compressor) by using gas blower modetector. (Refer to NOTE 1, 2 tor rotate. on page T5-7-115.) 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 Others sight glass. High pressure side is high. Refer to the Cooling Circuit Troubleshooting Table on page T5-7-106. Temperature is not cooled when compressor is operated at fast speed continuously. Air flow from blower is insufficient.







MOTE:

- 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/cm²) or less. When the clutch is turned OFF, the pressure difference between high-pressure side and low-pressure side will disappear within about 10 seconds.

EXCHANGE INSPECTION

Exchange inspection method is a troubleshooting method to find the trouble location by exchanging the suspected part / component with another part /component having identical characteristics.

Many sensors and solenoid valves used on this machine are identical. Therefore, by using this switch-check method, faulty part /component, and/or harness can be easily found.

Example: Abnormal pump 1 delivery pressure high voltage (MC fault code: 11200-3)

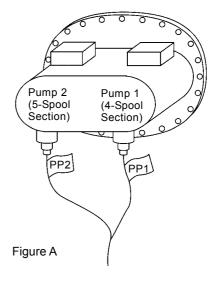
Check Method:

- 1. Switch two delivery pressure sensors located as shown in figure A to figure B.
- 2. Retry troubleshooting.

Result:

In case abnormal pump 2 delivery pressure high voltage is displayed (MC fault code 11202-3), the pump 1 delivery pressure sensor is considered to be faulty.

In case abnormal pump 1 delivery pressure high voltage is displayed (MC fault code 11200-3), the pump 1 delivery pressure sensor harness is considered to be faulty.



T157-07-04-006

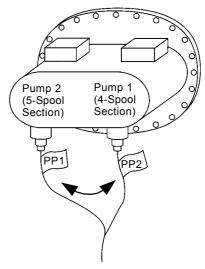


Figure B T157-07-04-006

Applicability	of Switch	-Check	Method

Fault Code	Trouble	Applicability
11000-2	Abnormal EEPROM	Not Applicable
11001-2	Abnormal RAM	
11002-2	Abnormal A/D Conversion	
11003-2	Abnormal Sensor Voltage	
11004-2	Abnormal CAN Communication	Not Applicable
11100-2	Abnormal Engine Speed	Not Applicable
11101-3	Abnormal Engine Control Dial Sensor High Voltage	Not Applicable
11101-4	Abnormal Engine Control Dial Sensor Low Voltage	Not Applicable
11200-3	Abnormal Pump 1 Delivery Pressure Sensor High Voltage	Applicable (Harness)
11200-4	Abnormal Pump 1 Delivery Pressure Sensor Low Voltage	Applicable (Harness)
11202-3	Abnormal Pump 2 Delivery Pressure Sensor High Voltage	Applicable (Harness)
11202-4	Abnormal Pump 2 Delivery Pressure Sensor Low Voltage	Applicable (Harness)
11206-3	Abnormal Pump 1 Control Pressure Sensor High Voltage	Applicable (Harness)
11206-4	Abnormal Pump 1 Control Pressure Sensor Low Voltage	Applicable (Harness)
11208-3	Abnormal Pump 2 Control Pressure Sensor High Voltage	Applicable (Harness)
11208-4	Abnormal Pump 2 Control Pressure Sensor Low Voltage	Applicable (Harness)
11301-3	Abnormal Swing Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11301-4	Abnormal Swing Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11302-3	Abnormal Boom Raise Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11302-4	Abnormal Boom Raise Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11303-3	Abnormal Arm Roll-In Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11303-4	Abnormal Arm Roll-In Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11304-3	Abnormal Travel Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11304-4	Abnormal Travel Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11307-3	Abnormal Front Attachment Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11307-4	Abnormal Front Attachment Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11400-2	Abnormal Feedback Current of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Applicable (Harness)
11400-3	Abnormal Feedback High Voltage of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Applicable (Harness)

Fault Code	Trouble	Applicability	
11400-4	Abnormal Feedback Low Voltage of Maxi-	Applicable (Harness)	
	mum Pump 2 Flow Rate Limit Control So-	Applicable (Harriess)	
	lenoid Valve		
11401-2	Abnormal Feedback Current of Torque Control Solenoid Valve	Applicable (Harness)	
11401-3	Abnormal Feedback High Voltage of Torque Control Solenoid Valve	Applicable (Harness)	
11401-4	Abnormal Feedback Low Voltage of Torque Control Solenoid Valve	Applicable (Harness)	
11402-2	Abnormal Feedback Current of Solenoid Valve Unit (SF)	Applicable (Harness/ Solenoid Valve)	
11402-3	Abnormal Feedback High Voltage of Solenoid Valve Unit (SF)	Applicable (Harness/ Solenoid Valve)	
11402-4	Abnormal Feedback Low Voltage of Sole- noid Valve Unit (SF)	Applicable (Harness/ Solenoid Valve)	
11403-2	Abnormal Feedback Current of Solenoid Valve Unit (SC)	Applicable (Harness/ Solenoid Valve)	
11403-3	Abnormal Feedback High Voltage of Solenoid Valve Unit (SC) Applicable (Harness/ Valve)		
11403-4	Abnormal Feedback Low Voltage of Solenoid Valve Unit (SC)	Applicable (Harness/ Solenoid Valve)	
11404-2	Abnormal Feedback Current of Solenoid Valve Unit (SG)	Applicable (Harness/ Solenoid Valve)	
11404-3	Abnormal Feedback High Voltage of Solenoid Valve Unit (SG)	Applicable (Harness/ Solenoid Valve)	
11404-4	Abnormal Feedback Low Voltage of Solenoid Valve Unit (SG)	Applicable (Harness/ Solenoid Valve)	
11405-2	Abnormal Feedback Current of Solenoid Valve Unit (SI)	Applicable (Harness/ Solenoid Valve)	
11405-3	Abnormal Feedback High Voltage of Solenoid Valve Unit (SI)	Applicable (Harness/ Solenoid Valve)	
11405-4	Abnormal Feedback Low Voltage of Solenoid Valve Unit (SI)	Applicable (Harness/ Solenoid Valve)	
11410-2	Abnormal Feedback Current of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve	Applicable (Harness)	
11410-3	Abnormal Feedback High Voltage of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve	Applicable (Harness)	
11410-4	Abnormal Feedback Low Voltage of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve	Applicable (Harness)	
11910-2	Actual Engine Speed	Not Applicable	
11918-2	Work Mode	Not Applicable	
11911-2	Security Signal	Not Applicable	
11920-2	Fuel Flow Rate	Not Applicable	
11914-2	Radiator Coolant Temperature	Not Applicable	
11901-3	Abnormal Hydraulic Oil Temperature Sensor High Voltage	Not Applicable	
11901-4	Abnormal Hydraulic Oil Temperature Sensor Low Voltage	Not Applicable	

EMERGENCY BOOM LOWERING PRO-CEDURE



CAUTION: Prevent personal injury. Confirm that no one is under the front attachment before starting the procedure below.

If the engine stalls and cannot be restarted, lower the boom to the ground referring to the emergency boom lowering procedure stated below.

 Loosen lock nut (1) in the control valve at the right. Loosen screw (2) one half of a turn. The boom lowering speed can be somewhat adjusted by loosening screw (2) more.

IMPORTANT: Lock nut (1) and screw (2) are located under the solenoid valve.

Pay attention to the screw turns.

2. After the boom is lowered, tighten screw (2) and tighten lock nut (1) to the specifications below.

Lock Nut (1) Tool: 13 mm

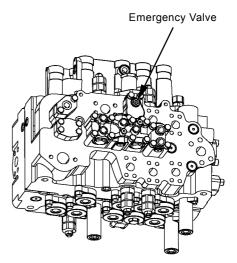
Torque: 13 N·m (1.3 kgf·m, 9.4 lbf·ft)

Screw (2)

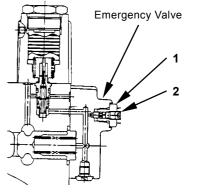
Tool: 4 mm (Hexagonal wrench) Torque: 6.9 N·m (0.7 kgf·m, 5.0 lbf·ft)

NOTE: Excessive leakage may result if the screw and the lock nut are tightened insufficiently.

Be sure to retighten the screw and the lock nut to specifications.



T1V1-05-04-005



T178-05-04-003

ONE PART OF DATA, "DAILY REPORT DATA", "DISTRIBUTION DATA" AND TOTAL OPERATING HOURS" IN NOT RECORDED

 The required signal for data may not be sent to ICF. As each signal is used for some data, check the corresponding signal system according to the table below.

Data		Input Signal
Daily report data is not recorded.		Key switch, alternator
Fuel Level		Fuel sensor data sent from monitor unit
Fuel Usage Amount		Value is calculated and recorded by accumulated
		fuel usage amount from ECM.
Machine Hour Meter		Hour meter sent from monitor unit
Engine Operating Hours	HP Mode Hours	Power mode switch information sent from MC
	P Mode Hours	Power mode switch information sent from MC
	E Mode Hours	Power mode switch information sent from MC
Auto-Idle Switch ON Time		Auto-idle switch information sent from MC
Travel Operating Hours	Fast Idle (Hi) Traveling Hours	Travel mode switch information sent from MC
	Slow Idle (Lo) Traveling Hours	Travel mode switch information sent from MC
Swing Operating Hours		Swing pressure sensor information sent from MC
Digging Operating Hours		Front attachment pressure sensor information sent
		from MC

Position to be checked	Remedy
Key signal line, alternator signal line	Check terminal #C7 (power ON signal line) of connector
	ICF-C in ICF.
Communication line between monitor unit and	Check terminals #C5, #C11 of connector ICF-C in ICF and
ICF (CAN bus line)	terminals #18, #38 of connector in ECM.
Communication line between ECM and ICF	Check terminals #C5, #C11 of connector ICF-C in ICF and
(CAN bus line)	terminals #18, #38 of connector in ECM.
Communication line between monitor unit and	Check terminals #C5, #C11 of connector ICF-C in ICF and
ICF (CAN bus line)	terminals #B6, #B7 of connector monitor-B in monitor unit.
Communication line between MC and ICF	Check terminals #C5, #C11 of connector ICF-C in ICF and
(CAN bus line)	terminals #B6, #B7 of connector monitor-B in monitor unit.
Communication line between MC and ICF	Check terminals #C5, #C11 of connector ICF-C in ICF and
(CAN bus line)	terminals #C4, #C15 of connector MC-C in MC.
Communication line between MC and ICF	Check terminals #C5, #C11 of connector ICF-C in ICF and
(CAN bus line)	terminals #C4, #C15 of connector MC-C in MC.
Communication line between MC and ICF	Check terminals #C5, #C11 of connector ICF-C in ICF and
(CAN bus line)	terminals #C4, #C15 of connector MC-C in MC.
Communication line between MC and ICF	Check terminals #C5, #C11 of connector ICF-C in ICF and
(CAN bus line)	terminals #C4, #C15 of connector MC-C in MC.

Data		Input Signal
Attachment Operating Hours	Breaker Operating Hours	Attachment information sent from MC
	Secondary Crusher Operating Hours	Attachment information sent from MC
	Primary Crusher Oper- ating Hours	Attachment information sent from MC
	Vibrating Hammer Op- erating Hours	Attachment information sent from MC
	Bucket Operating Hours or Others	Attachment information sent from MC
No Load Time		Pressure sensor information sent from MC
Radiator Coolant Temperature		Radiator coolant temperature data sent from monitor unit
Hydraulic Oil Temperature		Hydraulic oil temperature data sent from MC
Intake Air Temperature		Data sent from ECM

Position to be checked	Remedy
Communication line between MC and ICF	Check terminals #C5, #C11 of connector ICF-C in ICF and ter-
(CAN bus line)	minals #C4, #C15 of connector MC-C in MC.
Communication line between MC and ICF	Check terminals #C5, #C11 of connector ICF-C in ICF and ter-
(CAN bus line)	minals #C4, #C15 of connector MC-C in MC.
Communication line between MC and ICF	Check terminals #C5, #C11 of connector ICF-C in ICF and ter-
(CAN bus line)	minals #C4, #C15 of connector MC-C in MC.
Communication line between monitor unit and	Check terminals #C5, #C11 of connector ICF-C in ICF and ter-
ICF (CAN bus line)	minals #B6, #B7 of connector monitor-B in monitor unit.
Communication line between MC and ICF	Check terminals #C5, #C11 of connector ICF-C in ICF and ter-
(CAN bus line)	minals #C4, #C15 of connector MC-C in MC.
Communication line between ECM and ICF	Check terminals #C5, #C11 of connector ICF-C in ICF and ter-
(CAN bus line)	minals #18, #38 of connector in ECM.

(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.

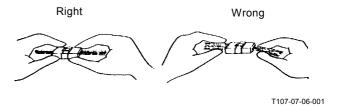
In cases on the design sheet where two colors are indicated for one wire, the left initial stands for base color, while the right initial stands for marking color.

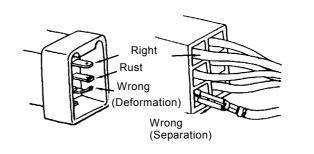
Code	Color	Code	Color
R	Red	W	White
L	Blue	G	Green
Or	Orange	Lg	Light green
Υ	Yellow	В	Black
Br	Brown	Р	Pink
Gr	Gray	V	Violet



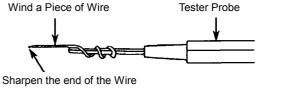
- NOTE: 1) Code BW indicates a black base wire with white fine-line marking.
 - 2) Initials "O" and "Or" both stand for the color orange.
 - 3) Wires with longitudinal stripes printed on them are not color coded. Do not confuse them with color coded wires.

- 3. Precautions for connecting and disconnecting terminal connectors.
 - When disconnecting the harnesses, grasp them by their connectors. Do not pull on the wire itself. Release the lock first before attempting to separate connectors, if a lock is provided. (Refer to "Instructions for Disconnecting Connector" on page T5-8-3.)
 - 2) The water-resistant connectors keep water out. If water enters them, water will not easily drain from them. When checking the water-resistant connectors, take extra care not to allow water to enter the connectors. In case water should enter the connectors, reconnect only after the connectors are thoroughly dried.
 - Before connecting terminal connectors, check that no terminals are bent or coming off. In addition, as most connectors are made of brass, check that no terminals are rusting.
 - 4) When connecting terminal connectors provided with a lock, insert them together until the lock "clicks."
 - 5) Pull the harness near the connector in order to check if it is correctly connected.
- 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.
 - 2) Before starting the connector test, always check the connector terminal numbers, referring to the circuit diagram. When the connector size is very small, and the standard probe size is too large to be used for testing, wind a fine piece of sharpened wire or a pin around the probe to make the test easier.
 - 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.





T107-07-06-002



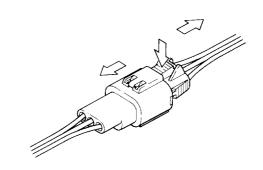
T107-07-06-003

FOR DISCONNECTING INSTRUCTIONS **CONNECTORS**

Push, Unlock and Separate Type

NOTE: 1. Connectors will not be easily separated even if the lock is pushed while being pulled. Push the lock first before pulling the connectors.

> 2. The lock is located on female side connector (harness end side).



T107-04-05-002

Locations of This Type Connector

Fuel Gauge Pump Delivery Pressure Sensor

Hydraulic Oil Level Switch General Relay Horn Solenoid Valve Diode Cab Harness Pressure Sensor Key Switch Washer **Engine Control Dial**

Radio Speaker Wiper Monitor Unit ECM **ICF**

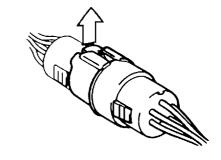
Raise Lock, Pull and Separate Type

Locations of This Type Connector Starter Relay 2

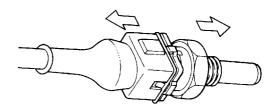


IMPORTANT: Before pulling and separating, release the lock of connector in the solenoid valve by using a pair of pincers.

Locations of This Type Connector Hydraulic Oil Temperature Sensor Dr. ZX



T107-04-05-003



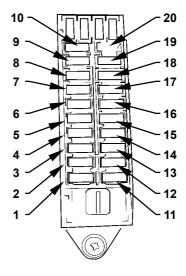
T107-04-05-004

FUSE INSPECTION

Cracks in a fuse are so fine that it is very difficult or impossible to find by visual inspection. Use a tester in order to correctly inspect fuse continuity by following the instructions described below.

- 1. Turn the key switch ON.
 - When the key switch is turned ON, current from key switch terminal M activates the battery relay so that electric power is supplied to all circuits except the glow plug relay circuit. (Refer to the circuit diagram.)
- 2. Remove the fuse box cover. Set the tester. (Measurement Range: 0 to 30 V)
- 3. Ground the negative probe of tester to the vehicle frame. Touch the terminals located away from center of the fuse box with the positive probe of tester one at a time. When normal continuity of a fuse is intact, the tester will indicate 20 to 25 V (battery voltage).

NOTE: All terminals located along the lengthwise centerline of the fuse box are connected to the power source, while terminals located away from center of the fuse box are connected to loads (accessories). Therefore, test all fuses in the same method except for the glow relay circuit fuse. Check the glow relay circuit fuse with the key switch turned to the ON position and follow the procedure in step 3.



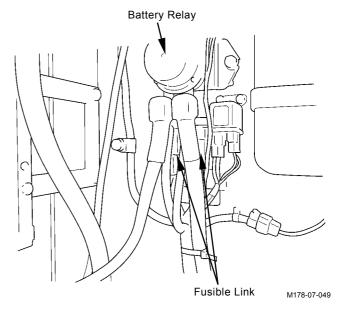
M178-07-034

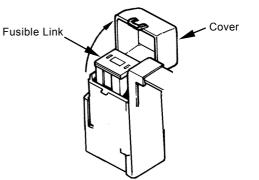
Fuse No.	Capacity	Connected to	Fuse No.	Capacity	Connected to
1	20 A	Work Light Relays 1 and 2	11	10 A	Horn Relay
2	10 A	Wiper Relay, Wiper Motor,	12	5 A	Radio, Cab Light
		Washer Relay			
3	20 A	Heater (Air Conditioner Unit)	13	10 A	Cigarette Lighter
4	10 A	MC (Solenoid Valve Power)	14	5 A	Fuel Pump
5	5 A	Optional 1	15	10 A	Auxiliary
6	10 A	Optional 2	16	5 A	Glow Relay
7	10 A	Empty	17	5 A	Air Conditioner Unit
8	30 A	ECM Main Relay	18	5 A	MC, ECM, ICF, Monitor Unit
					(Power ON Signal)
9	10 A	Security Horn, Security Horn	19	5 A	Monitor Unit (Main Power)
		Relay (Power), Radio (Backup)			
10	5 A	MC, ICF (Main Power)	20	5 A	Optional 3

FUSIBLE LINK INSPECTION

Inspection

- 1. Remove the negative cable from the battery.
- 2. Loosen bolt M8 holding the cable routed in front of the fusible link box. Slide the cable out of the way of the front cover.
- 3. Open the front cover of fusible link box and visually inspect the fusible link.

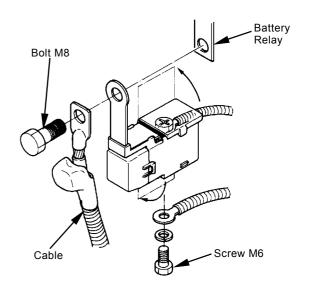




T178-05-06-002

Replacement

- 1. Check that the negative cable is removed from the battery.
- 2. Remove bolt M8. Remove the fusible link from the battery relay.
- 3. Open the upper and bottom side covers of fusible link box. Remove screws M6 (2 used).
- 4. Pull out the fusible link. Replace the fusible link.
- 5. Install screws M6 (2 used).
- 6. Install the fusible link box and the cable to the battery relay.
- 7. Connect the negative cable to the battery.



T107-04-05-008

BATTERY VOLTAGE CHECK

1. Turn the key switch OFF. Check voltage between the battery positive terminal and the vehicle frame.

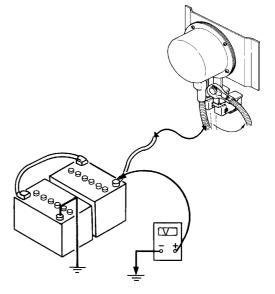
Normal Voltage: 24 V

NOTE: If voltage is abnormal, recharge or replace the battery.

2. Start the engine. Check voltage between the battery positive terminal and the vehicle frame.

Normal Voltage: 26 to 28 V

NOTE: If voltage is abnormal, check the charging system.



T157-07-06-007

ALTERNATOR CHECK

In general, the alternator indicator remains off when the alternator is generating power.

If the alternator indicator comes on while the engine is running, the alternator might be defective.

How to check the circuit

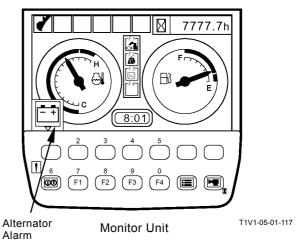
- 1. Turn the key switch to the ON position. Confirm that the alternator alarm is displayed.
- 2. Measure voltage between teminals B and E of the alternator. If the measured voltage is around 24 V, the alternator circuit can be considered normal. If the measured voltage is low, a shortage in battery capacity or looseness of the wire connectors of alternator circuit might be cause of the malfunction. When voltage is 0 V, the wiring between fuse box and alternator might be loose or disconnected.

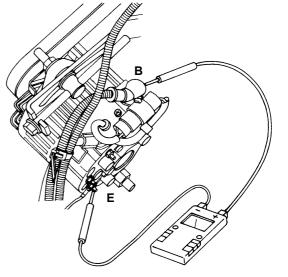
Also, the alternator cannot generate electricity if the ground line is disconnected.

3. Next, start the engine. Measure voltage generated while as the alternator rotates.

As described above, measure voltage between terminals B and E on the alternator side. If voltage is around 28 V, the alternator is operating normally.

If the rated voltage is not being generated, there is some trouble with the alternator or the regulator.





T157-07-06-003

CONTINUITY CHECK

Single-line continuity check

Disconnect both end connectors of the harness and check continuity between both ends:

If the ohm-meter reading is: 0 Ω = Continuity

 $\infty \Omega = Discontinuity$

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

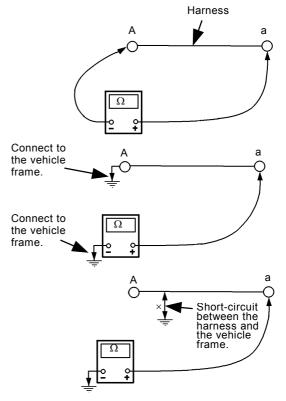
Single-line short-circuit check

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:

 $0 \Omega = Short circuit is present.$

 $\infty \Omega$ = 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 ∞ $\Omega,$ 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).

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.

 $\infty \Omega$ = Line (A) - (a) has discontinuity.

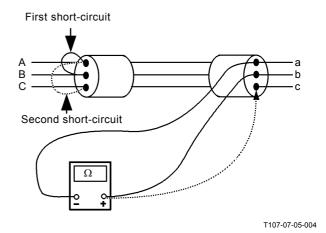
Multi-line short-circuit check

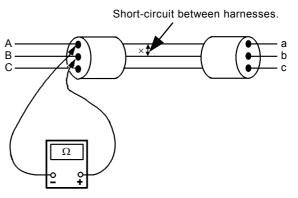
Disconnect both end connectors of the harness, and check continuity between terminals (A) and (B) or (C).

If the ohm-meter reading is:

 $0 \Omega = \text{Short-circuit exists between the lines}.$

 ∞ Ω = No short-circuit exists between the lines.





T107-07-05-005

VOLTAGE AND CURRENT MEASURE-MENT

Turn key switch ON so that the specified voltage (current) is supplied to the location to be measured. Judge if the circuit is normal by evaluating whether the measured voltage (current) matches the specification.

24-Volt Circuit

Start checking the circuit in order up to the location to be measured from either power source or actuator side. Thereby, the faulty location in the circuit will be found.

Black Probe (Negative) of Tester:

To ground to the vehicle frame

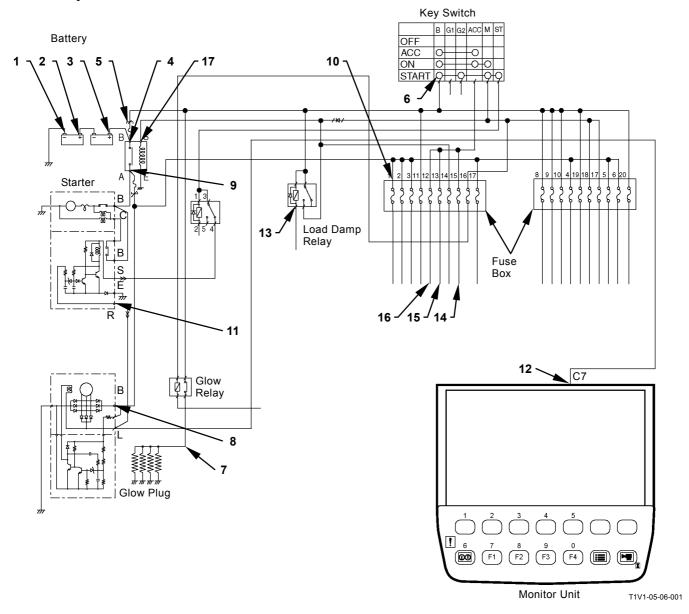
Red Probe (Positive) of Tester:

To touch the location to be measured

Engine	Key Switch	Location to be Measured	Specification
Power Source			
Circuit			
Stopped	OFF	Between (2) and (1): One Battery	10 to 12.5 V
Stopped	OFF	Between (3) and (2): One Battery	10 to 12.5 V
Stopped	OFF	Between (3) and (1): Two Batteries	20 to 25 V
Stopped	OFF	Between (4) and Ground: Battery Power	20 to 25 V
Stopped	OFF	Between (5) and Ground: Fusible Link	20 to 25 V
Stopped	OFF	Between (1) and Ground: Backup Current*	6 mA
Preheat Circuit			
Stopped	ON or START	Between (6) and Ground: Key Switch	20 to 25 V
Stopped	ON or START	Between (7) and Ground: Glow Plug	20 to 25 V
Charging Circuit			
Fast Speed	ON	Between (8) and Ground: Alternator (B) / Generating Voltage	26 to 30 V
Fast Speed	ON	Between (9) and Ground: Battery Relay / Generating Voltage	26 to 30 V
Fast Speed	ON	Between (10) and Ground: Fuse Box / Starter Relay 2 (R) / Generating Voltage	26 to 30 V
Fast Speed	ON	Between (11) and Ground: Generating Voltage	13 to 30 V
Fast Speed	ON	Between (12) and Ground: Monitor Unit (C7)	13 to 30 V
Surge Voltage			
Prevention Circuit			
Idle Speed	ON	Between (8) and Ground: Alternator (B)	26 to 30 V
Idle Speed	ON	Between (11) and Ground: Starter Relay 2 (R)	13 to 30 V
Idle Speed	ON	Between (13) and Ground: Load Damp Relay	26 to 30 V
Idle Speed	ON	Between (9) and Ground: Battery Relay	26 to 30 V
Accessory Circuit			
Stopped	ON	Between (14) and Ground: Auxiliary	20 to 25 V
Stopped	ON	Between (15) and Ground: Cigarette Lighter	20 to 25 V
Stopped	ON	Between (16) and Ground: Radio, Cab Light	20 to 25 V
Stopped	ON	Between (17) and Ground: Battery Relay	20 to 25 V

NOTE: *Before measurement, disconnect the negative cable from the battery.

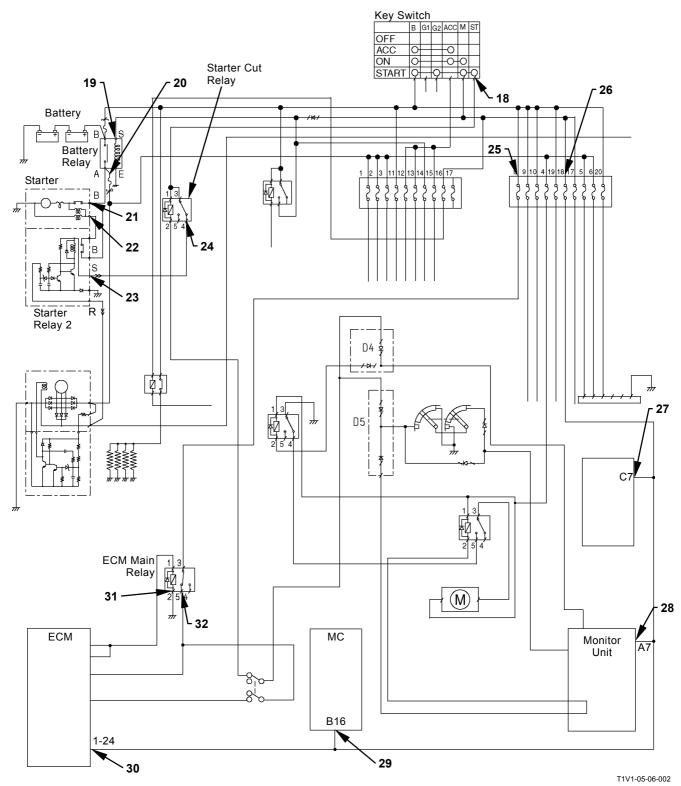
Power Source Circuit
Preheat Circuit
Charging Circuit
Surge Voltage Prevention Circuit
Accessory Circuit



Engine	Key Switch	Location to be Measured	Specification
Starting Circuit			
Started	START	Between (18) and Ground: Key Switch	20 to 25 V
Started	START	Between (19) and Ground: Battery Relay (Coil)	20 to 25 V
Started	START	Between (20) and Ground: Battery Relay (Switch)	20 to 25 V
Started	START	Between (21) and Ground: Starter (B)	20 to 25 V
Started	START	Between (22) and Ground: Starter (C)	20 to 25 V
Started	START	Between (23) and Ground: Starter Relay 2 (S)	20 to 25 V
Started	START	Between (24) and Ground: Starter Cut Relay	20 to 25 V
Started	START	Between (25) and Ground: Fuse Box	20 to 25 V
Started	START	Between (26) and Ground: Fuse Box	20 to 25 V
Started	START	Between (27) and Ground: ICF (C7)	20 to 25 V
Started	START	Between (28) and Ground: Monitor Unit (A7)	20 to 25 V
Started	START	Between (29) and Ground: MC (B16)	20 to 25 V
Started	START	Between (30) and Ground: ECM (1-24)	20 to 25 V
Started	START	Between (31) and Ground: ECM Main Relay	5 V
Started	START	Between (32) and Ground: ECM Main Relay	20 to 25 V

NOTE: *Before measurement, disconnect the negative cable from the battery.

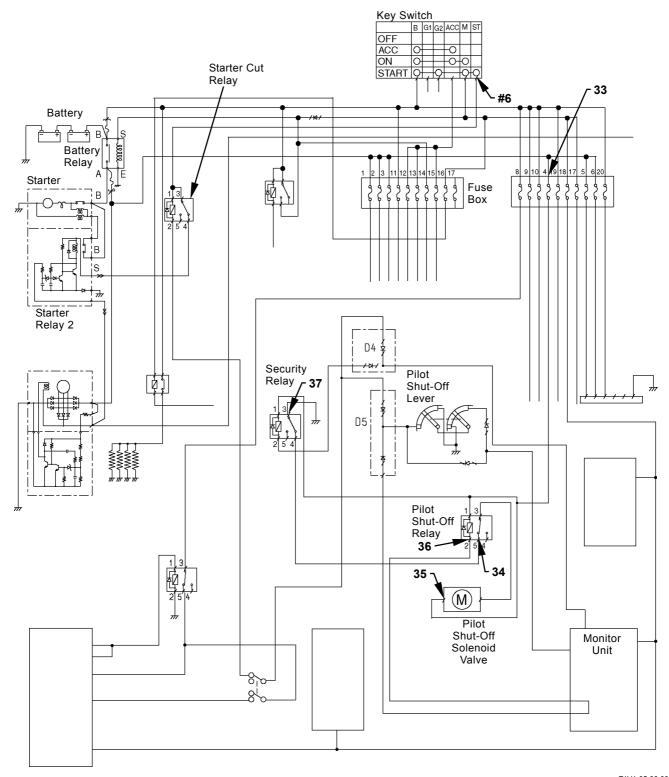
Starting Circuit



Engine	Key Switch	Location to be Measured	Specification
Pilot Shut-Off Cir-			
cuit			
Stopped	ON	Between (33) and Ground: Fuse Box	20 to 25 V
Stopped	ON	Between (34) and Ground: Pilot Shut-Off Relay	20 to 25 V
Stopped	ON	Between (35) and Ground: Pilot Shut-Off Solenoid Valve	20 to 25 V
Stopped	ON	Between (36) and Ground: Pilot Shut-Off Relay	20 to 25 V
Stopped	ON	Between (37) and Ground: Security Relay	20 to 25 V

NOTE: *Before measurement, disconnect the negative cable from the battery.

Pilot Shut-Off Circuit



T1V1-05-06-003

5 Voltage Circuit

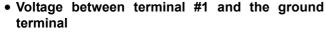
Voltage between terminal #1 and the vehicle frame

Disconnect the connector with the key switch OFF. Measure voltage between terminal #1 on the machine harness end connector and the vehicle frame (ground).

- · Key switch: ON
- Tester black terminal (negative):
 Connected to the vehicle frame (ground)
- Tester red terminal (positive): Connected to terminal #1

Evaluation:

If the measuring voltage is within 5 ± 0.5 volts, the circuit up to terminal #1 is normal.



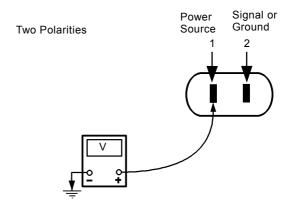
Disconnect the sensor connector with the key switch OFF.

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).

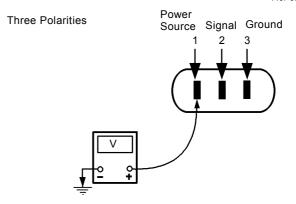
- · Key switch: ON
- Tester black terminal (negative): Connected to the ground terminal (terminal #2 or #3)
- Tester red terminal (positive): Connected to terminal #1

Evaluation:

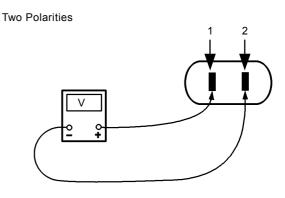
If the measured voltage is within 5 ± 0.5 volt, the circuit up to terminal #1 or the ground terminal (terminal #2 or #3) is normal.



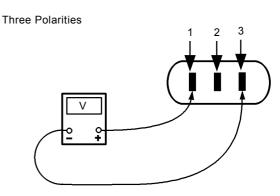
T107-07-05-006



T107-07-05-007



T107-07-05-008



T107-07-05-009

CHECK BY FALSE SIGNAL

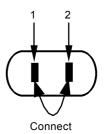
Turn the key switch OFF. Disconnect the sensor connector. Turn the key switch ON. Connect terminal #1 (power source) of machine harness end connector to terminal #2 (signal). (Power voltage is used as a false signal.) Check this state by using the monitor function of Dr. ZX. When the maximum value is displayed, MC and the circuit up to the machine harness end connector are normal. If "ON" is displayed, the pressure switch circuits are normal.

IMPORTANT: Do not connect terminal #1 or #2 to terminal #3 or to the vehicle frame (ground) when checking a three-polarity connector.

NOTE: Some kinds of sensors can be monitored by the service mode of monitor (the built-in diagnosing system). (Refer to the TROUBLESHOOTING / Diagnosing Procedure group.)

Two Polarities

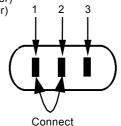
(Hydraulic Oil Temperature Sensor)



Three Polarities

T107-07-05-010

(Pressure Sensor) (Pump Delivery Pressure Sensor) (Pump Control Pressure Sensor)



T107-07-05-011

TEST HARNESS

Install a test harness between connectors. Check the circuit condition depending on whether the test harness lamp lights or extinguishes during operation.

Parts Number 4283594 (ST 7126)

Use in order to check a single-line (discontinuity and/or voltage).

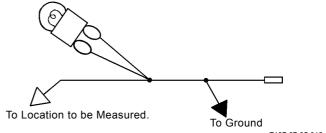
During Operation: Lamp is ON.

Parts Number (ST 7226)

Use in order to check the solenoid valve unit circuits. When the corresponding control lever or switch is operated: Lamp is ON.

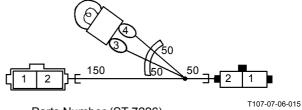
Parts Number (ST 7227)

Use in order to check the wiper circuit.

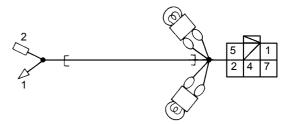


Parts Number 4283594 (ST 7126)

T107-07-05-012



Parts Number (ST 7226)



Parts Number (ST 7227)

MEMO

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THE ATTACHED DIAGRAM LIST

(The following diagrams are attached to this manual.)

- 1. ZAXIS200-3 CLASS/240-3 CLASS/270-3 CLASS/330-3 CLASS ELECTRICAL CIRCUIT DIAGRAM
- 2. ZAXIS200-3 CLASS/240-3 CLASS/270-3 CLASS/330-3 CLASS CONNECTORS
- 3. ZAXIS330-3 CLASS ENGINE HARNESS 1
- 4. ZAXIS200-3 CLASS/240-3 CLASS/270-3 CLASS/330-3 CLASS ENGINE HARNESS 2 ZAXIS200-3 CLASS/240-3 CLASS/270-3 CLASS/330-3 CLASS MONITOR UNIT HARNESS
- 5. ZAXIS200-3 CLASS/240-3 CLASS/270-3 CLASS/330-3 CLASS CAB HARNESS
- ZAXIS330-3 CLASS HYDRAULIC CIRCUIT DIAGRAM
 (BASE MACHINE)
 ZAXIS330-3 CLASS HYDRAULIC CIRCUIT DIAGRAM
 (2-PIECE BOOM, BOOM HOSE RUPTURE VALVE, ARM HOSE RUPTURE VALVE, POSITIONING HOSE RUPTURE VALVE))
 ZAXIS330-3 CLASS HYDRAULIC CIRCUIT DIAGRAM
 (BREAKER AND CRUSHER PIPING, 2-SPEED FLOW COMBINING PIPING)