

PART NO. TT1T1-E-00

**HITACHI**

# Technical Manual

## Troubleshooting

# ZAXIS

## 160LC-3

## 180LC-3

## 180LCN-3

## Hydraulic Excavator

ZAXIS160LC-3 • 180LC-3 • 180LCN-3  
HYDRAULIC EXCAVATOR TECHNICAL MANUAL TROUBLESHOOTING

 **Hitachi Construction Machinery Co., Ltd.**  
URL:<http://www.hitachi-c-m.com>

Service Manual consists of the following separate Part No;  
Technical Manual (Operational Principle) : Vol. No.TO1T1-E  
Technical Manual (Troubleshooting) : Vol. No.TT1T1-E  
Workshop Manual : Vol. No.W1T1-E  
Engine Manual : Vol. No.KM-4JJ1-E



# INTRODUCTION

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## TO THE READER

- This manual is written for an experienced technician to provide technical information needed to maintain and repair this machine.
- Be sure to thoroughly read this manual for correct product information and service procedures.
- If you have any questions or comments, at if you found any errors regarding the contents of this manual, please contact using “Service Manual Revision Request Form” at the end of this manual. (Note: Do not tear off the form. Copy it for usage.):  
Publications Marketing & Product Support  
Hitachi Construction Machinery Co. Ltd.  
TEL: 81-298-32-7173  
FAX: 81-298-31-1162

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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

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## MANUAL COMPOSITION

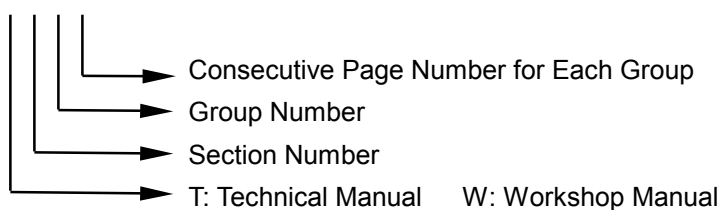
- This manual consists of three portions: the Technical Manual (Operational Principle), the Technical Manual (Troubleshooting) and the Workshop Manual.
- Information included in the Technical Manual (Operational Principle):  
technical information needed for redelivery and delivery, operation and activation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

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## PAGE NUMBER

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


Example : T 1-3-5



# 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 or machine damage.


 This is the safety alert symbol. When you see this symbol, be alert to the potential for personal injury. Never fail to follow the safety instructions prescribed along with the safety alert symbol.

The safety alert symbol is also used to draw attention to component/part weights.

To avoid injury and damage, be sure to use appropriate lifting techniques and equipment when lifting heavy parts.

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

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

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

## UNITS USED

- SI Units (International System of Units) are used in this manual.

MKSA system units and English units are also indicated in parentheses just behind SI units.

Example : 24.5 MPa (250 kgf/cm<sup>2</sup>, 3560 psi)

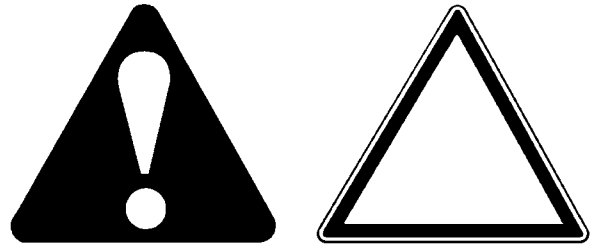
A table for conversion from SI units to other system units is shown below for reference purposes.

Quantity	To Convert From	Into	Multiply By	Quantity	To Convert From	Into	Multiply By
Length	mm	in	0.03937	Pressure	MPa	kgf/cm <sup>2</sup>	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 <sup>3</sup>	yd <sup>3</sup>	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 <sup>-1</sup>	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				

# SAFETY

## 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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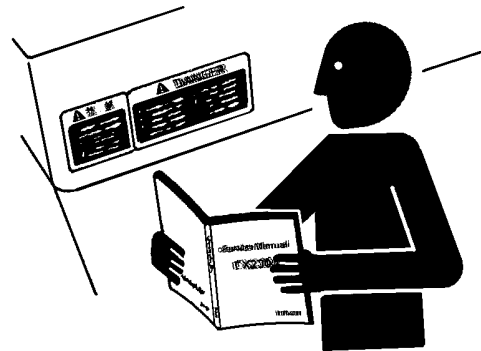
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# SAFETY

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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.



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003-E01B-0003

## SAFETY

### 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.



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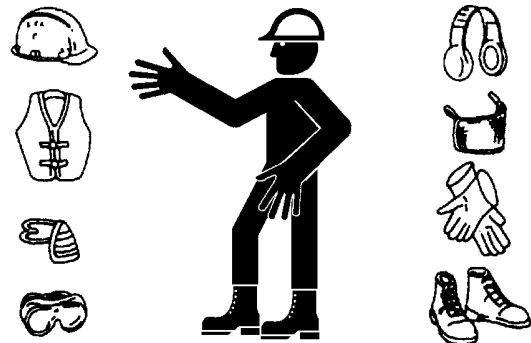
### WEAR PROTECTIVE CLOTHING

- 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.



SA-428

- 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.

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# SAFETY

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## PROTECT AGAINST NOISE

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



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## INSPECT MACHINE

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



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# SAFETY

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## 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.

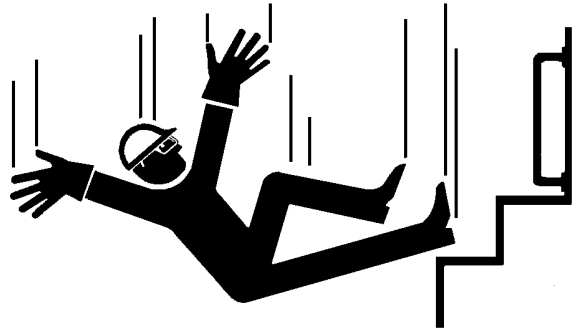
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## SAFETY

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### USE HANDHOLDS AND STEPS

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



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### 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.



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## SAFETY

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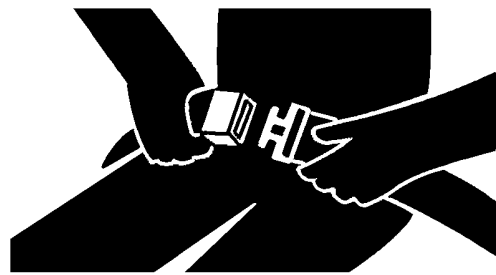
### ENSURE SAFETY BEFORE RISING FROM OR LEAVING OPERATOR'S SEAT

- 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.

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### 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.



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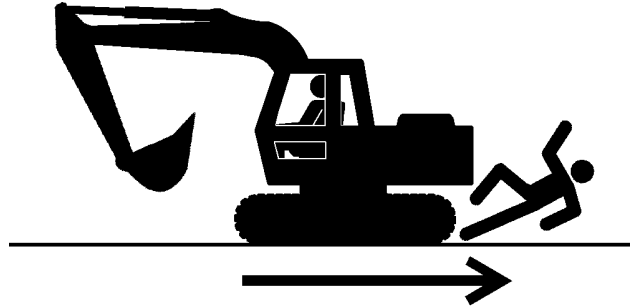
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## SAFETY

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### MOVE AND OPERATE MACHINE SAFELY

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



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### 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.



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## SAFETY

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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.



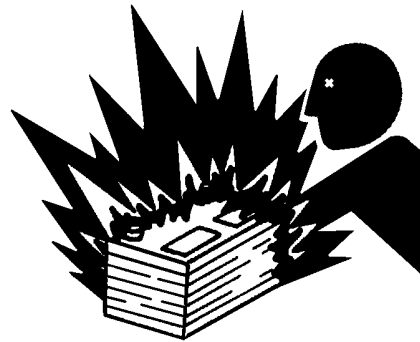
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### JUMP STARTING

- 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

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## SAFETY

### 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.

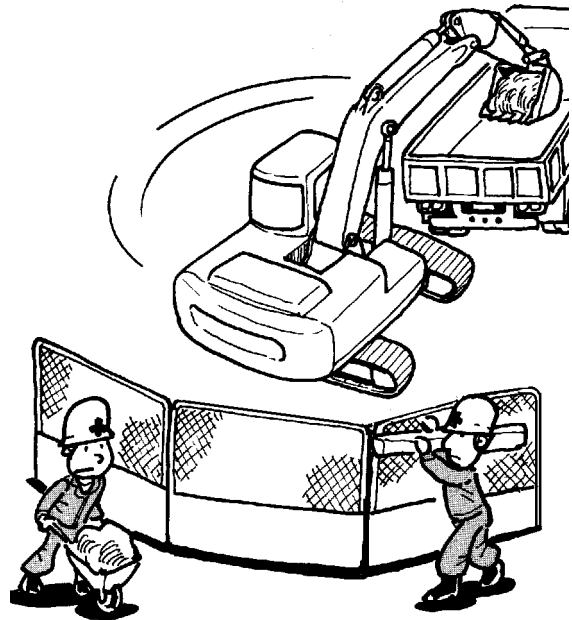
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SA-379

### 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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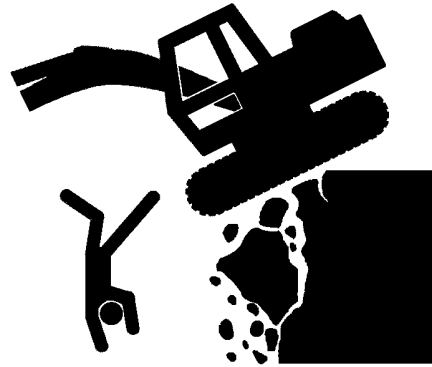
## SAFETY

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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.



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## SAFETY

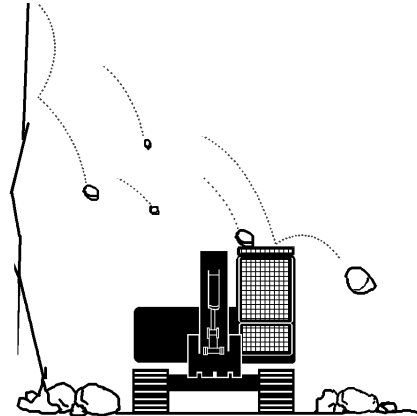
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### EQUIPMENT OF HEAD GUARD, ROPS, FOPS

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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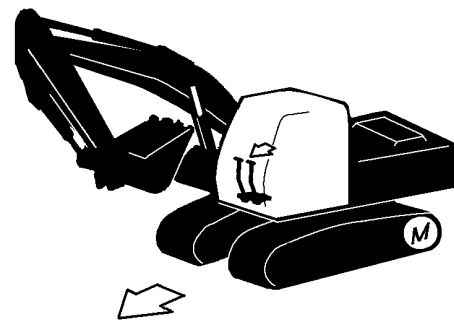


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### CONFIRM DIRECTION OF MACHINE TO BE DRIVEN

- 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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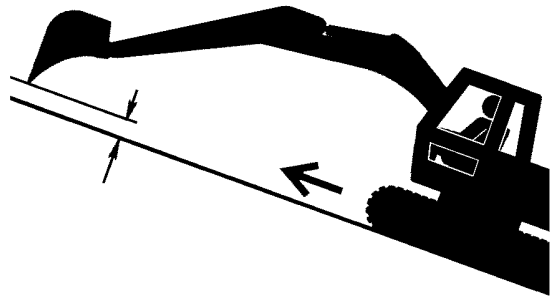
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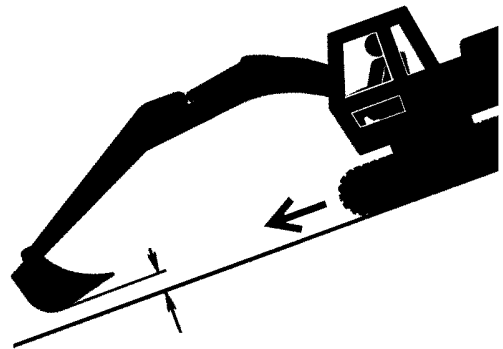
## SAFETY

### DRIVE MACHINE SAFELY

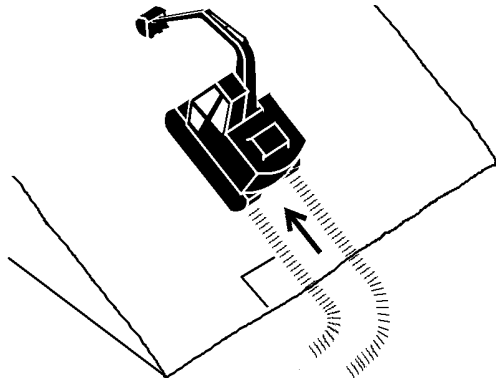
- Before driving the machine, always confirm that the travel levers/pedals direction corresponds to the direction you wish to drive.
- Be sure to detour around any obstructions.
- Avoid traveling over obstructions. Soil, fragments of rocks, and/or metal pieces may scatter around the machine. Don't allow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



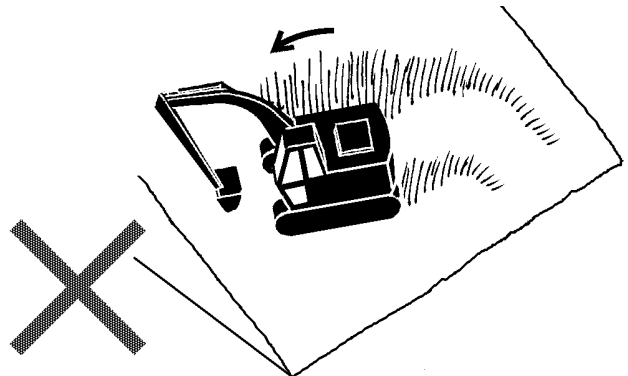
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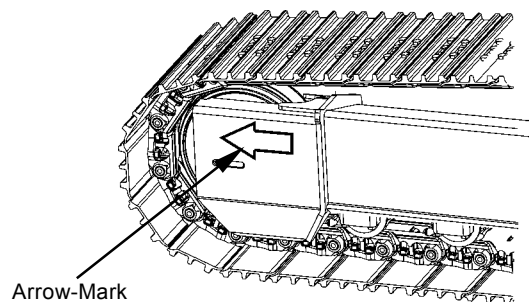
## SAFETY

### DRIVE MACHINE SAFELY

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



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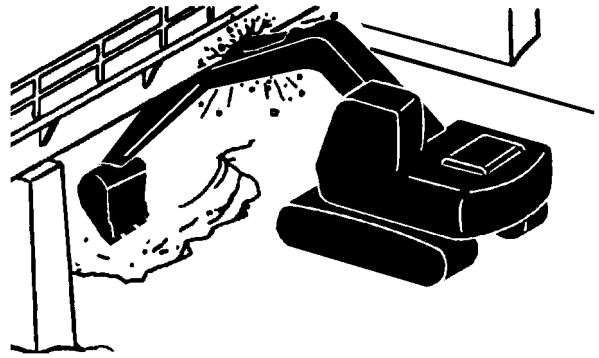


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## SAFETY

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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.



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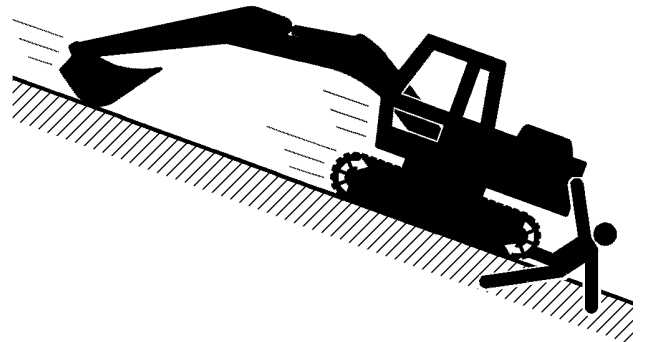
## SAFETY

### AVOID INJURY FROM ROLLAWAY ACCIDENTS

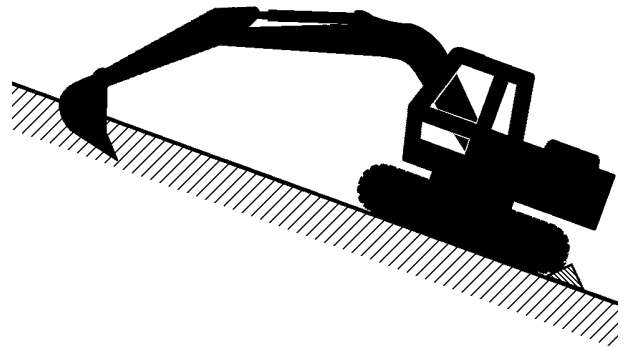
- Death or serious injury may result if you attempt to mount or stop a moving machine.

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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SA-392

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## SAFETY

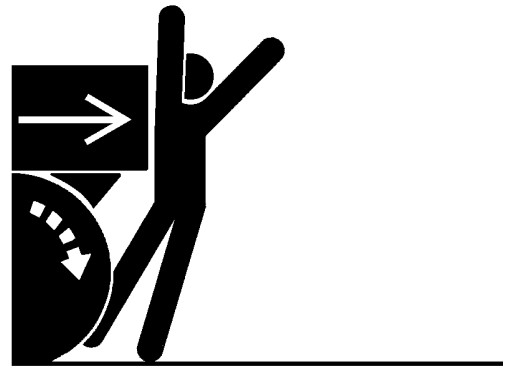
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### AVOID INJURY FROM BACK-OVER AND SWING ACCIDENTS

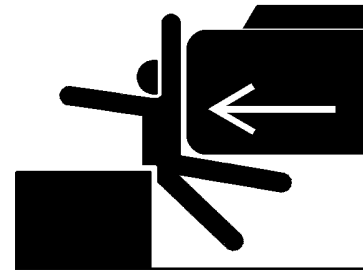
- If any person is present near the machine when backing or swinging the upperstructure, the machine may hit or run over that person, resulting in serious injury or death.

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.



SA-383



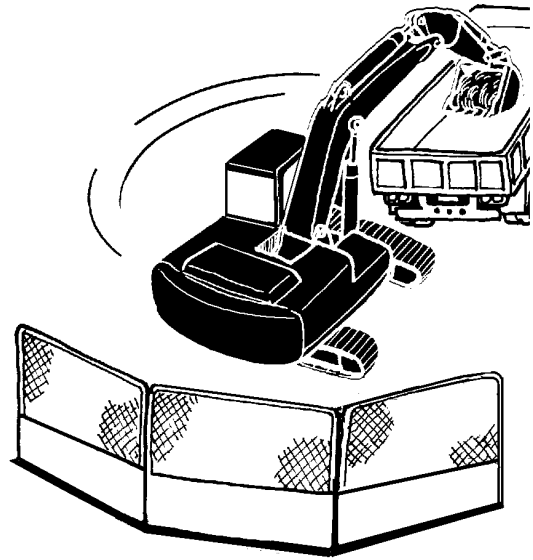
SA-384

021-E01A-0494

## SAFETY

### KEEP PERSON CLEAR FROM WORKING AREA

- A person may be hit severely by the swinging front attachment or counterweight and/or may be crushed against an other object, resulting in serious injury or death.
- Keep all persons clear from the area of operation and machine movement.
- Before operating the machine, set up barriers to the sides and rear area of the bucket swing radius to prevent anyone from entering the work area.



022-E01A-0386

SA-386

### NEVER POSITION BUCKET OVER ANYONE

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

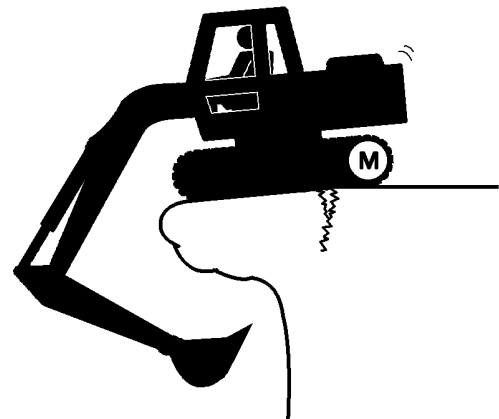


023-E01A-0487

SA-487

### AVOID UNDERCUTTING

- In order to retreat from the edge of an excavation if the footing should collapse, always position the undercarriage perpendicular to the edge of the excavation with the travel motors at the rear.
- If the footing starts to collapse and if retreat is not possible, do not panic. Often, the machine can be secured by lowering the front attachment, in such cases.



024-E01A-0488

SA-488

## SAFETY

### AVOID TIPPING

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

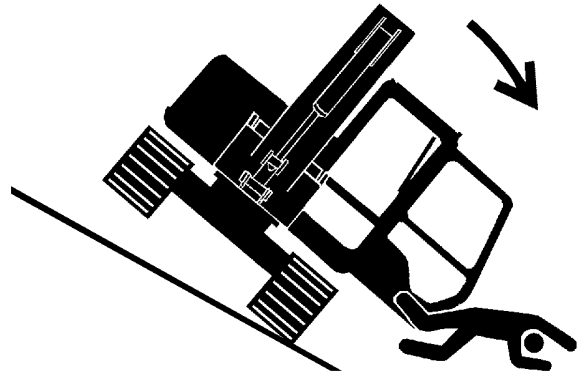
**MACHINE WILL TIP OVER FASTER THAN YOU CAN JUMP FREE**

**FASTEN YOUR SEAT BELT**

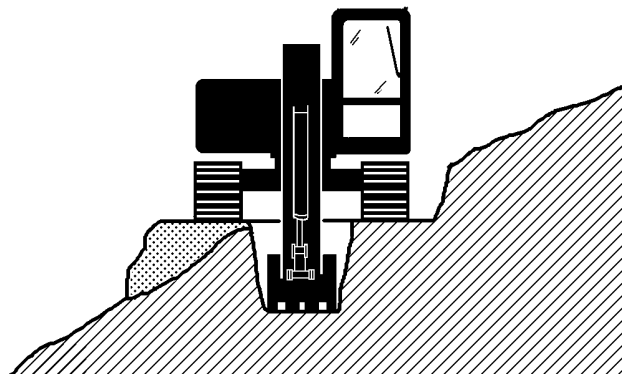
- The danger of tipping is always present when operating on a grade, possibly resulting in serious injury or death.

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.



SA-012



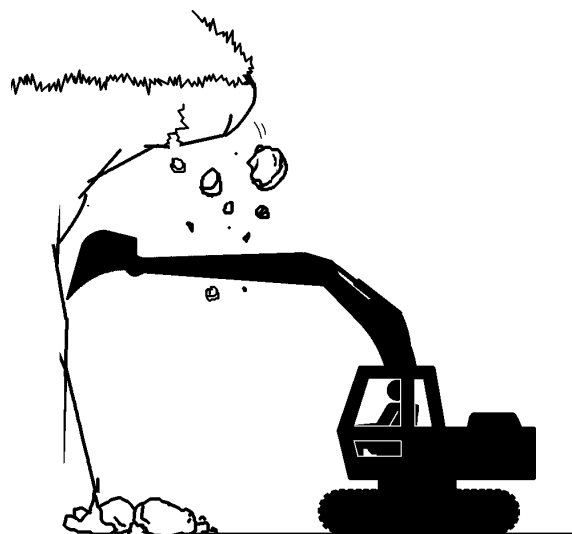
SA-440

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



SA-489

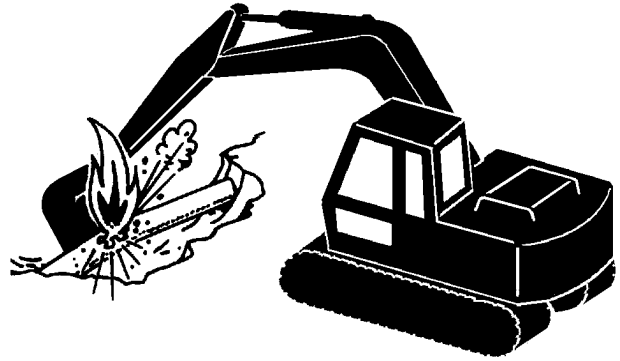
## SAFETY

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### 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



SA-382

### 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.

028-E01A-0389



SA-389



# SAFETY

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## AVOID POWER LINES

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

029-E01A-0381



SA-381

## PRECAUTIONS FOR LIGHTENING

- The machine is vulnerable to lightning 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.

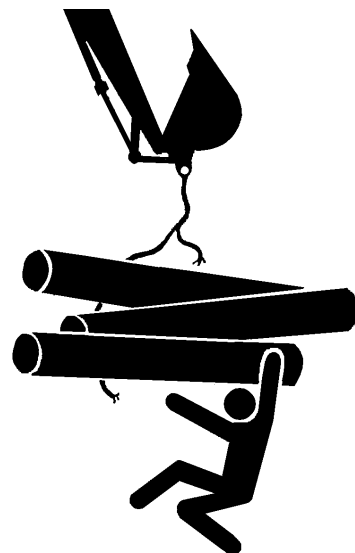


SA-1088

## 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, cables, slings, or ropes.
- Before craning, position the upperstructure with the travel motors at the rear.
- Move the load slowly and carefully. Never move it suddenly.
- Keep all persons well away from the load.
- Never move a load over a person's head.
- Do not allow anyone to approach the load until it is safely and securely situated on supporting blocks or on the ground.
- Never attach a sling or chain to the bucket teeth. They may come off, causing the load to fall.

032-E01A-0132

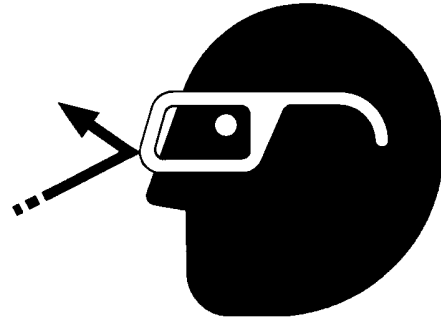


SA-014

## SAFETY

### PROTECT AGAINST FLYING DEBRIS

- If flying debris hit eyes or any other part of the body, serious injury may result.
- Guard against injury from flying pieces of metal or debris; wear goggles or safety glasses.
- Keep bystanders away from the working area before striking any object.



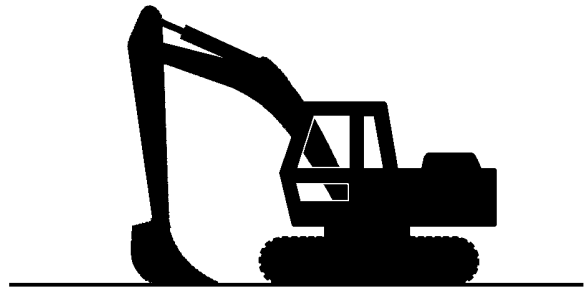
031-E01A-0432

SA-432

### PARK MACHINE SAFELY

To avoid accidents:

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



SA-390

### HANDLE FLUIDS SAFELY-AVOID FIRES

- Handle fuel with care; it is highly flammable. If fuel ignites, an explosion and/or a fire may occur, possibly resulting in serious injury or death.
- Do not refuel the machine while smoking or when near open flame or sparks.
- Always stop the engine before refueling the machine.
- Fill the fuel tank outdoors.
- All fuels, most lubricants, and some coolants are flammable.
- Store flammable fluids well away from fire hazards.
- Do not incinerate or puncture pressurized containers.
- Do not store oily rags; they can ignite and burn spontaneously.
- Securely tighten the fuel and oil filler cap.



SA-018



034-E01A-0496

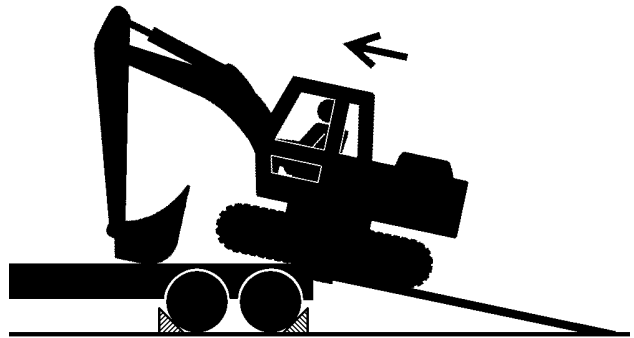
SA-019

## SAFETY

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### 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 flat-bed 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.



SA-395

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

035-E07A-0454

# SAFETY

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## PRACTICE SAFE MAINTENANCE

To avoid accidents:

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

Before servicing the machine:

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

500-E02C-0520



SA-028

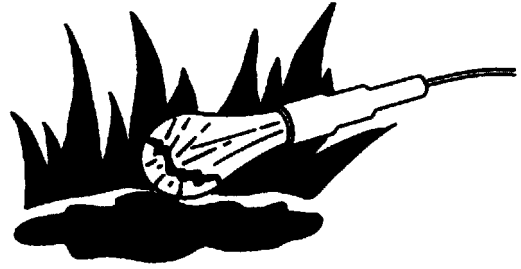


SA-527

## SAFETY

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- 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, anti-freeze fluid, or window washer fluid may catch fire.



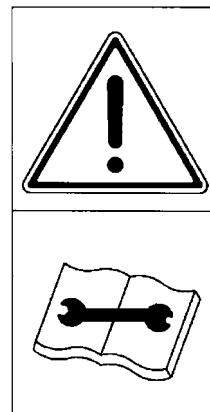
SA-037

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### 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

## SAFETY

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### SUPPORT MACHINE PROPERLY

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

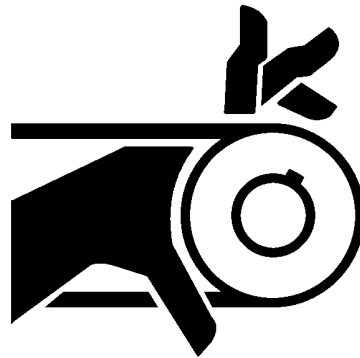


519-E01A-0527

SA-527

### STAY CLEAR OF MOVING PARTS

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



502-E01A-0026

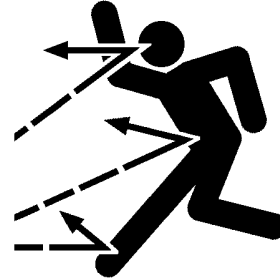
SA-026

## SAFETY

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### PREVENT PARTS FROM FLYING

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



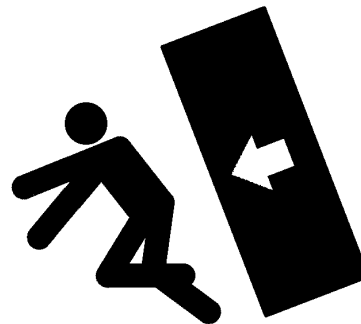
SA-344

503-E01B-0344

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### STORE ATTACHMENTS SAFELY

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



504-E01A-0034

SA-034

# SAFETY

## PREVENT BURNS

Hot spraying fluids:

- After operation, engine coolant is hot and under pressure. Hot water or steam is contained in the engine, radiator and heater lines. Skin contact with escaping hot water or steam can cause severe burns.
- To avoid possible injury from hot spraying water. DO NOT remove the radiator cap until the engine is cool. When opening, turn the cap slowly to the stop. Allow all pressure to be released before removing the cap.
- The hydraulic oil tank is pressurized. Again, be sure to release all pressure before removing the cap.



SA-039

Hot fluids and surfaces:

- Engine oil, gear oil and hydraulic oil also become hot during operation. The engine, hoses, lines and other parts become hot as well.
- Wait for the oil and components to cool before starting any maintenance or inspection work.



SA-225

505-E01B-0498

## REPLACE RUBBER HOSES PERIODICALLY

- Rubber hoses that contain flammable fluids under pressure may break due to aging, fatigue, and abrasion. It is very difficult to gauge the extent of deterioration due to aging, fatigue, and abrasion of rubber hoses by inspection alone.
- Periodically replace the rubber hoses. (See the page of "Periodic replacement of parts" in the operator's manual.)
- Failure to periodically replace rubber hoses may cause a fire, fluid injection into skin, or the front attachment to fall on a person nearby, which may result in severe burns, gangrene, or otherwise serious injury or death.



SA-019

S506-E01A-0019

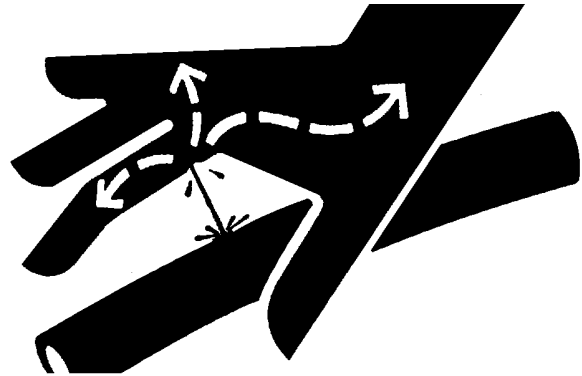


## SAFETY

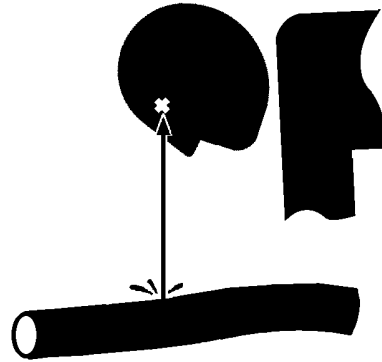
### AVOID HIGH-PRESSURE FLUIDS

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

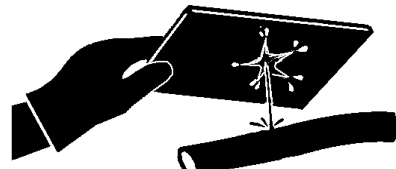
507-E03A-0499



SA-031



SA-292



SA-044

# SAFETY

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## PREVENT FIRES

Check for Oil Leaks:

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



SA-019

Check for Shorts:

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

Clean up Flammables:

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

Check Key Switch:

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

508-E02B-0019

Check Heat Shields:

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

508-E02A-0393

## SAFETY

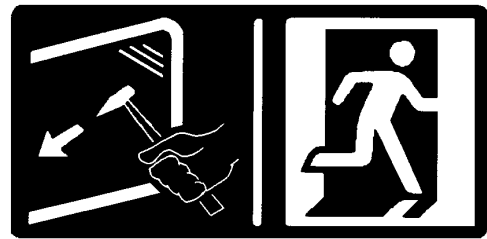
### EVACUATING IN CASE OF FIRE

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

18-E02B-0393



SA-393

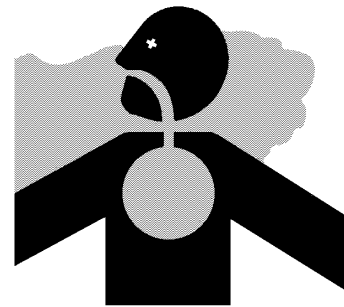


SS-1510

### BEWARE OF EXHAUST FUMES

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

509-E01A-0016



SA-016

### PRECAUTIONS FOR WELDING AND GRINDING

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

523-E01A-0818



SA-818

## SAFETY

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### 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

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### AVOID APPLYING HEAT TO LINES CONTAINING FLAMMABLE FLUIDS

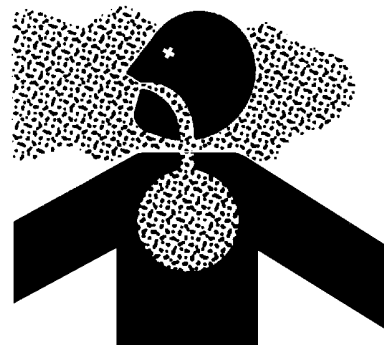
- Do not weld or flame cut pipes or tubes that contain flammable fluids.
- Clean them thoroughly with nonflammable solvent before welding or flame cutting them.

510-E01B-0030

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### REMOVE PAINT BEFORE WELDING OR HEATING

- Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch. If inhaled, these fumes may cause sickness.
- Avoid potentially toxic fumes and dust.
- Do all such work outside or in a well-ventilated area. Dispose of paint and solvent properly.
- Remove paint before welding or heating:
  1. If you sand or grind paint, avoid breathing the dust.  
Wear an approved respirator.
  2. If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.



SA-029

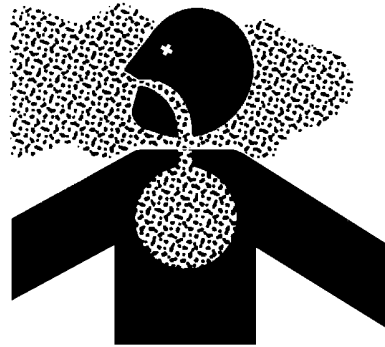
511-E01A-0029

## SAFETY

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### BEWARE OF ASBESTOS DUST

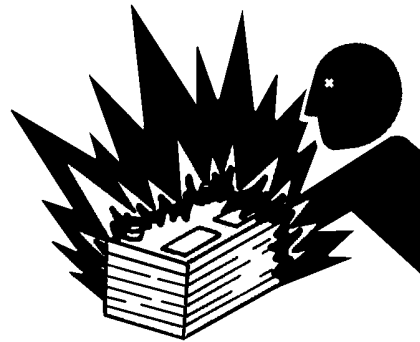
- Take care not to inhale dust produced in the work site. Inhalation of asbestos fibers may be the cause of lung cancer.
- Depending on the work site conditions, the risk of inhaling asbestos fiber may exist. Spray water to prevent asbestos from becoming airborne. Don't use compressed air.
- When operating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



SA-029

### PREVENT BATTERY EXPLOSIONS

- Battery gas can explode.
- Keep sparks, lighted matches, and flame away from the top of battery.
- Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.
- Do not charge a frozen battery or start engine with frozen battery.  
There is fear of explosion. If battery electrolyte is frozen, wait until it is liquefied completely in an atmospheric temperature room.
- Do not continue to use or charge the battery when electrolyte level is lower than specified. Explosion of the battery may result.
- Loose terminals may produce sparks. Securely tighten all terminals.
- Battery electrolyte is poisonous. If the battery should explode, battery electrolyte may be splashed into eyes, possibly resulting in blindness.
- Be sure to wear eye protection when checking electrolyte specific gravity.



SA-032

512-E01B-0032

## SAFETY

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### SERVICE AIR CONDITIONING SYSTEM SAFELY

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

513-E01A-0405



SA-405

### HANDLE CHEMICAL PRODUCTS SAFELY

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

515-E01A-0309



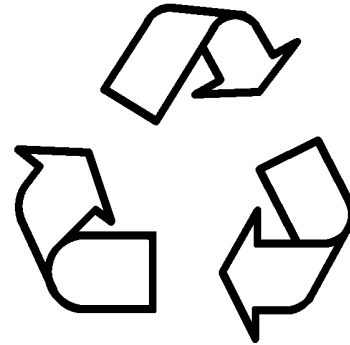
SA-309

## SAFETY

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### 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

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### 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



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SA-435

# SAFETY

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(Troubleshooting)

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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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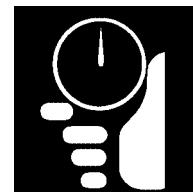
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# SECTION 4

# OPERATIONAL

# PERFORMANCE TEST



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# OPERATIONAL PERFORMANCE TEST / Introduction

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## OPERATIONAL PERFORMANCE TESTS

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

### **Purpose of Performance Tests**

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

### **Kinds of Tests**

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

### **Performance Standards**

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

### **Precautions for Evaluation of Test Data**

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

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

### **Definition of "Performance Standard"**

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

## OPERATIONAL PERFORMANCE TEST / Introduction

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### PREPARATION FOR PERFORMANCE TESTS

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

#### THE MACHINE

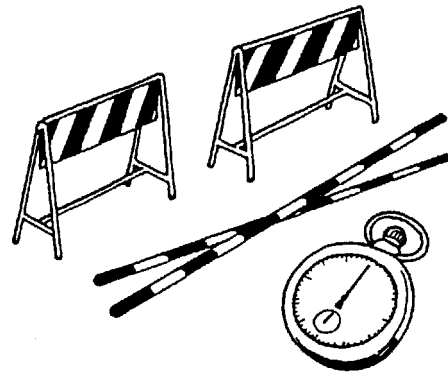
1. Repair any defects and damage found, such as oil or water leaks, loose bolts, cracks and so on, before starting to test.

#### TEST AREA

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

#### PRECAUTIONS

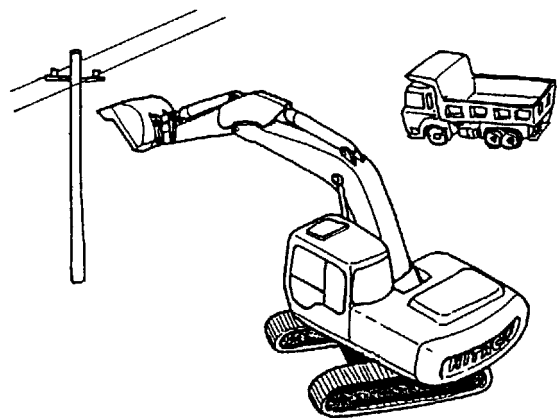
1. Before starting to test, agree upon the signals to be employed for communication among coworkers. Once the test is started, be sure to communicate with each other using these signals, and to follow them without fail.
2. Operate the machine carefully and always give first priority to safety.
3. While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



T105-06-01-003

#### MAKE PRECISE MEASUREMENT

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



T105-06-01-004

## OPERATIONAL PERFORMANCE TEST / Standard

### ZAXIS160LC-3 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.

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)

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:

PERFORMANCE TEST DESIGNATION	ZAXIS160LC-3 (Performance Standard)	Remarks	Reference Page
<b>ENGINE SPEED</b> <span style="float: right;">min<sup>-1</sup></span>			T4-3-1
Slow Idle Speed	900±50	Lever in neutral	
Fast Idle Speed (With ECO deactivated)	2000±50		
Fast Idle Speed	1900±50	Lever in neutral, Pilot shut-off lever: UNLOCK position	
Fast Idle Speed (Relief operation)	2000±50	Boom raise relief operation	
Fast Idle Speed (E mode)	1850±50	Lever in neutral	
Fast Idle Speed (HP mode)	2200±50	Relief operation of boom raise and arm roll-in	
Auto-Idle Speed	1200±50		
Warming-Up Speed	1400±100		
<b>ENGINE COMPRESSION PRESSURE</b> <span style="float: right;">MPa (kgf/cm<sup>2</sup>, psi)</span>	3.04±0.2 (31±2, 442±29)	Engine speed: 200min <sup>-1</sup>	T4-3-3
<b>VALVE CLEARANCE (IN, EX)</b>	0.15	With the engine cold	T4-3-4
<b>LUBRICANT CONSUMPTION</b> (Rated output) <span style="float: right;">mL/h</span>	30 or less	Hour meter: 2000 hours or less	T4-3-7

## OPERATIONAL PERFORMANCE TEST / Standard

PERFORMANCE TEST DESIGNATION	ZAXIS160LC-3 (Performance Standard)	Remarks	Reference Page
<b>TRAVEL SPEED</b> <span style="float: right;">sec/10 m</span>			T4-4-1
Fast Speed	6.8±0.6		
Slow Speed	10.5±1.0		
<b>TRACK REVOLUTION SPEED</b> <span style="float: right;">sec/3 rev</span>			T4-4-2
Fast Speed	16.9±2.0		
Slow Speed	26.2±2.0		
<b>MISTRACK</b> <span style="float: right;">mm/20 m</span> (With fast and slow travel speed modes)	200 or less		T4-4-3
<b>TRAVEL MOTOR LEAKAGE</b> <span style="float: right;">mm/5 min</span>	0		T4-4-4
<b>SWING SPEED</b> <span style="float: right;">sec/3 rev</span>	13.5±1.5	Bucket: empty	T4-4-5
<b>SWING FUNCTION DRIFT CHECK</b> <span style="float: right;">mm /180°</span>	1260 or less	Bucket: empty	T4-4-6
<b>SWING MOTOR LEAKAGE</b> <span style="float: right;">mm/5 min</span>	0	Bucket: loaded	T4-4-8
<b>MAXIMUM SWINGABLE SLANT ANGLE</b> <span style="float: right;">deg.</span>	25° or more	Bucket: loaded	T4-4-10
<b>SWING BEARING PLAY</b> <span style="float: right;">mm</span>	0.2 to 1.0	Allowable limit: 2.0 to 3.05	T4-4-11
<b>HYDRAULIC CYLINDER CYCLE TIME (Mono Boom)</b> <span style="float: right;">sec</span>		2.58 m arm 0.6 m <sup>3</sup> (PCSA heaped) bucket, bucket: empty	T4-4-12
Boom Raise	3.0±0.3		
Boom Lower (without HRV)	2.2±0.3	HRV: Hose Rupture Valve	
(with HRV)	2.4±0.3		
Arm Roll-In	3.6±0.3		
Arm Roll-Out	2.6±0.3		
Bucket Roll-In	3.2±0.3		
Bucket Roll-Out	2.0±0.3		
<b>HYDRAULIC CYLINDER CYCLE TIME (2-Piece Boom)</b> <span style="float: right;">sec</span>		2.58 m arm 0.6 m <sup>3</sup> (PCSA heaped) bucket, bucket: empty	T4-4-12
Boom Raise	3.5±0.3		
Boom Lower (without HRV)	3.1±0.3	HRV: Hose Rupture Valve	
(with HRV)	3.3±0.3		
Arm Roll-In	3.6±0.3		
Arm Roll-Out	2.6±0.3		
Bucket Roll-In	3.2±0.3		
Bucket Roll-Out	2.0±0.3		
Positioning Lower	4.5±0.3		
Positioning Raise	4.1±0.3		



## OPERATIONAL PERFORMANCE TEST / Standard

PERFORMANCE TEST DESIGNATION	ZAXIS160LC-3 (Performance Standard)	Remarks	Reference Page
<b>DIG FUNCTION DRIFT CHECK (Mono Boom)</b> <span style="float: right;">mm/5 min</span>		2.58 m arm 0.6 m <sup>3</sup> (PCSA heaped) bucket	T4-4-14
Boom Cylinder (Maximum Reach Position) (Arm Roll-In position)	5 or less 5 or less	Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In position)	10 or less 15 or less	Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In position)	15 or less 9 or less	Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In position)	100 or less 80 or less	Bucket: loaded Bucket: empty	
<b>DIG FUNCTION DRIFT CHECK (2-Piece Boom)</b> <span style="float: right;">mm/5 min</span>		2.58 m arm 0.6 m <sup>3</sup> (PCSA heaped) bucket	T4-4-14
Boom Cylinder (Maximum Reach Position) (Arm Roll-In position)	5 or less 5 or less	Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In position)	10 or less 15 or less	Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In position)	15 or less 9 or less	Bucket: loaded Bucket: empty	
Positioning Cylinder (Maximum Reach Position) (Arm Roll-In position)	40 or less 30 or less	Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In position)	200 or less 150 or less	Bucket: loaded Bucket: empty	

## OPERATIONAL PERFORMANCE TEST / Standard

PERFORMANCE TEST DESIGNATION	ZAXIS160LC-3 (Performance Standard)	Remarks	Reference Page
<b>CONTROL LEVER OPERATING FORCE</b> 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)	16 (1.6, 3.6) or less		
Travel Lever	28 (2.8, 6.3) or less		
<b>CONTROL LEVER STROKE</b> mm		HITACHI lever pattern	T4-4-17
Boom Lever	97±10		
Arm Lever (ISO Lever Pattern: Swing Lever)	82±10		
Bucket Lever	82±10		
Swing Lever (ISO Lever Pattern: Arm Lever)	97±10		
Travel Lever	120±10		
<b>BOOM RAISE/SWING</b> sec	3.5±0.4	2.58 m arm 0.6 m <sup>3</sup> (PCSA heaped) bucket, bucket: empty	T4-4-18
(Bucket Teeth Height: H) mm	5800 or more		
<b>BOOM RAISE/ARM ROLL-IN</b> sec	(4.3±0.5)	2.58 m arm 0.6 m <sup>3</sup> (PCSA heaped) bucket	T4-4-19
<b>HYDRAULIC SYSTEM</b>			
<b>PRIMARY PILOT PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-1
Engine: Fast Idle	4.0 <sup>+1.0</sup> <sub>-0.5</sub> , 580 <sup>+142</sup> <sub>-71</sub> (40 <sup>+10</sup> <sub>-5</sub> )		
Engine: Slow Idle	3.8 <sup>+1.0</sup> <sub>-0</sub> , 550 <sup>+145</sup> <sub>-0</sub> (38 <sup>+10</sup> <sub>-0</sub> )		
<b>SECONDARY PILOT PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-3
(Engine: Fast Idle (normal) and Slow Idle)	3.4 to 4.0 (34 to 40, 483 to 570)	Value indicated on Dr. ZX (Lever: Full stroke)	
<b>SOLENOID VALVE SET PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)	Value Indicated On Dr. ZX±0.2 (2, 29)		T4-5-4
<b>MAIN PUMP DELIVERY PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)	0.8 <sup>+1.2</sup> <sub>-0.5</sub> , 115 <sup>+175</sup> <sub>-71</sub> (8 <sup>+12</sup> <sub>-5</sub> )	In neutral	T4-5-6

## OPERATIONAL PERFORMANCE TEST / Standard

PERFORMANCE TEST DESIGNATION	ZAXIS160LC-3 (Performance Standard)	Remarks	Reference Page
<b>MAIN RELIEF VALVE PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-8
Arm, Bucket (Relief operation for each)	34.3 <sup>+2.0</sup> <sub>-0.5</sub> (350 <sup>+20</sup> <sub>-5</sub> , 4980 <sup>+284</sup> <sub>-71</sub> )		
Relief operation of Positioning (2-piece boom only)	34.3 <sup>+2.0</sup> <sub>-0.5</sub> (350 <sup>+20</sup> <sub>-5</sub> , 4980 <sup>+284</sup> <sub>-71</sub> )		
Power Digging Boom raise relief operation	36.3 <sup>+2.0</sup> <sub>-1.0</sub> (370 <sup>+20</sup> <sub>-10</sub> , 5260 <sup>+284</sup> <sub>-142</sub> )		
<b>RELIEF PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi) <b>(Relief operation for Swing)</b>	30.2 <sup>+2.3</sup> <sub>-0.5</sub> (308 <sup>+23</sup> <sub>-5</sub> , 4390 <sup>+330</sup> <sub>-73</sub> )		T4-5-10
<b>OVERLOAD RELIEF PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)		(Reference values at 50 L/min)	T4-5-12
Boom Lower, Arm Roll-In, Bucket Roll-In	37.2 <sup>+1.0</sup> <sub>-0</sub> (380 <sup>+10</sup> <sub>-0</sub> , 5400 <sup>+142</sup> <sub>-0</sub> )		
Boom Raise, Arm Roll-Out, Bucket Roll-Out	39.2 <sup>+1.0</sup> <sub>-0</sub> (400 <sup>+10</sup> <sub>-0</sub> , 5690 <sup>+142</sup> <sub>-0</sub> )		
<b>MAIN PUMP FLOW RATE</b> (L/min)	-	Refer to pages T4-2-12, 13.	T4-5-14
<b>SWING MOTOR DRAINAGE</b> (L/min)			T4-5-20
With constant speed	0.2 to 0.5		
With the motor relieved	(2 to 5)		
<b>TRAVEL MOTOR DRAINAGE</b> (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	

## OPERATIONAL PERFORMANCE TEST / Standard

### ZAXIS180LC-3 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.

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)

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:

PERFORMANCE TEST DESIGNATION	ZAXIS180LC-3 (Performance Standard)	Remarks	Reference Page
<b>ENGINE SPEED</b> <span style="float: right;">min<sup>-1</sup></span>			T4-3-1
Slow Idle Speed	900±50	Lever in neutral	
Fast Idle Speed (With ECO deactivated)	2000±50	With ECO deactivated	
Fast Idle Speed	1900±50	Lever in neutral, Pilot shut-off lever: UNLOCK position	
Fast Idle Speed (Relief operation)	2000±50	Boom raise relief operation	
Fast Idle Speed (E mode)	1850±50	Lever in neutral	
Fast Idle Speed (HP mode)	2200±50	Relief operation of boom raise and arm roll-in	
Auto-Idle Speed	1200±50		
Warming-Up Speed	1400±100		
<b>ENGINE COMPRESSION PRESSURE</b> <span style="float: right;">MPa (kgf/cm<sup>2</sup>, psi)</span>	3.04±0.2 (31±2, 442±29)	Engine speed: 200min <sup>-1</sup>	T4-3-3
<b>VALVE CLEARANCE (IN, EX)</b>	0.15	With the engine cold	T4-3-4
<b>LUBRICANT CONSUMPTION</b> (Rated output) <span style="float: right;">mL/h</span>	25 or less	Hour meter: 2000 hours or less	T4-3-7

## OPERATIONAL PERFORMANCE TEST / Standard

PERFORMANCE TEST DESIGNATION	ZAXIS180LC-3 (Performance Standard)	Remarks	Reference Page
<b>TRAVEL SPEED</b> <span style="float: right;">sec/10 m</span>			T4-4-1
Fast Speed	6.8±0.6		
Slow Speed	10.5±1.0		
<b>TRACK REVOLUTION SPEED</b> <span style="float: right;">sec/3 rev</span>			T4-4-2
Fast Speed	18.1±2.0		
Slow Speed	28.0±2.0		
<b>MISTRACK</b> <span style="float: right;">mm/20 m</span> (With fast and slow travel speed modes)	200 or less		T4-4-3
<b>TRAVEL MOTOR LEAKAGE</b> <span style="float: right;">mm/5 min</span>	0		T4-4-4
<b>SWING SPEED</b> <span style="float: right;">sec/3 rev</span>	12.8±1.5	Bucket: empty	T4-4-5
<b>SWING FUNCTION DRIFT CHECK</b> <span style="float: right;">mm /180°</span>	1260 or less	Bucket: empty	T4-4-6
<b>SWING MOTOR LEAKAGE</b> <span style="float: right;">mm/5 min</span>	0	Bucket: loaded	T4-4-8
<b>MAXIMUM SWINGABLE SLANT ANGLE</b> <span style="float: right;">deg.</span>	25° or more	Bucket: loaded	T4-4-10
<b>SWING BEARING PLAY</b> <span style="float: right;">mm</span>	0.2 to 1.0	Allowable limit: 2.0 to 3.05	T4-4-11
<b>HYDRAULIC CYLINDER CYCLE TIME (Mono Boom)</b> <span style="float: right;">sec</span>		2.70 m arm 0.7 m <sup>3</sup> (PCSA heaped) bucket, bucket: empty	T4-4-12
Boom Raise	3.2±0.3		
Boom Lower (without HRV)	2.2±0.3	HRV: Hose Rupture Valve	
(with HRV)	2.4±0.3		
Arm Roll-In	3.5±0.3		
Arm Roll-Out	2.7±0.3		
Bucket Roll-In	3.2±0.3		
Bucket Roll-Out	2.0±0.3		
<b>HYDRAULIC CYLINDER CYCLE TIME (2-Piece Boom)</b> <span style="float: right;">sec</span>		2.70 m arm 0.7 m <sup>3</sup> (PCSA heaped) bucket, bucket: empty	T4-4-12
Boom Raise	4.0±0.3		
Boom Lower (without HRV)	3.3±0.3	HRV: Hose Rupture Valve	
(with HRV)	3.5±0.3		
Arm Roll-In	3.5±0.3		
Arm Roll-Out	2.7±0.3		
Bucket Roll-In	3.2±0.3		
Bucket Roll-Out	2.0±0.3		
Positioning Lower (without HRV)	6.0±0.3	HRV: Hose Rupture Valve	
(with HRV)	6.4±0.3		
Positioning Raise	4.7±0.3		

## OPERATIONAL PERFORMANCE TEST / Standard

PERFORMANCE TEST DESIGNATION	ZAXIS180LC-3 (Performance Standard)	Remarks	Reference Page
<b>DIG FUNCTION DRIFT CHECK (Mono Boom)</b> <span style="float: right;">mm/5 min</span>		2.70 m arm 0.7 m <sup>3</sup> (PCSA heaped) bucket	T4-4-14
Boom Cylinder (Maximum Reach Position) (Arm Roll-In position)	5 or less 5 or less	Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In position)	10 or less 15 or less	Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In position)	15 or less 9 or less	Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In position)	100 or less 80 or less	Bucket: loaded Bucket: empty	
<b>DIG FUNCTION DRIFT CHECK (2-Piece Boom)</b> <span style="float: right;">mm/5 min</span>		2.70 m arm 0.7 m <sup>3</sup> (PCSA heaped) bucket	T4-4-14
Boom Cylinder (Maximum Reach Position) (Arm Roll-In position)	5 or less 5 or less	Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In position)	10 or less 15 or less	Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In position)	15 or less 9 or less	Bucket: loaded Bucket: empty	
Positioning Cylinder (Maximum Reach Position) (Arm Roll-In position)	40 or less 30 or less	Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In position)	200 or less 150 or less	Bucket: loaded Bucket: empty	

## OPERATIONAL PERFORMANCE TEST / Standard

PERFORMANCE TEST DESIGNATION	ZAXIS180LC-3 (Performance Standard)	Remarks	Reference Page
<b>CONTROL LEVER OPERATING FORCE</b> 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)	16 (1.6, 3.6) or less		
Travel Lever	28 (2.8, 6.3) or less		
<b>CONTROL LEVER STROKE</b> mm		HITACHI lever pattern	T4-4-17
Boom Lever	97±10		
Arm Lever (ISO Lever Pattern: Swing Lever)	82±10		
Bucket Lever	82±10		
Swing Lever (ISO Lever Pattern: Arm Lever)	97±10		
Travel Lever	120±10		
<b>BOOM RAISE/SWING</b> sec	3.7±0.4	2.70 m arm 0.7 m <sup>3</sup> (PCSA heaped) bucket, bucket: empty	T4-4-18
Bucket Teeth Height: H mm	6300 or more		
<b>BOOM RAISE/ARM ROLL-IN</b> sec	4.0±0.5	2.70 m arm 0.7 m <sup>3</sup> (PCSA heaped) bucket	T4-4-19
<b>HYDRAULIC SYSTEM</b>			
<b>PRIMARY PILOT PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-1
Engine: Fast Idle	4.0 <sup>+1.0</sup> <sub>-0.5</sub> (40 <sup>+10</sup> <sub>-5</sub> , 580 <sup>+142</sup> <sub>-71</sub> )		
Engine: Slow Idle	3.8 <sup>+1.0</sup> <sub>-0</sub> (39 <sup>+10</sup> <sub>-0</sub> , 550 <sup>+142</sup> <sub>-0</sub> )		
<b>SECONDARY PILOT PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-3
(Engine: Fast Idle (normal) and Slow Idle)	3.4 to 4.0 (34 to 40, 483 to 570)	Value indicated on Dr. ZX (Lever: Full stroke)	
<b>SOLENOID VALVE SET PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)	Value Indicated On Dr. ZX±0.2 (2, 28)		T4-5-4
<b>MAIN PUMP DELIVERY PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)	0.8 <sup>+1.2</sup> <sub>-0.5</sub> (8 <sup>+12</sup> <sub>-5</sub> , 115 <sup>+175</sup> <sub>-71</sub> )	In neutral	T4-5-6

## OPERATIONAL PERFORMANCE TEST / Standard

PERFORMANCE TEST DESIGNATION	ZAXIS180LC-3 (Performance Standard)	Remarks	Reference Page
<b>MAIN RELIEF VALVE PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-8
Arm, Bucket (Relief operation for each)	34.3 <sup>+2.0</sup> <sub>-0.5</sub> (350 <sup>+20</sup> <sub>-5</sub> , 4980 <sup>+284</sup> <sub>-71</sub> )		
Relief operation of Positioning (2-piece boom only)	34.3 <sup>+2.0</sup> <sub>-0.5</sub> (350 <sup>+20</sup> <sub>-5</sub> , 4980 <sup>+284</sup> <sub>-71</sub> )		
Power Digging Boom raise relief operation	36.3 <sup>+2.0</sup> <sub>-1.0</sub> (370 <sup>+20</sup> <sub>-10</sub> , 5260 <sup>+284</sup> <sub>-142</sub> )		
<b>RELIEF PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi) <b>(Relief operation for Swing)</b>	32.6 <sup>+2.3</sup> <sub>-0.5</sub> (333 <sup>+23</sup> <sub>-5</sub> , 4739 <sup>+334</sup> <sub>-73</sub> )		T4-5-10
<b>OVERLOAD RELIEF PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)		(Reference values at 50 L/min)	T4-5-12
Boom Lower, Arm Roll-In, Bucket Roll-In	37.2 <sup>+1.0</sup> <sub>-0</sub> (380 <sup>+10</sup> <sub>-0</sub> , 5400 <sup>+142</sup> <sub>-0</sub> )		
Boom Raise, Arm Roll-Out, Bucket Roll-Out	39.2 <sup>+1.0</sup> <sub>-0</sub> (400 <sup>+10</sup> <sub>-0</sub> , 5690 <sup>+142</sup> <sub>-0</sub> )		
<b>MAIN PUMP FLOW RATE</b> (L/min)	-	Refer to pages T4-2-12, 13.	T4-5-14
<b>SWING MOTOR DRAINAGE</b> (L/min)			T4-5-20
With constant speed	0.2 to 0.5		
With the motor relieved	(2 to 5)		
<b>TRAVEL MOTOR DRAINAGE</b> (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	



## OPERATIONAL PERFORMANCE TEST / Standard

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## OPERATIONAL PERFORMANCE TEST / Standard

### MAIN PUMP P-Q DIAGRAM

- P-Q Control (Torque Control)

(REFERENCE: Measured at Test Stand)

- Rated Pump Speed:  
 ZAXIS160LC-3: 2000 min<sup>-1</sup> (rpm)  
 ZAXIS180LC-3: 2000 min<sup>-1</sup> (rpm)
- Hydraulic Oil Temperature: 50±5 °C (122±41 °F)

 NOTE: Refer to T4-5-14.

- ZAXIS160LC-3 Points on P-Q Line

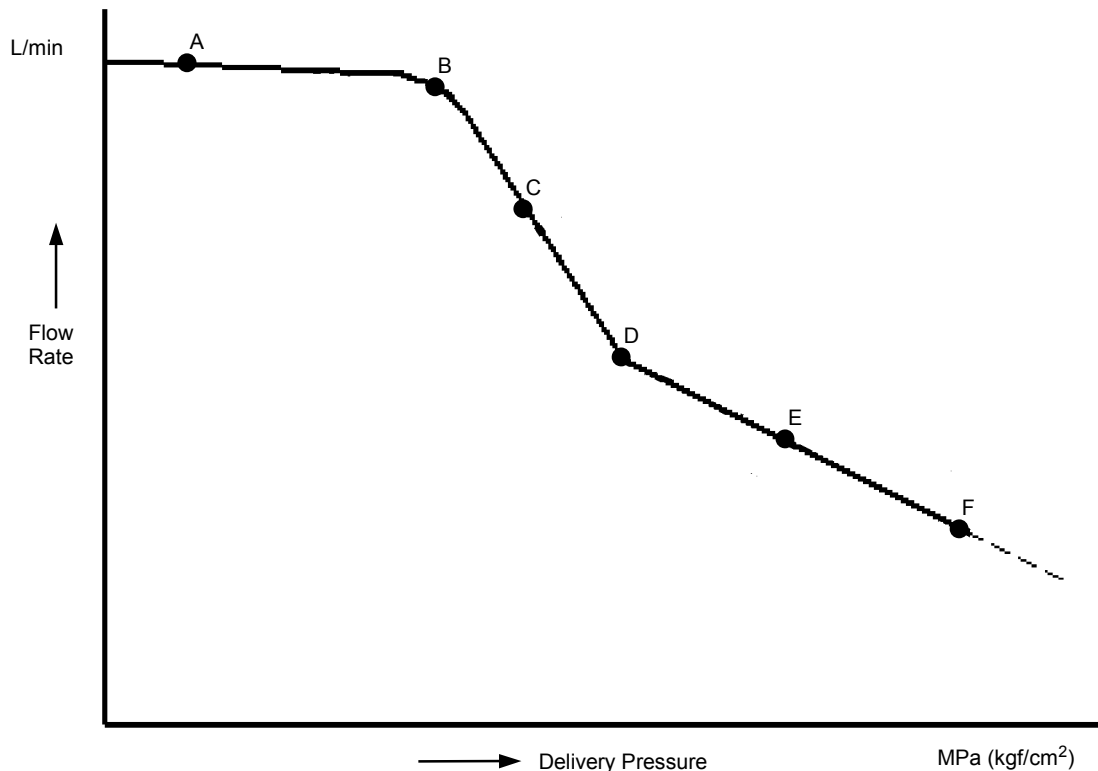
	Delivery Pressure MPa (kgf/cm <sup>2</sup> , psi)	Flow Rate L/min (gpm)
A	3.9 (40, 570)	174±3 (46±0.8)
B	14.2 (145, 2064)	[172] ([45])
C	16.7 (170, 2428)	150±6 (40±1.6)
D	20.1 (205, 2922)	[115] ([30])
E	21.4 (218, 3111)	110±6 (29±1.6)
F	34.3 (350, 4980)	52±10 (14±2.6)

The value indicated in parentheses is only a reference value.

- ZAXIS180LC-3 Points on P-Q Line

	Delivery Pressure MPa (kgf/cm <sup>2</sup> , psi)	Flow Rate L/min (gpm)
A	3.9 (40, 570)	174±3 (46±0.8)
B	14.2 (145, 2064)	[172] ([45])
C	16.7 (170, 2428)	150±6 (40±1.6)
D	20.1 (205, 2922)	[115] ([30])
E	21.4 (218, 3111)	110±6 (29±1.6)
F	34.3 (350, 4980)	52±10 (14±2.6)

The value indicated in parentheses is only a reference value.



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## OPERATIONAL PERFORMANCE TEST / Standard

• P-Q Control by Pump Control Pilot Pressure Signal

\* (REFERENCE: Measured at Test Stand)

- Rated Pump Speed:  
 ZAXIS160LC-3: 2000 min<sup>-1</sup> (rpm)  
 ZAXIS180LC-3: 2000 min<sup>-1</sup> (rpm)
- Hydraulic Oil Temperature: 50±5 °C (122±41 °F)

NOTE: Refer to T4-5-16.

• ZAXIS160LC-3 Points on P-Q Line

	Pump Control Pressure MPa (kgf/cm <sup>2</sup> , psi)	Flow Rate L/min (gpm)
A	1.9±0.2 (19±2.0, 276±29)	70±4 (18±1.0)
B	3.4±0.05 (35±0.5, 494±7.3)	150±8 (40±2.1)
C	2.9 <sup>+0.05</sup> <sub>-0.29</sub> (30 <sup>+0.5</sup> <sub>-3</sub> , 420 <sup>+7.3</sup> <sub>-42</sub> )	174±3 (46±0.8)

The value indicated in parentheses is only a reference value.

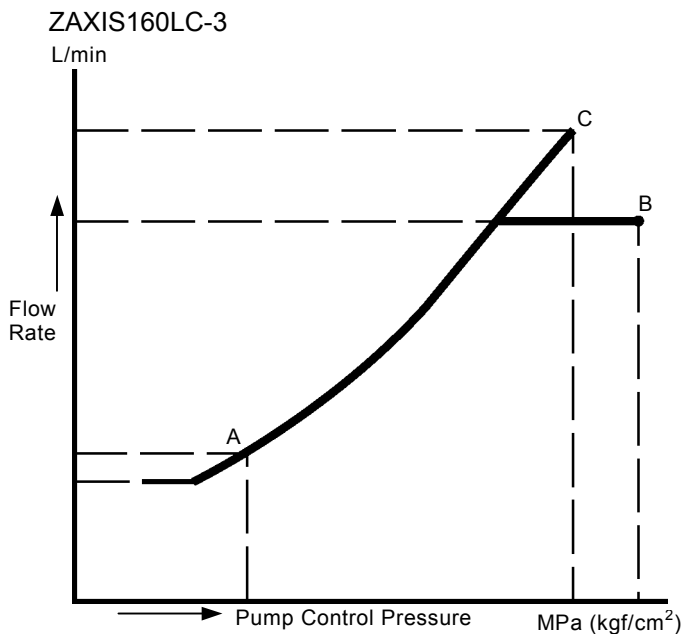
B: Flow rate (Flow rate limit control)

C: Flow rate (No flow rate limit control)

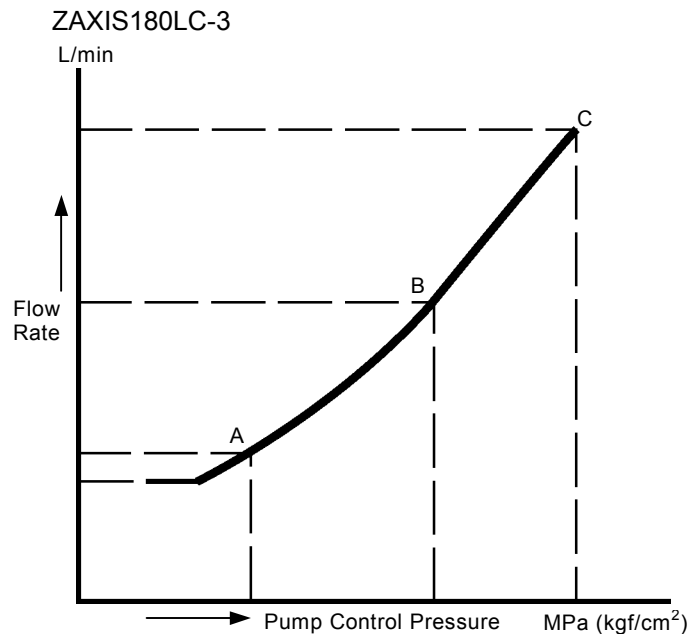
• ZAXIS180LC-3 Points on P-Q Line

	Pump Control Pressure MPa (kgf/cm <sup>2</sup> , psi)	Flow Rate L/min (gpm)
A	1.9±0.05 (19±0.5, 276±7.3)	70±2 (18±0.5)
B	2.0 (20, 290)	[80] ([21])
C	2.9 <sup>+0.05</sup> <sub>-0.29</sub> (30 <sup>+0.5</sup> <sub>-3</sub> , 420 <sup>+7.3</sup> <sub>-42</sub> )	174±3 (46±0.8)

The value indicated in parentheses is only a reference value.



T1T1-04-02-001



T1T1-04-02-002

## OPERATIONAL PERFORMANCE TEST / Standard

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### SENSOR ACTIVATING RANGE

#### 1. Checking Method

- Hydraulic Oil Temperature:  $50 \pm 5$  °C ( $122 \pm 41$  °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
	Slow Idle	4.0 to 4.7 V
Pressure Sensor	Control Lever: Neutral Pilot Shut-Off Lever: LOCK	0 to 0.1 MPa (0 to 1.0 kgf/cm <sup>2</sup> , 0 to 14.5 psi)
	Control Lever: Full Stroke Pilot Shut-Off Lever: UNLOCK	3.3 to 3.9 MPa (34 to 40 kgf/cm <sup>2</sup> , 480 to 570 psi)
Pump Control Pressure Sensor	Control Lever: Neutral	0 to 1 MPa (0 to 10 kgf/cm <sup>2</sup> , 0 to 14.5 psi)
	Control Lever: Full Stroke	2.9 to 3.9 MPa (30 to 40 kgf/cm <sup>2</sup> , 420 to 570 psi)

## OPERATIONAL PERFORMANCE TEST / Standard

### ADJUSTMENT DATA LIST

#### ZX160-3 class

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

#### ZX180-3 class


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

## OPERATIONAL PERFORMANCE TEST / Standard

### ATTACHMENT ADJUSTMENT DATA LIST


#### ZX160-3 class

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
<b>ATT1</b>				
ATT1 ATT Type	-	BR PU CR VI Un Non	BR	
ATT1 ATT No.	-	1 to 5	1	
ATT1 P1 Max Swash Angle Adjustment	0.5 L/min	76 to 152 L/min	152 L/min	
ATT1 P2 Max Swash Angle Adjustment	0.5 L/min	76 to 152 L/min	152 L/min	
ATT1 Engine Speed Increase/Decrease	10 min <sup>-1</sup>	-500 to 200 min <sup>-1</sup>	0 min <sup>-1</sup>	
ATT1 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT1 Selector Valve Selection	-	C/V or O/T	O/T	
ATT1 Accumulator Selection	-	ON/OFF	OFF	
ATT1 2-Speed Selection	-	ON/OFF	OFF	
<b>ATT2</b>				
ATT2 ATT Type	-	BR PU CR VI Un Non	BR	
ATT2 ATT No.	-	1 to 5	2	
ATT2 P1 Max Swash Angle Adjustment	0.5 L/min	76 to 152 L/min	152 L/min	
ATT2 P2 Max Swash Angle Adjustment	0.5 L/min	76 to 152 L/min	152 L/min	
ATT2 Engine Speed Increase/Decrease	10 min <sup>-1</sup>	-500 to 200 min <sup>-1</sup>	0 min <sup>-1</sup>	
ATT2 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT2 Selector Valve Selection	-	C/V or O/T	O/T	
ATT2 Accumulator Selection	-	ON/OFF	OFF	
ATT2 2-Speed Selection	-	ON/OFF	OFF	

 **NOTE:** ATT: Attachment  
 BR: Hydraulic Breaker  
 CR: Primary Crusher  
 VI: Vibrating Hammer  
 Un: Other (Special Machine)  
 Non: Non Selection  
 BK: Digging  
 PU: Secondary Crusher  
 C/V: Control Valve  
 O/T: Hydraulic Oil Tank


## OPERATIONAL PERFORMANCE TEST / Standard

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT3				
ATT3 ATT Type	-	BR PU CR VI Un Non	PU	
ATT3 ATT No.	-	1 to 5	1	
ATT3 P1 Max Swash Angle Adjustment	0.5 L/min	76 to 152 L/min	152 L/min	
ATT3 P2 Max Swash Angle Adjustment	0.5 L/min	76 to 152 L/min	152 L/min	
ATT3 Engine Speed Increase/Decrease	10 min <sup>-1</sup>	-500 to 200 min <sup>-1</sup>	200 min <sup>-1</sup>	
ATT3 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT3 Selector Valve Selection	-	C/V or O/T	C/V	
ATT3 Accumulator Selection	-	ON/OFF	OFF	
ATT3 2-Speed Selection	-	ON/OFF	ON	
ATT4				
ATT4 ATT Type	-	BR PU CR VI Un Non	CR	
ATT4 ATT No.	-	1 to 5	1	
ATT4 P1 Max Swash Angle Adjustment	0.5 L/min	76 to 152 L/min	152 L/min	
ATT4 P2 Max Swash Angle Adjustment	0.5 L/min	76 to 152 L/min	152 L/min	
ATT4 Engine Speed Increase/Decrease	10 min <sup>-1</sup>	-500 to 200 min <sup>-1</sup>	200 min <sup>-1</sup>	
ATT4 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT4 Selector Valve Selection	-	C/V or O/T	C/V	
ATT4 Accumulator Selection	-	ON/OFF	OFF	
ATT4 2-Speed Selection	-	ON/OFF	ON	

 **NOTE:** ATT: Attachment  
 BR: Hydraulic Breaker  
 CR: Primary Crusher  
 VI: Vibrating Hammer  
 Un: Other (Special Machine)  
 Non: Non Selection  
 BK: Digging  
 PU: Secondary Crusher  
 C/V: Control Valve  
 O/T: Hydraulic Oil Tank

## OPERATIONAL PERFORMANCE TEST / Standard


Adjustment Data	Min. Adjust-ment Value	Adjustable Range	Standard Adjustment	Remarks
ATT5				
ATT5 ATT Type	-	BR PU CR VI Un Non	Unregistration	
ATT5 ATT No.	-	1 to 5	Unregistration	
ATT5 P1 Max Swash Angle Adjustment	0.5 L/min	76 to 152 L/min	152 L/min	
ATT5 P2 Max Swash Angle Adjustment	0.5 L/min	76 to 152 L/min	152 L/min	
ATT5 Engine Speed Increase/Decrease	10 min <sup>-1</sup>	-500 to 200 min <sup>-1</sup>	0 min <sup>-1</sup>	
ATT5 Secondary Pilot Relief Pressure Selection	-	ON/OFF	Unregistration	
ATT5 Selector Valve Selection	-	C/V or O/T	Unregistration	
ATT5 Accumulator Selection	-	ON/OFF	Unregistration	
ATT5 2-Speed Selection	-	ON/OFF	Unregistration	

 **NOTE:** ATT: Attachment  
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 BK: Digging  
 PU: Secondary Crusher  
 C/V: Control Valve  
 O/T: Hydraulic Oil Tank




## OPERATIONAL PERFORMANCE TEST / Standard

<b>ZX180-3 class</b>				
Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
<b>ATT1</b>				
ATT1 ATT Type	-	BR PU CR VI Un Non	BR	
ATT1 ATT No.	-	1 to 5	1	
ATT1 P1 Max Swash Angle Adjustment	0.5 L/min	87 to 174 L/min	174 L/min	
ATT1 P2 Max Swash Angle Adjustment	0.5 L/min	87 to 174 L/min	174 L/min	
ATT1 Engine Speed Increase/Decrease	10 min <sup>-1</sup>	-500 to 200 min <sup>-1</sup>	0 min <sup>-1</sup>	
ATT1 Secondary Pilot Relief Pressure Selection	-	ON/OFF	ON	
ATT1 Selector Valve Selection	-	C/V or O/T	O/T	
ATT1 Accumulator Selection	-	ON/OFF	OFF	
ATT1 2-Speed Selection	-	ON/OFF	OFF	
<b>ATT2</b>				
ATT2 ATT Type	-	BR PU CR VI Un Non	BR	
ATT2 ATT No.	-	1 to 5	2	
ATT2 P1 Max Swash Angle Adjustment	0.5 L/min	87 to 174 L/min	174 L/min	
ATT2 P2 Max Swash Angle Adjustment	0.5 L/min	87 to 174 L/min	174 L/min	
ATT2 Engine Speed Increase/Decrease	10 min <sup>-1</sup>	-500 to 200 min <sup>-1</sup>	0 min <sup>-1</sup>	
ATT2 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT2 Selector Valve Selection	-	C/V or O/T	O/T	
ATT2 Accumulator Selection	-	ON/OFF	OFF	
ATT2 2-Speed Selection	-	ON/OFF	OFF	

 **NOTE:** ATT: Attachment  
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 CR: Primary Crusher  
 VI: Vibrating Hammer  
 Un: Other (Special Machine)  
 Non: Non Selection  
 BK: Digging  
 PU: Secondary Crusher  
 C/V: Control Valve  
 O/T: Hydraulic Oil Tank


## OPERATIONAL PERFORMANCE TEST / Standard

Adjustment Data	Min. Adjustment Value	Adjustable Range	Standard Adjustment	Remarks
ATT3				
ATT3 ATT Type	-	BR PU CR VI Un Non	PU	
ATT3 ATT No.	-	1 to 5	1	
ATT3 P1 Max Swash Angle Adjustment	0.5 L/min	87 to 174 L/min	174 L/min	
ATT3 P2 Max Swash Angle Adjustment	0.5 L/min	87 to 174 L/min	174 L/min	
ATT3 Engine Speed Increase/Decrease	10 min <sup>-1</sup>	-500 to 200 min <sup>-1</sup>	200 min <sup>-1</sup>	
ATT3 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT3 Selector Valve Selection	-	C/V or O/T	C/V	
ATT3 Accumulator Selection	-	ON/OFF	OFF	
ATT3 2-Speed Selection	-	ON/OFF	ON	
ATT4				
ATT4 ATT Type	-	BR PU CR VI Un Non	CR	
ATT4 ATT No.	-	1 to 5	1	
ATT4 P1 Max Swash Angle Adjustment	0.5 L/min	87 to 174 L/min	174 L/min	
ATT4 P2 Max Swash Angle Adjustment	0.5 L/min	87 to 174 L/min	174 L/min	
ATT4 Engine Speed Increase/Decrease	10 min <sup>-1</sup>	-500 to 200 min <sup>-1</sup>	200 min <sup>-1</sup>	
ATT4 Secondary Pilot Relief Pressure Selection	-	ON/OFF	OFF	
ATT4 Selector Valve Selection	-	C/V or O/T	C/V	
ATT4 Accumulator Selection	-	ON/OFF	OFF	
ATT4 2-Speed Selection	-	ON/OFF	ON	

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

## OPERATIONAL PERFORMANCE TEST / Standard

Adjustment Data	Min. Adjust-ment Value	Adjustable Range	Standard Adjustment	Remarks
ATT5				
ATT5 ATT Type	-	BR PU CR VI Un Non	Unregistration	
ATT5 ATT No.	-	1 to 5	Unregistration	
ATT5 P1 Max Swash Angle Adjustment	0.5 L/min	87 to 174 L/min	174 L/min	
ATT5 P2 Max Swash Angle Adjustment	0.5 L/min	87 to 174 L/min	174 L/min	
ATT5 Engine Speed Increase/Decrease	10 min <sup>-1</sup>	-500 to 200 min <sup>-1</sup>	0 min <sup>-1</sup>	
ATT5 Secondary Pilot Relief Pressure Selection	-	ON/OFF	Unregistration	
ATT5 Selector Valve Selection	-	C/V or O/T	Unregistration	
ATT5 Accumulator Selection	-	ON/OFF	Unregistration	
ATT5 2-Speed Selection	-	ON/OFF	Unregistration	


 **NOTE:** ATT: Attachment  
 BR: Hydraulic Breaker  
 CR: Primary Crusher  
 VI: Vibrating Hammer  
 Un: Other (Special Machine)  
 Non: Non Selection  
 BK: Digging  
 PU: Secondary Crusher  
 C/V: Control Valve  
 O/T: Hydraulic Oil Tank

## OPERATIONAL PERFORMANCE TEST / Standard

### ZAXIS160LC-3 DR. ZX MONITOR INDICATING VALUES

Unless specified, test under the following conditions.

Engine Speed: Fast Idle  
 Work Mode: Digging Mode  
 Power Mode Switch: P mode  
 Auto-Idle: OFF

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

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

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
<b>PUMP 1 PRESSURE</b> (MPa)						
Control Lever in Neutral*	0.4					
Boom Raise*	36.3					When relieving
Boom Lower*	-					
Arm Roll-in*	34.4					When relieving
Arm Roll-Out*	34.2					When relieving
Bucket Roll-Out*	35.4					When relieving
Bucket Roll-In*	35.4					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	34.4					When relieving
<b>PUMP 2 PRESSURE</b> (MPa)						
Control Lever in Neutral*	0.4					
Boom Raise*	36.3					When relieving
Boom Lower*	-					
Arm Roll-in*	34.4					When relieving
Arm Roll-Out*	34.4					When relieving
Bucket Roll-Out*	0.4					When relieving
Bucket Roll-In*	0.4					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	34.4					When relieving

## OPERATIONAL PERFORMANCE TEST / Standard

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
<b>PUMP 1 PUMP CONTROL PRESSURE</b> (MPa)						
Control Lever in Neutral*	1.02					
Boom Raise*	2.77					When relieving
Boom Lower*	-					
Arm Roll-in*	2.77					When relieving
Arm Roll-Out*	2.74					When relieving
Bucket Roll-Out*	2.79					When relieving
Bucket Roll-In*	2.79					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	2.65					When relieving
<b>PUMP 2 PUMP CONTROL PRESSURE</b> (MPa)						
Control Lever in Neutral*	0.97					
Boom Raise*	2.70					When relieving
Boom Lower*	-					
Arm Roll-in*	2.65					When relieving
Arm Roll-Out*	2.74					When relieving
Bucket Roll-Out*	1.02					When relieving
Bucket Roll-In*	1.00					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	2.70					When relieving

## OPERATIONAL PERFORMANCE TEST / Standard

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
<b>TARGET ENGINE SPEED</b> (min <sup>-1</sup> )						
Fast Idle*	1900					
Fast Idle (When operating a control lever)*	2000					When relieving boom raise
Fast Idle (HP Mode)*	2200					When relieving boom raise
Fast Idle (E Mode)*	1800					When relieving boom raise
Auto-Idle*	1200					
Slow Idle*	900					
<b>ACTUAL ENGINE SPEED</b> (min <sup>-1</sup> )						
Fast Idle*	1900					
Fast Idle (When operating a control lever)*	2000					When relieving boom raise
Fast Idle (HP Mode)*	2200					When relieving boom raise
Fast Idle (E Mode)*	1800					When relieving boom raise
Auto-Idle*	1200					
Slow Idle*	900					
<b>ENGINE SPEED DEVIATION</b> (min <sup>-1</sup> )						
Fast Idle*	0					
Fast Idle (When operating a control lever)*	0					When relieving boom raise
Fast Idle (HP Mode)*	0					When relieving boom raise
Fast Idle (E Mode)*	0					When relieving boom raise
Auto-Idle*	0					
Slow Idle*	0					
<b>DIAL ANGLE</b> (Volt)						
Minimum*	0.68					
Maximum*	4.35					

## OPERATIONAL PERFORMANCE TEST / Standard

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
<b>BOOM RAISE PILOT CONTROL PRESSURE*</b> (MPa)	3.89					When relieving boom raise
<b>ARM ROLL-IN PILOT CONTROL PRESSURE*</b> (MPa)	3.87					When relieving arm roll-in
<b>SWING PILOT CONTROL PRESSURE*</b> (MPa)	3.96					When relieving swing
<b>TRAVEL PILOT CONTROL PRESSURE*</b> (MPa)	3.96					
<b>FRONT ATTACHMENT CONTROL PRESSURE*</b> (MPa)	3.91					Operate either of boom, arm, bucket or swing
<b>DIGGING REGENERATIVE PROPORTIONAL VALVE OUTPUT</b> (MPa)	3.19					When relieving arm roll-in
<b>PUMP TORQUE PROPOR-TIONAL VALVE OUTPUT</b> (MPa)	0.19					Engine fast idle + when relieving arm roll-in
<b>PUMP 1 LOAD RATE</b>	27					When relieving arm roll-in
<b>PUMP 2 LOAD RATE</b>	27					When relieving arm roll-in
<b>ARM REGENERATIVE PRO-PORTIONAL VALVE OUTPUT*</b> (MPa)	3.99					Arm leveling
<b>POWER DIGGING CONTROL PRESSURE*</b> (MPa)						
During operation	2.99					
When relieving boom raise	2.99					
<b>TRAVEL MOTOR CONTROL PRESSURE*</b> (MPa)	2.99					Travel mode switch: Fast, When traveling
<b>PUMP TORQUE PROPOR-TIONAL VALVE OUTPUT FB</b> (mA)	471					When relieving arm roll-in
<b>DIGGING REGENERATIVE PROPORTIONAL VALVE OUTPUT FB</b> (mA)	511					When relieving arm roll-in
<b>ARM REGENERATIVE PRO-PORTIONAL VALVE OUTPUT FB</b> (mA)	511					Arm leveling
<b>POWER DIGGING CONTROL PRESSURE FB</b> (mA)	500					
<b>TRAVEL MODE CONTROL PRESSURE FB</b> (mA)	500					Travel mode switch: Fast, When traveling

## OPERATIONAL PERFORMANCE TEST / Standard

ECM						
Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
<b>Engine Torque</b> (%) *						
No load	9					
When relieving arm roll-in	63					
<b>Actual Engine Speed</b> (min <sup>-1</sup> ) *						
No load	1900					
When relieving arm roll-in	2000					
<b>Target Engine Speed</b> (min <sup>-1</sup> ) *						
No load	1900					
When relieving arm roll-in	2000					
<b>Engine Oil Pressure</b> (kPa) *						
No load	436					
When relieving arm roll-in	452					
<b>Fuel Rate</b> (L/h)						
No load	3.4					
When relieving arm roll-in	14.7					
<b>Atmospheric Pressure</b> (kPa) *	99.5					
<b>Boost Pressure</b> (kPa) *						
No load	130					
When relieving arm roll-in	184					
<b>Battery Voltage</b> (V)	28.7					



## OPERATIONAL PERFORMANCE TEST / Standard

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## OPERATIONAL PERFORMANCE TEST / Standard

### ZAXIS180LC-3 DR. ZX MONITOR INDICATING VALUES

Unless specified, test under the following conditions.

Engine Speed: Fast Idle  
 Work Mode: Digging Mode  
 Power Mode Switch: P mode  
 Auto-Idle: OFF

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

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

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
<b>PUMP 1 PRESSURE</b> (MPa)						
Control Lever in Neutral*	0.4					
Boom Raise*	36.8					When relieving
Boom Lower*	-					
Arm Roll-in*	34.4					When relieving
Arm Roll-Out*	34.4					When relieving
Bucket Roll-Out*	35.1					When relieving
Bucket Roll-In*	35.4					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	34.4					When relieving
<b>PUMP 2 PRESSURE</b> (MPa)						
Control Lever in Neutral*	0.4					
Boom Raise*	36.8					When relieving
Boom Lower*	-					
Arm Roll-in*	34.4					When relieving
Arm Roll-Out*	34.4					When relieving
Bucket Roll-Out*	0.7					When relieving
Bucket Roll-In*	0.7					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	34.4					When relieving

## OPERATIONAL PERFORMANCE TEST / Standard

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
<b>PUMP 1 PUMP CONTROL PRESSURE</b> (MPa)						
Control Lever in Neutral*	1.09					
Boom Raise*	3.84					When relieving
Boom Lower*	-					
Arm Roll-in*	3.84					When relieving
Arm Roll-Out*	3.91					When relieving
Bucket Roll-Out*	3.96					When relieving
Bucket Roll-In*	3.94					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	3.84					When relieving
<b>PUMP 2 PUMP CONTROL PRESSURE</b> (MPa)						
Control Lever in Neutral*	1.09					
Boom Raise*	3.82					When relieving
Boom Lower*	-					
Arm Roll-in*	3.84					When relieving
Arm Roll-Out*	3.87					When relieving
Bucket Roll-Out*	1.09					When relieving
Bucket Roll-In*	1.09					When relieving
Boom Raise + Arm Roll-In + Bucket Roll-In Combined Operation*	3.82					When relieving

## OPERATIONAL PERFORMANCE TEST / Standard

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
<b>TARGET ENGINE SPEED</b> (min <sup>-1</sup> )						
Fast Idle*	1900					
Fast Idle (When operating a control lever)*	2000					When relieving boom raise
Fast Idle (HP Mode)*	2200					When relieving boom raise
Fast Idle (E Mode)*	1850					When relieving boom raise
Auto-Idle*	1200					
Slow Idle*	900					
<b>ACTUAL ENGINE SPEED</b> (min <sup>-1</sup> )						
Fast Idle*	1898					
Fast Idle (When operating a control lever)*	1999					When relieving boom raise
Fast Idle (HP Mode)*	2200					When relieving boom raise
Fast Idle (E Mode)*	1849					When relieving boom raise
Auto-Idle*	1199					
Slow Idle*	903					
<b>ENGINE SPEED DEVIATION</b> (min <sup>-1</sup> )						
Fast Idle*	-2					
Fast Idle (When operating a control lever)*	-1					When relieving boom raise
Fast Idle (HP Mode)*	0					When relieving boom raise
Fast Idle (E Mode)*	-1					When relieving boom raise
Auto-Idle*	-1					
Slow Idle*	3					
<b>DIAL ANGLE</b> (Volt)						
Minimum*	0.56					
Maximum*	4.31					

## OPERATIONAL PERFORMANCE TEST / Standard

Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
<b>BOOM RAISE PILOT CONTROL PRESSURE*</b> (MPa)	4.06					When relieving boom raise
<b>ARM ROLL-IN PILOT CONTROL PRESSURE*</b> (MPa)	4.06					When relieving arm roll-in
<b>SWING PILOT CONTROL PRESSURE*</b> (MPa)	4.06					When relieving swing
<b>TRAVEL PILOT CONTROL PRESSURE*</b> (MPa)	4.15					
<b>FRONT ATTACHMENT CONTROL PRESSURE*</b> (MPa)	4.01					Operate either of boom, arm, bucket or swing
<b>DIGGING REGENERATIVE PROPORTIONAL VALVE OUTPUT</b> (MPa)	3.19					When relieving arm roll-in
<b>PUMP TORQUE PROPOR-TIONAL VALVE OUTPUT</b> (MPa)	0.19					Engine fast idle + when relieving arm roll-in
<b>PUMP 1 LOAD RATE</b>	28					When relieving arm roll-in
<b>PUMP 2 LOAD RATE</b>	28					When relieving arm roll-in
<b>ARM REGENERATIVE PRO-PORTIONAL VALVE OUTPUT*</b> (MPa)	3.19					Arm leveling
<b>POWER DIGGING CONTROL PRESSURE*</b> (MPa)						
During operation	2.99					
When relieving boom raise	2.99					
<b>TRAVEL MOTOR CONTROL PRESSURE*</b> (MPa)	2.99					Travel mode switch: Fast, When travel- ing
<b>PUMP TORQUE PROPOR-TIONAL VALVE OUTPUT FB</b> (mA)	485					When relieving arm roll-in
<b>DIGGING REGENERATIVE PROPORTIONAL VALVE OUTPUT FB</b> (mA)	489					When relieving arm roll-in
<b>ARM REGENERATIVE PRO-PORTIONAL VALVE OUTPUT FB</b> (mA)	504					Arm leveling
<b>POWER DIGGING CONTROL PRESSURE FB</b> (mA)	489					
<b>TRAVEL MODE CONTROL PRESSURE FB</b> (mA)	504					Travel mode switch: Fast, When travel- ing

## OPERATIONAL PERFORMANCE TEST / Standard

ECM						
Item	Reference Value	Measured Value				Remarks
		First	Second	Third	Average	
<b>Engine Torque</b> (%) <sup>*</sup>						
No load	10					
When relieving arm roll-in	60					
<b>Actual Engine Speed</b> (min <sup>-1</sup> ) <sup>*</sup>						
No load	1899					
When relieving arm roll-in	1997					
<b>Target Engine Speed</b> (min <sup>-1</sup> ) <sup>*</sup>						
No load	1900					
When relieving arm roll-in	2000					
<b>Engine Oil Pressure</b> (kPa) <sup>*</sup>						
No load	440					
When relieving arm roll-in	460					
<b>Fuel Rate</b> (L/h)						
No load	3.80					
When relieving arm roll-in	15.3					
<b>Atmospheric Pressure</b> (kPa) <sup>*</sup>	98.5					
<b>Boost Pressure</b> (kPa) <sup>*</sup>						
No load	124					
When relieving arm roll-in	192					
<b>Battery Voltage</b> (V)	28.15					


# OPERATIONAL PERFORMANCE TEST / Engine Test

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## ENGINE SPEED

### Summary

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

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

### Preparation:

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

## OPERATIONAL PERFORMANCE TEST / Engine Test

**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.

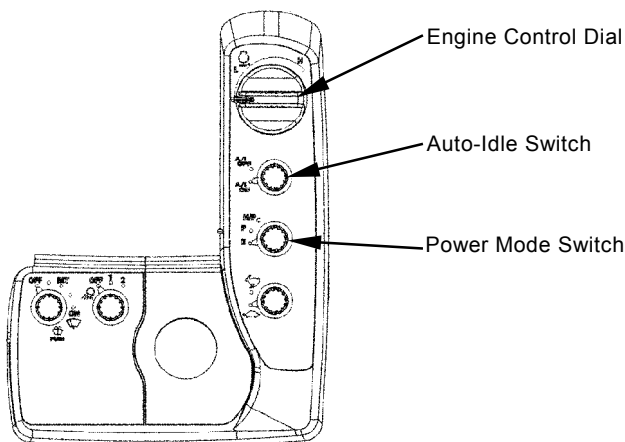
**Remedy:**

Refer to Troubleshooting B in Group T5-6.

**NOTE:** ECO stands for the auto engine speed reduction system by 100 min<sup>-1</sup>.

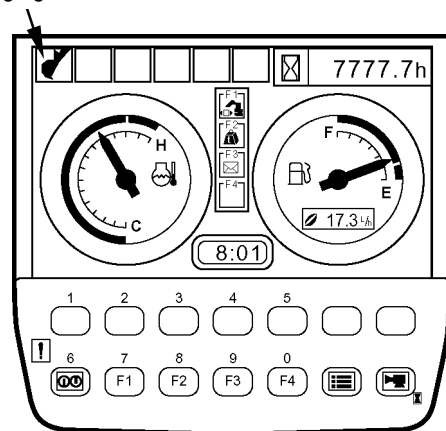
Item	Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode	Test Conditions
Slow Idle	Min. Speed	P	OFF	Digging Mode	
Fast Idle (With ECO deactivated)	Max. Speed	P	OFF	Digging Mode	Check in the Dr. ZX special functions with ECO deactivated. Measure engine speed with the lever in neutral.
Fast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

Switch Panel:



Monitor Unit:

Digging Mode



T1V1-04-03-001

T1V1-05-01-007



# OPERATIONAL PERFORMANCE TEST / Engine Test


## ENGINE COMPRESSION PRESSURE

### Summary:

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

### Preparation:

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

 : 20 N·m (2.0 kgf·m, 14.8 lbf·ft)

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

5. Disconnect the connector of injector.
6. Install the negative terminal of the battery.
7. Turn the starter. Exhaust foreign subjects from the cylinder.
8. Install a pressure gauge and an adaptor (Isuzu 5-8840-2815-0) to the glow plug mounting part. (Sufficiently install them in order to prevent air leakage.)

### Measurement:

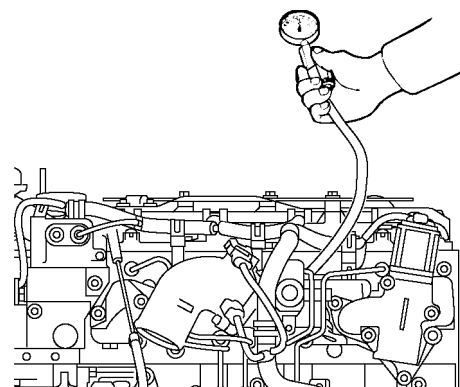
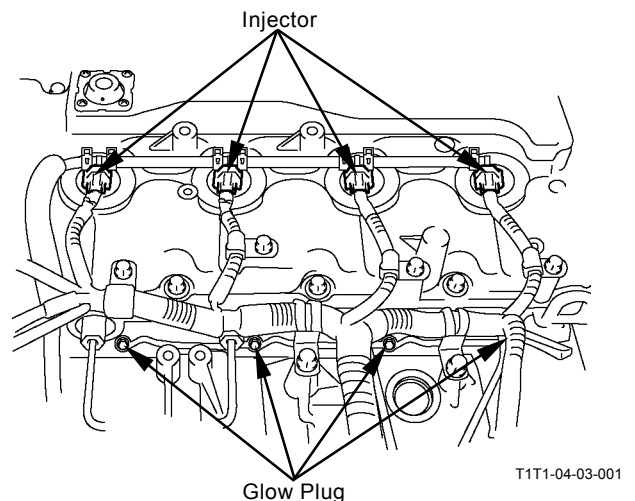
1. Turn the starter and measure compression pressure of each cylinder.
2. Repeat the measurement three times and calculate the mean values.

### Evaluation:

Refer to Operational Performance Standard in Group T4-2.

### Remedy:

Refer to the engine shop manual.



## OPERATIONAL PERFORMANCE TEST / Engine Test


### VALVE CLEARANCE

#### Summary:


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

#### Preparation:

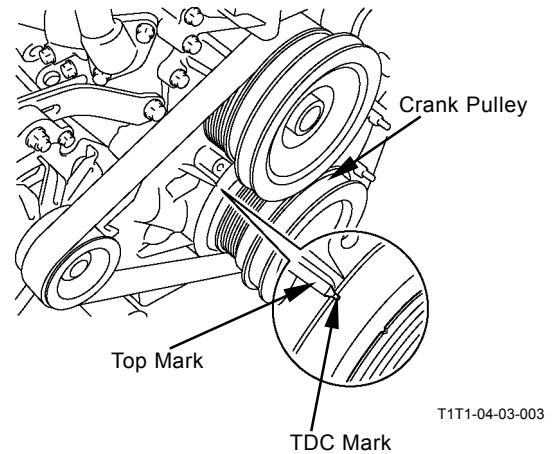
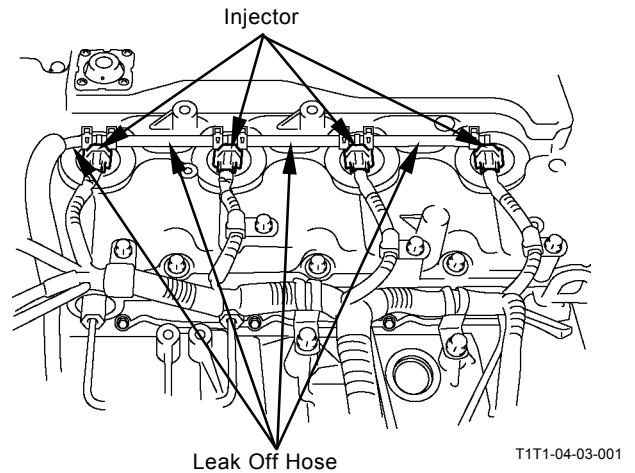
1. Disconnect the connector of inject.
2. Remove the leak off hose.
3. Remove the head cover.
4. Rotate the crank pulley. Align the top dead center (TDC) mark on crank pulley with the top mark located on timing gear case.

 **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.

5. 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.


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



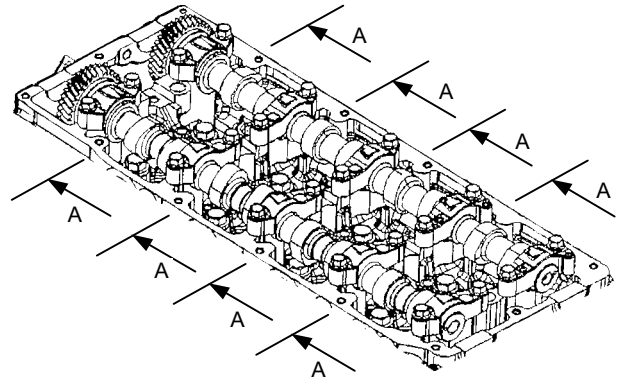
## OPERATIONAL PERFORMANCE TEST / Engine Test

**Measurement:**

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

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

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



T1T1-04-03-006

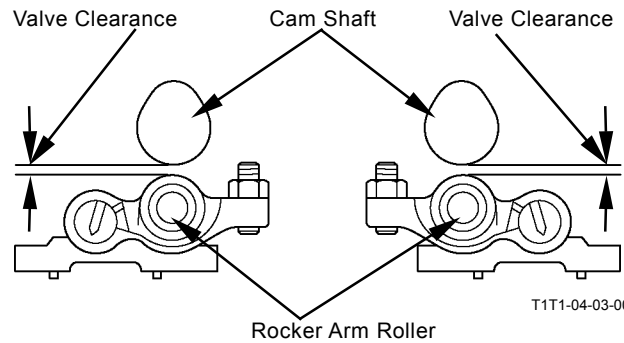
Cylinder No.	No.1		No.2		No.3		No.4	
Valve locations	I	E	I	E	I	E	I	E
When the measurement is started from No.1 cylinder	○	○	○			○		
When the measurement is started from No.4 cylinder				×	×		×	×

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

**Evaluation:**

Refer to Operational Performance Standard in Group T4-2.

Section A



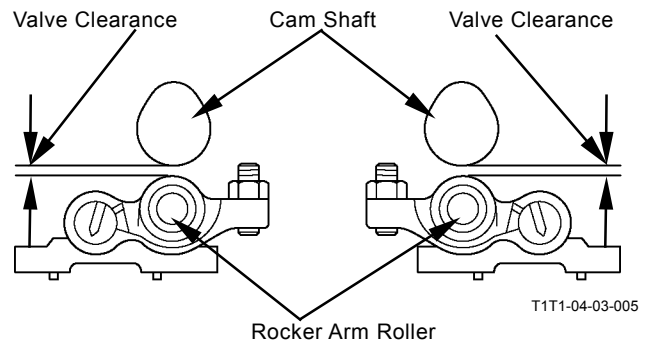
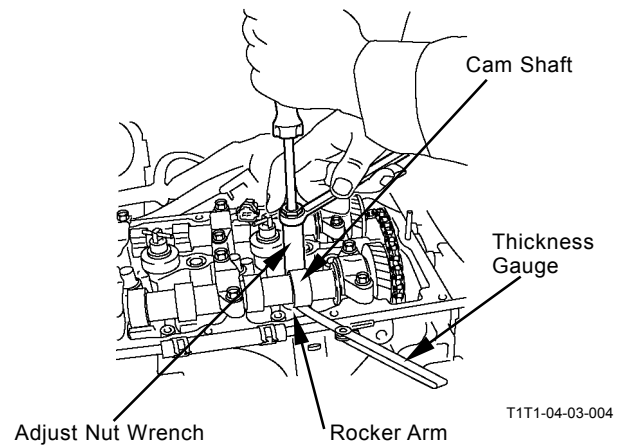
T1T1-04-03-005

## OPERATIONAL PERFORMANCE TEST / Engine Test

### Adjustment:

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

1. Loosen the lock nuts (16 used) and adjusting screws (16 used), which secure the rocker arm by using adjust nut wrench (Isuzu 5-8840-2822-0).
2. Insert a thickness gauge into the clearance between rocker arm roller and cam shaft.
3. Tighten the adjusting screw of rocker arm until condition for the thickness gauge is proper.
4. Tighten the lock nut of rocker arm.  
⚙️ : 18 N·m (1.8 kgf·m, 13.2 lbf·ft)
5. Check the valve clearance after the lock nuts are tightened.



# OPERATIONAL PERFORMANCE TEST / Engine Test

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## LUBRICANT CONSUMPTION

### Measuring Method

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

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

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

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

8. Determine lubricant consumption from the following equation:

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

### **Evaluation:**

Refer to Operational Performance Standard in Group T4-2.

**OPERATIONAL PERFORMANCE TEST / Engine Test**

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# OPERATIONAL PERFORMANCE TEST / Excavator Test

## TRAVEL SPEED

### Summary:

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

### Preparation:

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

### Measurement:

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

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

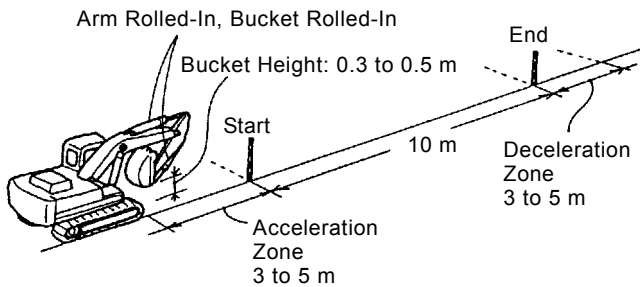
3. Start traveling the machine in the acceleration zone with the travel levers to full stroke.
4. Measure the time required to travel 10 m (33 ft).
5. After measuring the forward travel speed, turn the upperstructure 180° and measure the reverse travel speed.
6. Repeat the measurement three times in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

### Evaluation:

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

### Remedy:

Refer to the Troubleshooting B in Group T5-6.



T105-06-03-001

# OPERATIONAL PERFORMANCE TEST / Excavator Test

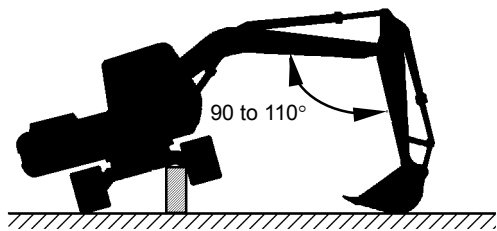
## TRACK REVOLUTION SPEED

**Summary:**

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

**Preparation:**

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



M104-07-067

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

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

**Measurement:**

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

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

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

**Evaluation:**

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

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

**Remedy:**

Refer to the Troubleshooting B in Group T5-6.



# OPERATIONAL PERFORMANCE TEST / Excavator Test

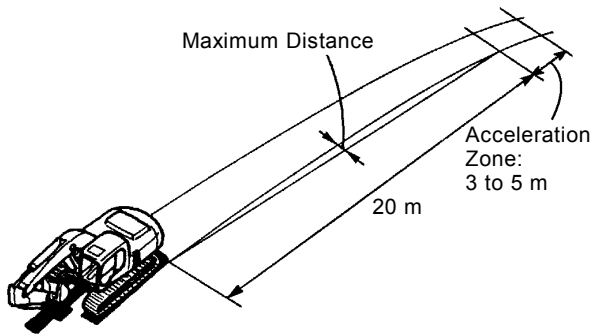
## MISTRACK CHECK

**Summary:**

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

**Preparation:**

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



T105-06-03-022

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

**Measurement:**

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

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

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

**Evaluation:**

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

**Remedy:**

Refer to the Troubleshooting B in Group T5-6.

# OPERATIONAL PERFORMANCE TEST / Excavator Test

## TRAVEL PARKING LEAKAGE

### Summary:

Measure the parking brake function on a specified slope.

### Preparation:

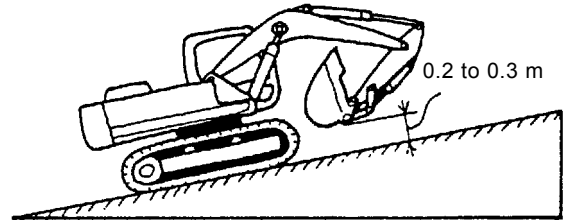
1. The surface of test slope shall be even with a gradient of 20 % (11.31°).
2. With the arm and bucket fully extended, hold the bucket 0.2 to 0.3 m (8 to 12 in) above the ground.
3. Maintain the hydraulic oil temperature at  $50\pm 5$  °C ( $122\pm 41$  °F).

### Measurement:

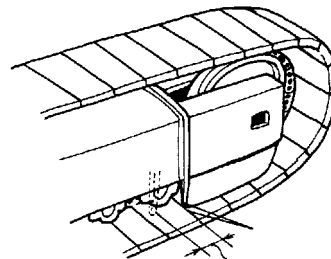
1. Measure the travel parking brake slip amount while parked.
2. Climb the slope and place the travel levers in neutral.
3. Stop the engine.
4. After the machine stops, put the matching marks on a track link or shoe and the track side frame.
5. After 5 minutes, measure the distance between marks on the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

### Evaluation:

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



T105-06-03-004



Displacement measured  
after 5 minutes.

T105-06-03-006

# OPERATIONAL PERFORMANCE TEST / Excavator Test

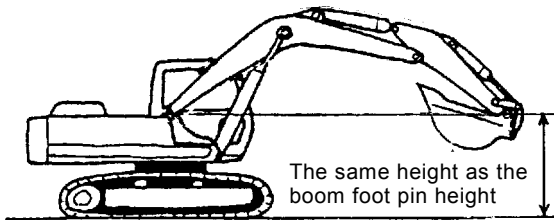
## SWING SPEED

### Summary:

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

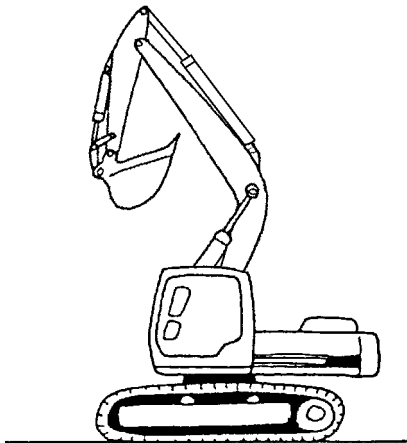
### Preparation:

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



T105-06-03-013

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



T178-04-03-001

4. Maintain the hydraulic oil temperature at  $50 \pm 5$  °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 Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

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

### Evaluation:

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

### Remedy:

Refer to the Troubleshooting B in Group T5-6.

## OPERATIONAL PERFORMANCE TEST / Excavator Test

### SWING FUNCTION DRIFT CHECK

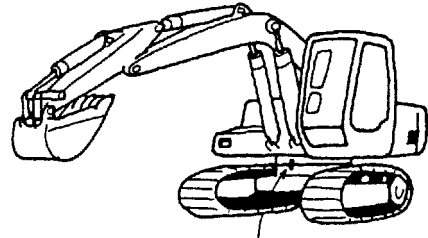
#### Summary:

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

#### Preparation:

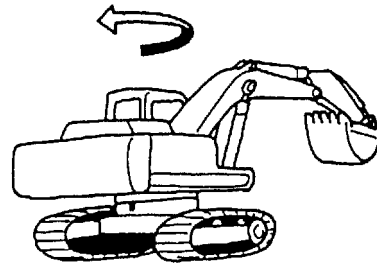
1. Check lubrication of the swing gear and swing bearing.
2. Place the machine on flat, solid ground with ample space for swinging. Do not conduct this test on a slope.
3. With the arm fully retracted and the bucket fully extended, hold the bucket so that the height of the bucket pin is the same as the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



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

T105-06-03-008



Before start the measurement, swing the upperstructure 180°

T105-06-03-009

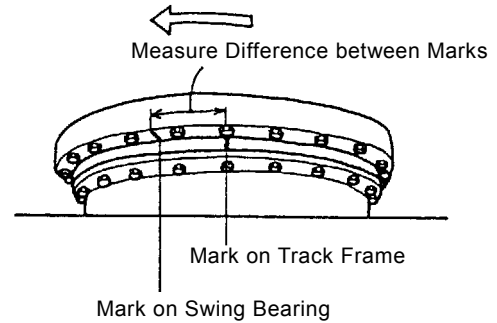
## OPERATIONAL PERFORMANCE TEST / Excavator Test

### Measurement:

1. Select the following switch positions:

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

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



T105-06-03-010

### Evaluation:

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

### Remedy:

Refer to the Troubleshooting B in Group T5-6.

## OPERATIONAL PERFORMANCE TEST / Excavator Test

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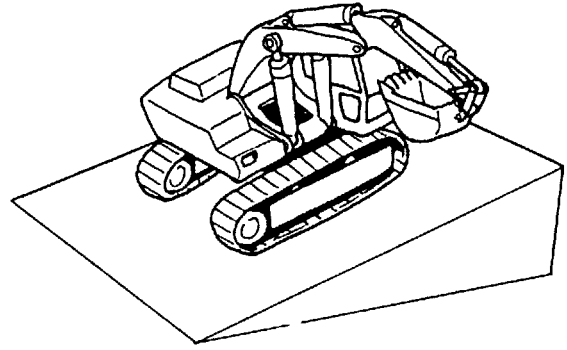
### SWING MOTOR LEAKAGE

#### Summary:

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

#### Preparation:

1. Check lubrication of the swing gear and swing bearing.
2. Load bucket fully. In lieu of loading the bucket, weight (W) of the following specification can be used.  
ZAXIS160LC-3: W=900 kg (1984 lb)  
ZAXIS180LC-3: W=900 kg (1984 lb)  
With the arm fully retracted and the bucket fully extended, position the arm top pin height to be level with the boom foot pin.
3. Park the machine on a smooth slope with a gradient of 26.8 % (15°).
4. 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.
5. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).



T105-06-03-011

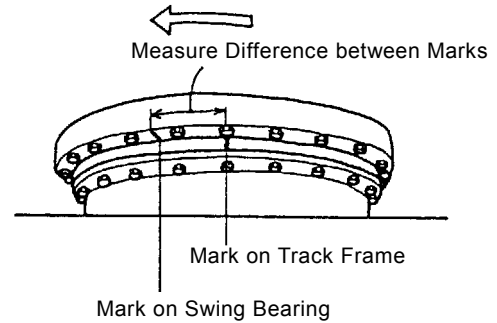
## OPERATIONAL PERFORMANCE TEST / Excavator Test

### Measurement:

1. Select the following switch position:

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

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



T105-06-03-010

### Evaluation:

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

### Remedy:

Refer to the Troubleshooting B in Group T5-6.

# OPERATIONAL PERFORMANCE TEST / Excavator Test

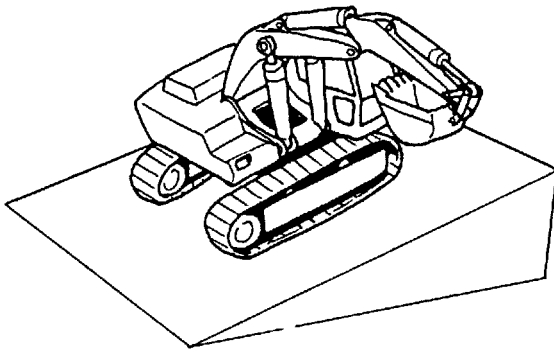
## MAXIMUM SWINGABLE SLANT ANGLE

### Summary:

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

### Preparation:

1. Check lubrication of the swing gear and bearing.
2. Load the bucket fully. In lieu of loading the bucket, weight (W) of the following specification can be used.  
ZAXIS160LC-3: W=900 kg (1984 lb)  
ZAXIS180LC-3: W=900 kg (1984 lb)  
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.
3. Climb a slope and swing the upperstructure 90° to the slope.
4. Maintain the hydraulic oil temperature at 50±5 °C (122±41 °F).



T105-06-03-011

### Measurement:

1. Select the following switch positions:

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

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

### Evaluation:

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

### Remedy:

Refer to the Troubleshooting B in Group T5-6.



## **OPERATIONAL PERFORMANCE TEST / Excavator Test**

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## OPERATIONAL PERFORMANCE TEST / Excavator Test


### SWING BEARING PLAY

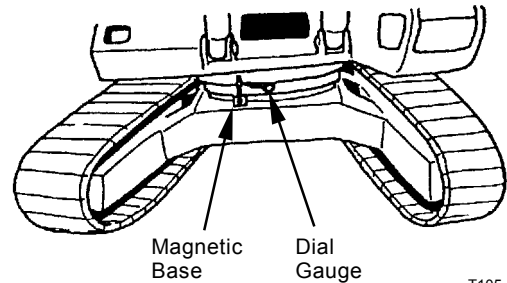
#### Summary:

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

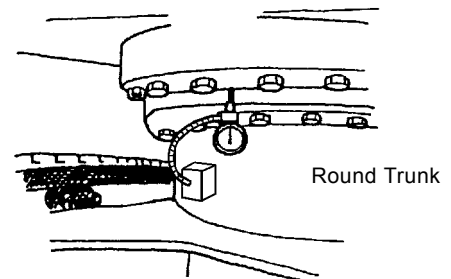
#### Preparation:

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

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



T105-06-03-014



T105-06-03-015

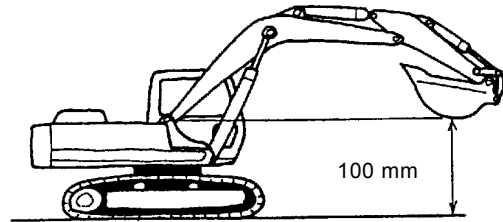
## OPERATIONAL PERFORMANCE TEST / Excavator Test

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### Measurement:

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

Measurement: ( $h_1$ )

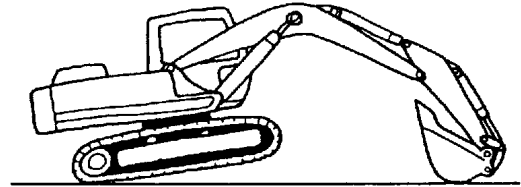


T105-06-03-007

### Evaluation:

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

Measurement: ( $h_2$ )



T105-06-03-017

# OPERATIONAL PERFORMANCE TEST / Excavator Test

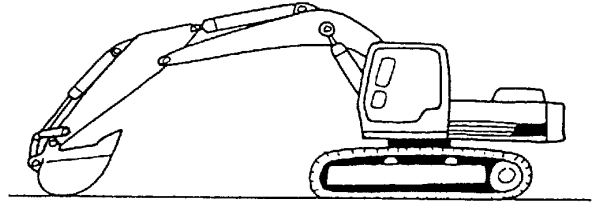
## HYDRAULIC CYLINDER CYCLE TIME

### Summary:

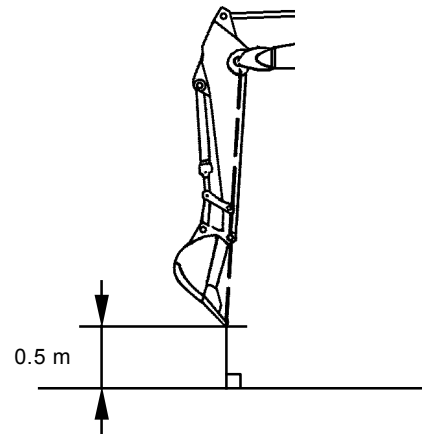
1. Measure the cycle time of boom, arm and bucket cylinders and check the performance of front attachment systems (from main pump to each cylinder).
2. The bucket must be empty.

### Preparation:

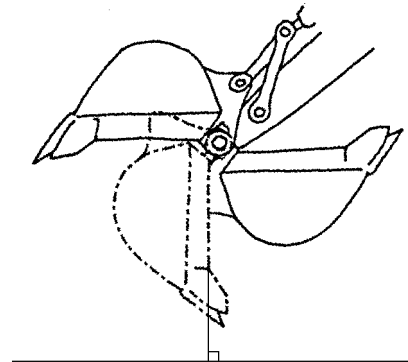
1. Measure at the position as follows.
  - Measurement of the cycle time of boom cylinders: With the arm fully retracted and the bucket fully extended, lower the bucket to the ground.
  - Measurement of the cycle time of arm cylinder: Retract or extend the bucket cylinder so that the arm and bucket teeth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



T105-06-03-018



T1V1-04-05-005



T105-06-03-020

## OPERATIONAL PERFORMANCE TEST / Excavator Test

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### Measurement:

1. Select the following switch positions:

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

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

### Evaluation:

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

### Remedy:

Refer to the Troubleshooting B in Group T5-6.

# OPERATIONAL PERFORMANCE TEST / Excavator Test

## DIG FUNCTION DRIFT CHECK

- Maximum Reach Position

### Summary:

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

### Preparation:

1. Load the bucket fully. In lieu of loading the bucket, weight (W) of the following specification can be used.  
ZAXIS160LC-3: W=900 kg (1984 lb)  
ZAXIS180LC-3: W=900 kg (1984 lb)  
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.
2. Position the arm cylinder with the rod 50 mm (2 in) extended from the fully retracted position.  
Position the bucket cylinder with the rod 50 mm (2 in) retracted from the fully extended position.
3. Maintain the hydraulic oil temperature at  $50\pm 5$  °C ( $122\pm 41$  °F).

### Measurement:

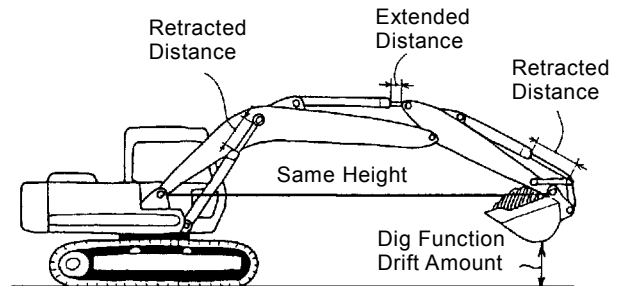
1. Stop the engine.
2. Five minutes after the engine has been stopped, measure the change in position of bottom of the bucket, as well as the boom, arm and bucket cylinders.
3. Repeat the measurement three times and calculate the average values.

### Evaluation:

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

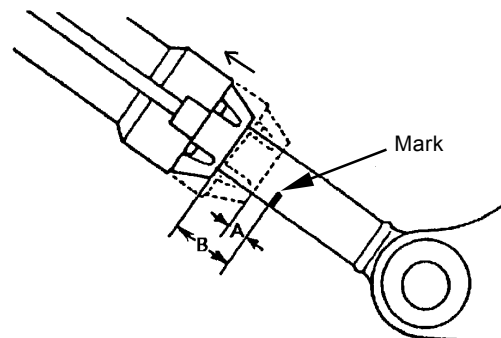
### Remedy:

Refer to the Troubleshooting B in Group T5-6.



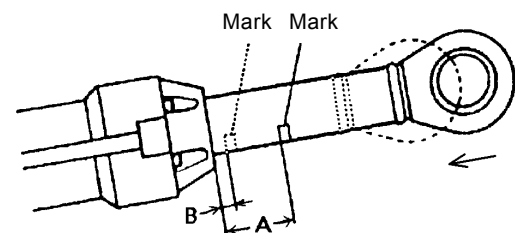
T105-06-03-021

Arm Cylinder Extension



T110-06-03-001

Boom and Bucket Cylinder Retraction



T110-06-03-002

## OPERATIONAL PERFORMANCE TEST / Excavator Test

### • Arm Roll-In Position

#### Summary:

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

#### Preparation:

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

#### Measurement:

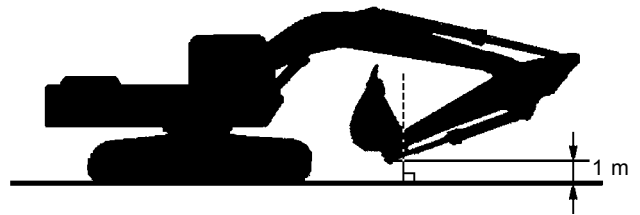
1. Stop the engine.
2. Five minutes after the engine has been stopped, measure the change in position of bottom of the arm tip, as well as the boom, arm and bucket cylinders.
3. Repeat the measurement three times and calculate the average values.

#### Evaluation:

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

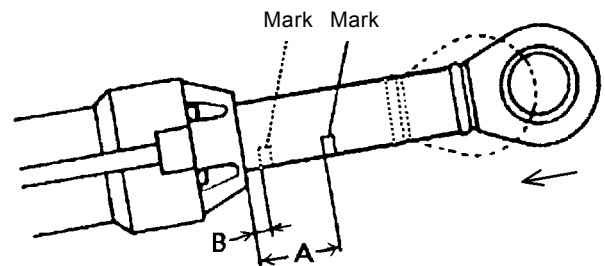
#### Remedy:

Refer to the Troubleshooting B in Group T5-6.



T173-04-03-001

Cylinder Retraction



T110-06-03-002

## OPERATIONAL PERFORMANCE TEST / Excavator Test

### CONTROL LEVER OPERATING FORCE

#### Summary:

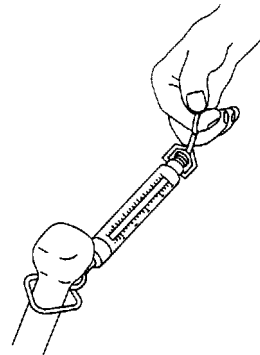
1. Measure a play and operating condition of each control lever.
2. Measure the maximum operating force of front attachment control lever.
3. Measure the operating force at the grip center of each control lever.

#### Preparation:

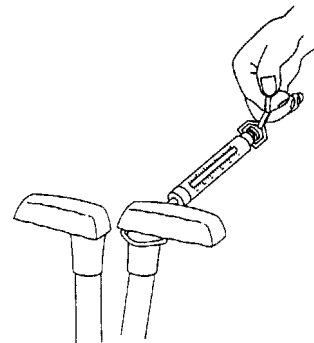
Maintain the hydraulic oil temperature at  $50\pm 5$  °C ( $122\pm 41$  °F).



**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.



T107-06-03-003



T107-06-03-004



## OPERATIONAL PERFORMANCE TEST / Excavator Test

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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.

### Evaluation:

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

# OPERATIONAL PERFORMANCE TEST / Excavator Test

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## CONTROL LEVER STROKE

### Summary:

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

### Preparation:

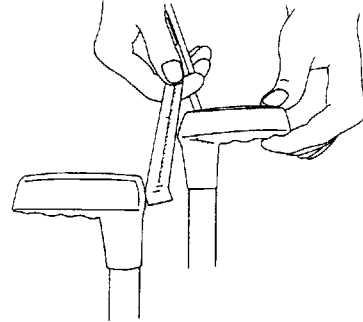
Maintain the hydraulic oil temperature at  $50 \pm 5$  °C ( $122 \pm 41$  °F).

### 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 measurement three times and calculate the average values.

### Evaluation:

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



T107-06-03-005

## **OPERATIONAL PERFORMANCE TEST / Excavator Test**

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## OPERATIONAL PERFORMANCE TEST / Excavator Test

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### COMBINED OPERATION OF BOOM RAISE / SWING FUNCTION CHECK

#### Summary:

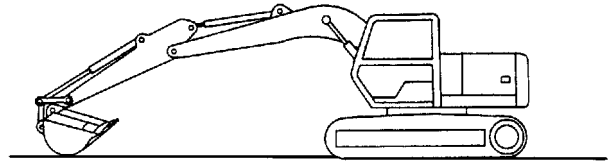
1. Check boom raise and swing movement and speeds while operating both functions simultaneously.
2. Check if the cylinders do not hesitate while operating the cylinder with the engine running at fast idle.

#### Preparation:

1. With the arm fully retracted and the bucket fully extended, lower the bucket onto the ground. The bucket must be empty.
2. Maintain the hydraulic oil temperature at  $50\pm 5$  °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.**



T107-06-03-009

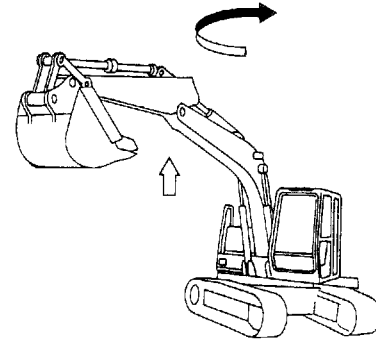
## OPERATIONAL PERFORMANCE TEST / Excavator Test

### Measurement:

1. Select the following switch positions:

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

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



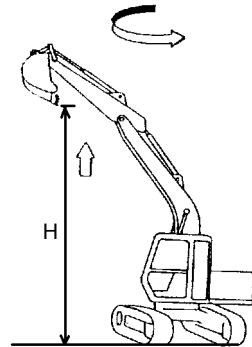
T107-06-03-010

### Evaluation:

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

### Remedy:

Refer to the Troubleshooting B in Group T5-6.



T107-06-03-011

## OPERATIONAL PERFORMANCE TEST / Excavator Test

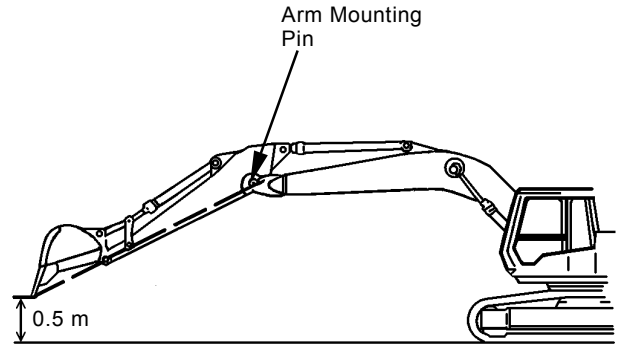
### COMBINED OPERATION OF BOOM RAISE / ARM ROLL-IN FUNCTION CHECK

**Summary:**

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

**Preparation:**

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



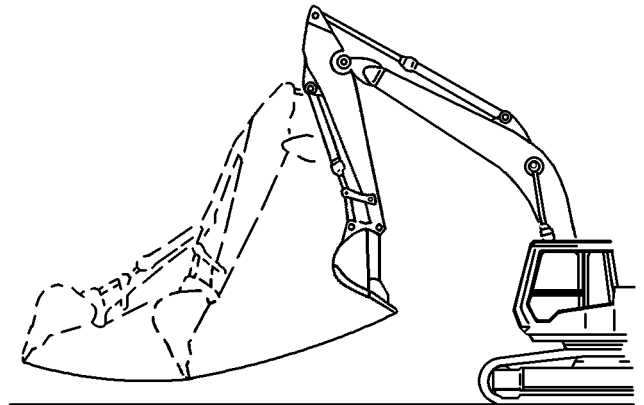
T107-06-03-006

**Measurement:**

1. Select the switch positions as follows.

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

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



T1V1-04-04-001

**Evaluation:**

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

**Remedy:**


Refer to Troubleshooting B in Group T5-6.

# OPERATIONAL PERFORMANCE TEST / Component Test

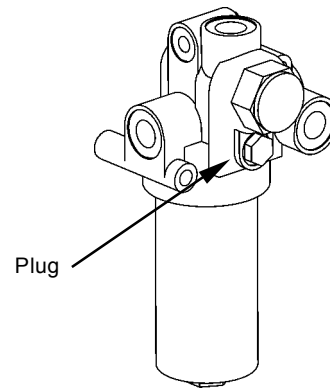
## PRIMARY PILOT PRESSURE

### 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  $50 \pm 5$  °C ( $122 \pm 41$  °F).



T178-03-07-001

### Measurement:

1. Select the following switch positions:

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

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

### Evaluation:

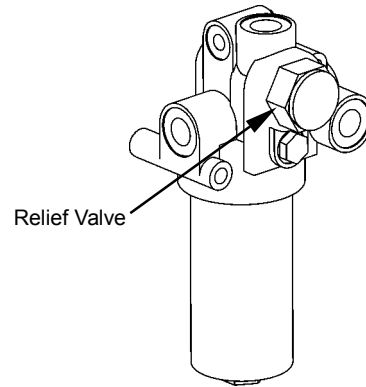
Refer to the Performance Standard Table in Group T4-2.

# OPERATIONAL PERFORMANCE TEST / Component Test



## Primary Pilot Pressure Adjustment Procedure

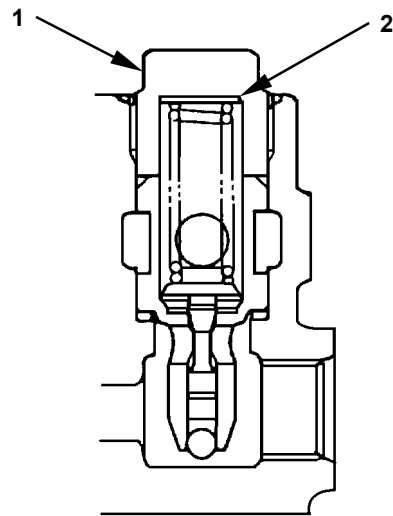
### Adjustment:

Adjust the relief valve set pressure if necessary.




T178-03-07-001

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



T111-06-04-004

 **NOTE: Standard Change in Pressure (Reference)**

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



## OPERATIONAL PERFORMANCE TEST / Component Test

### SECONDARY PILOT PRESSURE

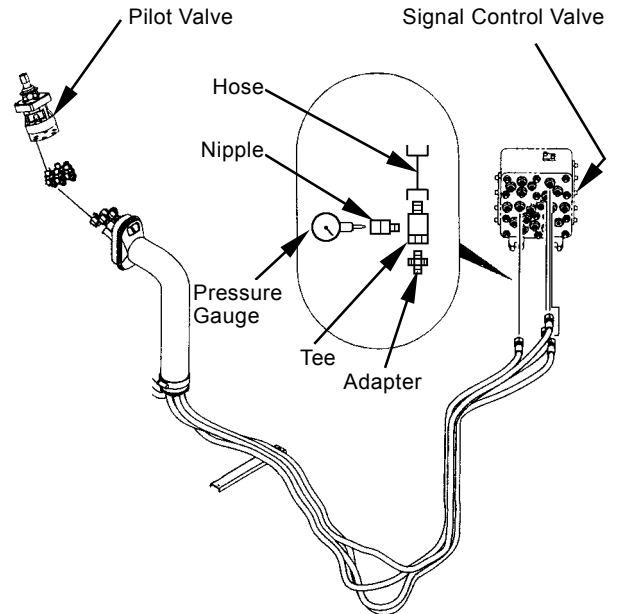
#### Preparation:

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

🔧 : 17 mm, 19 mm

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

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



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## OPERATIONAL PERFORMANCE TEST / Component Test

---

### 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 T5-6.


## OPERATIONAL PERFORMANCE TEST / Component Test

### SOLENOID VALVE SET PRESSURE

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

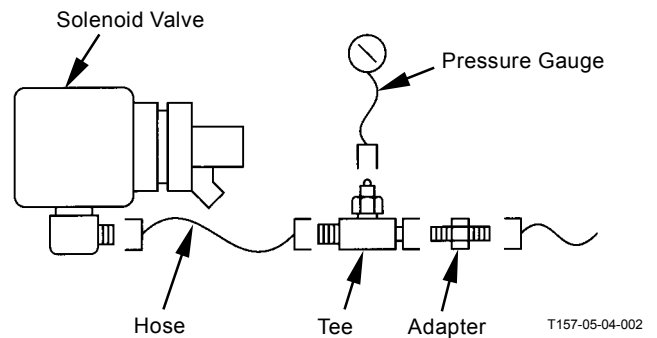
#### Preparation:

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  $50\pm 5$  °C ( $122\pm 41$  °F).



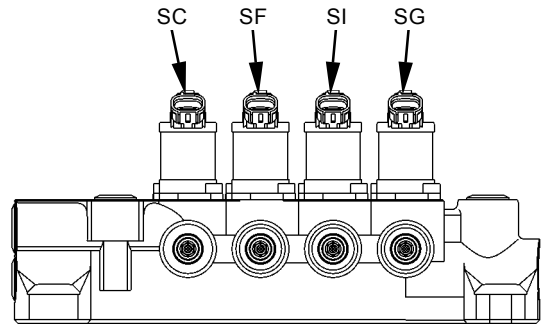
## OPERATIONAL PERFORMANCE TEST / Component Test

### Measurement:

1. Select the following switch positions:

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

2. Operate as instructed below for each measuring solenoid valve:  
Solenoid Valve SG: Turn the power digging switch ON and OFF.  
Solenoid Valve SI: Travel, Stop  
Solenoid Valve SF: Relief operation of arm roll-in.  
Solenoid Valve SC: Combined operation of swing and arm roll-in.
3. Read the values on both Dr. ZX and the pressure gauge.
4. Repeat the measurement three times and calculate the average values.



T1V1-03-07-007

### Evaluation:

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


# OPERATIONAL PERFORMANCE TEST / Component Test


## Solenoid Valve Adjustment Procedure


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

**Do not loosen adjusting screw (8) more than 2 turns.**

1. Loosen lock nut (7). Turn adjusting screw (8) and adjust the set pressure.
2. After adjustment, tighten lock nut (7).

 : 10 mm

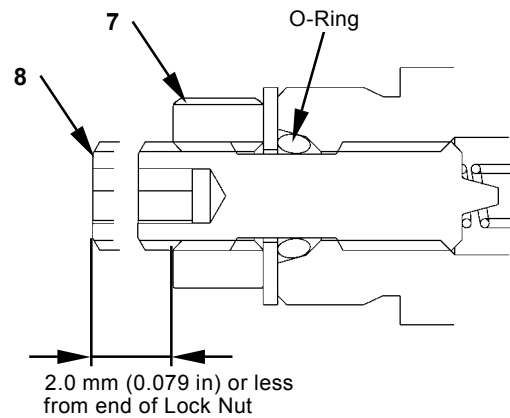
 : 3 mm

 : 3 N·m (0.3 kgf·m, 2.2 lbf·ft)

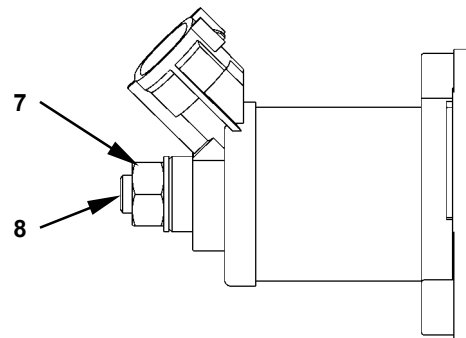
3. After adjustment, check the set pressure.

 **NOTE:** Standard Change in Pressure (Reference)

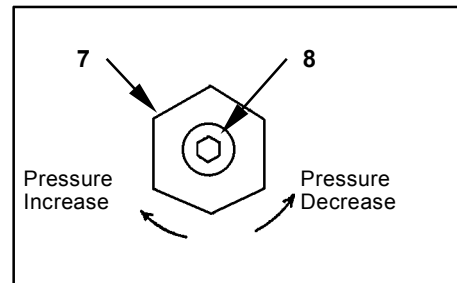
Screw Turns		1/4	1/2	3/4	1
Change in Pressure	kPa	69	137	206	275
	(kgf/cm <sup>2</sup> )	(0.7)	(1.4)	(2.1)	(2.8)
	(psi)	(10)	(20)	(30)	(40)



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W107-02-05-129


## OPERATIONAL PERFORMANCE TEST / Component Test

### MAIN PUMP DELIVERY PRESSURE

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

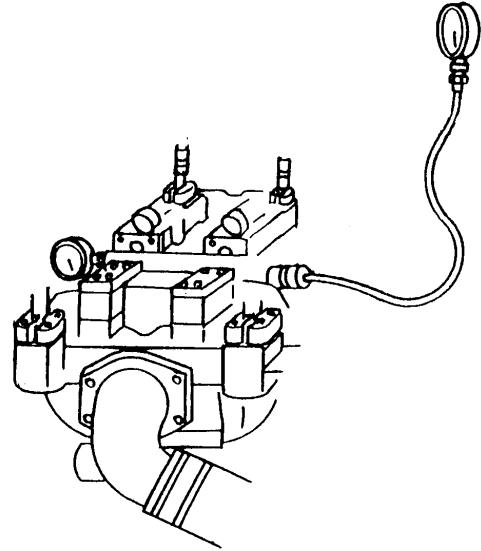
#### Preparation:

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

 : 6 mm

Connect Dr. ZX and select the monitoring function.

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



T157-05-04-005

#### Measurement:

1. Select the following switch positions:

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

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

#### Evaluation:

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

#### Remedy:

Refer to the Troubleshooting B in Group T5-6.

## OPERATIONAL PERFORMANCE TEST / Component Test

---


### MAIN RELIEF SET PRESSURE

#### Summary:

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

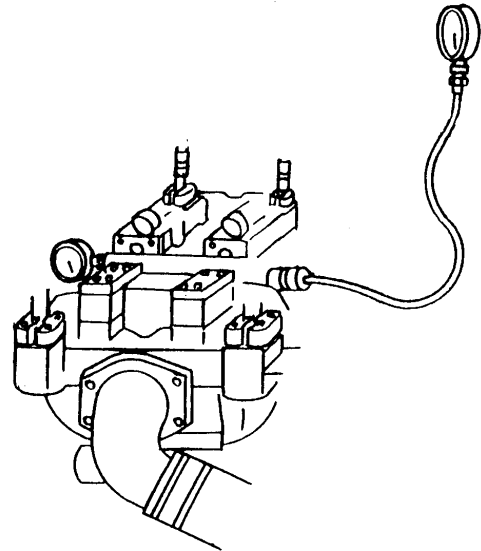
#### Preparation:

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

 : 6 mm

Connect Dr. ZX and select the monitoring function.

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



T157-05-04-005

## OPERATIONAL PERFORMANCE TEST / Component Test

---

### Measurement:


1. Select the following switch positions:

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

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

### Evaluation:

Refer to the Performance Standard in Group T4-2.

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



# OPERATIONAL PERFORMANCE TEST / Component Test


## Main Relief Pressure Adjustment Procedure


### Adjustment:

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

### • High-Pressure Side of Main Relief Pressure Adjustment Procedure

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

 : 27 mm


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


: Lock Nut (1):

68 to 78 N·m

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

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

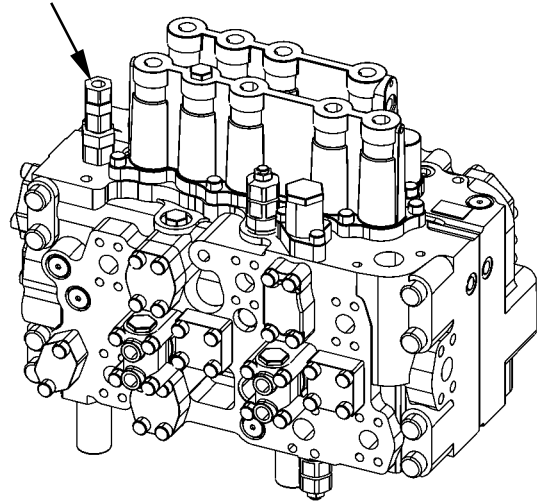
 : 27 mm, 32 mm

 : Lock Nut (4):

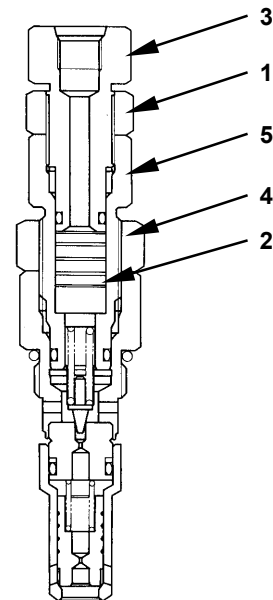
78 to 88 N·m

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

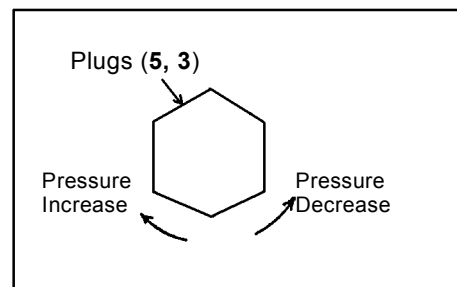
Main Relief Valve



T1V1-04-05-001



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# OPERATIONAL PERFORMANCE TEST / Component Test

## • Low-Pressure Side of Main Relief Pressure Adjustment Procedure

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

 : 27 mm

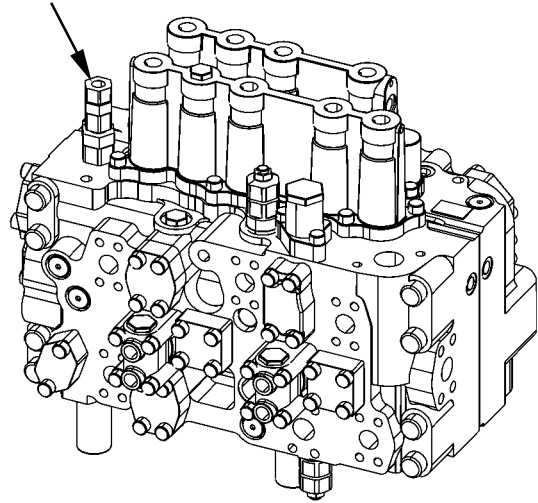
 : Lock Nut (1):

59 to 68 N·m

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

- After adjustment, check the set pressures.

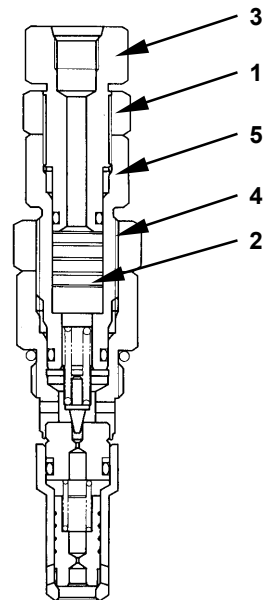
Main Relief Valve



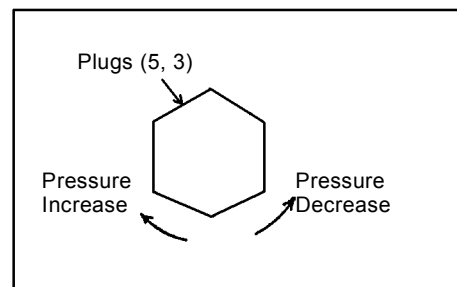
T1V1-04-05-001

### NOTE: Standard Change in Pressure (Reference)

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



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W107-02-05-127


## OPERATIONAL PERFORMANCE TEST / Component Test


### RELIEF PRESSURE (WHEN RELIEVING SWING)


#### ZX160-3 class

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

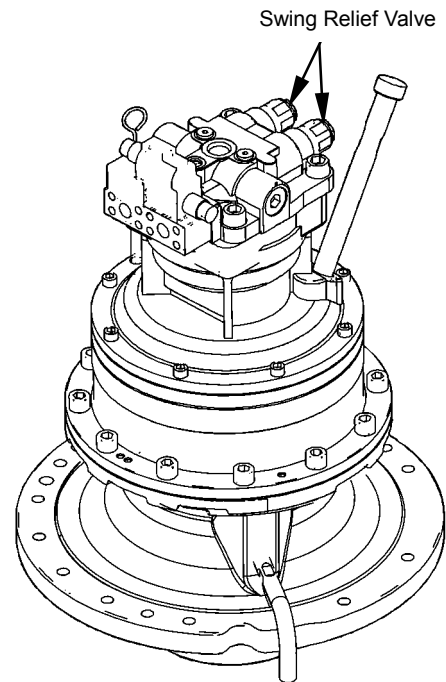
1. Remove the swing relief valve.  
 : 41 mm
2. Remove plug (5), sleeve (4) and piston (3).  
 : 30 mm
3. Install shims (2) between piston (3) and spring seat (1) in order to adjust pressure.
4. After adjustment, install piston (3), sleeve (4) and plug (5).  
 : 118 N·m (12 kgf·m, 88 lbf·ft)

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

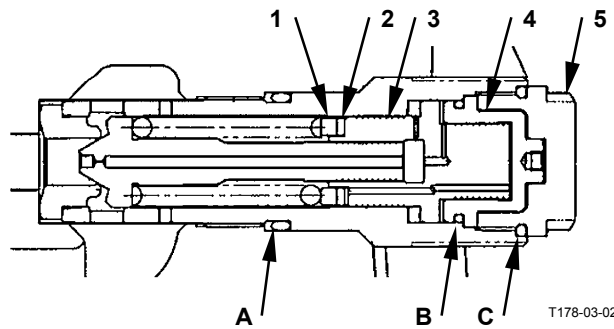
5. Install the swing relief valve.  
 : 176 N·m (18 kgf·m, 130 lbf·ft)
6. Check the set pressure.

 **NOTE:** Standard Change in Pressure (Reference)

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



T1V1-03-02-003






T178-03-02-005

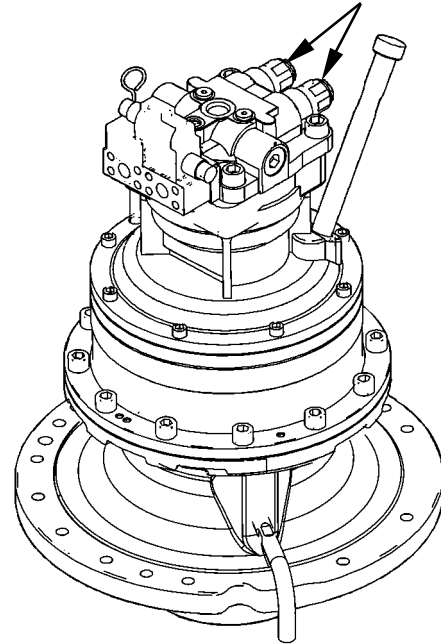
## OPERATIONAL PERFORMANCE TEST / Component Test


### ZX180-3 class

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

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

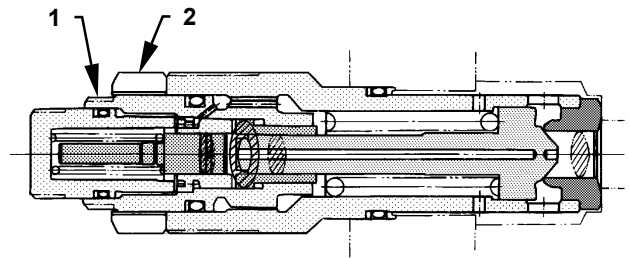
Swing Relief Valve



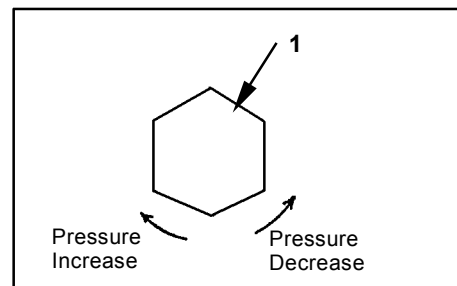
 **NOTE:** Standard Change in Pressure (Reference)

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

T1V1-03-02-003



T107-02-04-020



T157-05-04-023

## OPERATIONAL PERFORMANCE TEST / Component Test


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### OVERLOAD RELIEF VALVE SET PRESSURE

#### Summary:

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

#### Preparation:

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

## OPERATIONAL PERFORMANCE TEST / Component Test

### Measurement:

1. Select the following switch positions:

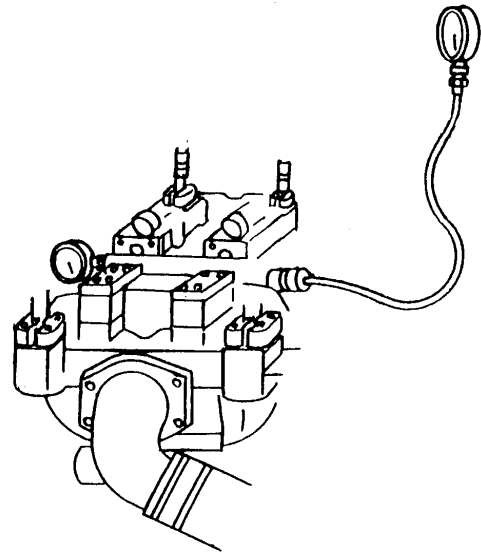
Engine Control Dial	Power Mode Switch	Auto-Idle Switch	Work Mode
Fast Idle	P Mode	OFF	Digging Mode

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

### 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.



T157-05-04-005


# OPERATIONAL PERFORMANCE TEST / Component Test

## Overload Relief Valve Pressure Adjustment Procedure


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

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


1. Loosen lock nut (1).


 : 17 mm

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

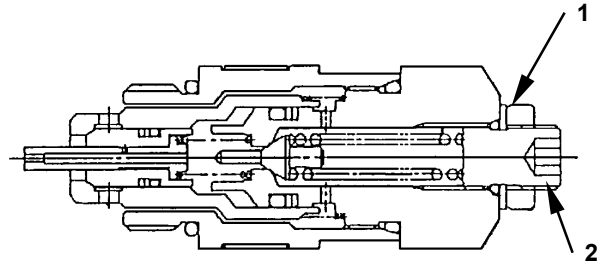
 : 6 mm

3. Tighten lock nut (1).


 : 17 mm

 : 29.5 N·m (3.0 kgf·m, 22 lbf·ft)

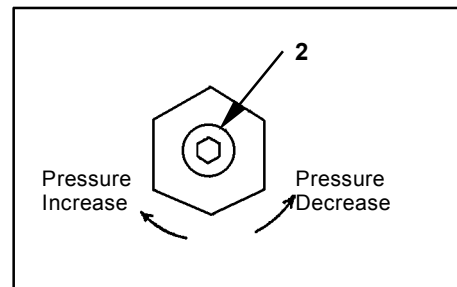
4. Check the set pressure.



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 **NOTE:** Standard Change in Pressure (Reference)

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



W107-02-05-129

# OPERATIONAL PERFORMANCE TEST / Component Test

## MAIN PUMP FLOW RATE MEASUREMENT

- P-Q Control (Torque Control)


**Summary:**

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


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


**Preparation:**

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


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


2. Remove the delivery hose from main pump (one side) to be measured. Install pipe (1 or 2) by using the split flanges and bolts which were used for the removed delivery hose.

 : 41 mm


 : 10 mm

3. Install pipe (1 or 2) to hydraulic tester (5) by using test hose (3) and adapter (4). Install adapter (6), joint (7), test hose (8) and flange (9) to hydraulic tester (5).


 : 41 mm

 : 10 mm


4. Install the delivery hose to flange (9) with split flanges (10) and bolt (11).

 : 10 mm

5. Install a pressure gauge to the main pump to be measured. (Refer to “Main Relief Set Pressure”.)

 : 6 mm

6. Remove pipe (13) from the regulator. Install plug (G 1/4) to pipe (13) in the regulator.

 : 17 mm

7. Remove the vacuum pump. Loosen plug (12) on top of the pump casing. Bleed air from the casing until oil only comes out.

8. Fully open the loading valve of hydraulic tester.

9. Start the engine. Check the pressure gauge connection for any oil leaks. Install Dr. ZX and select the monitoring function.

**Measurement:**

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

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

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

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



# OPERATIONAL PERFORMANCE TEST / Component Test

## Evaluation:

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

$$Q_c = (N_s \times Q) / N_e$$

Q<sub>c</sub> : Converted Flow Rate

Q : Measured Flow Rate

N<sub>s</sub> : Specified Engine Speed

(ZAXIS160LC-3: 2000 min<sup>-1</sup>)


(ZAXIS180LC-3: 2000 min<sup>-1</sup>)

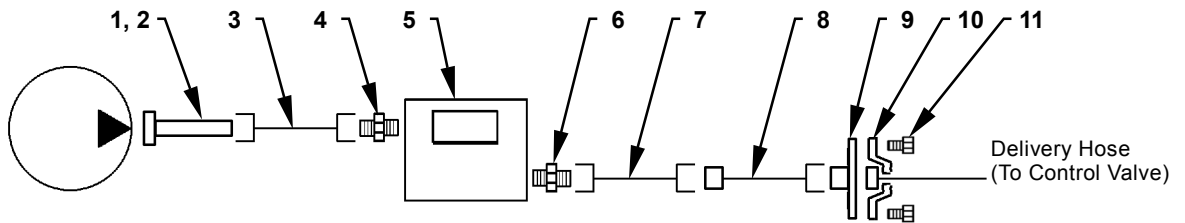
N<sub>e</sub> : Measured Engine Speed:

Values indicated on Dr. ZX

2. Standard Flow Rate

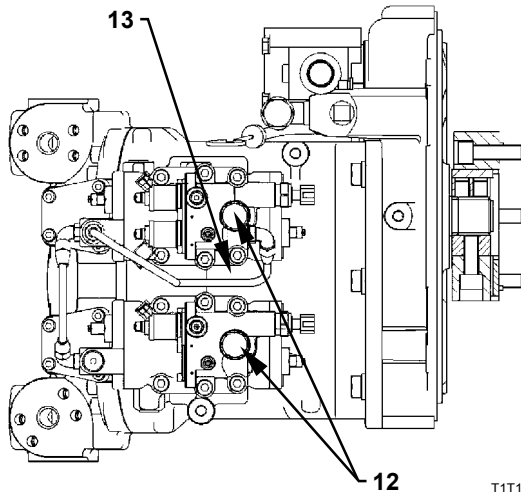
Refer to Operational Performance Standard in Group T4-2.

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



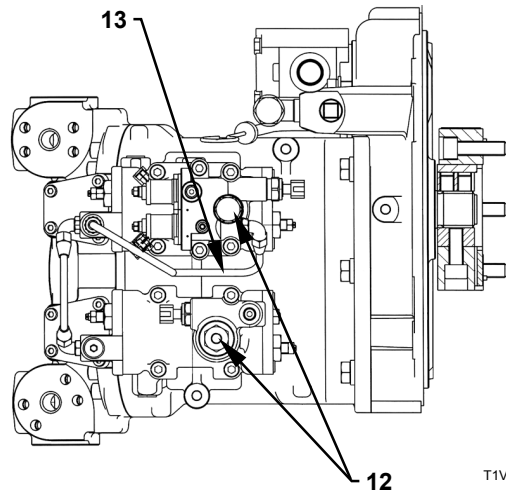
T173-04-04-002

ZAXIS160LC-3



T1T1-01-02-006

ZAXIS180LC-3



T1V1-04-05-002

1 - Pipe E (ST 6144)

2 - Pipe B (ST 6143)

3 - Test Hose (ST 6145)

4 - Adapter PF1 × UNF1-7/8  
(ST 6146)

5 - Hydraulic Tester (ST 6299)

6 - Adapter PF1 × UNF1-7/8  
(ST 6146)

7 - Joint (ST 6330)

8 - Test Hose (ST 6320)

9 - Flange (ST 6118)

10 - Split Flange (ST 6130)

11 - Bolt (ST 6409) (4 Used)

12 - Plug

13 - Pipe

## OPERATIONAL PERFORMANCE TEST / Component Test

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### • Pilot Characteristics



#### Summary:

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

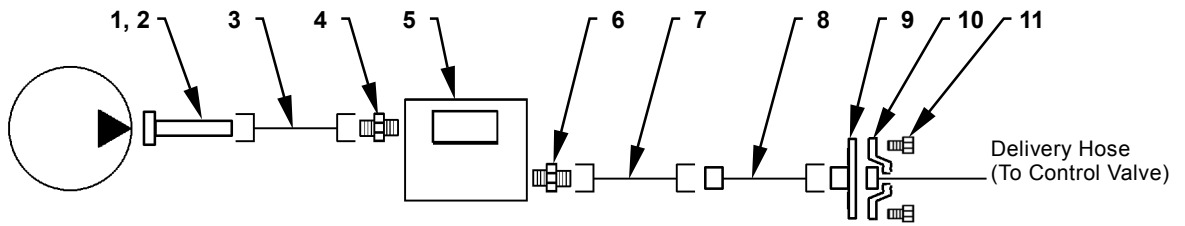
**IMPORTANT: This measurement procedure is a simple method. The measured data will be lower by approx. 5 % than the accurately measured value. In order to measure accurately, disconnect the return circuit from the control valve and connect it to the hydraulic oil tank.**

#### Preparation:

1. While referring to steps 1 to 4 on page T4-5-18. Install a hydraulic tester to the main pump to be measured.
2. Remove the hose from regulator port Pi of the pump to be measured. Install plug (ST 6213) to the removed hose.  
 : 6 mm, 19 mm
3. Install adapters (15) (3 used) to pressure reducing valve (16). Remove plug M from the pilot filter. Install adapter (13) and hose (14) to the pilot filter. Install hose (14) to regulator port P1 on pressure reducing valve (16).  
 : 19 mm
4. Install tee (17) to port P2 of pressure reducing valve (16). Install pressure gauge (18) and hose (14) to tee (17). Install hose (14) to the regulator.  
 : 19 mm

5. Install hose (19) and adapter (20) to port T of pressure reducing valve (16). Remove plug L from the return pipe. Install hose (19).  
 : 19 mm, 22 mm
6. Remove pipe (21) from the regulator. Install plug (G 1/4) to the mounting hole for pipe (21) in the regulator.  
 : 17 mm
7. Remove the vacuum pump. Loosen the plug from top of the pump casing. Bleed air from the pump casing until oil only comes out.
8. Fully open the loading valve of hydraulic tester.
9. Start the engine. Check the connections for any oil leaks.

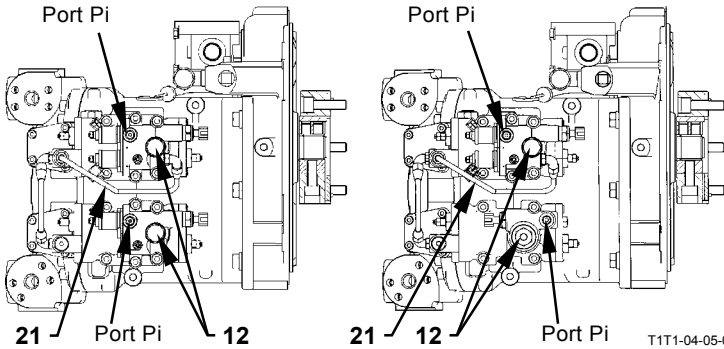
# OPERATIONAL PERFORMANCE TEST / Component Test



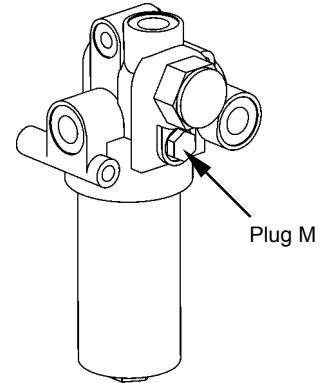
T173-04-04-002

ZAXIS160LC-3

ZAXIS180LC-3

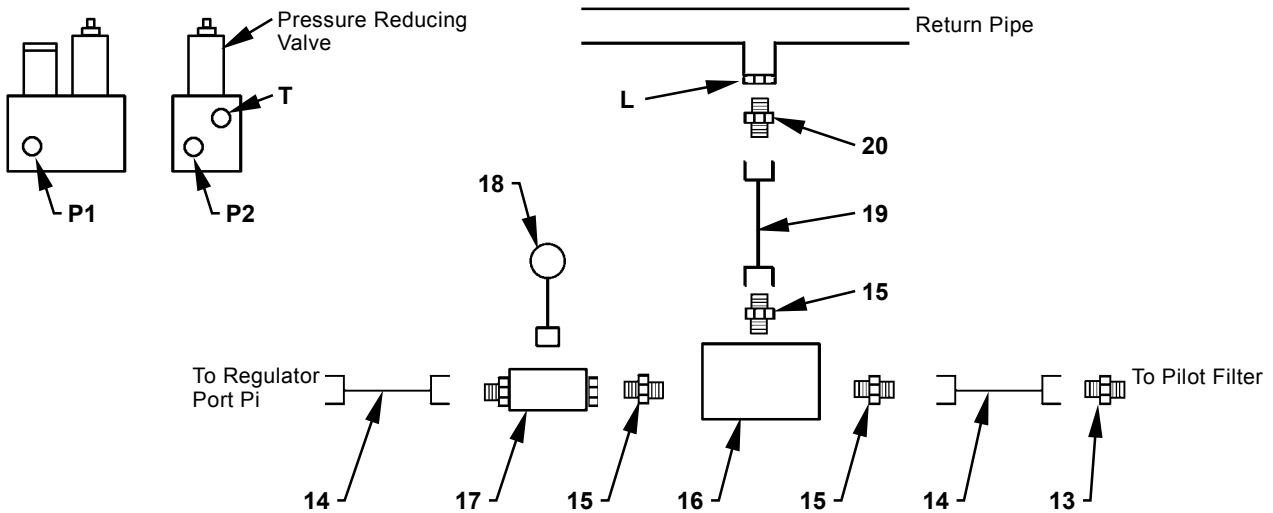


T1T1-04-05-001



T178-03-07-001

## Pressure Reducing Valve Port Position



T178-04-04-004

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

## OPERATIONAL PERFORMANCE TEST / Component Test

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### Measurement:

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

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

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

### Evaluation:

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

$$Q_c = (N_s \times Q) / N_e$$


Q<sub>c</sub> : Converted Flow Rate

Q : Measured Flow Rate

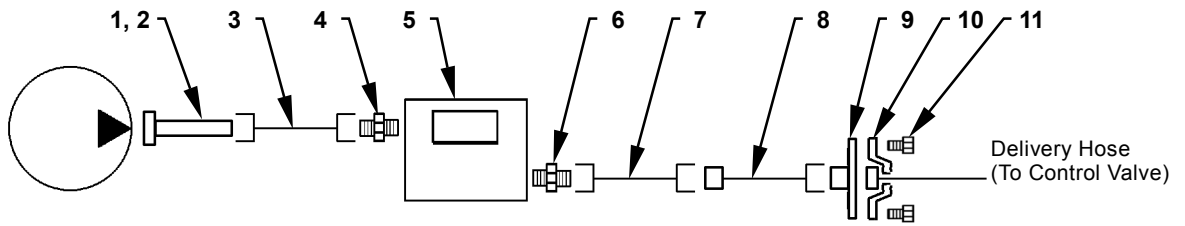
N<sub>s</sub> : Specified Engine Speed  
 (ZAXIS160LC-3: 2000 min<sup>-1</sup>)  
 (ZAXIS180LC-3: 2000 min<sup>-1</sup>)

N<sub>e</sub> : Measured Engine Speed  
 Values indicated on Dr. ZX

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

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

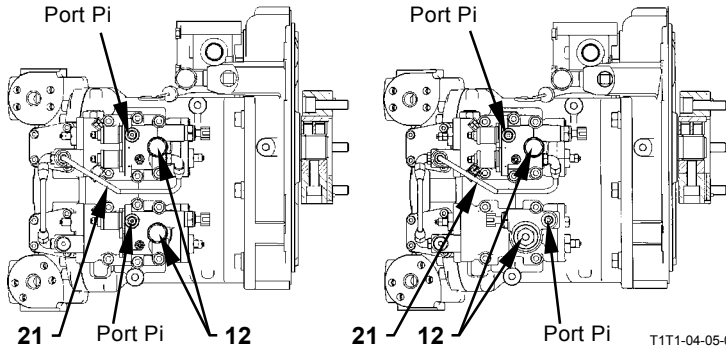
# OPERATIONAL PERFORMANCE TEST / Component Test



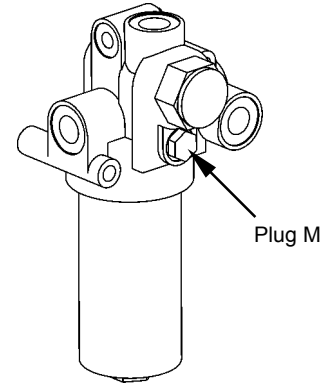
T173-04-04-002

ZAXIS160LC-3

ZAXIS180LC-3

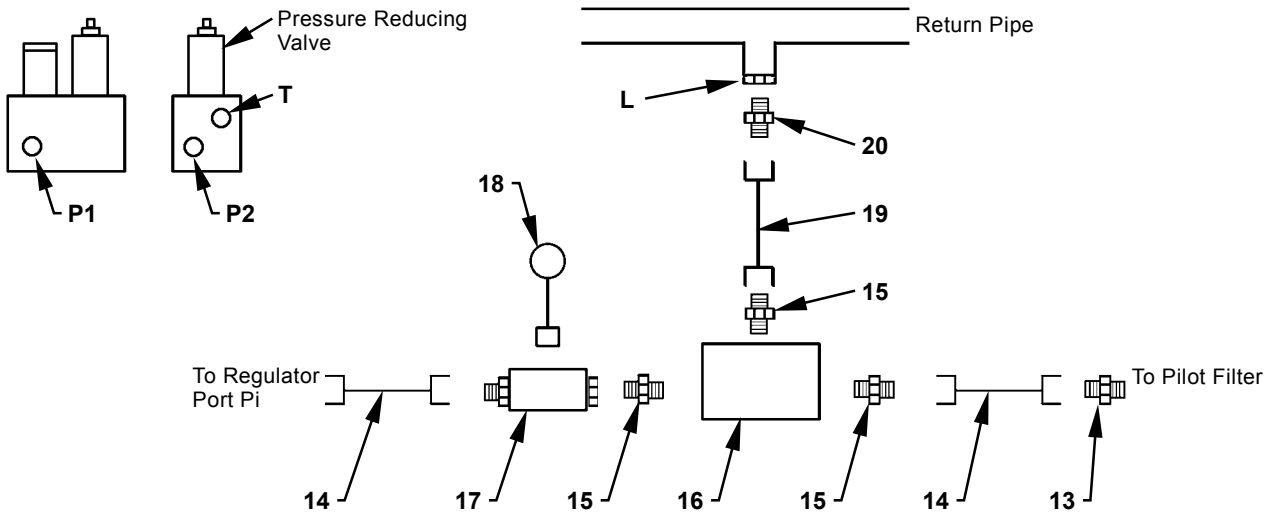


T1T1-04-05-001



T178-03-07-001

## Pressure Reducing Valve Port Position

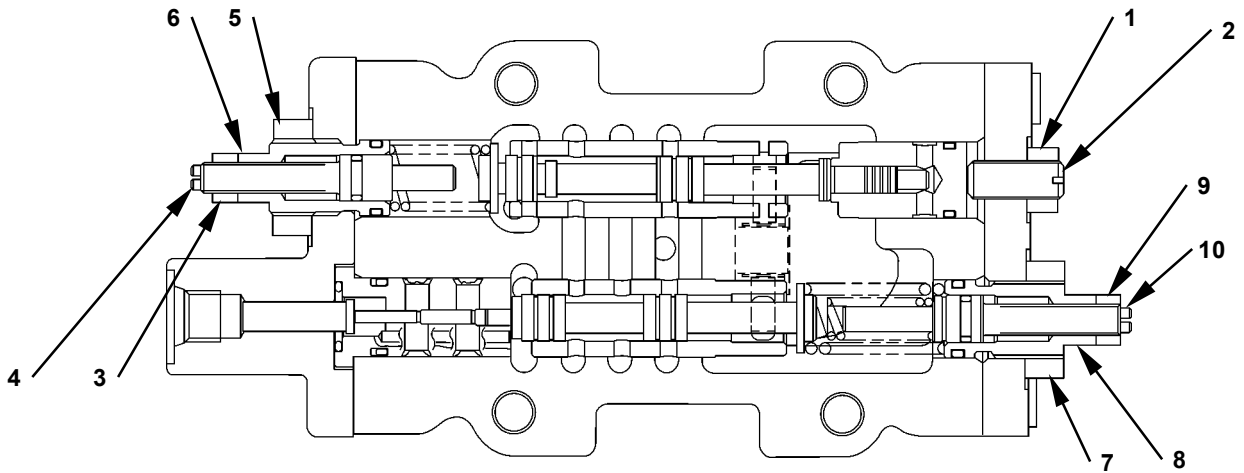


T178-04-04-004

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

# OPERATIONAL PERFORMANCE TEST / Component Test

## Regulator Adjustment

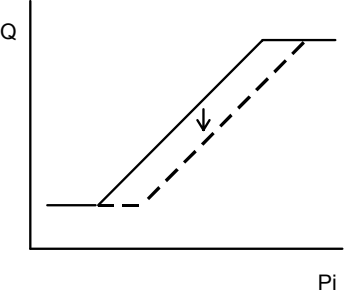


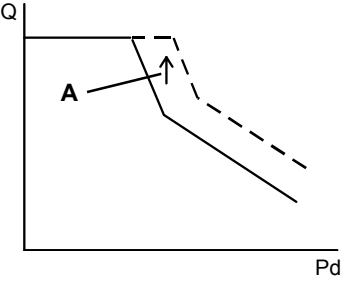
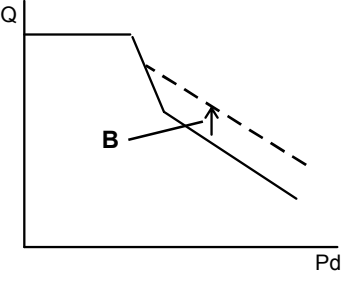


T1V1-03-01-009

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

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

## OPERATIONAL PERFORMANCE TEST / Component Test

Adjustment Item	Adjustment Procedure	Remarks
<p>3. Pilot Pressure Characteristics</p> 	<p>Loosen lock nut (5) and turn adjusting screw (6).            Rotating adjusting screw (6) 1/4 a turn clockwise decreases the flow rate by 13.2 cm<sup>3</sup>/rev. (0.71 in<sup>3</sup>/rev).   : 30 mm   : 29.4 N·m (3 kgf·m, 21.7 lbf·ft)</p>	<ol style="list-style-type: none"> <li>1) Do not turn adjusting screw (6) more than one turn.</li> <li>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.</li> <li>3) Securely tighten lock nut (5) after adjustment.</li> </ol>
<p>4. P-Q Control (Torque Adjustment)</p>  	<p>A: Loosen lock nut (7) and turn adjusting screw (8).            Rotating adjusting screw (8) 1/4 a turn clockwise increases the flow rate by 15.3 cm<sup>3</sup>/rev. (0.93 in<sup>3</sup>/rev.).            B: Loosen lock nut (9) and turn adjusting screw (10).            Rotating adjusting screw (10) 1/4 a turn clockwise increases the flow rate by 3.60 cm<sup>3</sup>/rev. (0.22 in<sup>3</sup>/rev.).</p>	<ol style="list-style-type: none"> <li>1) Do not turn the adjusting screws more than one turn.</li> <li>2) Rotate the adjusting screws watching the engine performance.</li> <li>3) Securely tighten lock nut (7) or (9) after adjustment.</li> </ol>

# OPERATIONAL PERFORMANCE TEST / Component Test

## SWING MOTOR DRAINAGE

### Summary:

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





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

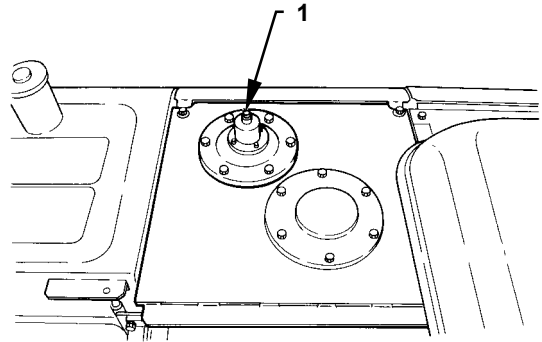
**Also, take care not to fall off the machine while the measurement.**

### Preparation:

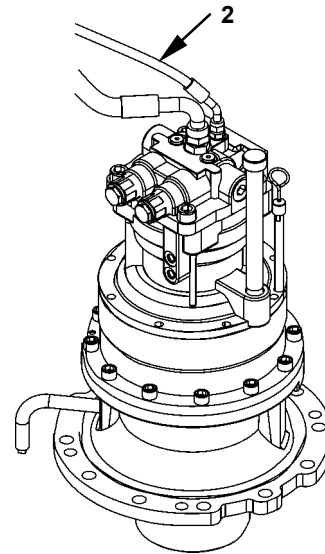
1. Maintain hydraulic oil temperature at  $50\pm 5$  °C ( $122\pm 41$  °F). Rotate the swing motor in order to warm inside of the motor.
2. Stop the engine. Push air bleed valve (1) on top of the hydraulic oil tank and release any remaining pressure.
3. Remove drain hose (2) of the swing motor at the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

 : 22 mm

 : 39 N·m (4 kgf·m, 29 lbf·ft)



T157-05-04-014



T178-04-04-005



# OPERATIONAL PERFORMANCE TEST / Component Test

## Preconditions for Measurement:

1. Select the following switch positions:

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

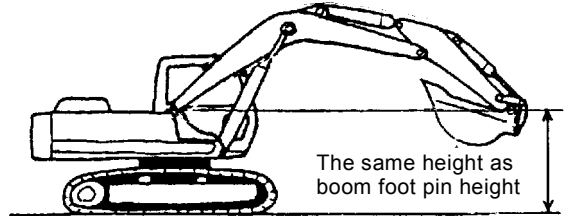
## Measurement:

1. Amount of Oil Drained While Swinging the Upperstructure

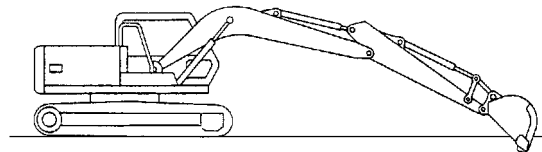
- 1-1. Fully retract the arm cylinder. Fully extend the bucket cylinder. Hold the boom so that the arm tip pin height is the same as the boom foot pin height. The bucket must be empty.
- 1-2. Start the engine. Operate and hold the swing lever full stroke. After the swing speed reaches a constant maximum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

2. Amount of Oil Drained While Relieving Swing Motor Circuit

- 2-1. Thrust the bucket teeth into the ground so that the upperstructure does not rotate.
- 2-2. 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.
- 2-3. Repeat the measurement at least three times in both clockwise and counterclockwise directions, and calculate the average values.
- 2-4. The measuring time should be more than 45 seconds.



T105-06-03-013



T107-06-06-005

## OPERATIONAL PERFORMANCE TEST / Component Test

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### Evaluation:

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

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

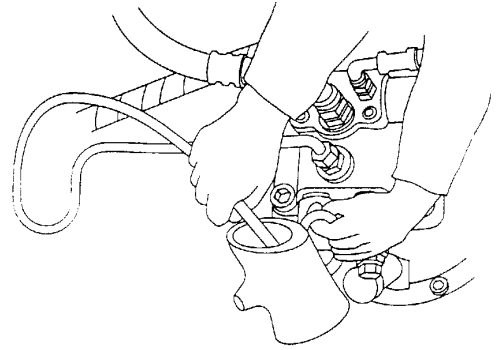
First measure amount of drain oil by using a calibrated container. Then, convert the measured drain oil into the per-minute value by using the formula below:

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

$\Delta Q$  : Amount of drain oil per minute (L/min)

$t$  : Measured time (seconds)

$q$  : Total amount of drain oil (L)



T107-06-05-008

# OPERATIONAL PERFORMANCE TEST / Component Test

## TRAVEL MOTOR DRAINAGE

### Summary:

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





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

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

### Preparation:

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

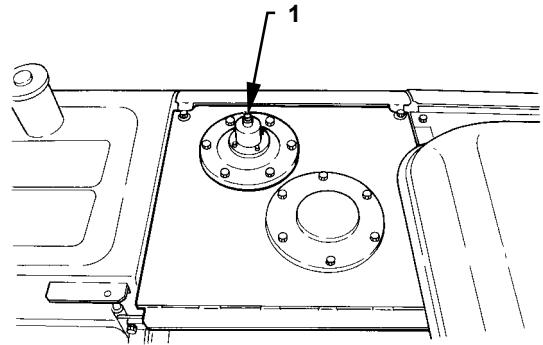
 : 27 mm

 : 78 N·m (8.0 kgf·m, 58 lbf·ft)

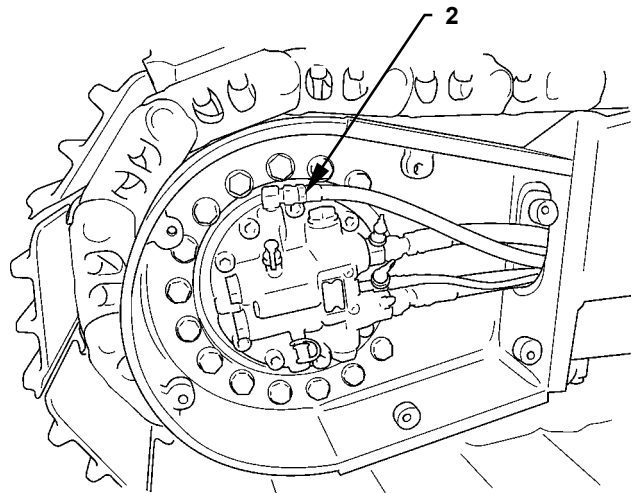
### Preconditions for Measurement:

1. Select the following switch positions:

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



T157-05-04-014



M178-07-047

## OPERATIONAL PERFORMANCE TEST / Component Test

### 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.

### Evaluation:

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

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

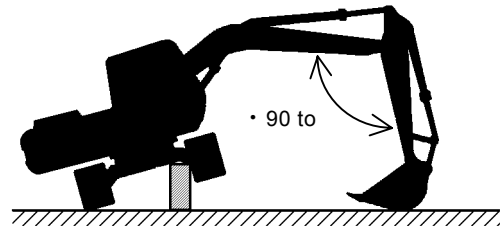
First measure amount of drain oil using a calibrated container. Then, convert the measured drain oil into the per-minute value using the formula below:

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

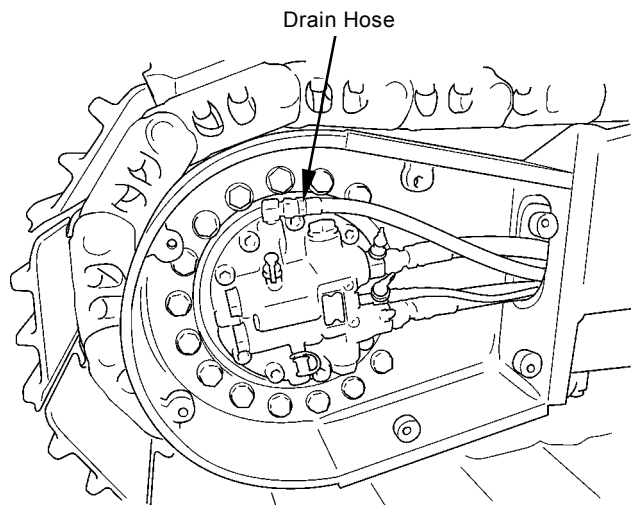
$\Delta Q$  : Amount of drain oil per minute (L/min)

$t$  : Measured time (seconds)

$q$  : Total amount of drain oil (L)



M104-07-067



M178-07-047

## OPERATIONAL PERFORMANCE TEST/Adjustment

### ADJUSTMENT

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

#### Parameter Change


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

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

## OPERATIONAL PERFORMANCE TEST/Adjustment


### Attachment Parameter Change

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

 **NOTE:** ATT: Attachment  
 BR: Hydraulic Breaker  
 PU: Secondary Crusher  
 CR: Primary Crusher  
 VI: Vibrating Hammer  
 Others: Other Attachments  
 Non: Attachment Unset  
 C/V: Control Valve  
 O/T: Hydraulic Oil Tank


## OPERATIONAL PERFORMANCE TEST/Adjustment

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

 **NOTE:** ATT: Attachment  
 BR: Hydraulic Breaker  
 PU: Secondary Crusher  
 CR: Primary Crusher  
 VI: Vibrating Hammer  
 Others: Other Attachments  
 Non: Attachment Unset  
 C/V: Control Valve  
 O/T: Hydraulic Oil Tank

## OPERATIONAL PERFORMANCE TEST/Adjustment

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

 **NOTE:** ATT: Attachment  
 BR: Hydraulic Breaker  
 PU: Secondary Crusher  
 CR: Primary Crusher  
 VI: Vibrating Hammer  
 Others: Other Attachments  
 Non: Attachment Unset  
 C/V: Control Valve  
 O/T: Hydraulic Oil Tank



## OPERATIONAL PERFORMANCE TEST/Adjustment

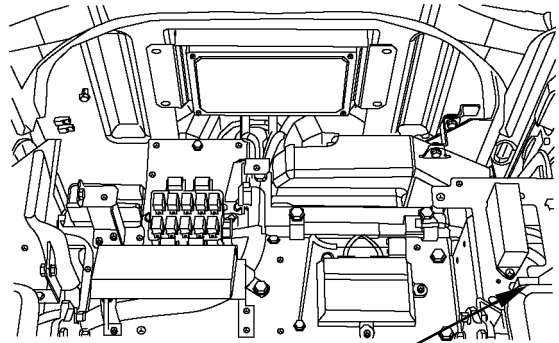
---

(Blank)

# OPERATIONAL PERFORMANCE TEST/Adjustment

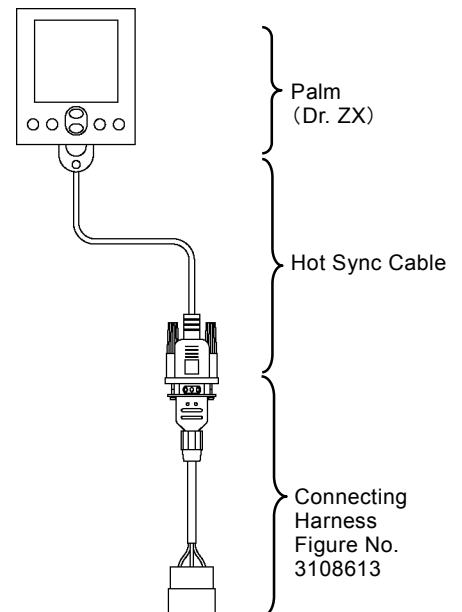
## Adjustment

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



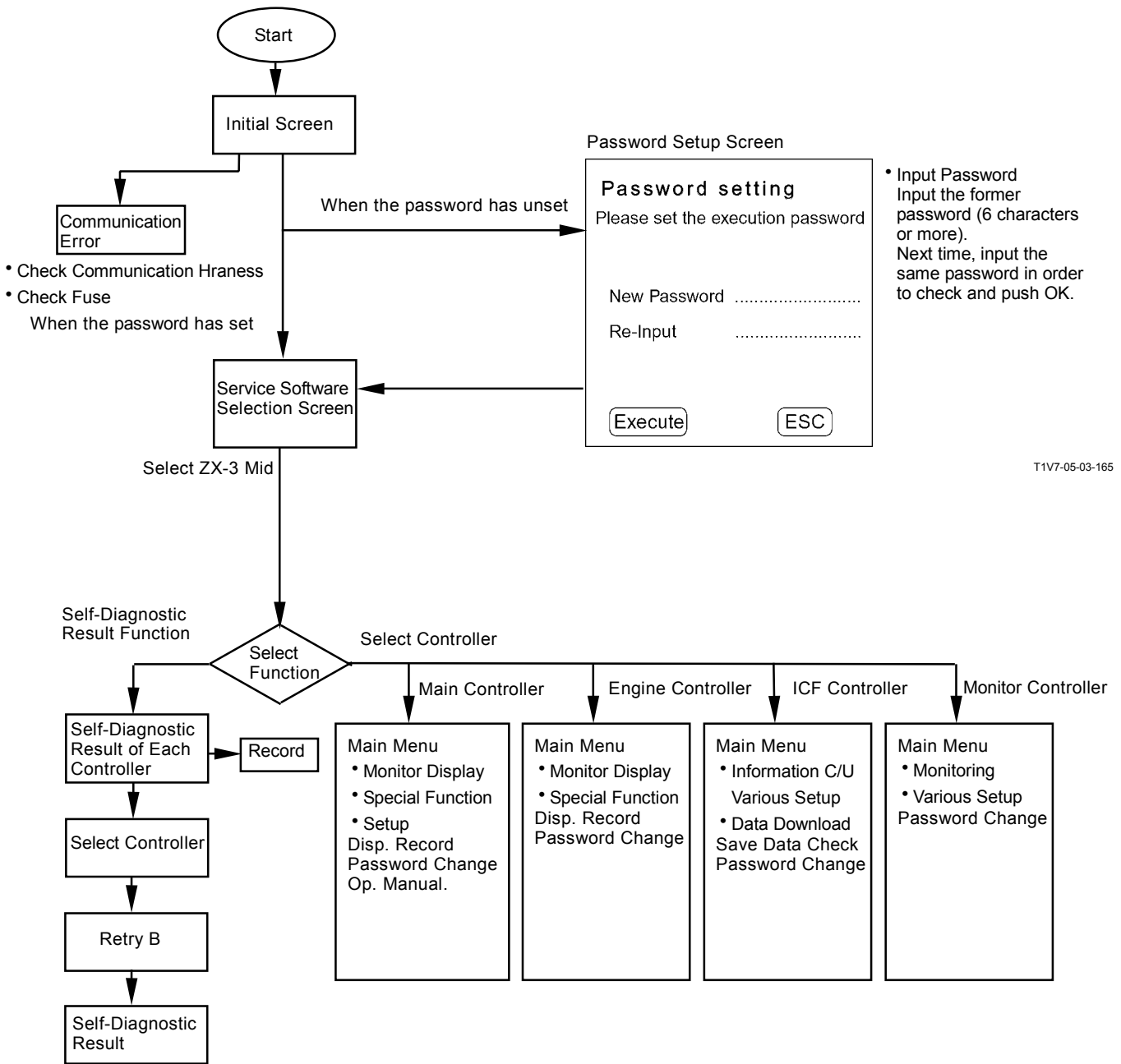
Dr. ZX  
Connector

T1V1-05-07-001



T1V1-05-07-002

# OPERATIONAL PERFORMANCE TEST/Adjustment

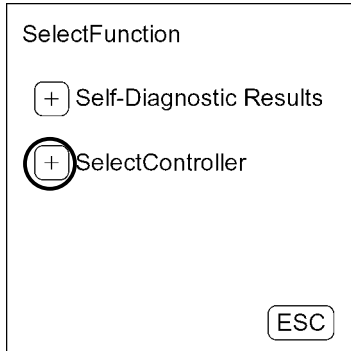


# OPERATIONAL PERFORMANCE TEST/Adjustment

## Setting

- Parameter Change

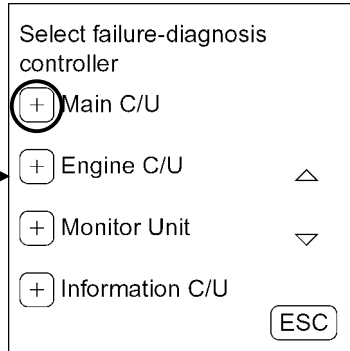
After starting Dr. ZX, push Select Controller.



T1V7-05-03-001

Function Selection Screen

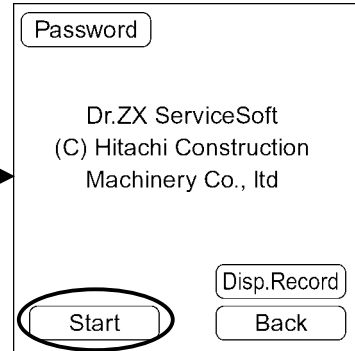
Push Main C/U.



T1V7-05-03-009

Controller Selection Screen

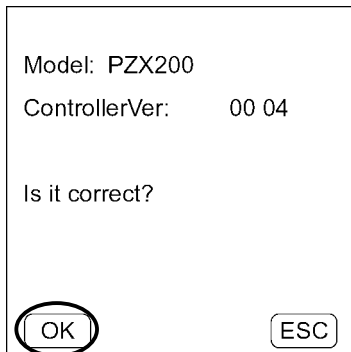
Push Start.



T1V7-05-03-011

Main Controller Screen

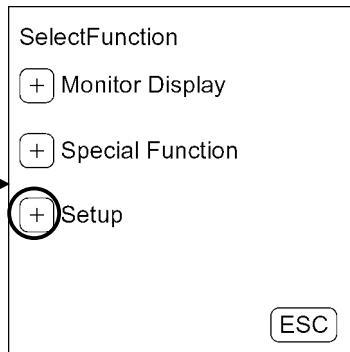
Push OK.



T1V7-05-03-010

Title Screen

Push Setup.



T1V7-05-03-012

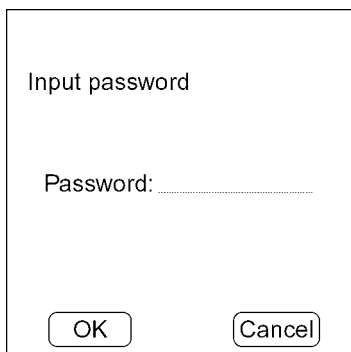
Main Menu Screen

Boot up Service Program

To the lower

T1V7-05-03-016

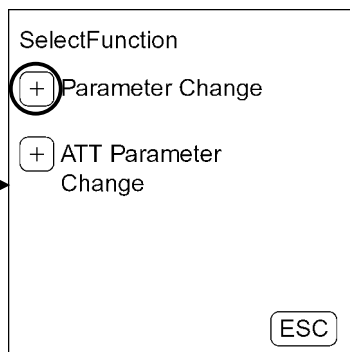
Input the password and push OK. Push Cancel and return to Main Menu Screen.



T1V7-05-03-022

Setup Password Input Screen

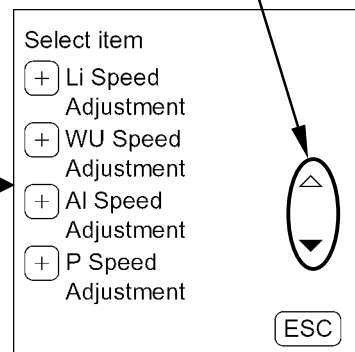
Push Parameter Change. Push ESC and return to Main Menu Screen.



T1V7-05-03-206

Setup Item Selection Screen

Refer to T4-6-1 as for the item of Parameter Change. Display the forward and backward item by pushing these marks.



T1V7-05-03-105

Parameter Change Selection Screen

# OPERATIONAL PERFORMANCE TEST/Adjustment

## Parameter Input

**Example: Li Speed Adjustment**

**Input Value = Normal Value**

Push Li Speed Adjustment.

Select item

- Li Speed Adjustment
- WU Speed Adjustment
- AI Speed Adjustment
- P Speed Adjustment

△  
▽

ESC

T1V7-05-03-105

Parameter Change Selection Screen

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

Li Speed Adjustment  
Adjustable range  
0 ~ 400min-1

Initial                    0 min-1  
Current                    0 min-1

Adjustment : .....min-1

Execution                    ESC

T1V7-05-03-106

Parameter Input Screen

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

**\*Adjust Data Confirm\***  
Adjust Data Name:  
LiSpeed Adjustment  
Current                    0 min-1  
Adjustment                +200 min-1

To the lower

Execute                    ESC

T1V7-05-03-113

Push ESC and return to Parameter Change Selection Screen.

Data has canged

ESC

T1V7-05-03-107

# OPERATIONAL PERFORMANCE TEST/Adjustment

---

## Input Value = Current Value

Push Li Speed Adjustment.

Select item

- Li Speed Adjustment
- WU Speed Adjustment
- AI Speed Adjustment
- P Speed Adjustment

△  
▽

ESC

T1V7-05-03-105

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

Li Speed Adjustment

Adjustable range 0 ~ 400min-1

Initial 0 min-1

Current 0 min-1

Adjustment : .....min-1

Execution      ESC

T1V7-05-03-106

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

Adjustment is same as current value. Is it correct?

Current: 0 min-1

Adjustment : 0 min-1

Execute      ESC

T1V7-05-03-108

Parameter Change Selection Screen

Parameter Input Screen

Push ESC and return to Parameter Change Selection Screen

Data has canged

ESC

T1V7-05-03-107

To the lower

# OPERATIONAL PERFORMANCE TEST/Adjustment

---

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

Push Li Speed Adjustment.

Select item

- Li Speed Adjustment
- WU Speed Adjustment
- AI Speed Adjustment
- P Speed Adjustment

ESC

T1V7-05-03-105

Parameter Change Selection Screen

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

Li Speed Adjustment  
Adjustable range  
0 ~ 400min-1

Initial                   0 min-1  
Current                   0 min-1

Adjustment : .....min-1

Execution                   ESC

T1V7-05-03-106

Parameter Input Screen

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

An approximate deviation is unaccep table.  
Input maximum deviation or Re-input in the range

Maximum:       400       min-1

Re-Input       Max       ESC

T1V7-05-03-109

To the lower

Push ESC and return to Parameter Change Selection Screen.

Data has canged

ESC

T1V7-05-03-107

# OPERATIONAL PERFORMANCE TEST/Adjustment

## When the input value cannot be divided

Push Li Speed Adjustment.

Select item

- Li Speed Adjustment
- WU Speed Adjustment
- AI Speed Adjustment
- P Speed Adjustment

△  
▼

ESC

T1V7-05-03-105

Parameter Change Selection Screen

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

Li Speed Adjustment  
Adjustable range  
0 ~ 400min-1

Initial                   0 min-1  
Current                   0 min-1

Adjustment : .....min-1

Execution           ESC

T1V7-05-03-106

Parameter Input Screen

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

An approximate deviation is unaccep table.  
Re-input in the range or select approximae Deviation A or B.

Approximate Deviation  
(A)                   +10 min-1  
(B)                   +20 min-1

Re-Input   A   B   ESC

T1V7-05-03-110

To the lower

Push ESC and return to Parameter Change Selection Screen.

Data has canged

ESC

T1V7-05-03-107



# OPERATIONAL PERFORMANCE TEST/Adjustment

## Status Selection

**Example: ATT Torque Reducing On/Off: Off**

Push ATT Torque Reducing On/Off.

Select item

- ATT SpeedIncreases Down WaitingTime
- ATT Torque Reducing On/Off
- ECO Mode On/Off
- HP Mode On/Off

▲    ▼

ESC

T1V7-05-03-179

Parameter Change Selection Screen

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

ATT Torque Reducing On/Off

Status:  OFF     ON

OFF     ON

Exec

ESC

T1V7-05-03-111

Status Selection Screen

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

**\*Adjust Data Confirm\***

Adjust Data Name:  
ATT Torque Reducing On/Off

Current     OFF

Adjustment  ON

Execute

ESC

T1V7-05-03-112

To the lower

Push ESC and return to Parameter Change Selection Screen.

Data has canged

ESC

T1V7-05-03-107

# OPERATIONAL PERFORMANCE TEST/Adjustment

## • Attachment Parameter Change

After starting Dr. ZX, push Select Controller.

SelectFunction

- (+) Self-Diagnostic Results
- (+) SelectController

ESC

T1V7-05-03-001

Function Selection Screen

Push Main C/U.

Select failure-diagnosis controller

- (+) Main C/U
- (+) Engine C/U
- (+) Monitor Unit
- (+) Information C/U

ESC

T1V7-05-03-009

Controller Selection Screen

Push Start.

Password

Dr.ZX ServiceSoft  
(C) Hitachi Construction Machinery Co., Ltd

Start

Disp.Record

Back

T1V7-05-03-011

Main Controller Screen

To the lower

Push OK.

Model: PZX200

ControllerVer: 00 04

Is it correct?

OK

ESC

T1V7-05-03-010

Title Screen

Push Setup.

SelectFunction

- (+) Monitor Display
- (+) Special Function
- (+) Setup

ESC

T1V7-05-03-012

Main Menu Screen

Boot up Service Program

T1V7-05-03-016

To the lower

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

Input password

Password: .....

OK

Cancel

T1V7-05-03-022

Setup Password Input Screen

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

SelectFunction

- (+) Parameter Change
- (+) ATT Parameter Change

ESC

T1V7-05-03-206

Setup Item Selection Screen

Refer to T4-6-2 as for the item of ATT Parameter Change. Display the forward and backward item by pushing these marks.

Select ATT

- (+) ATT1
- (+) ATT2
- (+) ATT3
- (+) ATT4

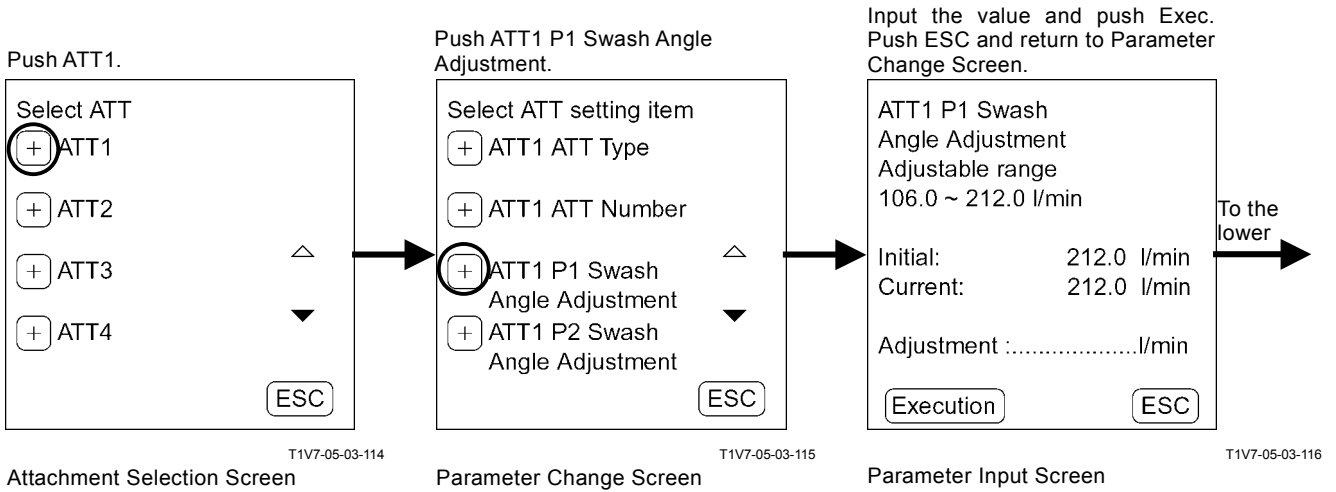
ESC

T1V7-05-03-114

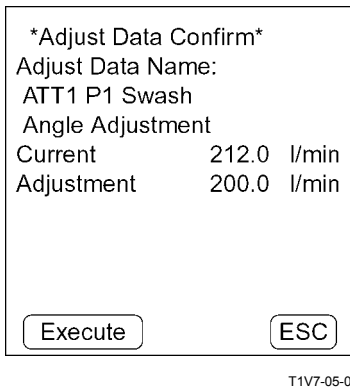
Attachment Selection Screen

# OPERATIONAL PERFORMANCE TEST/Adjustment

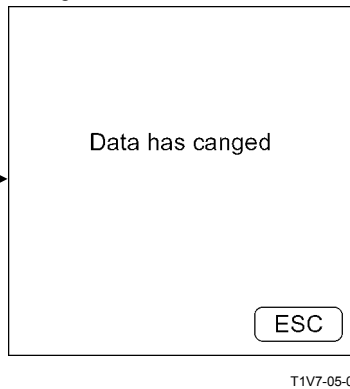
## Attachment Parameter Input Input Value = Normal Value



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

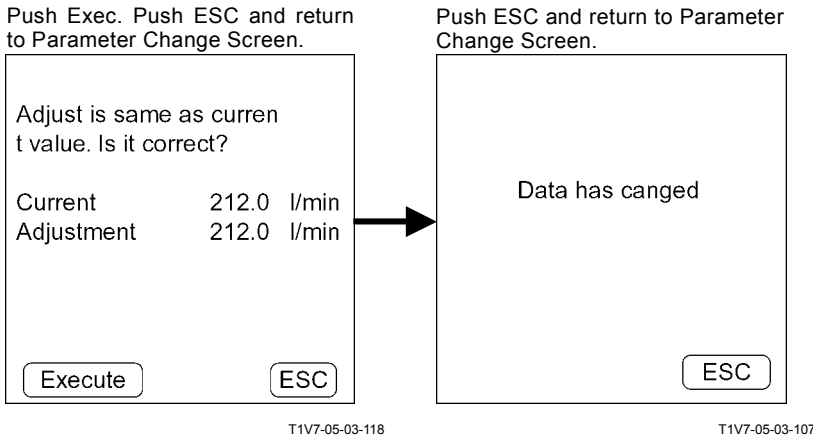
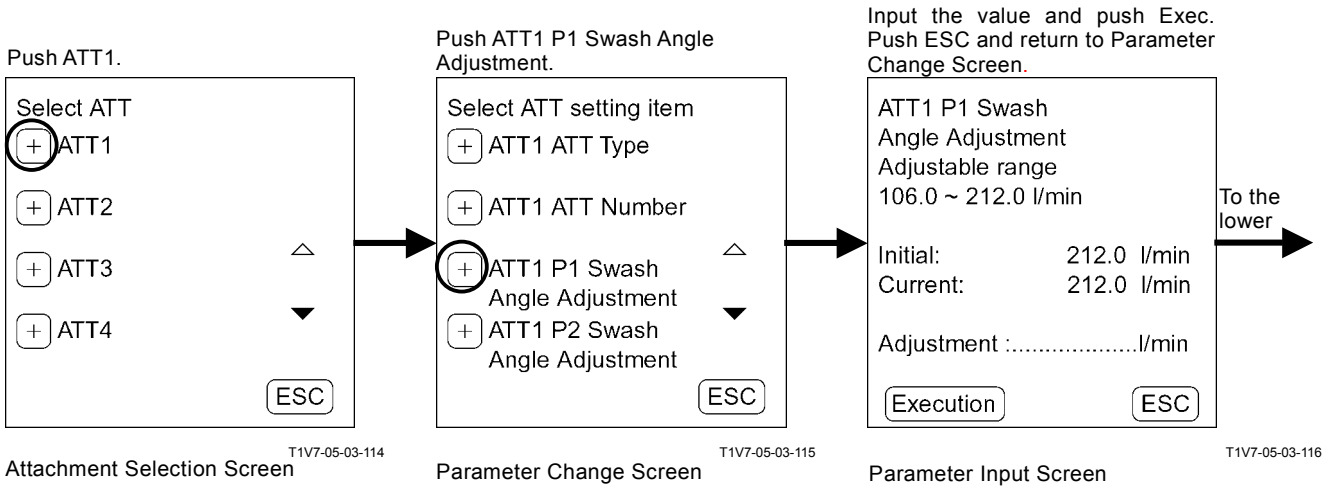


Push ESC and return to Parameter Change Screen.



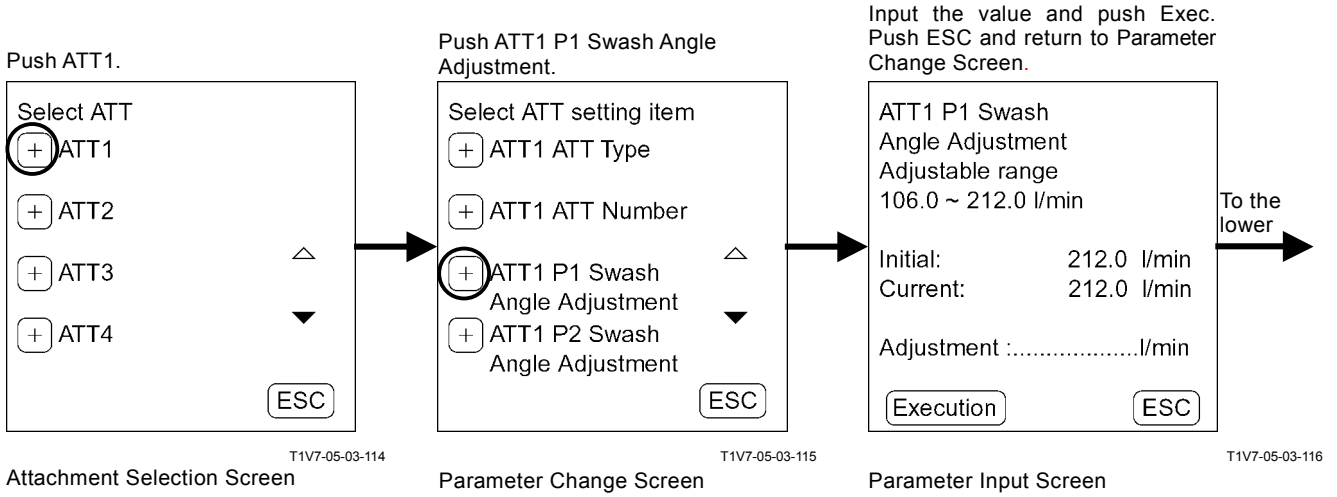
# OPERATIONAL PERFORMANCE TEST/Adjustment

**Input Value = Current Value**

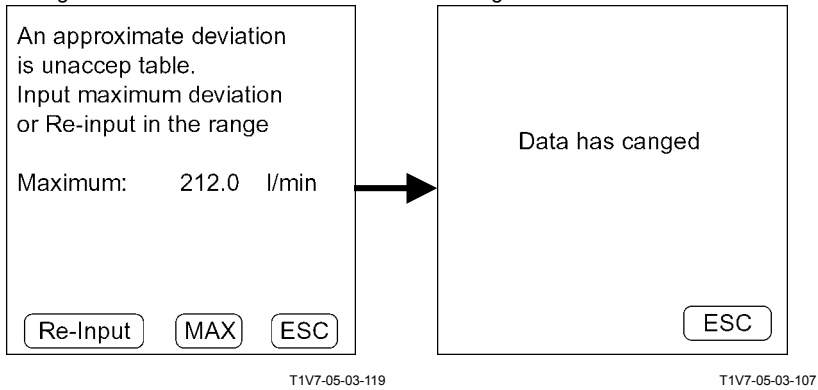


# OPERATIONAL PERFORMANCE TEST/Adjustment

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

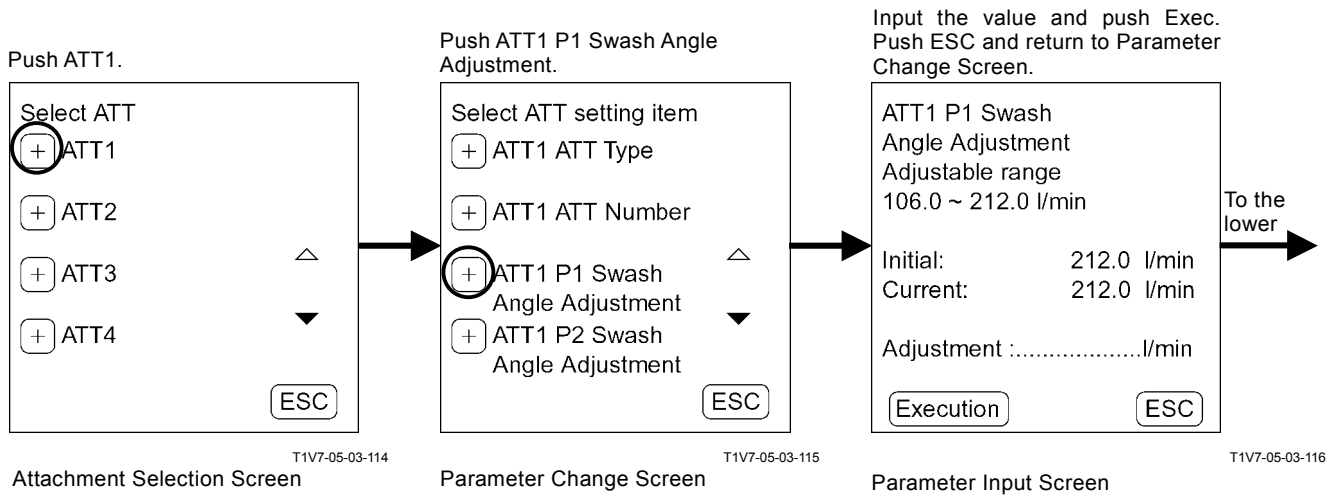


Push Re-Input and return to Parameter Input Screen. Push Max and the maximum value is input. Push ESC and return to Parameter Change Screen.



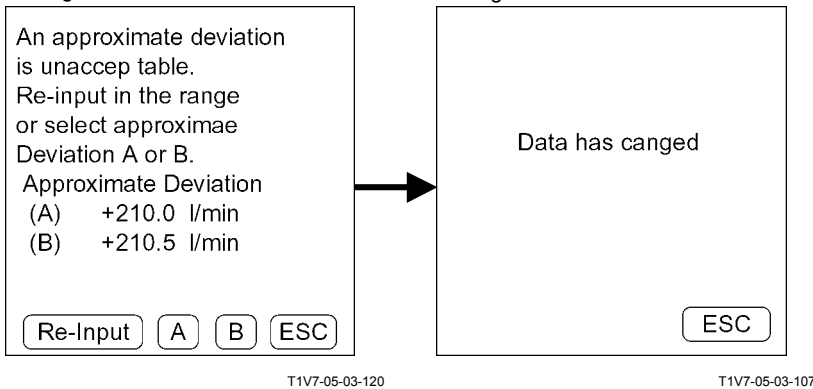
# OPERATIONAL PERFORMANCE TEST/Adjustment

## When the input value cannot be divided



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

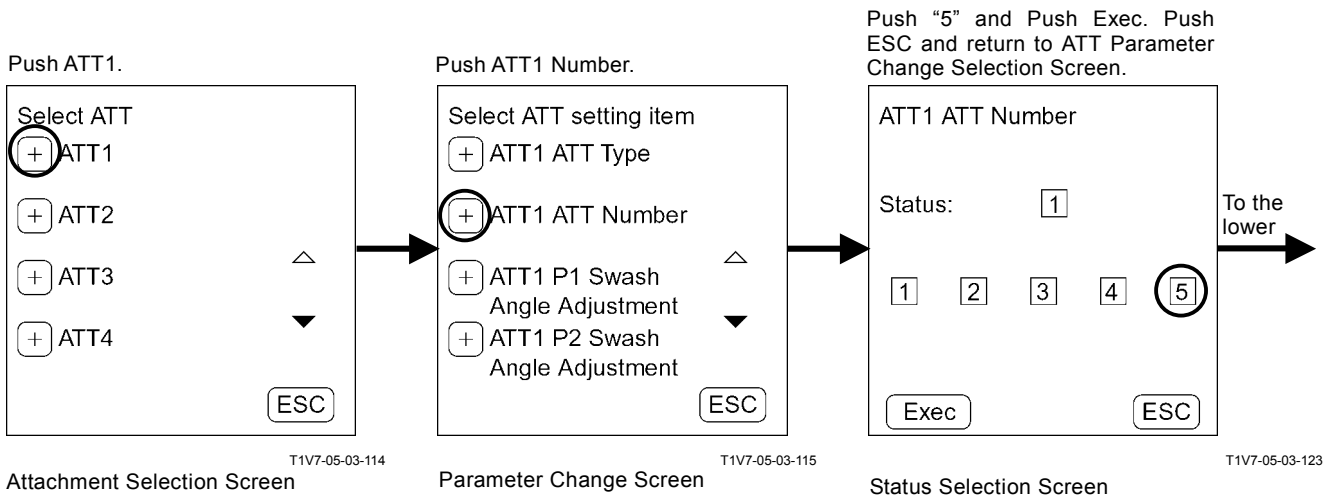
Push ESC and return to Parameter Change Screen.



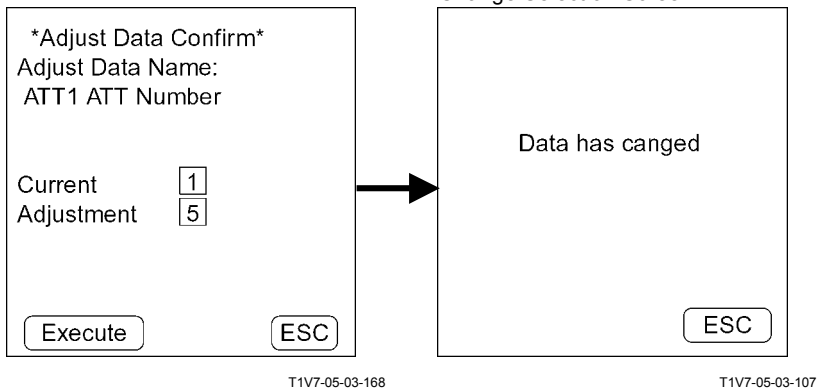
# OPERATIONAL PERFORMANCE TEST/Adjustment

## Status Selection

Example: ATT1, ATT No.



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



# OPERATIONAL PERFORMANCE TEST/Adjustment

## ATTACHMENT SETTING

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

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

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

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

### Work Mode Display

#### Attachment Mode

##### Breaker



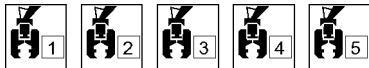
T1V1-05-01-104

##### Pulverizer



T1V1-05-01-105

##### Crusher



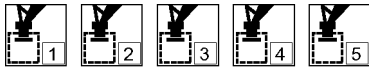
T1V1-05-01-106

##### Vibrating Hammer



T1V1-05-01-107

##### Others

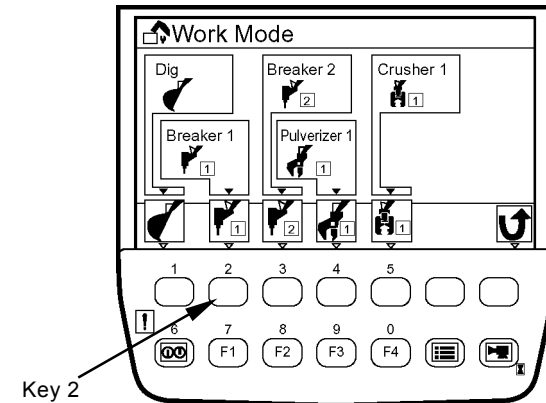


T1V1-05-02-003

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

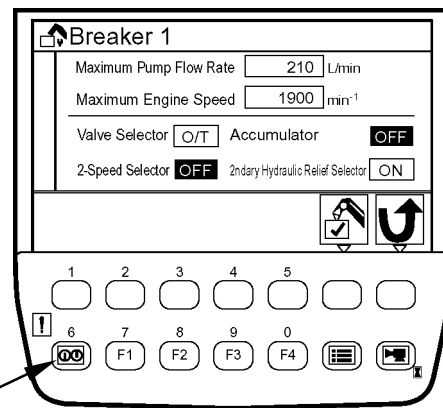
Monitor Unit	HITACHI pattern
Breaker1	Hydraulic Breaker1
Breaker2	Hydraulic Breaker2
Pulverizer1	Secondary Crusher1
Crusher1	Primary Crusher1

### Monitor Unit



T1V5-05-01-109

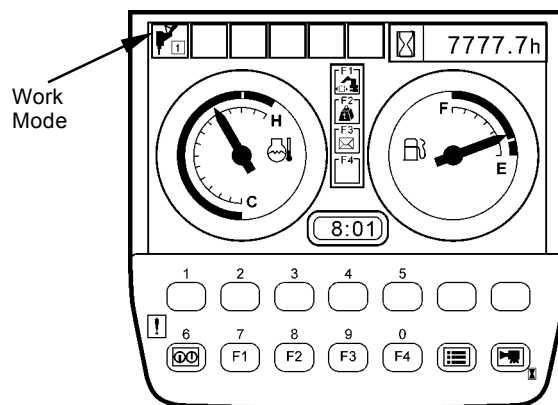
### Work Mode Screen



Key 6

T1V5-05-01-001

### Attachment Specification Screen (Breaker 1)




T1V1-05-03-006

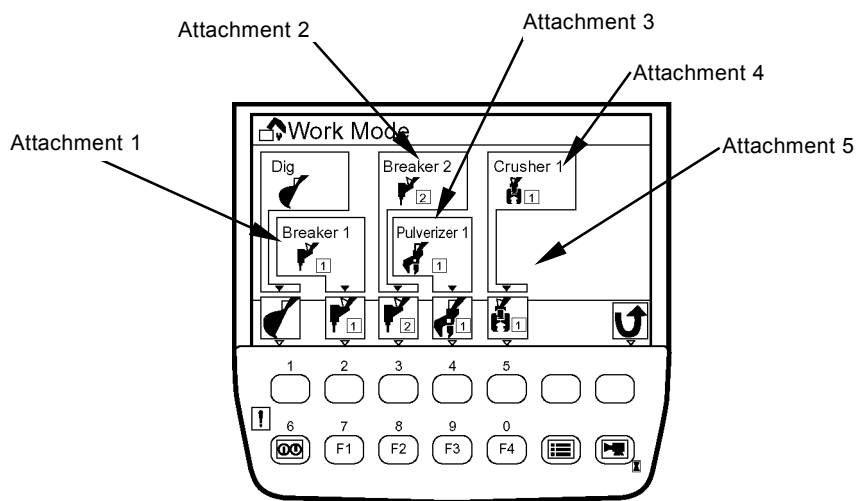
### Primary Screen



## OPERATIONAL PERFORMANCE TEST/Adjustment

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 T4-6-2 to 4.)

 **NOTE:** Attachment setting at the time of shipping from the factory  
Attachment 1: Breaker 1  
Attachment 2: Breaker 2  
Attachment 3: Pulverizer 1  
Attachment 4: Crusher 1  
Attachment 5: Non-setting

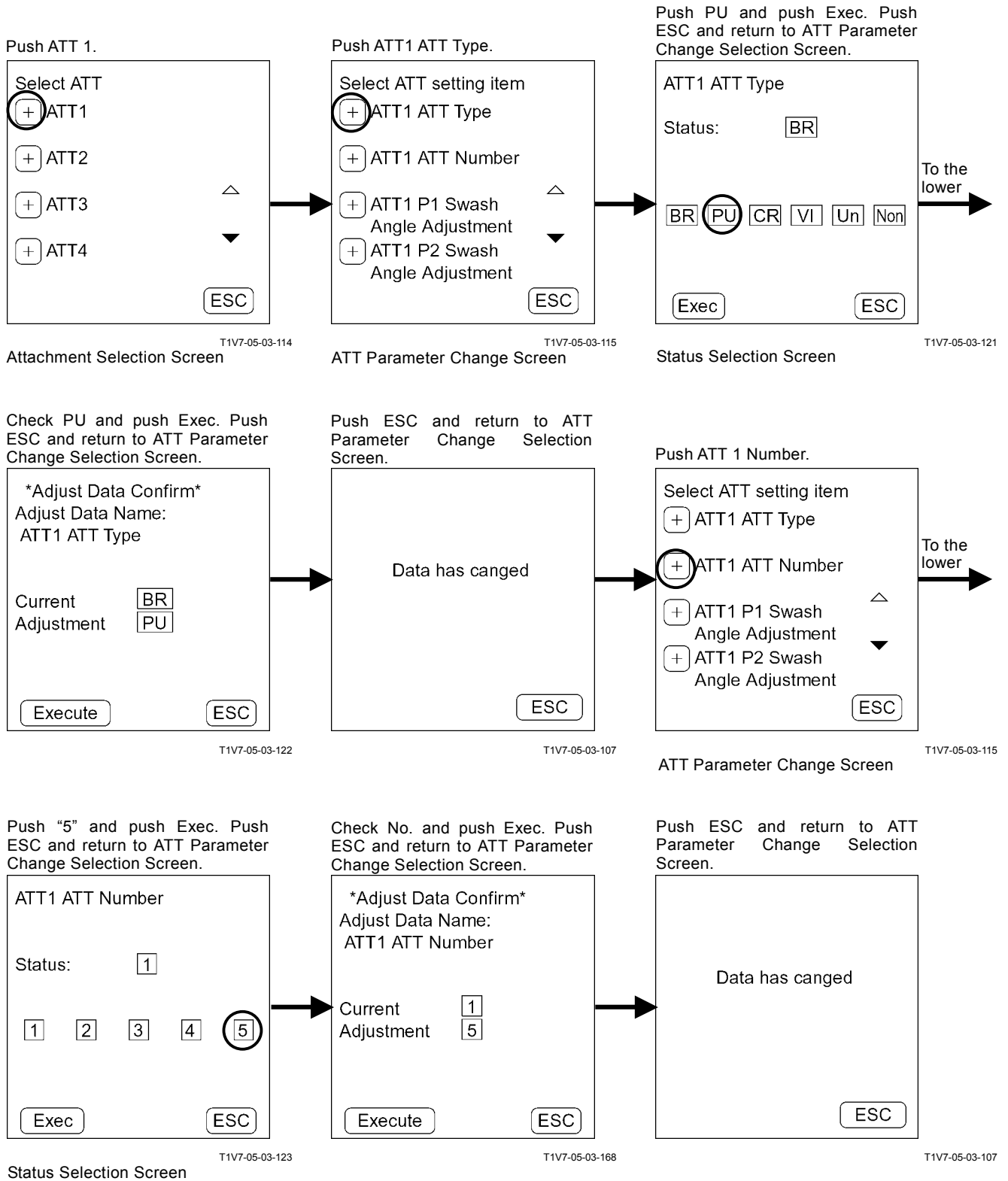


T1V5-05-01-109

# OPERATIONAL PERFORMANCE TEST/Adjustment

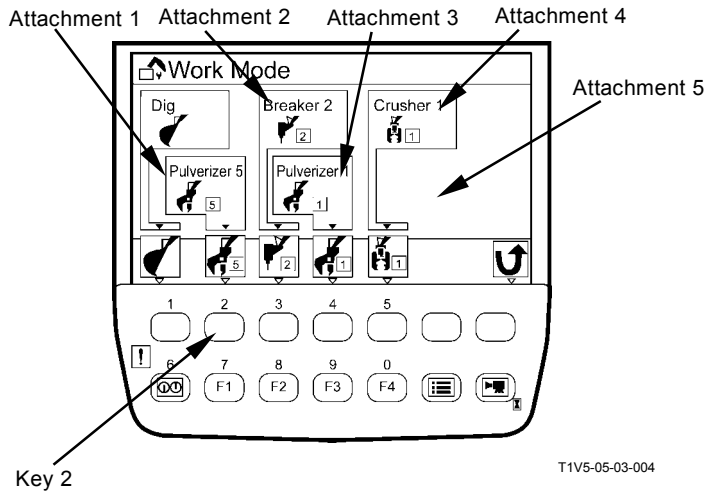
## Attachment Setting

Example: Set Pulverizer 5 to Attachment 1



## OPERATIONAL PERFORMANCE TEST/Adjustment

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.



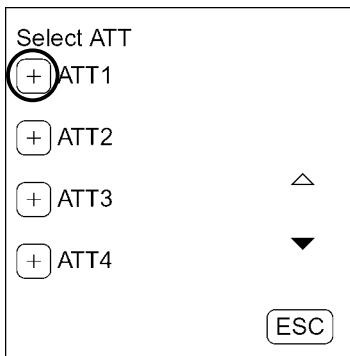
# OPERATIONAL PERFORMANCE TEST/Adjustment

## Attachment Non-Setting

**IMPORTANT: When the attachment is “non-setting”, the attachment cannot be selected on the monitor unit.**

Example: Set Attachment to Non-Setting

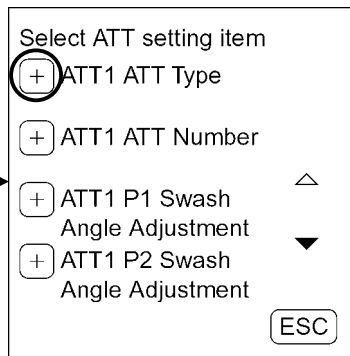
Push ATT 1.



T1V7-05-03-114

Attachment Selection Screen

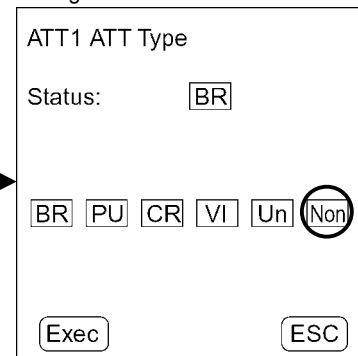
Push ATT1 ATT Type.



T1V7-05-03-115

ATT Parameter Change Screen

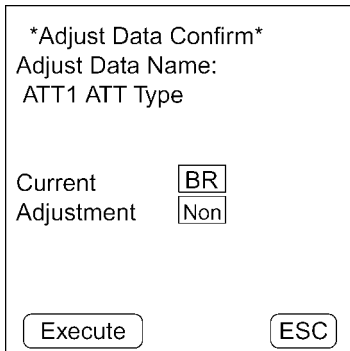
Push Non and push Exec. Push ESC and return to ATT Parameter Change Selection Screen.



T1V7-05-03-121

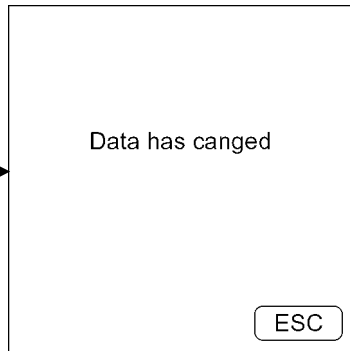
Status Selection Screen

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



T1V7-05-03-178

Push ESC and return to ATT Parameter Change Selection Screen.

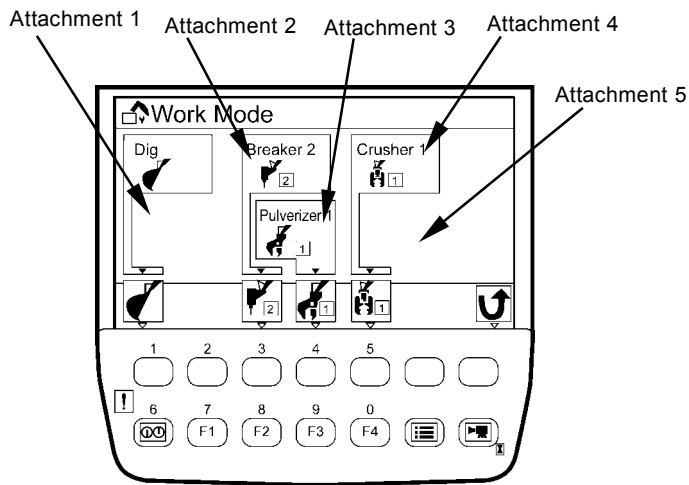


T1V7-05-03-107

## OPERATIONAL PERFORMANCE TEST/Adjustment

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



T1V5-05-03-005

## OPERATIONAL PERFORMANCE TEST/Adjustment

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(Blank)

# MEMO

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A series of horizontal dotted lines for writing, spanning the width of the page.

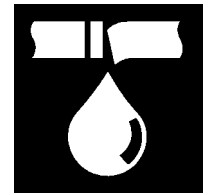




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# SECTION 5 TROUBLESHOOTING



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MC Fault Code 11304.....	T5-5-82	ECM, Communication System	
MC Fault Code 11307.....	T5-5-84	ECM Fault Codes 639 .....	T5-5-110
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CAN Harness Check			
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# TROUBLESHOOTING / Diagnosing Procedure

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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

# TROUBLESHOOTING / Diagnosing Procedure

## 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.

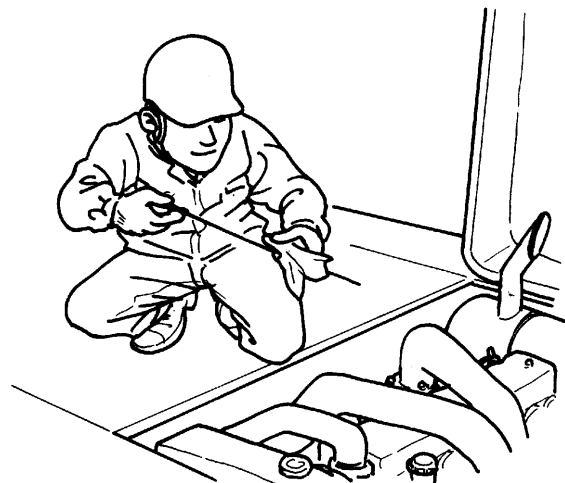
If troubleshooting is started without checking for blown fuses, a wrong diagnosis may result, wasting time. Check for blown fuses before troubleshooting. Even if a fuse looks normal by visual inspection, a fine crack is difficult to find. Always use a tester when checking the fuses.



T107-07-01-001



T107-07-01-002



T107-07-01-003

## **TROUBLESHOOTING / Diagnosing Procedure**

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### 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 corresponding to the trouble.

## TROUBLESHOOTING / Diagnosing Procedure

### 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-predictable 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).



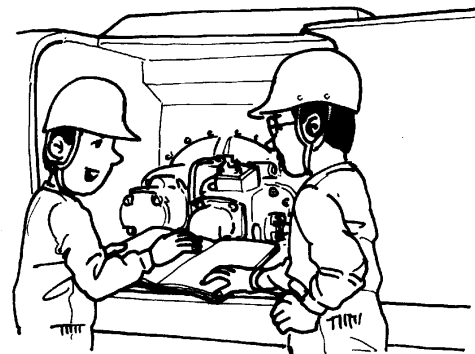
**NOTE:** Note that the fault codes displayed do not necessarily indicate machine trouble. The controller stores even temporary electrical malfunctions, such as a drop in battery output voltage or disconnections of the switches, sensors, etc., for inspections. For this reason, the "RETRIAL" is required 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



## **TROUBLESHOOTING / Diagnosing Procedure**

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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.

## **TROUBLESHOOTING / Diagnosing Procedure**

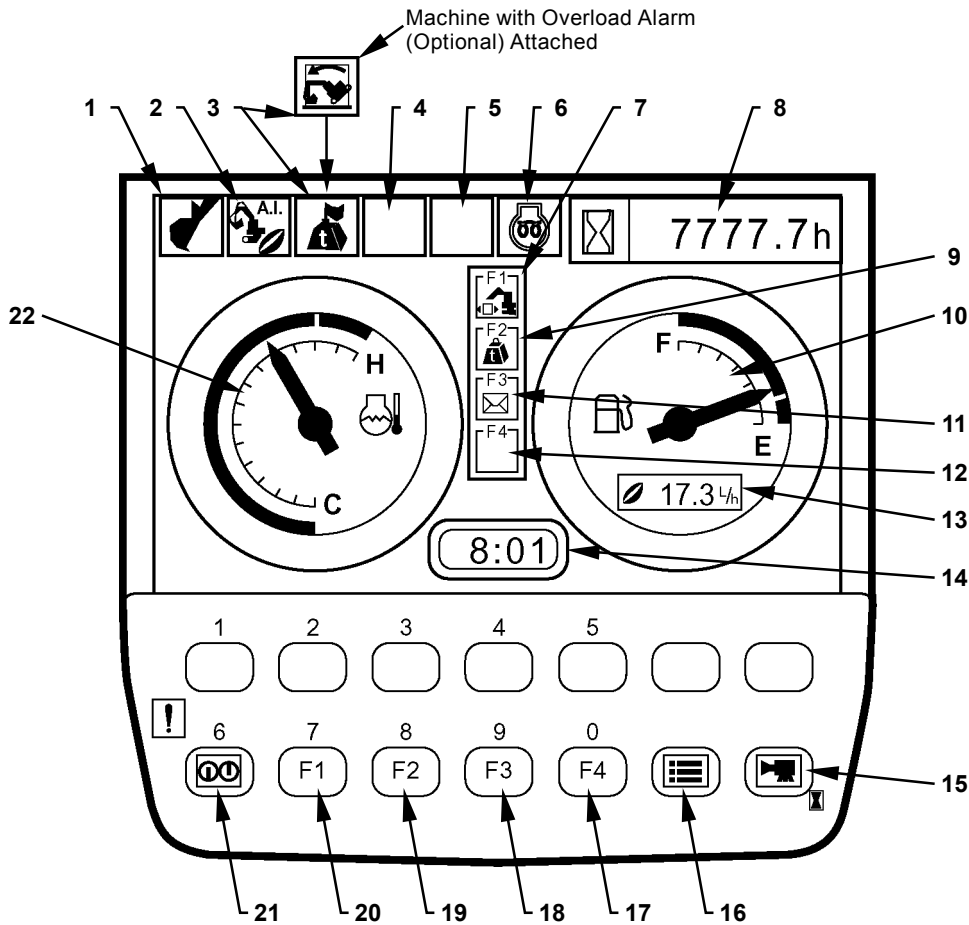
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# TROUBLESHOOTING/Monitor Unit

## OUTLINE

### Primary Screen



T1V1-05-01-094

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

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

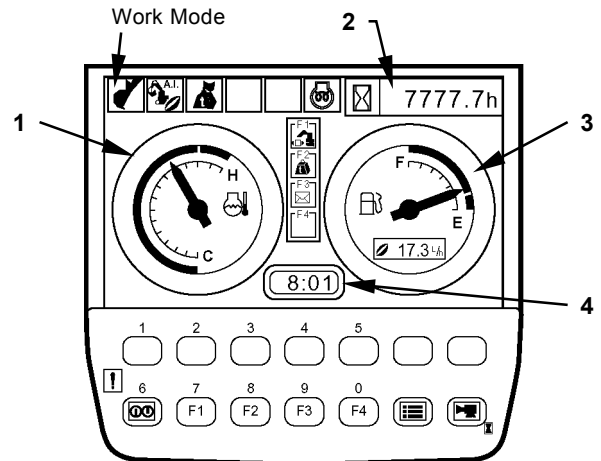
## TROUBLESHOOTING/Monitor Unit

- Display of Meters

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

Items to be displayed

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



T1V1-05-01-008

- Work Mode Display

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

Digging Mode



Attachment Mode

Breaker



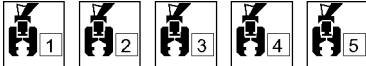
T1V1-05-01-108

Pulverizer



T1V1-05-01-104

Crusher



T1V1-05-01-105

Vibrating Hammer



T1V1-05-01-106

Others



T1V1-05-01-107

T1V1-05-02-003

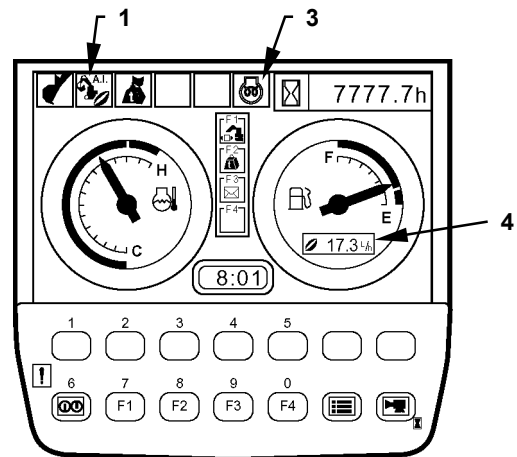
**NOTE:** The items on monitor unit and HITACHI pattern are same.

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

## TROUBLESHOOTING/Monitor Unit

- Auto-Idle Display (1)

When the switch is turned ON, the data is displayed.  
When the key switch is turned ON with the auto-idle switch ON, the data blinks for 10 seconds.



T1V1-05-01-008

- Overload Alarm (2)



T1V1-05-02-002

The system measures the load of suspended load from the bottom pressure of boom cylinder. When overload is detected, an alarm is displayed.  
(Refer to T5-2-18.)

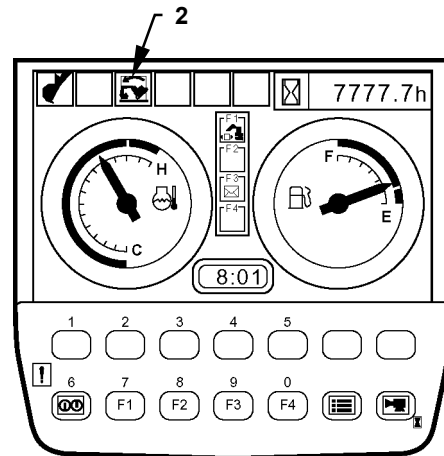
- Glow Display (3)

While ECM is supplying current to the glow plug, the date is displayed according to the signal from ECM.

- Fuel Consumption Gauge Display (4)

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

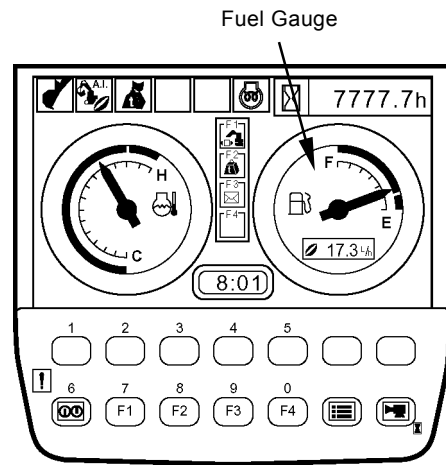
Fuel consumption is displayed according to the signal from ECM, which is received through MC by using CAN bus line.



T1V1-05-01-128

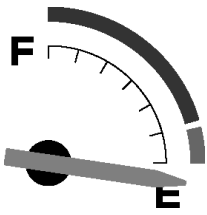
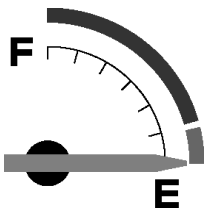
# TROUBLESHOOTING/Monitor Unit

- Fuel Gauge  
Fuel level is displayed on .

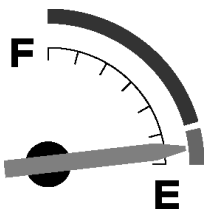
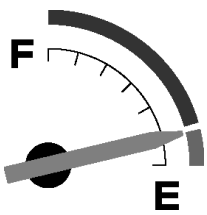
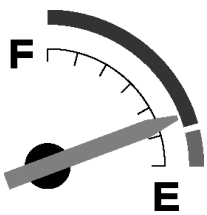
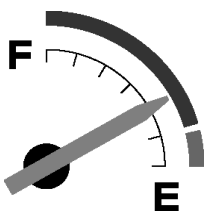
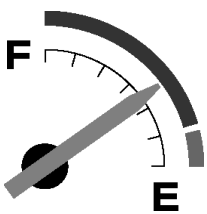
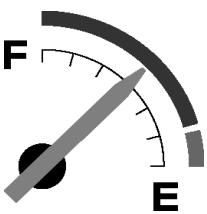


Primary Screen

T1V1-05-01-008

Fuel Level	Primary Screen
Less than 1%	 <p style="text-align: right; font-size: small;">T1V1-05-02-010</p>
1% or more Less than 3%	 <p style="text-align: right; font-size: small;">T1V1-05-02-012</p>

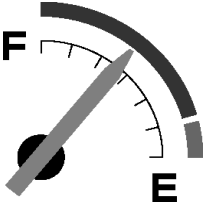
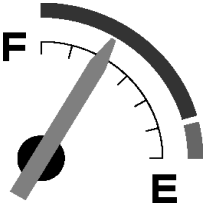
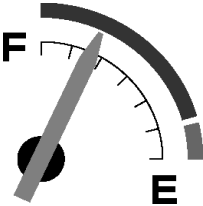
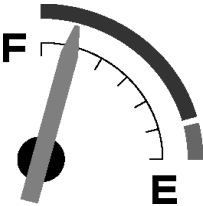
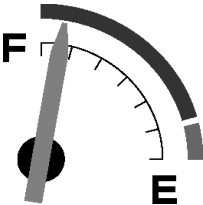
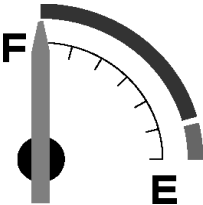
## TROUBLESHOOTING/Monitor Unit

Fuel Level	Primary Screen
3% or more Less than 5%	 <p style="text-align: right; font-size: small;">T1V1-05-02-014</p>
5% or more Less than 12%	 <p style="text-align: right; font-size: small;">T1V1-05-02-016</p>
12% or more Less than 20%	 <p style="text-align: right; font-size: small;">T1V1-05-02-018</p>
20% or more Less than 30%	 <p style="text-align: right; font-size: small;">T1V1-05-02-020</p>
30% or more Less than 40%	 <p style="text-align: right; font-size: small;">T1V1-05-02-022</p>
40% or more Less than 50%	 <p style="text-align: right; font-size: small;">T1V1-05-02-024</p>

## TROUBLESHOOTING/Monitor Unit

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



## **TROUBLESHOOTING/Monitor Unit**

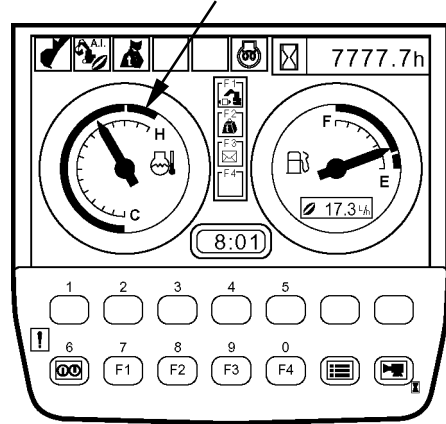
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# TROUBLESHOOTING/Monitor Unit

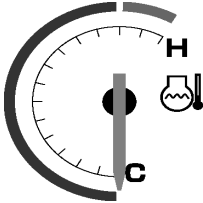
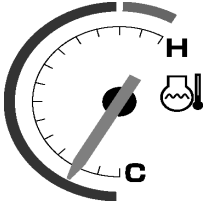
- Coolant Temperature Gauge  
Temperature of engine coolant is displayed on.

Coolant Temperature Gauge



Primary Screen

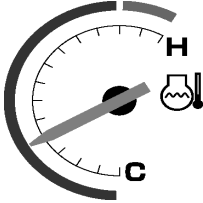
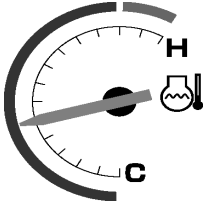
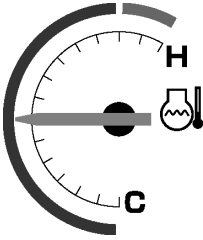
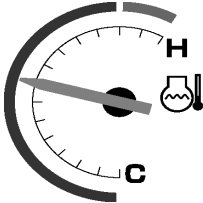
T1V1-05-01-008

Coolant Temperature	Primary Screen
Less than 40°C	
40°C or more Less than 45°C	

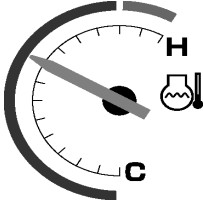
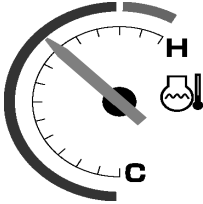
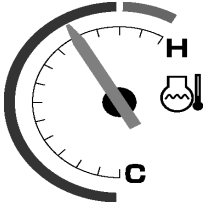
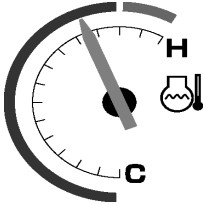
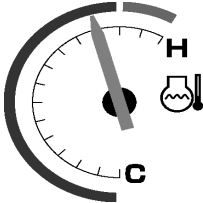
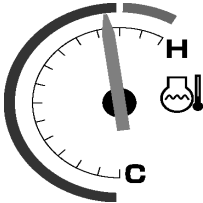
T1V1-05-02-038

T1V1-05-02-040

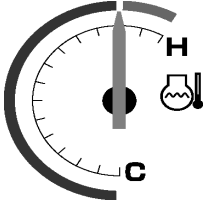
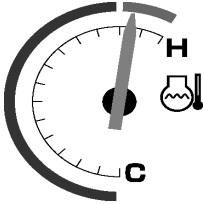
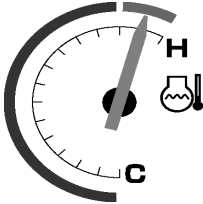
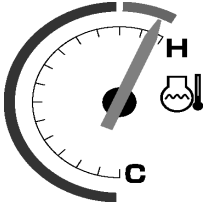
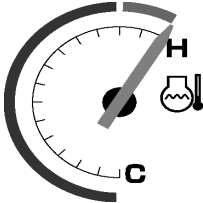
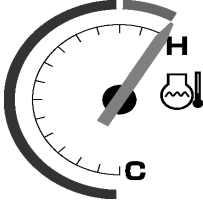
## TROUBLESHOOTING/Monitor Unit

Coolant Temperature	Primary Screen
45°C or more Less than 50°C	 <p style="text-align: right; font-size: small;">T1V1-05-02-042</p>
50°C or more Less than 60°C	 <p style="text-align: right; font-size: small;">T1V1-05-02-045</p>
60°C or more Less than 80°C	<p style="text-align: center;">↑</p>
80°C or more Less than 96°C	 <p style="text-align: right; font-size: small;">T1V1-05-02-047</p>
96°C or more Less than 98°C	 <p style="text-align: right; font-size: small;">T1V1-05-02-049</p>

# TROUBLESHOOTING/Monitor Unit

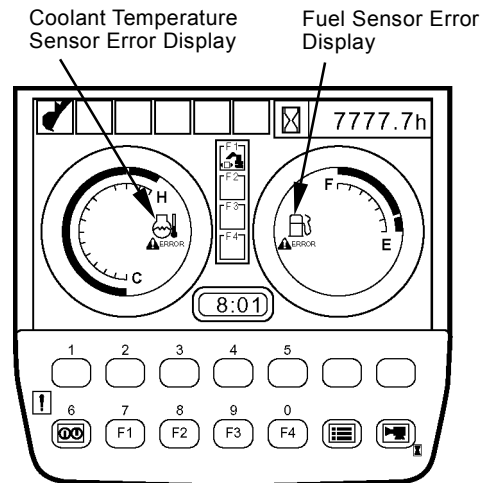
Coolant Temperature	Primary Screen
98°C	 <p>T1V1-05-02-051</p>
99°C	 <p>T1V1-05-02-053</p>
100°C	 <p>T1V1-05-02-054</p>
101°C	 <p>T1V1-05-02-056</p>
102°C	 <p>T1V1-05-02-058</p>
103°C	 <p>T1V1-05-02-060</p>

## TROUBLESHOOTING/Monitor Unit

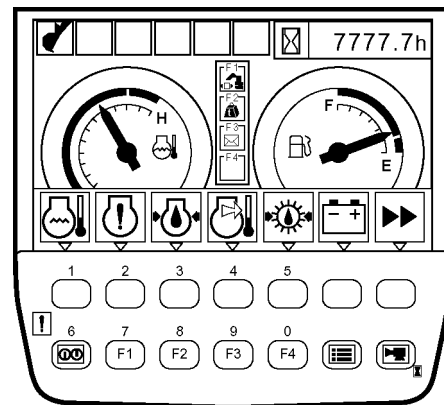
Coolant Temperature	Primary Screen
104°C	 <p style="text-align: right; font-size: small;">T1V1-05-02-062</p>
105°C or more Less than 110°C	 <p style="text-align: right; font-size: small;">T1V1-05-02-064</p>
110°C or more Less than 115°C	 <p style="text-align: right; font-size: small;">T1V1-05-02-066</p>
115°C or more Less than 120°C	 <p style="text-align: right; font-size: small;">T1V1-05-02-067</p>
120°C or more	 <p style="text-align: right; font-size: small;">T1V1-05-02-068</p>
Overheat SW=ON	 <p style="text-align: right; font-size: small;">T1V1-05-02-068</p>

## TROUBLESHOOTING/Monitor Unit

- **Fuel Sensor Error Display**  
 When the fuel sensor is faulty or if the harness between fuel sensor and monitor unit is open circuit, the data is displayed on the fuel gauge.
- **Coolant Temperature Sensor Error Display**  
 When the coolant temperature sensor is faulty, the data is displayed on the coolant temperature gauge.
- **Alarm and Remedy Displays against Alarm**  
 Alarm marks are displayed on bottom of the screen according to the alarm signals from pilot shut-off lever, overheat switch, fuel sensor, hydraulic oil filter alarm switch (optional), air cleaner restriction switch, alternator, battery system and ECM and the alarm signals received by using CAN bus line. The remedy for each alarm is displayed by key operation.

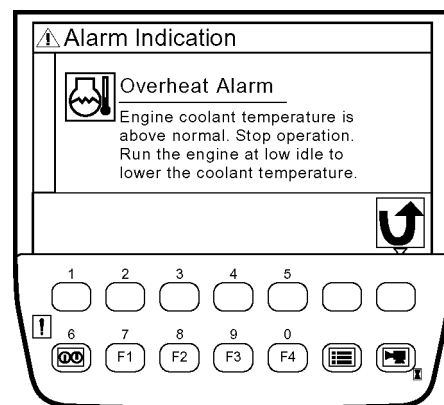


T1V1-05-02-005



Alarm Display

T1V1-05-01-096



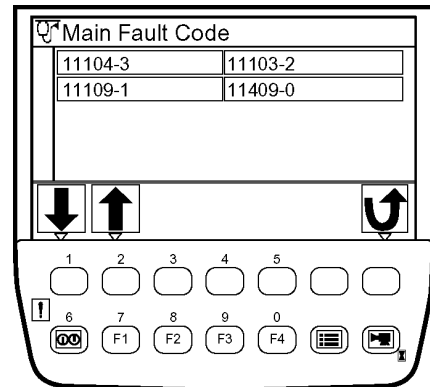
Remedy Display against Alarm

T1V5-05-01-013

## TROUBLESHOOTING/Monitor Unit

- Troubleshooting

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



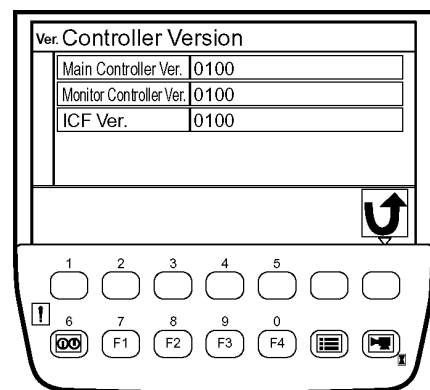
Fault Code Display

T1V5-05-01-097

- Controller Version

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

**NOTE:** The version of ECM is not displayed.

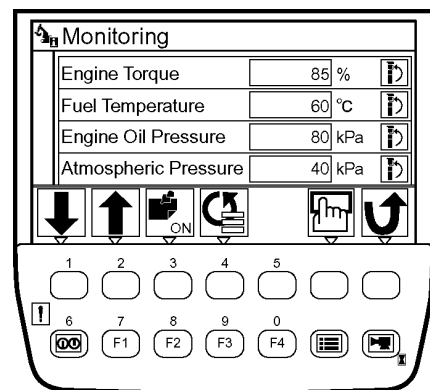


Controller Version Display

T1V5-05-01-122

- Monitoring

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

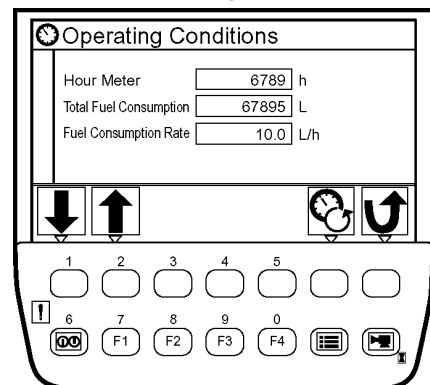


Monitoring Screen

T1V5-05-01-087

- Operating Conditions

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



Operating Conditions Screen

T1V5-05-01-025

## TROUBLESHOOTING/Monitor Unit

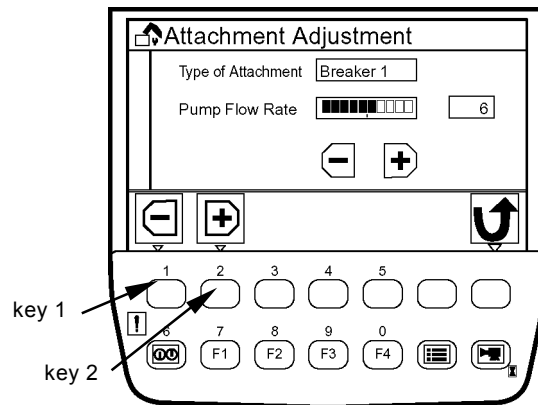
- Pump 2 Flow Rate Adjustment

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

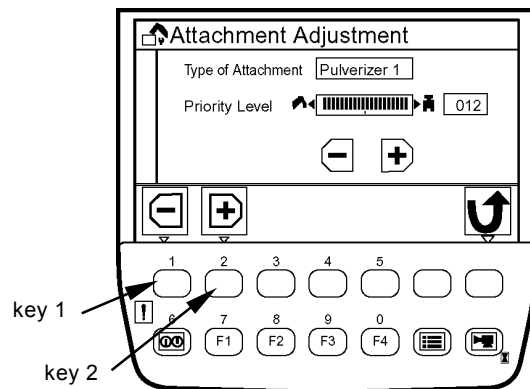


When using Breaker 1

T1V5-05-01-111

**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 below is the setting of various factors at the time of shipment from the factory.



When using Pulverizer 1

T1V5-05-01-024

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

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

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

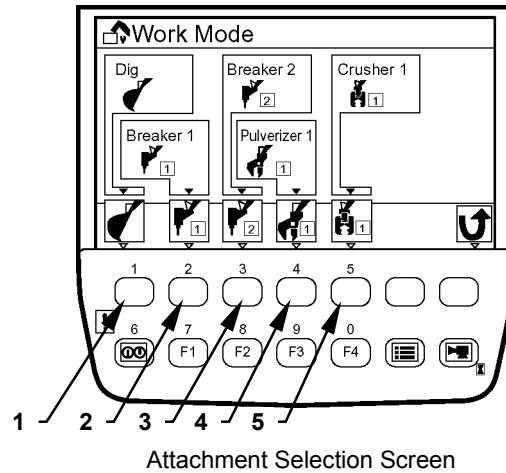


## TROUBLESHOOTING/Monitor Unit

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

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

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



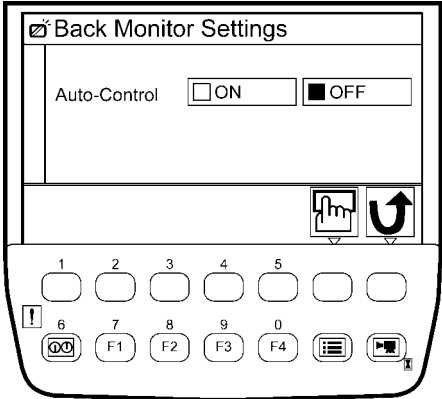
T1V5-05-01-109

**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

# TROUBLESHOOTING/Monitor Unit

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



T1V5-05-01-173

## TROUBLESHOOTING/Monitor Unit

- **Maintenance Settings**

This screen displays the hour meter reading at replacement time and the remaining hours until the next replacement.

As the items to be replaced are displayed in a list, record performed replacement by selecting an item from the list.

- **Interval ON/OFF Settings**

Set change interval for each item to be replaced.

- **Items included in Maintenance Settings**

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

- **Language Settings**

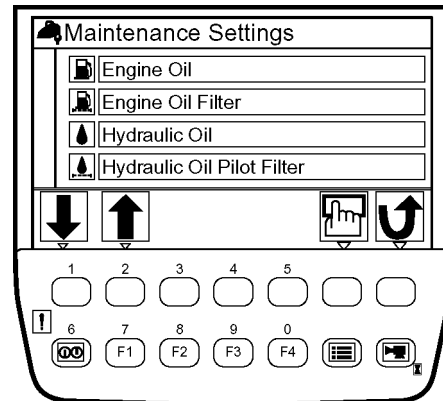
Select a language to be used in screens from among preset languages, according to work environment.

- **Mail**

(Optional Function)

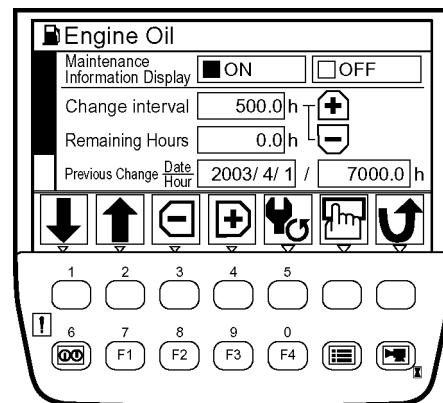
Send requests such as general, fuel replenishment, service maintenance and forwarding requests in the mail switch screen.

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



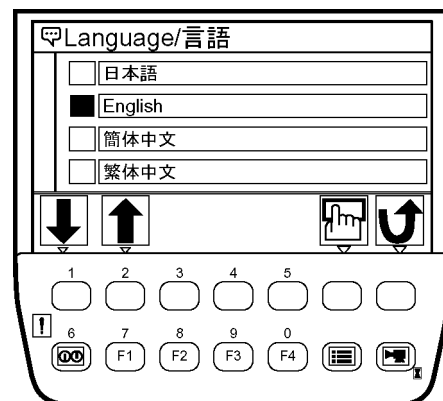
Maintenance Setup Screen

T1V5-05-01-049



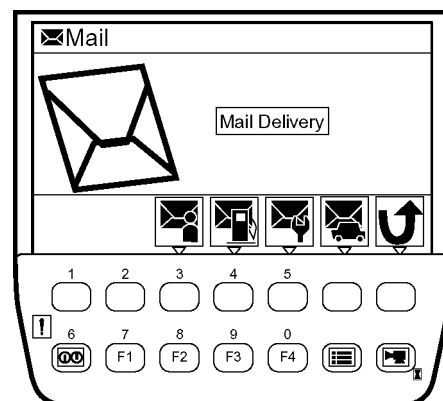
Interval ON/OFF Setup Screen

T1V5-05-01-052



Language Setup Screen

T1V1-05-01-137



Mail Switch Screen

T1V5-05-01-037


## TROUBLESHOOTING/Monitor Unit

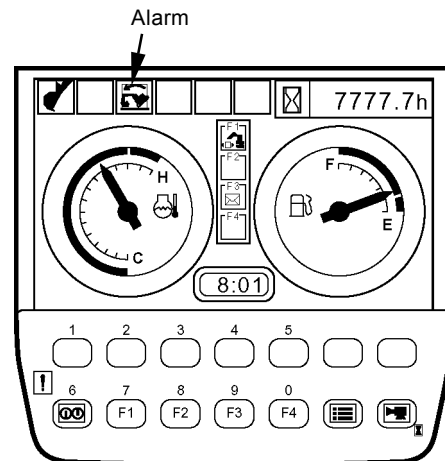
- Overload Alarm  
(Only machines equipped with optional parts)

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

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

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

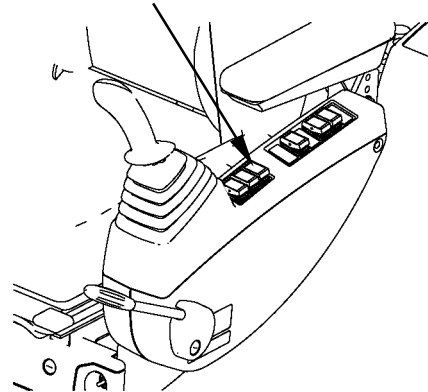
 **NOTE:** Even if the work is done while displaying a screen except the primary screen, when an overload condition is reached, the screen of monitor unit is switched to the primary screen, an alarm message is displayed, and a buzzer is rung.  
Even after the overload alarm is dissolved, the monitor unit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



Primary Screen

T1V1-05-01-128

Overload Alarm ON/OFF Switch (Optional)



T1V1-05-02-004

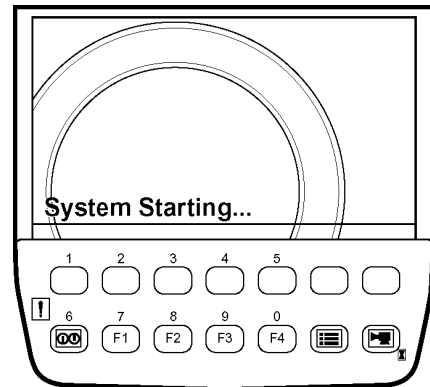
# TROUBLESHOOTING/Monitor Unit

## HOW TO USE SCREENS

### Displaying Primary Screen

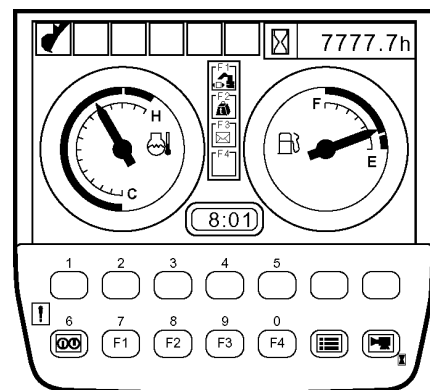
**IMPORTANT:** Start the engine after the primary screen is displayed.

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



Key Switch: ON

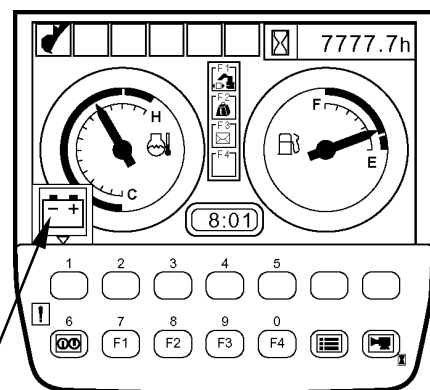
T1V1-05-01-115



Primary Screen

T1V1-05-01-123

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



Alternator Alarm

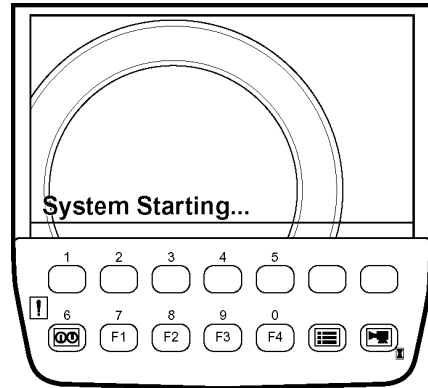
T1V1-05-01-117

## TROUBLESHOOTING/Monitor Unit

### 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.

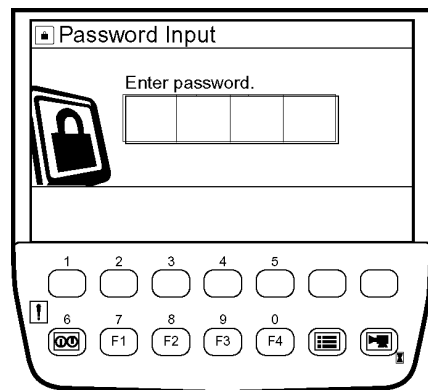


Starting Screen

T1V1-05-01-115

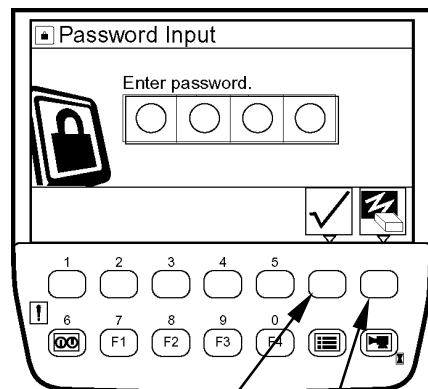
2. Input a password by using the keys located under the screen. If pushing the confirm key, the monitor unit matches the input password to the registered one. If they match, the primary screen appears.

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



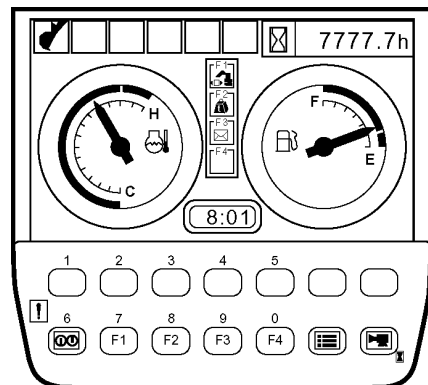
Password Input Screen

T1V5-05-01-093



Confirm Key Erase Key

T1V5-05-01-002



Primary Screen

T1V1-05-01-123

**TROUBLESHOOTING/Monitor Unit**

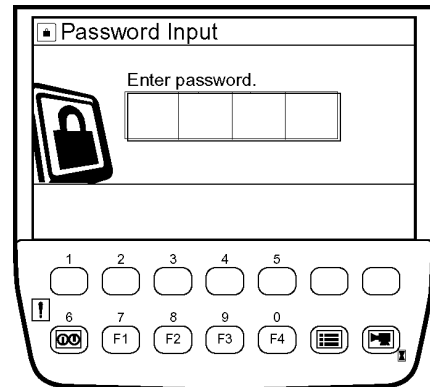
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## TROUBLESHOOTING/Monitor Unit

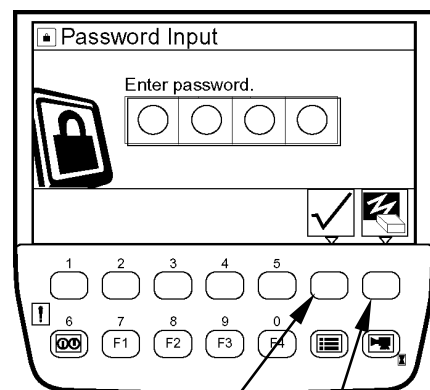
### In Case of Inputting an Incorrect Password

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



Password Input Screen


T1V5-05-01-093

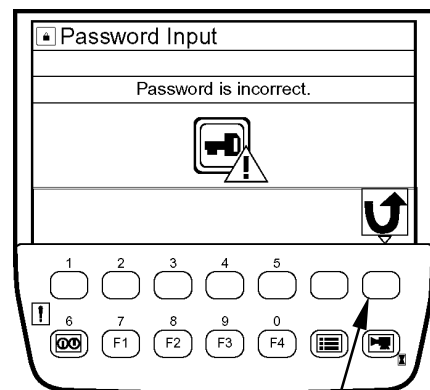


Confirm Key Erase Key

T1V5-05-01-002

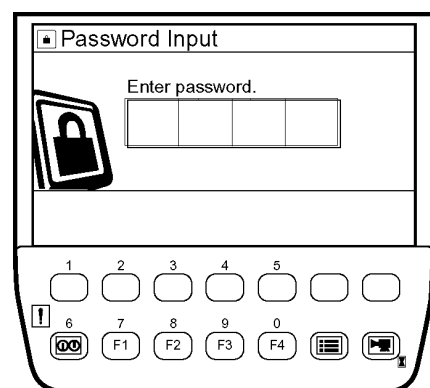
2. Return to the password input screen by pushing the back key.

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



Back Key

T1V5-05-01-004

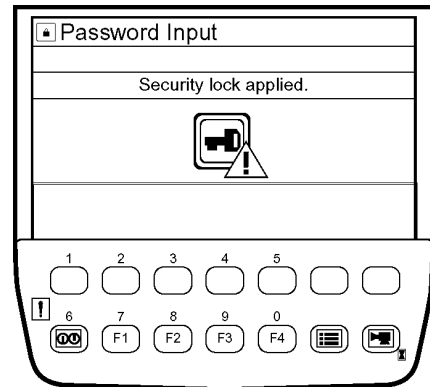


T1V5-05-01-093



## TROUBLESHOOTING/Monitor Unit

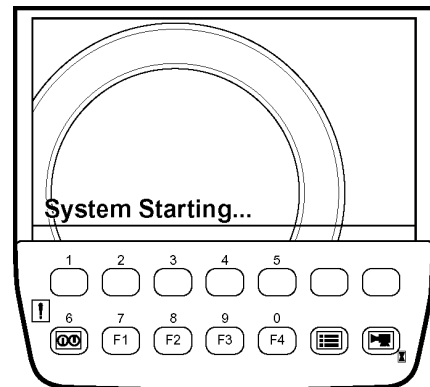
3. If inputting an incorrect password three times, a screen appears informing that the security lock has been applied, and a buzzer rings. While the key switch is turned to the ON position, the buzzer does not stop ringing. When the key switch is turned to the OFF position, the buzzer rings for thirty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



Security Lock Screen

T1V5-05-01-005

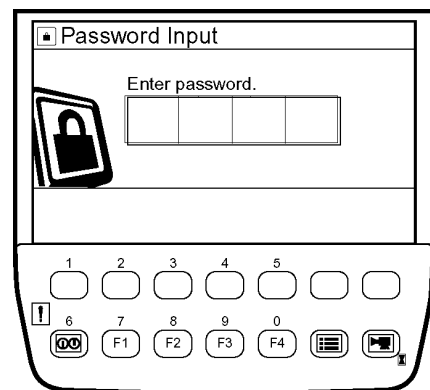
4. After thirty seconds, if the key switch is turned to the ON position, the starting screen appears and the password input screen appears again. Then a password can be input again. If inputting an incorrect password even once this time, the security lock screen appears again and a buzzer rings. While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



Starting Screen

T1V1-05-01-115

5. After the buzzer stops ringing, a password can be input again. Turn the key switch to the ON position and input a password after the password input screen appears. (Refer to T5-2-20).
6. If inputting an incorrect password again, the security lock screen appears again and a buzzer rings. While the key switch is turned to the ON position, the buzzer does not stop ringing. When the key switch is turned to the OFF position, the buzzer rings for thirty seconds.



Password Input Screen

T1V5-05-01-093

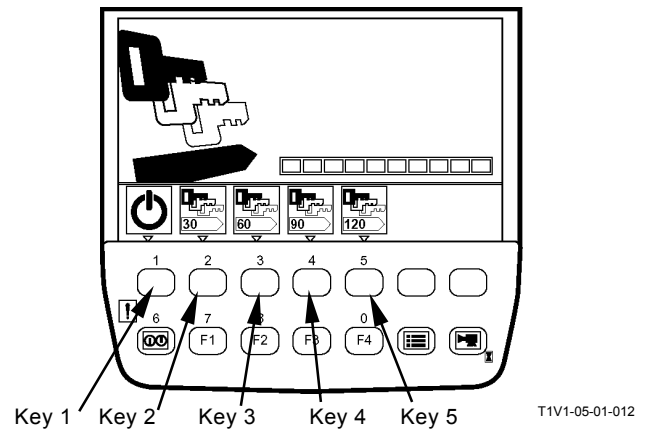
## TROUBLESHOOTING/Monitor Unit

### Extending Password Duration Time

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


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

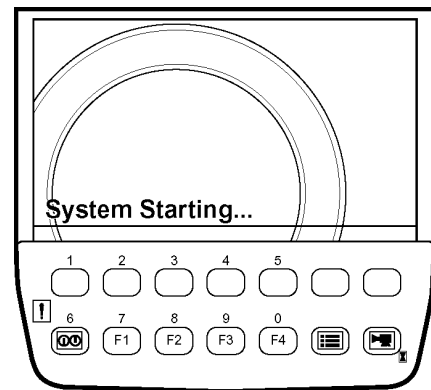
1. When turn the key switch to the OFF position, the monitor unit displays the password duration screen for ten seconds.



Password Duration Screen (Key Switch: OFF)

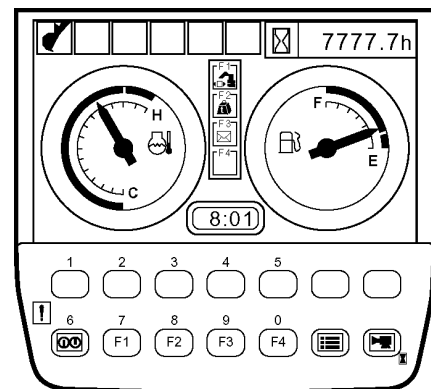
2. While the password duration screen is still displayed, push a relevant key, and password duration time is set. Duration time assigned to each key is as follows:
  - key 1: 0 minute
  - key 2: 30 minutes
  - key 3: 60 minutes
  - key 4: 90 minutes
  - key 5: 120 minutes

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



Key Switch: ON

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



Primary Screen

**TROUBLESHOOTING/Monitor Unit**

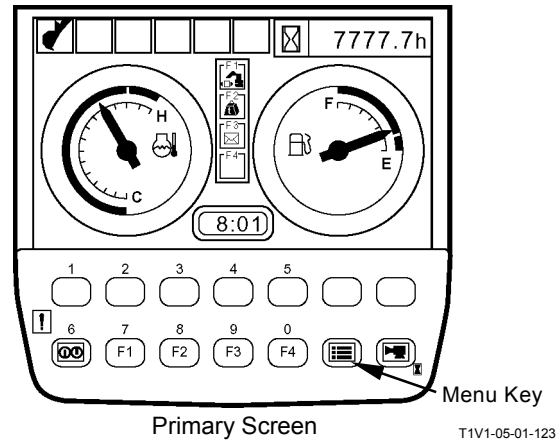
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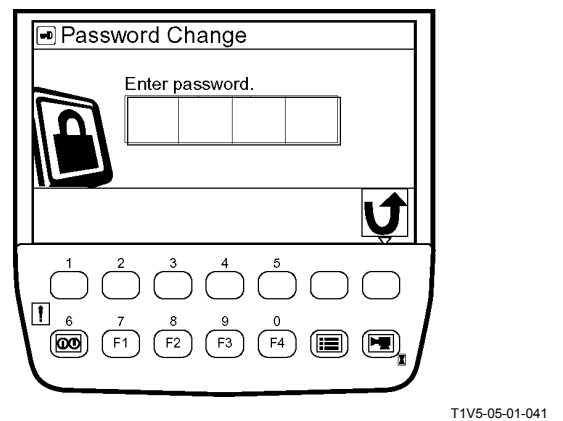
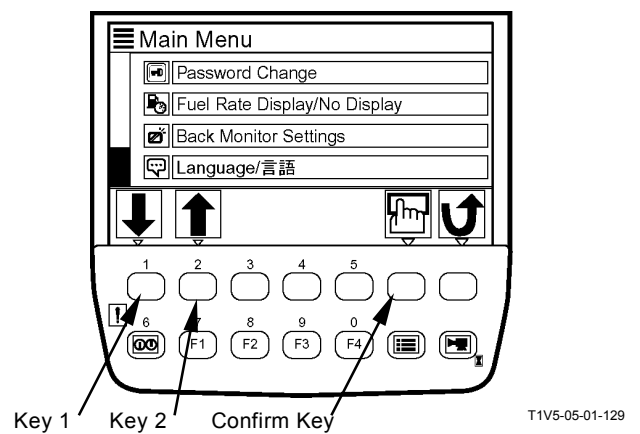
# TROUBLESHOOTING/Monitor Unit

## Password Change (Optional)

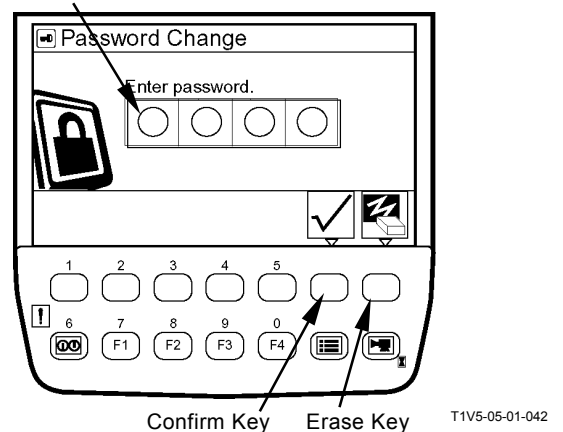
1. After the primary screen is displayed, push the menu key in order to display the main menu.




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

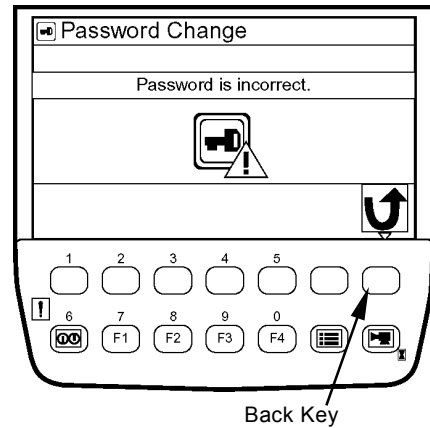


3. Input the registered password and push the confirm key.
4. If inputting the password again, the entered characters can be erased by pushing the erase key.



## TROUBLESHOOTING/Monitor Unit

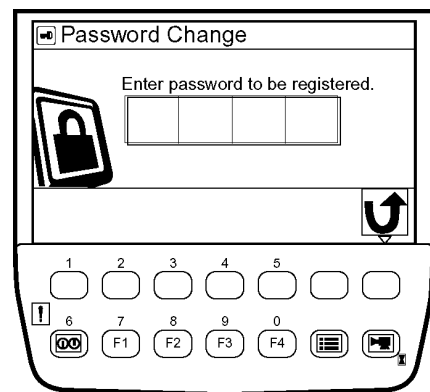
 **NOTE:** If inputting an incorrect password after pushing the confirm key, the message "Password is incorrect." appears. Push the back key and go back to the previous screen, Input the password again.



T1V5-05-01-044

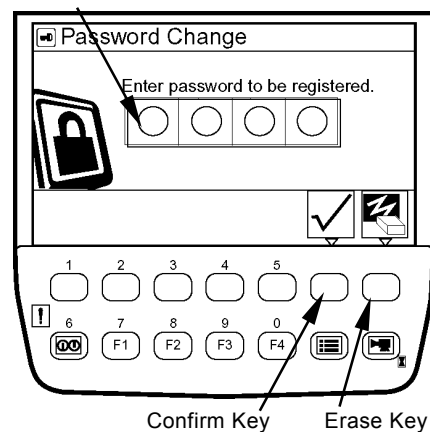
5. The message "Enter password to be registered." appears. Then, input a new password with three or four digits and push the confirm key.

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



T1V5-05-01-130

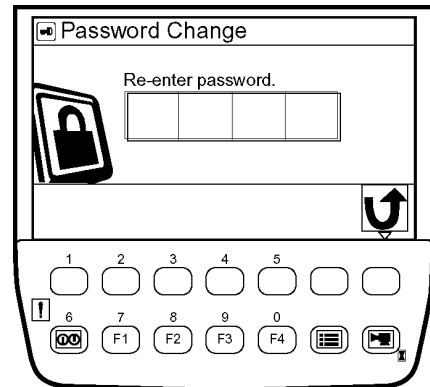
A New Password



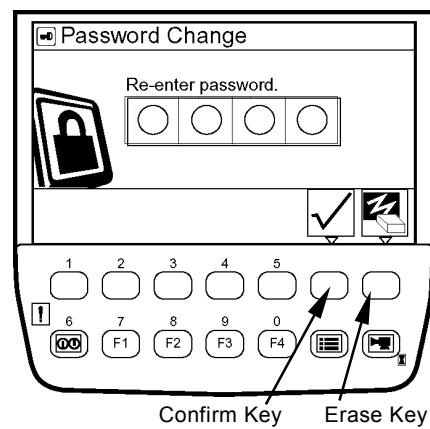
T1V5-05-01-131

## TROUBLESHOOTING/Monitor Unit

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



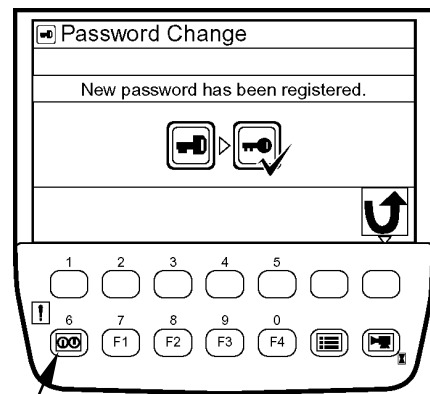
T1V5-05-01-132



Confirm Key Erase Key

T1V5-05-01-133

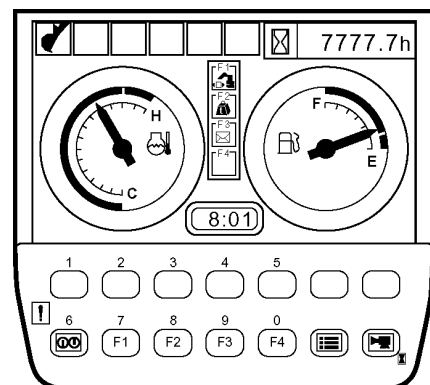
- The message "New password has been registered." appears. This completes the password change process.



Key 6

T1V5-05-01-043

- Push key 6 and the primary screen appears.

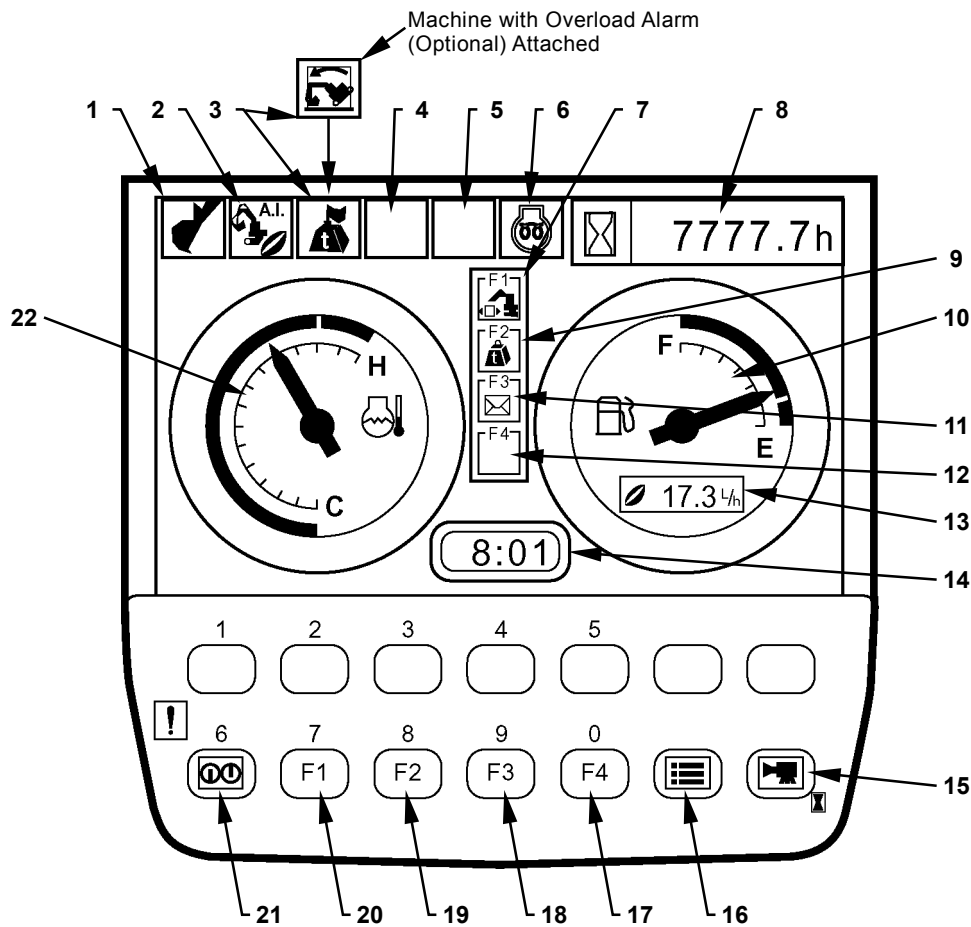


Primary Screen

T1V1-05-01-123

# TROUBLESHOOTING/Monitor Unit

## PRIMARY SCREEN



T1V1-05-01-094

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

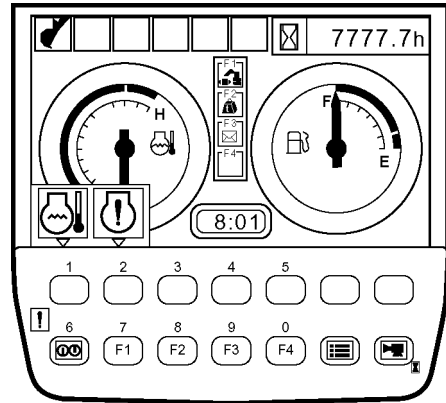
**NOTE:** \*ML crane display and ML crane selection is only available in Japanese domestic marked.

## TROUBLESHOOTING/Monitor Unit

### SCREEN DISPLAY WHEN AN ALARM IS ISSUED

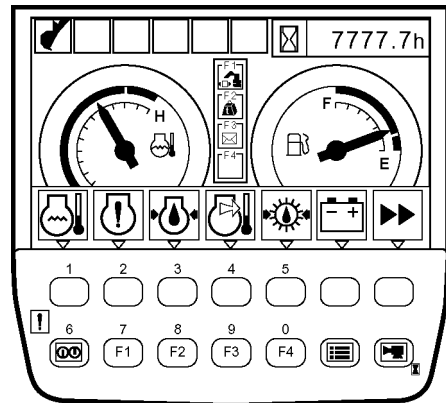
When an alarm is issued, the alarm marks are displayed at the bottom of screen.

- When the number of alarms is two or less



T1V1-05-01-095

- When the number of alarms is three or more

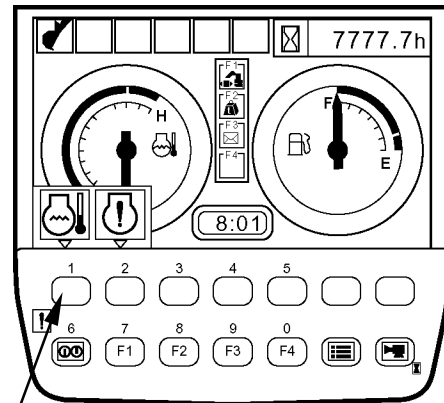


T1V1-05-01-096



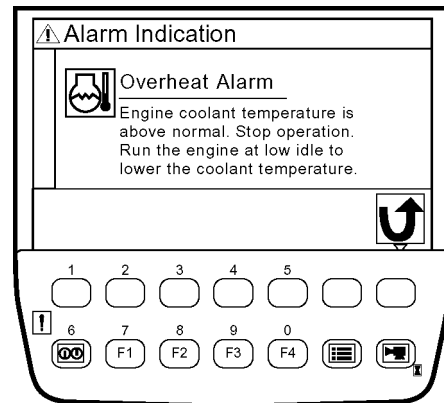
## TROUBLESHOOTING/Monitor Unit

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



Push a Relevant Key










T1V1-05-01-095



T1V5-05-01-013

## TROUBLESHOOTING/Monitor Unit

### CONTENTS OF ALARMS

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

## **TROUBLESHOOTING/Monitor Unit**

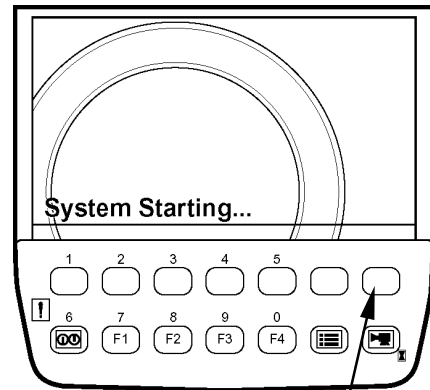
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# TROUBLESHOOTING/Monitor Unit

## TROUBLESHOOTING

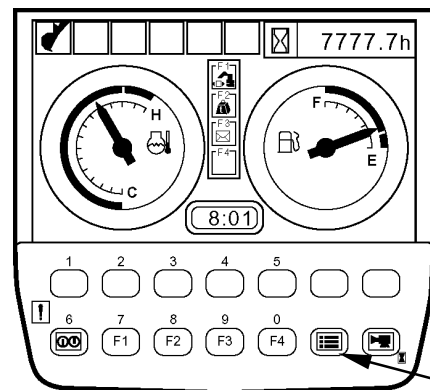
1. Displaying Service Menu  
Turn the key switch to the ON position while pushing the key at upper right corner of the monitor unit. Therefore, service menu is added to main menu.



Turn key switch ON while pushing the key

T1V1-05-01-115

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




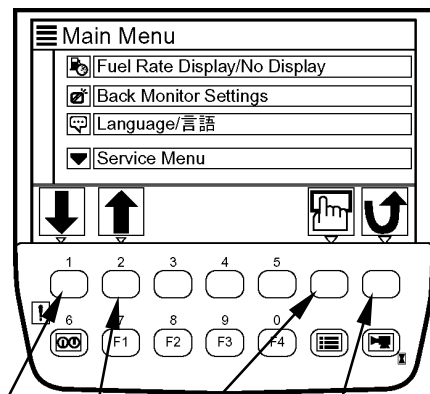
Primary Screen

Menu Key

T1V1-05-01-123

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

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



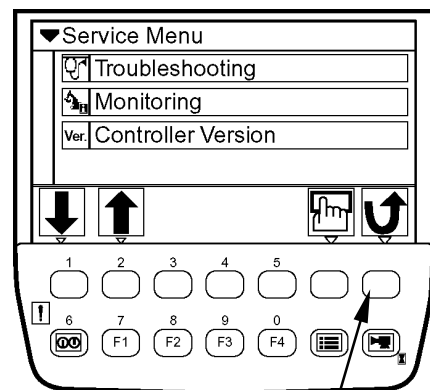
Key 1

Key 2

Confirm Key

Back Key

T1V5-05-01-114




Back Key

T1V5-05-01-083

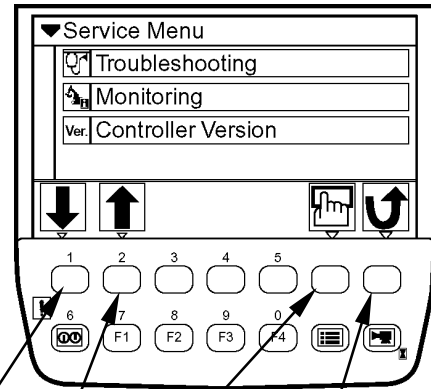
## TROUBLESHOOTING/Monitor Unit

4. Select troubleshooting by using keys 1 and 2. Push the confirm key. Then, the troubleshooting screen appears.
5. Results of trouble analyses for each controller are displayed on the screen.
6. Select Abnormal of a faulty controller by using keys 1 and 2. Push the confirm key. Then, fault code screen appears.  
For details of trouble analyses, refer to "Troubleshooting A."

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

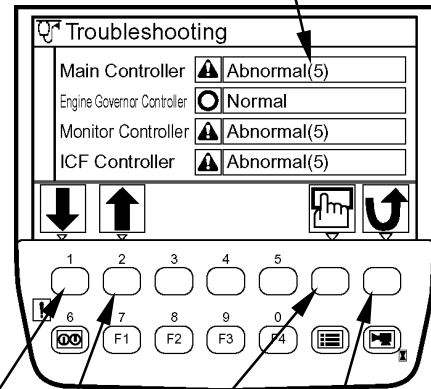
 **NOTE:** When pushing the back key, return to the previous screen.

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

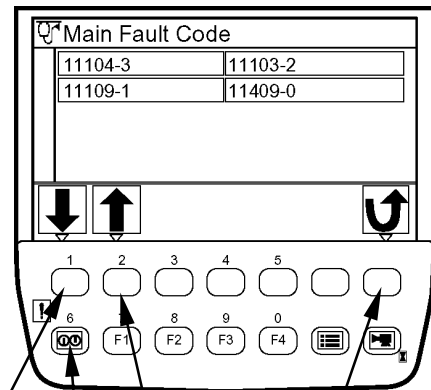


Key 1    Key 2    Confirm Key    Back Key T1V5-05-01-083

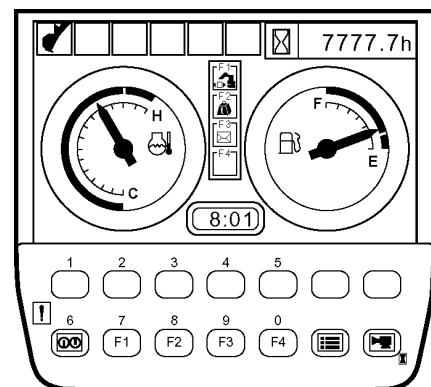
A figure enclosed in ( ) indicates the number of failure codes.



Key 1    Key 2    Confirm Key    Back Key T1V5-05-01-085



Key 1    Key 6    Key 2    Back Key T1V5-05-01-097

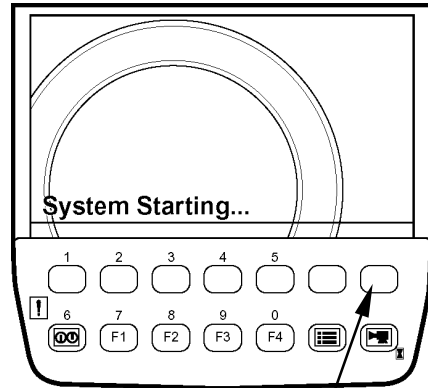


Primary Screen T1V1-05-01-123

# TROUBLESHOOTING/Monitor Unit

## CONTROLLER VERSION

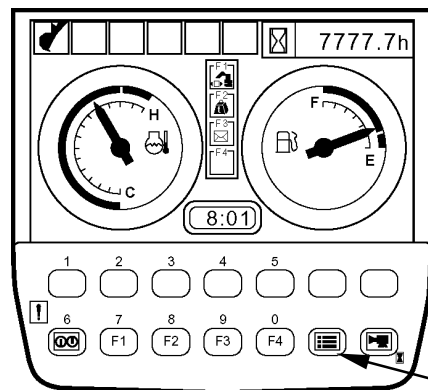
1. Displaying Service Menu  
Turn the key switch to the ON position while pushing the key at upper right corner of the monitor unit. Therefore, service menu is added to main menu.



Turn the key switch ON while pushing the key

T1V1-05-01-115

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




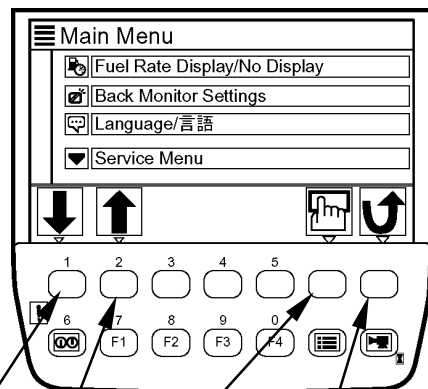
Primary Screen

Menu Key

T1V1-05-01-123

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

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



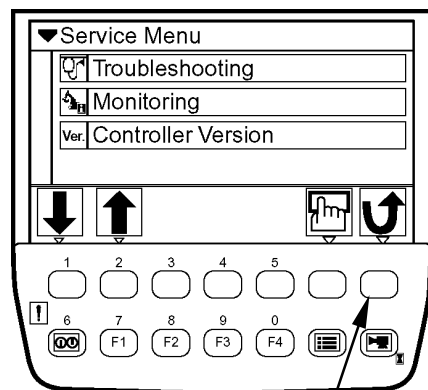
Key 1

Key 2

Confirm Key

Back Key

T1V5-05-01-114





Back Key

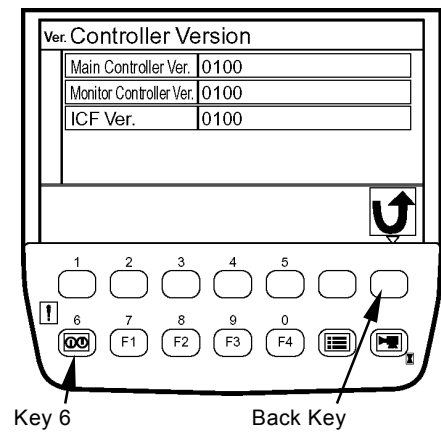
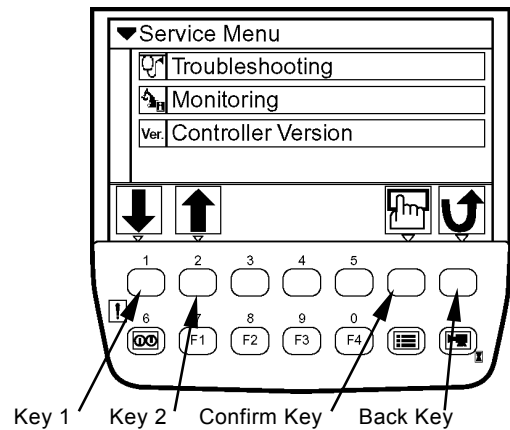
T1V5-05-01-083

## TROUBLESHOOTING/Monitor Unit

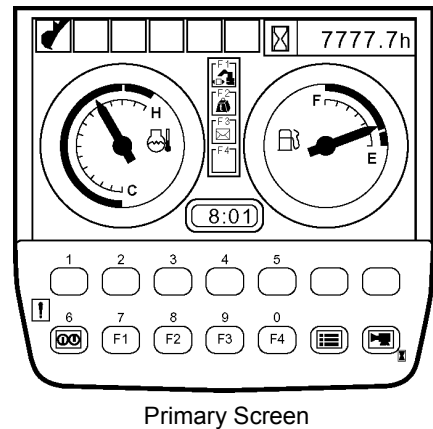
4. Select controller version by using keys 1 and 2.  
Push the confirm key. Then, the controller version screen appears.

 **NOTE:** The version of ECM is not displayed.

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



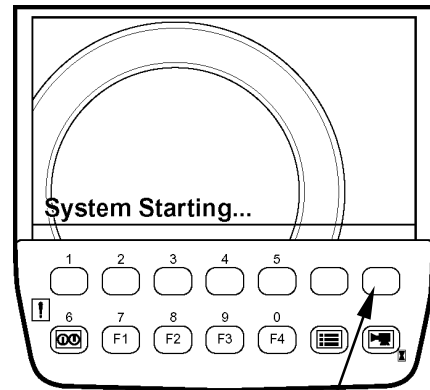
5. Push key 6, and the primary screen appears.



# TROUBLESHOOTING/Monitor Unit

## MONITORING

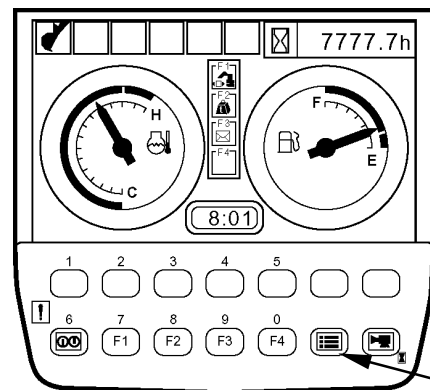
1. Displaying Service Menu  
Turn the key switch to the ON position while pushing the key at upper right corner of the monitor unit. Therefore, service menu is added to main menu.



Turn the key switch ON while pushing the key

T1V1-05-01-115

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




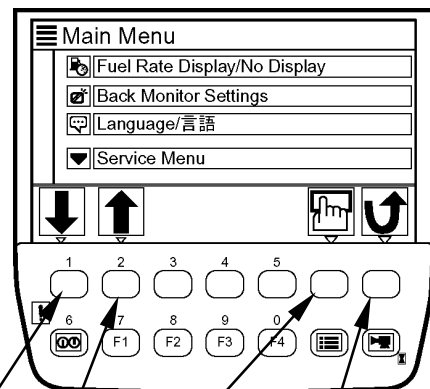
Primary Screen

Menu Key

T1V1-05-01-123

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

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



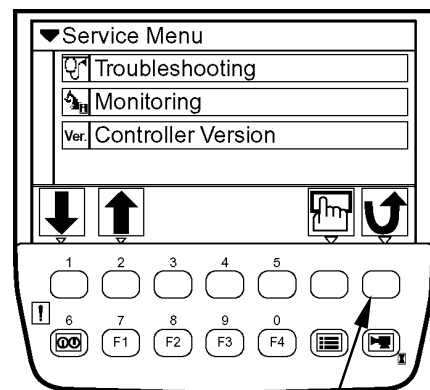
Key 1

Key 2

Confirm Key

Back Key

T1V5-05-01-114



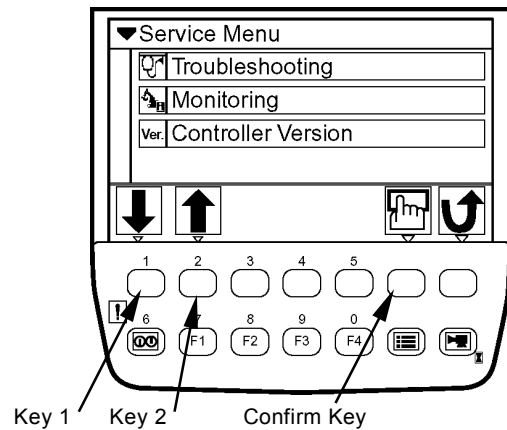
Back Key

T1V5-05-01-083



## TROUBLESHOOTING/Monitor Unit

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

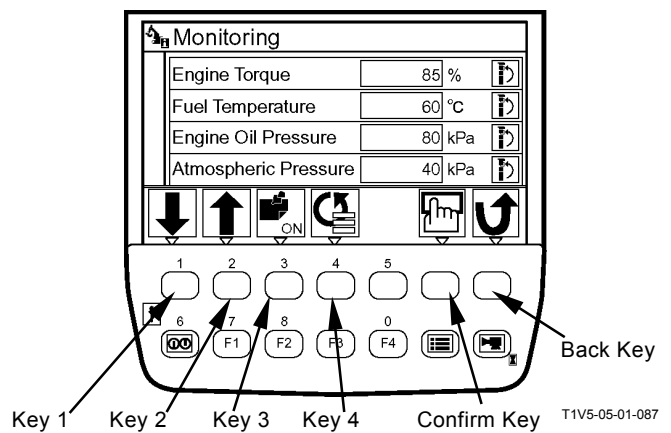


T1V5-05-01-083

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

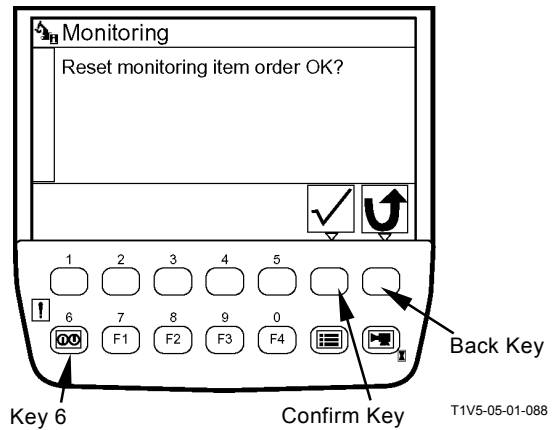
6. Push key 3, and the displayed data are put on hold. Push key 3 again, and the records are updated with the displayed data.

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



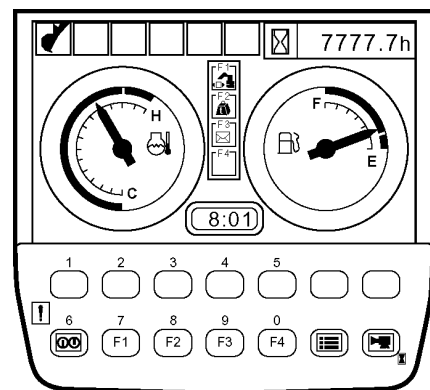
T1V5-05-01-087

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



T1V5-05-01-088

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



Primary Screen

T1V1-05-01-123

## TROUBLESHOOTING/Monitor Unit

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### 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 <sup>-1</sup>
Actual Engine Speed	min <sup>-1</sup>
Pump 1 Delivery Pressure	MPa
Pump 1 Pump Control Pressure	MPa
Pump 1 Target Flow Rate	L/min
Pump 2 Delivery Pressure	MPa
Pump 2 Pump Control Pressure	MPa
Pump 2 Target Flow Rate	L/min
Front Attachment Control Pilot Pressure	MPa
Boom Raise Control Pilot Pressure	MPa
Arm Roll-In Pilot Pressure	MPa
Swing Control Pilot Pressure	MPa
Travel Control Pilot Pressure	MPa
Attachment Control Pilot Pressure	MPa
EC Dial Angle	V
Hydraulic Oil Temperature	°C
Pump Torque Proportional Valve	MPa
Digging Regenerative Valve	MPa
Arm Regenerative Valve	MPa
Travel Mode Control Pressure	MPa
Power Digging Control Pressure	MPa
Power Mode	-
Travel Mode Switch	-
Power Digging Switch	-
Radio Signal Strength	-

# TROUBLESHOOTING/Monitor Unit

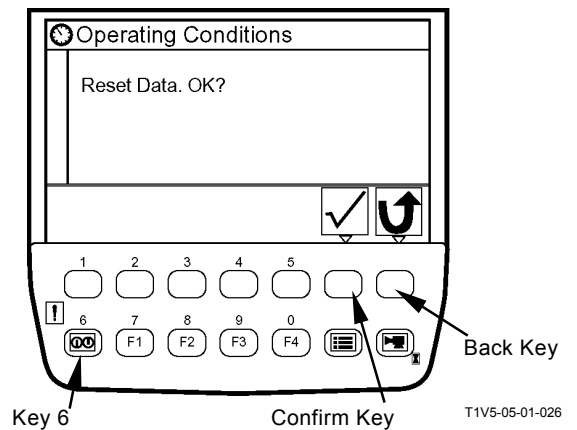
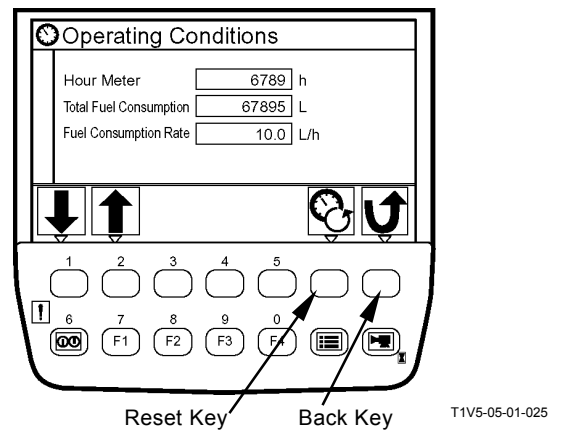
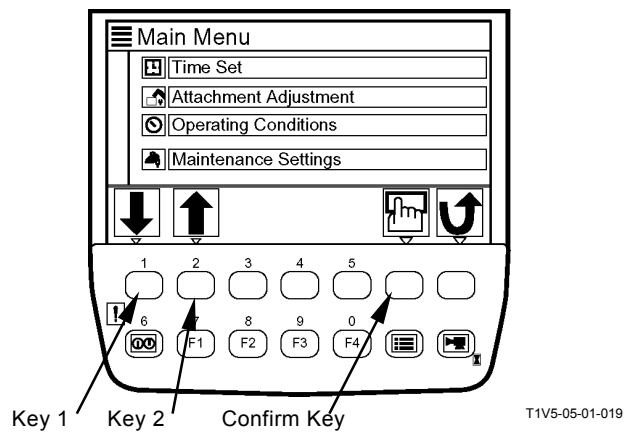
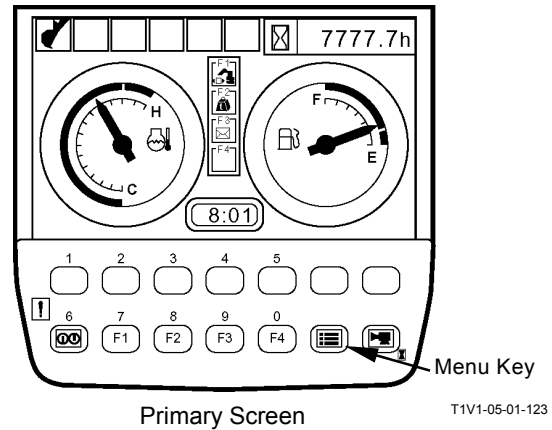
## DISPLAYING OPERATING CONDITIONS

1. When the primary screen appears, push the menu key and display main menu.
2. Select operating conditions from main menu by using keys 1 and 2. Push the confirm key. Then, the operating conditions screen appears.
3. Push the reset key, and a screen appears to confirm if it's OK to reset data.  
If it's OK to reset data, push the confirm key.

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

**IMPORTANT:** Total fuel consumption and fuel consumption rate depend on the operating environment and the operation method of machine. The values shown on the screen are just for reference. There could arise  $\pm 20\%$  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.

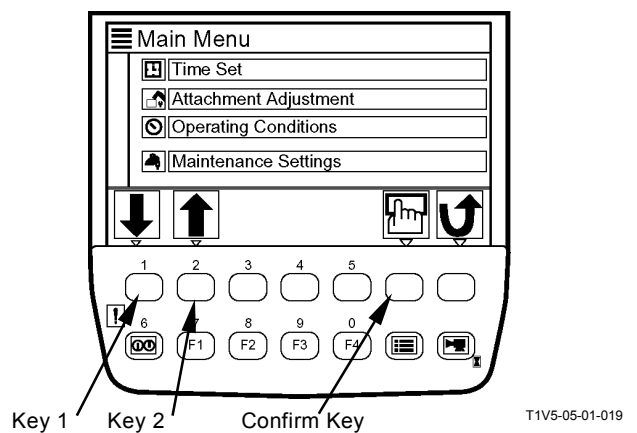
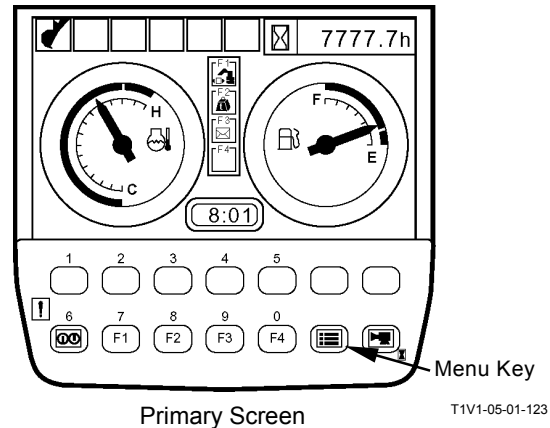


## TROUBLESHOOTING/Monitor Unit

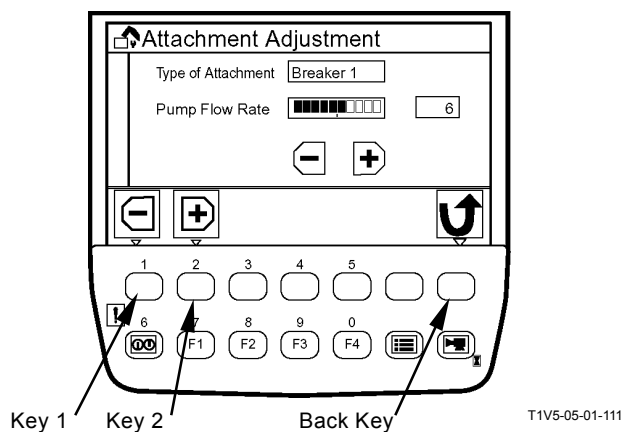
### PUMP 2 FLOW RATE ADJUSTMENT (Only Machines Equipped with Optional Parts)

**IMPORTANT:** This operation is effective when attachments are used.

1. When the primary screen appears, push the menu key and display main menu.
2. Select attachment adjustment from main menu by using keys 1 and 2. Push the confirm key. Then, the attachment adjustment screen appears.
3. Push key 2. Then, the attachment adjustment screen for currently installed attachments appears.



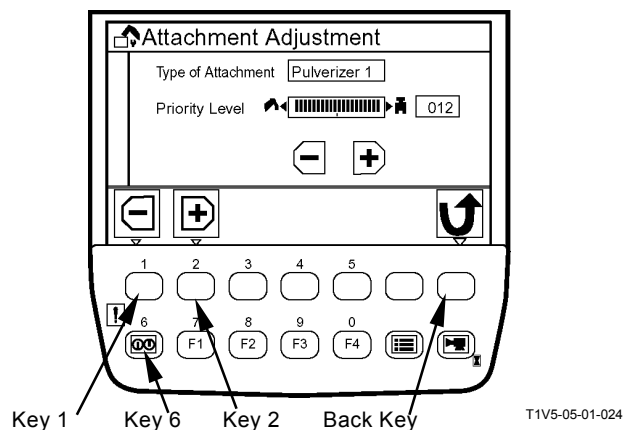
4. Adjust flow rate of pump 2 by using keys 1 and 2. When breaker 1 or breaker 2 is used, pushing key 1 will decrease flow rate of pump 2 and pushing key 2 will increase respectively.



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

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

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



## **TROUBLESHOOTING/Monitor Unit**

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## TROUBLESHOOTING/Monitor Unit

### ATTACHMENT SELECTION (Only Machines Equipped with Optional Parts)


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

#### Selecting Attachment by Using Key F1

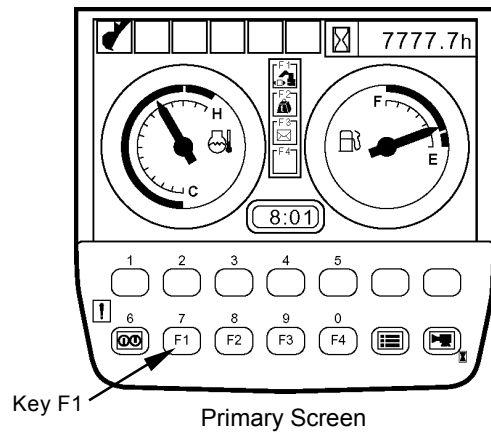
1. When the primary screen appears, push key F1 and display the work mode screen.
2. Push a relevant key under an attachment mark to be used in order to select the attachment.  
(In the right example, Crusher 1 is selected.)

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

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

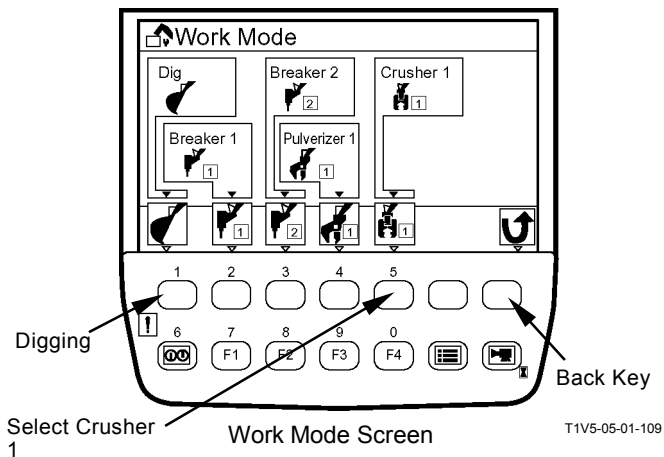
 **NOTE:** When pushing the back key, return to the previous screen.

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



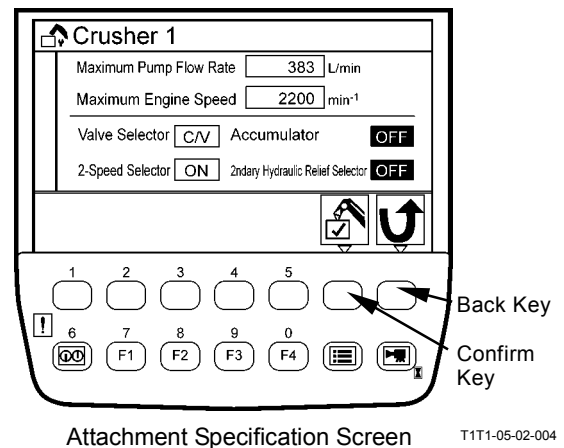
Primary Screen

T1V1-05-01-123



Work Mode Screen

T1V5-05-01-109



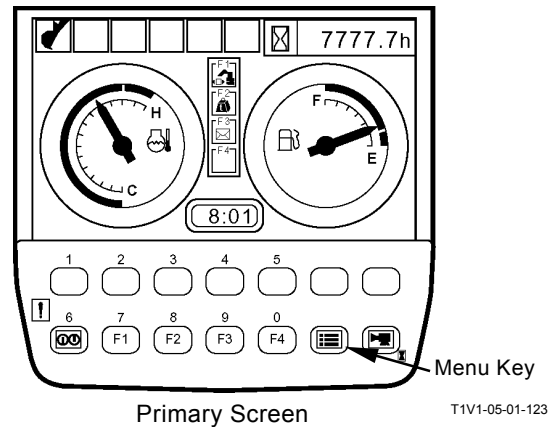
Attachment Specification Screen

T1T1-05-02-004

# TROUBLESHOOTING/Monitor Unit

## Selecting Attachment from Main Menu

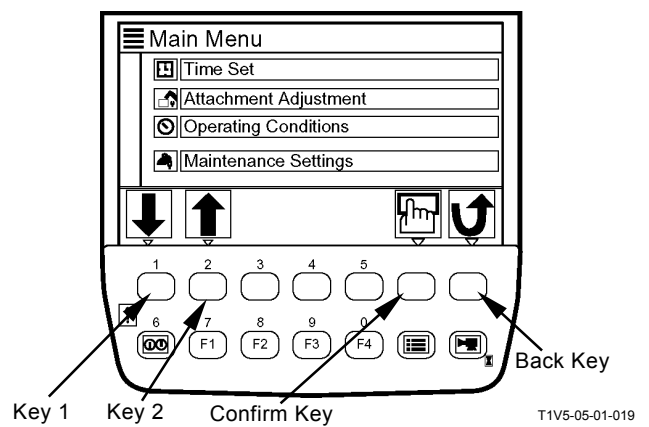
1. When the primary screen appears, push the menu key and display main menu.
2. Select work mode from main menu by using keys 1 and 2. Push the confirm key. Then, the work mode screen appears.
3. Push the relevant key under an attachment mark to be used in order to select the attachment. (In the right example, Crusher 1 is selected.)



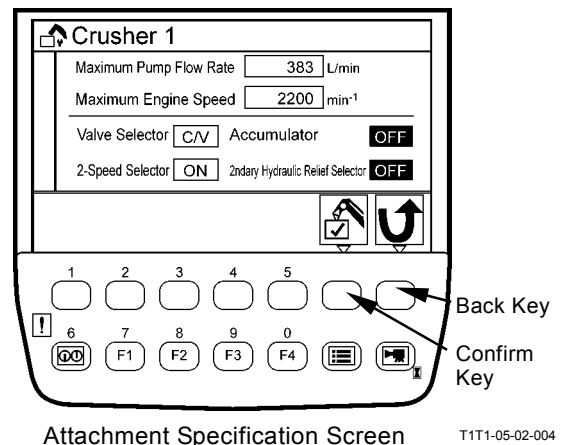
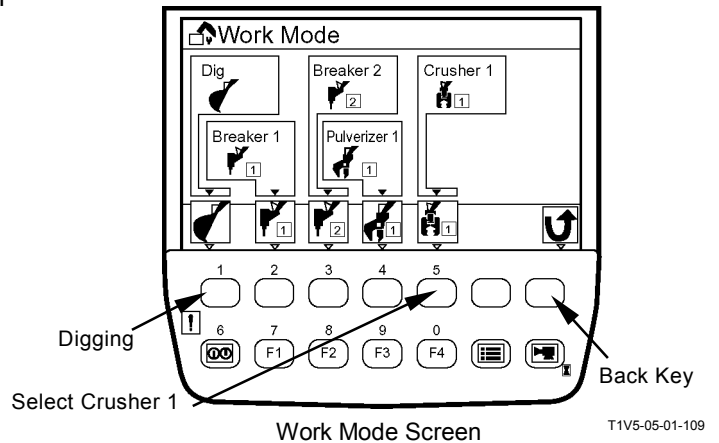
**NOTE:** When selecting digging, return to main menu.

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

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

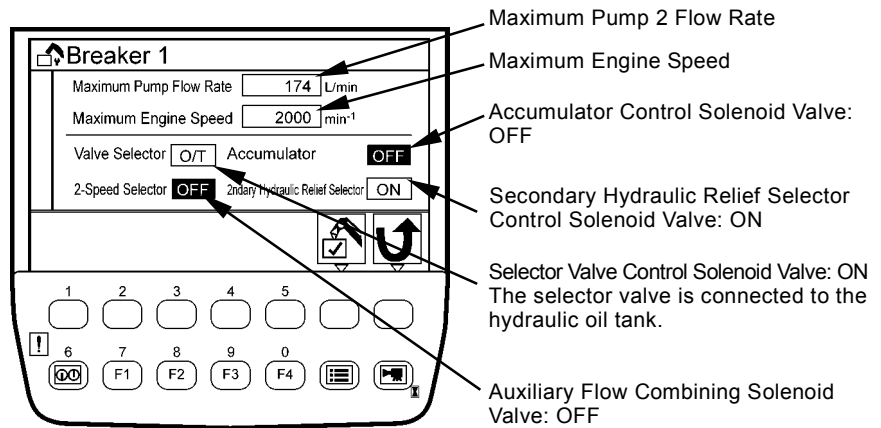


5. Push the confirm key, and the primary screen appears.

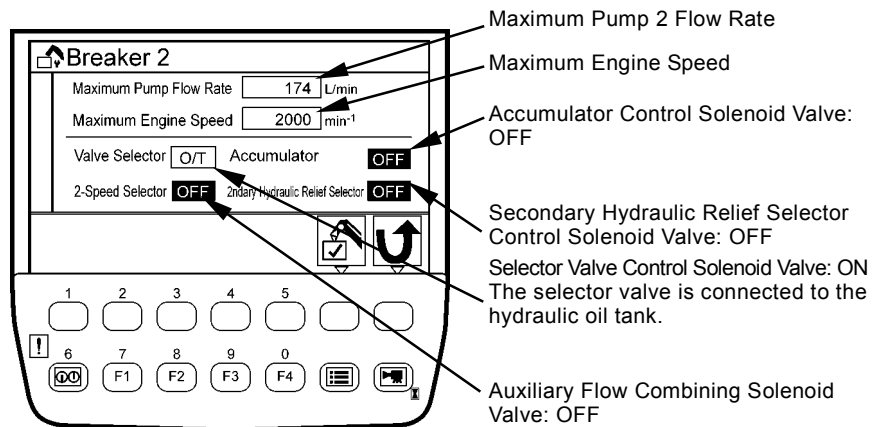


# TROUBLESHOOTING/Monitor Unit

## Attachment Specification Screen



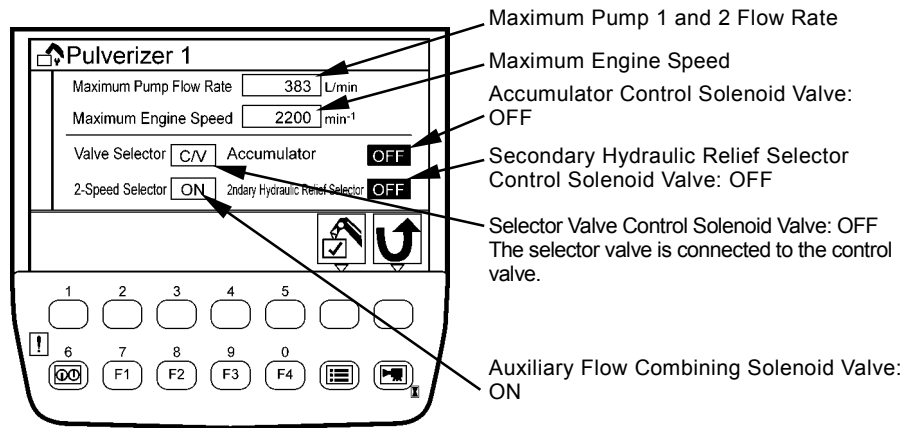
T1T1-05-02-001



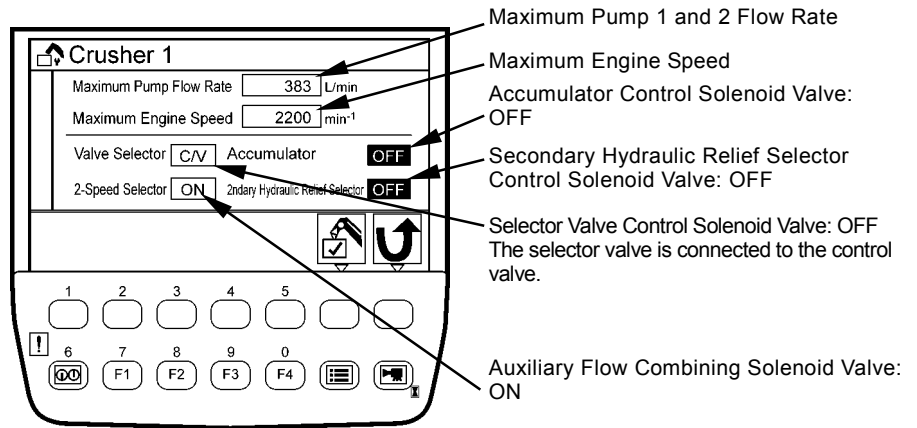
T1T1-05-02-002



# TROUBLESHOOTING/Monitor Unit



T1T1-05-02-003

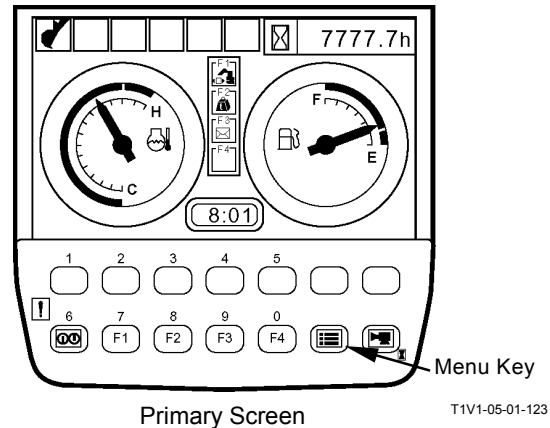


T1T1-05-02-004

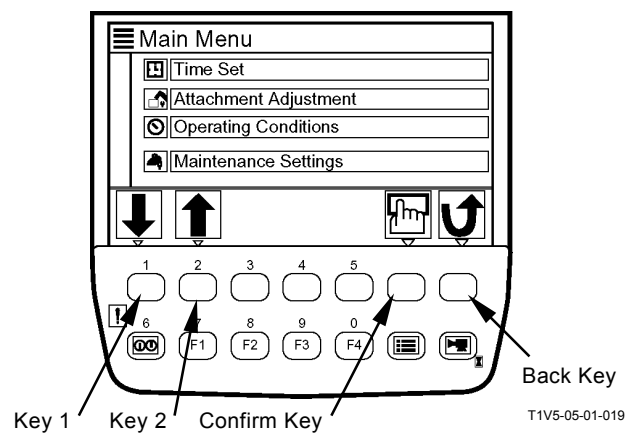
# TROUBLESHOOTING/Monitor Unit

## TIME SETTING

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



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

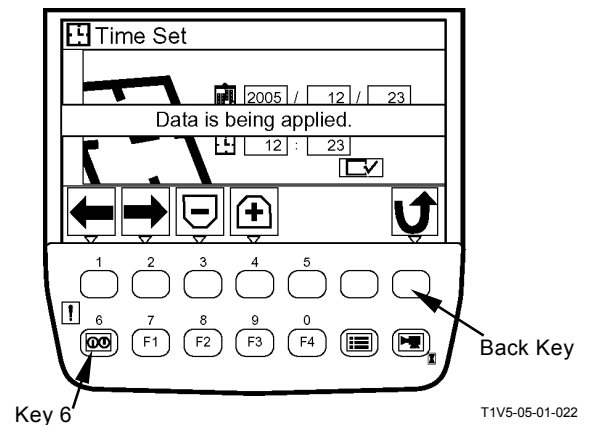
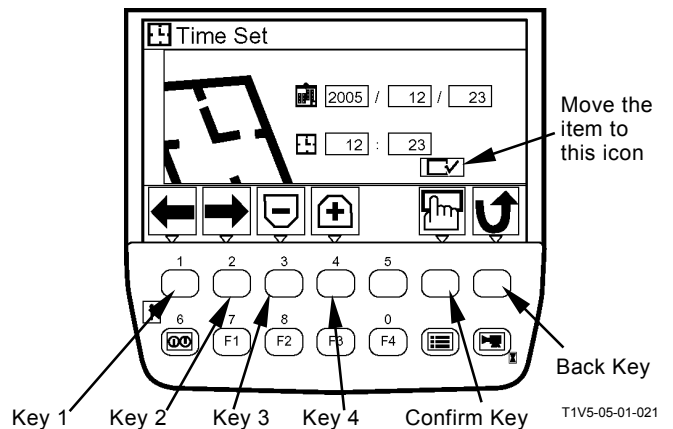


3. On the time set screen, select the items to be set (Year, Month, Day and Time) by using keys 1 and 2 and set the figures by using keys 3 and 4.

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



**TROUBLESHOOTING/Monitor Unit**

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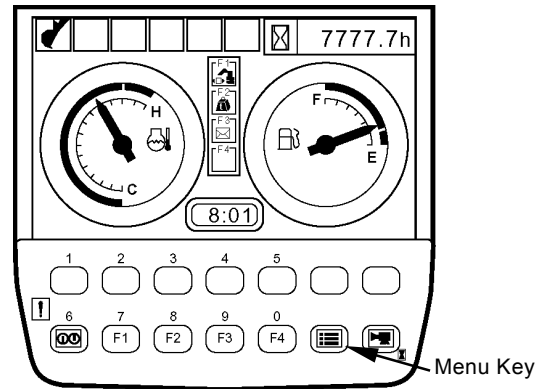
# TROUBLESHOOTING/Monitor Unit

## FUEL RATE DISPLAY/NO DISPLAY

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

### Fuel Rate Display

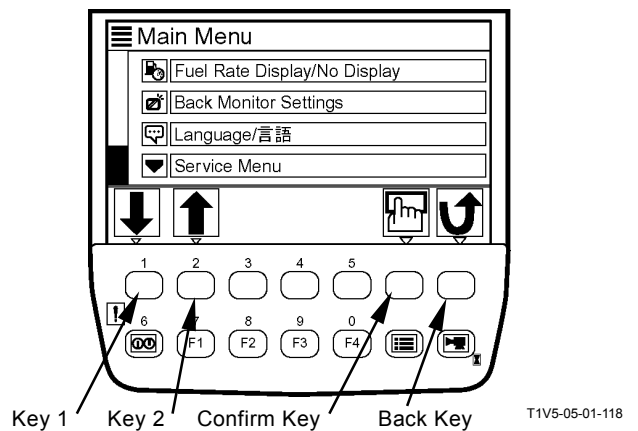
1. When the primary screen appears, push the menu key and display main menu.



Primary Screen

T1V1-05-01-123

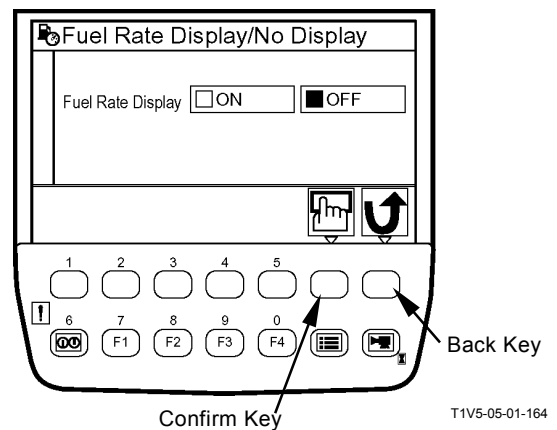
2. Select fuel rate display/no display from main menu by using keys 1 and 2. Push the confirm key. Then, the fuel rate display/no display screen appears.



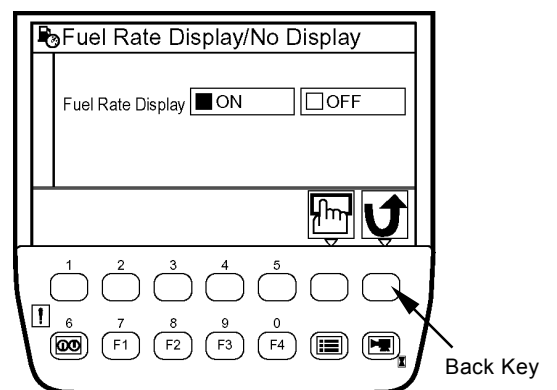
T1V5-05-01-118

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

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



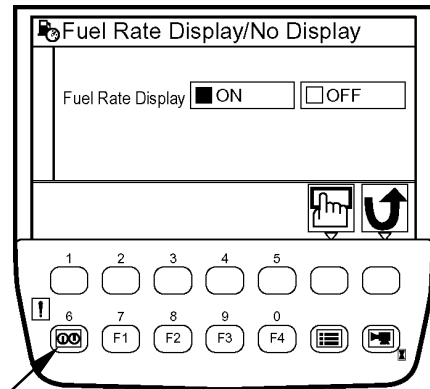
T1V5-05-01-164



T1V5-05-01-119

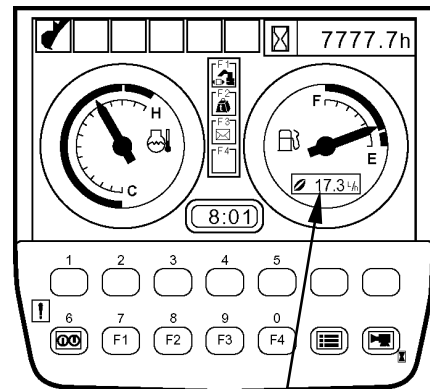
## TROUBLESHOOTING/Monitor Unit

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



Key 6

T1V5-05-01-119



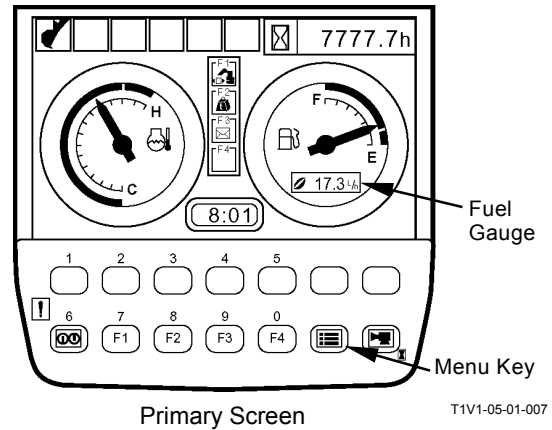
Fuel Gauge

T1V1-05-01-007

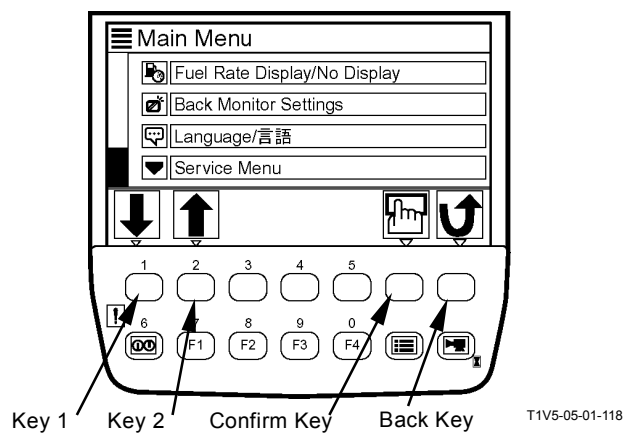
## TROUBLESHOOTING/Monitor Unit

### Fuel Rate No Display

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

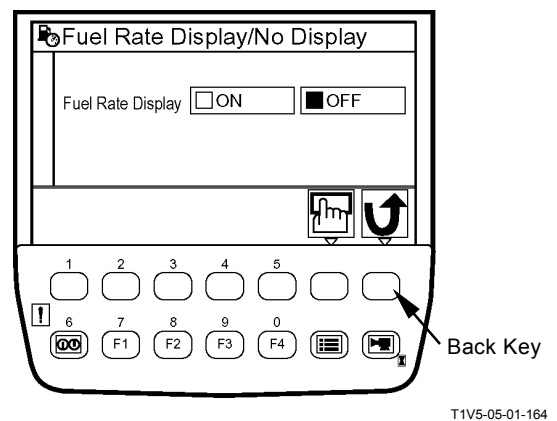
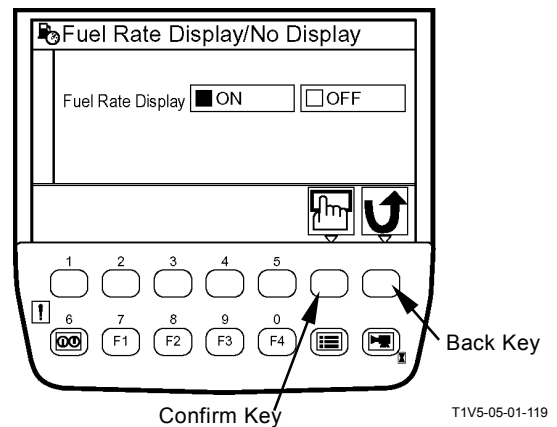


2. Select fuel rate display/no display from main menu by using keys 1 and 2. Push the confirm key. Then, the fuel rate display/no display screen appears.



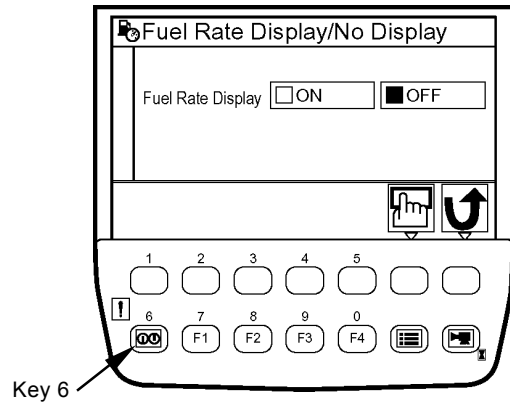
3. Push the confirm key, and fuel rate display is set to OFF.

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

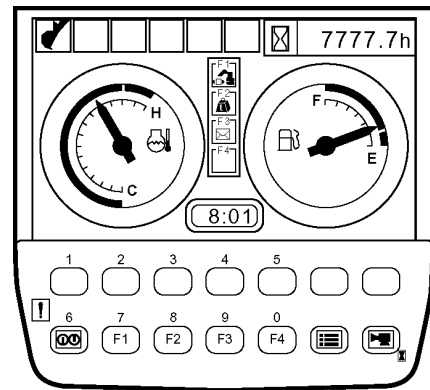


## TROUBLESHOOTING/Monitor Unit

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



T1V5-05-01-164



Primary Screen

T1V1-05-01-123

# TROUBLESHOOTING/Monitor Unit

## BACK MONITOR SETTINGS

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


### Auto-Control: ON

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

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

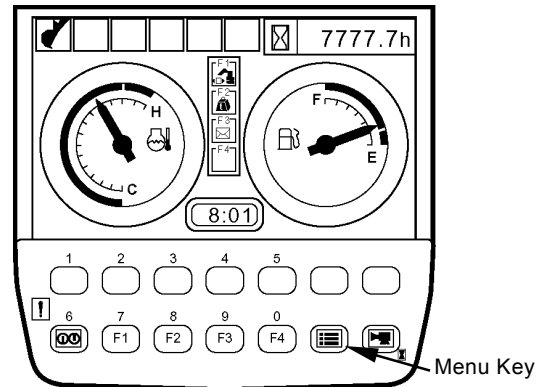
2. Select back monitor settings from main menu by using keys 1 and 2. Push the confirm key. Then, the back monitor settings screen appears.

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

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

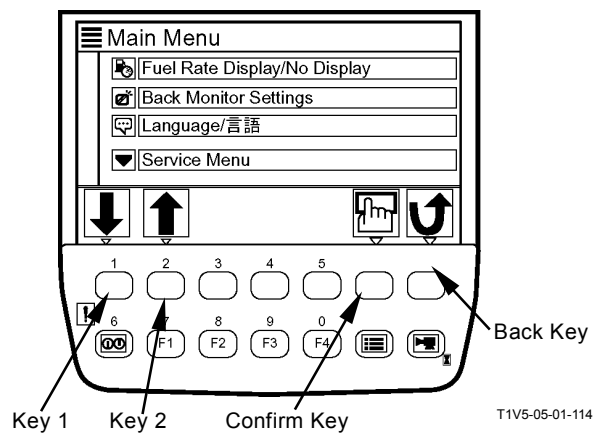
4. Push key 6, and return to the primary screen.

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



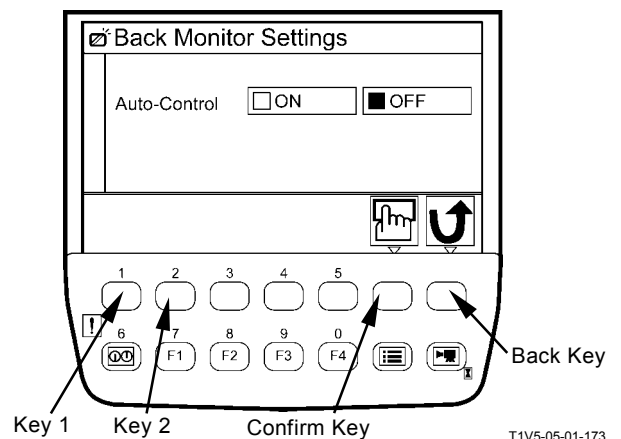
Primary Screen

T1V1-05-01-123



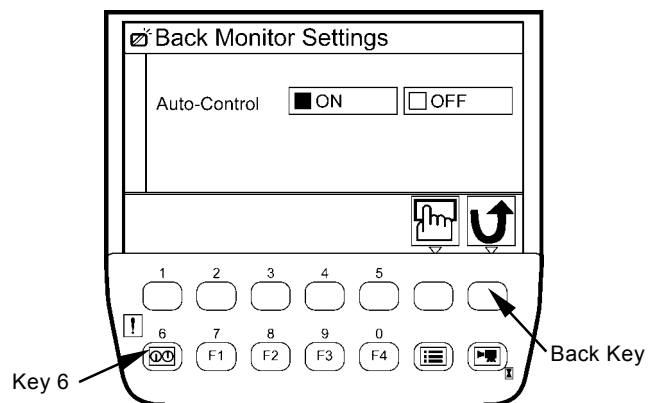
Back Key

T1V5-05-01-114



Back Key

T1V5-05-01-173



Back Key

T1V5-05-01-174

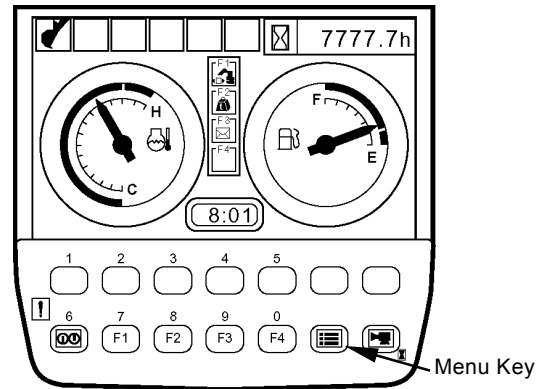


## TROUBLESHOOTING/Monitor Unit

### Auto-Control: OFF

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

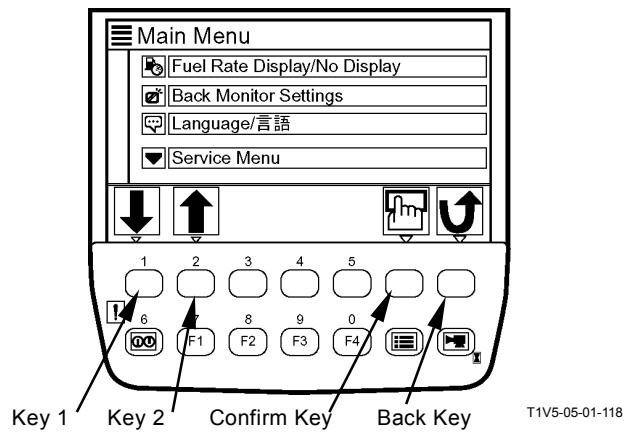
1. When the primary screen appears, push the menu key and display main menu.



Primary Screen

T1V1-05-01-123

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



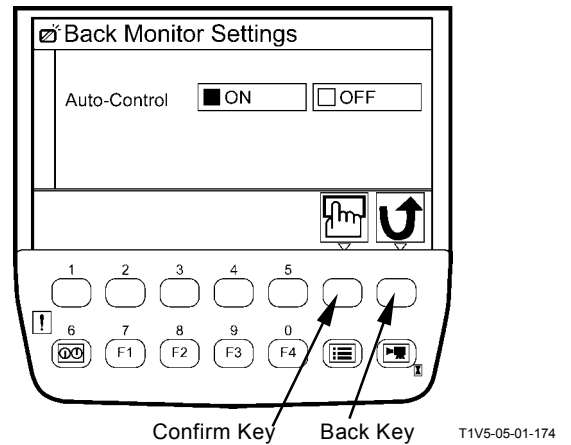
Key 1    Key 2    Confirm Key    Back Key

T1V5-05-01-118

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

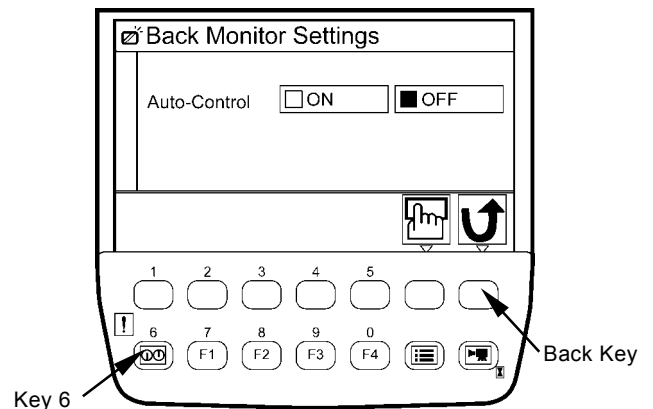
**NOTE:** When pushing the back key, return to the previous screen.

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



Confirm Key    Back Key

T1V5-05-01-174



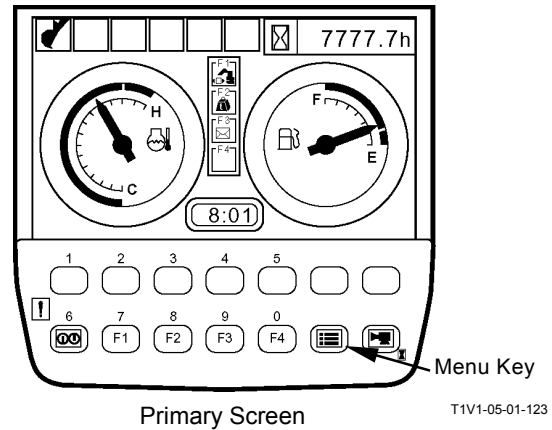
Key 6

T1V5-05-01-173

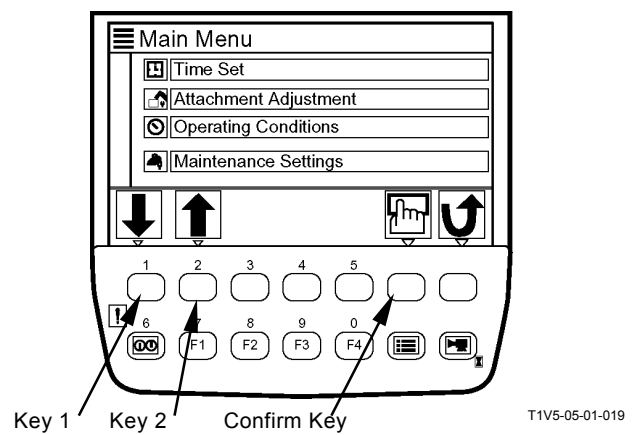
# TROUBLESHOOTING/Monitor Unit

## MAINTENANCE SETTINGS

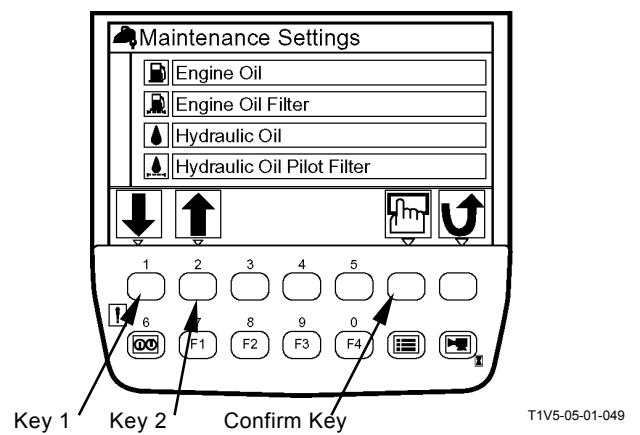
1. When the primary screen appears, push the menu key and display main menu.



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



## TROUBLESHOOTING/Monitor Unit

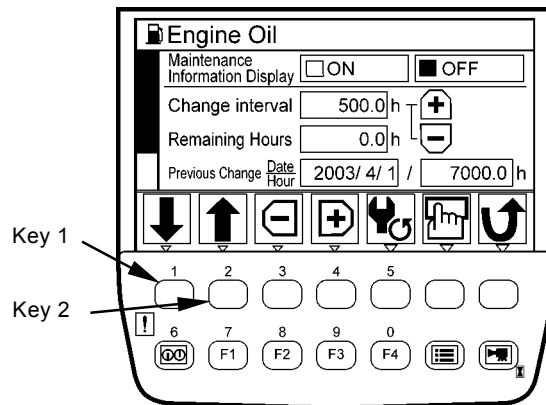
### Maintenance Information Display ON/OFF

Example: Maintenance Information Display OFF→ON

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

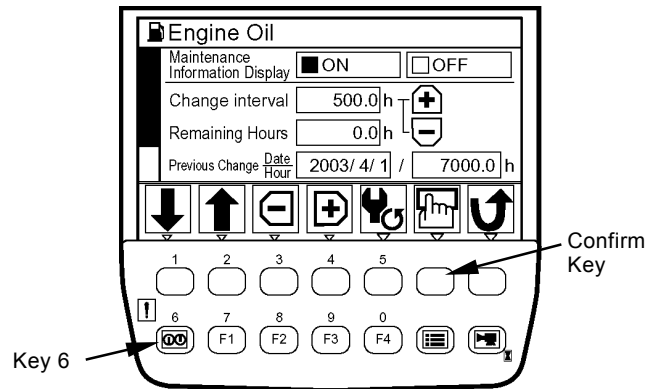
OFF: No information message is displayed.

1. Select maintenance information display by using keys 1 and 2.
2. Push the confirm key and select ON.
3. In order to complete setting, push key 6. Then, the primary screen appears.

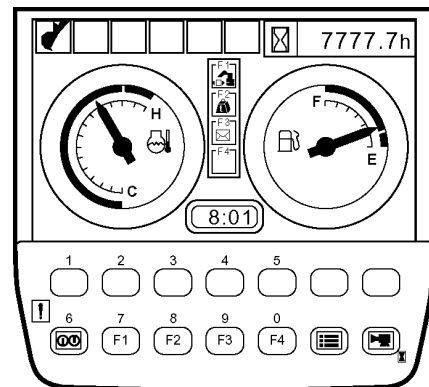


Interval ON/OFF Setup Screen

T1T1-05-02-005



T1V5-05-01-052



Primary Screen

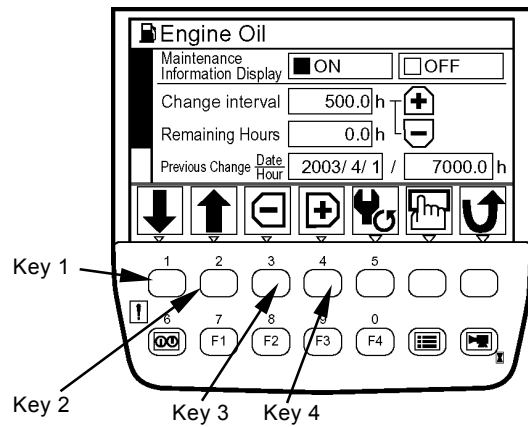
T1V1-05-01-123

## TROUBLESHOOTING/Monitor Unit

### Change Interval Settings

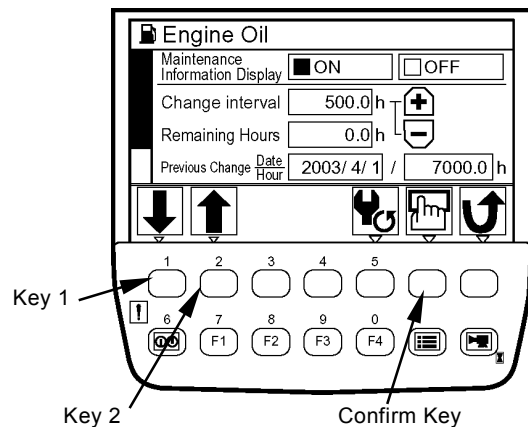
**IMPORTANT: Change interval can only be set when maintenance information display is set to ON.**

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

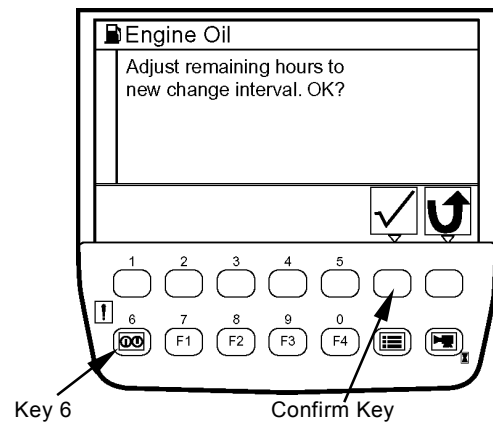


T1V5-05-01-052

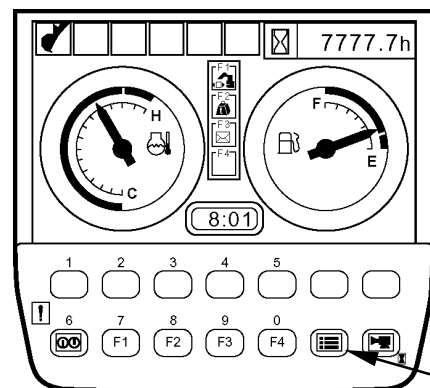
Interval ON/OFF Setup Screen



T1V5-05-01-138



T1V5-05-01-139



Primary Screen

T1V1-05-01-123

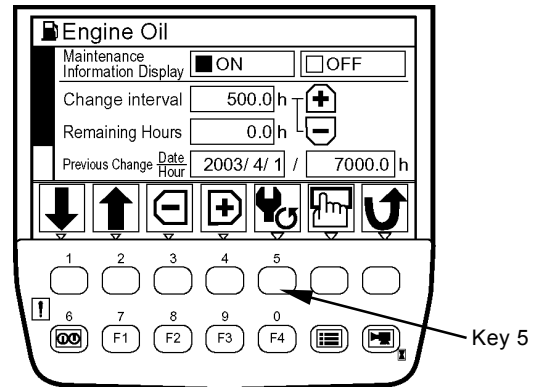
## TROUBLESHOOTING/Monitor Unit

### Resetting Data

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

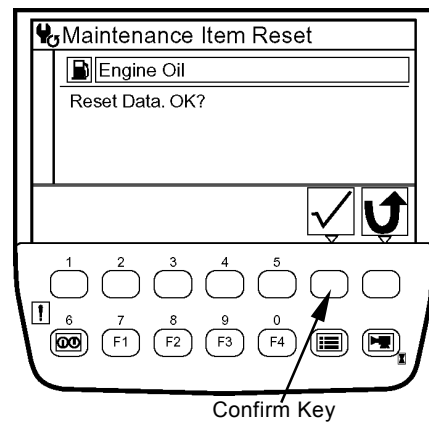
The message "Reset Data. OK?" appears. Then, push the confirm key.

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



Interval ON/OFF Setup Screen

T1V5-05-01-052



Confirm Key

T1V5-05-01-140

## TROUBLESHOOTING/Monitor Unit

### Screen Display when Maintenance Information Display is ON

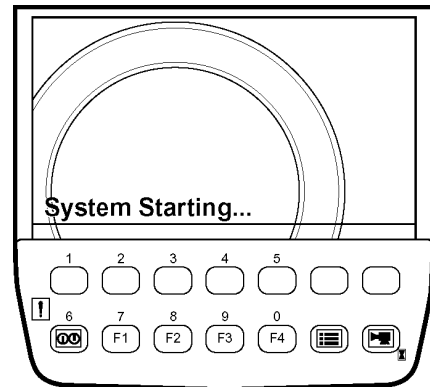
- When only one item is displayed
  1. If turning the key switch to the ON position, the starting screen appears. Then, the maintenance information display screen for the item whose change interval has expired appears for ten seconds. Finally the primary screen appears.  
(In the right example, Hydraulic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

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

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

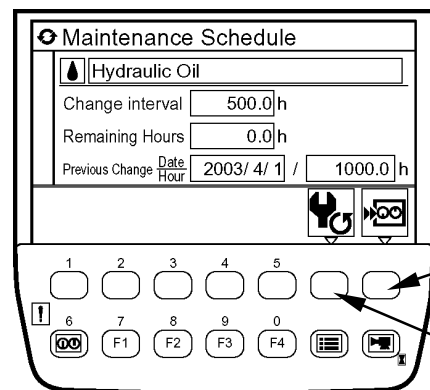
**NOTE:** When pushing the back key while the maintenance information display screen is displayed, return to the primary screen.

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



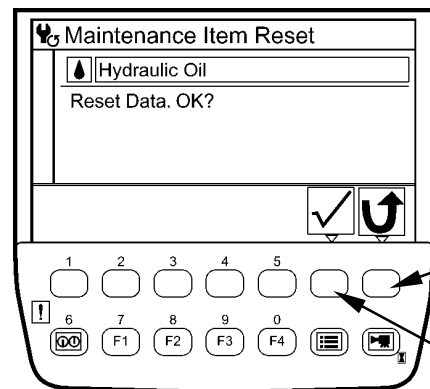
Starting Screen

T1V1-05-01-115



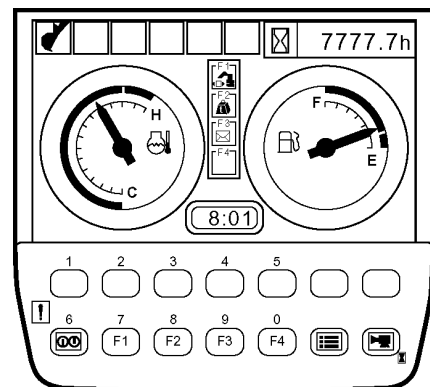
Maintenance Information Display Screen

T1V5-05-01-170



Reset Screen

T1V5-05-01-171



Primary Screen

T1V1-05-01-123

## TROUBLESHOOTING/Monitor Unit

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

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

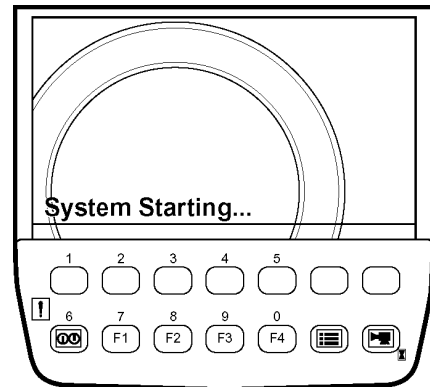
2. If data is reset, while the scheduled maintenance screen is displayed, select desired item by using keys 1 and 2. Push the confirm key. Then, the maintenance information display screen for the selected item appears.  
(In the right example, Hydraulic Oil is selected.)

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

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

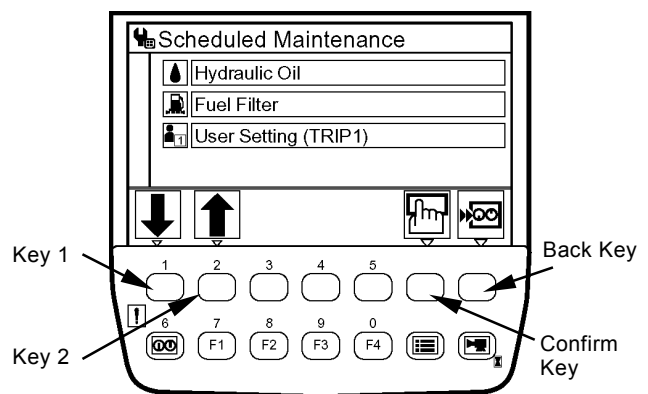
**NOTE:** When pushing the back key while the maintenance information display screen is displayed, return to the scheduled maintenance screen.

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



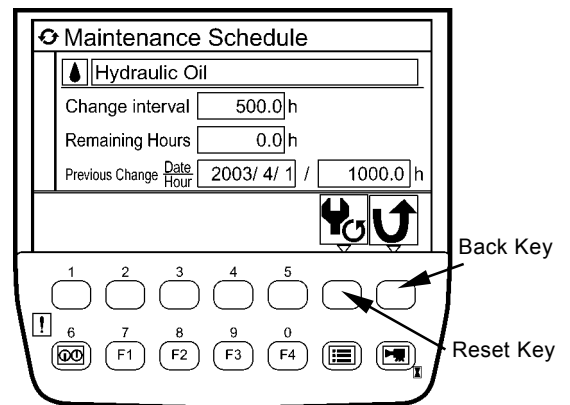
Starting Screen

T1V1-05-01-115



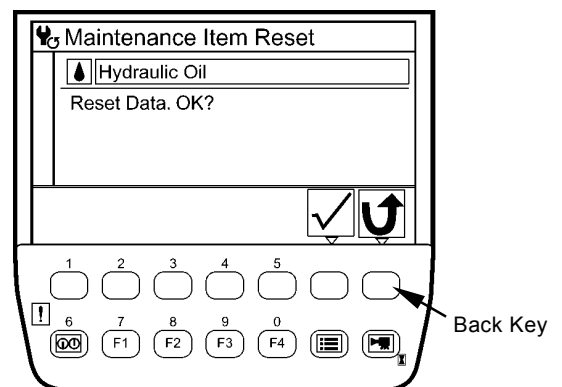
Scheduled Maintenance Screen

T1V5-05-01-169



Maintenance Information Display Screen

TCHB-05-02-011




Reset Screen


T1V5-05-01-171

# TROUBLESHOOTING/Monitor Unit

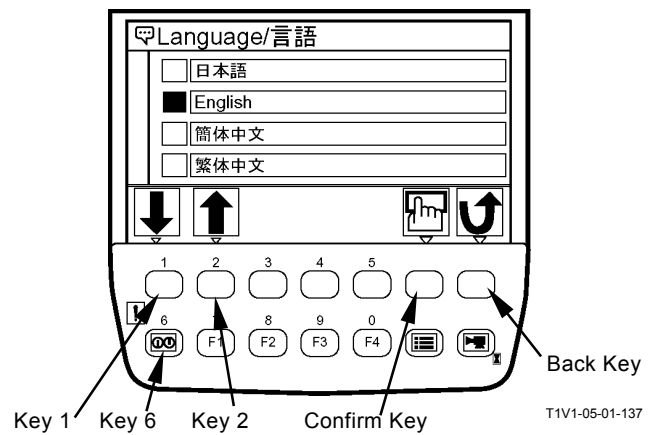
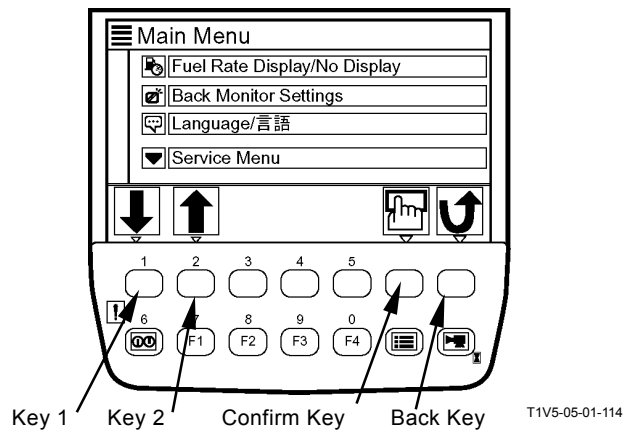
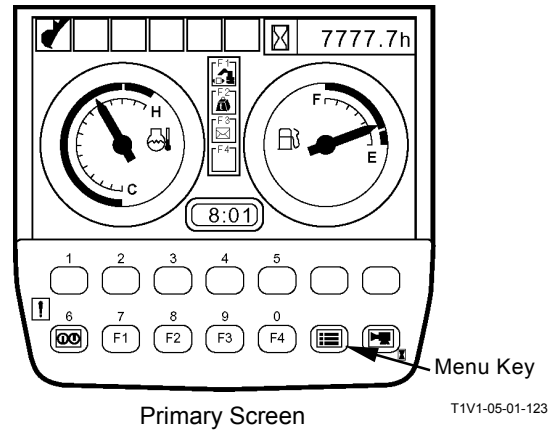
## LANGUAGE SETTINGS

1. When the primary screen appears, push the menu key and display main menu.
2. Select language from main menu by using keys 1 and 2. Push the confirm key. Then, the language settings screen appears.
3. Select a desired language by using keys 1 and 2. Push the confirm key.

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

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

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





## TROUBLESHOOTING/Monitor Unit

### Lists of Display Languages

#### Display Languages 1

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

#### Display Languages 2

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


## TROUBLESHOOTING/Monitor Unit

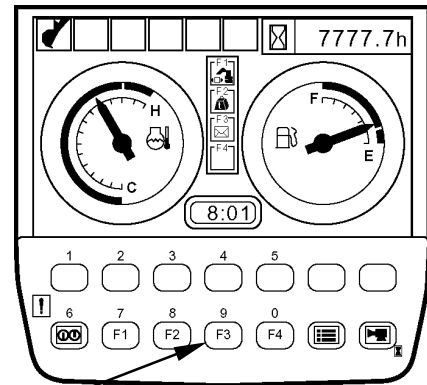
### MAIL (Optional)

**IMPORTANT:** This function is available only to a machine equipped with a satellite terminal.

**When using the mail function, make the mail function available by using Dr. ZX.**

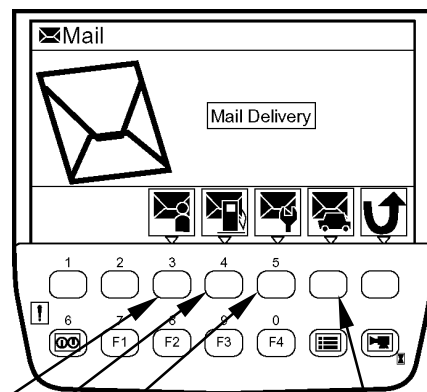
1. When the primary screen appears, push key F3 and display the mail screen.
2. If pushing a relevant request key, mail information is sent to ICF.
  - 1 - General Request
  - 2 - Fuel Replenishment Request
  - 3 - Service Maintenance Request
  - 4 - Forwarding Request
3. While mail information is sent to ICF, the message "Mail is being delivered." is displayed on the screen.
4. When ICF completes receives mail information, the message "Mail delivery successful." is displayed on the screen. When pushing the back key, return to the mail screen.
5. Then, a mail is sent from the satellite terminal to the central server via the satellite.

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



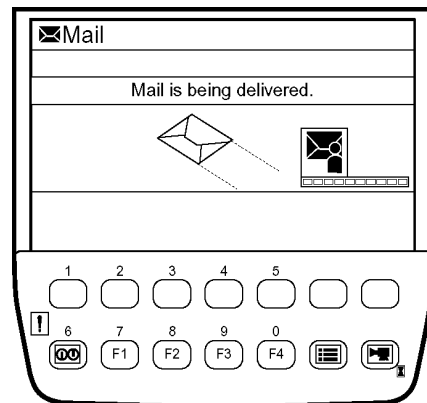
Key F3 → Primary Screen

T1V1-05-01-123

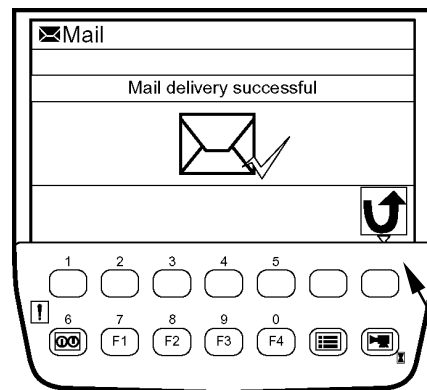


1 → 2 → 3 → Mail Screen → 4

T1V5-05-01-037




T1V5-05-01-038

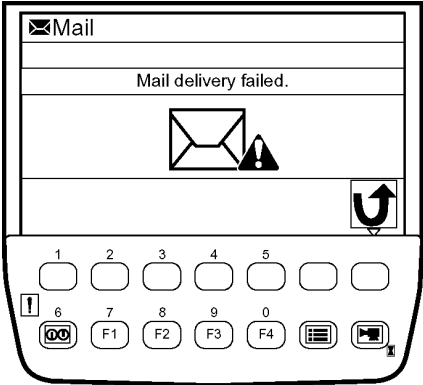


Back Key

T1V5-05-01-039

# TROUBLESHOOTING/Monitor Unit

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



T1V5-05-01-040


## TROUBLESHOOTING/Monitor Unit

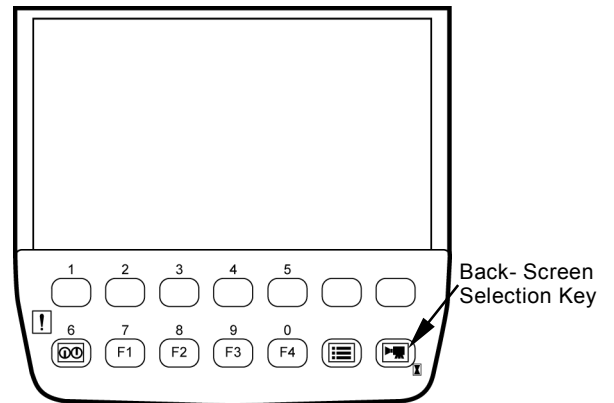
### KEYLESS HOUR METER

When the key switch is OFF, the following items can be displayed on the monitor.

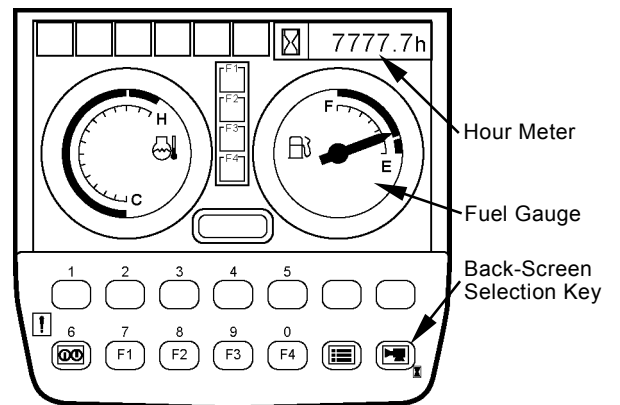
- Hour Meter
- Fuel Gauge

1. When the back-screen selection key is pushed beyond 1 second, the keyless hour meter screen is displayed.

 **NOTE:** While the back-screen selection key is pushed, the keyless hour meter screen is displayed.



T1T1-05-01-010



Keyless Hour Meter Screen

T1T1-05-01-002

2. When the back-screen selection key is released, the keyless hour meter screen disappears.

## TROUBLESHOOTING/Monitor Unit

### LIST OF MONITOR UNIT SETTING FUNCTION

○: with setting function

×: without setting function

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

## TROUBLESHOOTING/Monitor Unit

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

## TROUBLESHOOTING/Monitor Unit

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

## TROUBLESHOOTING/Monitor Unit

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



## TROUBLESHOOTING / e-Shovel

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### OUTLINE

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

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

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

The machine equipped with the optional satellite communication terminal sends the data to center server by using satellite communication. (As for the satellite communication system, refer to T5-3-24.)

## TROUBLESHOOTING / e-Shovel


### LIST OF DAILY REPORT DATA

#### Data which can be downloaded by Dr. ZX (Palm)

Item	Details	
Date	Date of daily report data	
Start: Time	Time when key switch is first turned ON during a day (Time is recorded by key switch ON signal.)	
Stop: Time	Time when key switch is last turned OFF during a day (Time is recorded by key switch ON signal.)	
Fuel Level	The value of the final remained fuel during a day (Value is recorded by fuel sensor data from monitor unit.)	
Fuel Usage Amount	The value of fuel used during a day (Value is calculated and recorded by accumulated fuel usage amount from ECM.)	
Machine Hour Meter	Hour meter cumulative hours (Hours are recorded by hour meter from monitor unit.)	
Engine Operating Hours	HP Mode Hours	Total engine operating hours selecting HP mode during a day (Hours are recorded by power mode switch information from MC.)
	P Mode Hours	Total engine operating hours selecting P mode during a day (Hours are recorded by power mode switch information from MC.)
	E Mode Hours	Total engine operating hours selecting E mode during a day (Hours are recorded by power mode switch information from MC.)
Auto-Idle Switch ON Hours	Hours when auto-idle switch is turned ON during a day (Hours are recorded by switch information from MC.)	
Travel Operating Hours	Fast Idle (Hi) Traveling Hours	Total operating hours of travel mode (Hi) during a day (Hours are recorded by travel mode switch information from MC.)
	Slow Idle (Lo) Traveling Hours	Total operating hours of travel mode (Lo) during a day (Hours are recorded by travel mode switch information from MC.)
Swing Operating Hours	Total swing operating hours during a day (Hours are recorded by swing pressure sensor information from MC.)	
Digging Operating Hours	Total operating hours selecting front attachment during a day (Hours are recorded by front attachment pressure sensor information from MC.)	
Attachment Operating Hours	Breaker Operating Hours	Total operating hours selecting breaker during a day (Hours are recorded by attachment information from MC.)
	Secondary Crusher Operating Hours	Total operating hours selecting secondary crusher during a day (Hours are recorded by attachment information from MC.)
	Primary Crusher Operating Hours	Total operating hours selecting primary crusher during a day (Hours are recorded by attachment information from MC.)
	Vibrating Hammer Operating Hours	Total operating hours selecting vibrating hammer during a day (Hours are recorded by attachment information from MC.)
	Bucket Operating Hours or Others	Total operating hours selecting bucket during a day (Hours are recorded by attachment information from MC.)

## TROUBLESHOOTING / e-Shovel


Item	Details
No Load Hours	Total machine's waiting hours during a day (Hours are recorded by each pressure sensor information from MC.)
Radiator Coolant Temperature	The highest radiator coolant temperature during a day (Value is recorded from monitor unit.)
Hydraulic Oil Temperature	The highest hydraulic oil temperature during a day (Value is recorded from MC.)
Intake-Air Temperature	The highest intake-air temperature during a day (Value is recorded from ECM.)
Engine Operating Hour Distribution Data	Engine operating hour distribution during a day (Operating hours are recorded only when alternator output signal is continuously delivered for more than 10 minutes.)
Loaded Hours Distribution Data	Machine operating hour distribution during a day (Operating hours are recorded only when operating pressure is continuously detected for more than 5 minutes while the engine runs.)

 **NOTE:** *The daily operation in this table is equivalent to the hours between 0:00 and 23:59:59 counted by the ICX built-in clock. In case the engine is kept operated beyond 0:00, such data are recorded as those for the following day.*

## TROUBLESHOOTING / e-Shovel

### Data which can be sent by Satellite Communication

Item	Details
Date	Date of daily report data
Fuel Level	The value of the final remained fuel during a day (Value is recorded by fuel sensor data from monitor unit.)
Fuel Usage Amount	The value of fuel used during a day (Value is calculated and recorded by accumulated fuel usage amount from ECM.)
Machine Hour Meter	Hour meter cumulative hours (Hours are recorded by hour meter from monitor unit.)
Engine Operating Hours	Total engine operating hours during daily operation (Hours are recorded with alternator signal ON.)
Travel Operating Hours	Total travel operating hours during daily operation
Swing Operating Hours	Total swing operating hours during daily operation
Front Attachment Operating Hours	Total front attachment and swig operating hours during daily operation
Attachment Operating Hours	Total attachment operating hours during daily operation
No Load Hours	Total machine's waiting hours during daily operation
Radiator Coolant Temperature	The highest radiator coolant temperature during a day
Hydraulic Oil Temperature	The highest hydraulic oil temperature during a day
Intake-Air Temperature	The highest intake-air temperature during a day
Engine Operating Hour Distribution Data	Engine operating hour distribution during daily operation (Operating hours are recorded only when alternator output signal is continuously delivered for more than 10 minutes.)
Loaded Hour Distribution Data	Machine operating hour distribution during daily operation (Operating hours are recorded only when operating pressure is continuously detected for more than 5 minutes while the engine runs.)

 **NOTE:** The daily operation in this table is equivalent to the hours between 0:00 and 23:59:59 counted by the ICX built-in clock. In case the engine is kept operated beyond 0:00, such data are recorded as those for the following day.

## TROUBLESHOOTING / e-Shovel

### LIST OF FREQUENCY DISTRIBUTION DATA

Item	Details
Fuel Temperature	Frequency distribution of fuel temperature
Pump Load	Frequency distribution of average pump delivery pressure of pumps 1 and 2
Average Pump Delivery Pressure in Digging Operation	Frequency distribution of average delivery pressure from pumps during digging operation
Average Pump Delivery Pressure in Travel Operation	Frequency distribution of average delivery pressure from pumps during travel operation
Radiator Coolant Temperature	Frequency information of coolant temperature
Hydraulic Oil Temperature	Frequency information of hydraulic oil temperature
Radiator Coolant Temperature – Intake-Air Temperature	Frequency information on temperature in which intake air temperature is pulled from coolant temperature
Hydraulic Oil Temperature – Intake-Air Temperature	Frequency information on temperature in which intake air temperature is pulled from hydraulic oil temperature
Pump Load Rate	Frequency information of engine speed and average load rate (average of pump 1 load rate and pump 2 load rate)
Engine Load Rate	Frequency information of engine speed and engine torque
Radiator Coolant Temperature/Intake-Air Temperature	Frequency information of coolant temperature and intake air temperature
Hydraulic Oil Temperature/Intake-Air Temperature	Frequency information of hydraulic oil temperature and intake air temperature

## TROUBLESHOOTING / e-Shovel

### LIST OF TOTAL OPERATING HOURS

Item	Details	
Inner Hour Meter	Hour meter's value accumulated inside ICF	
Machine Hour Meter	Hour meter's value accumulated in machine's monitor	
Engine Operating Hour	HP Mode Hours	Total engine operating hours selecting HP mode
	P Mode Hours	Total engine operating hours selecting P mode
	E Mode Hours	Total engine operating hours selecting E mode
Auto-Idle Switch ON Hours	Hours when auto-idle switch is turned ON	
Travel Operating Hour	Fast Idle (Hi) Traveling Hours	Total operating hours of travel mode (Hi)
	Slow Idle (Lo) Traveling Hours	Total operating hours of travel mode (Lo)
Swing Operating Hour	Total swing operating hours during	
Front Attachment Operating Hour	Total front attachment and swig operating hours	
Attachment Operating Hour	Breaker Operating Hours	Total operating hours selecting breaker during daily operation
	Secondary Crusher Operating Hours	Total operating hours selecting secondary crusher during daily operation
	Primary Crusher Operating Hours	Total operating hours selecting primary crusher during daily operation
	Vibrating Hammer Operating Hours	Total operating hours selecting vibrating hammer during daily operation
	Bucket Operating Hours or Others	Total operating hours selecting bucket during daily operation
No Load Hours	Total machine's waiting hours	

## TROUBLESHOOTING / e-Shovel

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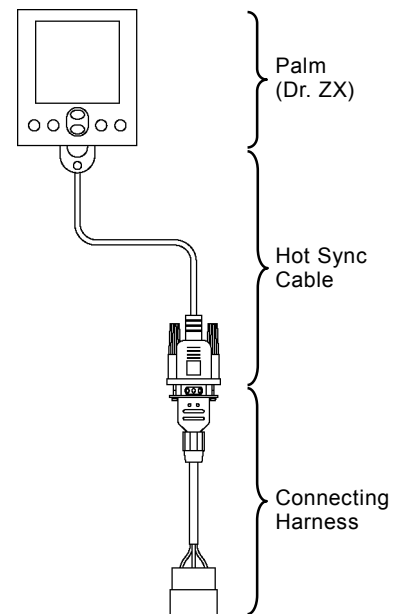
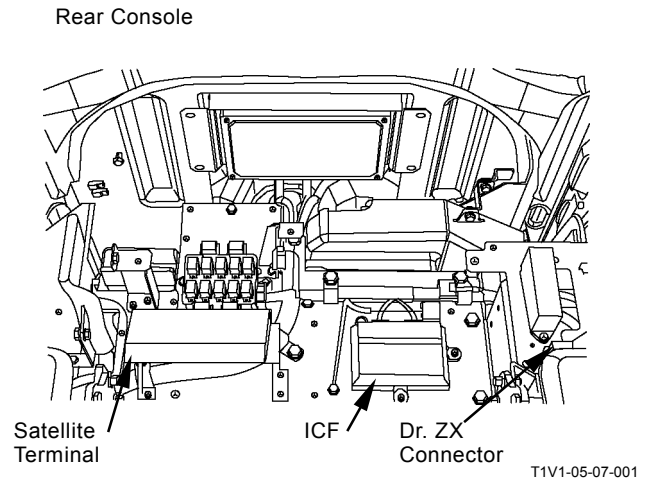
## TROUBLESHOOTING / e-Shovel

### HOW TO DOWNLOAD AND UPLOAD DATA OF ICF

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

#### How to Download Data from Machine to Palm

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



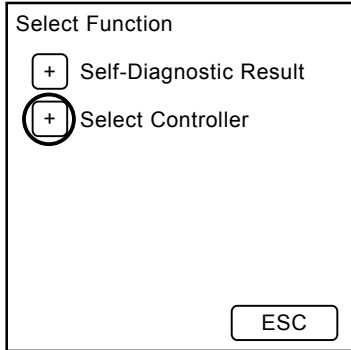
T1V1-05-07-002



# TROUBLESHOOTING / e-Shovel

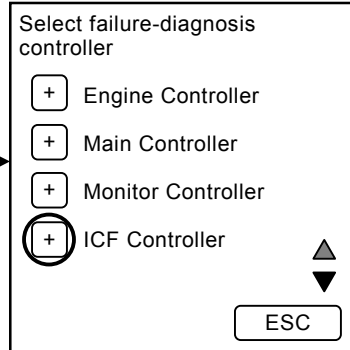
## Data Download

After starting Dr. ZX, push Select Controller.



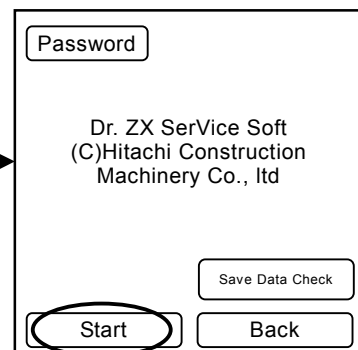
Function Selection Screen

Push ICF Controller.



Controller Selection Screen

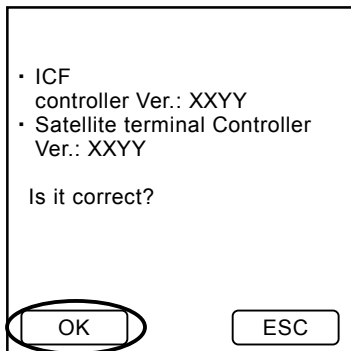
Push Start.



Title Screen

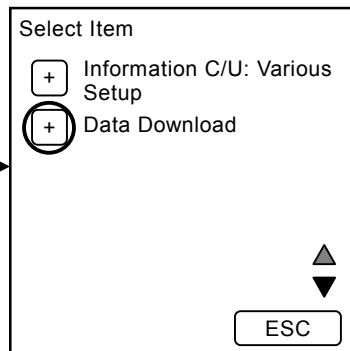
To the lower

Push OK.



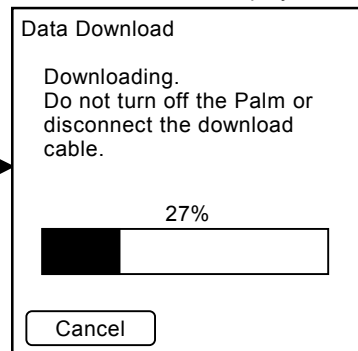
ICF Controller Screen

Push Date Download.



Main Menu Screen

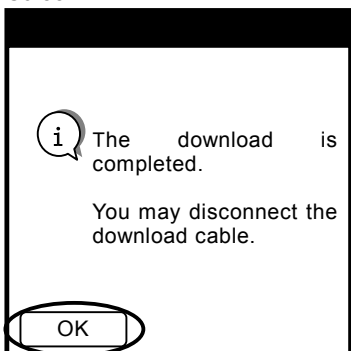
While downloading data, Download Screen is displayed.



Data Download Screen

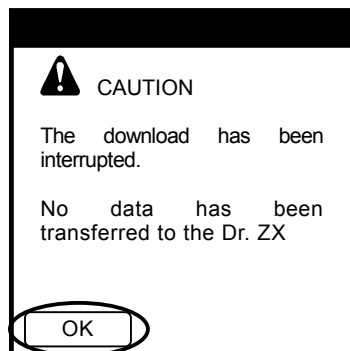
To the lower

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



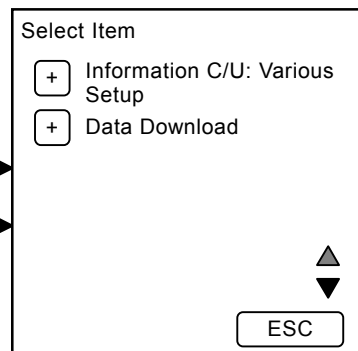
Normal End Screen

If pushing Cancel on Data Download Screen, Alarm Screen is displayed. Push OK and return to Main Menu Screen.



Alarm Screen

Push ESC and return to Title Screen.




Main Menu Screen

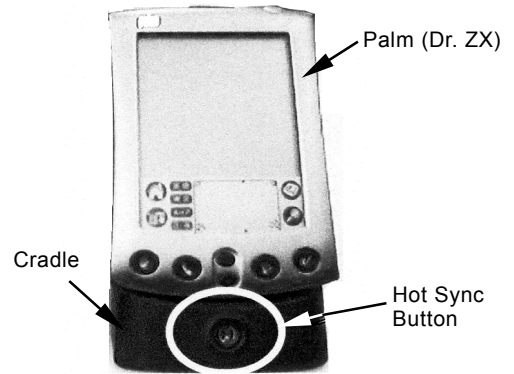
## TROUBLESHOOTING / e-Shovel

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### How to Upload Data from Palm (Dr. ZX) to Personal Computer

1. Set Palm (Dr. ZX) to the cradle. Connect the USB cable to the personal computer.
2. Push the Hot Sync button.

 **NOTE:** When pushing the Hot Sync button and uploading the data to the personal computer, the Palm Desktop software attached with (Dr. ZX) Palm need to be installed.



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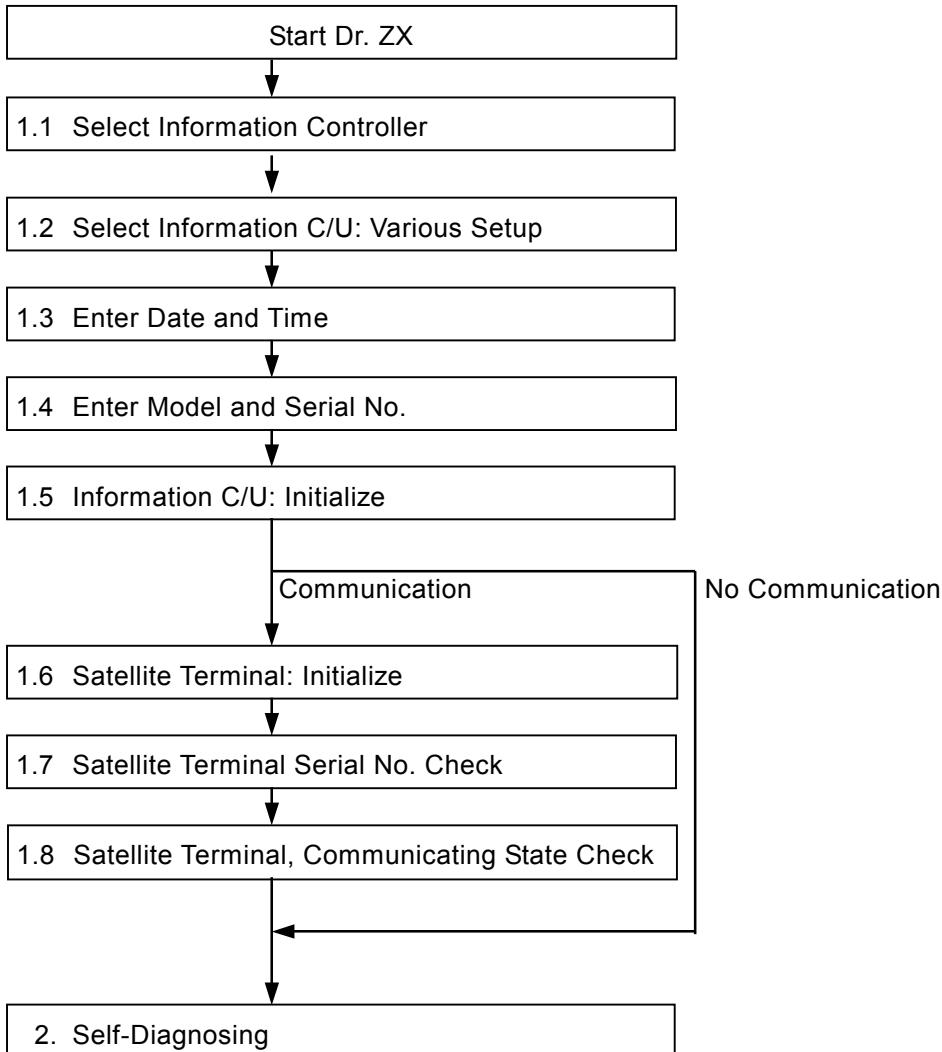
## TROUBLESHOOTING / e-Shovel

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### 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



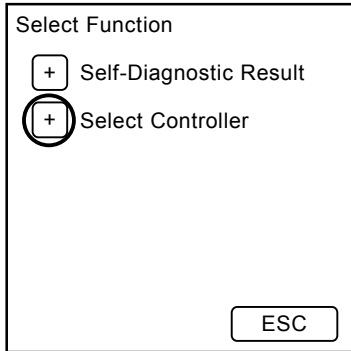
# TROUBLESHOOTING / e-Shovel

## 1.1 Select Information Controller

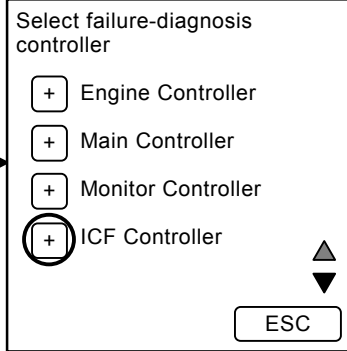
### 1.2 Select Information C/U: Various Setup

#### 1.1 Select Information Controller

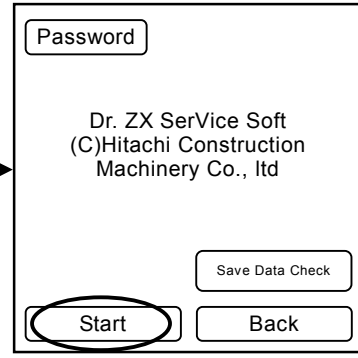
After starting Dr. ZX, push Select Controller.



Push ICF Controller.

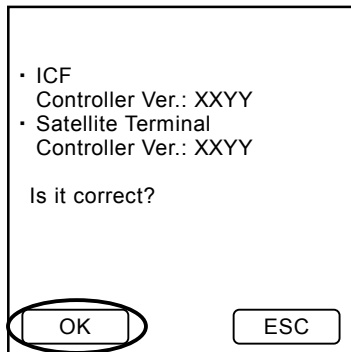


Push Start.

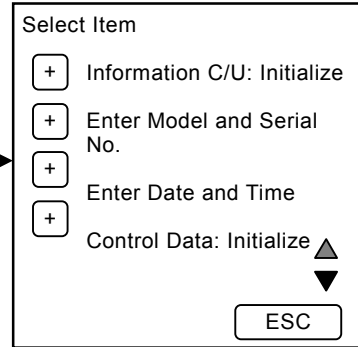
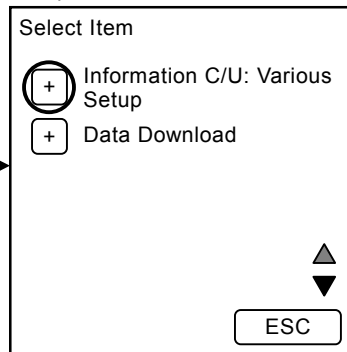


#### 1.2 Select Information C/U: Various Setup

Push OK.



Push Information C/U: Various Setup.

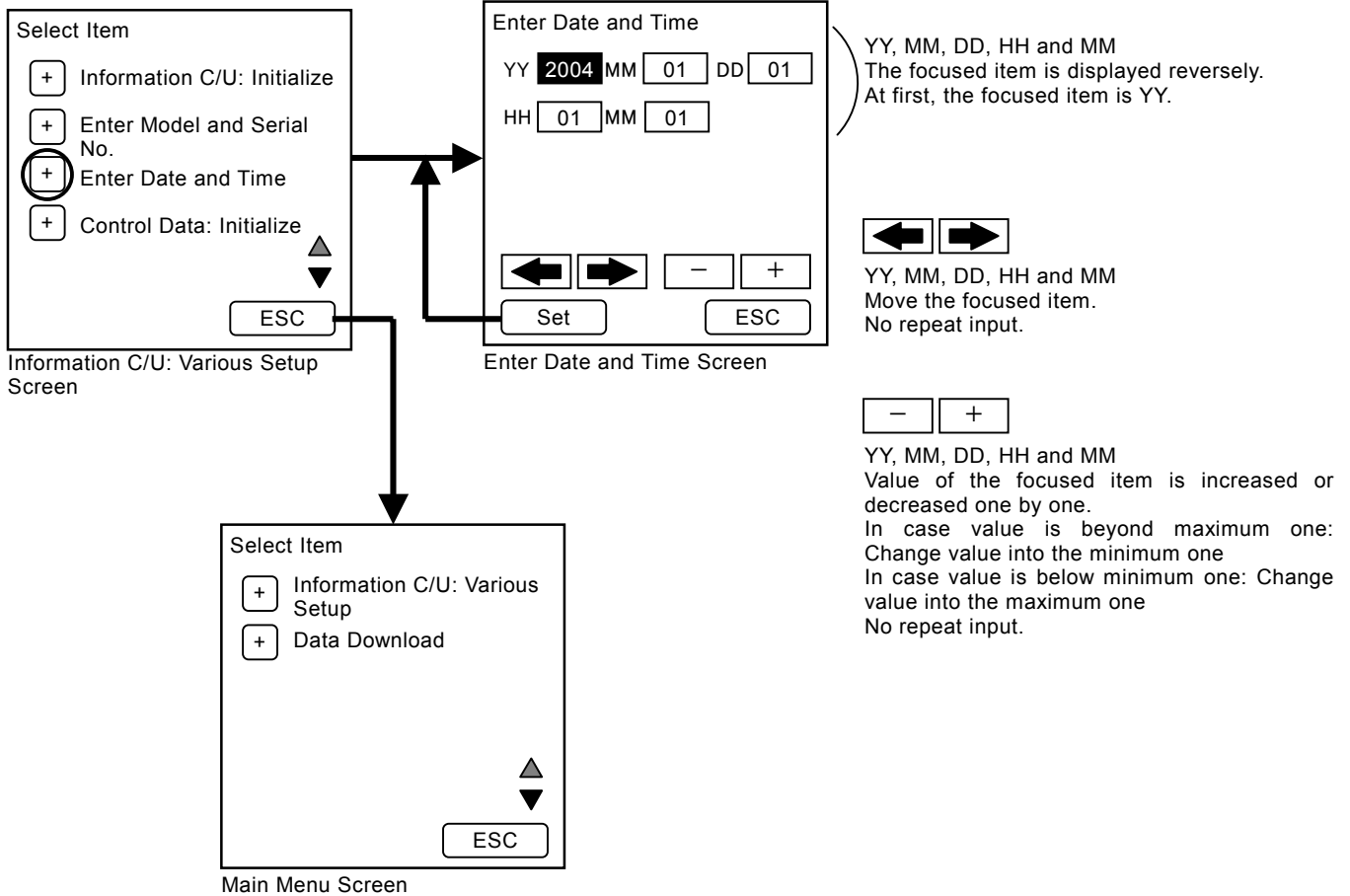


# TROUBLESHOOTING / e-Shovel

## 1.3 Enter Date and Time

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

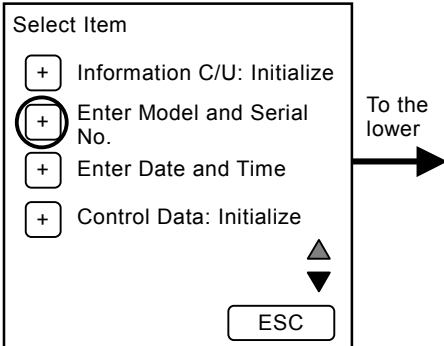
Push Set and the focused item is YY.  
Push ESC and return to Information C/U: Various Setup Screen.



# TROUBLESHOOTING / e-Shovel

## 1.4 Enter Model and Serial No.

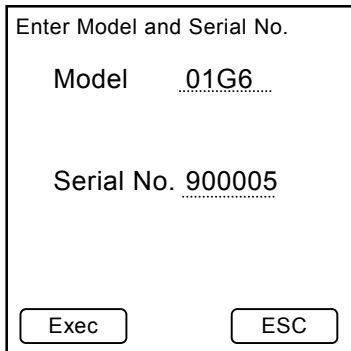
Push Enter Model and Serial No.



Information C/U: Various Setup Screen

Push Exec, and model and serial No. can be input.

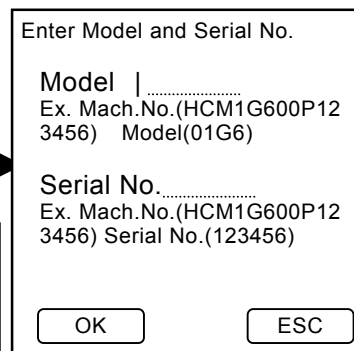
Push ESC and return to Information C/U: Various Setup Screen.



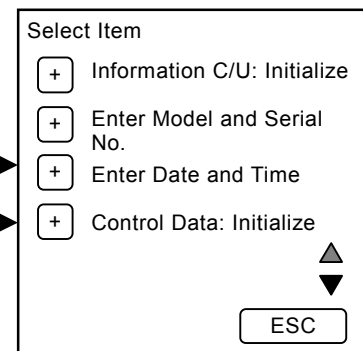
Enter Model and Serial No.

After inputting model and serial No., push OK and return to Enter Model and Serial No. Screen.

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



Push ESC and return to Main Menu Screen.

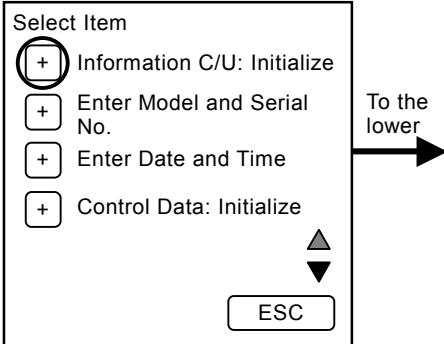


Information C/U: Various Setup Screen

# TROUBLESHOOTING / e-Shovel

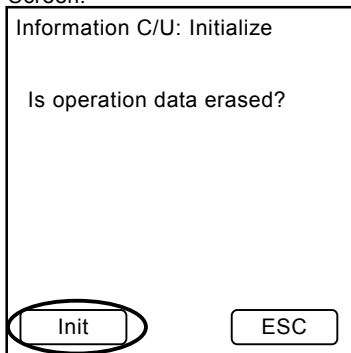
## 1.5 Information C/U: Initialize

Push Information C/U: Initialize.



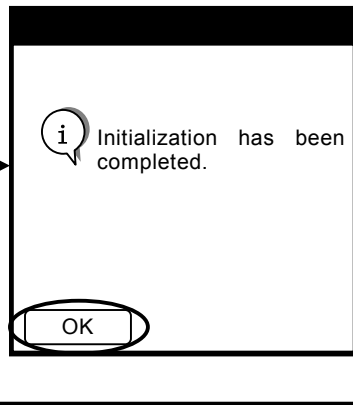
Information C/U: Various Setup Screen

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

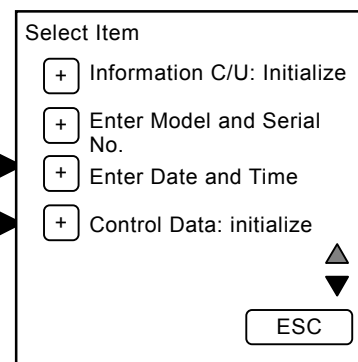


Information C/U: Initialize Screen

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



Push ESC and return to Main Menu Screen.

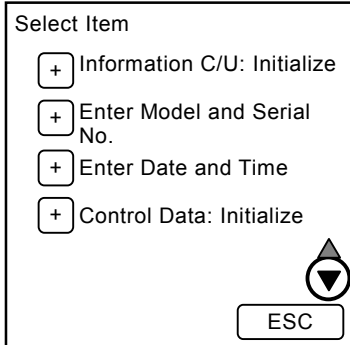


Information C/U: Various Setup Screen

# TROUBLESHOOTING / e-Shovel

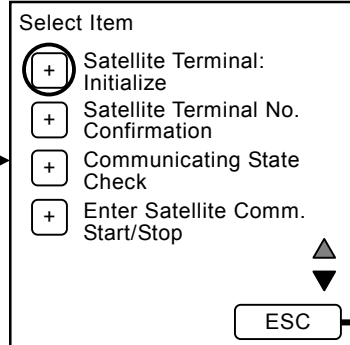
## 1.6 Satellite Terminal: Initialize

Display the next screen of Information C/U: Various Setup Screen.



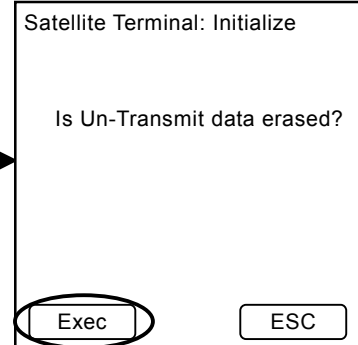
Information C/U: Various Setup Screen

Push Satellite Terminal: Initialize. Push ESC and return to Main Menu Screen.



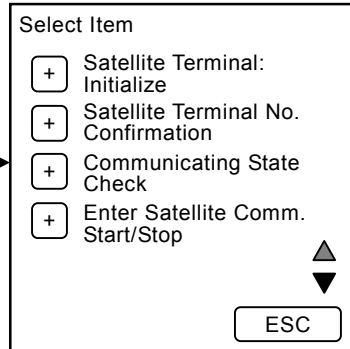
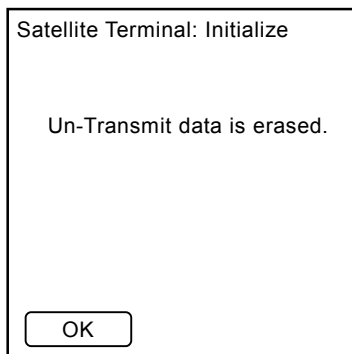
Next Screen of Information C/U: Various Setup Screen

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

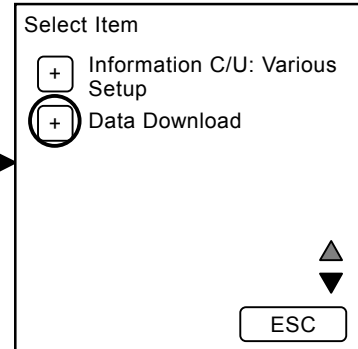


Satellite Terminal: Initialize

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



Information C/U: Various Setup Screen



Main Menu Screen

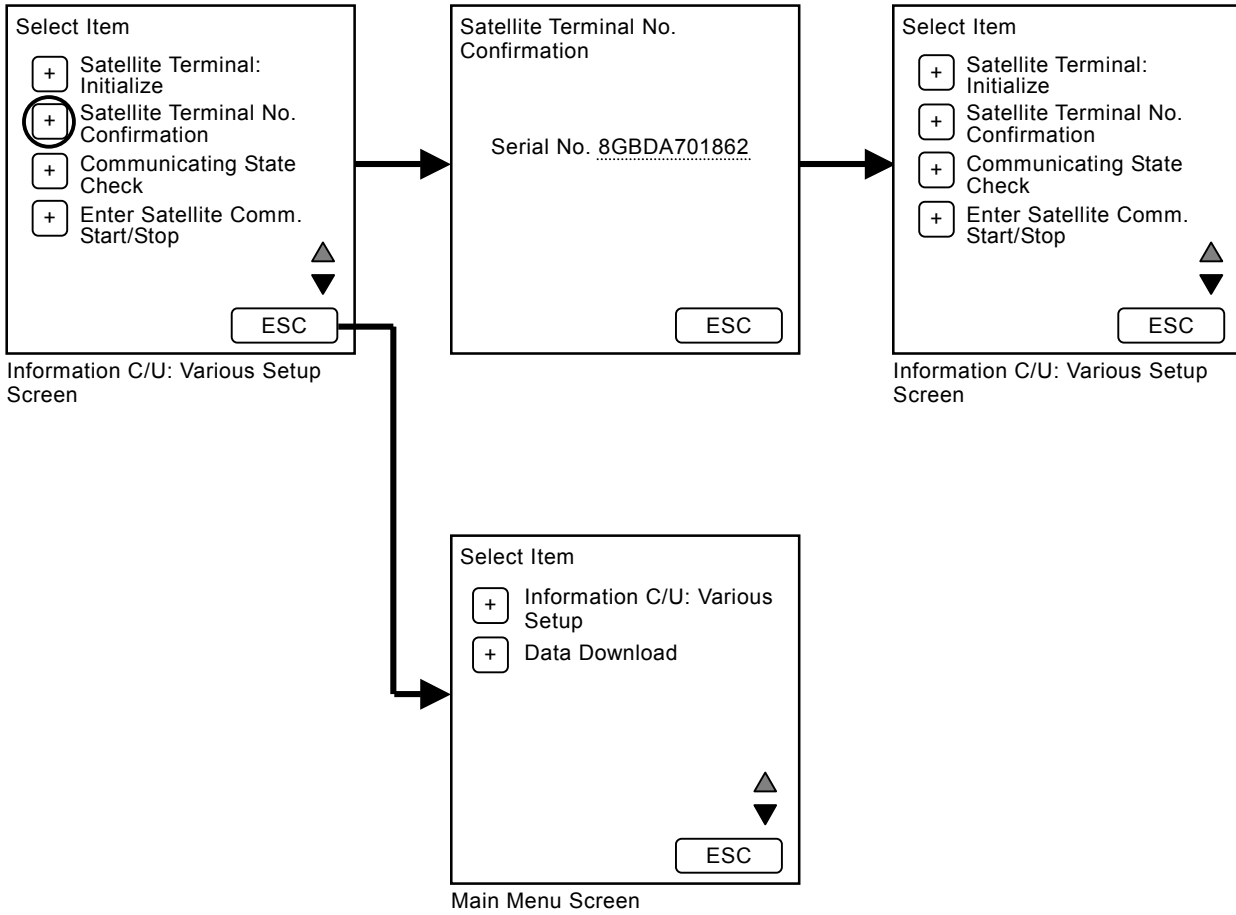


# TROUBLESHOOTING / e-Shovel

## 1.7 Satellite Terminal Serial No. Check

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

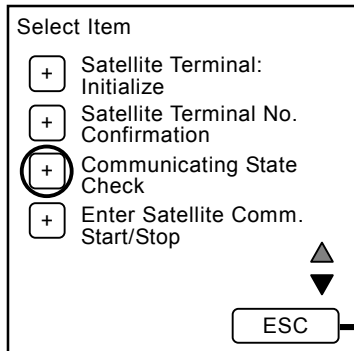
Confirm serial no. (12 digits).  
Push ESC and return to Information C/U: Various Setup Screen.



# TROUBLESHOOTING / e-Shovel

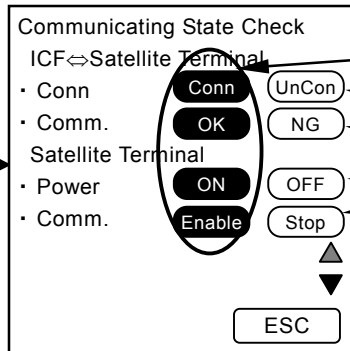
## 1.8 Satellite Terminal, Communicating State Check

Push Communicating State Check.  
Push ESC and return to Main Menu Screen.

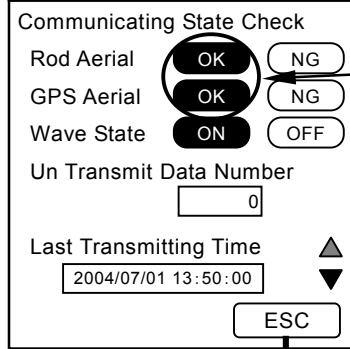


Information C/U: Various Setup Screen

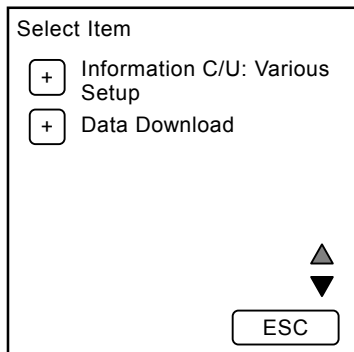
Check communicating state.



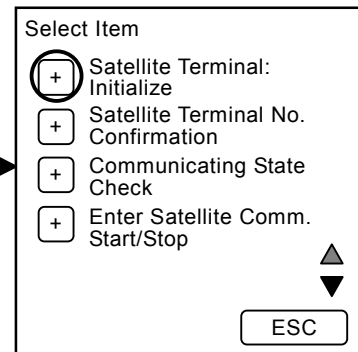
Check the enclosed state.  
Uncon: Faulty harness  
NG: Faulty harness for Comm.  
OFF: Faulty harness, Faulty controller  
Stop: 1.9 Enter Satellite Comm. Start/Stop



When electrical wave of the satellite is caught, the items are turned into OK.  
**IMPORTANT:** Check this with the key of machine ON in outdoor. According to state of electrical wave, it may take a little longer time.



Main Menu Screen

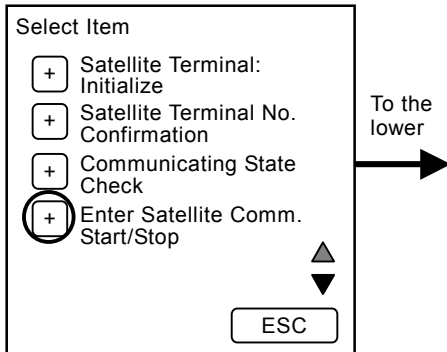


Information C/U: Various Setup Screen

# TROUBLESHOOTING / e-Shovel

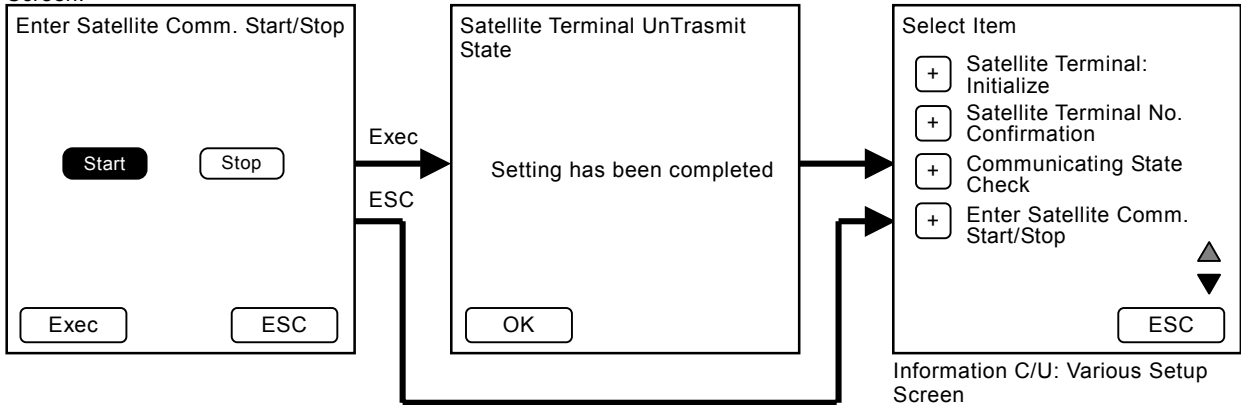
## 1.9 Enter Satellite Comm. Start/Stop

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



Information C/U: Various Setup Screen

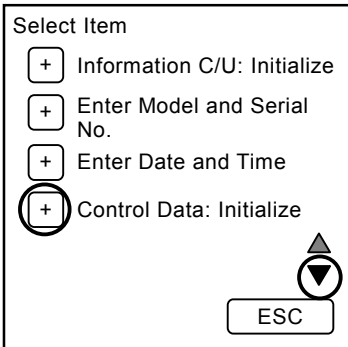
When starting Satellite Comm., push Start and push Exec.  
When stopping Satellite Comm., push Stop and push Exec.  
Push ESC and return to Information C/U: Various Setup Screen.



# TROUBLESHOOTING / e-Shovel

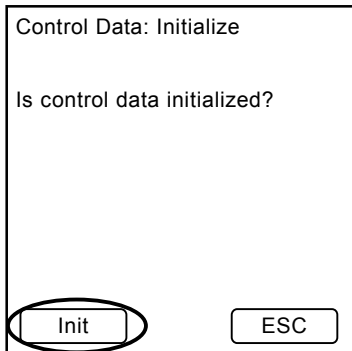
## 1.10 Control Data: Initialize

Push Control Data: Initialize.



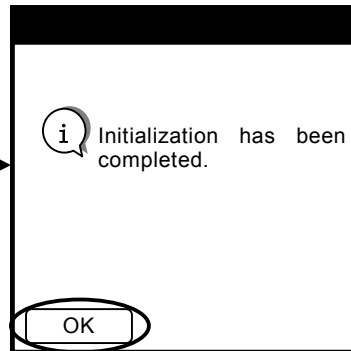
Information C/U: Various Setup Screen

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

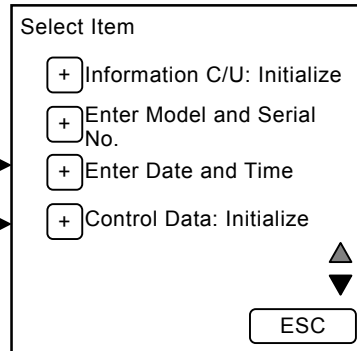


Control Data: Initialize Screen

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



Push ESC and return to Main Menu Screen.



Information C/U: Various Setup Screen

## TROUBLESHOOTING / e-Shovel

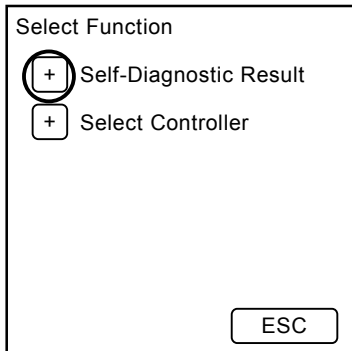
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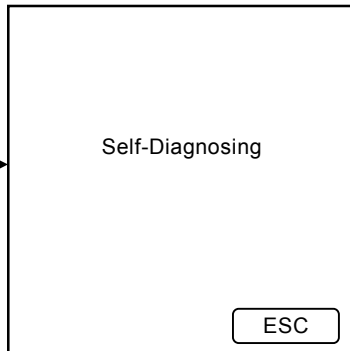
# TROUBLESHOOTING / e-Shovel

## 2. Self-Diagnosing

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

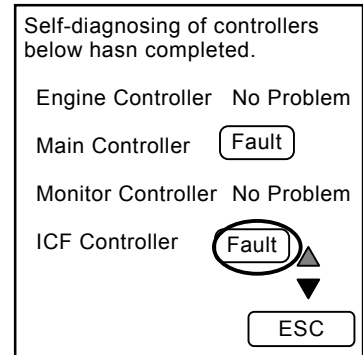


Function Selection Screen



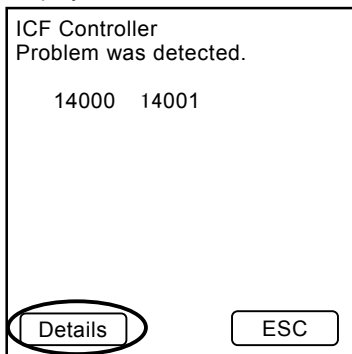
Change the page and the fault code in back and forth is displayed.

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



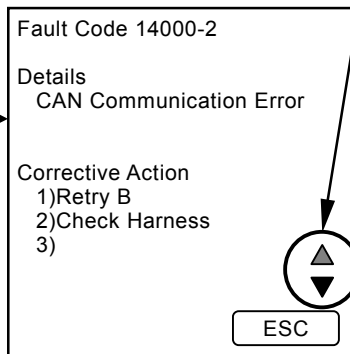
Controller Self-Diagnosing Screen

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

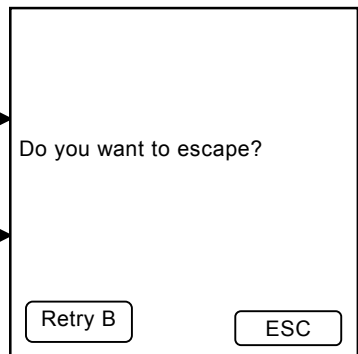


Fault Code Screen

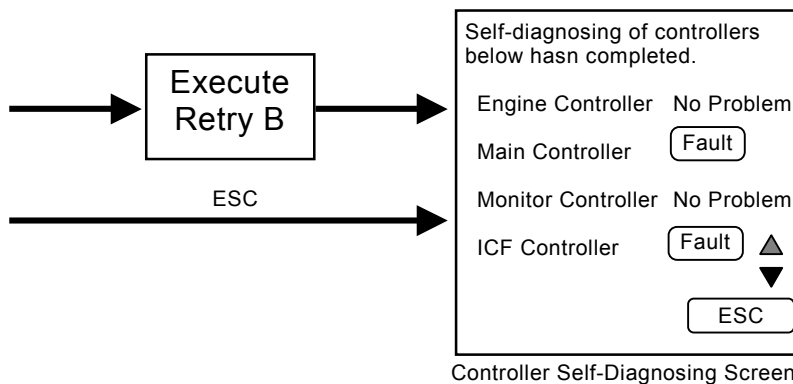
Push ESC and Retry B Screen is displayed.



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



Retry B Screen



Controller Self-Diagnosing Screen

## TROUBLESHOOTING / e-Shovel


### LIST OF FAULT CODE

Fault Code	Details	Remedy
14000-2	CAN Communication Error	Execute retry B in self-diagnosing. If this error code is displayed after re-try, check the following item. Check the CAN communication line (check the harness).
14001-2	ICF: Flash Memory: Read / Write Error	Execute retry B in self-diagnosing and execute the following item. Execute 1.5 Information C/U: Initialize (T5-3-15).
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 (T5-3-20). 2. Execute 1.4 Enter Model and Serial No. (T5-3-14).  Then, execute self-diagnosing and execute retry B.
14006-2	ICF: Satellite Communication Terminal: Communication Error	Execute retry B in self-diagnosing. If this error code is displayed after re-try, check the following item. Check the communication line. Check the power source line of satellite terminal. Check the fuse.  Then, execute self-diagnosing and execute retry B.
14008-2	ICF: Abnormal Internal RAM	Execute retry B in self-diagnosing. If this error code is displayed after re-try, replace the controller.
14100-2	Satellite Communication Terminal: Abnormal EEPROM	
14101-2	Satellite Communication Terminal: Abnormal IB/OB Queue	
14102-2	Satellite Communication Terminal: Abnormal Local Loop Back	
14103-2	Satellite Communication Terminal: The satellite is not found.	Check the communication aerial of satellite terminal.
14104-2	Satellite Communication Terminal: Fail 1 of Remote Loop Back	Execute retry B in self-diagnosing. If this error code is displayed after re-try, replace the controller.
14105-2	Satellite Communication Terminal: Fail 2 of Remote Loop Back	
14106-2	Satellite Communication Terminal: Sending and receiving data are unmatched.	

## TROUBLESHOOTING / e-Shovel

### SATELLITE COMMUNICATION SYSTEM

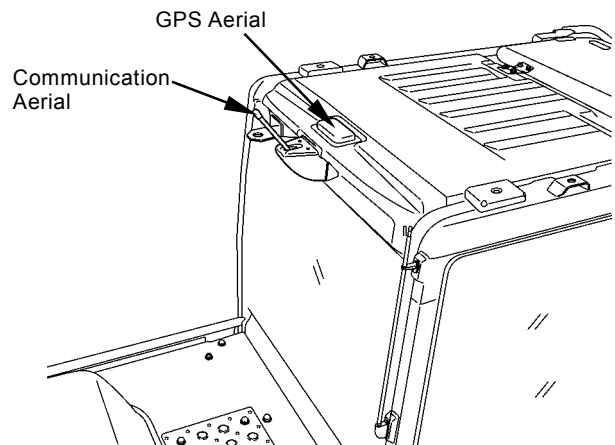
The satellite communication system is used for maintenance of the machine, "e-Service" by transmitting various data of the machine regularly via a low earth orbit satellite.

 **NOTE:** Depending on the circumstances of the machine (ex. in the constructions, in the tunnel, affected by the surrounding building and affected of noise), the data transfer rate may become slower, or the communication might not be established. The satellite communication system using a low earth orbit satellite transmits digital data through the radio wave. If there is excessively noise or use of electrical equipment which causes noise near the machine, they cause reduces data transfer rate or communication might not be established at worst.

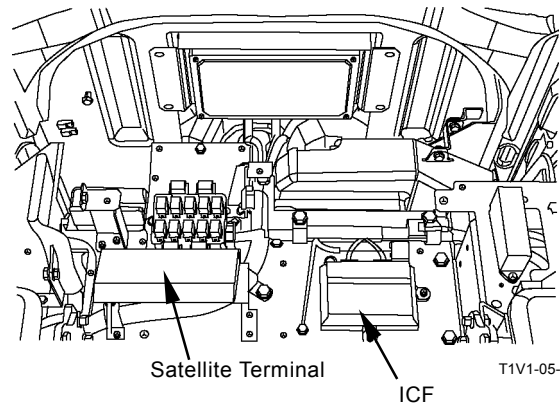
The satellite communication system consists of satellite communication terminal, GPS aerial and communication aerial. The mail function of monitor unit becomes effective.

The functions of each equipment are:

- **Satellite Communication Terminal**  
Receives the data from ICF, GPS aerial and monitor unit, and sends the data to the communication aerial.
  - **GPS Aerial**  
Receives location information of the machine from a low earth orbit satellite.
  - **Communication Aerial**  
Communicates the data with a low earth orbit satellite.
  - **Monitor Unit**  
Sends the mail when pushing the key corresponding to requirement.
1. General Requirement
  2. Fuel Replenishing Requirement
  3. Service Maintenance Requirement
  4. Forwarding Requirement

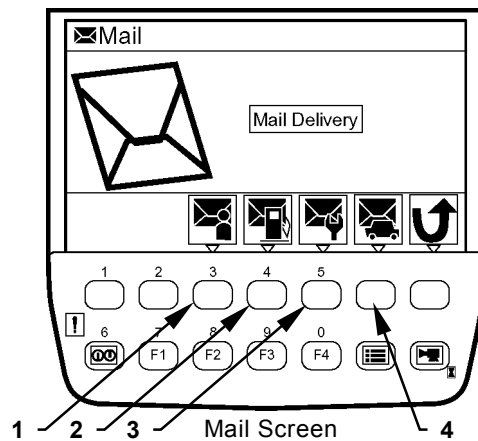


T1V1-05-07-003



T1V1-05-07-001

Monitor Unit



T1V5-05-01-037



## TROUBLESHOOTING / e-Shovel

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

Data Type sent from the machine by using satellite communication:

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

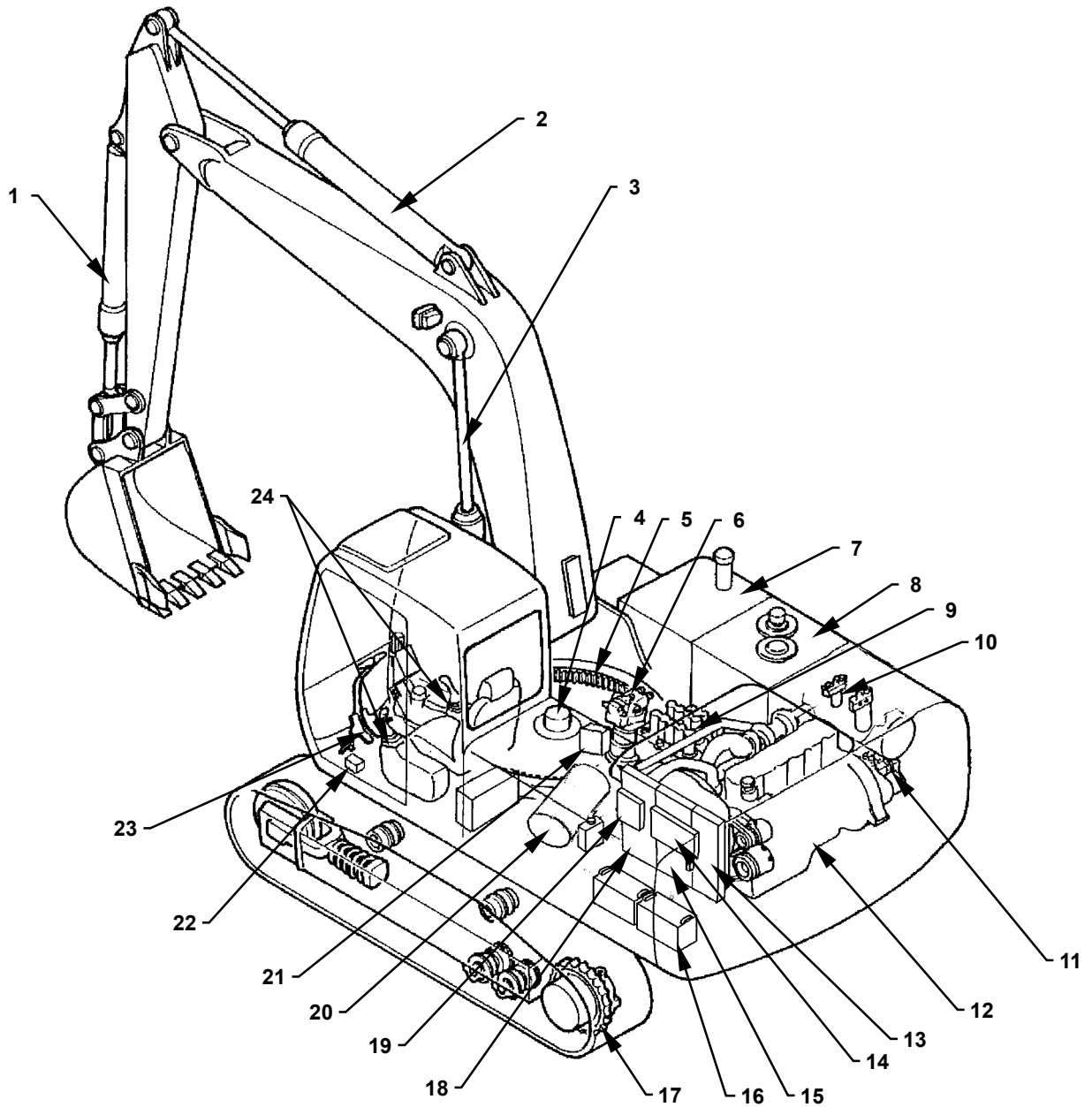
## TROUBLESHOOTING / e-Shovel

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# TROUBLESHOOTING / Component Layout

## MAIN COMPONENTS

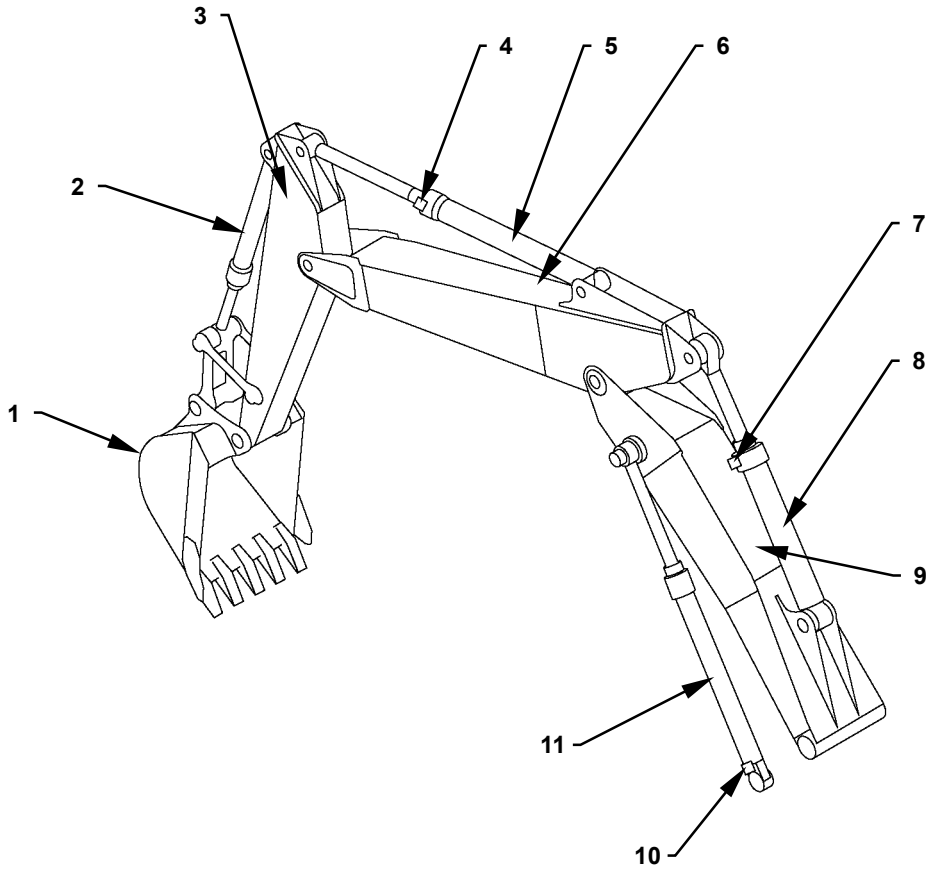


T1T1-01-02-010

- |                     |                                       |                                |   |
|---------------------|---------------------------------------|--------------------------------|---|
| 1 - Bucket Cylinder | 7 - Fuel Tank                         | 13 - Intercooler               | 19 - Fuel Cooler                          |
| 2 - Arm Cylinder    | 8 - Hydraulic Oil Tank                | 14 - Air Conditioner Condenser | 20 - Air Cleaner                          |
| 3 - Boom Cylinder   | 9 - Control Valve                     | 15 - Radiator                  | 21 - Signal Control Valve                 |
| 4 - Center Joint    | 10 - Pilot Filter/ Pilot Relief Valve | 16 - Battery                   | 22 - Pilot Shut-Off Solenoid Valve        |
| 5 - Swing Bearing   | 11 - Pump Device                      | 17 - Travel Device             | 23 - Travel Pilot Valve                   |
| 6 - Swing Device    | 12 - Engine                           | 18 - Oil Cooler                | 24 - Front Attachment / Swing Pilot Valve |

# TROUBLESHOOTING / Component Layout

## Front Attachment (2-Piece Boom)

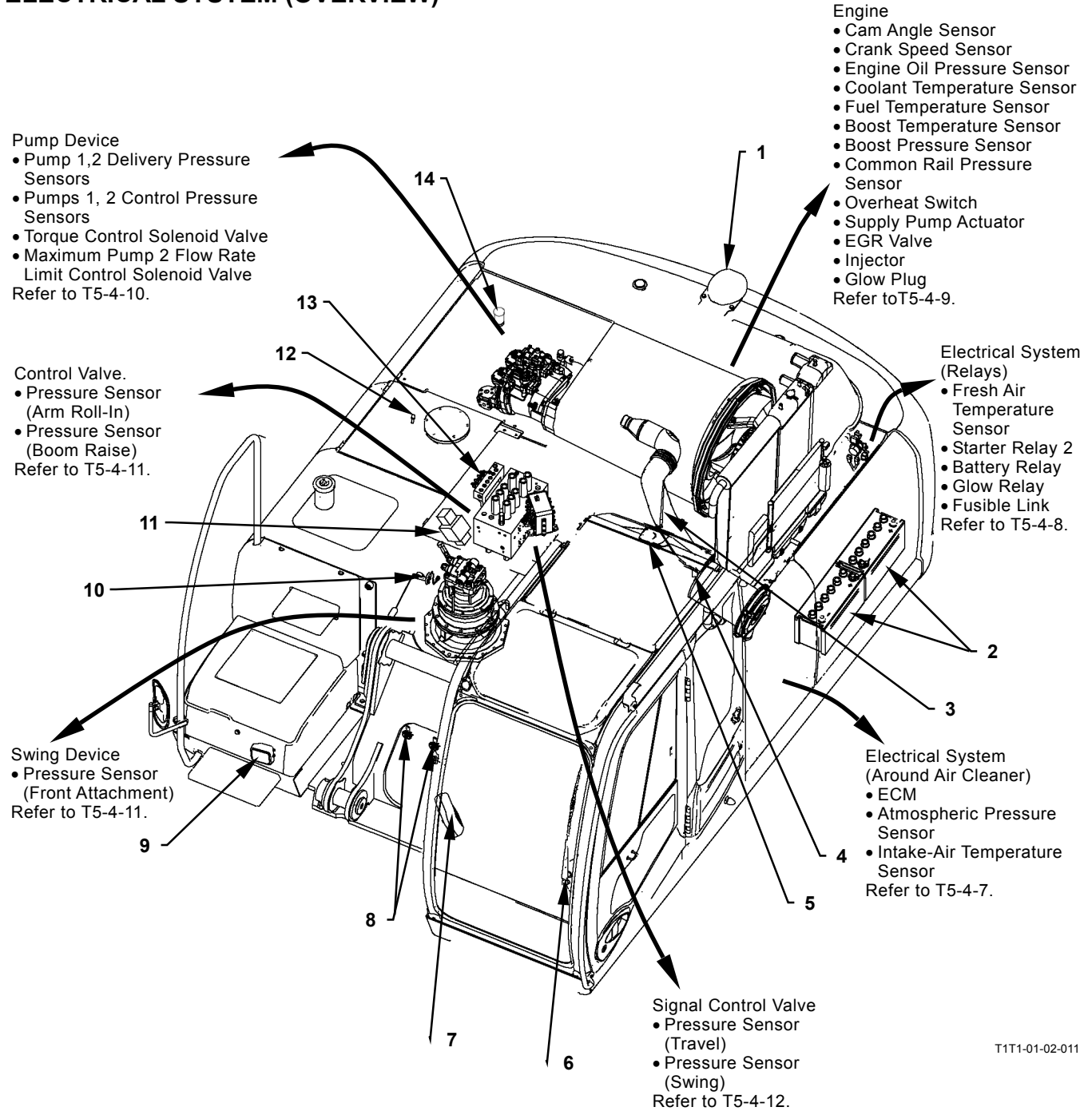


T1V1-01-02-006

- |                     |                                       |   |   |
|---------------------|---------------------------------------|---|---|
| 1 - Bucket          | 4 - Hose Rupture Valve (Arm Cylinder) | 7 - Hose Rupture Valve (Positioning Cylinder) | 10 - Hose Rupture Valve (Boom Cylinder) |
| 2 - Bucket Cylinder | 5 - Arm Cylinder                      | 8 - Positioning Cylinder                      | 11 - Boom Cylinder                      |
| 3 - Arm             | 6 - Upper Boom                        | 9 - Bottom Boom                               |   |

# TROUBLESHOOTING / Component Layout

## ELECTRICAL SYSTEM (OVERVIEW)

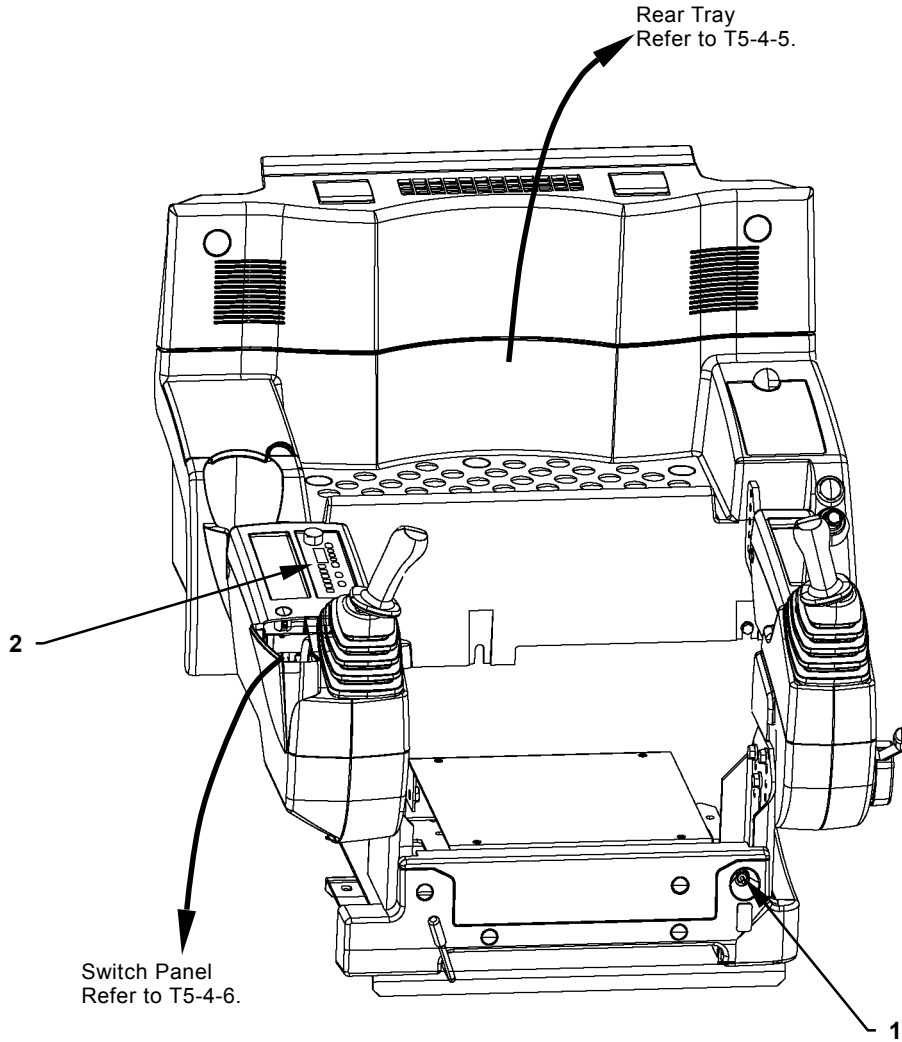


T1T1-01-02-011

- |                                   |  |  |                                       |
|-----------------------------------|--|--|---------------------------------------|
| 1 - Rear View Camera              | 5 - GPS (Global Positioning System) Aerial | 9 - Working Light  | 12 - Hydraulic Oil Temperature Sensor |
| 2 - Battery                       | 6 - Wiper Motor                            | 10 - Fuel Sensor   | 13 - Solenoid Valve Unit              |
| 3 - Communication Aerial          | 7 - Monitor Unit                           | 11 - Positioning Control Valve (2-Piece Boom Machine Only) | 14 - Solenoid Pump                    |
| 4 - Air Filter Restriction Switch | 8 - Horn                                   |  |                                       |

# TROUBLESHOOTING / Component Layout

## ELECTRICAL SYSTEM (IN CAB)



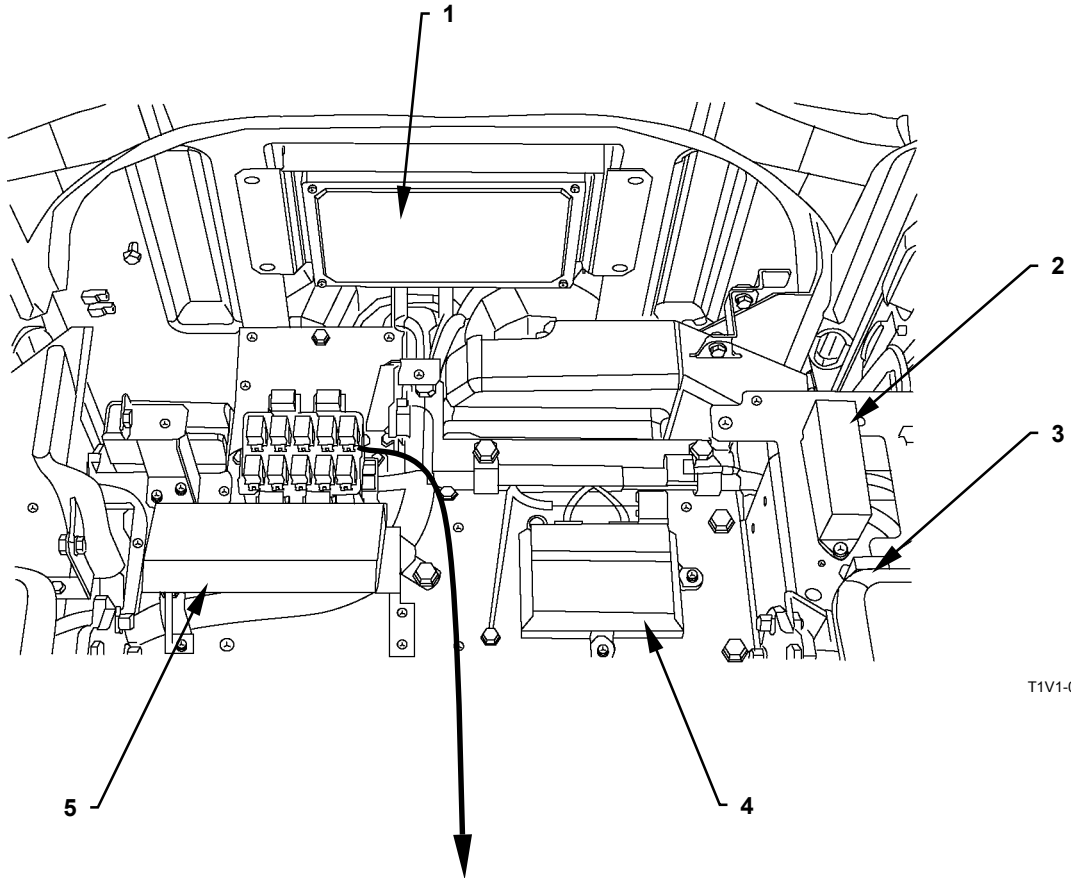
T1V1-01-02-011

1 - Engine Stop Switch

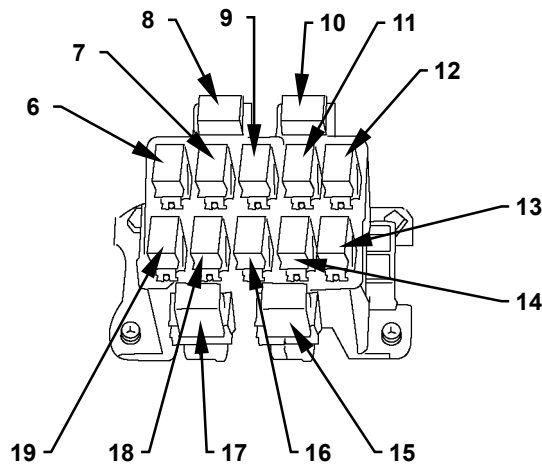
2 - Radio

# TROUBLESHOOTING / Component Layout

## ELECTRICAL SYSTEM (REAR TRAY)



T1V1-01-02-007

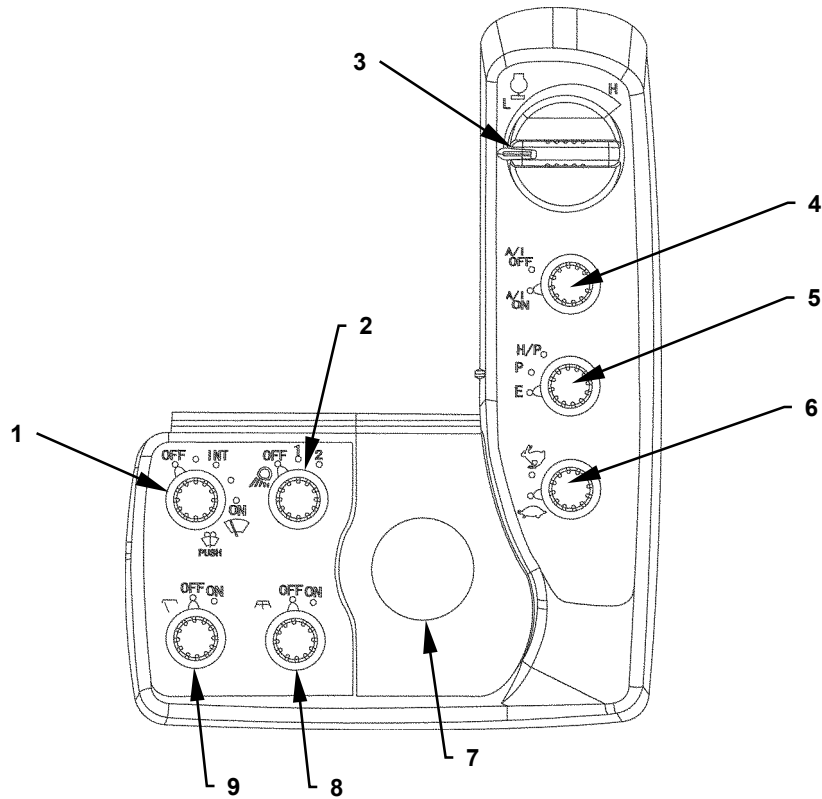


T1V1-01-02-009

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

# TROUBLESHOOTING / Component Layout

## ELECTRICAL SYSTEM (SWITCH PANEL)



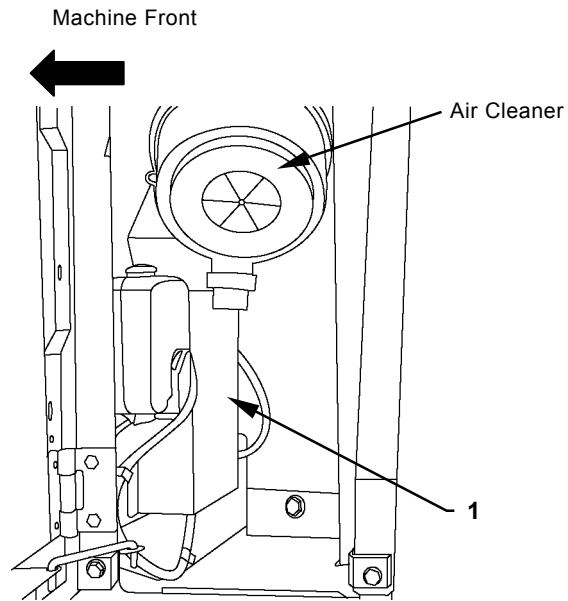
T1V1-01-02-037

- |                           |                       |                        |  |
|---------------------------|-----------------------|------------------------|--|
| 1 - Wiper / Washer Switch | 4 - Auto-Idle Switch  | 6 - Travel Mode Switch | 8 - Overhead Window Washer Switch (Optional) |
| 2 - Working Light Switch  | 5 - Power Mode Switch | 7 - Key Switch         | 9 - Overhead Window Wiper Switch (Optional)  |
| 3 - Engine Control Dial   |                       |                        |  |

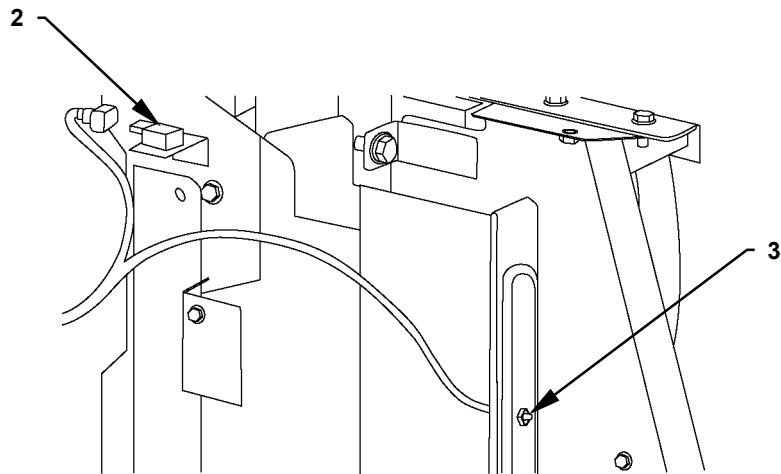


# TROUBLESHOOTING / Component Layout

## ELECTRICAL SYSTEM (AROUND AIR CLEANER)



T1T1-01-02-009



T1T1-01-02-008

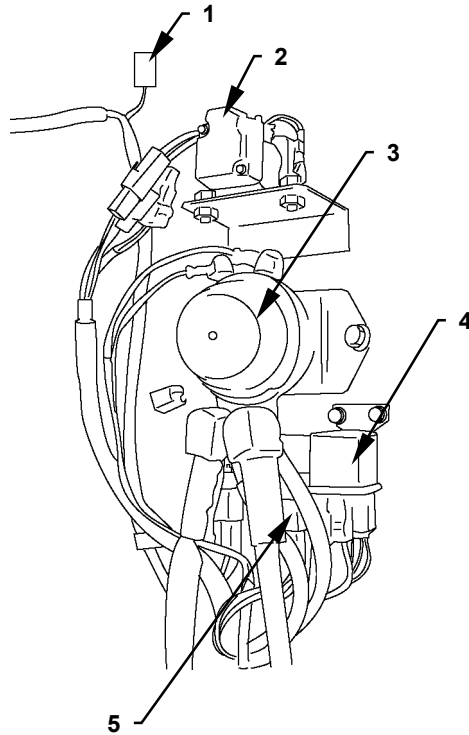
1 - ECM (Engine Control Module)

2 - Atmospheric Pressure Sensor

3 - Intake-Air Temperature Sensor

## TROUBLESHOOTING / Component Layout

### ELECTRICAL SYSTEM (RELAYS)



T1V1-01-02-018

1 - Fresh Air Temperature  
Sensor  
2 - Starter Relay 2

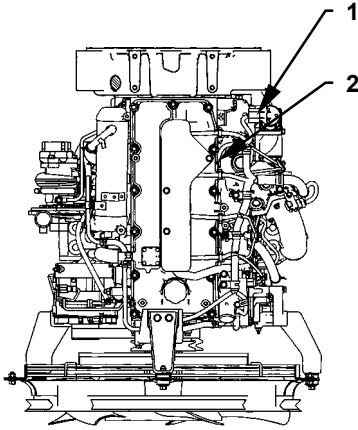
3 - Battery Relay

4 - Glow Relay

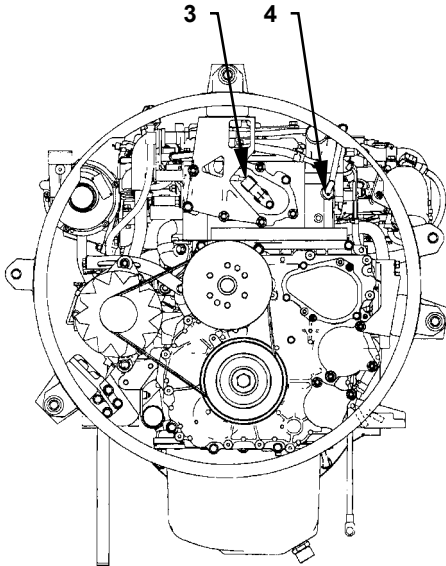
5 - Fusible Link

# TROUBLESHOOTING / Component Layout

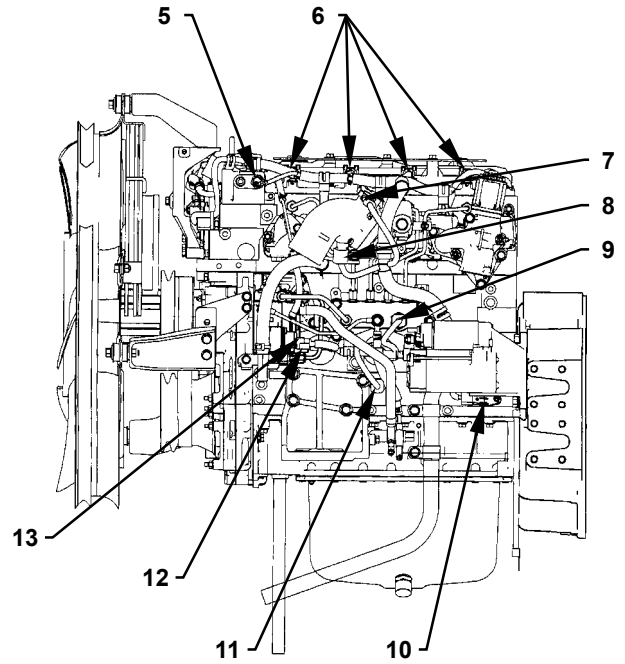
## ENGINE



T1T1-01-02-005



T1T1-01-02-003



T1T1-01-02-004

- 1 - EGR (Exhaust Gas Recirculation) Valve
- 2 - Glow Plug
- 3 - Cam Angle Sensor
- 4 - Coolant temperature sensor

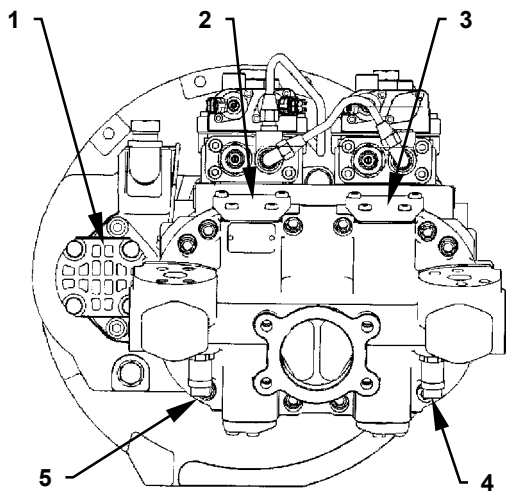
- 5 - Overheat Switch
- 6 - Injector
- 7 - Boost Pressure Sensor

- 8 - Boost Temperature Sensor
- 9 - Common Rail Pressure Sensor
- 10 - Crank Speed Sensor

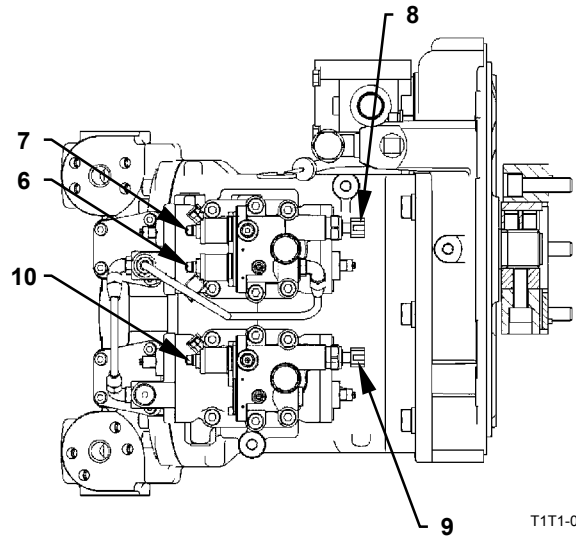
- 11 - Hydraulic Oil Pressure Sensor
- 12 - Fuel Temperature Sensor
- 13 - Supply Pump Actuator

# TROUBLESHOOTING / Component Layout

## PUMP DEVICE ZX160-3 class

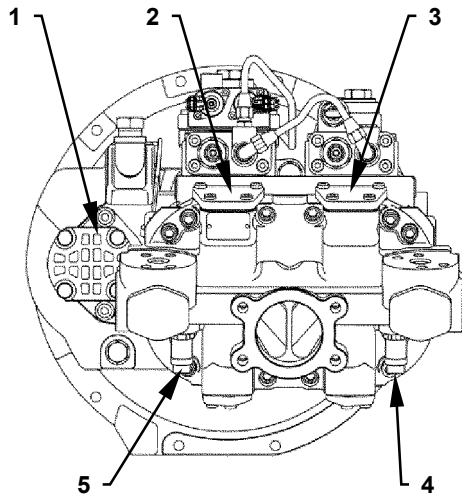


T1T1-01-02-007

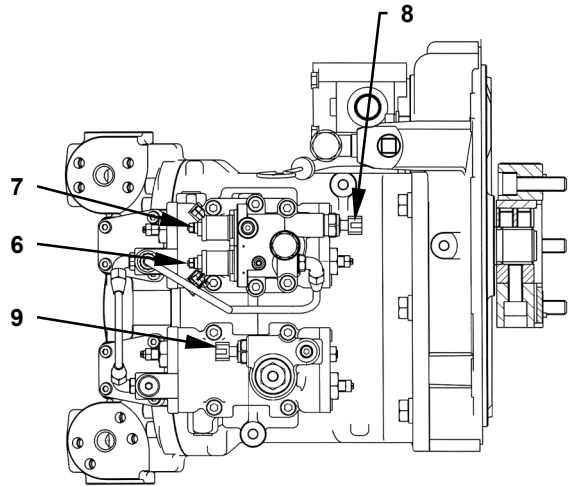


T1T1-01-02-006

## ZX180-3 class



T1V1-01-02-032

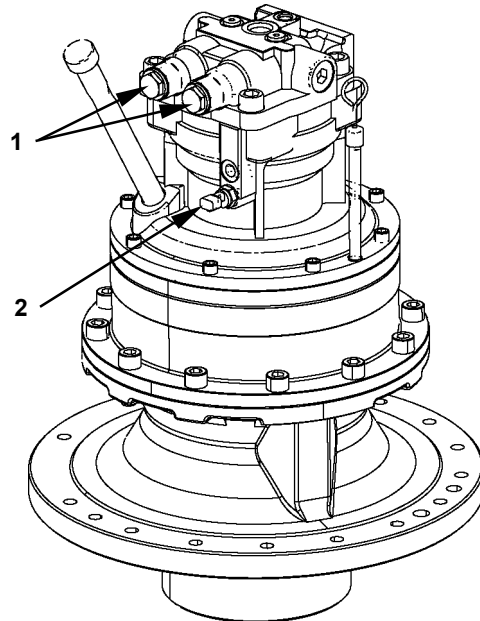


T1V1-04-05-002

- |                |                                     |   |  |
|----------------|-------------------------------------|---|--|
| 1 - Pilot Pump | 4 - Pump 1 Delivery Pressure Sensor | 7 - Maximum Pump 2 Flow Rate Limit Control Solenoid Valve | 9 - Pump 1 Control Pressure Sensor                         |
| 2 - Pump 2     | 5 - Pump 2 Delivery Pressure Sensor | 8 - Pump 2 Control Pressure Sensor                        | 10 - Maximum Pump 1 Flow Rate Limit Control Solenoid Valve |
| 3 - Pump 1     | 6 - Torque Control Solenoid Valve   |   |  |

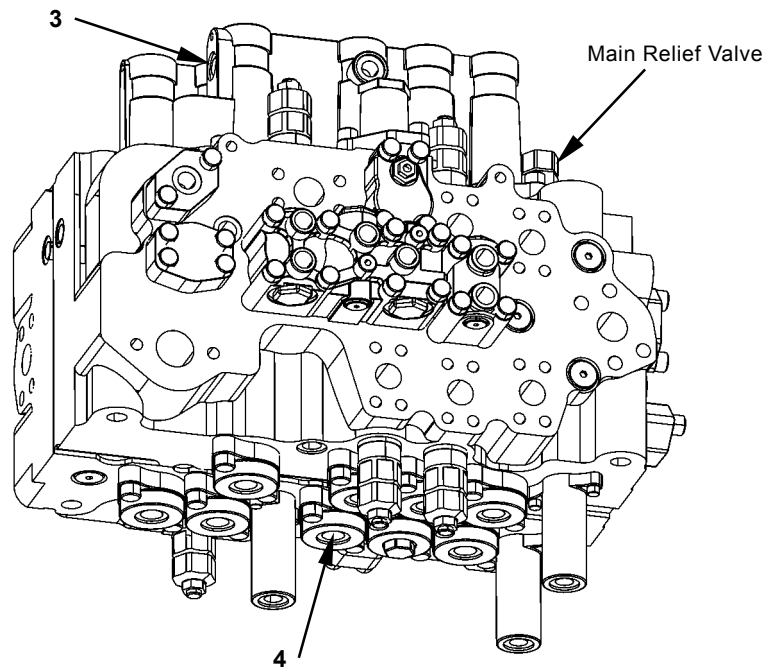
# TROUBLESHOOTING / Component Layout

## SWING DEVICE



T1V1-01-02-005

## CONTROL VALVE



T1V1-03-03-073

1 - Swing Relief Valve

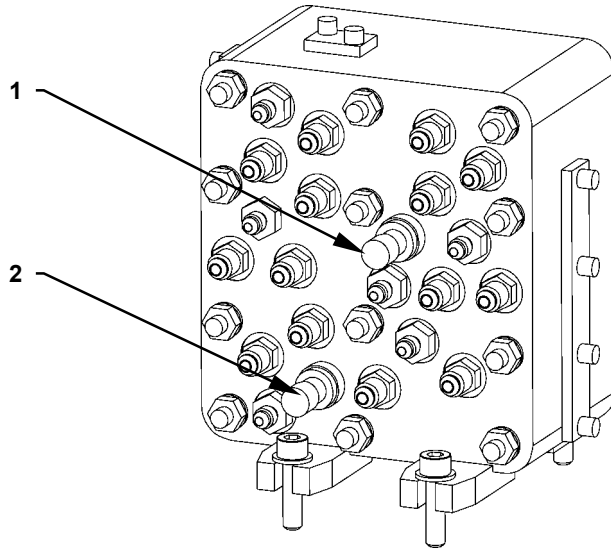
2 - Pressure Sensor (Front Attachment)

3 - Pressure Sensor (Arm Roll-In)

4 - Pressure Sensor (Boom Raise)

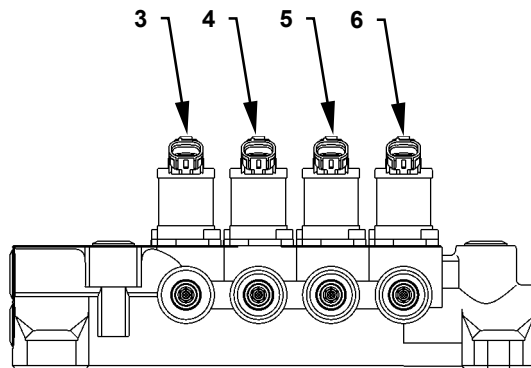
# TROUBLESHOOTING / Component Layout

## SIGNAL CONTROL VALVE



T1V1-01-02-014

## SOLENOID VALVE UNIT



T1V1-03-07-007

1 - Pressure Sensor (Swing)  
2 - Pressure Sensor (Travel)

3 - Solenoid Valve Unit SC  
4 - Solenoid Valve Unit SF

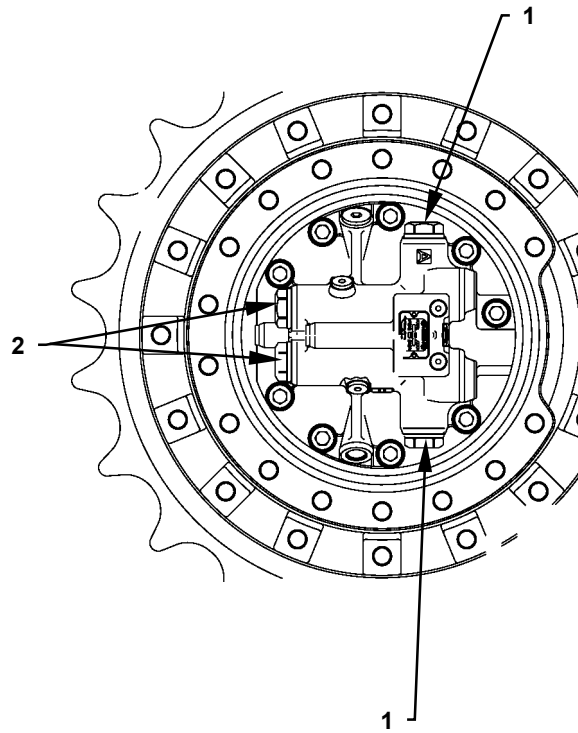
5 - Solenoid Valve Unit SI

6 - Solenoid Valve Unit SG

## TROUBLESHOOTING / Component Layout

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### TRAVEL DEVICE



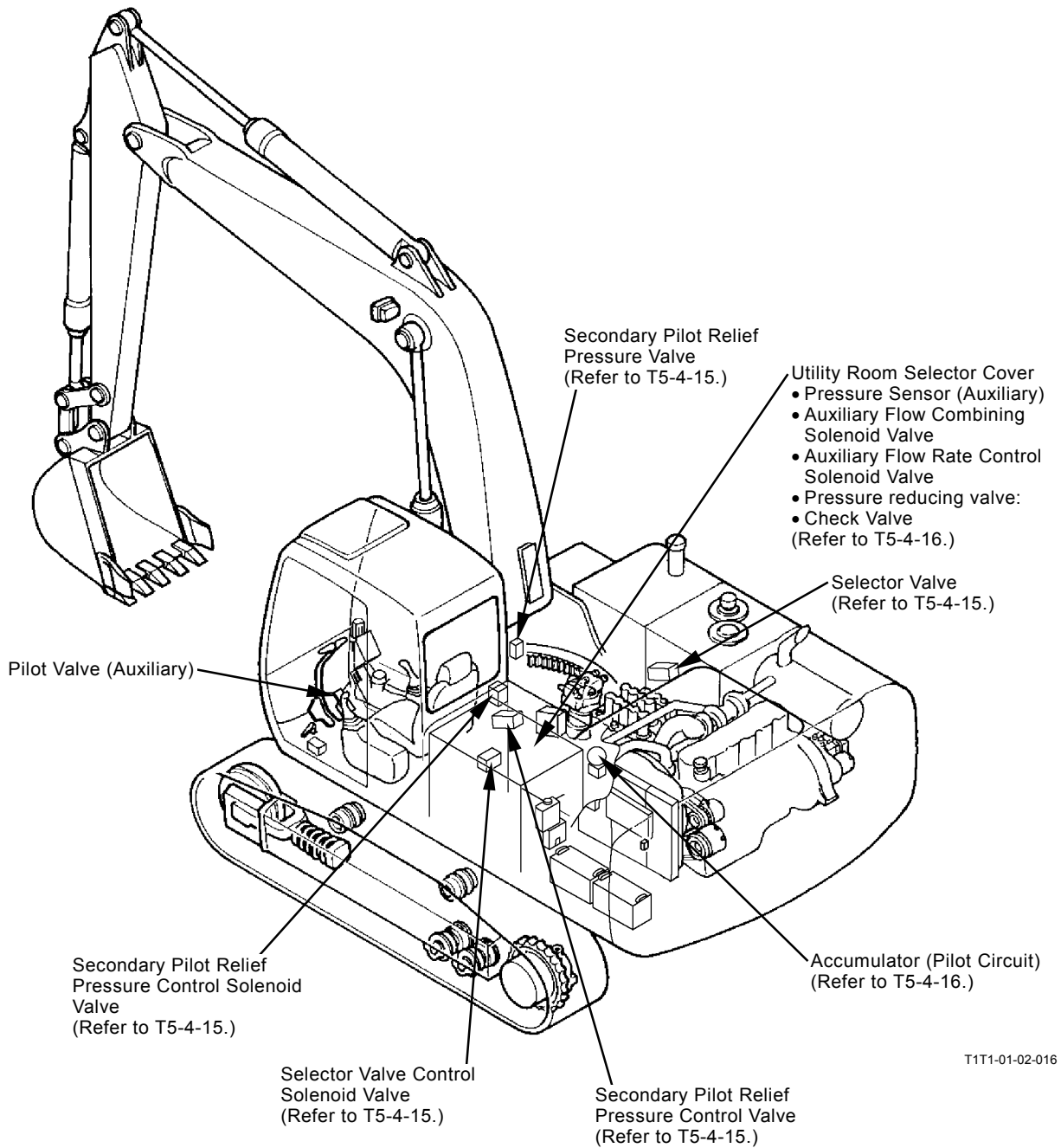
T1HD-01-02-001

1 - Counterbalance Valve

2 - Travel Relief Valve

# TROUBLESHOOTING / Component Layout

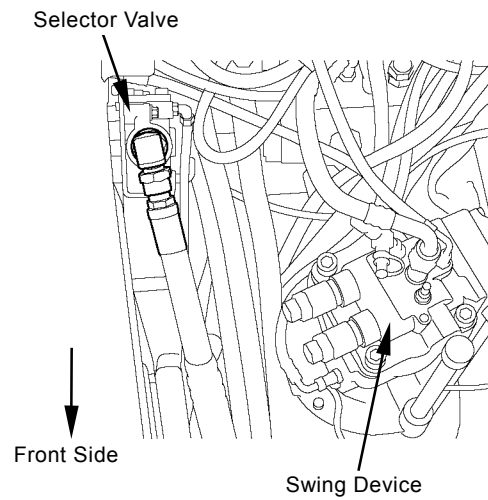
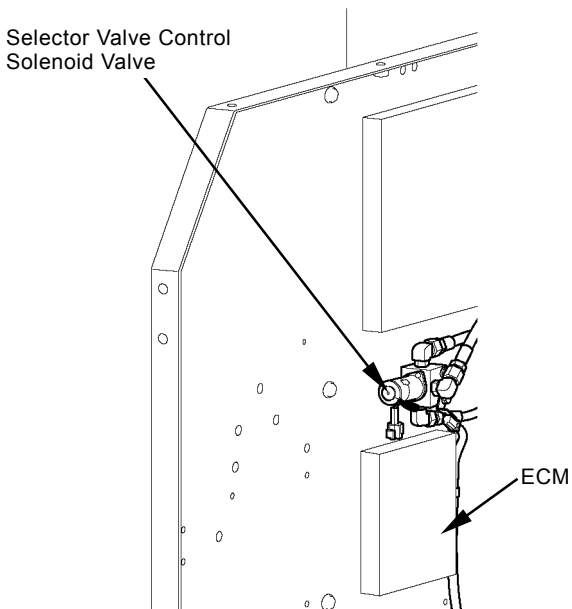
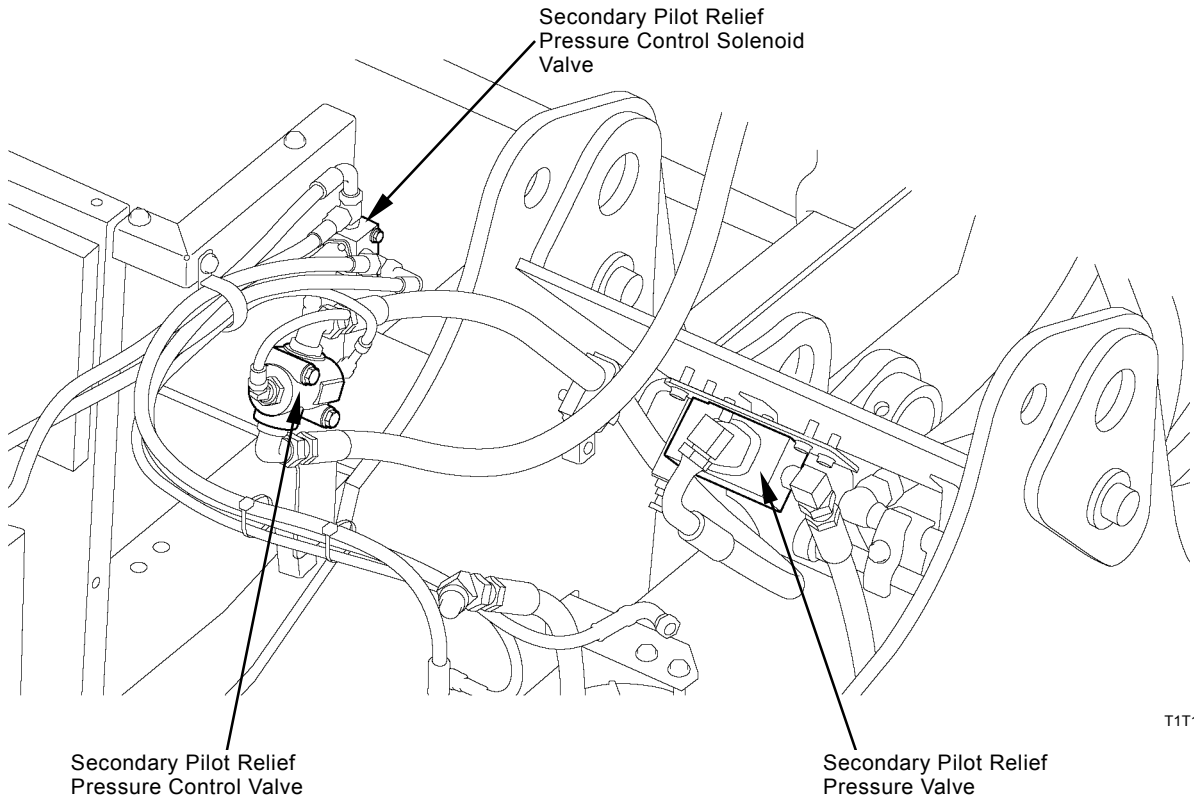
## LAYOUT OF ATTACHMENT SPEC. PARTS



T1T1-01-02-016

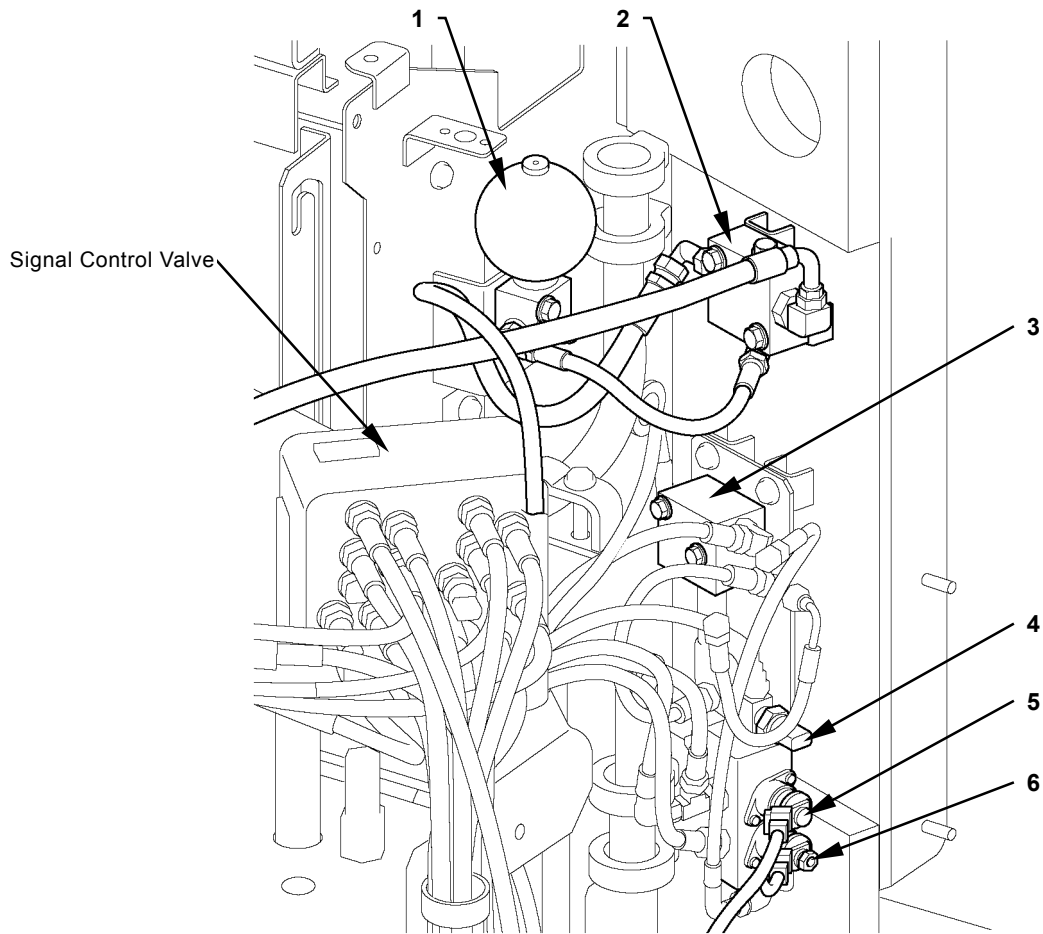


# TROUBLESHOOTING / Component Layout



# TROUBLESHOOTING / Component Layout

## Utility Room Selector Cover



T1T1-01-02-015

- |                                 |                                 |   |  |
|---------------------------------|---------------------------------|---|--|
| 1 - Accumulator (Pilot Circuit) | 3 - Pressure Reducing Valve     | 5 - Auxiliary Flow Combining Solenoid Valve | 6 - Auxiliary Flow Rate Control Solenoid Valve |
| 2 - Check Valve                 | 4 - Pressure Sensor (Auxiliary) |   |  |

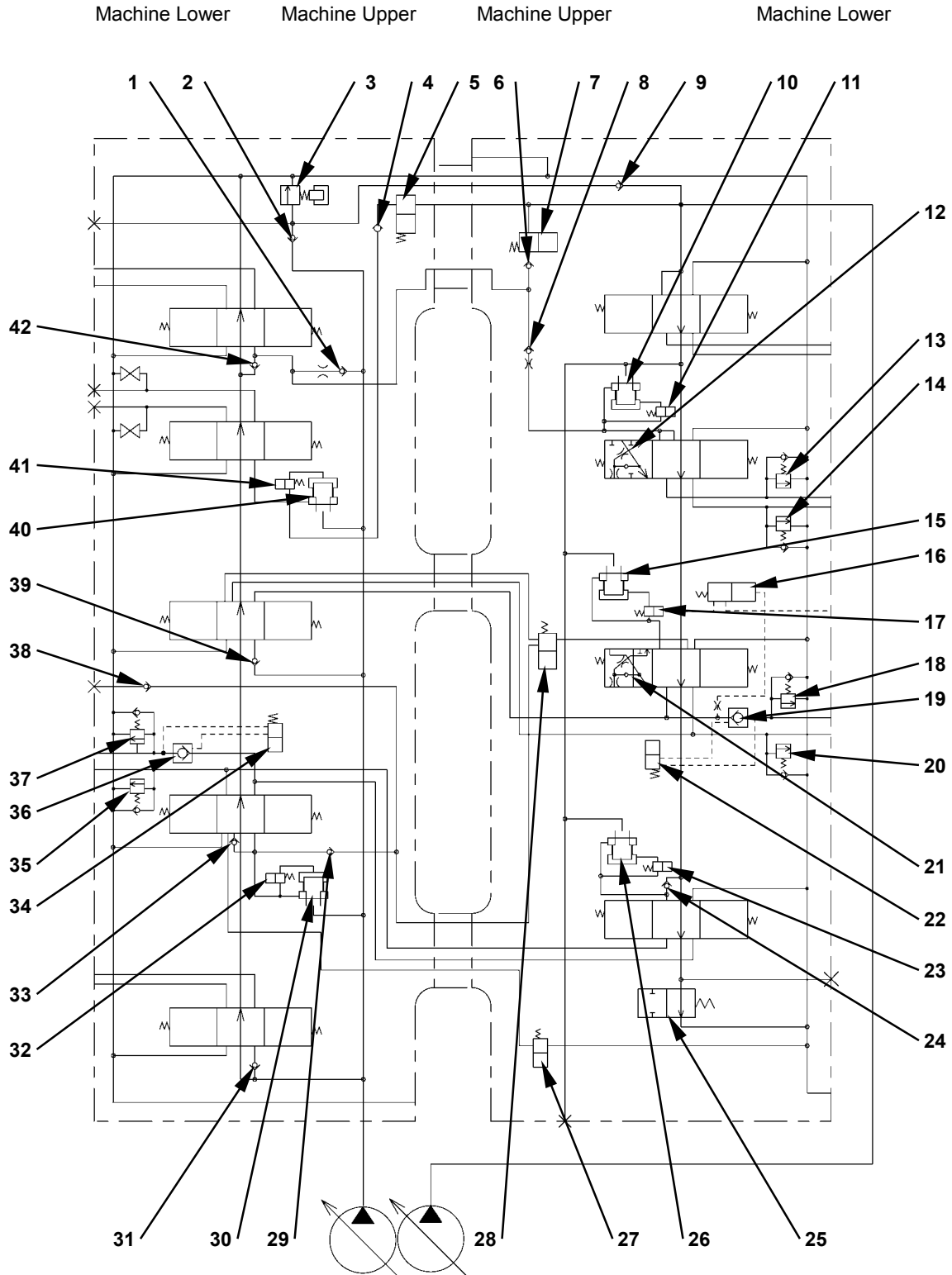
## TROUBLESHOOTING / Component Layout

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# TROUBLESHOOTING / Component Layout

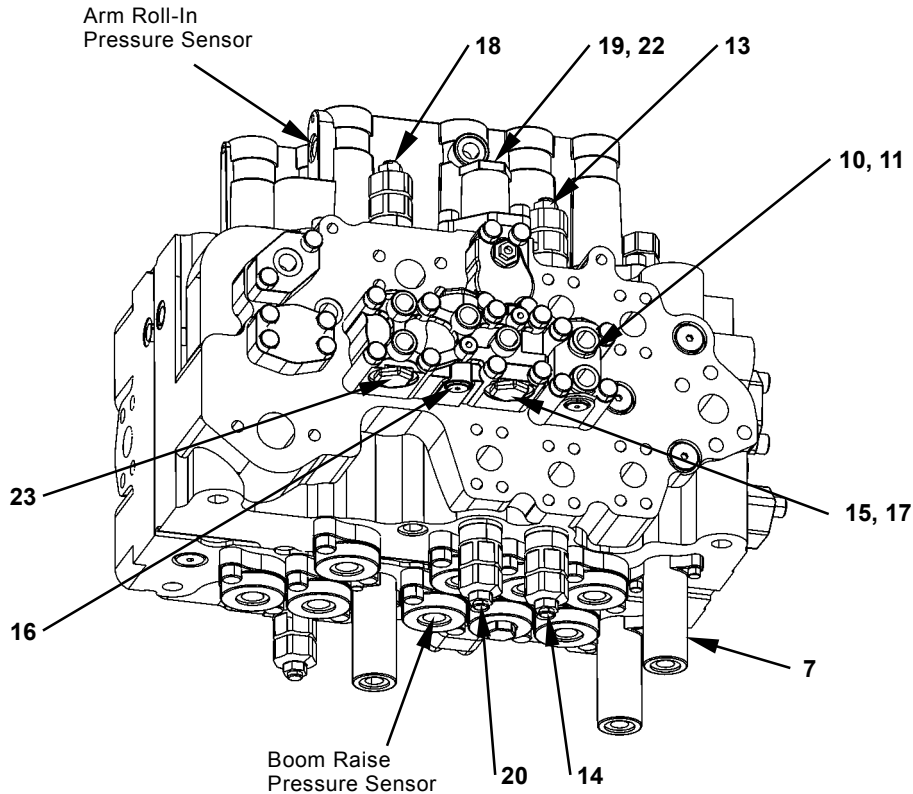
## LAYOUT OF CONTROL VALVE



T1V1-03-03-021

# TROUBLESHOOTING / Component Layout

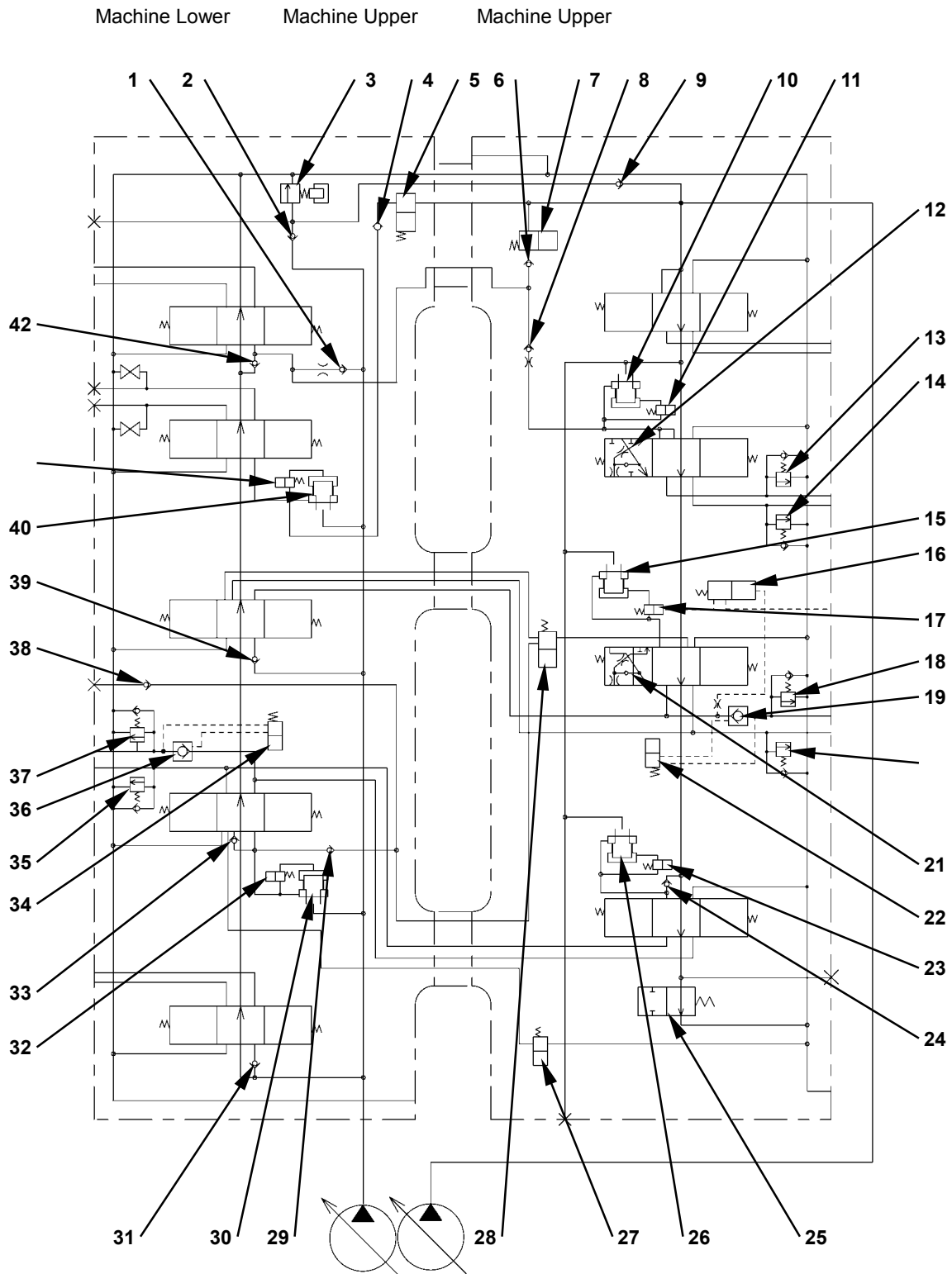
## 4-Spool Section



T1V1-03-03-073

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

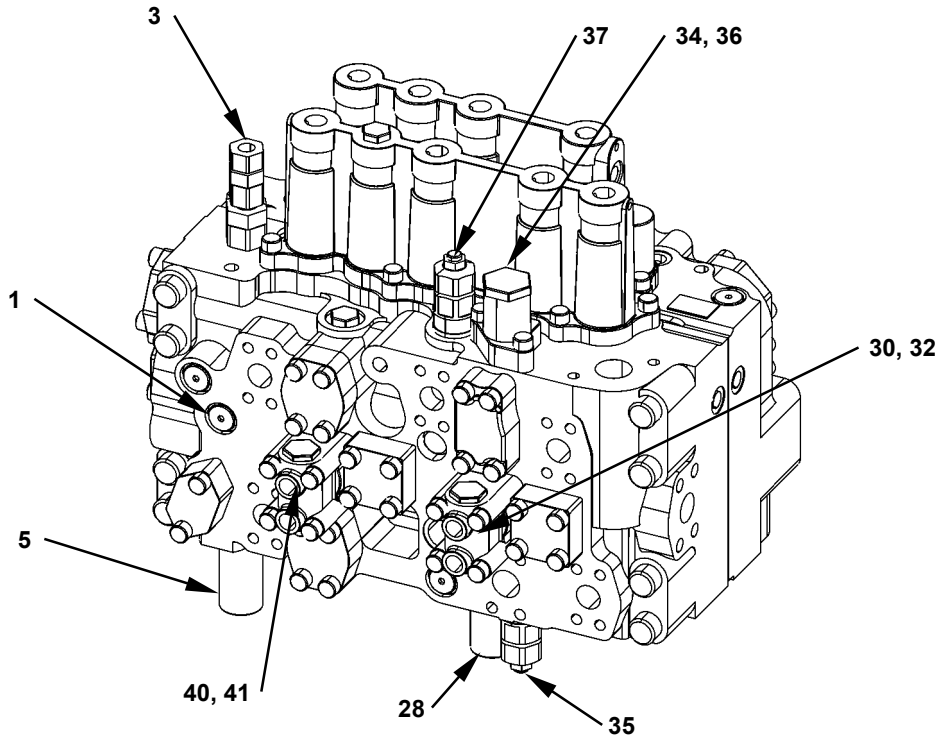
# TROUBLESHOOTING / Component Layout



T1V1-03-03-021

## TROUBLESHOOTING / Component Layout

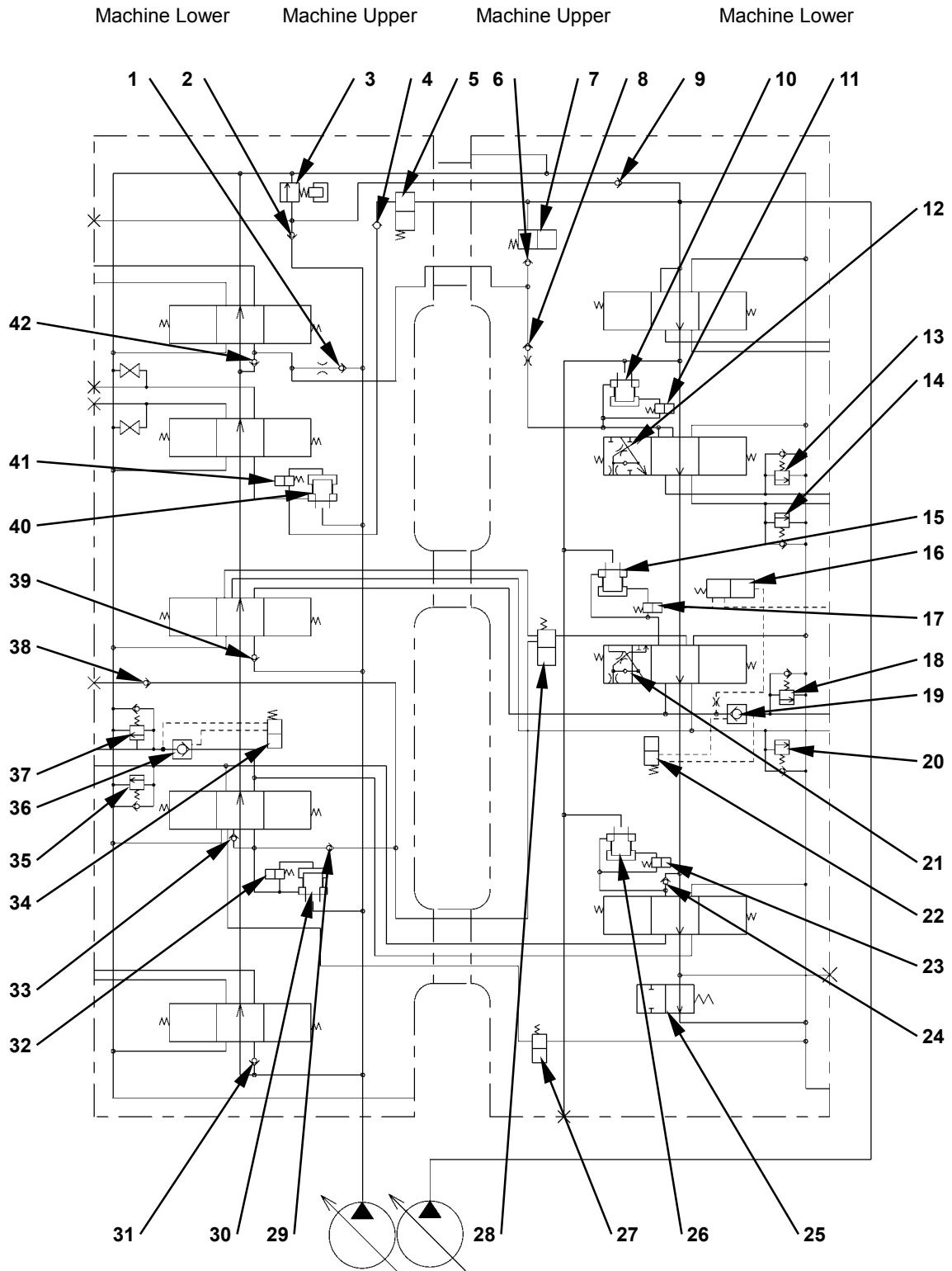
### 5-Spool Section



T1V1-03-03-072

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

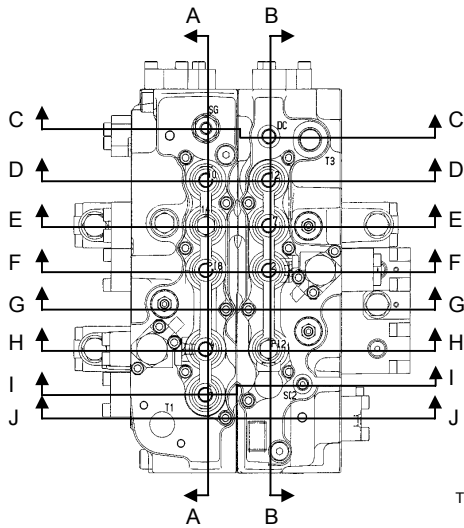
# TROUBLESHOOTING / Component Layout



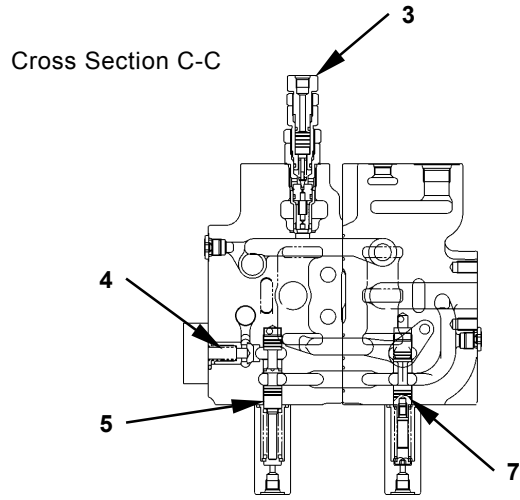
T1V1-03-03-021



# TROUBLESHOOTING / Component Layout

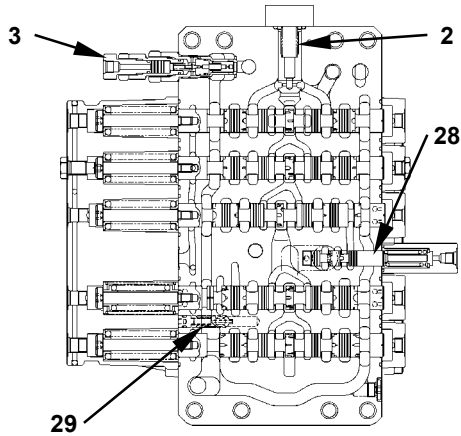


T1V1-03-03-026



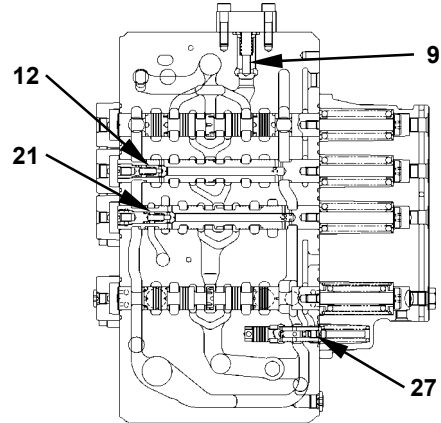
T1V1-03-03-003

Cross Section A-A



T1V1-03-03-001

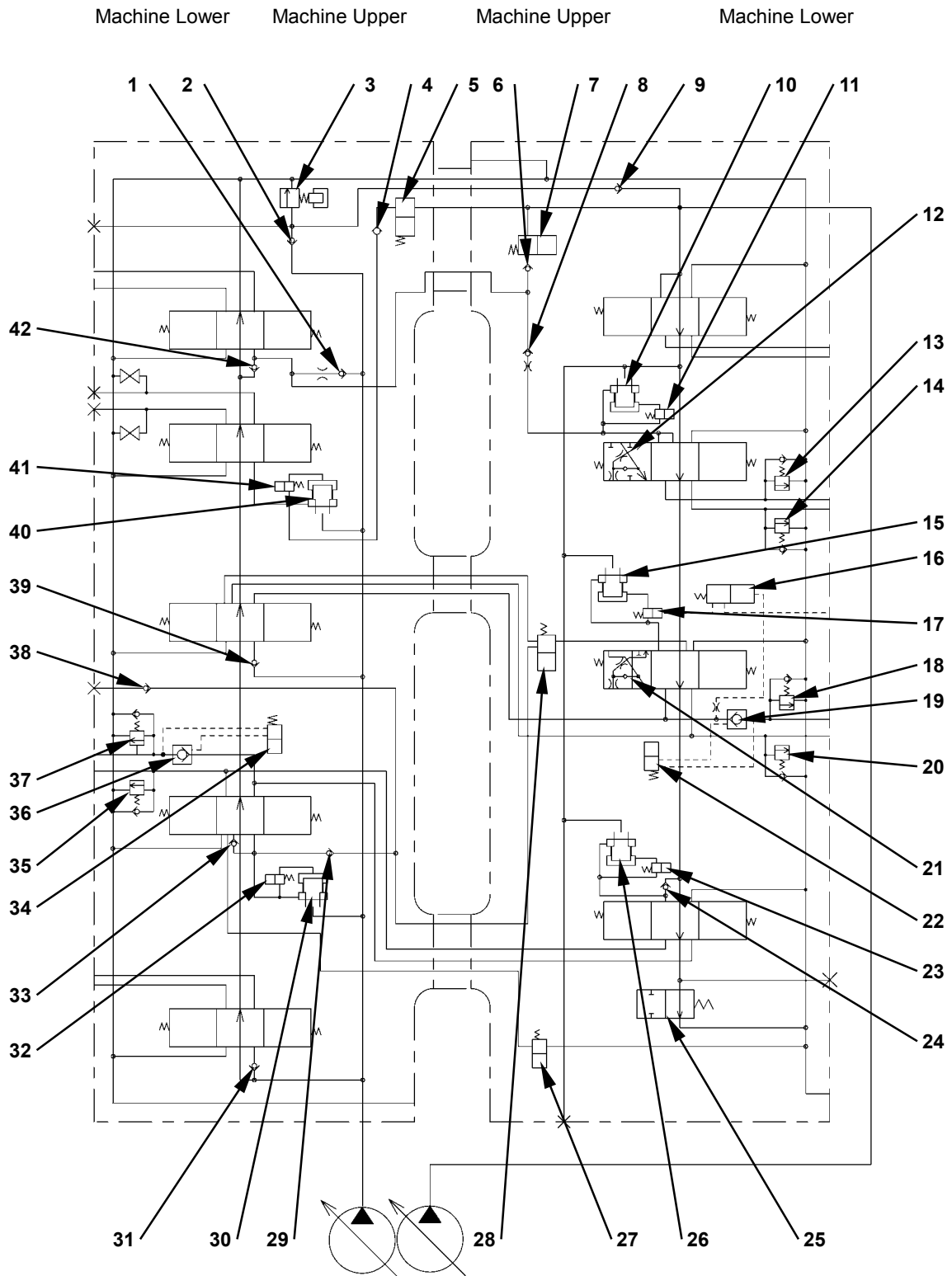
Cross Section B-B



T1V1-03-03-002

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

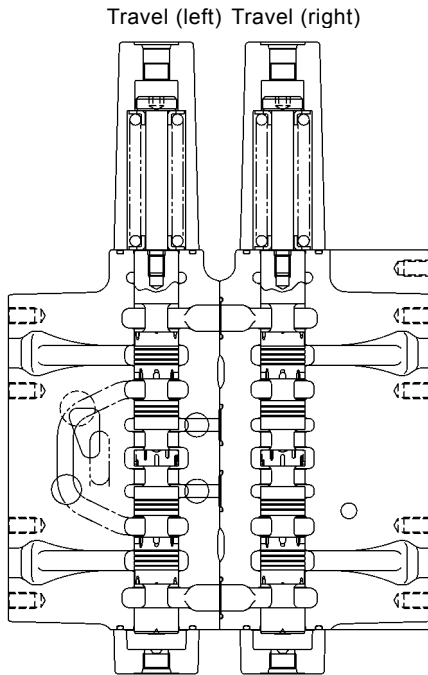
# TROUBLESHOOTING / Component Layout



T1V1-03-03-021

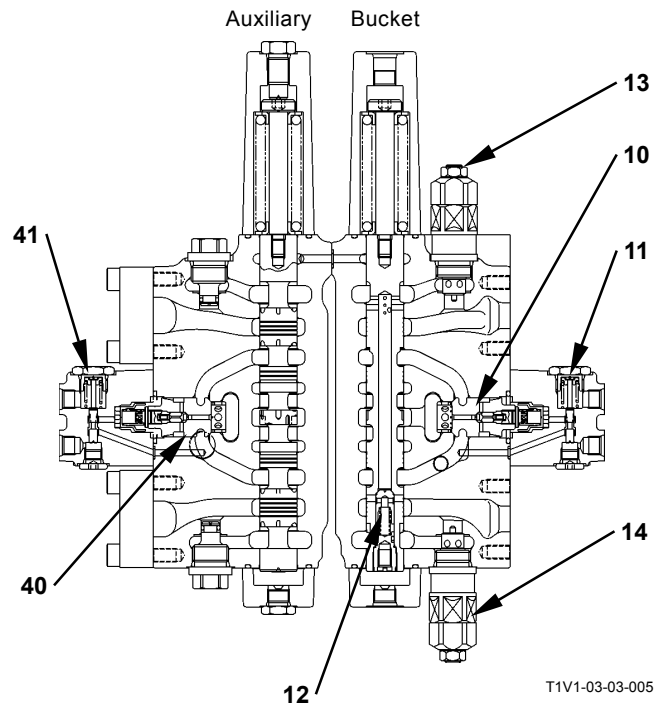
# TROUBLESHOOTING / Component Layout

Cross Section D-D



T1V1-03-03-004

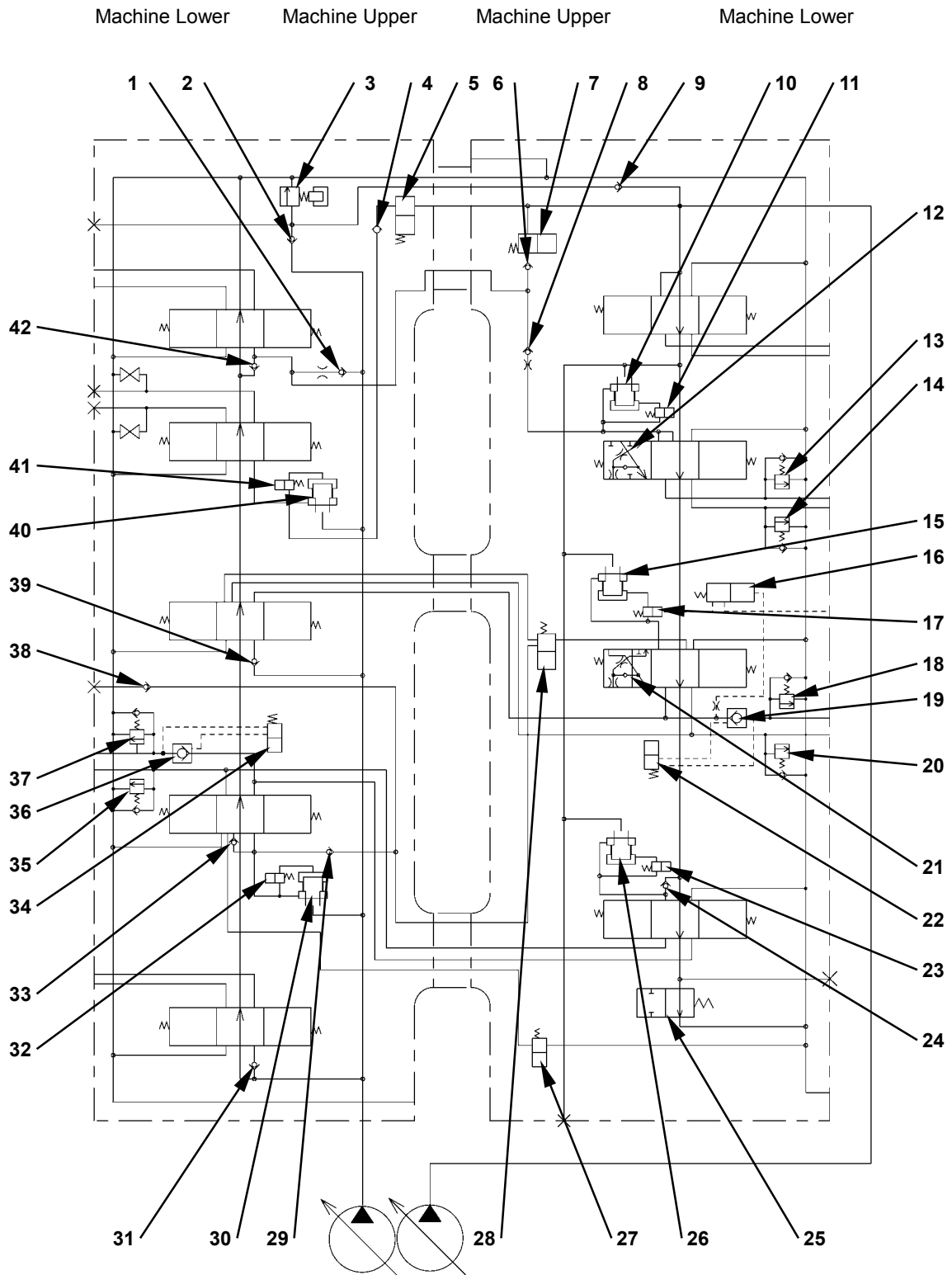
Cross Section E-E



T1V1-03-03-005

- |  |   |  |   |
|--|---|--|---|
| <p>1 - Load Check Valve (Left Travel Parallel Circuit)</p> <p>2 - Check Valve (Main Relief Circuit)</p> <p>3 - Main Relief Valve</p> <p>4 - Check Valve (Auxiliary Combining Valve Circuit)</p> <p>5 - Auxiliary Flow Combiner Valve</p> <p>6 - Check Valve (Flow Combiner Valve Circuit)</p> <p>7 - Flow Combiner Valve</p> <p>8 - Load Check Valve (Orifice) (Bucket)</p> <p>9 - Check Valve (Main Relief Circuit)</p> <p>10 - Bucket Flow Rate Control Valve (Poppet Valve)</p> <p>11 - Bucket Flow Rate Control Valve (Switch Valve)</p> | <p>12 - Bucket Regenerative Valve</p> <p>13 - Overload Relief Valve (Bucket: Rod Side)</p> <p>14 - Overload Relief Valve (Bucket: Bottom Side)</p> <p>15 - Boom Flow Control Valve (Poppet Valve)</p> <p>16 - Boom Lower Meter-In Cut Valve</p> <p>17 - Boom Flow Rate Control Valve (Switch Valve)</p> <p>18 - Overload Relief Valve (Boom: Bottom Side)</p> <p>19 - Boom Anti-Drift Valve (Check Valve)</p> <p>20 - Overload Relief Valve (Boom: Rod Side)</p> <p>21 - Boom Regenerative Valve</p> <p>22 - Boom Anti-Drift Valve (Switch Valve)</p> | <p>23 - Arm 2 Flow Rate Control Valve (Switch Valve)</p> <p>24 - Load Check Valve (Arm 2 Tandem Circuit)</p> <p>25 - Bypass Shut-Out Valve</p> <p>26 - Arm 2 Flow Rate Control Valve (Poppet Valve)</p> <p>27 - Arm Regenerative Valve</p> <p>28 - Digging Regenerative Valve</p> <p>29 - Load Check Valve (Digging Regenerative Circuit)</p> <p>30 - Arm 1 Flow Rate Control Valve (Poppet Valve)</p> <p>31 - Load Check Valve (Swing Circuit)</p> <p>32 - Arm 1 Flow Rate Control Valve (Switch Valve)</p> <p>33 - Load Check Valve (Arm Regenerative Circuit)</p> | <p>34 - Arm Anti-Drift Valve (Switch Valve)</p> <p>35 - Overload Relief Valve (Arm: Bottom Side)</p> <p>36 - Arm Anti-Drift Valve (Check Valve)</p> <p>37 - Overload Relief Valve (Arm: Rod Side)</p> <p>38 - Check Valve (Digging Regenerative Circuit)</p> <p>39 - Load Check Valve (Boom 2 Parallel Circuit)</p> <p>40 - Auxiliary Flow Rate Control Valve (Poppet Valve)</p> <p>41 - Auxiliary Flow Rate Control Valve (Switch Valve)</p> <p>42 - Load Check Valve (Left Travel Tandem Circuit)</p> |
|--|---|--|---|

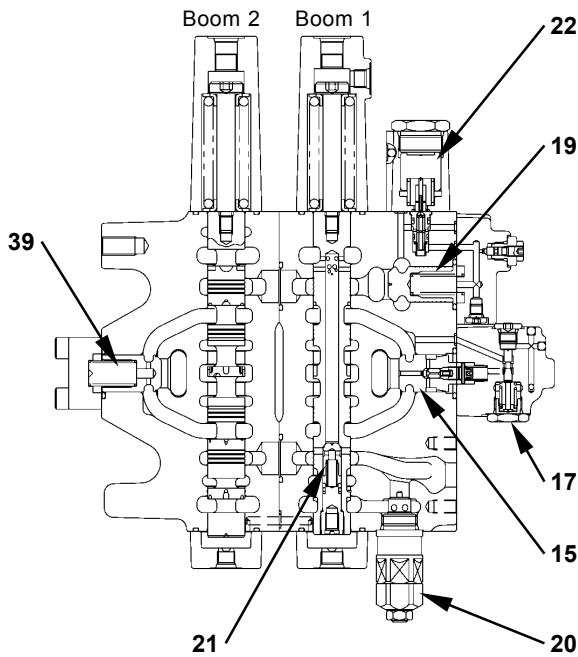
# TROUBLESHOOTING / Component Layout



T1V1-03-03-021

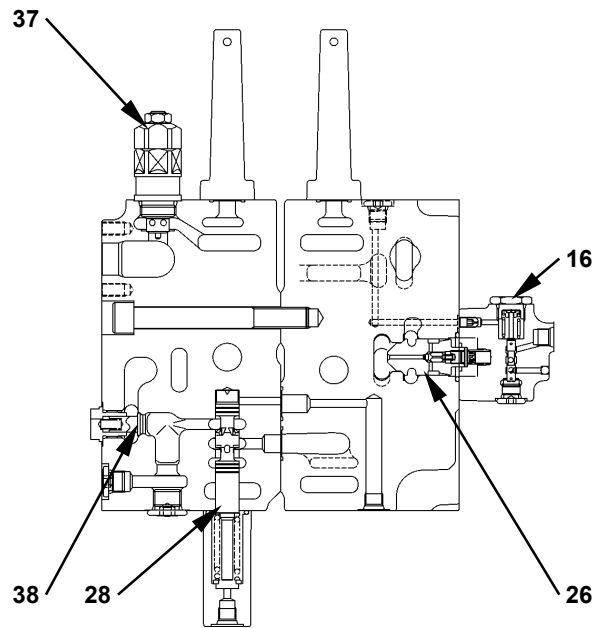
# TROUBLESHOOTING / Component Layout

Cross Section F-F



T1V1-03-03-006

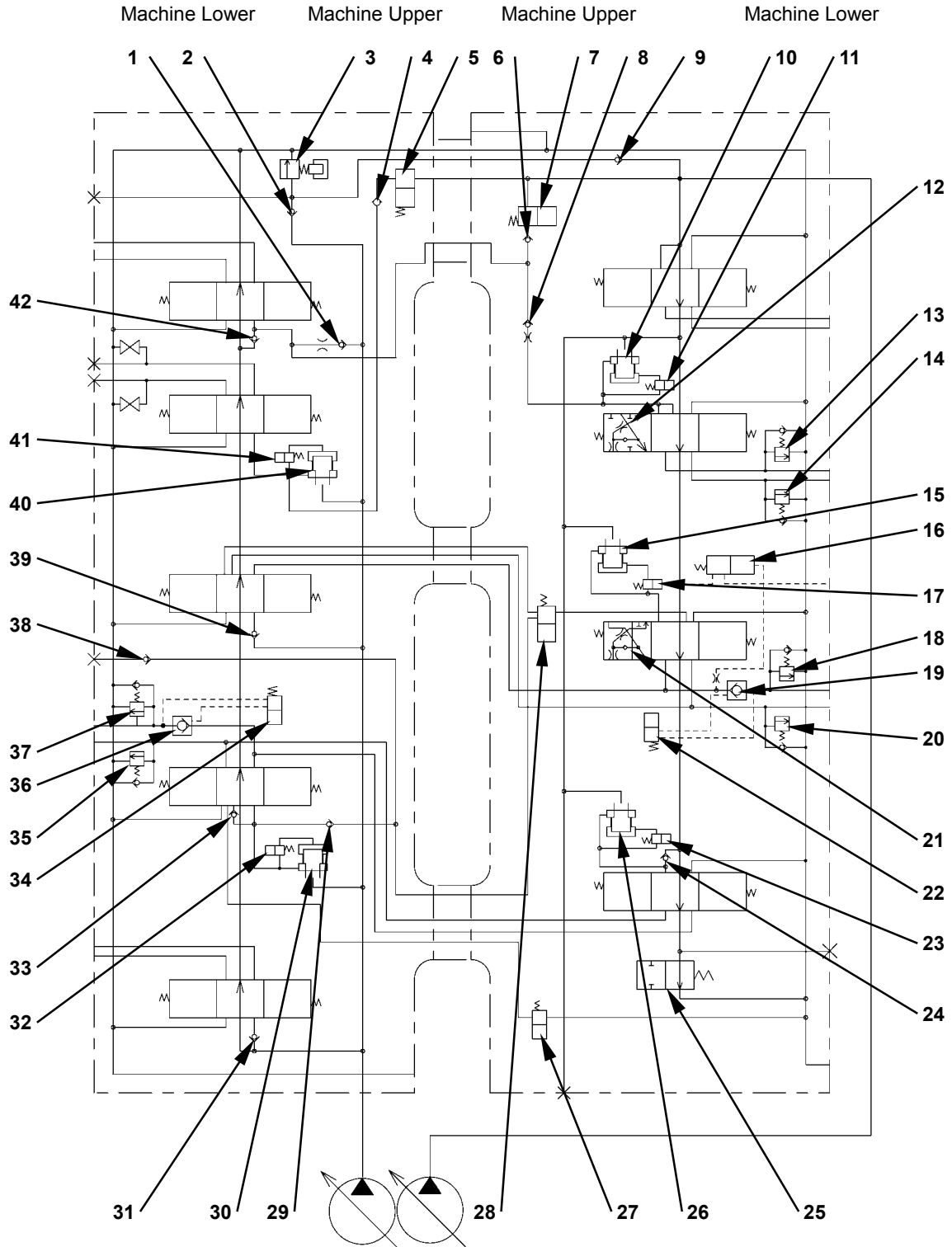
Cross Section G-G



T1V1-03-03-007

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

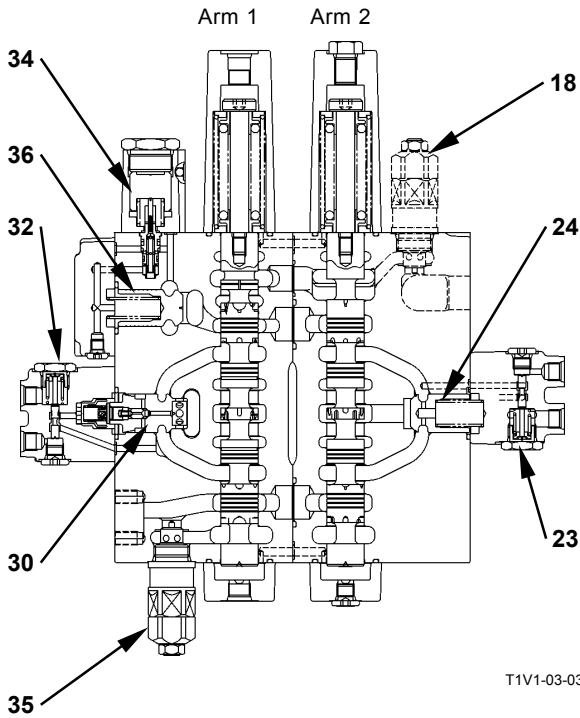
# TROUBLESHOOTING / Component Layout



T1V1-03-03-021

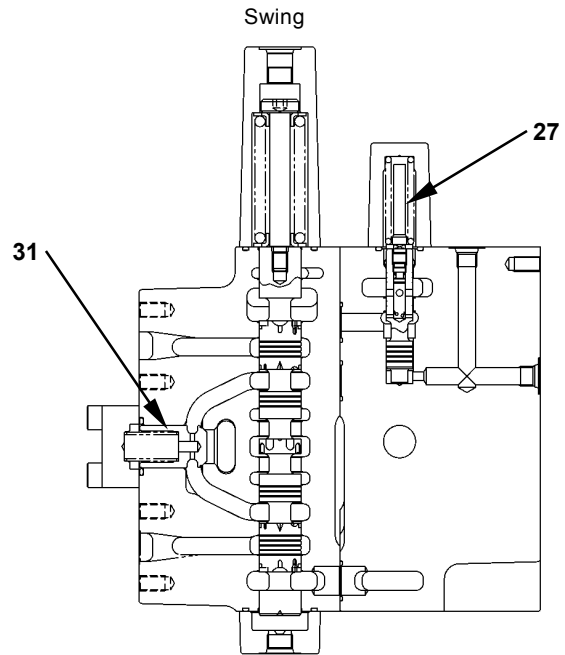
# TROUBLESHOOTING / Component Layout

Cross Section H-H



T1V1-03-03-008

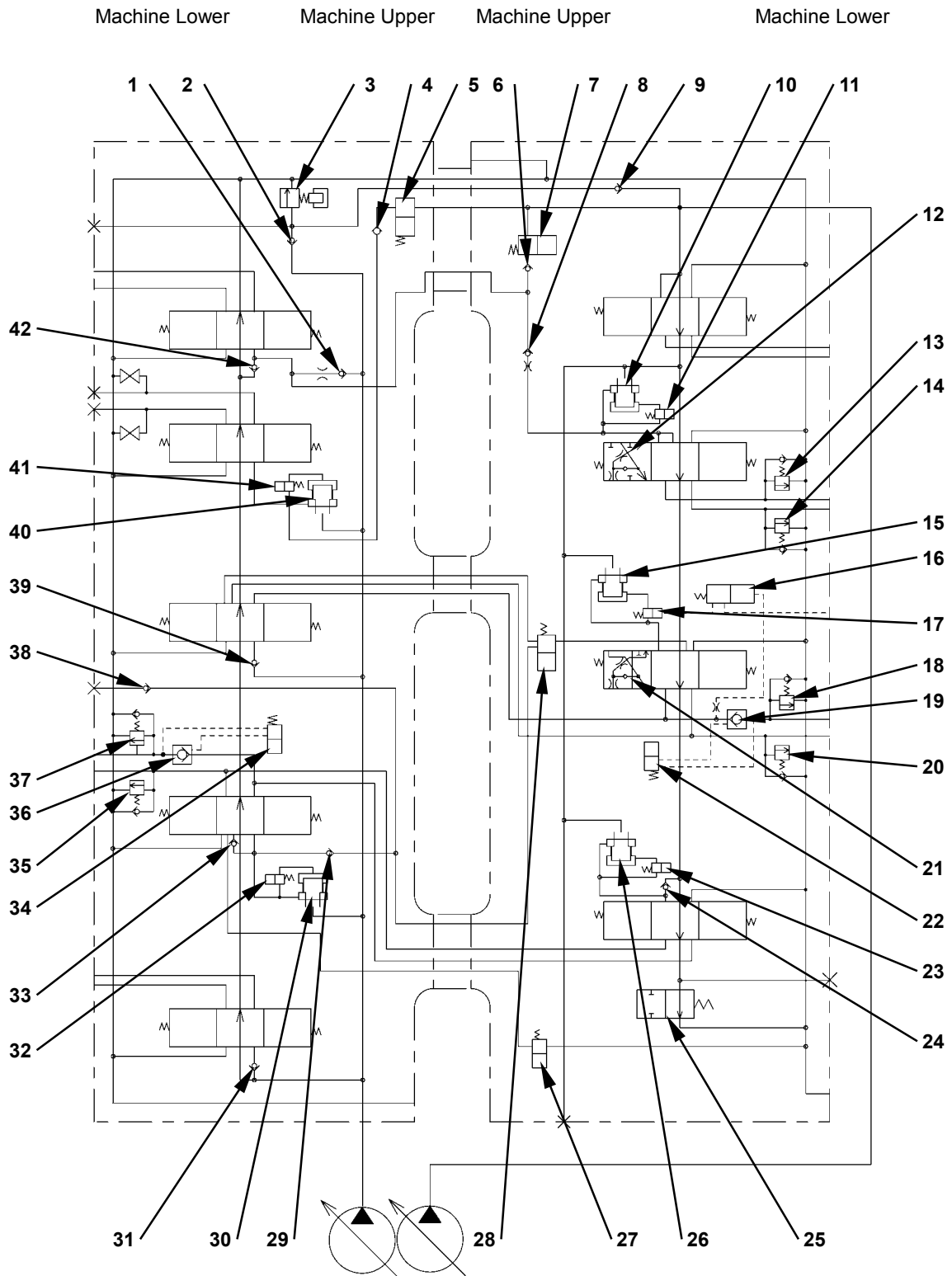
Cross Section I-I



T1V1-03-03-009

- |   |  |  |   |
|---|--|--|---|
| 1 - Load Check Valve (Left Travel Parallel Circuit) | 12 - Bucket Regenerative Valve                   | 23 - Arm 2 Flow Rate Control Valve (Switch Valve)    | 34 - Arm Anti-Drift Valve (Switch Valve)              |
| 2 - Check Valve (Main Relief Circuit)               | 13 - Overload Relief Valve (Bucket: Rod Side)    | 24 - Load Check Valve (Arm 2 Tandem Circuit)         | 35 - Overload Relief Valve (Arm: Bottom Side)         |
| 3 - Main Relief Valve                               | 14 - Overload Relief Valve (Bucket: Bottom Side) | 25 - Bypass Shut-Out Valve                           | 36 - Arm Anti-Drift Valve (Check Valve)               |
| 4 - Check Valve (Auxiliary Combiner Valve Circuit)  | 15 - Boom Flow Control Valve (Poppet Valve)      | 26 - Arm 2 Flow Rate Control Valve (Poppet Valve)    | 37 - Overload Relief Valve (Arm: Rod Side)            |
| 5 - Auxiliary Flow Combiner Valve                   | 16 - Boom Lower Meter-In Cut Valve               | 27 - Arm Regenerative Valve                          | 38 - Check Valve (Digging Regenerative Circuit)       |
| 6 - Check Valve (Flow Combiner Valve Circuit)       | 17 - Boom Flow Rate Control Valve (Switch Valve) | 28 - Digging Regenerative Valve                      | 39 - Load Check Valve (Boom 2 Parallel Circuit)       |
| 7 - Flow Combiner Valve                             | 18 - Overload Relief Valve (Boom: Bottom Side)   | 29 - Load Check Valve (Digging Regenerative Circuit) | 40 - Auxiliary Flow Rate Control Valve (Poppet Valve) |
| 8 - Load Check Valve (Orifice) (Bucket)             | 19 - Boom Anti-Drift Valve (Check Valve)         | 30 - Arm 1 Flow Rate Control Valve (Poppet Valve)    | 41 - Auxiliary Flow Rate Control Valve (Switch Valve) |
| 9 - Check Valve (Main Relief Circuit)               | 20 - Overload Relief Valve (Boom: Rod Side)      | 31 - Load Check Valve (Swing Circuit)                | 42 - Load Check Valve (Left Travel Tandem Circuit)    |
| 10 - Bucket Flow Rate Control Valve (Poppet Valve)  | 21 - Boom Regenerative Valve                     | 32 - Arm 1 Flow Rate Control Valve (Switch Valve)    |   |
| 11 - Bucket Flow Rate Control Valve (Switch Valve)  | 22 - Boom Anti-Drift Valve (Switch Valve)        | 33 - Load Check Valve (Arm Regenerative Circuit)     |   |

# TROUBLESHOOTING / Component Layout

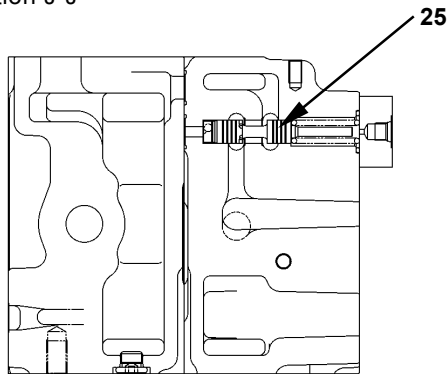


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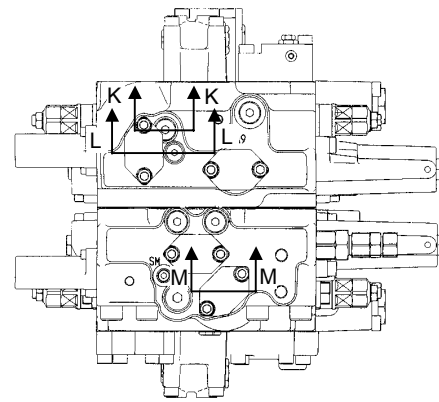


# TROUBLESHOOTING / Component Layout

Cross Section J-J

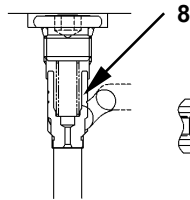


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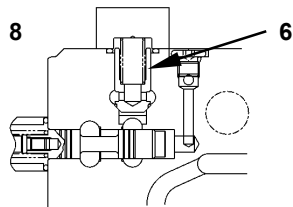


T1V1-03-03-027

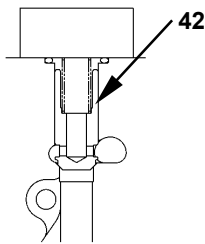
Cross Section K-K



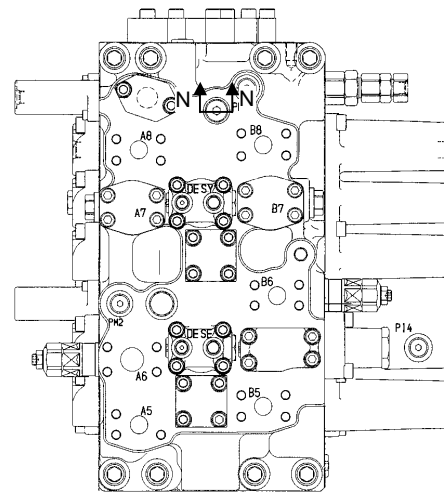
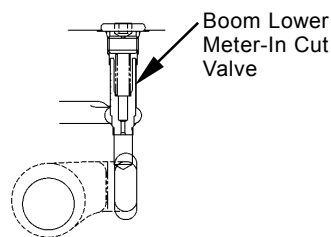
Cross Section L-L



Cross Section M-M



Cross Section N-N



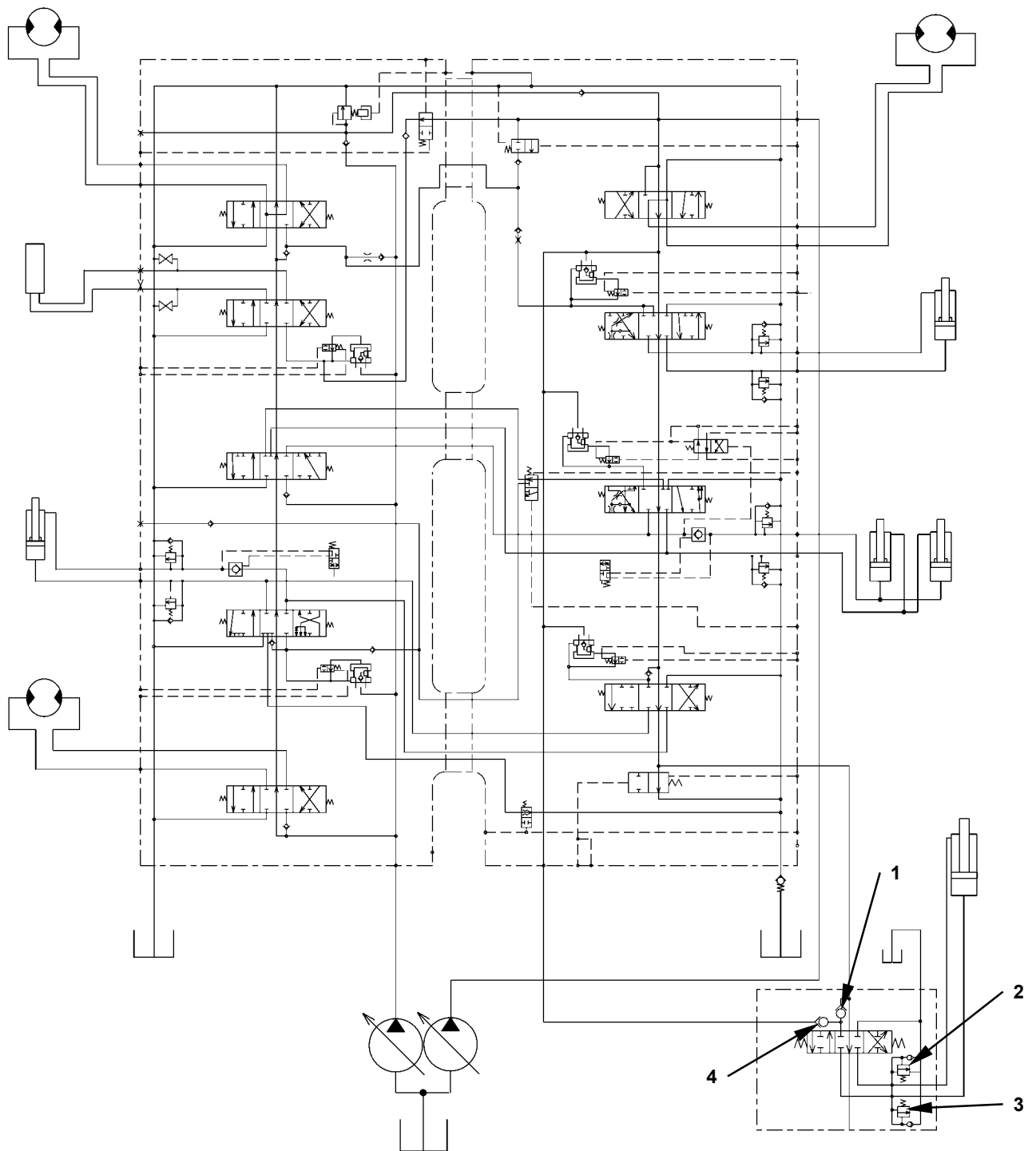
T1V1-03-03-028

T1V1-03-03-022

- |   |  |  |   |
|---|--|--|---|
| 1 - Load Check Valve (Left Travel Parallel Circuit) | 23 - Bucket Regenerative Valve                   | 34 - Arm 2 Flow Rate Control Valve (Switch Valve)    | 43 - Arm Anti-Drift Valve (Switch Valve)              |
| 2 - Check Valve (Main Relief Circuit)               | 24 - Overload Relief Valve (Bucket: Rod Side)    | 35 - Load Check Valve (Arm 2 Tandem Circuit)         | 44 - Overload Relief Valve (Arm: Bottom Side)         |
| 3 - Main Relief Valve                               | 25 - Overload Relief Valve (Bucket: Bottom Side) | 36 - Bypass Shut-Out Valve                           | 45 - Arm Anti-Drift Valve (Check Valve)               |
| 4 - Check Valve (Auxiliary Combining Valve Circuit) | 26 - Boom Flow Control Valve (Poppet Valve)      | 37 - Arm 2 Flow Rate Control Valve (Poppet Valve)    | 46 - Overload Relief Valve (Arm: Rod Side)            |
| 5 - Auxiliary Flow Combiner Valve                   | 27 - Boom Lower Meter-In Cut Valve               | 38 - Arm Regenerative Valve                          | 47 - Check Valve (Digging Regenerative Circuit)       |
| 6 - Check Valve (Flow Combiner Valve Circuit)       | 28 - Boom Flow Control Valve (Switch Valve)      | 39 - Digging Generative Valve                        | 48 - Load Check Valve (Boom 2 Parallel Circuit)       |
| 7 - Flow Combiner Valve                             | 29 - Overload Relief Valve (Boom: Bottom Side)   | 40 - Load Check Valve (Digging Regenerative Circuit) | 49 - Auxiliary Flow Rate Control Valve (Poppet Valve) |
| 8 - Load Check Valve (Orifice) (Bucket)             | 30 - Boom Anti-Drift Valve (Check Valve)         | 41 - Arm 1 Flow Rate Control Valve (Poppet Valve)    | 50 - Auxiliary Flow Rate Control Valve (Switch Valve) |
| 9 - Check Valve (Main Relief Circuit)               | 31 - Overload Relief Valve (Boom: Rod Side)      | 42 - Load Check Valve (Swing Circuit)                | 51 - Load Check Valve (Left Travel Tandem Circuit)    |
| 10 - Bucket Flow Rate Control Valve (Poppet Valve)  | 32 - Boom Regenerative Valve                     | 43 - Arm 1 Flow Rate Control Valve (Switch Valve)    |   |
| 11 - Bucket Flow Rate Control Valve (Switch Valve)  | 33 - Boom Anti-Drift Valve (Switch Valve)        | 44 - Load Check Valve (Arm Regenerative Circuit)     |   |

# TROUBLESHOOTING / Component Layout

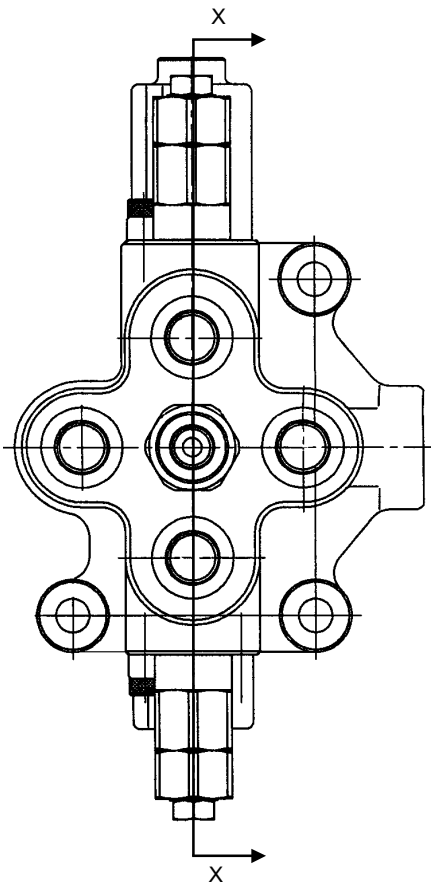
## Layout of Positioning Control Valve (2-Piece Boom)



T1V1-03-03-019

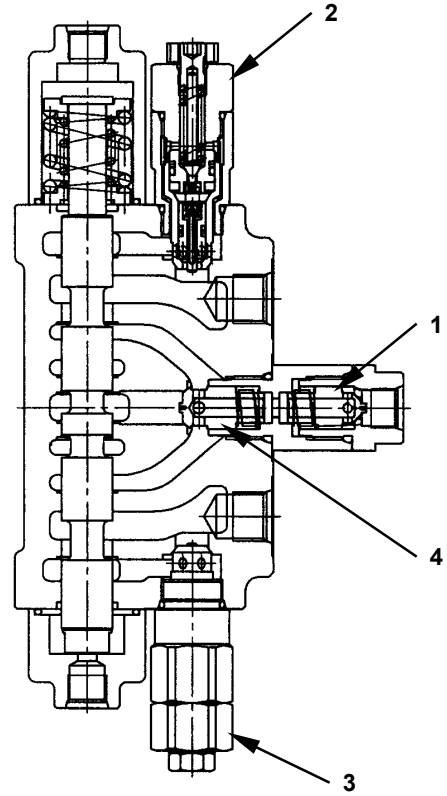
# TROUBLESHOOTING / Component Layout

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T178-03-03-070

Cross Section X-X



T198-03-03-003

1 - Load Check Valve  
(Positioning Tandem Circuit)

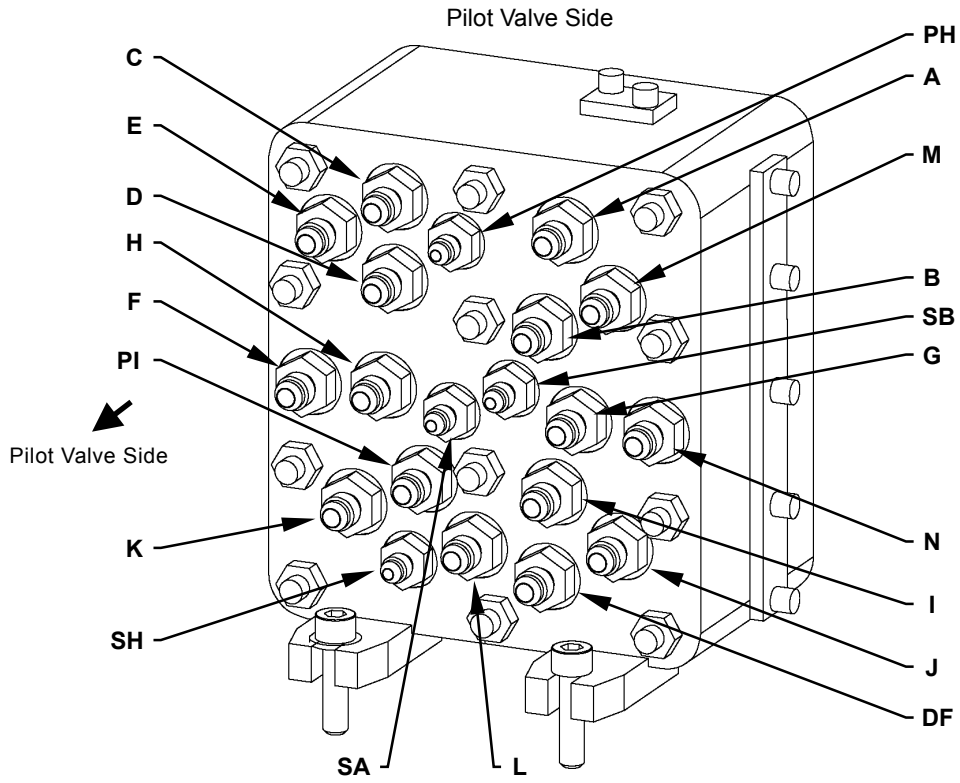
2 - Overload Relief Valve  
(Positioning: Rod Side)

3 - Overload Relief Valve  
(Positioning: Bottom Side)

4 - Load Check Valve  
(Positioning Parallel Circuit)

# TROUBLESHOOTING / Component Layout

## PILOT PORT (Signal Control Valve)



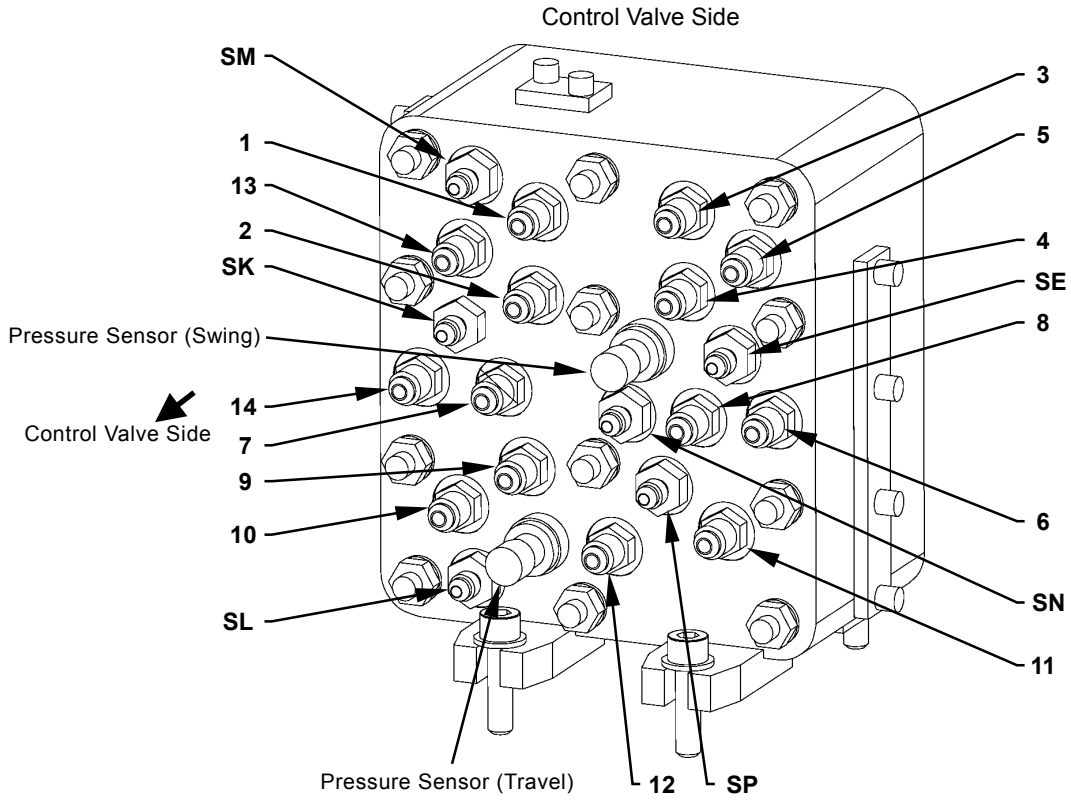
T178-03-06-016

## TROUBLESHOOTING / Component Layout

### 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

# TROUBLESHOOTING / Component Layout



T178-03-06-015

## TROUBLESHOOTING / Component Layout

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

Port SM	Auxiliary Flow Rate Combiner Solenoid Valve	Auxiliary Flow Rate Combiner Valve Control Pressure
Port SN	Auxiliary Flow Rate Combiner Control Valve	Auxiliary Flow Rate Combiner Valve Control Pressure
Port SP	Auxiliary Flow Rate Combiner Solenoid Valve	Pump 1 Control Pressure

## TROUBLESHOOTING / Component Layout

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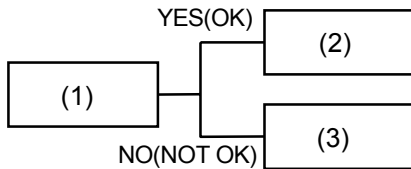


# TROUBLESHOOTING / Troubleshooting A

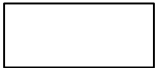

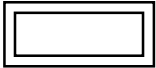

## TROUBLESHOOTING A PROCEDURE


Refer to troubleshooting A procedure in case any fault codes are displayed after diagnosing by using Dr. ZX or the service menu of monitor unit.

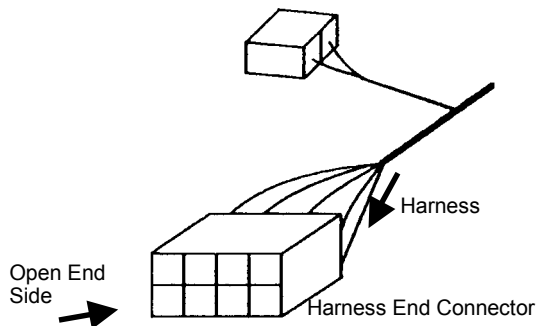
- How to Read Troubleshooting Flow Charts



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

-  Instructions, reference, and/or inspection methods and/or measurements are occasionally described under the box. If incorrectly checked or measured, not only will troubleshooting be unsuccessful but also damage to the components may result.  
Key switch: ON
-  Refer to "Electrical System Inspection" Group (Group 7) for descriptions in the dotted-line box.
-  Use Dr. ZX for descriptions in the double-line box.
-  Causes of machine problems are stated in the thick-line box. Scanning quickly through the thick-line boxes allows you to estimate the possible causes before actually following the flow chart.

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



T158-05-03-001


## TROUBLESHOOTING / Troubleshooting A

### FAULT CODE LIST MC

#### Controller Hardware Failure

Fault Code	Trouble	Cause	Influenced Control
11000-2	Abnormal EEPROM	Faulty MC	All Control
11001-2	Abnormal RAM	Faulty MC	All Control
11002-2	Abnormal A/D Conversion	Faulty MC	All Control
11003-3	Abnormal Sensor Voltage	Faulty MC	All Control
11004-2	Abnormal CAN Communication	Faulty MC	<ul style="list-style-type: none"> <li>• Speed Sensing Control</li> <li>• Attachment Operation Speed Increase Control</li> <li>• Attachment Operation Speed Limit Control</li> <li>• Pump 1 Flow Rate Limit Control</li> <li>• Pump 2 Flow Rate Limit Control</li> <li>• Attachment Flow Rate Control (Optional)</li> <li>• Attachment Valve Selection (Optional)</li> <li>• CAN Cycle Data Communication</li> </ul>

## TROUBLESHOOTING / Troubleshooting A

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	<ul style="list-style-type: none"> <li>• Check sensor connected to MC</li> <li>• Check Harness</li> <li>• Replace MC</li> </ul>
<ul style="list-style-type: none"> <li>• Machine movement is slow.</li> <li>• The work mode alarm is displayed on the monitor unit.</li> </ul> <div style="text-align: center;">  <p style="font-size: small; margin: 0;">T1V1-05-01-102</p> </div>	Retrial B	<ul style="list-style-type: none"> <li>• Check CAN Harness</li> <li>• Replace MC</li> </ul>

## TROUBLESHOOTING / Troubleshooting A

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### Engine Failure

Fault Code	Trouble	Cause	Influenced Control
11100-2	Abnormal Engine Speed	Engine Speed: more than 4000 min <sup>-1</sup>	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

## TROUBLESHOOTING / Troubleshooting A

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Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
Machine movement is slow. (During speed sensing, torque is reduced.)	Retrial B	<ul style="list-style-type: none"><li>• Check Crank Speed Sensor</li><li>• Check Cam Angle Sensor</li></ul>
<ul style="list-style-type: none"><li>• Trouble condition with the key ON: Engine speed is kept at idle speed.</li><li>• Trouble condition with the key ON: engine speed is kept at speed immediately before trouble.</li></ul>	Retrial B	<ul style="list-style-type: none"><li>• Check Harness</li><li>• Replace Engine Control Dial</li></ul>
<ul style="list-style-type: none"><li>• Trouble condition with the key ON: Engine speed is kept at idle speed.</li><li>• Trouble condition with the key ON: engine speed is kept at speed immediately before trouble.</li></ul>	Retrial B	<ul style="list-style-type: none"><li>• Check Harness</li><li>• Replace Engine Control Dial</li></ul>

## TROUBLESHOOTING / Troubleshooting A

### Pump Failure

Fault Code	Trouble	Cause	Influenced Control
11200-3	Abnormal Pump 1 Delivery Pressure Sensor High Voltage	Voltage: 4.5 V or higher	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Travel HP Mode Control</li> <li>• E Mode Control</li> <li>• Travel Torque-Up Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Auto-Power Lift Control</li> <li>• Travel Motor Swash Angle Control</li> </ul>
11200-4	Abnormal Pump 1 Delivery Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Travel HP Mode Control</li> <li>• E Mode Control</li> <li>• Travel Torque-Up Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Auto-Power Lift Control</li> <li>• Travel Motor Swash Angle Control</li> </ul>
11202-3	Abnormal Pump 2 Delivery Pressure Sensor High Voltage	Voltage: 4.5 V or higher	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Travel HP Mode Control</li> <li>• E Mode Control</li> <li>• Travel Torque-Up Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Travel Motor Swash Angle Control</li> </ul>
11202-4	Abnormal Pump 2 Delivery Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Travel HP Mode Control</li> <li>• E Mode Control</li> <li>• Travel Torque-Up Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Travel Motor Swash Angle Control</li> </ul>
11206-3	Abnormal Pump 1 Pump Control Pressure Sensor High Voltage	Voltage: 4.75 V or higher	<ul style="list-style-type: none"> <li>• E Mode Control</li> <li>• Travel Motor Swash Angle Control</li> </ul>
11206-4	Abnormal Pump 1 Pump Control Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• E Mode Control</li> <li>• Travel Motor Swash Angle Control</li> </ul>
11208-3	Abnormal Pump 2 Pump Control Pressure Sensor High Voltage	Voltage: 4.75 V or higher	<ul style="list-style-type: none"> <li>• E Mode Control</li> <li>• Travel Motor Swash Angle Control</li> </ul>
11208-4	Abnormal Pump 2 Pump Control Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• E Mode Control</li> <li>• Travel Motor Swash Angle Control</li> </ul>

## TROUBLESHOOTING / Troubleshooting A

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
<ul style="list-style-type: none"> <li>• Combined operation of arm roll-in and boom raise or combined operation of arm-roll-in and swing: Arm speed is slow.</li> <li>• Single operation of boom raise: Lifting force is weak.</li> <li>• Travel: Slow speed</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Pump 1 Delivery Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• Combined operation of arm roll-in and boom raise or combined operation of arm-roll-in and swing: Arm speed is slow.</li> <li>• Single operation of boom raise: Lifting force is weak.</li> <li>• Travel: Slow speed</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Pump 1 Delivery Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• Combined operation of arm roll-in and boom raise or combined operation of arm-roll-in and swing: Arm speed is slow.</li> <li>• Travel: Slow speed</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Pump 2 Delivery Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• Combined operation of arm roll-in and boom raise or combined operation of arm-roll-in and swing: Arm speed is slow.</li> <li>• Travel: Slow speed</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Pump 2 Delivery Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• Although speed operating in E mode returns to P speed, returning speed becomes low due to this failure.</li> <li>• Travel: Slow speed</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Pump 1 Control Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• Although speed operating in E mode returns to P speed, returning speed becomes low due to this failure.</li> <li>• Travel: Slow speed</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Pump 1 Control Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• Although speed operating in E mode returns to P speed, returning speed becomes low due to this failure.</li> <li>• Travel: Slow speed</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Pump 2 Control Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• Although speed operating in E mode returns to P speed, returning speed becomes low due to this failure.</li> <li>• Travel: Slow speed</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Pump 2 Control Pressure Sensor</li> </ul>

## TROUBLESHOOTING / Troubleshooting A

### Pilot Failure

Fault Code	Trouble	Cause	Influenced Control
11301-3	Abnormal Swing Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	<ul style="list-style-type: none"> <li>• Arm Regenerative Control</li> <li>• Attachment Flow Rate Control</li> <li>• Swing Alarm Control</li> </ul>
11301-4	Abnormal Swing Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• Arm Regenerative Control</li> <li>• Attachment Flow Rate Control</li> <li>• Swing Alarm Control</li> </ul>
11302-3	Abnormal Boom Raise Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Auto-Power Lift Control</li> <li>• Attachment Flow Rate Control</li> </ul>
11302-4	Abnormal Boom Raise Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Auto-Power Lift Control</li> <li>• Attachment Flow Rate Control</li> </ul>
11303-3	Abnormal Arm Roll-In Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Auto-Power Lift Control</li> </ul>
11303-4	Abnormal Arm Roll-In Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Auto-Power Lift Control</li> </ul>



## TROUBLESHOOTING / Troubleshooting A

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
<ul style="list-style-type: none"> <li>• Combined operation of arm-roll-in and swing: Arm speed is slow.</li> <li>• In case of the machine equipped with the swing alarm (optional) and when swing alarm is effective, swing alarm continues to ring.</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Swing Pilot Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• Combined operation of arm-roll-in and swing: Arm speed is slow.</li> <li>• In case of the machine equipped with the swing alarm (optional) and when swing alarm is effective, swing alarm continues to ring.</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Swing Pilot Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• During HP control, boom raise speed does not increase.</li> <li>• Combined operation of arm roll-in and boom raise: Arm speed is slow.</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Boom Raise Pilot Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• During HP control, boom raise speed does not increase.</li> <li>• Combined operation of arm roll-in and boom raise: Arm speed is slow.</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Boom Raise Pilot Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• During HP control, arm roll-in speed does not increase.</li> <li>• Combined operation of arm roll-in and swing: Arm speed is slow.</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Arm Roll-In Pilot Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• During HP control, arm roll-in speed does not increase.</li> <li>• Combined operation of arm roll-in and swing: Arm speed is slow.</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Arm Roll-In Pilot Pressure Sensor</li> </ul>

## TROUBLESHOOTING / Troubleshooting A

Fault Code	Trouble	Cause	Influenced Control
11304-3	Abnormal Travel Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	<ul style="list-style-type: none"> <li>• Auto-Idle Control</li> <li>• Idle Speed-Up Control</li> <li>• ECO Control</li> <li>• Travel HP Mode Control</li> <li>• Travel Torque-Up Control</li> <li>• Pump 1 Flow Rate Limit Control</li> <li>• Pump 1 Flow Rate Control Valve at Travel (ZX160-3 Class Only)</li> <li>• Pump 2 Flow Rate Limit Control</li> <li>• Pump 2 Flow Rate Control Valve at Travel (ZX160-3 Class Only)</li> <li>• Travel Motor Swash Angle Control</li> <li>• Attachment Flow Rate Control</li> <li>• Travel Alarm Control</li> </ul>
11304-4	Abnormal Travel Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• Auto-Idle Control</li> <li>• Idle Speed-Up Control</li> <li>• ECO Control</li> <li>• Travel HP Mode Control</li> <li>• Travel Torque-Up Control</li> <li>• Pump 1 Flow Rate Limit Control</li> <li>• Pump 1 Flow Rate Control Valve at Travel (ZX160-3 Class Only)</li> <li>• Pump 2 Flow Rate Limit Control</li> <li>• Pump 2 Flow Rate Control Valve at Travel (ZX160-3 Class Only)</li> <li>• Travel Motor Swash Angle Control</li> <li>• Attachment Flow Rate Control</li> <li>• Travel Alarm Control</li> </ul>
11307-3	Abnormal Front Attachment Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	<ul style="list-style-type: none"> <li>• Auto-Idle Control</li> <li>• Idle Speed-Up Control</li> <li>• ECO Control</li> <li>• Travel HP Mode Control</li> <li>• Travel Motor Swash Angle Control</li> </ul>
11307-4	Abnormal Front Attachment Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• Auto-Idle Control</li> <li>• Idle Speed-Up Control</li> <li>• ECO Control</li> <li>• Travel HP Mode Control</li> <li>• Travel Motor Swash Angle Control</li> </ul>

## TROUBLESHOOTING / Troubleshooting A

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
<ul style="list-style-type: none"> <li>• When traveling at idle speed, engine speed does not increase to the specification.</li> <li>• When traveling, speed does not return from auto idle speed.</li> <li>• When traveling, speed does not return from ECO speed.</li> <li>• Travel: Slow speed</li> <li>• When operating ATT, the machine mis-tracks.</li> <li>• In case of the machine equipped with the travel alarm (optional), travel alarm continues to ring.</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Travel Pilot Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• When traveling at idle speed, engine speed does not increase to the specification.</li> <li>• When traveling, speed does not return from auto idle speed.</li> <li>• When traveling, speed does not return from ECO speed.</li> <li>• Travel: Slow speed</li> <li>• When operating ATT, the machine mis-tracks.</li> <li>• In case of the machine equipped with the travel alarm (optional), travel alarm continues to ring.</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Travel Pilot Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• When operating the front attachment at idle speed, engine speed does not increase to the specification.</li> <li>• When operating the front attachment, speed does not return from auto idle speed.</li> <li>• When operating the front attachment, speed does not return from ECO speed.</li> <li>• Although the front attachment is operated, travel becomes fast.</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Front Pilot Pressure Sensor</li> </ul>
<ul style="list-style-type: none"> <li>• When operating the front attachment at idle speed, engine speed does not increase to the specification.</li> <li>• When operating the front attachment, speed does not return from auto idle speed.</li> <li>• When operating the front attachment, speed does not return from ECO speed.</li> <li>• Although the front attachment is operated, travel becomes fast.</li> </ul>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Front Pilot Pressure Sensor</li> </ul>

## TROUBLESHOOTING / Troubleshooting A

### Proportional Solenoid Valve Failure

Fault Code	Trouble	Cause	Influenced Control
11400-2	Abnormal Current Feedback of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Both of Higher than 920 mA or Less than 60 mA	<ul style="list-style-type: none"> <li>• Pump 2 Flow Rate Limit Control</li> <li>• Pump 2 Flow Rate Control Valve at Travel (ZX160-3 Class Only)</li> </ul>
11400-3	Abnormal Feedback High Current of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Higher than 920 mA	<ul style="list-style-type: none"> <li>• Pump 2 Flow Rate Limit Control</li> <li>• Pump 2 Flow Rate Control Valve at Travel (ZX160-3 Class Only)</li> </ul>
11400-4	Abnormal Feedback Low Current of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Less than 56 mA	<ul style="list-style-type: none"> <li>• Pump 2 Flow Rate Limit Control</li> <li>• Pump 2 Flow Rate Control Valve at Travel (ZX160-3 Class Only)</li> </ul>
11401-2	Abnormal Current Feedback of Torque Control Solenoid Valve	Current: Both of Higher than 920 mA or Less than 60 mA	<ul style="list-style-type: none"> <li>• Speed Sensing Control</li> <li>• Travel Torque-Up Control</li> </ul>
11401-3	Abnormal Feedback High Current of Torque Control Solenoid Valve	Current: Higher than 920 mA	<ul style="list-style-type: none"> <li>• Speed Sensing Control</li> <li>• Travel Torque-Up Control</li> </ul>
11401-4	Abnormal Feedback Low Current of Torque Control Solenoid Valve	Current: Less than 56 mA	<ul style="list-style-type: none"> <li>• Speed Sensing Control</li> <li>• Travel Torque-Up Control</li> </ul>
11402-2	Abnormal Current Feedback of Solenoid Valve Unit (SF) (Digging Regeneration)	Current: Both of Higher than 920 mA or Less than 60 mA	Digging Regenerative Control
11402-3	Abnormal Feedback High Current of Solenoid Valve Unit (SF) (Digging Regeneration)	Current: Higher than 920 mA	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 920 mA or Less than 60 mA	Arm Regenerative Control
11403-3	Abnormal Feedback High Current of Solenoid Valve Unit (SC) (Arm Regeneration)	Current: Higher than 920 mA	Arm Regenerative Control
11403-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SC) (Arm Regeneration)	Current: Less than 56 mA	Arm Regenerative Control

## TROUBLESHOOTING / Troubleshooting A

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: <ul style="list-style-type: none"> <li>• Travel mistakes.</li> <li>• Boom raise operation is slow.</li> <li>• Arm operation is slow.</li> <li>• Swing operation is slow.</li> </ul>	Retrial B	• Check Harness
Actual Operation of Proportional Valve during Low Current: <ul style="list-style-type: none"> <li>• In case ATT flow rate is limited, it cannot be limited.</li> </ul>	Retrial B	• Check Harness
Machine overall operation is slow.	Retrial B	• Check Harness
Actual Operation of Proportional Valve during High Current: <ul style="list-style-type: none"> <li>• The engine is stalled at Low idle speed.</li> <li>• Engine Speed: Middle to Fast: Engine Stall or Large Lug Down</li> </ul>	Retrial B	• Check Harness
Actual Operation of Proportional Valve during Low Current: <ul style="list-style-type: none"> <li>• Machine overall operation is slow.</li> </ul>	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: <ul style="list-style-type: none"> <li>• Combined operation of boom raise and arm roll-in during lifting/precision: The boom raise operation is not smooth.</li> </ul>	Retrial B	• Check Harness
Actual Operation of Proportional Valve during Low Current: <ul style="list-style-type: none"> <li>• During digging, arm speed is slow. (As deceleration rate is low, this state is not easy to find.)</li> </ul>	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: <ul style="list-style-type: none"> <li>• Digging force (arm) becomes weak.</li> </ul>	Retrial B	• Check Harness
Actual Operation of Proportional Valve during Low Current: <ul style="list-style-type: none"> <li>• 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.</li> </ul>	Retrial B	• Check Harness

## TROUBLESHOOTING / Troubleshooting A

Fault Code	Trouble	Cause	Influenced Control
11404-2	Abnormal Current Feedback of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Both of Higher than 920 mA or Less than 60 mA	<ul style="list-style-type: none"> <li>• Power Digging Control</li> <li>• Auto-Power Lift Control</li> <li>• Travel Pressure Increasing Control</li> </ul>
11404-3	Abnormal Feedback High Current of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Higher than 920 mA	<ul style="list-style-type: none"> <li>• Power Digging Control</li> <li>• Auto-Power Lift Control</li> <li>• Travel Pressure Increasing Control</li> </ul>
11404-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Less than 56 mA	<ul style="list-style-type: none"> <li>• Power Digging Control</li> <li>• Auto-Power Lift Control</li> <li>• Travel Pressure Increasing Control</li> </ul>
11405-2	Abnormal Current Feedback of Solenoid Valve Unit (SI) (Travel Motor Fast Speed Selection)	Current: Both of Higher than 920 mA 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 920 mA	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 (ZX160-3 Class Only)	Abnormal Current Feedback of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve	Current: Both of Higher than 920 mA or Less than 60 mA	<ul style="list-style-type: none"> <li>• Pump 1 Flow Rate Limit Control</li> <li>• Pump 1 Flow Rate Control Valve at Travel</li> </ul>
11410-3 (ZX160-3 Class Only)	Abnormal Feedback High Current of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve	Current: Higher than 920 mA	<ul style="list-style-type: none"> <li>• Pump 1 Flow Rate Limit Control</li> <li>• Pump 1 Flow Rate Control Valve at Travel</li> </ul>
11410-4 (ZX160-3 Class Only)	Abnormal Feedback Low Current of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve	Current: Less than 56 mA	<ul style="list-style-type: none"> <li>• Pump 1 Flow Rate Limit Control</li> <li>• Pump 1 Flow Rate Control Valve at Travel</li> </ul>

## TROUBLESHOOTING / Troubleshooting A


Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
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
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 mistakes. • Boom raise operation is slow. • Arm operation is slow. • Bucket 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

## TROUBLESHOOTING / Troubleshooting A

<b>CAN Data Reception Failure</b>			
Fault Code	Trouble	Cause	Influenced Control
11910-2	Actual Engine Speed Received from ECM	Faulty Harness	<ul style="list-style-type: none"> <li>• Speed Sensing Control</li> <li>• Send to ICF</li> </ul>
11918-2	Work Mode Received from Monitor Unit	Faulty Harness	<ul style="list-style-type: none"> <li>• Attachment Operation Speed Increase Control</li> <li>• Attachment Operation Speed Limit Control</li> <li>• Pump 1 Flow Rate Limit Control</li> <li>• Pump 2 Flow Rate Limit Control</li> <li>• Attachment Flow Rate Control</li> <li>• Attachment Valve Selection (Optional)</li> </ul>
11911-2	Security Signal Received from Monitor Unit	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	Radiator Coolant Temperature Auto-Warming Up Control



## TROUBLESHOOTING / Troubleshooting A



Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
Machine operation speed is slow. (During speed sensing, torque is decreased.) During e-service, the engine is stalled.	Retrial B	• Check Harness
<ul style="list-style-type: none"> <li>• Digging Mode: Lock</li> <li style="padding-left: 20px;">In case flow rate is decreased and speed decreases during ATT, stop this control, or Digging is not changed into ATT mode.</li> <li>• Work Mode Alarm is displayed on the monitor unit.</li> </ul> <div style="text-align: center; margin-top: 10px;">  </div> <p style="text-align: right; font-size: small; margin-top: 5px;">T1V1-05-01-102</p>	Retrial B	• Check Harness
In case theft prevention is turned ON by Dr. ZX, engine speed is kept at Minimum speed and pump torque is kept Minimum.	Retrial B	• Check Harness
When the monitor setting is displayed fuel consumption at moment, engine display at moment is “----”.	Retrial B	• Check Harness
Heater Control: Ineffective	Retrial B	• Check Harness

## TROUBLESHOOTING / Troubleshooting A

### Other Failures

Fault Code	Trouble	Cause	Influenced Control
11901-3	Hydraulic Oil Temperature Sensor High Voltage	Voltage: 4.52 V or higher	<ul style="list-style-type: none"> <li>• Hydraulic Oil Temperature Auto-Warming Up Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> </ul>
11901-4	Hydraulic Oil Temperature Sensor Low Voltage	Voltage: Less than 0.23 V	<ul style="list-style-type: none"> <li>• Hydraulic Oil Temperature Auto-Warming Up Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> </ul>
11905-3	Abnormal Boom Bottom Pressure Sensor High Voltage (Optional)	Voltage: 4.5 V or higher	<ul style="list-style-type: none"> <li>• Overload Alarm</li> </ul>
11905-4	Abnormal Boom Bottom Pressure Sensor Low Voltage (Optional)	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• Overload Alarm</li> </ul>

## TROUBLESHOOTING / Troubleshooting A

Symptoms in Machine Operation When Trouble Occurs.	Remedy for Dr. ZX	Remark
When temperature is low (hydraulic oil temperature is less than 0 °C), the auto-warming up control is inoperable.	Retrial B	• Check Harness
When temperature is low (hydraulic oil temperature is less than 0 °C), the auto-warming up control is inoperable.	Retrial B	• Check Harness
When overload alarm is used. <ul style="list-style-type: none"> <li>• Overload alarm buzzer rings.</li> <li>• The overload alarm is displayed on the monitor unit.</li> </ul> <div style="text-align: center;">  </div> <div style="text-align: right; font-size: small;">T1V1-05-02-002</div>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Boom Bottom Pressure Sensor</li> </ul>
When overload alarm is used. <ul style="list-style-type: none"> <li>• Overload alarm buzzer rings.</li> <li>• The overload alarm is displayed on the monitor unit.</li> </ul> <div style="text-align: center;">  </div> <div style="text-align: right; font-size: small;">T1V1-05-02-002</div>	Retrial B	<ul style="list-style-type: none"> <li>• Check Harness</li> <li>• Replace Boom Bottom Pressure Sensor</li> </ul>

## TROUBLESHOOTING / Troubleshooting A

### ECM

#### Sensor System

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

## TROUBLESHOOTING / Troubleshooting A

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
<ul style="list-style-type: none"> <li>• While the engine runs, there is nothing abnormal with machine operation.</li> <li>• After the engine is stalled, the re-start is impossible.</li> </ul>	While the engine runs, operate according to standard of the crank sensor. When the engine stops, the start is impossible (in order to prevent the engine from damaging).	P0340
		P0341
<ul style="list-style-type: none"> <li>• The output power may decrease, white smoke may occur and vibration may occur.</li> <li>• The engine may be stalled. (If the cam sensor is normal, the engine can re-start.)</li> </ul>	Operate according to standard of the cam sensor.	P0335
		P0336
<ul style="list-style-type: none"> <li>• While the engine runs, there is nothing abnormal with machine operation.</li> <li>• After the engine is stalled, the re-start is impossible.</li> </ul>	The timing chain and the belt does not turn smoothly but turn in reverse.	P1345
Nothing special	When starting: -10 °C (14 °F) (Start the engine although what state.) When operating: 25 °C (77 °F) (Operate normally.)	P0113
		P0112
Normal temperature: When starting, dark smoke may occur and engine combustion sound may become loud. While warming up with fresh air in low temperature: Rough idle, engine stall or white smoke may occur.	When starting: -20 °C (-4 °F) (Start the engine although what state.) When operating: 80 °C (176 °F) (Operate normally.)	P0118
		P0117
Dark smoke occurs.	Boost pressure cannot be corrected.	P0238
		P0237
There is influence to exhaust gas.	As the sensor input is not certain, it cannot be controlled. Exhaust gas becomes bad. Operate the engine with EGR valve fully open.	P0487
Dark smoke occurs at high altitude.	Atmospheric pressure 80 kPa (0.8 kgf/cm <sup>2</sup> , 12 psi) (2000 m above the sea)	P0108
		P0107
Nothing special	When starting: -20 °C (-4 °F) (Start the engine although what state.) When operating: 70 °C (158 °F) (Operate normally.)	P0183
		P0182

## TROUBLESHOOTING / Troubleshooting A

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

## TROUBLESHOOTING / Troubleshooting A

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

## TROUBLESHOOTING/ Troubleshooting A

Fault Code	Trouble	Influence to Engine Performance (Presumption)	Operating Rank (Current State)				Remark
			A	B	C	D	
636-2	Abnormal Cam Angle Sensor (No Signal)	No influence during operationg	○			○	
636-2	Abnormal Cam Angle Sensor (Abnormal Signal)	After stopping, the re-start is impossible.	○			○	
723-2	Abnormal Crank Speed Sensor (No Signal)	No output power decrease	○				
723-2	Abnormal Crank Speed Sensor (Abnormal Signal)		○				
636-7	Phase Mismatch of Cam Angle Sensor	No influence during operationg After stopping, the re-start is impossible.	○			○	
172-3	Abnormal Intake-Air Temperature Sensor (Abnormal High Voltage)	No output power decrease	○				
172-4	Abnormal Intake-Air Temperature Sensor (Abnormal Low Voltage)		○				
110-3	Abnormal Coolant Temperature Sensor (Abnormal High Voltage)	No output power decrease	○				
110-4	Abnormal Coolant Temperature Sensor (Abnormal Low Voltage)		○				
102-4	Abnormal Boost Pressure Sensor (Abnormal High Voltage)	No output power decrease	○				
102-3	Abnormal Boost Pressure Sensor (Abnormal Low Voltage)		○				
10001-3	Abnormal EGR Position (Brushless spec.)	No output power change	○				
108-4	Abnormal Atmospheric Pressure Sensor (Abnormal High Voltage)	No output power decrease	○				
108-3	Abnormal Atmospheric Pressure Sensor (Abnormal Low Voltage)		○				
174-3	Abnormal Fuel Temperature Sensor (Abnormal High Voltage)	No output power decrease	○				
174-4	Abnormal Fuel Temperature Sensor (Abnormal Low Voltage)		○				
157-3	Abnormal Common Rail Pressure Sensor (Abnormal High Voltage)	Output power decrease: 50%		○	○		
157-4	Abnormal Common Rail Pressure Sensor (Abnormal Low Voltage)				○	○	
100-4	Abnormal Engine Oil Pressure Sensor (Abnormal High Voltage)	No output power change	○				
100-3	Abnormal Engine Oil Pressure Sensor (Abnormal Low Voltage)		○				



## TROUBLESHOOTING/ Troubleshooting A

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

### Operating Rank

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

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

## TROUBLESHOOTING/ Troubleshooting A

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### External Device System

Fault Code	Trouble	Cause
10002-2	Abnormal EGR valve control	Difference between the target valve lift and actual position is beyond 20%.
1347-0	Open circuit in suction control valve drive system, Shorted circuit in + B or GND	The suction control valve drive current is beyond 2400 mA or below 50 mA. Or, difference between the target current and actual current is 1000 mA or more.
651-3	Open circuit in injection nozzle #1 drive system	No input signal of injector 1 monitor.
652-3	Open circuit in injection nozzle #2 drive system	No input signal of injector 2 monitor.
653-3	Open circuit in injection nozzle #3 drive system	No input signal of injector 3 monitor.
654-3	Open circuit in injection nozzle #4 drive system	No input signal of injector 4 monitor.

## TROUBLESHOOTING/ Troubleshooting A

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 circuit condition. Dark smoke occurs. Output power is too large.	The supply pump cannot be controlled. → Prevent the engine from increasing the rotation speed automatically and abnormally (Protect the engine).	P0090
Vibration of the engine is large, Rough idle, output power decrease, faulty increasing of rotation speed, output power decrease	#1 injector cannot be controlled. → Stop drive pulse output of #1 injector.	P0201
	#2 injector cannot be controlled. → Stop drive pulse output of #2 injector.	P0202
	#3 injector cannot be controlled. → Stop drive pulse output of #3 injector.	P0203
	#4 injector cannot be controlled. → Stop drive pulse output of #4 injector.	P0204

## TROUBLESHOOTING/ Troubleshooting A

### Fuel System

Fault Code	Trouble	Cause
157-0	Abnormal common rail pressure (First stage)	Common rail pressure is beyond 185 MPa.
157-0	Abnormal common rail pressure (Second stage)	The first stage "Abnormal common rail pressure" is approved and common rail pressure is beyond 190 MPa.
157-2	Abnormal common rail 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 <sup>3</sup> /sec or less, actual rail pressure is 40 MPa (410 kgf/cm <sup>2</sup> , 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 <sup>3</sup> /sec or more and 1200 min <sup>-1</sup> , actual rail pressure is 50 MPa (510 kgf/cm <sup>2</sup> , 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 <sup>-1</sup> , actual rail pressure is 15 MPa (150 kgf/cm <sup>2</sup> , 2180 psi) or less.

## TROUBLESHOOTING/ Troubleshooting A

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed, dark smoke may occur, output power may be too large.	Prevention the junction system (pump) from damage (Protect the RP sensor by over-pressure)	P0088
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed, dark smoke may occur, output power may be too large.	Prevention the junction system from damage (Pressure is too much as PR is clogged.)	P0088
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed, dark smoke may occur, output power may be too large.	Prevention the junction system (pmp) from damage (Protect the RP sensor by over-pressure)	P0089
Output power decrease	Rial pressure is beyond the allowable pressure.	P1095
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed, dark smoke may occur, output power may be too large.	Fuel leakage is too much. Difference between target rail pressure and actual rail pressure is larger than the specification. (Large deflection)	P1093
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed, dark smoke may occur, output power may be too large.	Fuel leakage is too much. Actual rail pressure does not increase to the required pressure.	P0087

## TROUBLESHOOTING/ Troubleshooting A

Fault Code	Trouble	Influence to Engine Performance (Presumption)	Operating Rank (Current)				Remark
			A	B	C	D	
10002-2	Abnormal EGR valve control	No output power change	○				
1347-0	Open circuit in suction control valve drive system, Shorted circuit in + B or GND	Output power decrease: 50%		○			
651-3	Open circuit in injection nozzle #1 drive system	Output power decrease: 30% (three cylinders drive.)		○			
652-3	Open circuit in injection nozzle #2 drive system			○			
653-3	Open circuit in injection nozzle #3 drive system			○			
654-3	Open circuit in injection nozzle #4 drive system			○			

Fault Code	Trouble	Influence to Engine Performance (Presumption)	Operating Rank (Current)				Remark
			A	B	C	D	
157-0	Abnormal common rail pressure (First stage)	Output power decrease: 50%		○			
157-0	Abnormal common rail pressure (Second stage)	Output power decrease: 50%		○			
157-2	Abnormal common rail pressure (Pump over-pressure)	Output power decrease: 50%		○			
633-7	Pressure limiter open	Output power decrease: 50%		○			
1240-1	No pressure to pump (Fuel leakage)	Output power decrease: 50%		○			
1239-1	No pressure to pump (Fuel leakage)			○			

### Operating Rank

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

## TROUBLESHOOTING/ Troubleshooting A

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## TROUBLESHOOTING/ Troubleshooting A

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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 <sup>-1</sup>

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.



## TROUBLESHOOTING/ Troubleshooting A

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 <sup>-1</sup> or more.	Mistake of gear change, etc.	P0219

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
There is no influence when operating the machine.	Nothing special	P0650
The engine cannot start.	Nothing	P1625
Electrical power is kept supplying to the machine.	Nothing	

## TROUBLESHOOTING/ Troubleshooting A

Fault Code	Trouble	Influence to Engine Performance (Presumption)	Operating Ranke (Current)				Remark
			A	B	C	D	
110-0	Overheating	No output power change	○				
190-0	Overrunning	No output power change	○				

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

**Operating Rank**

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

## TROUBLESHOOTING/ Troubleshooting A

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## TROUBLESHOOTING/ Troubleshooting A

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

## TROUBLESHOOTING/ Troubleshooting A

Presumptive Symptoms in Real Machine Operation	Assumptive Conditions at Backup	Fault Code (Tech 2)
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed may occur, the engine may be stalled.	The injector cannot be controlled. → Stop output of drive signal at broken common side (Protect the engine from damage)	P0611
		P0612
Output power decrease, dark smoke occur.	All analogue sensor cannot be used.	P1630
Output power decrease	CPU is broken.	P0606
The engine cannot start.		P0606
Output power decrease	Sub CPU is broken.	P0606
The engine stops.	Data of ROM cannot be read.	P0601
There is no influence when operating the machine.	Data cannot be written to EEPROM.	P0603
Same as Abnormal accelerator Sensor	←	P1631
Same as Abnormal atmospheric and in-take temperature sensors	←	P1632
Same as Abnormal coolant temperature, fuel temperature and hydraulic oil pressure sensors	←	P1633
Same as Abnormal boost pressure and boost temperature sensors	←	P1634
Same as Abnormal rail pressure and EGR position sensors	←	P1635
Vibration of the engine may be large, Rough idle, output power decrease may occur, faulty increasing of rotation speed may occur, the engine may be stalled.	The injector cannot be controlled. → Stop output of drive signal at broken common side (Protect the engine from damage)	P1261
		P1262

## TROUBLESHOOTING/ Troubleshooting A

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

### Operating Rank

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

## TROUBLESHOOTING/ Troubleshooting A

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## TROUBLESHOOTING/ Troubleshooting A

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### Communication System

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



## TROUBLESHOOTING/ Troubleshooting A

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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

## TROUBLESHOOTING/ Troubleshooting A

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Fault Code	Trouble	Influence to Engine Performance (Presumption)	Operating Rank (Current)				Remark
			A	B	C	D	
639-2	Abnormal CAN Bus Line	Idle speed	○				
639-3	Abnormal CAN Time Out		○				

## TROUBLESHOOTING/ Troubleshooting A

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## TROUBLESHOOTING/ Troubleshooting A



### ICF

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

## TROUBLESHOOTING/ Troubleshooting A

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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.  <i>NOTE: When initialising the information C/U, all stored data is deleted.</i>
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.  <i>NOTE: When initialising the information C/U, all stored data is deleted.</i>
14003-2	As ICF may be broken, replace ICF.
14006-2	Check for the items below. <ol style="list-style-type: none"><li>1. Check if the communication line is abnormal.</li><li>2. Check if the electrical power source of communication terminal is abnormal.<ul style="list-style-type: none"><li>• Electrical power source</li><li>• Fuses</li></ul></li><li>3. Check if the satellite terminal is broken.</li></ol>
14008-2	Re-try in the troubleshooting by using Dr.ZX. If the error code is displayed after re-try, ICF may be broken.

## TROUBLESHOOTING/ Troubleshooting A

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### Satellite Terminal

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

## TROUBLESHOOTING/ Troubleshooting A

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Fault Code	Remedy
14100-2	Replace the controller.
14101-2	Replace the controller.
14102-2	Check communication aerial of satellite terminal.
14103-2	Check communication aerial of satellite terminal.
14104-2	Replace the controller.
14105-2	Replace the controller.
14106-2	Replace the controller.

## TROUBLESHOOTING/ Troubleshooting A

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### Monitor Unit

Fault Code	Trouble	Cause
13303-2	Abnormal Thermister Temperature	Thermister temperature is 85 °C (185 °F) or higher.
13304-2	Abnormal REG Input H Level	During REG input H level
13306-2	Abnormal EEPROM	When failure reading EEPROM occurs
13308-2	Abnormal CAN Communication	Bus off occurs beyond five times.
13310-3	Shorted circuit in Coolant Temperature Sensor	The state, input $105\pm 30 \Omega$ or less, is kept over 60 seconds.
13311-3	Shorted circuit in Fuel Level Sensor	The state, input $3\pm 1 \Omega$ or less, is kept over 60 seconds.
13311-4	Open circuit in Fuel Level Sensor	The state, input $135\pm 20 \Omega$ or less, is kept over 60 seconds.



## TROUBLESHOOTING/ Troubleshooting A

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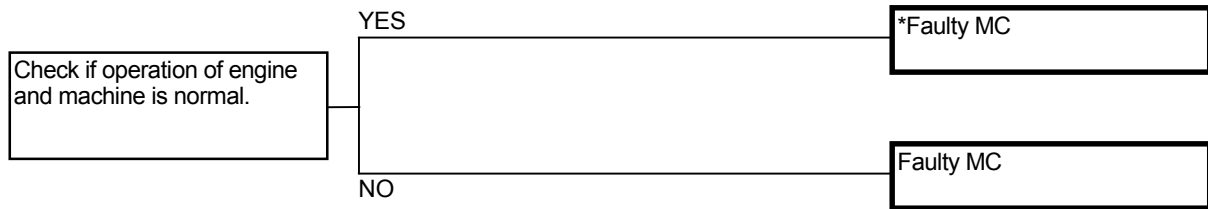
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Fault Code	Remedy
13303-2	Cool the monitor unit and so on until temperature inside the monitor unit is less than 85 °C (185 °F).
13304-2	(Refer to the Troubleshooting flow chart.)
13306-2	If this fault code is displayed after retarial, replace the monitor unit.
13308-2	Refer to “Check CAN Harness” on page T5-5-54.
13310-3	Check coolant temperature sensor and harness.
13311-3	Check fuel level sensor and harness.
13311-4	Check fuel level sensor and harness.

## TROUBLESHOOTING / Troubleshooting A

### 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

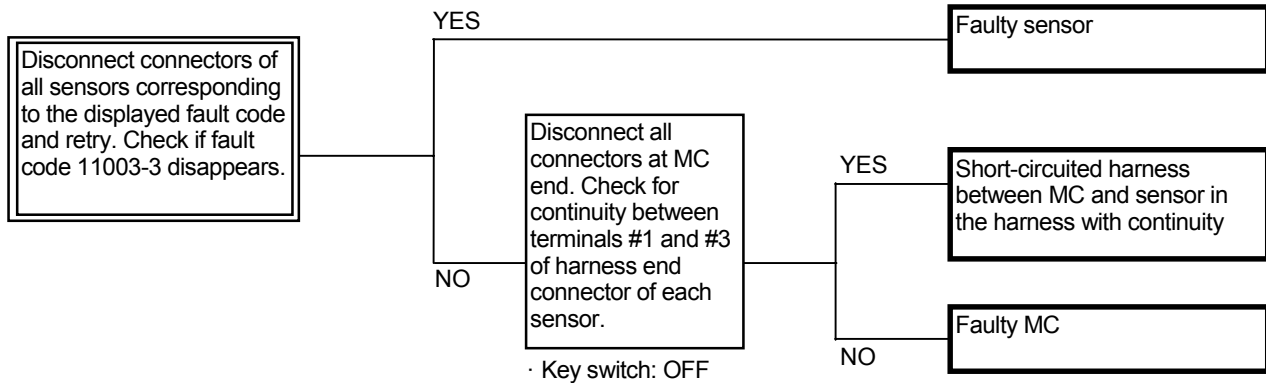


\* When the fault code is displayed in the result of retrial and If operation of engine and machine is normal, the machine can be used.

## TROUBLESHOOTING / Troubleshooting A

### MC FAULT CODE 11003

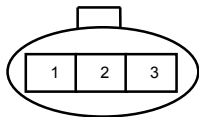
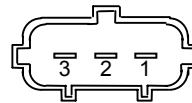
Fault Code	Trouble	Cause	Influenced Control
11003-3	Abnormal Sensor Voltage	Faulty MC	All Control



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

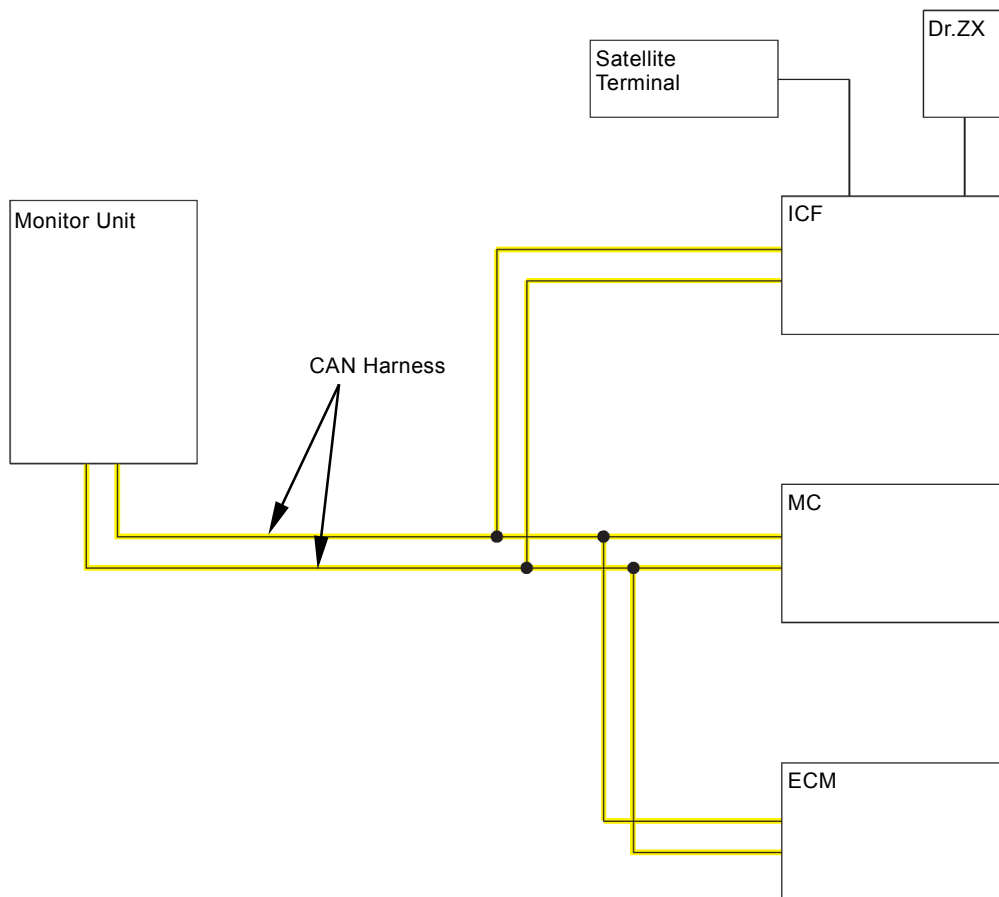
- Pump 1 Delivery Pressure Sensor:
- Pump 2 Delivery Pressure Sensor



## TROUBLESHOOTING / Troubleshooting A

### MC FAULT CODE 11004

Fault Code	Trouble	Cause	Influenced Control
11004-2	Abnormal CAN Communication	Faulty MC	<ul style="list-style-type: none"> <li>• Speed Sensing Control</li> <li>• Attachment Operation Speed Increase Control</li> <li>• Attachment Operation Speed Limit Control</li> <li>• Pump 1 Flow Rate Limit Control</li> <li>• Pump 2 Flow Rate Limit Control</li> <li>• Attachment Flow Rate Control (Optional)</li> <li>• Attachment Valve Selection (Optional)</li> <li>• CAN Cycle Data Communication</li> </ul>



T1V1-02-01-050

## TROUBLESHOOTING / Troubleshooting A

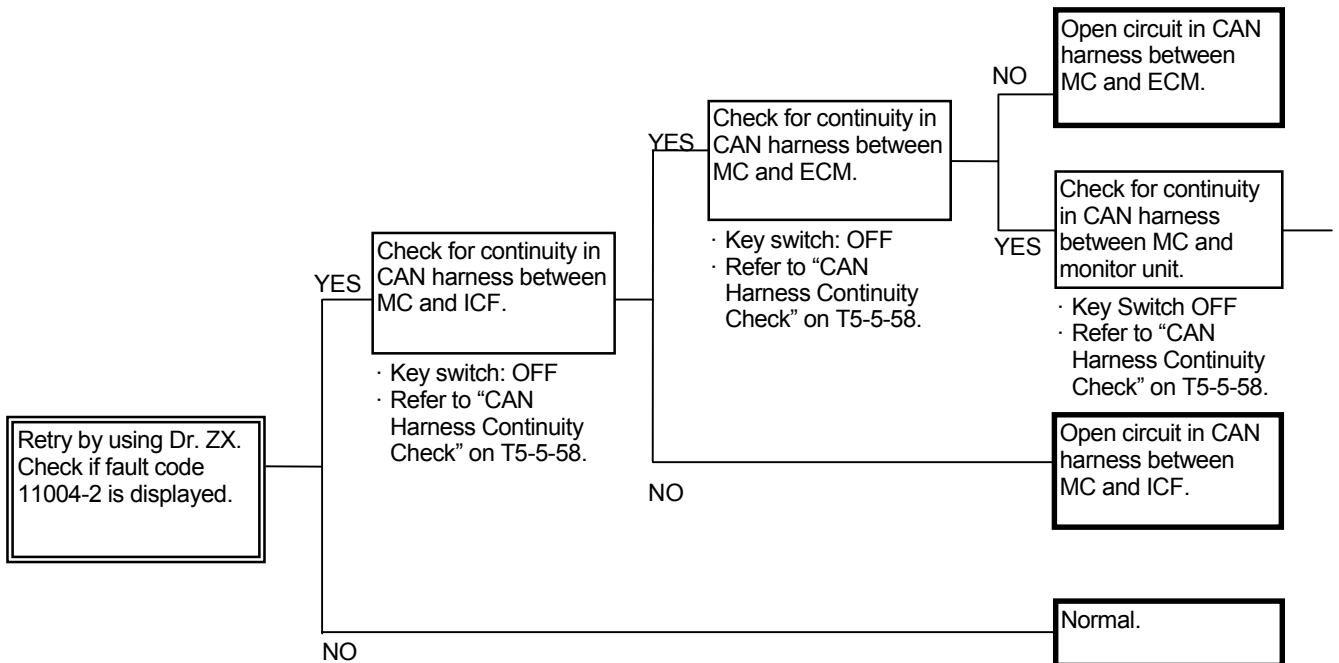
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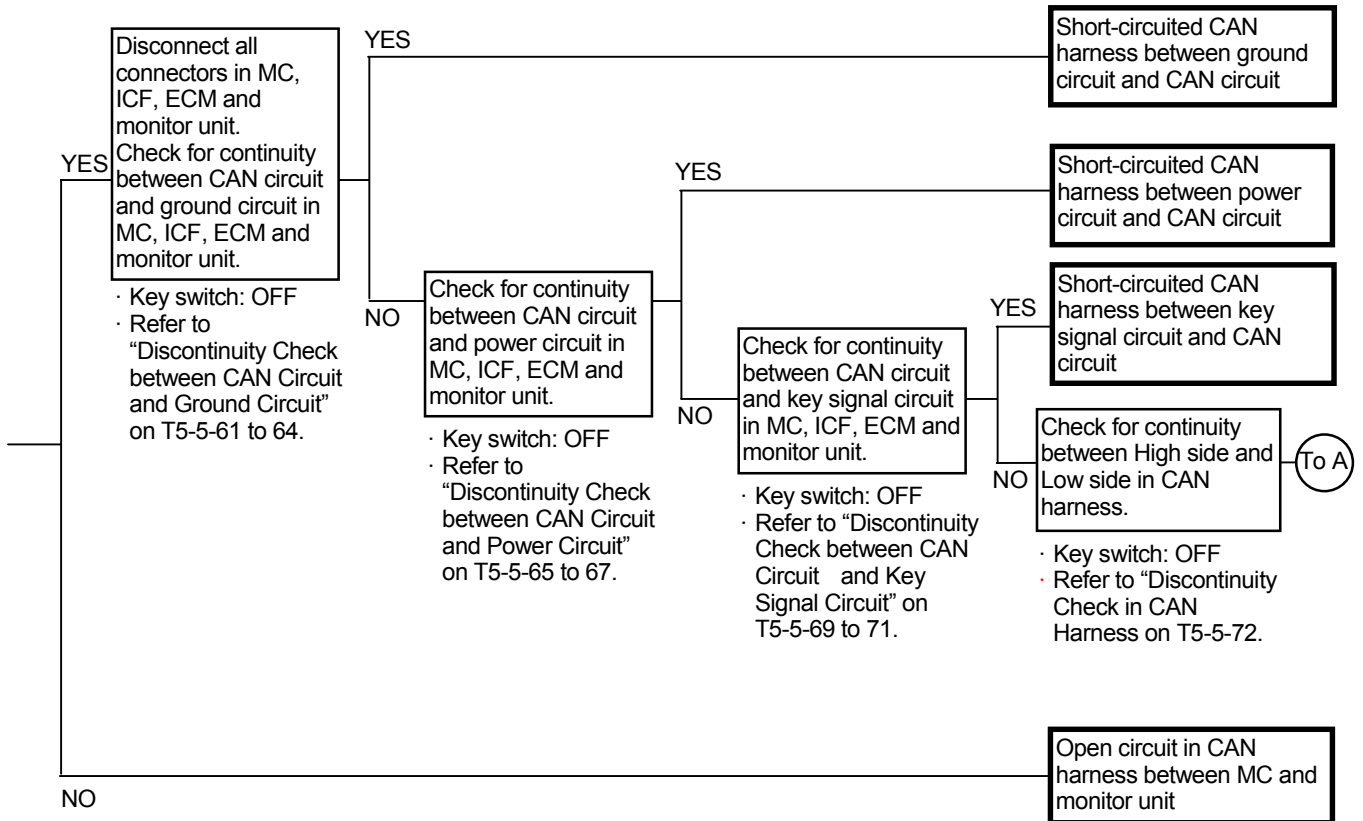
# TROUBLESHOOTING / Troubleshooting A

## CAN HARNESS CHECK

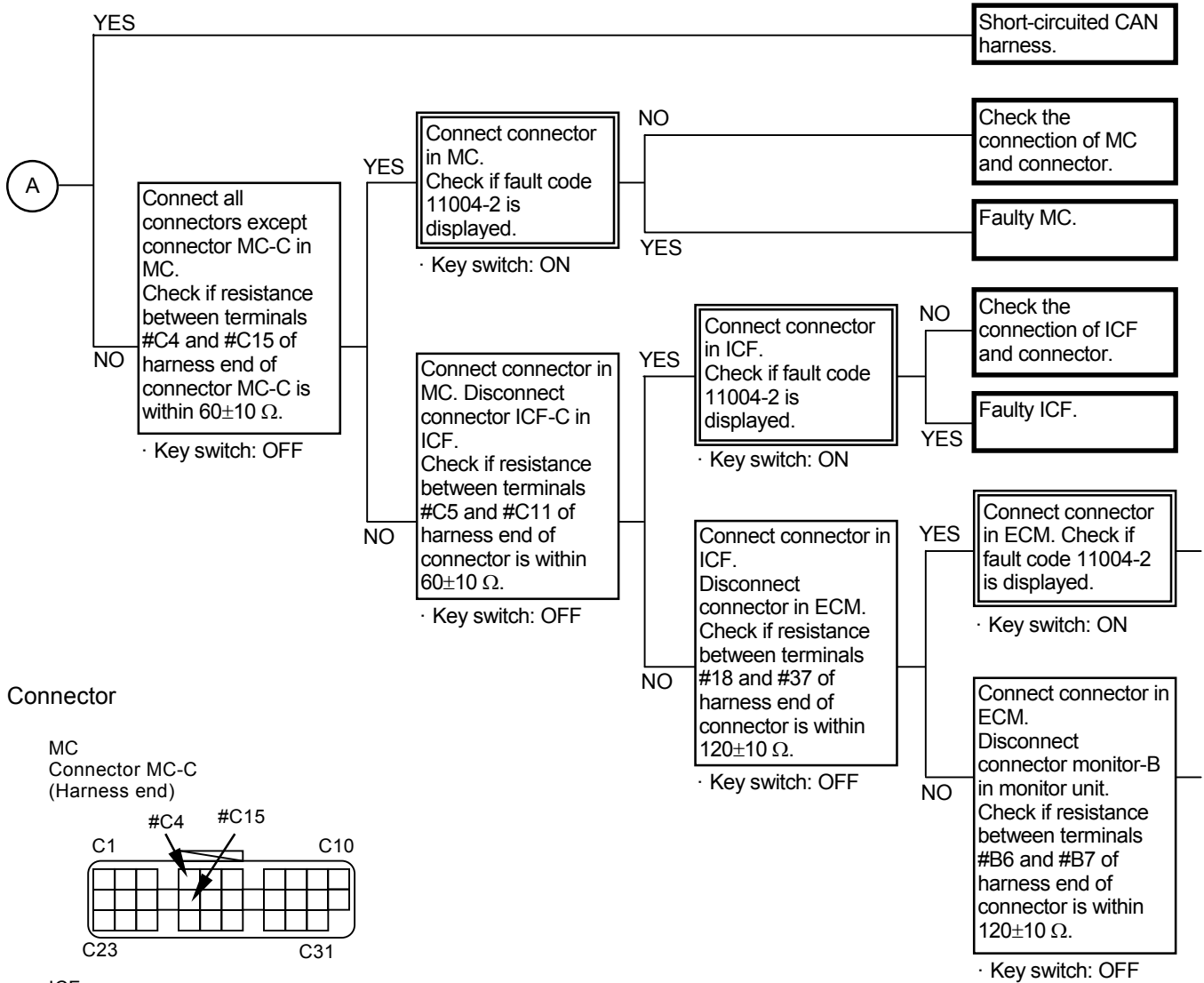
- Check the wiring connections first.



# TROUBLESHOOTING / Troubleshooting A

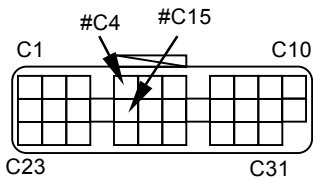


# TROUBLESHOOTING / Troubleshooting A

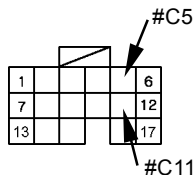


## Connector

MC  
Connector MC-C  
(Harness end)

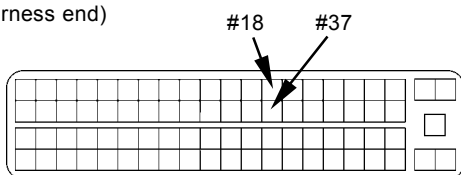


ICF  
Connector ICF-C  
(Harness end)



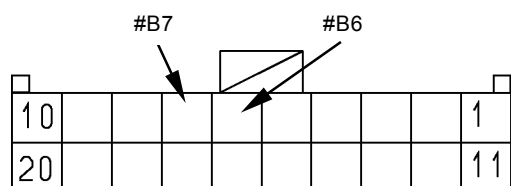
T1V1-05-04-002

ECM  
Connector  
(Harness end)



T1GR-05-04-002

Monitor Unit  
Connector Monitor-B Connector  
(Harness end)

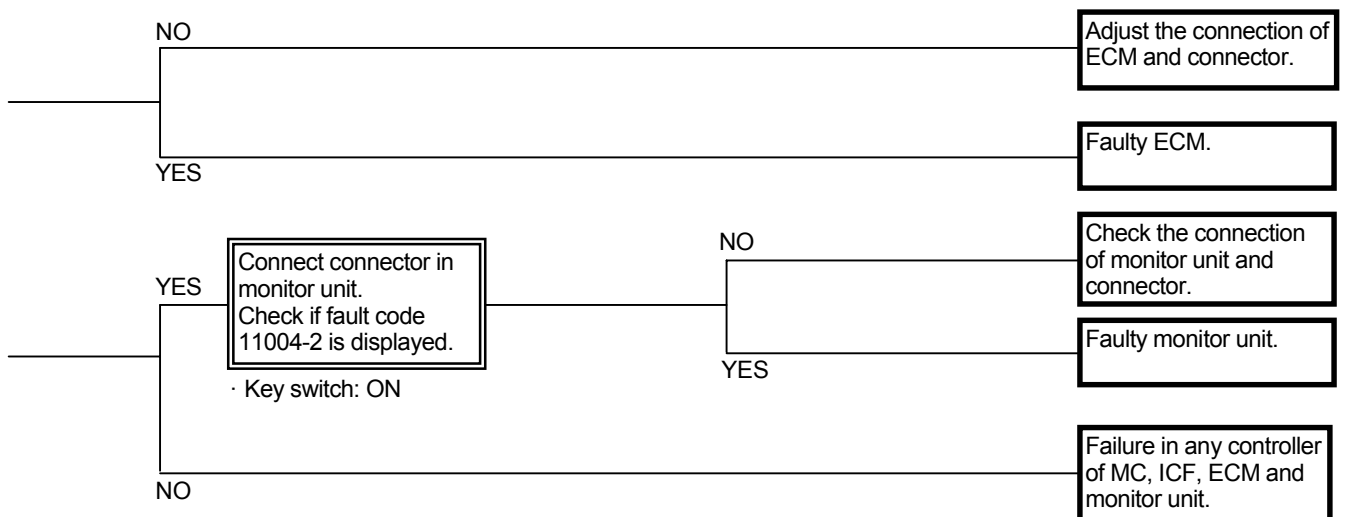


T183-05-04-013



## TROUBLESHOOTING / Troubleshooting A

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# TROUBLESHOOTING / Troubleshooting A

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## Continuity Check in CAN Harness

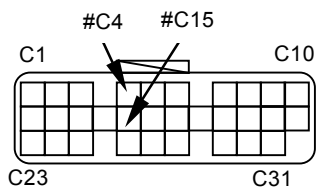
**IMPORTANT: Before continuity check, turn the key switch OFF.**

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

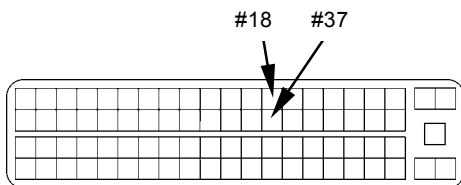
CAN Harness (Low Side)  
Check for continuity between terminal #C15 of harness end of connector MC-C in MC and terminal #37 of harness end of connector in ECM.

### Connector

MC  
Connector MC-C  
(Harness end)



ECM  
Connector  
(Harness end)



T1GR-05-04-002

## TROUBLESHOOTING / Troubleshooting A

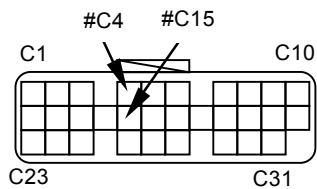
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- Between MC and ICF  
CAN Harness (High Side)  
Check for continuity between terminal #C4 of harness end of connector MC-C in MC and terminal #C5 of harness end of connector ICF-C in ICF.

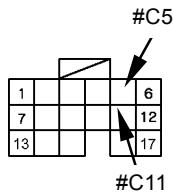
CAN Harness (Low Side)  
Check for continuity between terminal #C15 of harness end of connector MC-C in MC and terminal #C11 of harness end of connector ICF-C in ICF.

### Connector

MC  
Connector MC-C  
(Harness end)



ICF  
Connector ICF-C  
(Harness end)



T1V1-05-04-002

## TROUBLESHOOTING / Troubleshooting A

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- Between MC and Monitor Unit

### CAN Harness (High Side)

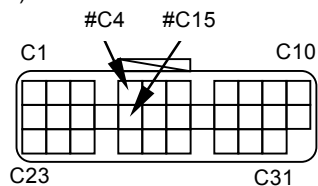
Check for continuity between terminal #C4 of harness end of connector MC-C in MC and terminal #B7 of harness end of connector monitor-B in the monitor unit.

### CAN Harness (Low Side)

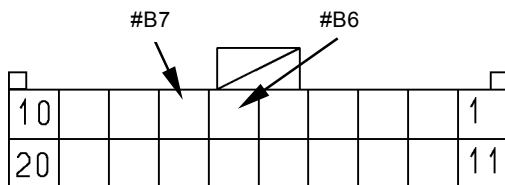
Check for continuity between terminal #C15 of harness end of connector MC-C in MC and terminal #B6 of harness end of connector monitor-B in the monitor unit.

### Connector

MC  
Connector MC-C  
(Harness end)



Monitor Unit  
Connector Monitor-B  
(Harness end)



T183-05-04-013

# TROUBLESHOOTING / Troubleshooting A

## Discontinuity Check between CAN Circuit and Ground Circuit

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

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

• MC

Between CAN Circuit (High Side) and Ground Circuit

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

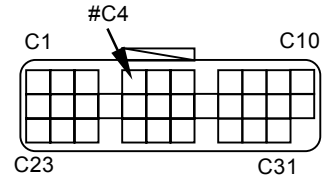
Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #A13 of harness end of connector in MC-A.

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

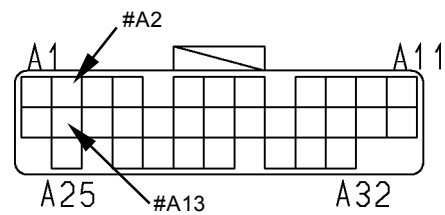
Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B18 of harness end of connector in MC-B.

### Connector

Connector MC-C  
(Harness end)

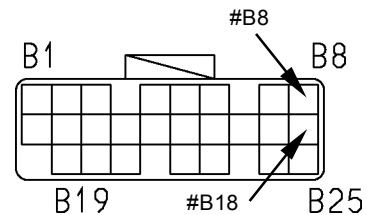


Connector MC-A  
(Harness end)



T183-05-04-008

Connector MC-B  
(Harness end)



T183-05-04-021

# TROUBLESHOOTING / Troubleshooting A

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 connector in MC-A.

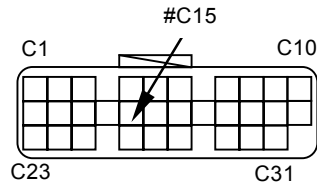
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #A13 of harness end of connector in MC-A.

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

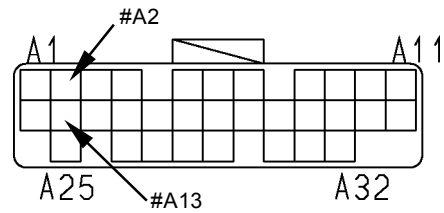
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B18 of harness end of connector in MC-B.

## Connector

Connector MC-C  
(Harness end)

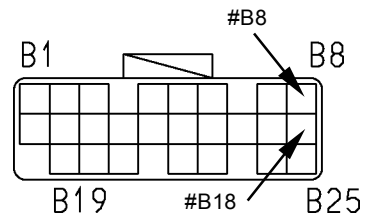


Connector MC-A  
(Harness end)



T183-05-04-008

Connector MC-B  
(Harness end)



T183-05-04-021

## TROUBLESHOOTING / Troubleshooting A

- ECM

Between CAN Circuit (High Side) and Ground Circuit

Check for continuity between terminals #18 and #1 of harness end of connector.

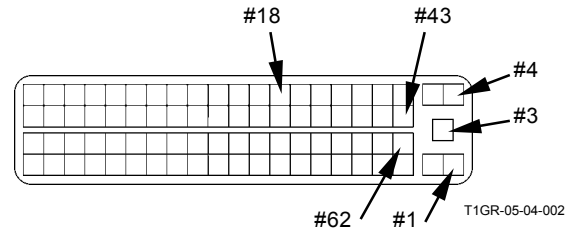
Check for continuity between terminals #18 and #3 of harness end of connector.

Check for continuity between terminals #18 and #4 of harness end of connector.

Check for continuity between terminals #18 and #43 of harness end of connector.

Check for continuity between terminals #18 and #62 of harness end of connector.

ECM  
Connector  
(Harness end)



Between CAN Circuit (Low Side) and Ground Circuit

Check for continuity between terminals #37 and #1 of harness end of connector.

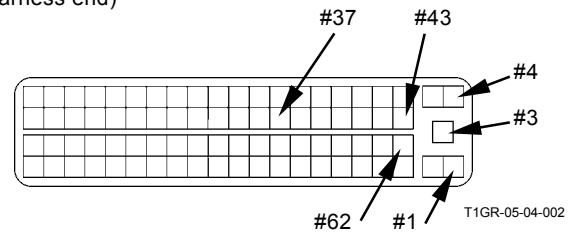
Check for continuity between terminals #37 and #3 of harness end of connector.

Check for continuity between terminals #37 and #4 of harness end of connector.

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

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

ECM  
Connector  
(Harness end)



# TROUBLESHOOTING / Troubleshooting A

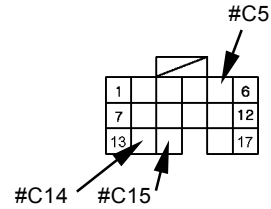
- ICF

Between CAN Circuit (High Side) and Ground Circuit

Check for continuity between terminals #C5 and #C14 of harness end of connector ICF-C.

Check for continuity between terminals #C5 and #C15 of harness end of connector ICF-C.

ICF  
Connector ICF-C  
(Harness end)



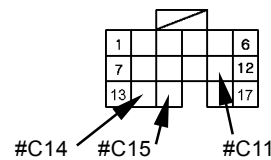
T1V1-05-04-002

Between CAN Circuit (Low Side) and Ground Circuit

Check for continuity between terminals #C11 and #C14 of harness end of connector ICF-C.

Check for continuity between terminals #C11 and #C15 of harness end of connector ICF-C.

ICF  
Connector ICF-C  
(Harness end)



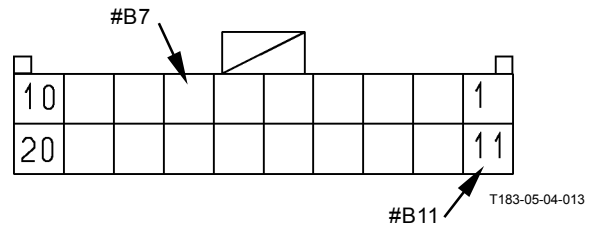
T1V1-05-04-002

- Monitor Unit

Between CAN Circuit (High Side) and Ground Circuit

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

Monitor Unit  
Connector Monitor-B  
(Harness end)

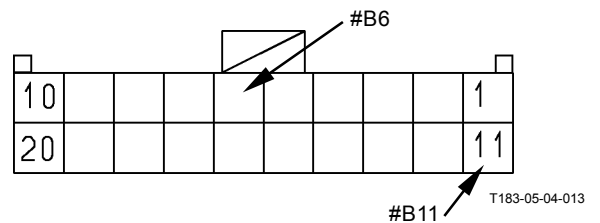


T183-05-04-013

Between CAN Circuit (Low Side) and Ground Circuit

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

Monitor Unit  
Connector Monitor-B  
(Harness end)



T183-05-04-013



# TROUBLESHOOTING / Troubleshooting A

## Discontinuity Check between CAN Circuit and Power Circuit

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

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

- MC  
Between CAN Circuit (High Side) and Power Circuit  
Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #A1 of harness end connector MC-A.

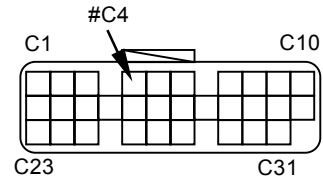
Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #A12 of harness end connector MC-A.

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

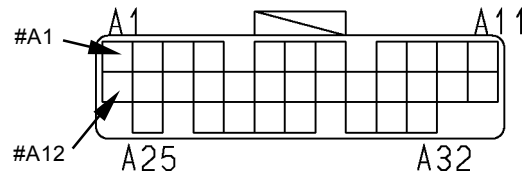
Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B17 of harness end connector MC-B.

### Connector

Connector MC-C  
(Harness end)

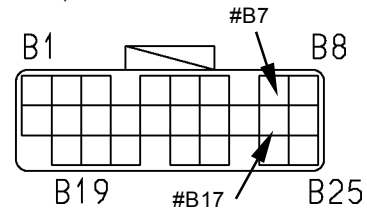


Connector MC-A  
(Harness end)



T183-05-04-008

Connector MC-B  
(Harness end)



T183-05-04-021

# TROUBLESHOOTING / Troubleshooting A

Between CAN Circuit (Low Side) and Power Circuit

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

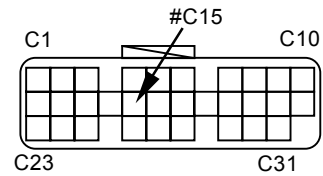
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #A12 of harness end connector MC-A.

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

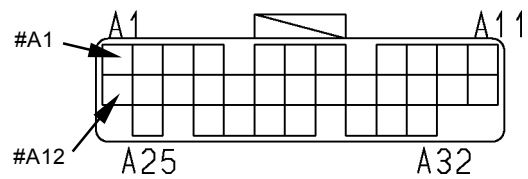
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B17 of harness end connector MC-B.

## Connector

Connector MC-C  
(Harness end)

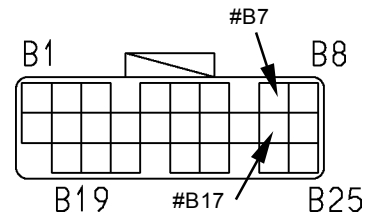


Connector MC-A  
(Harness end)



T183-05-04-008

Connector MC-B  
(Harness end)



T183-05-04-021

# TROUBLESHOOTING / Troubleshooting A

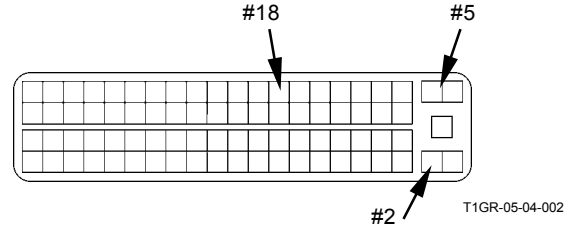
- ECM

Between CAN Circuit (High Side) and Power Circuit

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

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

ECM  
Connector  
(Harness end)

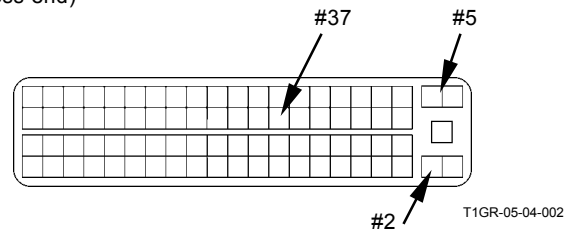


Between CAN Circuit (Low Side) and Power Circuit

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)



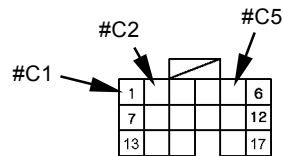
- ICF

Between CAN Circuit (High Side) and Power Circuit

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

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

ICF  
Connector ICF-C  
(Harness end)

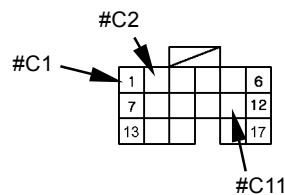


Between CAN Circuit (Low Side) and Power Circuit

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)



# TROUBLESHOOTING / Troubleshooting A

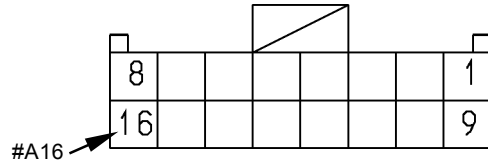
---

- Monitor Unit

Between CAN Circuit (High Side) and Power Circuit

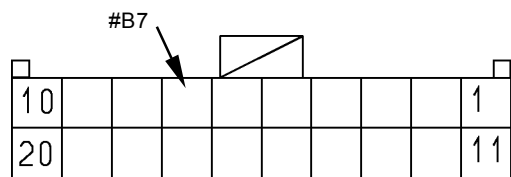
Check for continuity between terminal #B7 of harness end of connector in the monitor unit and terminal #A16 of harness end of connector monitor-A in the monitor unit.

Monitor Unit  
Connector Monitor-A  
(Harness end)



T183-05-05-001

Monitor Unit  
Connector Monitor-B  
(Harness end)

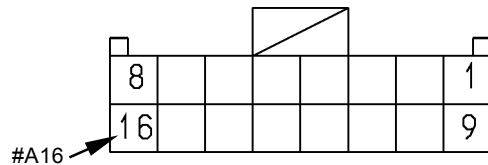


T183-05-04-013

Between CAN Circuit (Low Side) and Power Circuit

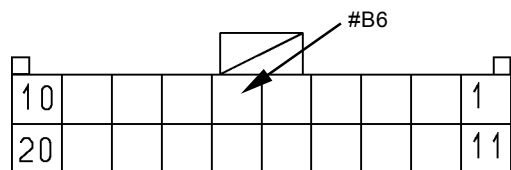
Check for continuity between terminal #B6 of harness end of connector in the monitor unit and terminal #A16 of harness end of connector monitor-A in the monitor unit.

Monitor Unit  
Connector Monitor-A  
(Harness end)



T183-05-05-001

Monitor Unit  
Connector Monitor-B  
(Harness end)



T183-05-04-013

# TROUBLESHOOTING / Troubleshooting A

## 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

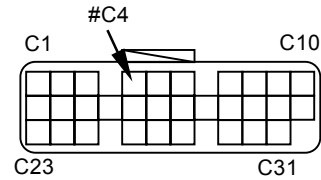
Check for continuity between terminal #C4 of harness end of connector MC-C and terminal #B16 of harness end of connector MC-B.

Between CAN Circuit (Low Side) and Key Signal Circuit

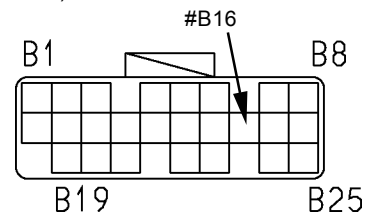
Check for continuity between terminal #C15 of harness end of connector MC-C and terminal #B16 of harness end of connector MC-B.

### Connector

Connector MC-C  
(Harness end)



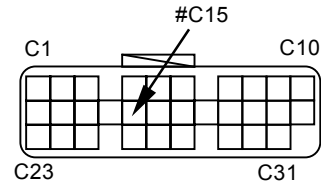
Connector MC-B  
(Harness end)



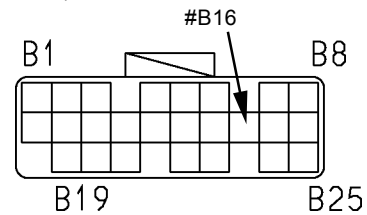
T183-05-04-021

### Connector

Connector MC-C  
(Harness end)



Connector MC-B  
(Harness end)



T183-05-04-021

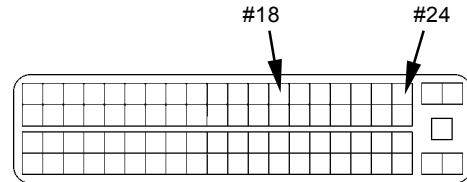
# TROUBLESHOOTING / Troubleshooting A

- 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)

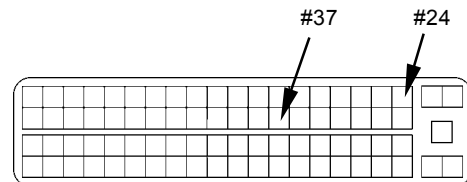


T1GR-05-04-002

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)



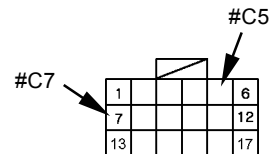
T1GR-05-04-002

- 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)

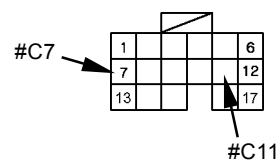


T1V1-05-04-002

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

# TROUBLESHOOTING / Troubleshooting A

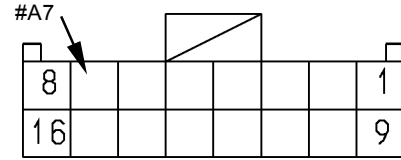
---

- Monitor Unit

Between CAN Circuit (High Side) and Power Circuit

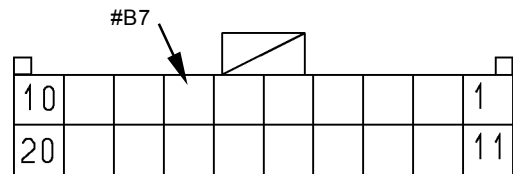
Check for continuity between terminal #B7 of harness end of connector in the monitor unit and terminal #A7 of harness end of connector monitor-A in the monitor unit.

Monitor Unit  
Connector Monitor-A  
(Harness end)



T183-05-05-001

Monitor Unit  
Connector Monitor-B  
(Harness end)

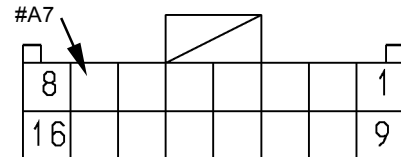


T183-05-04-013

Between CAN Circuit (Low Side) and Power Circuit

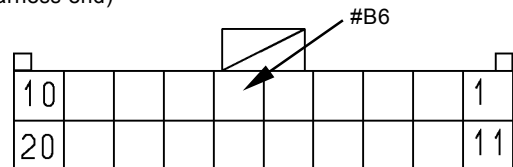
Check for continuity between terminal #B6 of harness end of connector in the monitor unit and terminal #A7 of harness end of connector monitor-A in the monitor unit.

Monitor Unit  
Connector Monitor-A  
(Harness end)



T183-05-05-001

Monitor Unit  
Connector Monitor-B  
(Harness end)



T183-05-04-013

# TROUBLESHOOTING / Troubleshooting A

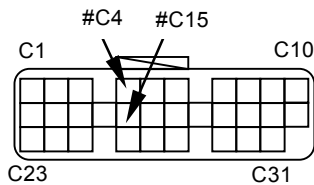
## Discontinuity Check in CAN Harness

**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.

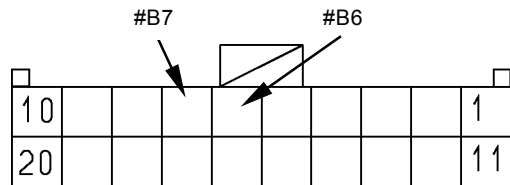
- Connector MC-C  
Check for continuity between terminals #C4 and #C15 of harness end of connector MC-C in MC.

MC  
Connector MC-C  
(Harness end)



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

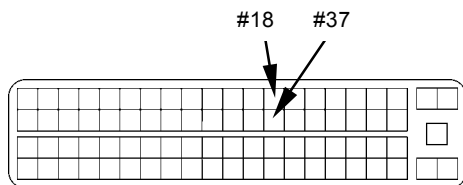
Monitor Unit  
Connector Monitor-B  
(Harness end)



T183-05-04-013

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

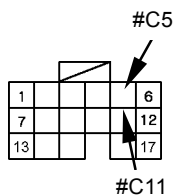
ECM  
Connector  
(Harness end)



T1GR-05-04-002

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

ICF  
Connector ICF-C  
(Harness end)



T1V1-05-04-002



## TROUBLESHOOTING / Troubleshooting A

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### ENGINE FAILURE MC FAULT CODE 11100

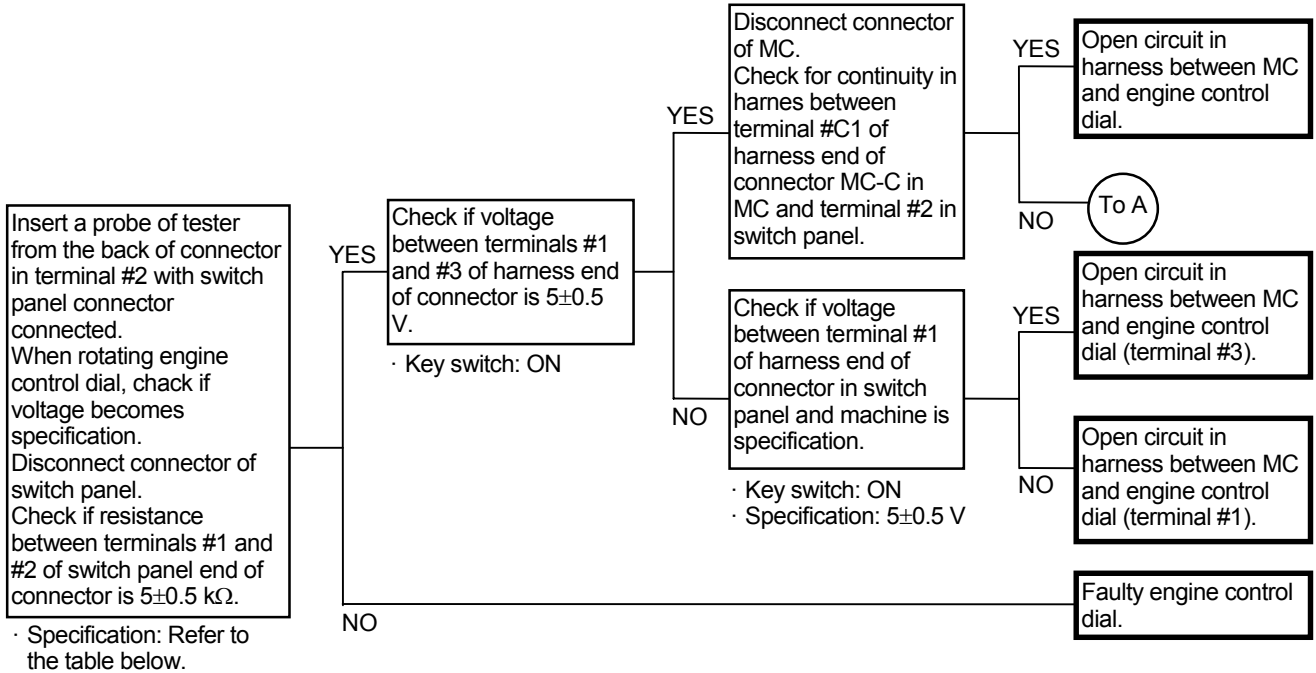
Fault Code	Trouble	Cause	Influenced Control
11100-2	Abnormal Engine Speed	Engine Speed: 4000 min <sup>-1</sup> or faster	Speed Sensing Control

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

# TROUBLESHOOTING / Troubleshooting A

## MC FAULT CODE 11101

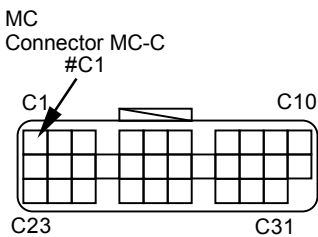
Fault Code	Trouble	Cause	Influenced Control
11101-3	Abnormal Engine Control Dial Sensor High Voltage	Voltage: 4.78 V or higher	Engine Control Dial Control
11101-4	Abnormal Engine Control Dial Sensor Low Voltage	Voltage: Less than 0.22 V	Engine Control Dial Control



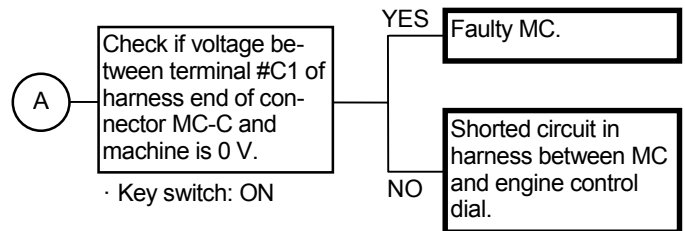
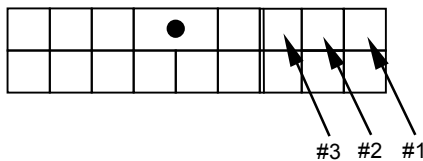
### Specification of Engine Control Dial

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

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



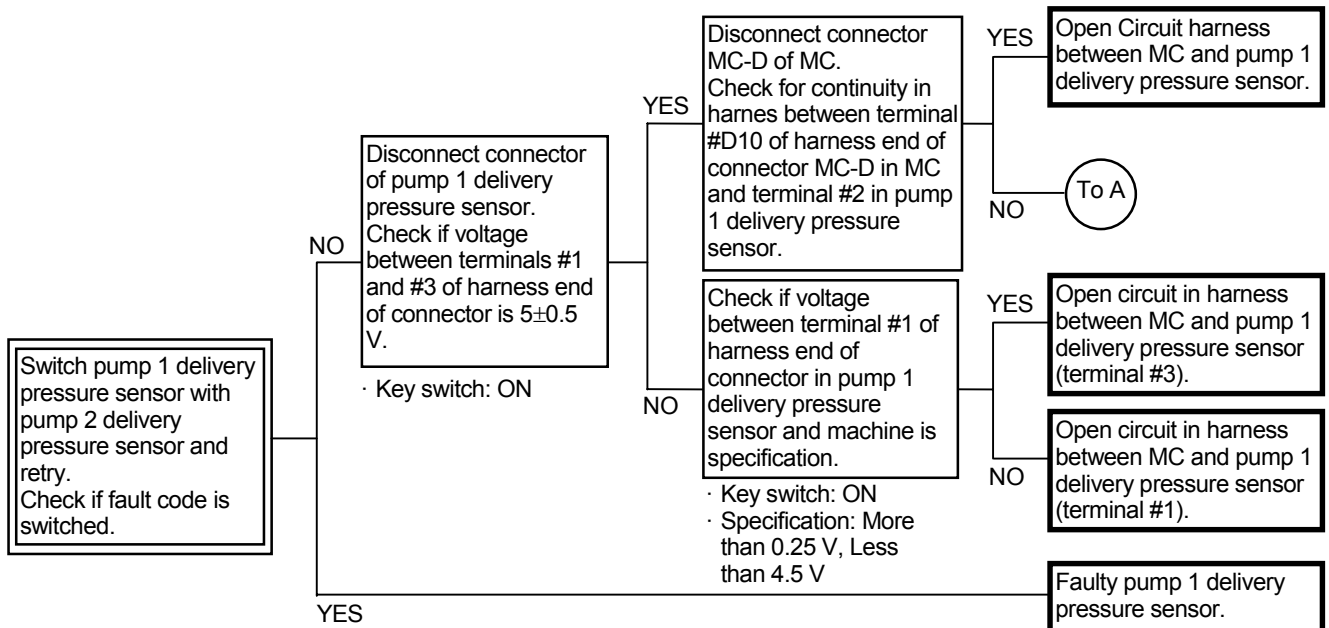
Switch Panel



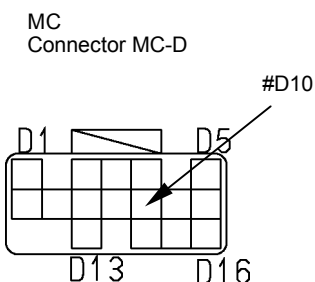
# TROUBLESHOOTING / Troubleshooting A

## PUMP FAILURE MC FAULT CODE 11200

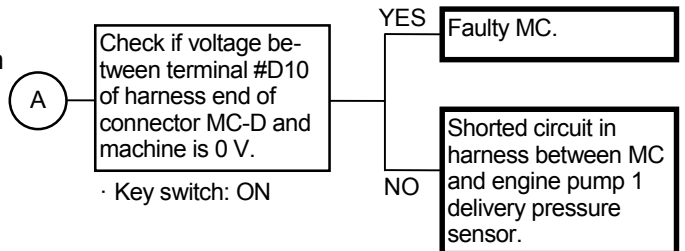
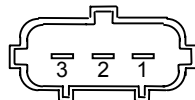
Fault Code	Trouble	Cause	Influenced Control
11200-3	Abnormal Pump 1 Delivery Pressure Sensor High Voltage	Voltage: 4.5 V or higher	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Travel HP Mode Control</li> <li>• E Mode Control</li> <li>• Travel Torque-Up Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Auto-Power Lift Control</li> <li>• Travel Motor Swash Angle Selection Control</li> </ul>
11200-4	Abnormal Pump 1 Delivery Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Travel HP Mode Control</li> <li>• E Mode Control</li> <li>• Travel Torque-Up Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Auto-Power Lift Control</li> <li>• Travel Motor Swash Angle Selection Control</li> </ul>



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



Pump 1 Delivery Pressure Sensor

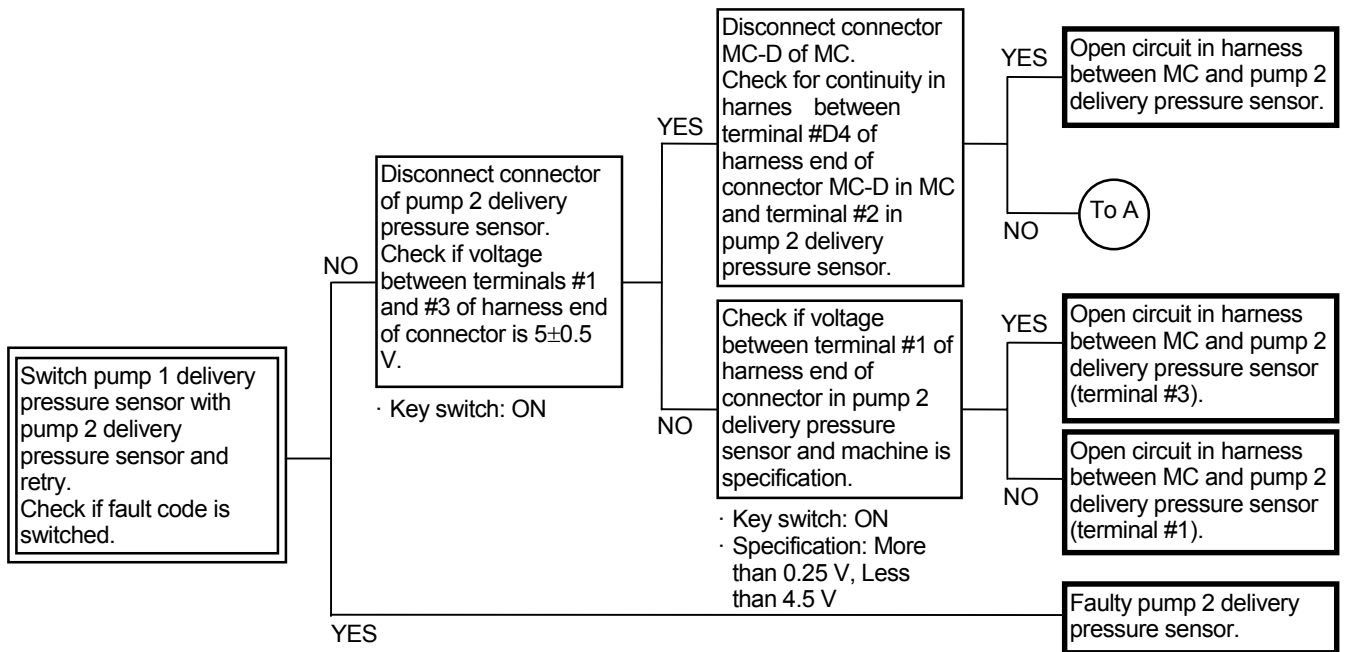


T183-05-04-009

# TROUBLESHOOTING / Troubleshooting A

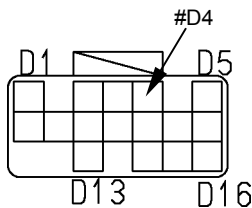
## MC FAULT CODE 11202

Fault Code	Trouble	Cause	Influenced Control
11202-3	Abnormal Pump 2 Delivery Pressure Sensor High Voltage	Voltage: 4.5 V or higher	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Travel HP Mode Control</li> <li>• E Mode Control</li> <li>• Travel Torque-Up Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Travel Motor Swash Angle Selection Control</li> </ul>
11202-4	Abnormal Pump 2 Delivery Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Travel HP Mode Control</li> <li>• E Mode Control</li> <li>• Travel Torque-Up Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Travel Motor Swash Angle Selection Control</li> </ul>

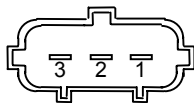


Connector (Harness end of connector viewed from the open side)

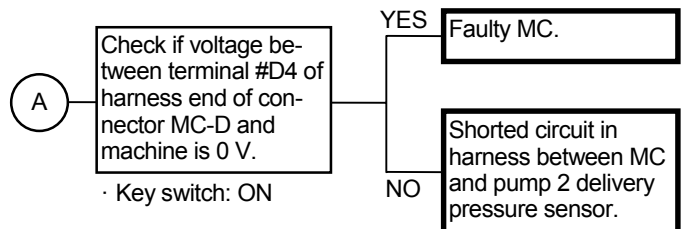
MC  
Connector MC-D



Pump 2 Delivery Pressure Sensor



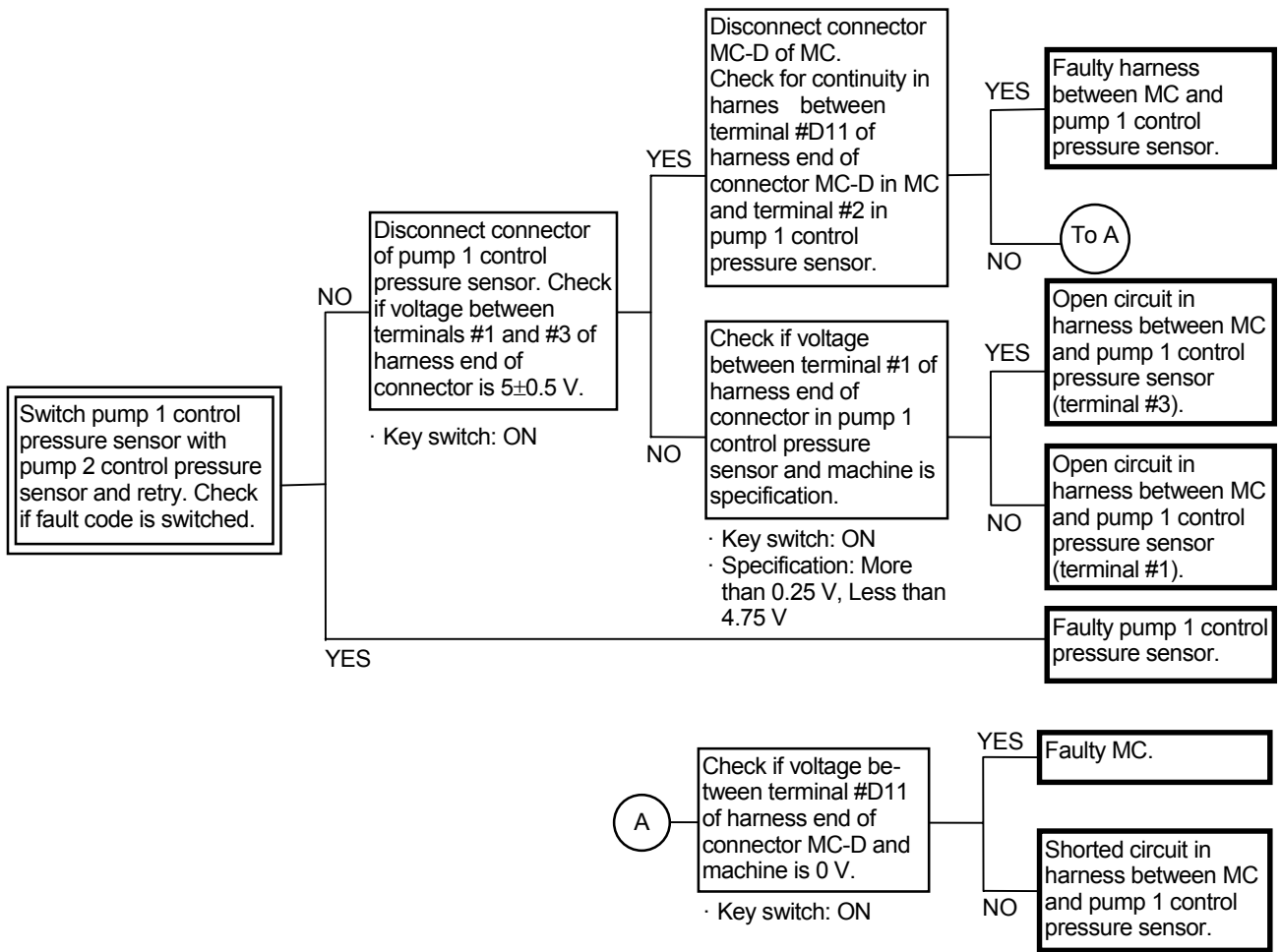
T183-05-04-009



# TROUBLESHOOTING / Troubleshooting A

## MC FAULT CODE 11206

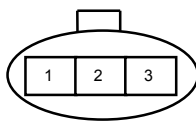
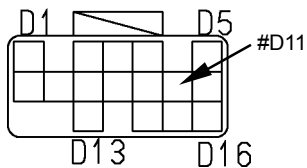
Fault Code	Trouble	Cause	Influenced Control
11206-3	Abnormal Pump 1 Control Pressure Sensor High Voltage	Voltage: 4.75 V or higher	<ul style="list-style-type: none"> <li>E Mode Control</li> <li>Travel Motor Swash Angle Selection Control</li> </ul>
11206-4	Abnormal Pump 1 Control Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>E Mode Control</li> <li>Travel Motor Swash Angle Selection Control</li> </ul>



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

MC  
Connector MC-D

Pump 1 Control Pressure Sensor

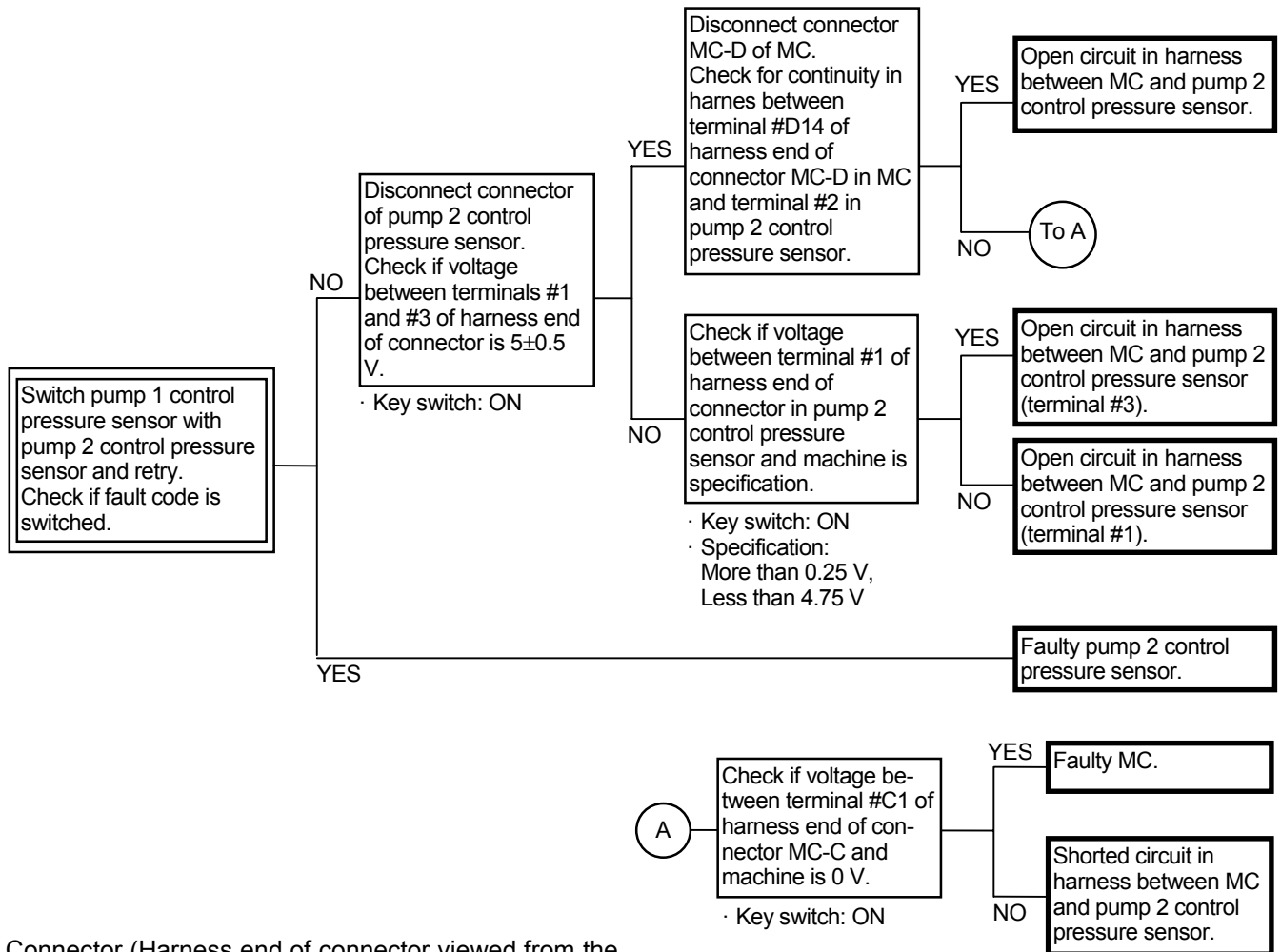


T183-05-04-009

# TROUBLESHOOTING / Troubleshooting A

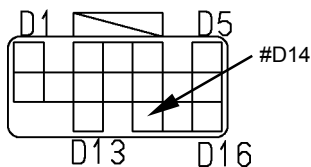
## MC FAULT CODE 11208

Fault Code	Trouble	Cause	Influenced Control
11208-3	Abnormal Pump 2 Control Pressure Sensor High Voltage	Voltage: 4.75 V or higher	<ul style="list-style-type: none"> <li>E Mode Control</li> <li>Travel Motor Swash Angle Selection Control</li> </ul>
11208-4	Abnormal Pump 2 Control Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>E Mode Control</li> <li>Travel Motor Swash Angle Selection Control</li> </ul>

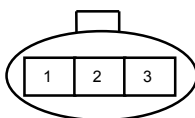


Connector (Harness end of connector viewed from the open side)

MC Connector MC-D



Pump Control Pressure Sensor

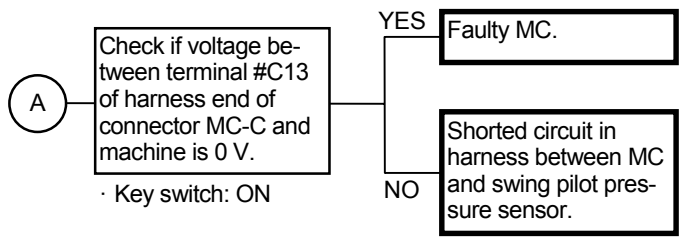
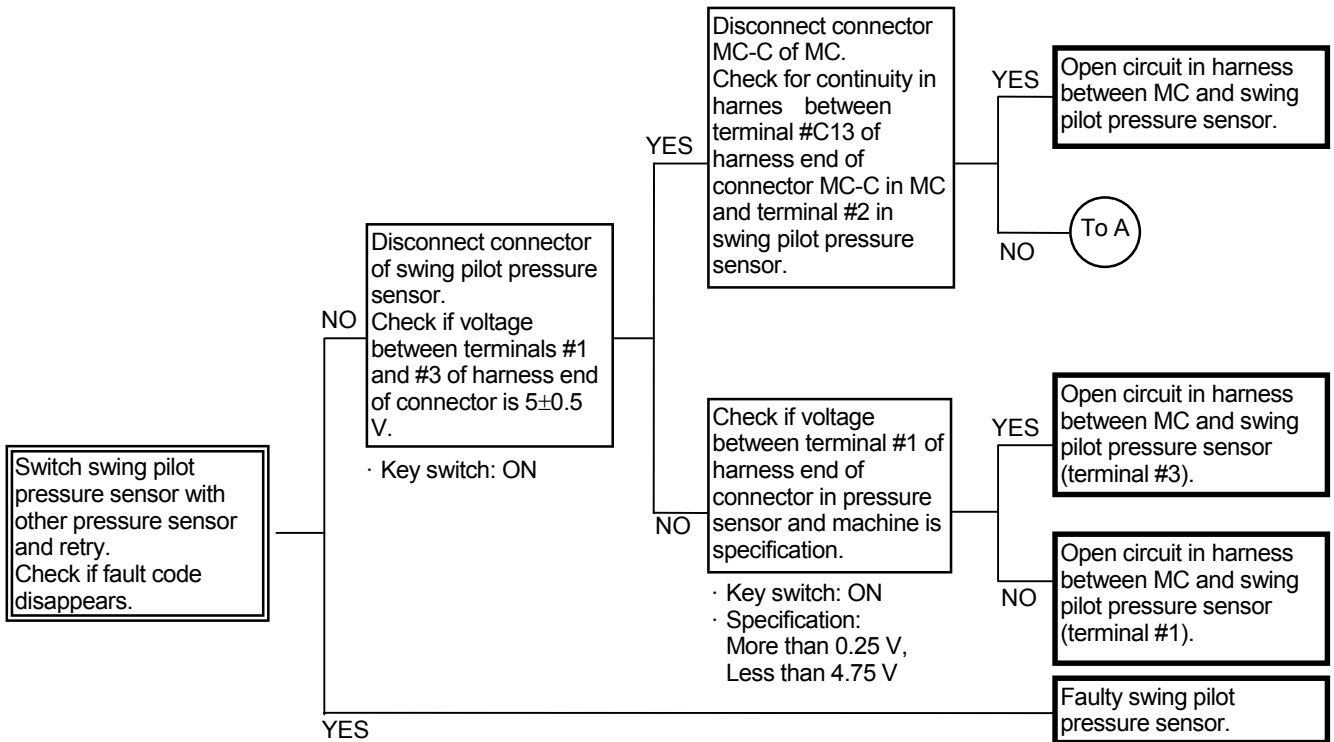


T183-05-04-009

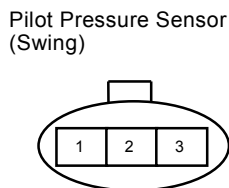
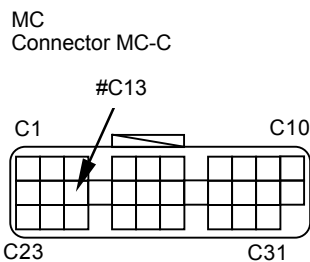
# TROUBLESHOOTING / Troubleshooting A

## 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	<ul style="list-style-type: none"> <li>• Arm Regenerative Control</li> <li>• Attachment Flow Rate Control</li> <li>• Swing Alarm Control</li> </ul>
11301-4	Abnormal Swing Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• Arm Regenerative Control</li> <li>• Attachment Flow Rate Control</li> <li>• Swing Alarm Control</li> </ul>



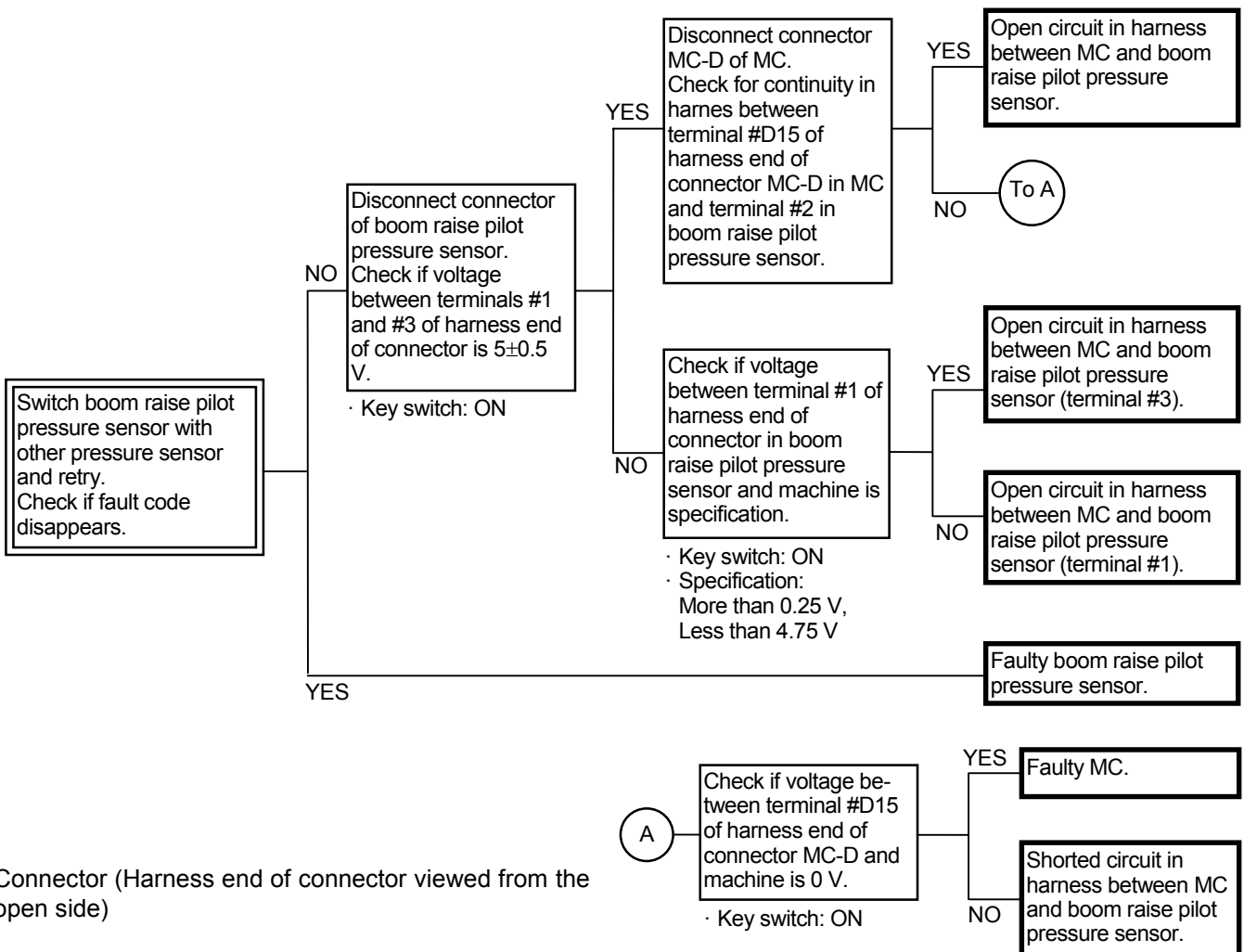
Connector (Harness end of connector viewed from the open side)



# TROUBLESHOOTING / Troubleshooting A

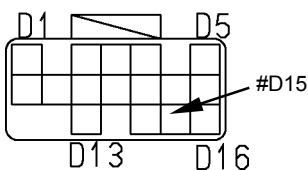
## MC FAULT CODE 11302

Fault Code	Trouble	Cause	Influenced Control
11302-3	Abnormal Boom Raise Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Auto-Power Lift Control</li> <li>• Attachment Flow Rate Control</li> </ul>
11302-4	Abnormal Boom Raise Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Auto-Power Lift Control</li> <li>• Attachment Flow Rate Control</li> </ul>

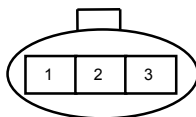


Connector (Harness end of connector viewed from the open side)

MC  
Connector MC-D



Pilot Pressure Sensor (Boom Raise)



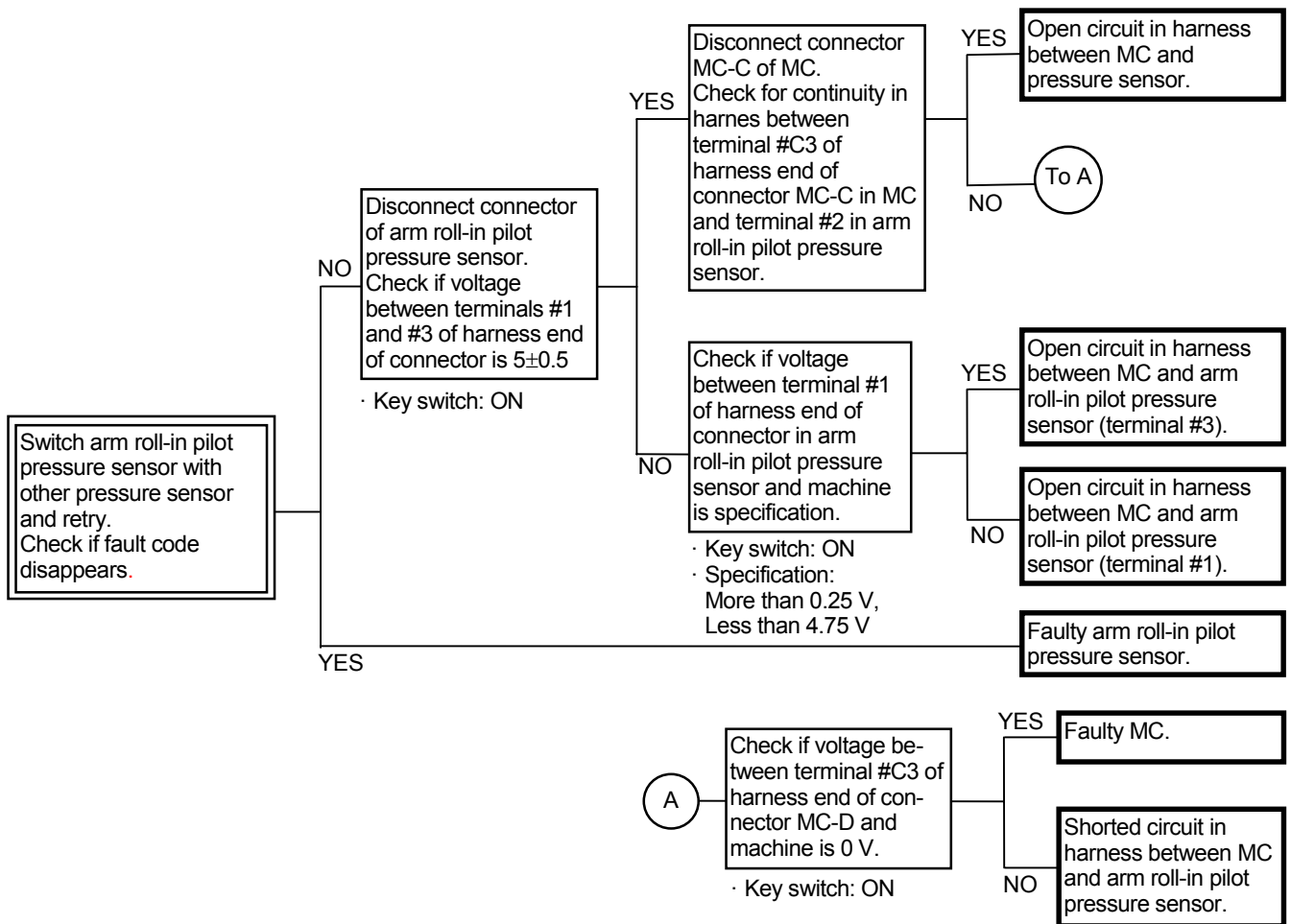
T183-05-04-009



# TROUBLESHOOTING / Troubleshooting A

## MC FAULT CODE 11303

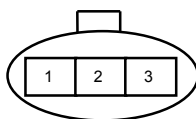
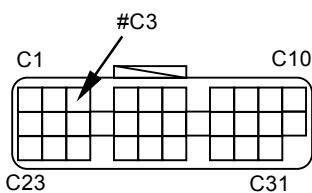
Fault Code	Trouble	Cause	Influenced Control
11303-3	Abnormal Arm Roll-In Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Auto-Power Lift Control</li> </ul>
11303-4	Abnormal Arm Roll-In Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• HP Mode Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> <li>• Auto-Power Lift Control</li> </ul>



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

MC  
Connector MC-C

Pilot Pressure Sensor  
(Arm Roll-In)

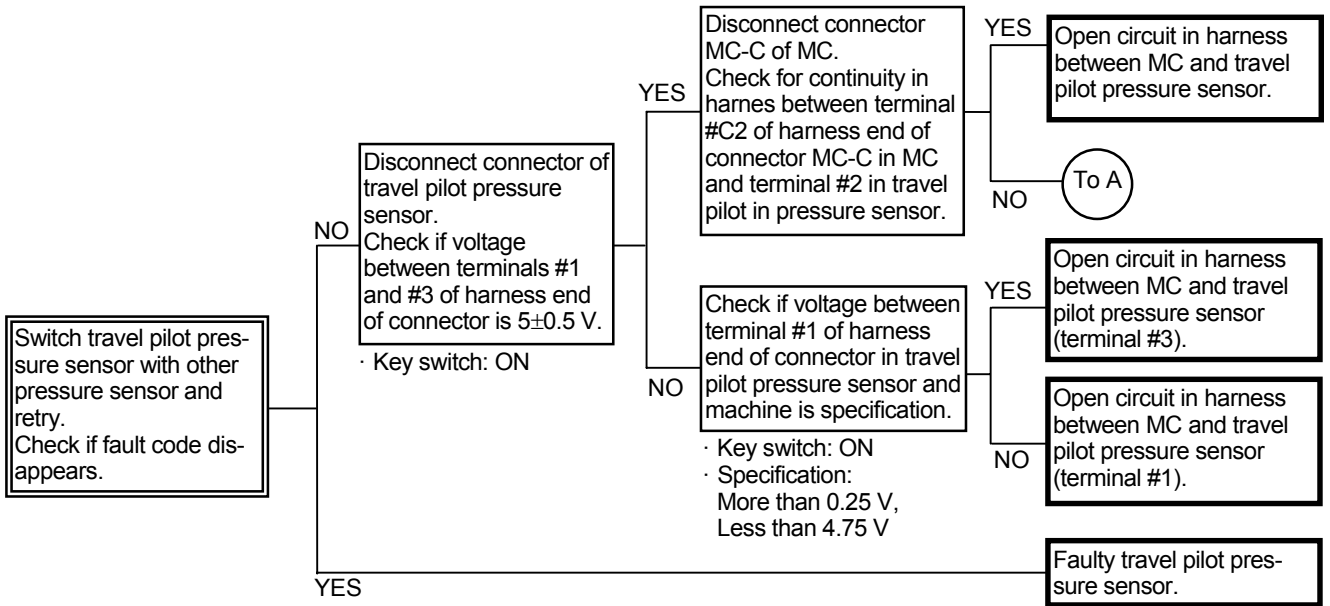


## TROUBLESHOOTING / Troubleshooting A

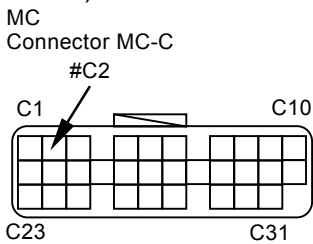
### MC FAULT CODE 11304

Fault Code	Trouble	Cause	Influenced Control
11304-3	Abnormal Travel Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	<ul style="list-style-type: none"> <li>• Auto-Idle Control</li> <li>• Idle Speed-Up Control</li> <li>• ECO Control</li> <li>• Travel HP Mode Control</li> <li>• Travel Torque-Up Control</li> <li>• Pump 1 Flow Rate Limit Control</li> <li>• Pump 1 Flow Rate Control Valve at Travel (ZX160-3 Class Only)</li> <li>• Pump 2 Flow Rate Limit Control</li> <li>• Pump 2 Flow Rate Control Valve at Travel (ZX160-3 Class Only)</li> <li>• Travel Motor Swash Angle Control</li> <li>• Attachment Flow Rate Control</li> <li>• Travel Alarm Control</li> </ul>
11304-4	Abnormal Travel Pilot Pressure Sensor Low Voltage	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• Auto-Idle Control</li> <li>• Idle Speed-Up Control</li> <li>• ECO Control</li> <li>• Travel HP Mode Control</li> <li>• Travel Torque-Up Control</li> <li>• Pump 1 Flow Rate Limit Control</li> <li>• Pump Flow Rate Control Valve at Travel (ZX160-3 Class Only)</li> <li>• Pump 2 Flow Rate Limit Control</li> <li>• Pump Flow Rate Control Valve at Travel (ZX160-3 Class Only)</li> <li>• Travel Motor Swash Angle Control</li> <li>• Attachment Flow Rate Control</li> <li>• Travel Alarm Control</li> </ul>

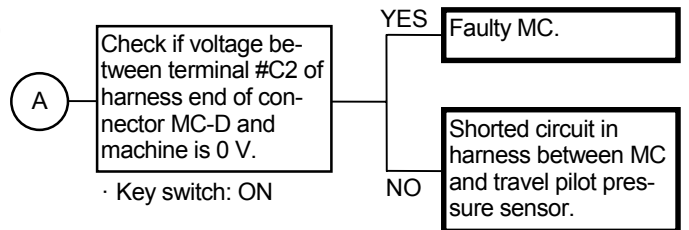
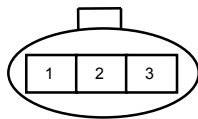
# TROUBLESHOOTING / Troubleshooting A



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



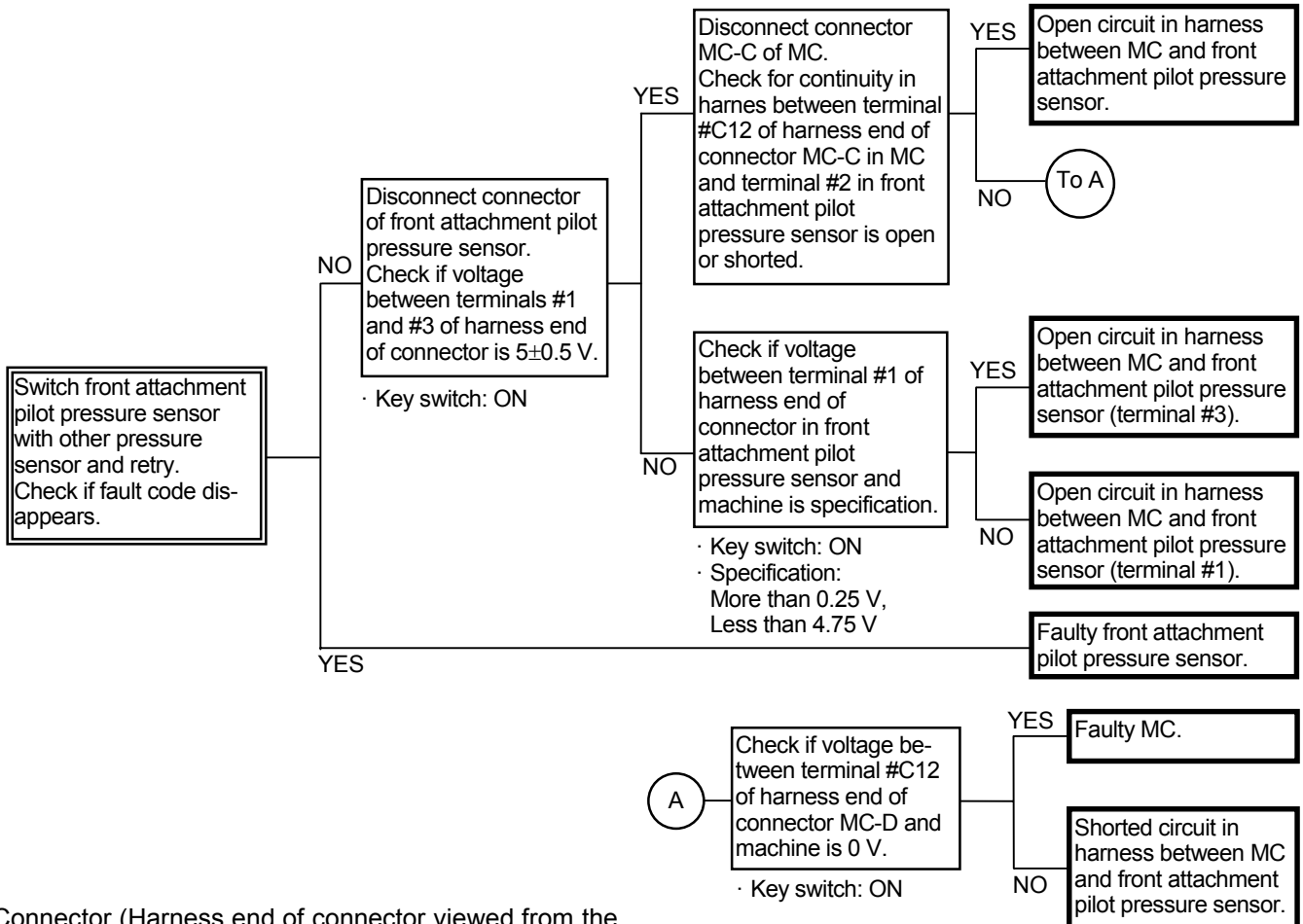
Pilot Pressure Sensor (Travel)



# TROUBLESHOOTING / Troubleshooting A

## MC FAULT CODE 11307

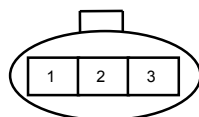
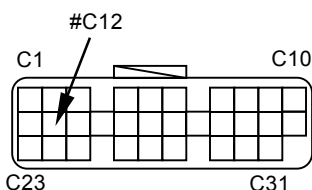
Fault Code	Trouble	Cause	Influenced Control
11307-3	Abnormal Front Attachment Pilot Pressure Sensor High Voltage	Voltage: 4.75 V or higher	<ul style="list-style-type: none"> <li>• Auto-Idle Control</li> <li>• Idle Speed-Up Control</li> <li>• ECO Control</li> <li>• Travel HP Mode Control</li> <li>• Travel Motor Swash Angle Control</li> </ul>
11307-4	Replace Front Attachment Pilot Pressure Sensor	Voltage: Less than 0.25 V	<ul style="list-style-type: none"> <li>• Auto-Idle Control</li> <li>• Idle Speed-Up Control</li> <li>• ECO Control</li> <li>• Travel HP Mode Control</li> <li>• Travel Motor Swash Angle Control</li> </ul>



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

MC Connector MC-C

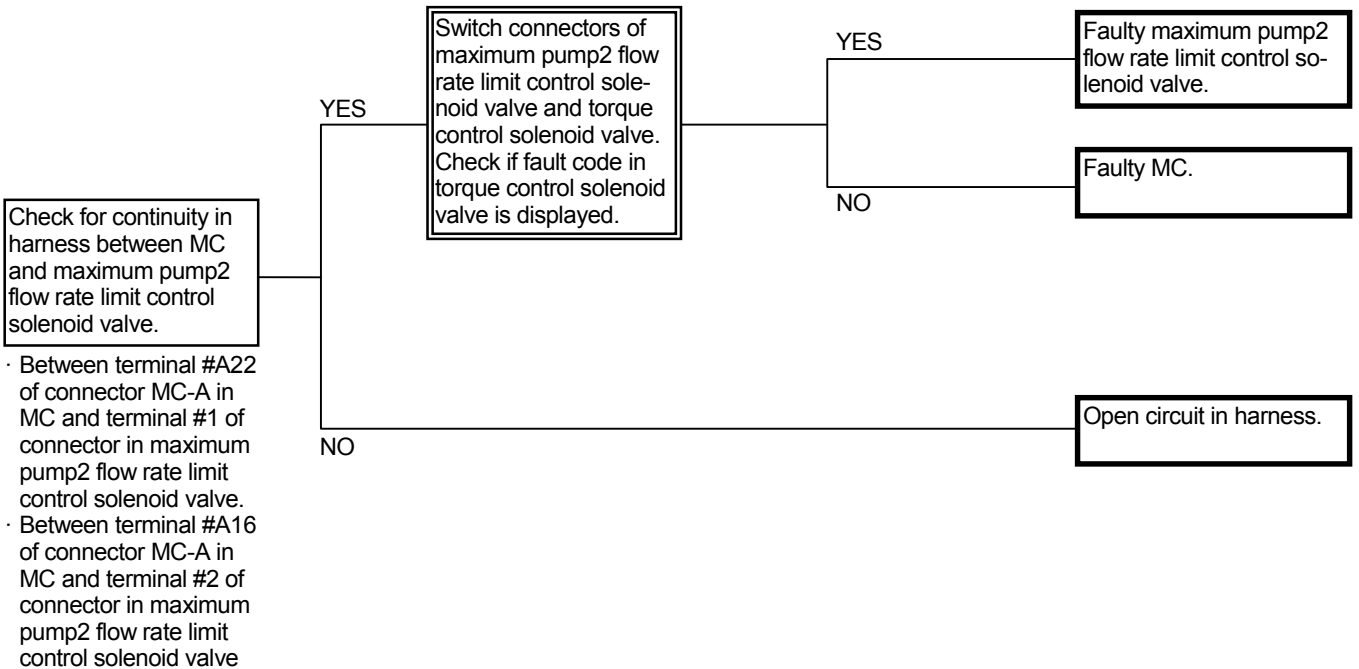
Pilot Pressure Sensor (Front Attachment)



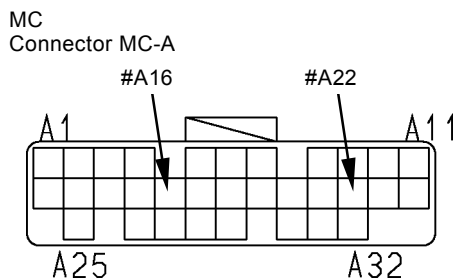
# TROUBLESHOOTING / Troubleshooting A

## PROPORTIONAL SOLENOID VALVE FAILURE MC FAULT CODE 11400

Fault Code	Trouble	Cause	Influenced Control
11400-2	Abnormal Current Feedback of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Both of Higher than 920 mA or Less than 60 mA	<ul style="list-style-type: none"> <li>Pump 2 Flow Rate Limit Control</li> <li>Pump 2 Flow Rate Control Valve at Travel (ZX160-3 Class Only)</li> </ul>
11400-3	Abnormal Feedback High Current of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Higher than 920 mA	<ul style="list-style-type: none"> <li>Pump 2 Flow Rate Limit Control</li> <li>Pump 2 Flow Rate Control Valve at Travel (ZX160-3 Class Only)</li> </ul>
11400-4	Abnormal Feedback Low Current of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Current: Less than 56 mA	<ul style="list-style-type: none"> <li>Pump 2 Flow Rate Limit Control</li> <li>Pump 2 Flow Rate Control Valve at Travel (ZX160-3 Class Only)</li> </ul>



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



T183-05-04-008

Maximum Pump 2 Flow Rate  
Limit Control Solenoid Valve

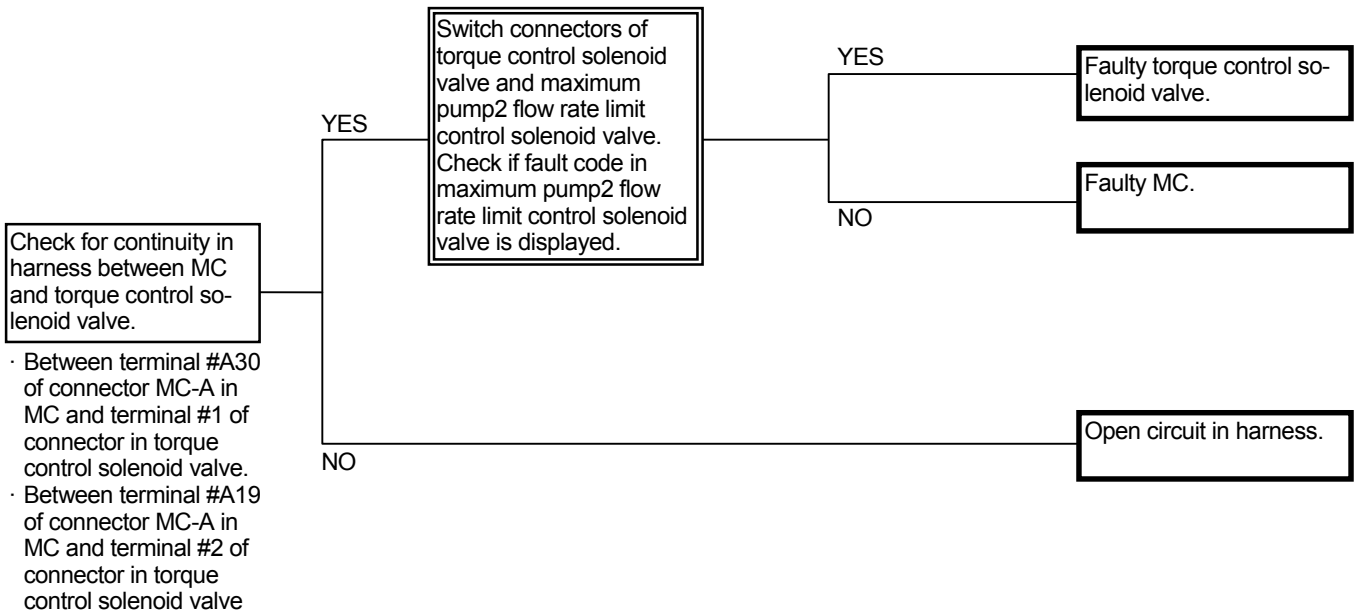


T1V1-05-04-003

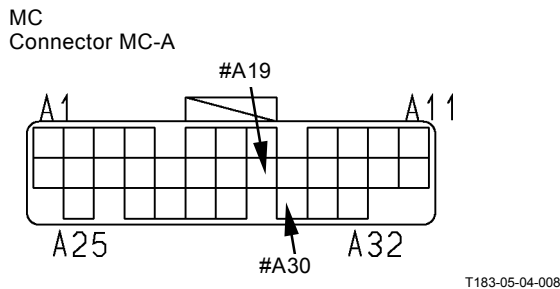
# TROUBLESHOOTING / Troubleshooting A

## MC FAULT CODE 11401

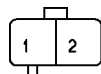
Fault Code	Trouble	Cause	Influenced Control
11401-2	Abnormal Current Feedback of Torque Control Solenoid Valve	Current: Both of Higher than 920 mA or Less than 60 mA	<ul style="list-style-type: none"> <li>Speed Sensing Control</li> <li>Travel Torque-Up Control</li> </ul>
11401-3	Abnormal Feedback High Current of Torque Control Solenoid Valve	Current: Higher than 920 mA	<ul style="list-style-type: none"> <li>Speed Sensing Control</li> <li>Travel Torque-Up Control</li> </ul>
11401-4	Abnormal Feedback Low Current of Torque Control Solenoid Valve	Current: Less than 56 mA	<ul style="list-style-type: none"> <li>Speed Sensing Control</li> <li>Travel Torque-Up Control</li> </ul>



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



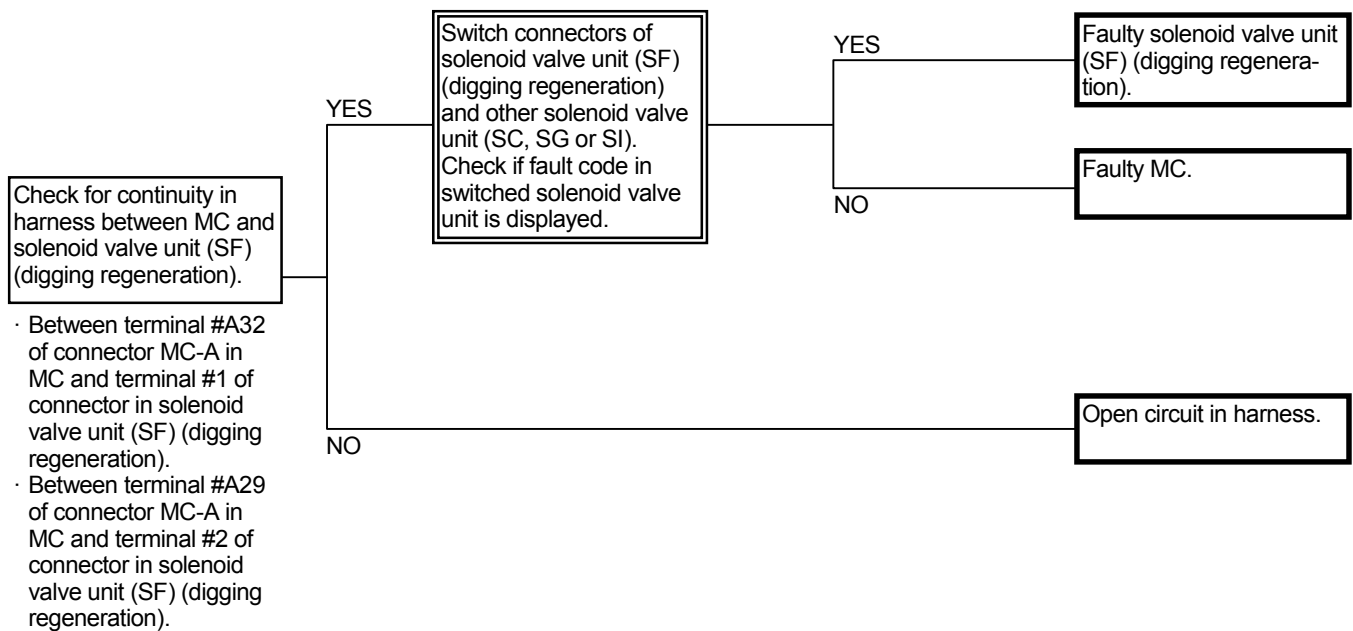
Torque Control Solenoid Valve



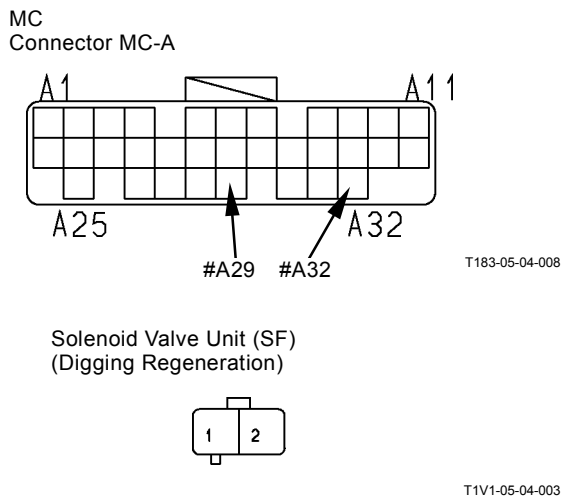
# TROUBLESHOOTING / Troubleshooting A

## MC FAULT CODE 11402

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



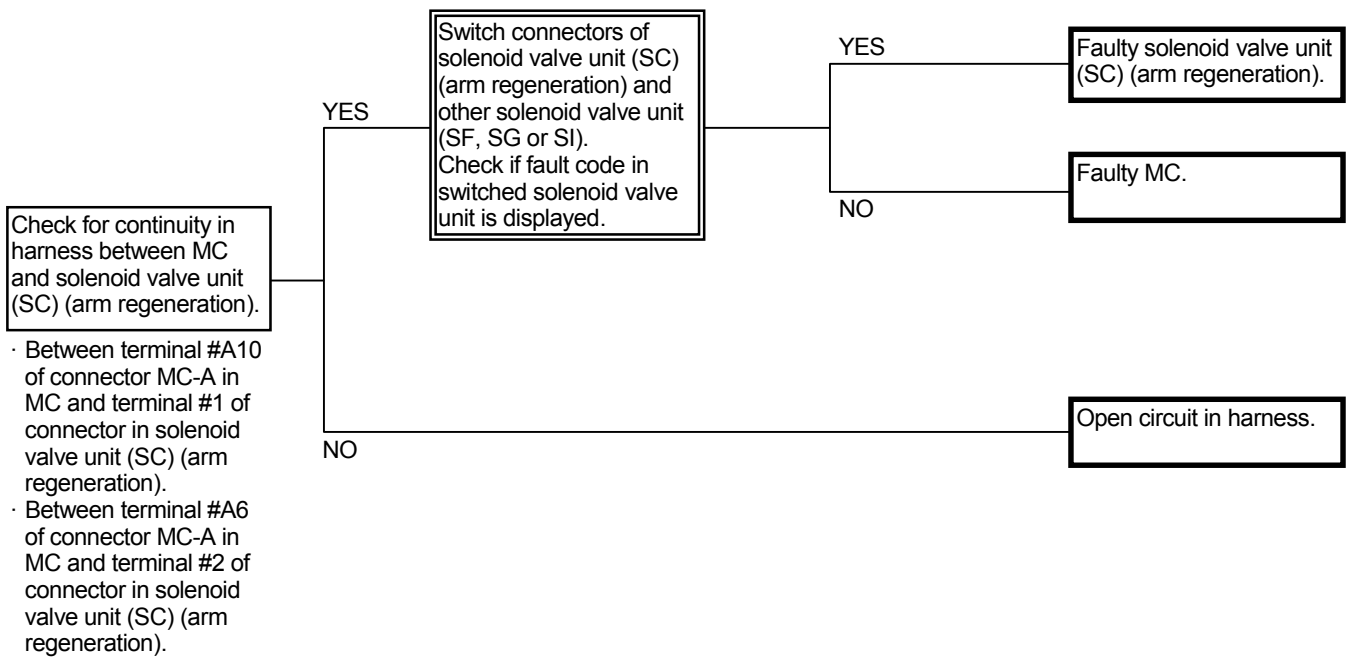
Connector (Harness end of connector viewed from the open side)



# TROUBLESHOOTING / Troubleshooting A

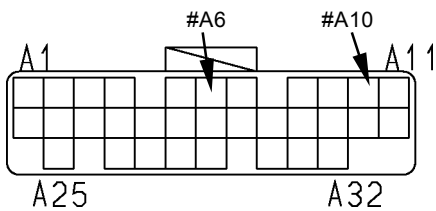
## MC FAULT CODE 11403

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



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

MC  
Connector MC-A



T183-05-04-008

Solenoid Valve Unit (SC)  
(Arm Regeneration)



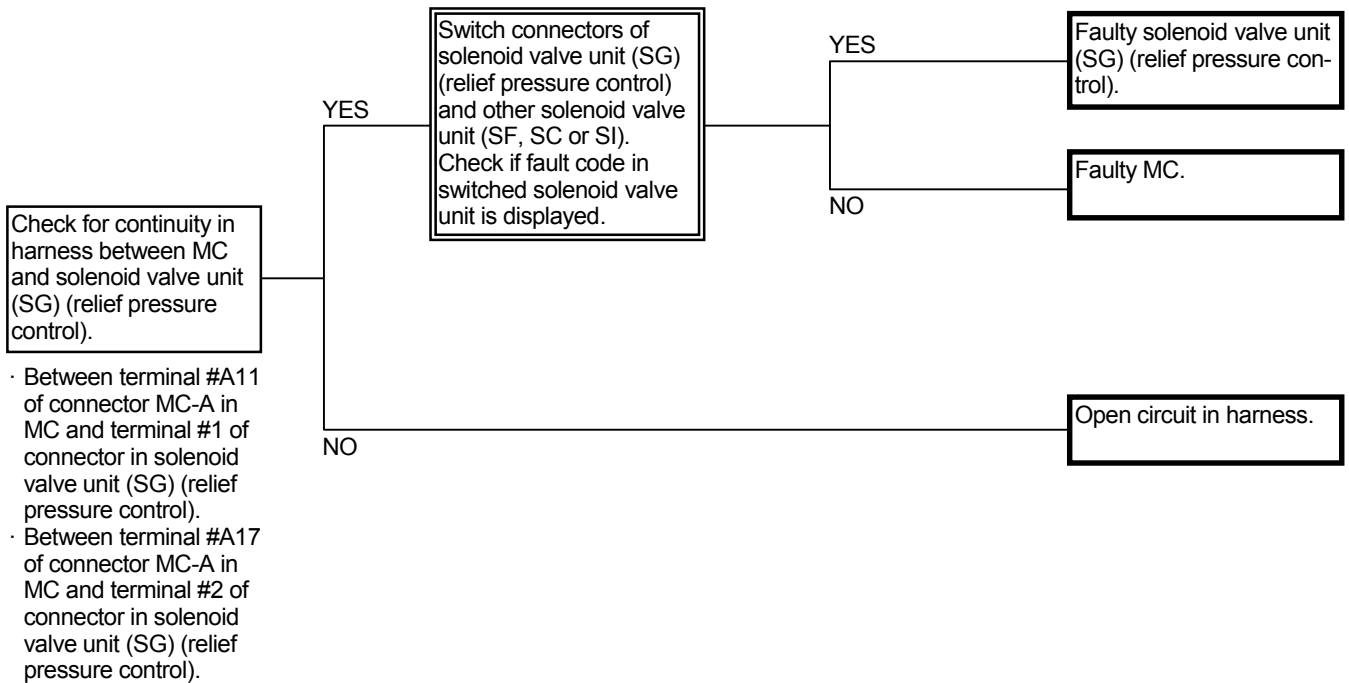
T1V1-05-04-003



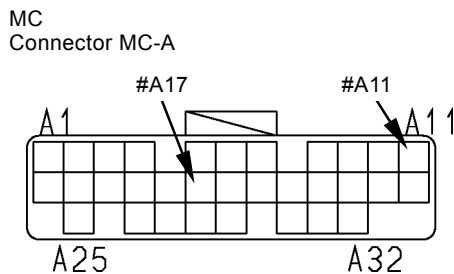
# TROUBLESHOOTING / Troubleshooting A

## MC FAULT CODE 11404

Fault Code	Trouble	Cause	Influenced Control
11404-2	Abnormal Current Feedback of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Both of Higher than 920 mA or Less than 60 mA	<ul style="list-style-type: none"> <li>• Power Digging Control</li> <li>• Auto-Power Lift Control</li> <li>• Travel Pressure Increasing Control</li> </ul>
11404-3	Abnormal Feedback High Current of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Higher than 920 mA	<ul style="list-style-type: none"> <li>• Power Digging Control</li> <li>• Auto-Power Lift Control</li> <li>• Travel Pressure Increasing Control</li> </ul>
11404-4	Abnormal Feedback Low Current of Solenoid Valve Unit (SG) (Relief Pressure Control)	Current: Less than 56 mA	<ul style="list-style-type: none"> <li>• Power Digging Control</li> <li>• Auto-Power Lift Control</li> <li>• Travel Pressure Increasing Control</li> </ul>



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



T183-05-04-008

Solenoid Valve Unit (SG)  
(Relief Pressure Control)

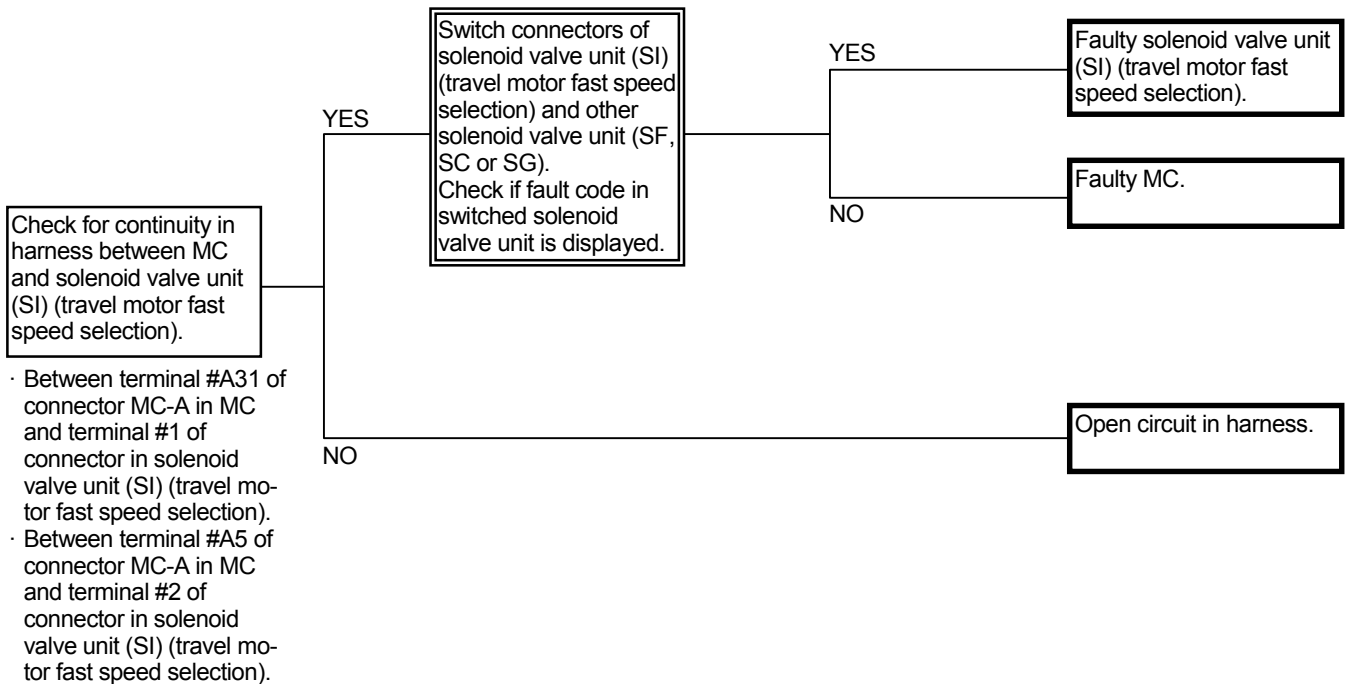


T1V1-05-04-003

# TROUBLESHOOTING / Troubleshooting A

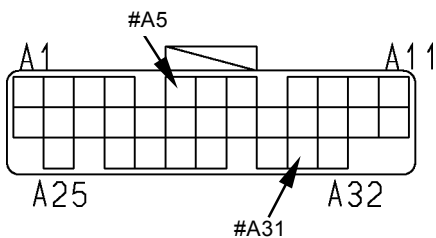
## MC FAULT CODE 11405

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



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

MC  
Connector MC-A



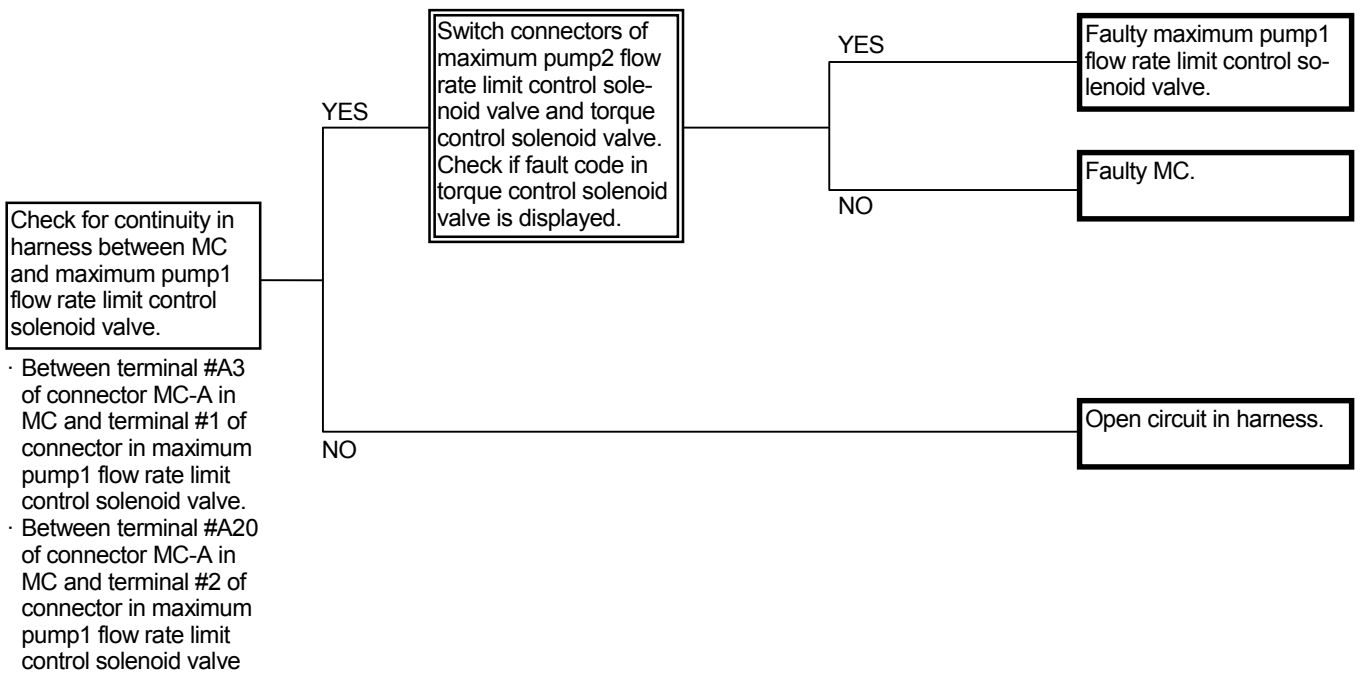
Solenoid Valve Unit (SI)  
(Travel Motor Fast Speed Selection)



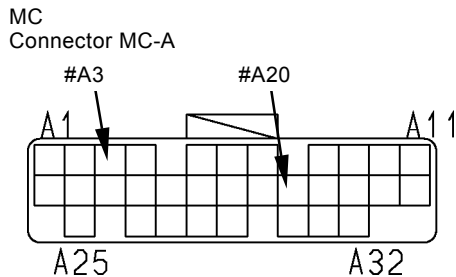
# TROUBLESHOOTING / Troubleshooting A

## MC FAULT CODE 11410 (ZX160-3 Class Only)

Fault Code	Trouble	Cause	Influenced Control
11410-2	Abnormal Current Feedback of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve	Current: Both of Higher than 920 mA or Less than 60 mA	<ul style="list-style-type: none"> <li>Pump 1 Flow Rate Limit Control</li> <li>Pump 1 Flow Rate Control Valve at Travel</li> </ul>
11410-3	Abnormal Feedback High Current of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve	Current: Higher than 920 mA	<ul style="list-style-type: none"> <li>Pump 1 Flow Rate Limit Control</li> <li>Pump 1 Flow Rate Control Valve at Travel</li> </ul>
11410-4	Abnormal Feedback Low Current of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve	Current: Less than 56 mA	<ul style="list-style-type: none"> <li>Pump 1 Flow Rate Limit Control</li> <li>Pump 1 Flow Rate Control Valve at Travel</li> </ul>



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



T183-05-04-008

Maximum Pump 1 Flow Rate Limit Control Solenoid Valve

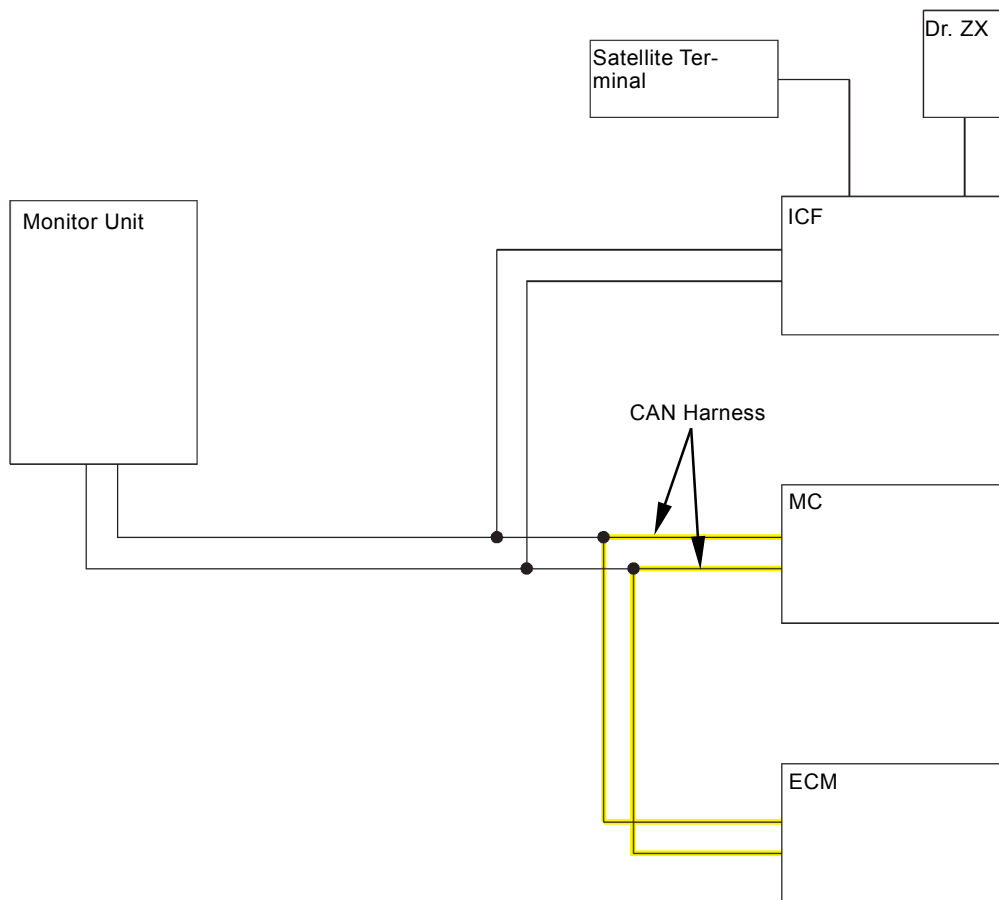


T1V1-05-04-003

## TROUBLESHOOTING / Troubleshooting A

### CAN DATA RECEPTION FAILURE MC FAULT CODE 11910, 11914, 11920

Fault Code	Trouble	Cause	Influenced Control
11910-2	Actual Engine Speed Received from ECM	Faulty CAN Harness	<ul style="list-style-type: none"> <li>• Speed Sensing Control</li> <li>• Send to ICF</li> </ul>
11914-2	Radiator Coolant Temperature Received from ECM	Faulty Harness	Radiator Coolant Temperature Auto-Warming Up Control
11920-2	Fuel Flow Rate Received from ECM	Faulty CAN Harness	Fuel Flow Rate



T1V1-02-01-051

## **TROUBLESHOOTING / Troubleshooting A**

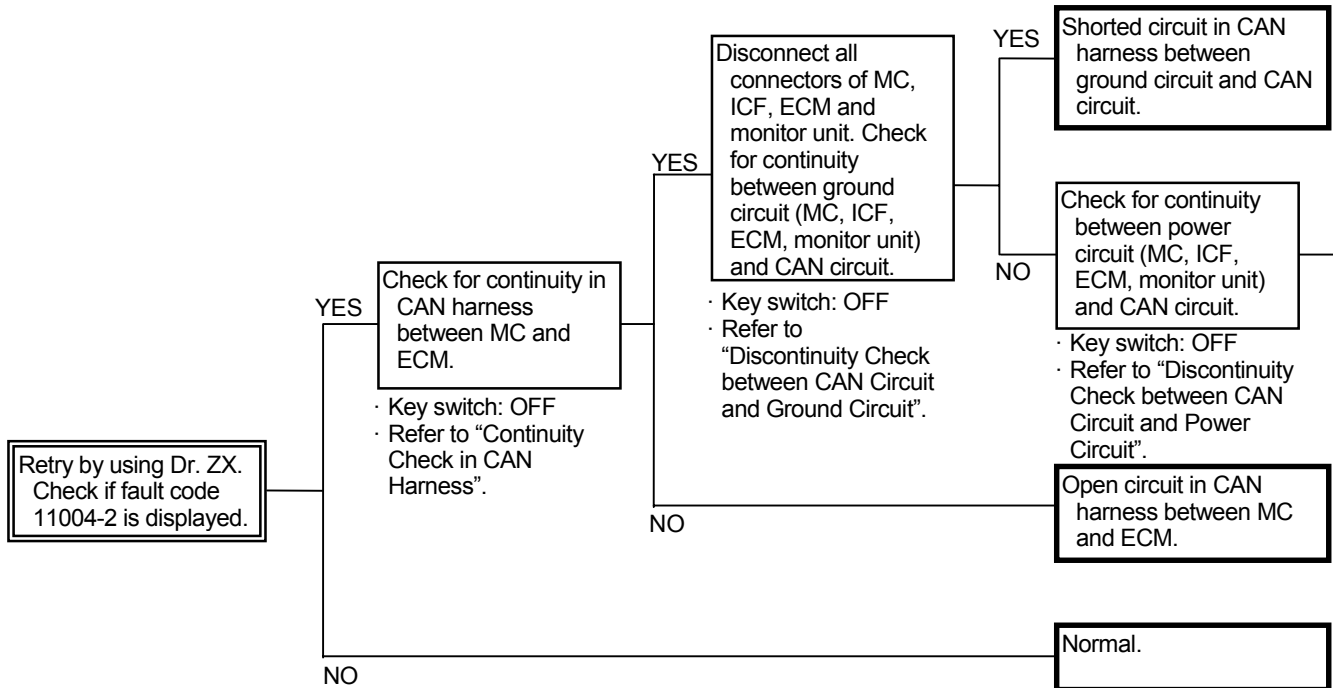
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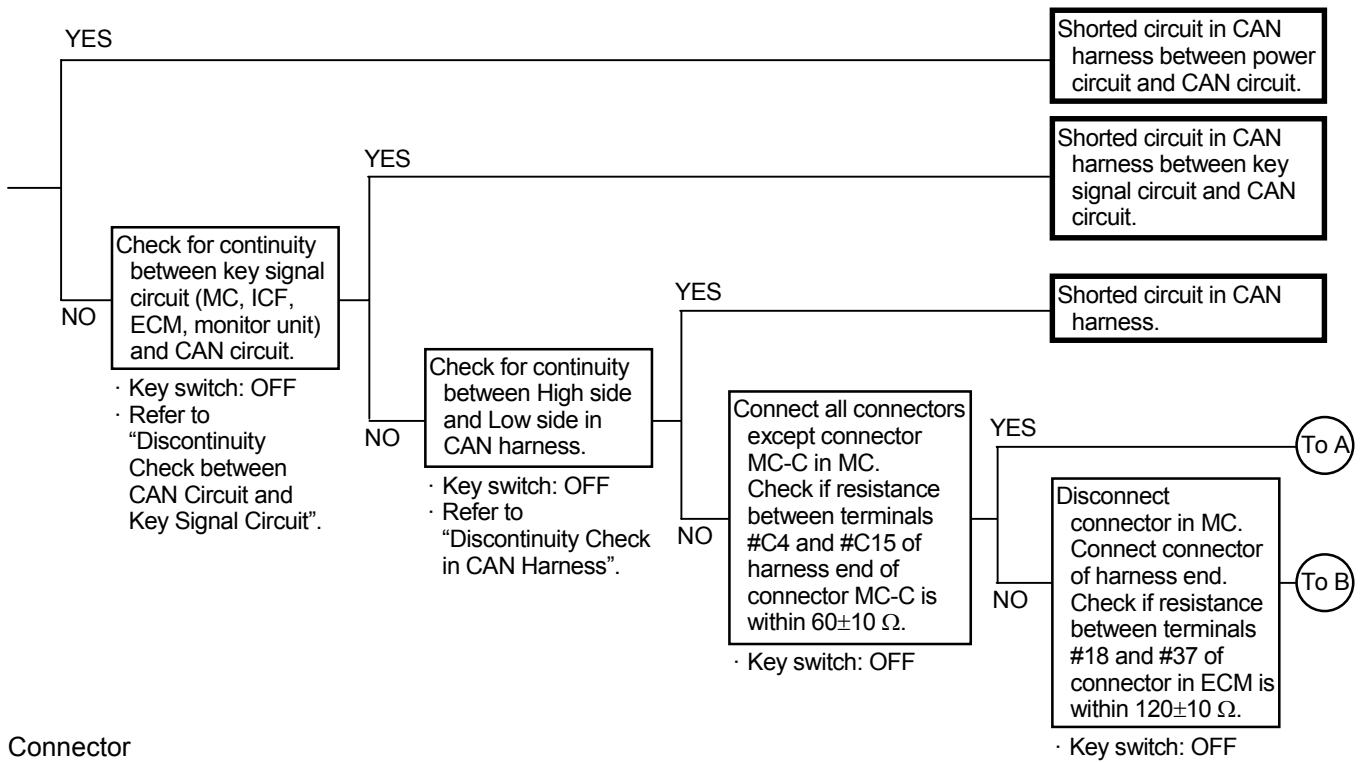
## TROUBLESHOOTING / Troubleshooting A

### CAN HARNESS CHECK (MC FAULT CODE 11910, 11914, 11920)

- Check the wiring connections first.

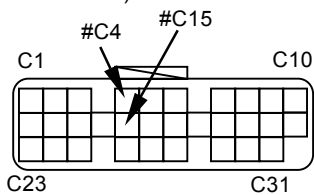


# TROUBLESHOOTING / Troubleshooting A

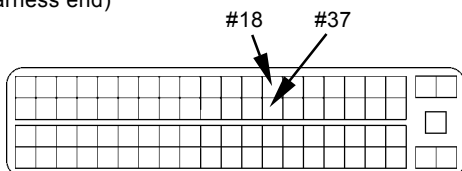


## Connector

MC  
Connector MC-C  
(Harness end)

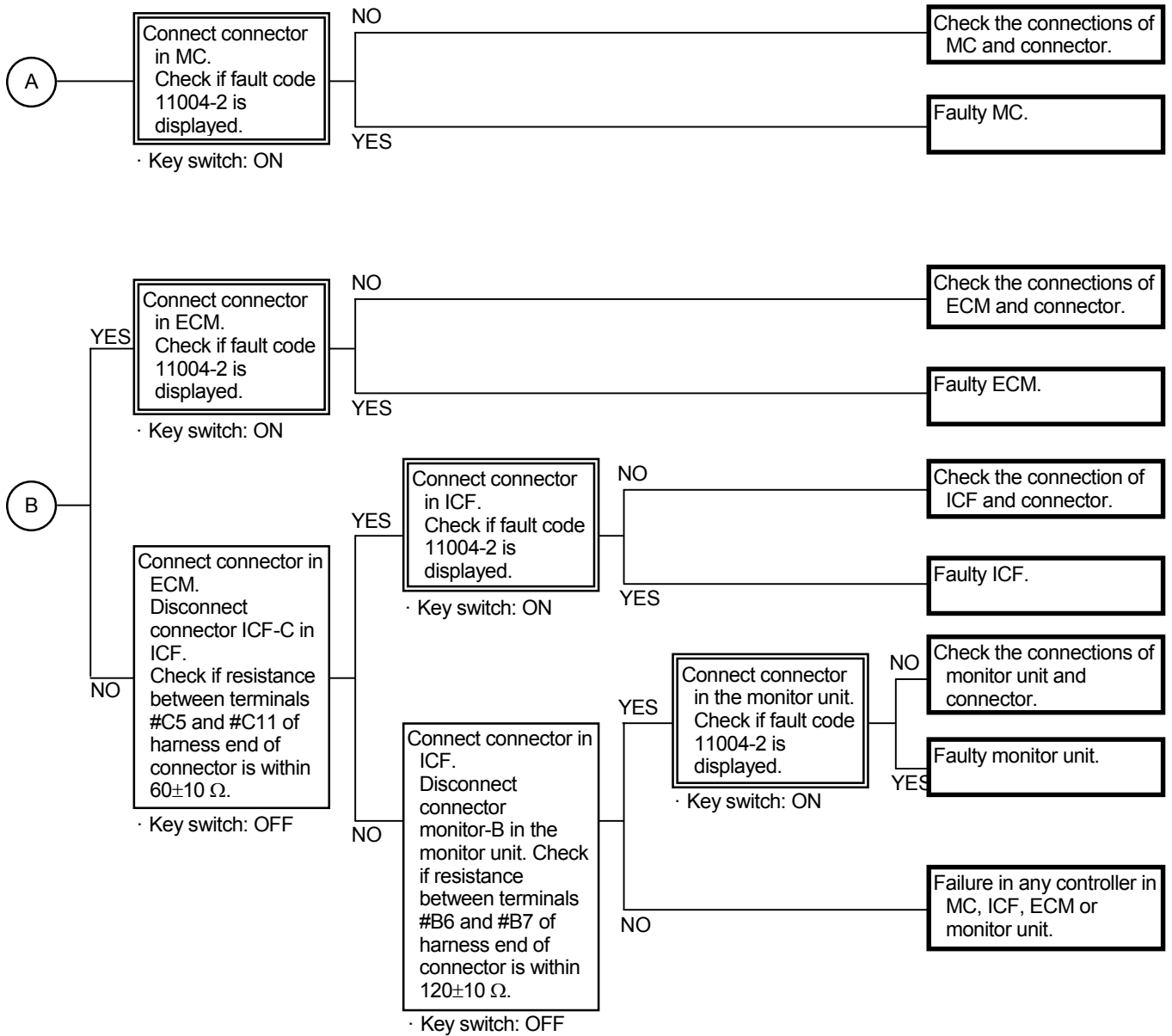


ECM  
Connector  
(Harness end)

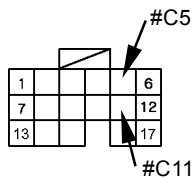


T1GR-05-04-002

# TROUBLESHOOTING / Troubleshooting A

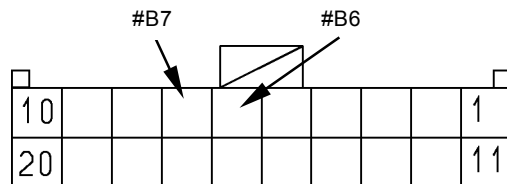


Connector  
ICF  
Connector ICF-C  
(Harness end)



T1V1-05-04-002

Monitor Unit  
Connector Monitor-B  
(Harness end)



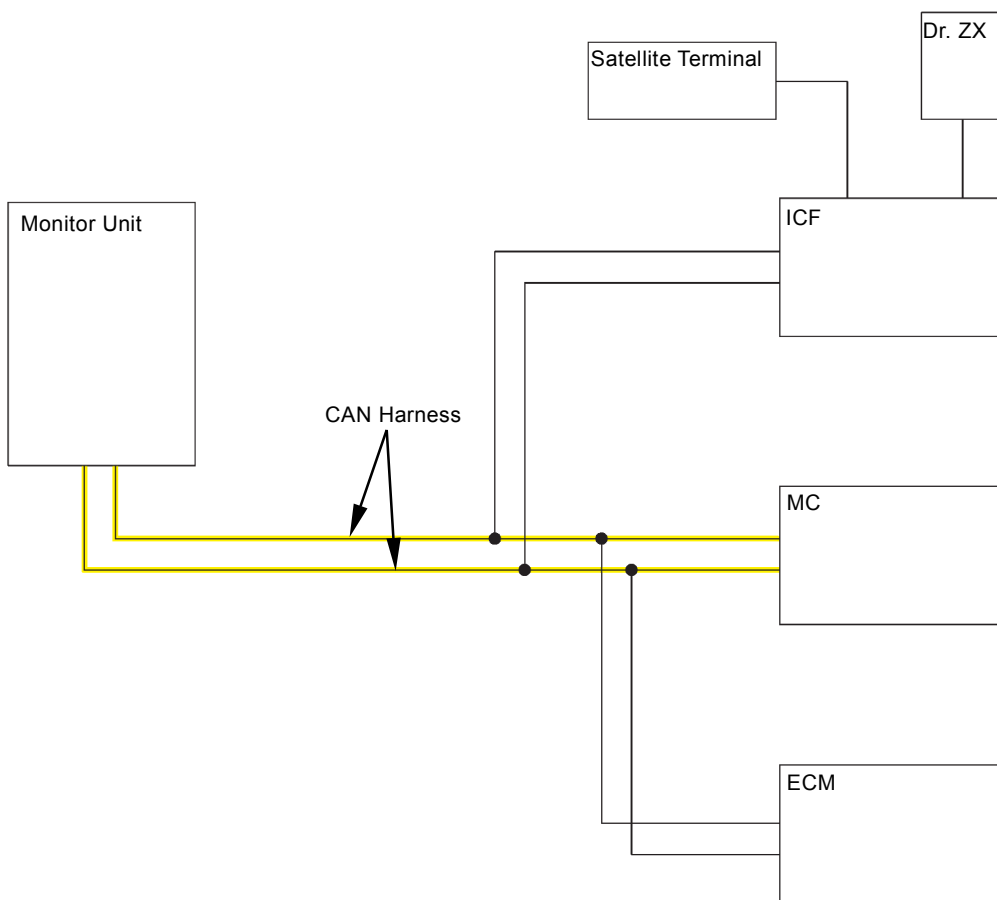
T183-05-04-013



## TROUBLESHOOTING / Troubleshooting A

### MC FAULT CODE 11911, 11918

Fault Code	Trouble	Cause	Influenced Control
11911-2	Security Signal Received from Monitor Unit	Faulty CAN Harness	Theft Prevention Engine Speed, Engine Torque
11918-2	Work Mode Received from Monitor Unit	Faulty CAN Harness	<ul style="list-style-type: none"> <li>• Attachment Operation Speed Increase Control</li> <li>• Attachment Operation Speed Limit Control</li> <li>• Pump 1 Flow Rate Limit Control</li> <li>• Pump 2 Flow Rate Limit Control</li> <li>• Attachment Flow Rate Control</li> <li>• Attachment Valve Selection Control</li> </ul>

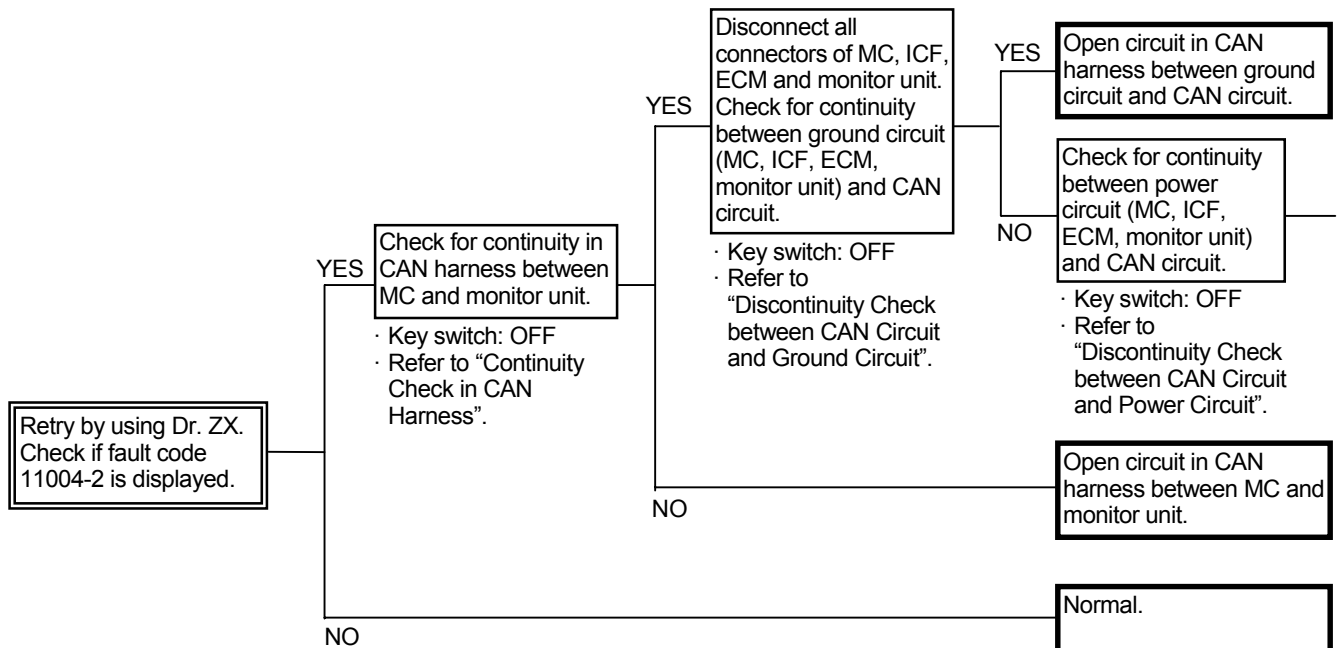


T1V1-02-01-052

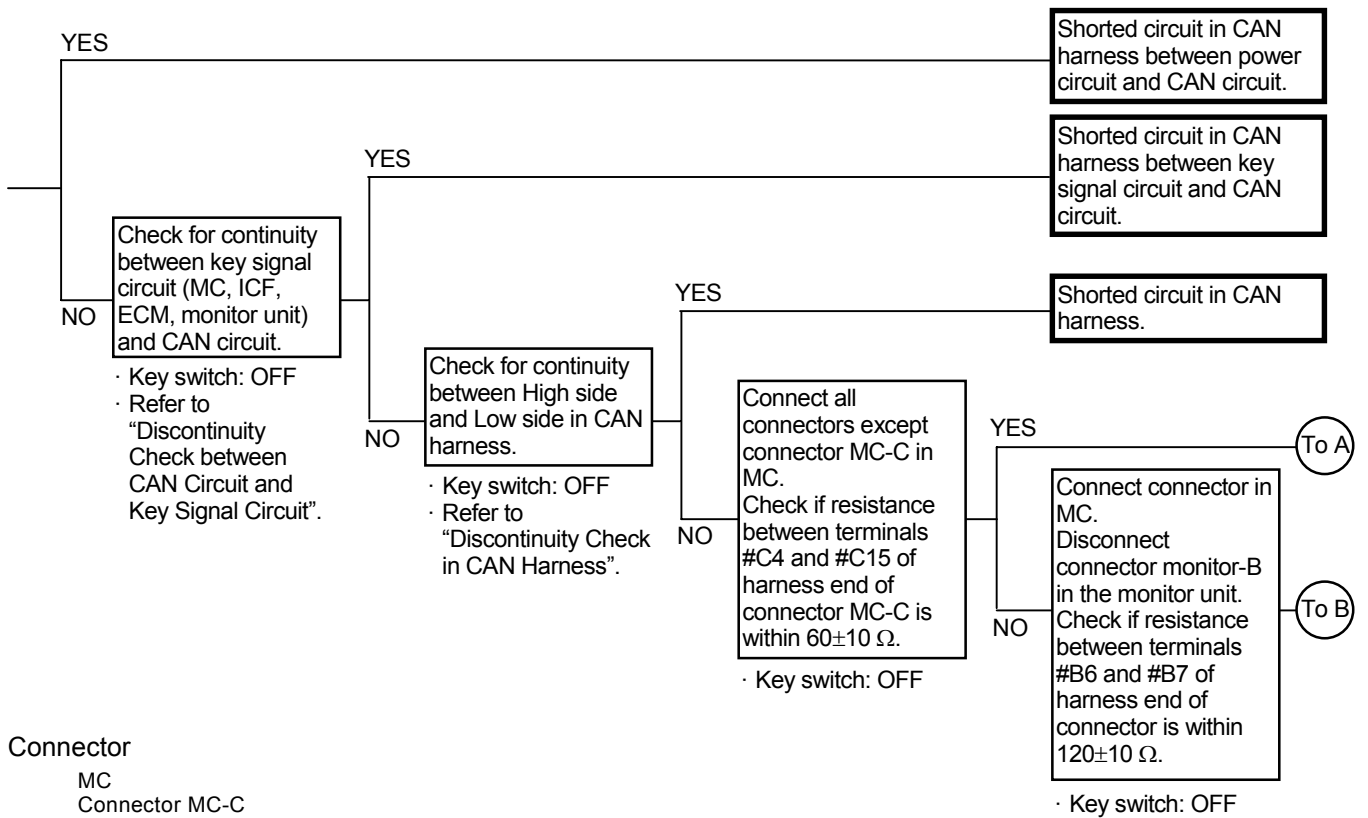
## TROUBLESHOOTING / Troubleshooting A

### CAN HARNESS CHECK (MC FAULT CODE 11911, 11918)

- Check the wiring connections first.

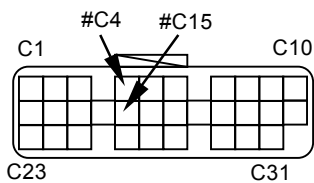


# TROUBLESHOOTING / Troubleshooting A

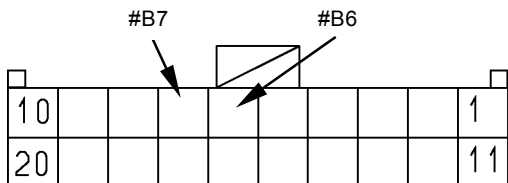


## Connector

MC  
Connector MC-C  
(Harness end)

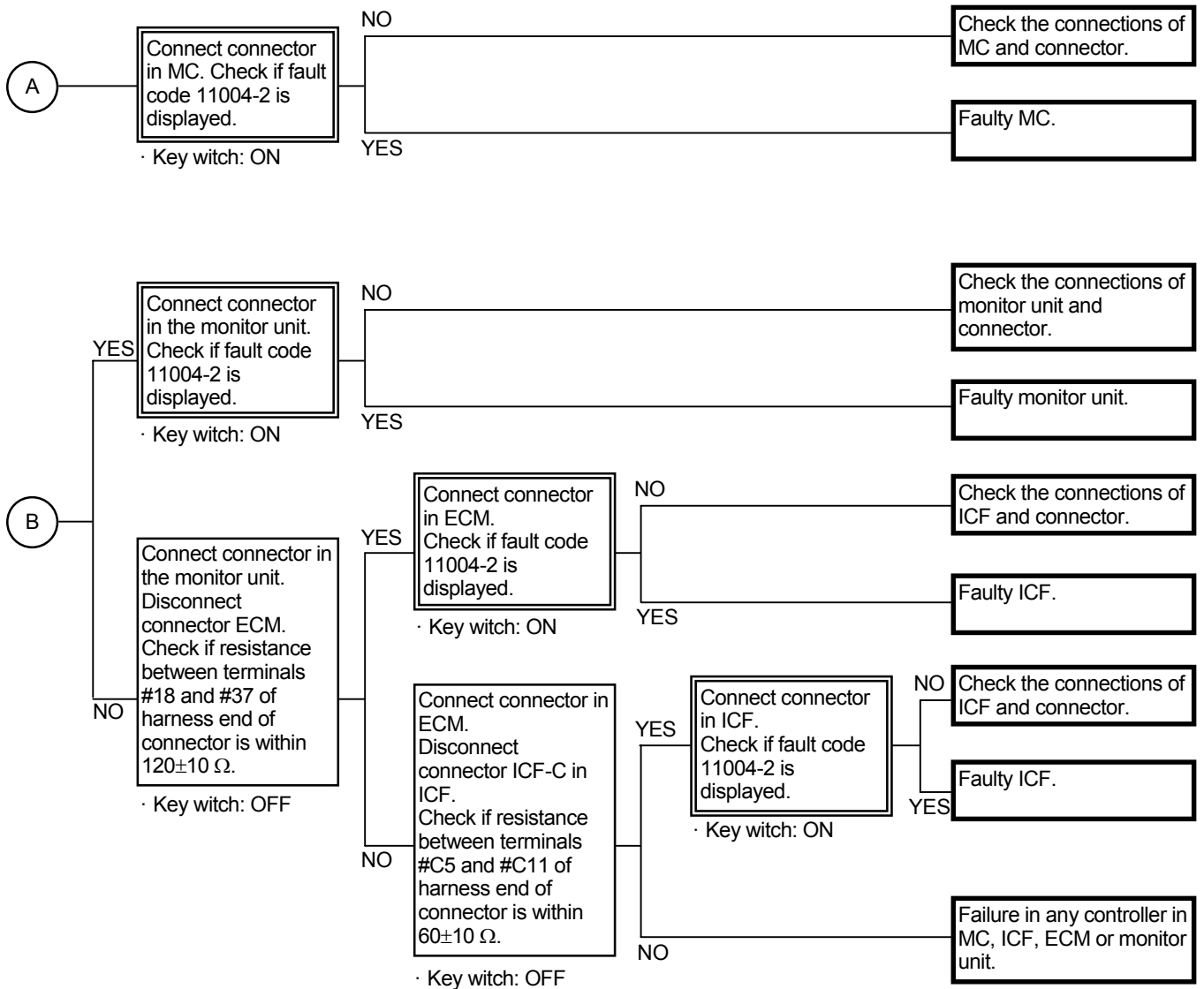


Monitor Unit  
Connector Monitor-B  
(Harness end)



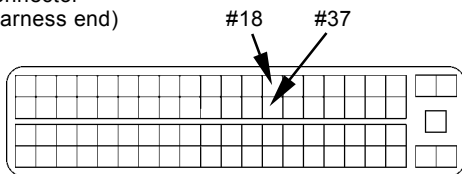
T183-05-04-013

# TROUBLESHOOTING / Troubleshooting A



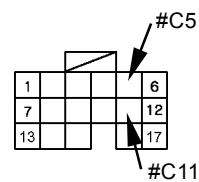
## Connector

ECM  
Connector  
(Harness end)



T1GR-05-04-002

ICF  
Connector ICF-C  
(Harness end)

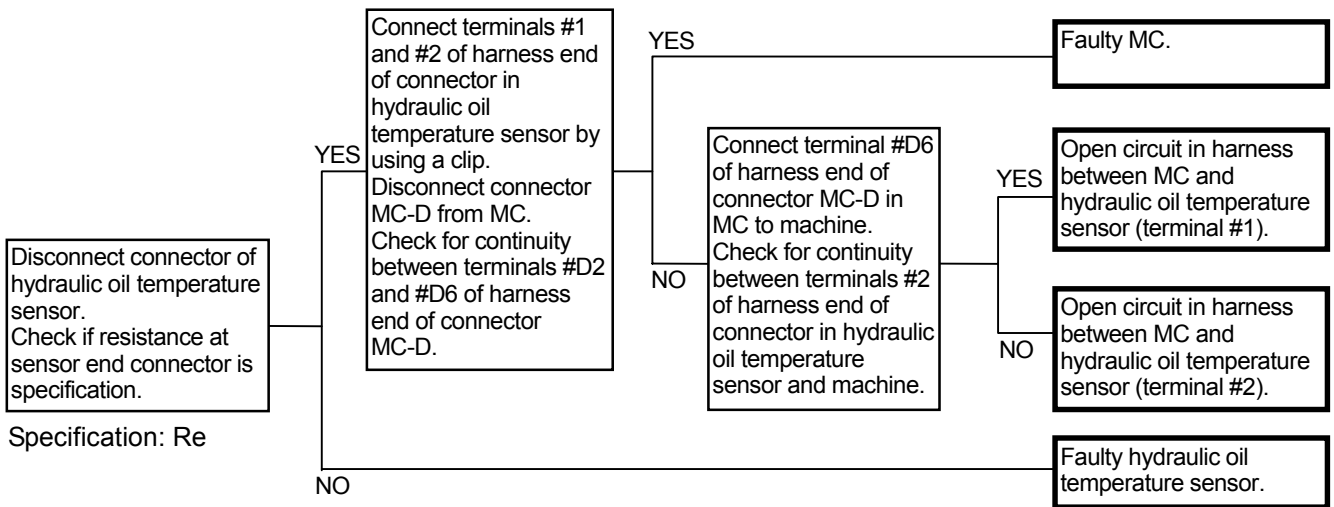


T1V1-05-04-002

# TROUBLESHOOTING / Troubleshooting A

## OTHER FAILURES MC FAULT CODE 11901

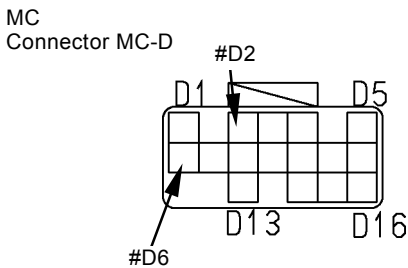
Fault Code	Trouble	Cause	Influenced Control
11901-3	Hydraulic Oil Temperature Sensor High Voltage	Voltage: 4.52 V or higher	<ul style="list-style-type: none"> <li>• Auto-Warming Up Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> </ul>
11901-4	Hydraulic Oil Temperature Sensor Low Voltage	Voltage: Less than 0.23 V	<ul style="list-style-type: none"> <li>• Auto-Warming Up Control</li> <li>• Arm Regenerative Control</li> <li>• Digging Regenerative Control</li> </ul>



### Specification of Hydraulic Oil Temperature Sensor

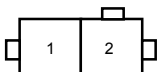
Hydraulic Oil Temperature (°C)	Resistance (kΩ)
-20	16.2±1.6
0	(5.88)
20	2.45±0.24
40	(1.14)
60	(0.534)
80	0.322

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



T183-05-04-009

Hydraulic Oil Temperature Sensor



## TROUBLESHOOTING / Troubleshooting A

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### 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

## TROUBLESHOOTING / Troubleshooting A

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### 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.

## TROUBLESHOOTING / Troubleshooting A

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

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
651-3	Open Circuit in Injection Nozzle #1 Drive System	P0201	1E-301
652-3	Open Circuit in Injection Nozzle #2 Drive System	P0202	1E-308
653-3	Open Circuit in Injection Nozzle #3 Drive System	P0203	1E-315
654-3	Open Circuit in Injection Nozzle #4 Drive System	P0204	1E-322
1347-0	Open Circuit in Suction Control Valve Drive System, Shorted Circuit in + B or GND	P0090	1E-225
10002-2	Abnormal EGR Valve Control	P0488	1E-397



## TROUBLESHOOTING / Troubleshooting A

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### 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

## TROUBLESHOOTING / Troubleshooting A

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### 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

## TROUBLESHOOTING / Troubleshooting A

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### 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

## TROUBLESHOOTING / Troubleshooting A

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

Fault Code	Trouble	Fault Code (Tech 2)	Reference Page on Engine Troubleshooting Manual
628-2	Abnormal ROM	P0601	1E-417
1077-2	Abnormal IC for CPU Watching	P0606	1E-421
1079-2	Abnormal 5 V Power Source 1 Voltage	P1631	1E-538
1080-2	Abnormal 5 V Power Source 2 Voltage	P1632	1E-541
10003-2	Abnormal Injection Nozzle Common 1 Drive System	P1261	1E-476
10004-2	Abnormal Injection Nozzle Common 2 Drive System	P1262	1E-487
10005-1	Abnormal Charge Circuit (Bank 1)	P0611	1E-423

## TROUBLESHOOTING / Troubleshooting A

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### 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

## TROUBLESHOOTING / Troubleshooting A

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### 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

## TROUBLESHOOTING / Troubleshooting A

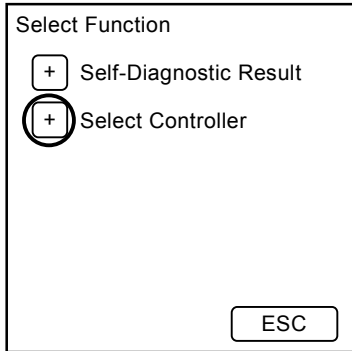
### ICF, SATELLITE TERMINAL FAULT CODES 14000 to 14003

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. <ul style="list-style-type: none"><li>• Check the CAN communication line (harness).</li></ul>
14001-2	ICF: Flash Memory: Read / Write Error	Execute retry B in self-diagnosing and execute the following item. <ul style="list-style-type: none"><li>• Execute "Information C/U: Initialize".</li></ul>
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. <ul style="list-style-type: none"><li>• Execute "Control Data: Initialize".</li><li>• Execute "Enter Model and Serial No.".</li></ul> Then, execute self-diagnosing and execute retry B.

# TROUBLESHOOTING / Troubleshooting A

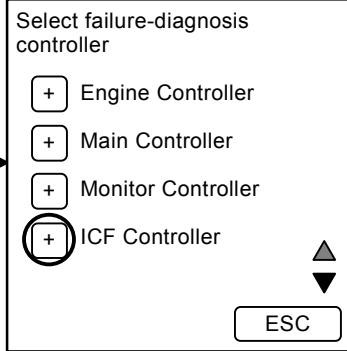
## Information C/U: Initialize

After starting Dr. ZX, push Select Controller.



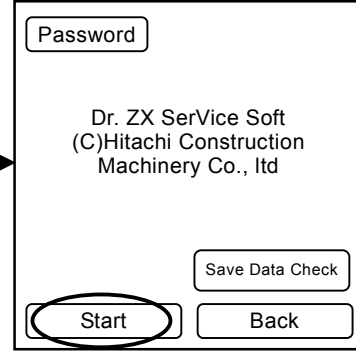
Function Selection Screen

Push ICF Controller.



Controller Selection Screen

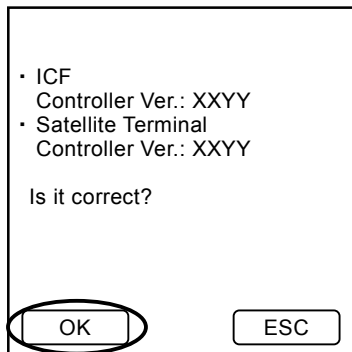
Push Start.



Title Screen

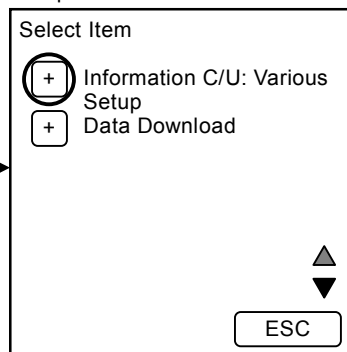
To the lower

Push OK.



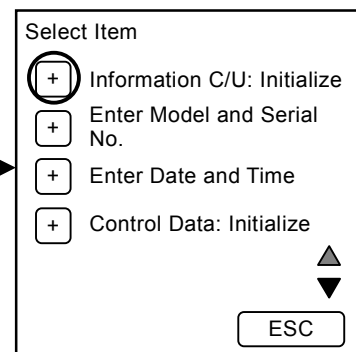
ICF Controller Screen

Push Information C/U: Various Setup.



Main Menu Screen

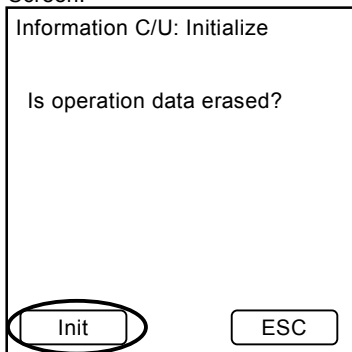
Push Information C/U: Initialize.



Information C/U: Various Setup Screen

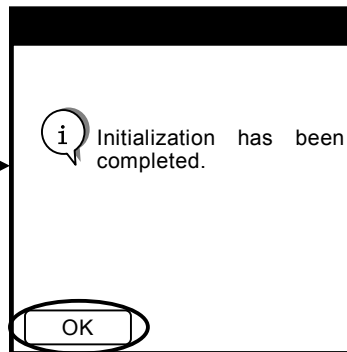
To the lower

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

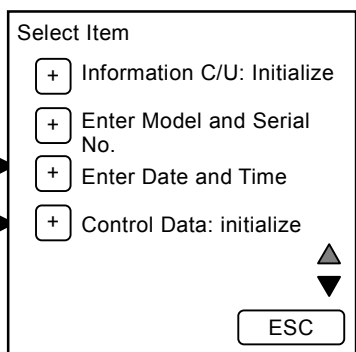


Information C/U: Initialize Screen

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



Push ESC and return to Main Menu Screen.



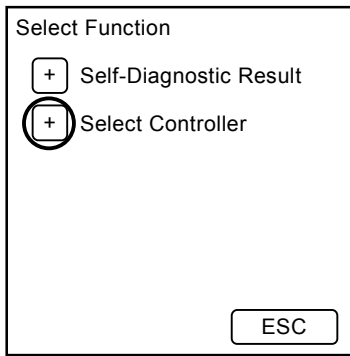
Information C/U: Various Setup Screen



# TROUBLESHOOTING / Troubleshooting A

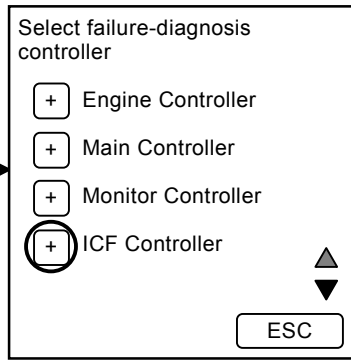
## Control Data: Initialize

After starting Dr. ZX, push Select Controller.



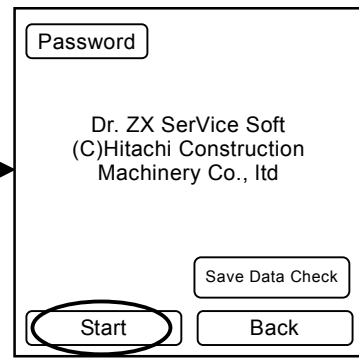
Function Selection Screen

Push ICF Controller.



Controller Selection Screen

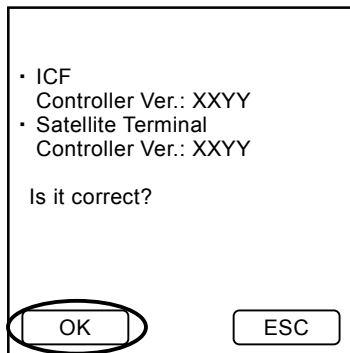
Push Start.



Title Screen

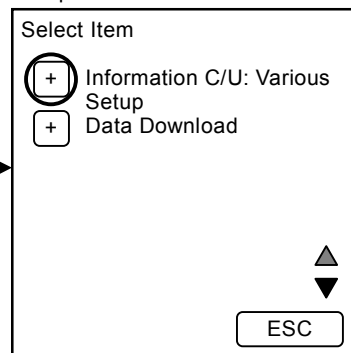
To the lower

Push OK.



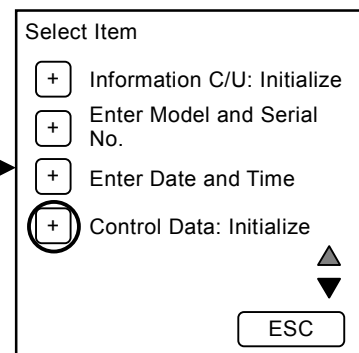
ICF Controller Screen

Push Information C/U: Various Setup.



Main Menu Screen

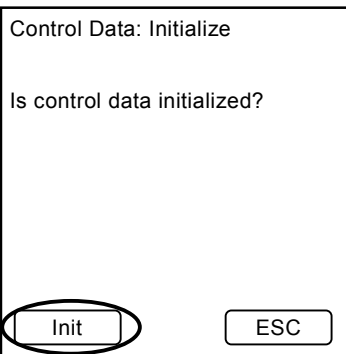
Push Control Data: Initialize.



Information C/U: Various Setup Screen

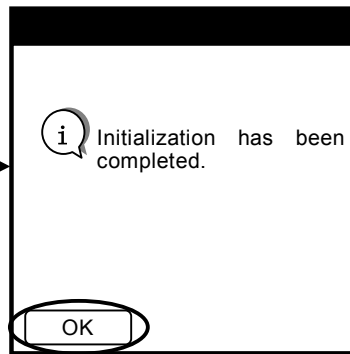
To the lower

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



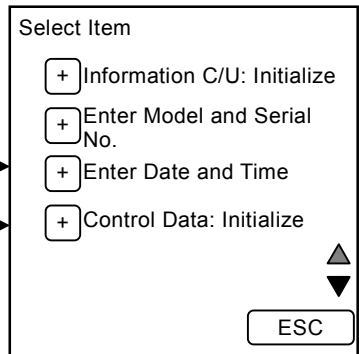
Control Data: Initialize Screen

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



Information C/U: Various Setup Screen

Push ESC and return to Main Menu Screen.



Information C/U: Various Setup Screen

# TROUBLESHOOTING / Troubleshooting A

## Enter Model and Serial No.

After starting Dr. ZX, push Select Controller.

Select Function

- Self-Diagnostic Result
- Select Controller

Function Selection Screen

Push ICF Controller.

Select failure-diagnosis controller

- Engine Controller
- Main Controller
- Monitor Controller
- ICF Controller

Controller Selection Screen

Push Start.

Password

Dr. ZX SerVice Soft  
(C)Hitachi Construction Machinery Co., Ltd

Title Screen

To the lower

Push OK.

- ICF Controller Ver.: XXYY
- Satellite Terminal Controller Ver.: XXYY

Is it correct?

ICF Controller Screen

Push Information C/U: Various Setup.

Select Item

- Information C/U: Various Setup
- Data Download

Main Menu Screen

Push Enter Model and Serial No.

Select Item

- Information C/U: Initialize
- Enter Model and Serial No.
- Enter Date and Time
- Control Data: Initialize

Information C/U: Various Setup Screen

To the lower

Push Exec, and model and serial No. can be input.  
Push ESC and return to Information C/U: Various Setup Screen.

Enter Model and Serial No.

Model 01G6

Serial No. 900005

Enter Model and Serial No.

After inputting model and serial No., push OK and return to Enter Model and Serial No. Screen.  
Push ESC and return to Information C/U: Various Setup Screen.

Enter Model and Serial No.

Model | .....  
Ex. Mach.No.(HCM1G600P12 3456) Model(01G6)

Serial No. ....  
Ex. Mach.No.(HCM1G600P12 3456) Serial No.(123456)

Push ESC and return to Main Menu Screen.

Select Item

- Information C/U: Initialize
- Enter Model and Serial No.
- Enter Date and Time
- Control Data: Initialize

Information C/U: Various Setup Screen

## TROUBLESHOOTING / Troubleshooting A

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

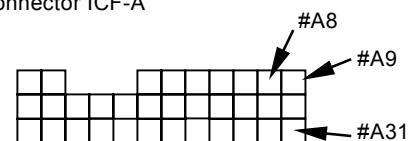
Fault Code	Trouble	Remedy
14006-2	ICF: Satellite Communication Terminal: Communication Error	Execute retry B in self-diagnosing. If this error code is displayed after re-try, check the following item. Check the communication line. Check the power source line of satellite terminal. Check the fuse.  Then, execute self-diagnosing and execute retry B.
14008-2	ICF: Abnormal Internal RAM	Execute retry B in self-diagnosing. If this error code is displayed after re-try, replace the controller.
14100-2	Satellite Communication Terminal: Abnormal EEPROM	
14101-2	Satellite Communication Terminal: Abnormal IB/OB Queue	
14102-2	Satellite Communication Terminal: Abnormal Local Loop Back	Check the communication aerial of satellite terminal. (Refer to T5-5-116.)
14103-2	Satellite Communication Terminal: The satellite is not found.	
14104-2	Satellite Communication Terminal: Fail 1 of Remote Loop Back	Execute retry B in self-diagnosing. If this error code is displayed after re-try, replace the controller.
14105-2	Satellite Communication Terminal: Fail 2 of Remote Loop Back	
14106-2	Satellite Communication Terminal: Sending and receiving data are mismatched.	

#### Fault Code 14006-2

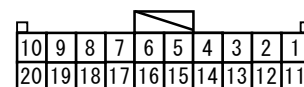
- Check the communication line
1. Check for continuity between terminal #A8 of harness end of connector ICF-A in ICF and terminal #10 of harness end of connector A in satellite terminal.
  2. Check for continuity between terminal #A9 of harness end of connector ICF-A in ICF and terminal #20 of harness end of connector A in satellite terminal.
  3. Check for continuity between terminal #A31 of harness end of connector ICF-A in ICF and terminal #2 of harness end of connector B in satellite terminal.
- Check the power source line of satellite terminal
1. Check the battery power  
Check voltage between terminal #2 of harness end of connector A in satellite terminal and machine is 24 V.
  2. Check the main power  
With the key switch ON, check voltage between terminal #1 of harness end of connector A in satellite terminal and machine is 24 V.
  3. Check the ground power  
Check for continuity between terminals #11 and #12 of harness end of connector A in satellite terminal.

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

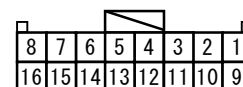
ICF  
Connector ICF-A



Satellite  
Connector A

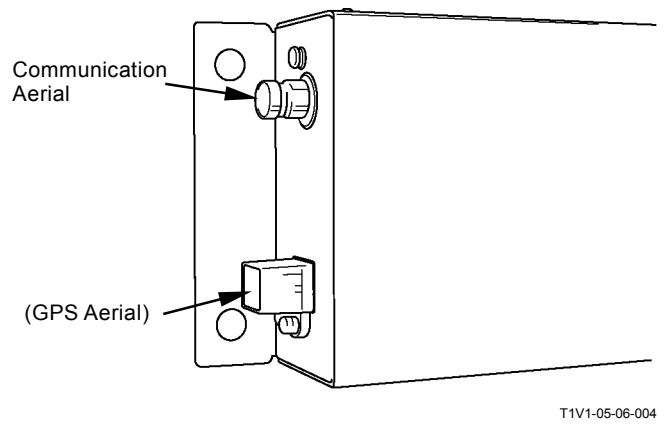
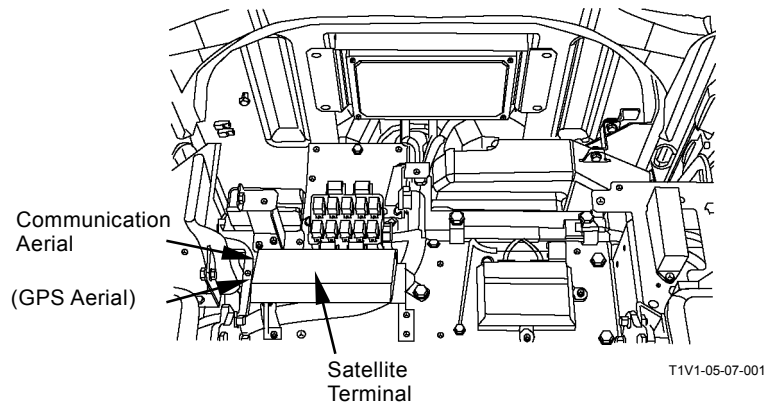


Satellite  
Connector B



# TROUBLESHOOTING / Troubleshooting A

Fault Codes 14102-2, 14103-2

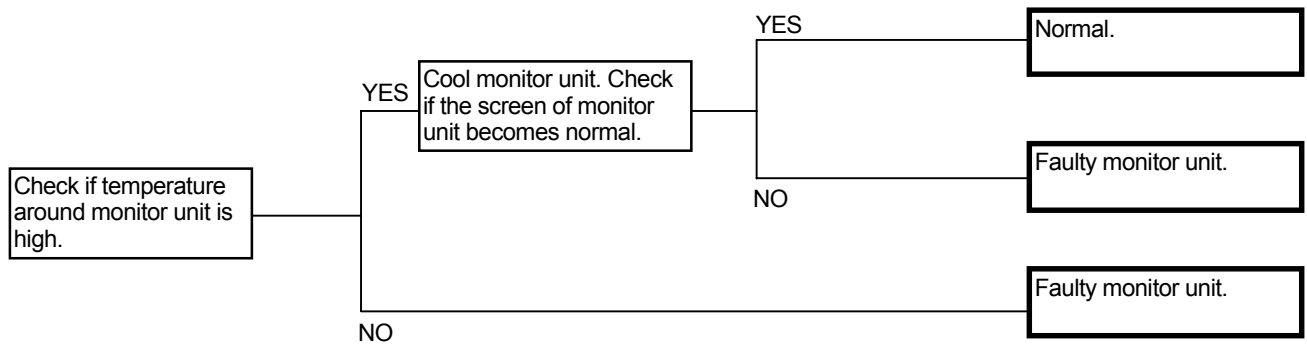


## TROUBLESHOOTING / Troubleshooting A

### MONITOR UNIT FAULT CODE 13303

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

The screen of monitor unit becomes dark.



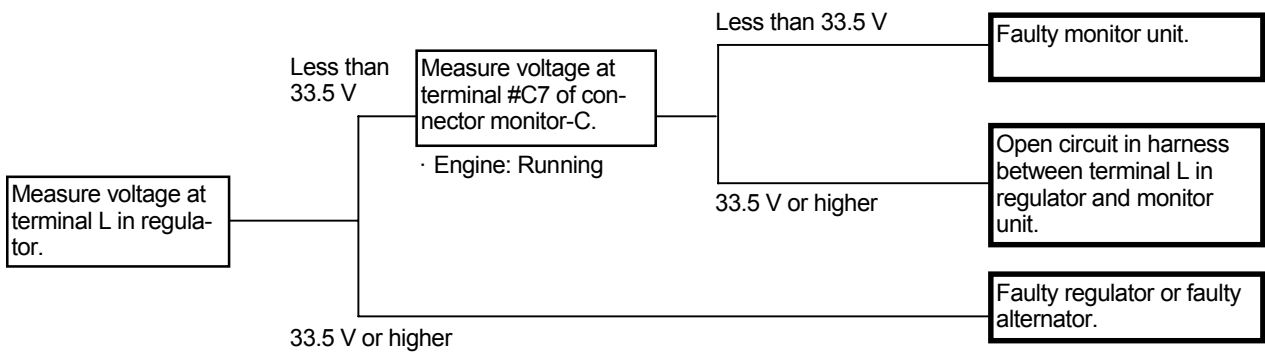
## TROUBLESHOOTING / Troubleshooting A

### MONITOR UNIT FAULT CODE 13304

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

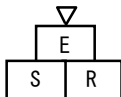
- Check the wiring connections first.

**NOTE:** As terminal L in the regulator is a water-proof 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.

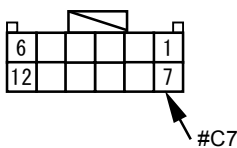


Connector (Harness end of connector viewed from the open end)

Starter Relay 2



Monitor Unit  
Connector Monitor-C



## TROUBLESHOOTING / Troubleshooting A

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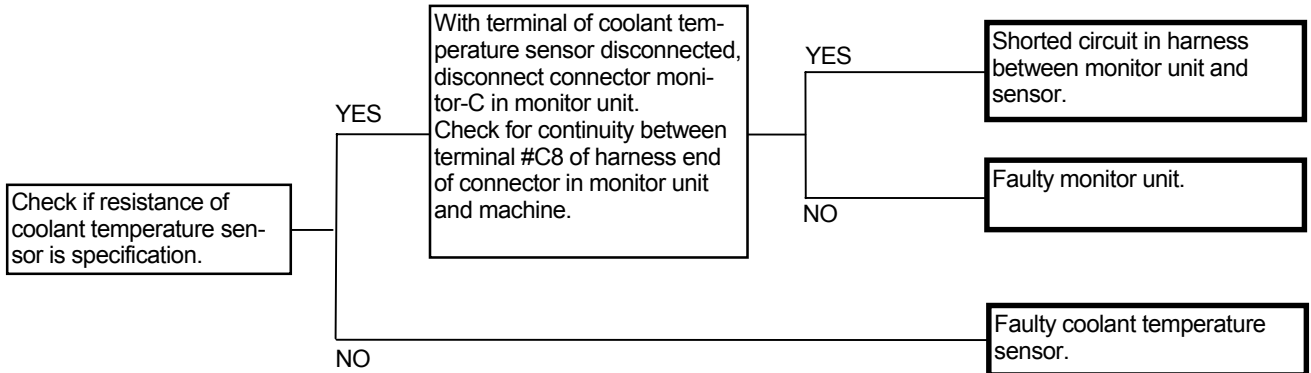
### MONITOR UNIT FAULT CODES 13306, 13308

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" (T5-5-54).

## TROUBLESHOOTING / Troubleshooting A

### MONITOR UNIT FAULT CODE 13310

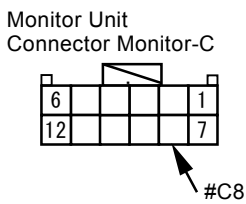
Fault Code	Trouble	Remedy
13310-2	Shorted Circuit in Coolant Temperature Sensor	Check the coolant temperature sensor and harness.



#### Coolant Temperature Sensor

Coolant Temperature (°C)	Resistance (kΩ)
25	7.6±0.76
40	4.0±0.35
50	2.7±0.22
80	0.92±0.07
95	0.56±0.04
105	0.42±0.03
120	0.28±0.01

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

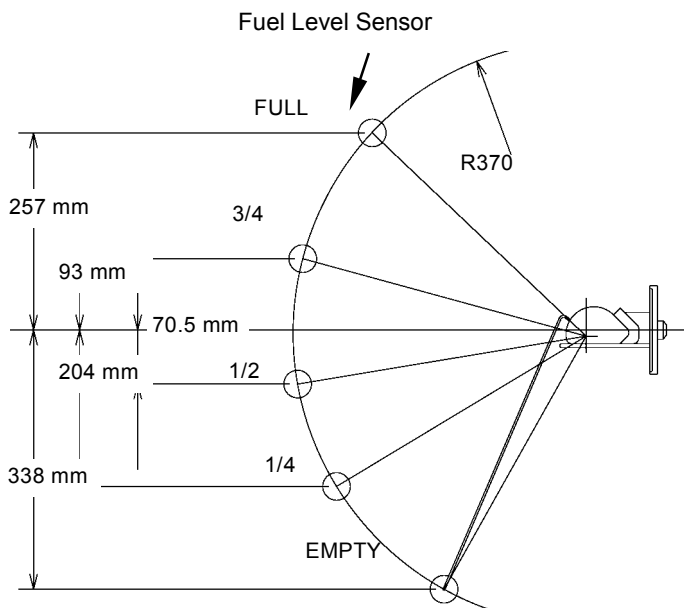
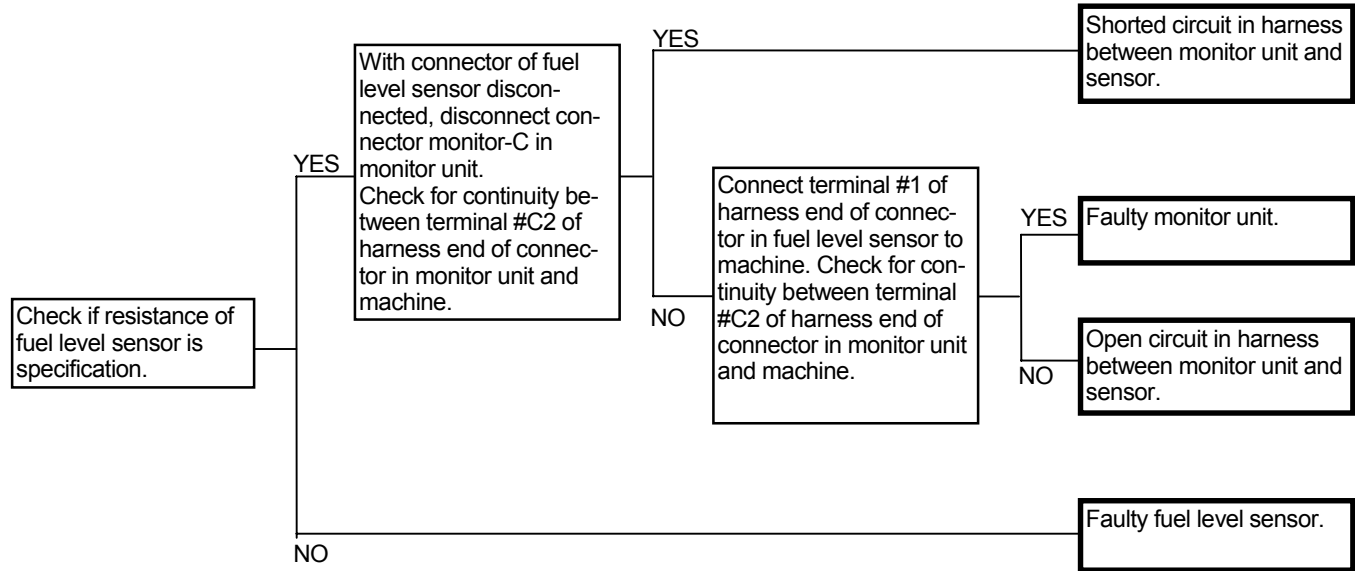




# TROUBLESHOOTING / Troubleshooting A

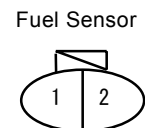
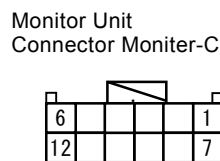
## MONITOR UNIT FAULT CODE 13311

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.



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

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

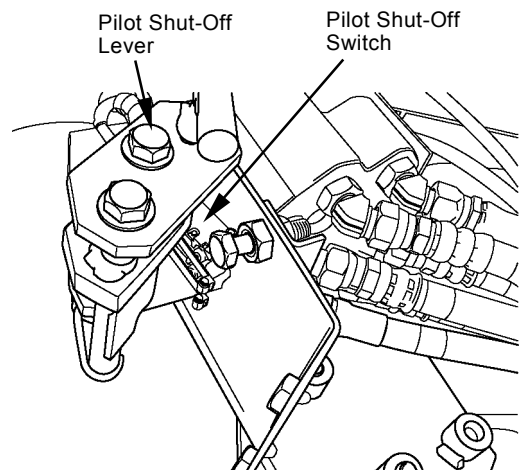
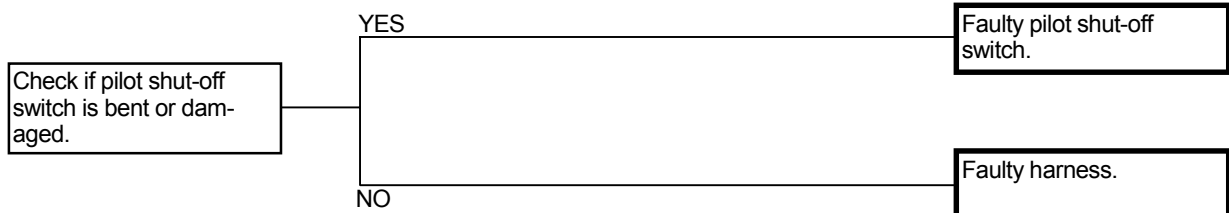


T178-05-05-001

## TROUBLESHOOTING / Troubleshooting A

### PILOT SHUT-OFF LEVER ALARM

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



T1V1-05-06-005

# TROUBLESHOOTING / Troubleshooting B

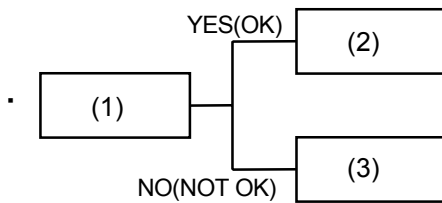
## TROUBLESHOOTING B PROCEDURE

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

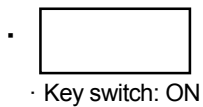
On the front section pages of this group are the tables indicating the relationship between machine trouble symptoms and related parts which may cause such trouble if failed.

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

### • How to Read the Troubleshooting Flow Charts



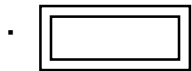
- After checking or measuring item (1), select either YES (OK) or NO (NOT OK) and proceed to item (2) or (3), as appropriate.



- 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 7) in this section.



- Use the service menu (diagnosing system/monitoring ) in monitor unit or the diagnosing system / monitor function in Dr. ZX.



- Causes are stated in a thick-line box. Scanning through thick-line boxes, possible causes can be seen without going through the flow chart.

## TROUBLESHOOTING / Troubleshooting B

### 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	Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Engine Control Dial		<ul style="list-style-type: none"> <li>Instructs engine target speed.</li> </ul>	<ul style="list-style-type: none"> <li>Engine speed is kept at idling speed when trouble occurs with key ON.</li> <li>Engine speed is kept at speed just before trouble occurred when trouble occurs during operation.</li> </ul>	<ul style="list-style-type: none"> <li>Engine speed is kept at idling speed when trouble occurs with key ON.</li> <li>Engine speed is kept at speed just before trouble occurred when trouble occurs during operation.</li> </ul>
Pump Control Pressure Sensor		<ul style="list-style-type: none"> <li>Monitors pump control pressure in order to control travel motor swash angle control.</li> </ul>	<ul style="list-style-type: none"> <li>E mode control In normal, P speed is returned whenever operating. P speed is not returned when this trouble occurs.</li> <li>Heater Control Heater control is ineffective.</li> <li>Travel motor displacement angle control The machine travels at slow speed.</li> </ul>	<ul style="list-style-type: none"> <li>E mode control In normal, P speed is returned whenever operating. P speed is not returned when this trouble occurs.</li> <li>As the machine is kept to travel at slow speed, speed does not change into fast automatically.</li> </ul>
Pump 1 Delivery Pressure Sensor		<ul style="list-style-type: none"> <li>Monitors pump delivery pressure in order to control HP mode, slow speed torque increase, auto-power lift and travel motor swash angle controls.</li> </ul>	<ul style="list-style-type: none"> <li>HP mode control Engine speed does not increase.</li> <li>Travel HP mode control This control is operated by pressure except P1.</li> <li>P-Q torque correction Torque does not increase.</li> <li>Travel torque-up control The machine may mistrack.</li> <li>Bom regeneration control Arm regeneration control is ineffective.</li> <li>Digging regeneration control Digging regeneration control is ineffective.</li> <li>Auto-power lift control. Auto-power lift control is ineffective.</li> <li>Travel motor displacement angle control. The machine travels at slow speed.</li> </ul>	<ul style="list-style-type: none"> <li>During combined operation of boom raise and arm roll-in or of arm roll-in and swing, arm speed is slow.</li> <li>During boom raise operation, lifting power is weak.</li> <li>As the machine is kept to travel at slow speed, speed does not change into fast.</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

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Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11101-3, 11101-4	Monitor Item: Target engine speed, Dial angle (Possible to display by service menu and monitoring in monitor unit)	-	-	T2-2
11206-3, 11206-4, 11208-3, 11208-4	Monitor Item: Pump 1 pump control pressure, Pump 2 pump control pressure (Possible to display by service menu and monitoring in monitor unit)	-	-	T2-2
11200-3, 11200-4	Monitor Item: Pump 1 pressure (Possible to display by service menu and monitoring in monitor unit)	-	-	T2-2

## TROUBLESHOOTING / Troubleshooting B

Parts	Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Pump 2 Delivery Pressure Sensor		<ul style="list-style-type: none"> <li>Monitors pump delivery pressure in order to control HP mode, slow speed torque increase, arm flow rate, arm regeneration and travel motor displacement angle controls.</li> </ul>	<ul style="list-style-type: none"> <li>HP mode control Engine speed does not increase.</li> <li>Travel HP mode control This control is operated by pressure except P2.</li> <li>P-Q torque correction Torque does not increase.</li> <li>Travel torque-up control The machine mistracks.</li> <li>Arm regeneration control Arm regeneration control is ineffective.</li> <li>Digging regeneration control Digging regeneration control is ineffective.</li> <li>Travel motor displacement angle control The machine travels at slow speed.</li> </ul>	<ul style="list-style-type: none"> <li>During combined operation of boom raise and arm roll-in or of arm roll-in and swing, arm speed is slow.</li> <li>As the machine is kept to travel at slow speed, speed does not change into fast.</li> </ul>
Pump 3 Delivery Pressure Sensor (Optional)		<ul style="list-style-type: none"> <li>Monitors pump delivery pressure in order to control pump 3 torque decrease control.</li> </ul>	<ul style="list-style-type: none"> <li>Engine stalls if pump 3 is loaded (pump torque is increased).</li> </ul>	<ul style="list-style-type: none"> <li>Engine stalls if pump 3 is loaded (pump torque is increased).</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11202-3, 11202-4	Monitor Item: Pump 2 pressure (Possible to display by service menu and monitoring in monitor unit)	-	-	T2-2
-	-	-	-	T2-2

## TROUBLESHOOTING / Troubleshooting B

Parts \ Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Pressure Sensor (Travel)	<ul style="list-style-type: none"> <li>• Monitors travel pilot pressure in order to control auto-idle, idle speed-up, engine speed automatic increase at travel, slow speed torque increase and travel motor displacement angle controls.</li> </ul>	<ul style="list-style-type: none"> <li>• Idle speed-up control Engine speed does not change into idle speed-up speed when traveling.</li> <li>• Auto-idle control Although the machine travels, auto-idle is not released.</li> <li>• ECO control Although the machine travels, engine speed does not increase.</li> <li>• Travel HP mode control Travel HP mode control is ineffective.</li> <li>• Operation torque decrease control Operation torque decrease control is ineffective.</li> <li>• Travel torque-up control Travel torque-up control is ineffective.</li> <li>• Travel motor displacement angle control The machine travels at slow speed.</li> <li>• Attachment flow rate control During combined operation of secondary crusher or primary crusher and travel, attachment operation speed may become slow.</li> <li>• Travel alarm (optional) control Travel alarm is kept ON.</li> </ul>	<ul style="list-style-type: none"> <li>• When the machine travels at idle speed, engine speed is not changed into idle speed-up speed.</li> <li>• Although the machine travels, engine speed is kept at auto-idle speed.</li> <li>• Although the machine travels, engine speed does not increase.</li> <li>• As the machine is kept to travel at slow speed, speed does not change into fast.</li> <li>• During combined operation of attachment and travel, the machine mistracks.</li> <li>• The travel alarm is kept to ring as for the machine equipped with travel alarm (optional).</li> </ul>



## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11304-3, 11304-4	Monitor Item: Travel control pressure (Possible to display by service menu and monitoring in monitor unit) Monitor pressure change while traveling machine.		Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor.	T2-2

## TROUBLESHOOTING / Troubleshooting B

Parts \ Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Pressure Sensor (Front Attachment)	<ul style="list-style-type: none"> <li>• Monitors front attachment pilot pressure in order to control auto-idle, idle speed-up and engine speed automatic increase at travel controls.</li> </ul>	<ul style="list-style-type: none"> <li>• Idle speed-up control Engine speed does not change into idle speed-up speed when operating front attachment.</li> <li>• Auto-idle control Although the front attachment is operated, auto-idle is not released.</li> <li>• ECO control Although the front attachment is operated, engine speed does not increase.</li> <li>• Operation torque decrease control Operation torque decrease control is ineffective.</li> <li>• Travel torque-up control Although the front attachment is operated, travel torque-up control is not released.</li> <li>• Travel motor displacement angle control Although the front attachment is operated, the machine travels at fast speed.</li> </ul>	<ul style="list-style-type: none"> <li>• When the front attachment is operated at idle speed, engine speed is not changed into idle speed-up speed.</li> <li>• When the front attachment is operated, engine speed is kept at auto-idle speed.</li> <li>• When the front attachment is operated, engine speed does not increase.</li> <li>• Although the front attachment is operated, the machine travels at fast speed.</li> </ul>
Pressure Sensor (Swing)	<ul style="list-style-type: none"> <li>• Monitors swing pilot pressure in order to control arm flow rate and arm regeneration controls.</li> </ul>	<ul style="list-style-type: none"> <li>• Arm regeneration control During combined operation of arm roll-in and swing, arm regeneration is reduced.</li> <li>• Swing alarm (optional) control Swing alarm is kept ON.</li> </ul>	<ul style="list-style-type: none"> <li>• Arm speed is slow during combined operation of arm roll-in and swing.</li> <li>• The swing alarm is kept to ring when swing alarm is effective as for the machine equipped with swing alarm (optional).</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11307-3, 11307-4	Monitor Item: Front attachment operation (Possible to display by service menu and monitoring in monitor unit) Monitor pressure change while operating front attachment.	-	Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor.	T2-2
11301-3, 11301-4	Monitor Item: Swing control pressure (Possible to display by service menu and monitoring in monitor unit) Monitor pressure change while swinging upper-structure.	-	Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor.	T2-2

## TROUBLESHOOTING / Troubleshooting B

Parts	Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Pressure Sensor (Boom Raise)		<ul style="list-style-type: none"> <li>• Monitors boom raise pilot pressure in order to control HP mode, arm regeneration and auto-power lift controls.</li> </ul>	<ul style="list-style-type: none"> <li>• HP mode control Engine speed does not increase when operating boom raise.</li> <li>• Arm regeneration control Arm regeneration is ineffective during combined operation of boom raise and arm roll-in.</li> <li>• Digging regeneration control Digging regeneration control is ineffective.</li> <li>• Travel motor displacement angle control The machine travels at slow speed.</li> <li>• Auto-power lift control The operating boom raise, pressure does not increase.</li> <li>• Attachment flow rate control During combined operation of attachment and boom raise, attachment operation speed is fast.</li> <li>• Boom limit is operated.</li> </ul>	<ul style="list-style-type: none"> <li>• When operating boom raise during HP mode control, engine speed does not increase.</li> <li>• During combined operation of boom raise and arm roll-in, arm speed is slow.</li> <li>• During boom raise operation, lifting power is weak.</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

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Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11302-3, 11302-4	Monitor Item: Boom raise pilot pressure (Possible to display by service menu and monitoring in monitor unit) Monitor pressure change while raising boom.	-	Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor.	T2-2

## TROUBLESHOOTING / Troubleshooting B

Parts	Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Pressure Sensor (Arm Roll-In)		<ul style="list-style-type: none"> <li>Monitors arm roll-in pilot pressure in order to control HP mode, arm flow rate, and arm regeneration controls.</li> </ul>	<ul style="list-style-type: none"> <li>HP mode control Engine speed does not increase when operating arm roll-in.</li> <li>Arm regeneration control Arm regeneration is not operated during combined operation of arm roll-in and swing.</li> <li>Digging regeneration control Arm operation speed is slightly slow when operating digging during combined operation of boom raise and arm roll-in.</li> <li>Auto-power lift control Pressure increases when operating digging during combined operation of boom raise and arm roll-in.</li> </ul>	<ul style="list-style-type: none"> <li>When operating arm roll-in with the HP mode switch ON, engine speed does not increase.</li> <li>During combined operation of arm roll-in and swing, arm speed is slow.</li> </ul>
Pressure Sensor (Auxiliary) (Optional)		<ul style="list-style-type: none"> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>Attachment Open part: Maximum</li> <li>Pump 1, 2 flow rate limits are ineffective.</li> </ul>	<ul style="list-style-type: none"> <li>During combined operation of attachment and front attachment, front attachment speed is slow.</li> <li>Pump 1, 2 flow rates are not limited at attachment mode.</li> </ul>
Torque Control Solenoid Valve		<ul style="list-style-type: none"> <li>Supplies control pressure to pumps 1 and 2 in order to control speed sensing and slow speed torque increase controls.</li> </ul>	<ul style="list-style-type: none"> <li>High current: Pump torque is kept maximum. The engine stalls or lugging-down is remarkable at high loaded.</li> <li>Low current: Pump torque is kept minimum.</li> </ul>	<ul style="list-style-type: none"> <li>High current: If pump torque is maximum at low idle, the engine stalls or lugging-down occurs.</li> <li>Low current: The machine operation is totally slow.</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11303-3, 11303-4	Monitor Item: Arm roll-In pilot pressure (Possible to display by service menu and monitoring in monitor unit) Monitor pressure change while rolling arm in.	-	Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor.	T2-2
-	Monitor Item: ATT control pressure (Possible to display by service menu and monitoring in monitor unit) Monitor pressure change while operating attachment.	-	Judge if pressure sensor is faulty or port is clogged by switching pressure sensor with other pressure sensor.	T2-2
11401-2, 11401-3, 11401-4	Monitor Item: Pump torque proportional solenoid valve output	-	-	T2-2

## TROUBLESHOOTING / Troubleshooting B

Parts \ Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Solenoid Valve Unit (SG)	<ul style="list-style-type: none"> <li>Temporarily increases main relief valve relief pressure in power digging and auto-power lift control.</li> </ul>	<ul style="list-style-type: none"> <li>High current: Pressure is kept increasing.</li> <li>Low current: Pressure cannot increase.</li> </ul>	<ul style="list-style-type: none"> <li>High current: Pressure is kept increasing according to the valve open condition. Therefore, power increases as for all operations.</li> <li>Low current: Relief pressure: 34 MPa (350 kgf/cm<sup>2</sup>) is kept. Therefore, although the power digging switch is pushed, relief pressure does not increase. Power does not increase.</li> </ul>
Solenoid Valve Unit (SF)	<ul style="list-style-type: none"> <li>Routes return oil from boom cylinder rod side to arm cylinder bottom side during digging operation and increases arm speed.</li> </ul>	<ul style="list-style-type: none"> <li>High current: Digging regeneration control is always effective.</li> <li>Low current: Digging regeneration control is always ineffective.</li> </ul>	<ul style="list-style-type: none"> <li>High current: During combined operation of boom raise and arm roll-in with suspended load and fine operation, boom does not raise easily.</li> <li>Low current: During digging operation, arm operation speed is slow. (Slowdown is not remarkable.)</li> </ul>
Solenoid Valve Unit (SC)	<ul style="list-style-type: none"> <li>Routes return oil from arm cylinder rod side to arm cylinder bottom side when rolling arm in and increases arm speed.</li> </ul>	<ul style="list-style-type: none"> <li>High current: Digging power (arm) becomes weak.</li> <li>Low current: Arm regeneration is always ineffective.</li> </ul>	<ul style="list-style-type: none"> <li>High current: Digging power (arm) becomes weak.</li> <li>Low current: During combined operation of boom raise and arm roll-in above the ground, boom does not raise easily and maximum arm roll-in operation speed is slow.</li> </ul>



## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11404-2, 11404-3, 11404-4	Monitor Item: Power digging control pressure	Install lamp harness (ST 7226). Check output signals from MC and harness condition.	Proportional solenoid valve is used as an ON/OFF valve. When power digging switch is pushed or released and lamp comes ON, harness is normal. If lamp goes OFF, it may be due to open circuit in harness.	T2-2
11402-2, 11402-3, 1402-4	Monitor Item: Digging regenerative valve	Install lamp harness (ST 7226). Check output signals from MC and harness condition.	-	T2-2
11403-2, 11403-3, 11403-4	Monitor Item: Arm regenerative proportional solenoid valve output	Install lamp harness (ST 7226). Check output signals from MC and harness condition.	-	T2-2

## TROUBLESHOOTING / Troubleshooting B

Parts \ Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Solenoid Valve Unit (SI)	<ul style="list-style-type: none"> <li>When pump delivery pressure is low in fast travel mode, travel motor swash angle is reduced and increases travel speed.</li> </ul>	<ul style="list-style-type: none"> <li>High current: Travel motor is always operated at fast speed.</li> <li>Low current: Travel motor is always operated at slow speed.</li> </ul>	<ul style="list-style-type: none"> <li>High current: Travel motor is always operated at fast speed.</li> <li>Low current: Travel motor is always operated at slow speed.</li> </ul>
Max. Pump 1 Flow Rate Limit Solenoid Valve • ZX160-3 class: Standard • ZX180-3 class: Optional	<ul style="list-style-type: none"> <li>Limits maximum pump 1 flow rate when operating attachment.</li> <li>Control flow rate of pump 1 when operating travel. (ZX160-3 class only)</li> </ul>	<ul style="list-style-type: none"> <li>High current: Pump 1 flow rate becomes minimum.</li> <li>Low current: Pump 1 flow rate does not decrease. Pump 1 attachment flow rate cannot be controlled.</li> </ul>	<ul style="list-style-type: none"> <li>High current: The machine mistracks. Boom raise operation speed is slow. Arm roll-out and roll-in operation speeds are slow. Bucket roll-in and roll-put operation speeds are slow.</li> <li>Low current: Attachment flow rate cannot be controlled.</li> </ul>
Max. Pump 2 Flow Rate Limit Solenoid Valve	<ul style="list-style-type: none"> <li>Limits maximum pump 2 flow rate when operating attachment.</li> <li>Control flow rate of pump 2 when operating travel. (ZX160-3 class only)</li> </ul>	<ul style="list-style-type: none"> <li>High current: Pump 2 flow rate becomes minimum.</li> <li>Low current: Pump 2 flow rate does not decrease.</li> </ul>	<ul style="list-style-type: none"> <li>High current: The machine mistracks. Boom raise operation speed is slow. Arm roll-out and roll-in operation speeds are slow. Swing operation speed is slow.</li> <li>Low current: Attachment flow rate cannot be controlled.</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
11405-2, 11405-3, 11405-4	Monitor Item: Digging regenerative valve	Install lamp harness (ST 7226). Check output signals from MC and harness condition.	-	T2-2
<ul style="list-style-type: none"> <li>• ZX160-3 class: 11410-2, 11410-3, 11410-4</li> <li>• ZX180-3 class: None</li> </ul>	-	-	-	T2-2
11400-2, 11400-3, 11400-4	-	-	-	T2-2

## TROUBLESHOOTING / Troubleshooting B

Parts \ Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Auxiliary Flow Rate Control Solenoid Valve (Optional)	<ul style="list-style-type: none"> <li>Restricts flow rate to auxiliary spool during combined operation and improves operability.</li> </ul>	<ul style="list-style-type: none"> <li>If auxiliary flow rate control solenoid valve is not activated, pressure at output port becomes 0 MPa (0 kgf/cm<sup>2</sup>).</li> </ul>	<ul style="list-style-type: none"> <li>High current: If valve is bound fully closed, attachment speed becomes slow during single operation.</li> <li>Low current: If valve is bound fully open, boom does not raise during 3-combined operation of boom raise.</li> </ul>
Auxiliary Flow Combining Solenoid Valve (Optional)	<ul style="list-style-type: none"> <li>Activates during auxiliary operation and shifts spool in auxiliary flow combining valve.</li> </ul>	<ul style="list-style-type: none"> <li>If auxiliary flow combining solenoid valve is not activated, pressure at output port becomes 0 MPa (0 kgf/cm<sup>2</sup>) when operating attachment.</li> </ul>	<ul style="list-style-type: none"> <li>Speed does not increase during single operation of attachment.</li> </ul>
Selector Valve Control Solenoid Valve (Optional)	<ul style="list-style-type: none"> <li>Activates when attachment "selector valve returning to hydraulic oil tank" is selected and shifts selector valve spool.</li> </ul>	<ul style="list-style-type: none"> <li>If selector valve control solenoid valve is not activated, pressure at output port becomes 0 MPa (0 kgf/cm<sup>2</sup>) when attachment "selector valve returning to hydraulic oil tank" is selected.</li> </ul>	<ul style="list-style-type: none"> <li>Breaker stroke becomes few.</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T2-2
-	-	-	-	T2-2
-	-	-	When pedal is depressed, pressure in the right piping hose occurs.	T2-2

## TROUBLESHOOTING / Troubleshooting B

Parts	Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Secondary Pilot Relief Pressure Control Solenoid Valve (Optional)		<ul style="list-style-type: none"> <li>Activates when attachment "secondary pilot relief pressure ON" is selected and shifts secondary pilot relief pressure control valve spool.</li> </ul>	<ul style="list-style-type: none"> <li>If secondary pilot relief pressure control solenoid valve is not activated, pressure at output port becomes 0 MPa (0 kgf/cm<sup>2</sup>) when attachment "secondary pilot relief pressure ON" is selected.</li> </ul>	<ul style="list-style-type: none"> <li>Relief set-pressure in auxiliary circuit does not decrease.</li> </ul>
Oil Temperature Sensor		<ul style="list-style-type: none"> <li>Monitors hydraulic oil temperature in order to control auto-warming control.</li> </ul>	<ul style="list-style-type: none"> <li>Auto-warming control Auto-warming control is ineffective.</li> </ul>	<ul style="list-style-type: none"> <li>When oil temperature is lower than 0 °C, auto-warming up control is not operated.</li> </ul>
Power Digging Switch		<ul style="list-style-type: none"> <li>Activates power digging control.</li> </ul> <p>ON: 0 V→Increasing pressure OFF: 5 V→ Not increasing pressure</p>	<ul style="list-style-type: none"> <li>Open circuit: Pressure does not increase.</li> <li>Shorted circuit: Pressure does not increase for 8 seconds after the key switch is turned ON.</li> </ul>	<ul style="list-style-type: none"> <li>Power digging control is not operated if open circuit or shorted circuit occurs.</li> </ul>
Travel Mode Switch		<ul style="list-style-type: none"> <li>Shifts travel mode.</li> </ul> <p>Fast mode: 0 V Slow mode: 5 V</p>	<ul style="list-style-type: none"> <li>Open circuit in switch: Travel speed remains unchanged in slow mode (5 V).</li> <li>Shorted circuit in switch: Travel speed remains unchanged in auto-second gear (0 V).</li> </ul>	<ul style="list-style-type: none"> <li>Even if travel mode switch is turned to the FAST position, fast travel mode cannot be selected.</li> <li>Even if travel mode switch is turned to the SLOW position, travel mode is turned to the auto-second gear.</li> </ul>
MC		<ul style="list-style-type: none"> <li>Controls engine, pump and valve operations.</li> </ul>	<ul style="list-style-type: none"> <li>Depending on trouble situations, control system malfunction may differ. (The following symptoms in machine operation indicates that MC logic circuit has failed.)</li> </ul>	<ul style="list-style-type: none"> <li>Even if engine starts, engine speed remains in idle speed.</li> <li>As pump displacement is kept at minimum, all operation speeds are slow.</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T2-2
11901-3, 11901-4	Monitor Item: Hydraulic oil temperature	-	-	T2-2
-	Monitor Item: Power Digging Switch	-	-	T2-2
-	Monitor Item: Travel Mode	-	-	T2-2
11000-2, 11001-2, 11002-2, 11003-3	-	-	Before suspecting a failure in MC, check fuses in control system. If any sensor in 5 V system is shorted circuit, fault codes of all sensor is displayed.	T2-2

## TROUBLESHOOTING / Troubleshooting B

Parts	Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Auto-Idle Switch		<ul style="list-style-type: none"> <li>Activates auto-idle. ON: 0 V → Auto-idle control is operated. OFF: 5 V → Auto-idle is not operated.</li> </ul>	<ul style="list-style-type: none"> <li>Open circuit: Auto-idle is not operated.</li> <li>Shorted circuit: Even if auto-idle switch is in OFF position, auto-idle control is always operated.</li> </ul>	<ul style="list-style-type: none"> <li>Open circuit: Auto-idle is not operated.</li> <li>Shorted circuit: Even if auto-idle switch is in OFF position, auto-idle control is always operated.</li> </ul>
Power Mode Switch (HP Mode)		<ul style="list-style-type: none"> <li>Activates HP mode control. ON: 0 V → HP mode control is operated. OFF: 5 V → Normal.</li> </ul>	<ul style="list-style-type: none"> <li>Open circuit: Even if HP mode is selected, HP mode is not operated.</li> <li>Shorted circuit: Even if HP mode switch is turned OFF, HP mode is continued. Attachment speed increase control (optional) becomes ineffective.</li> </ul>	<ul style="list-style-type: none"> <li>Open circuit: Even if HP mode is selected, HP mode is not operated.</li> <li>Shorted circuit: Even if HP mode switch is turned OFF, HP mode is continued. Attachment speed increase control (optional) becomes ineffective.</li> </ul>
Power Mode Switch (E Mode)		<ul style="list-style-type: none"> <li>Selects E mode. ON: 0 V → E mode OFF: 5 V → Normal.</li> </ul>	<ul style="list-style-type: none"> <li>Open circuit: Even if E mode is selected, engine speed does not decrease with the control lever in neutral. When E mode is selected and engine is operated at full speed with light load, engine speed does not increase.</li> <li>Shorted circuit: When the control lever is in neutral and the engine control dial is at FAT idle position and even if the power mode switch is shifted from E mode to P mode, engine speed does not increase.</li> </ul>	<ul style="list-style-type: none"> <li>Open circuit: Even if E mode is selected, engine speed does not decrease with the control lever in neutral. When E mode is selected and engine is operated at full speed with light load, engine speed does not increase.</li> <li>Shorted circuit: When the control lever is in neutral and the engine control dial is at FAT idle position and even if the power mode switch is shifted from E mode to P mode, engine speed does not increase.</li> </ul>



## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T2-2
-	Monitor Item: E/P/HP mode switch	-	-	T2-2
-	Monitor Item: E/P/HP mode switch	-	-	T2-2

## TROUBLESHOOTING / Troubleshooting B

Parts	Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Arm 2 Flow Rate Control Valve		<ul style="list-style-type: none"> <li>• Be shifted by pilot pressure from solenoid valve unit (SC).</li> <li>• Ensures boom raise speed during combined operation of boom and arm.</li> </ul>	<ul style="list-style-type: none"> <li>• If spool is bound or spring is broken, orifice does not change</li> </ul>	<ul style="list-style-type: none"> <li>• If fully opened: Boom raise speed is slow.</li> <li>• If fully closed: Arm roll-in speed is slow during arm level crowd operation.</li> </ul>
Flow Combiner Valve		<ul style="list-style-type: none"> <li>• Supplies oil to both right and left travel spools from pump 1 during combined operation of travel and front/swing.</li> </ul>	<ul style="list-style-type: none"> <li>• 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.</li> </ul>	<ul style="list-style-type: none"> <li>• While traveling and when front/swing lever is operated, machine mistracks to the left.</li> </ul>
Arm 1 Flow Rate Control Valve		<ul style="list-style-type: none"> <li>• Be shifted by pilot pressure from arm flow rate control valve in signal control valve.</li> <li>• Ensures swing power.</li> </ul>	<ul style="list-style-type: none"> <li>• If spool is bound or spring is broken, orifice does not change.</li> </ul>	<ul style="list-style-type: none"> <li>• If fully opened: swing power is lack.</li> <li>• If fully closed: Arm roll-in speed is slow during arm level crowd operation.</li> </ul>
Bucket Flow Rate Control Valve		<ul style="list-style-type: none"> <li>• Restricts oil flow to bucket during 3-combined operation of bucket, arm roll-in and boom raise, and allows boom to raise.</li> </ul>	<ul style="list-style-type: none"> <li>• If selector valve is bound with selector valve activated, bucket circuit is always restricted.</li> </ul>	<ul style="list-style-type: none"> <li>• If poppet valve is bound at fully closed position or if selector valve is bound when poppet valve is fully closed, bucket speed becomes slow.</li> <li>• If poppet valve is bound at fully open position or if selector valve is bound when poppet valve is fully open, boom does not raise during 3-combined operation of bucket, arm roll-in and boom raise.</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-3
-	-	-	-	T3-3
-	-	-	-	T3-3
-	-	-	-	T3-3

## TROUBLESHOOTING / Troubleshooting B

Parts	Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Auxiliary Flow Rate Control Valve		<ul style="list-style-type: none"> <li>Be shifted by pilot pressure from auxiliary flow rate control solenoid valve.</li> </ul>	<ul style="list-style-type: none"> <li>If spool is bound or spring is broken, orifice does not change.</li> </ul>	<ul style="list-style-type: none"> <li>If bound at fully closed position, attachment speed becomes slow.</li> <li>If bound at fully open position, boom does not raise during 3-combined operation of swing, arm roll-in and boom raise.</li> </ul>
Boom Valve	Regenerative	<ul style="list-style-type: none"> <li>Routes return oil from boom cylinder bottom side to rod side and prevents boom cylinder hesitation.</li> </ul>	<ul style="list-style-type: none"> <li>If check valve is kept closed, boom is not smoothly lowered.</li> <li>If check valve is kept open, machine cannot be raised off ground with front attachment.</li> </ul>	<ul style="list-style-type: none"> <li>If check valve is kept closed, boom is not smoothly lowered.</li> <li>If check valve is kept open, machine cannot be raised off ground with front attachment.</li> </ul>
Arm Regenerative Valve		<ul style="list-style-type: none"> <li>Be shifted by pilot pressure from solenoid valve unit (SC).</li> <li>Routes return oil from arm cylinder rod side to bottom side and increases arm speed.</li> </ul>	<ul style="list-style-type: none"> <li>Arm regenerative function is not operated.</li> </ul>	<ul style="list-style-type: none"> <li>Arm speed is extremely slow during arm level crowd operation while arm regenerative valve is kept closed.</li> <li>The lever operated first is given priority during combined operation of arm roll-in and swing while arm regenerative valve is kept open.</li> </ul>
Bucket Valve	Regenerative	<ul style="list-style-type: none"> <li>Routes return oil from bucket cylinder rod side to bottom side and prevents bucket cylinder hesitation.</li> </ul>	<ul style="list-style-type: none"> <li>If check valve is kept closed, bucket is not smoothly rolled in.</li> <li>If check valve is kept open, bucket power is weak.</li> </ul>	<ul style="list-style-type: none"> <li>If check valve is kept closed, bucket is not smoothly rolled in.</li> <li>If check valve is kept open, bucket power is weak.</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-3
-	-	-	-	T3-3
-	-	-	-	T3-3
-	-	-	-	T3-3

## TROUBLESHOOTING / Troubleshooting B

Parts \ Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Arm Anti-Drift Valve	<ul style="list-style-type: none"> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>If switch valve is bound, check valve does not open.</li> </ul>	<ul style="list-style-type: none"> <li>If check valve is kept closed, arm roll-in speed becomes slow.</li> <li>If check valve is kept open, front attachment drift increases due to oil leaks in control valve.</li> <li>Arm moves jerky or arm speed becomes slow depending on valve bound conditions.</li> </ul>
Boom Anti-Drift Valve	<ul style="list-style-type: none"> <li>Forcibly open check valve in boom lower return circuit and allows boom to move only when boom is lowered. Prevents boom from drifting due to oil leaks in control valve.</li> </ul>	<ul style="list-style-type: none"> <li>If switch valve is bound, check valve does not open.</li> </ul>	<ul style="list-style-type: none"> <li>If check valve is kept closed, boom does not lower.</li> <li>If check valve is kept open, front attachment drift increases due to oil leaks in control valve.</li> <li>Boom moves jerky or boom speed becomes slow depending on valve bound conditions.</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

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Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-3
-	-	-	-	T3-3

## TROUBLESHOOTING / Troubleshooting B

Parts	Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
	Bypass Shut-Out Valve	<ul style="list-style-type: none"> <li>• Supplies pressure oil from pump 1 to auxiliary spool when auxiliary spool is operated.</li> <li>• Increases pump 1 pressure when machine is raised off the ground.</li> </ul>	<ul style="list-style-type: none"> <li>• If spool is bound at fully open, single attachment operation speed becomes slow.</li> <li>• If spool is bound at fully closed, main relief valve continues to relieve with all control levers in neutral.</li> <li>• When all control levers are in neutral, pump 1 pressure is higher than pump 2 pressure by depending on spool bound condition.</li> <li>• If spool is bound at fully closed, machine cannot be raised off the ground.</li> </ul>	<ul style="list-style-type: none"> <li>• If spool is bound at fully open, single attachment operation speed becomes slow.</li> <li>• If spool is bound at fully closed, main relief valve continues to relieve with all control levers in neutral.</li> <li>• When all control levers are in neutral, pump 1 pressure is higher than pump 2 pressure by depending on spool bound condition.</li> <li>• If spool is bound at fully closed, machine cannot be raised off the ground.</li> </ul>



## TROUBLESHOOTING / Troubleshooting B

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Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-3

## TROUBLESHOOTING / Troubleshooting B

Parts	Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Pump 1 Flow Rate Control Valve		<ul style="list-style-type: none"> <li>Supplies flow rate control pressure <math>P_i</math> 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.</li> </ul>	<ul style="list-style-type: none"> <li>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.)</li> <li>If spool is bound at fully open, pump 1 control pressure sensor detects the maximum pressure.</li> <li>If spool is bound at fully closed, even if control lever is operated, pump 1 swash angle is tilted to minimum. (Right travel is not operated during single travel operation. Bucket speed becomes very slow.)</li> <li>If spool is bound at fully open, pump 1 control pressure sensor cannot detect pump control pressure. (Right travel does not run fast with right track jacked-up.)</li> </ul>	<ul style="list-style-type: none"> <li>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.)</li> <li>If spool is bound at fully open, pump 1 control pressure sensor detects the maximum pressure.</li> <li>If spool is bound at fully closed, even if control lever is operated, pump 1 swash angle is tilted to minimum. (Right travel is not operated during single travel operation. Bucket speed becomes very slow.)</li> <li>If spool is bound at fully open, pump 1 control pressure sensor cannot detect pump control pressure. (Right travel does not run fast with right track jacked-up.)</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

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Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-6

## TROUBLESHOOTING / Troubleshooting B

Parts	Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Pump 2 Flow Rate Control Valve		<ul style="list-style-type: none"> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>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.)</li> <li>If spool is bound at fully open, pump 2 control pressure sensor detects the maximum pressure.</li> <li>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.)</li> <li>If spool is bound at fully open, pump 2 control pressure sensor cannot detect pump control pressure. (Left travel does not run fast with left track jacked-up.)</li> </ul>	<ul style="list-style-type: none"> <li>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.)</li> <li>If spool is bound at fully open, pump 2 control pressure sensor detects the maximum pressure.</li> <li>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.)</li> <li>If spool is bound at fully open, pump 2 control pressure sensor cannot detect pump control pressure. (Left travel does not run fast with left track jacked-up.)</li> </ul>
Flow Combiner Valve Control Spool		<ul style="list-style-type: none"> <li>Be shifted by right travel pilot pressure and supplies control pressure to flow combiner valve in control valve.</li> </ul>	<ul style="list-style-type: none"> <li>If spool is bound at fully open, when boom, arm, bucket or swing is operated, flow combiner valve is shifted.</li> <li>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.)</li> </ul>	<ul style="list-style-type: none"> <li>If spool is bound at fully open, when boom, arm, bucket or swing is operated, flow combiner valve is shifted.</li> <li>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.)</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-6
-	-	-	-	T3-6

## TROUBLESHOOTING / Troubleshooting B

Parts	Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
	Swing Parking Brake Release Spool	<ul style="list-style-type: none"> <li>Be shifted by boom, arm, bucket or swing pilot pressure and supplies swing parking brake release pressure.</li> </ul>	<ul style="list-style-type: none"> <li>If spool is bound at fully open, swing parking brake is kept released. (Machine vibrates while traveling.)</li> <li>If spool is bound at fully open, pressure sensor (front attachment) is always turned into ON. Thus, engine speed does not decrease when control lever is in neutral during auto-idle control.</li> <li>If spool is bound at fully closed, swing parking brake is kept applied. (Dragging is felt.)</li> <li>If spool is bound at fully closed, pressure sensor (front attachment) is always turned into OFF. Thus, engine speed does not increase when control lever is operated during auto-idle control.</li> </ul>	<ul style="list-style-type: none"> <li>If spool is bound at fully open, swing parking brake is kept released. (Machine vibrates while traveling.)</li> <li>If spool is bound at fully open, pressure sensor (front attachment) is always turned into ON. Thus, engine speed does not decrease when control lever is in neutral during auto-idle control.</li> <li>If spool is bound at fully closed, swing parking brake is kept applied. (Dragging is felt.)</li> <li>If spool is bound at fully closed, pressure sensor (front attachment) is always turned into OFF. Thus, engine speed does not increase when control lever is operated during auto-idle control.</li> </ul>
	Bucket Flow Rate Control Valve Control Spool	<ul style="list-style-type: none"> <li>Be shifted by arm roll-in pilot pressure and supplies boom raise pilot pressure to bucket flow rate control valve as control pressure.</li> </ul>	<ul style="list-style-type: none"> <li>If spool is bound at fully open, bucket speed becomes slow during combined operation of boom raise and bucket. (Bucket flow rate control is ineffective.)</li> <li>If spool is bound at fully closed, boom does not raise during 3-combined operation of bucket, arm roll-in and boom raise.</li> </ul>	<ul style="list-style-type: none"> <li>If spool is bound at fully open, bucket speed becomes slow during combined operation of boom raise and bucket. (Bucket flow rate control is ineffective.)</li> <li>If spool is bound at fully closed, boom does not raise during 3-combined operation of bucket, arm roll-in and boom raise.</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-3
-	-	-	-	T3-3

## TROUBLESHOOTING / Troubleshooting B

Parts	Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
	Arm Flow Rate Control Valve Control Spool	<ul style="list-style-type: none"> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>If spool is bound at fully open, arm speed decreases during single arm operation. (Arm flow rate control is always operated.)</li> <li>If spool is bound at fully closed, swing power becomes insufficient during combined operation of swing and arm roll-in. (Arm flow rate control is not operated.)</li> </ul>	<ul style="list-style-type: none"> <li>If spool is bound at fully open, arm speed decreases during single arm operation. (Arm flow rate control is always operated.)</li> <li>If spool is bound at fully closed, swing power becomes insufficient during combined operation of swing and arm roll-in. (Arm flow rate control is not operated.)</li> </ul>
Digging Valve	Regenerative Valve	<ul style="list-style-type: none"> <li>Be shifted by pilot pressure from solenoid valve unit (SF).</li> <li>Routes return oil from boom cylinder rod side to arm cylinder bottom side and increases arm speed.</li> </ul>	<ul style="list-style-type: none"> <li>If valve is kept closed, arm roll-in speed becomes slow during digging operation.</li> <li>If valve is kept open, arm speed becomes fast.</li> <li>Shock occurs during boom raise operation.</li> </ul>	<ul style="list-style-type: none"> <li>If valve is kept closed, arm roll-in speed becomes slow during digging operation.</li> <li>If valve is kept open, arm speed becomes fast.</li> <li>Shock occurs during boom raise operation.</li> </ul>
	Boom Flow Rate Control Valve	<ul style="list-style-type: none"> <li>Be shifted by pilot pressure from boom lower meter-in cut valve.</li> <li>Controls flow rate to boom 1 spool during combined operation and improves combined operation.</li> </ul>	<ul style="list-style-type: none"> <li>If valve is at fully open, boom lower speed becomes fast during combined operation.</li> <li>If valve is at fully closed, machine cannot be raised off ground with front attachment.</li> </ul>	<ul style="list-style-type: none"> <li>If valve is at fully open, boom lower speed becomes fast during combined operation.</li> <li>If valve is at fully closed, machine cannot be raised off ground with front attachment.</li> </ul>



## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-6
-	-	-	-	T3-3
-	-	-	-	T3-3

## TROUBLESHOOTING / Troubleshooting B

Parts	Item	Function	Symptoms in control system when trouble occurs.	Symptoms in machine operation when trouble occurs.
Boom Lower Meter-In Cut Valve		<ul style="list-style-type: none"> <li>• Be shifted by return oil from boom cylinder bottom side.</li> <li>• Shifts boom flow rate control valve by boom lower pilot pressure.</li> </ul>	<ul style="list-style-type: none"> <li>• If valve is kept closed, as boom flow rate control valve is not shifted, boom lower speed becomes fast during combined operation.</li> <li>• 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.</li> </ul>	<ul style="list-style-type: none"> <li>• If valve is kept closed, as boom flow rate control valve is not shifted, boom lower speed becomes fast during combined operation.</li> <li>• 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.</li> </ul>
Auxiliary Flow Combining Valve (Optional)		<ul style="list-style-type: none"> <li>• Be shifted by pilot pressure from auxiliary flow combining solenoid valve when attachment mode (secondary crusher, primary crusher) of travel speed "ON" is selected.</li> <li>• Supplies pressure oil from pump 1 to auxiliary spool.</li> </ul>	<ul style="list-style-type: none"> <li>• If switch valve is kept closed, attachment speed does not become fast during single auxiliary operation.</li> <li>• If switch valve is kept open, attachment speed does not become slow when attachment mode (HSB breaker, NPK breaker) of travel speed "OFF" is selected.</li> </ul>	<ul style="list-style-type: none"> <li>• If switch valve is kept closed, attachment speed does not become fast during single auxiliary operation.</li> <li>• If switch valve is kept open, attachment speed does not become slow when attachment mode (HSB breaker, NPK breaker) of travel speed "OFF" is selected.</li> </ul>
Selector Valve (Optional)		<ul style="list-style-type: none"> <li>• Be shifted by pilot pressure from selector valve control solenoid valve.</li> </ul>	<ul style="list-style-type: none"> <li>• If spool is bound or spring is broken, pressure oil from breaker does not return to hydraulic oil tank.</li> </ul>	<ul style="list-style-type: none"> <li>• Breaker stroke becomes few.</li> </ul>
Secondary Pilot Relief Pressure Control Valve (Optional)		<ul style="list-style-type: none"> <li>• Be shifted by pilot pressure from secondary pilot relief pressure control solenoid valve.</li> </ul>	<ul style="list-style-type: none"> <li>• If spool is bound or spring is broken, relief circuit in breaker is blocked.</li> </ul>	<ul style="list-style-type: none"> <li>• Relief set-pressure in auxiliary circuit does not decrease.</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

Evaluation by MC Fault Code	Evaluation by Monitor Function	Evaluation by using Test Harness	NOTE	Descriptions of Control (Operational Principle Section in T/M)
-	-	-	-	T3-3
-	-	-	-	T3-3
-	-	-	-	T2-2
-	-	-	-	T2-2

## TROUBLESHOOTING / Troubleshooting B

### CORRELATION BETWEEN TROUBLE SYMPTOMS AND PART FAILURES

This table indicates the relationship between machine troubles and parts contributing to the cause of the trouble if failed.

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

#### Engine System Troubleshooting

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



## TROUBLESHOOTING / Troubleshooting B

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

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



## TROUBLESHOOTING / Troubleshooting B

Trouble Symptom	E-14	E-15
	Engine stalls during operation under adverse condition such as at high altitude.	Engine is difficult to start at low temperature.
<b>Parts</b>		
MC	●	
ECM	●	●
ICF		
Monitor Unit		
Pump 1 Delivery Pressure Sensor		
Pump 2 Delivery Pressure Sensor		
Pump 1 Control Pressure Sensor		
Pump 2 Control Pressure Sensor		
Pressure Sensor (Travel)		
Pressure Sensor (Front Attachment)		
Pressure Sensor (Swing)		
Pressure Sensor (Boom Raise)		
Pressure Sensor (Arm Roll-In)		
Pressure Sensor (Auxiliary)		
Hyd. Oil Temperature Sensor		
Coolant Temperature Sensor		●
Key Switch		
Engine Control Dial		
Auto-Idle Switch		
Power Mode Switch		
Travel Mode Switch		
Torque Control Solenoid Valve	●	
Starter Cut Relay		
ECM Main Relay		
Battery Relay		
Glow Relay		●
Engine Electrical Equipment	○	●
Engine Unit	○	●
Pump Regulator	●	
Swing Parking Brake Release Spool (Signal Control Valve)		
Remarks	Check batteries.	



## **TROUBLESHOOTING / Troubleshooting B**


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## TROUBLESHOOTING / Troubleshooting B

### All Actuator System Troubleshooting

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

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

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



## TROUBLESHOOTING / Troubleshooting B

Trouble Symptom	A-8
Parts	Engine lug down is large when actuator in maximum flow rate gear pump (optional) is operated.
MC	●
ECM	
Monitor Unit	
Torque Control Solenoid Valve	●
Pilot Shut-Off Solenoid Valve	
Pump 2 Delivery Pressure Sensor	
Pressure Sensor (Swing)	
Pressure Sensor (Arm Roll-In)	
Pilot Shut-Off Lever	
Pilot Shut-Off Relay	
Security Relay	
Spool	
Main Relief Valve	
Arm 1 Flow Rate Control Valve	
Main Pump	
Regulator	
Pilot Pump	
Pilot Valve	
Pilot Relief Valve	
Pump 1 Flow Rate Control Valve (Signal Control Valve)	
Pump 2 Flow Rate Control Valve (Signal Control Valve)	
Arm Flow Rate Control Valve Control Spool (Signal Control Valve)	
Pump 3 Delivery Pressure Sensor (Optional)	●
Remarks	

## **TROUBLESHOOTING / Troubleshooting B**

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## TROUBLESHOOTING / Troubleshooting B

### Front Attachment System Troubleshooting

Trouble Symptom	F-1	F-2	F-3
	All front attachment actuator power is weak.	Even if power digging switch is pushed, power does not increase. Boom raise power is weak when digging.	Some cylinder are not operated or speeds are slow.
<b>Parts</b>			
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			

## TROUBLESHOOTING / Troubleshooting B


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

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

F-4	F-5	F-6	F-7	F-8
Arm speed is slow during combined operation. During combined operation of boom raise and arm roll-in, boom raise speed is slow. Arm speed is slow during arm level crowding.	Arm roll-in speed is slow when digging.	Bucket is slightly slow during bucket roll-in single operation. Bucket does not move smoothly during bucket roll-in single operation.	When starting to move during combined operation, arm does not smoothly move. Arm starts to move slightly slow during arm roll-in single operation. These troubles often occur when temperature is low.	When starting to move during combined operation, boom does not smoothly move. Boom starts to move slightly slow during boom lower single operation.
●	●			
	●			
●				
○	○			
○	○			
○				
○	○			
○	○			
	●			
●			●	●
		●		
●				
●		●		
				●
			●	
		○		
		●		
●				

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

## TROUBLESHOOTING / Troubleshooting B

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

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

### Front Attachment System Troubleshooting

Trouble Symptom	F-9	F-10	F-11	F-12
	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 above ground is faster than other actuators during combined operation.	Machine cannot be raised off ground.
MC				
Solenoid Valve Unit (SG)				
Solenoid Valve Unit (SF)				
Solenoid Valve Unit (SC)				
Pump 1 Delivery Pressure Sensor				
Pump 2 Delivery Pressure Sensor				
Pressure Sensor (Swing)				
Pressure Sensor (Boom Raise)				
Pressure Sensor (Arm Roll-In)				
Power Digging Switch				
Spool		●		
Main Relief Valve				
Overload Relief Valve		●		
Load Check Valve	●			
Digging Regenerative Valve				
Boom Regenerative Valve				
Arm Regenerative Valve				
Bucket Regenerative Valve				
Boom Flow Rate Control Valve			●	●
Arm 1 Flow Rate Control Valve				
Arm 2 Flow Rate Control Valve				
Bucket Flow Rate Control Valve				
Boom Lower Meter-In Cut Valve			●	●
Boom Anti-Drift Valve	●	●		
Arm Anti-Drift Valve	●	●		
Emergency Valve		○		
Shockless Valve (Signal Control Valve)				
Shuttle Valve (Signal Control Valve)				
Bucket Flow Rate Control Valve Control Spool (Signal Control Valve)				
Arm Flow Rate Control Valve Control Spool (Signal Control Valve)		●		
Pilot Valve				
Cylinder		●		
Remarks				

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



## TROUBLESHOOTING / Troubleshooting B


Parts	Trouble Symptom	F-13	F-14	F-15
		Attachment speed is fast during combined operation of attachment (optional) and front attachment (when secondary crusher or primary crusher is used).	Attachment speed is fast during combined operation of attachment (optional) and front attachment (when breaker attached with auxiliary flow combining line is used).	Attachment speed is fast during combined operation of attachment (optional) and front attachment (when vibrating hammer is used).
MC		●	●	●
Auxiliary Flow Rate Control Solenoid Valve		●		
Auxiliary Flow Combining Solenoid Valve			●	
Maximum Pump 1 Flow Rate Limit Control Solenoid Valve				●
Pressure Sensor (Auxiliary)		●	●	●
Pressure Sensor (Travel)				●
Pressure Sensor (Arm Roll-Out)		●	●	
Auxiliary Flow Rate Control		●		
Auxiliary Flow Combining Valve			●	
Remarks				

## TROUBLESHOOTING / Troubleshooting B

### Swing/Travel/Other System Troubleshooting

Trouble Symptom	S-1	S-2	T-1	T-2
	Swing is slow or un-moving.	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 mis-tracks.
<b>Parts</b>				
MC (Main Controller)		●		
Torque Control Solenoid Valve				
Solenoid Valve Unit (SC)				
Solenoid Valve Unit (SI)				
Pump 1 Delivery Pressure Sensor				
Pump 2 Delivery Pressure Sensor		○		
Pump 1 Control Pressure Sensor				
Pump 2 Control Pressure Sensor				
Pressure Sensor (Travel)				
Pressure Sensor (Swing)		○		
Pressure Sensor (Arm Roll-In)		○		
Travel Mode Switch				
Pump Device				
Spool				●
Load Check Valve				
Arm 1 Flow Rate Control Valve		●		
Flow Combiner Valve				
Swing Parking Brake Release Spool (Signal Control Valve)	●			
Pump 1 Flow Rate Control Valve (Signal Control Valve)				○
Pump 2 Flow Rate Control Valve (Signal Control Valve)	●			○
Flow Combiner Valve Control Spool (Signal Control Valve)				
Arm Flow Rate Control Valve Control Spool (Signal Control Valve)		●		
Shuttle Valve (Signal Control Valve)	○			○
Swing Device	●			
Travel Device				●
Center Joint				●
Pilot Valve	●			●
Remarks			Refer to T-5.	In case either bucket or swing is also slow, refer to A-3 or A-4.

## TROUBLESHOOTING / Troubleshooting B

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

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

T-3	T-4	T-5	O-1	O-2
Machine mistracks during combined operation of travel and front attachment.	Occasionally, machine may mistrack when traveling with engine running at slow speed.	Fast travel is not selected. Travel mode does not change from slow mode to fast mode.	Wiper is not operated.	Air Conditioner is faulty.
	●			
	●			
		●		
	○	○		
	○	○		
		○		
		○		
	○	○		
		●		
	●			
●				
●				
●				
		●		
			Operate the wire switch.	

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

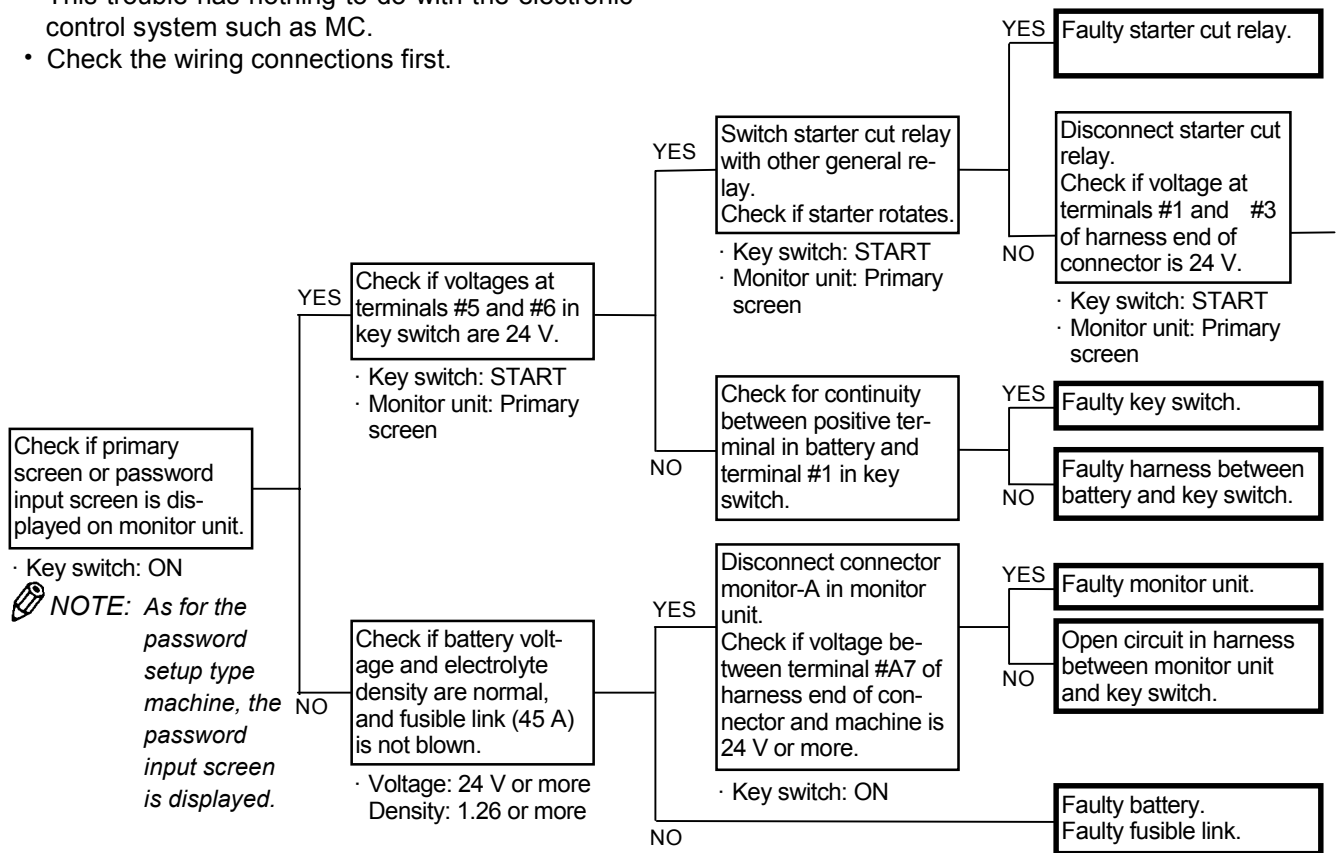
# TROUBLESHOOTING / Troubleshooting B

## ENGINE SYSTEM TROUBLESHOOTING

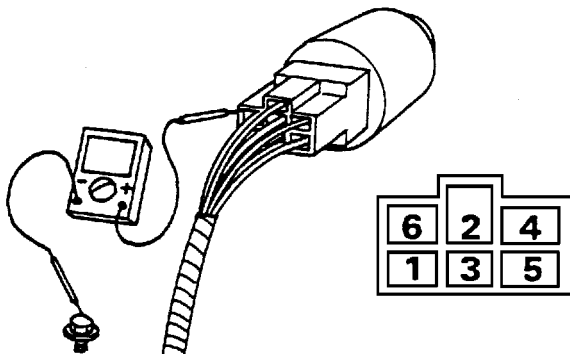
**E-1 Starter does not rotate.**  
 Related MC Fault Code: None

**IMPORTANT:** As electric current from the key switch is not routed to starter relay 2 with the pilot shut-off lever in ON position, the starter does not rotate. (Refer to “Electrical System”.)

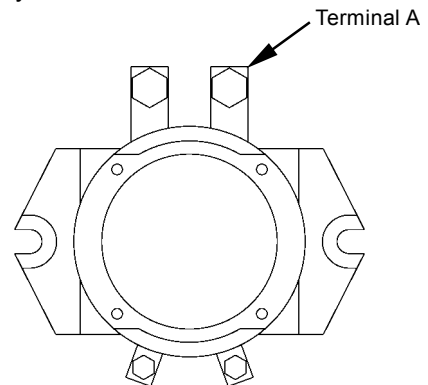
- This trouble has nothing to do with the electronic control system such as MC.
- Check the wiring connections first.



Key Switch:



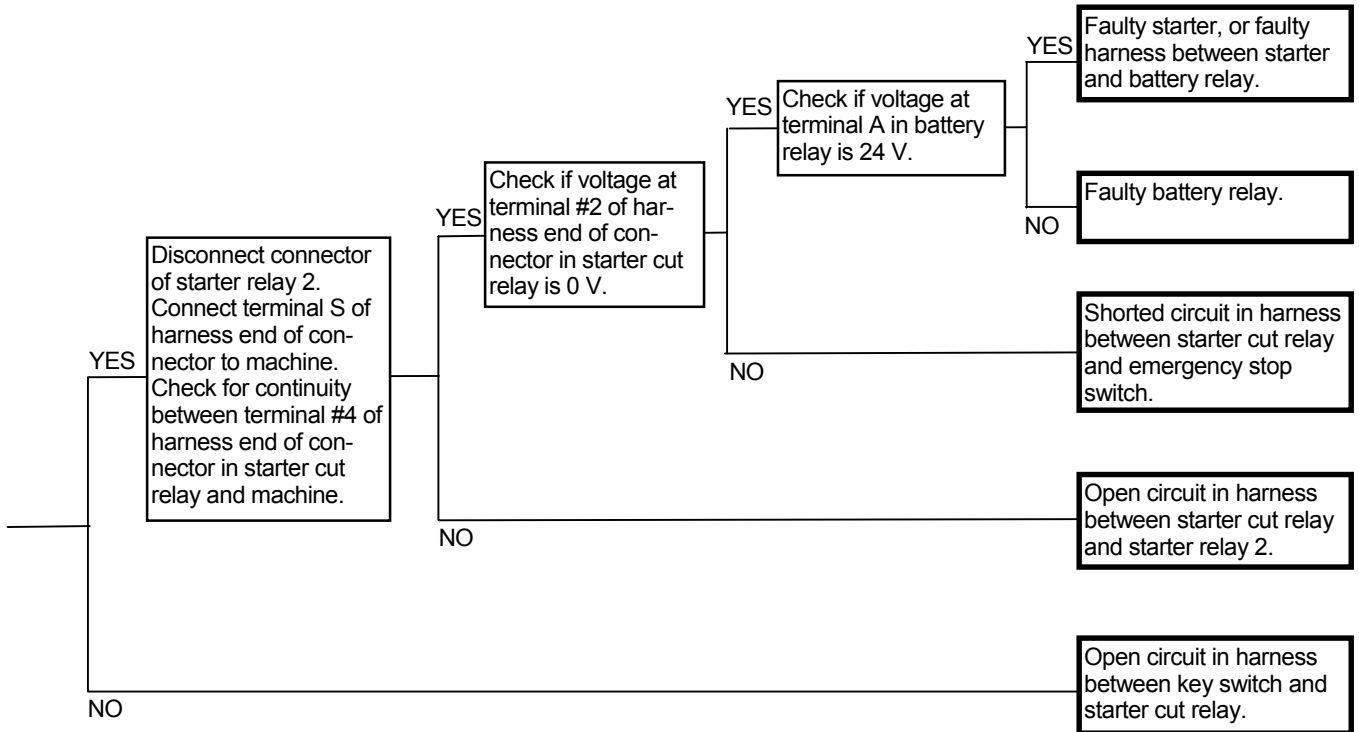
Battery Relay:



T105-07-04-002

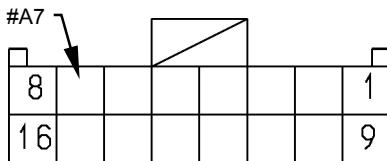
T178-05-04-001

## TROUBLESHOOTING / Troubleshooting B



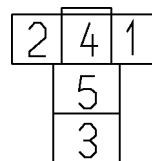
Connector (Harness end of connector viewed from the open side)

Monitor Unit  
Connector Monitor-A



T183-05-05-001

Starter Cut Relay



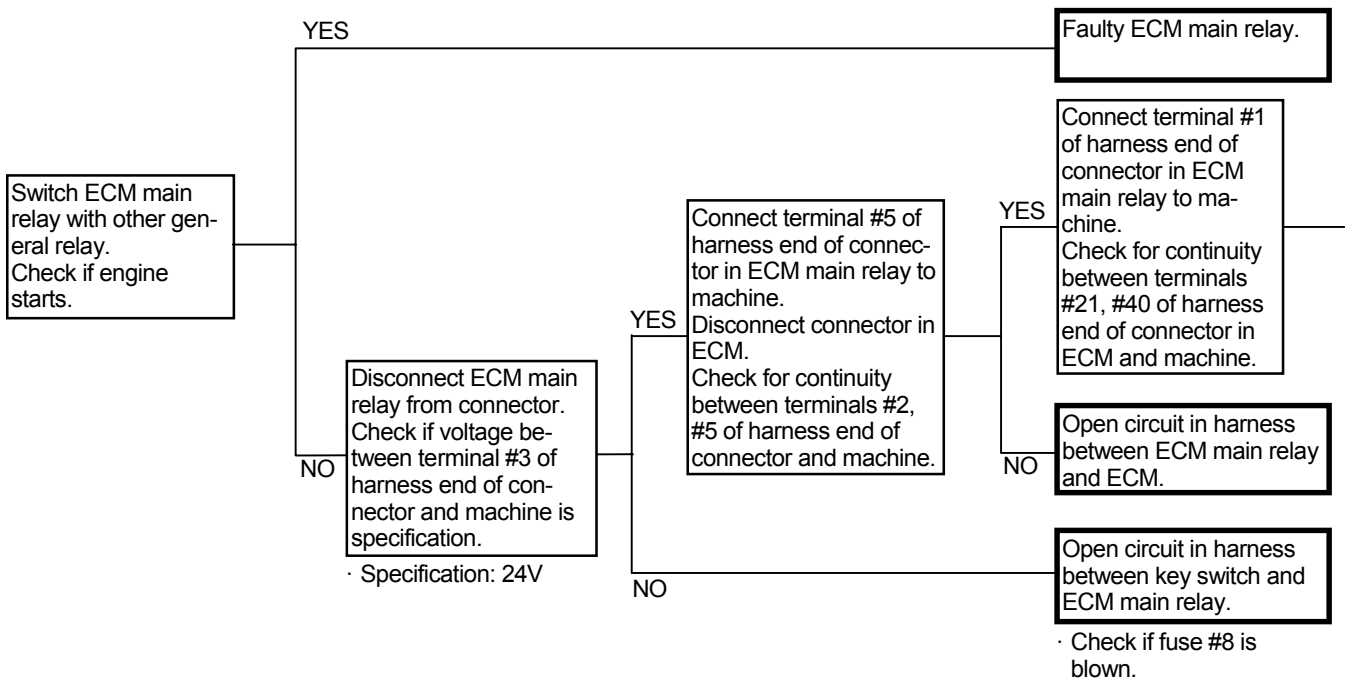
T183-05-04-003

# TROUBLESHOOTING / Troubleshooting B

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

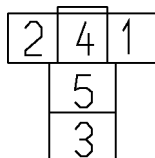
Related MC Fault Code: None

- Check the wiring connections first.



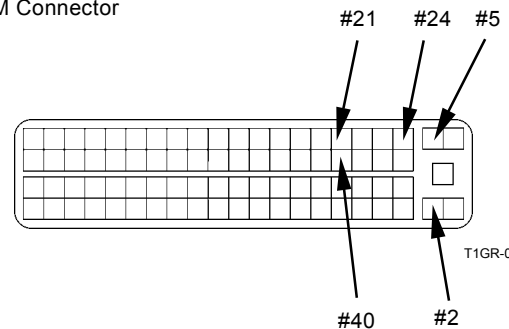
Connector (Harness end of connector viewed from the open side)

ECM Main Relay



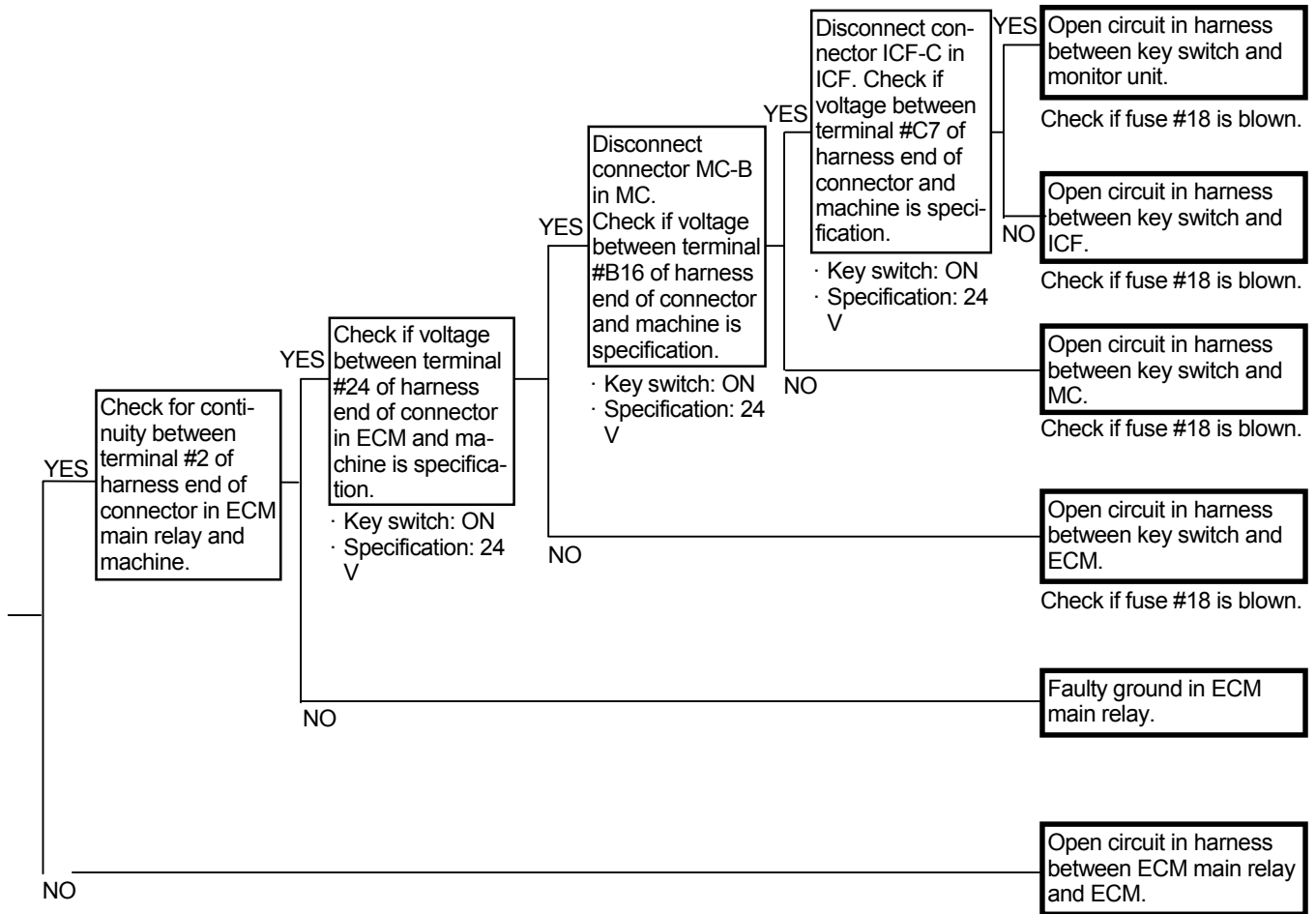
T183-05-04-003

ECM Connector

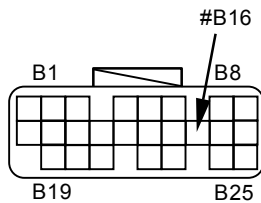


T1GR-05-04-002

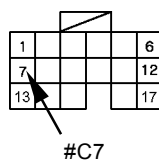
# TROUBLESHOOTING / Troubleshooting B



Connector MC-B



Connector ICF-C



T1V1-05-04-002

## TROUBLESHOOTING / Troubleshooting B

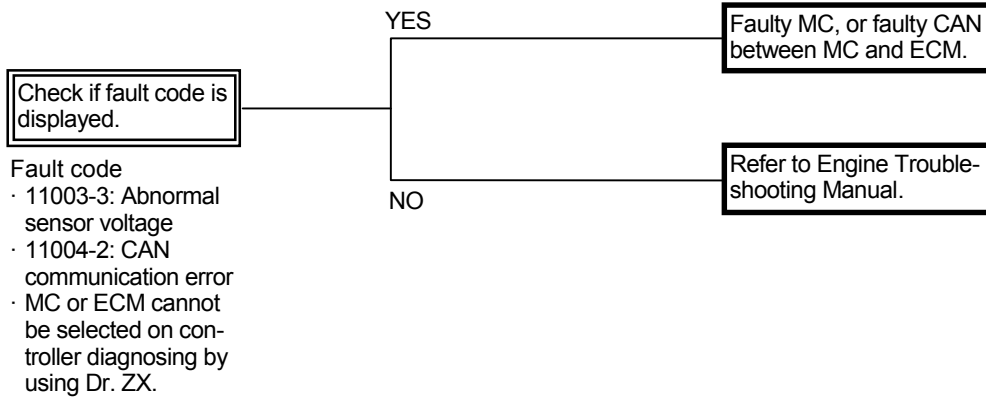
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**E-3** When engine control dial is fully rotated, engine stalls.

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

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

- Check the wiring connections first.



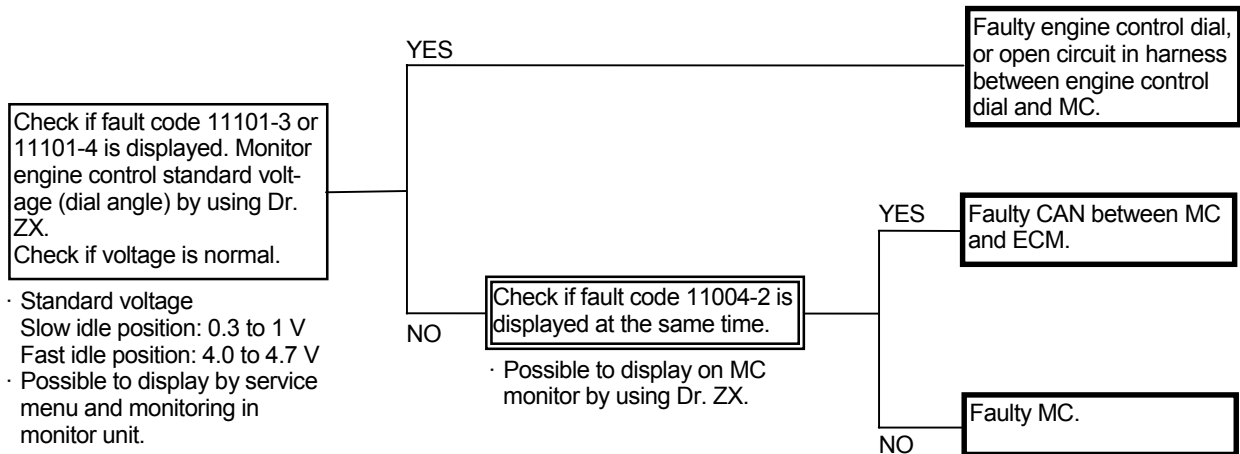


## TROUBLESHOOTING / Troubleshooting B

**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.

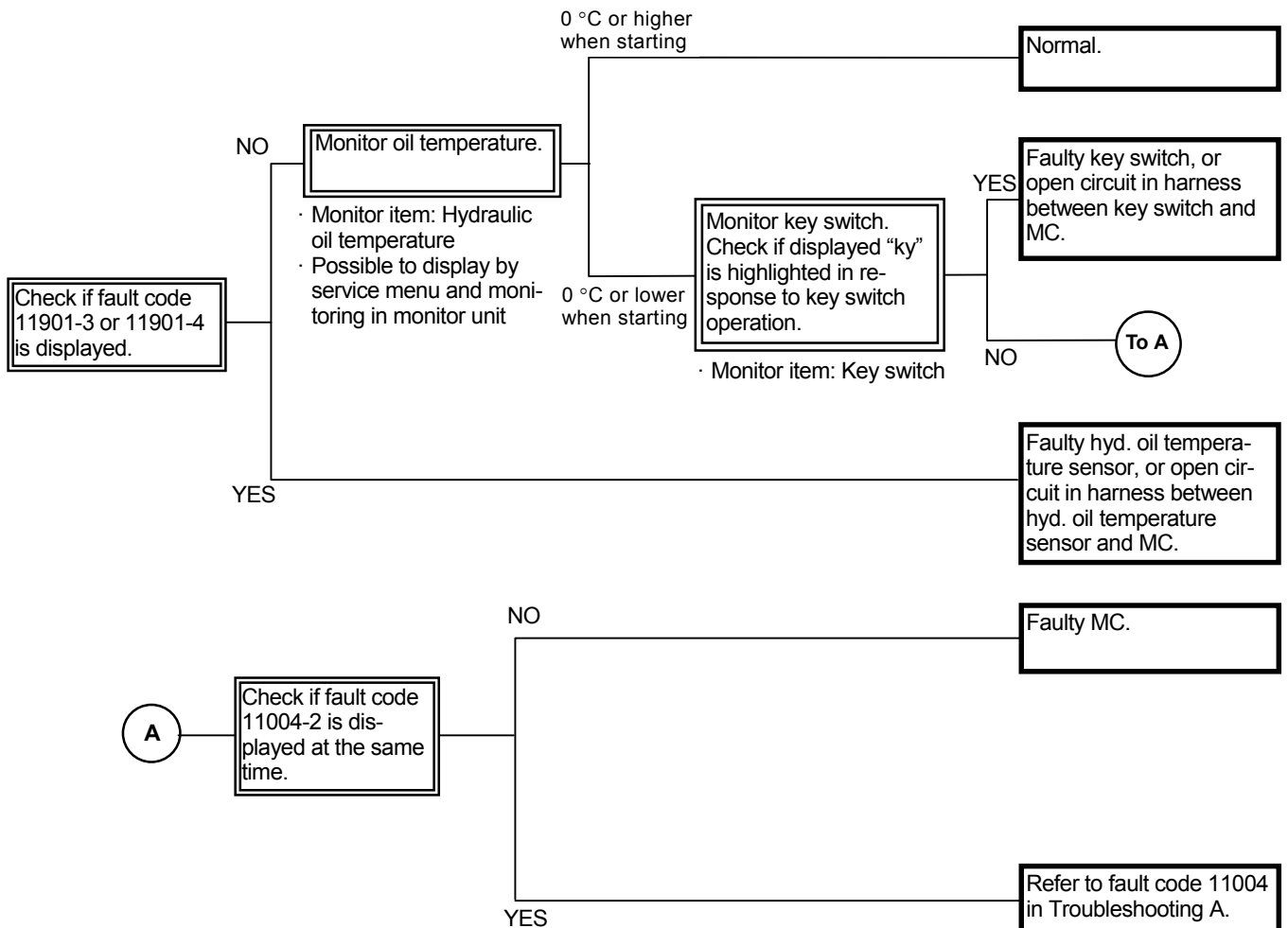


## TROUBLESHOOTING / Troubleshooting B

**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.



## **TROUBLESHOOTING / Troubleshooting B**

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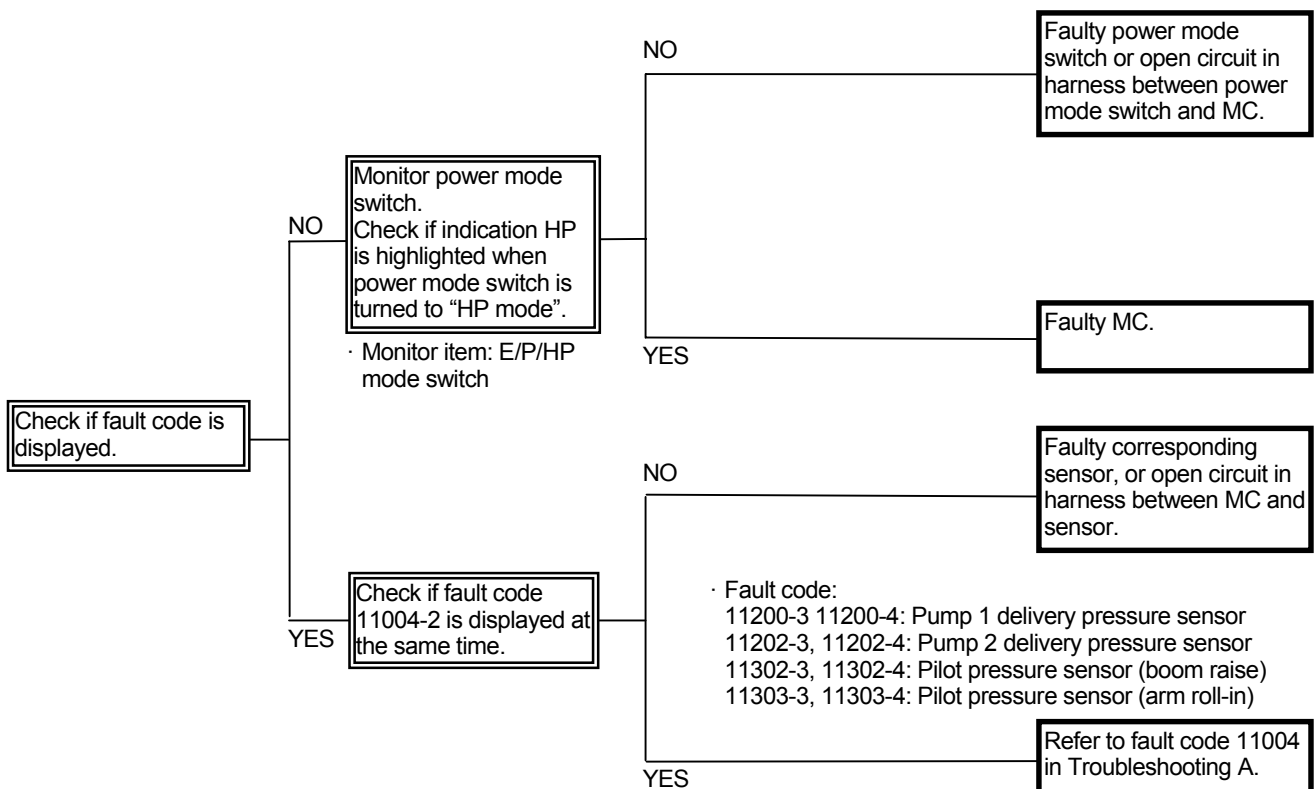
## TROUBLESHOOTING / Troubleshooting B

### E-6 Faulty HP mode

- Even if power mode switch is turned to the HP mode position, HP mode is not operated. (General mode normally operates.)

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

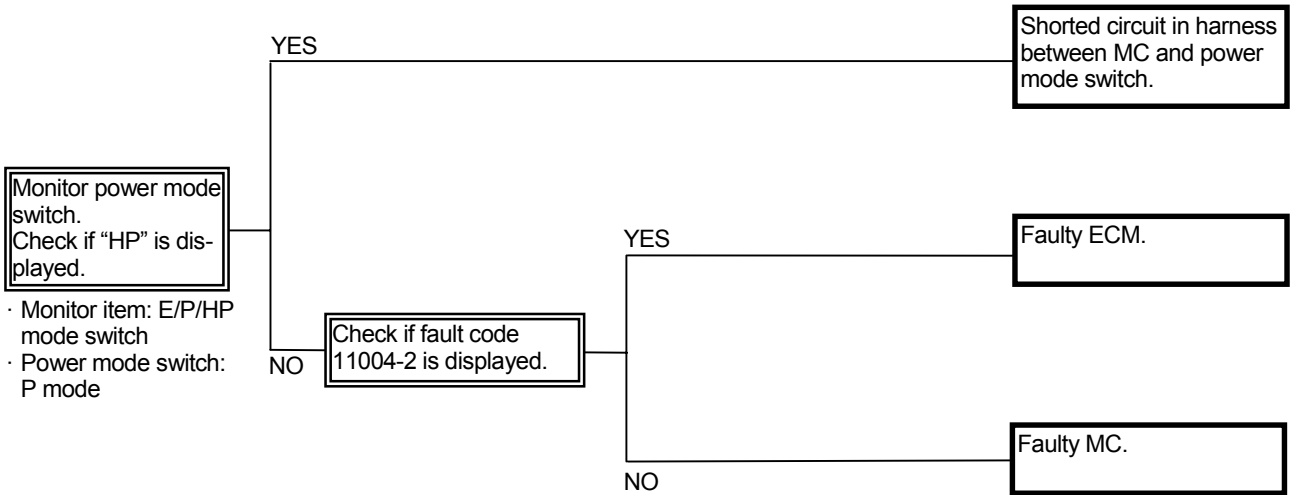
- The sensors detect the conditions necessary to operate HP mode. Therefore, if any of these sensors fails, HP mode becomes ineffective.
- Pressure sensors (arm roll-in and boom raise) and pump 1 and 2 delivery pressure sensors are also engaged in the HP mode control. However, if these sensors fail,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



## TROUBLESHOOTING / Troubleshooting B

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



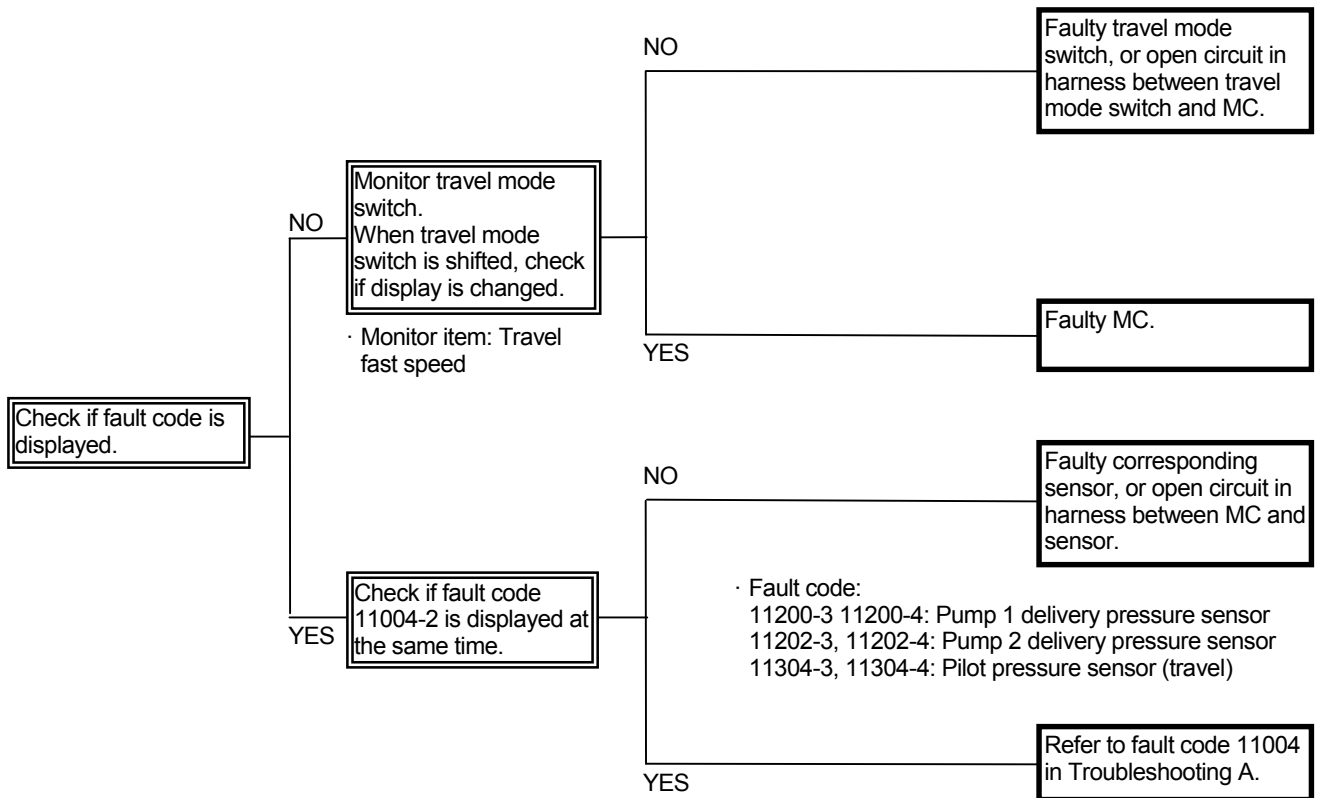
# TROUBLESHOOTING / Troubleshooting B

## E-7 Faulty Travel HP mode

- Even if the travel mode switch is turned to FAST during single travel operation, travel HP mode is not operated.

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

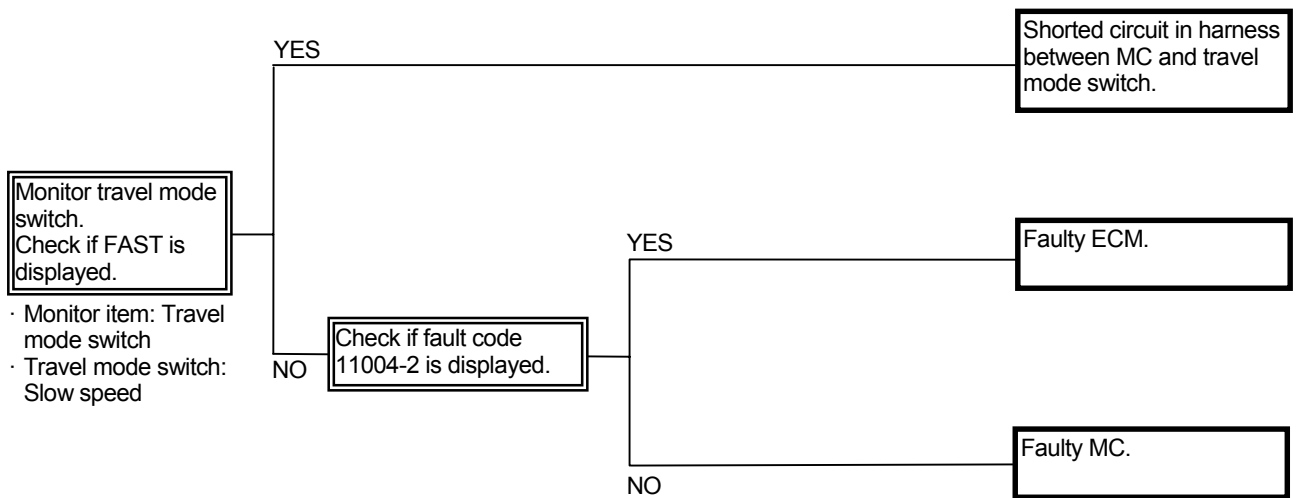
- The sensors detect the conditions necessary to operate travel HP mode. Therefore, if any of these sensors fails, travel HP mode becomes ineffective.
- Pressure sensor (travel) and pump 1 and 2 delivery pressure sensors are also engaged in the HP mode control. However, if these sensors fails, other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



## TROUBLESHOOTING / Troubleshooting B

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- 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.

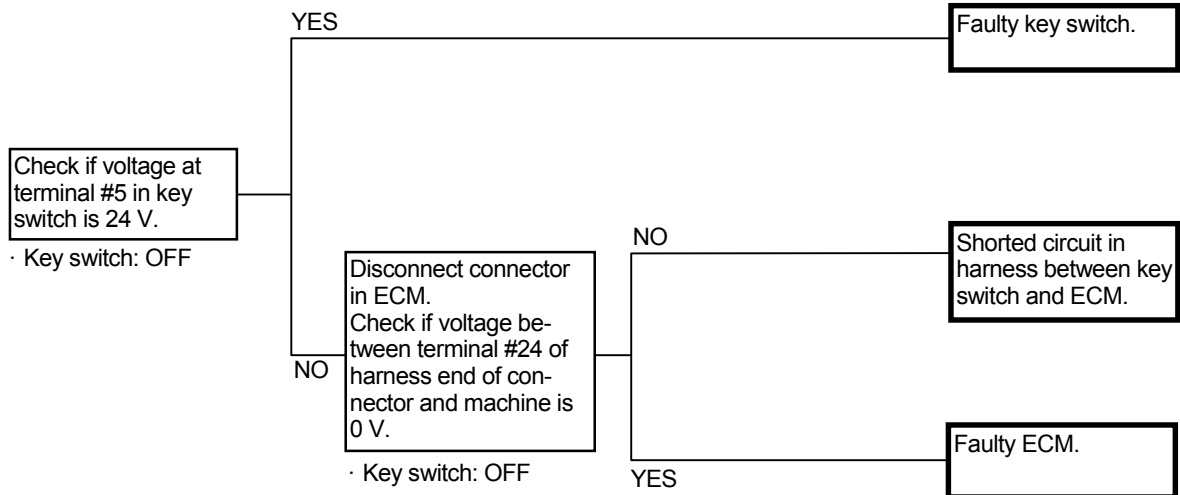


## TROUBLESHOOTING / Troubleshooting B

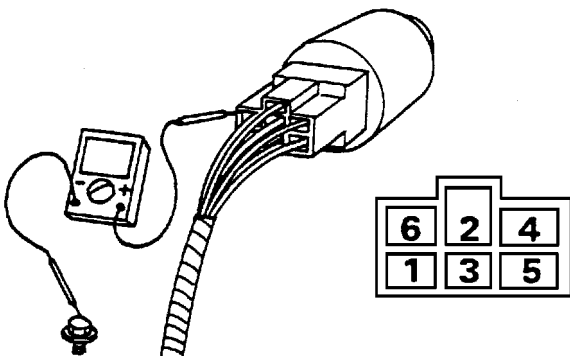
**E-8** Even if key switch is turned OFF, engine does not stop. (In case engine does not stop, stop engine by turning the emergency stop switch ON located under the seat stand. Then, begin inspection.)

**Related MC Fault Codes:**

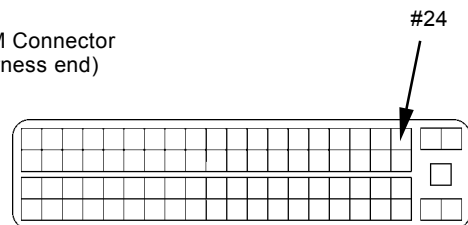
- Probably the symptoms such as “Engine speed is slower than specification in all operating ranges” or “Even if engine control dial is rotated, engine speed remains unchanged” may come up. Perform troubleshooting for these symptoms.



Key Switch



ECM Connector  
(Harness end)



T1GR-05-04-002

T105-07-04-002



## **TROUBLESHOOTING / Troubleshooting B**

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# TROUBLESHOOTING / Troubleshooting B

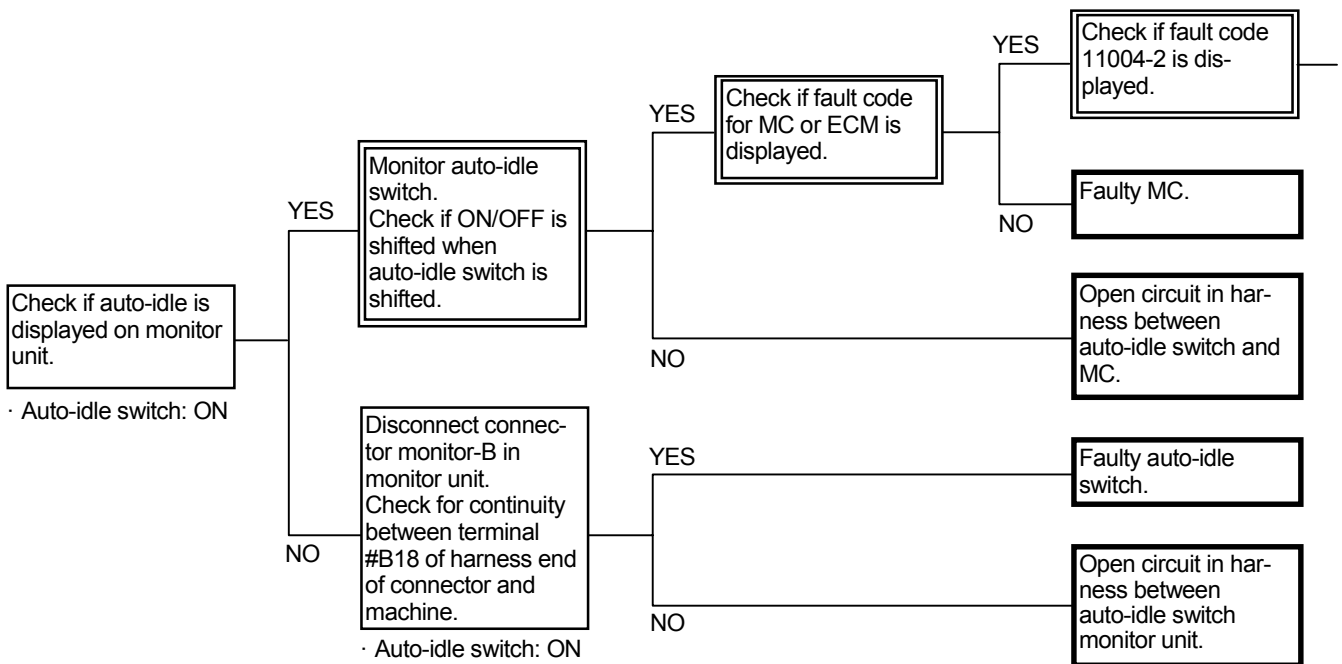
## E-9 Faulty auto-idle system

- Even if control lever is turned to neutral, auto-idle system is not operated.

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

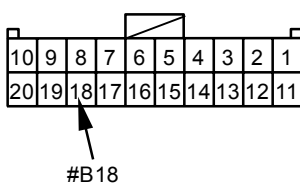
**Related ECM Fault Code: 639-2, 639-3**

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



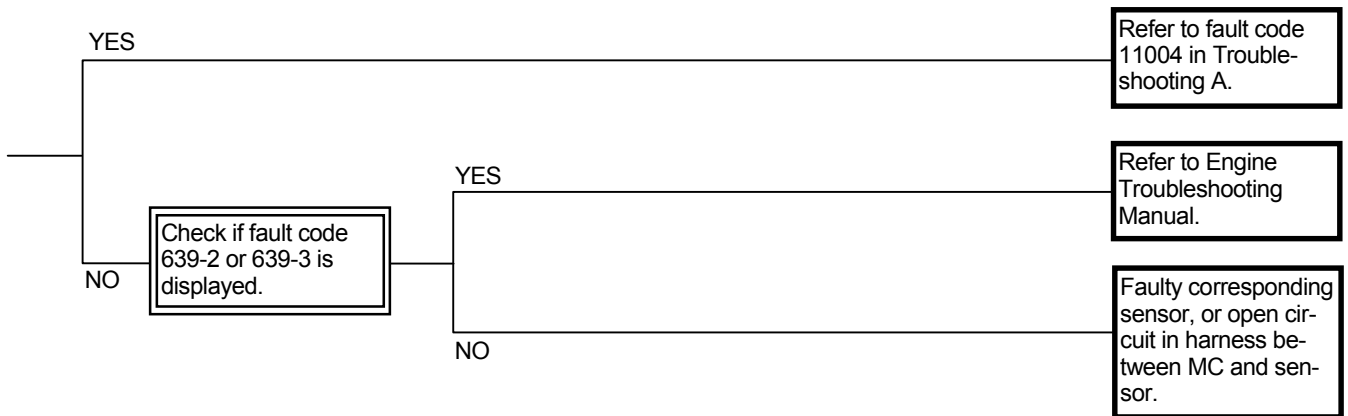
Connector (Harness end of connector viewed from the open side)

Connector Monitor-B



## TROUBLESHOOTING / Troubleshooting B

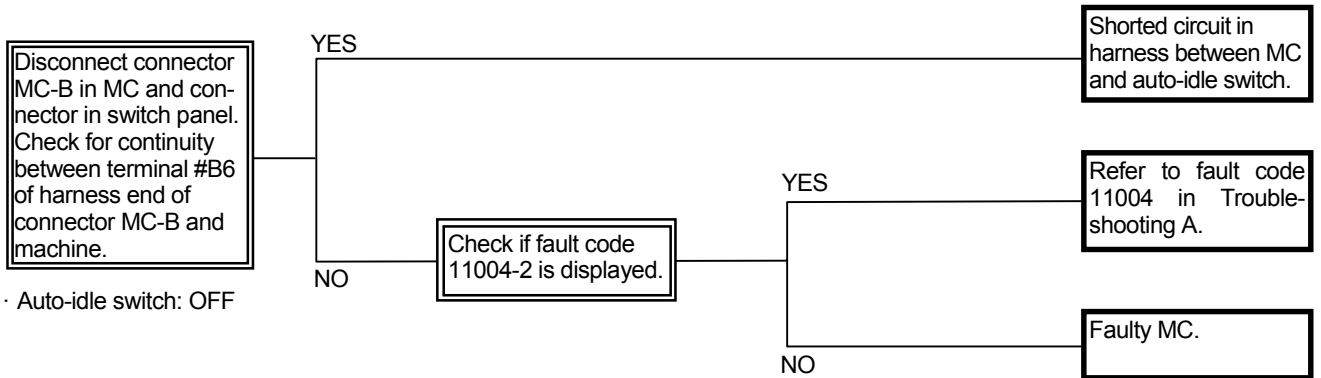
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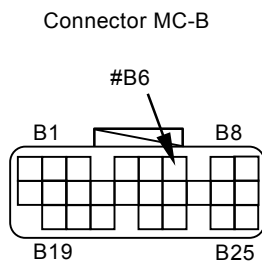
- Fault code:  
11304-3, 11304-4: Pilot pressure sensor (travel)  
11307-3, 11307-4: Pilot pressure sensor (front attachment)

## TROUBLESHOOTING / Troubleshooting B

Even if auto-idle switch is turned OFF, auto-idle is operated.



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



## **TROUBLESHOOTING / Troubleshooting B**

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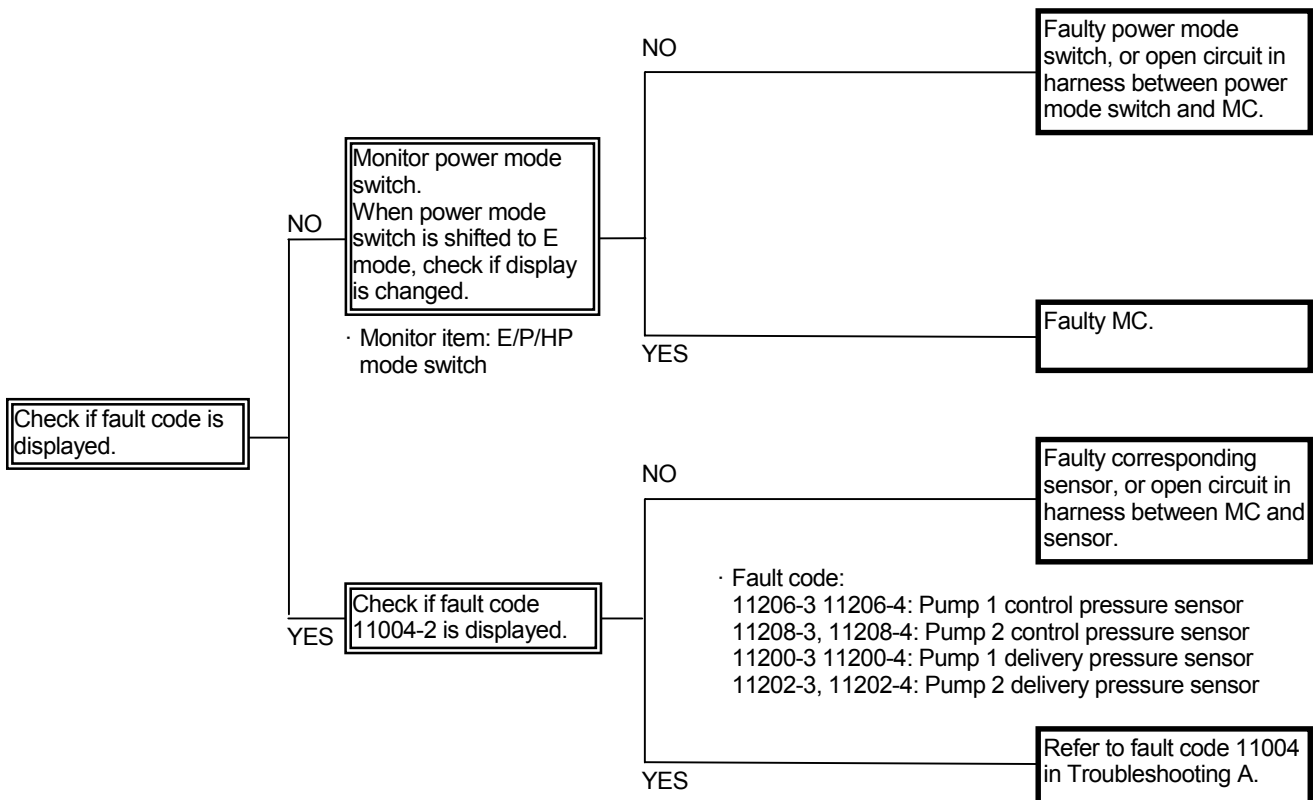
## TROUBLESHOOTING / Troubleshooting B

### 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**

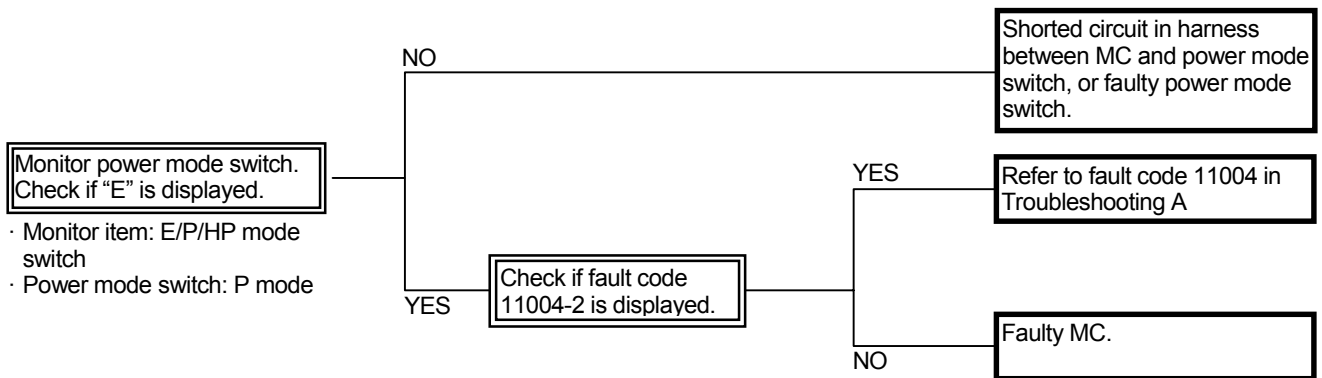
- In case trouble symptoms E-1 to E-9 are recognized, perform the troubleshooting of these troubles first.
- The sensors detect the conditions necessary to operate E mode. Therefore, if any of these sensors fails, E mode becomes ineffective.
- Pump 1, 2 control pressure sensors and pump 1, 2 delivery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



## TROUBLESHOOTING / Troubleshooting B

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- 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  $1800 \text{ min}^{-1}$  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.

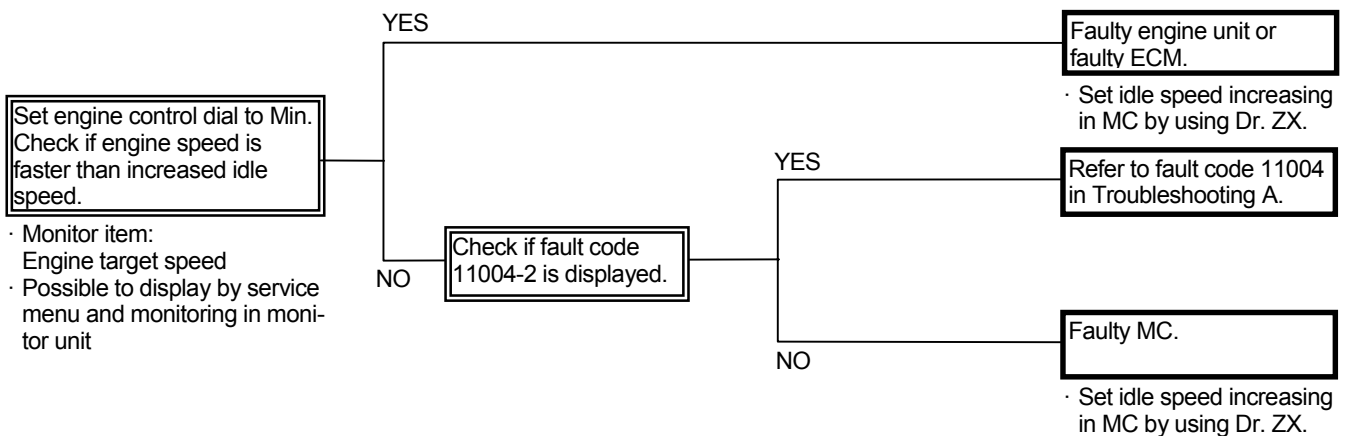


## TROUBLESHOOTING / Troubleshooting B

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

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

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



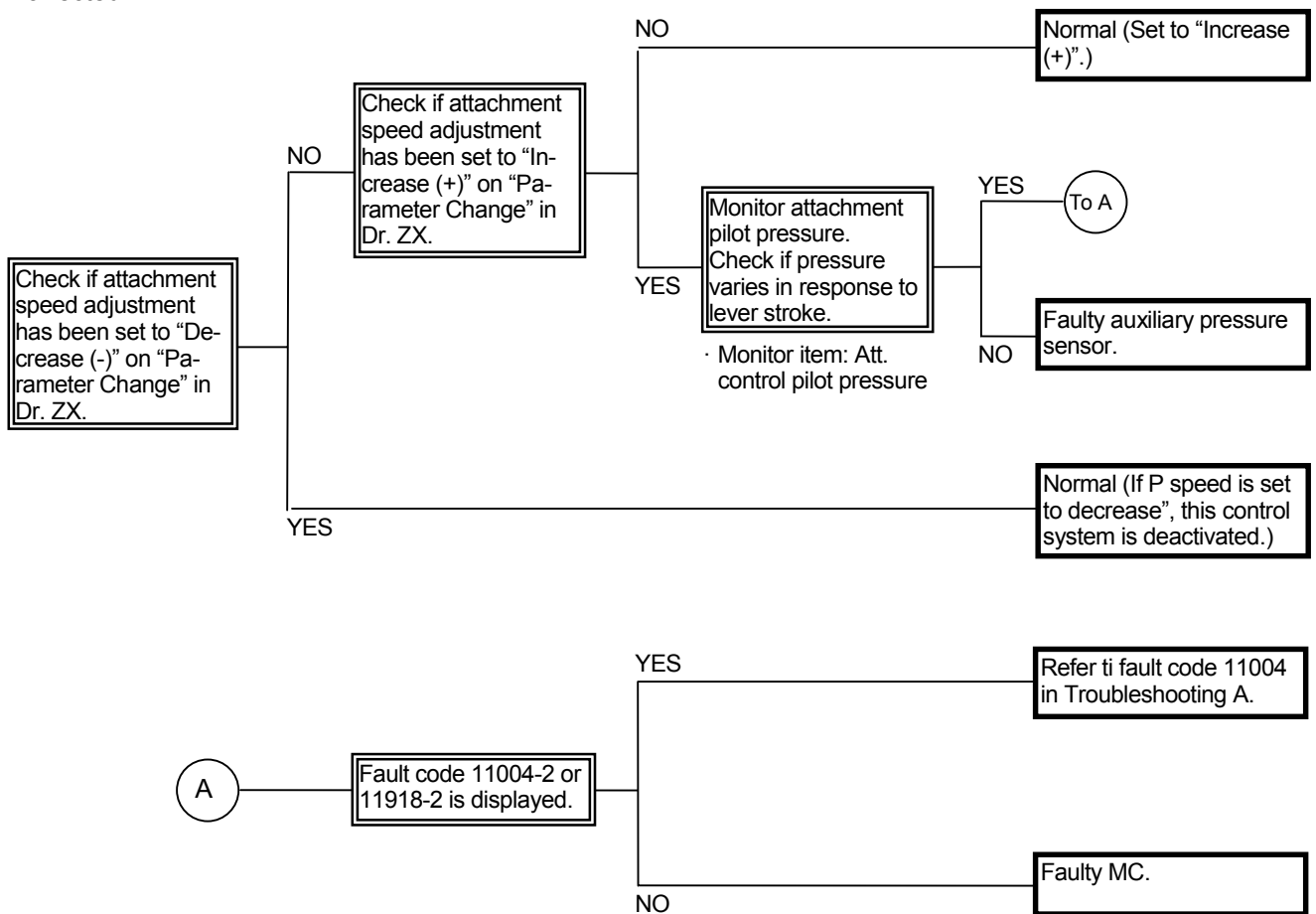


## TROUBLESHOOTING / Troubleshooting B

### E-12 Engine speed does not increase even if attachment is operated in attachment mode.

**Related MC Fault Code: 11004-2, 11918-2**

- In case trouble symptoms E-1 to E-11 are recognized, perform the troubleshooting of these troubles first.
- Even if the failure in pressure sensor (auxiliary) and power mode switch may have relevance to the malfunction of attachment operation speed increase control. However, if these sensor and switches fail, other operating functions will also be affected.
- Refer to the pages for Attachment Operation Speed Increase Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- Check the wiring connections first.

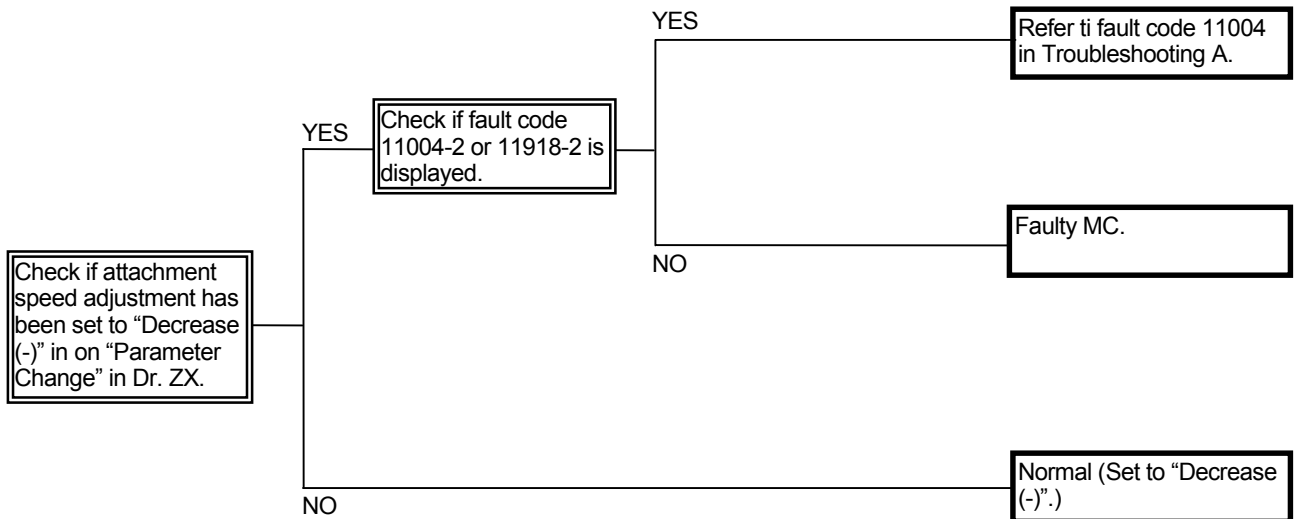


## TROUBLESHOOTING / Troubleshooting B

**E-13 When attachment mode is selected, engine speed does not decrease.**

**Related MC Fault Code: 11004-2, 11918-2**

- In case trouble symptoms E-1 to E-11 are recognized, perform the troubleshooting of these troubles beforehand.
- Refer to the pages for Attachment Operation Speed Limit Control in the SYSTEM / Control System group in the T/M (Operational Principle).
- Check the wiring connections first.



## **TROUBLESHOOTING / Troubleshooting B**

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## TROUBLESHOOTING / Troubleshooting B

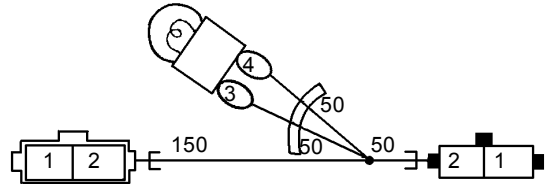
### E-14 Engine stalls during operation under adverse condition such as at high altitude.

**Related MC Fault Code: 11004-2, 11100-2, 11910-2, 11401-2, 11401-3, 11401-4**

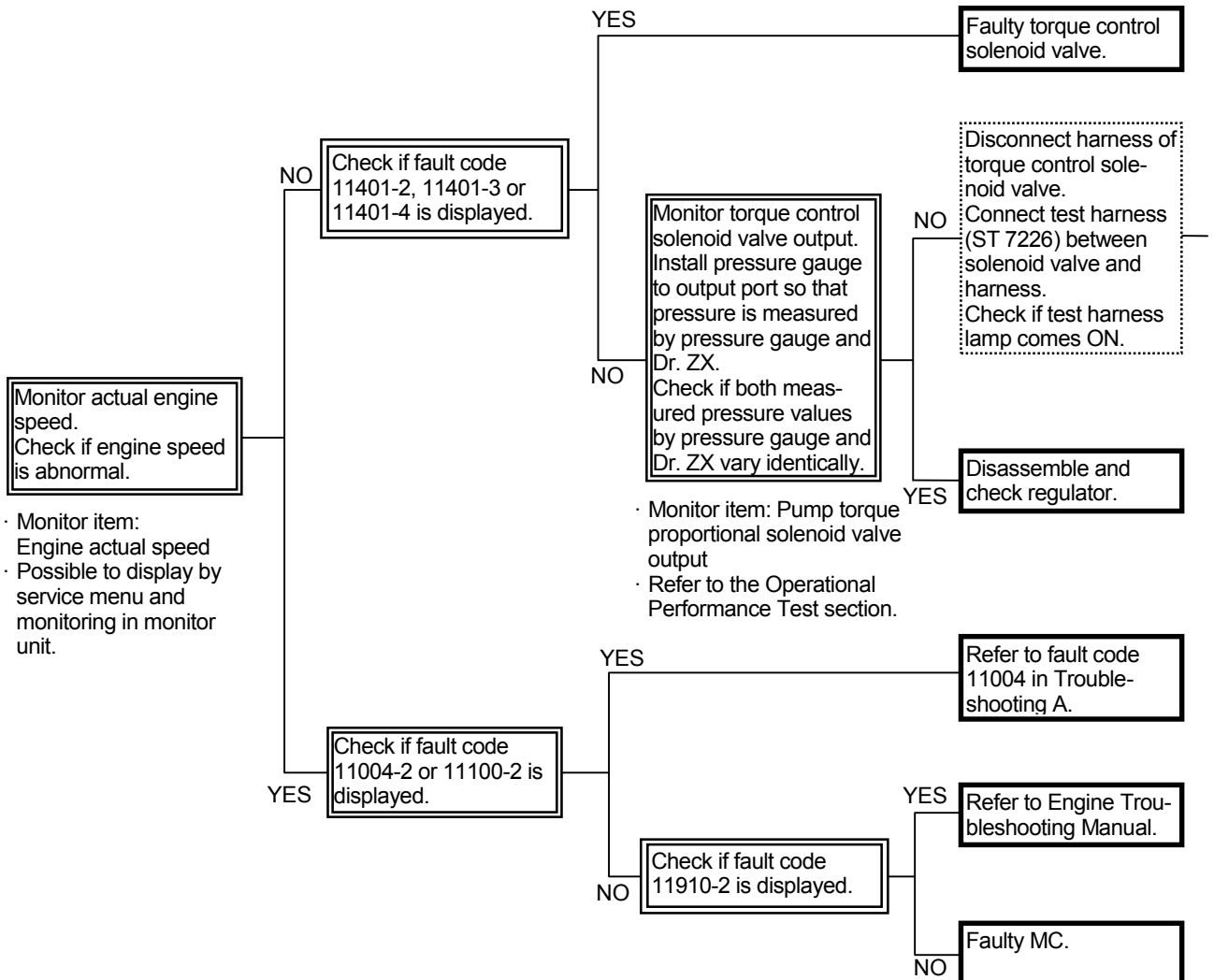
- If speed sensing control is not operated, the engine will stall under adverse operating conditions.
- Check the wiring connections first.

### Test Harness (ST 7226)

When operating corresponding control lever and switch: ON



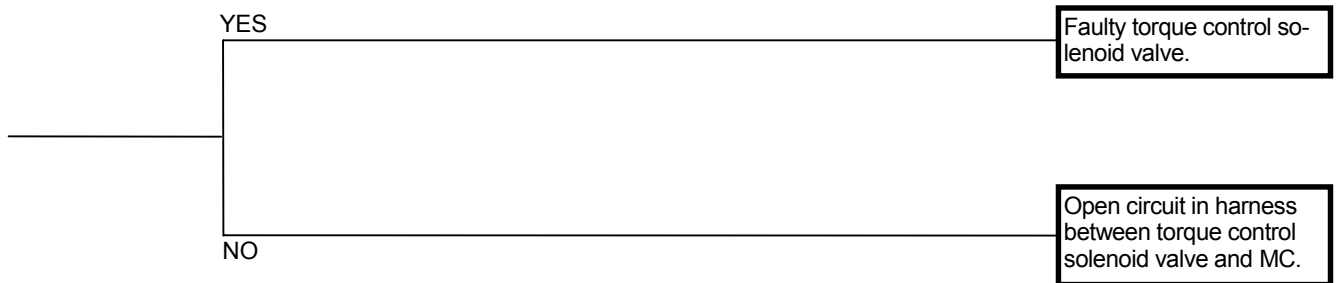
T107-07-06-015



## TROUBLESHOOTING / Troubleshooting B

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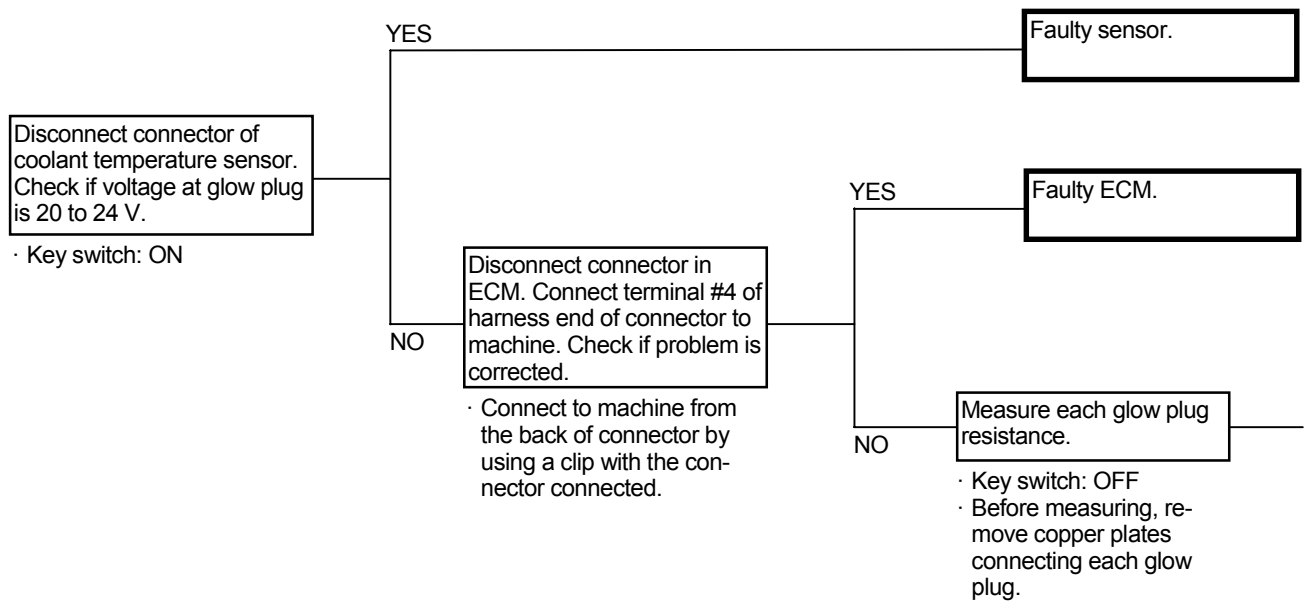


## TROUBLESHOOTING / Troubleshooting B

**E-15 Engine is difficult to start at low temperature. (During cold weather or in cold districts, engine is difficult to start or does not start even if pre-heated.)**

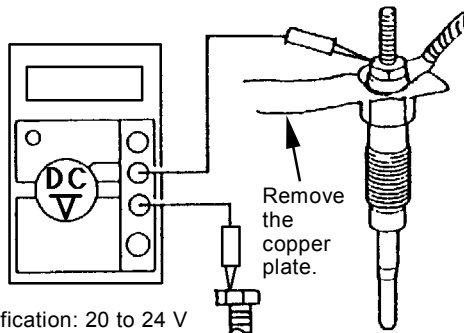
**Related MC Fault Code: None**

- Check if electricity is routed to the glow plugs. Check the glow plugs for any abnormality.
- The pre-heat system operates only when coolant temperature is below 20 °C (68 °F).
- Check the battery.
- Check the wiring connections first.



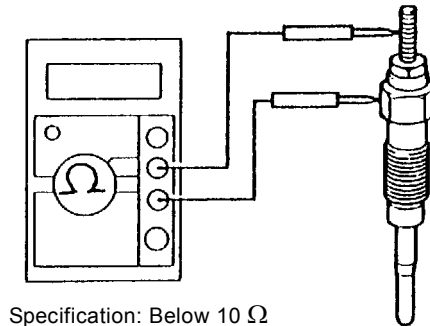
• **Measurement of Glow Plug Voltage and Resistance**

• Voltage Check



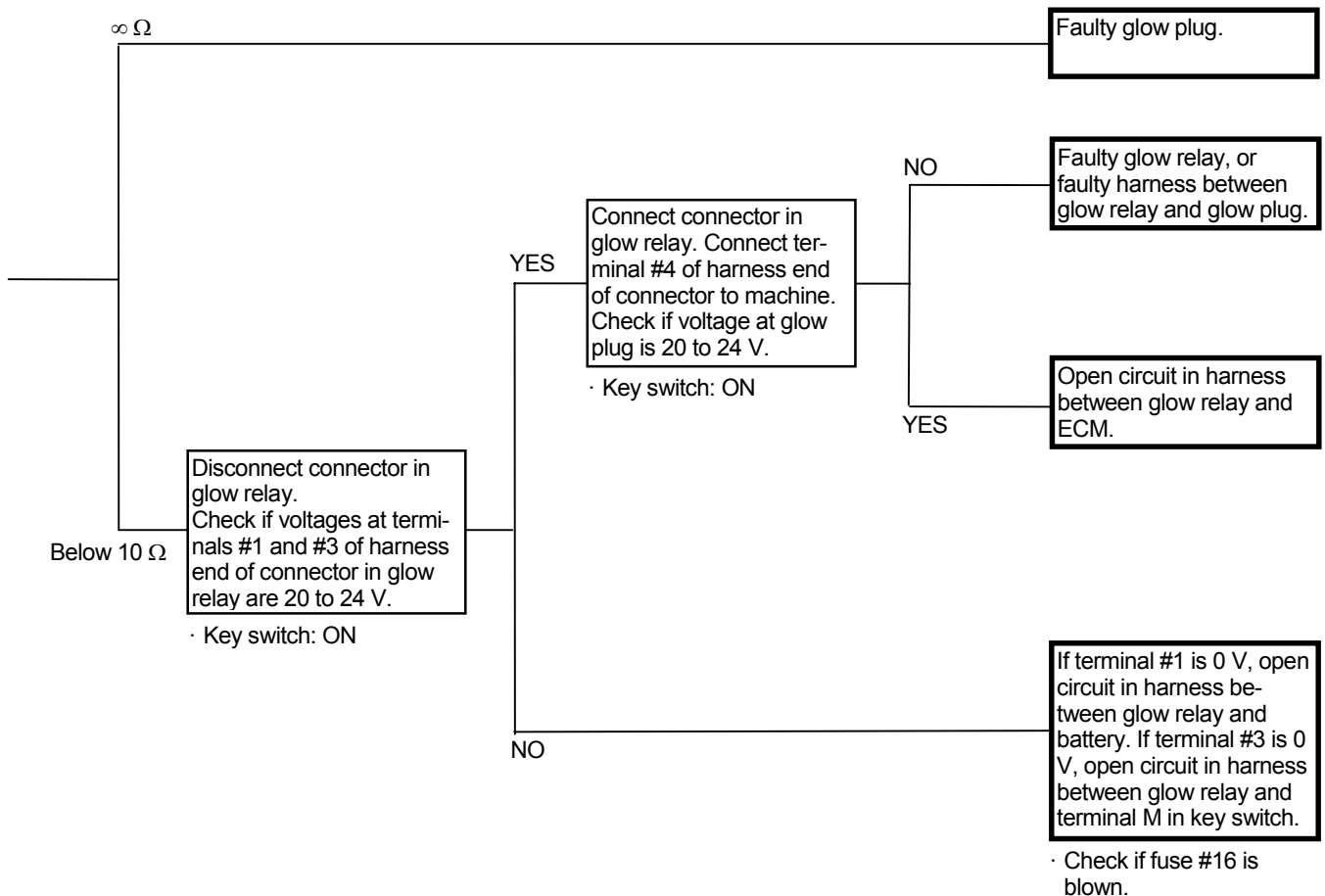
T105-07-04-006

• Resistance Check



T105-07-04-007

## TROUBLESHOOTING / Troubleshooting B



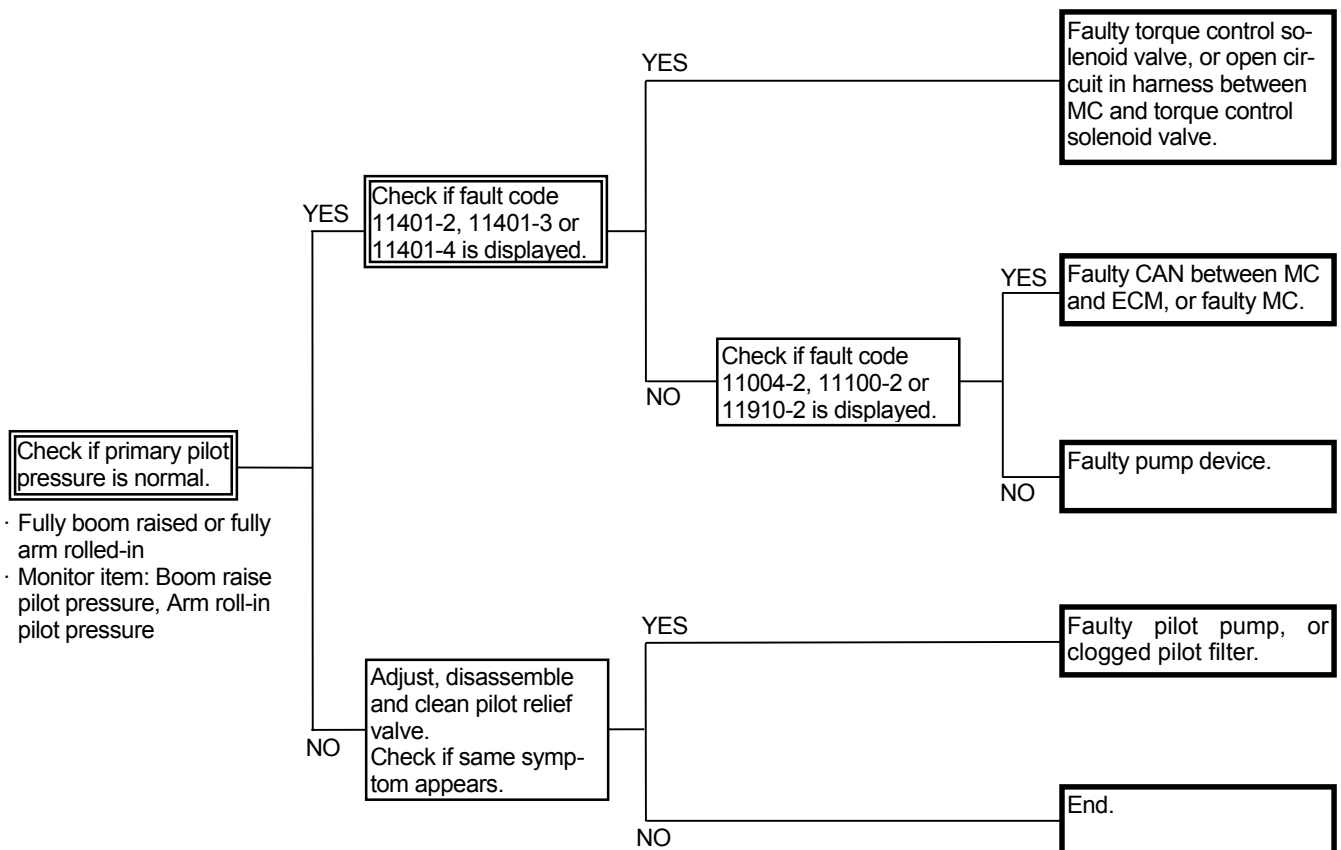
## TROUBLESHOOTING / Troubleshooting B

### ALL ACTUATOR SYSTEM TROUBLESHOOTING

**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.





## **TROUBLESHOOTING / Troubleshooting B**

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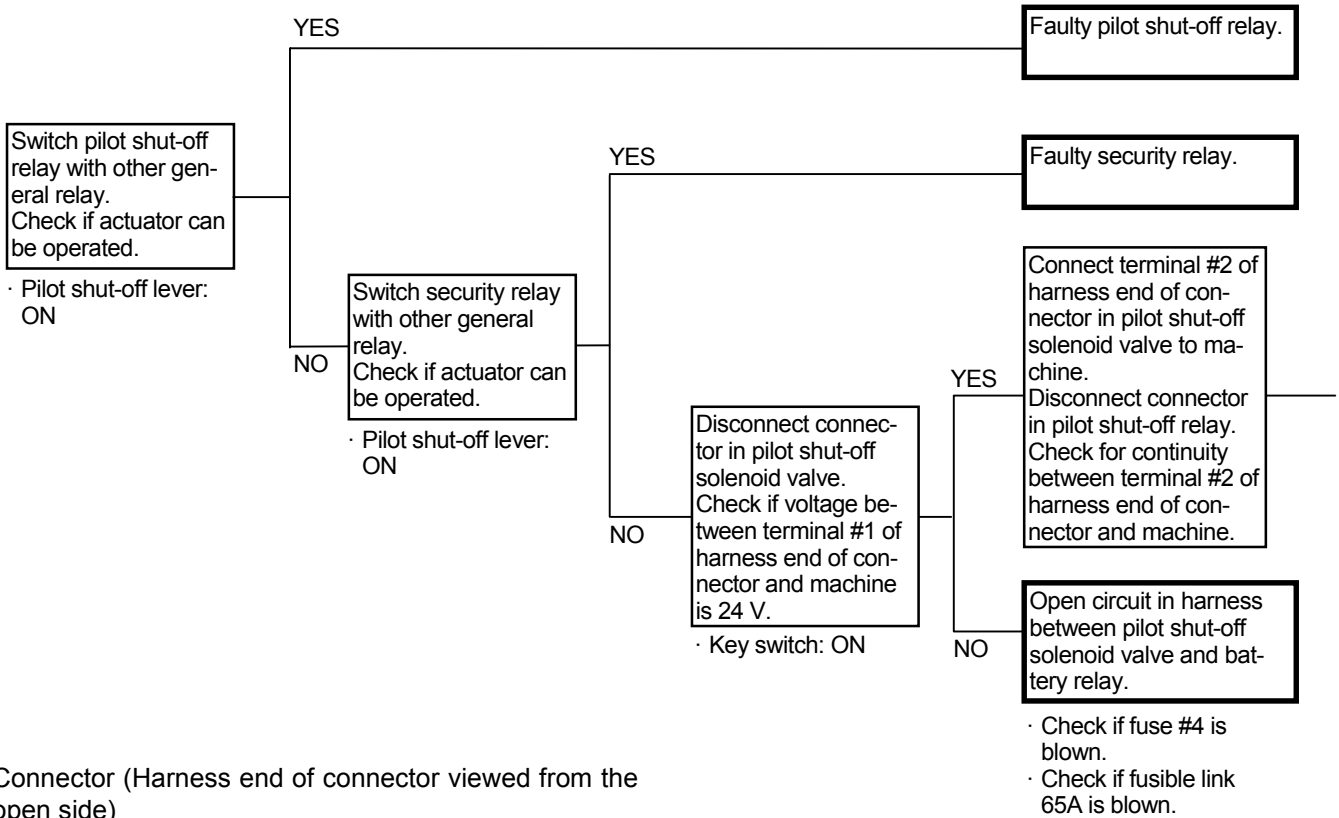
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# TROUBLESHOOTING / Troubleshooting B

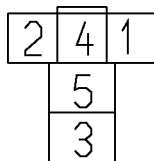
## A-2 All actuator are not operated.

**Related MC Fault Code: None**

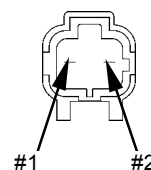
- The pilot shut-off circuit may be faulty.
- Check the wiring connections first.
- When the key switch is turned to the START position with the pilot shut-off lever in the ON position, the starter does not rotate.
- When the key switch is turned to the START position with the emergency switch and the pilot shut-off lever in the ON position, the starter rotates.
- Refer to the pages for the Electrical System group / SYSTEM in the T/M (Operational Principle).



Pilot shut-Off Relay  
Security Relay



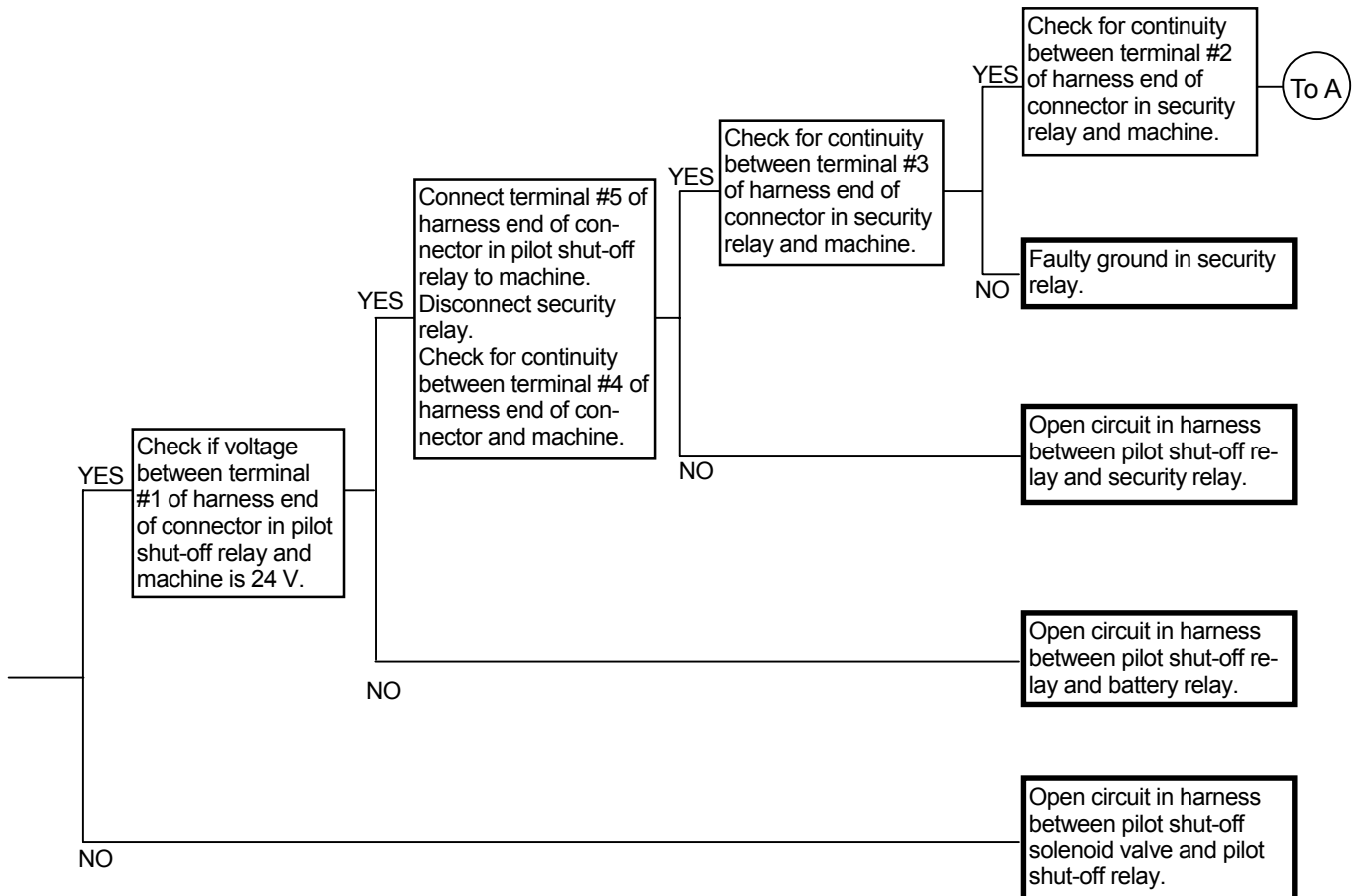
Pilot Shut-Off Solenoid Valve



T1V1-05-04-103

T183-05-04-003

# TROUBLESHOOTING / Troubleshooting B





## **TROUBLESHOOTING / Troubleshooting B**

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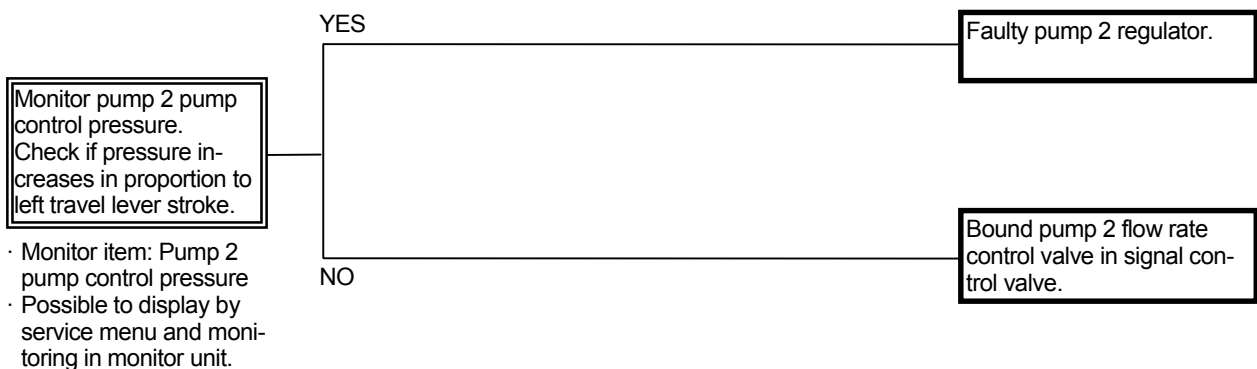
## TROUBLESHOOTING / Troubleshooting B

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**A-3 Left travel is not operated during single travel operation. Single swing operation speed becomes slow. Arm speed is slightly slow during arm level crowding. (All problems occur at the same time.)**

**Related MC Fault Code: None**

- The pump 2 flow rate is minimized (approx. 20 L/min) due to some reasons. Accordingly, the left travel and swing motors, which are driven by pressure oil from pump 2, moves very slow.
- Pressure oil from pump 1 is also routed to the arm and boom cylinders so that the arm and boom can move at a slightly slow speed in single operation. However, in level crowd operation, pressure oil is routed to the boom prior to the arm so that arm speed becomes very slow.
- Refer to the SYSTEM / Hydraulic System group in the T/M (Operational Principle).



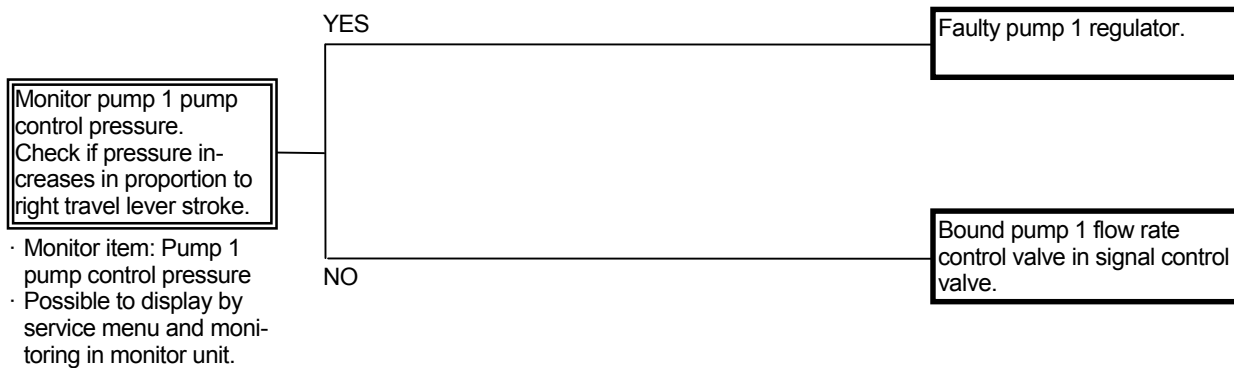
## TROUBLESHOOTING / Troubleshooting B

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**A-4 Right travel is operated during single travel operation. Single bucket operation speed becomes slow. Boom is not raised properly during arm level crowding. (All problems occur at the same time.)**

**Related MC Fault Code: None**

- The pump 1 flow rate is minimized (approx. 20 L/min) due to some reasons. Accordingly, the right travel motor and bucket cylinder, which are actuated by pressure oil from pump 1, moves very slow.
- Pressure oil from pump 2 is also routed to the arm and boom cylinders so that the arm and boom can move at a slightly slow speed in single operation. However, in level crowd operation, pressure oil is routed to the arm prior to the boom so that boom is scarcely raised.
- Refer to the SYSTEM / Hydraulic System group in the T/M (Operational Principle).



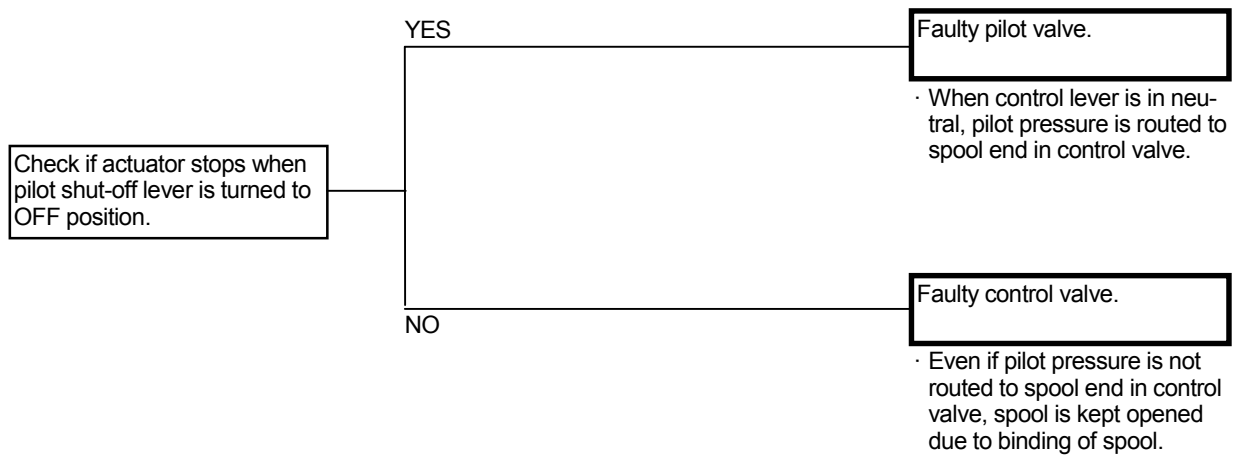
## TROUBLESHOOTING / Troubleshooting B

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### 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.





## TROUBLESHOOTING / Troubleshooting B

**A-6 Occasionally, swing or arm roll-in speed becomes slow during combined operation of swing and arm roll-in.**

**Related MC Fault Code: None**

- The arm 1 flow rate control valve may be faulty.
- Refer to the pages for the COMPONENT OPERATION / Control valve group in the T/M (Operational Principle).

Install a pressure gauge to hose SE connecting from signal control valve to arm 1 flow rate control valve in control valve.  
When relieving during combined operation of swing and arm roll-in, check if pressure is 3.9 MPa (40 kgfcm<sup>2</sup>).

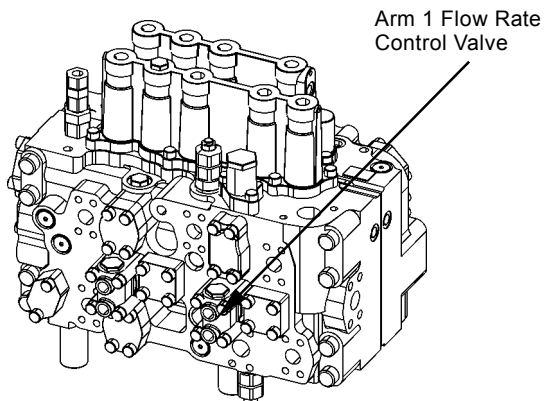
YES

Faulty arm 1 flow rate control valve in control valve.

NO

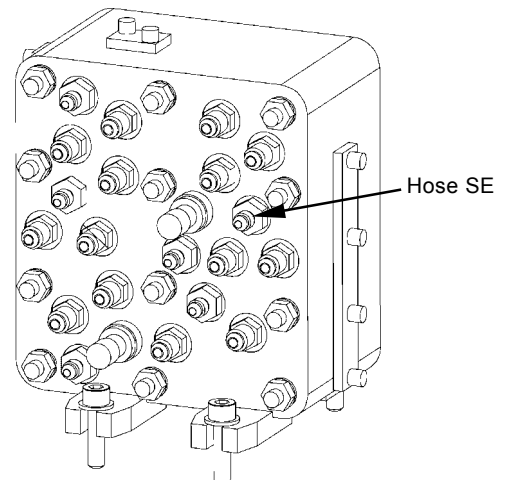
Bound control spool of arm 1 flow rate control valve in signal control valve.

Control Valve



T1V1-05-04-004

Signal Control Valve  
(Control Valve Side)



T178-03-06-015

## TROUBLESHOOTING / Troubleshooting B

### A-7 Actuator speed is faster than normal

Machine mistracks when travel lever is operated at half stroke. Precise control cannot be performed.

Related MC Fault Code: None

- The pump 1 or 2 flow rate is maximized due to some reasons.  
Therefore, the maximum flow rate is supplied and actuator speed is faster though the control lever does not reach the full stroke.
- Pressure oil from pump 1 makes right travel perform, and pressure oil from pump 2 makes left travel during single travel operation. When the travel lever is operated at half stroke, different flow rates between pump 1 and 2 occur and the machine mistracks.
- Refer to the SYSTEM / Hydraulic System group in the T/M (Operational Principle).

Monitor pump control pressure of pump 1 and 2.  
Check if pressure changes in response to lever operation.

- Pump 1: Bucket operation
- Pump 2: Swing operation
- Monitor item: Pump 1 and 2 pump control pressures
- Possible to display by service menu and monitoring in monitor unit.

YES

Faulty pump regulator.

NO

Bound pump flow rate control valve in signal control valve.

## **TROUBLESHOOTING / Troubleshooting B**

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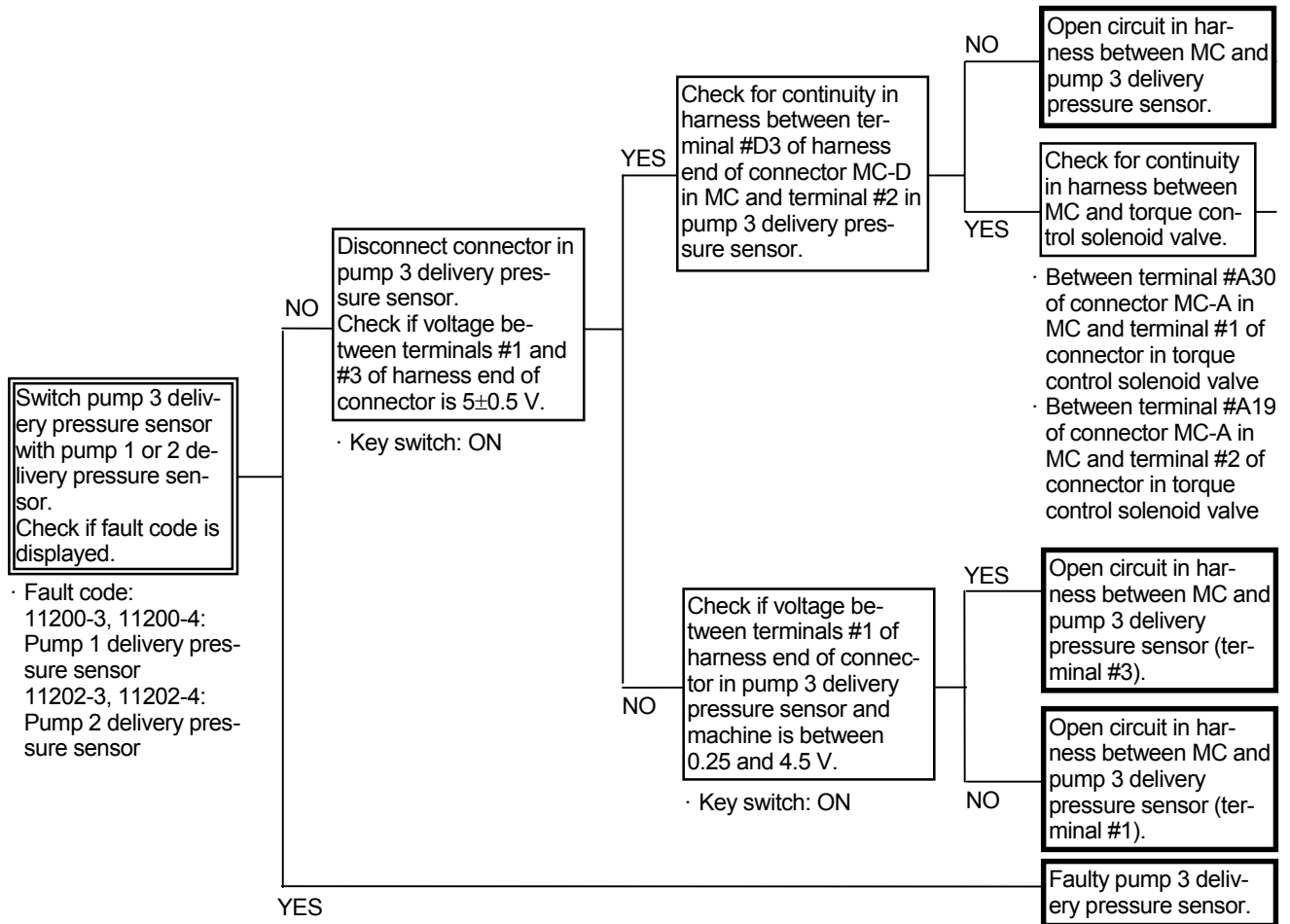
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# TROUBLESHOOTING / Troubleshooting B

**A-8 Engine lug down is large when actuator in maximum flow rate gear pump (optional) is operated.**

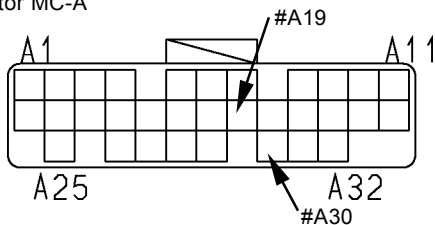
**Related MC Fault Code: None**

- Check the wiring connections first.



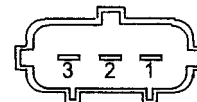
Connector (Harness end of connector viewed from the open side)

MC Connector MC-A



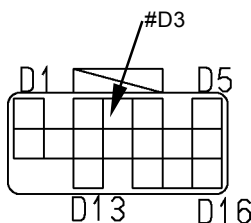
T183-05-04-008

Pump 3 Delivery Pressure Sensor



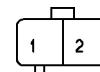
T1V1-05-07-101

MC Connector MC-D



T183-05-04-009

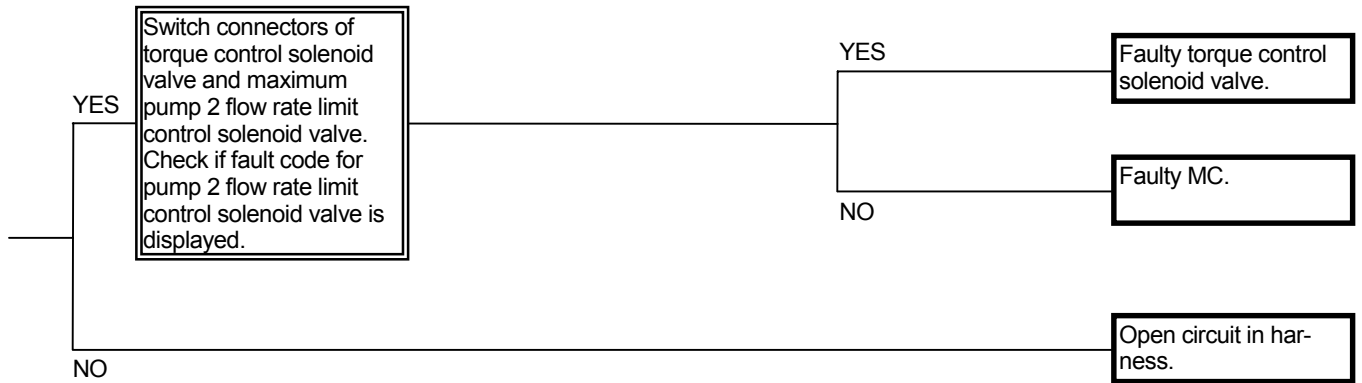
Torque Control Solenoid Valve



T1V1-05-04-003

## TROUBLESHOOTING / Troubleshooting B

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## TROUBLESHOOTING / Troubleshooting B

### 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.

Monitor pump 1 and 2 delivery pressures.

- Monitor item: Pump 1 and 2 delivery pressure
- Possible to display by service menu and monitoring in monitor unit.
- Relieve boom, arm and bucket circuits.
- Power mode switch: OFF
- Work mode: Digging

34.3 to 36.3 MPa  
(350 to 370 kgf/cm<sup>2</sup>)

Main relief valve should be normal.  
Find out cause of trouble by tracing other trouble symptoms.

Less than 34.3 MPa  
(Less than 350 kgf/cm<sup>2</sup>)

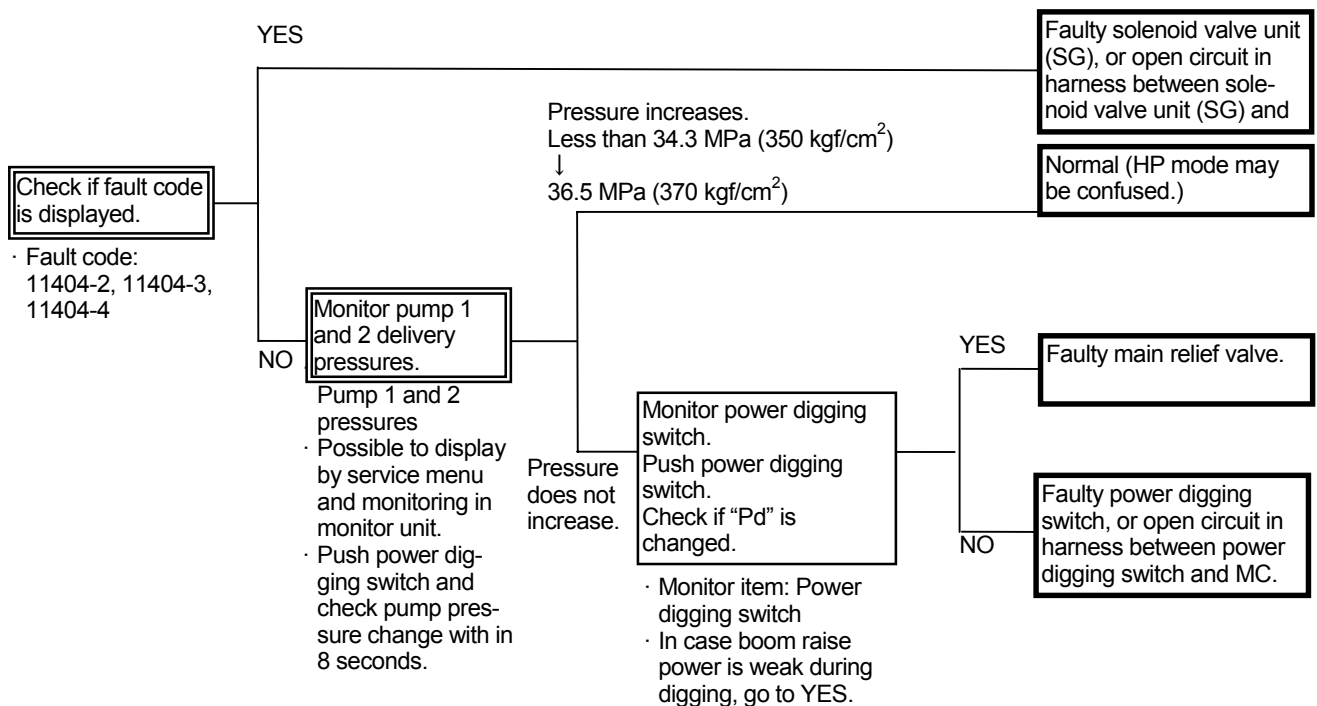
Adjust main relief valve.

## TROUBLESHOOTING / Troubleshooting B

**F-2 Even if power digging switch is pushed, power does not increase. Boom raise power is weak when digging.**

**Related MC fault Code: 11404-2, 11404-3, 11404-4**

- Refer to the pages for the SYSTEM / Control System group / Power Digging Control and Auto-Power Lift Control in the T/M (Operational Principle).
- Check the wiring connections first.

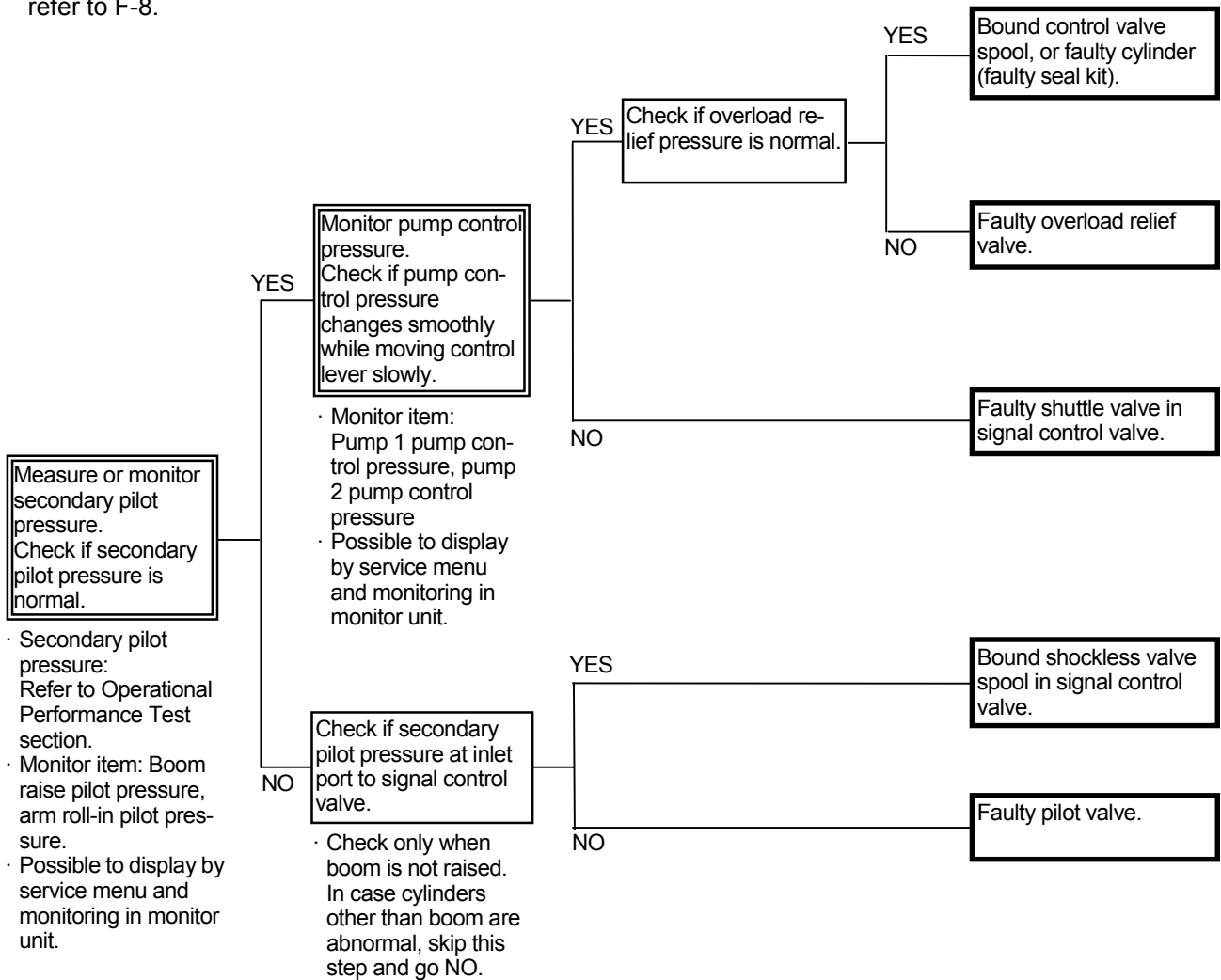


## TROUBLESHOOTING / Troubleshooting B

### F-3 Some cylinders are not operated or speeds are slow.

**Related MC Fault Code: None**

- When other actuators (travel and swing) operate normally, the pilot pump (primary pilot pressure) is considered to be normal.
- In case single bucket operation speed is slow, refer to F-6.
- In case single arm roll-in operation speed is slow, refer to F-7.
- In case single boom lower operation speed is slow, refer to F-8.





## **TROUBLESHOOTING / Troubleshooting B**

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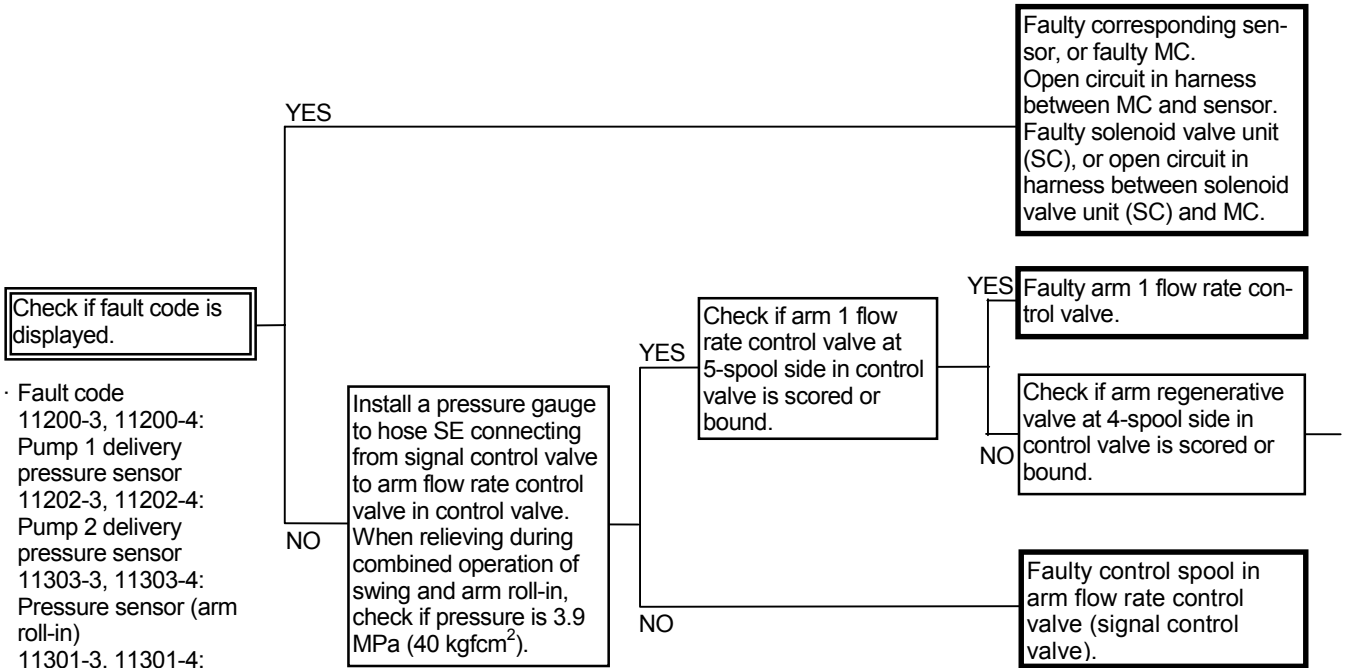
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# TROUBLESHOOTING / Troubleshooting B

**F-4 Arm speed is slow during combined operation.** During combined operation of boom raise and arm roll-in, boom raise speed is slow. Arm speed is slow during arm level crowding.

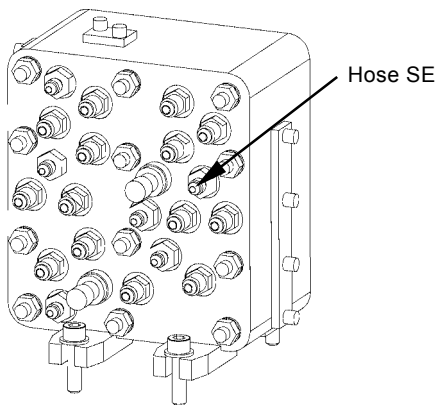
**Related MC Fault Codes:** 11200-3, 11200-4, 11202-3, 11202-4, 11303-3, 11303-4, 11301-3, 11301-4, 11302-3, 11302-4, 11403-2, 11403-3, 11403-4

• Refer to the pages for the SYSTEM / Control System group / Arm Regenerative Control in the T/M (Operational Principle).



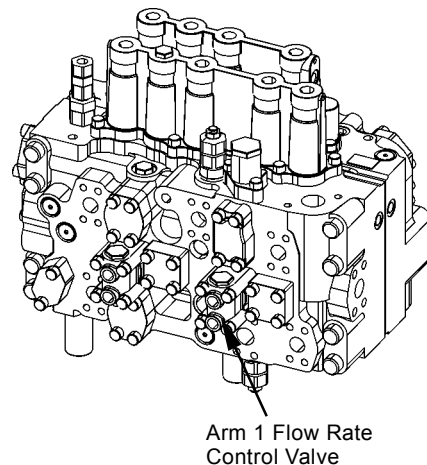
- Fault code
- 11200-3, 11200-4: Pump 1 delivery pressure sensor
- 11202-3, 11202-4: Pump 2 delivery pressure sensor
- 11303-3, 11303-4: Pressure sensor (arm roll-in)
- 11301-3, 11301-4: Pressure sensor (swing)
- 11302-3, 11302-4: Pressure sensor (boom raise)
- 11403-2, 11403-3, 11403-4: Solenoid valve unit (SC)

Signal Control Valve (Control Valve Side)



T178-03-06-015

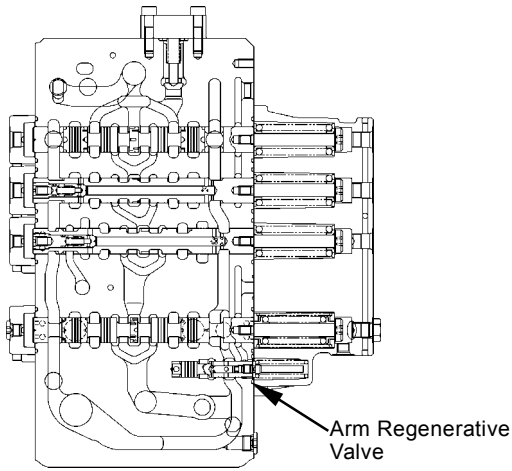
Control Valve



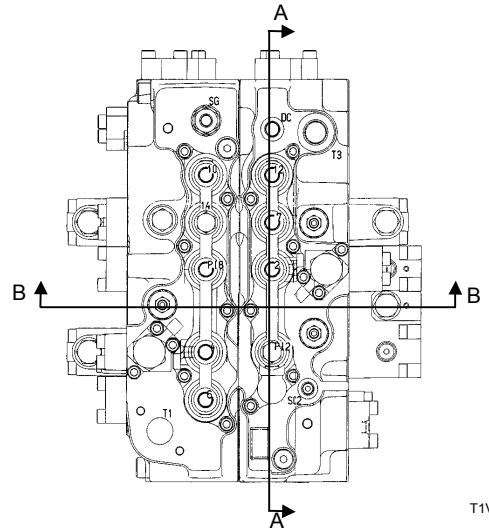
T1V1-05-04-004

# TROUBLESHOOTING / Troubleshooting B

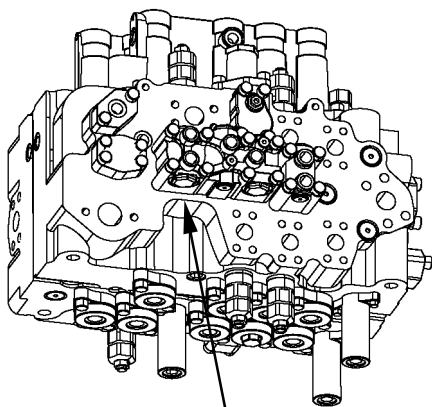
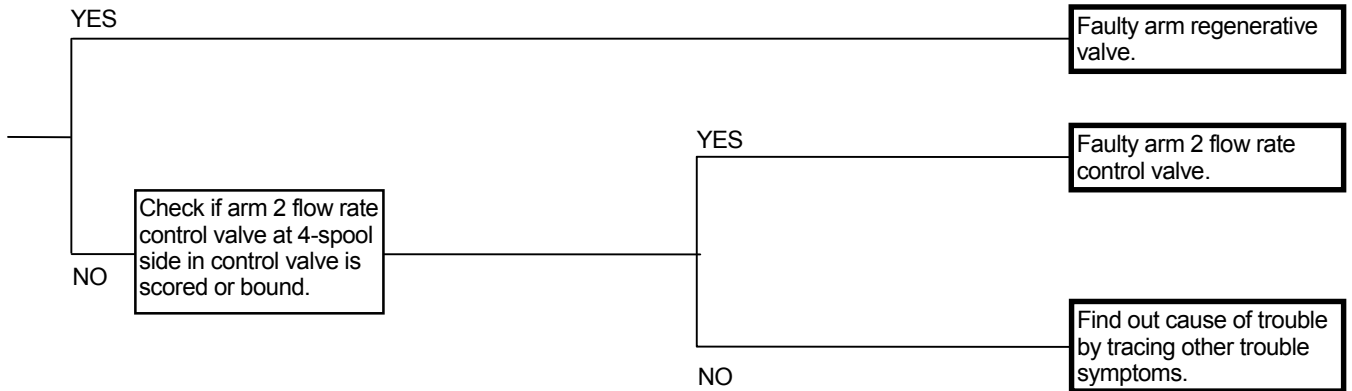
## Section A-A



T1V1-03-03-002

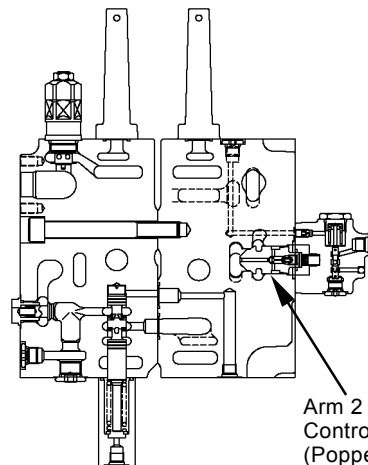


T1V1-03-03-026



T1V1-05-04-005

## Section B-B



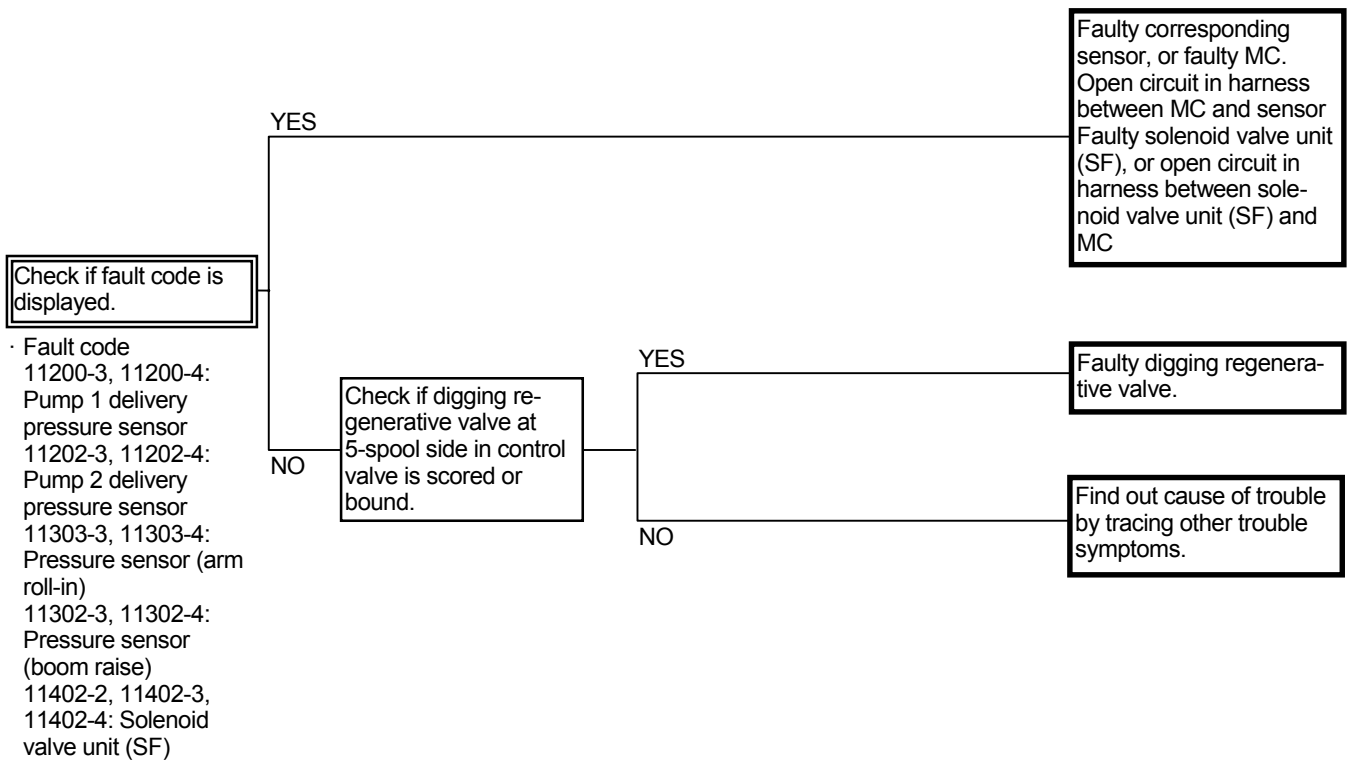
T1V1-05-04-007

# TROUBLESHOOTING / Troubleshooting B

## 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).

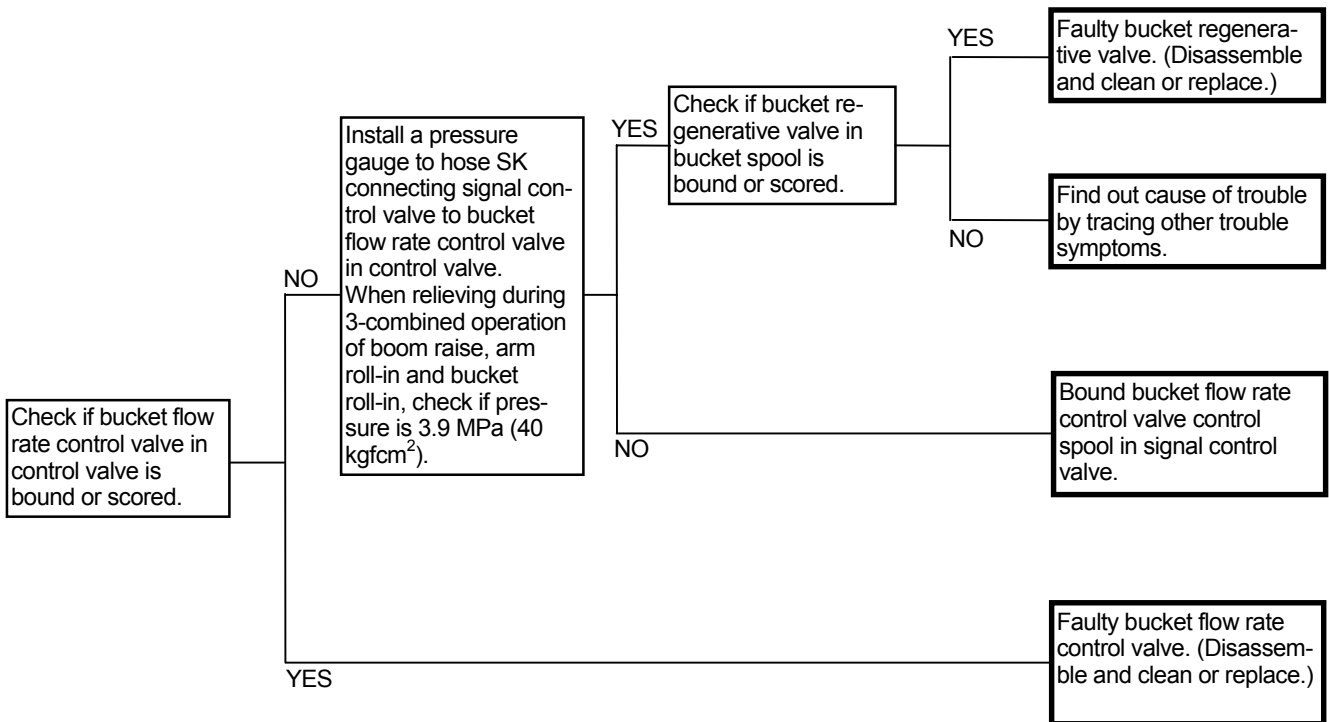


## TROUBLESHOOTING / Troubleshooting B

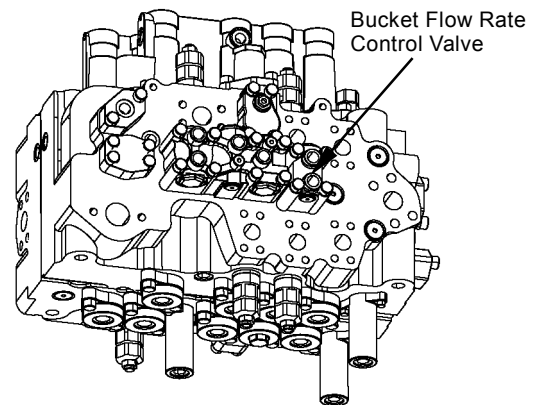
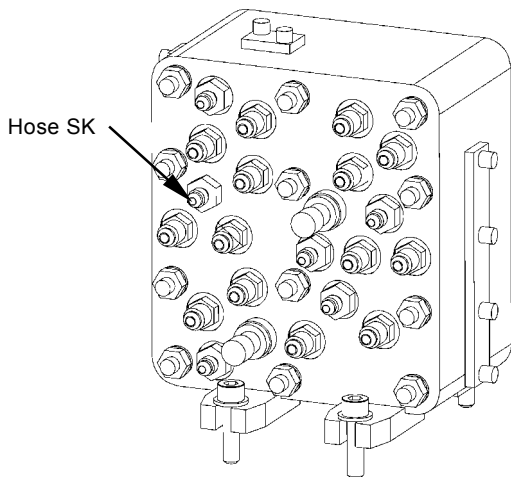
**F-6 Bucket is slightly slow during bucket roll-in single operation. Bucket does not move smoothly during bucket roll-in single operation.**

**Related MC Fault Code: None**

- Bucket flow rate control valve or bucket regenerative valve may be faulty.
- Refer to the COMPONENT OPERATION / Control Valve group in the T/M (Operational Principle).



Signal Control Valve (Control Valve Side)



T1V1-05-04-005

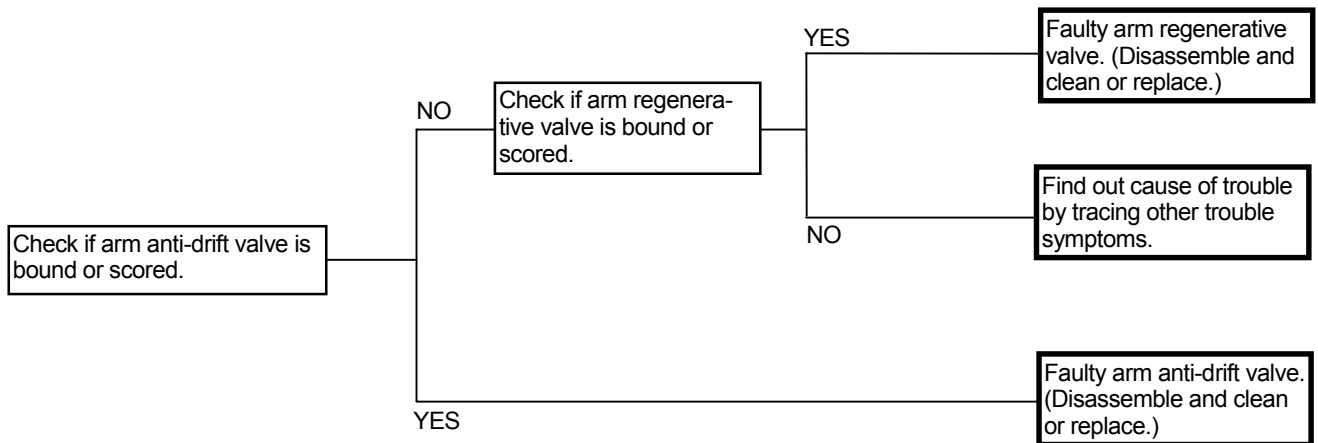
T178-03-06-015

## TROUBLESHOOTING / Troubleshooting B

**F-7** When starting to move during combined operation, arm does not smoothly move. Arm starts to move slightly slow during arm roll-in single operation. These troubles often occur when temperature is low.

**Related MC Fault Code: None**

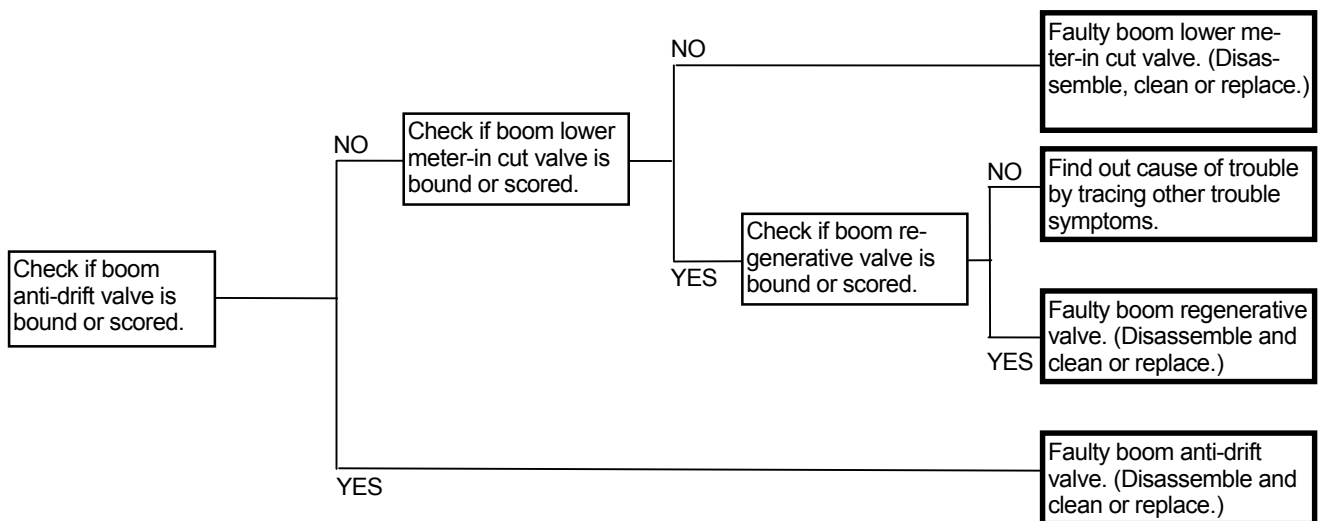
- Refer to the COMPONENT OPERATION / Control Valve group in the T/M (Operational Principle).



**F-8** When starting to move during combined operation, boom does not move smoothly. Boom starts to move slightly slow during boom lower single operation.

**Related MC Fault Code: None**

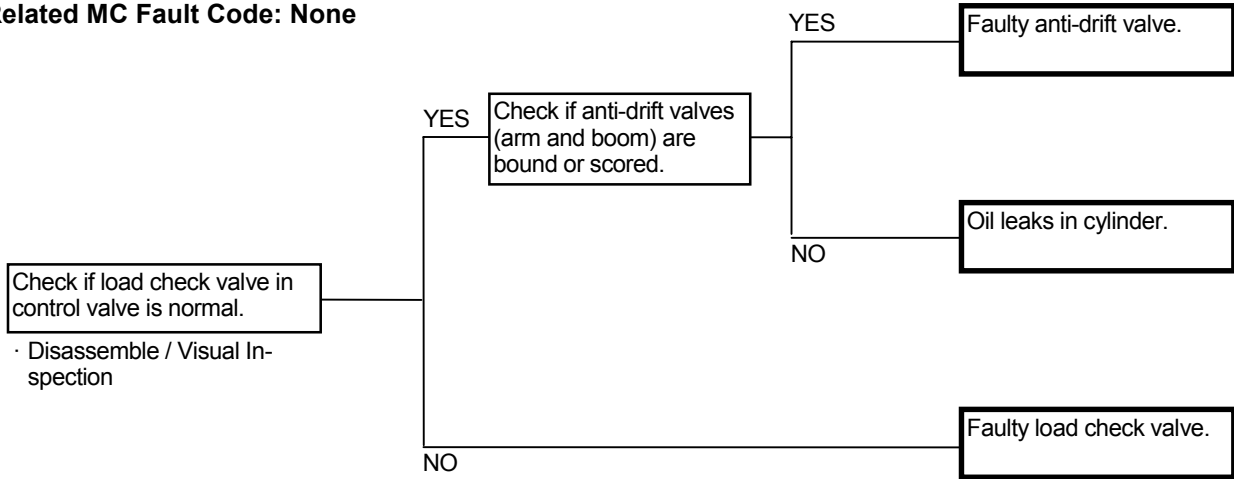
- Refer to the COMPONENT OPERATION / Control Valve group in the T/M (Operational Principle).




## TROUBLESHOOTING / Troubleshooting B

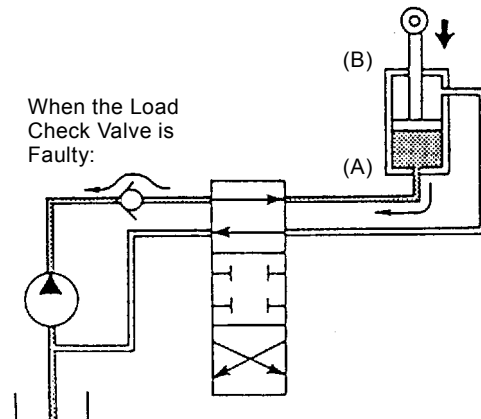
**F-9** When boom raise or arm roll-out is operated, boom or arm starts to move after moving slightly downward.

Related MC Fault Code: None



 **NOTE:** 1. During the initial stage of operation, oil pressure and flow rate from the pump is low. Therefore, if the load check valve is malfunctioning, the oil in the bottom side of the boom cylinder flows back into the circuit through the load check valve so that the boom cylinder temporarily is retracted.

2. As oil pressure and flow rate from the pump is low, if oil leaks from bottom side (A) to rod side (B) due to faulty boom cylinder piston or cylinder barrel, the boom cylinder is temporarily retracted during the initial stage of operation. In addition, cylinder force is reduced. The cylinder drift increases in this case.

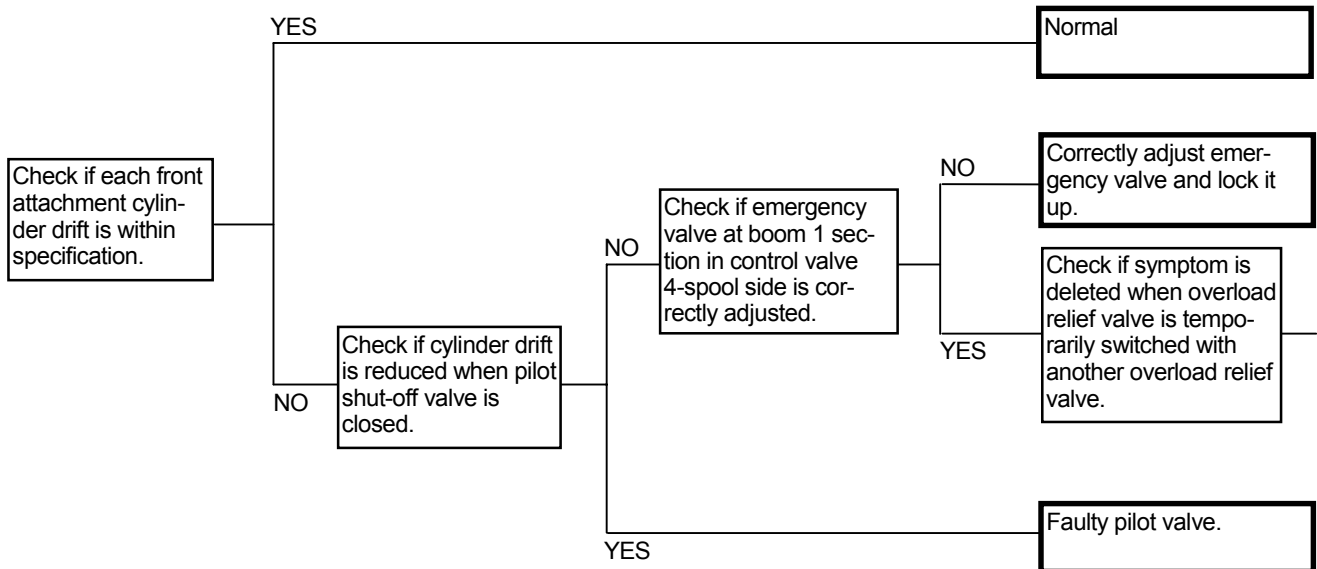


T105-07-04-012

## TROUBLESHOOTING / Troubleshooting B

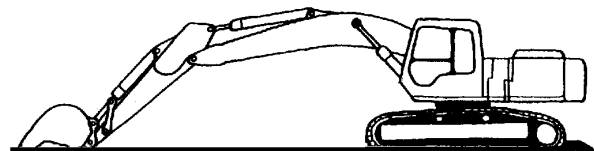
### F-10 Front attachment drifts remarkably.

Related MC Fault Code: None



#### • Boom Cylinder Internal Leakage Check

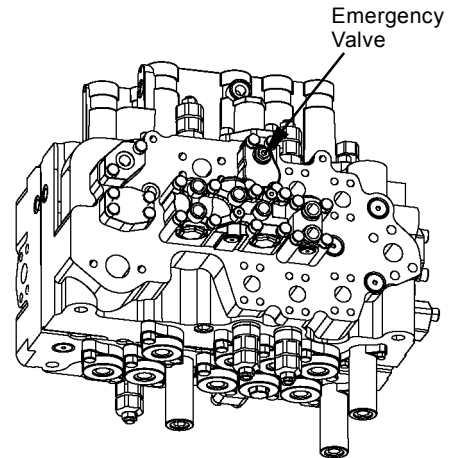
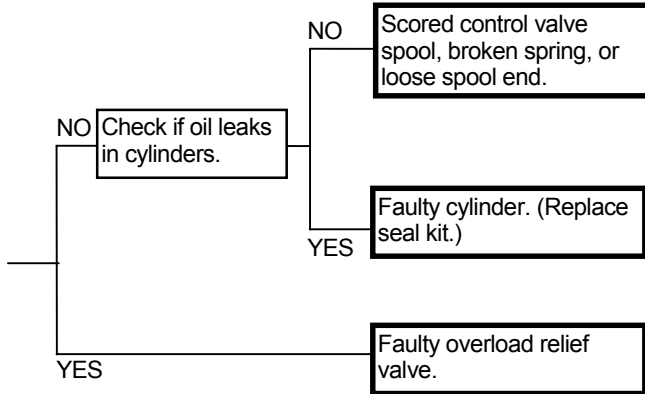
1. With the bucket cylinder fully retracted and the arm cylinder slightly extended from the fully retracted position, lower the bucket tooth tips onto the ground.
2. Remove the hoses from the boom cylinder rod side. Drain oil from the hoses and cylinders. (Plug the disconnected hose ends.)
3. Retract the arm cylinder and lift the bucket off the ground. If oil flows out of the hose removed pipe ends and the boom cylinders are retracted at this time, oil leaks in the boom cylinders. In case no oil flows out of the hose removed pipe ends but the boom cylinders are retracted, oil leaks in the control valve.



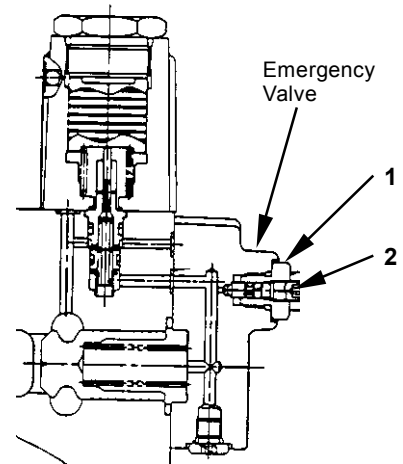
T105-07-04-009



## TROUBLESHOOTING / Troubleshooting B



T1V1-05-04-005



T178-05-04-003

Adjustment Procedure:  
Tighten (1) and tighten (2).

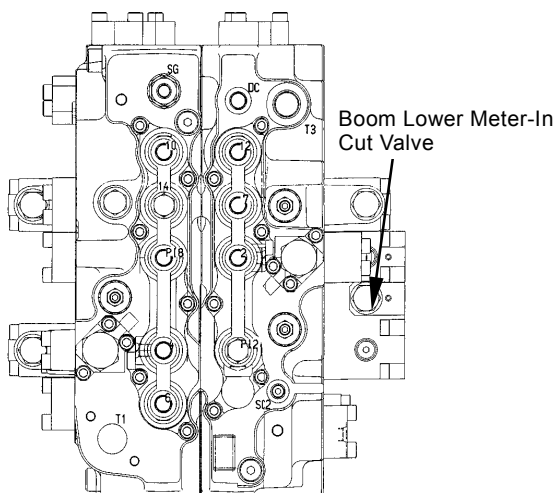
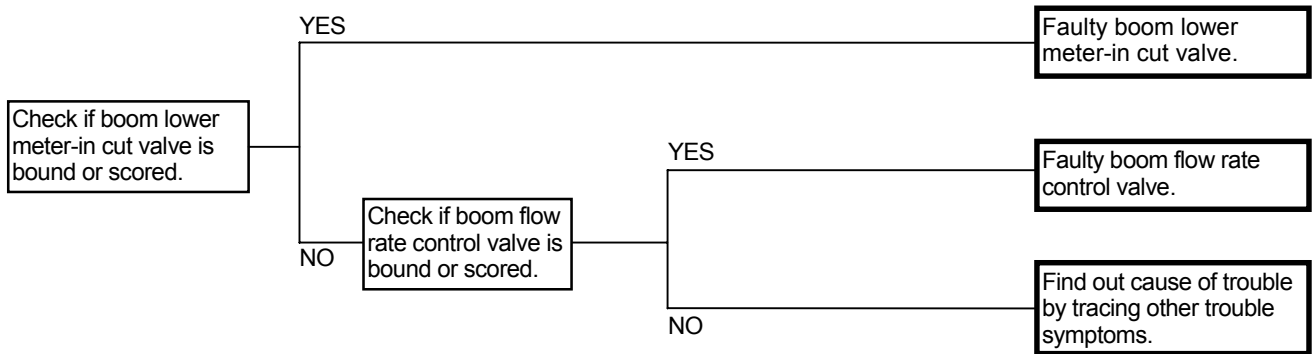
Tightening Torque:  
(1)- 13 N·m (1.3 kgf·m)  
(2)- 7 N·m (0.7 kgf·m)

## TROUBLESHOOTING / Troubleshooting B

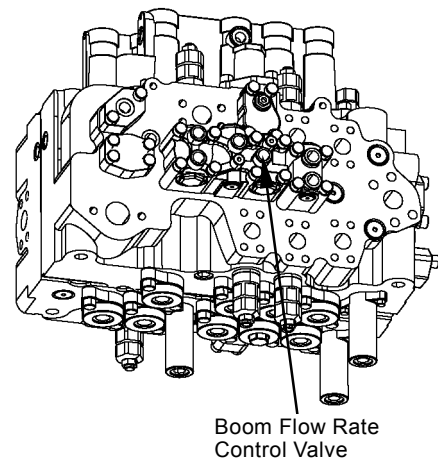
**F-11 Boom lower above ground is faster than other actuators during combined operation.**

**Related MC Fault Code: None**

- Boom lower meter-in cut valve or boom flow rate control valve may be faulty.
- Refer to the pages for the SYSTEM / Hydraulic System group and the COMPONENT OPERATION / Control Valve group in the T/M (Operational Principle).
- In case boom lower single operation is slow, refer to F-8.



T1V1-03-03-026



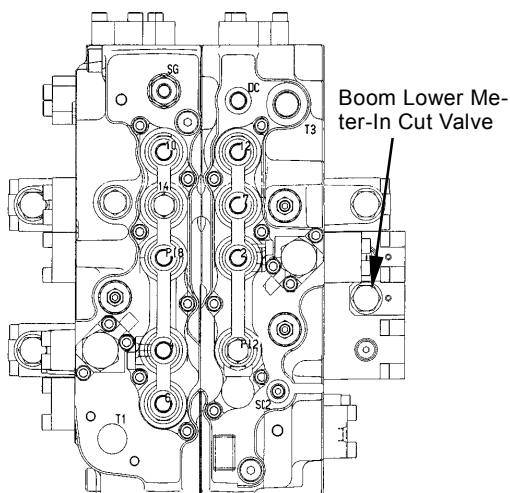
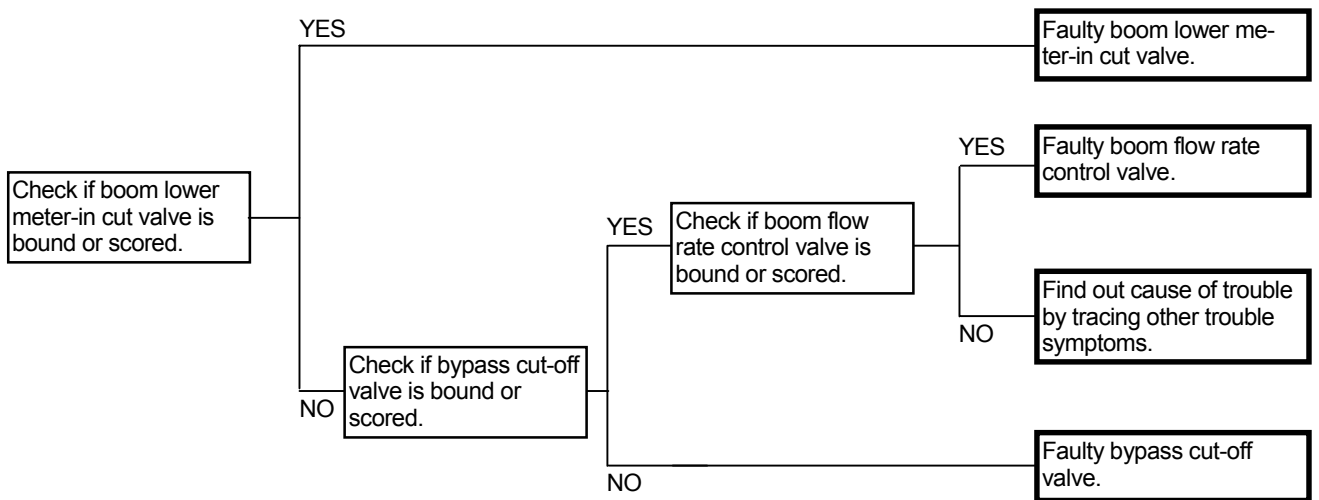
T1V1-05-04-005

## TROUBLESHOOTING / Troubleshooting B

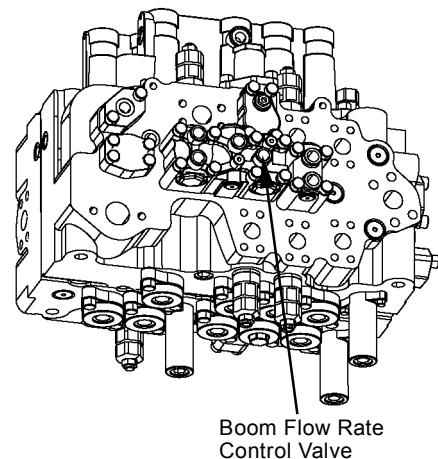
### F-12 Machine cannot be raised off ground.

#### Related MC Fault Code: None

- Boom lower meter-in cut valve or boom flow rate control valve may be faulty.
- Refer to the pages for the SYSTEM / Hydraulic System group and the COMPONENT OPERATION / Control Valve group in the T/M (Operational Principle).
- In case boom lower single operation is slow, refer to F-8.



T1V1-03-03-026



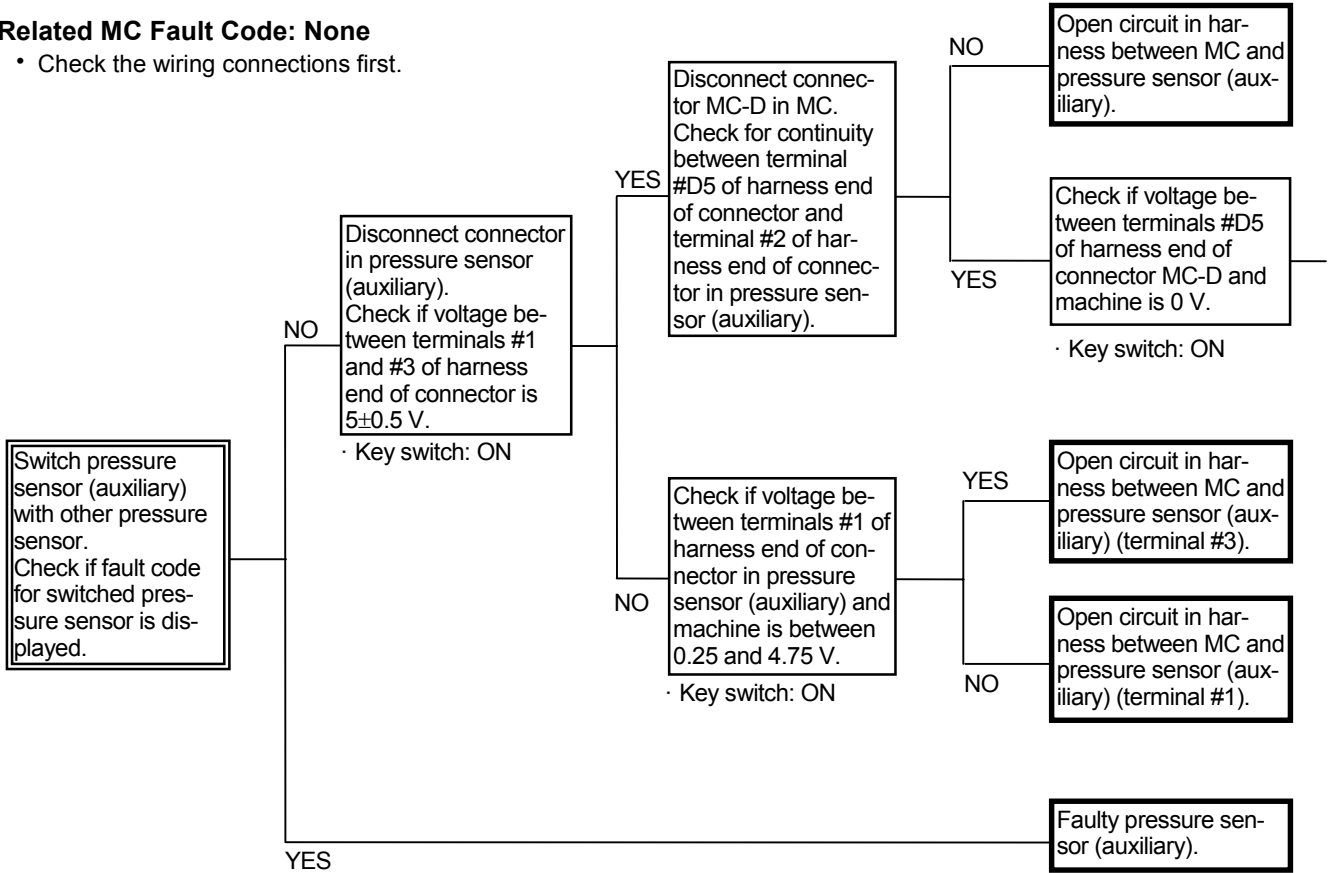
T1V1-05-04-005

# TROUBLESHOOTING / Troubleshooting B

**F-13 Attachment speed is fast during combined operation of attachment (optional) and front attachment (when secondary crusher or primary crusher is used).**

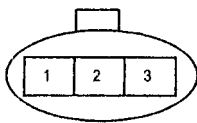
**Related MC Fault Code: None**

- Check the wiring connections first.



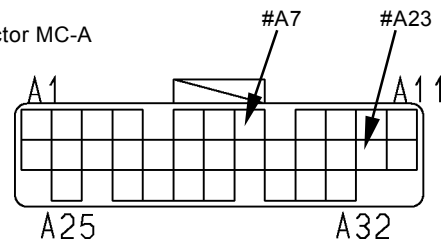
Connector (Harness end of connector viewed from the open side)

Pilot Pressure Sensor (Auxiliary)  
Pilot Pressure Sensor (Arm Roll-Out)



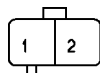
T1V1-05-07-102

MC  
Connector MC-A



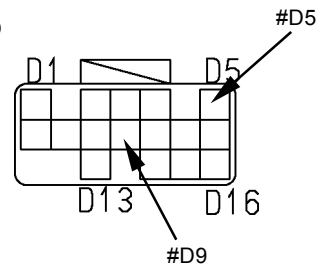
T183-05-04-008

Auxiliary Flow Rate Control  
Solenoid Valve



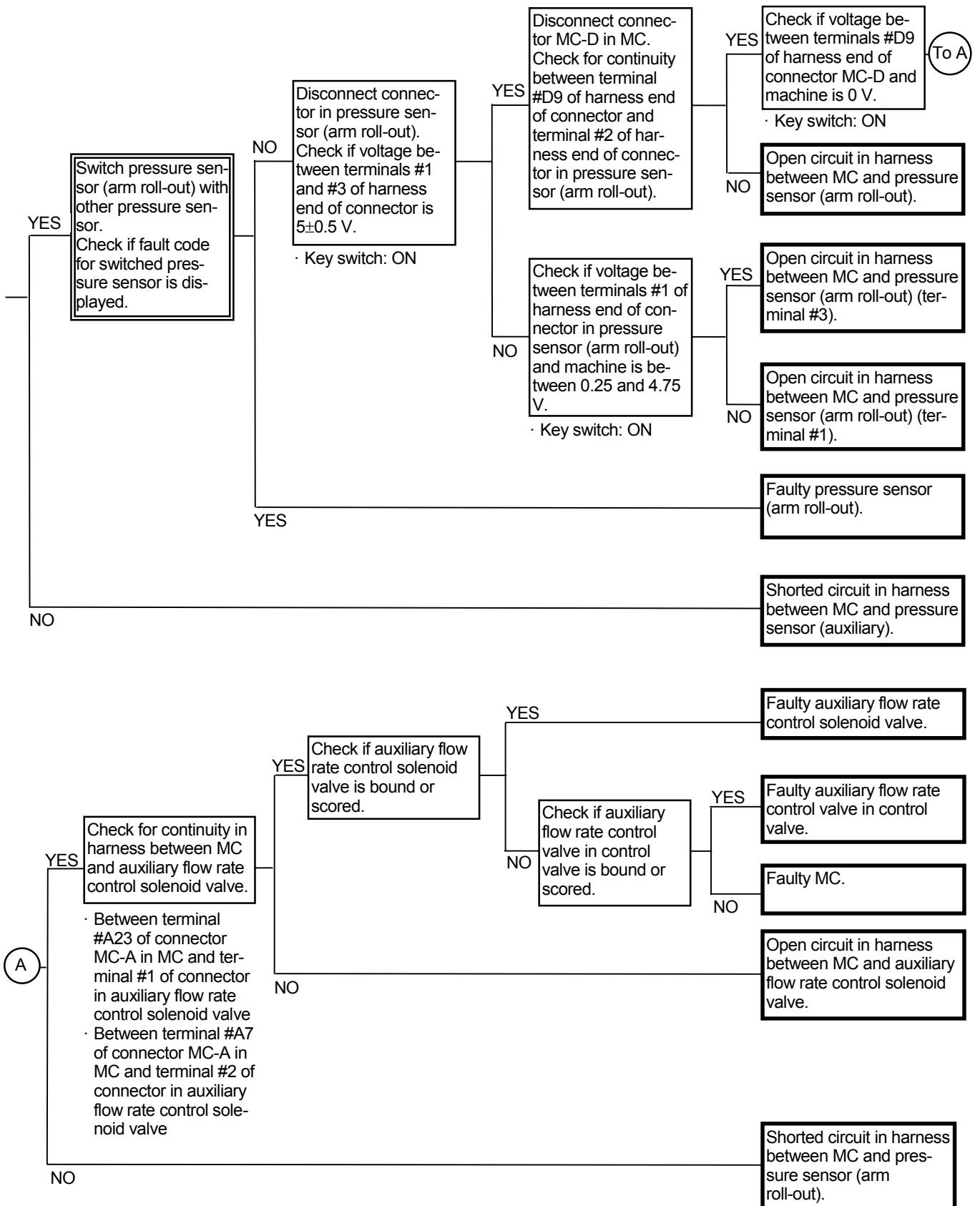
T1V1-05-04-003

MC  
Connector MC-D



T183-05-04-009

## TROUBLESHOOTING / Troubleshooting B

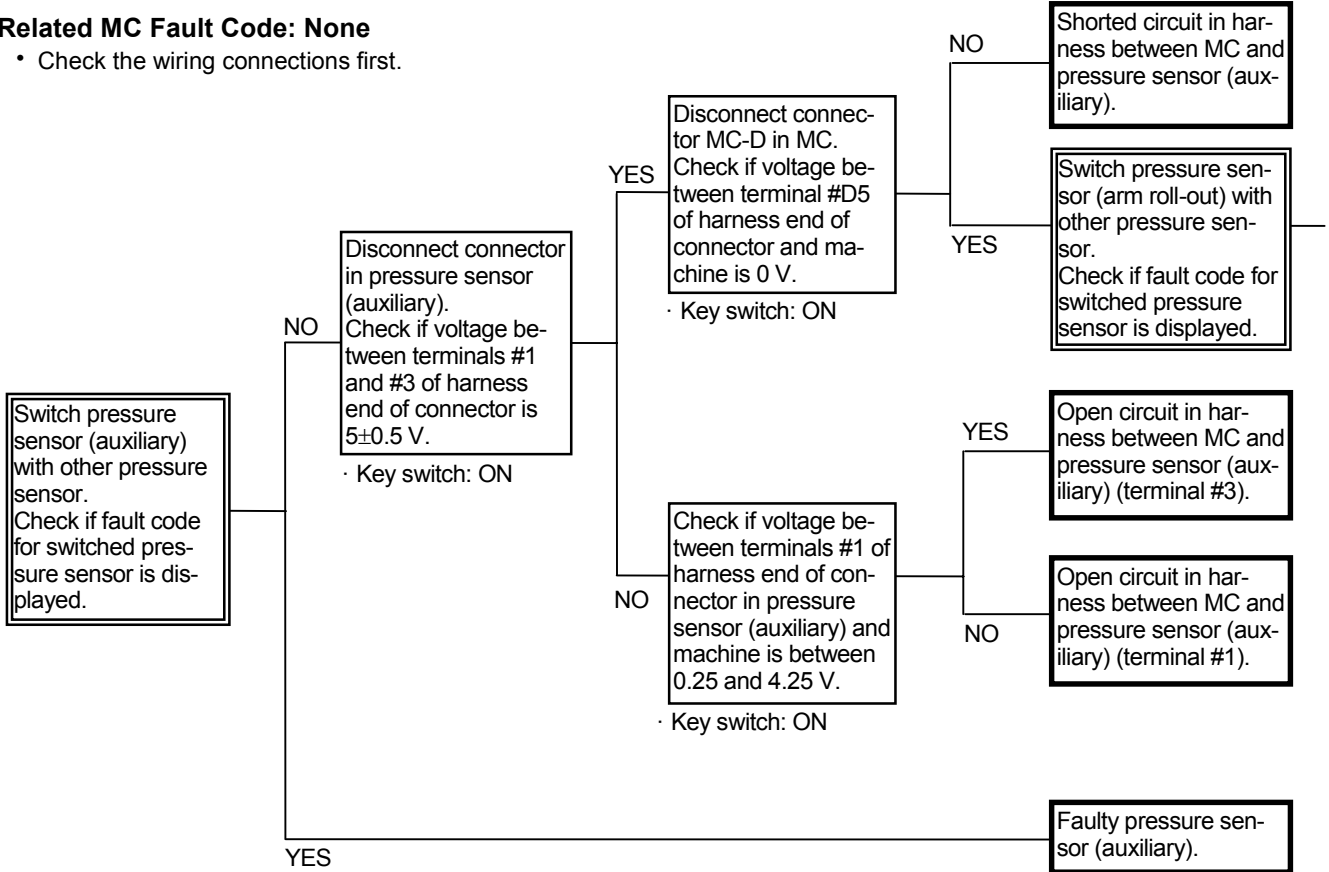


# TROUBLESHOOTING / Troubleshooting B

**F-14 Attachment speed is fast during combined operation of attachment (optional) and front attachment (when breaker attached with auxiliary flow combining line is used).**

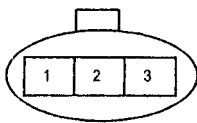
**Related MC Fault Code: None**

- Check the wiring connections first.



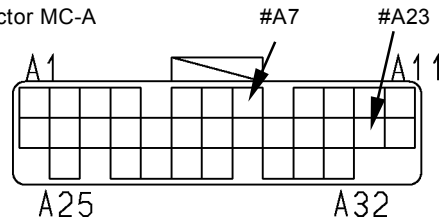
Connector (Harness end of connector viewed from the open side)

Pilot Pressure Sensor (Auxiliary)  
Pilot Pressure Sensor (Arm Roll-Out)



T1V1-05-07-102

MC  
Connector MC-A



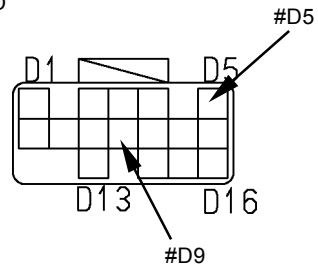
T183-05-04-008

Auxiliary Flow Combining Solenoid Valve



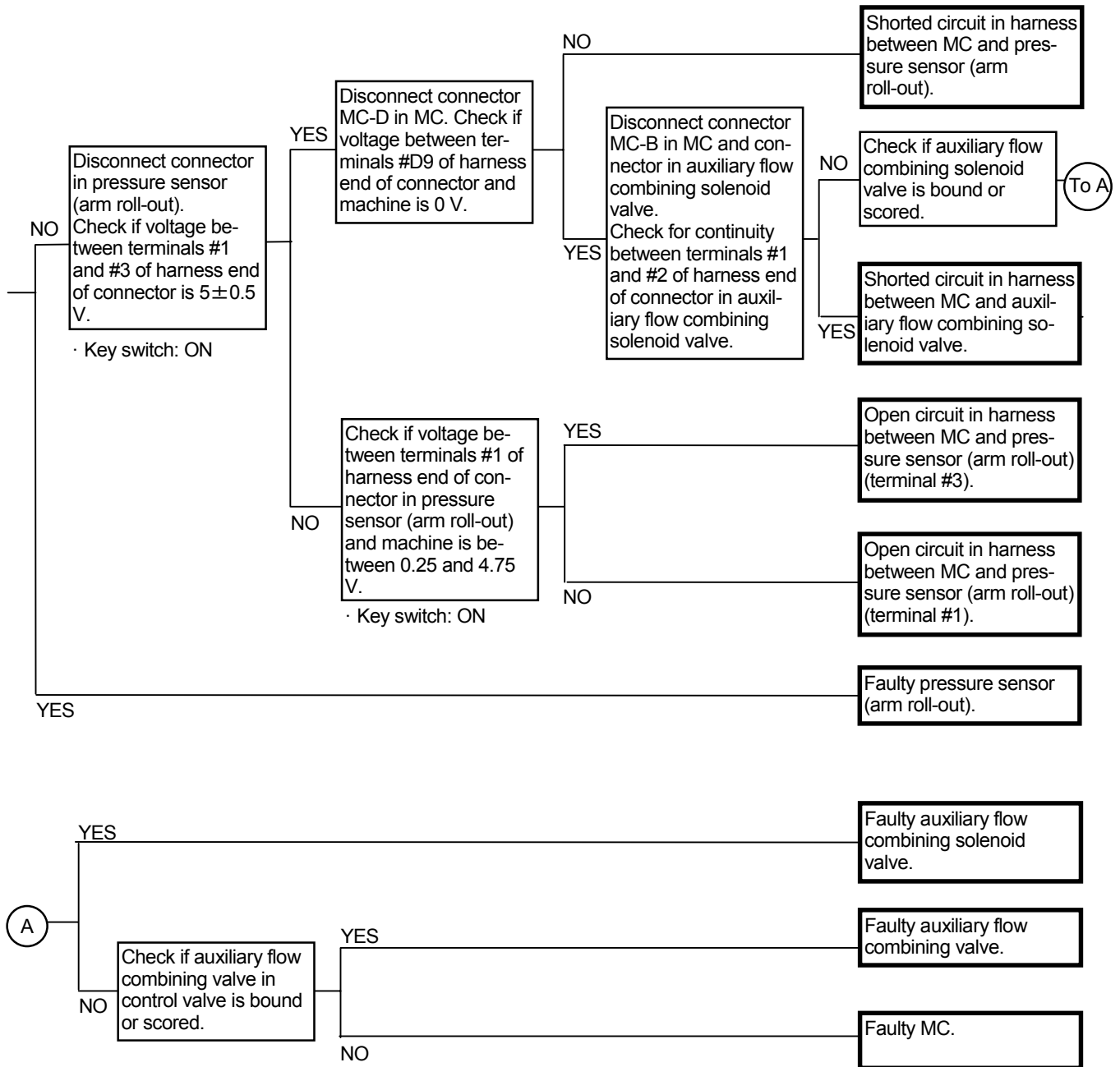
T1V1-05-04-003

MC  
Connector MC-D



T183-05-04-009

## TROUBLESHOOTING / Troubleshooting B

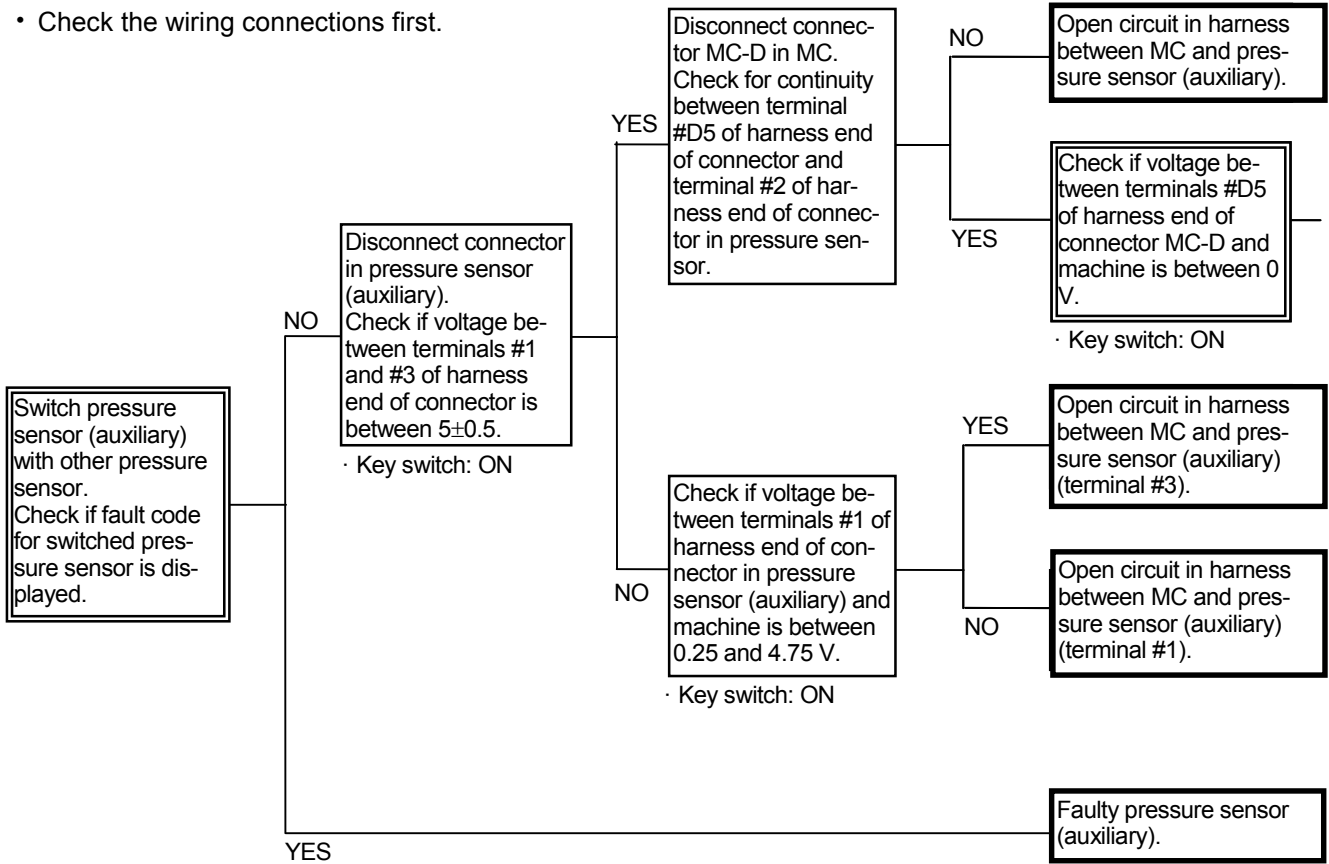


# TROUBLESHOOTING / Troubleshooting B

**F-15 Attachment speed is fast during combined operation of attachment (optional) and front attachment (when vibrating hammer is used).**

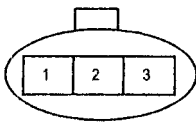
**Related MC Fault Code: None**

- Check the wiring connections first.



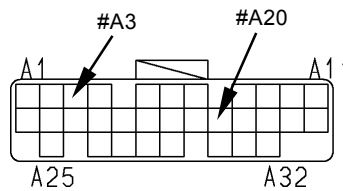
Connector (Harness end of connector viewed from the open side)

Pilot Pressure Sensor (Auxiliary)  
Pilot Pressure Sensor (Travel)



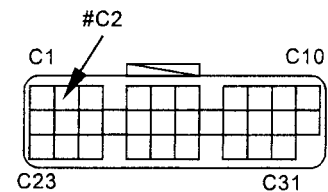
T1V1-05-07-102

MC  
Connector MC-A



T183-05-04-008

MC  
Connector MC-C



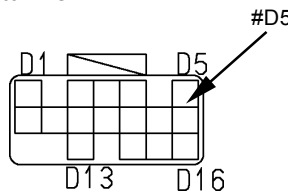
T1V1-05-07-103

Maximum Pump 1 Flow Rate Limit  
Control Solenoid Valve (Optional)



T1V1-05-04-003

MC  
Connector MC-D



T183-05-04-009





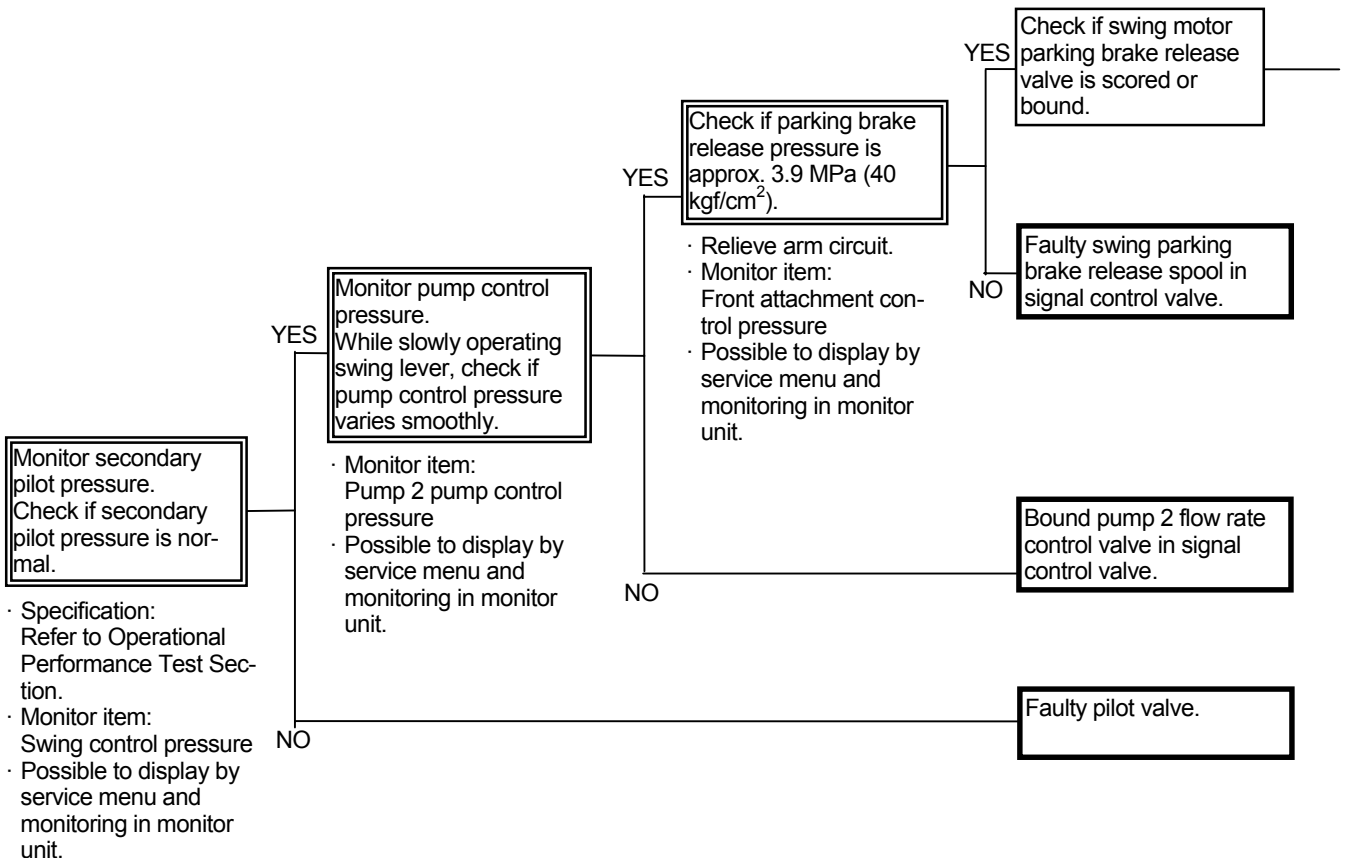
# TROUBLESHOOTING / Troubleshooting B

## SWING SYSTEM TROUBLESHOOTING

### S-1 Swing is slow or unmoving.

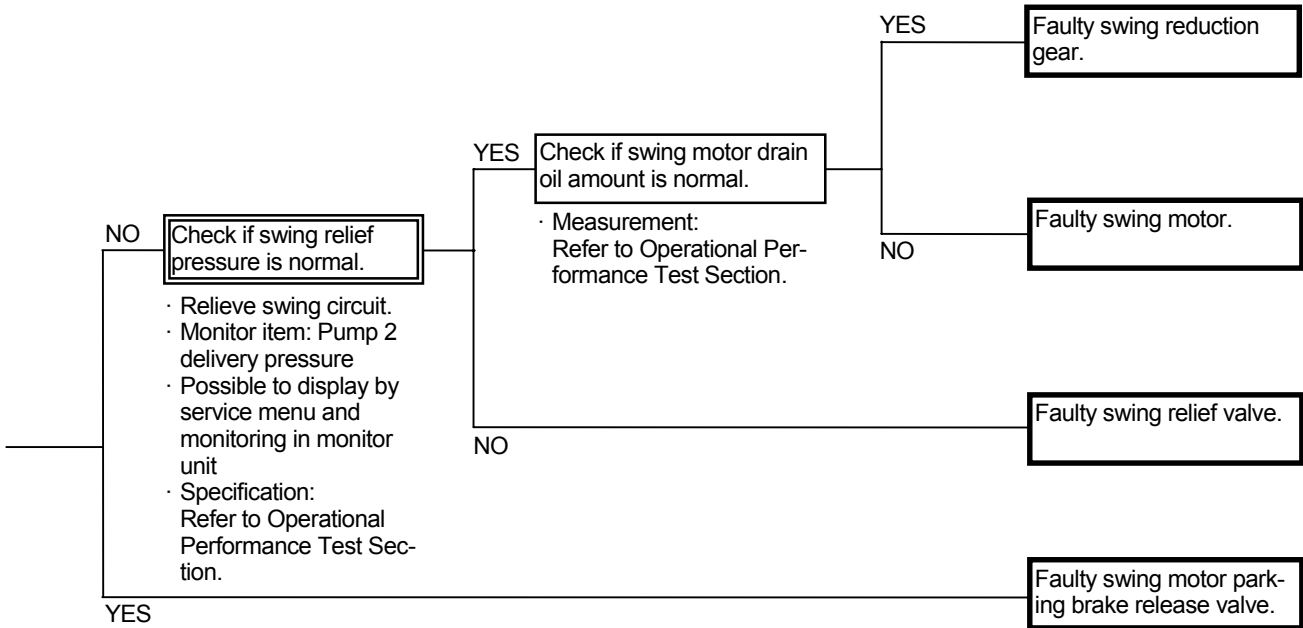
**Related MC Fault Code: None**

- Check whether the pilot system is faulty or the main circuit is faulty.
- In case other functions (front attachment and travel) operate normally, the pilot pump is considered to be normal. If the pilot system is displaying a problem, the cause of trouble may exist in the circuit after pilot valve.
- In case left travel speed is also slow, refer to A-3.



## TROUBLESHOOTING / Troubleshooting B

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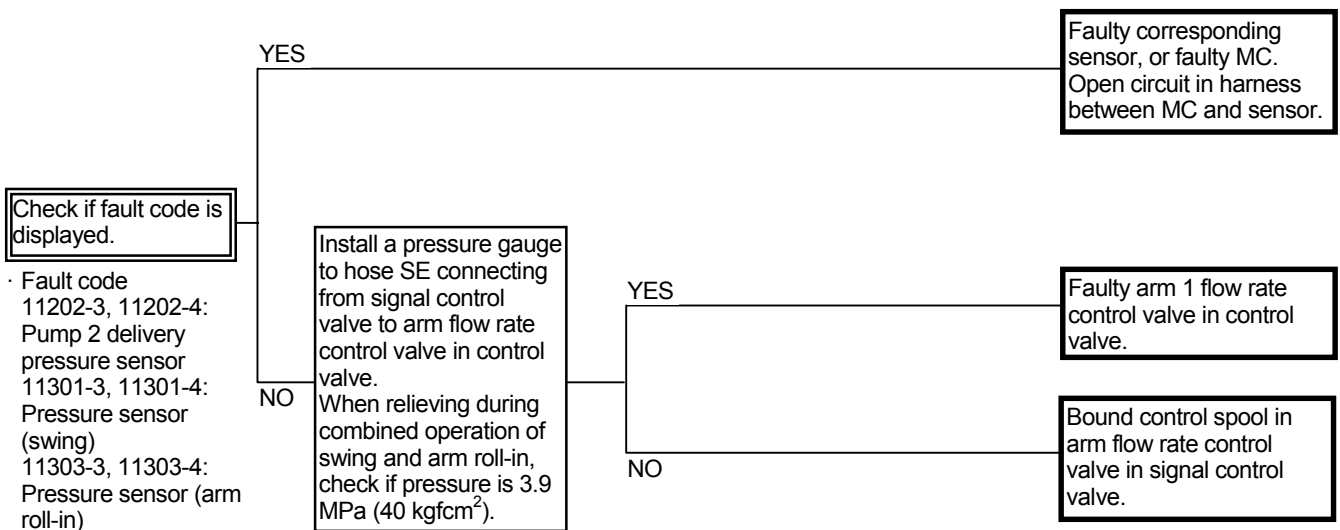


## TROUBLESHOOTING / Troubleshooting B

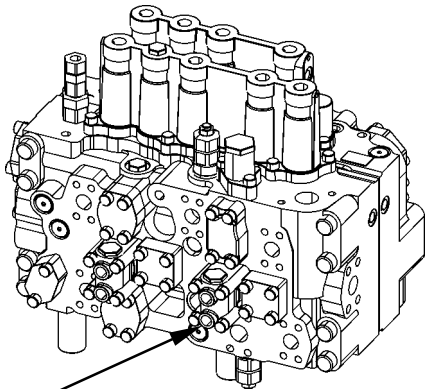
**S-2 Swing is slow (weak in power) during combined operation of swing and arm roll-in.**  
**Swing does not start smoothly.**  
**Swing power is weak.**

**Related MC Fault Codes: 11202-3, 11202-4, 11301-3, 11301-4, 11303-3, 11303-4**

- Refer to the pages for the SYSTEM / Hydraulic System group / Valve Control Circuit in the T/M (Operational Principle).
- Check the wiring connections first.



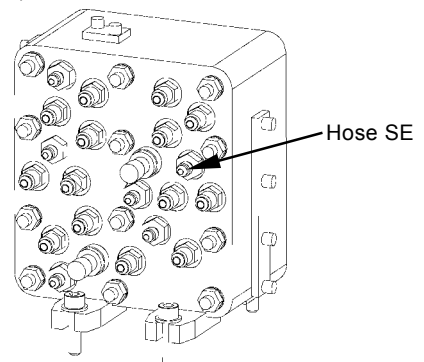
**NOTE:** *In case other fault codes are displayed, perform troubleshooting corresponding to the displayed fault code.*



Arm 1 Flow Rate Control Valve

T1V1-05-04-004

Signal Control Valve (Control Valve Side)



T178-03-06-015

## **TROUBLESHOOTING / Troubleshooting B**

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## **TROUBLESHOOTING / Troubleshooting B**

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### **TRAVEL SYSTEM TROUBLESHOOTING**

**T-1 Both right and left tracks do not rotate or rotate slowly.**

**Related MC Fault Code: None**

- Both right and left pilot valves, travel motors, and/or control valve spools are unlikely to be faulty at the same time.
- In case both travel systems do not operate, the pilot system, which is applied to both side travel motors, may be faulty. If primary pilot pressure is lower than specification, front attachment operating speed becomes slow as well. Refer to A-1.
- In case the fast travel mode cannot be selected, refer to T-5.

## **TROUBLESHOOTING / Troubleshooting B**

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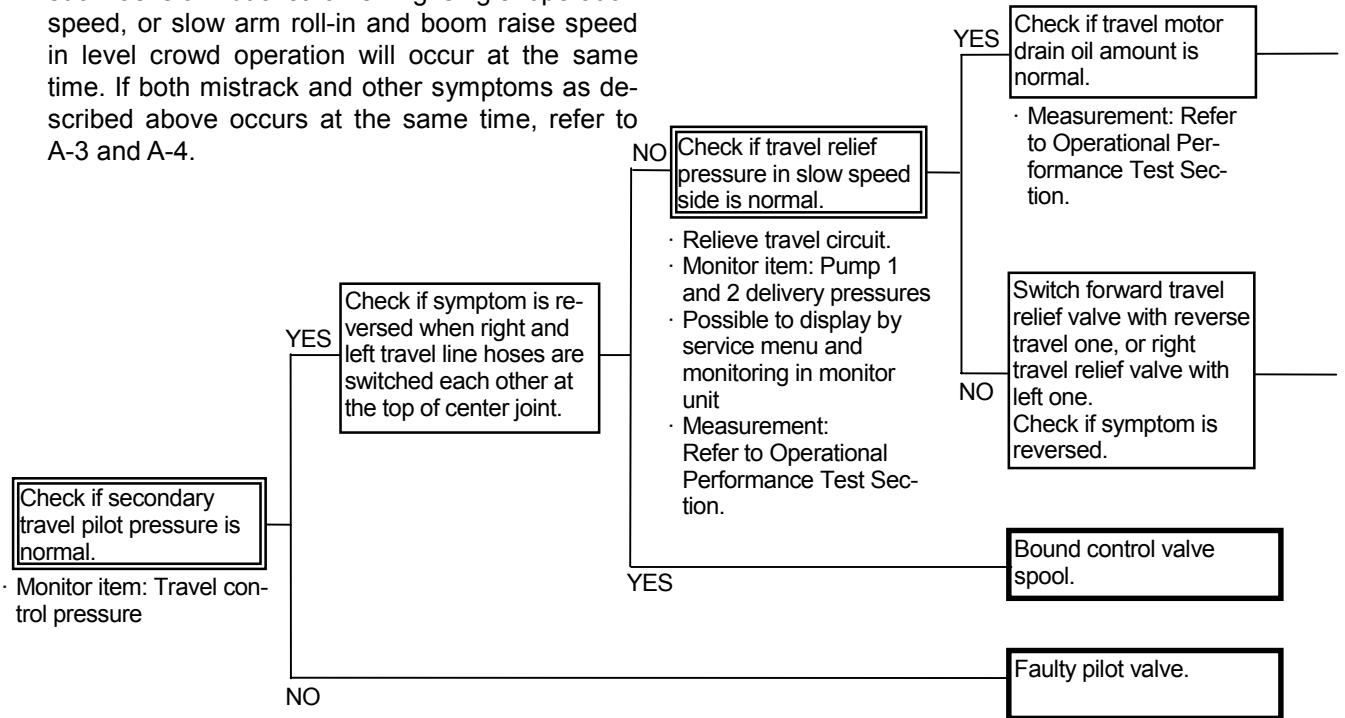
(Blank)

# TROUBLESHOOTING / Troubleshooting B

## T-2 One side track does not rotate or rotates slowly. Machine mistracks.

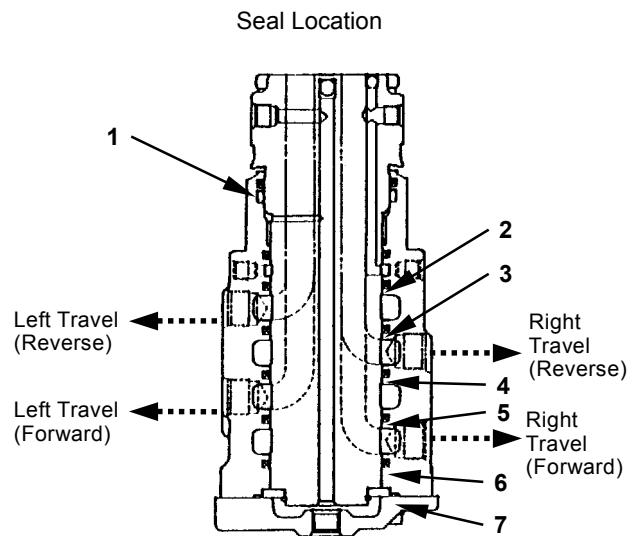
**Related MC Fault Code: None**

- Check that both side track sags are equally adjusted.
- Faulty pump control will cause the machine to mistrack. In this case, other trouble symptoms such as slow bucket or swing single operation speed, or slow arm roll-in and boom raise speed in level crowd operation will occur at the same time. If both mistrack and other symptoms as described above occurs at the same time, refer to A-3 and A-4.
- In one side track only does not rotate, the pilot valve, control valve, travel motor, or center joint may be faulty.



Relationship between Faulty Seal Location and Mistrack Direction

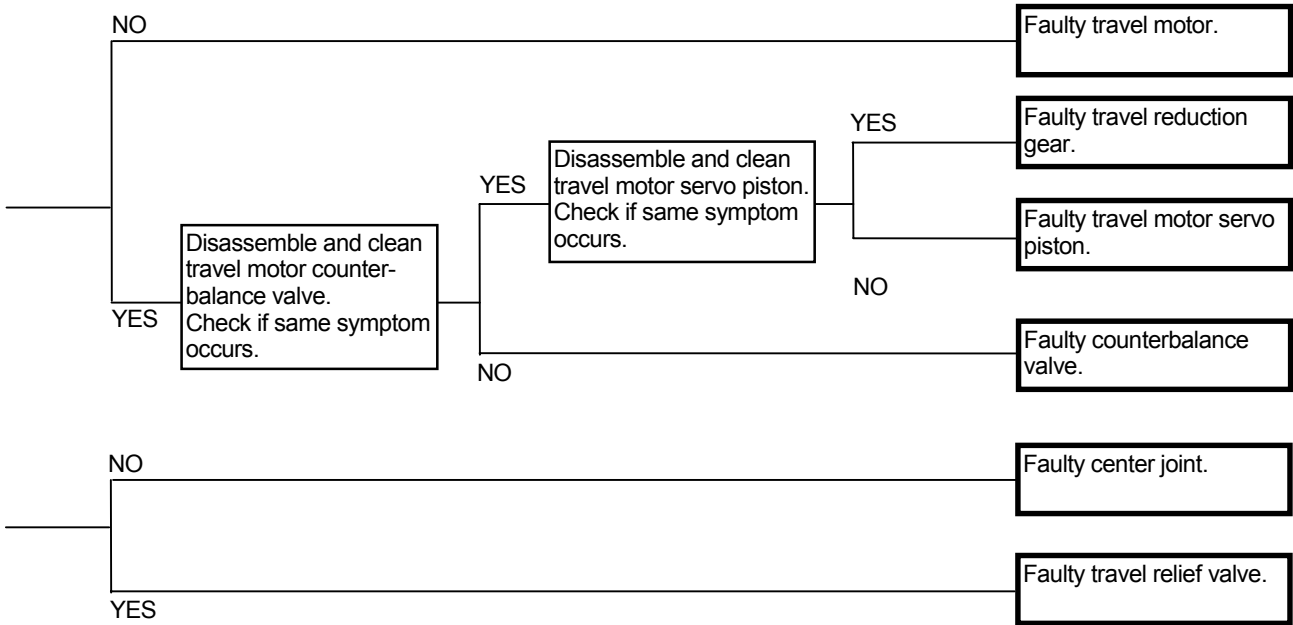
Seal No.	When traveling straight:	When pivot turn is performed:
1	External Oil Leak	←
2		
3		
4		
5		
6		
7	External Oil Leak	←



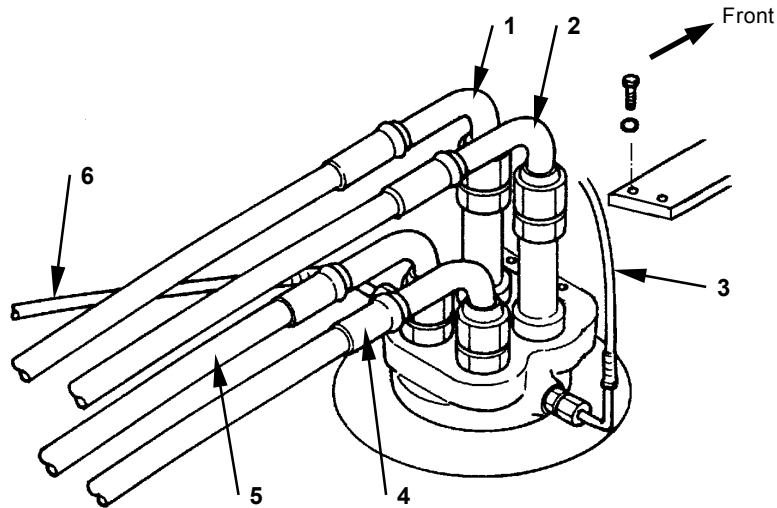
T105-07-04-015



## TROUBLESHOOTING / Troubleshooting B



Arrangement of Pipe Line



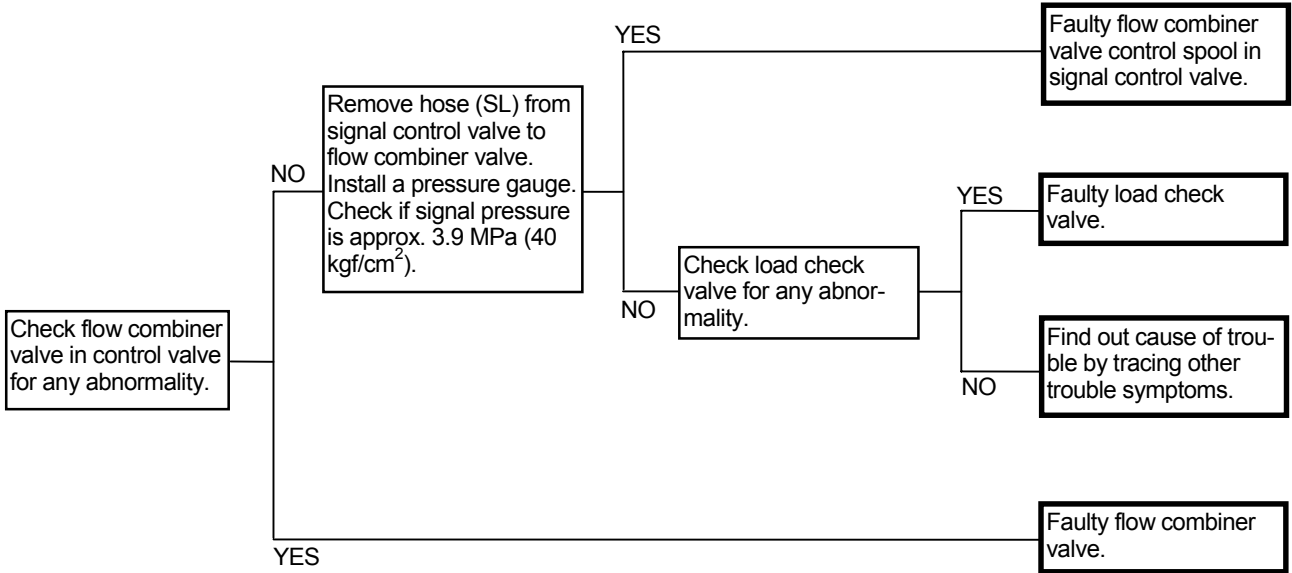
W157-03-03-003

- |                            |                            |                           |
|----------------------------|----------------------------|---------------------------|
| 1 - Left Travel (Forward)  | 3 - Pilot                  | 5 - Left Travel (Reverse) |
| 2 - Right Travel (Forward) | 4 - Right Travel (Reverse) | 6 - Drain                 |

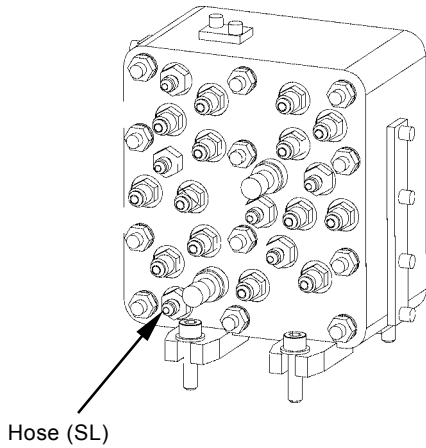
# TROUBLESHOOTING / Troubleshooting B

## T-3 Machine mistracks during combined operation of travel and front attachment.

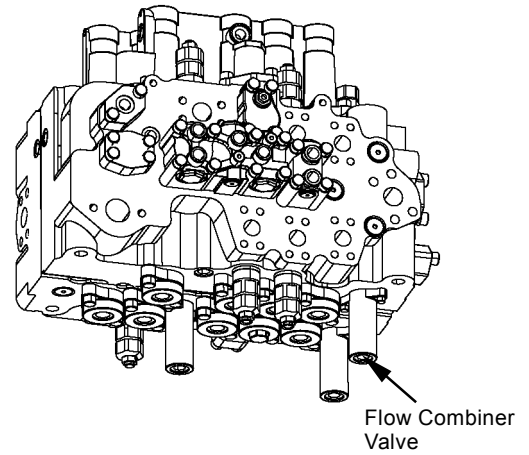
Related Fault Code: None



Signal Control Valve (Control Valve Side)



T178-03-06-015



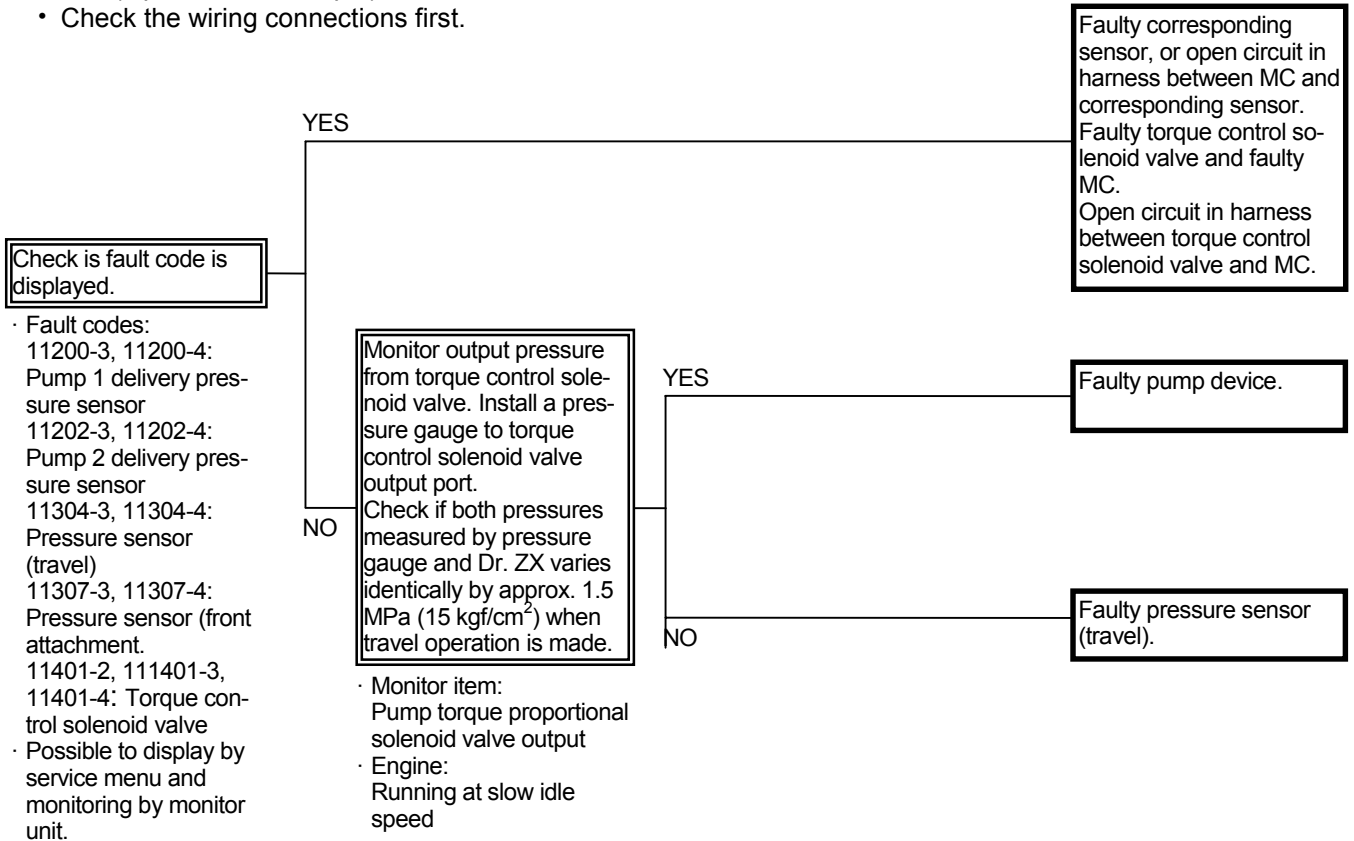
T1V1-05-04-005

## TROUBLESHOOTING / Troubleshooting B

**T-4 Occasionally, machine may mistrack when traveling with engine running at slow speed.**

**Related MC Fault Codes: 11200-3, 11200-4, 11202-3, 11202-4, 11304-3, 11304-4, 11307-3, 11307-4, 11401-2, 11401-3, 11401-4**

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



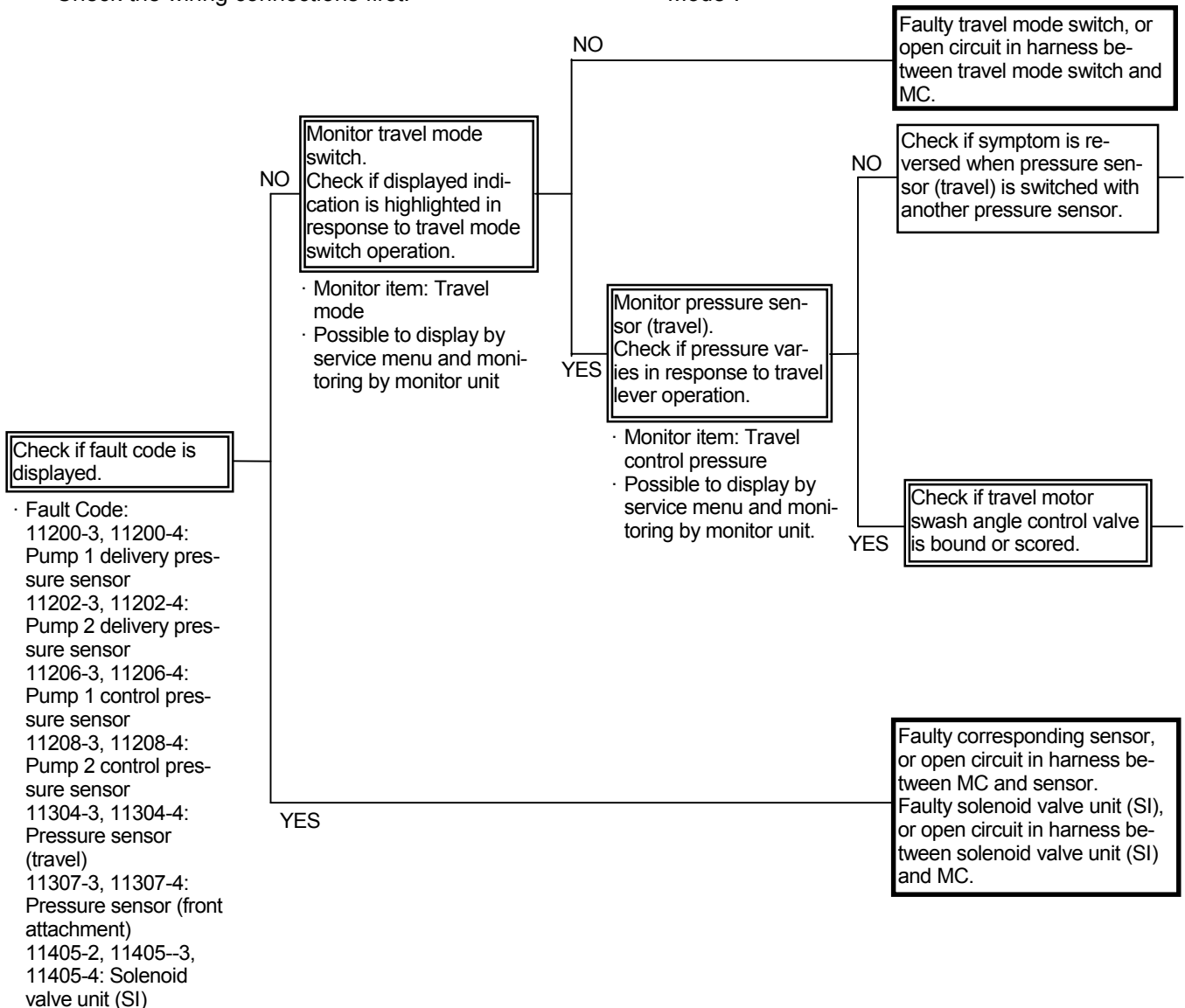
## TROUBLESHOOTING / Troubleshooting B

### T-5 Fast travel is not operated.

Travel mode does not change from slow mode to fast mode.

**Related MC Fault Codes:** 11200-3, 11200-4, 11202-3, 11202-4, 11206-3, 11206-4, 11208-3, 11208-4, 11304-3, 11304-4, 11307-3, 11307-4, 11405-2, 11405-3, 11405-4

- Refer to the pages for the SYSTEM / Control section / Travel Motor Swash Angle Control in the T/M (Operational Principle).
- Check the wiring connections first.
- If the maximum speed cannot reach at the fast mode, the engine speed automatic increase control at travel may be faulty. Refer to “E-6 Faulty HP Mode”.

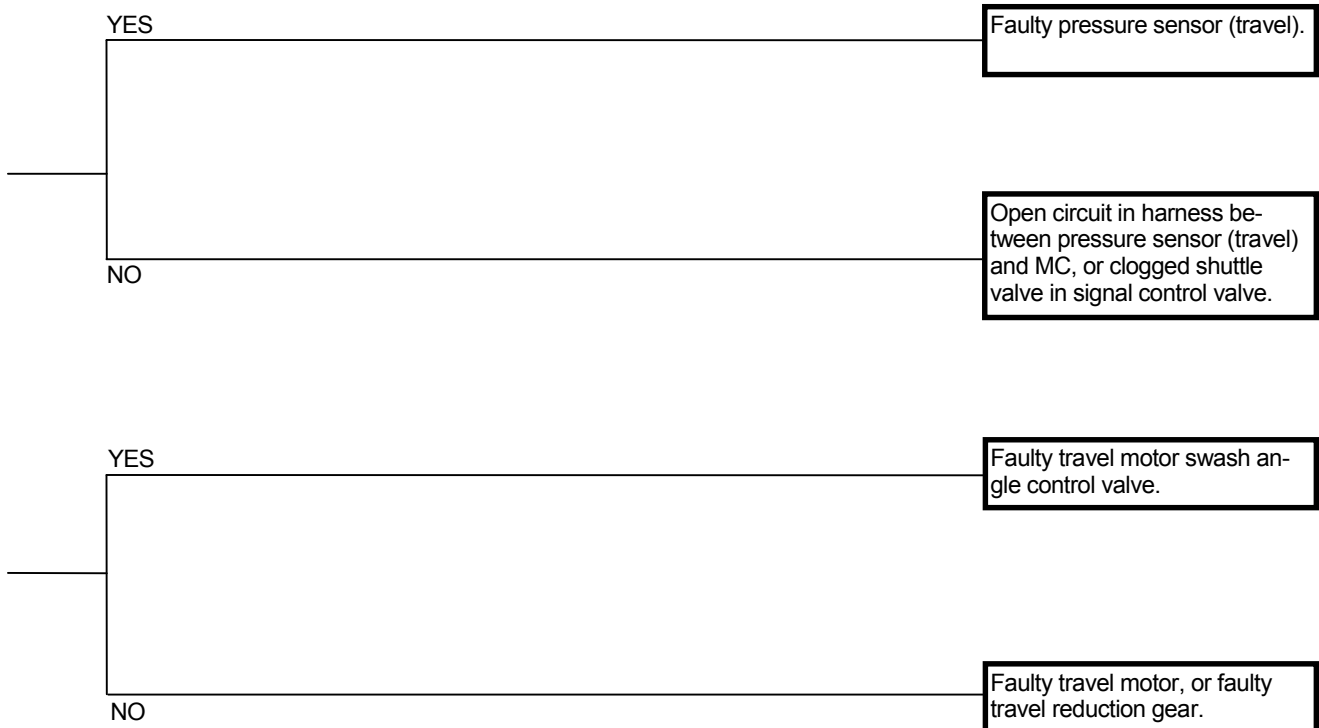


**NOTE:** In case other fault codes are displayed, perform troubleshooting corresponding to the displayed fault code.

## TROUBLESHOOTING / Troubleshooting B

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# TROUBLESHOOTING / Troubleshooting B

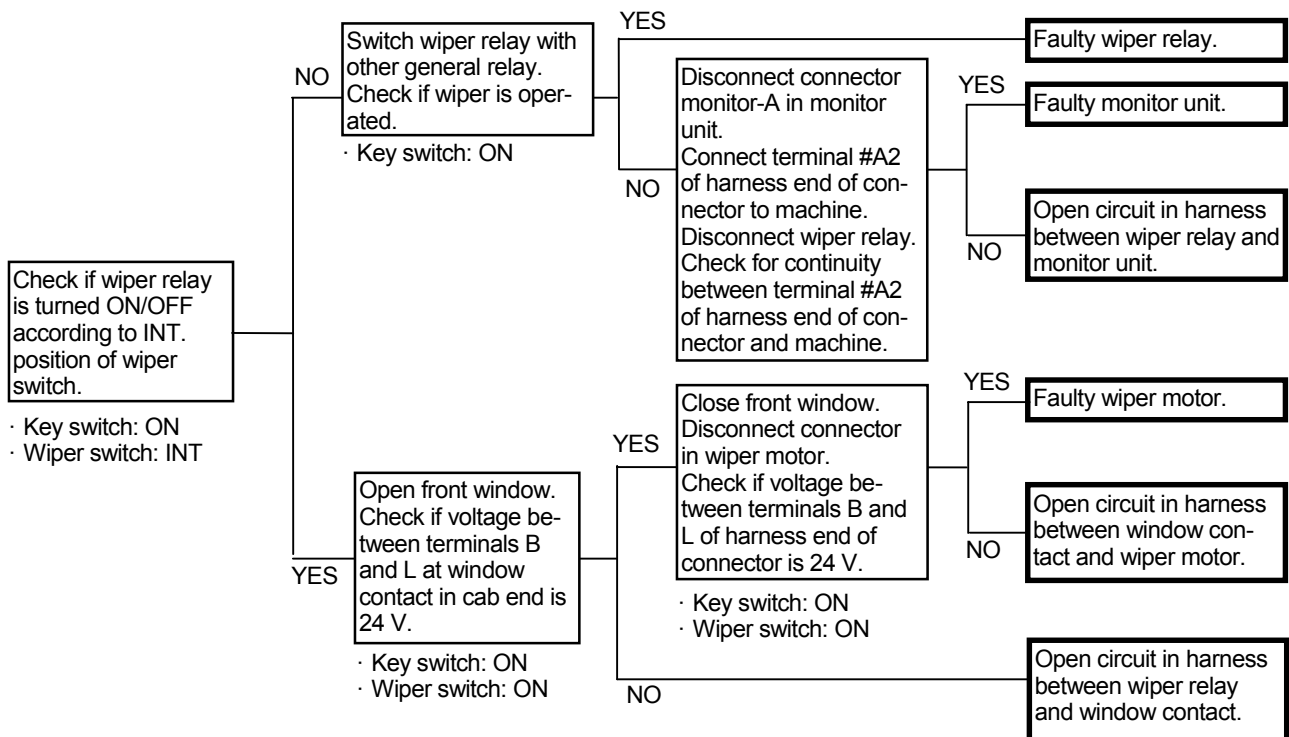
## OTHER SYSTEM TROUBLESHOOTING

**O-1 Wiper is not operated.**

**Related MC Fault Code: None**

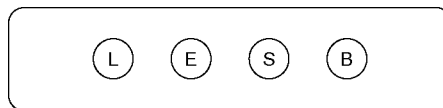
### Checking Instructions

- The wiper is driven by electric power routed via the relay circuit. The relay circuit is controlled by the monitor unit. In case the wiper is not operated, first check if the wiper relay is activated. Next, check if electric power is routed to the wiper motor.



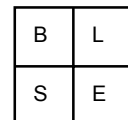
INT. Position	Setting Time
Slow Speed	8 seconds
Middle Speed	6 seconds
Fast Speed	3 seconds

Window Contact (Cab end)

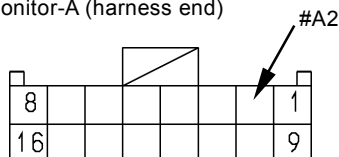


T1V1-05-07-005

Connector Wiper Motor (harness end)



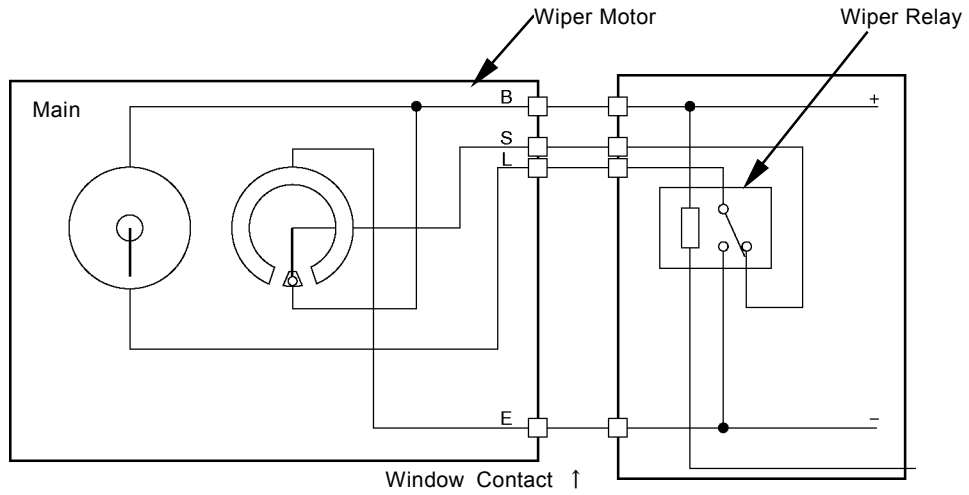
Monitor Unit Connector Monitor-A (harness end)



T183-05-05-001

# TROUBLESHOOTING / Troubleshooting B

## Wiper Driving Circuit

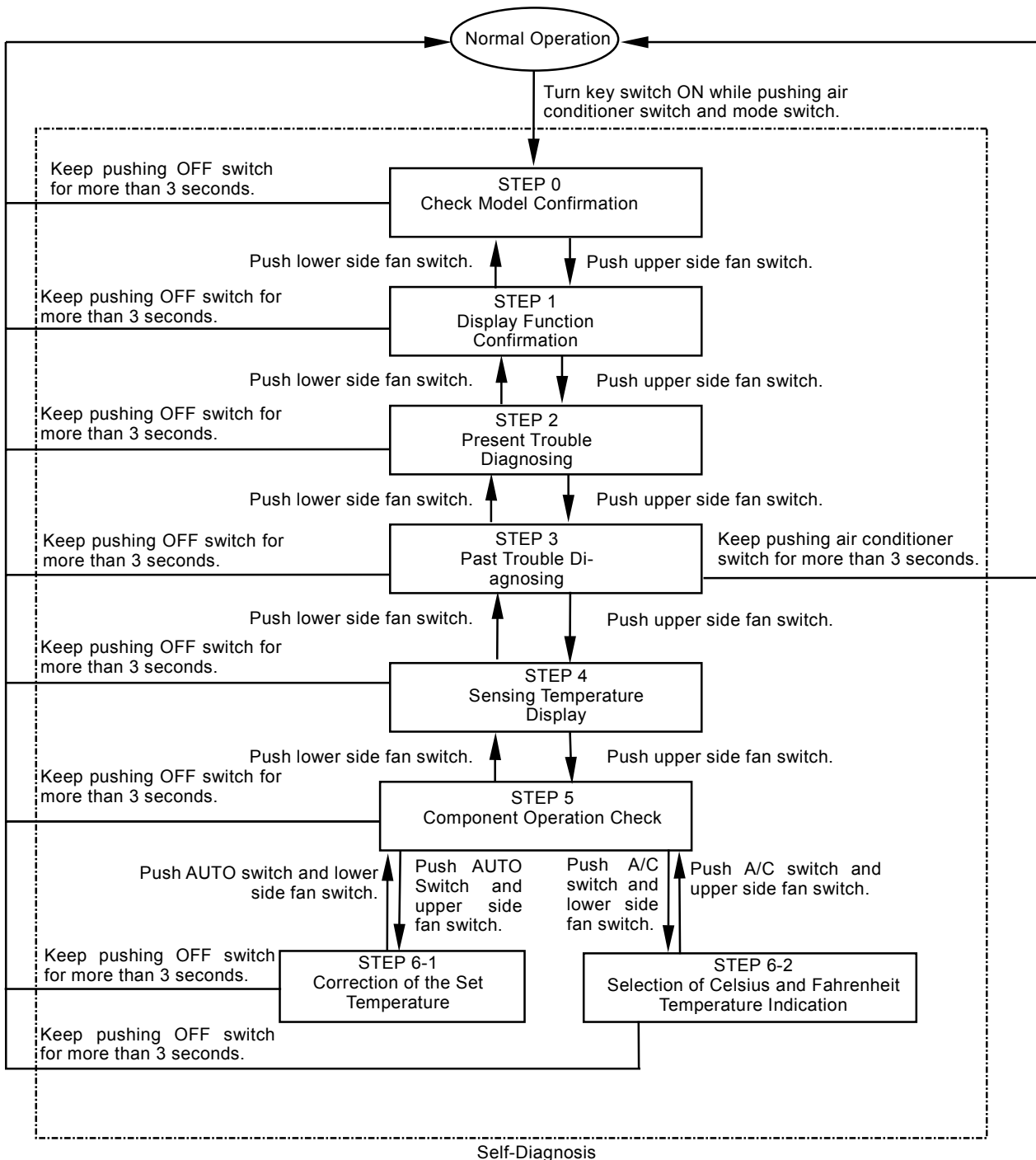


T1V1-05-07-004

# TROUBLESHOOTING / Troubleshooting B

## O-2 Air Conditioner is faulty

The air conditioner operation system has a self-diagnosing function. This system performs the diagnosis by 8-steps as shown in the flow chart below: Check Model Confirmation, Display Function Confirmation, Present Trouble Diagnosing, Past Trouble Diagnosing, Sensing Temperature Display, and Component Operation Check, Correction of the Set Temperature and Selection of Celsius and Fahrenheit Temperature Indication.





## TROUBLESHOOTING / Troubleshooting B


### Self-Diagnostic System Activation

Turn the key switch ON while pushing the air conditioner switch and mode switch on air conditioner control panel.

### STEP 0 Check Model Confirmation

The liquid crystal display (LCD) indicates the machine model name this system can diagnose.

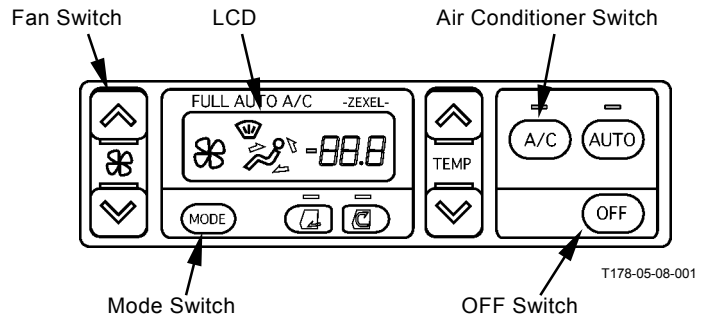
- The LCD will indicate “Sd” as the check model name.
- Select next step in order to be performed by operating the switch as described below.
  - Upper side fan switch: To proceed to Step 1
  - Keep pressing OFF switch for more than 3 seconds: To return to normal operation

 **NOTE:** The system operation will automatically proceed to STEP 1 after 5 seconds have passed after the check model is displayed.

### STEP 1 Display Function Confirmation

Turn all indicators ON in order to check indicator bulbs.

- The LCD panel and all switch indicators light.
- Select the next step in order to be performed by operating the switches as follows:
  - Push the upper side of fan switch: To proceed to “STEP 2.”
  - Push the lower side of fan switch: To return to “STEP 0.”
  - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed.)



## TROUBLESHOOTING / Troubleshooting B

### STEP 2 Present Trouble Diagnosing

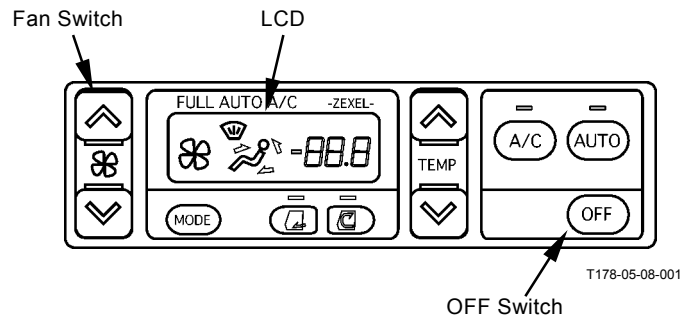
The LCD indicates the fault codes for present abnormalities of the mix door, mode encoder, and/or sensors.

- In case any abnormalities are present, the LCD indicates the fault codes. If more than one fault code is detected, the following fault code is displayed after flashing (0.5 seconds) twice.

	Fault Code	
	Open Circuit	Shorted Circuit
Mix Door	21	-21
Mode Encoder	22	
In-Cab Ambient Temperature Sensor	23	-23
Outdoor Ambient Temperature Sensor	24	-24
Coolant Temperature Sensor	25	-25
Solar Radiation Sensor	26*	-26

\* : When solar radiation is shaded, the solar radiation sensor indicates the fault code of open circuit.

- Select the next step in order to be performed by operating the switches as follows:
  - Push the upper side of fan switch: To proceed to "STEP 3."
  - Push the lower side of fan switch: To return to "STEP 1."
  - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed)



## TROUBLESHOOTING / Troubleshooting B

### STEP 3 Past Trouble Diagnosing

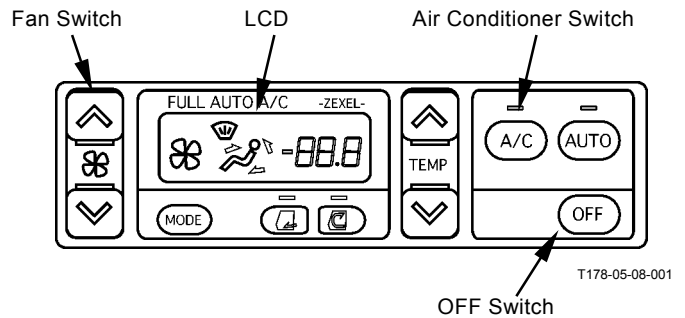
The LCD indicates the fault codes for past abnormalities of the mix door, mode encoder, and/or sensors.

The past stored fault codes are deleted.

- In case any abnormalities occurred in the past, the LCD indicates the fault codes. If more than one fault code is detected, the following fault code is displayed after flashing (0.5 seconds) twice.

	Fault Code	
	Open circuit	Shorted Circuit
Mix Door	21	-21
Mode Encoder	22	
In-Cab Ambient Temperature Sensor	23	-23
Outdoor Ambient Temperature Sensor	24	-24
Coolant Temperature Sensor	25	-25
Solar Radiation Sensor		-26

- When the air conditioner switch is kept pushing for more than 3 seconds, the failure records are deleted. After this operation, the air conditioner switch indicator flashes 5 times. Then, the self-diagnosing system is deactivated. (Normal functions are resumed.)
- Select the next step in order to be performed by operating the switches as follows:
  - Push the upper side of fan switch: To proceed to "STEP 4."
  - Push the lower side of fan switch: To return to "STEP 2."
  - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed.)




## TROUBLESHOOTING / Troubleshooting B

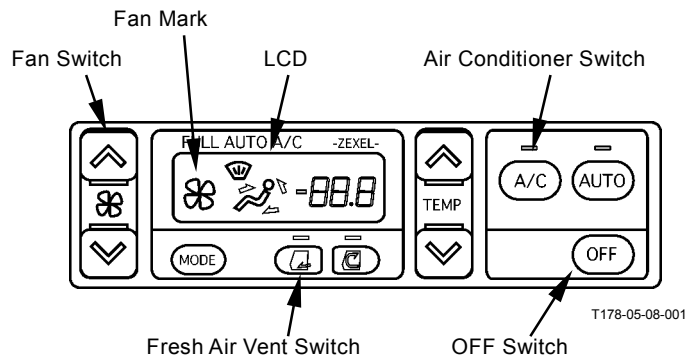
### STEP 4 Sensing Temperature Display

The LCD indicates the sensing temperature detected by each temperature sensor (excluding the insulation sensor).

- The sensing temperature detected by the in-cab ambient temperature sensor, outdoor ambient temperature sensor and coolant temperature sensor are displayed on the LCD in real time. (Figures less than the decimal point are not displayed.)

 **NOTE:** The coolant temperature sensor indicates "H" when coolant temperature is more than 21 °C (70 °F) and "L" when coolant temperature is less than 21 °C (70 °F).

- Sensing temperature detected by each sensor is automatically displayed on the LCD and is cycled at an interval of 3 seconds with the timer. The timer is turned ON or OFF by operating the fresh air vent switch.
- Referring to the fan mark can check which sensing temperature is displayed.
- Select the next step in order to be performed by operating the switches as follows:
  - Push the upper side of fan switch: To proceed to "STEP 5."
  - Push the lower side of fan switch: To return to "STEP 3."
  - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed.)




## TROUBLESHOOTING / Troubleshooting B

### STEP 5 Component Operation Check

Each component operation is checked by performing pattern operation.

- Each time the fresh air vent switch is pushed, the component to be checked is selected in order. Check which component has been selected by referring to No. indicated on the LCD. (Refer to table 1.)
- Operating pattern of the selected component is shifted at an interval of 10 seconds. Operating pattern is cycled. (Refer to table 1.)

 **NOTE:** The components other than selected operate under the standard conditions (shown by marks\* in table 1).

- Select the next step in order to be performed by operating the switches as follows:
  - Push the AUTO switch and upper side of fan switch: To proceed to “STEP 6-1”.
  - Push the A/C switch and upper side of fan switch: To proceed to “STEP 6-2”.
  - Push the lower side of fan switch: To return to “STEP 4.”
  - Keep pushing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed.)

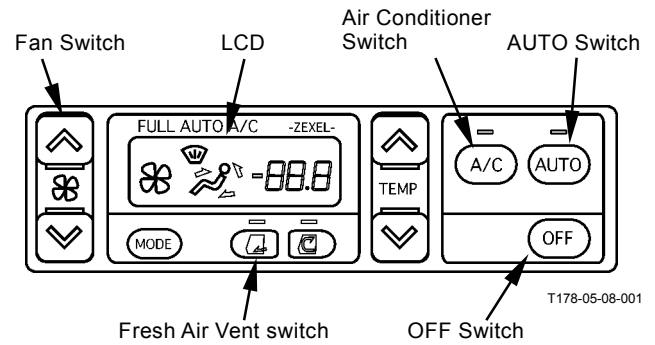


Table 1

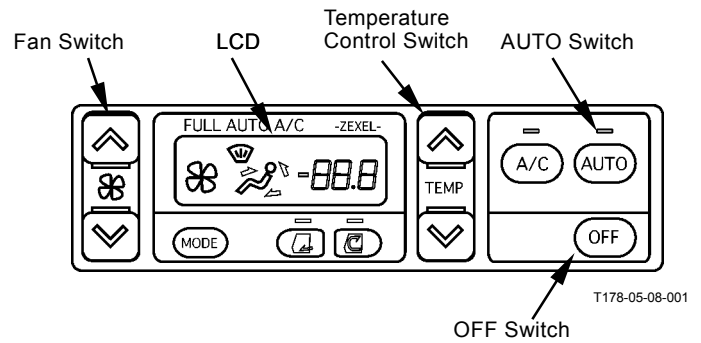
Component	Indication on LCD	Operation Pattern	Remarks
Air Mix Damper	51	Controls opening extent of air mix damper: 0% (fully closed) → 50%* → 100% (fully opened)	0%, 50%, 100%: “C”, “5” and “H” are indicated next to the decimal point respectively.
Fan	52	Controls air flow volume: Lo → M(Lo) → M(Hi) → Hi	Indicators corresponding to air flow volume light.
Air Vent Location	53	Selects air vent: Front* → Front/Rear → Front/Foot → Foot	Indicator corresponding to selected air vent lights.
Fresh / Circulation Air Vent Selection	54	Select Ventilation Mode: Circulation* → Fresh	Indicator corresponding to selected mode light.
Air Conditioner	55	Turns air conditioner switch: ON* → OFF	ON: Indicator lights. OFF: Indicator is extinguished.

## TROUBLESHOOTING / Troubleshooting B

### 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.)



## TROUBLESHOOTING / Troubleshooting B

### STEP 6-2 Selection of Celsius and Fahrenheit Temperature Indication

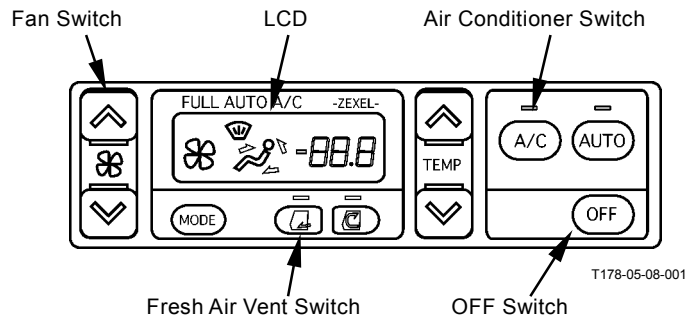
Selection of Celsius and Fahrenheit Temperature Indication.

- 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.)



# TROUBLESHOOTING / Troubleshooting B

※ Please fill in all sections and return this AIR CONDITIONER TROUBLE REPORT to Hitachi Tsuchiura Works Quality Assurance Dept. after experiencing a problem with your machine's air conditioning system.

< AIR CONDITIONER TROUBLE REPORT >

File No.

(1) What

Model	(Serial No. )		
Operation Type	Manual	Semi-Auto	Full-Auto
Delivery Date	Year	Month	

Checked by:
-------------

(2) When

Date	Year	Month	Day	Operating Hour ( h)
Time	Morning	Daytime	Evening	Night
Frequency	Every Day	Once a Week	Once a Month	Times per

(3) Where

Job Site Address	State	County	Town
Access Road Condition	Paved	Not Paved (Gravel	Sand Soil)

(4) How (Operating Conditions)

Weather	Fine	Cloudy	Rain	Snow	
Atmospheric Temperature	Very Hot	Hot	Cold	Very Cold	
Operating Conditions	Parking	Traveling	Working		
Control Panel	Temperature Control	Paint blanks equal to red indicators. / Fill in set-temperature when full-auto operation			
	A/C	ON	OFF		
	Air Induction	Re-Circulation	Fresh Air Circulation		
	AUTO	ON	OFF	Not Available	
	Fill following items when operated in manual mode or when manual control type unit is used.				
	Vent Position	Front	Front / Rear	Foot	Front / Rear and Foot
Fan	First	Second	Third	Fourth Fifth Sixth	

(5) How (Problem Symptom)

Abnormal Compressor Operation	
Symptom	Not turned ON
	Not turned OFF
	Others
Uncontrollable air temperature	
Symptom	No cool air
	No warm air
	Others
Uncontrollable air volume	
Symptom	Air flows in Hi mode only
	No air flows
	Small air volume
	Others
Uncontrollable vent hole	
Symptom	Vent hole isn't selected
	Others
Abnormal panel indication	
Faulty Indicator	Vent Hole
	A/C
	AUTO
	Fresh Air Circulation
	Fan OFF
	Fan (Lo • • • Hi)
	Temperature Control
Symptom	Stays OFF
	Stays ON
	Blinks
	Others

<Check Result>

(1) Is problem reproducible ?

Reproducible
Not reproducible

(2) Pressure (To be measured at gauge manifold)

Low Pressure
High Pressure

(3) Which parts have been replaced ?

1
2

\* Before replacing the control amplifier, be sure to check that the connectors are correctly connected while repeatedly disconnecting and reconnecting connectors.



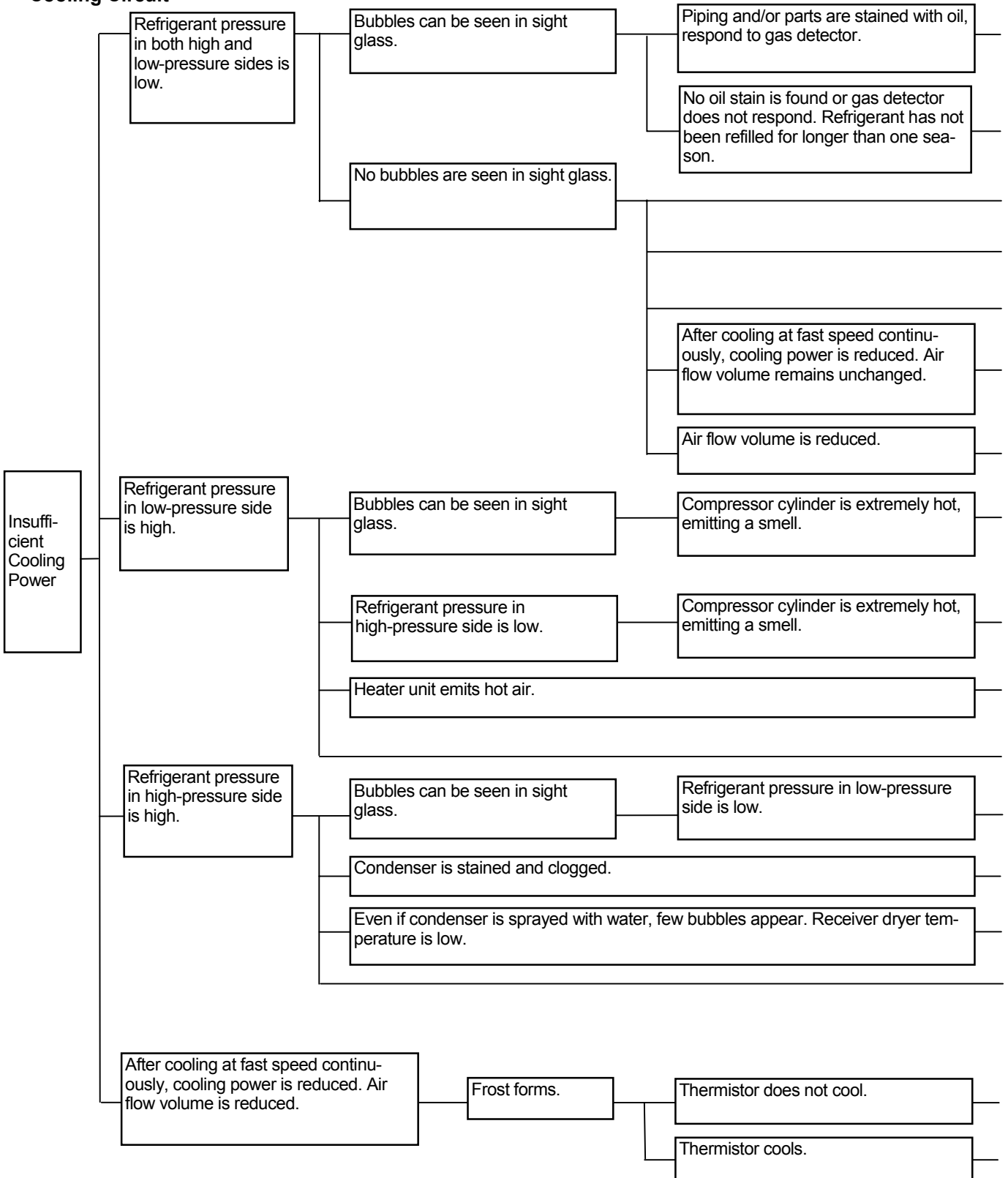
## TROUBLESHOOTING / Troubleshooting B

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Refrigerant Quantity..... 850±50 g  
Compressor Oil Quantity ..... 180 cm<sup>3</sup>

# TROUBLESHOOTING / Troubleshooting B

## Cooling Circuit

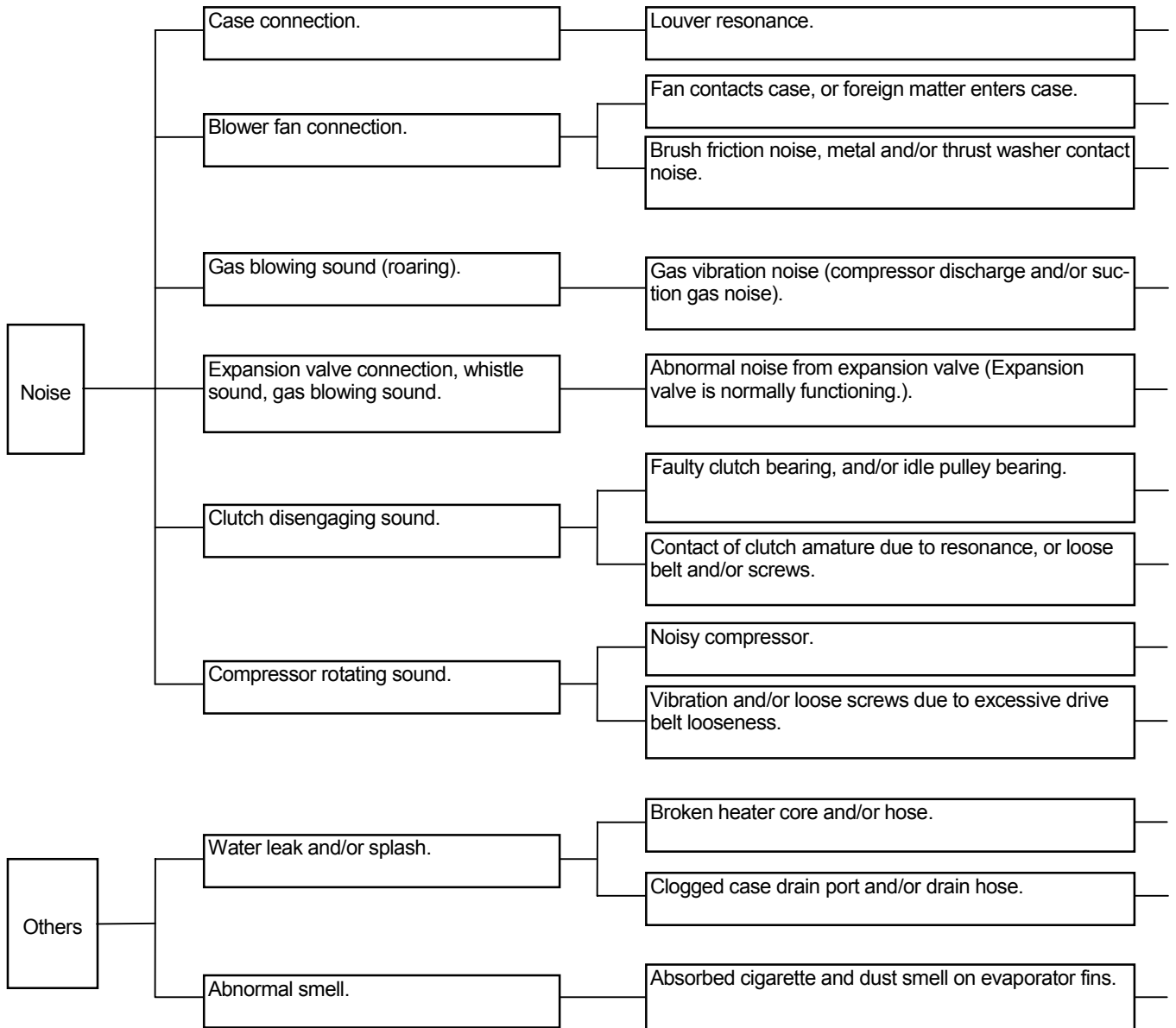


## TROUBLESHOOTING / Troubleshooting B

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.)

# TROUBLESHOOTING / Troubleshooting B

## Cooling Circuit



## TROUBLESHOOTING / Troubleshooting B

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Clean evaporator. When humidity is high, open door. While rotating fan at approx. 1500 min<sup>-1</sup> in L mode for more than 10 minutes, flush smell out by condensed water.

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.

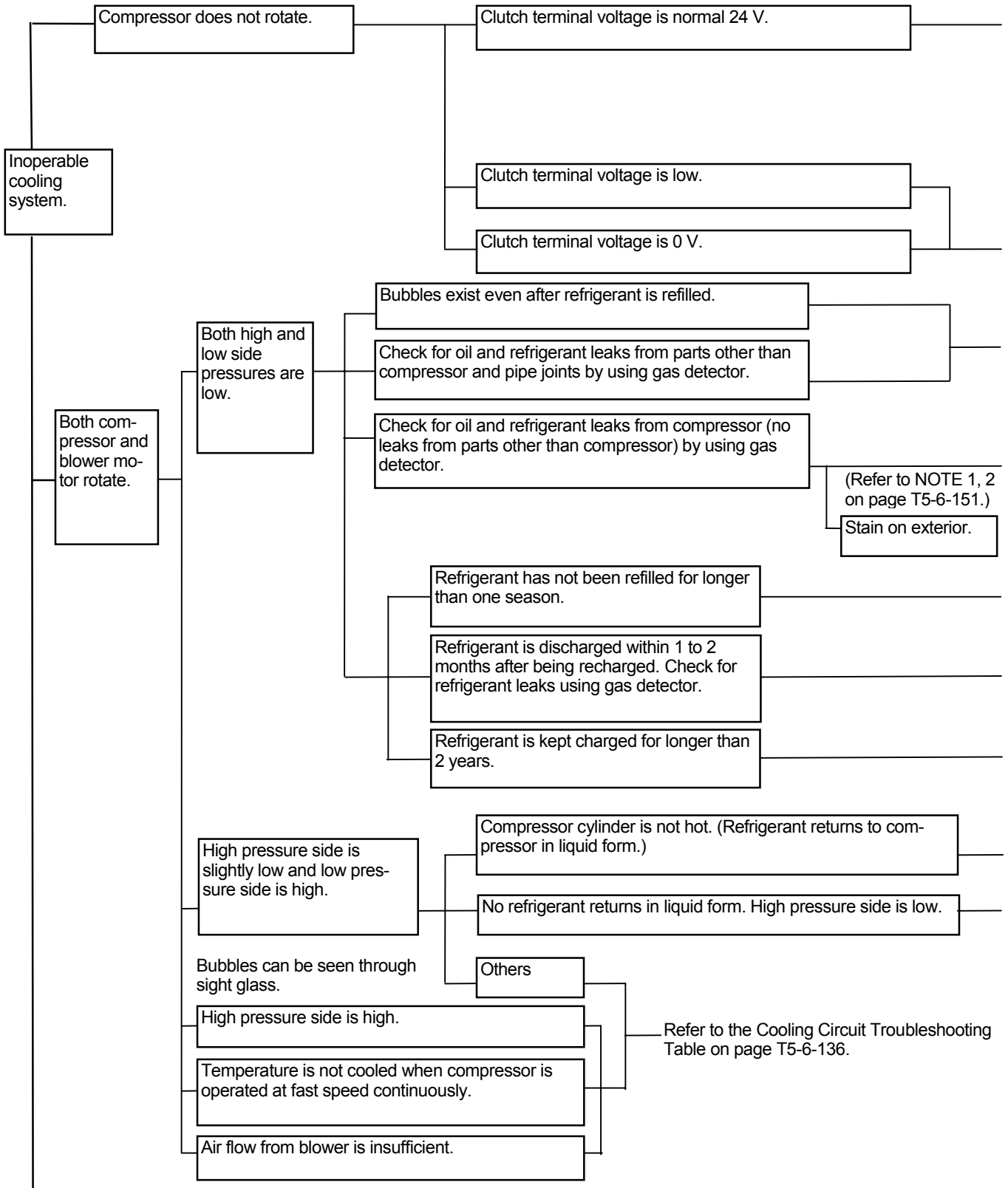
Replace.

Clean.

Clean evaporator. When humidity is high, open door. While rotating fan at approx. 1500 min<sup>-1</sup> in L mode for more than 10 minutes, flush smell out by condensed water.

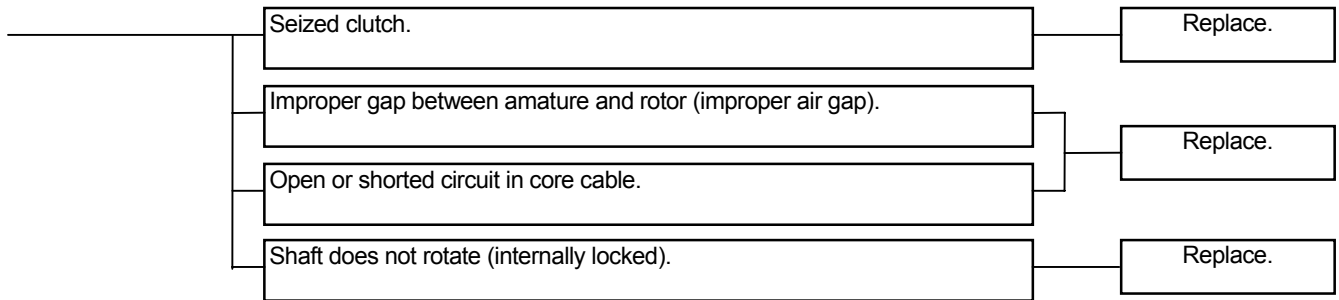
# TROUBLESHOOTING / Troubleshooting B

## Compressor

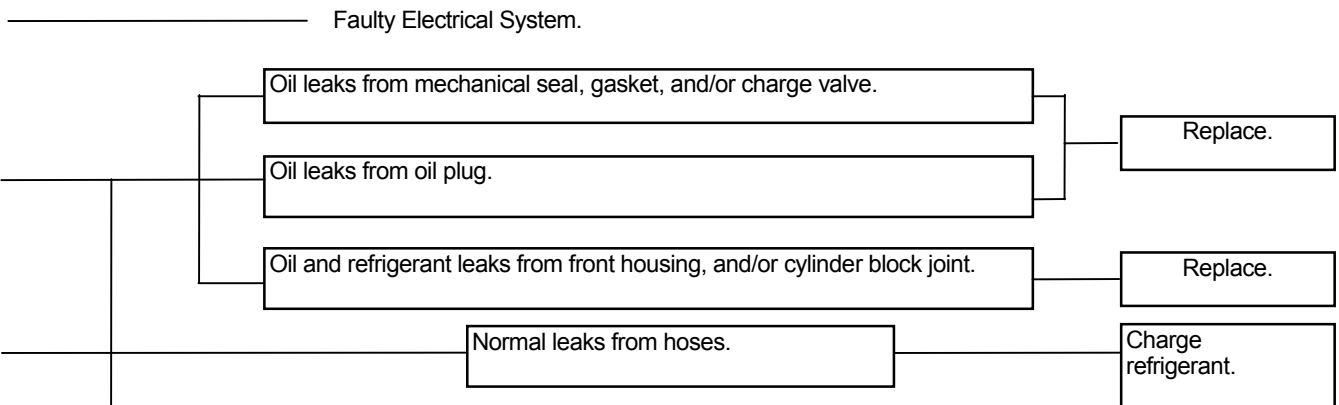


## TROUBLESHOOTING / Troubleshooting B

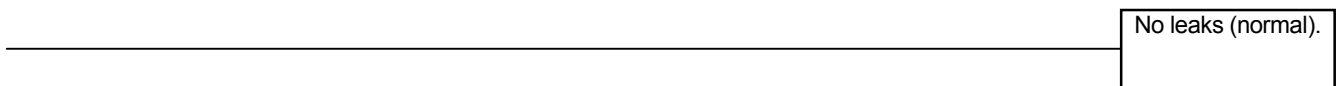
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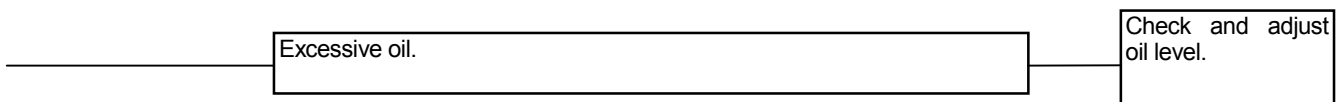
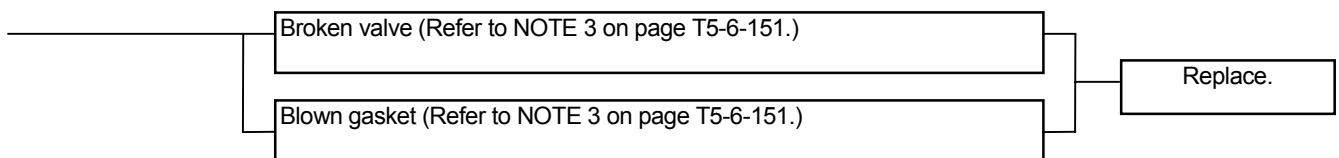
Faulty Electrical System.



Faulty Electrical System.



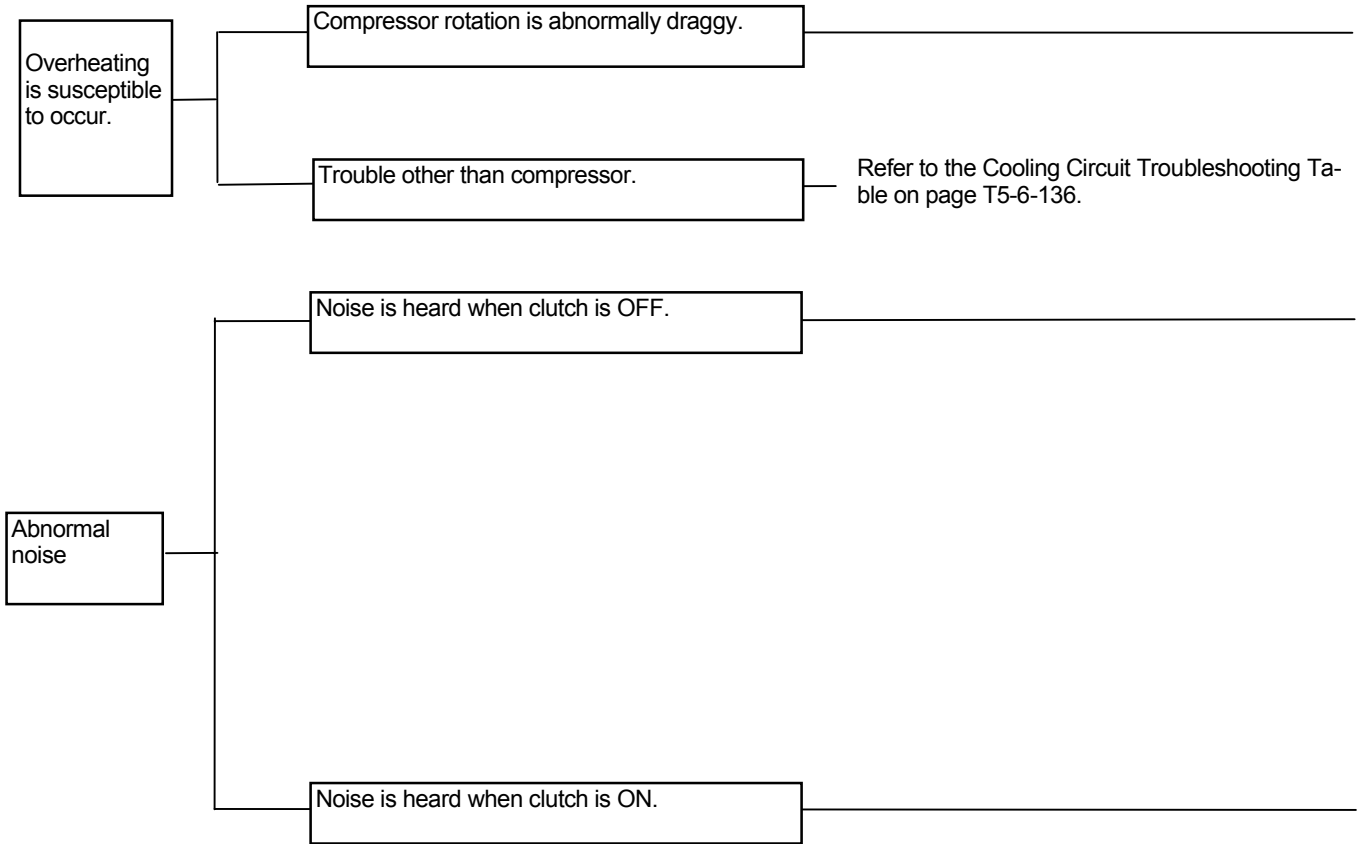
Refer to the Cooling Circuit Troubleshooting Table on page T5-6-136.



## TROUBLESHOOTING / Troubleshooting B

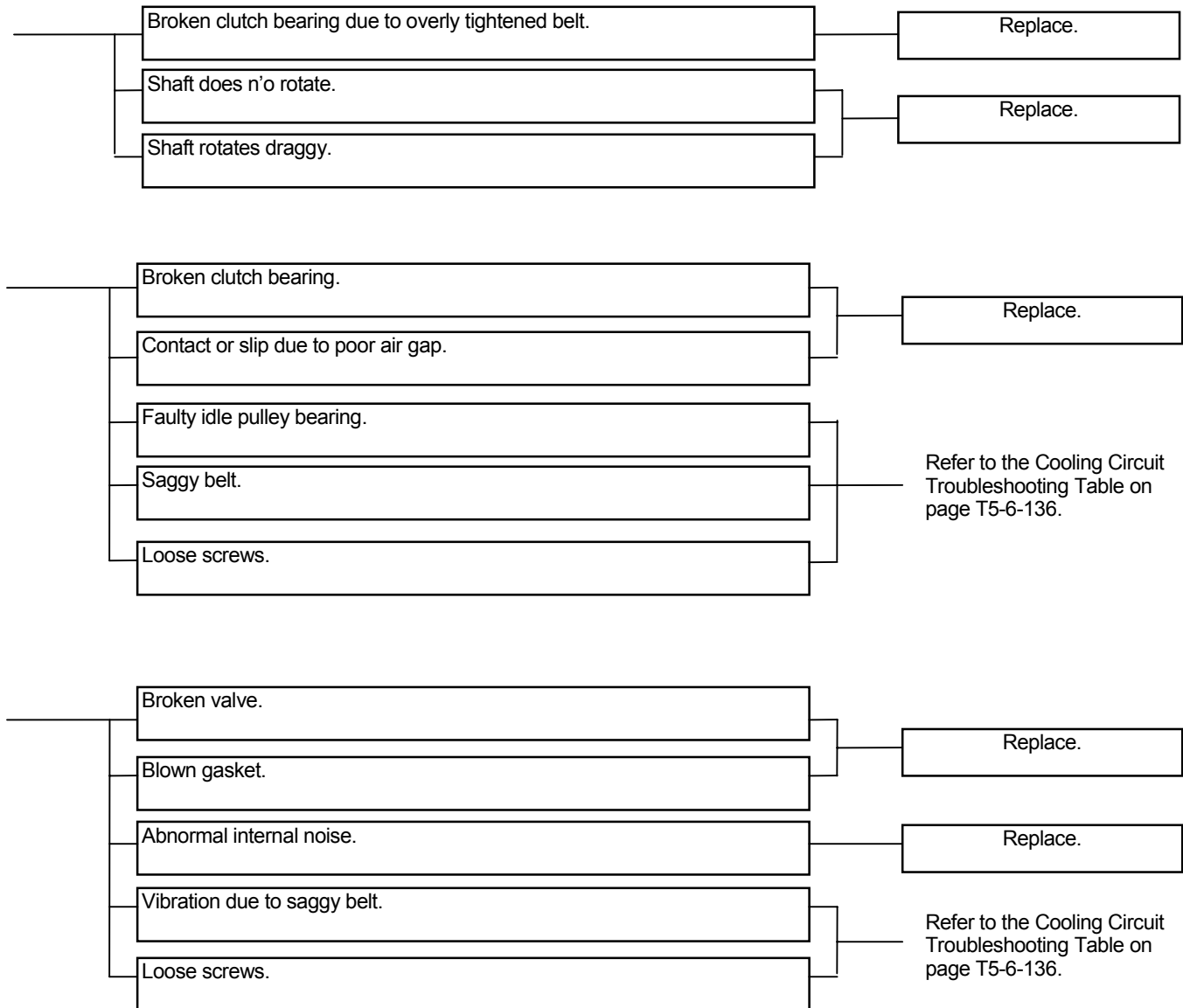
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### Compressor





## TROUBLESHOOTING / Troubleshooting B



 **NOTE:**

1. Do not quickly decide that oil is leaking when a stain around the clutch and/or gasket is found. A slight oil seepage will appear due to the seal construction. However, this oil seepage will not cause malfunction. Accurately check whether oil is leaking or seeping only.
2. When gas detector is used in the high sensitivity range, normal gas leaks from rubber hose surface may be detected. As long as the specified rubber hoses are used, the problem should not occur. (In case a large leaks is detected, the hose may be broken.)
3. After allowing the compressor to idle for 10 to 15 minutes, normal pressure difference between high-pressure side and low-pressure side is 0.5 MPa (5 kgf/cm<sup>2</sup>) 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.

## TROUBLESHOOTING / Troubleshooting B

### EXCHANGE INSPECTION

Exchange inspection method is a troubleshooting method to find the trouble location by exchanging the suspected part / component with another part /component having identical characteristics.

Many sensors and solenoid valves used on this machine are identical. Therefore, by using this switch-check method, faulty part /component, and/or harness can be easily found.

Example: Abnormal pump 1 delivery pressure high voltage (MC fault code: 11200-3)

Check Method:

1. Switch two delivery pressure sensors located as shown in figure A to figure B.
2. Retry troubleshooting.

Result:

In case abnormal pump 2 delivery pressure high voltage is displayed (MC fault code 11202-3), the pump 1 delivery pressure sensor is considered to be faulty.

In case abnormal pump 1 delivery pressure high voltage is displayed (MC fault code 11200-3), the pump 1 delivery pressure sensor harness is considered to be faulty.

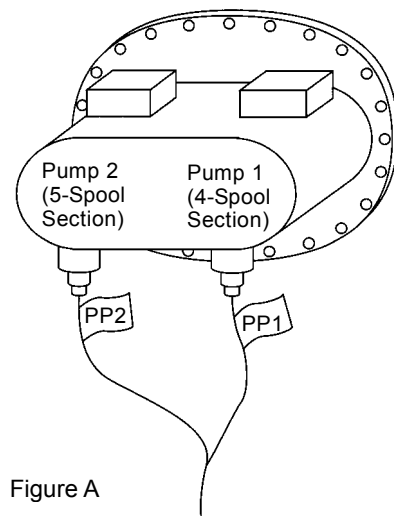


Figure A

T157-07-04-006

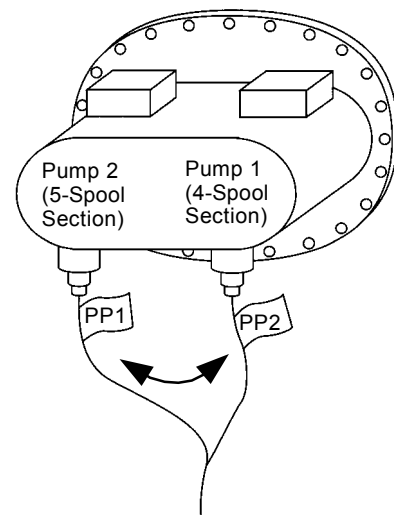


Figure B

T157-07-04-006

## TROUBLESHOOTING / Troubleshooting B

### 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	CAN Communication Error	Not Applicable
11100-2	Abnormal Engine Speed	Not Applicable
11101-3	Abnormal Engine Control Dial Sensor High Voltage	Not Applicable
11101-4	Abnormal Engine Control Dial Sensor Low Voltage	Not Applicable
11200-3	Abnormal Pump 1 Delivery Pressure Sensor High Voltage	Applicable (Harness)
11200-4	Abnormal Pump 1 Delivery Pressure Sensor Low Voltage	Applicable (Harness)
11202-3	Abnormal Pump 2 Delivery Pressure Sensor High Voltage	Applicable (Harness)
11202-4	Abnormal Pump 2 Delivery Pressure Sensor Low Voltage	Applicable (Harness)
11206-3	Abnormal Pump 1 Control Pressure Sensor High Voltage	Applicable (Harness)
11206-4	Abnormal Pump 1 Control Pressure Sensor Low Voltage	Applicable (Harness)
11208-3	Abnormal Pump 2 Control Pressure Sensor High Voltage	Applicable (Harness)
11208-4	Abnormal Pump 2 Control Pressure Sensor Low Voltage	Applicable (Harness)
11301-3	Abnormal Swing Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11301-4	Abnormal Swing Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11302-3	Abnormal Boom Raise Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11302-4	Abnormal Boom Raise Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11303-3	Abnormal Arm Roll-In Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11303-4	Abnormal Arm Roll-In Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11304-3	Abnormal Travel Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11304-4	Abnormal Travel Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11307-3	Abnormal Front Attachment Pilot Pressure Sensor High Voltage	Applicable (Harness/ Sensor)
11307-4	Abnormal Front Attachment Pilot Pressure Sensor Low Voltage	Applicable (Harness/ Sensor)
11400-2	Abnormal Feedback Current of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Applicable (Harness)
11400-3	Abnormal Feedback High Voltage of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Applicable (Harness)

## TROUBLESHOOTING / Troubleshooting B

Fault Code	Trouble	Applicability
11400-4	Abnormal Feedback Low Voltage of Maximum Pump 2 Flow Rate Limit Control Solenoid Valve	Applicable (Harness)
11401-2	Abnormal Feedback Current of Torque Control Solenoid Valve	Applicable (Harness)
11401-3	Abnormal Feedback High Voltage of Torque Control Solenoid Valve	Applicable (Harness)
11401-4	Abnormal Feedback Low Voltage of Torque Control Solenoid Valve	Applicable (Harness)
11402-2	Abnormal Feedback Current of Solenoid Valve Unit (SF)	Applicable (Harness/ Solenoid Valve)
11402-3	Abnormal Feedback High Voltage of Solenoid Valve Unit (SF)	Applicable (Harness/ Solenoid Valve)
11402-4	Abnormal Feedback Low Voltage of Solenoid Valve Unit (SF)	Applicable (Harness/ Solenoid Valve)
11403-2	Abnormal Feedback Current of Solenoid Valve Unit (SC)	Applicable (Harness/ Solenoid Valve)
11403-3	Abnormal Feedback High Voltage of Solenoid Valve Unit (SC)	Applicable (Harness/ Solenoid Valve)
11403-4	Abnormal Feedback Low Voltage of Solenoid Valve Unit (SC)	Applicable (Harness/ Solenoid Valve)
11404-2	Abnormal Feedback Current of Solenoid Valve Unit (SG)	Applicable (Harness/ Solenoid Valve)
11404-3	Abnormal Feedback High Voltage of Solenoid Valve Unit (SG)	Applicable (Harness/ Solenoid Valve)
11404-4	Abnormal Feedback Low Voltage of Solenoid Valve Unit (SG)	Applicable (Harness/ Solenoid Valve)
11405-2	Abnormal Feedback Current of Solenoid Valve Unit (SI)	Applicable (Harness/ Solenoid Valve)
11405-3	Abnormal Feedback High Voltage of Solenoid Valve Unit (SI)	Applicable (Harness/ Solenoid Valve)
11405-4	Abnormal Feedback Low Voltage of Solenoid Valve Unit (SI)	Applicable (Harness/ Solenoid Valve)
11410-2	Abnormal Feedback Current of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve (ZX160-3 class only)	Applicable (Harness)
11410-3	Abnormal Feedback High Voltage of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve (ZX160-3 class only)	Applicable (Harness)
11410-4	Abnormal Feedback Low Voltage of Maximum Pump 1 Flow Rate Limit Control Solenoid Valve (ZX160-3 class only)	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

## TROUBLESHOOTING / Troubleshooting B

### EMERGENCY BOOM LOWERING PROCEDURE



**CAUTION:** Prevent personal injury. Confirm that no one is under the front attachment before starting the procedure below.


If the engine stalls and cannot be restarted, lower the boom to the ground referring to the emergency boom lowering procedure stated below.


1. Loosen lock nut (1) in the control valve at the right. Loosen screw (2) one half of a turn. The boom lowering speed can be somewhat adjusted by loosening screw (2) more.

**IMPORTANT:** Lock nut (1) and screw (2) are located under the solenoid valve. Pay attention to the screw turns.

2. After the boom is lowered, tighten screw (2) and tighten lock nut (1) to the specifications below.


Lock Nut (1)


 : 13 mm

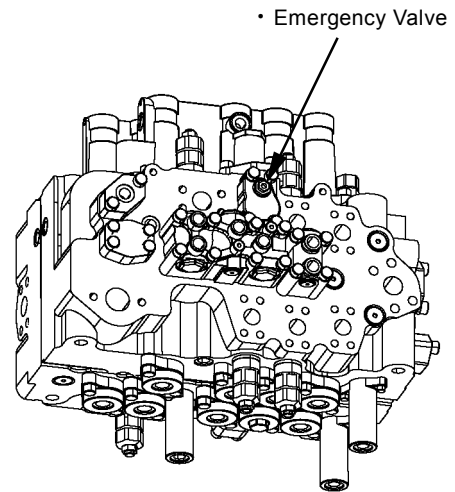
 : 13 N·m (1.3 kgf·m, 9.4 lbf·ft)

Screw (2)

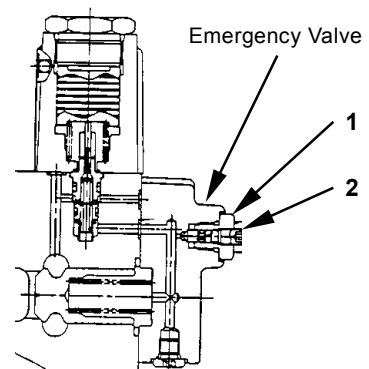
 : 4 mm (Hexagonal wrench)

 : 6.9 N·m (0.7 kgf·m, 5.0 lbf·ft)

 **NOTE:** Excessive leakage may result if the screw and the lock nut are tightened insufficiently. Retighten the screw and the lock nut to specifications.



T1V1-05-04-005



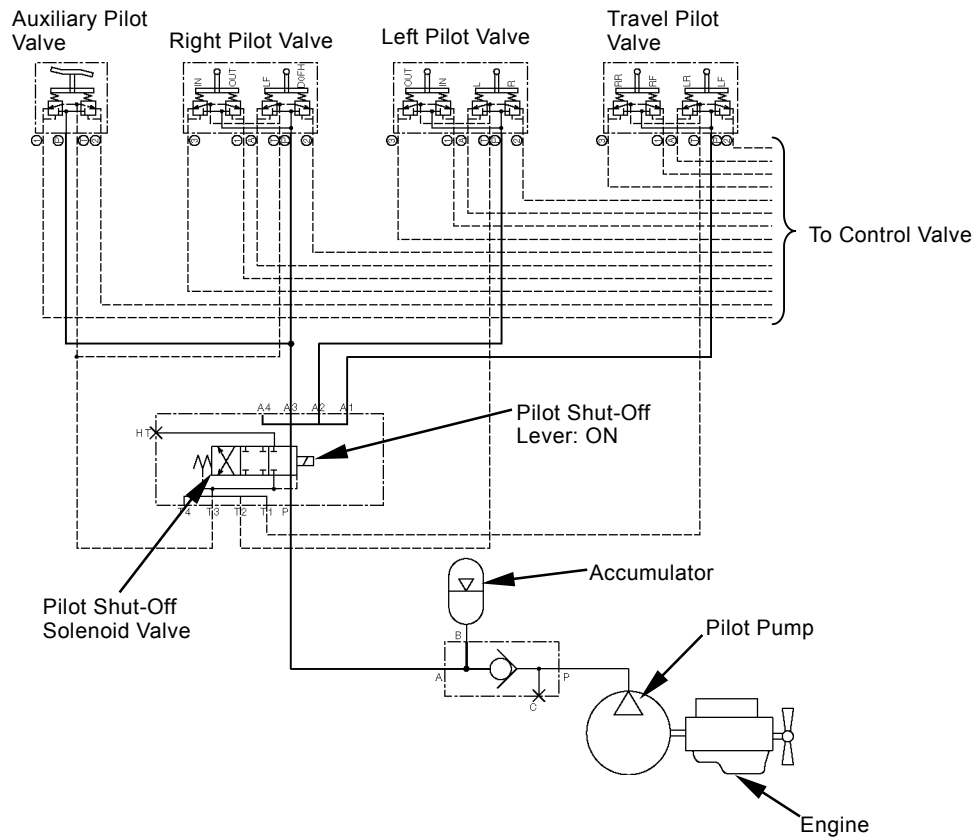
T178-05-04-003

## TROUBLESHOOTING / Troubleshooting B

### ATTACHMENT PILOT CIRCUIT PRESSURE RELEASE PROCEDURE

As for the attachment spec machine, the accumulator is equipped between pilot pump and pilot valve.

After the engine stops, when the control lever is operated by the emergency stop switch with the pilot shut-off lever ON, the accumulator releases pressure in the pilot circuit.



T1V1-05-07-006

## **TROUBLESHOOTING / Troubleshooting B**

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(Blank)

## TROUBLESHOOTING / Troubleshooting B

### ONE PART OF DATA, "DAILY REPORT DATA", "DISTRIBUTION DATA" AND TOTAL OPERATING HOURS" IS NOT RECORDED

- The required signal for data may not be sent to ICF. As each signal is used for some data, check the corresponding signal system according to the table below.

Data	Input Signal
Daily report data is not recorded.	Key switch, alternator
Fuel Level	Fuel sensor data sent from monitor unit
Fuel Usage Amount	Value is calculated and recorded by accumulated fuel usage amount from ECM.
Machine Hour Meter	Hour meter sent from monitor unit



## TROUBLESHOOTING / Troubleshooting B

Position to be checked	Remedy
Key signal line, alternator signal line	Check if voltage between terminal #C7 (power ON signal line) of connector ICF-C in ICF and machine is 24 V or more.
Communication line between monitor unit and ICF (CAN bus line)	<ul style="list-style-type: none"> <li>• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #B7 of connector monitor-B in monitor unit. (Refer to T5-6-161.)</li> <li>• Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #B6 of connector monitor-B in monitor unit. (Refer to T5-6-161.)</li> <li>• Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-5-62.)</li> <li>• Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-5-65.)</li> <li>• Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-5-68.)</li> <li>• Check for shorted circuit in CAN harness. (Refer to T5-5-70.)</li> </ul>
Communication line between ECM and ICF (CAN bus line)	<ul style="list-style-type: none"> <li>• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #18 of connector in ECM. (Refer to T5-6-160.)</li> <li>• Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #37 of connector in ECM. (Refer to T5-6-160.)</li> <li>• Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-5-62.)</li> <li>• Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-5-65.)</li> <li>• Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-5-68.)</li> <li>• Check for shorted circuit in CAN harness. (Refer to T5-5-70.)</li> </ul>
Communication line between monitor unit and ICF (CAN bus line)	<ul style="list-style-type: none"> <li>• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #B7 of connector monitor-B in monitor unit. (Refer to T5-6-161.)</li> <li>• Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #B6 of connector monitor-B in monitor unit. (Refer to T5-6-161.)</li> <li>• Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-5-62.)</li> <li>• Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-5-65.)</li> <li>• Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-5-68.)</li> <li>• Check for shorted circuit in CAN harness. (Refer to T5-5-70.)</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

Data		Input Signal
Engine Operating Hours	HP Mode Hours	Power mode switch information sent from MC
	P Mode Hours	Power mode switch information sent from MC
	E Mode Hours	Power mode switch information sent from MC
Auto-Idle Switch ON Hours		Auto-idle switch information sent from MC
Travel Operating Hours	Fast Idle (Hi) Traveling Hours	Travel mode switch information sent from MC
	Slow Idle (Lo) Traveling Hours	Travel mode switch information sent from MC
Swing Operating Hours		Swing pressure sensor (swing) information sent from MC
Digging Operating Hours		Front attachment pressure sensor (front attachment) information sent from MC
Attachment Operating Hours	Breaker Operating Hours	Attachment information sent from MC
	Secondary Crusher Operating Hours	Attachment information sent from MC
	Primary Crusher Operating Hours	Attachment information sent from MC
	Vibrating Hammer Operating Hours	Attachment information sent from MC
	Bucket Operating Hours or Others	Attachment information sent from MC
No Load Time		Pressure sensor information sent from MC

## TROUBLESHOOTING / Troubleshooting B

Position to be checked	Remedy
Communication line between MC and ICF (CAN bus line)	<ul style="list-style-type: none"> <li>• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #C4 of connector MC-C in MC. (Refer to T5-5-57.)</li> <li>• Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #C15 of connector MC-C in MC. (Refer to T5-5-57.)</li> <li>• Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-5-62.)</li> <li>• Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-5-65.)</li> <li>• Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-5-68.)</li> <li>• Check for shorted circuit in CAN harness. (Refer to T5-5-70.)</li> </ul>
Communication line between MC and ICF (CAN bus line)	
Communication line between MC and ICF (CAN bus line)	
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Communication line between MC and ICF (CAN bus line)	<ul style="list-style-type: none"> <li>• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #C4 of connector MC-C in MC. (Refer to T5-5-57.)</li> <li>• Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #C15 of connector MC-C in MC. (Refer to T5-5-57.)</li> <li>• Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-5-62.)</li> <li>• Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-5-65.)</li> <li>• Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-5-68.)</li> <li>• Check for shorted circuit in CAN harness. (Refer to T5-5-70.)</li> </ul>

## TROUBLESHOOTING / Troubleshooting B

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Data	Input Signal
Radiator Coolant Temperature	Radiator coolant temperature data sent from monitor unit
Hydraulic Oil Temperature	Hydraulic oil temperature data sent from MC
Intake Air Temperature	Data sent from ECM

## TROUBLESHOOTING / Troubleshooting B

Position to be checked	Remedy
Communication line between MC and ICF (CAN bus line)	<ul style="list-style-type: none"> <li>• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #B7 of connector monitor-B in monitor unit. (Refer to T5-6-161.)</li> <li>• Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #B6 of connector monitor-B in monitor unit. (Refer to T5-6-161.)</li> <li>• Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-5-62.)</li> <li>• Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-5-65.)</li> <li>• Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-5-68.)</li> <li>• Check for shorted circuit in CAN harness. (Refer to T5-5-70.)</li> </ul>
Communication line between MC and ICF (CAN bus line)	<ul style="list-style-type: none"> <li>• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #C4 of connector MC-C in MC. (Refer to T5-5-57.)</li> <li>• Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #C15 of connector MC-C in MC. (Refer to T5-5-57.)</li> <li>• Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-5-62.)</li> <li>• Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-5-65.)</li> <li>• Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-5-68.)</li> <li>• Check for shorted circuit in CAN harness. (Refer to T5-5-70.)</li> </ul>
Communication line between monitor unit and ICF (CAN bus line)	<ul style="list-style-type: none"> <li>• Check for continuity between terminals #C5 of connector ICF-C in ICF and terminals #18 of connector in ECM. (Refer to T5-6-160.)</li> <li>• Check for continuity between terminals #C11 of connector ICF-C in ICF and terminals #37 of connector in ECM. (Refer to T5-6-160.)</li> <li>• Check for shorted circuit in harness between CAN circuit in ground circuit. (Refer to T5-5-62.)</li> <li>• Check for shorted circuit in harness between CAN circuit in power circuit. (Refer to T5-5-65.)</li> <li>• Check for shorted circuit in harness between CAN circuit in key signal circuit. (Refer to T5-5-68.)</li> <li>• Check for shorted circuit in CAN harness. (Refer to T5-5-70.)</li> </ul>

# TROUBLESHOOTING / Troubleshooting B

## Discontinuity Check in CAN Harness

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

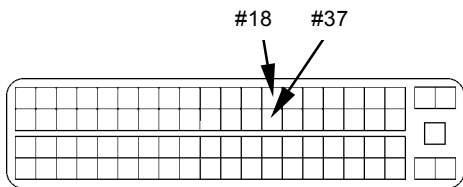
- Between ECM and ICF  
Can Harness (High Side)  
Check for continuity between terminal #18 of harness end of connector in ECM and terminal #C5 of harness end of connector ICF-C in ICF.

### CAN Harness (Low Side)

Check for continuity between terminal #37 of harness end of connector in ECM and terminal #11 of harness end of connector ICF-C in ICF.

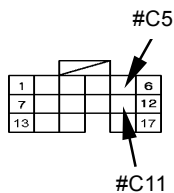
### Connector

ECM  
Connector  
(Harness end)



T1GR-05-04-002

ICF  
Connector ICF-C  
(Harness end)



T1V1-05-04-002

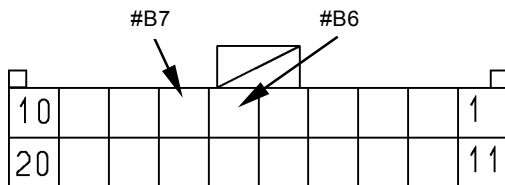
## TROUBLESHOOTING / Troubleshooting B

- Between Monitor Unit and ICF  
CAN Harness (High Side)  
Check for continuity between terminal #B7 of harness end of connector monitor-B in the monitor unit and terminal #C5 of harness end of connector ICF-C in ICF.

CAN Harness (Low side)  
Check for continuity between terminal #B6 of harness end of connector monitor-B in the monitor unit and terminal #C11 of harness end of connector ICF-C in ICF.

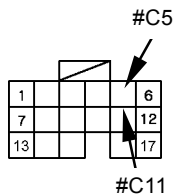
### Connector

Monitor Unit  
Connector Monitor-B  
(Harness end)



T183-05-04-013

ICF  
Connector ICF-C  
(Harness end)



T1V1-05-04-002

## **TROUBLESHOOTING / Troubleshooting B**

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## TROUBLESHOOTING / Electrical System Inspection

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### PRECAUTIONS FOR INSPECTION AND MAINTENANCE

1. Disconnect the power source.  
Remove the harness from the negative terminal side in battery first when taking wire harnesses and connectors off for repair or replacement work. Failure to do so can result in damage to the wire harnesses, fuses and fusible links and, in some cases, cause fire due to short circuiting.
2. Color coding of wire harnesses.  
As for the color codes of wire harnesses in the electrical system, refer to the table below.  
In cases on the design sheet where two colors are indicated for one wire, the left initial stands for base color, while the right initial stands for marking color.

Code	Color	Code	Color
R	Red	W	White
L	Blue	G	Green
Or	Orange	Lg	Light green
Y	Yellow	B	Black
Br	Brown	P	Pink
Gr	Gray	V	Violet

-  **NOTE:** 1) Code BW indicates a black base wire with white fine-line marking.
- 2) Initials "O" and "Or" both stand for the color orange.
- 3) Wires with longitudinal stripes printed on them are not color coded. Do not confuse them with color coded wires.

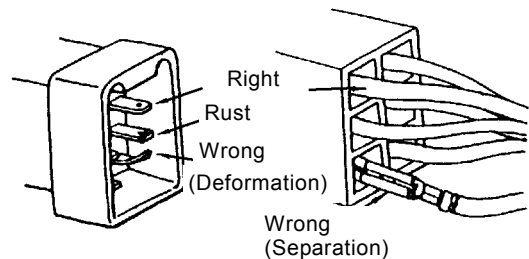
## TROUBLESHOOTING / Electrical System Inspection

### 3. Precautions for connecting and disconnecting terminal connectors.

- 1) When disconnecting the harnesses, grasp them by their connectors. Do not pull on the wire itself. Release the lock first before attempting to separate connectors, if a lock is provided. (Refer to "Instructions for Disconnecting Connector" on page T5-7-3.)
- 2) The water-resistant connectors keep water out. If water enters them, water will not easily drain from them. When checking the water-resistant connectors, take extra care not to allow water to enter the connectors. In case water should enter the connectors, reconnect only after the connectors are thoroughly dried.
- 3) Before connecting terminal connectors, check that no terminals are bent or coming off. In addition, as most connectors are made of brass, check that no terminals are rusting.
- 4) When connecting terminal connectors provided with a lock, insert them together until the lock "clicks."
- 5) Pull the harness near the connector in order to check if it is correctly connected.



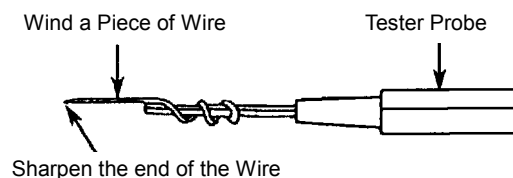
T107-07-06-001



T107-07-06-002

### 4. Precaution for using a circuit tester.

- 1) Before using a circuit tester, refer to the instructions in the circuit tester manual. Then, set the circuit tester to meet the object to be measured, voltage range and current polarity.
- 2) Before starting the connector test, always check the connector terminal numbers, referring to the circuit diagram. When the connector size is very small, and the standard probe size is too large to be used for testing, wind a fine piece of sharpened wire around the probe to make the test easier.
- 3) When checking the connector by using a tester, insert a tester probe from the harness end of connector in order not to damage the terminal inside connector.



T107-07-06-003

## TROUBLESHOOTING / Electrical System Inspection

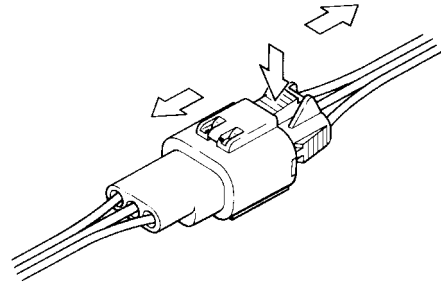
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### INSTRUCTIONS FOR DISCONNECTING CONNECTORS

- Push, Unlock and Separate Type

**NOTE:** 1. Connectors will not be easily separated even if the lock is pushed while being pulled. Push the lock first before pulling the connectors.

2. The lock is located on female side connector (harness end side).



T107-04-05-002

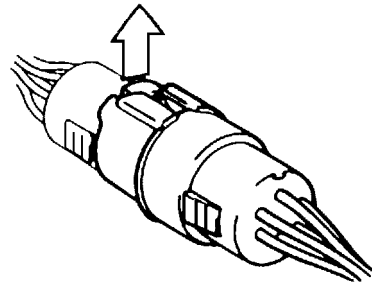
#### Locations of This Type Connector

Fuel Gauge	Pump Delivery Pressure Sensor	Radio
Hydraulic Oil Level Switch	General Relay	Speaker
Horn	Solenoid Valve	Wiper
Cab Harness	Diode	Monitor Unit
Pressure Sensor	Key Switch	ECM
Washer	Engine Control Dial	ICF

- Raise Lock, Pull and Separate Type

#### Locations of This Type Connector

Starter Relay 2



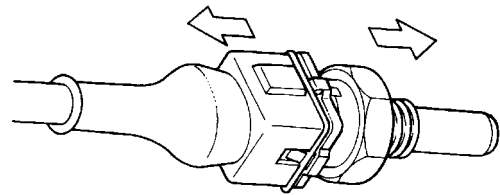
T107-04-05-003

- Pull and Separate Type

**IMPORTANT:** Before pulling and separating, release the lock of connector in the solenoid valve by using a pair of pincers.

#### Locations of This Type Connector

Hydraulic Oil Temperature  
Sensor  
Dr. ZX




T107-04-05-004

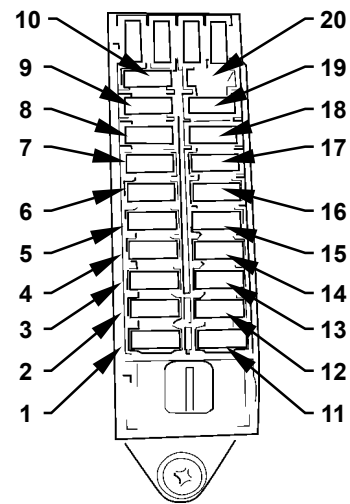
## TROUBLESHOOTING / Electrical System Inspection

### FUSE INSPECTION

Cracks in a fuse are so fine that it is very difficult or impossible to find by visual inspection. Use a tester in order to correctly inspect fuse continuity by following the instructions described below.

1. Turn the key switch ON.  
When the key switch is turned ON, current from key switch terminal M activates the battery relay so that electric power is supplied to all circuits except the glow plug relay circuit. (Refer to the circuit diagram.)
2. Remove the fuse box cover. Set the tester. (Measurement Range: 0 to 30 V)
3. Ground the negative probe of tester to the vehicle frame. Touch the terminals located away from center of the fuse box with the positive probe of tester one at a time. When normal continuity of a fuse is intact, the tester will indicate 20 to 25 V (battery voltage).

 **NOTE:** All terminals located along the lengthwise centerline of the fuse box are connected to the power source, while terminals located away from center of the fuse box are connected to loads (accessories). Therefore, test all fuses in the same method except for the glow relay circuit fuse. Check the glow relay circuit fuse with the key switch turned to the ON position and follow the procedure in step 3.



M178-07-034

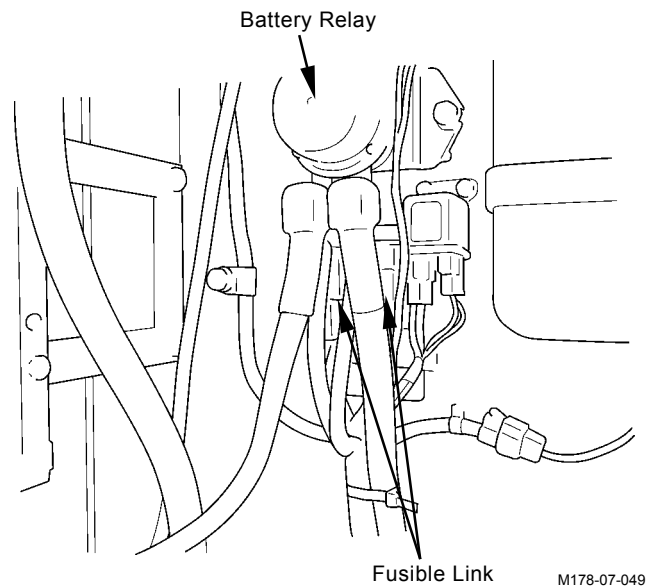
Fuse No.	Capacity	Connected to	Fuse No.	Capacity	Connected to
1	20 A	Work Light Relays 1 and 2	11	10 A	Horn Relay
2	10 A	Wiper Relay, Wiper Motor, Washer Relay	12	5 A	Radio, Cab Light
3	20 A	Heater (Air Conditioner Unit)	13	10 A	Cigarette Lighter
4	10 A	MC (Solenoid Valve Power)	14	5 A	Fuel Pump
5	5 A	Optional 1	15	10 A	Auxiliary
6	10 A	Optional 2	16	5 A	Glow Relay
7	10 A	Empty	17	5 A	Air Conditioner Unit
8	30 A	ECM Main Relay	18	5 A	MC, ECM, ICF, Monitor Unit (Power ON Signal)
9	10 A	Security Horn, Security Horn Relay (Power), Radio (Backup)	19	5 A	Monitor Unit (Main Power)
10	5 A	MC, ICF (Main Power)	20	5 A	Optional 3

## TROUBLESHOOTING / Electrical System Inspection

### FUSIBLE LINK INSPECTION

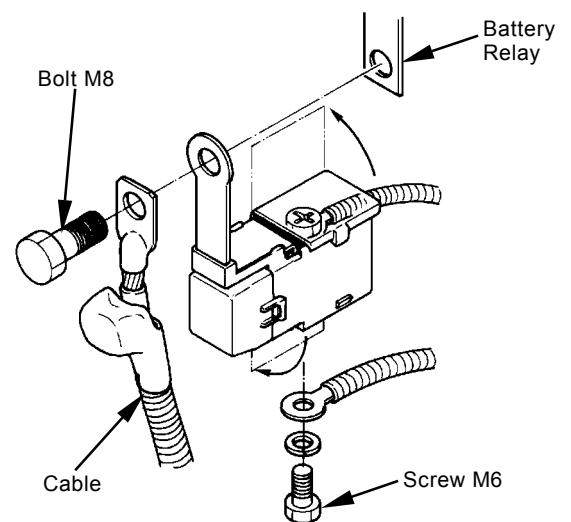
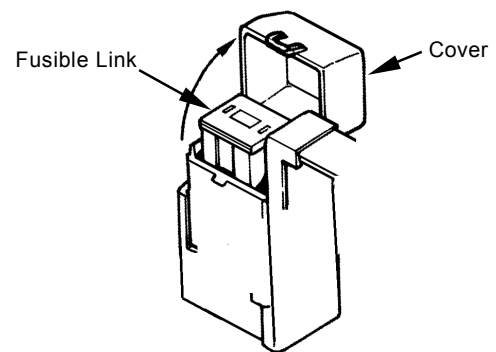
#### Inspection

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.



#### 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.




## TROUBLESHOOTING / Electrical System Inspection

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### BATTERY VOLTAGE CHECK


1. Turn the key switch OFF. Check voltage between the battery positive terminal and the vehicle frame.

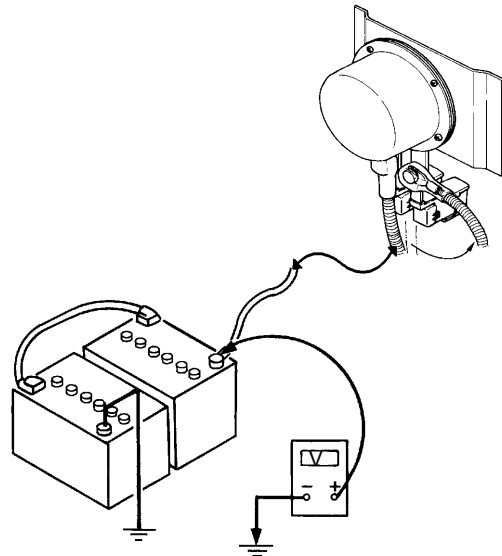
Normal Voltage: 24 V

 **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

# TROUBLESHOOTING / Electrical System Inspection

## ALTERNATOR CHECK

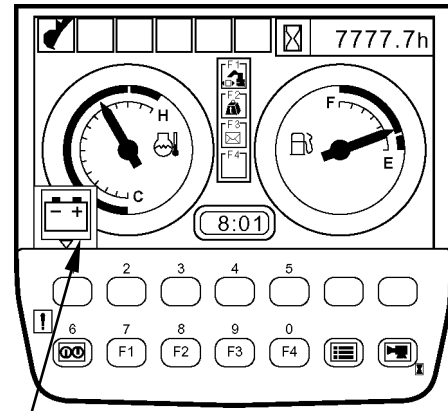
In general, the alternator indicator remains off when the alternator is generating power.

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 terminals B and E of the alternator. If the measured voltage is around 24 V, the alternator circuit can be considered normal. If the measured voltage is low, a shortage in battery capacity or looseness of the wire connectors of alternator circuit might be cause of the malfunction. When voltage is 0 V, the wiring between fuse box and alternator might be loose or disconnected.  
Also, the alternator cannot generate electricity if the ground line is disconnected.

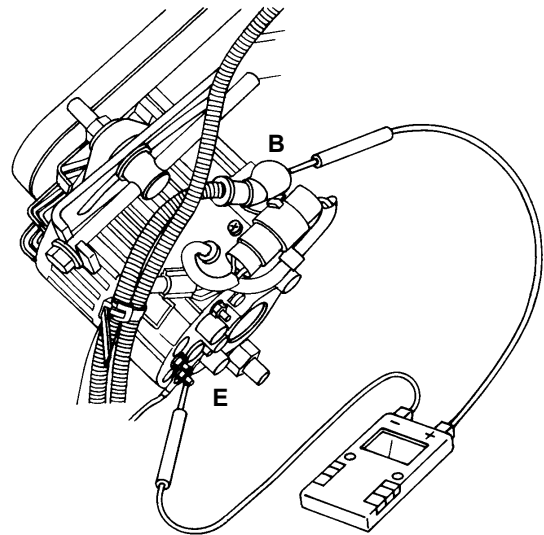
3. Next, start the engine. Measure voltage generated while as the alternator rotates.  
As described above, measure voltage between terminals B and E on the alternator side. If voltage is around 28 V, the alternator is operating normally.  
If the rated voltage is not being generated, there is some trouble with the alternator or the regulator.



Alternator Alarm

Monitor Unit

T1V1-05-01-117



T157-07-06-003

# TROUBLESHOOTING / Electrical System Inspection


## 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:  $0 \Omega$  = 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:  $0 \Omega$  = Continuity

$\infty \Omega$  = Discontinuity

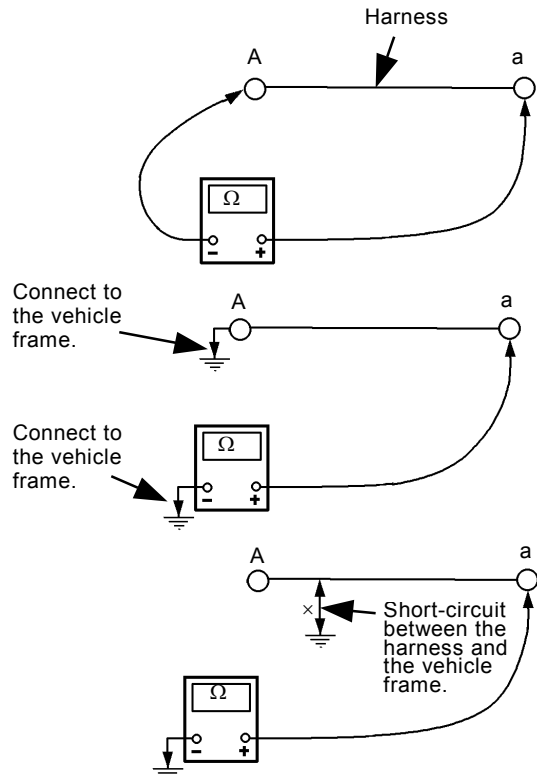
### Single-line short-circuit check

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



## TROUBLESHOOTING / Electrical System Inspection

### 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  $\infty \Omega$ , 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:

$0 \Omega$  = Line (B) - (b) has discontinuity.

$\infty \Omega$  = Line (A) - (a) has discontinuity.

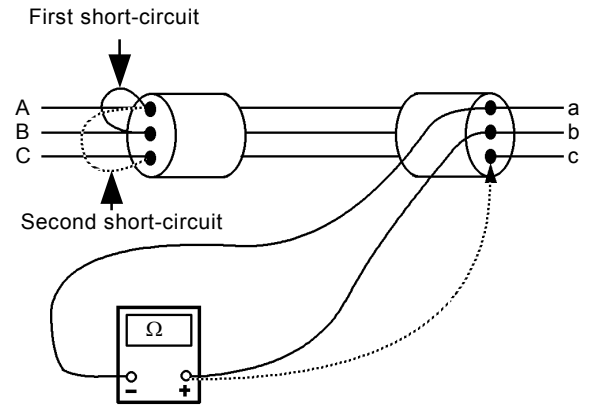
### Multi-line short-circuit check

Disconnect both end connectors of the harness, and check continuity between terminals (A) and (B) or (C).

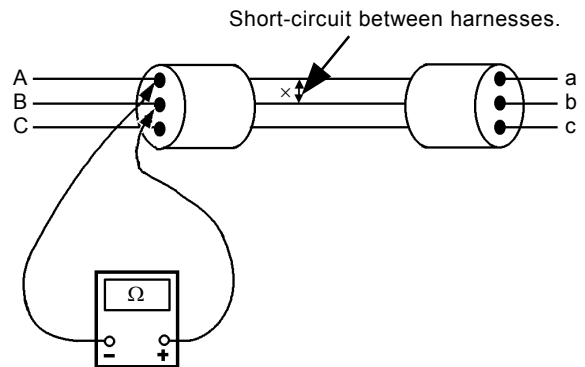
If the ohm-meter reading is:

$0 \Omega$  = Short-circuit exists between the lines.

$\infty \Omega$  = No short-circuit exists between the lines.



T107-07-05-004



T107-07-05-005

## TROUBLESHOOTING / Electrical System Inspection

### VOLTAGE AND CURRENT MEASUREMENT

Turn key switch ON so that the specified voltage (current) is supplied to the location to be measured. Judge if the circuit is normal by evaluating whether the measured voltage (current) matches the specification.

#### 24-Volt Circuit

**Start checking the circuit in order up to the location to be measured from either power source or actuator side. Thereby, the faulty location in the circuit will be found.**


Black Probe (Negative) of Tester:

To ground to the vehicle frame

Red Probe (Positive) of Tester:

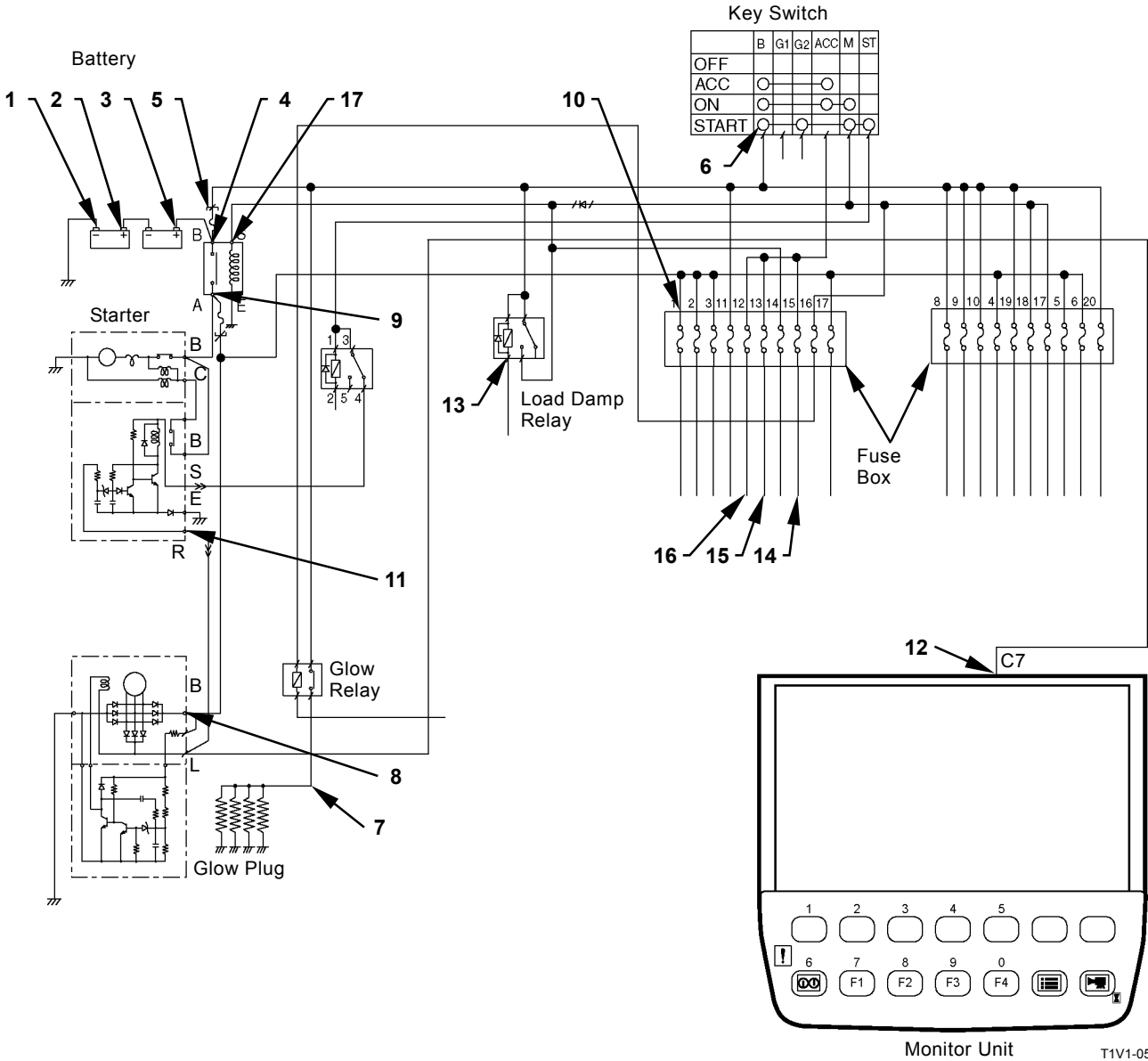
To touch the location to be measured

Engine	Key Switch	Location to be Measured	Specification
<b>Power Source Circuit</b>			
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
<b>Preheat Circuit</b>			
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
<b>Charging Circuit</b>			
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
<b>Surge Voltage Prevention Circuit</b>			
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
<b>Accessory Circuit</b>			
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.

# TROUBLESHOOTING / Electrical System Inspection

- Power Source Circuit
- Preheat Circuit
- Charging Circuit
- Surge Voltage Prevention Circuit
- Accessory Circuit



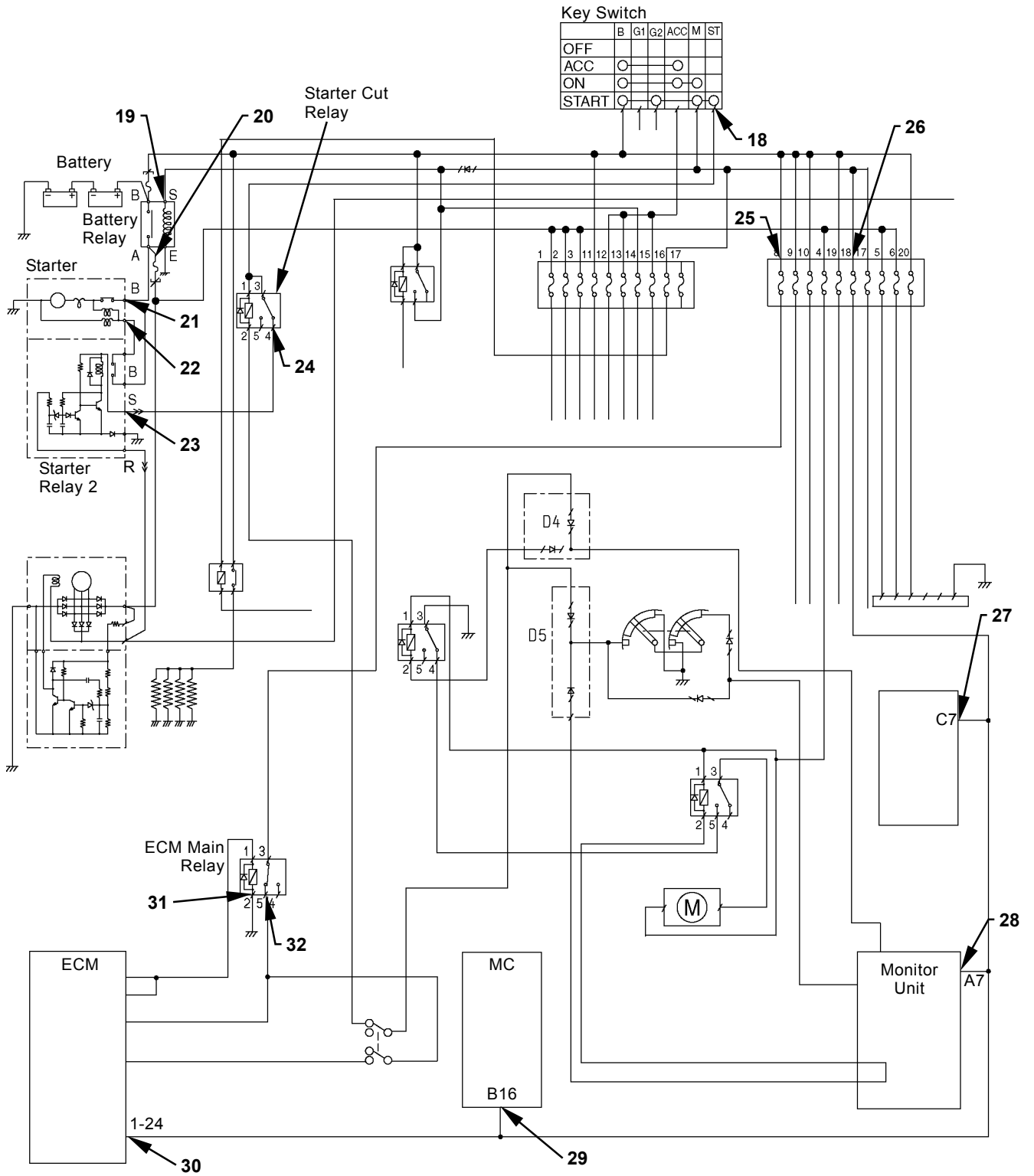
## TROUBLESHOOTING / Electrical System Inspection

Engine	Key Switch	Location to be Measured	Specification
<b>Starting Circuit</b>			
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.

# TROUBLESHOOTING / Electrical System Inspection


## Starting Circuit



T1V1-05-06-002

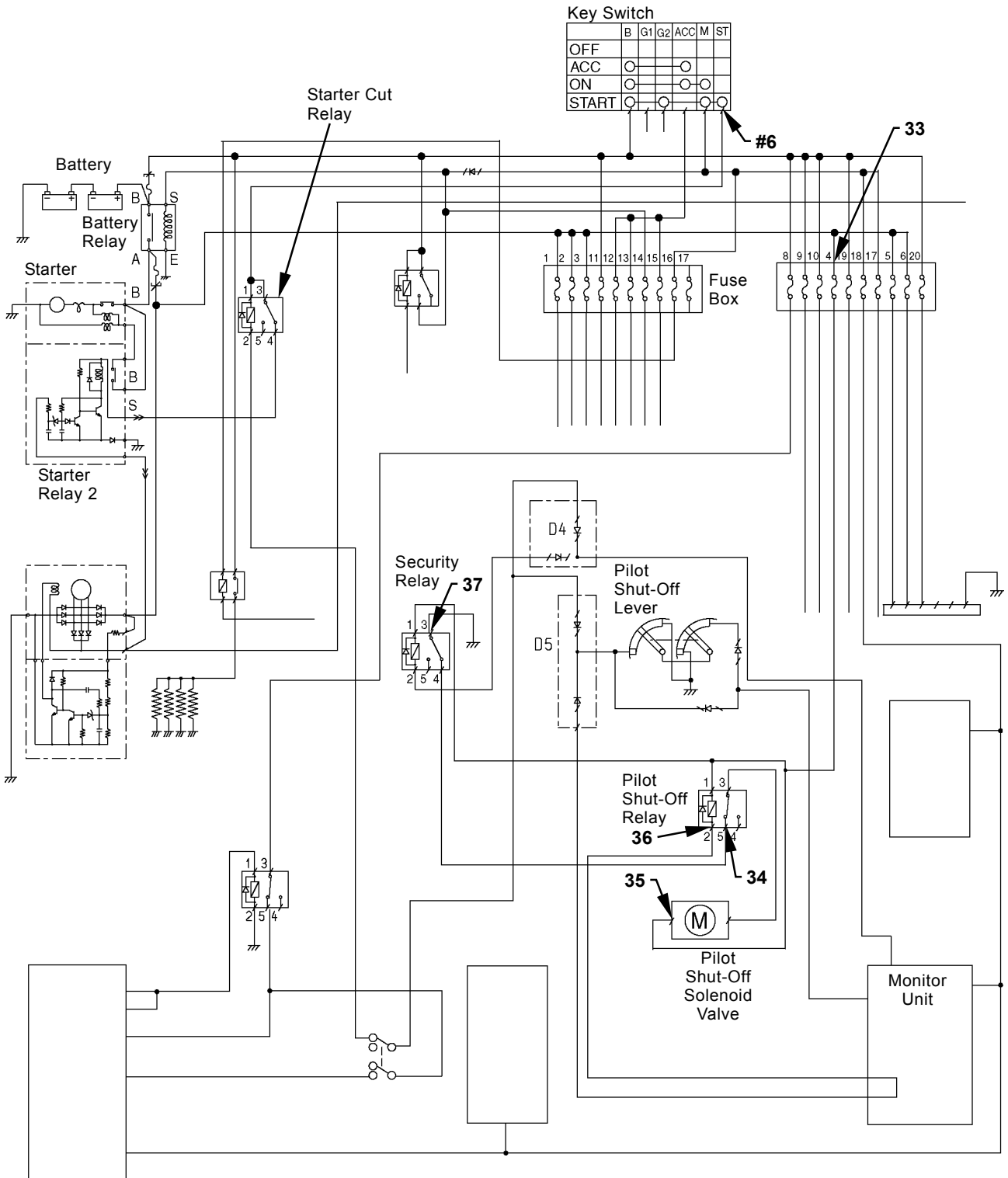
## TROUBLESHOOTING / Electrical System Inspection

Engine	Key Switch	Location to be Measured	Specification
<b>Pilot Shut-Off Circuit</b>			
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.

# TROUBLESHOOTING / Electrical System Inspection

## Pilot Shut-Off Circuit



T1V1-05-06-003

# TROUBLESHOOTING / Electrical System Inspection

## 5 Voltage Circuit

### • Voltage between terminal #1 and the vehicle frame

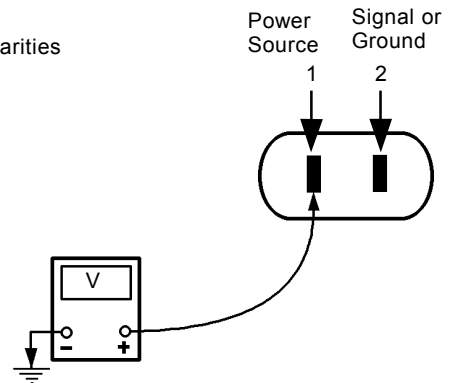
Disconnect the connector with the key switch OFF. Measure voltage between terminal #1 on the machine harness end connector and the vehicle frame (ground).

- Key switch: ON
- Tester black terminal (negative):  
Connected to the vehicle frame (ground)
- Tester red terminal (positive):  
Connected to terminal #1

#### Evaluation:

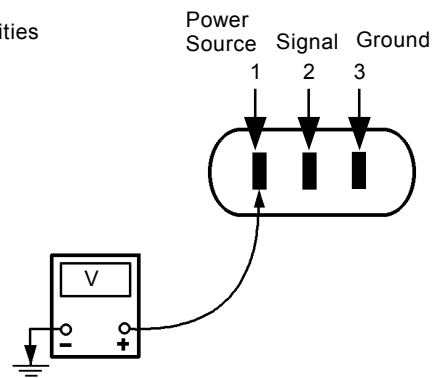
If the measuring voltage is within  $5\pm 0.5$  volts, the circuit up to terminal #1 is normal.

Two Polarities



T107-07-05-006

Three Polarities



T107-07-05-007

### • Voltage between terminal #1 and the ground terminal

Disconnect the sensor connector with the key switch OFF. Measure voltage between terminal #1 on the machine harness end connector and the ground terminal (terminal #2 for two polarities, or terminal #3 for three polarities).

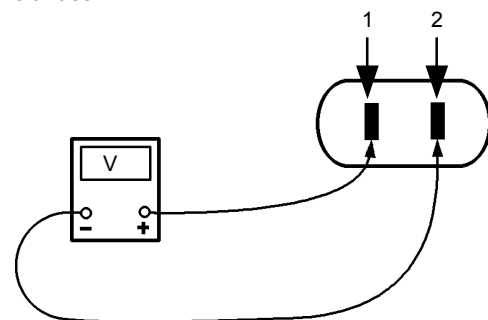
Measure voltage between terminal #1 on the machine harness end connector and the ground terminal (terminal #2 for two polarities, or terminal #3 for three polarities).

- 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:

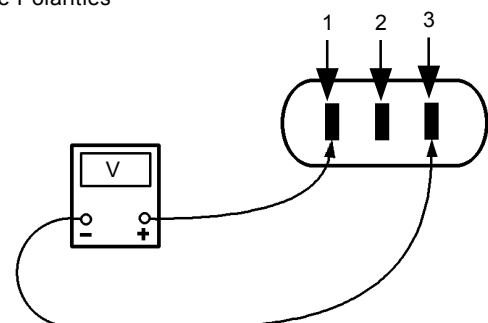
If the measured voltage is within  $5\pm 0.5$  volt, the circuit up to terminal #1 or the ground terminal (terminal #2 or #3) is normal.

Two Polarities



T107-07-05-008

Three Polarities



T107-07-05-009




## TROUBLESHOOTING / Electrical System Inspection

### CHECK BY FALSE SIGNAL

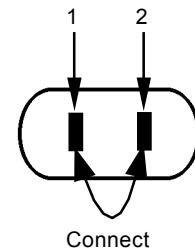
Turn the key switch OFF. Disconnect the sensor connector. Turn the key switch ON. Connect terminal #1 (power source) of machine harness end connector to terminal #2 (signal). (Power voltage is used as a false signal.) Check this state by using the monitor function of Dr. ZX. When the maximum value is displayed, MC and the circuit up to the machine harness end connector are normal. If "ON" is displayed, the pressure switch circuits are normal.

**IMPORTANT: Do not connect terminal #1 or #2 to terminal #3 or to the vehicle frame (ground) when checking a three-polarity connector.**

 **NOTE:** Some kinds of sensors can be monitored by the service menu of monitor unit. (Refer to the TROUBLESHOOTING / Monitor Unit group.)

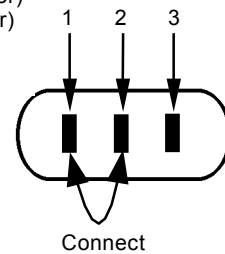
#### Two Polarities

(Hydraulic Oil Temperature Sensor)



#### Three Polarities

(Pressure Sensor)  
(Pump Delivery Pressure Sensor)  
(Pump Control Pressure Sensor)



T107-07-05-010

T107-07-05-011

# TROUBLESHOOTING / Electrical System Inspection

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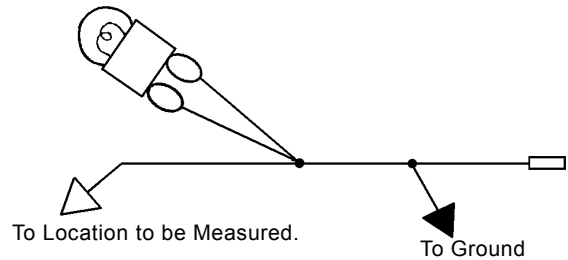
## TEST HARNESS

Install a test harness between connectors. Check the circuit condition depending on whether the test harness lamp lights or extinguishes during operation.

### Parts Number 4283594 (ST 7126)

Use in order to check a single-line (discontinuity and/or voltage).

During Operation: Lamp is ON.



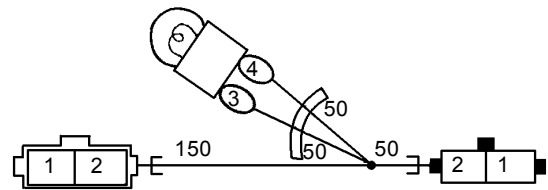
Parts Number 4283594 (ST 7126)

T107-07-05-012

### 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.

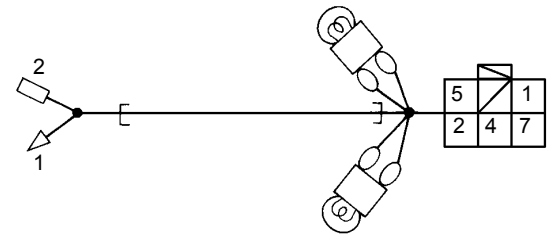


Parts Number (ST 7226)

T107-07-06-015

### Parts Number (ST 7227)

Use in order to check the wiper circuit.



Parts Number (ST 7227)

T178-05-06-003





Hitachi Construction Machinery Co. Ltd  
Attn: Publications, Marketing & Product Support  
Fax: 81-29-831-1162

Hitachi Ref. No.

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## SERVICE MANUAL REVISION REQUEST FORM

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NAME OF COMPANY:

MODEL:

YOUR NAME:

PUBLICATION NO.:

(Located at the right top corner in the cover page)

DATE:

PAGE NO.:

(Located at the bottom center in the page. If two or more revisions are requested, use the comment column)

FAX:

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YOUR COMMENTS / SUGGESTIONS:

Attach photo or sketch if required.

If your need more space, please use another sheet.

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REPLY:

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(Copy this form for usage)

## THE ATTACHED DIAGRAM LIST

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(The following diagrams are attached to this manual.)

1. ZAXIS160-3 CLASS/180-3 CLASS ELECTRICAL DIAGRAM
  2. ZAXIS160-3 CLASS/180-3 CLASS CONNECTORS
  3. ZAXIS160-3 CLASS/180-3 CLASS ENGINE HARNESS  
ZAXIS160-3 CLASS/180-3 CLASS CAB HARNESS
  4. ZAXIS160-3 CLASS/180-3 CLASS  
MONITOR UNIT HARNESS
  5. ZAXIS160-3 CLASS  
HYDRAULIC CIRCUIT DIAGRAM
  6. ZAXIS160-3 CLASS HYDRAULIC CIRCUIT DIAGRAM  
(2-PIECE BOOM, BOOM HOSE RUPTURE VALVE, ARM HOSE RUPTURE VALVE,  
POSITIONING HOSE RUPTURE VALVE))  
ZAXIS160-3 CLASS  
HYDRAULIC CIRCUIT DIAGRAM  
(BREAKER AND CRUSHER PIPING, 2-SPEED FLOW COMBINING PIPING)
  7. ZAXIS180-3 CLASS  
HYDRAULIC CIRCUIT DIAGRAM
  8. ZAXIS180-3 CLASS  
(2-PIECE BOOM, BOOM HOSE RUPTURE VALVE, ARM HOSE RUPTURE VALVE,  
POSITIONING HOSE RUPTURE VALVE))  
ZAXIS180-3 CLASS  
HYDRAULIC CIRCUIT DIAGRAM  
(BREAKER AND CRUSHER PIPING, 2-SPEED FLOW COMBINING PIPING)
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