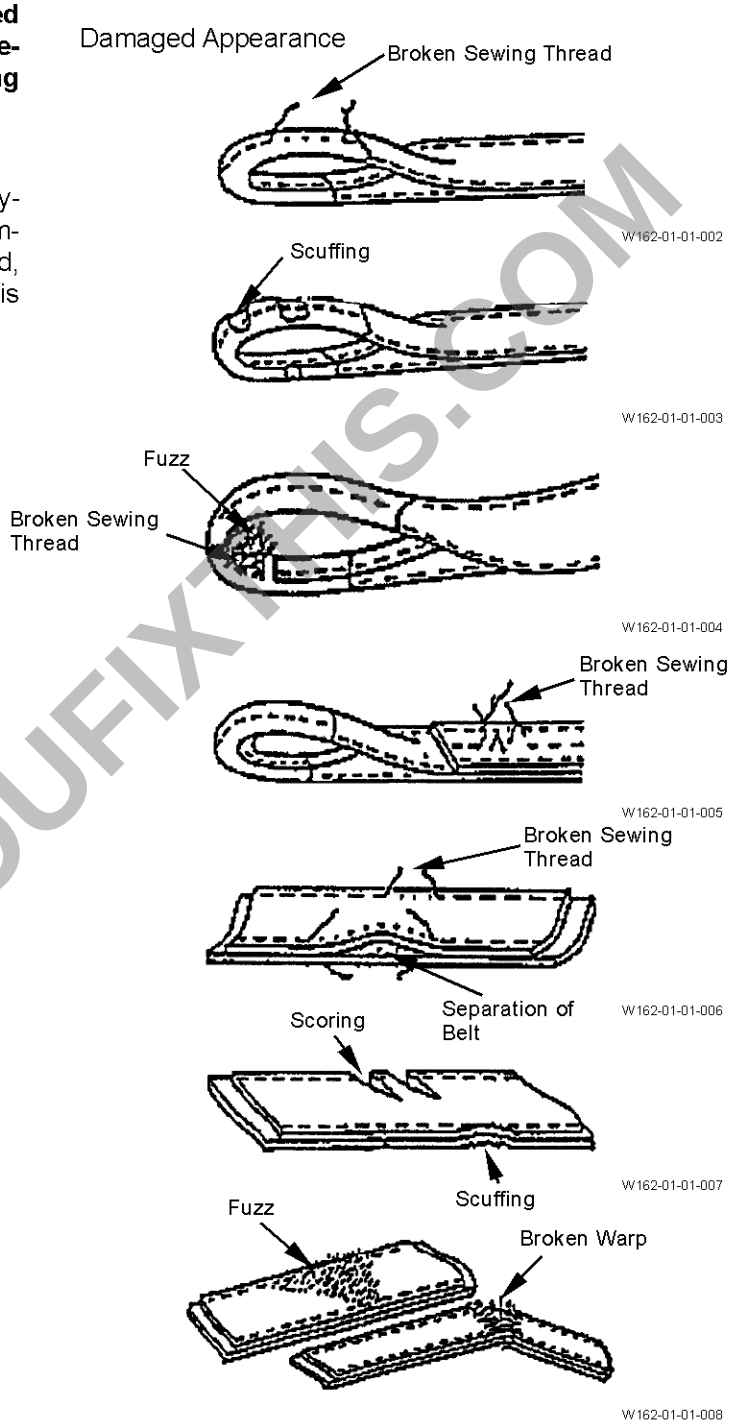
CAUTION: If a load is lifted with a damaged nylon sling, serious personal injury may result. Be sure to visually check the nylon sling for any damage before using.

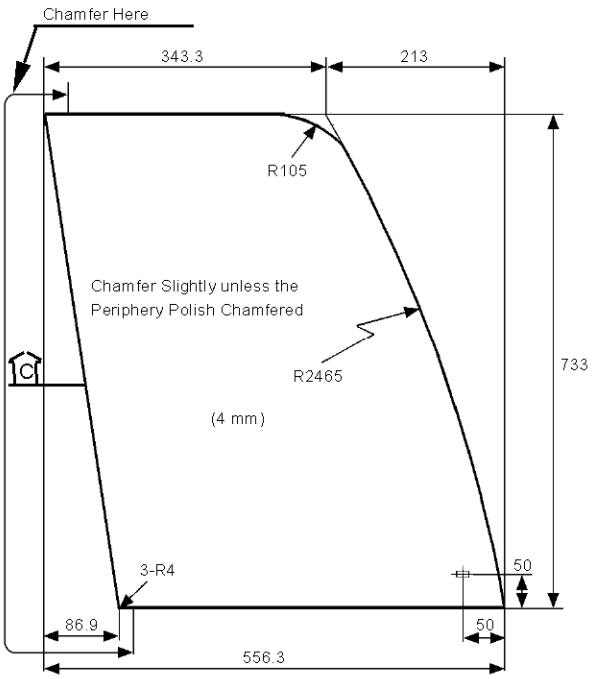
2. Before using a nylon sling, visually check the nylon sling for any damage corresponding to examples shown to the right. If any damage is found, cut and discard the sling. Even if no damage is found, do not use slings older than 7-years.



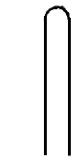
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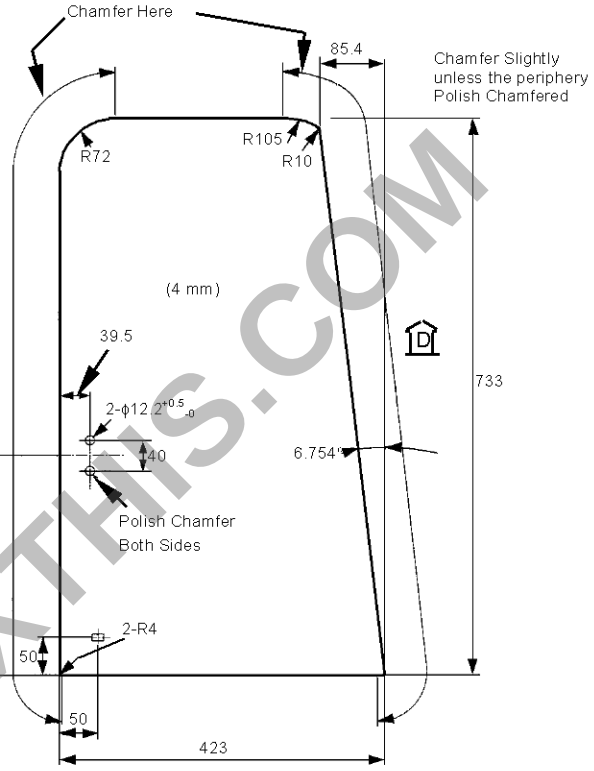
Unit: mm



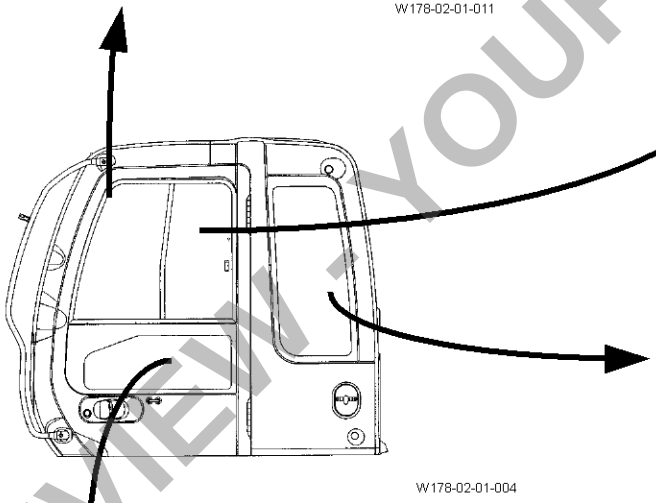
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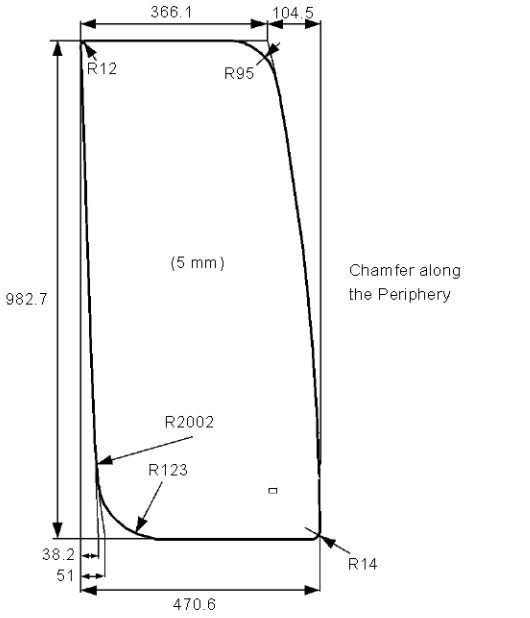
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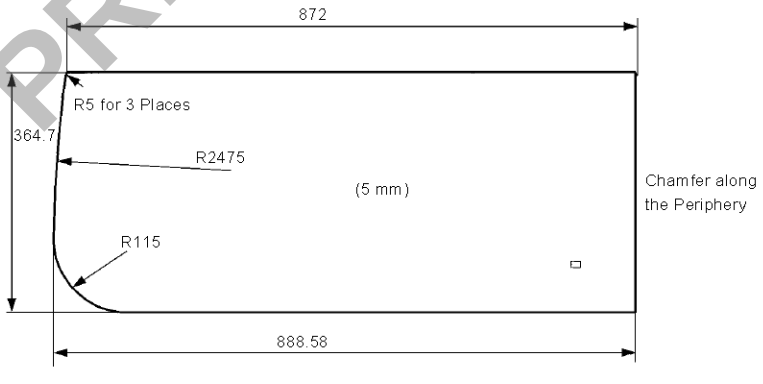
W178-02-01-008



W178-02-01-004



W178-02-01-009



W178-02-01-010

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18. Tap on the back of each outer race of roller bearing (30) (2 used) on drum (36) with a bar and hammer evenly to remove it. However, don't remove it unless replacing it.

NOTE: There is no need to replace the inner race of roller bearing (30) on the motor side, so don't remove it.

19. Disassemble the first stage carrier (11) assembly.
    - Tap spring pin (18) out from the first stage carrier (11) using pin (ST 1391). (3 places)
    - Remove pins (19) (3 used), thrust plates (20) (6 used), planetary gears (22) (3 used), needle bearings (21) (3 used), spacer (9) from the first stage carrier (11).

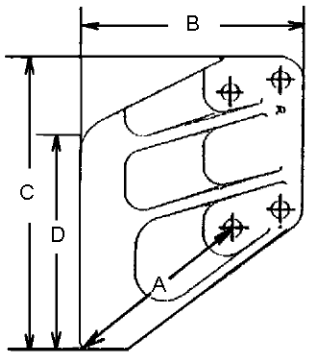
20. Disassemble the second stage carrier (8) assembly.
    - Tap spring pin (7) out from second stage carrier (8) using pin (ST 1391). (3 places)
    - Remove pins (6) (3 used), thrust plates (3) (6 used), planetary gears (4) (3 used), needle bearings (5) (3 used), spacer (9) from second stage carrier (8).

21. Disassemble the third stage carrier (1) assembly.
    - Tap spring pin (23) out from third stage carrier (1) using pin (ST 1463). (3 places)
    - Remove pins (24) (3 used), thrust plates (25) (6 used), planetary gears (27) (3 used), needle bearings (26) (6 used) from third stage carrier (1).

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Side Cutter
(ZAXIS200, 200-E, 225US, 225USR)

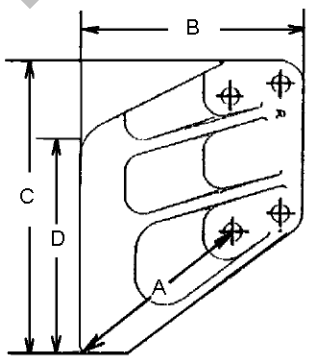


W155-04-01-002

Unit: mm (in)

	Standard	Allowable Limit	Remedy
A	278 (10.9)	181 (7.1)	Replace
B	295 (11.6)	—	
C	433 (17.0)	—	
D	135 (5.3)	—	

Side Cutter
(ZAXIS230, 270)



W155-04-01-002

Unit: mm (in)

	Standard	Allowable Limit	Remedy
A	290 (11.42)	189 (7.44)	Replace
B	300 (11.81)	—	
C	400 (15.75)	—	
D	300 (11.81)	—	

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SECTION 5
ENGINE AND ACCESSORY



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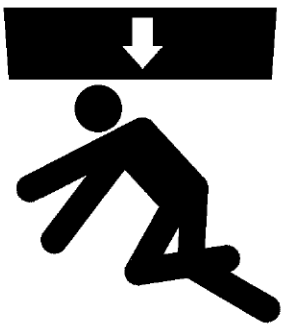
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- If a maintenance procedure must be performed with the engine running, do not leave machine unattended.
- If the machine must be raised, maintain a 90 to 110 angle between the boom and arm. Securely support any machine elements that must be raised for service work.
- Never work under a machine raised by the boom.
- Inspect certain parts periodically and repair or replace as necessary. Refer to the section discussing that part in the “MAINTENANCE” chapter in the operator’s 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 frammable oil such as fuel oil and gasoline to clean parts or surfaces.
- Disconnect battery ground cable (-) before making adjustments to electrical systems or before welding on the machine.
- Illuminate your work area adequately but safely.
- Use a portable safety light for working inside or under the machine.
- Make sure that the bulb is enclosed by a wire cage.
  The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.
- Sufficiently illuminate the work site. Use a maintence work light when working under or inside the machine.
- Always use a work light protected with a guard. In case the light bulb is broken, spilled fuel, oil antifreeze fluid, or window washer fluid may catch fire.

S500-E02B-0497



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SA-527



SA-037

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SAFETY ALERT SYMBOL AND HEADLINE NOTATIONS

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

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

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

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

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

UNITS USED

- SI Units (International System of Units) are used in this manual.
  MKSA system units and English units are also indicated in parenthheses just behind SI units.
  Example : 24.5 MPa (250 kgf/cm^2, 3560 psi)

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

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

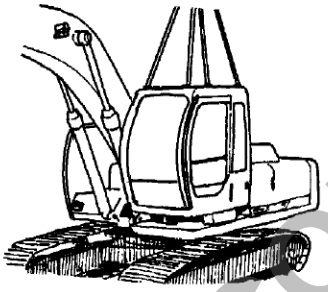
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Installation (ZAXIS225US)

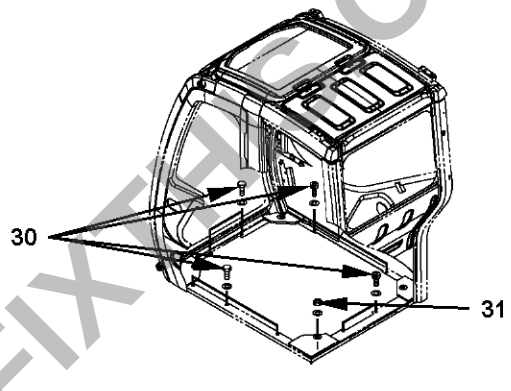
CAUTION: Cab weight: 270 kg (600 lb)

1. Attach lifting straps to the cab (4 places), lift and place the cab onto frame by crane.



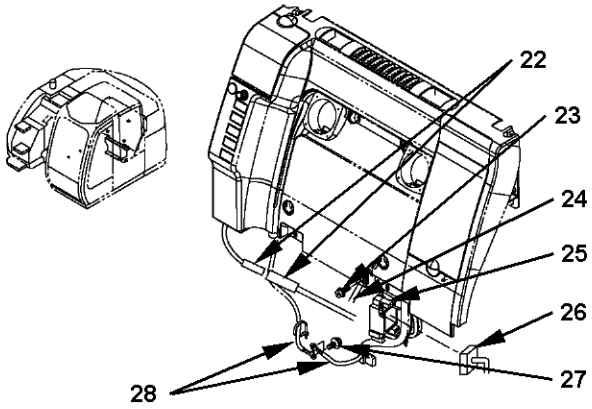
W157-02-01-001

2. Install cab mounting bolts (30) and nut (31).
   - : 17 mm
   - : 50 N·m (5.1 kgf·m, 37 lbf·ft)
   - : 24 mm
   - : 210 N·m (21.5 kgf·m, 156 lbf·ft)
   - : 8 mm
   - : 50 N·m (5.1 kgf·m, 37 lbf·ft)



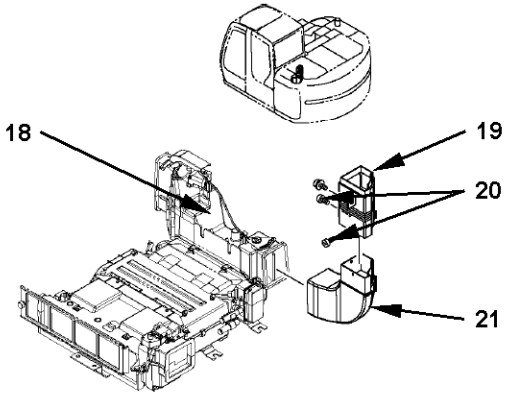
W1SE-02-01-10

3. Connect ground (28) with bolts (27) (2 used).
   Insert junction box (harness side) (26) into the junction box.
   Connect connectors (25) (6 used).
   Connect ground (24) with screw (23).
   Insert the connector of radio antenna feeder (22) from both sides.
   - : 13 mm
   - : 10 N·m (1.0 kgf·m, 7.2 lbf·ft)



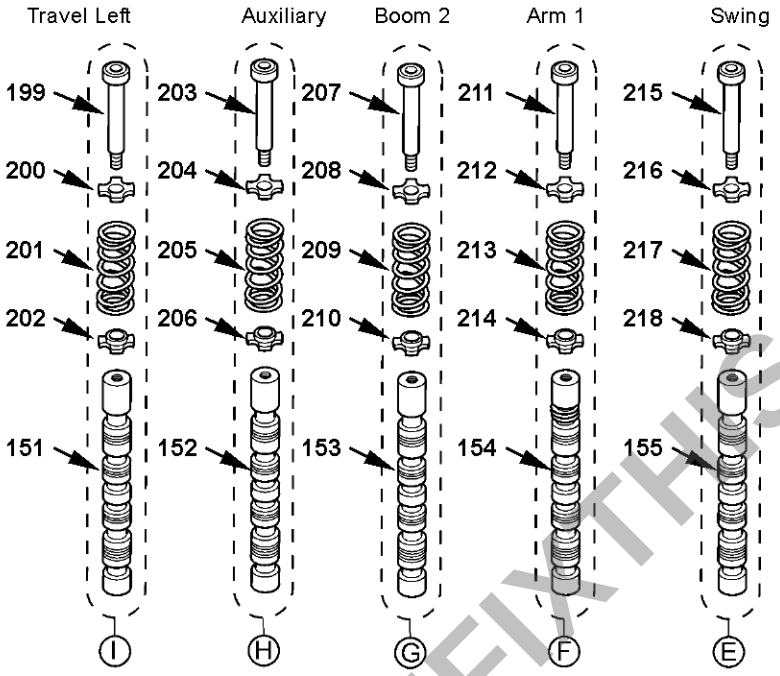
W1SE-02-01-09

4. Install duct (21) into ducts (18) and (19) with screws (20) (2 used).



W1SE-02-01-008

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151 -Spool (Travel Left)
152 -Spool (Auxiliary)
153 -Spool (Boom 2)
154 -Spool (Arm 1)
155 -Spool (Swing)
199 -Bolt
200 -Spring Seat
201 -Spring
202 -Spring Seat
203 -Bolt
204 -Spring Seat
205 -Spring
206 -Spring Seat
207 -Bolt
208 -Spring Seat
209 -Spring
210 -Spring Seat
211 -Bolt
212 -Spring Seat
213 -Spring
214 -Spring Seat
215 -Bolt
216 -Spring Seat
217 -Spring
218 -Spring Seat

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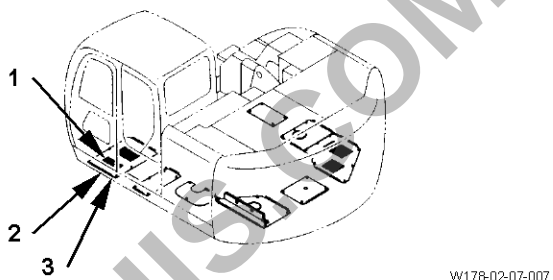
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REMOVE AND INSTALL TRAVEL PILOT VALVE

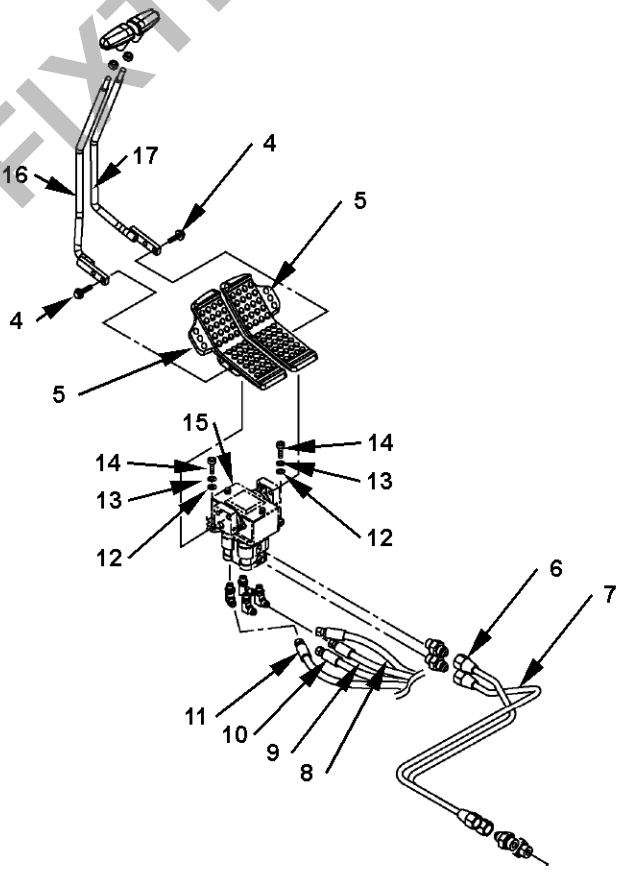
IMPORTANT: Release any pressure in the hydraulic oil tank before doing any work. (Refer to BLEED AIR FROM HYDRAULIC OIL TANK on W1-4-1.)

Removal

1. Remove floor mat (1).
2. Remove bolts (3) (6 used) from the swing frame. Remove under cover (2).
   : 17 mm
3. Remove bolts (4) (2 used) from levers (16, 17). Remove pedals (5) (2 used) and levers (16, 17).
   : 17 mm
4. Remove pipes (6, 7) and hoses (8 to 11). Attach an identification tag onto the removed hoses and pipes for assembling. Cap the ends of all removed pipes and hoses.
   : 19 mm
5. Remove socket bolt (14), spring washer (13), and plain washer (12). Remove pilot valve (15).
   : 8 mm



W178-02-07-007

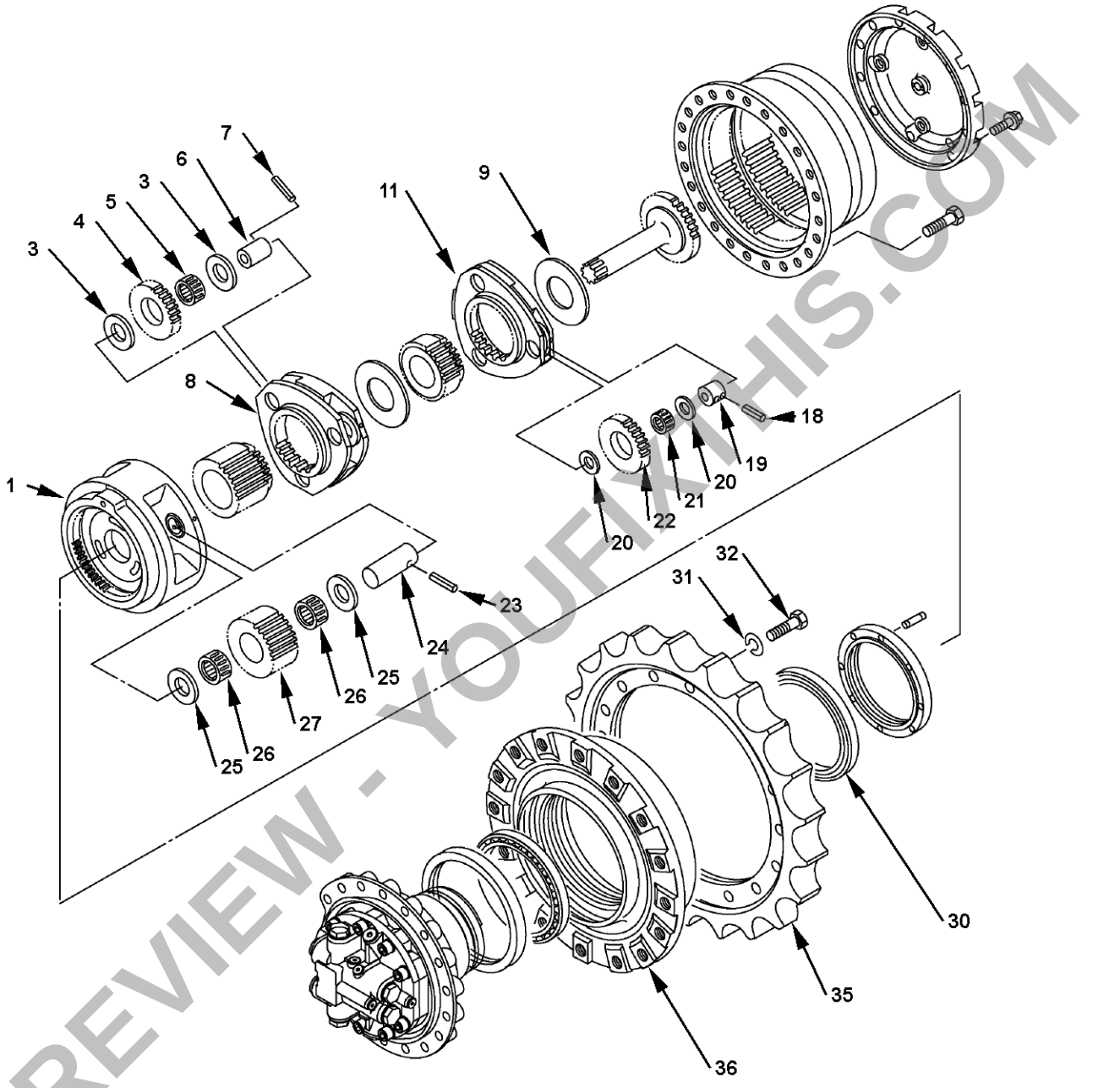


W178-02-07-005

6 - Pipe T2: (To pilot shut-off valve)
7 - Pipe A3: (From pilot shut-off valve)
8 - Hose K: (To the signal control valve port K for travel right and forward)
9 - Hose L: (To the signal control valve port L for travel right and reverse)
10 - Hose J: (To the signal control valve port J for travel left and reverse)
11 - Hose I: (To the signal control valve port I for travel right and forward)

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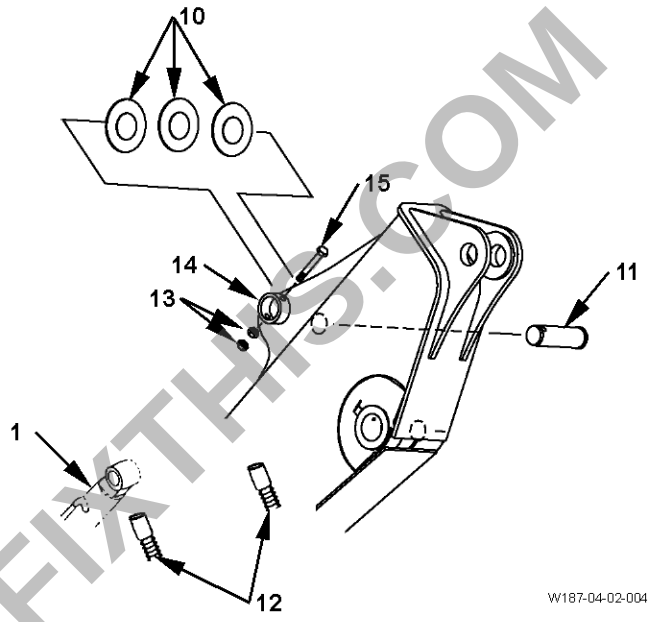
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Install Bucket Cylinder

IMPORTANT: When installing the bushing and if a hammer is used, the bushing may be damaged. Install the bushing by using a press.

CAUTION: Bucket cylinder weight:
ZAXIS200, 200-E, 225US, 225USR: 145 kg (320 lb)
ZAXIS230:
Cylinder No.: Up to serial No. 884-390: 185 kg (410 lb)
Cylinder No.: Serial No. 884-391 and up: 205 kg (460 lb)
ZAXIS270: 220 kg (490 lb)

CAUTION: Metal fragments may fly off when a hammer is used. Wear necessary protection, such as goggles, hard hats, etc in order to prevent personal injury.



1. Hoist bucket cylinder (1). Align the hole on cylinder tube side with the cylinder mounting hole on arm. Insert thrust plate (10) and install pin (11).

2. Insert bolt (15) into stopper (14) and pin (11) in the arm. Install nut (13).

   ZAXIS200, 200-E, 225US, 225USR
   : 24 mm
   : 270 N·m (27.5 kgf·m, 200 lbf·ft)

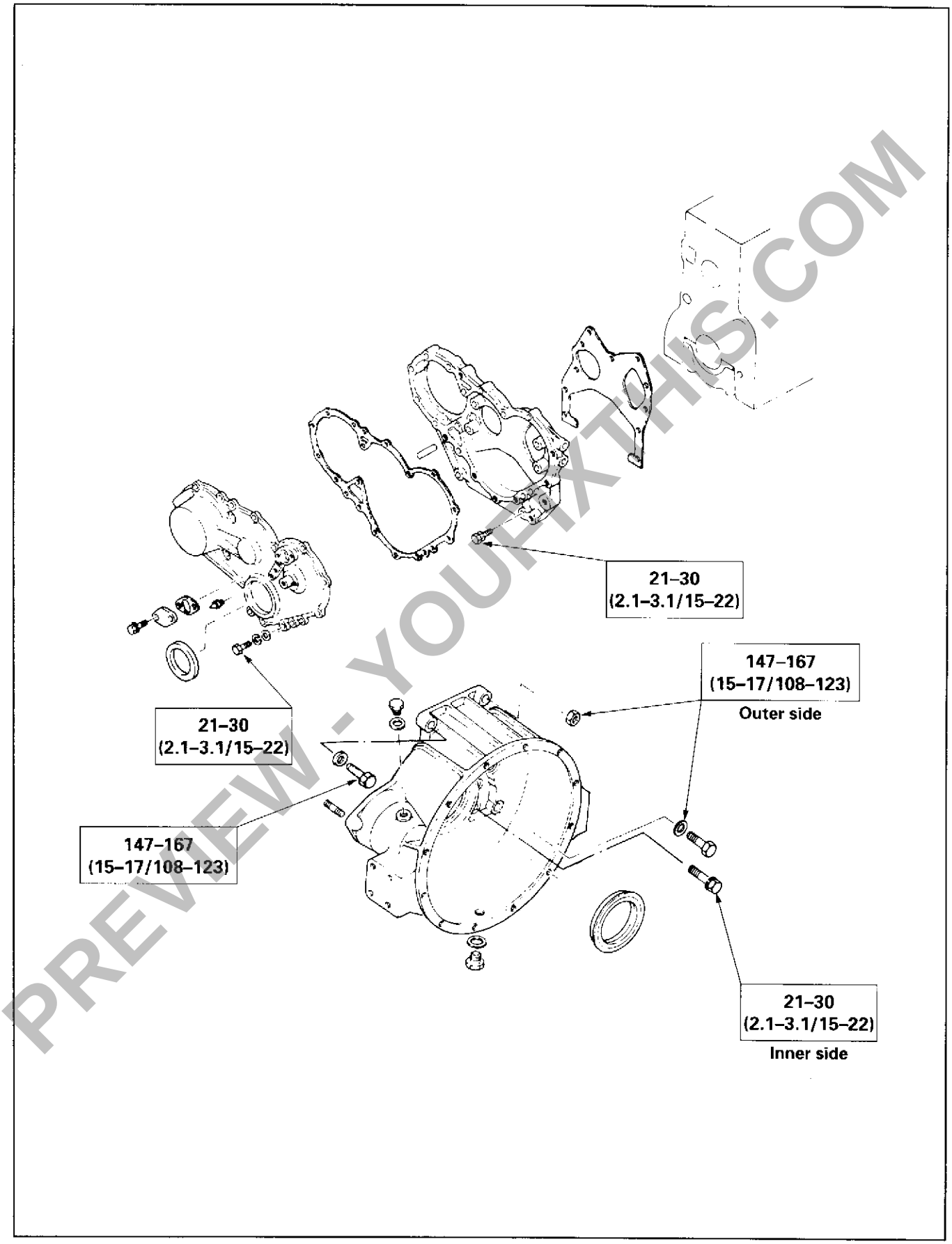
   ZAXIS230, 270
   : 32 mm
   : 235 N·m (24 kgf·m, 175 lbf·ft)

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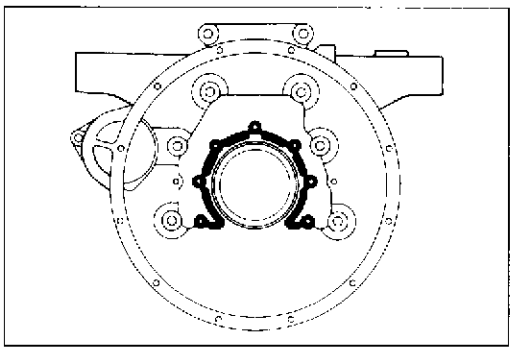
Timing Gear Case and Flywheel Housing

N·m (kgf·m/lb.ft)



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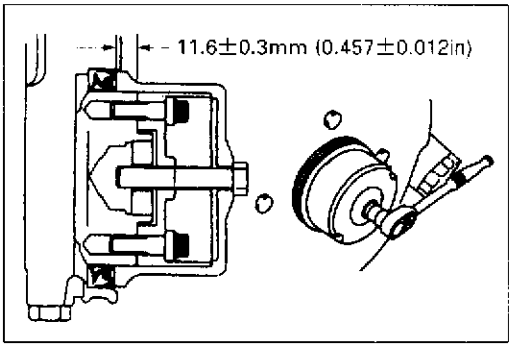
13. Flywheel Housing

1) Apply a sealant to the shaded area of the illustration.
2) Install the flywheel housing.

   Tighten the flywheel housing bolts to the specified torque.

N·m (kgf·m/lb.ft)

Flywheel Housing Bolt Torque	Outer Bolt	147–167(15.0–17.0/108–123)
	Inner Bolt	21–30 (2.1–3.1/15–22)

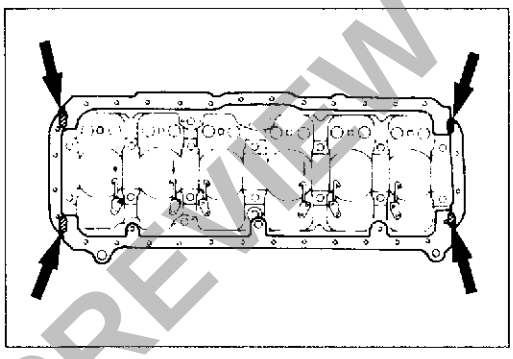


14. Rear Oil Seal (Axial Type)

1) Tighten the adapter to the crankshaft rear and section with 2 bolts.
2) Insert the oil seal into the peripheral section of adapter.
3) Insert the sleeve into the adapter section, and 1) tighten it with a bolt until the adapter section hits the sleeve.
4) Remove the adapter and the sleeve.
5) With the seal pressed in, check the dimension of the oil seal section.

   Standard Dimension = 11.6 ± 0.3 mm (0.457 ± 0.012 in)

   Rear oil Seal Installer: 5-8840-9025-0



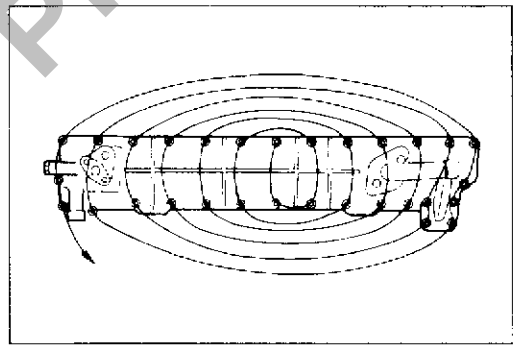
15. Oil Pan

1) Apply sealant to the area indicated by the arrows in the illustration.
2) Install the oil pan gasket
3) Install the oil pan.

   Tighten the oil pan bolts to the specified torque.

N·m (kgf·m/lb.ft)

Oil Pan Bolt Torque	21–30 (2.1–3.1/15–22)



16. Oil Cooler

1) Apply sealant to the oil cooler gasket.
2) Install the oil cooler gasket to the oil cooler body case.
3) Install the oil cooler.

   Tighten the oil cooler bolts to the specified torque.

   Start from the middle and work out to either side.

   Refer to the illustration

N·m (kgf·m/lb.ft)

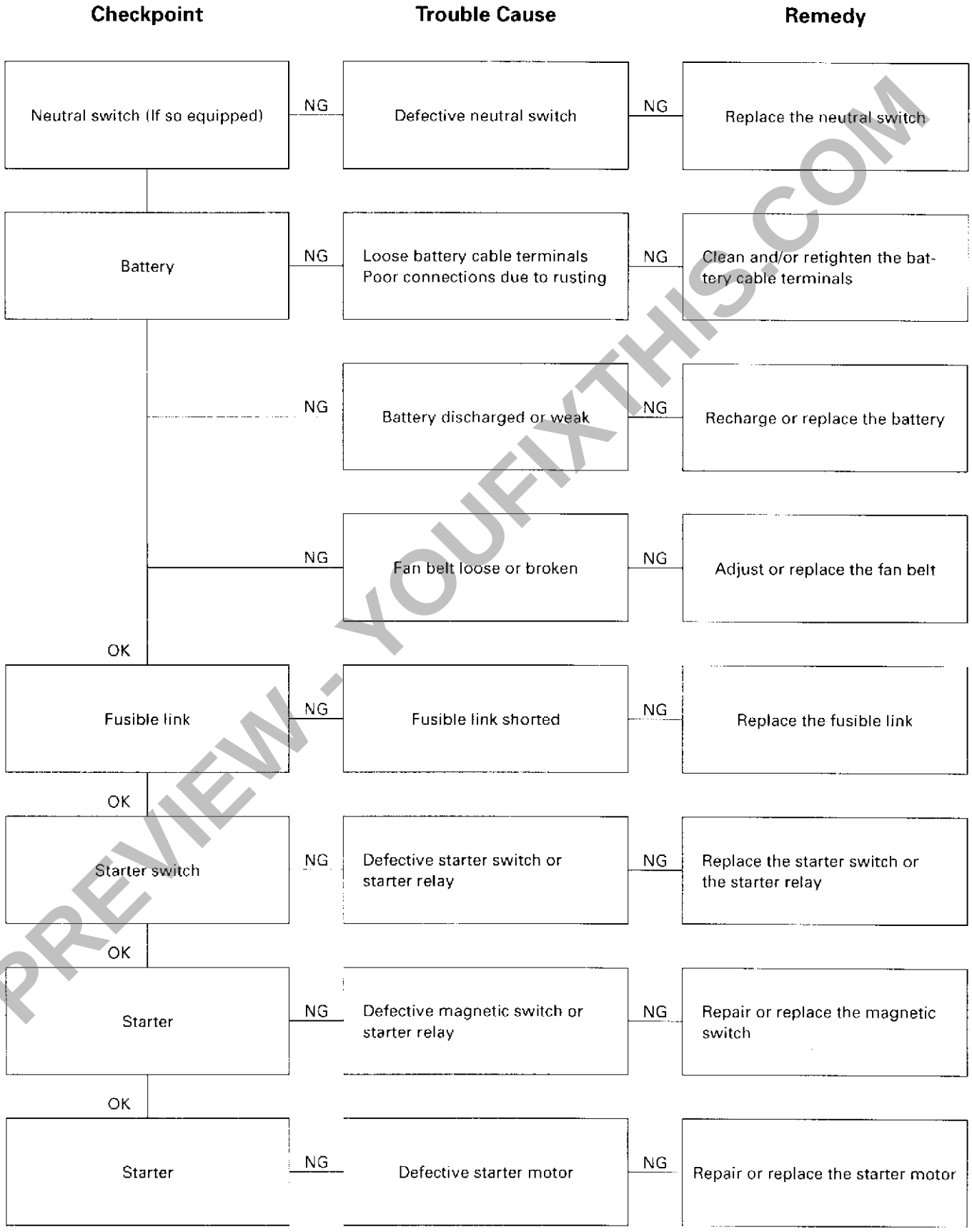
Oil Cooler Torque	14–24 (1.4–2.4/10–17)

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HARD STARTING

1) STARTER INOPERATIVE



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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 (10 ft) 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.

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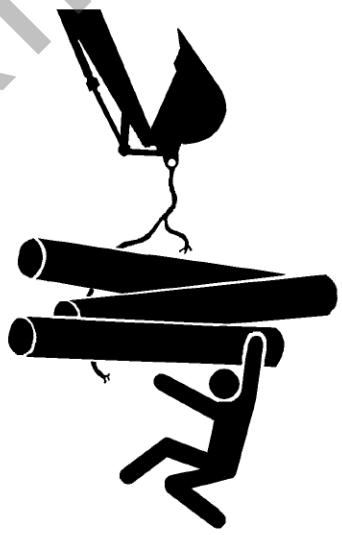


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OBJECT HANDLING

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

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INJECTION TIMING

Inspection:

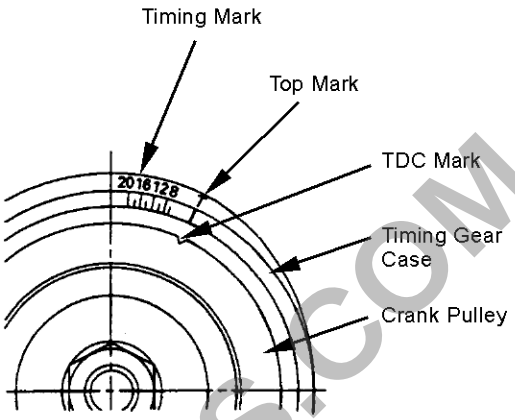
1. Position No.1 piston to the top dead center. Turn the crank pulley in the direction of rotation (clockwise as seen from the front of the engine) to set a "TDC" mark on the crank pulley under the "Top mark", located on the timing gear case.

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 to release the compression pressure.

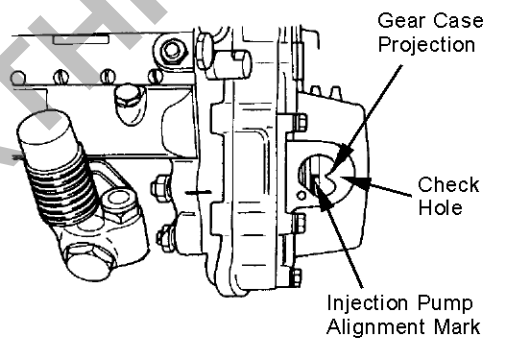
2. Remove the timing check hole cover on the front section of the fuel injection pump.
   When the mark on the injection pump is set under the projection of the gear case, No.1 piston is positioned at the top dead center. If the mark is not set under the projection, keep turning to adjust.

NOTE: The alignment mark on the injection pump cannot be directly seen through the check hole. Use a mirror for checking.

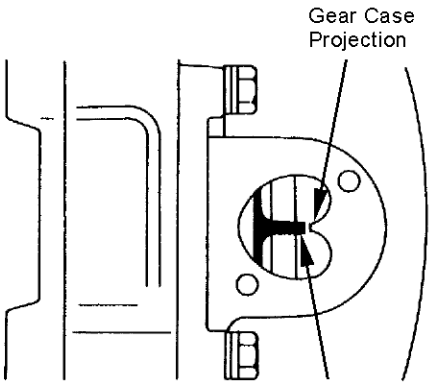
3. Remove the injection piping from No.1 cylinder.
4. Remove the delivery valve holder for No.1 cylinder from the injection pump to pull the delivery valve and the spring out. Reinstall the delivery valve holder.
   : 39 to 44 N·m
   (4 to 4.5 kgf·m, 28.9 to 32.6 lbf·ft)



T157-05-02-002



T107-02-12-007



T107-02-12-008

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DR. ZX FAULT CODE LIST

Fault Code	Trouble	Cause
01 02 03	Abnormal EEPROM Abnormal RAM Abnormal A/D Conversion	• Faulty MC
04	Abnormal Sensor Voltage	• Faulty MC • Faulty Harness • Faulty Sensor
06	Abnormal EC Sensor	• Faulty MC • Faulty Harness • Faulty EC Sensor
07	Abnormal Engine Control Dial Angle	• Faulty MC • Faulty Harness • Faulty Engine Control Dial
10 11	Abnormal Pump 1 Delivery Pressure Abnormal Pump 2 Delivery Pressure	• Faulty MC • Faulty Harness • Faulty Pump Delivery Pressure Sensor
12 13	Abnormal Pump1 Pump Control Pressure Abnormal Pump2 Pump Control Pressure	• Faulty MC • Faulty Harness • Faulty Pump Control Pressure Sensor
14 15 16 18	Abnormal Swing Pilot Pressure Abnormal Boom Raise Pilot Pressure Abnormal Arm Roll-In Pilot Pressure Abnormal Travel Pilot Pressure	• Faulty MC • Faulty Harness • Faulty Pilot Pressure Sensor
19	Abnormal Hydraulic Oil Temperature	• Faulty MC • Faulty Harness • Faulty Hydraulic Oil Temperature Sensor

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Parts		Auxiliary Flow Combiner Valve	Bypass Cut Valve
Function		• Supplies pressure oil from pump 1 to auxiliary spool when auxiliary spool is operated.	• Supplies pressure oil from pump 1 to auxiliary spool when auxiliary spool is operated.
Symptoms in control system when trouble occurs.		• If control valve is kept closed, operating speed doesn't increase in single auxiliary operation.	• If spool is bound in the fully open position, single attachment operation speed becomes slow. • If spool is bound in the fully closed position, main relief valve continues to relieve with all control levers positioned in neutral. • If spool is bound in opened position, when all control levers are in neutral, pump 1 pressure is higher than pump 2 pressure.
Symptoms in machine operation when trouble occurs.		• Same as described above.	• Same as described above.
Evaluation	By Fault Code	—	—
	By Monitor Function	—	—
	Using Test Harness	—	—
	Others	—	—
NOTE		—	—
Descriptions of Control (Operational Principle Section in T/M)		T3-3	T3-3

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STEP 2 Present Trouble Diagnosing

The LCD indicates the fault codes for present abnormalities of the mix door, mode encoder, and/or sensors.

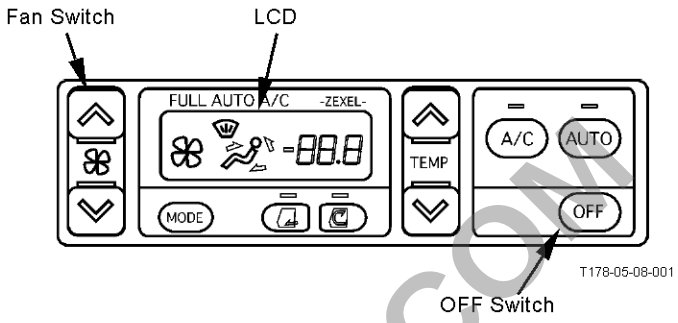
- In case any abnormalities are present, the LCD indicates the fault codes. If more than one fault code is detected, the following fault code is displayed after flashing (0.5 seconds) twice.

	Fault Code	
	Breakage	Short 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 breakage.

NOTE: As for ZAXIS225US, the fault code for the coolant temperature sensor isn't displayed. In case no failures are present, the LCD indicates "20."

- Select the next step to be performed by operating the switches as follows:
  - Press the upper side of the fan switch: To proceed to "STEP 3."
  - Press the lower side of the fan switch: To return to "STEP 1."
  - Keep pressing the OFF switch for more than 3 seconds: Deactivate the self-diagnostic system. (Normal function is resumed)



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UNITS USED

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

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

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

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

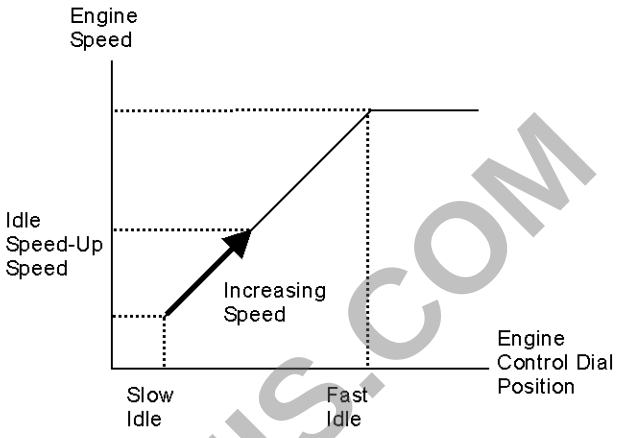
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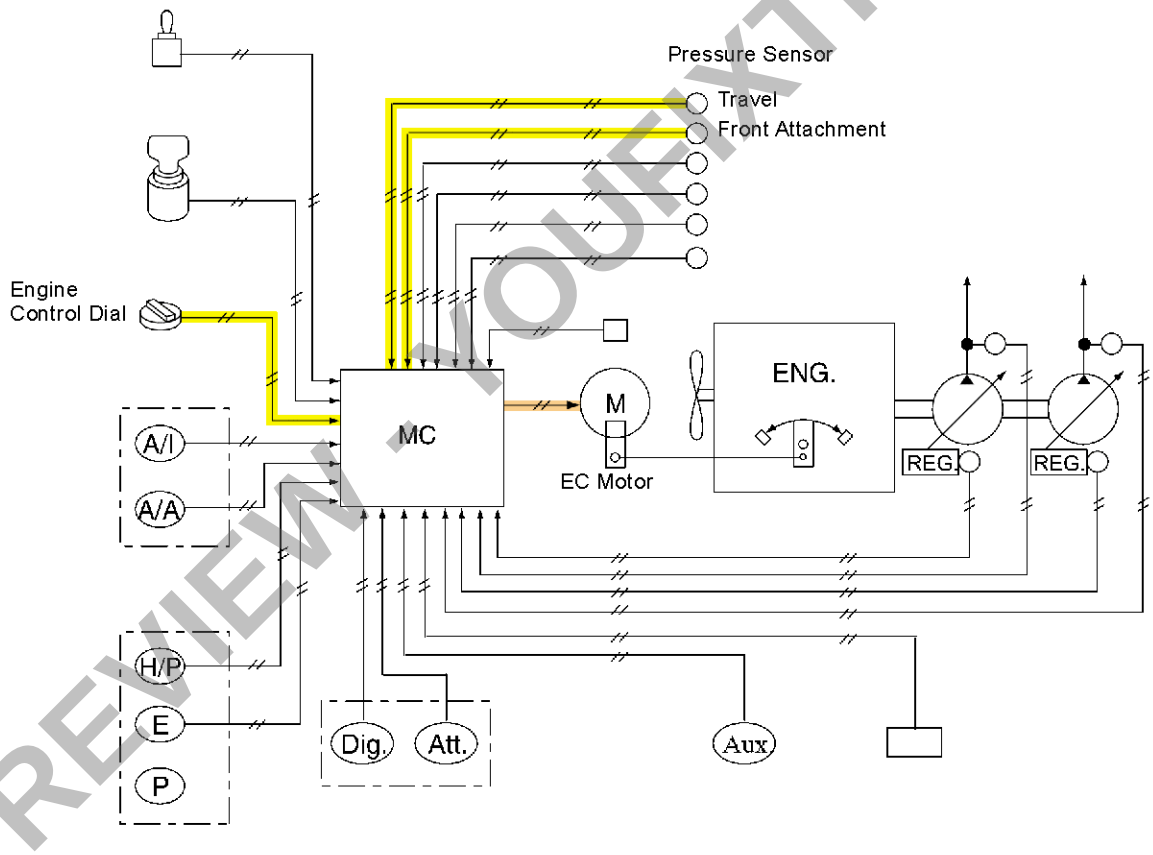
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Idle Speed-Up Control

Function: Prevents the engine from hunting when running the engine at slow speed.

Operation: When the travel or front attachment function is operated while the engine is running at a speed between the minimum speed and the Idle Speed-Up Speed, the MC drives the EC motor so that the engine speed is increased to the Idle Speed-Up Speed.



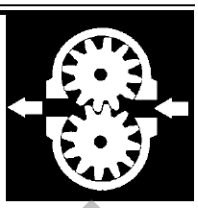


T178-02-01-010

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SECTION 3
COMPONENT OPERATION



CONTENTS

Group 1 Pump Device
Outline T3-1-1
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Regulator T3-1-6
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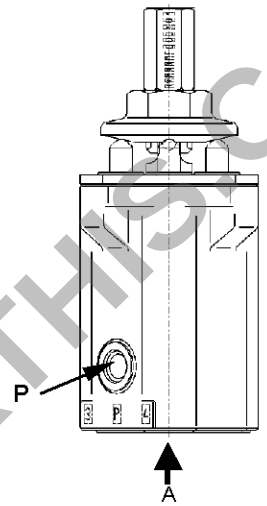
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ZAXIS200 class : Serial No. 109562 and up
ZAXIS225 class
(ZAXIS225USR) : Serial No. 109556 and up
(ZAXIS225US) : Serial No. 109546 and up
ZAXIS230 class : Serial No. 11231 and up
ZAXIS270 class : Serial No. 20336 and up

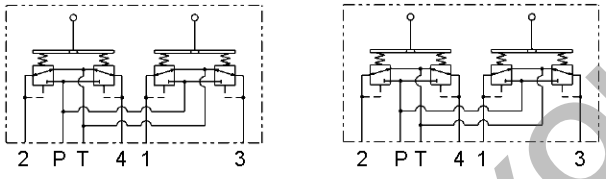
• Front and Swing Pilot Valve

	Port No.	HITACHI Standard	ISO Standard
Right	1	Bucket Roll-Out	←
	2	Boom Lower	←
	3	Bucket Roll-In	←
	4	Boom Raise	←
Left	1	Arm Roll-In	Swing Right
	2	Swing Right	Arm Roll-Out
	3	Arm Roll-Out	Swing Left
	4	Swing Left	Arm Roll-In



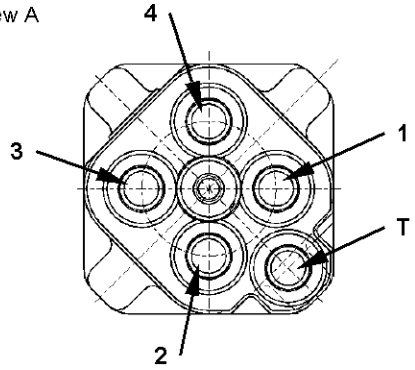
T1M9-03-05-001

Hydraulic Symbol



T1M7-03-04-001

View A



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