EX3500-3
Workshop Manual

SECTION 1
GENERAL INFORMATION

—CONTENTS—

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PRECAUTIONS FOR DISASSEMBLING AND ASSEMBLING

Preparations for Disassembling

- Clean the Machine

  Thoroughly wash the machine before bringing it into the shop. Bringing a dirty machine into the shop may cause machine components to be contaminated during disassembling/assembling, resulting in damage to machine components, as well as decreased efficiency in service work.

- Inspect the Machine

  Be sure to thoroughly understand all disassembling/assembling procedures beforehand, to help avoid incorrect disassembling of components as well as personal injury.
  Check and record the items listed below to prevent problems from occurring in the future.

  - The machine model, machine serial number, and hour meter reading.
  - Reason for disassembly (symptoms, failed parts, and causes).
  - Clogging of filters and oil, water or air leaks, if any.
  - Capacities and condition of lubricants.
  - Loose or damaged parts.

- Prepare and Clean Tools and Disassembly Area

  Prepare the necessary tools to be used and the area for disassembling work.

Precautions for Disassembling and Assembling

- Precautions for Disassembling

  - To prevent dirt from entering, cap or plug the removed pipes.
  - Before disassembling, clean the exterior of the components and place it on a work bench.
  - Before disassembling, drain gear oil from the reduction gear.
  - Be sure to provide appropriate containers for draining fluids.
  - Use matching marks for easier reassembling.
  - Be sure to use the specified special tools, when instructed.
  - If a part or component cannot be removed after removing its securing nuts and bolts, do not attempt to remove it forcibly. Find the cause(s), then take the appropriate measures to remove it.
  - Orderly arrange disassembled parts. Mark and tag them as necessary.
  - Store common parts, such as bolts and nuts with reference to where they are to be used and in a manner that will prevent loss.
  - Inspect the contact or sliding surfaces of disassembled parts for abnormal wear, sticking, or other damage.
  - Measure and record the degree of wear and clearances.

- Precautions for Assembling

  - Be sure to clean all parts and inspect them for any damage. If any damage is found, repair or replace it.
  - Dirt or debris on the contact or sliding surfaces may shorten the service life of the machine. Take care not to contaminate any contact or sliding surfaces.
  - Be sure to replace O-rings, backup rings, and oil seals with new ones once they are disassembled. Apply a film of grease before installing.
  - Be sure that liquid-gasket-applied surfaces are clean and dry.
  - If an anti-corrosive agent has been used on a new part, be sure to thoroughly clean the part to remove the agent.
  - Utilize matching marks when assembling.
  - Be sure to use the designated tools to assemble bearings, bushings and oil seals.
  - Keep a record of the number of tools used for disassembly/assembly. After assembling is complete, count the number of tools, so as to make sure that no tools are missing.

Bleeding Air from Hydraulic System

When hydraulic oil is drained, the suction filter or the suction lines are replaced, or the removal and installation of the pump, swing motor, travel motor or cylinders done, bleed air from the hydraulic system in the following procedures:

- Bleeding Air from Hydraulic Pump

IMPORTANT: If the engine is started with air trapped in the hydraulic pump housing, damage to the pump may result. Be sure to bleed air before staring the engine.

1. Disconnect the contamination sensor plug cable connector from the pump.
2. Open the all stop valves in suction pipings. Loosen the contamination sensor plug: plug hole appears.

NOTE: Once the contamination sensor plug is completely removed, hydraulic oil may spout. Take care.

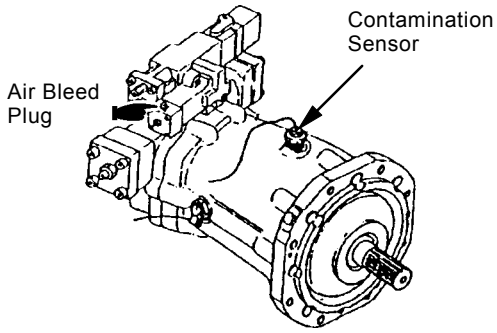
: 36 mm

3. Bleed air until only hydraulic oil oozes around the contamination sensor plug thread.
4. Tighten the contamination sensor plug.
   : 118 N·m (12 kgf·m)
5. Connect the contamination sensor plug cable connector to the pump.

- Remove the air bleeding plug from the top of the pump and fill the pump housing with hydraulic oil.
- After the pump housing is filled with hydraulic oil, temporarily tighten the plug. Then, start the engine and run at slow idle speed.
- Slightly loosen the plug to bleed air from the pump housing until hydraulic oil oozes out.
- After bleeding all the air, securely tighten the plug.

- Bleeding Air from Travel Motor, Swing Motor
  - With the upper travel motor, swing motor drain plug removed, fill the motor case with hydraulic oil.

- Bleeding Air from Hydraulic Circuit
  - After refilling hydraulic oil, start the engine. While operating each cylinder, swing motor and travel motor evenly, operate the machine under light loads for 10 to 15 minutes. Slowly start each operation (never fully stroke the cylinders during initial operation stage). As the pilot oil circuit has an air bleed device, air trapped in the pilot oil circuit will be bled while performing the above operation for approx. 5 minutes.
  - Reposition the front attachment to check hydraulic oil level.
  - Stop the engine. Recheck hydraulic oil level. Replenish oil as necessary.



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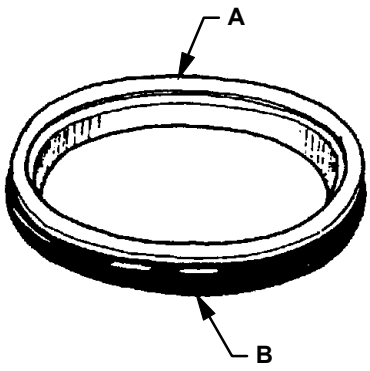
Floating Seal Precautions

1. In general, replace the floating seal with a new one.
   If the floating is to be reused, follow these procedures:

   (1) Keep seal rings together as a matched set with seal ring faces together. Insert a piece of cardboard to protect surfaces.

   (2) Check the seal ring face (A) for scuffing, scoring, corrosion, deformation or uneven wear.

   (3) Check O-ring (B) for tears, breaks, deformation or hardening.



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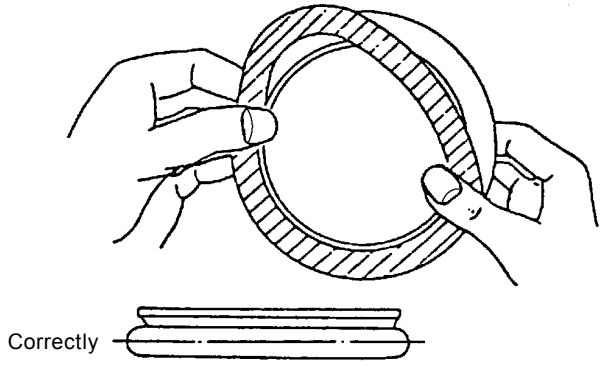
2. If incorrectly assembled, oil leakage or damage will occur. Be sure to do the following, to prevent trouble.

   (1) Clean the floating seal and seal mounting bores with cleaning solvent.
   Use a wire brush to remove mud, rust or dirt.
   After cleaning, thoroughly dry parts with compressed air.

   (2) Clean the floating seal and seal mounting bores, as dust on them tends to enter the floating seal when installing it.

   (3) Check that the O-ring is not twisted, and that it is installed correctly on the seal ring.

   (4) After installing the floating seal, check that seal ring surface (C) is parallel with idler face (D) by measuring the distances (C) and (D) at point (a) and (b), as illustrated. If these distances differ, correct the O-ring seating.



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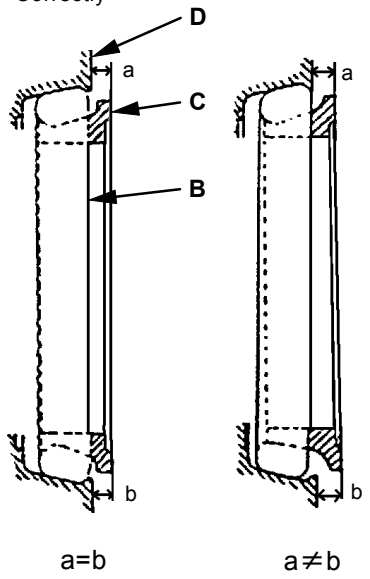

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TIGHTENING TORQUE SPECIFICATIONS

	Descriptions	Bolt Dia (mm)	Qty	Wrench Size (mm)	Torque		
					N·m	kgf·m	lbf·ft
1	Engine cushion rubber mounting bolt	33	4	50	2550	260	1880
2	Engine bracket mounting bolt	27 u 003/4	24 4	41 28.6	1030 441	105 45	760 325
3	Hydraulic oil tank mounting bolt	30	12	46	1420	145	1050
4	Fuel tank mounting bolt	30	18	46	1420	145	1050
5	Pump transmission mounting bolt	16	24	24	206	21	150
6	Pump mounting bolt/nut	20 16	40 64	46 24	392 206	40 21	290 150
7	Control valve mounting bolt	20	12	30	392	40	290
8	Swing device mounting bolt (Main frame) (Truck frame)	33 24	56 96	50 36	2250 686	260 70	1880 510
9	Swing motor mounting bolt	20	16	30	392	40	290
10	Battery mounting bolt	6	24	10	21	2	15
11	Cab mounting bolt	18	8	27	294	30	220
12	Cab bed mounting bolt	12	43	19	108	11	80
13	Swing bearing mounting bolt	56	60	85	9800	1000	7230
14	Counterweight mounting bolt	56	11	85	6860	700	5060
15	Engine unit mounting bolt	33	60	50	2550	260	1880
16	Engine cover support mounting bolt	16	32	24	265	27	195
17	Radiator mounting bolt	27	16	41	1370	140	1010
18	Travel device cover mounting bolt (A) (B) (C)	30 39 20	24 56 36	46 60 30	1910 4410 392	195 450 40	1410 3255 290
19	Travel motor mounting bolt	20	16	30	392	40	290
20	Upper roller mounting bolt	24	48	36	686	70	510
21	Lower roller mounting bolt	45	32	70	4700	480	3470
22	Truck pin	30	152	46	1911	195	1410
23	Side frame mounting bolt	56	68	85	9800	1000	7230
24	Front attachment pin	24 20	28 72	36 30	686 392	70 40	510 290

NOTE: 1. Apply lubricant (e.g.white zinc B solved into spindle oil) to bolts and nuts to stabilize friction coefficient of them.

2. Make sure bolt and nut threads are clean before installing.

TORQUE CHART

CAUTION: Use tools appropriate for the work to be done. Makeshift tools and procedures can create safety hazards. For loosening and tightening nuts and bolts, use correct size tools. Otherwise, tightening tools may slip, potentially causing personal injury.

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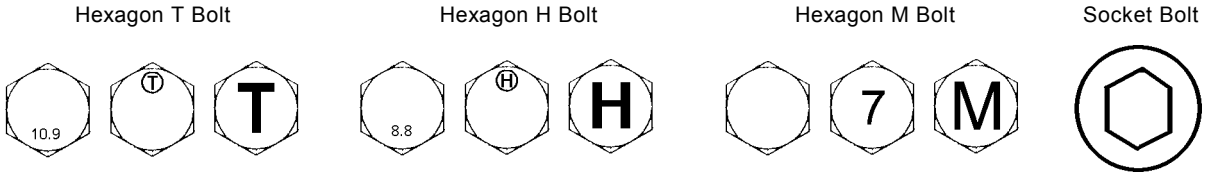
Bolt Types

Tighten nuts or bolts correctly to torque specifications. Four different types and grades of bolt are employed. Make sure to employ correct bolts and tighten them correctly when assembling the machine or components.



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Specified Tightening Torque Chart

Bolt Dia.	Wrench Size	Hexagon Wrench Size	T Bolt, Socket Bolt			H Bolt			M Bolt		
			N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M 8	13	6	29.5	3	22	19.5	2	14.5	9.8	1	7.2
M 10	17	8	64	6.5	47	49	5	36	19.5	2	14.5
M 12	19	10	108	11	80	88	9	65	34	3.5	25.5
M 14	22	12	175	18	130	137	14	101	54	5.5	40
M 16	24	14	265	27	195	205	21	152	78	8	58
M 18	27	14	390	40	290	295	30	220	118	12	87
M 20	30	17	540	55	400	390	40	290	167	17	123
M 22	32	17	740	75	540	540	55	400	215	22	159
M 24	36	19	930	95	690	690	70	505	275	28	205
M 27	41	19	1370	140	1010	1030	105	760	390	40	290
M 30	46	22	1910	195	1410	1420	145	1050	540	55	400
M 33	50	24	2550	260	1880	1910	195	1410	740	75	540
M 36	55	27	3140	320	2310	2400	245	1770	930	95	690

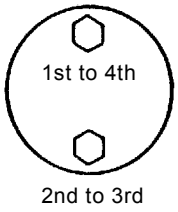
IMPORTANT: The following items are applied to both fine and coarse pitch threads.

1. **Apply lubricant (i. e. white zinc B dissolved Into Spindle oil) to nuts and bolts to reduce their friction coefficients.**
   The plated bolts require no lubricant.
2. **Torque tolerance is ±10 %.**
3. **Be sure to use bolts of correct length. Bolts that are too long cannot be tightened, as the bolt tip comes into contact with the bottom of the bolt hole. Bolts that are too short cannot develop sufficient tightening force.**
4. **The torques given in the chart are for general use only. Do not use these torques if a different torque is given for a specific application.**
5. **Make sure that nut and bolt threads are clean before installing.**
   Remove dirt or corrosion, if any.

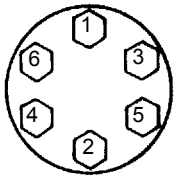
Bolt Tightening Order

When tightening two or more bolts, tighten them alternately, as shown, to ensure even tightening.

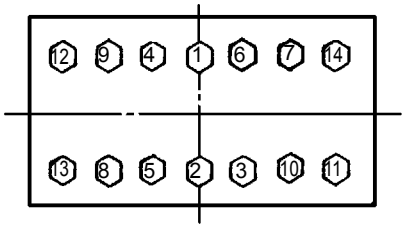
Equally tighten upper and lower alternately



Tighten diagonally



Tighten from center and diagonally



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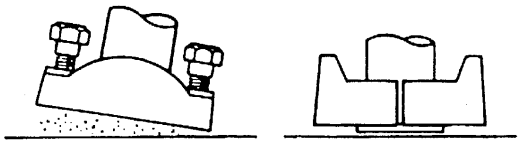
Service Recommendations for Split Flange

IMPORTANT:
(1) Be sure to clean and inspect sealing surfaces. Scratches / roughness cause leaks and seal wear. Unevenness causes seal extrusion. If defects cannot be polished out, replace the component.
(2) Be sure to use only specified O-rings. Inspect O-rings for any damage. Take care not to file O-ring surfaces. When installing an O-ring into a groove, use grease to hold it in place.
(3) Loosely assemble split flange halves. Make sure that the split is centrally located and perpendicular to the port. Hand-tighten the bolts to hold the parts in place. Take care not to pinch the O-ring.
(4) Tighten bolts alternately and diagonally, as shown, to ensure even tightening.
(5) Do not use air wrenches. Using an air wrench often causes tightening of one bolt fully before tighten the others, resulting in damage to O-rings or uneven tightening of bolts.



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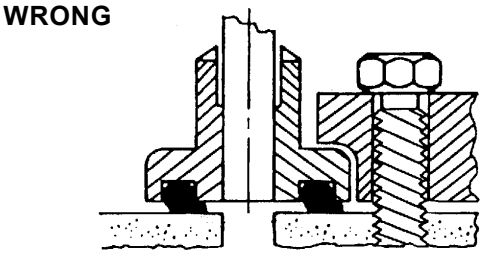

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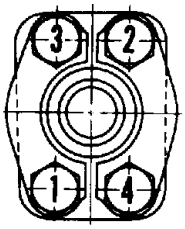

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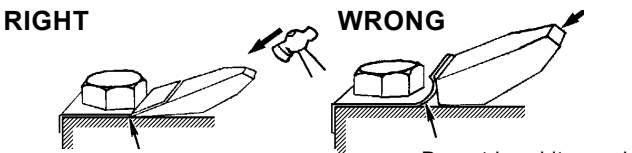
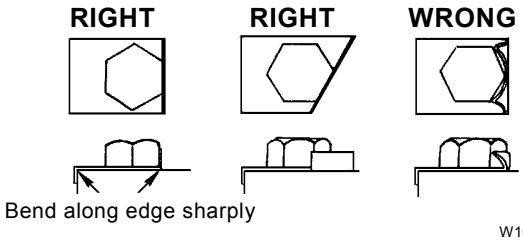
Nut and Bolt Lockings

• Lock Plate

IMPORTANT: Do not reuse lock plates. Do not try to bend the same point twice.





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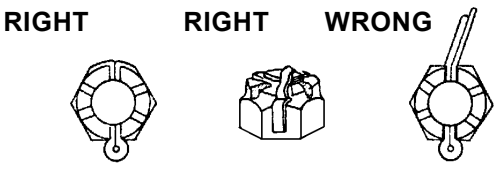
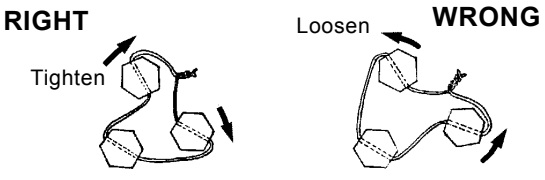
• Cotter Pin

IMPORTANT: Do not reuse cotter pins. Match the holes in the bolt and nut while tightening, not while loosening.



• Lock Wire

IMPORTANT: Apply wire to bolts in the bolt-tightening direction, not in the bolt-loosening direction.



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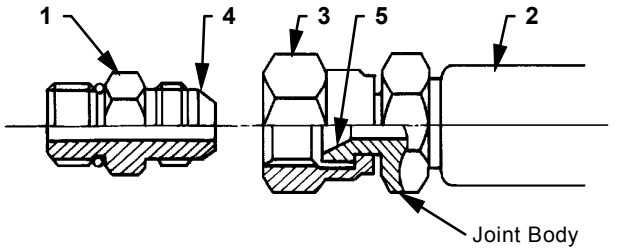
PIPING JOINT

IMPORTANT: The torques given in the chart are for general use only.
Do not use these torques if a different torque is given for a specific application.



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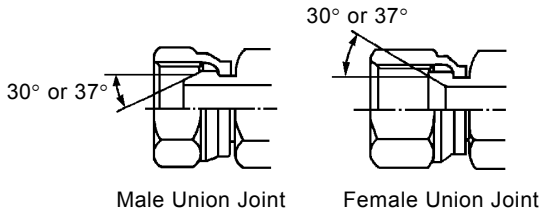
Pipe Thread Connection / Union Joint Tightening Torque Specifications

Union Joint

Metal sealing faces (4) and (5) of adaptor (1) and hose (2) fit together to seal pressure oil. Union joints are used to join small-diameter lines.



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IMPORTANT: (1) Do not over-tighten union nut (3). Excessive force will be applied to metal sealing surfaces (4) and (5), possibly cracking adaptor (1). Be sure to tighten union nut (3) to specifications.

(2) Scratches or other damage to sealing surfaces (4) or (5) will cause oil leakage at the joint. Take care not to damage them when connecting /disconnecting.

Type	Wrench Size		Tightening Torque	
	Union Nut	Joint Body	N·m (kgf·m)	lbf·ft
30° Male Union Joint	19	19	59 (6)	43
	22	22	98 (10)	72
	27	27	118 (12)	87
	36	36	235 (24)	134
	41	41	295 (30)	215
	50	50	490 (50)	360
	60	60	670 (68)	490
	70	70	980 (100)	720
37° Female Union Joint	19	17	44 (4.5)	32.5
	22	19	59 (6)	43
	27	22	118 (12)	87
	36	30, 32	235 (24)	134
	41	36	295 (30)	215
	50	46	490 (50)	360

NOTE: Tightening torque for the non-union type 37 ° male joint is the same as the 37 ° female union joint.

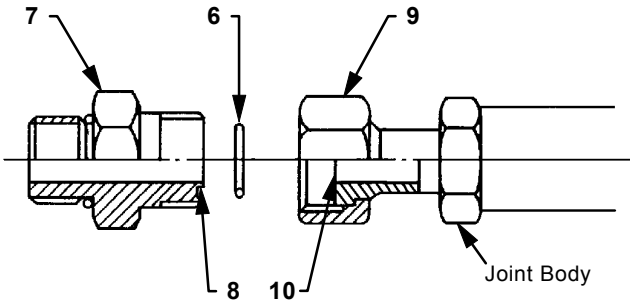
O-Ring Seal Joint
O-ring (6) seats against the end face of adaptor (7) to seal pressure oil.

IMPORTANT: (1) Be sure to replace O-ring (6) with a new one when reconnecting.

(2) Before tightening union nut (9), confirm that O-ring (6) is seated correctly in O-ring groove (8). Tightening union nut (9) with O-ring (6) displaced will damage O-ring (6), resulting in oil leakage.

(3) Take care not to damage O-ring groove (8) or sealing face (10). Damage to O-ring (6) will cause oil leakage.

(4) If union nut (9) is found to be loose, causing oil leakage, do not tighten it to stop the leak. Instead, replace O-ring (6) with a new one, then tighten union nut (9) after confirming that O-ring (6) is securely seated in place.



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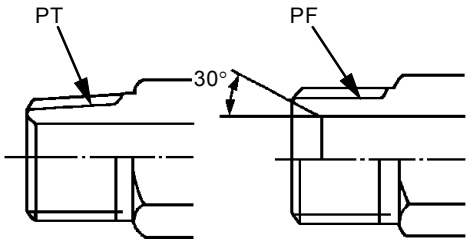
Wrench Size		Tightening Torque	
Union Nut	Joint Body	N·m (kgf·m)	lbf·ft
19	17	59 (6)	43
22	19	98 (10)	72
27	22	118 (12)	87
36	30, 32	235 (24)	134
41	36	295 (30)	215
50	46	490 (50)	360

Screwed-In Connection

IMPORTANT: Many types of screwed-in connections are used for hose connections. Be sure to confirm that the thread pitch and thread type (tapered or straight) are the correct type before using any screw-in connection.



Male Tapered Thread Male Straight Thread

W105-01-01-018

Male Tapered Thread		
Wrench	Tightening Torque	
Joint Body	N·m (kgf·m)	lbf·ft
17, 19	59 (6)	43
19, 22	98 (10)	72
27, 22	118 (12)	87
36, 32	235 (24)	134
41	295 (30)	215
50	490 (50)	360
60	670 (68)	490
70	980 (100)	720

Seal Tape Application

Seal tape is used to seal clearances between male and female threads, so as to prevent any leakage between threads.

Be sure to apply just enough seal tape to fill up thread clearances. Do not overwrap.

Internal Thread

External Thread Clearance

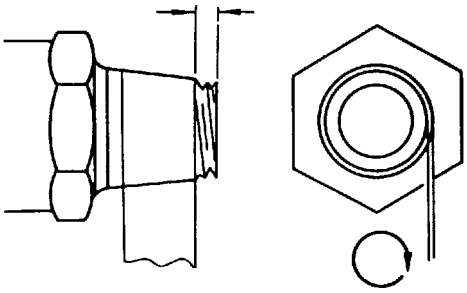
W105-01-01-019

- Application Procedure

  Confirm that the thread surface is clean, free of dirt or damage.

  Apply seal tape around threads as shown. Wrap seal tape in the same direction as the threads.

Leave one to two pitch threads uncovered



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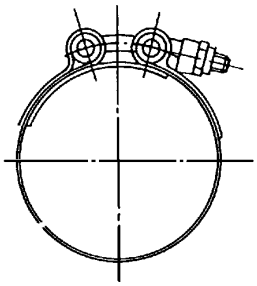
Low-Pressure-Hose Clamp Tightening Torque

Low-pressure-hose clamp tightening torque differs depending on the type of clamp.

See below for correct tightening torque of each type of low-pressure-hose clamp.

T-Bolt Type Band Clamp:
4.4 N·m (0.45 kgf·m, 3.25 lbf·ft)
Worm Gear Type Band Clamp:
5.9 to 6.9 N·m (0.6 to 0.7 kgf·m, 4.3 to 5.1 lbf·ft)

T-Bolt Type



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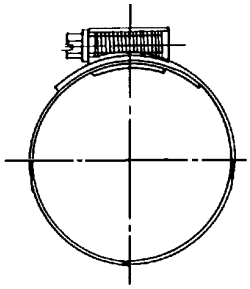
Worm Gear Type



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Connecting Hose

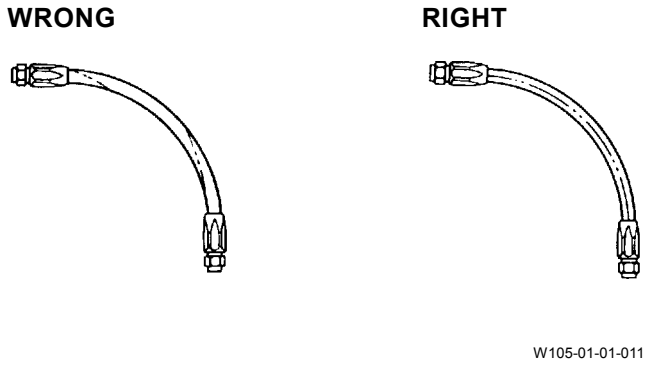
CAUTION:

(1) When replacing hoses, be sure to use only genuine Hitachi service parts. Using hoses other than genuine Hitachi hoses may cause oil leakage, hose rupture or separation of fitting, possibly resulting in a fire on the machine.

(2) Do not install hoses kinked. Application of high oil pressure, vibration, or an impact to a kinked hose may result in oil leakage, hose rupture or separation of fitting. Utilize print marks on hoses when installing hoses to prevent hose from being installed kinked.

(3) If hoses rub against each other, wear to the hoses will result, leading to hose rupture. Take necessary measures to protect hoses from rubbing against each other.

Take care that hoses do not come into contact with moving parts or sharp objects.



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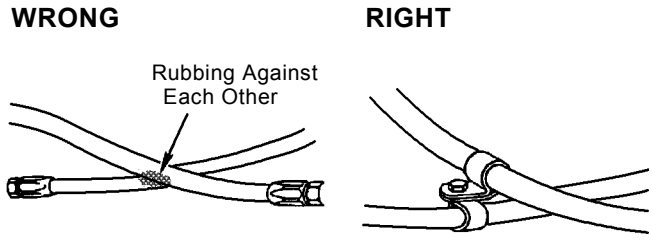

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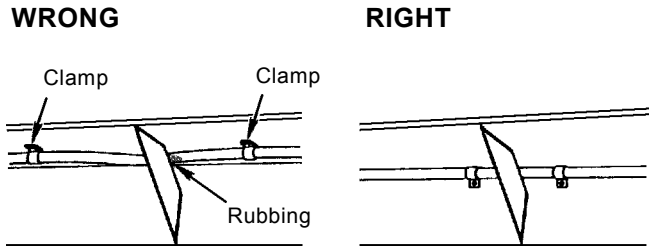

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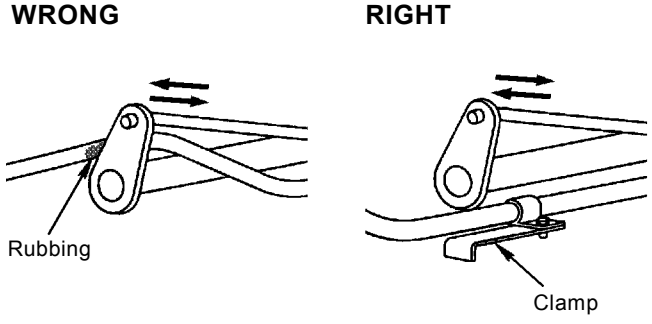

W105-01-01-014

*** REFEREVCE: Major Parts to Be Replaced at Regular Intervals.**

The parts listed below deteriorate as the machine ages and are worn out or fatigued by repeated loads, resulting in possible severe personal injury and/or machine trouble. The service life of these parts can not be detected through machine operation or visual inspection.

Therefore, these parts should be replaced at regular intervals even if no abnormalities are noticed. In case any abnormalities are found on a part at any time regardless of its specified replacement interval, immediately replace the part.

Periodic Replacement Parts			Replacement Intervals
Engine		Fuel hose (Fuel tank to filter)	Every 2 years
		Fuel hose (Fuel tank to injection pump)	Every 2 years
		Heater hose (Heater to engine)	Every 2 years
Hydraulic System	Basic Machine	Pump suction hose	Every 2 years
		Pump delivery hose	Every 2 years
	Front-End Attachment	Motor line hose	Every 2 years
		Cylinder line hose	Every 2 years
		Pilot hose	Every 2 years

IMPORTANT: Be sure to replace seals, such as O-rings and hose clamp along with replacing hoses. Each hose has an individual service life. If any abnormalities are found during the regular interval check and/or maintenance service, be sure to replace with a new one.

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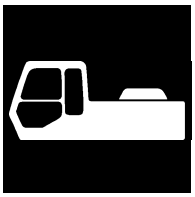
SECTION 2
UPPERSTRUCTURE



—CONTENTS—

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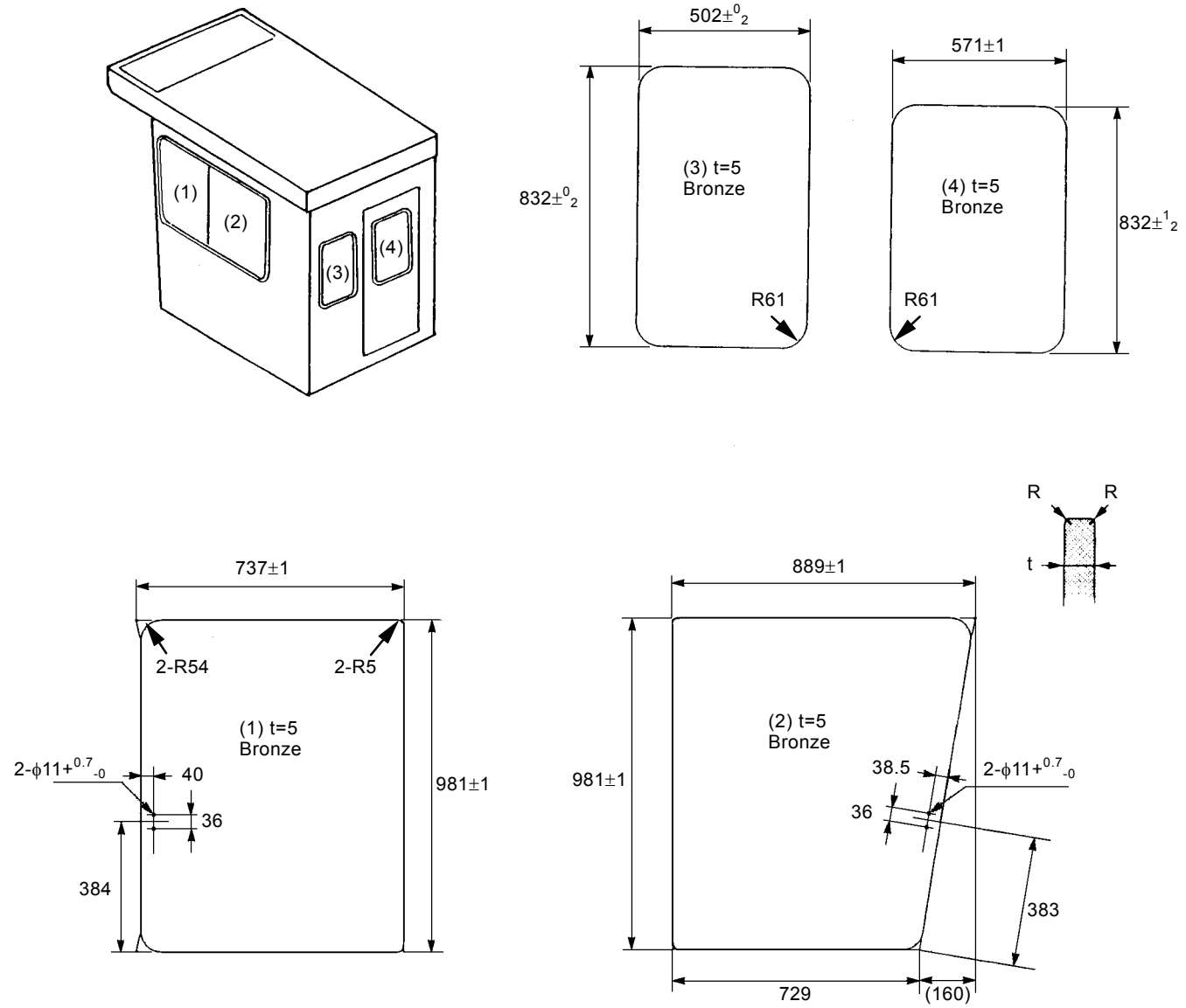
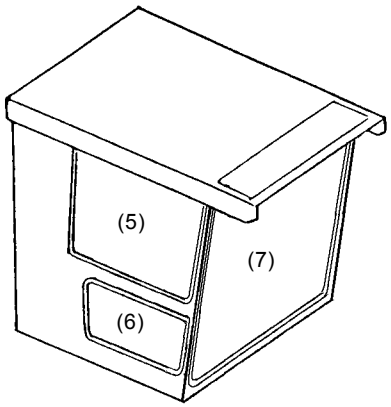
WINDOWPANE DIMENSIONS

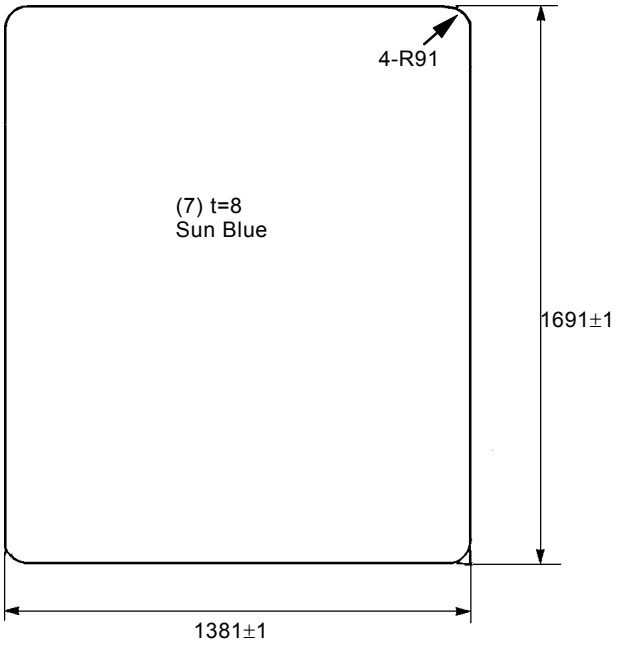
Unit: mm

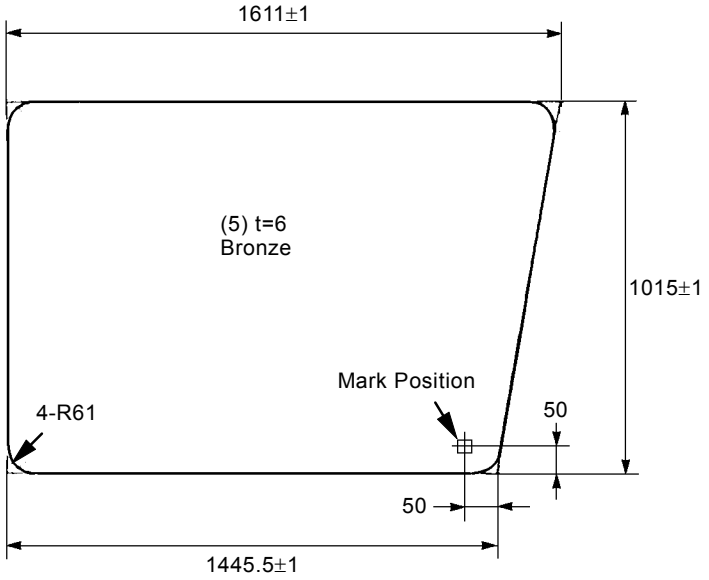


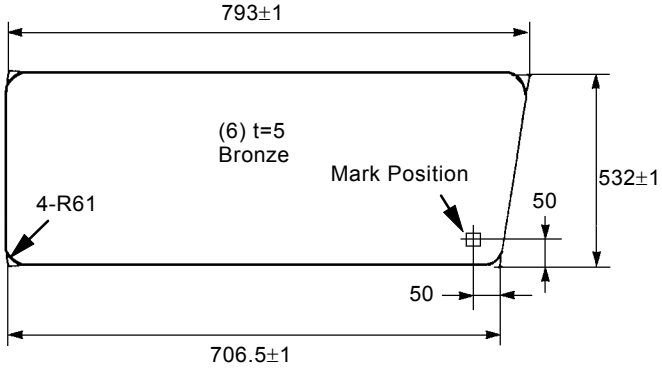
W145-02-01-001

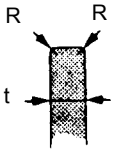
NOTE: 1 in=0.03937 mm











W145-02-01-002

REMOVE AND INSTALL FUEL TANK

Removal

1. Remove the plug located underneath the fuel tank. Then, open the cock to drain fuel.

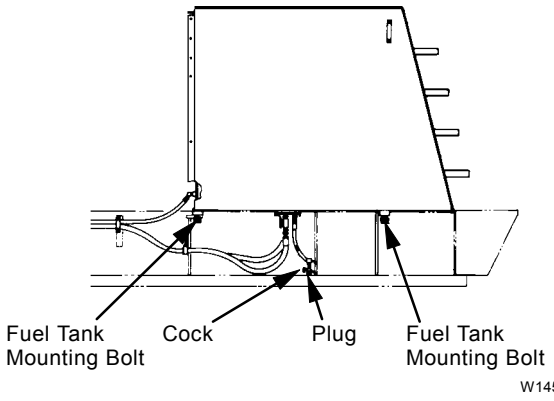
NOTE: Fuel tank capacity: 1320 US gal (5000 L)

2. Disconnect electrical harness and all piping from the fuel tank.
3. Remove the lubrication device from the fuel tank.

CAUTION: Fuel tank weight: 1810 kg (3990 lb)

4. Remove fuel tank mounting bolts, then remove the fuel tank.

: 46 mm
: 1400 N·m (145 kgf·m, 1050 lbf·ft)



W145-02-02-001

Installation

1. Install the fuel tank using mounting bolts.
2. Install the lubrication device to the fuel tank.
3. Connect electrical harness and all piping to the fuel tank.

REMOVE AND INSTALL HYDRAULIC OIL TANK

Removal

1. Remove the plug located underneath the hydraulic oil tank. Then, open the cock to drain hydraulic oil.

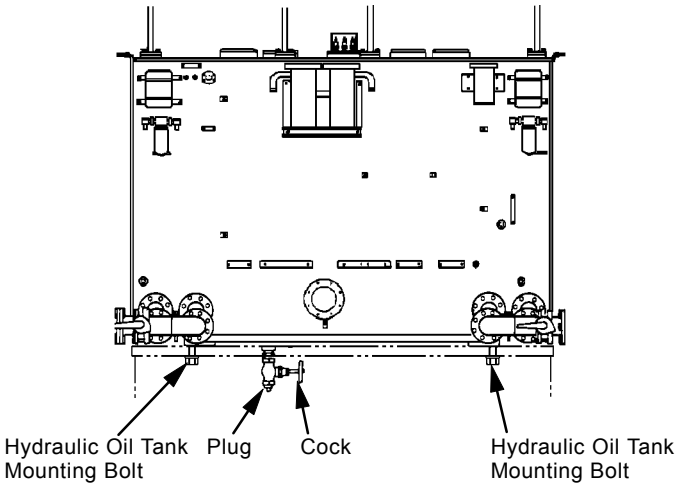
NOTE: Hydraulic tank capacity: 422 US gal (1600 L)

2. Disconnect electrical harness and all piping from the hydraulic oil tank.

CAUTION: Hydraulic oil tank weight: 2840 kg (6260 lb)

3. Remove hydraulic oil tank mounting bolts, then remove the hydraulic oil tank.

: 46 mm
: 1400 N·m (145 kgf·m, 1050 lbf·ft)



W145-02-02-002

Installation

1. Install the hydraulic oil tank using mounting bolts.
2. Connect electrical harness and all piping to the hydraulic oil tank.

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REMOVE AND INSTALL PUMP DEVICE

CAUTION:
Escaping fluid under pressure can penetrate the skin, causing serious injury.
Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines.

Hydraulic oil may be hot just after operation. Hot hydraulic oil may spout, possibly causing severe burns. Be sure to wait for oil to cool before starting work.

Preparation

1. Park the machine on a firm, level surface.

2. Stop the engine. Move all control levers to release pressure remaining in the system. Rotate the air release cock on top of the hydraulic oil tank to release any remaining pressure.

3. Close the all stop valves for hydraulic pipings

Remove Pump Device

1. Disconnect electrical harness and all piping from the pump device.

2. Attach crane to the pump device using a sling. Then, lift and hold the pump device.

CAUTION: Pump device weight: 194 kg (428 lb)

3. Remove pump mounting bolts. Then, remove the pump using removing bolts (M12, length 45 mm).

: 24 mm

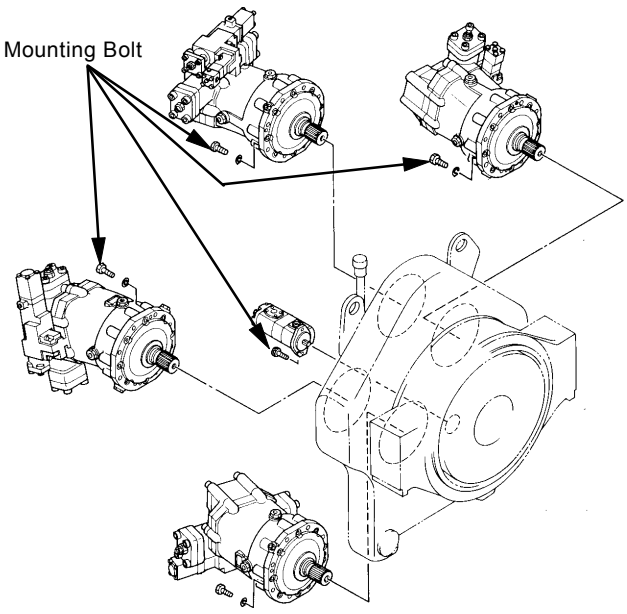
: 206 N·m (21 kgf·m, 152 lbf·ft)

Install Pump Device

1. Install the pump using mounting bolts.

2. Connect electrical harness and all piping to the pump.

IMPORTANT: Be sure to perform a break-in operation after installing the pump to prevent premature pump seizure. Refer to W2-3-16.



W145-02-03-001