

UNIC

WORK SHOP MANUAL

URW376C1U

URW546C1U

FURUKAWA UNIC CORPORATION

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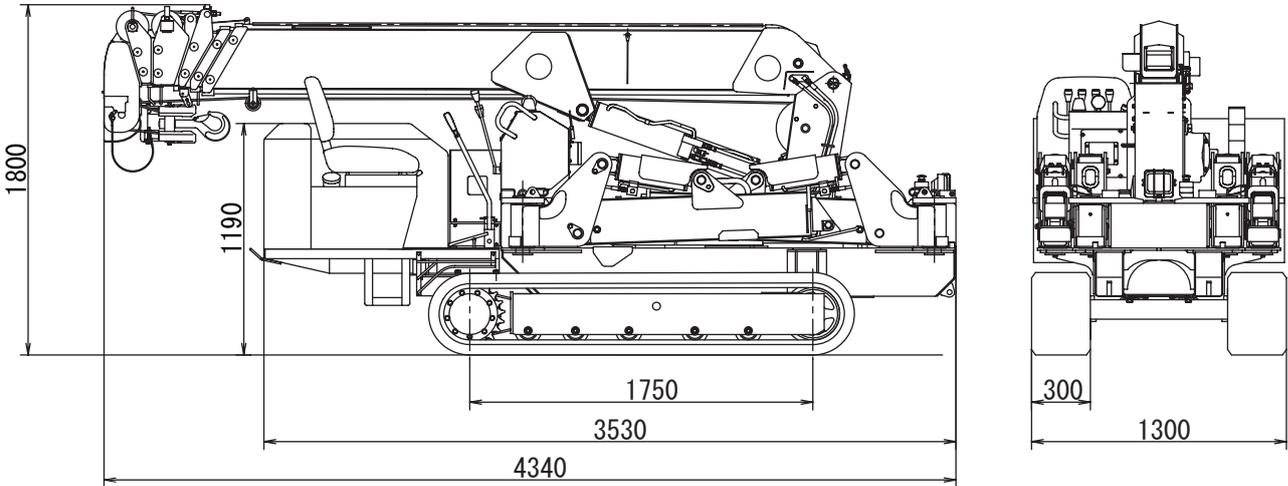
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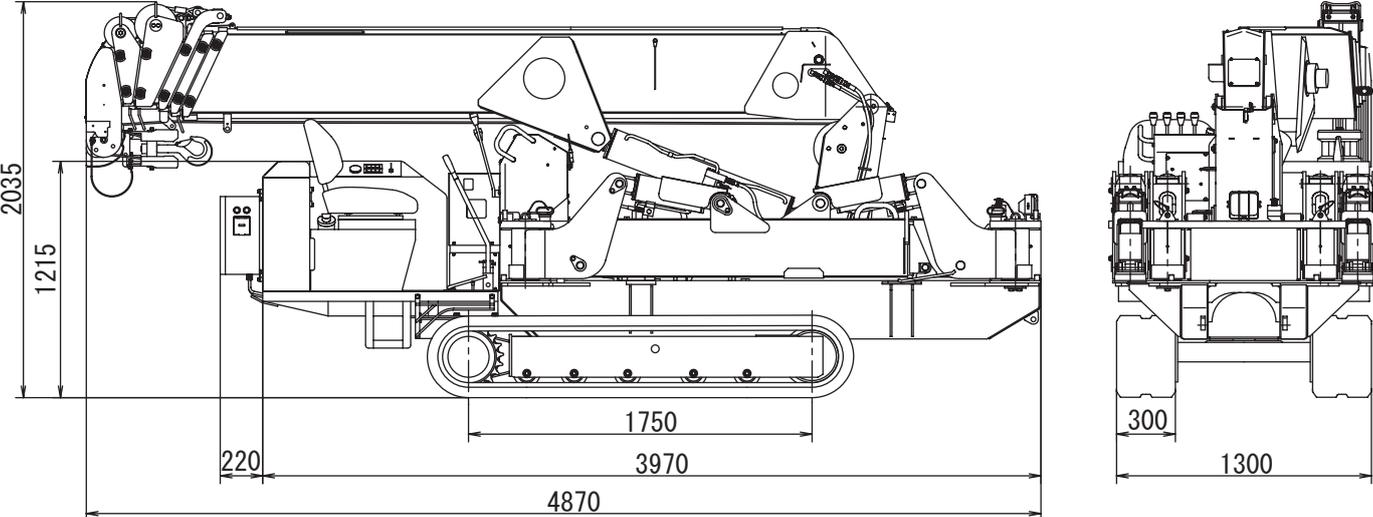
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1. GENERAL VIEW

URW376C



URW546C



1 URW376C1U(6-section boom)

(Speed indicated in the table below is at oil temperature range of 113~131°F(45~55°C), operating with no-load, and at rated pump discharge.)

Major specifications

Crane capacity (Net rated load)		6610 lbs(3.0t) × 8.0ft(2.5m) (With outriggers, extended fully)
Maximum lift above ground (Hook)		48.8ft(14.9m)
Boom to be extended to:		11.9ft~19.2ft~26.4ft~33.6ft~40.8ft~47.9ft
Maximum working radius		47.4ft(14.45m)
Speed of winding-up (Rope speed)		223ft(68m)/min (At 4th layer on the drum)
Hoisting speed of hook		55.8ft(17m)/min (At 4th layer on the drum, with 4-part line hooking)
Extending speed of boom		36ft(10.98m)/23sec
Raising speed of boom		0° ~ 80°/10sec
Slewing speed		2.5rpm
Slewing range		360°(continuous)
Hoisting rope	Construction	IWRC6 × WS(26) calss B[Breaking load:42.4kN (9520 lbf(4320kgf))]
	Diameter×length	5/16in.(8mm) × 254ft(75.5m)
Outrigger	Horizontal	Direct pushing by double acting hydraulic cylinder (directly connected to hydraulic automatic locking device)
	Vertical	Direct pushing by double acting hydraulic cylinder (directly connected to hydraulic automatic locking device)
Hydraulic pump	Rated pressure	Crane: 20.6MPa 2987psi(210kgf/cm ²) Crawl: 21.6MPa 3130psi(220kgf/cm ²)
	Rated discharge	Approx. 15.9gal/min (60 ℓ/min)
	Rated rotation	Approx. 2100rpm
Hydraulic oil tank Capacity		18.5gal(70 liters)

MAJOR SPECIFICATIONS

Equipment and construction

Boom telescoping	Boom:6-section, Hexagonal box beam
	Telescoped by direct pushing of double acting hydraulic cylinder together with by wire rope (With hydraulic automatic locking device) (2nd section : sequential actuation, 3rd, 4th, 5th & 6th sections: simultaneous actuation)
Boom derricking	Direct pushing by hydraulic cylinder (With hydraulic automatic locking device)
Hoisting	Hydraulic motor: Axial plunger type
	Reduction gears: Spur-gear reduction
	Brake: Automatic mechanical brake
Slewing	Hydraulic motor: Axial plunger type
	Reduction gears: Worm-gear+Spur-gear reduction (Supported by ball bearings)
	Brake: Worm self-lock
Hydraulic pump	Variable delivery piston pump
Hooking capacity	6610 lbs.(3.0t) Number of slinging rope: 4
Safety devices	Safety valve for hydraulic circuit
	Hydraulic automatic lock
	Automatic stop for overwinding
	Overwinding alarm
	Slewing automatic lock
	Automatic stop for leaving minimum wire rope
	Load indicator (With angle meter)
	Alarm buzzer
	Retaining mechanism to prevent wire rope from disengagement
	Interlock for crane-crawl operation
	Crane/outrigger interlocking device
	Checker for outrigger rotary set pin insertion
	Digital load meter
	Emergency stop button
U-AOL system	
Level	
Weight	Approx. 8490 lbs.(3850kg)

Crawling device

Crawling	Endless rubber crawler
Crawler	11.8in.×2in.×88links(300×52.5×88)
Length of ground contact	5.74ft(1750mm)
Pressure of ground contact	36.0kPa (5.3psi(0.37kgf/cm ²))
Crawling speed	Forward/Backward: 0~1.8mph(0~3km/h)
Hill-climbing ability	23°
Engine	Rated output23.5hp(17.5kW)/2100rpm (23.8PS/2100rpm)
Crawling	Independently driven by hydraulic power
Parking brake	Disc brake with hydraulic motor built-in
Starting engine	Electric starter
Fuel tank	Capacity:10.6gal(40 liters)

MAJOR SPECIFICATIONS

Chart of net rated load

Net rated loads chart

BOOM SECTION		1 • 1+2										
WORKING RADIUS(ft)		6.5	8.0	10.0	11.0	13.0	15.0	17.0	18.6			
RATED	OUTRIGGERS MAX EXT	6680	6680	5150	4570	3760	3180	2780	2420			
LOAD(lbs)	OUTRIGGERS NOT MAX EXT	6680	6680	4730	3700	2550	2000	1500	1100			
BOOM SECTION		1+2+3										
WORKING RADIUS(ft)		8.5	10.0	11.0	13.0	15.0	16.0	18.0	20.0	23.0	25.8	
RATED	OUTRIGGERS MAX EXT	5000	4580	3950	3150	2710	2500	2160	1870	1580	1360	
LOAD(lbs)	OUTRIGGERS NOT MAX EXT	4880	4500	3800	2770	2250	2000	1500	1130	720	480	
BOOM SECTION		1+2+3+4										
WORKING RADIUS(ft)		13.0	15.0	16.0	20.0	23.0	26.0	30.0	33.0			
RATED	OUTRIGGERS MAX EXT	2330	2080	1960	1650	1430	1220	1080	900			
LOAD(lbs)	OUTRIGGERS NOT MAX EXT	2330	1810	1540	1050	740	560	330	260			
BOOM SECTION		1+2+3+4+5										
WORKING RADIUS(ft)		15.0	16.0	20.0	23.0	26.0	30.0	33.0	36.0	40.2		
RATED	OUTRIGGERS MAX EXT	1670	1480	1100	920	820	710	650	590	570		
LOAD(lbs)	OUTRIGGERS NOT MAX EXT	1670	1480	910	610	470	340	260	200	80		
BOOM SECTION		1+2+3+4+5+6										
WORKING RADIUS(ft)		16.0	18.0	20.0	23.0	26.0	30.0	33.0	36.0	39.0	43.0	47.3
RATED	OUTRIGGERS MAX EXT	720	660	610	550	510	470	410	370	350	300	280
LOAD(lbs)	OUTRIGGERS NOT MAX EXT	720	660	610	550	450	290	240	170	130	110	80

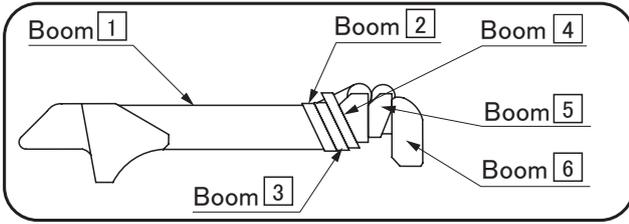
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Points to notice, Rated load

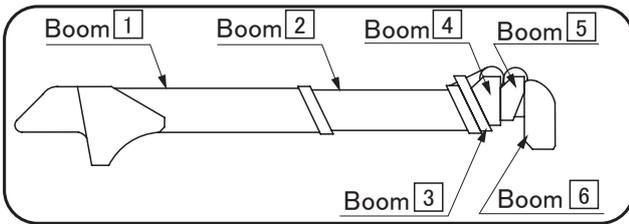
- The net rated load is performance when the crane is placed level and is based on actual working radius including boom deflection under loaded. The net rated load is also based on strength and stability of the crane.
- 'Outriggers max ext' means the state that the inner box is extended to the position where the 2nd ● mark is visible.
- 'Outriggers not max ext' means the state that the inner box is extended to the position where the 2nd ● mark is invisible.
- When each of 4 outriggers has been set to different extension, operate the crane by using the worst extended capacity.
- When each of boom sections being extended is exceeded even slightly, operate it by application of the capacity for the next boom section.
- Boom $1+2+3+4$ means that the boom is extended to the position where the 1st ▼ mark on the 4th boom-section is visible.
- Boom $1+2+3+4+5$ means that the boom is extended to the position where the 2nd ▼ mark on the 4th boom-section is visible.
- Operate the crane using the rated load capacity data under the boom extension of:
 $1+2+3+4$ when the ▼ mark on the 3rd boom-section goes beyond the 2nd boom section, regardless of the displacement, $1+2+3+4+5$ when the 1st ▼ mark on the side plate of the 4th boom-section goes beyond the 3rd boom-section, regardless of the displacement, $1+2+3+4+5+6$ when the 2nd ▼ mark on the side plate of the 4th boom-section goes beyond the 3rd boom-section, regardless of the displacement.

MAJOR SPECIFICATIONS

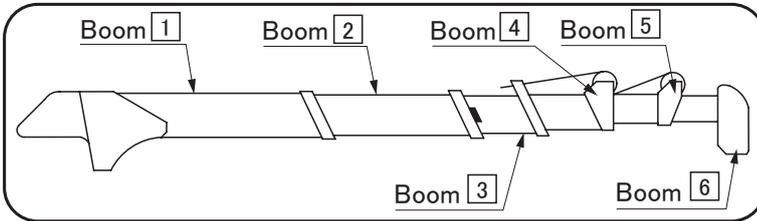
● Operating condition of booms;



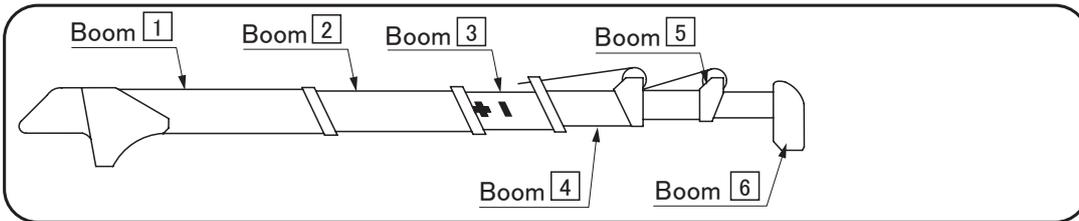
Boom 1 :
All booms are completely retracted.



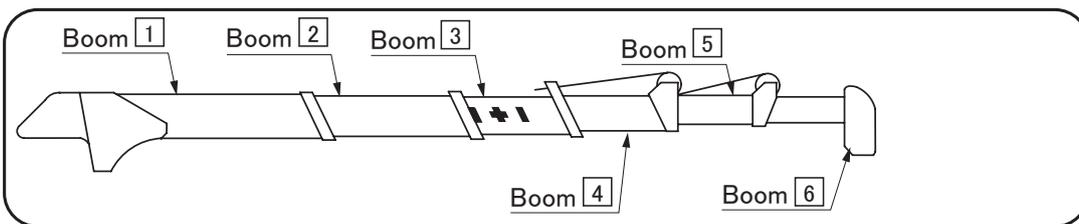
Boom 1+2 or 2 :
Boom 2 is extended.



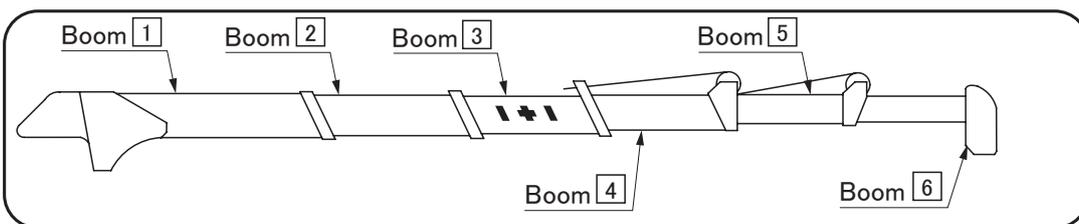
Boom 1+2+3 or 3 :
Boom is extended to the mark \ on the side plate of Boom 3.



Boom 1+2+3+4 or 4 :
Boom is extended to where 2nd mark on the side plate of Boom 3 is visible.



Boom 1+2+3+4+5 or 5 :
Boom is extended to where 3rd mark on the side plate of Boom 3 is visible.



Boom 1+2+3+4+5+6 or 6 :
Boom 2, 3, 4, 5 and 6 are all extended to their extremes.

1 URW546C1U(6-section boom)

(Speed indicated in the table below is at oil temperature range of 113~131°F(45~55°C), operating with no-load, and at rated pump discharge.)

Major specifications

Crane capacity (Net rated load)		8810 lbs(4.0t) × 8.0ft(2.5m) (With outriggers, extended fully)
Maximum lift above ground (Hook)		52.5ft(16.0m)
Boom to be extended to:		12.8ft~20.7ft~28.6ft~36.2ft~43.8ft~51.5ft
Maximum working radius		50.9ft(15.52m)
Speed of winding-up (Rope speed)		183ft(56m)/min (At 5th layer on the drum)
Hoisting speed of hook		46ft(14m)/min (At 5th layer on the drum, with 4-part line hooking)
Extending speed of boom		38.6ft(11.78m)/35sec
Raising speed of boom		0° ~ 80°/18sec
Slewing speed		2.5rpm
Slewing range		360°(continuous)
Hoisting rope	Construction	IWRC6 × WS(26) O/O B[Breaking load:42.4kN (10515 lbf(4770kgf))]
	Diameter×length	5/16in.(8mm) × 300ft(91.5m)
Outrigger	Horizontal	Direct pushing by double acting hydraulic cylinder (directly connected to hydraulic automatic locking device)
	Vertical	Direct pushing by double acting hydraulic cylinder (directly connected to hydraulic automatic locking device)
Hydraulic pump	Rated pressure	Crane: 20.6MPa 2987psi(210kgf/cm ²) Crawl: 21.6MPa 3130psi(220kgf/cm ²)
	Rated discharge	Approx. 15.9gal/min (60 ℓ/min)
	Rated rotation	Approx. 2100rpm
Hydraulic oil tank Capacity		18.5gal(70 liters)

MAJOR SPECIFICATIONS

Equipment and construction

Boom telescoping	Boom:6-section, Hexagonal box beam
	Telescoped by direct pushing of double acting hydraulic cylinder together with by wire rope (With hydraulic automatic locking device) (2nd section : sequential actuation, 3rd, 4th, 5th & 6th sections: simultaneous actuation)
Boom derricking	Direct pushing by hydraulic cylinder (With hydraulic automatic locking device)
Hoisting	Hydraulic motor: Axial plunger type
	Reduction gears: Spur-gear reduction
	Brake: Automatic mechanical brake
Slewing	Hydraulic motor: Axial plunger type
	Reduction gears: Worm-gear+Spur-gear reduction (Supported by ball bearings)
	Brake: Worm self-lock
Hydraulic pump	Variable delivery piston pump
Hooking capacity	8810 lbs(4.0t) Number of slinging rope: 4
Safety devices	Safety valve for hydraulic circuit
	Hydraulic automatic lock
	Automatic stop for overwinding
	Overwinding alarm
	Slewing automatic lock
	Automatic stop for leaving minimum wire rope
	Load indicator (With angle meter)
	Alarm buzzer
	Retaining mechanism to prevent wire rope from disengagement
	Interlock for crane-crawl operation
	Crane/outrigger interlocking device
	Checker for outrigger rotary set pin insertion
	Digital load meter
	Emergency stop button
	U-AOL system
Level	
Weight	Approx. 10820 lbs(4910kg)

Crawling device

Crawling	Endless rubber crawler
Crawler	11.8in.×2in.×88links(300×52.5×88)
Length of ground contact	5.74ft(1750mm)
Pressure of ground contact	45.1kPa (6.5psi(0.46kgf/cm ²))
Crawling speed	Forward/Backward: 0~1.8mph(0~3km/h)
Hill-climbing ability	23°
Engine	Rated output23.5hp(17.5kW)/2100rpm (23.8PS/2100rpm)
Crawling	Independently driven by hydraulic power
Parking brake	Disc brake with hydraulic motor built-in
Starting engine	Electric starter
Fuel tank	Capacity:10.6gal(40 liters)

MAJOR SPECIFICATIONS

Chart of net rated load

Rated loads chart

BOOM SECTION		1 • 1+2										
WORKING RADIUS(ft)		8.0	9.5	11.0	13.0	14.0	16.0	19.0	19.5	20.1		
RATED LOAD(lbs)	OUTRIGGERS MAX EXT	8920	7900	6950	5750	5300	4600	3810	3700	3630		
	OUTRIGGERS NOT MAX EXT	8920	7900	6950	5430	4850	3900	2700	2530	2310		
BOOM SECTION		1+2+3										
WORKING RADIUS(ft)		11.5	13.0	15.0	16.0	18.0	20.0	21.0	23.0	24.0	26.0	27.9
RATED LOAD(lbs)	OUTRIGGERS MAX EXT	6720	5750	5000	4600	4070	3680	3450	3080	2850	2560	2270
	OUTRIGGERS NOT MAX EXT	6720	5450	4400	3900	3080	2450	2150	1760	1550	1250	1100
BOOM SECTION		1+2+3+4										
WORKING RADIUS(ft)		13.0	14.0	15.0	16.0	18.0	20.0	23.0	26.0	29.0	32.0	35.6
RATED LOAD(lbs)	OUTRIGGERS MAX EXT	4510	4510	4200	3900	3420	3030	2640	2320	2100	1900	1540
	OUTRIGGERS NOT MAX EXT	4510	4510	3980	3730	3090	2450	1760	1240	1020	820	660
BOOM SECTION		1+2+3+4+5										
WORKING RADIUS(ft)		16.0	18.0	20.0	23.0	26.0	30.0	33.0	36.0	39.0	43.2	
RATED LOAD(lbs)	OUTRIGGERS MAX EXT	2530	2210	1980	1670	1440	1300	1210	1100	1000	880	
	OUTRIGGERS NOT MAX EXT	2310	2090	1850	1540	1230	960	760	660	550	440	
BOOM SECTION		1+2+3+4+5+6										
WORKING RADIUS(ft)		19.0	23.0	26.0	29.0	33.0	36.0	39.0	43.0	46.0	49.0	50.9
RATED LOAD(lbs)	OUTRIGGERS MAX EXT	2000	1670	1430	1330	1200	1080	980	820	700	580	460
	OUTRIGGERS NOT MAX EXT	1210	990	890	790	660	570	510	430	390	350	130

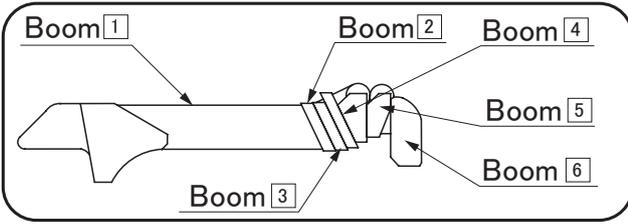
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Points to notice, Rated load

- The net rated load is performance when the crane is placed level and is based on actual working radius including boom deflection under loaded. The net rated load is also based on strength and stability of the crane.
- ‘Outriggers extended to maximum’ means the state that the inner box is extended to the position where the 2nd ● mark is visible.
- ‘Outriggers extended to halfway’ means the state that the inner box is extended to the position where the 1st ● mark is visible.
- ‘Outriggers extended to minimum’ means the state that the inner box is extended to the position where the 1st ● mark is invisible.
- When each of 4 outriggers has been set to different extension, operate the crane by using the worst extended capacity.
- When each of boom sections being extended is exceeded even slightly, operate it by application of the capacity for the next boom section.
- Boom **1+2+3+4** means that the boom is extended to the position where the 1st \ mark on the 4th boom-section is visible.
- Boom **1+2+3+4+5** means that the boom is extended to the position where the 2nd \ mark on the 4th boom-section is visible.
- Operate the crane using the rated load capacity data under the boom extension of: **1+2+3+4** when the \ mark on the 3rd boom-section goes beyond the 2nd boom section, regardless of the displacement, **1+2+3+4+5** when the 1st \ mark on the side plate of the 4th boom-section goes beyond the 3rd boom-section, regardless of the displacement, **1+2+3+4+5+6** when the 2nd \ mark on the side plate of the 4th boom-section goes beyond the 3rd boom-section, regard less of the displacement.

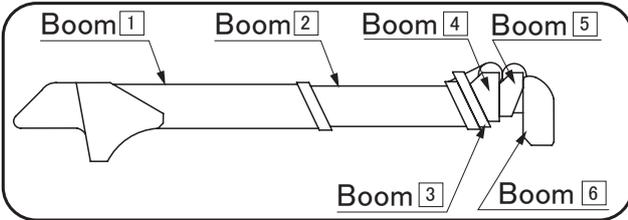
MAJOR SPECIFICATIONS

● How boom-sections are extended



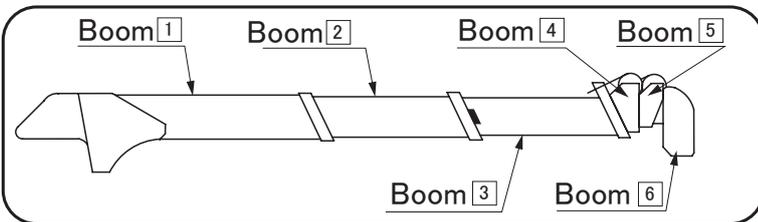
Boom :

All boom sections are retracted.



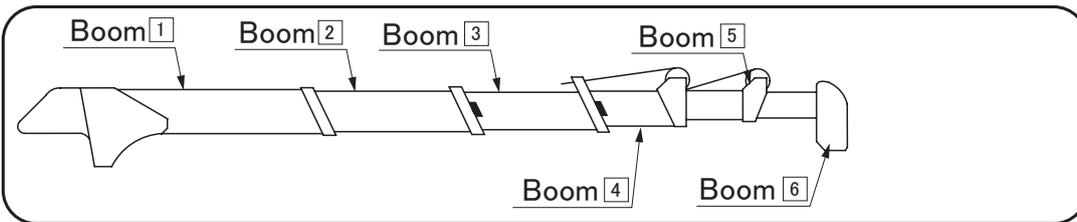
Boom : or

Boom section(2) only is extended.



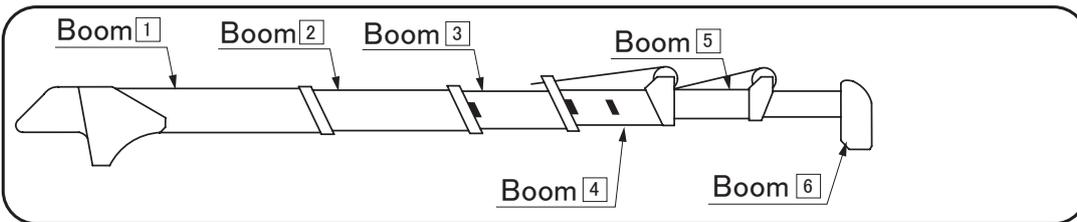
Boom : or

Boom sections(2) and (3) extended to a position where the mark  on the boom section (3) is visible.



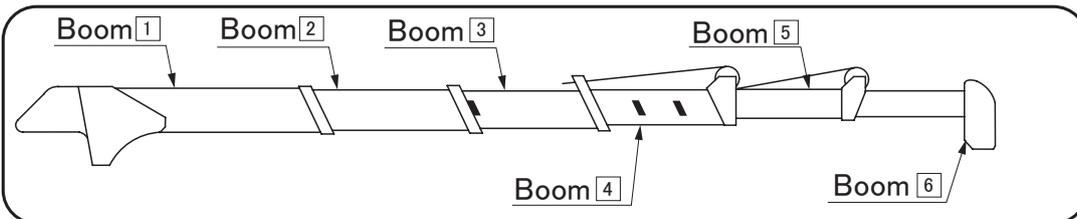
Boom : or

Boom sections are extended to a position where 1st mark  on the boom section (4) is visible.



Boom : or

Boom sections are extended to a position where 2rd mark  on the boom section(4) is visible.

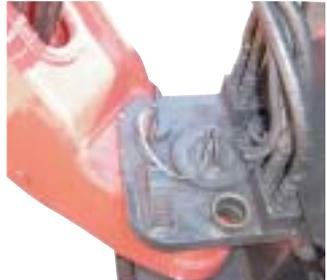


Boom : or

Boom sections(2), (3), (4), (5), and (6) are fully extended.

4. OUTRIGGER OPERATION

HOW TO EXTEND OUTRIGGERS



Outrigger extension detector
Extract the pins to rotate outriggers, then insert the pins.

1. Throw the interlock of crane · traveling lever to crane side.
2. Rotate the outriggers and insert the set pins securely to light up the extension lamp.

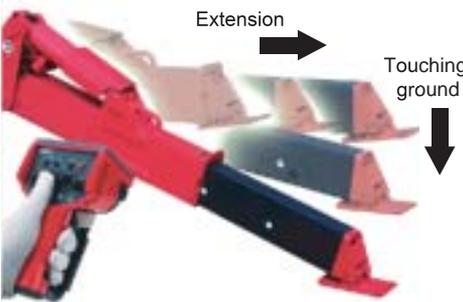
Outriggers cannot be

operated unless all 4 pieces of set pin have been inserted.

3. As a general rule, extend the lateral members of outrigger to their full extents.
4. Touch the vertical members of outrigger to the ground and raise the crawler by approximately 50mm to



Detector for ground contact of outrigger



Boom storage detector

5. Unwind the hook until it is off the weight for over-winding alarm, then raise the boom.
Crane can now be operated when the storage lamps have gone out.



HOW TO STORE OUTRIGGERS

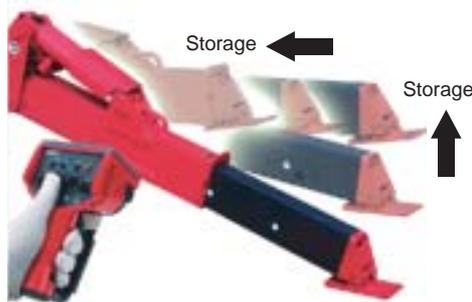
1. Store the hook and lower the boom until the storage
2. Retract vertical members of outrigger to make outriggers horizontal.
Check that all 4 lamps indicating the outriggers touched
3. Retract the lateral members of outrigger.
4. Extract the pins to rotate the outriggers then insert the pins.
5. Throw the interlock of crane · traveling lever to traveling side.



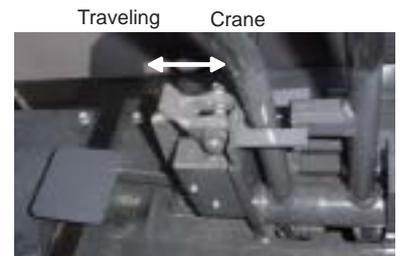
Boom storage detector



Detector for ground contact of outrigger



Outrigger extension detector
Extract the pins to rotate outriggers, then insert the pins.



5.HOW TO STORE OUTRIGGERS WHEN IN AN EMERGENCY

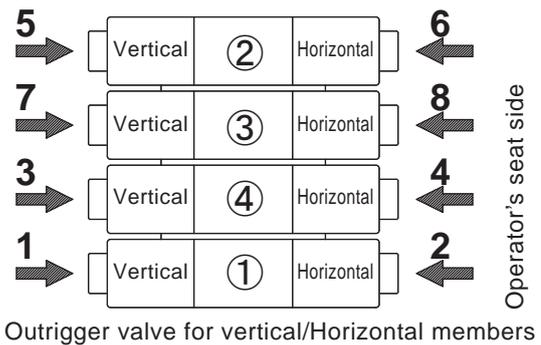
HOW TO STORE OUTRIGGERS WHEN FAILED STORAGE BY NORMAL OPERATION

1. Remove the label stuck cover located in the arrow direction.



- Return the boom to the position where it is to be stored.
- Turn the retraction button on the valve for extension/retraction by 90° with the button depressed to secure it.
- Depress, with a screwdriver, button on the solenoid valve for which is intended to be actuated located on the outrigger valve for vertical/lateral members.

Outrigger to be actuated		Operation
Outrigger①	Vertical	Depressing 1 to operate lever
	Horizontal	Depressing 2 to operate lever
Outrigger②	Vertical	Depressing 5 to operate lever
	Horizontal	Depressing 6 to operate lever
Outrigger③	Vertical	Depressing 7 to operate lever
	Horizontal	Depressing 8 to operate lever
Outrigger④	Vertical	Depressing 3 to operate lever
	Horizontal	Depressing 4 to operate lever



5. Throw the outrigger lever to your side with the solenoid valve button depressed.



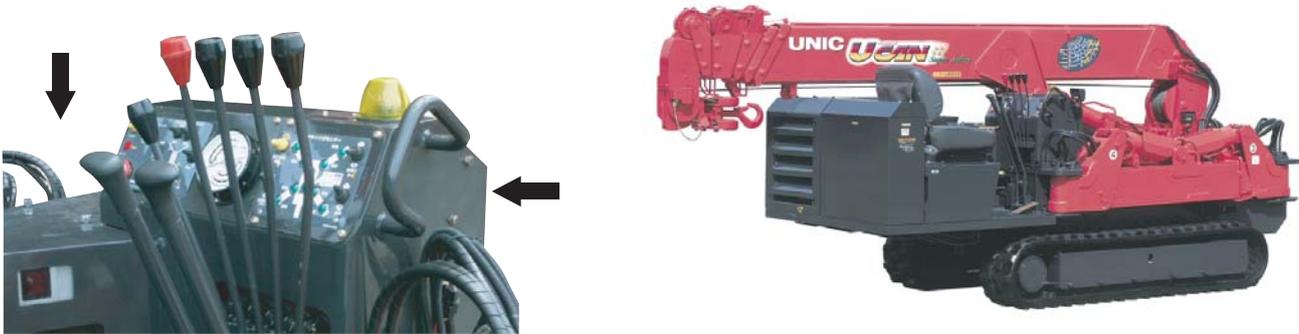
Sticker showing instructions on how to operate outriggers when in an emergency is stuck here.



Push the button at the center of solenoid valve with a screwdriver.

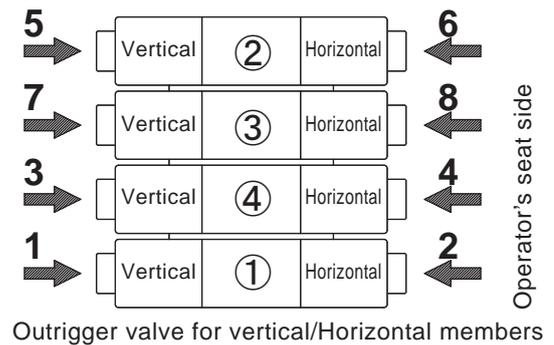
HOW TO EXTEND OUTRIGGERS WHEN FAILED EXTENSION BY NORMAL OPERATION

1. Remove the label stuck cover located in the arrow direction.



- 2. Return the boom to the position where it is to be stored.
- 3. Turn the retraction button on the valve for extension/retraction by 90° with the button depressed to secure it.
- 4. Depress, with a screwdriver, button on the solenoid valve for which is intended to be actuated located on the outrigger valve for vertical/Horizontal members.

Outrigger to be actuated		Operation
Outrigger①	Vertical	Depressing 1 to operate lever
	Horizontal	Depressing 2 to operate lever
Outrigger②	Vertical	Depressing 5 to operate lever
	Horizontal	Depressing 6 to operate lever
Outrigger③	Vertical	Depressing 7 to operate lever
	Horizontal	Depressing 8 to operate lever
Outrigger④	Vertical	Depressing 3 to operate lever
	Horizontal	Depressing 4 to operate lever



Remove cover on arrow mark side and depress extension button to turn it to secure it.



5. Throw the outrigger lever to your side with the solenoid valve button depressed.



Sticker showing instructions on how to operate outriggers when in an emergency is stuck here.

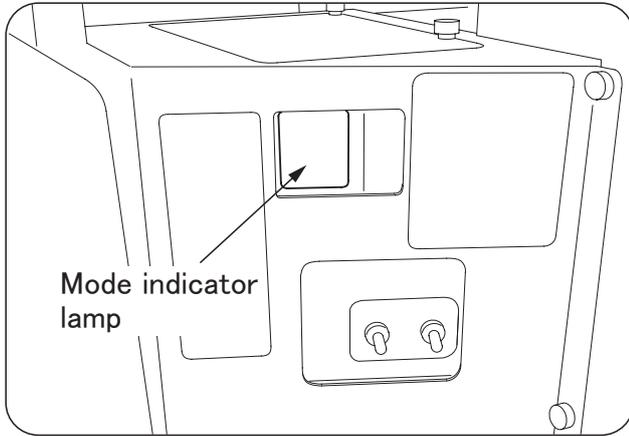


Push the button at the center of solenoid valve with a screwdriver.

6. MODE INDICATOR LAMP (Control Box)

1 Mode indicator lamp (Control box)

The “mode indicator lamp” is mounted in the control box indicating conditions of crane operation and troubles in detail.



When the “mode indicator lamp” lights, the crane system is working normally.

When the “mode indicator lamp” blinks, the crane system is in a trouble or prohibited operation is being carried out.

◆1.Mode indication when crane is in normal operation

It indicates each operation mode and condition of the crane when it is normal.
Description of mode indication when it is in normal is as follows:

Mode indication when crane is in normal condition (lighting indication)

Mode	Mode description	Radio control operation mode	Manual operation mode	Priority
0F	Current control is on traveling mode. No operation other than traveling is possible either by manual control or by radio remote control.	×	×	1
00	Current control is on normal crane operation mode. Operation is possible either by manual control or by radio remote control.	○	×	9
01.	Current control is on normal crane operation mode. Operation can only be carried out manually but not through radio remote control device.	×	○	9
04 05	Current operation is in outrigger radio control mode. Extension and retraction of outriggers can only be possible by manual control when in manual control mode or by radio remote control when in radio remote control mode. Operation other than the above is impossible either by manual or by radio remote control.	○	×	5
		×	○	
06	Current control is on low temperature operation mode. Operation can be carried either by manual control or by radio remote control device.	(○)	(○)	8

MODE INDICATOR LAMP (Control Box)

Mode	Mode description	Radio control operation mode	Manual operation mode	Priority
07.	Current control is on low temperature operation mode. Operation can be carried by manual control but not through radio remote control.	×	○	8
10	Hook hits against weight for over-winding alarm (over-wound condition).	—	—	7
13	During operation of storing hook.	—	—	6
14	Automatic stop for over-winding reset switch is being controlled	—	—	4
15	Boom store or Automatic stop for overloading is actuated .	—	—	2
16	Automatic stop for overloading alarm is actuated .	—	—	3

●Remarks

Since priority is assigned for each mode description, it is to be indicated in the order of higher priority.

If the [.] (dot) is indicated on the bottom right of “mode indicator lamp”, it means the “radio control OFF” mode.

Crane cannot be operated through radio control transmitter.

When operated on outrigger radio control mode, crane operation other than extension/retraction of outriggers cannot be carried out.

When the shock-less function has been cancelled, the letter on the left indicated in the mode indicator changes to [-].

MODE INDICATOR LAMP (Control Box)

◆2.Mode indication when crane is mistakenly operated

When prohibited operation or combination of operation which may invites dangerous situations has been carried out, the “mode indicator lamp” will blink corresponding numbers (operation error indication).

When the operation error is indicated, the ”mode indicator lamp” blinks showing corresponding numbers accordingly.

Confirm and follow the mode description concerned on the table illustrated below:

●Remarks

The operation error indication is not to indicate that the crane system is in trouble.

The error indication is to be reset when stopping the operation concerned.

Mode description when crane is mistakenly operated (Blinking indication)

Mode	Description of wrong operation	Measures to be taken
01	<p>Radio remote control operation is carried out in manual control mode.</p> <p>●Mode indicator lamp located in front of crane control levers will not be lit when in manual control mode.</p>	<p>Radio remote control cannot be carried out in manual control mode.</p> <p>When operating with radio remote controller, turn the selector switch located on the top of cover to radio remote control mode.</p> <p>●Mode indicator lamp located in front of crane control levers will be lit when in radio remote control mode.</p>
04	Crane is being operated when in outrigger mode.	<p>Crane cannot be operated when in outrigger control mode.</p> <p>When operating crane, turn the mode selector switch to “crane” to select crane mode.</p>
	Crane and outriggers are operated simultaneously.	<p>When crane and outriggers are operated simultaneously, both operating functions are stopped automatically to avoid a risk.</p> <p>Stop the simultaneous operation once and carry out either one of operation.</p>
06	“Low temperature operation mode” is being switched during crane operation.	<p>In order to avoid a risk, “low temperature operation mode” cannot be switched during crane operation.</p> <p>Stop crane operation once to switch it to “low temperature operation mode”.</p> <p>For switching “low temperature operation mode”, refer to section 6u.“How to correct when operation becomes unstable due to low temperature” (on page 6-22).</p>

MODE INDICATOR LAMP (Control Box)

Mode	Description of wrong operation	Measures to be taken
10	Either one of operation such as "boom Up", "hook Up", or "boom Extend" (when operated on para-hook mode) is being carried out while hook has hit against weight for over-winding alarm.	Detach hook from weight for over-winding alarm. When raising boom through radio control device with hook hit against the weight for over-winding alarm, boom is to be "Up" while hook is winding "Down" as this operation allows hook to be released. Do not lift up a cargo while this is being indicated.
90	Emergency stop switch on the remote control device is pressed.	Release the Emergency stop switch when operating crane.
94	Operating one of boom lowering, wind-up, boom extending or slewing while the boom is at stowed position and fully lowered.	Operate boom raising to release the automatic stop system then operate others.
96	Operation of winding down hook is carried out while the sensor detecting minimum wire rope is being activated.	Stop winding down hook and wind it up so that the sensor detecting minimum wire rope will not be activated.
97	In the boom/outrigger interlocking device, outrigger operation is being carried out without boom being stored.	Stop outrigger operation without boom being stored. Operate outriggers after boom has been stored.

6 . 3 Mode indication of each operation

Mode indication	Operation
20	Fastest speed mode
21	Medium speed mode
22	Slow speed mode
23	2 interlocking operation
24	3 interlocking operation
25	4 interlocking operation
26	5 interlocking operation
27	6 interlocking operation
28	7 interlocking operation

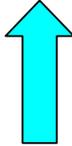
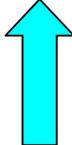
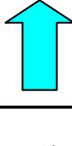
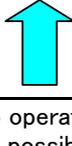
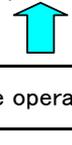
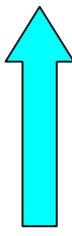
Mode indication	Operation
30	Raising boom
31	Lowering boom
32	Hoisting-up
33	Hoisting-down
34	Retracting boom
35	Extending boom
36	Slewing C.W.
37	Slewing C.C.W

Mode indication	Operation
38	Storing hook
39	Mode select
40	Horn
00 ~ 0.0	Speed: 0 ~ 100%

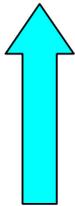
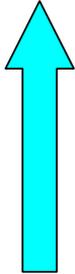
When wind-up switch of transmitter and radio control selector switch are pushed at the same time, it is change to the operation display. It returns to the state display when wind-up switch of transmitter and radio control selector switch are pushed at the same time again.

6. 4 Error indication

When an error is detected, the mode indicator goes off or blinks and the voice message “Service remote control” sounds.

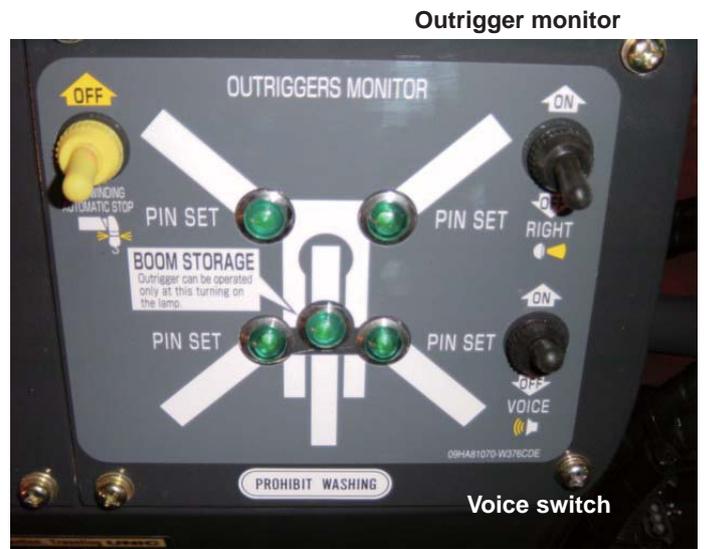
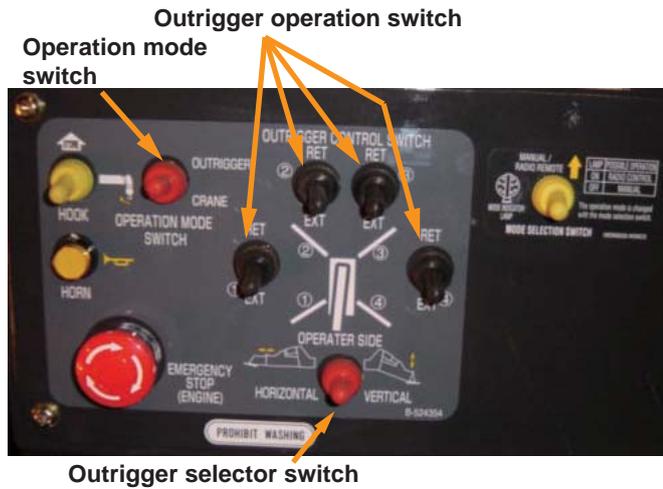
Mode indication	Trouble		Available operation	Measures		
17	Turnover prevention error		No operation is possible.	Check all load cell wirings on outrigger and Digital Amplifier wirings. Zero-Point Adjust Digital Amplifier. Replace Digital Amplifier.		
None	System error		No operation is possible.	Replace fuse in control box. Turn power ON again. In case where it happens again, replace control box.		
42						
43						
44						
45						
46					No operation is possible.	Readjust zero point.
47					Operation is possible.	Turn power ON again.
48						In case where it happens again, replace control box.
49						
50						
51	Failure in radio controller receiver Transmitter lever has been pulled before indication on indicator “8.8” goes off. Transmitter switch has been depressed before indication on indicator “8.8” goes off. Signal from receiver failed to be received	Radio controller cannot be operated.			Check transmitter and receiver.	
52			After turning power ON again, wait until mode on “8.8” indicator goes off to operate radio controller.			
53			Check connection of cable to receiver.			
55	“Hook storing/releasing switch” on crane side has been controlled before indicator “8.8” goes off. “Radio controller selector switch” in control box has been controlled before indicator “8.8” goes off.	Operation is possible.		After turning power ON again, wait until mode on “8.8” indicator goes off to operate radio controller. Turn power ON again. In case where it happens again, replace control box.		
56	System error		No operation is possible.	Turn power ON again.		
57					In case where it happens again, replace control box.	
58	Unloading error	Radio controller cannot be operated.		Replace control box.		
60	Spool neutral error Manual lever (spool) fails to be returned to neutral within 2 seconds after power has been turned ON.	Derrick	No operation is possible.		After turning power ON again, wait until “8.8” on mode indicator goes off to operate radio controller. Check that manual lever has not been caught. If lever has no problem, replace proportional solenoid valve.	
61		Hoisting				
62		Telescoping				
63		Slewing				
64		Outrigger				
65		Acceleration				

When an error is detected, the mode indicator goes off or blinks and the voice message “Service remote control” sounds.

Mode indication	Trouble	Available operation	Measures
66	Outrigger selection switch	Front right RET/EXT	Damaged switch exchange It is possible to operate it excluding the damaged switch.
67		Front left RET/EXT	
68		Rear right RET/EXT	
69		Rear left ET/EXT	
70	Spool deviation error. Manual lever (spool) fails to be controlled as intended while radio controller is operated.	Derrick	No operation is possible.  Operation is possible.
71		Hoisting	
72		Telescoping	
73		Slewing	
74		High outrigger	
75		Acceleration	
76	Transmitter switch is broken.	Derrick	Radio controller cannot be operated. 
77		Hoisting	
78		Telescoping	
79		Slewing	
80	Feed-back signal wire is broken. Differential transformer is not functioning normally.	Derrick	No operation is possible.  Operation is possible.
81		Hoisting	
82		Telescoping	
83		Slewing	
84		Outrigger	
85		Acceleration	
98	The voltage of the battery is nine volts or less.	No operation is possible.	Battery exchange 98 blinking when the engine starts is not abnormal.
99	Transmitter batteries are dead. When batteries have run out, voice message requesting replacement of batteries is to be issued.	Operation is possible.	Replace batteries of transmitter to turn it ON again. Radio controller is wrong unless power indicator lamp on transmitter lights or blinks quickly.

7.LIST OF VOICE MESSAGES

<p>Remote control ready.</p>	<p>When power to the crane is supplied with key switch turn on. When it is turned to normal mode by depression of radio control selector switch. When emergency stop is released by depression of emergency stop switch.</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <p data-bbox="699 566 970 622">When switch is not depressed. Emergency stop is released</p> <p data-bbox="1045 566 1316 622">When switch is depressed. Emergency stop is functioning.</p> </div>
<p>Stop winch up.</p>	<p>When "raising boom", "winding-up hook", or "extending boom" operation is carried out on over-wound condition.</p>
<p>Secure lifting hook.</p>	<p>When hook storing switch is controlled.</p>
<p>Change control mode.</p>	<p>When it has been selected to outrigger radio control mode. When outrigger radio control mode has been released. When it has been selected to low temperature operation mode. When low temperature operation mode has been released.</p>
<p>Service remote control.</p>	<p>When mode indicator is blinking any of figures, [42~58] and [60~87].</p>
<p>Low transmitter battery.</p>	<p>When battery in the transmitter has run down.</p>



8.1 Switching of mode (Manual mode ⇔ Radio control mode)

However, this operation is possible under the following condition.

1) Starter switch on.



2) Shift the lever to “Crane” position.

3) All the monitor lamps are lit.

Boom storage monitor lamp

The monitor lamp lights when the boom has been stored.

Outriggers can be operated only when the monitor lamp lights.

Outrigger monitor lamp (extension)

When turning outriggers manually from their stored positions and set pins have fully been inserted, the lamp indicating extension of outrigger lights.

Outriggers cannot be operated unless all the four (4) pins have been inserted.



4) Push the mode selector switch to switch it to the radio remote control mode.
The Mode indicator lamp



Manual mode

The Mode indicator lamp lights off.
Manual lever only

Radio control mode

The Mode indicator lamp lights on.
Radio control only



8.2 How to operate outriggers by manual lever.

However, this operation is possible under the following condition.

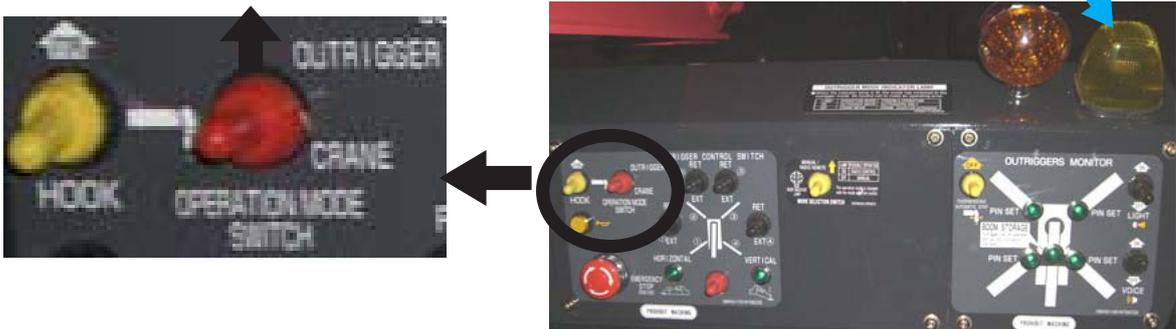
- 1) Starter switch on.



- 2) Shift the lever to "Crane" position.



- 3) Operation mode switch is changed to the outrigger side.
Outrigger mode indicator lamp lights on.



- 4) There are four (4) outrigger control switches and each switch is numbered.
Select an outrigger control switch to throw it to desired function and operate the outrigger lever accordingly.



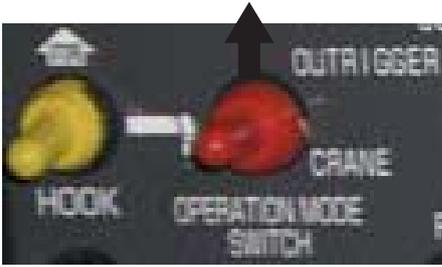
8.3 How to operate outriggers by radio control transmitter.

However, this operation is possible under the following condition.

- 1) Starter switch on.



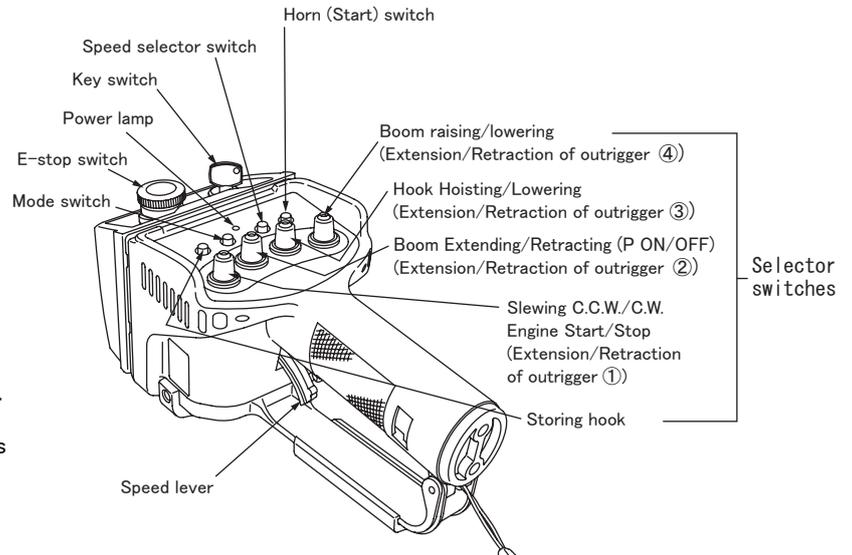
- 2) Shift the lever to "Crane" position.
- 3) Operation mode switch is changed to the outrigger side.



- 4) Mode selector switch is changed.
Mode indicator lamp lights on.
Outrigger mode indicator lamp lights on.



- 5) All the monitor lamps are lit.
Boom storage monitor lamp
The monitor lamp lights when the boom has been stored.
Outriggers can be operated only when the monitor lamp lights.



Outrigger monitor lamp (extension)

When turning outriggers manually from their stored positions and set pins have fully been inserted, the lamp indicating extension of outrigger lights.

Outriggers cannot be operated unless all the four (4) pins have been inserted.

- 6) The key switch of the transmitter is turned on.
- 7) Power lamp is lit pushing start switch of the transmitter.
- 8) The selection switch is changed, and the speed lever is pulled.



8.4 Switching of mode indicator (State ⇌ Operation)

Depress both winding-up and mode selector switch simultaneously.

State indication
(normal case)



Operation indication

Depress both winding-up and mode selector switches at the same time or turn OFF power to crane and turn it ON again.



8.5 Resetting of interlocking balance control



Depress the switch for storing hook with the switch for boom-down turned ON.

Retaining function of
dividing operation ON
(normal case)



Depress the switch for storing hook with the switch for boom-down turned ON.



Retaining function of
dividing operation OFF

Mode indicator shows [oF].

Voice message, "change control mode" is issued



8.6 Switching of "shockless" function (Carry it out when it is not over-wound)



Turn ON winding-down switch with para-hook switch depressed.



"shockless"
(normal case)



Turn ON winding-up switch with para-hook switch depressed.

No "shockless"
"[-]" appears on the left side of mode indicator.



8.7 Switching of low-temperature operation mode



Depress the switch for storing hook with the switch for slewing C.C.W.turned ON.



Low-temperature
operation mode
OFF(normal case)



Depress the switch for storing hook with the switch for slewing C.W.turned ON.

Low-temperature
operation mode ON
Mode indicator shows [06].
Voice message, "change control mode" is issued.



8.8 Method of engine start and stop that uses radio controller

However, this operation is possible under the following condition.

- 1) Starter switch on.



- 2) Shift the lever to "Crane" position.



- 3) Push the mode selector switch to switch it to the radio remote control mode. The Mode indicator lamp lights on.



- 4) Key switch on.



Depress the switch for mode select with the switch for slewing C.C.W.turned ON.

Engine stop



Engine start



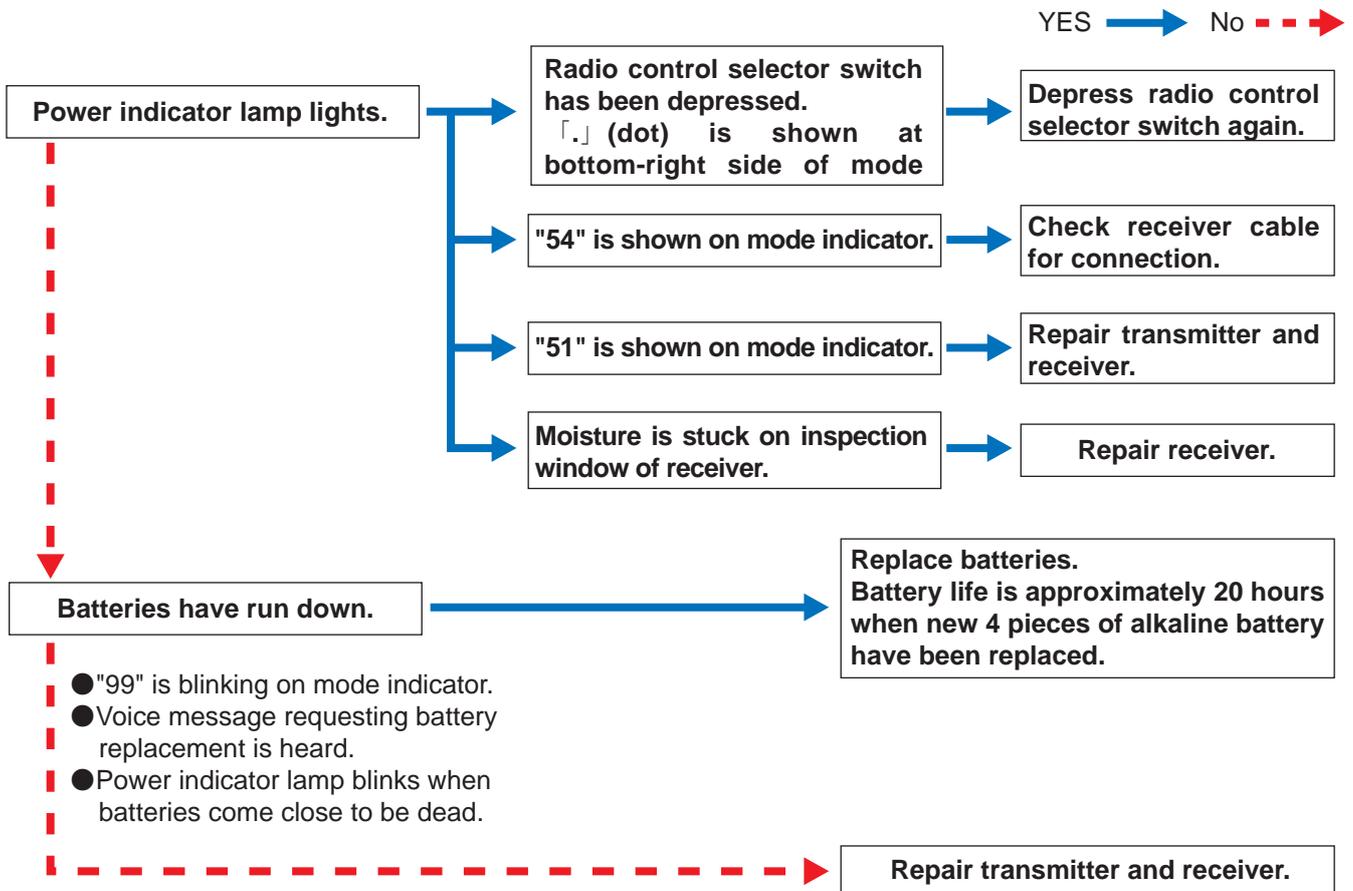
Depress the switch for mode select with the switch for slewing C.W.turned ON.



9.RADIO CONTROL CANNOT BE OPERATED

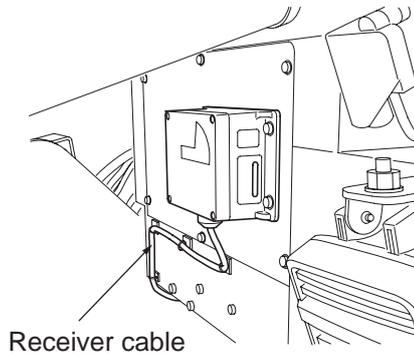
(In case where it is due to electrical failure)

◆ Turn "ON" the voice switch and start engine to check it.



- "99" is blinking on mode indicator.
- Voice message requesting battery replacement is heard.
- Power indicator lamp blinks when batteries come close to be dead.

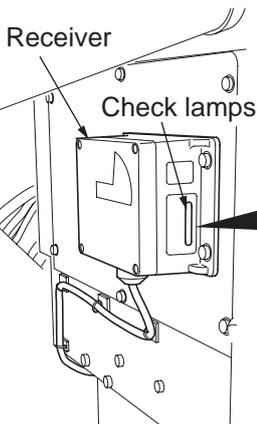
Power indicator lamp



Receiver cable



Voice switch



- | | | |
|-----------------------|---|--|
| Interference (Lights) | ● | When receiving noise from outside, it lights in red. |
| Receiving (Blinks) | ● | When receiving signal from transmitter, it blinks in green. |
| Error (Blinks) | ● | When receiver is in trouble or batteries are running down, it blinks in red. |
| Power (Blinks) | ● | When key switch turn on, it blinks in green. |

10.EMERGENCY MEASURES TO BE TAKEN WHEN CRANE CANNOT BE OPERATED AT ALL

Procedure 1

Operate it while the safety device reset switch is being pushed up.

When outriggers are raised before storing boom and hook, overturn prevention device is actuated so that crane cannot be operated.

Store the crane while the reset switch of safety device is pushed up.

If it is key switch type, operate it with the key turned to release side.

Procedure 2

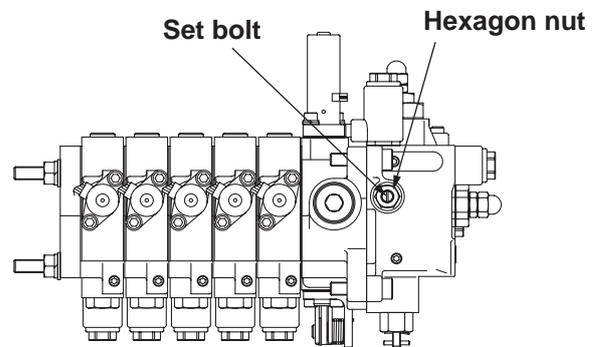
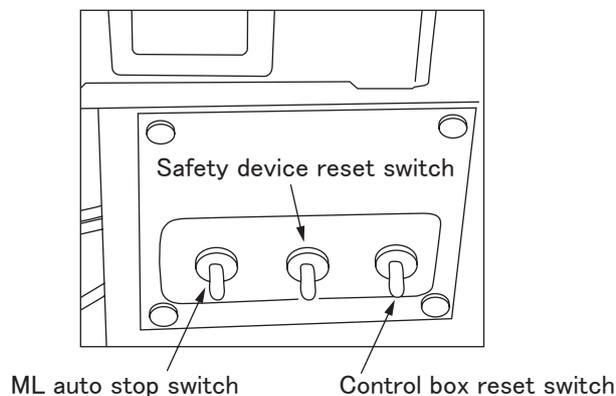
(In case where the crane cannot be operated even if the safety device reset switch is controlled.)

Store the crane with the control box reset switch pushed up.

Procedure 3

(In case where the crane cannot be operated even if control box reset switch is operated.)

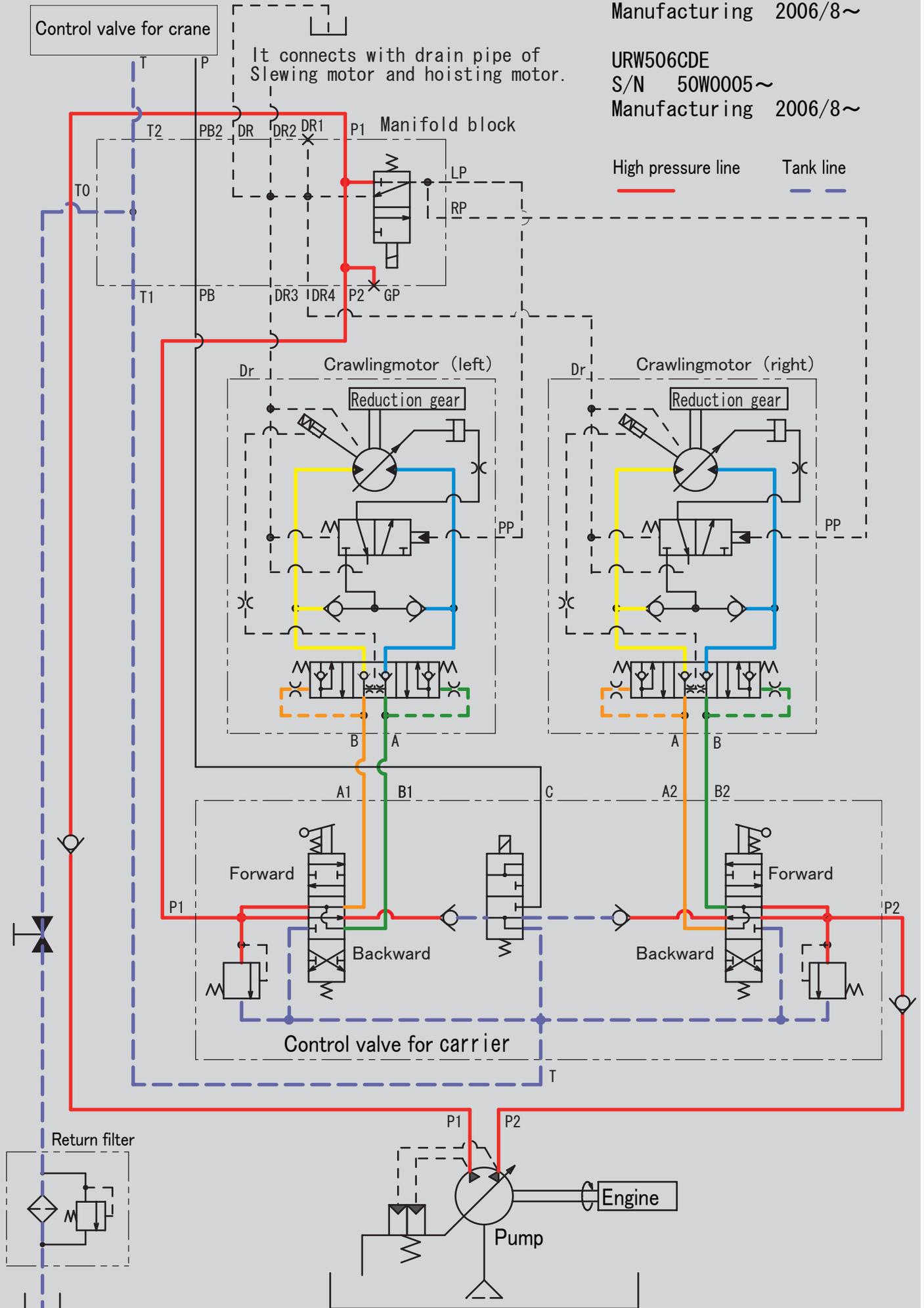
Unfasten the hexagon nut on the control valve to screw in the set bolt until it stops, then store the crane by using control lever.



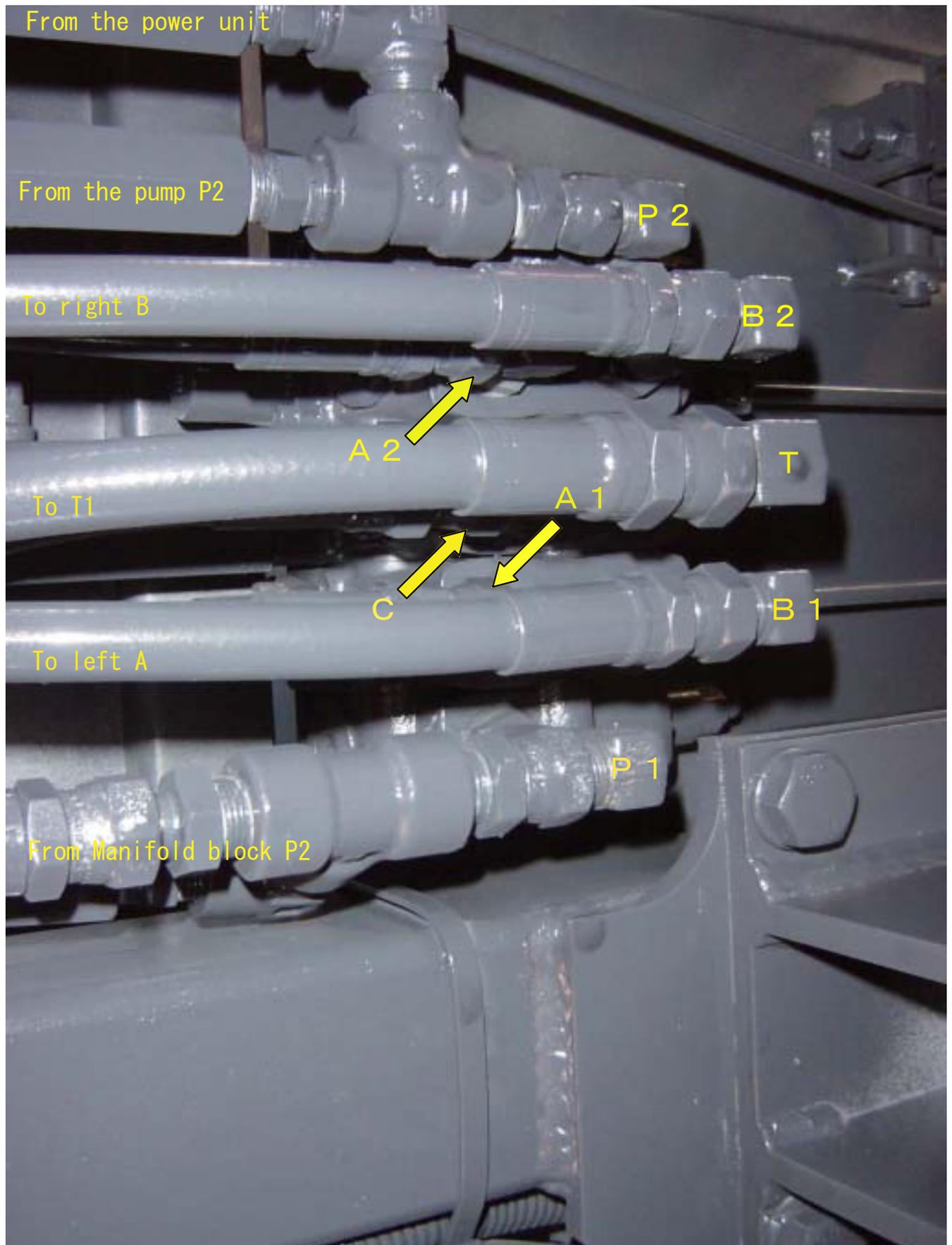
Hydraulic Circuit Diagram (Carrier)

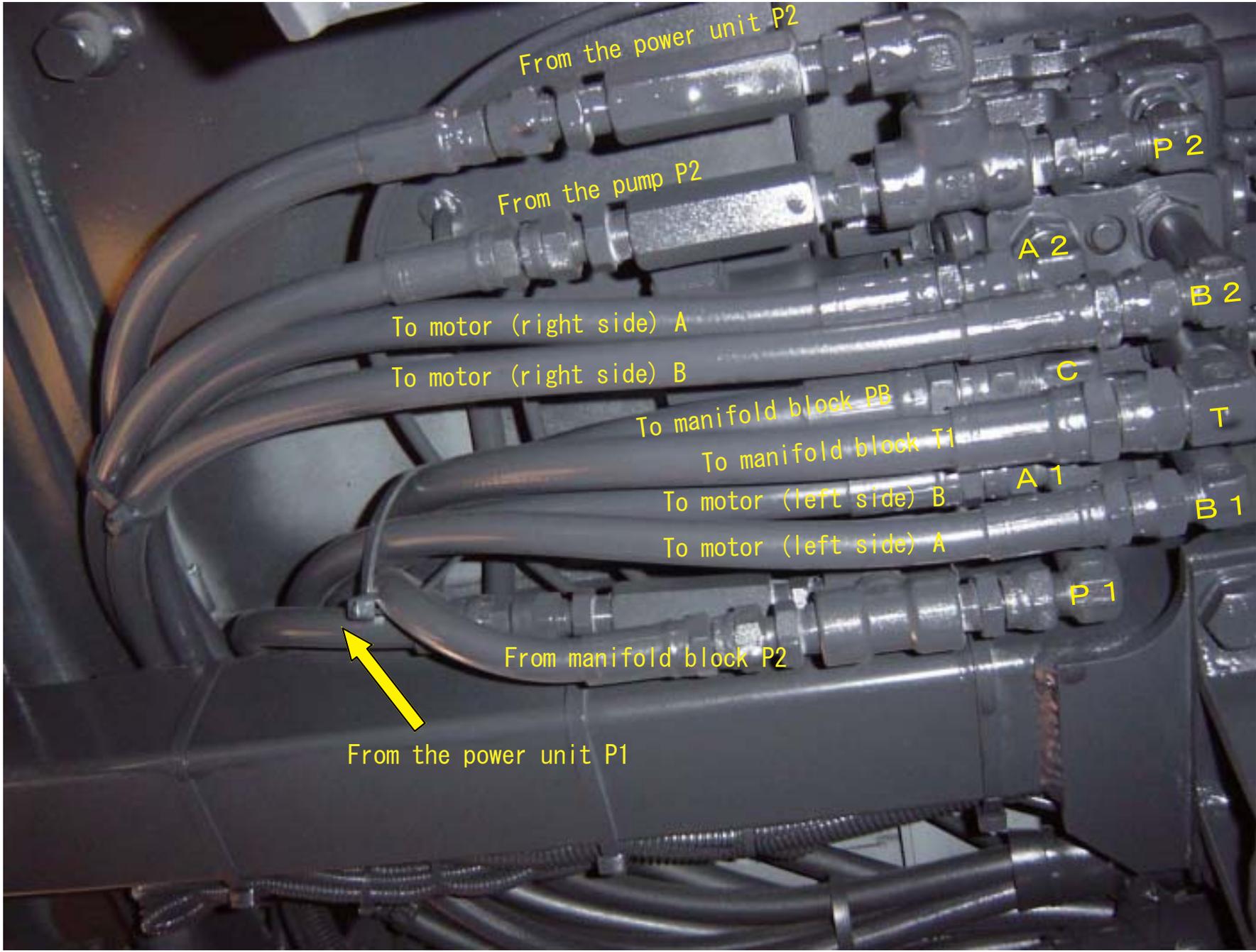
URW370CDE
S/N 37W0062~
Manufacturing 2006/8~

URW506CDE
S/N 50W0005~
Manufacturing 2006/8~



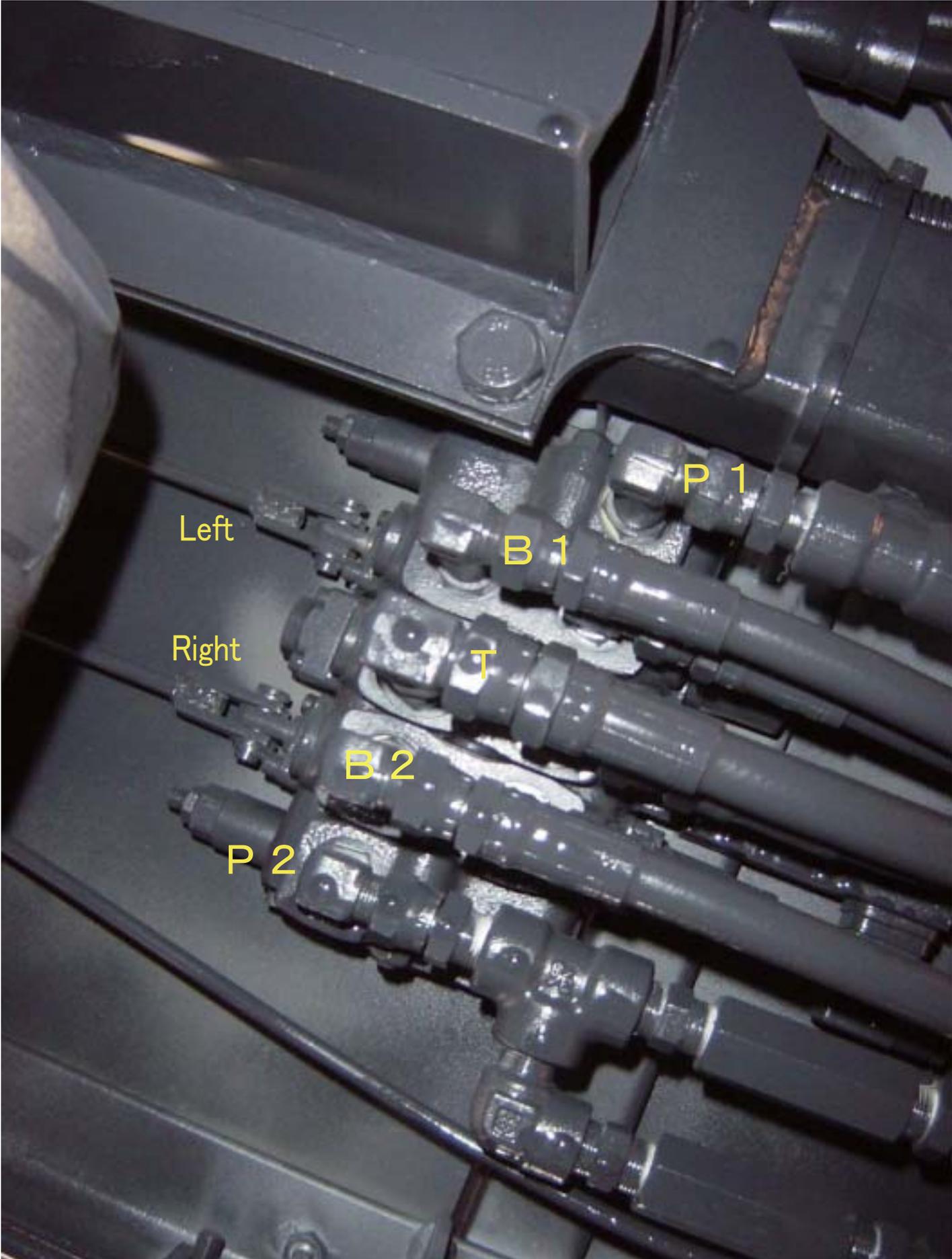
Control valve for carrier



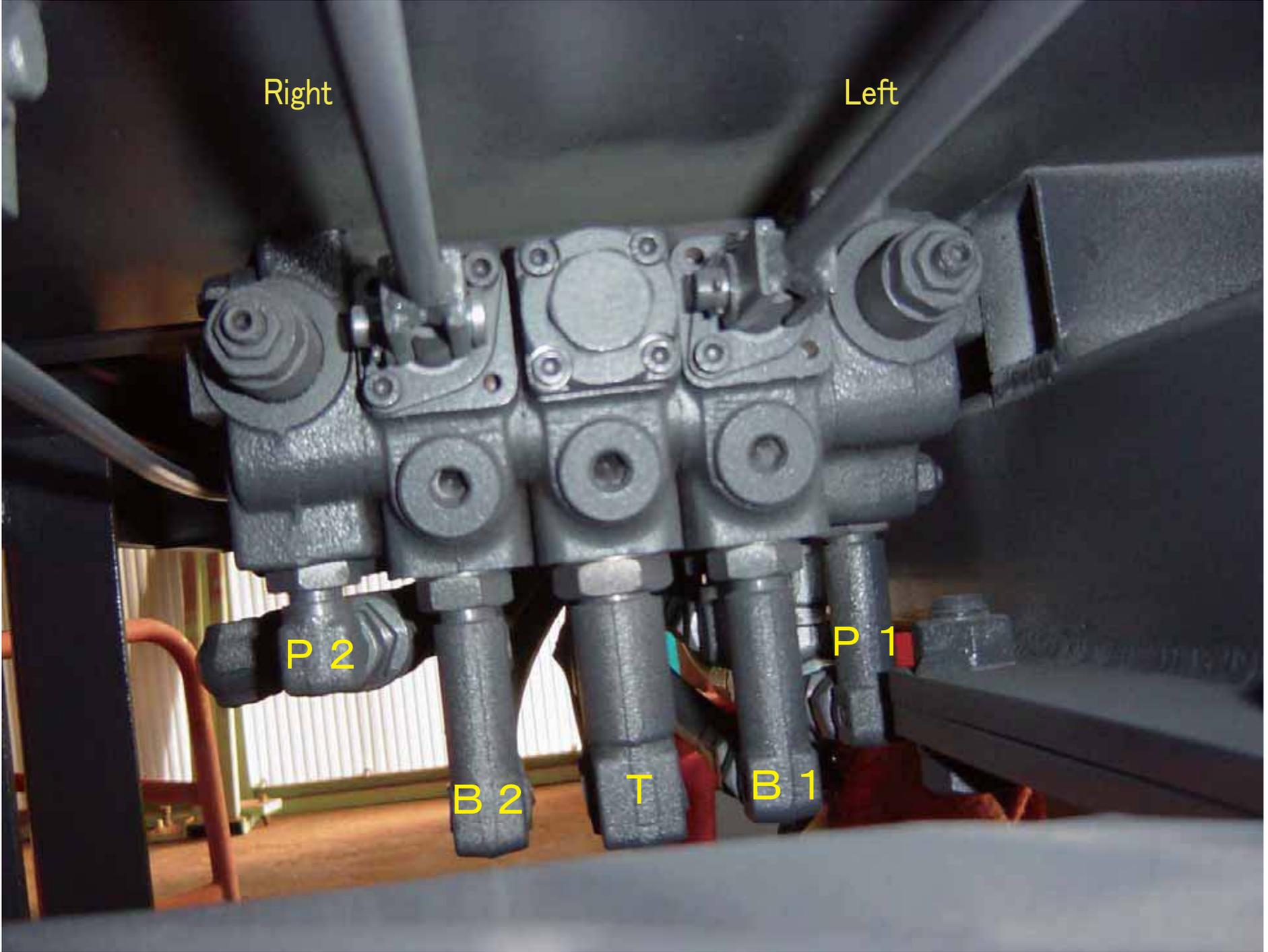


Control valve for carrier

Control valve for carrier



Control valve for carrier



Right

Left

Sky



11-5

Ground

P 2

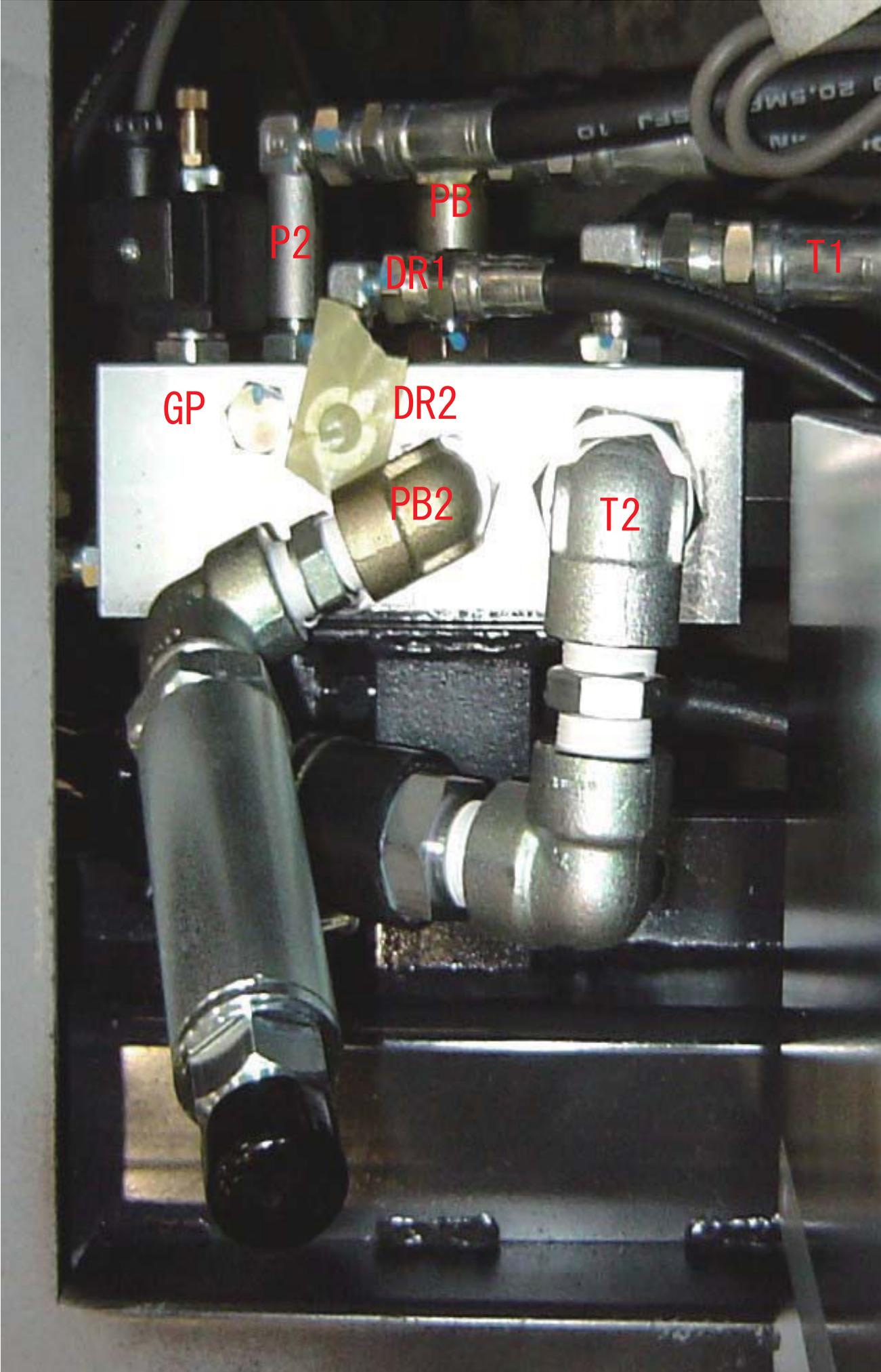
B 2

T

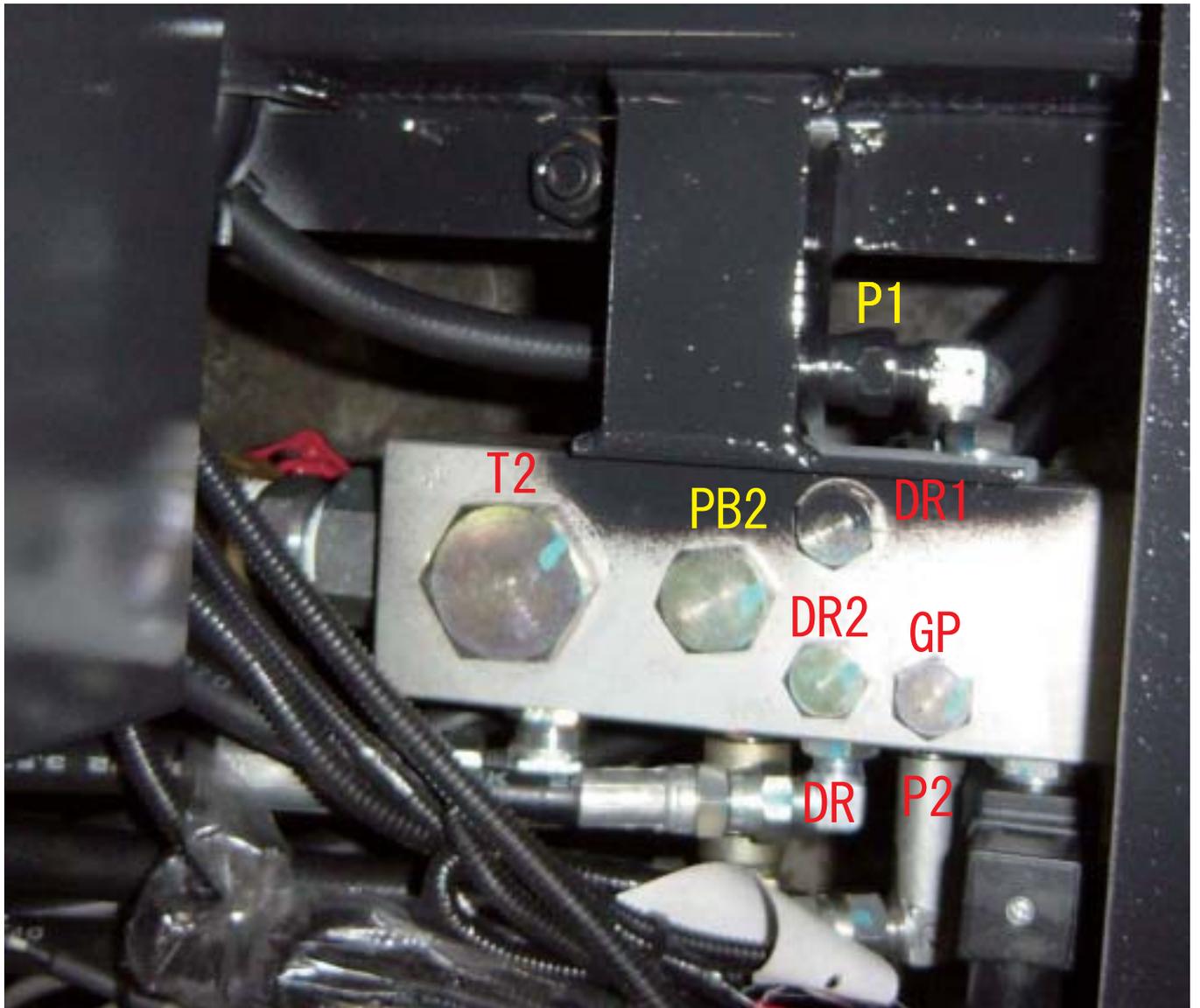
B 1

P 1

The upper surface of manifold block



The upper surface of Manifold block





Side of manifold block

Sky



Ground

11-8

RP

GP

DR2

PB2

T2

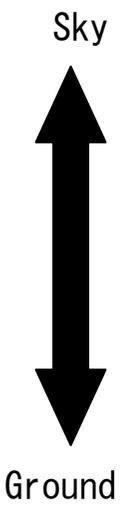
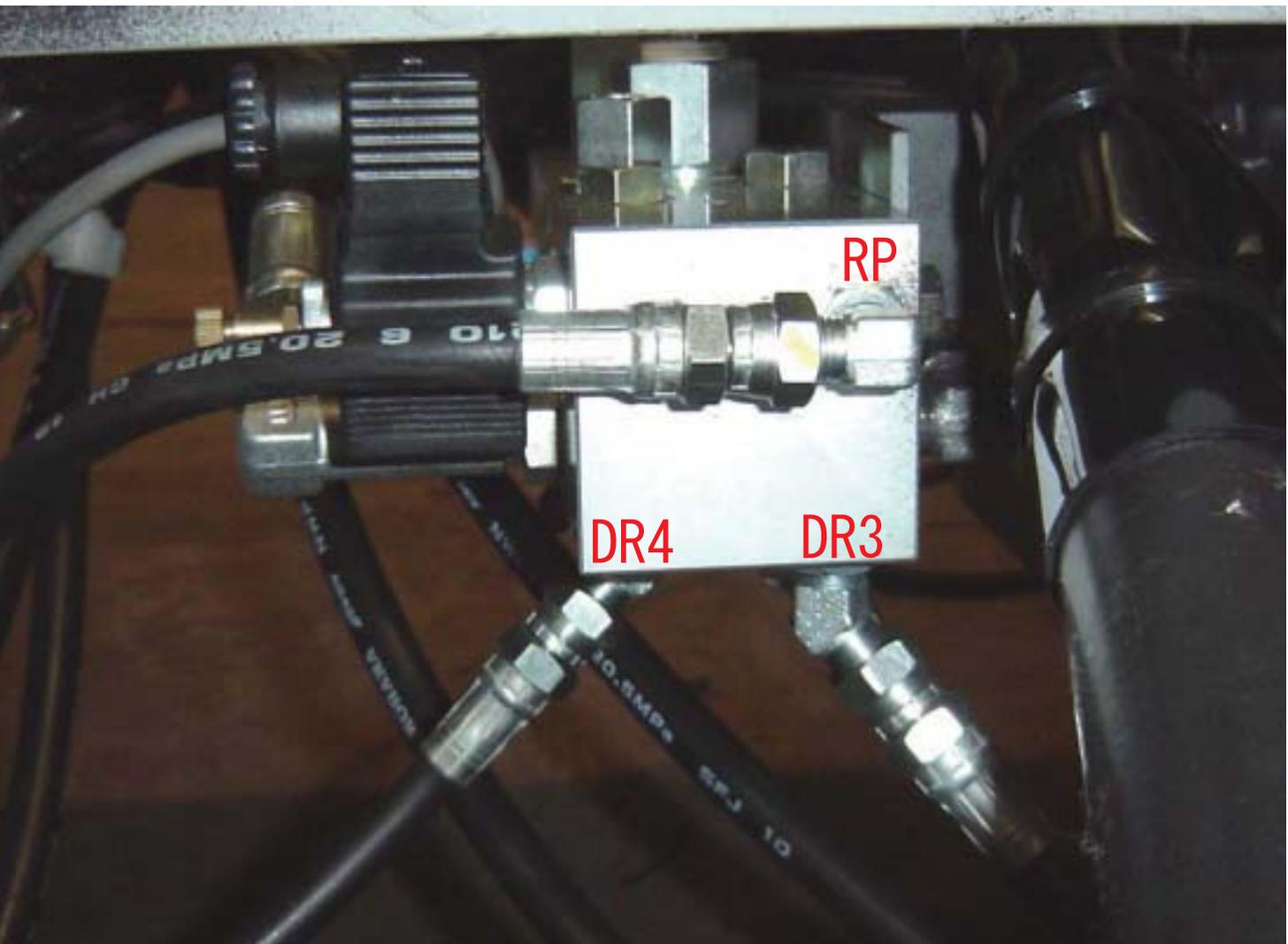
P2

DR

PB

T1

The front side of Manifold block



The front side of manifold block



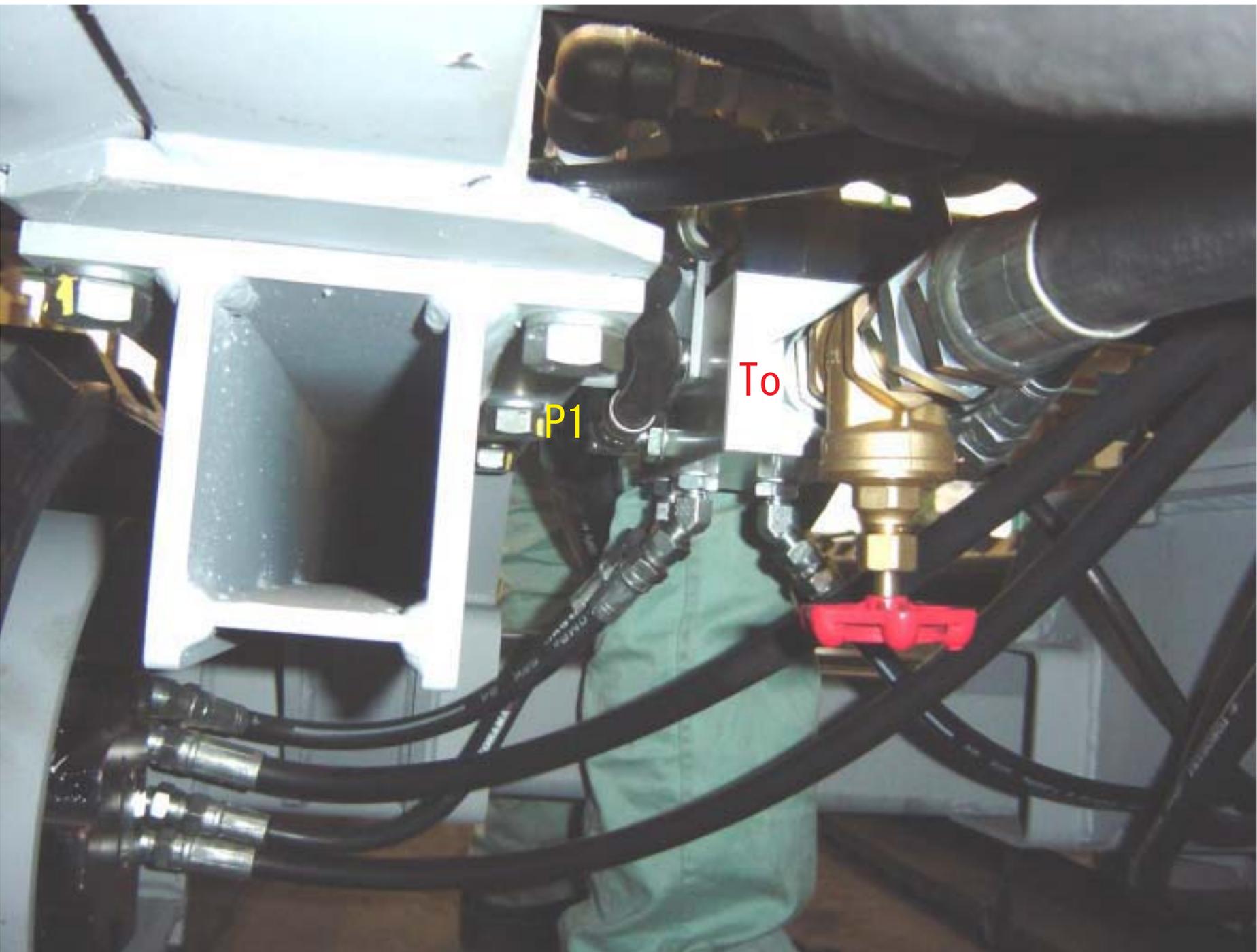
Sky



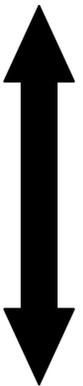
Ground

11-10

The back side of Manifold block

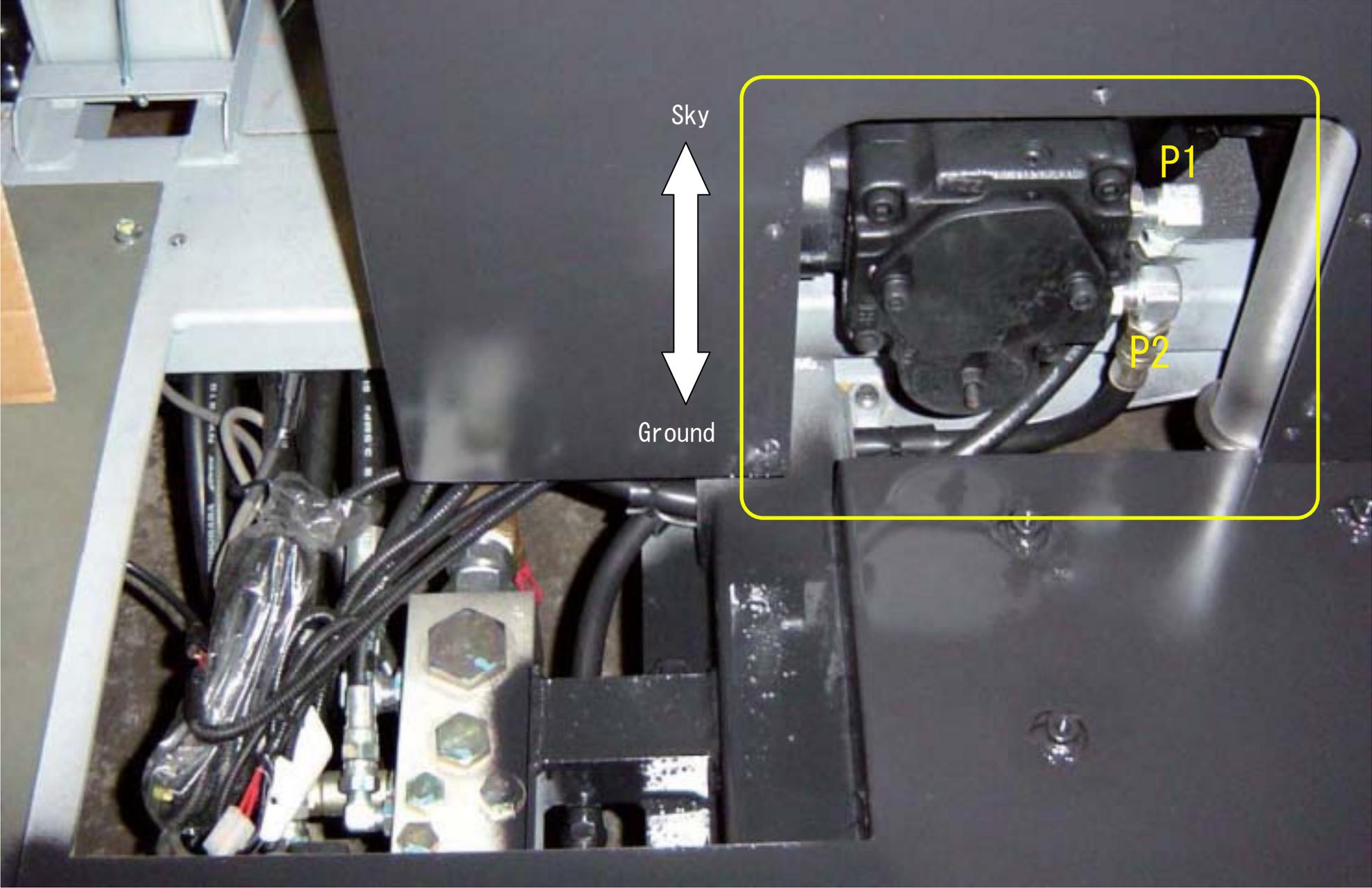


Sky

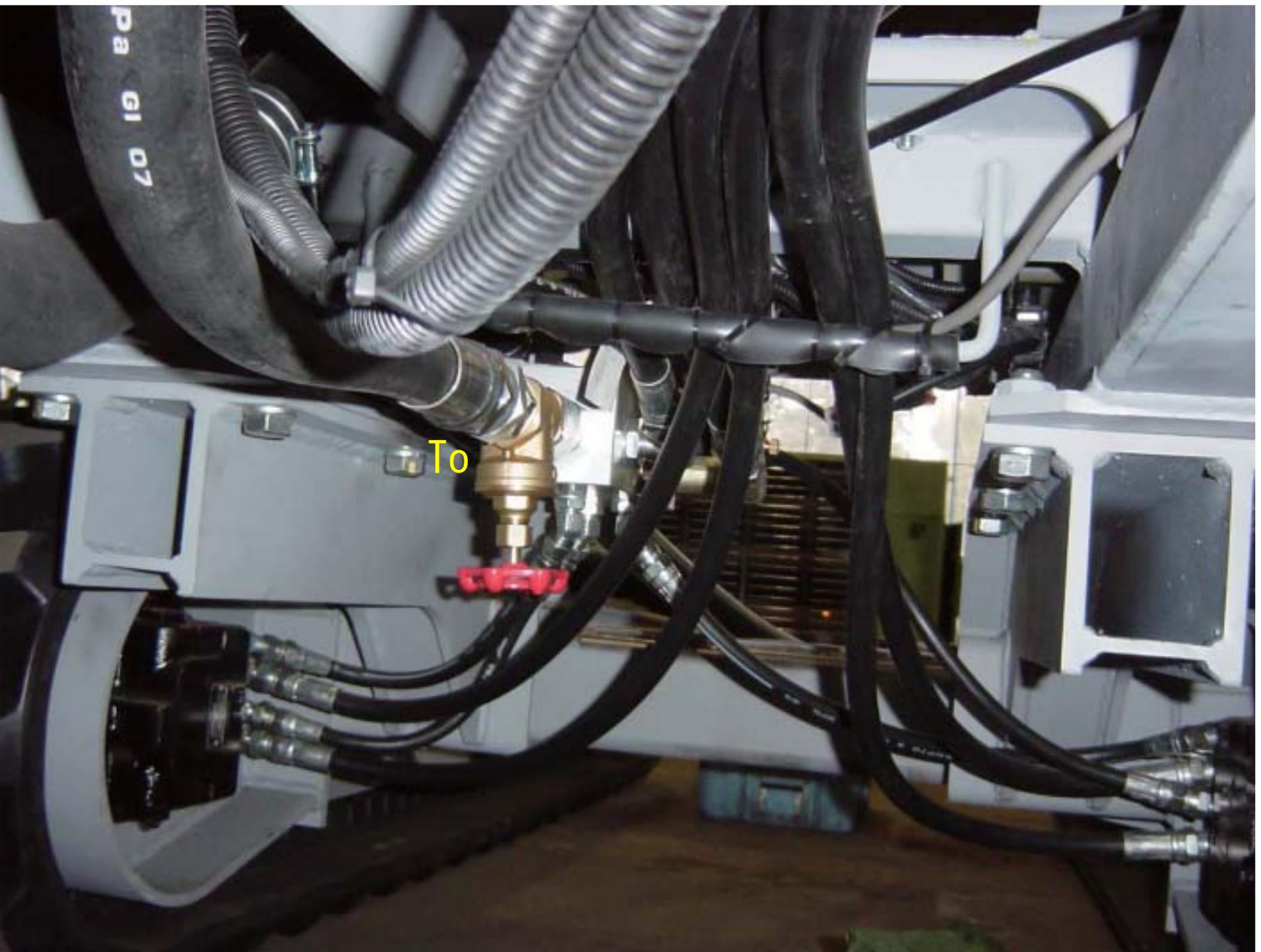


Ground

11-11



Crawling motor



Sky



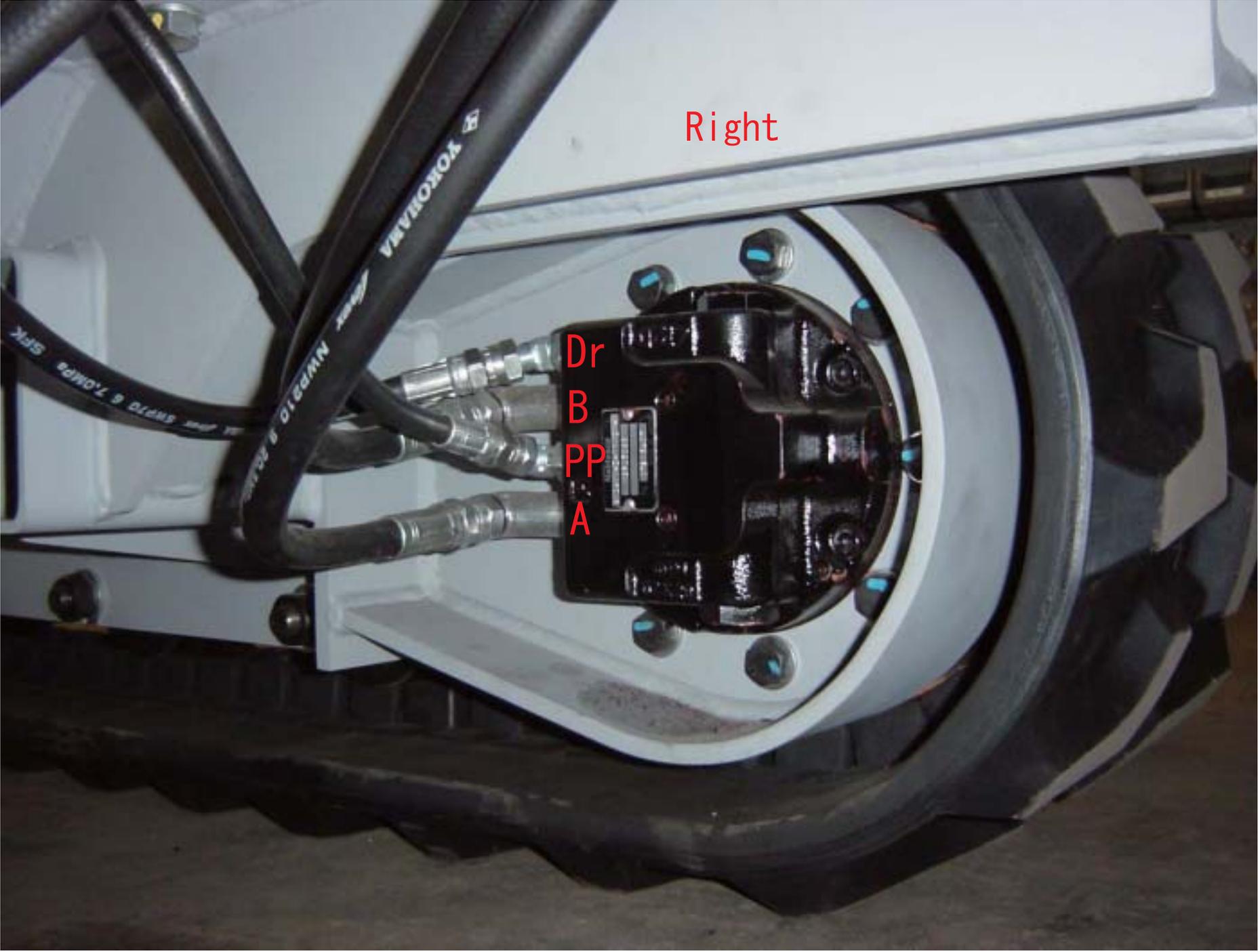
Ground

11-13

To

Pa GI 07

Crawling motor



Right

Dr
B
PP
A

Sky



Ground

11-14

Crawling motor



Left

Dr
A
PP
B

Sky

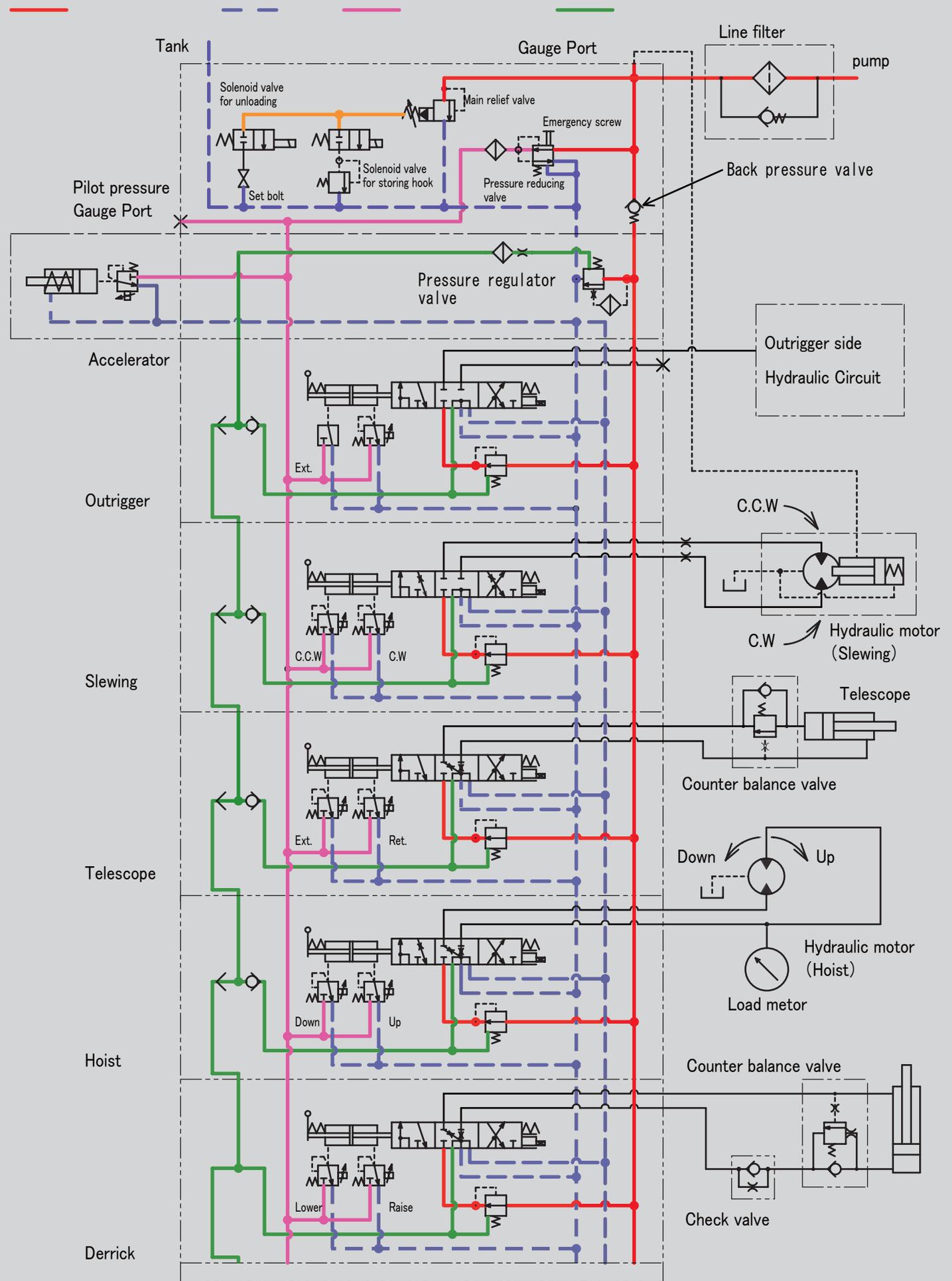


Ground

11-15

Hydraulic Circuit Diagram (control valve for crane)

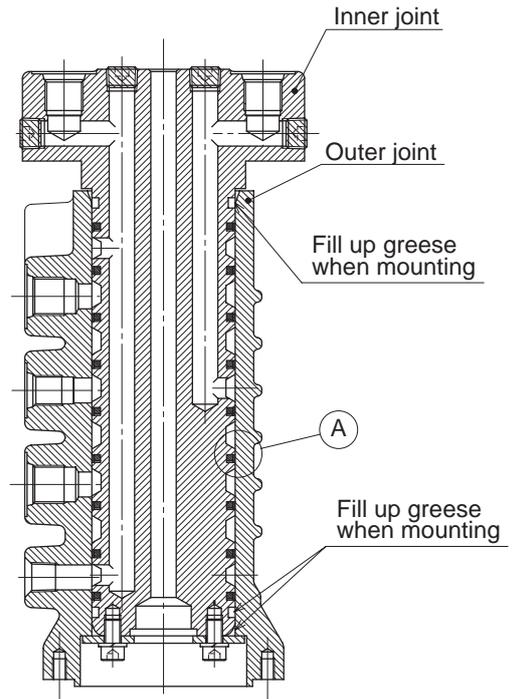
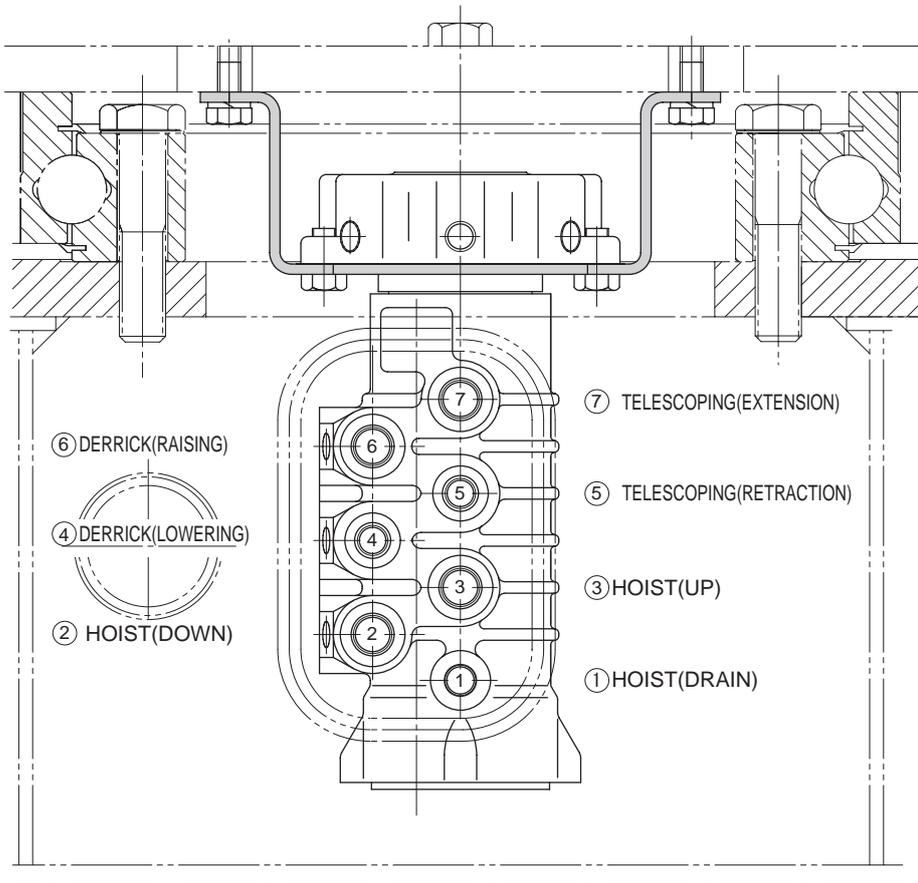
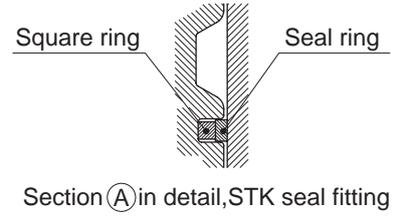
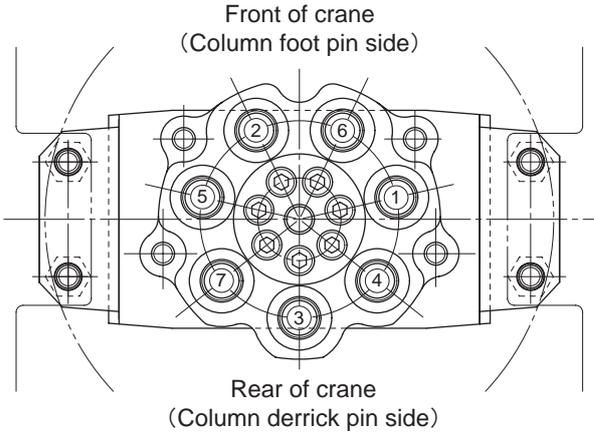
High pressure line Tank line Pilot pressure line Feed-back line

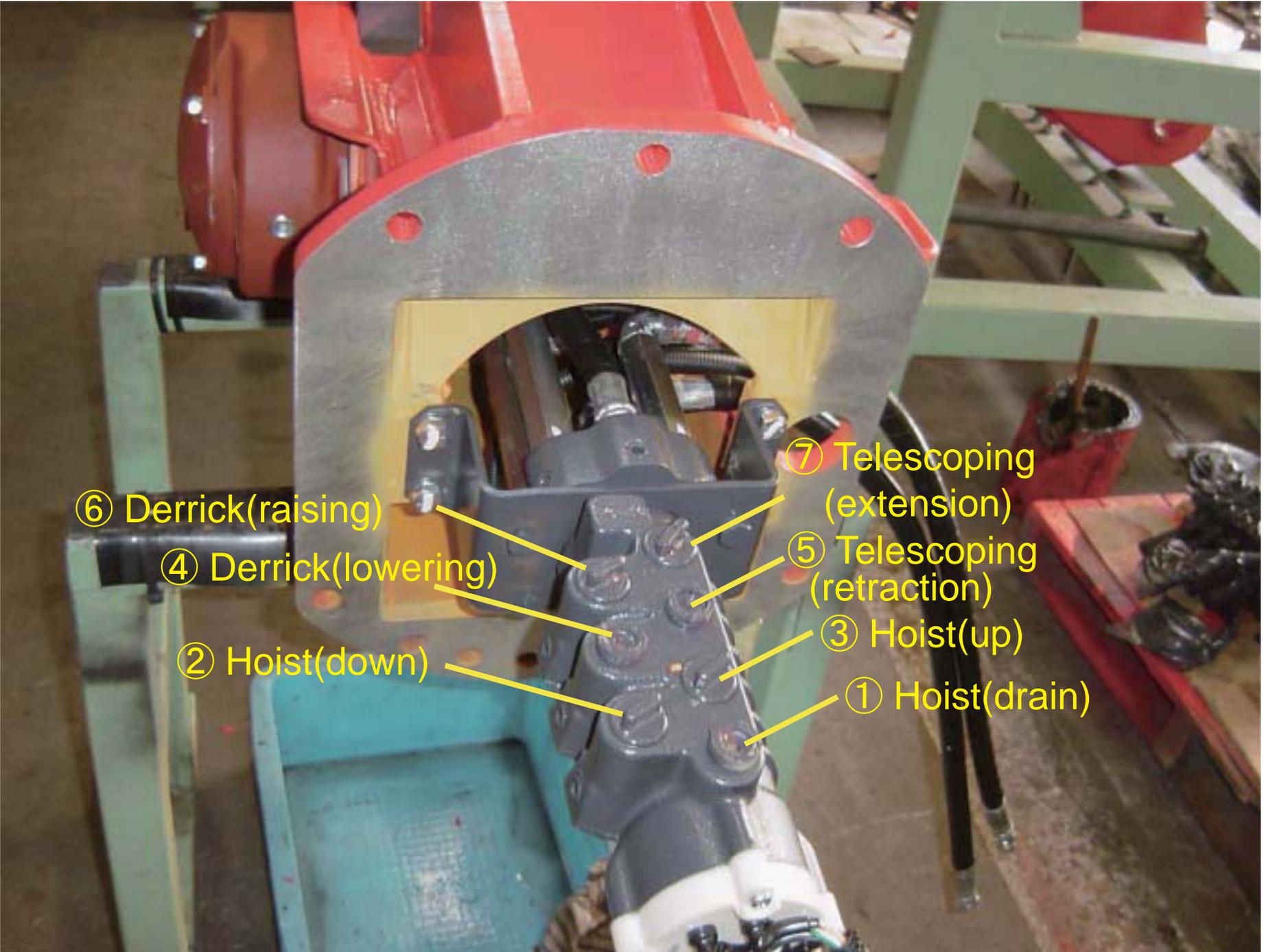


Control valve (for crane)

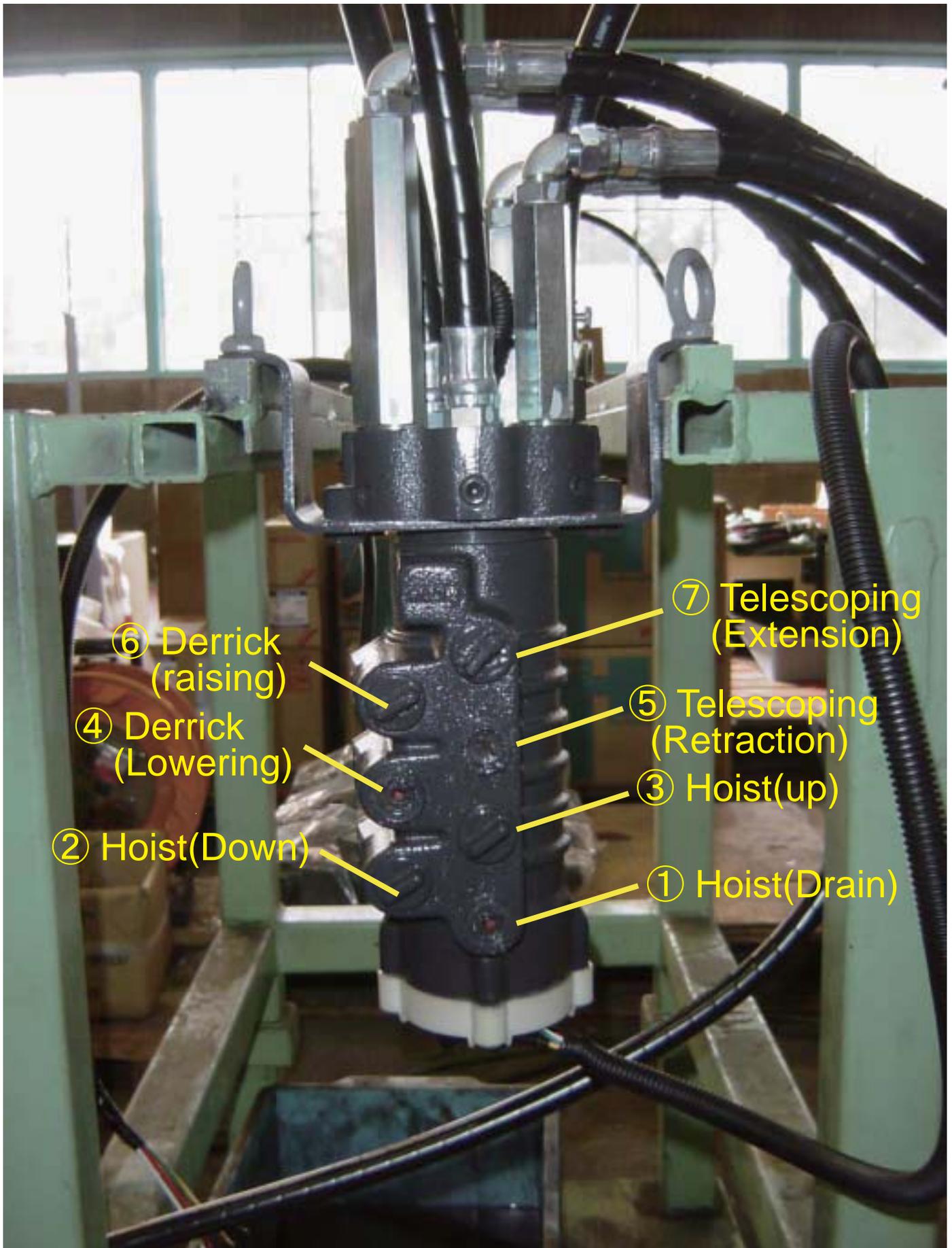
13.SWIVEL JOINT

Construction of swivel joint and where hoses are attached

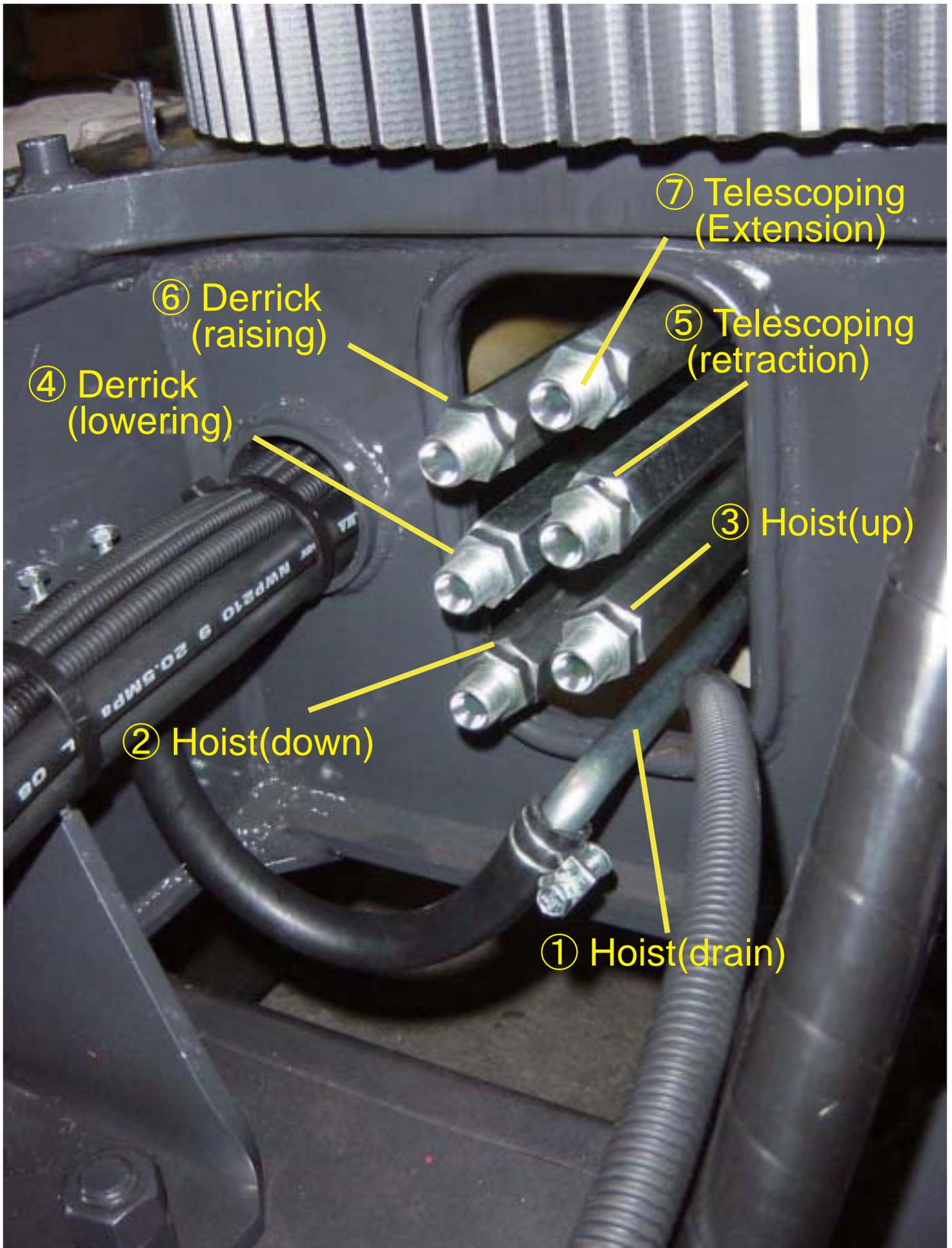




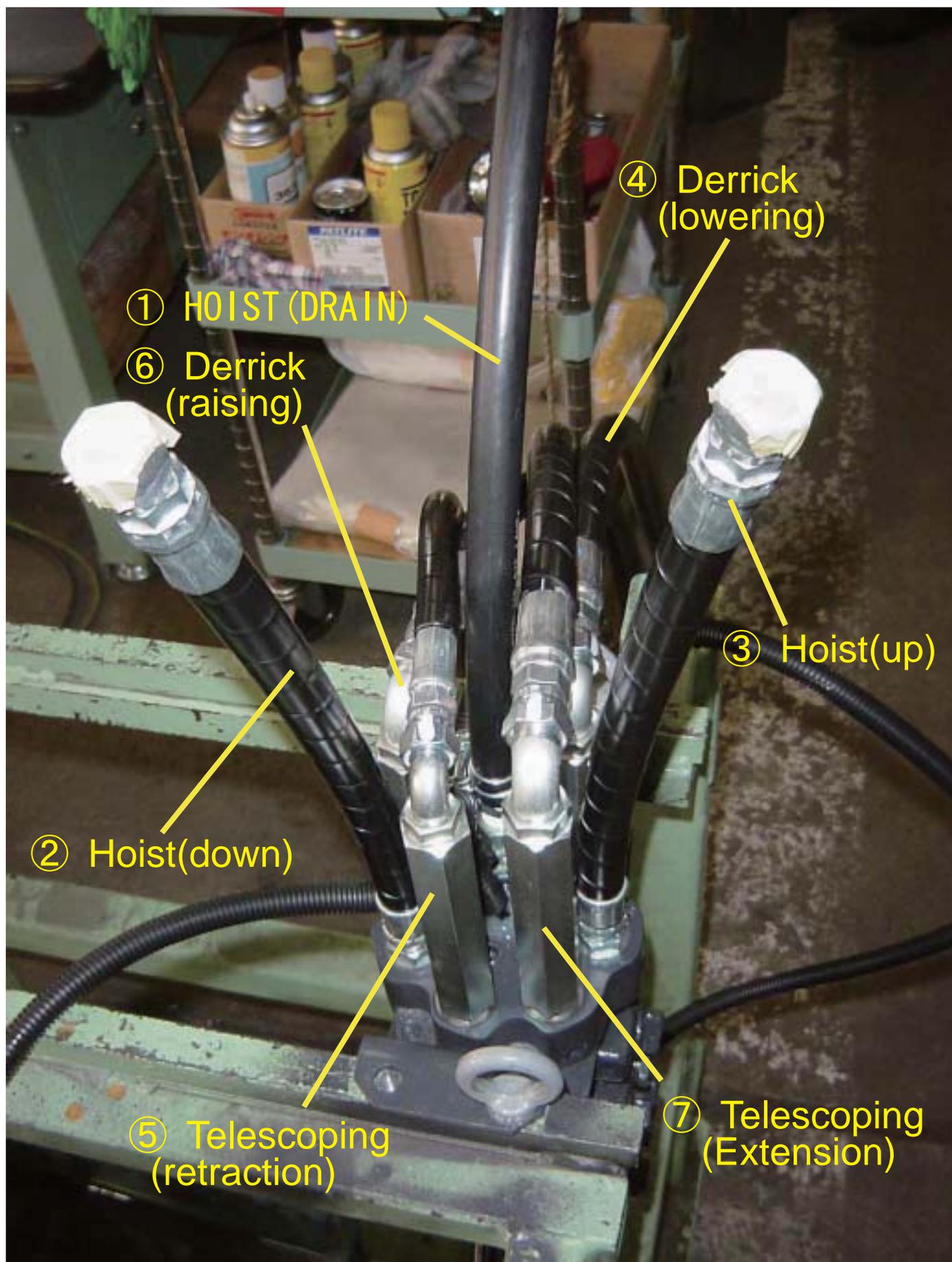
SWIVEL JOINT PIPING



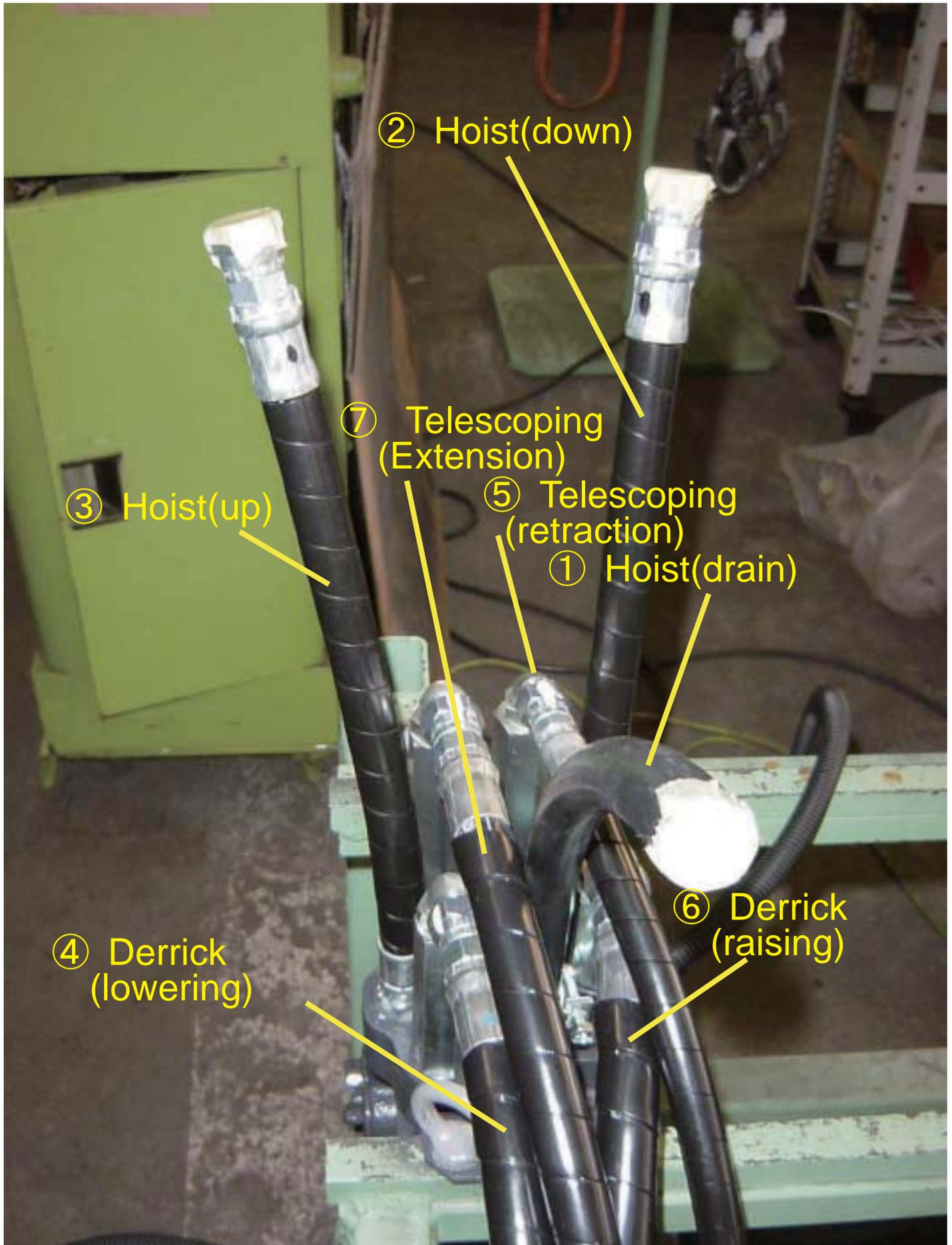
SWIVEL JOINT PIPING



SWIVEL JOINT PIPING



SWIVEL JOINT PIPING

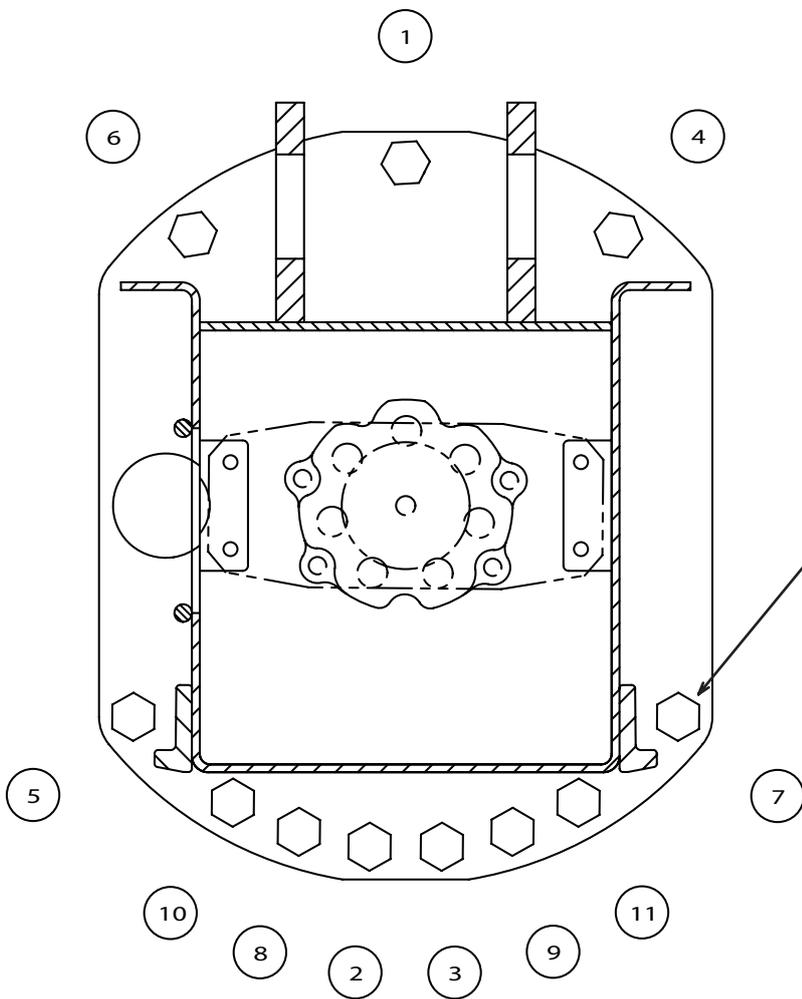


14 COLUMN

14.1 Tightening torque for bolts fastening column and tightening order



Bolt for derrick pin
Torque 78N-m (8kgf-m)



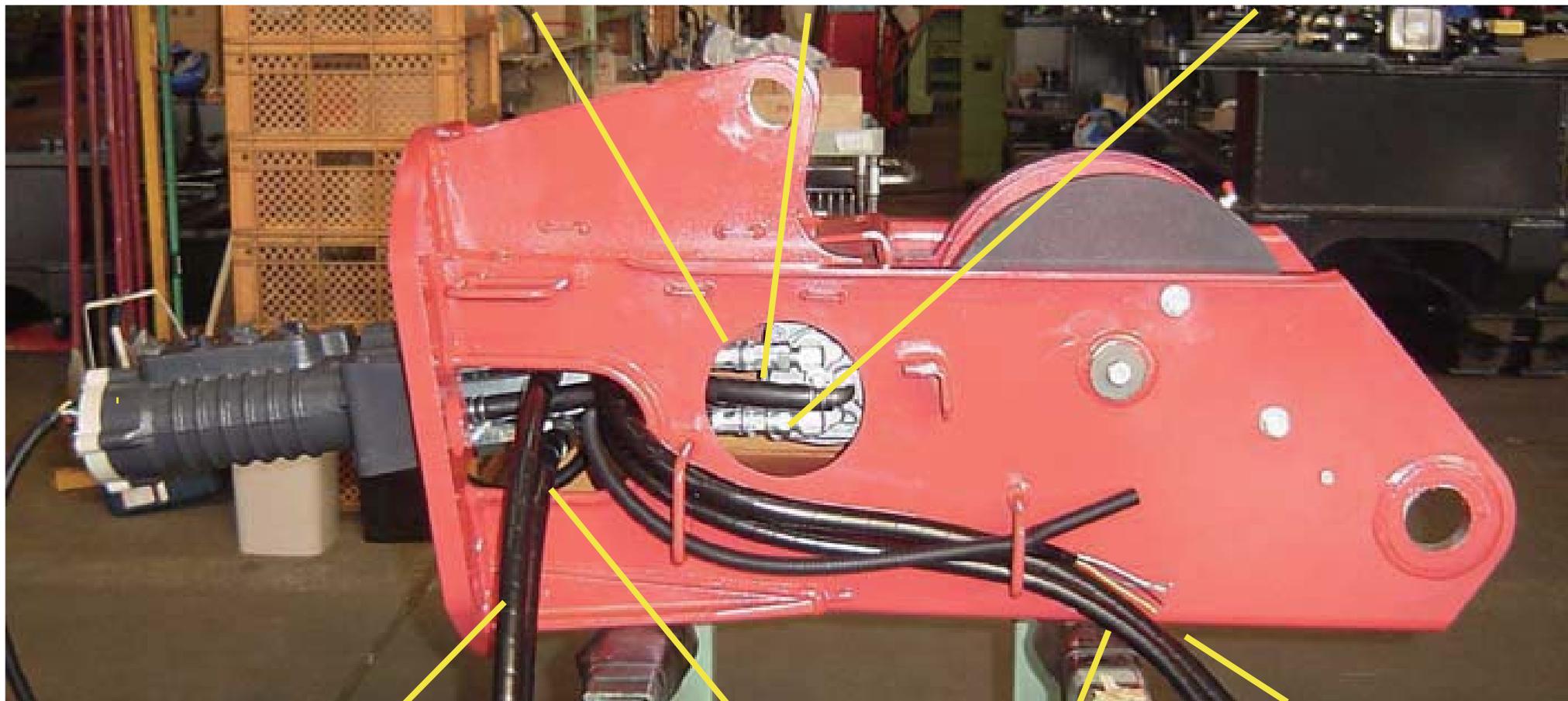
Bolt for column
When assembling, apply "LOCTITE #962T"
Tighten the bolts in the numerical
order as illustrated in the figure.

Torque
URW376CDE → 245N-m (25kgf-m)
URW506CDE → 333N-m (34kgf-m)

③ Hoist(up)

① Hoist(drain)

② Hoist(down)



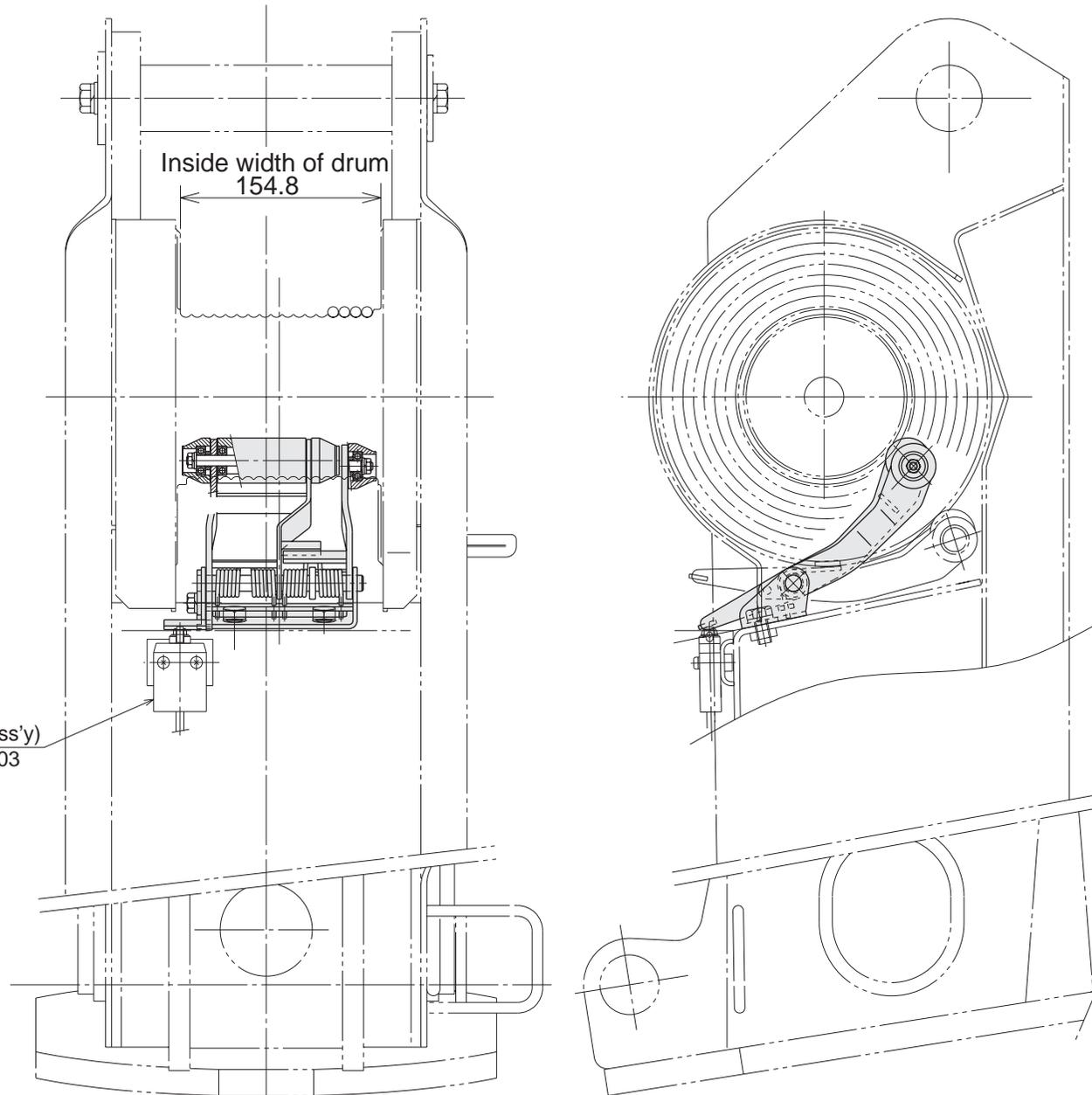
④ Derrick
(lowering)

⑥ Derrick
(raising)

⑤ Telescoping
(retraction)

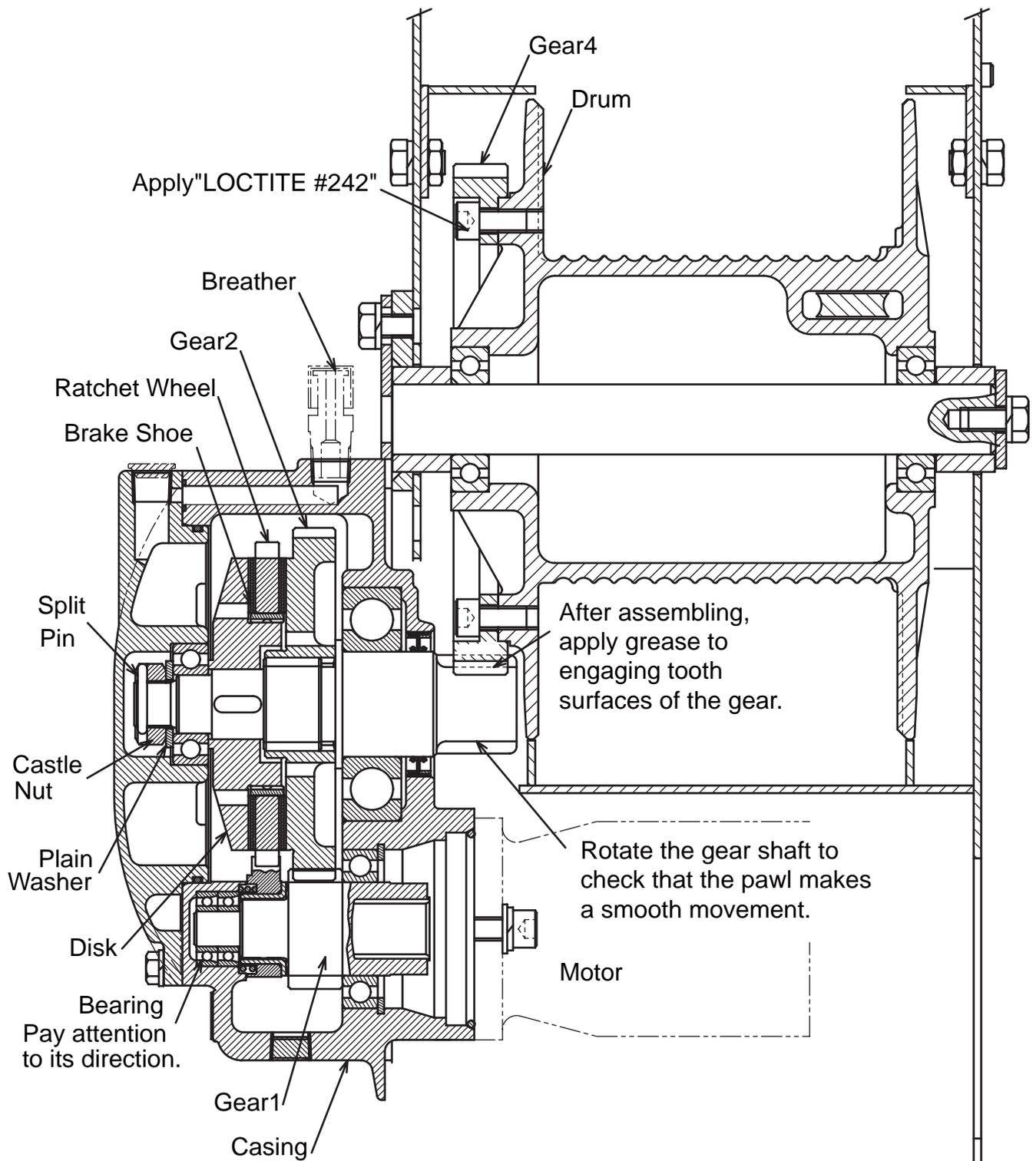
⑦ Telescoping
(extension)

WIRE ROPE RETAINING MECHANISM



15. HOIST WINCH

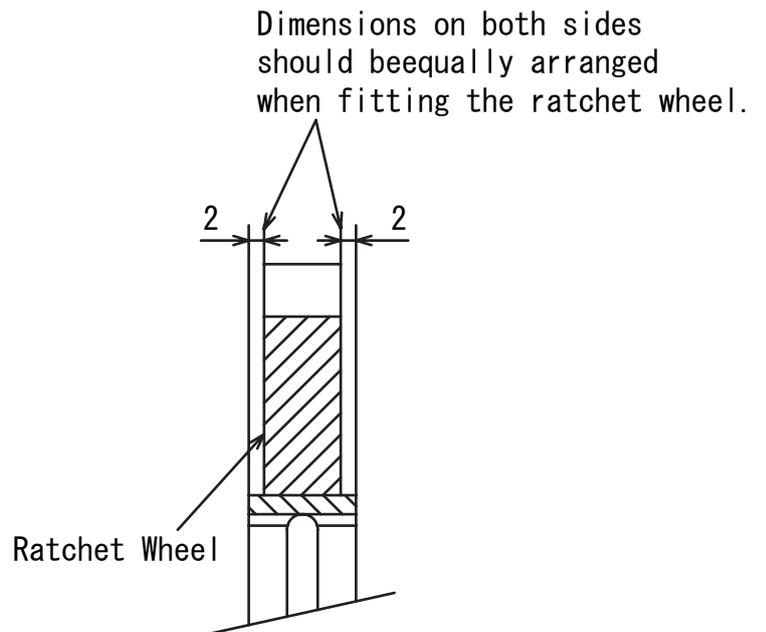
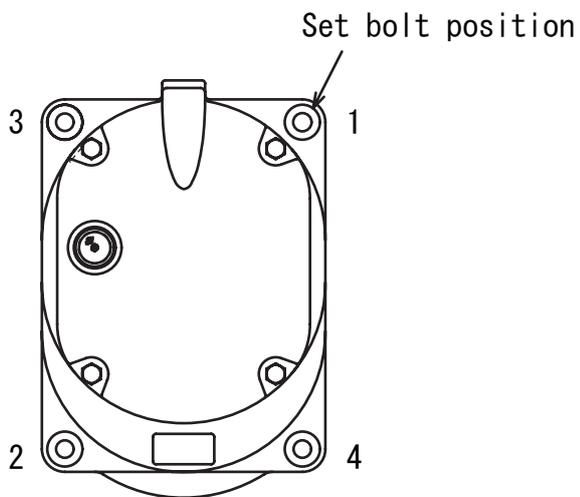
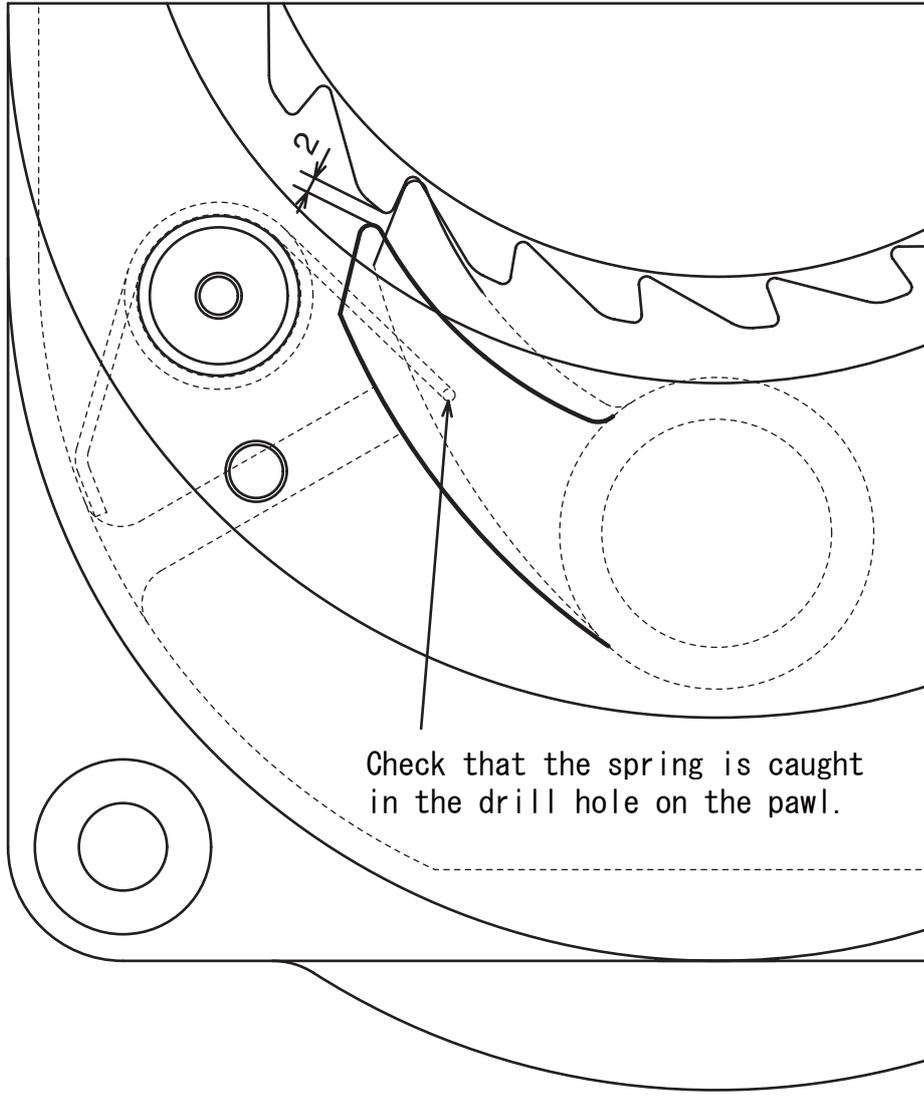
15. 1 Construction of Hoist Winch and brake shoe adjusting procedure



Brake Shoe Adjusting procedures

1. Tighten the castle nut lightly with a spanner.
2. After tightening, loosen the castle nut for approx. 1/6 turn and within this range align the castle nut with the hole in the gear shaft; and fix it with the split pin.
3. Replace the brake shoe every 3 years.

15. 2 Caution to be taken when reassembling hoist winch



Tightening order of bolts for mounting reduction gear
Tighten the hexagon socket head screws in diagonal order after the set bolt has been fastened first to align each screw hole.

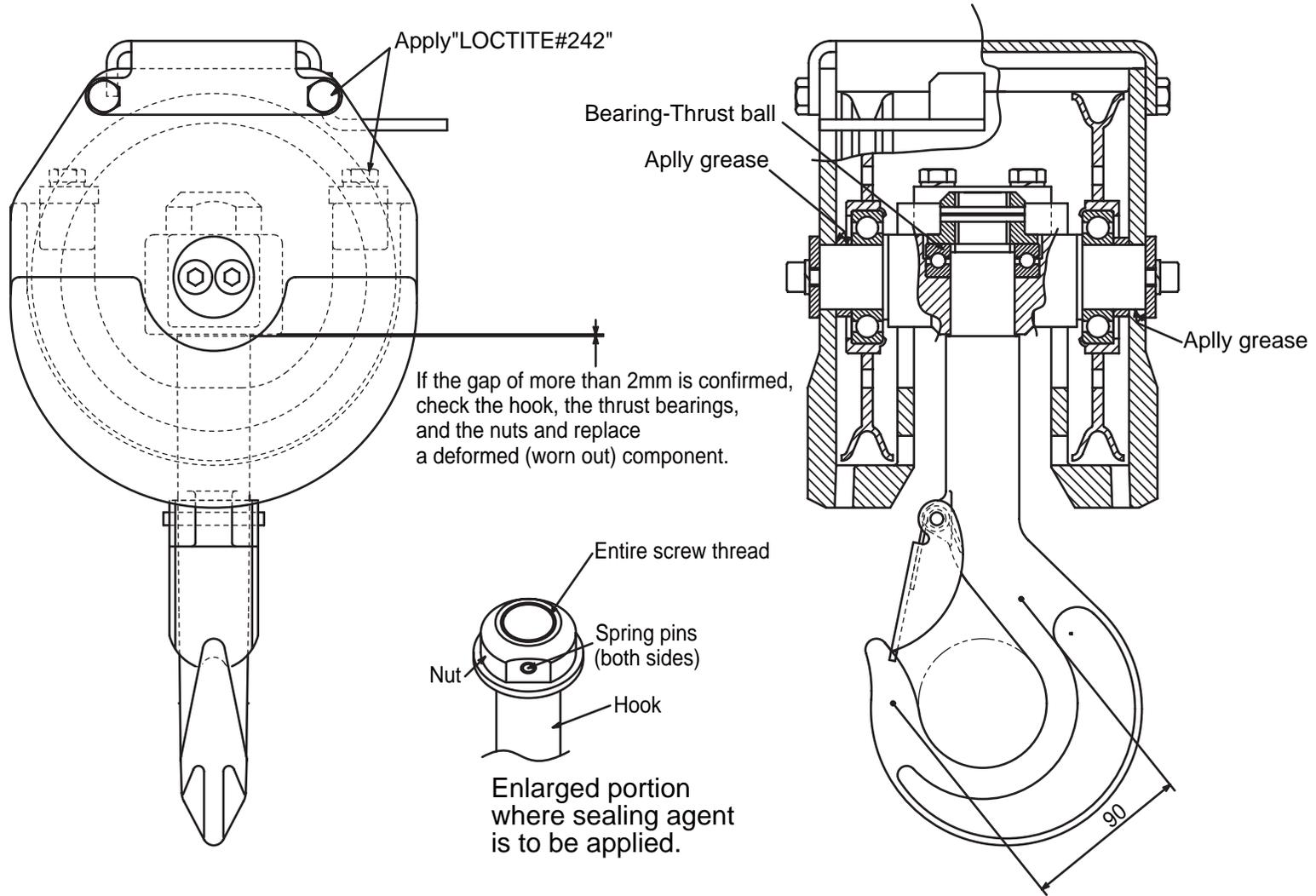
15. 3 Cause of Troubles and Measures to be Taken

(1) Hoist winch

Problems	Possible cause	Measures to be taken
① Pressure does not rise.	<ul style="list-style-type: none"> • Pump is faulty. (Pressure does not rise at idling speed.) (Total pressure required for operation is insufficient.) 	<ul style="list-style-type: none"> • Replace.
	<ul style="list-style-type: none"> • Relief set of control valve is faulty. (Pressure rises but not enough.) 	<ul style="list-style-type: none"> • Adjust or replace.
	<ul style="list-style-type: none"> • O-ring and other parts of relief valve of control valve are faulty. (Adjusting bolt of relief valve is tightened but unable to control pressure.) 	<ul style="list-style-type: none"> • Replace parts or replace relief ass'y with new one.
	<ul style="list-style-type: none"> • Hoist motor is faulty. (Quantity of drain is larger than the specified.) 	<ul style="list-style-type: none"> • Replace.
② Pressure rises but hoisting up impossible.	<ul style="list-style-type: none"> • Drum or internal mechanism of reduction gear is faulty. 	<ul style="list-style-type: none"> • Overhaul reduction gear. • Inspect the drum
③ Pressure rises but lowering is impossible.	<ul style="list-style-type: none"> • Brake shoe is over-tightened.. • Drum or reduction gear is defective. 	<ul style="list-style-type: none"> • Adjust tightening of brake shoe. • Overhaul reduction gear. • Check drum.
④ Unable to maintain suspended load.	<ul style="list-style-type: none"> • Brake shoe is faulty. • Pawl is faulty. 	<ul style="list-style-type: none"> • Replace brake shoe. • Replace pawl.
⑤ When lowering, hunting occurs.	<ul style="list-style-type: none"> • Brake shoe is faulty. • Over-tightening of brake shoe. • Internal mechanism of reduction gear is faulty. 	<ul style="list-style-type: none"> • Inspect brake shoe and check quantity of oil. • Adjust tightening of nut. • Disassemble reduction gear.
⑥ When hoisting up, clattering sound is heard.	<ul style="list-style-type: none"> • Spring pressing the pawl against slide plate is faulty. • Bushing the part of fitting pawl is worn out. 	<ul style="list-style-type: none"> • Replace spring. • Replace bushing.

16. HOOK

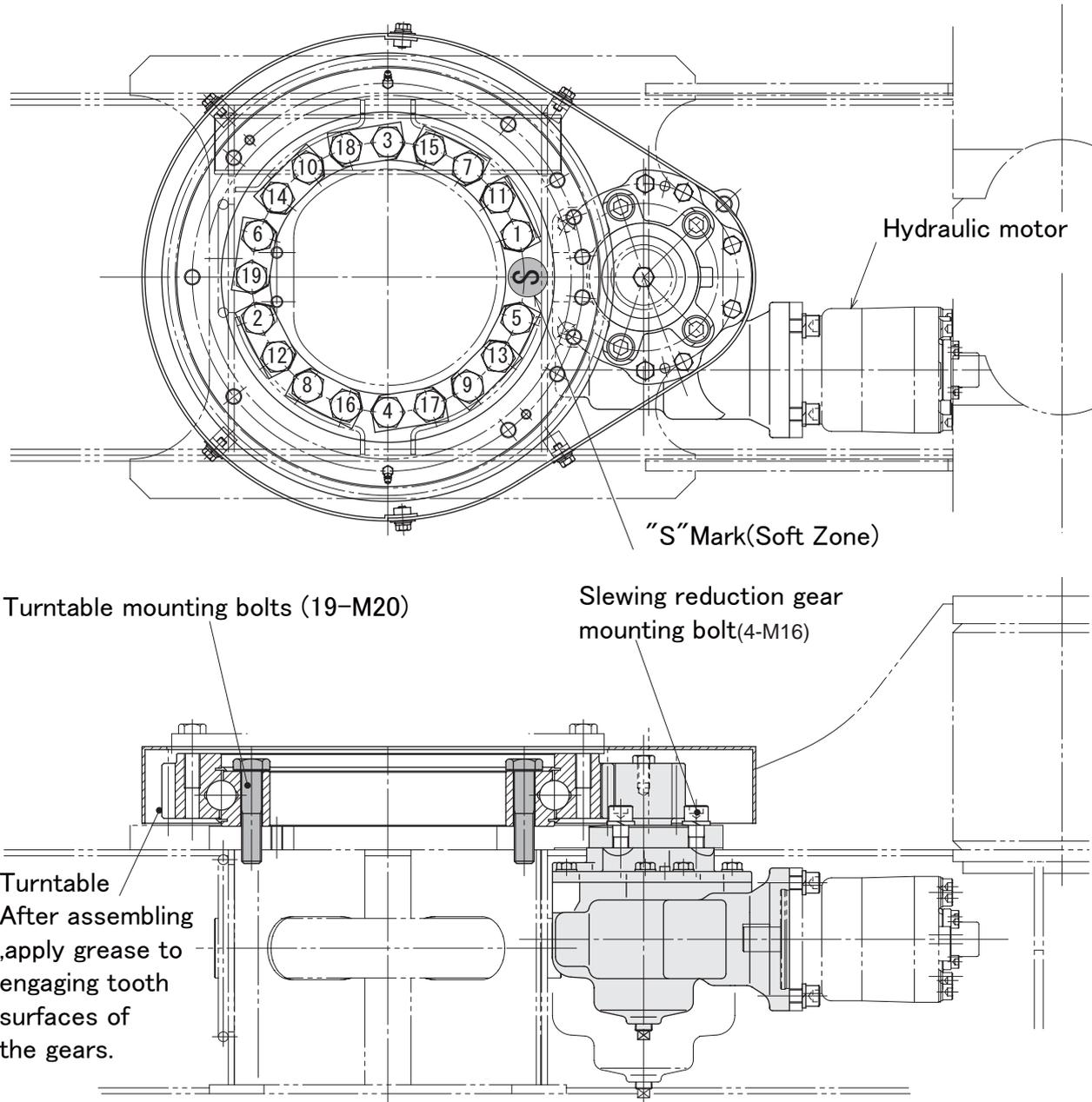
16-1



17. Turntable Mounting Procedures

(1) Turntable mounting procedures

1. Install the slewing reduction gear to the base.
2. Set the turntable on the base to screw-in the bolts for mounting turntable lightly.
3. Insert the thickness gauge (0.1~0.2mm) into the space between the turntable gear and the pinion gear, and press strongly the turntable to the pinion gear.



Note:

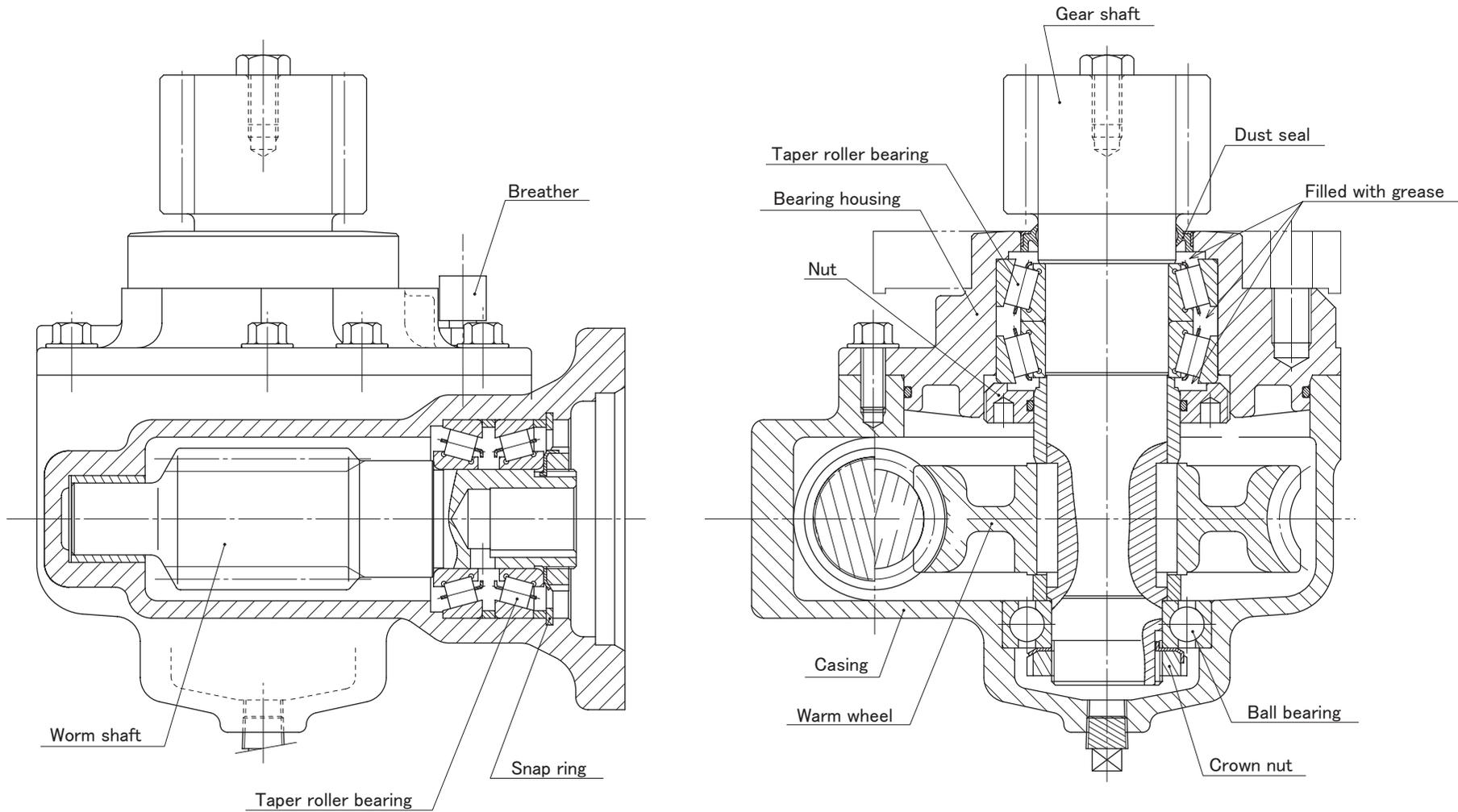
1. Tightening torque of bolts (4-M16) mounting slewing reduction gear is $255 \pm 29 \text{ N}\cdot\text{m}$ ($26 \pm 3 \text{ Kg}\cdot\text{m}$)
Tighten the mounting bolts in diagonal order.
2. Position the mark "S" on the inner part of turntable directed toward the truck front when mounting turntable.
3. Tighten the bolts in the numerical order as illustrated in the figure above.
4. Tighten the turntable mounting bolts (19-M20) equally with a torque of $471 \pm 39 \text{ N}\cdot\text{m}$ ($48 \pm 4 \text{ Kg}\cdot\text{m}$)
Before mounting bolts are tightened, degrease the bolts and the tapped holes to apply "LOCTITE #962T" to the bolts and tighten them with an equal torque.
5. The bolts for fastening the turntable (tempered bolts) must be UNIC genuine bolts, on which mark "UNIC12" is inscribed on the head.



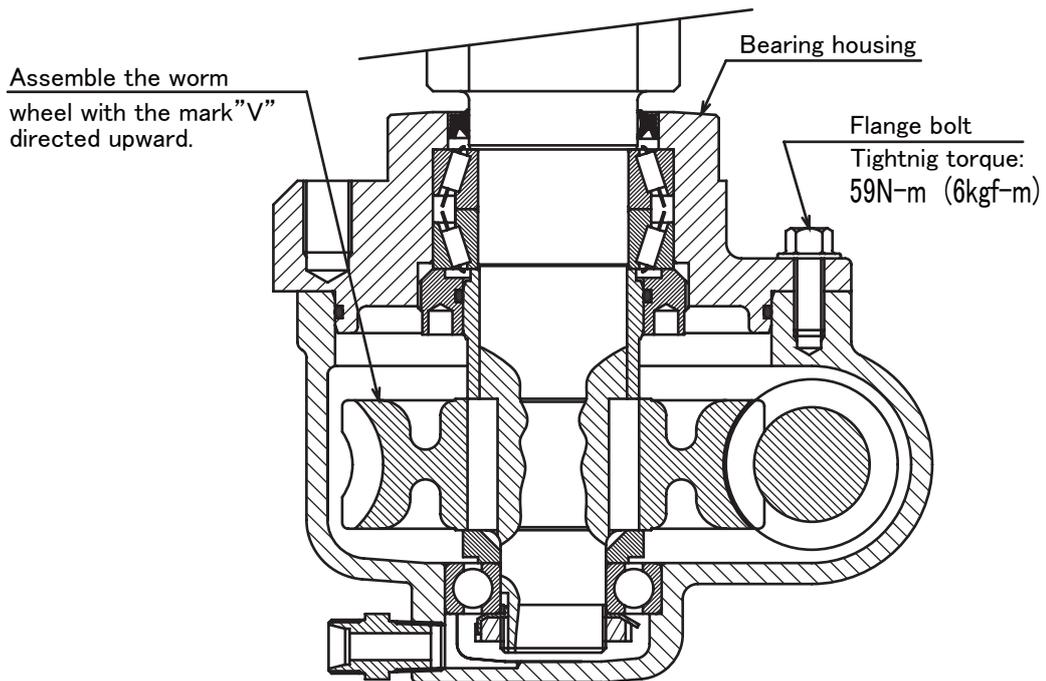
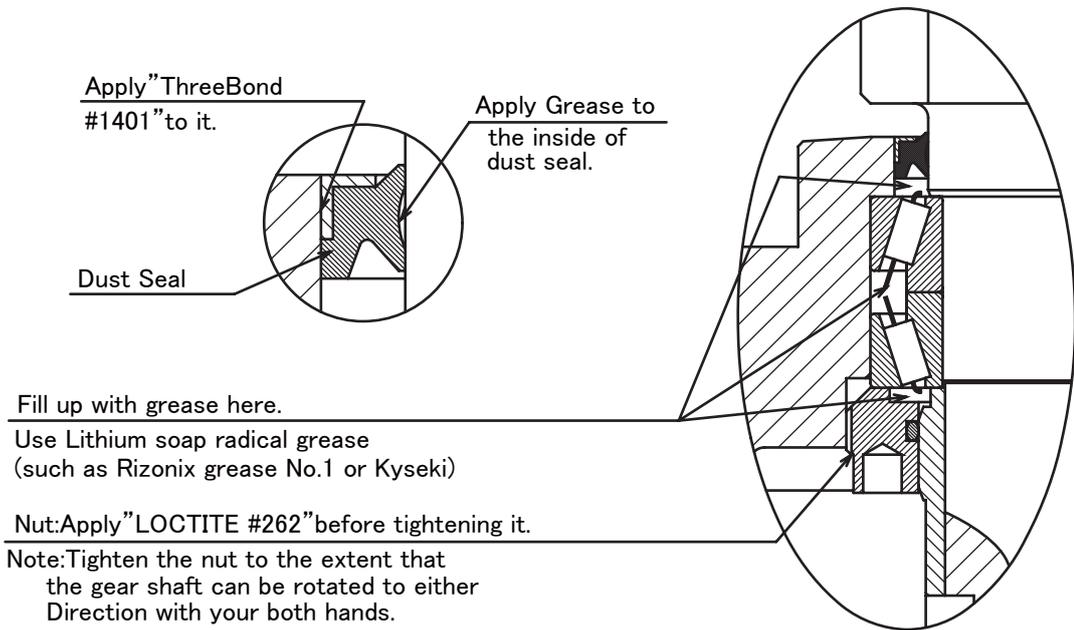
18.SLEWING REDUCTION GEAR

1)Construction

18-1

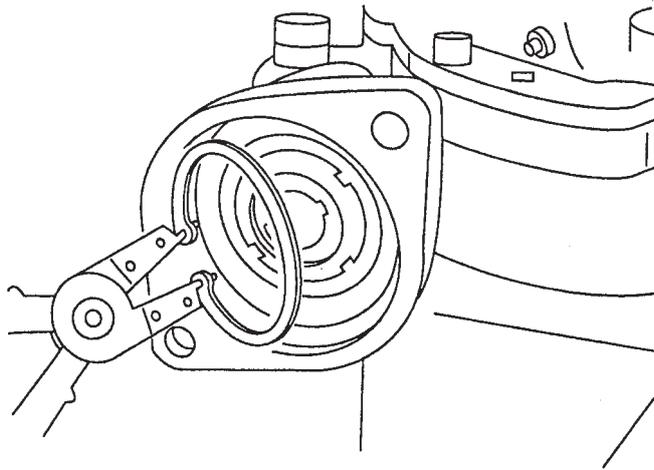


(2) Construction to be taken when reassembling slewing reduction gear

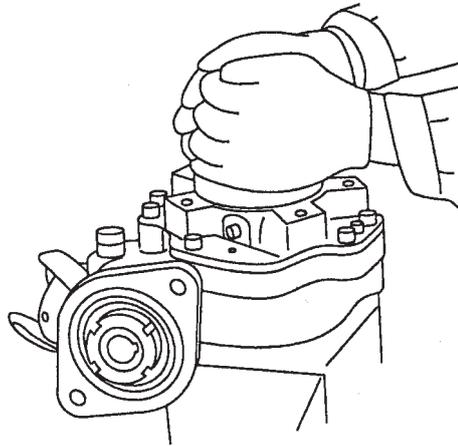


(3) Slewing reduction gear disassembly procedures

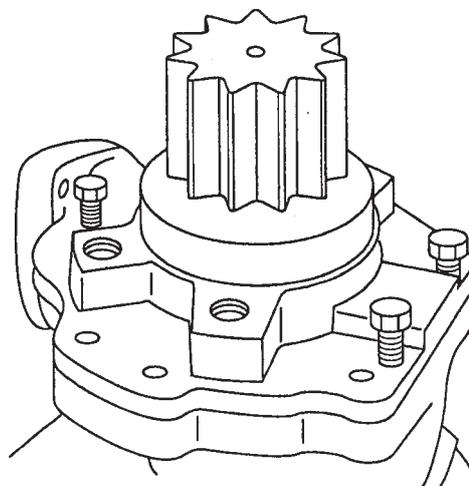
① Remove a snap ring (H-80) retaining the taper roller bearing which sustains the worm shaft.



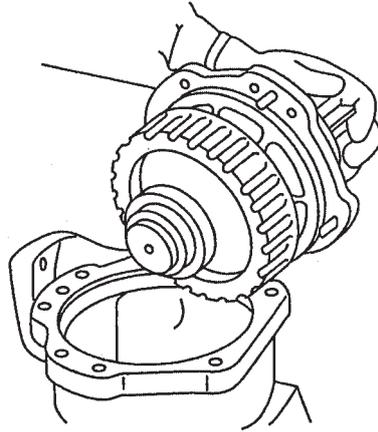
② Turn the gear shaft counterclockwise, and pull out the worm shaft from the casing. (Use of special tool for removing worm shaft is recommended.)



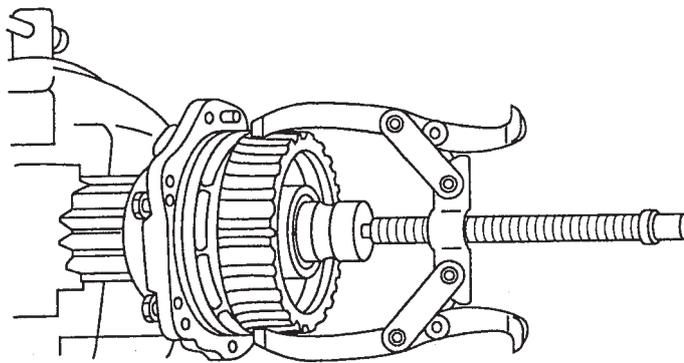
③ Remove 8 pcs. of bolt (M10 X 250) which fasten the bearing housing and pull out the housing, utilizing 3 pcs. of bolt for 3 through holes in the housing.



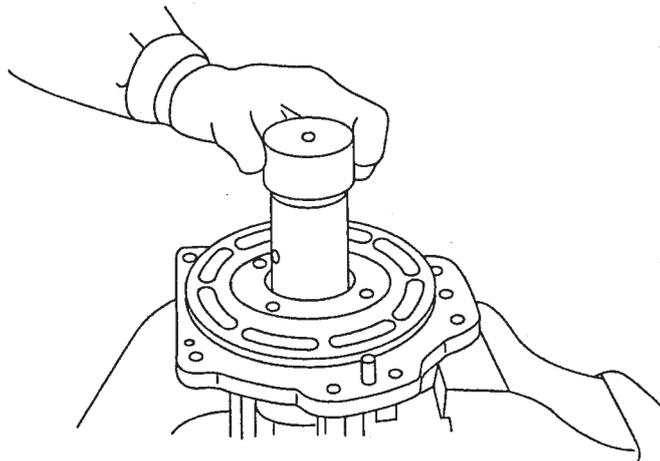
④ This figure shows the pulled out housing with gear shaft and worm wheel.



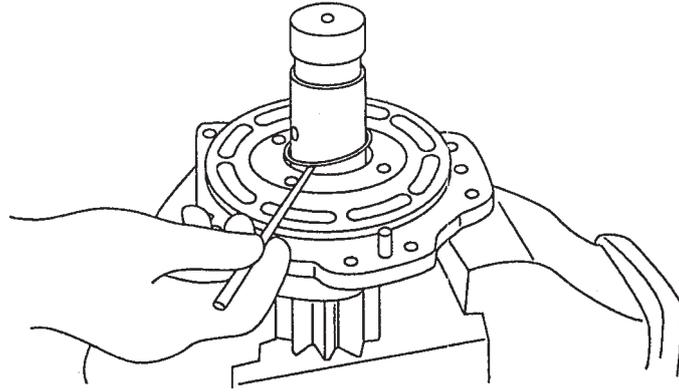
⑤ Grip the housing with a vice and pull out the worm wheel with a gear puller.



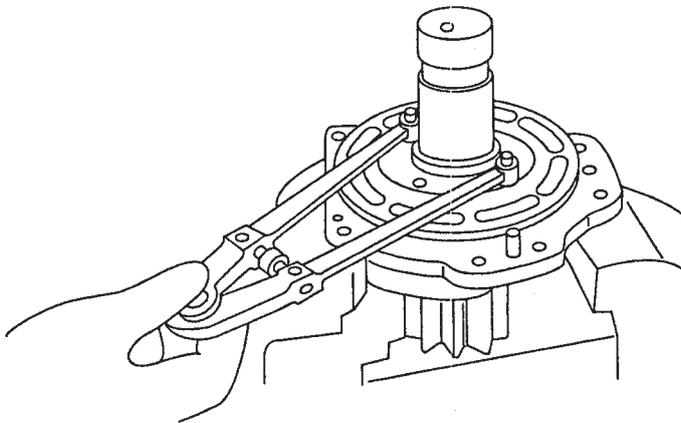
⑥ Pull out the collar which is assembled in the nut.



⑦ Pull out the O-ring which is assembled in the nut.

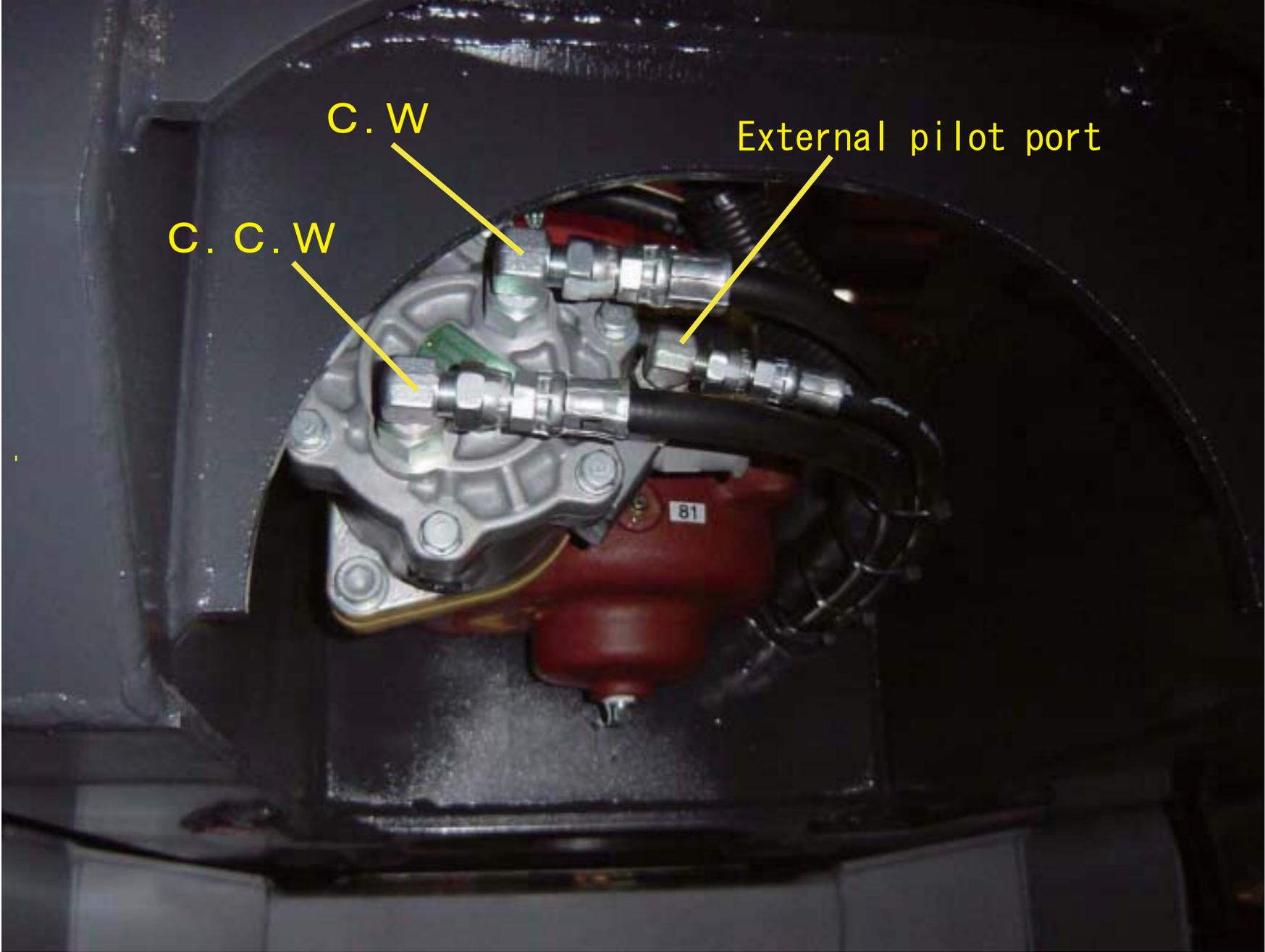


⑧ With a pin spanner, remove the nut which retains the taper roller bearing.



Note: To the threaded part of the nut, "LOCTITE" was applied. Therefore, when loosening, warm up lightly the threaded part with gas flame, and then loosen. When reassembling, be sure to apply "LOCTITE #262" to the threaded part.

Piping of Hydraulic Motor for Slewing



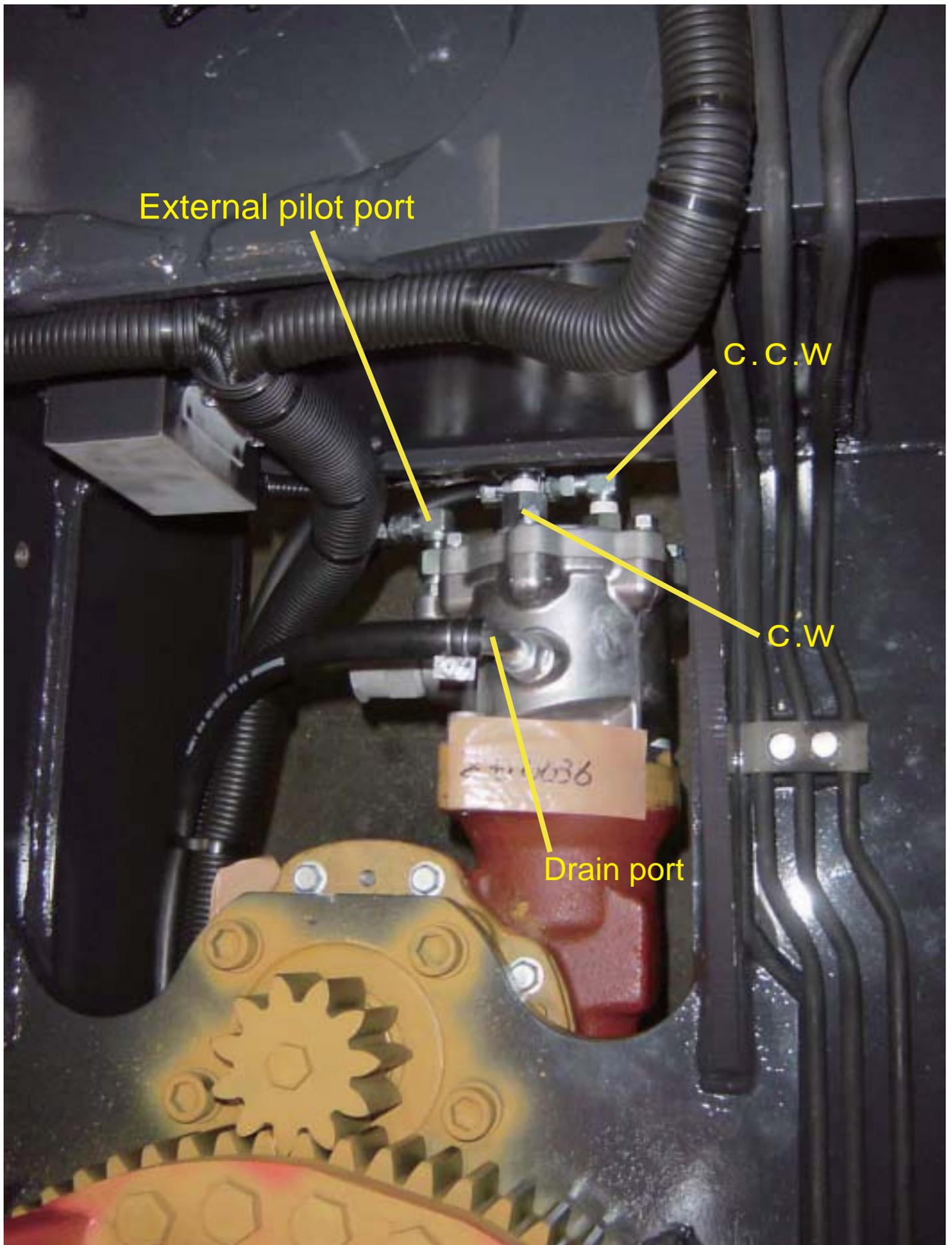
Sky



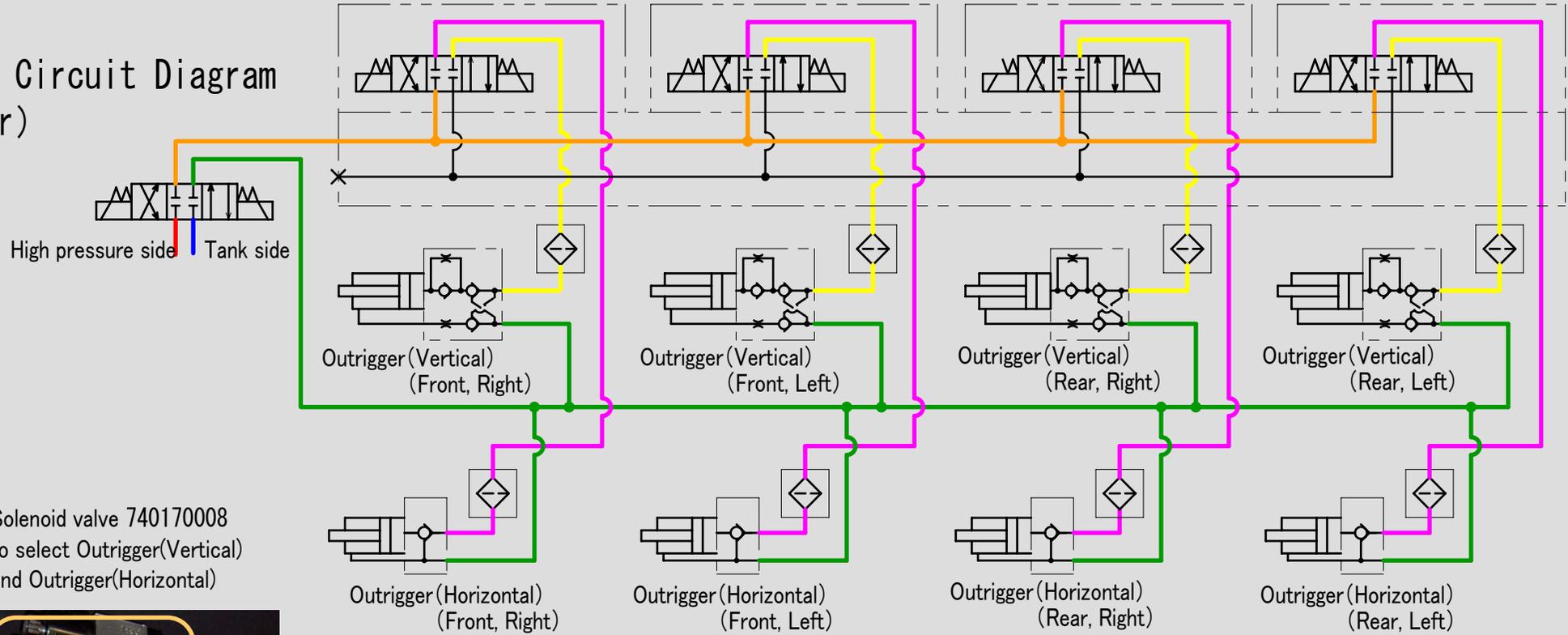
Ground

18-6

Pinping of Hydraulic Motor for Slewing

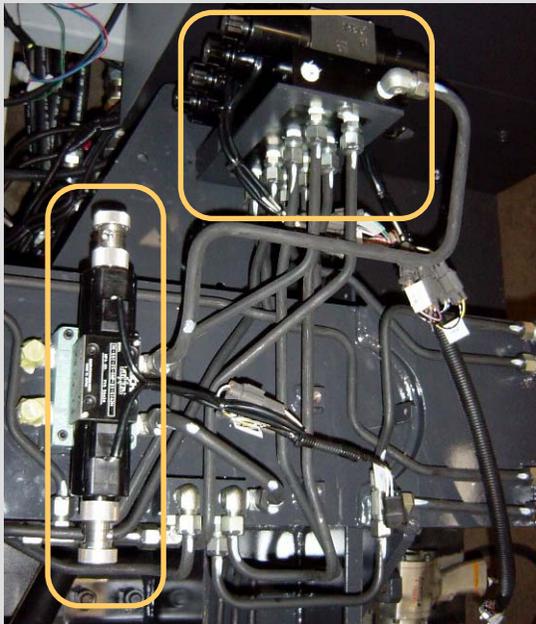


1 9 Hydraulic Circuit Diagram (Outrigger)



Solenoid valve 740170008 to select Outrigger (Vertical) and Outrigger (Horizontal)

1 9 - 1



Solenoid valve 740170009 to extend Outrigger cylinder, and to withdraw Outrigger cylinder



Outrigger cylinder (Horizontal)



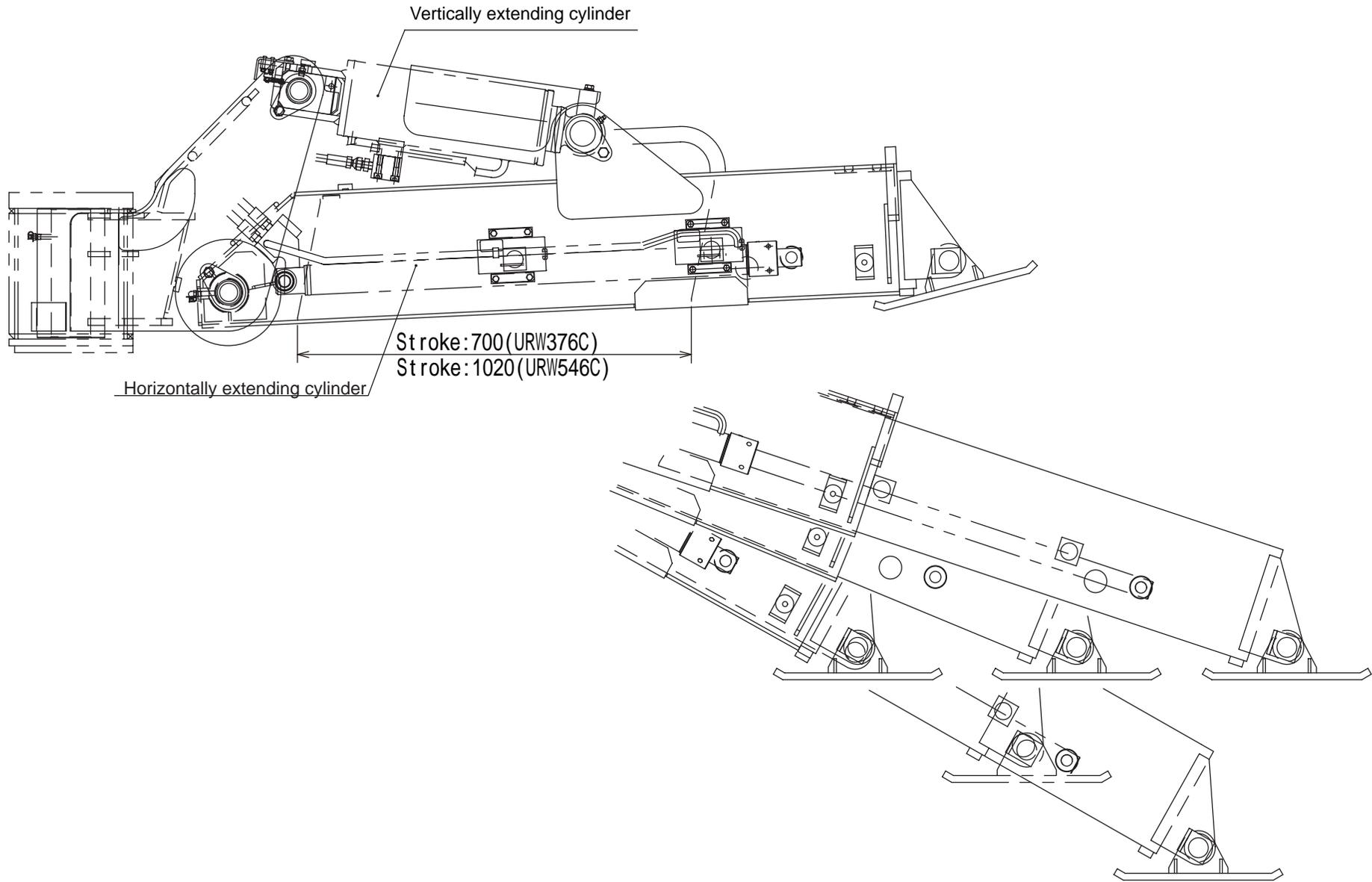
Outrigger cylinder (Vertical)

Double pilot check valve 740197040

Pilot check valve 601529000



19.HOW OUTRIGGERS ARE EXTENDED



19.OUTRIGGER CYLINDER

1)Construction of vertically extending cylinder

In order to prevent moisture from entering the cylinder from the threads, apply liquid gasket, solventless type #1101(fatty acid degenerated phenolic resin family),supplied by ThreeBond here (4 places on its circumference).

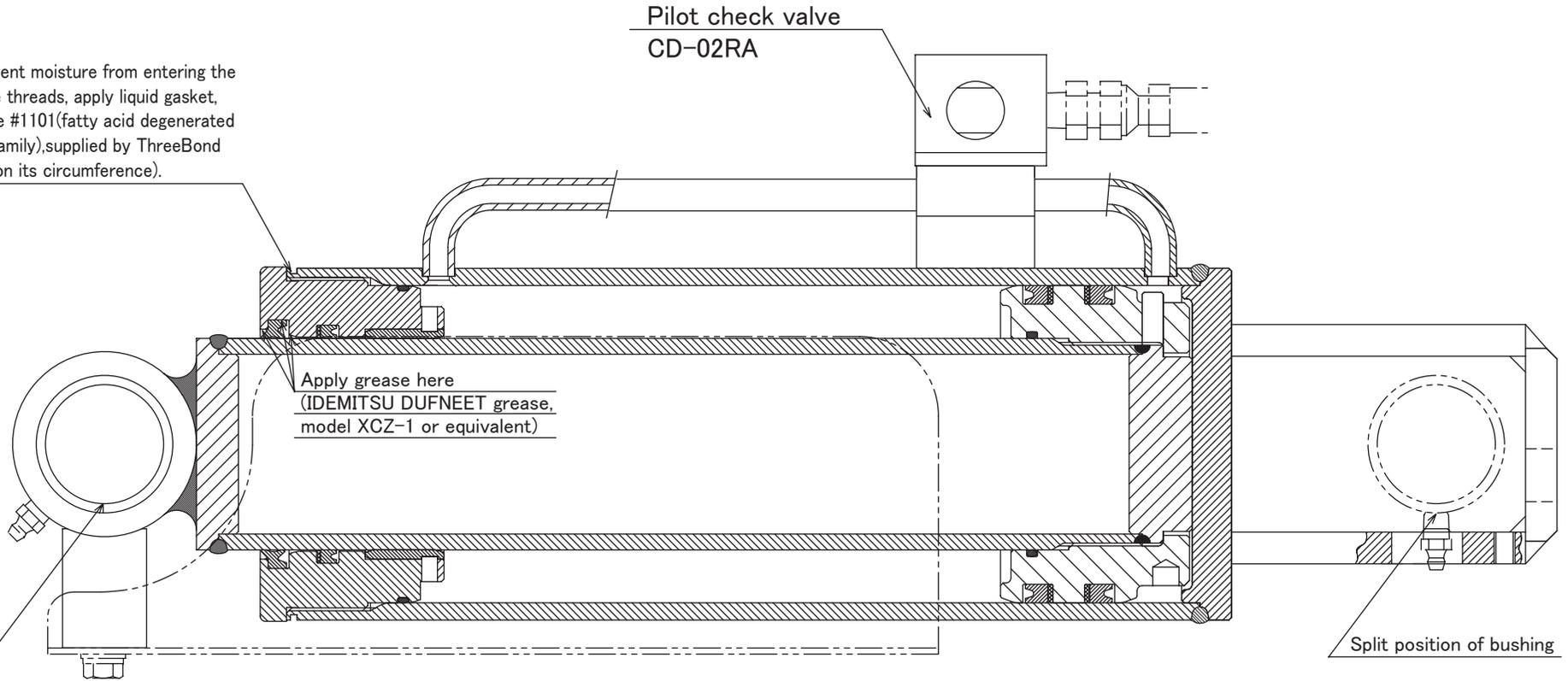
19-3

Pilot check valve
CD-02RA

Apply grease here
(IDEMITSU DUFNEET grease,
model XCZ-1 or equivalent)

Split position of bushing

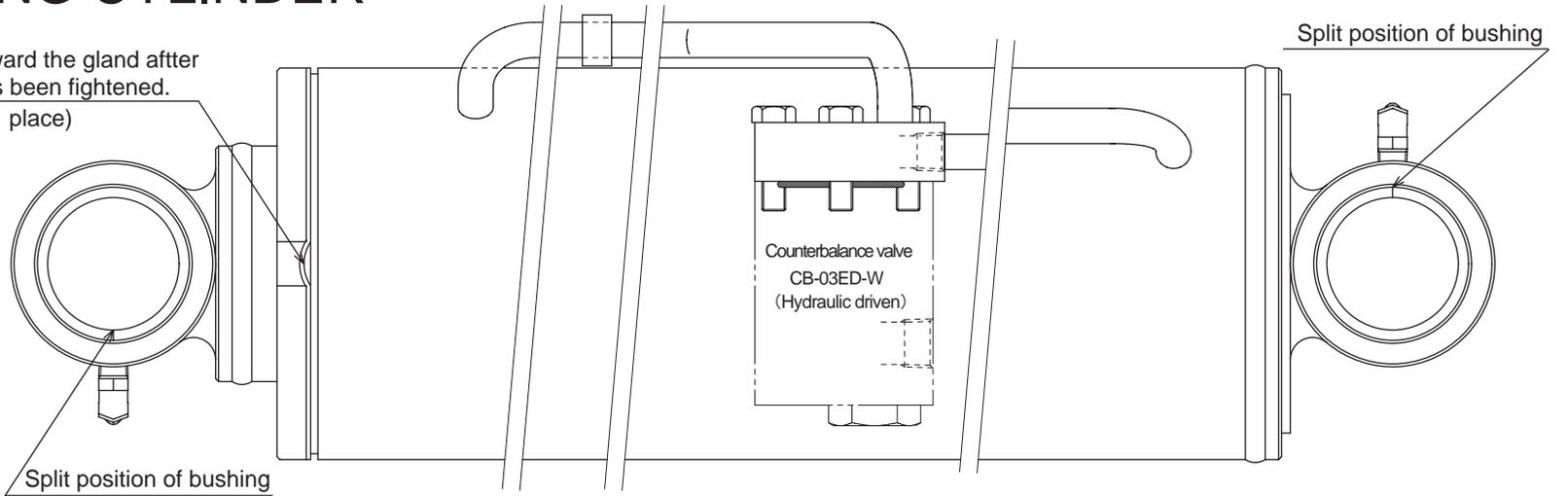
Split position of bushing



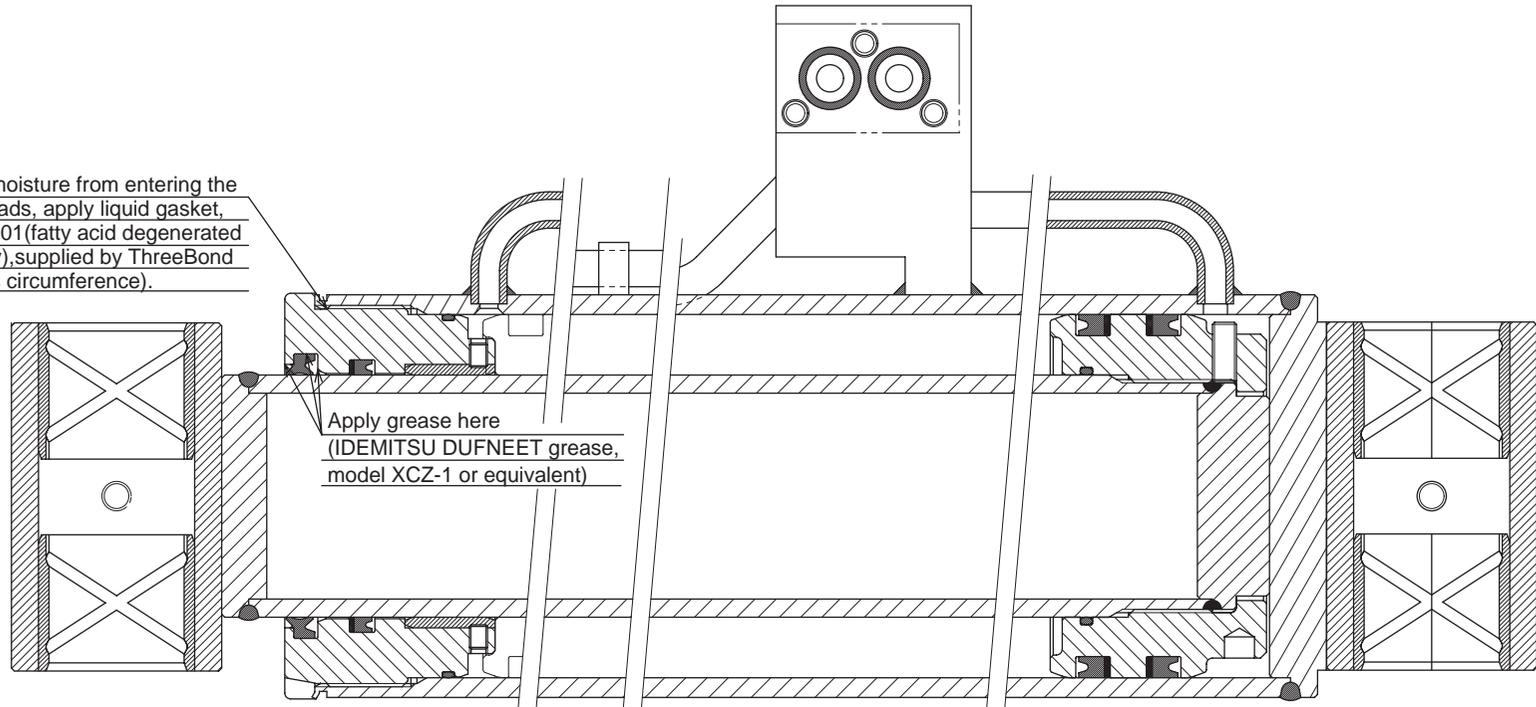
20.DERRICKING CYLINDER

Bend this toward the gland after the gland has been tightened.

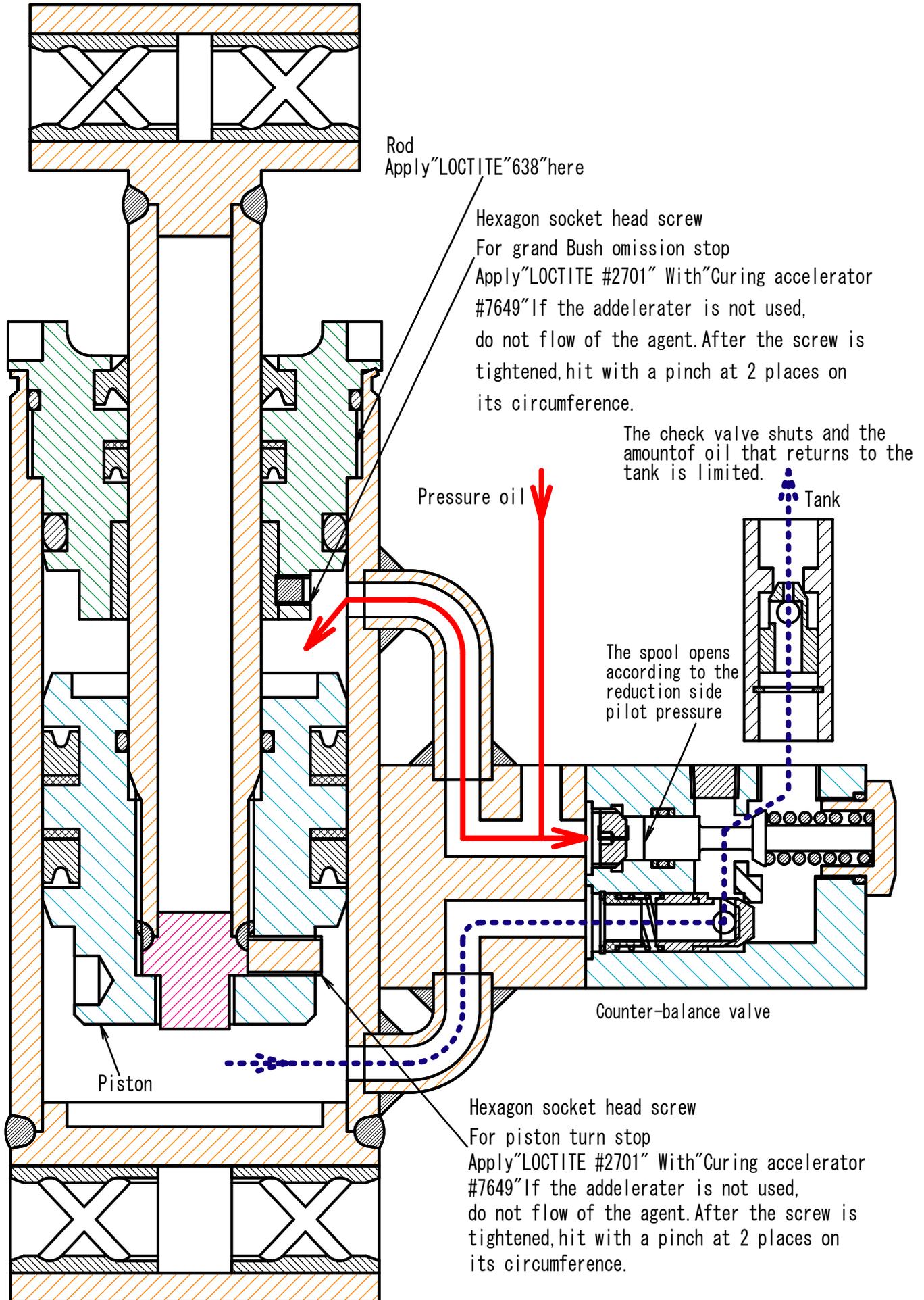
(1 place)



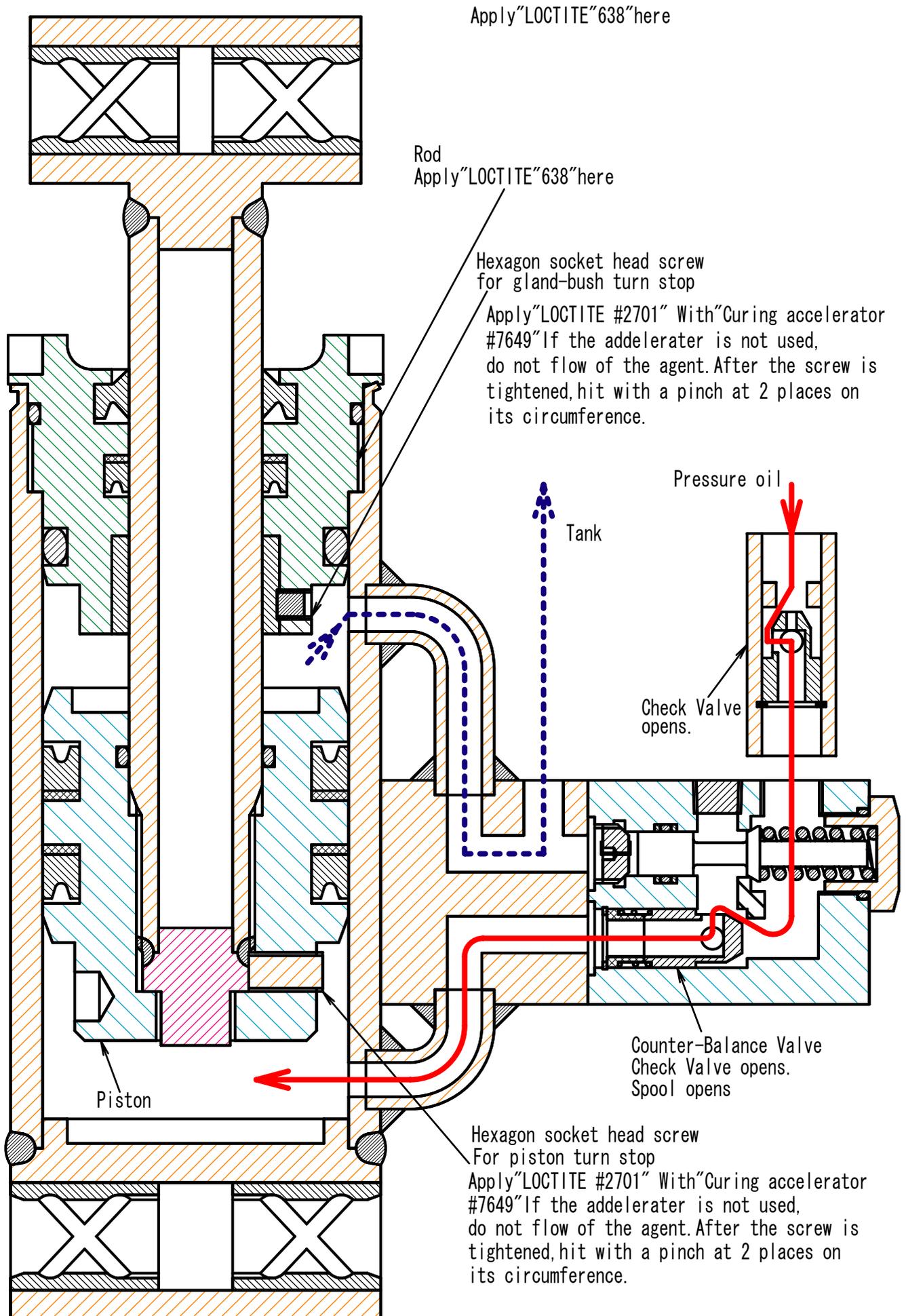
In order to prevent moisture from entering the cylinder from the threads, apply liquid gasket, solventless type #1101 (fatty acid degenerated phenolic resin family), supplied by ThreeBond here (4 places on its circumference).



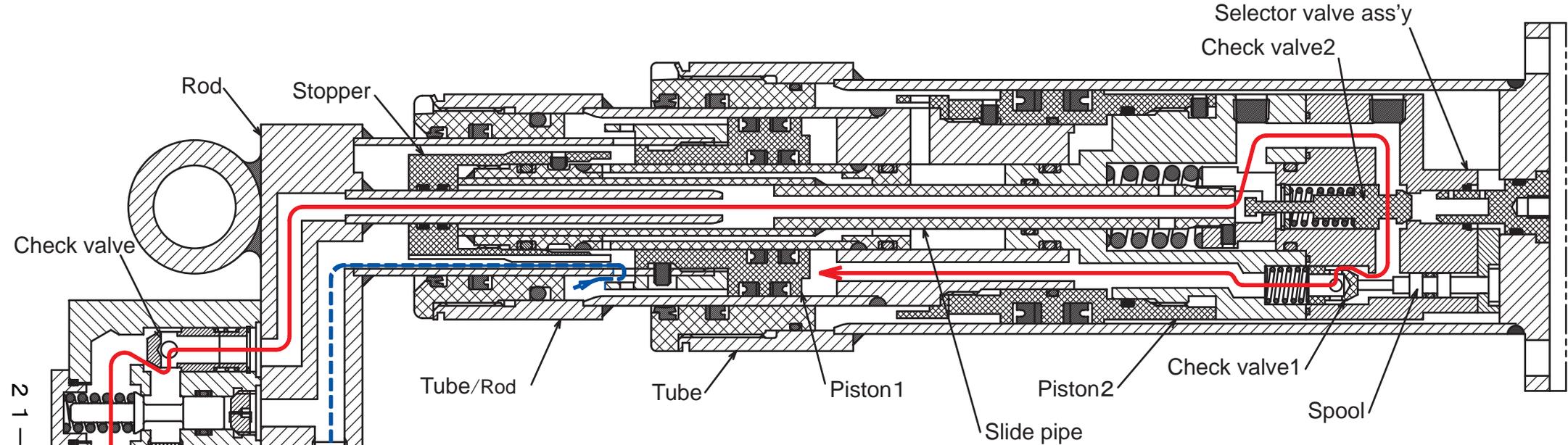
20.2 Flow of oil, when lowering



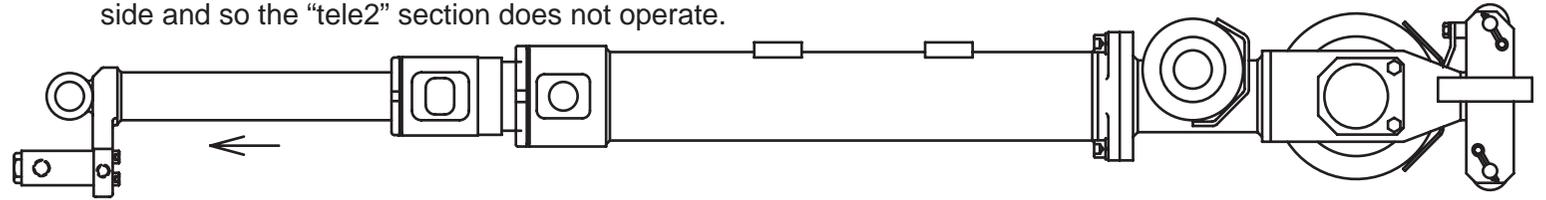
20.3 Flow of oil, when raising



When telescoping cylinder1 extends (URW376C)

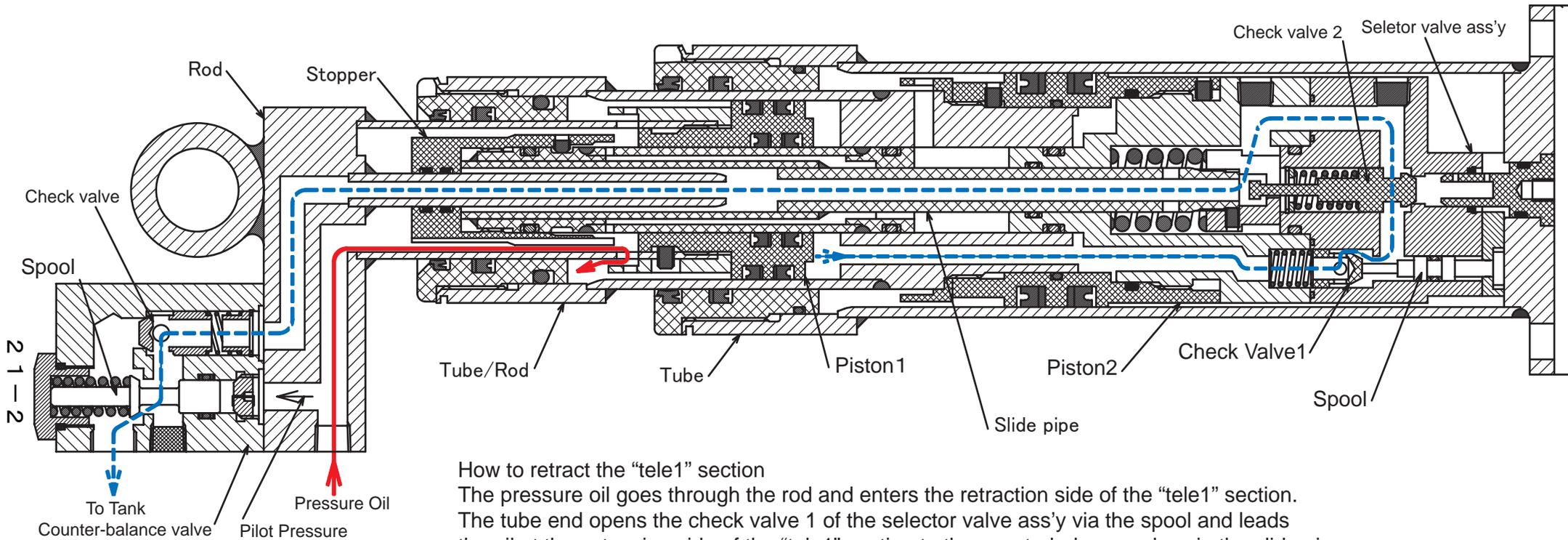


How to extend the "tele1" section
 The pressure oil opens the check valve in the counterbalance valve, enters the rod, goes through the slide pipe and reaches the check valve 1 of the selector valve ass'y. The "tele2" section is fully retracted at this time.
 The tube end opens the check valve 1 of the selector valve ass'y via the spool to lead the pressure oil to the extension side.
 Simultaneously, the oil at the retraction side of the "tele1" section flows through the rod and returns to the tank to extend the "tele1" section.
 Since the check valve 2 of the selector valve ass'y is closed, the pressure oil does not flow into the "tele2" section.
 Since the "tele2" section is fully retracted, the oil does not remain at the retraction side and so the "tele2" section does not operate.



21-1

When telescoping cylinder1 retracts (URW376C)

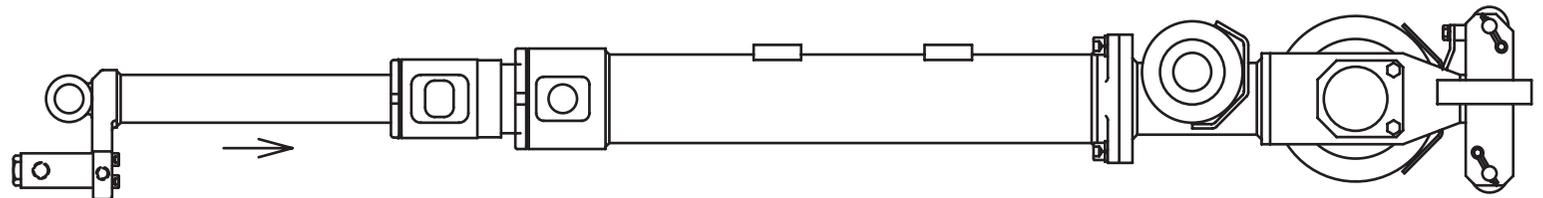


How to retract the "tele1" section

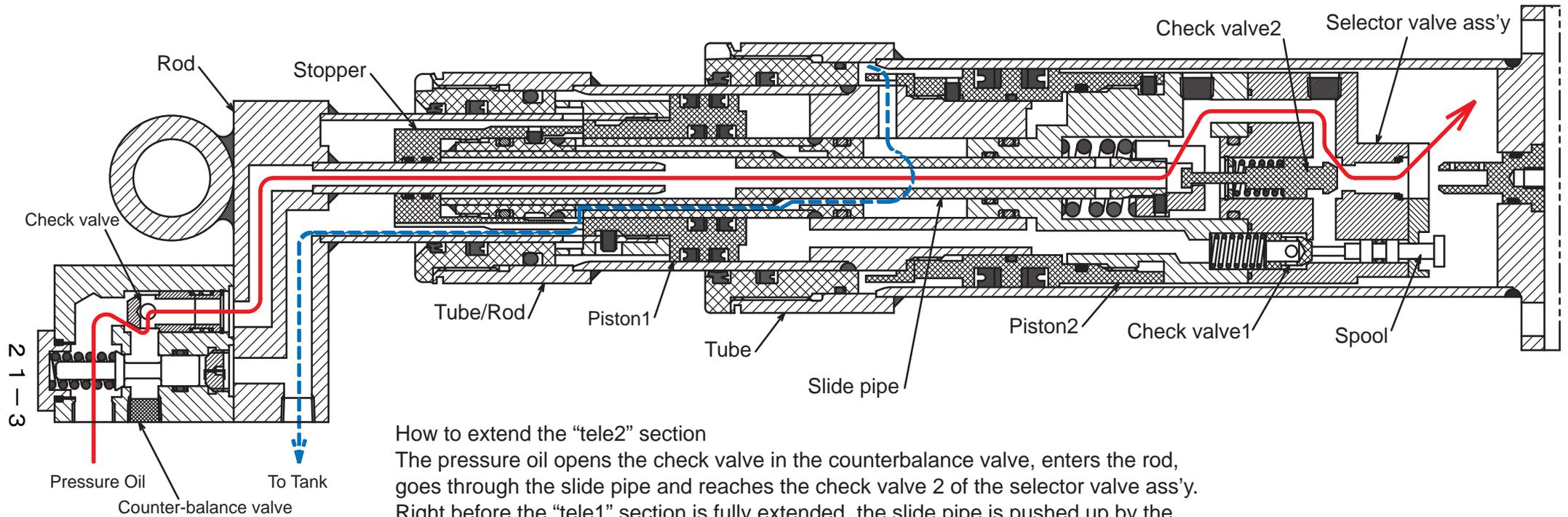
The pressure oil goes through the rod and enters the retraction side of the "tele1" section. The tube end opens the check valve 1 of the selector valve ass'y via the spool and leads the oil at the extension side of the "tele1" section to the counterbalance valve via the slide pipe. Although the check valve in the counterbalance valve is closed at this time, the spool is opened by the pilot pressure supplied from the retraction side. Therefore, the oil at the extension side is returned to the tank and the "tele1" section is retracted.

Although pressure is applied to the retraction side of the "tele2" section at the same time, the check valve 2 of the selector valve ass'y is closed and the passage at the extension side of the "tele2" section is interrupted.

So, the oil does not remain at the extension side of the "tele2" section and the "tele2" section does not operate.



When telescoping cylinder2 extends (URW376C)



How to extend the “tele2” section

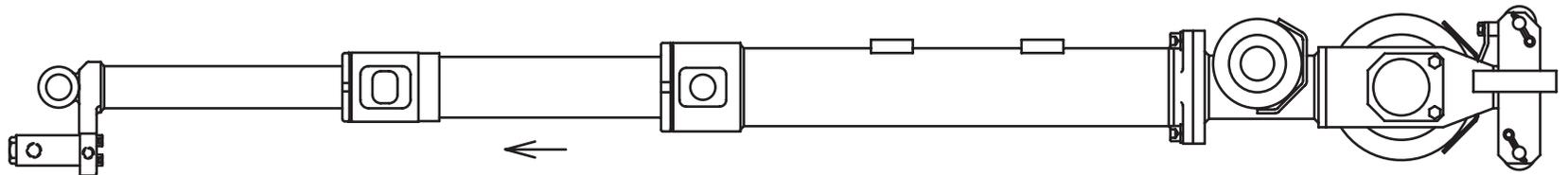
The pressure oil opens the check valve in the counterbalance valve, enters the rod, goes through the slide pipe and reaches the check valve 2 of the selector valve ass’y. Right before the “tele1” section is fully extended, the slide pipe is pushed up by the stopper to open the check valve 2 of the selector valve ass’y.

Then, the pressure oil is led to the extension side of the “tele2” section.

Simultaneously, the oil at the retraction side of the “tele2” section goes through the rod and returns to the tank. Then, the “tele2” section is extended.

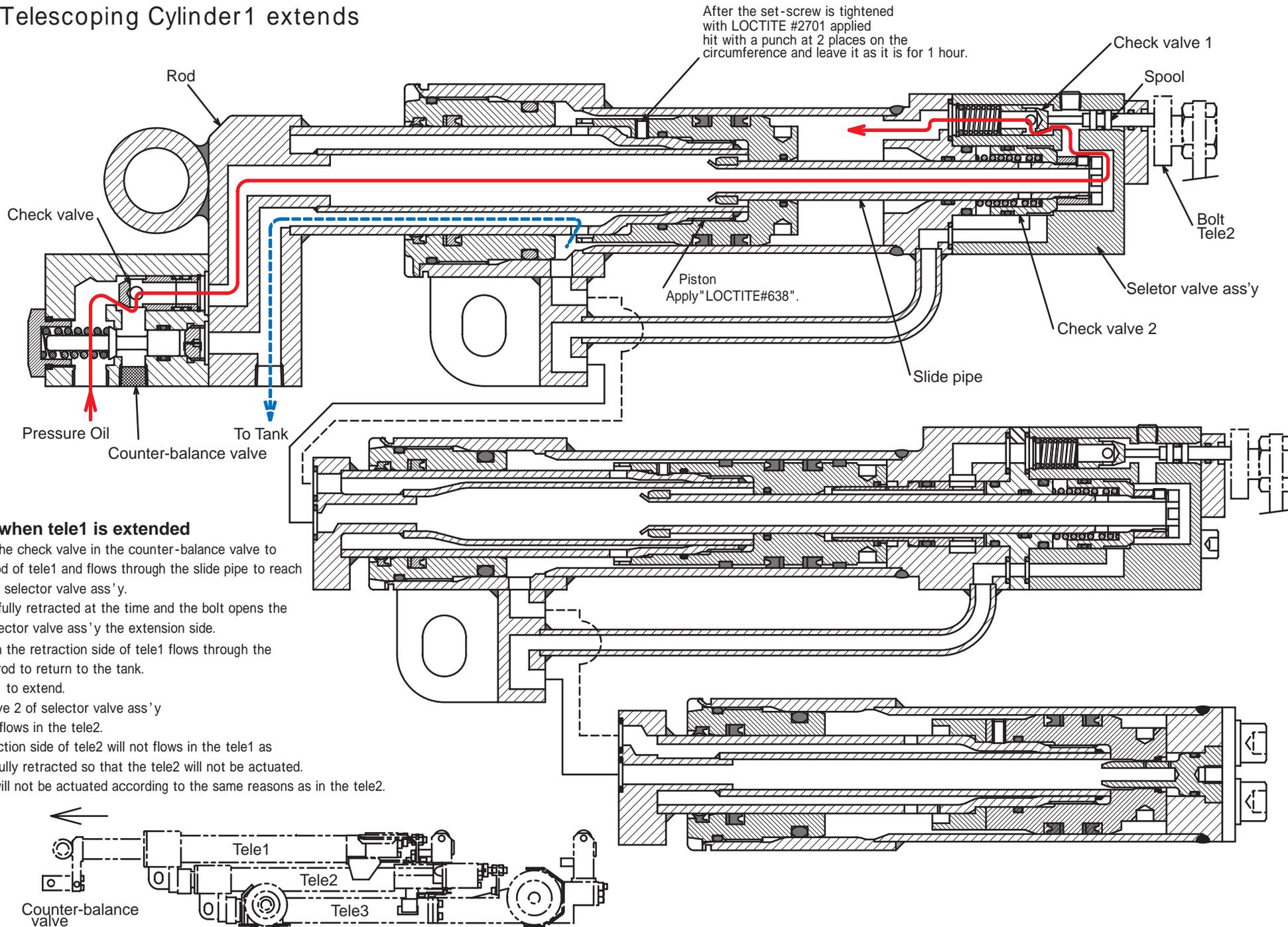
At this time, the check valve 1 of the selector valve ass’y is closed and the passage at the extension side of the “tele1” section is interrupted.

Since the “tele1” section is fully extended, the oil does not remain at the extension side and so the “tele1” section does not operate.



6-Section Boom (Dual Cylinder) Operation(URW5 4 6C)

(1) When Telescoping Cylinder1 extends



How oil flows when tele1 is extended

Pressure oil opens the check valve in the counter-balance valve to enter the cylinder rod of tele1 and flows through the slide pipe to reach the check valve 1 of selector valve ass'y.

The tele2 has been fully retracted at the time and the bolt opens the check valve 1 of selector valve ass'y the extension side.

Simultaneously, oil in the retraction side of tele1 flows through the dual cylinder in the rod to return to the tank.

This allows the tele1 to extend.

Since the check valve 2 of selector valve ass'y pressure oil will not flow in the tele2.

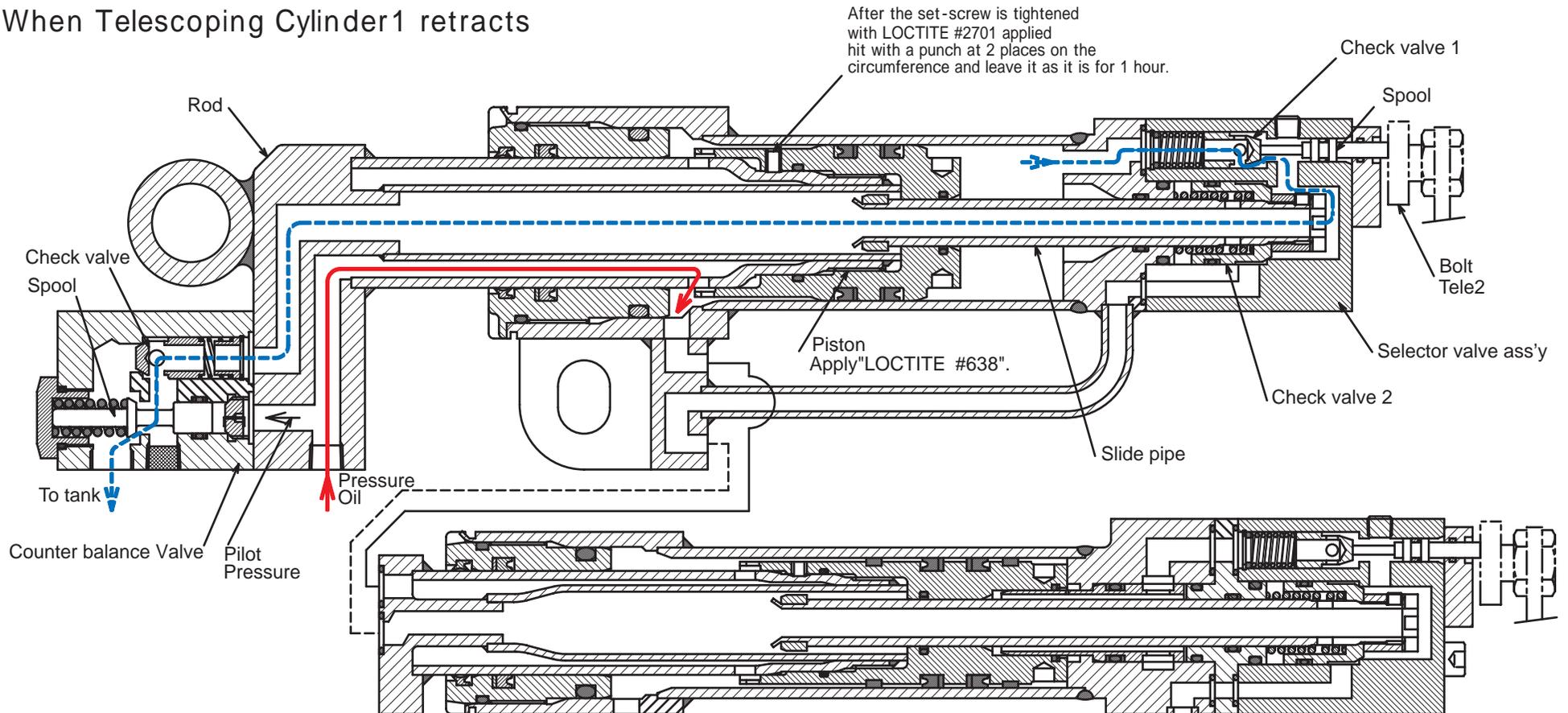
Also, oil in the retraction side of tele2 will not flow in the tele1 as the tele2 has been fully retracted so that the tele2 will not be actuated.

And the tele3 also will not be actuated according to the same reasons as in the tele2.

21-5

6-Section Boom (Dual Cylinder) Operation(URW 5 4 6C)

(2) When Telescoping Cylinder1 retracts



2 1 - 6

How oil flows when tele1 is retracted

Pressure oil flows through the dual cylinder of cylinder rod of tele1 to enter the retraction side of tele1.

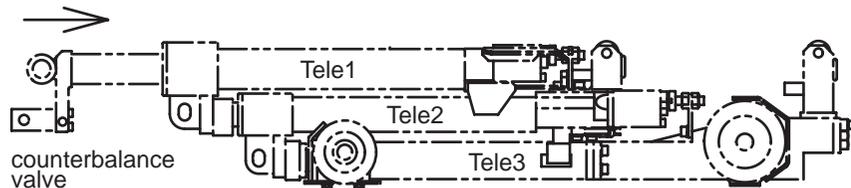
At this stage, the bolt opens the check valve 1 of selector valve ass via spool which leads the oil in the extension side to the counter-balance valve by way of slide pipe.

Although the check valve in the counter-balance valve is closed at this time, the spool is opened by pilot pressure from the retraction side allowing the oil in the extension side to return to the tank.

This allows the tele1 to retract.

Although pressure is also applied to the retraction side of tele2 at this stage, the tele2 will not be actuated because the check valve 1 of selector valve ass'y for tele1 is closed and the passage to the extension side of tele2 is shut off so that no oil is to be remained in the extension side of tele2.

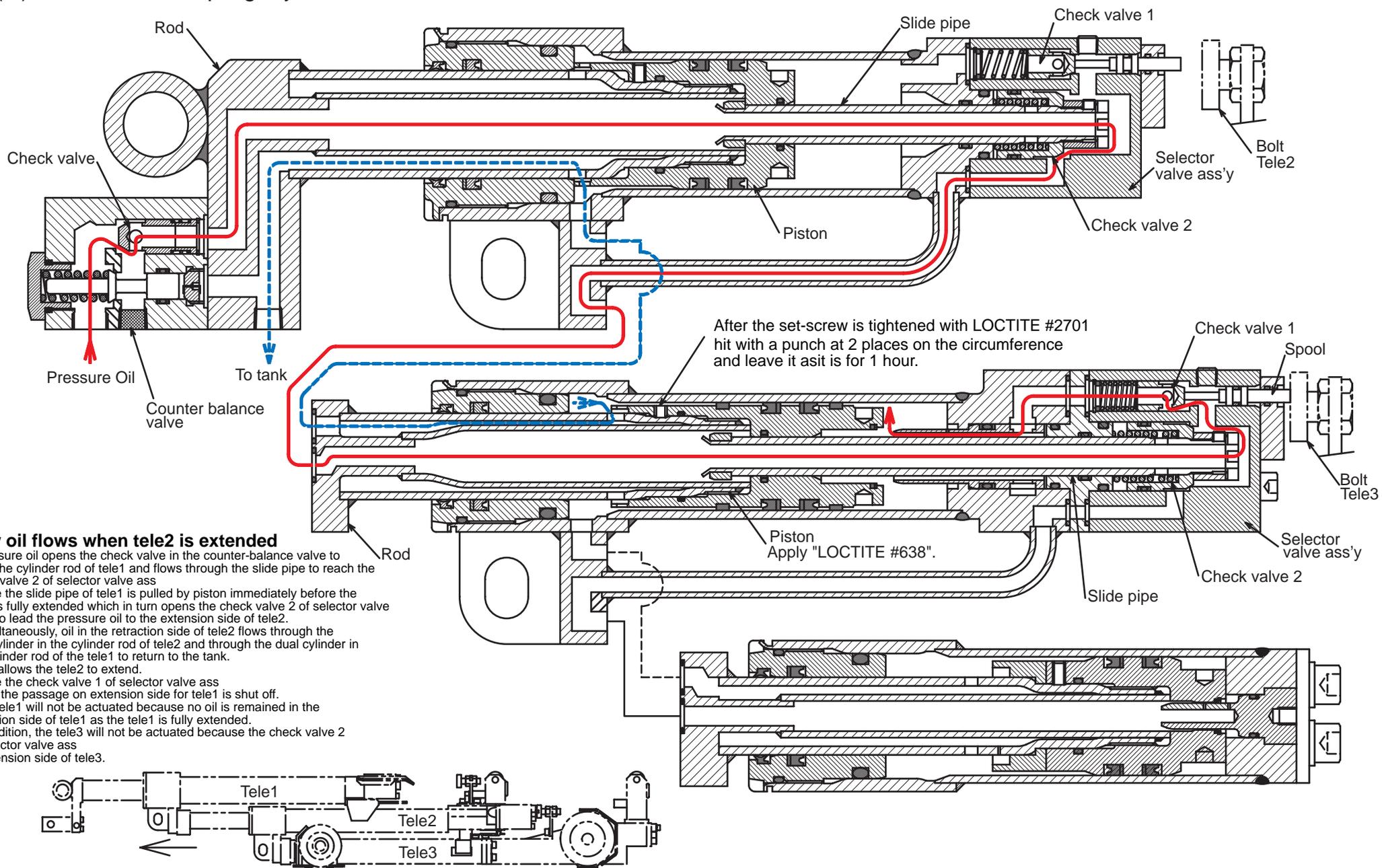
And the tele3 also will not be actuated according to the same reasons as in the tele2.



6-Section Boom (Dual Cylinder) Operation (URW5 4 6C)

(3) When Telescoping Cylinder2 extends

21 - 7



How oil flows when tele2 is extended

Pressure oil opens the check valve in the counter-balance valve to enter the cylinder rod of tele1 and flows through the slide pipe to reach the check valve 2 of selector valve ass

Since the slide pipe of tele1 is pulled by piston immediately before the tele1 is fully extended which in turn opens the check valve 2 of selector valve ass'y to lead the pressure oil to the extension side of tele2.

Simultaneously, oil in the retraction side of tele2 flows through the dual cylinder in the cylinder rod of tele2 and through the dual cylinder in the cylinder rod of the tele1 to return to the tank.

This allows the tele2 to extend.

Since the check valve 1 of selector valve ass stage, the passage on extension side for tele1 is shut off.

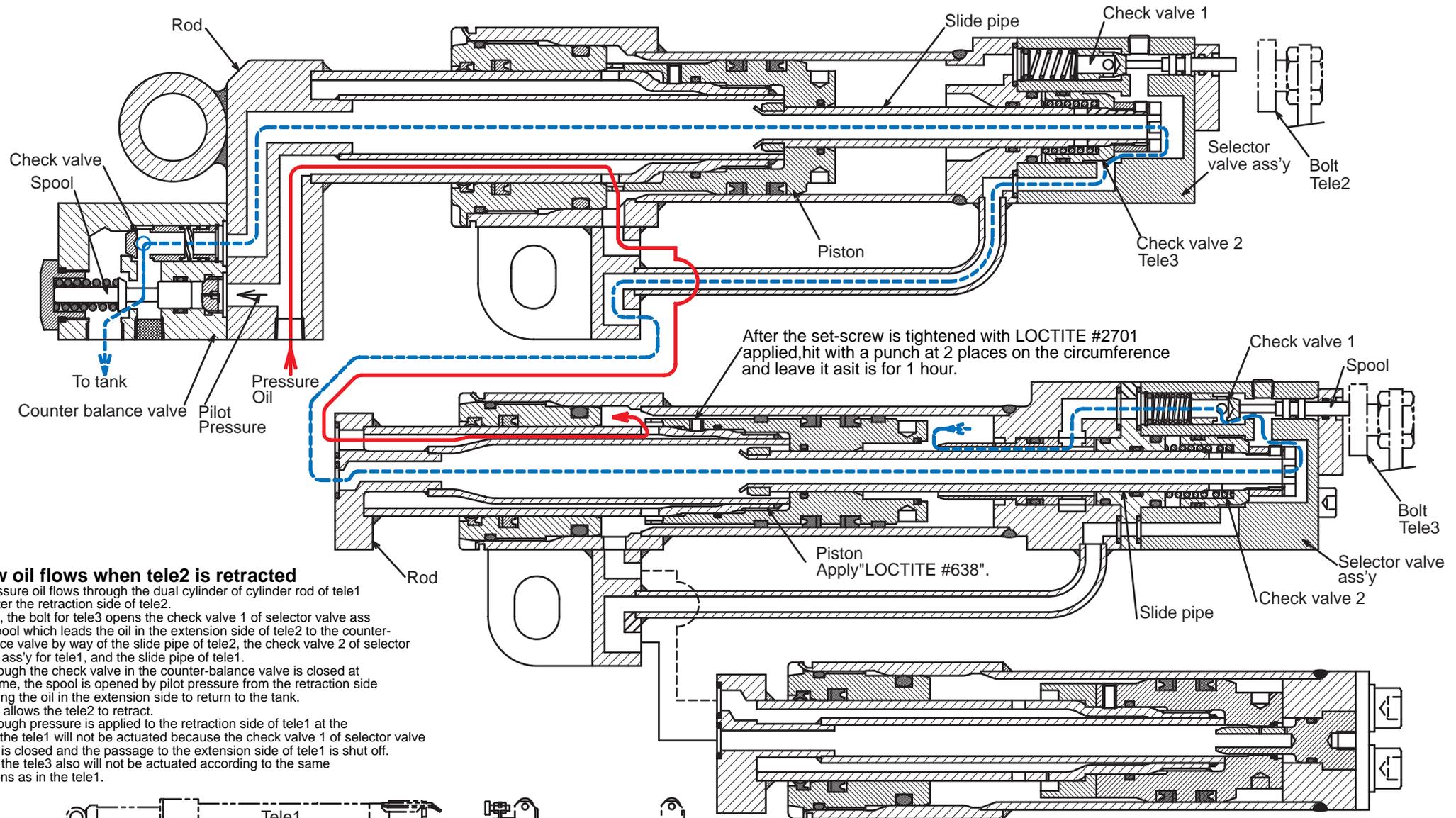
The tele1 will not be actuated because no oil is remained in the retraction side of tele1 as the tele1 is fully extended.

In addition, the tele3 will not be actuated because the check valve 2 of selector valve ass to extension side of tele3.

6-Section Boom (Dual Cylinder) Operation(URW5 4 6C)

(4) When Telescoping Cylinder2 retracts

21 - 8



How oil flows when tele2 is retracted

Pressure oil flows through the dual cylinder of cylinder rod of tele1 to enter the retraction side of tele2.

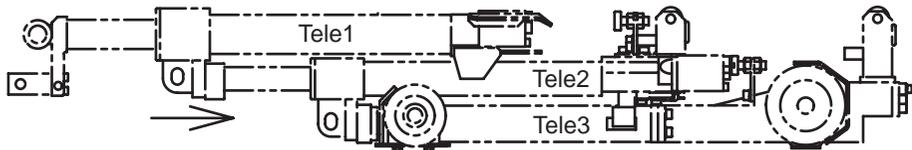
Also, the bolt for tele3 opens the check valve 1 of selector valve ass'y via spool which leads the oil in the extension side of tele2 to the counter-balance valve by way of the slide pipe of tele2, the check valve 2 of selector valve ass'y for tele1, and the slide pipe of tele1.

Although the check valve in the counter-balance valve is closed at this time, the spool is opened by pilot pressure from the retraction side allowing the oil in the extension side to return to the tank.

This allows the tele2 to retract.

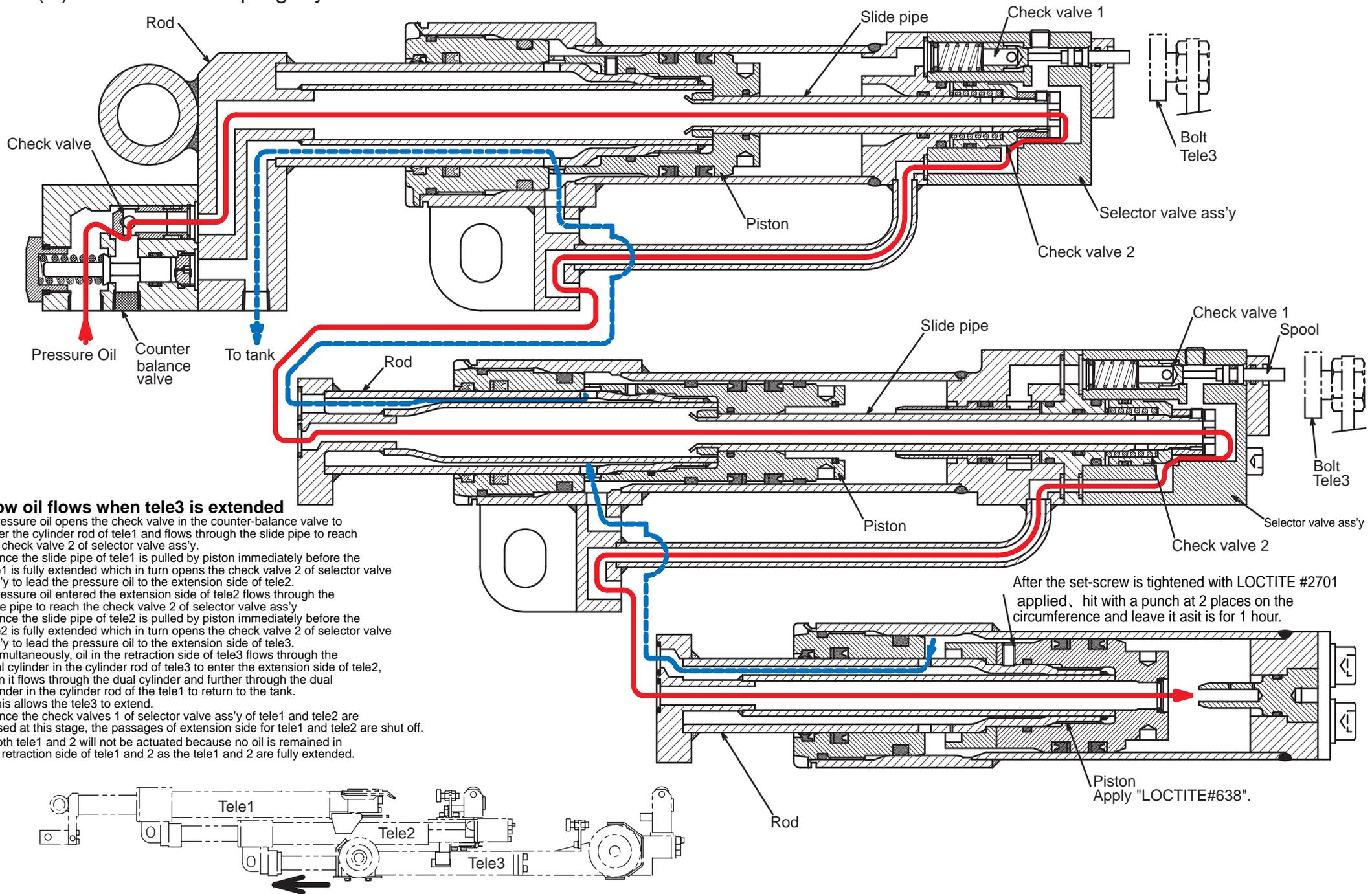
Although pressure is applied to the retraction side of tele1 at the time, the tele1 will not be actuated because the check valve 1 of selector valve ass'y is closed and the passage to the extension side of tele1 is shut off.

And the tele3 also will not be actuated according to the same reasons as in the tele1.



6 - Section Boom (Dual Cylinder) Operation(URW5 4 6C)

(5) When Telescoping Cylinder3 extends



2 1 - 9

How oil flows when tele3 is extended

Pressure oil opens the check valve in the counter-balance valve to enter the cylinder rod of tele1 and flows through the slide pipe to reach the check valve 2 of selector valve ass'y.

Since the slide pipe of tele1 is pulled by piston immediately before the tele1 is fully extended which in turn opens the check valve 2 of selector valve ass'y to lead the pressure oil to the extension side of tele2.

Pressure oil entered the extension side of tele2 flows through the slide pipe to reach the check valve 2 of selector valve ass'y.

Since the slide pipe of tele2 is pulled by piston immediately before the tele2 is fully extended which in turn opens the check valve 2 of selector valve ass'y to lead the pressure oil to the extension side of tele3.

Simultaneously, oil in the retraction side of tele3 flows through the dual cylinder in the cylinder rod of tele3 to enter the extension side of tele2, then it flows through the dual cylinder and further through the dual cylinder in the cylinder rod of the tele1 to return to the tank.

This allows the tele3 to extend.

Since the check valves 1 of selector valve ass'y of tele1 and tele2 are closed at this stage, the passages of extension side for tele1 and tele2 are shut off.

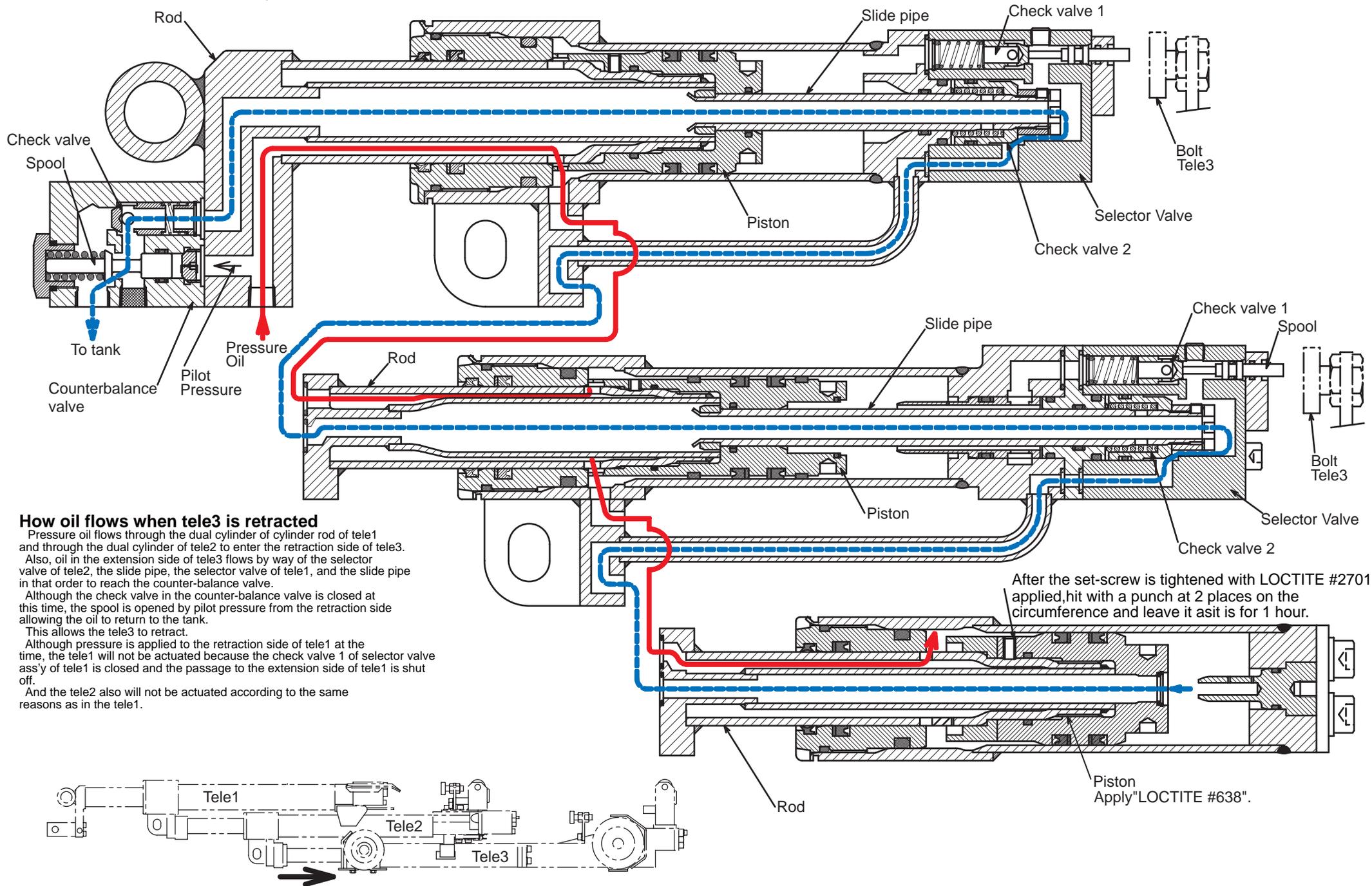
Both tele1 and 2 will not be actuated because no oil is remained in the retraction side of tele1 and 2 as the tele1 and 2 are fully extended.

After the set-screw is tightened with LOCTITE #2701 applied, hit with a punch at 2 places on the circumference and leave it as it is for 1 hour.

Piston Apply "LOCTITE#638".

6-Section Boom (Dual Cylinder) Operation (URW5 4 6C)

(6) When Telescoping Cylinder3 retracts



How oil flows when tele3 is retracted

Pressure oil flows through the dual cylinder of cylinder rod of tele1 and through the dual cylinder of tele2 to enter the retraction side of tele3.

Also, oil in the extension side of tele3 flows by way of the selector valve of tele2, the slide pipe, the selector valve of tele1, and the slide pipe in that order to reach the counter-balance valve.

Although the check valve in the counter-balance valve is closed at this time, the spool is opened by pilot pressure from the retraction side allowing the oil to return to the tank.

This allows the tele3 to retract.

Although pressure is applied to the retraction side of tele1 at the time, the tele1 will not be actuated because the check valve 1 of selector valve ass'y of tele1 is closed and the passage to the extension side of tele1 is shut off.

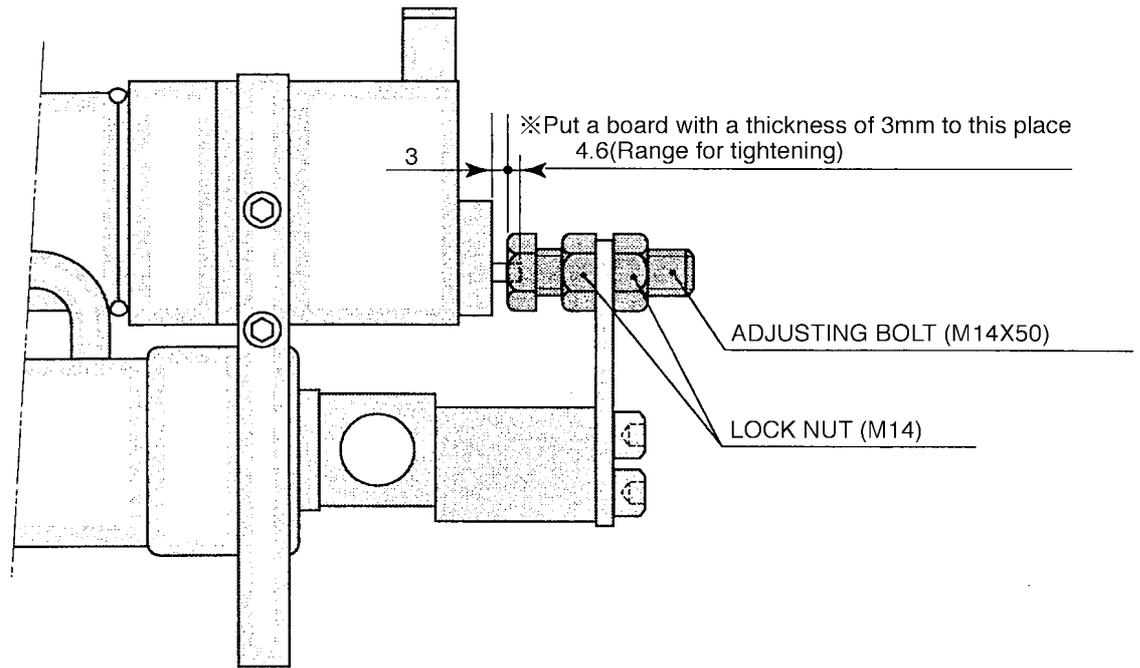
And the tele2 also will not be actuated according to the same reasons as in the tele1.

After the set-screw is tightened with LOCTITE #2701 applied, hit with a punch at 2 places on the circumference and leave it as it is for 1 hour.

Piston Apply "LOCTITE #638".

2 1 - 1 0

(7) Adjusting Procedures for Selector Valve with Adjusting Bolt



☞ Adjusting Procedures with Adjusting Bolt

Retract telescoping cylinders (1) and (2) to their minimum.

Apply LOCTITE #242 to the threads of the adjusting bolt.

Put a board with a thickness of 3mm to the part marked with*.and tighten the adjusting bolt.

After adjusting, lock with the lock nut.

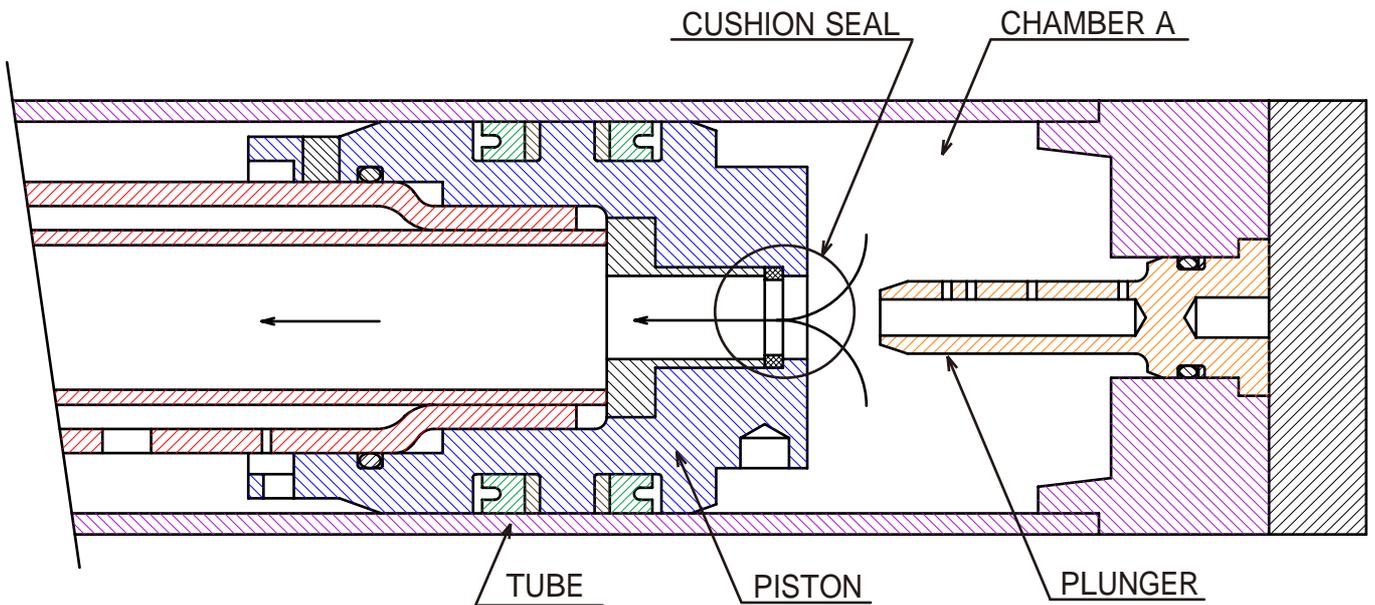
Function and Working of Cushion Seal

For the purpose of absorbing a piston shock to the stroke end, the 6-section boom have the cushion seal in the part of piston of the telescoping cylinder (2) and (3).

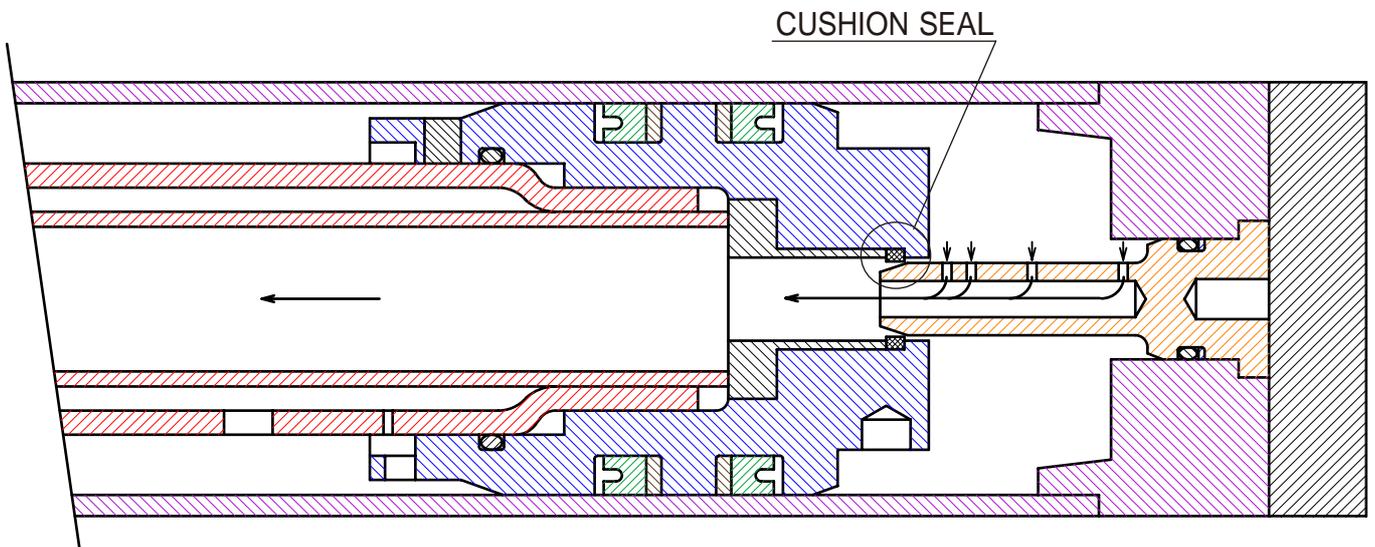
(1) Flow of Pressure Oil When Retracting

1. Cushion mechanism of the telescoping cylinder (3) for 6-section booms.

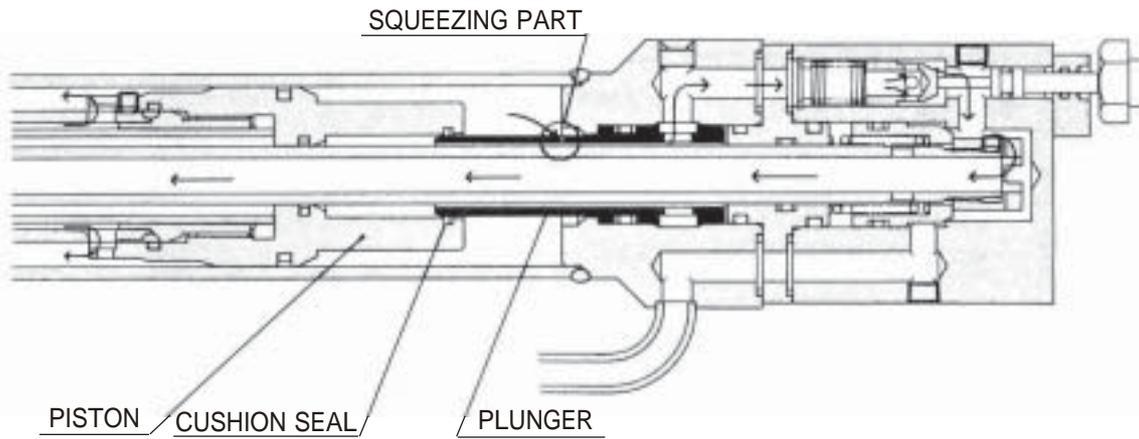
In the retracting process, before the piston gets in the plunger, the pressure oil in the chamber A flows through the central part of the piston as shown in the illustration and returns to the tank without being squeezed.



At the same time when the piston gets in the plunger, the chamber A is closed with the cushion seal. As a result, the pressure oil in the chamber A is forced to return only through a drilled hole in the state of being squeezed. Thus the piston shock at the stroke end is absorbed.

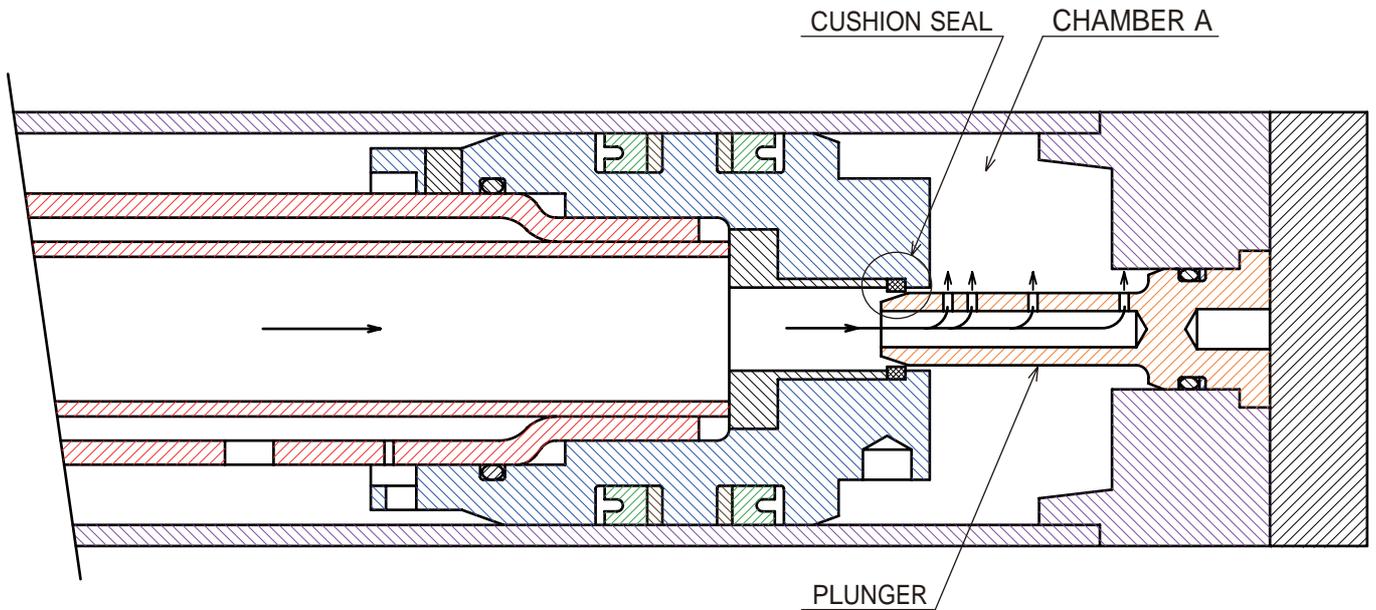


2. Cushion mechanism of the telescoping cylinder (2) for 6-section boom.

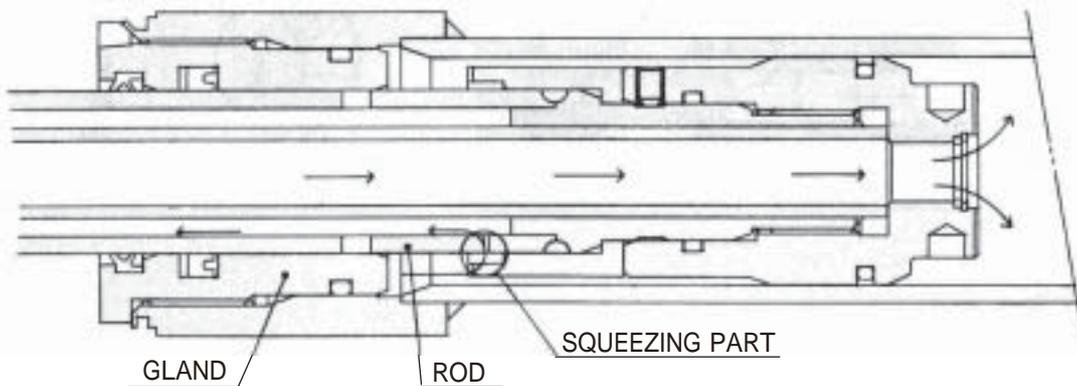


(2) Flow of Pressure Oil When Extending

When extending, the pressure oil flows into the chamber A as shown in the illustration. In this way, the telescoping cylinder extends.



Cushion mechanism of the telescoping cylinder for 6-section booms is to squeeze the return pressure oil at the position just before the end of extension and absorb the piston shock to the stroke end.

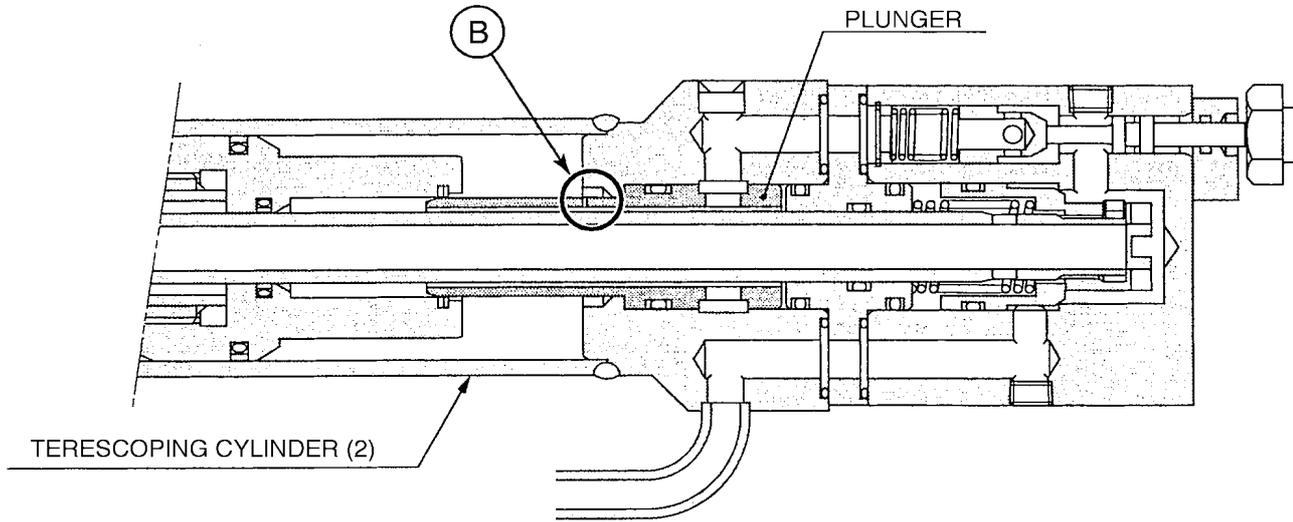


Cause of Troubles and Measures to be Taken

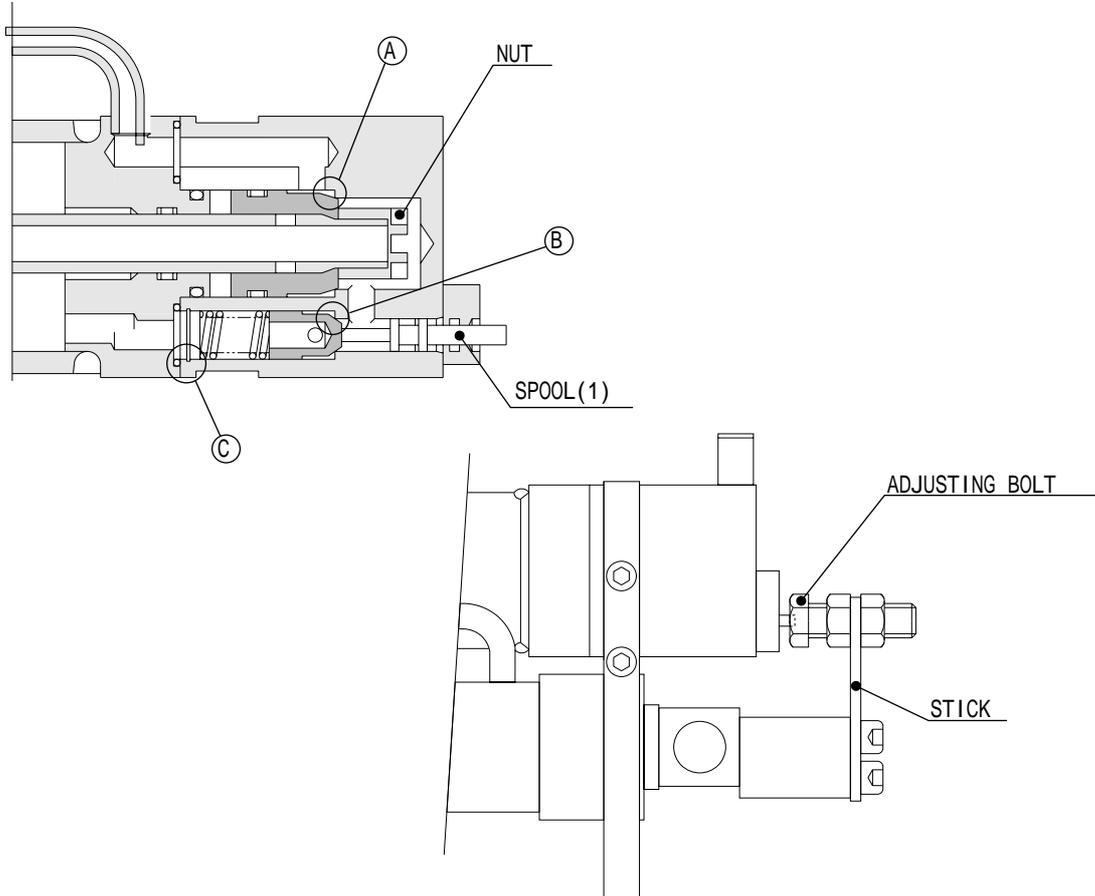
(1) 6-section boom

When retraction of the boom (3) becomes impossible at the position just before full retraction of the booms (4), (5) and (6), inspect the plunger which is assembled in the telescoping cylinder (3).

When the boom (3) does not change over to the boom (2), and retraction becomes impossible at the position just before full retraction, inspect the drilled hole at the position of the plunger of the telescoping cylinder (2).
of the plunger of the telescoping cylinder (2).



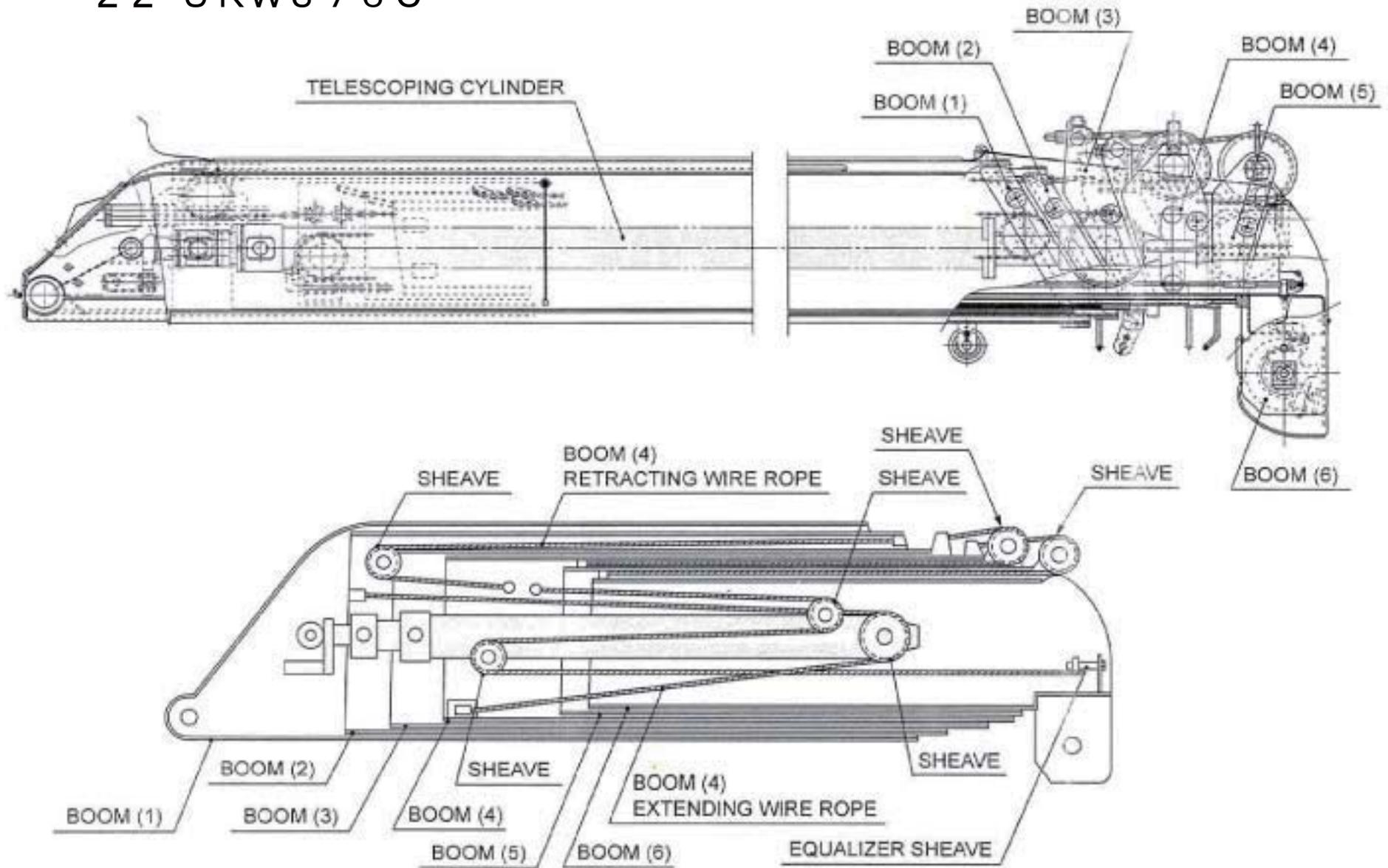
(2) Cause of Troubles and Remedy



Troubles	Possible cause	Measures to be taken
① Retraction is normal, but when extending, booms (2) and (3) extend at the same time, in other words disorderly.	<ul style="list-style-type: none"> ●Some foreign substances are clogging the part? of selector valve of telescoping cylinder (1). 	<ul style="list-style-type: none"> ●Disassemble selector valve for cleaning, or replace it with a new one.
② Extension is normal, but when retracting, booms (3) (4) and (5) retract at the same time, in other words disorderly.	<ul style="list-style-type: none"> ●Some foreign substances are clogging the part? of selector valve of telescoping cylinder (2). 	
③ Extension is normal, but when retracting, booms (3), (4) and (5) retract at the same time, in other words disorderly.	<ul style="list-style-type: none"> ●Some foreign substances are clogging the part of selector valve of telescoping cylinder (2). ●Snap ring at the part? of selector valve of telescoping cylinder (2) got out of place. 	<ul style="list-style-type: none"> ●Disassemble selector valve for cleaning, or replace it with a new one. ●Rearrange snap ring.
④ Extension is normal, but when retracting, booms (2) and (3) retract at the same time, in other words disorderly.	<ul style="list-style-type: none"> ●Some foreign substances are clogging the part of selector valve of telescoping cylinder (1). ●Snap ring at the part? of selector valve of telescoping cylinder (2) got out of place. 	
⑤ Boom (2) extends but boom (3) does not extend.	<ul style="list-style-type: none"> ●Nut at slide pipe of telescoping cylinder (1) was loosened. 	
⑥ Boom (2) and (3) extend, but boom (4) and (5) does not extend.	<ul style="list-style-type: none"> ● Nut at slide pipe of telescoping cylinder (2) loosened. 	
⑦ After full extension, booms (5) retracts but boom (3) does not retract.	<ul style="list-style-type: none"> ● Adjusting bolt pushing the spool of selector valve of telescoping cylinder (2) was loosened. ● Selector valve spool of telescoping cylinder (2) was bent. 	<ul style="list-style-type: none"> ● Adjust the bolt. ● Replace selector valve ass'y with a new one.
⑧ Boom (3), (4) and (5) retracts but boom (2) does not retract.	<ul style="list-style-type: none"> ● Adjusting bolt pushing the spool of selector valve of telescoping cylinder (1) was loosened. ● Selector valve spool of telescoping cylinder (1) was bent. 	

Note: During operation test after disassembling and repairing, the reason why the booms (4), (5) and (6) stop extending halfway is presumed that the left and the right wire ropes for extension were crossed when reassembling.

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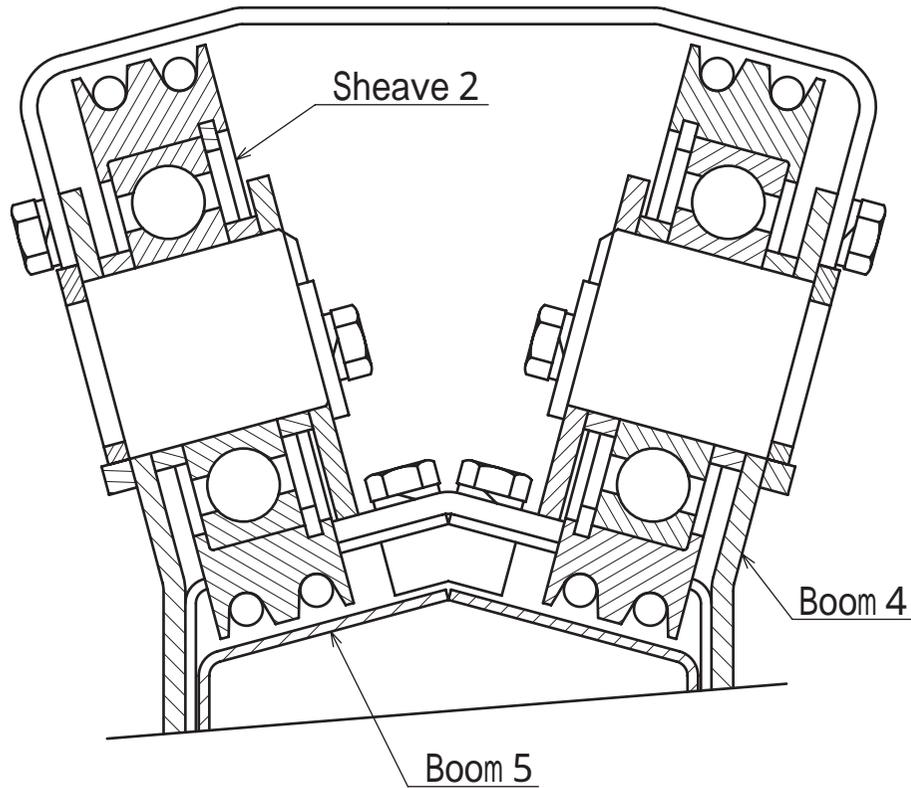
2 2 - 1

6 -section boom

Boom 4 front side section in detail
How sheave2 is mounted

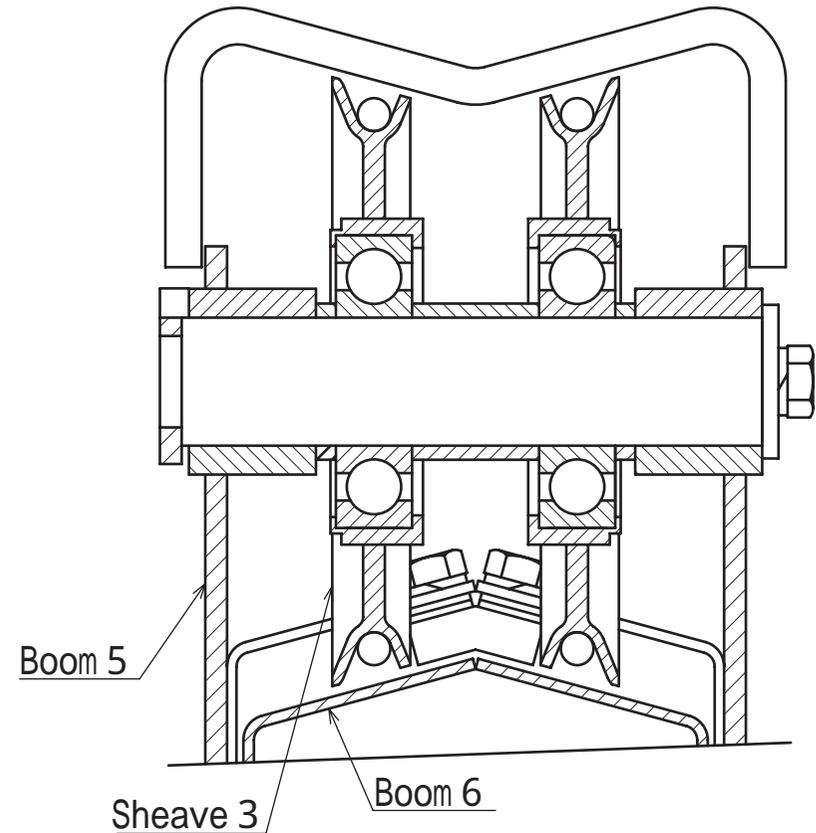
Wire rope with role to extend boom 5
and role to retract boom 4

2 2 - 2



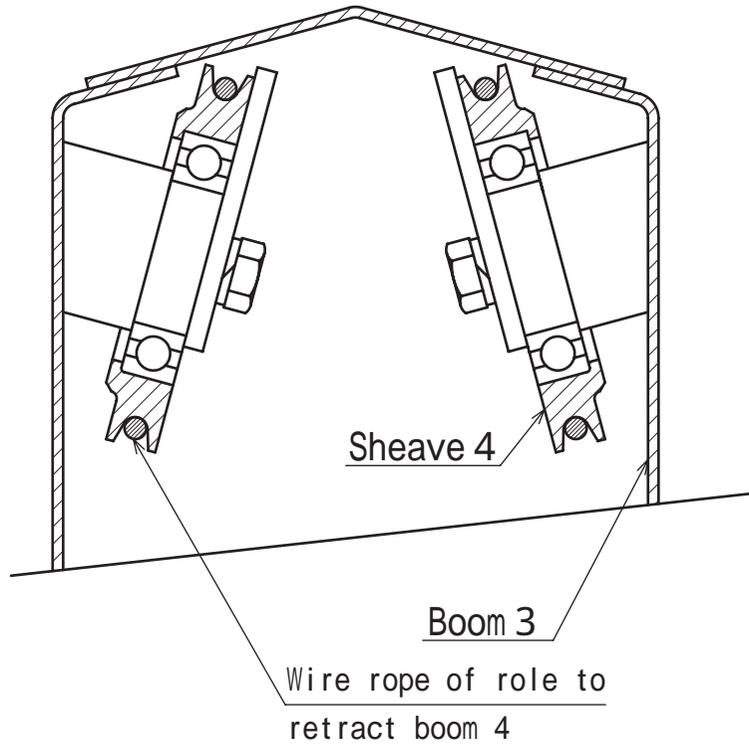
Boom 5 front side section in detail
How sheave3 is mounted

Wire rope with role to extend boom 6
and role to retract boom 5

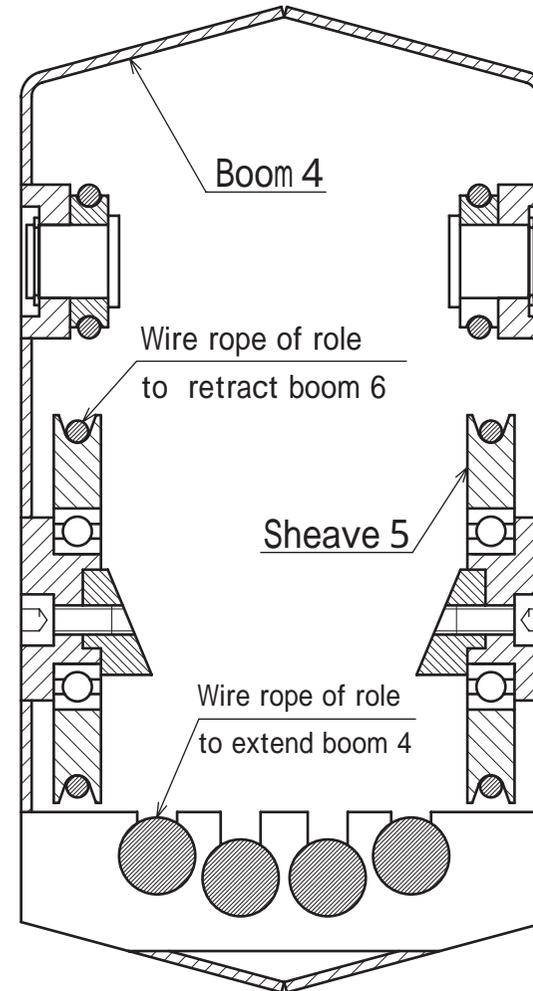


6 -section boom

Boom 3 rear side section in detail
How sheave4 is mounted

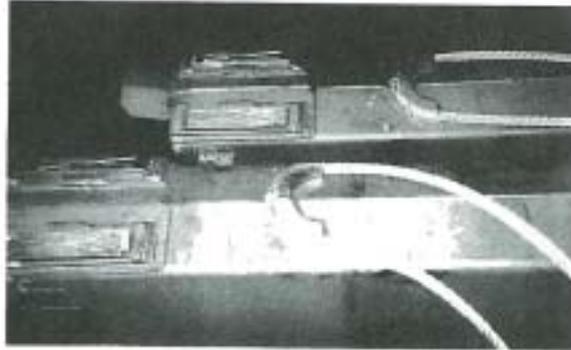


Boom 4 rear side section in detail
How sheave5 is mounted



Boom Assembly Procedure (6-Section Boom)

- ① Apply the boom (6) retracting wire rope to the boom (6). Then, bend the end of the plate.
☞ Make the right and left length of the wire rope equal.



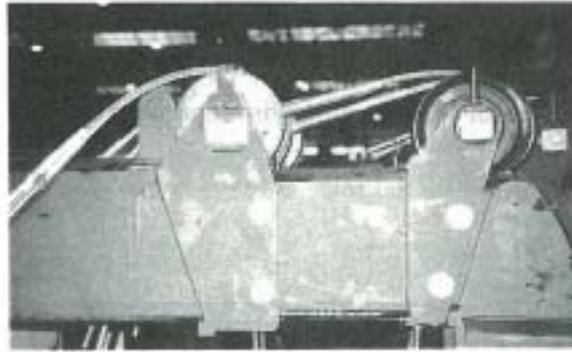
- ② Apply the boom (5) extending wire rope to the boom (5). Then bend the end of the plate.
☞ Two wire ropes should be applied to the boom (5). They are different in length, so be careful.



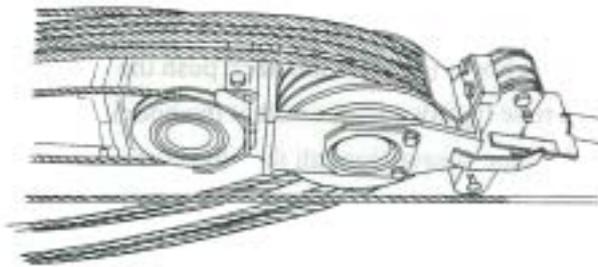
- ③ Put the boom (6) into the boom (5). Leave part (approx. 200mm) of the boom (6) outside.



④ Put the booms (5) and (6) into the boom (4).

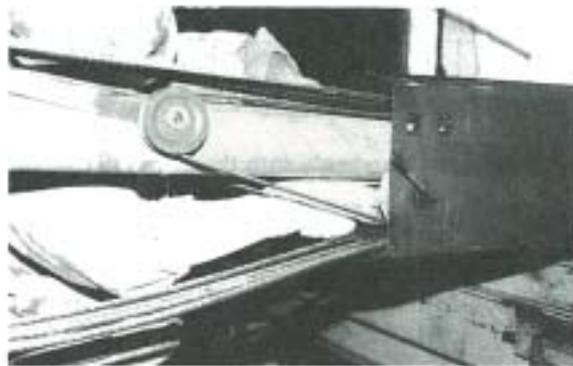


⑤ Apply the four boom (4) extending wire ropes and the one retracting wire rope to the telescoping cylinder. Install the wire rope cover.



☐ Fix the wire ropes with rubber tape, etc. so as not to twist them with each other. Refer to the above illustration.

⑥ Assemble the telescoping cylinder to the booms (4), (5) and (6).



- ⑦ Put the sheave to which the boom (6) retracting wire rope is applied into the pin at the rear end of the boom (4), and fix the plate.
- ⑧ Put the pin which runs through the thimble of the boom (6) retracting wire rope into the innermost boss at the rear upper end of the boom (4), and fix it with the snap ring. (Fig.1)
- ⑨ Put the pin through which the boom (4) retracting wire rope runs into the boss on the front side, and fix it with the snap ring.

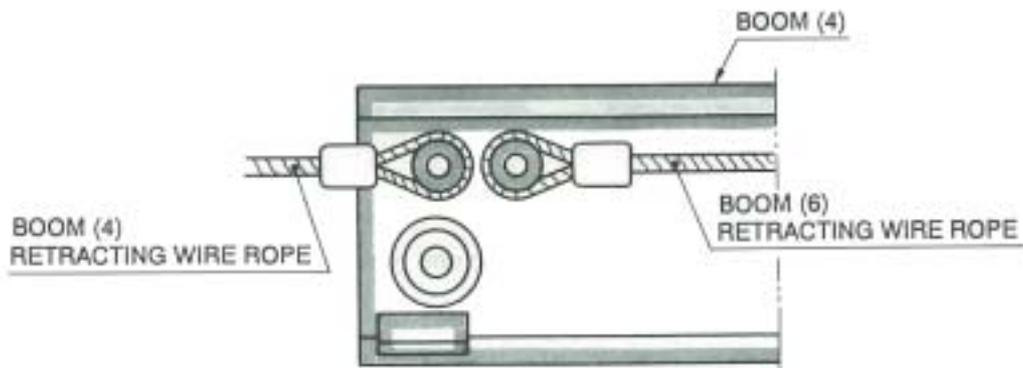


Fig. 1

- ⑩ Push the booms (5) and (6) into the boom (4) fully, and then push the telescoping cylinder.
- ⑪ Fix the boom (6) retracting wire rope lightly with the bolt at the boom end.
- ⑫ Pass the boom (5) extending wire rope sheave through the pin and fix it.

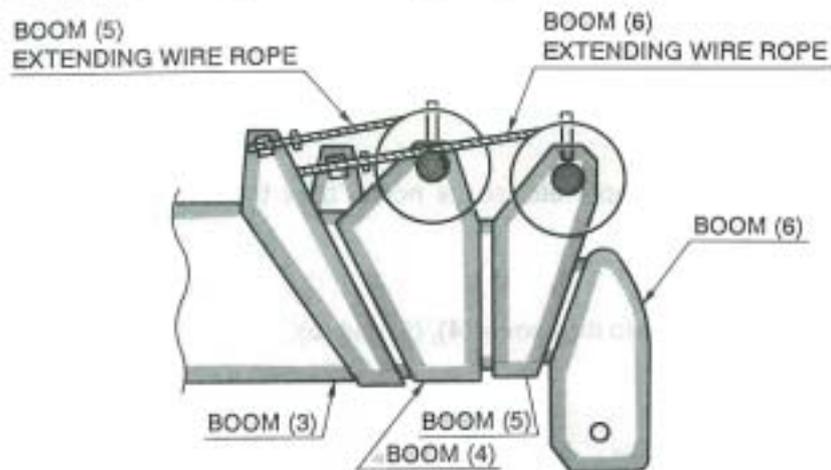


Fig. 2

- ⑬ Put the booms (4), (5), (6) and the telescoping ass'y into the boom (3).
- ☞ Leave part (approx. 200mm) of the boom (4) outside.
- ⑭ Fix the thread end of the boom (5) extending wire rope on the boom (3) lightly.

- ⑮ Put the sheave to which the boom (4) retracting wire rope is applied into the rear end of the boom (3), and fix it. (Fig.3)

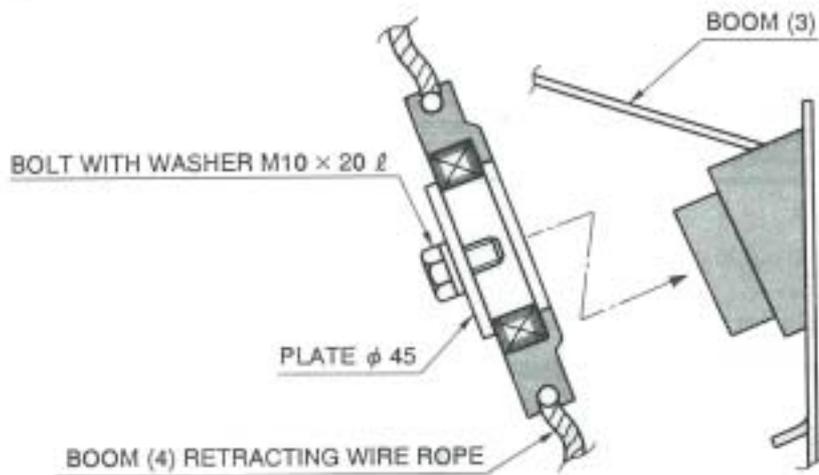


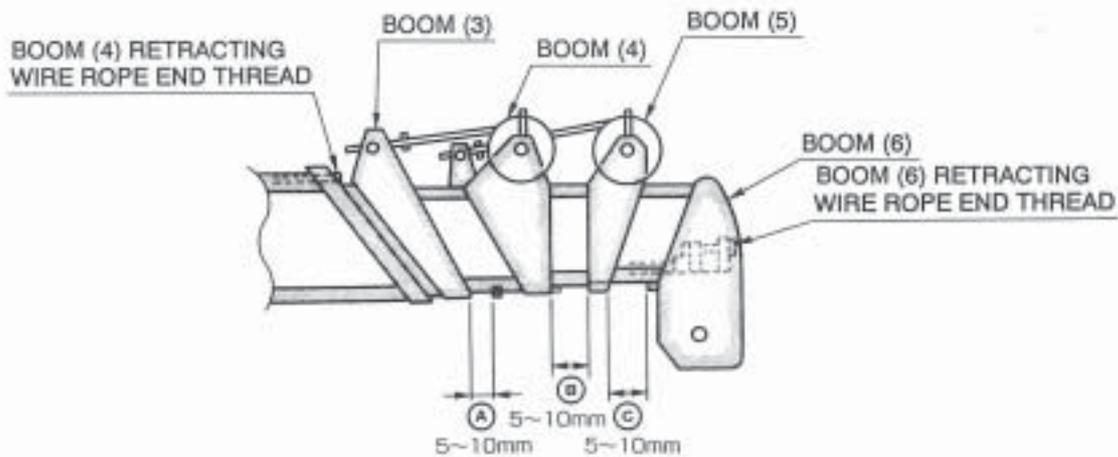
Fig. 3

- ⑯ Set the end of the boom (4) retracting wire rope at the boom end and put the booms (3), (4), (5), (6) and the telescoping cylinder ass'y into the boom (2).
1. Set the four boom (4) extending wire ropes and fix them with the lock nut.
 2. Set the boom (4) retracting wire rope at the end of the boom (2).
 3. Set the telescoping cylinder pin.
- ⑰ Assemble the booms (2), (3), (4), (5), (6) and the telescoping cylinder ass'y into the boom (1). Leave part (approx.200mm) of the boom (2) outside.
1. Install the boom rear-end cover.
 2. Install the joint.

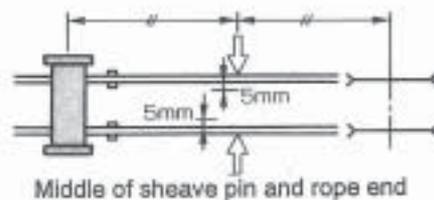
How to Adjust Wire Ropes for Boom Extension/Retraction

(2) 6-Section Boom

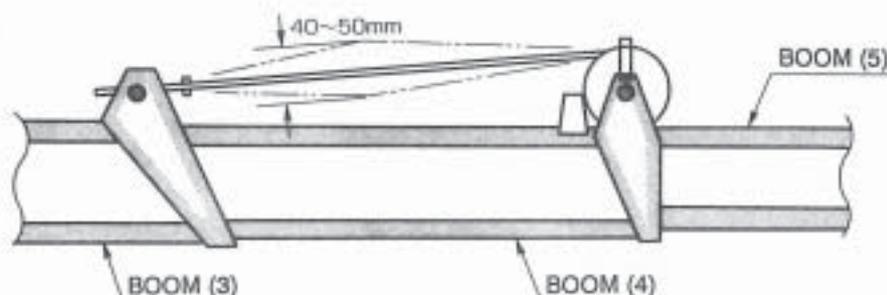
- ① Retract and extend the boom fully two or three times. Exhaust air from the telescoping cylinder and retract the boom fully.
- ② Make sure that the booms (6), (5) and (4) are extending a little (5~10mm).
If they are not so, loosen the extending wire rope and extend the boom manually.



- ③ Tighten the boom (4) retracting wire rope till the part (A) is lost.
Then, tighten it by two more turns and fix it with the double nut.
- ④ Tighten the boom (4) extending wire rope from the boom (1) rear end.
While the wire rope end is pulled with $16 \pm 2\text{kg}$, turn the long nut by hand lightly and put it against the boom (2) bracket. Then, tighten it by two more turns and fix it with the double nut.
- ⑤ Tighten the boom (6) retracting wire rope till the parts (B) and (C) are lost. Then, tighten it by two more turns and stop turning.
- ⑥ Tighten the boom (6) extending wire rope uniformly both right and left.
Holding the right and left wire ropes by hand, tighten them till each of them can move approx. 5mm.

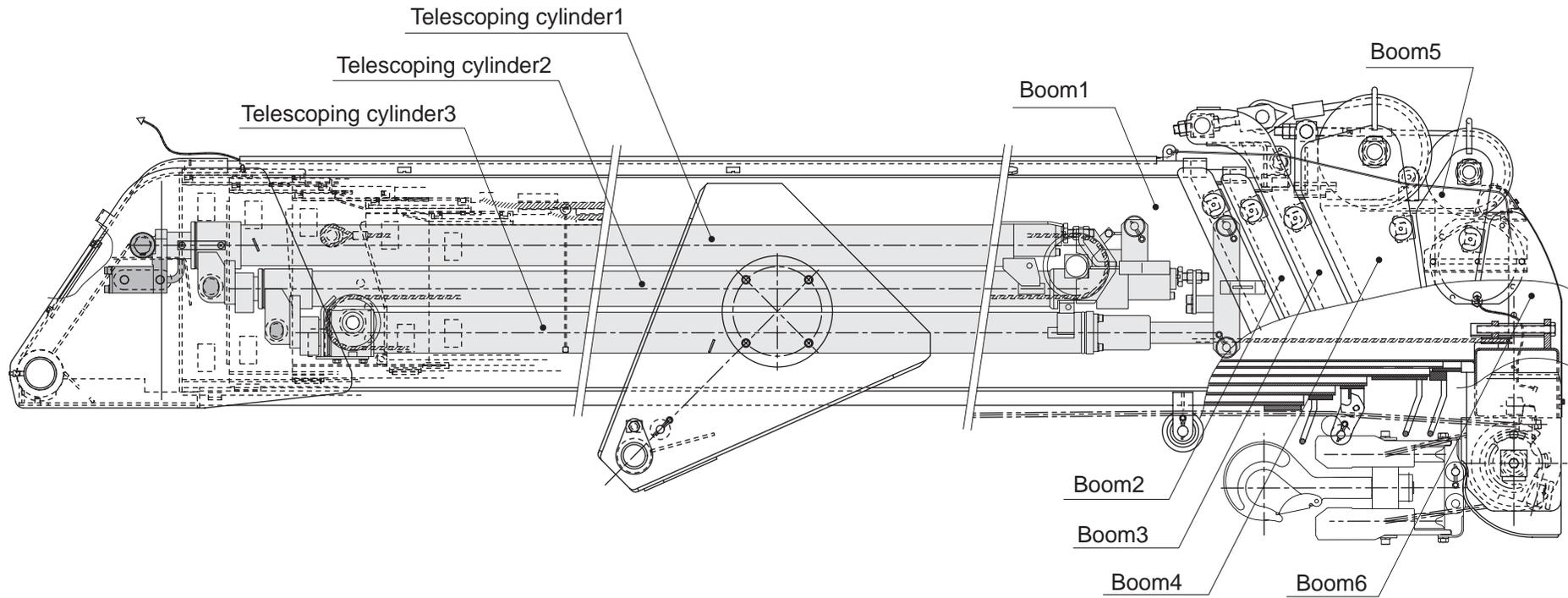


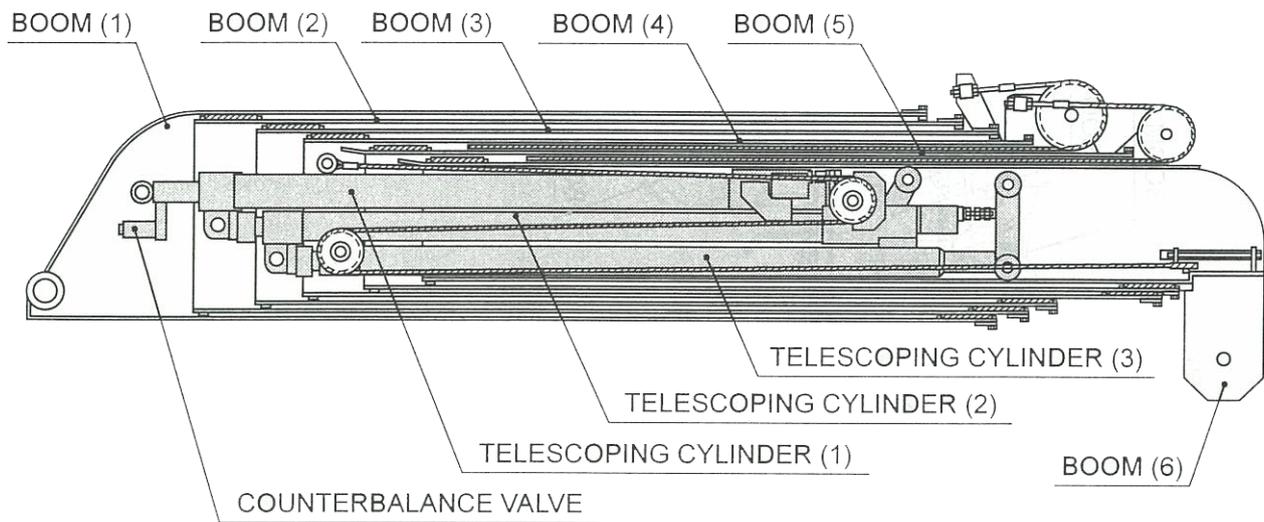
- ⑦ Extend the boom fully, and then retract it 50~100mm to slacken the boom (5) extending wire rope.
Tighten the extending wire rope till it is not slackened any more, and fix it with the double nut.
Don't make the tension of the boom (5) extending wire rope too tight. (It should be moved 40~50mm up and down in the middle by hand.)



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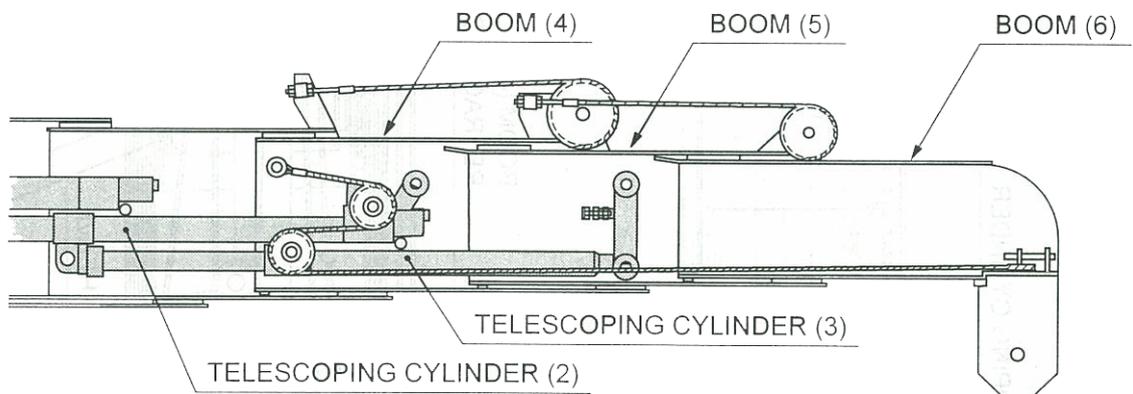
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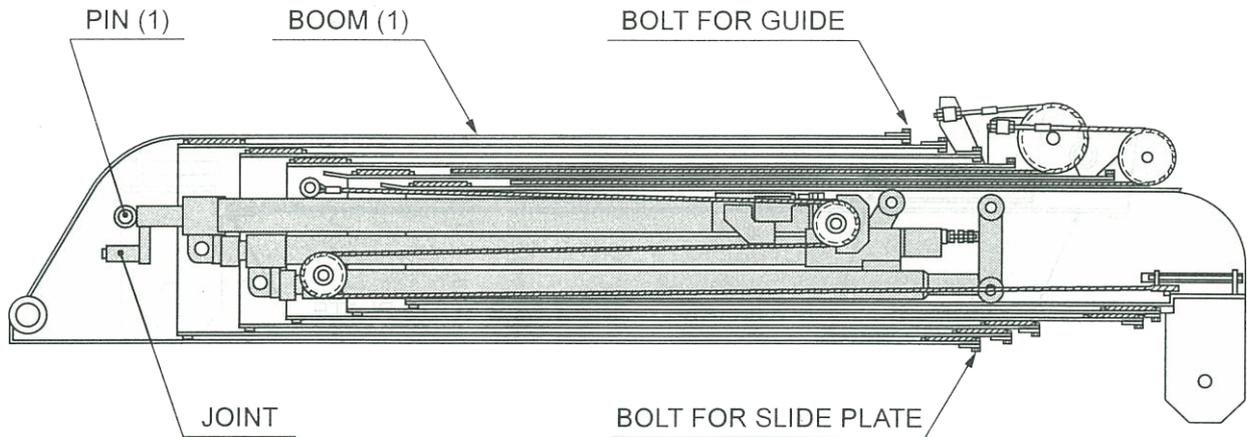
The 6-section boom is composed of three combined telescoping cylinders and wire ropes and the booms (4), (5) and (6) are extended and retracted at the same time.

As illustrated below, the telescoping cylinder (3) is fixed on the boom (4). When the telescoping cylinder (3) is extended and retracted, the booms (5) and (6) are extended and retracted by the wire rope at the same time.



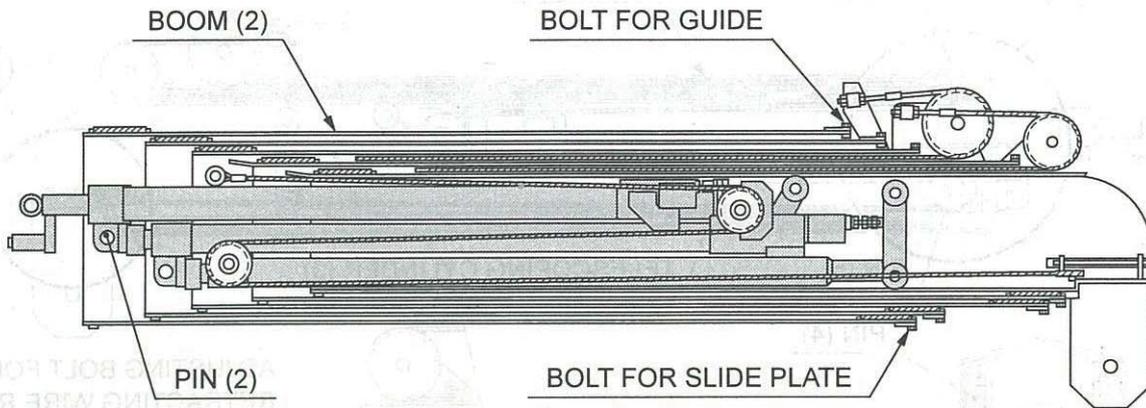
(3) 6-Section Boom

- ① Pull out the booms (2), (3), (4), (5) and (6) from the boom (1).



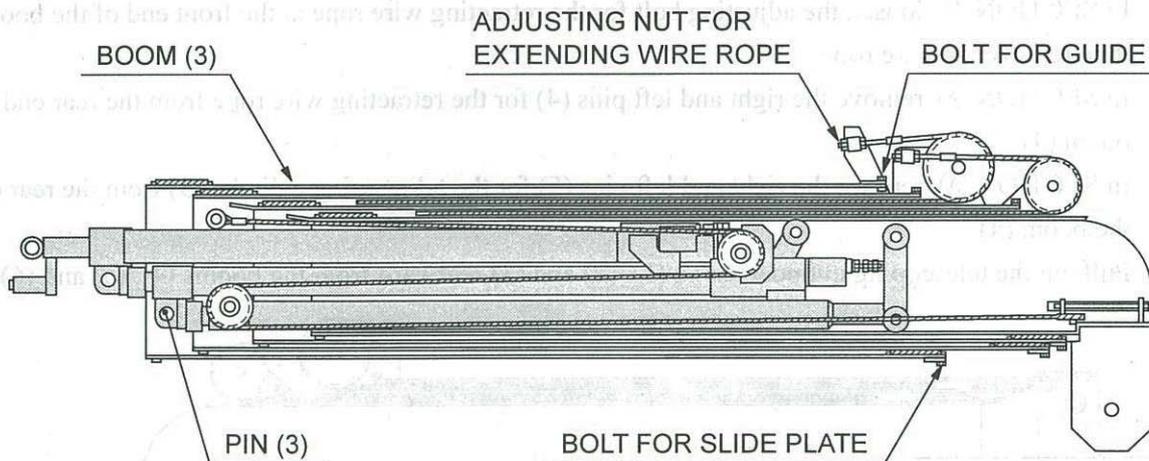
1. Remove the joint (for piping) of the telescoping cylinder.
2. Remove the slide plates (side and lower plates) and guide from the tip of the boom (1).
3. Remove the pin (1) from the boom (1) and then pull out the booms (2), (3), (4), (5) and (6).

- ② Pull out the booms (3), (4), (5) and (6) from the boom (2).



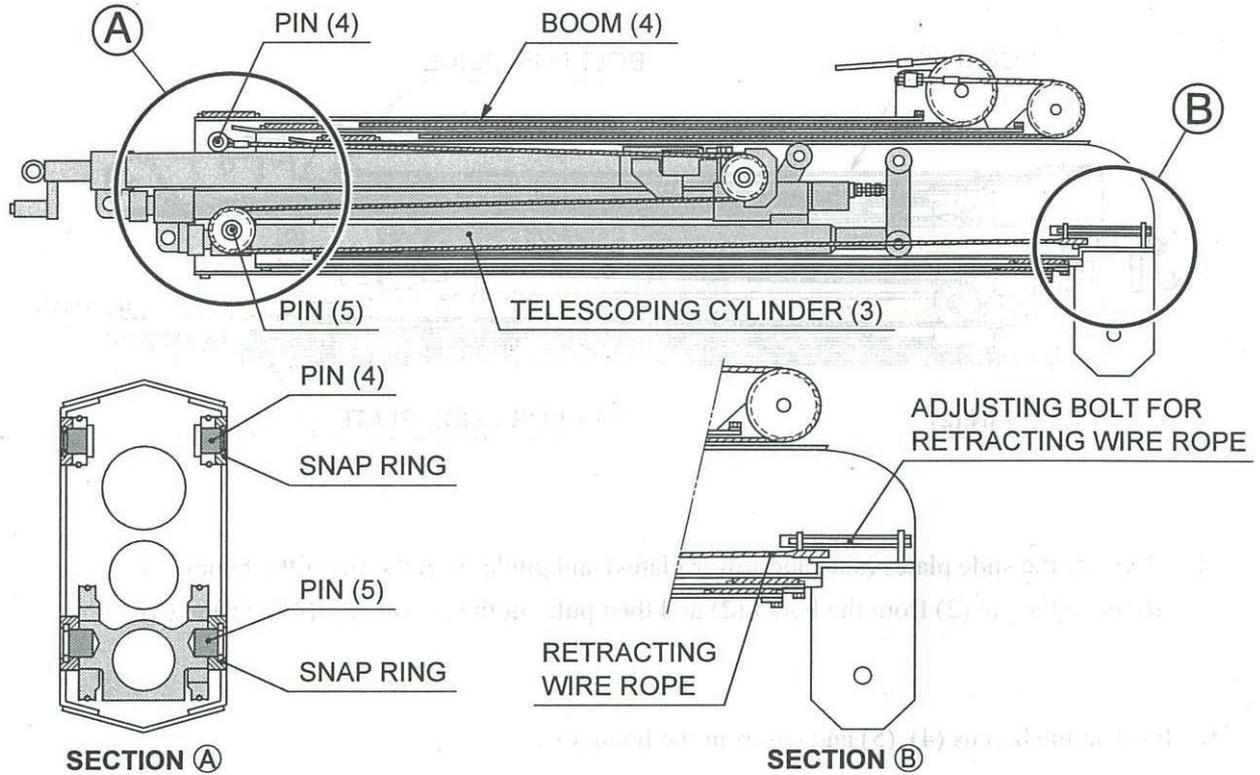
1. Remove the slide plates (side and lower plates) and guide from the tip of the boom (2).
2. Remove the pin (2) from the boom (2) and then pull out the booms (3), (4), (5) and (6).

- ③ Pull out the booms (4), (5) and (6) from the boom (3).

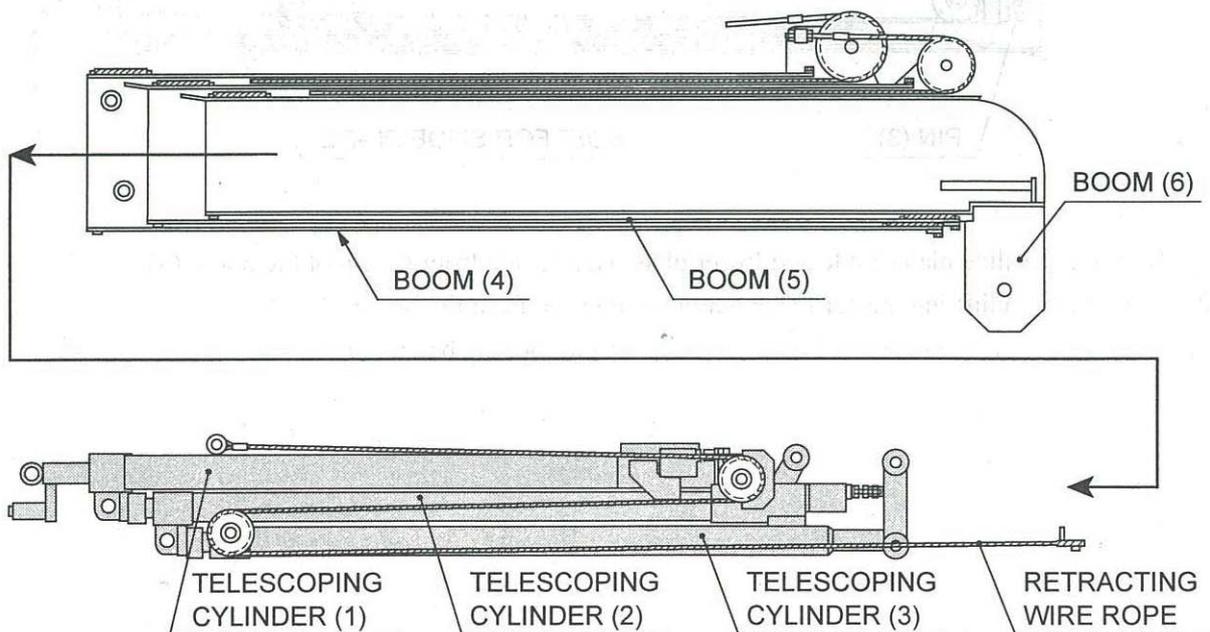


1. Remove the slide plates (side and lower plates) and guide from the tip of the boom (3).
2. Remove the adjusting nut for the extending wire rope from the boom (3).
3. Remove the pin (3) from the boom (3) and then pull out the booms (4), (5) and (6).

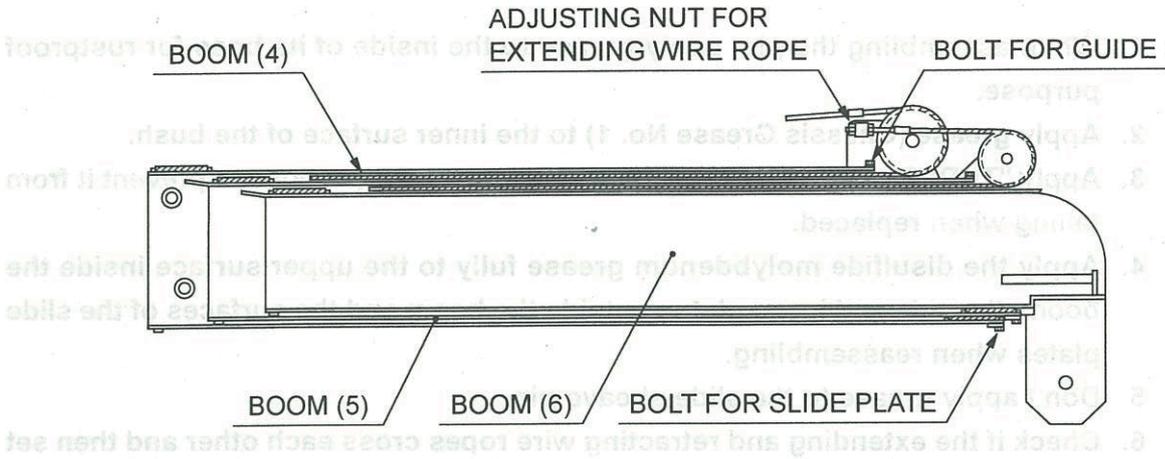
④ Pull out the telescoping cylinders (1), (2) and (3) from the booms (4), (5) and (6).



1. In SECTION B, loosen the adjusting bolt for the retracting wire rope at the front end of the boom and then remove the wire rope.
2. In SECTION A, remove the right and left pins (4) for the retracting wire rope from the rear end of the boom (4).
3. In SECTION A, remove the right and left pins (5) for the telescoping cylinder (3) from the rear end of the boom (4).
4. Pull out the telescoping cylinder ass'ys (1), (2) and (3) rearward from the booms (4), (5) and (6).

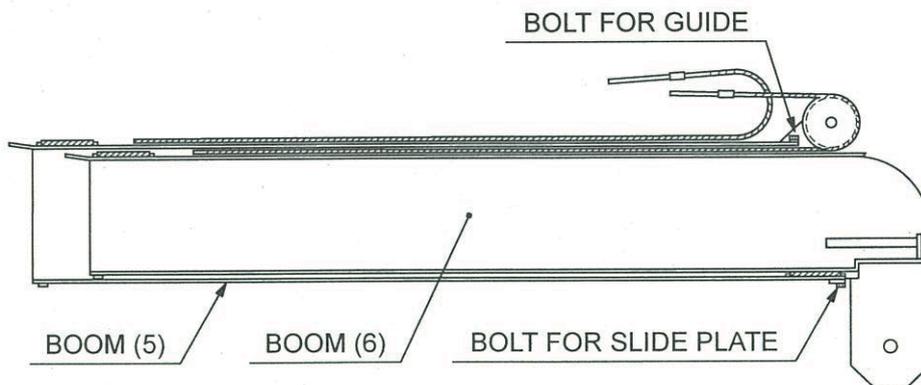


- ⑤ Pull out the booms (5) and (6) from the boom (4).

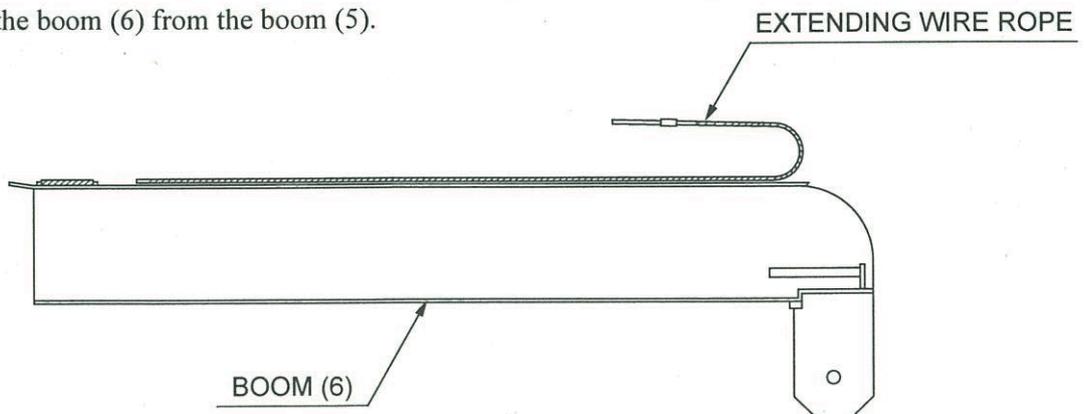


1. Remove the slide plates (side and lower plates) and guide from the tip of the boom (4).
2. Remove the adjusting nut for the extending wire rope and then pull out the booms (5) and (6) from the boom (4).

- ⑥ Pull out the boom (6) from the boom (5).



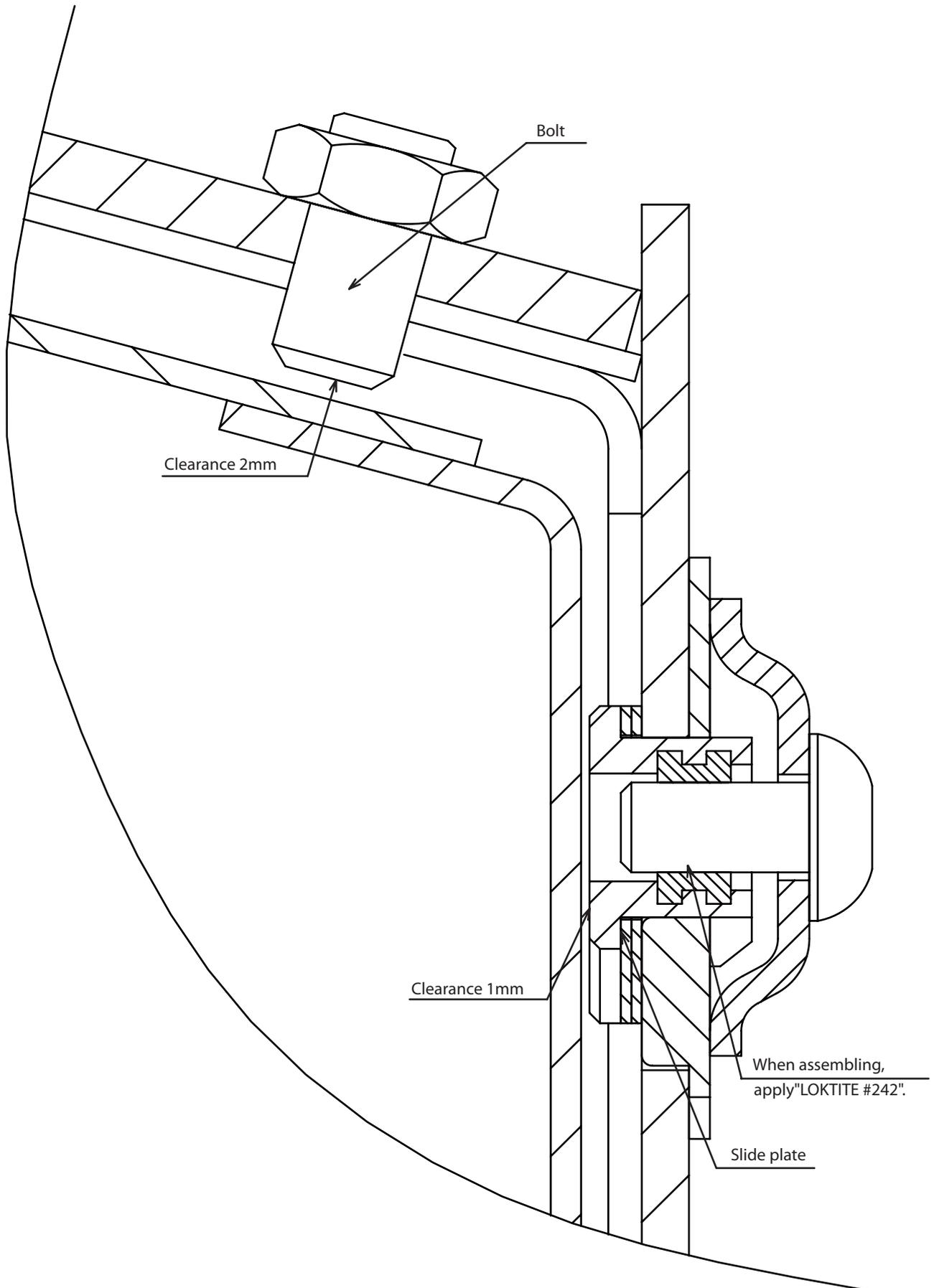
1. Remove the slide plates (side and lower plates) and guide from the tip of the boom (5).
2. Pull out the boom (6) from the boom (5).



☞ Reassembling shall be made in reverse order of the disassembly procedures.

- Notes:**
1. When assembling the pin, apply grease to the inside of its boss for rustproof purpose.
 2. Apply grease (Chassis Grease No. 1) to the inner surface of the bush.
 3. Apply "THREE BOND #1102" to the slide plate for the purpose to prevent it from falling when replaced.
 4. Apply the disulfide molybdenum grease fully to the upper surface inside the boom, the side and lower plates outside the boom and the surfaces of the slide plates when reassembling.
 5. Don't apply grease to the slide sheave pin.
 6. Check if the extending and retracting wire ropes cross each other and then set them inside the boom.

Installation procedures for slide plate and guide
It has similar construction irrespective of number of boom section



23 HOW TO PUNCH

(1) Purpose

Troubles injuring the inside surface of cylinder tube due to screws mounting piston being loosened have been happened.

Therefore, we not only upgraded the screw lock agent “LOCTITE #262” to “#2701” to strengthen adhesion but also added punching process (partly carried out for derrick cylinder). The section defines how to punch.

(2) Punching procedures

1. Use a punch whose tip is hard and sharp enough.



Closeup



2. Hit the punch head hard enough with a hammer with the punch put at a distance of 1.5mm from the screw end.
3. Hit the punch head so hard that the diameter of punch mark will be more than 1.5mm
4. Punch 2 places around the screw thread in diagonal position.

Hexagon socket head screw
Tighten each hexagon socket screw with “LOCTITE #2701” applied to the threads to punch specified places close to screw threads.



Fig.1 Piston

Points to remember

1. Take care not to break the target piston while punching.
 2. Make the clear punch mark as illustrated in Fig. 1.
 3. Punch within 5 minutes after “LOCTITE” has been applied.
- (Try not to give shock to the area where “LOCTITE” has been applied as it starts curing.)

TELESCOPING/DERRICK CYLINDER ASS'Y, MEASURES TO PREVENT PISTON FROM BEING LOOSE

(Description)

In order to ensure preventing the pistons of telescoping and derrick cylinders from becoming loose, fix the screw threads on the rods and the pistons with the adhesive "LOCTITE #638" (excepting for W376C telescopic cylinders). Besides, securing piston with screws and punching after application of "LOCTITE #2701" are also to be carried out as before

(Rods and pistons are to be fixed perfectly by application of adhesive "LOCTITE #638".)

(Main points)

Rods and pistons are fixed by tightening after application of "LOCTITE" to the threads on the rods and on the pistons.

Apply "LOCTITE" to the entire circumference of 2nd to 3rd threads from the thread end.

Apply the primer as the gap in the effective diameter of threads exceeds 0.1mm.

Use type #7474 (primer T) for the primer.

(Although type #7469 is being used currently, type #7474 is more effective as the target adhesion is to be at between metal components.)

Note : Pay special attention to observing the points to notice illustrated below while working as curing itself and curing time of "LOCTITE" depends largely on how the adhesion procedures have been carried out.

Points to notice on procedures to apply "LOCTITE"

Procedures

1. Degreasing and cleaning →2. Priming coating →3. Application of "LOCTITE" →4. Assembly 5. Curing

(1) Degreasing and cleaning

· Separate the oil well enough which has been applied to the threads (of rod/piston) to wipe it off with a rag or blow it off with compressed air.

When blowing it off with air, remember that the unclean oil will not be blown off but will just escape along the threads.

· In case of spray cleaning as well, target oil will not be removed but return if doing nothing but just spraying.

· After carrying out degreasing and cleaning, wait until cleaning fluid is dried up completely.

(2) Priming coating

· After primer #7471 has been applied, do not wipe it off but allow as it is for 5 10 minutes to dry naturally.

(Application of "LOCTITE" without complete drying may result in reduction of adhesive strength by half.)

· Although a component primed is effective for 7 days, store it by preventing dust and/or oil from being stuck before use.

· When "LOCTITE" is applied to a component and it is shut off air, curing will start after 5 minutes from application and will reach approx. 70% of curing in about 2 hours.

(Curing time will be shortened by priming, but theoretical adhesive strength will be 85% against a component without priming.)

· Do not dip a primed component in "LOCTITE" agent directly.

· Carry out priming at a place where well ventilated because priming agent escapes into air as vapor.

TELESCOPING/DERRICK CYLINDER ASS'Y, MEASURES TO PREVENT PISTON FROM BEING LOOSEMED

(3) Application of "LOCTITE"

- Apply "LOCTITE" sufficiently to the threads to fill them.
- Apply "LOCTITE" to the component mounting o-ring (piston) at the 2nd to 3rd threads from the thread end. (Refer to "Estimated adhesive consumption" illustrated below.)
- "LOCTITE #638" is an anaerobic adhesive so that the part forced out will not cure because it is in contact with air. In addition, sticking of "#638" to o-rings and packings may cause the rubber to be

(When it is possible to be stuck on the rubber such as o-rings and packing, apply "LOCTITE" to the threads on piston side to avoid sticking to them.)

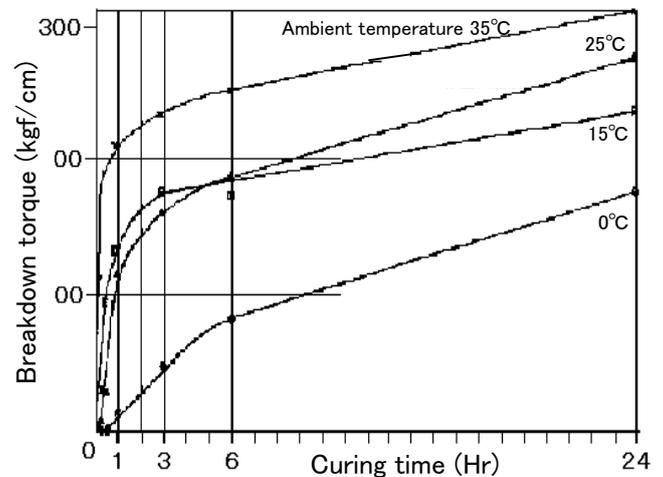
- Try shortening the working period from the time when application of the "LOCTITE" to a primed component to completion of fitting the component.

(4) Assembly

- Tighten the component after application so that applied "LOCTITE" may spread entirely to the threads of the component.
- Since "LOCTITE" forced out of the threads will not be cured, take care not the "LOCTITE" to be out during application as hydraulic oil is to be contaminated with it.
- Work quickly as the "LOCTITE" in the treads starts curing.
- Curing speed differs according to temperature (ambient temperature included) of target component. Since curing time becomes excessively longer at a temperature below 10° C, work with the component temperature raised to 15° C or over.

Chart of breakdown torque vs. curing time
When using "Lock Tight #638 with primer #7471 (primer T)

Bolt: M10 × P1.5- L2S
Nut: M10 × P1.5
Material: Soft steel (raw)



(5) Curing

- This is a period while an adhesive is being joined. Store the components still during the period. (Recommended conditions is at a component temperature of 15° C min. for more than 1 hour.)

Reference:

Estimated adhesive consumption when it is applied to 3 spirals of thread entirely.

Threading diameter	Amount to be applied
M40	0.46cc
M60	0.69cc
M80	0.92cc
M100	1.15cc
M120	1.38cc

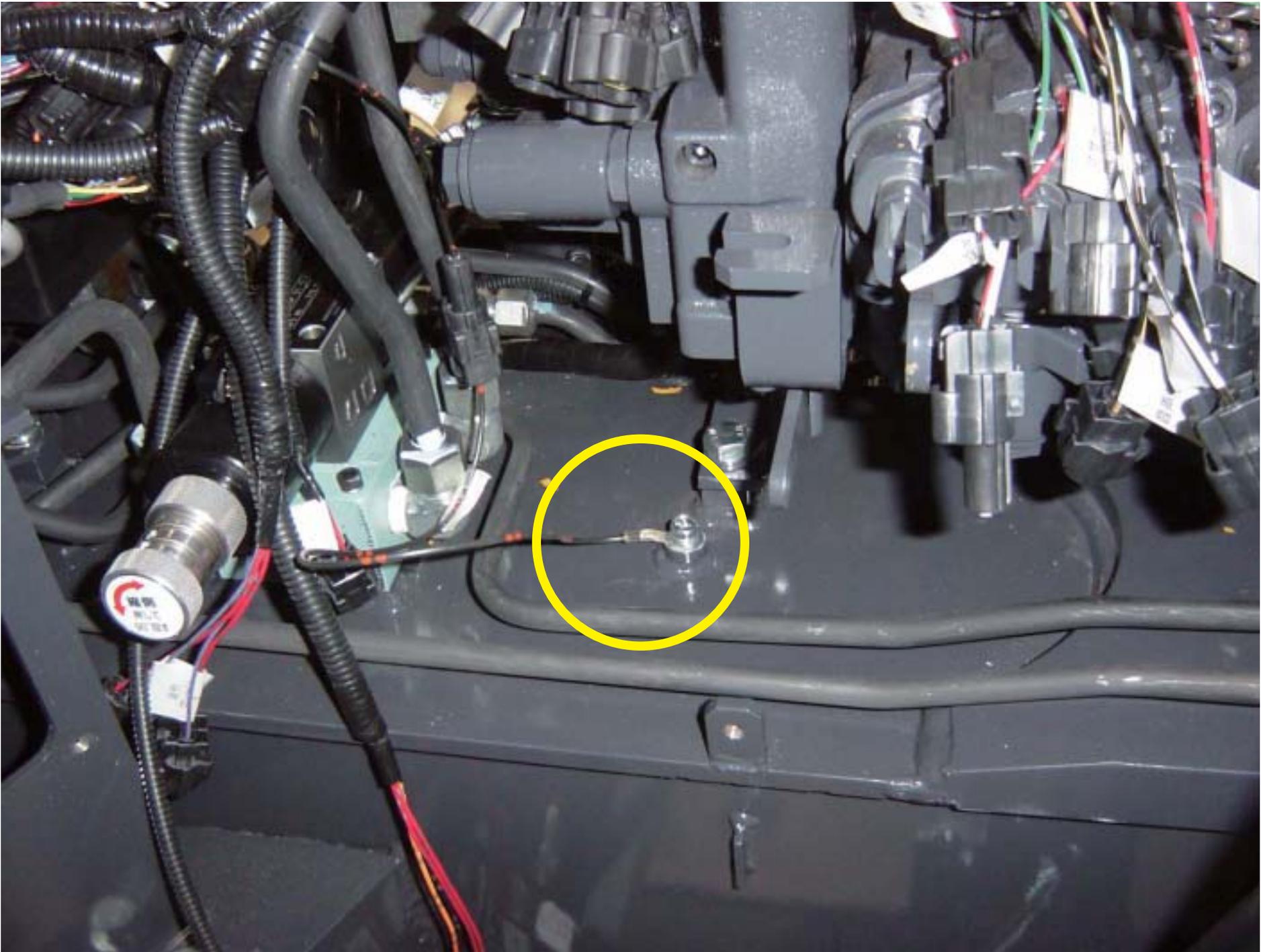
Which primer of #7649 and #7471 should be used together with "LOCTITE #638".

Curing speed of #7469 is faster than that of #7471 but adhesion strength is lower.

If adhesion is to be carried out between metal articles, #7471 gives better result.

Type #7471 is to be used in normal case (refer to manufacturer's comment and catalog specifications).

Earth for engine start relay and engine stop relay



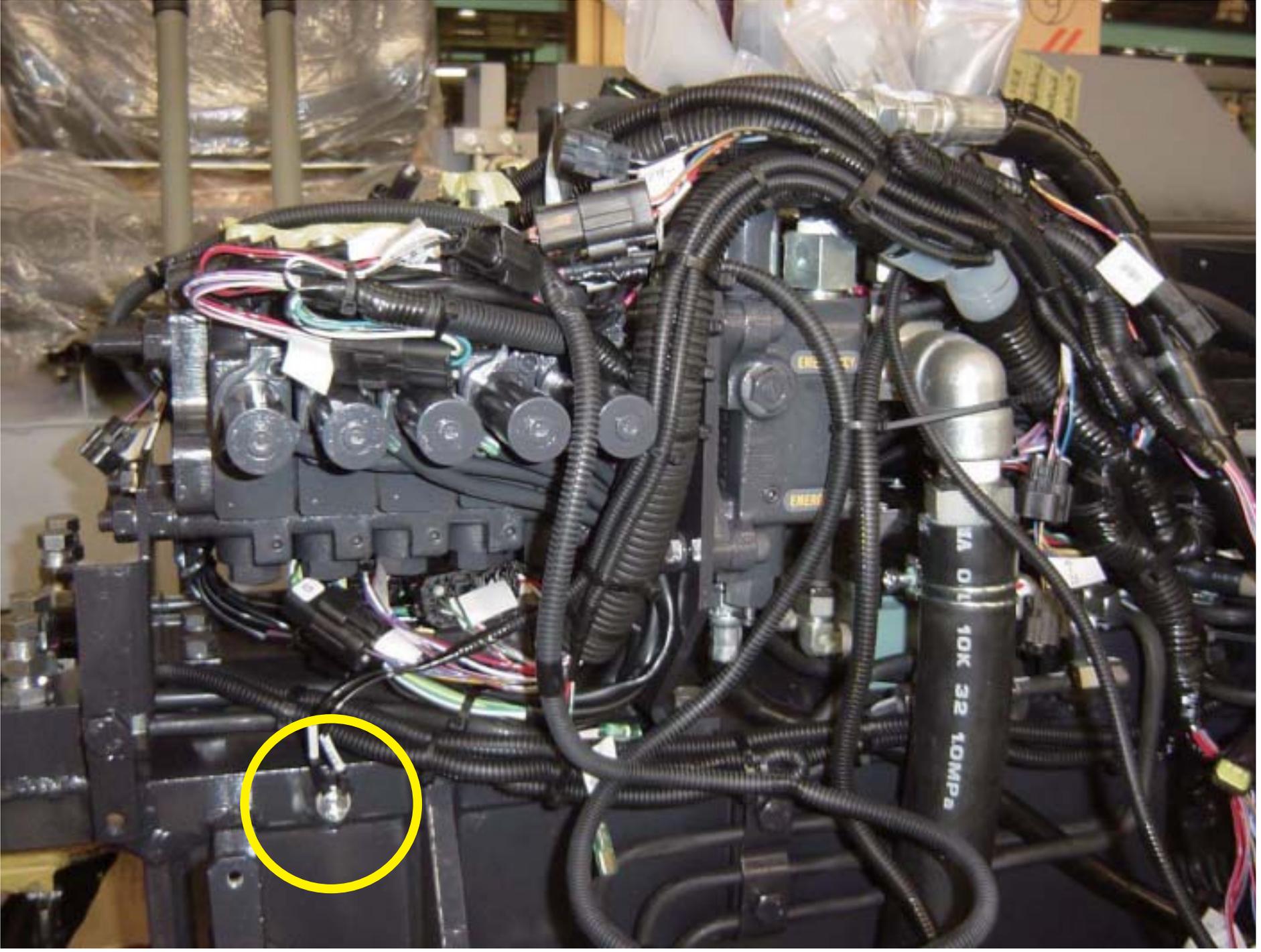
Sky



Ground

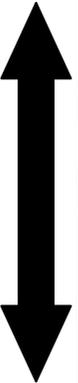
25-1

Earth of the main harness



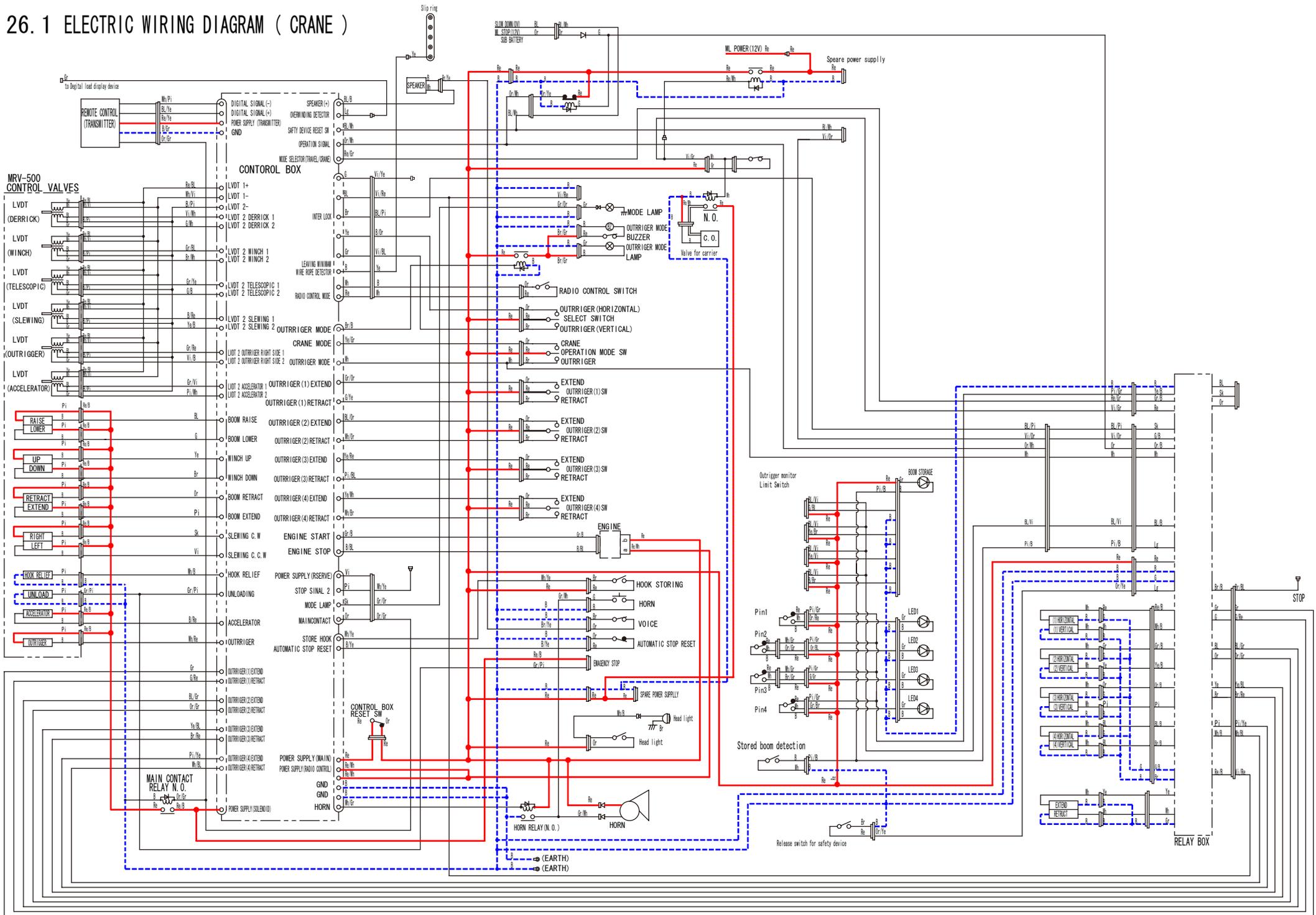
25-2

Sky

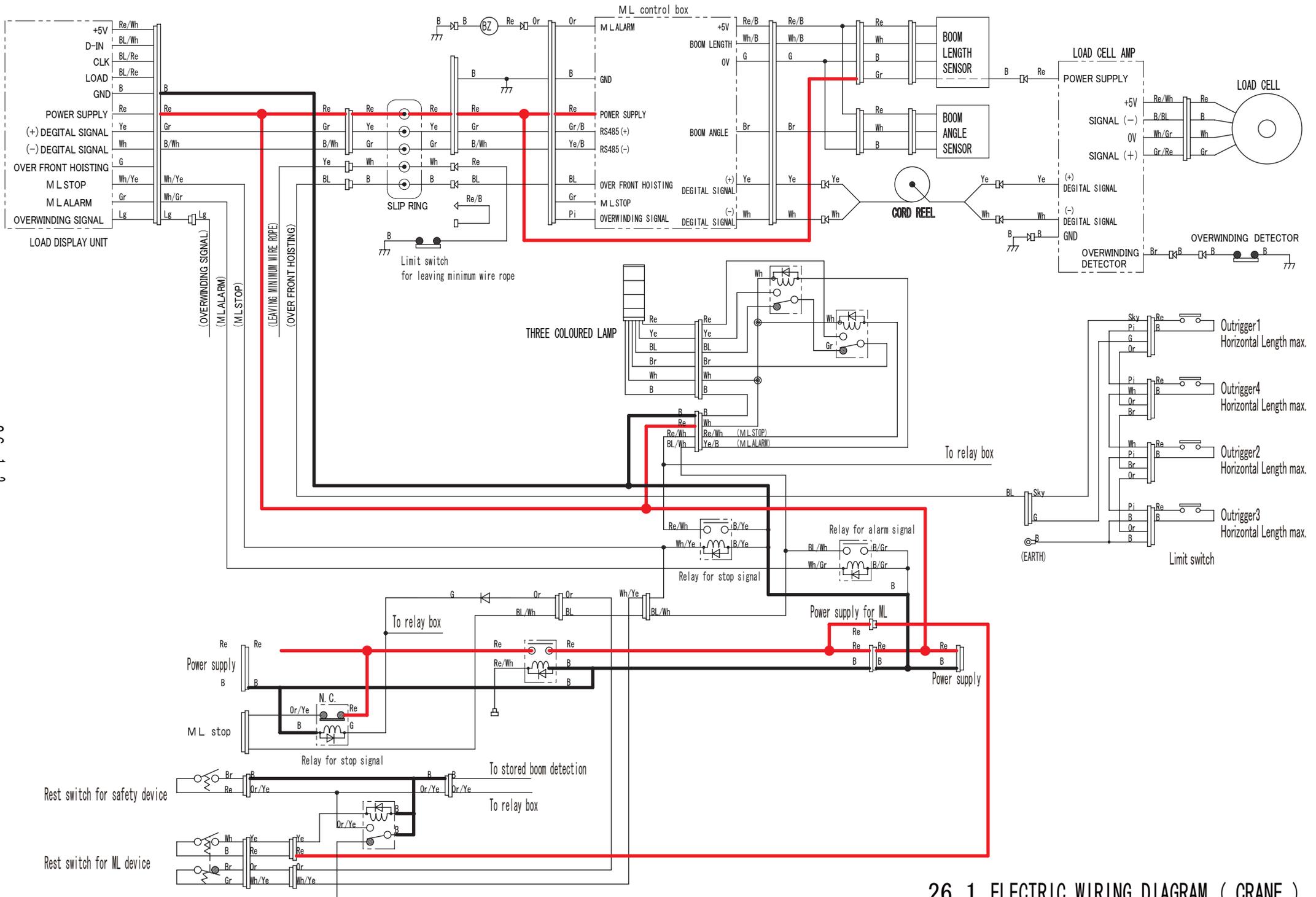


Ground

26.1 ELECTRIC WIRING DIAGRAM (CRANE)



26-1-1



26.1 ELECTRIC WIRING DIAGRAM (CRANE)

Electric wiring in control seat part



Operation switch panel (left side)



Operation switch panel (under side)

Operation switch panel (right side)



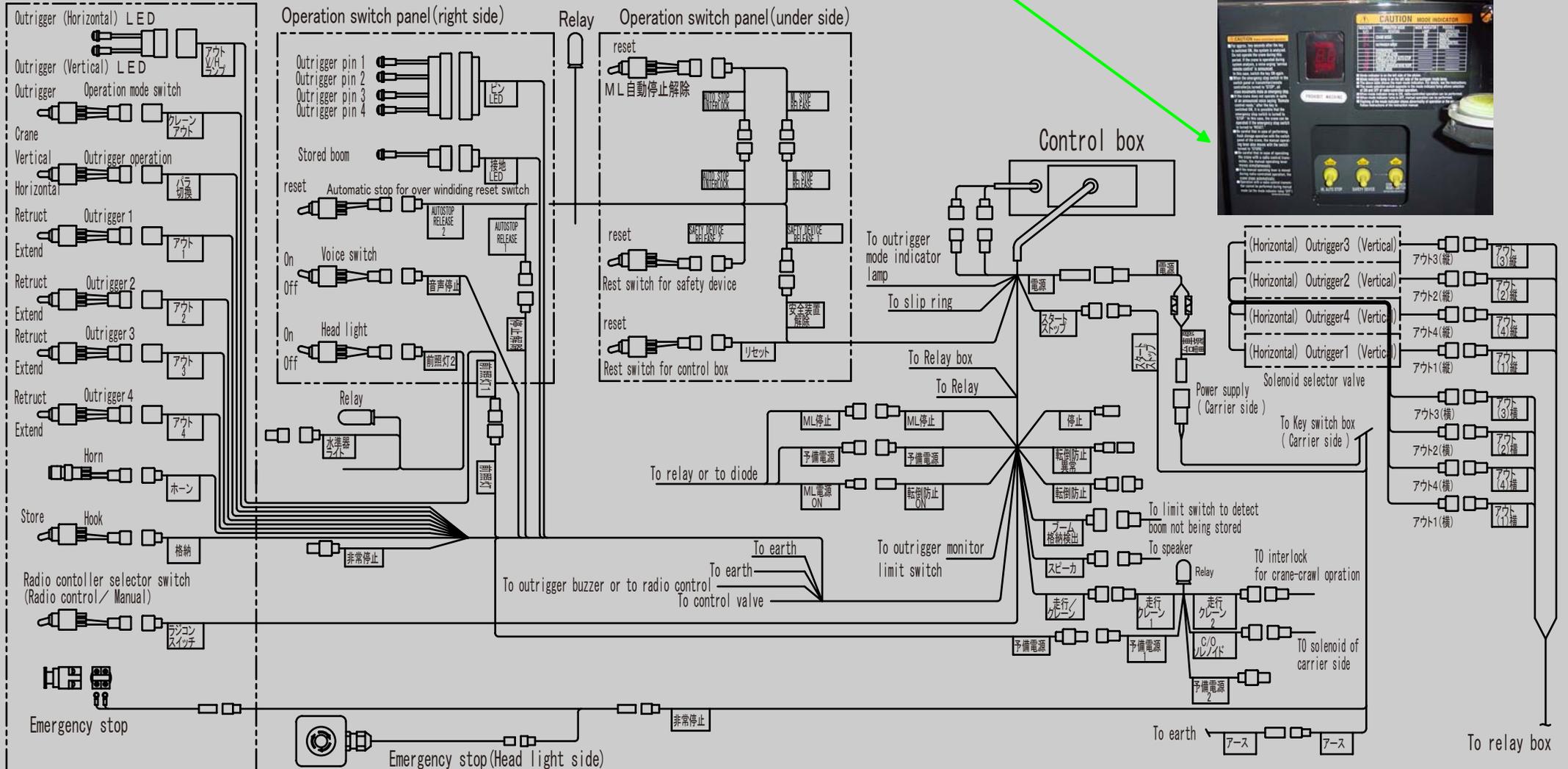
Operation switch panel(left side)

Operation switch panel(right side)

Relay Operation switch panel(under side)

Control box

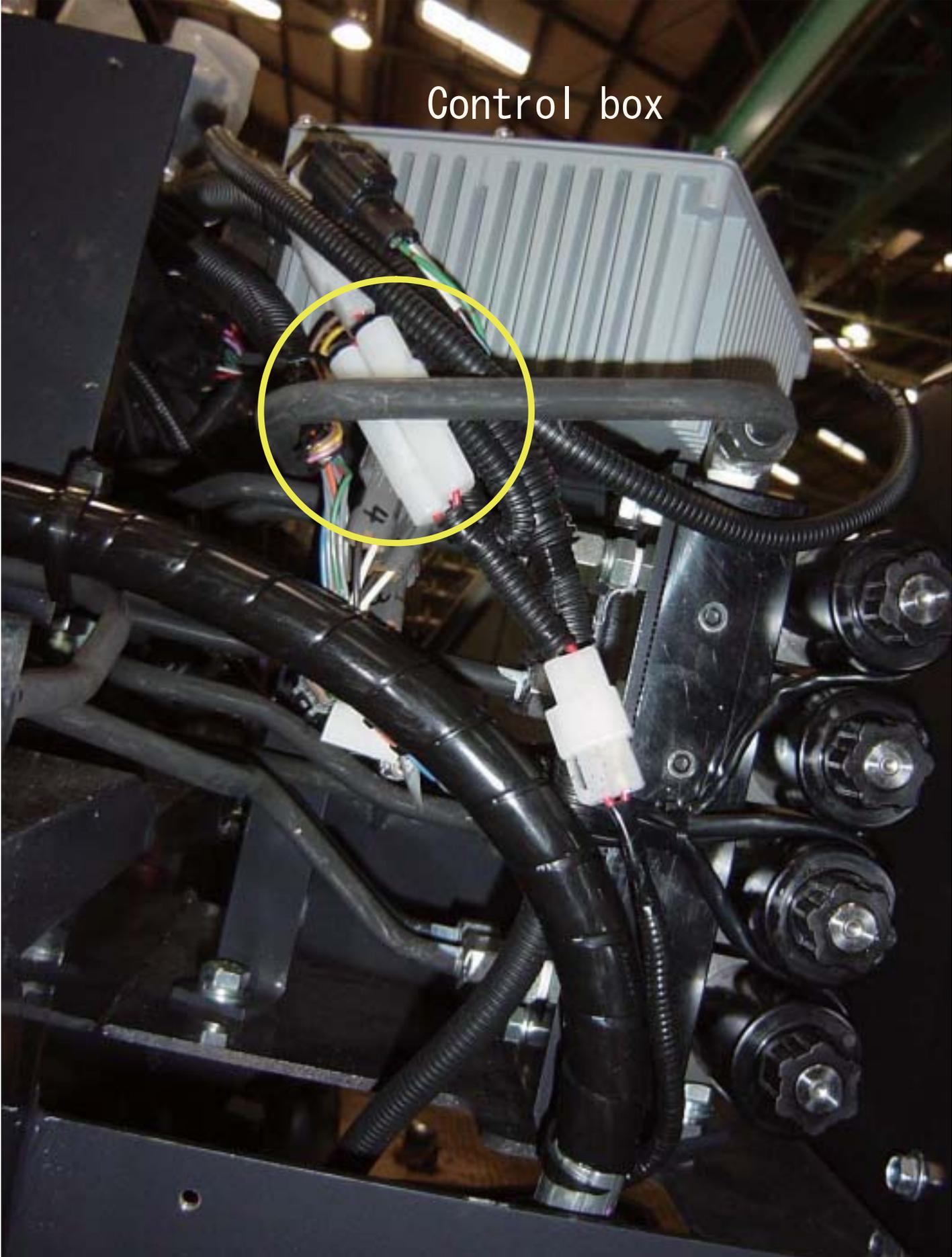
26-2



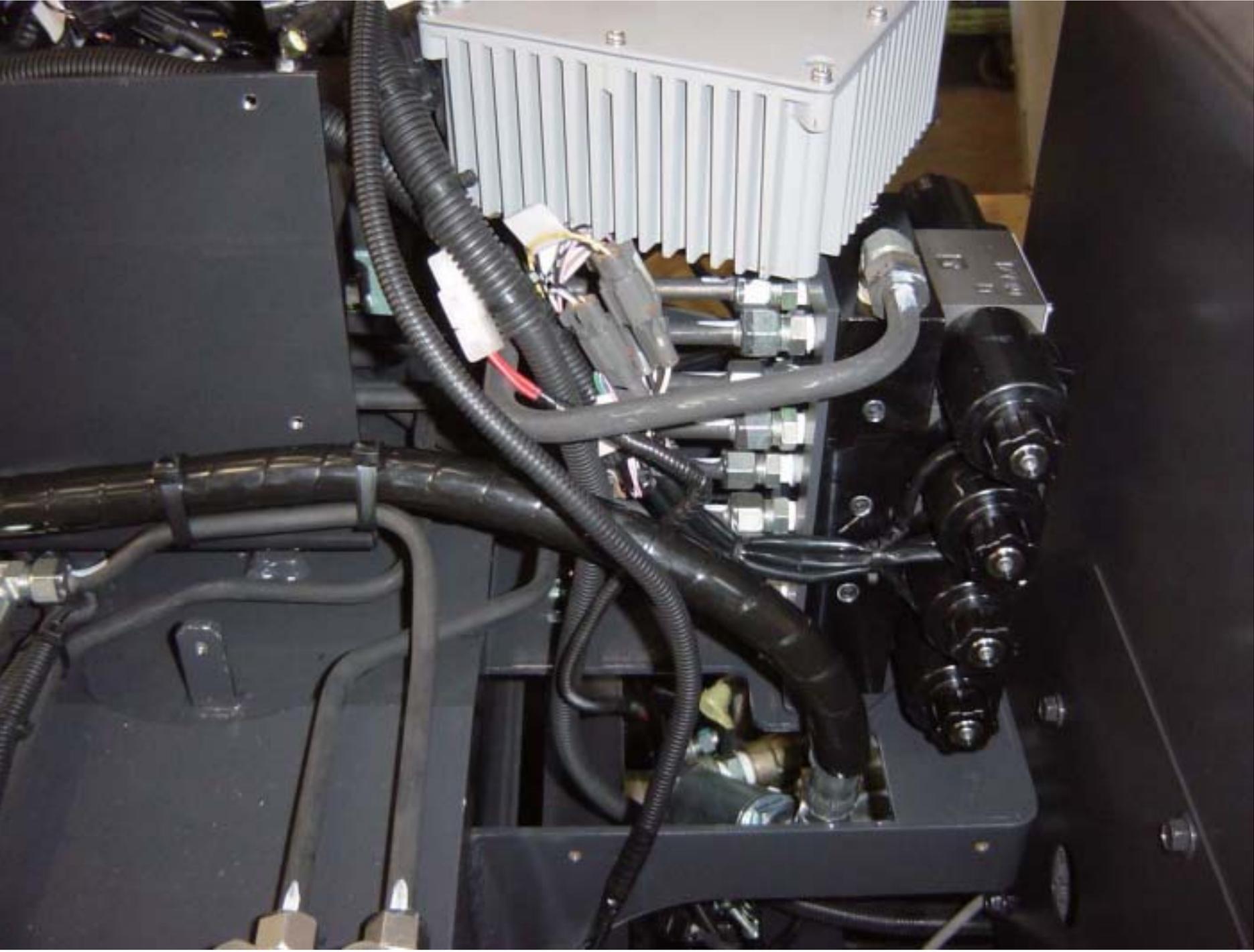
To relay box

Power supply fuse

Control box



Solenoid valves for operating outrigger



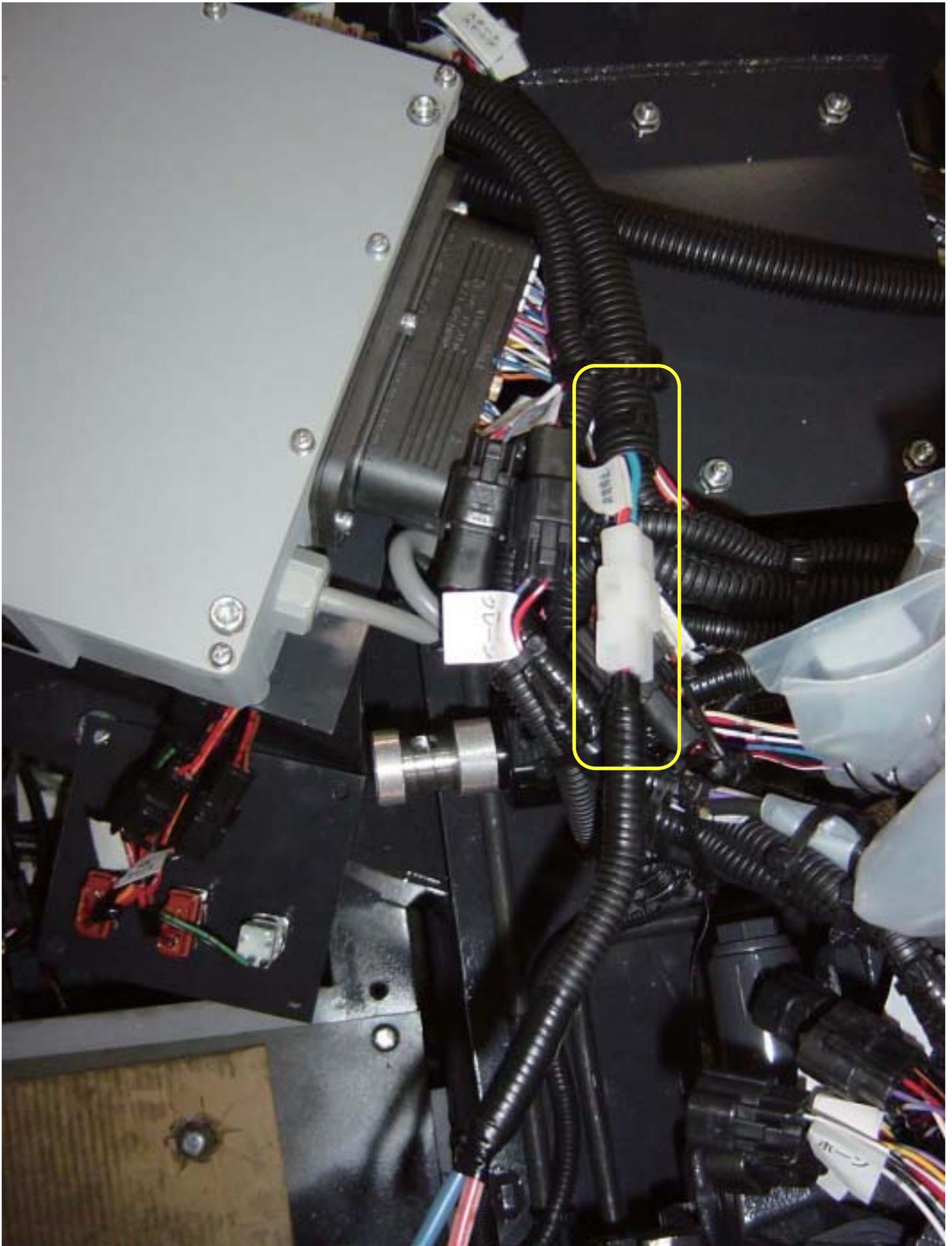
Sky



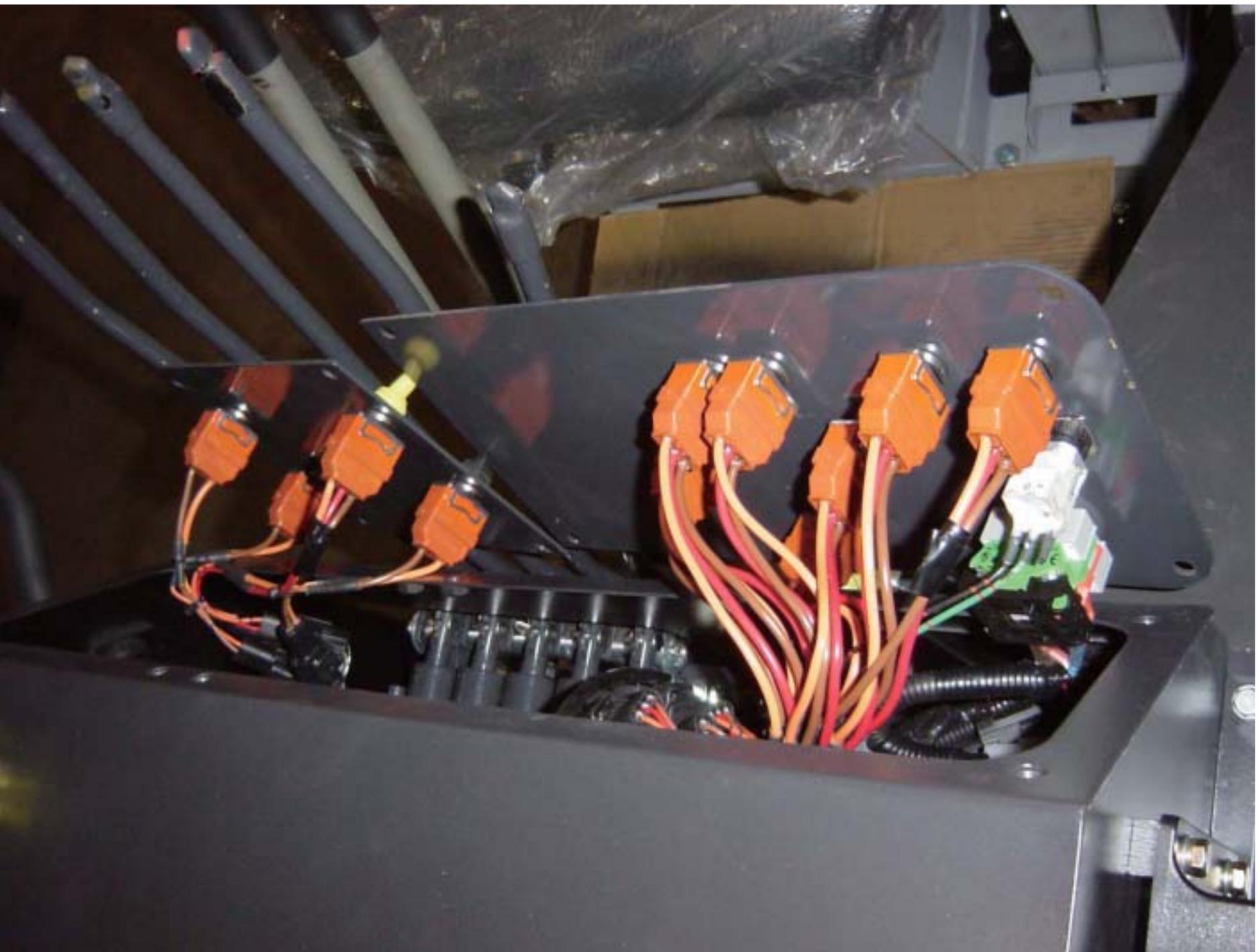
Ground

26-4

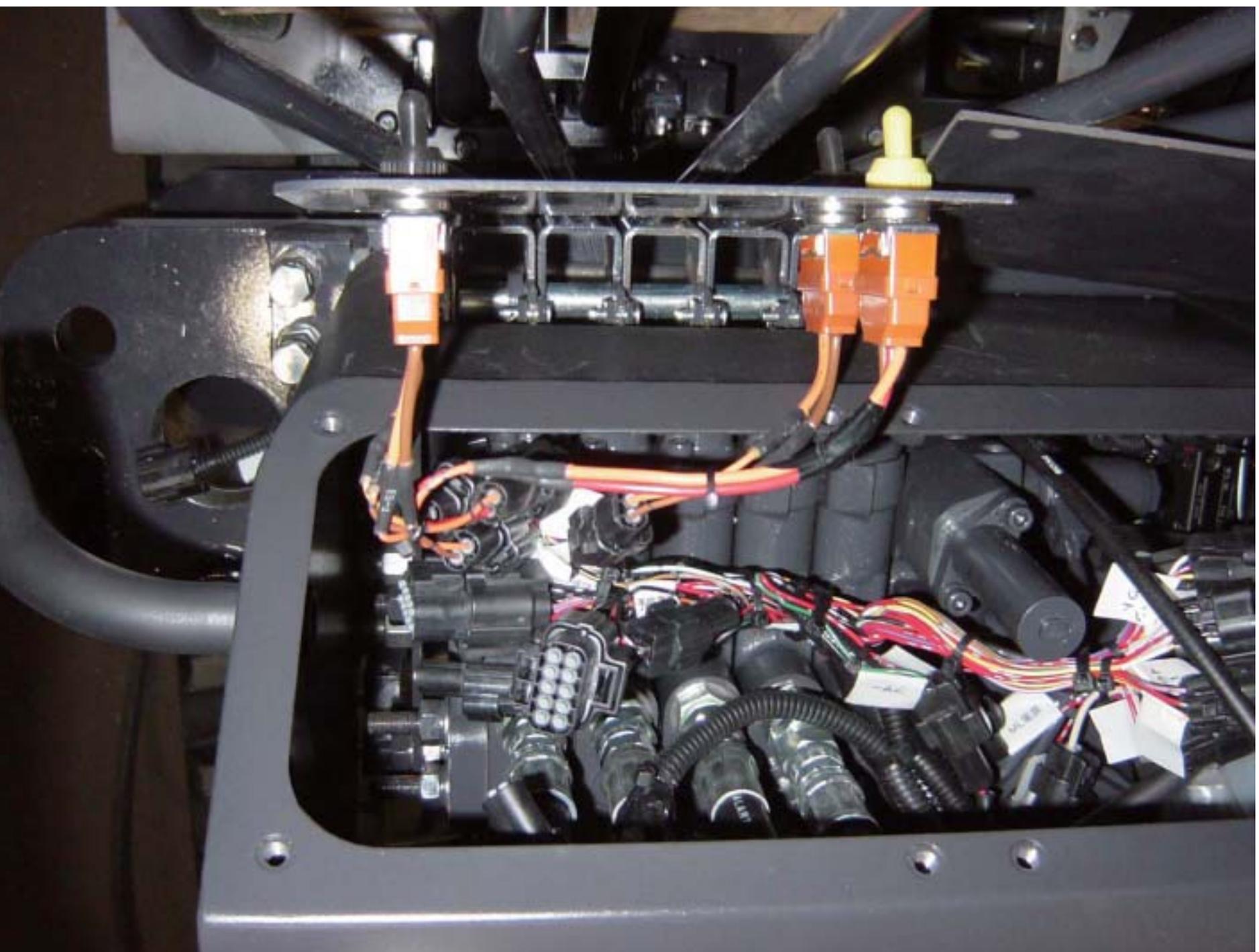
Connector of Emergency stop



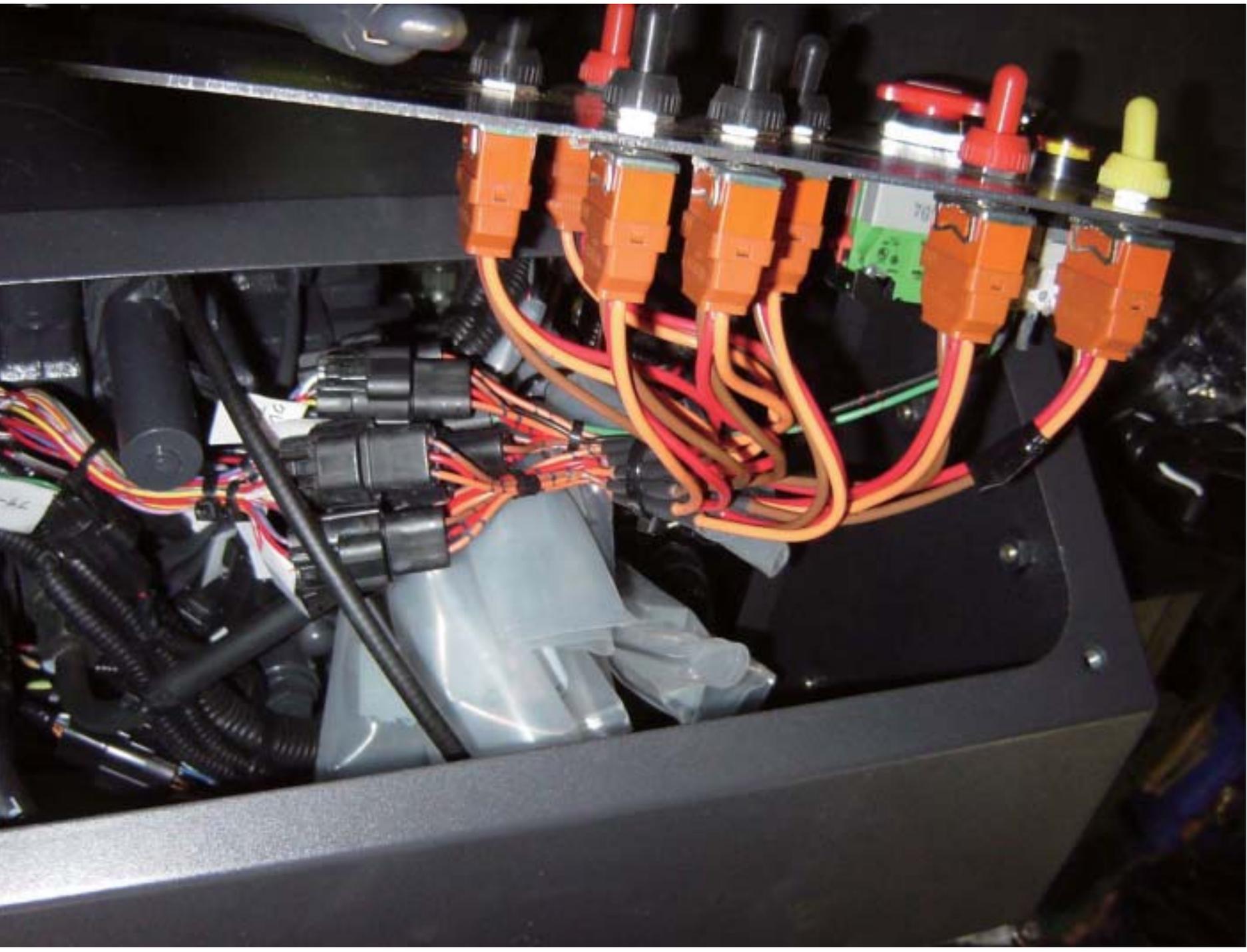
Wiring for operation switch panel



Wiring for operation switch panel



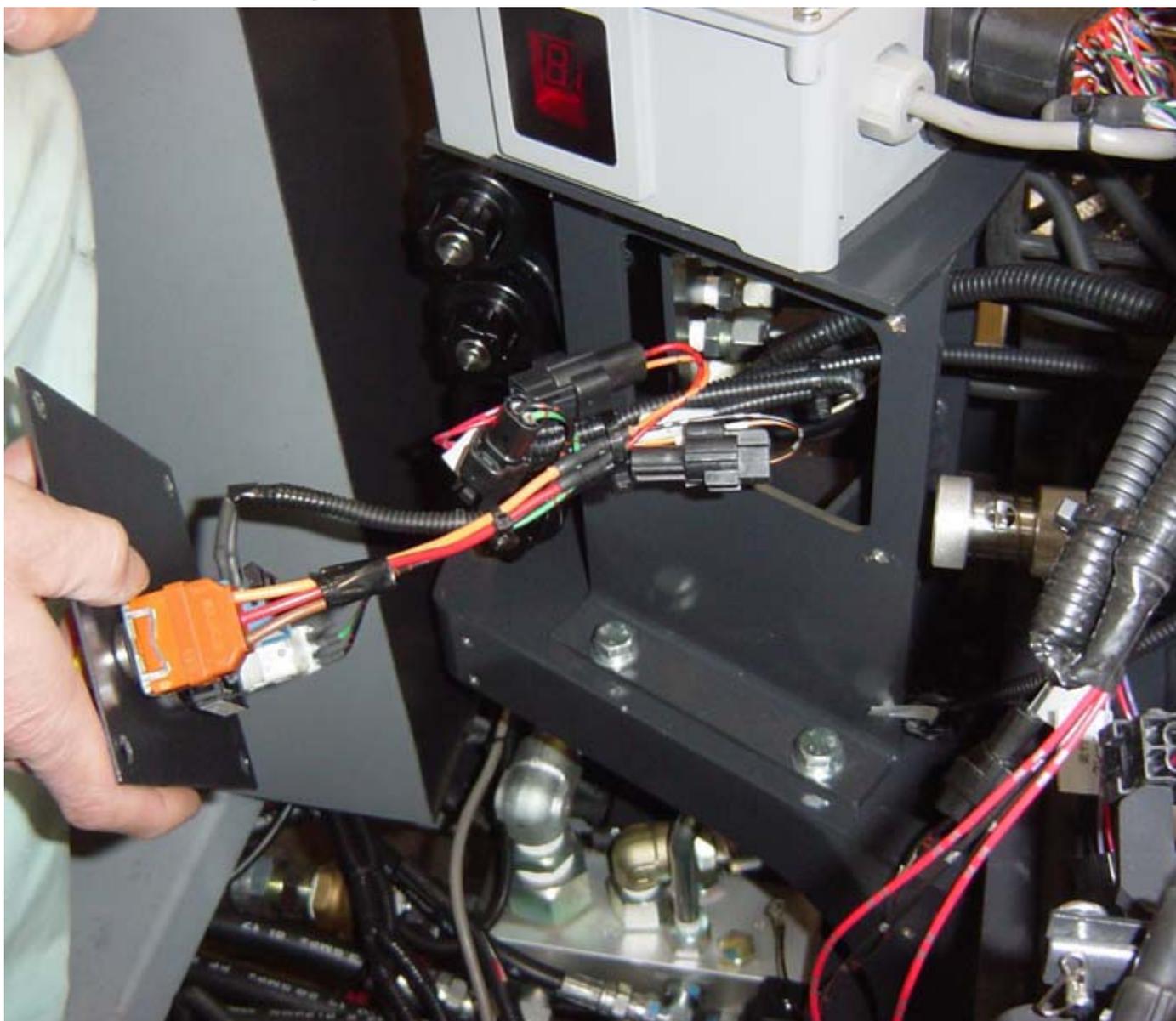
Wiring for operation switch panel



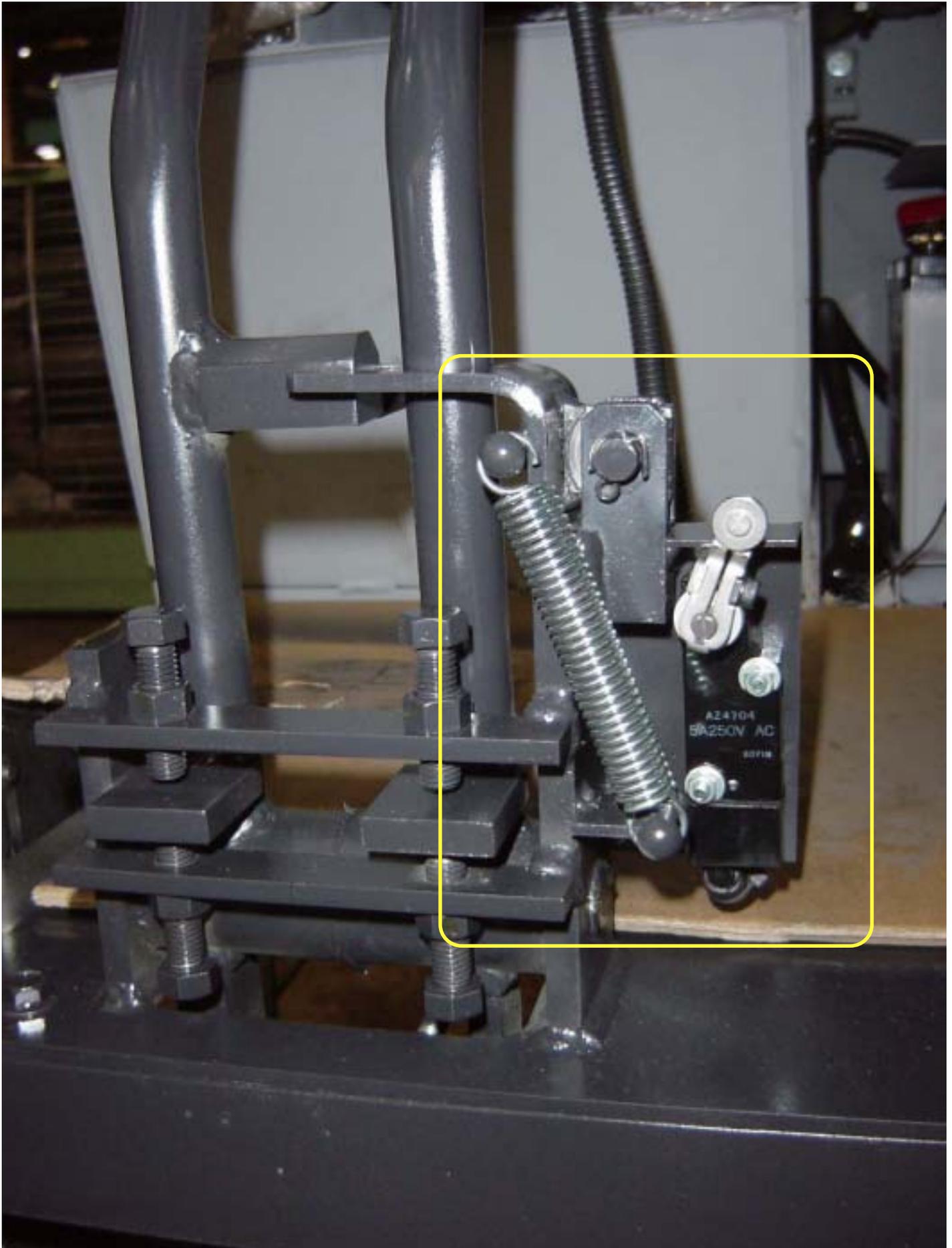
Switch panel



Switch panel (Key switch type)
(Turnover prevention device)

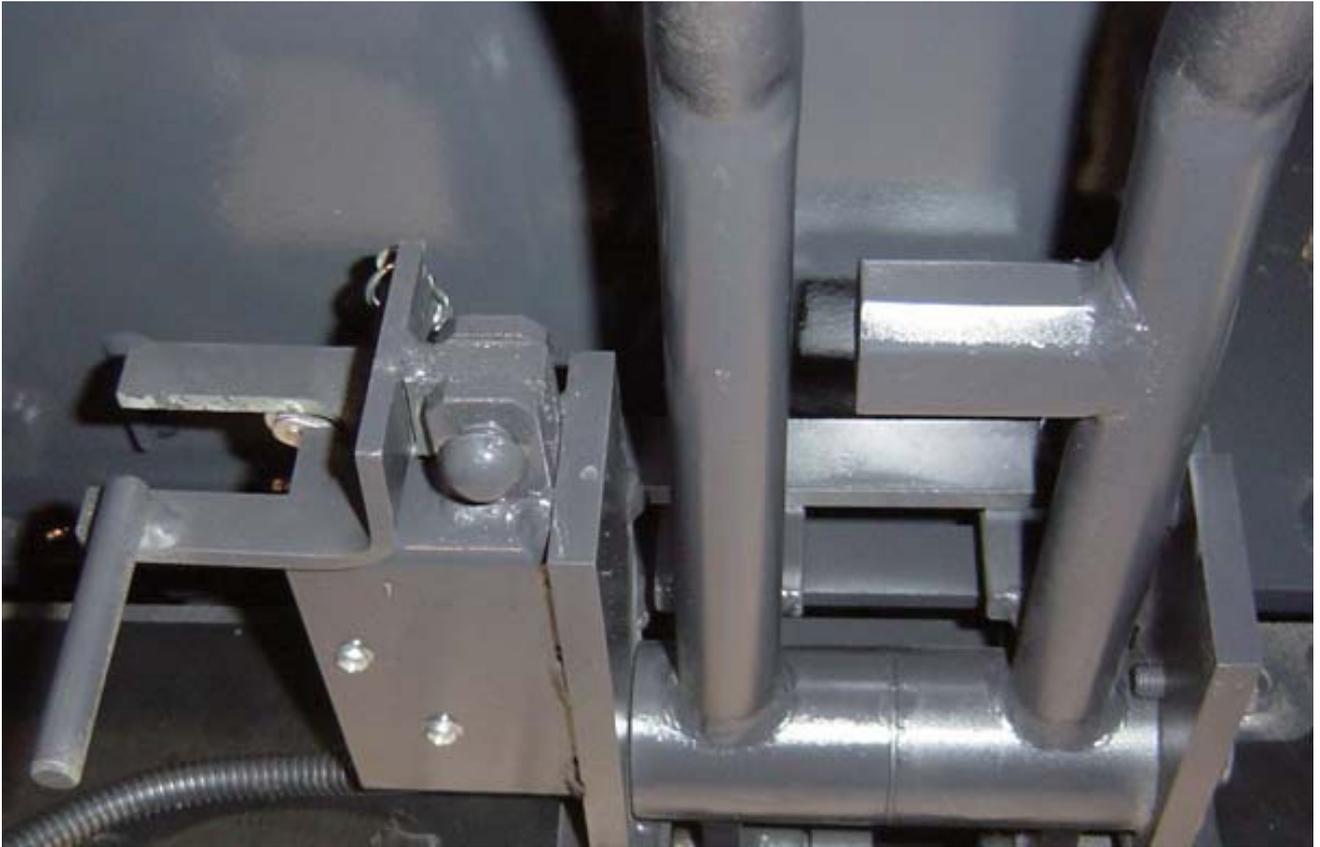


Interlock for crane-crawl lever

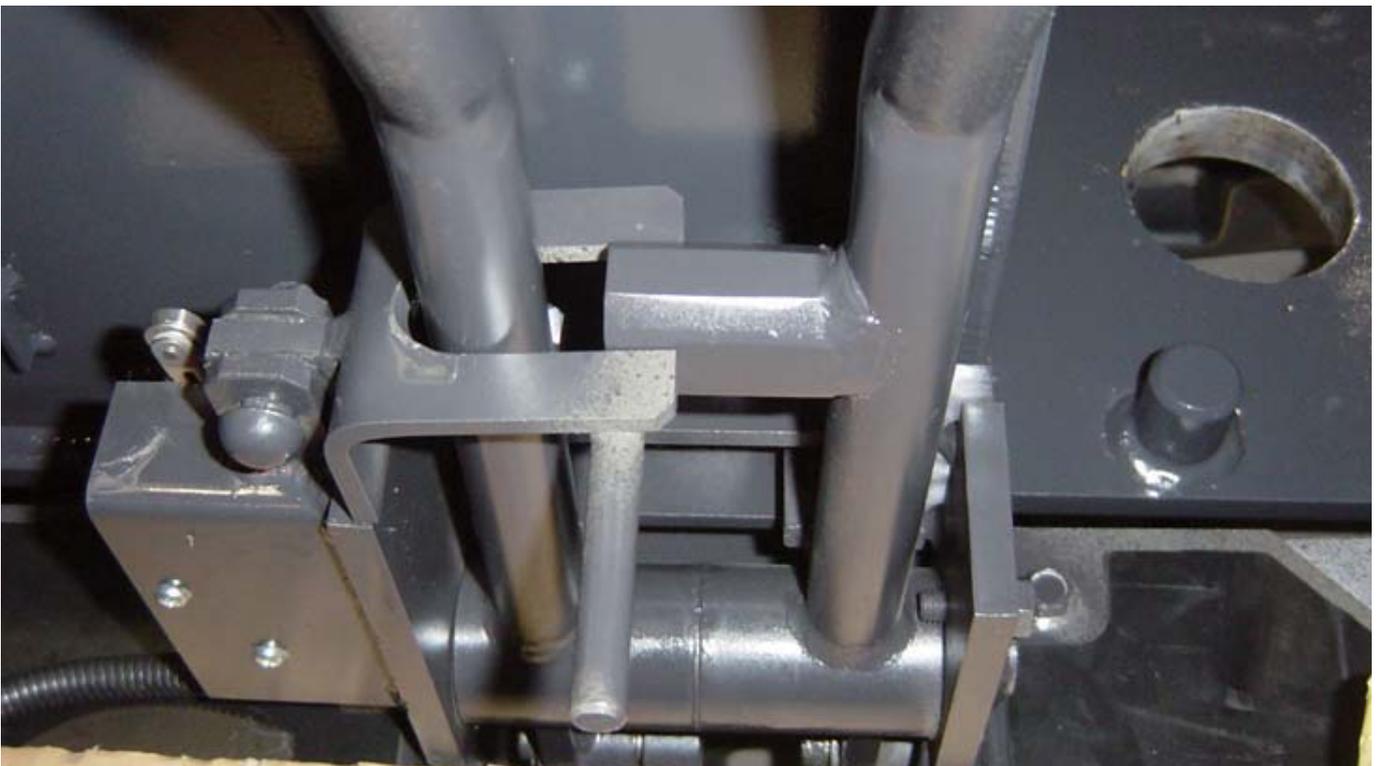


Interlock for crane-crawl lever

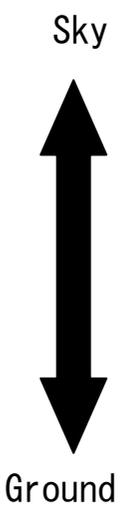
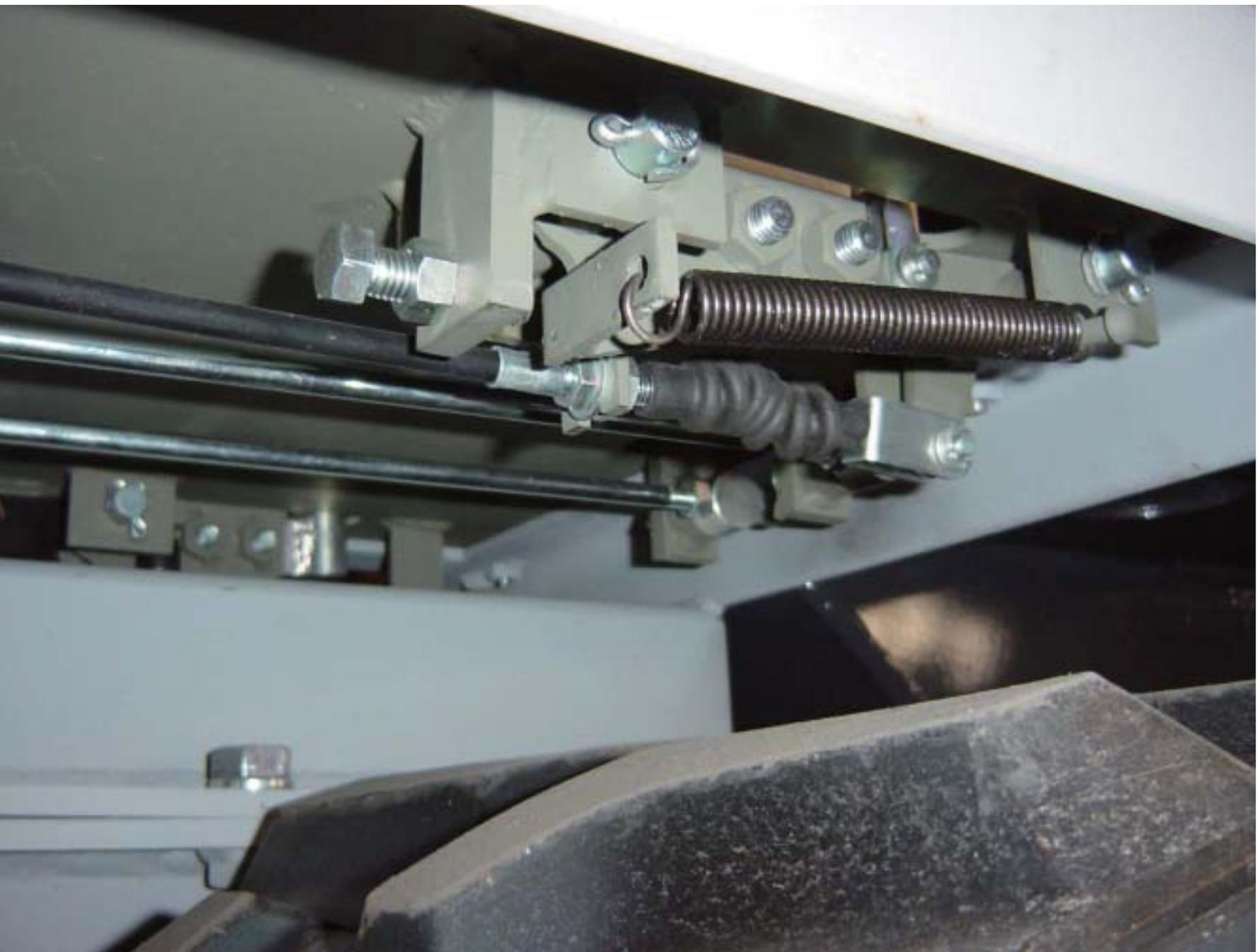
Crawl position



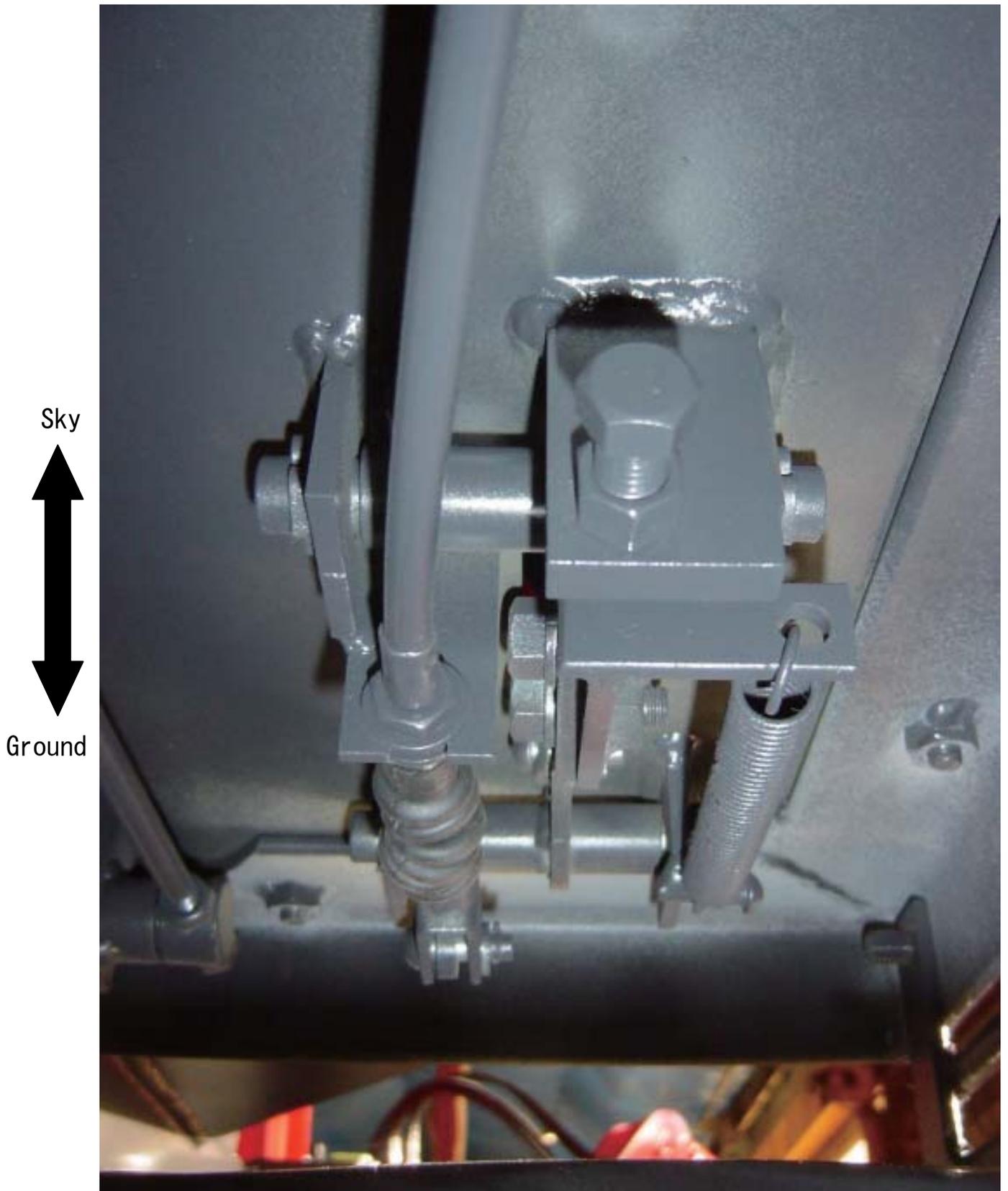
Crane position



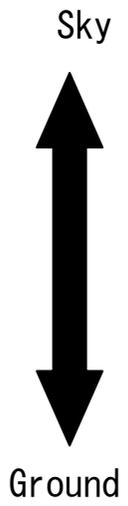
The other side of accelerator pedal



The other side of accelerator pedal

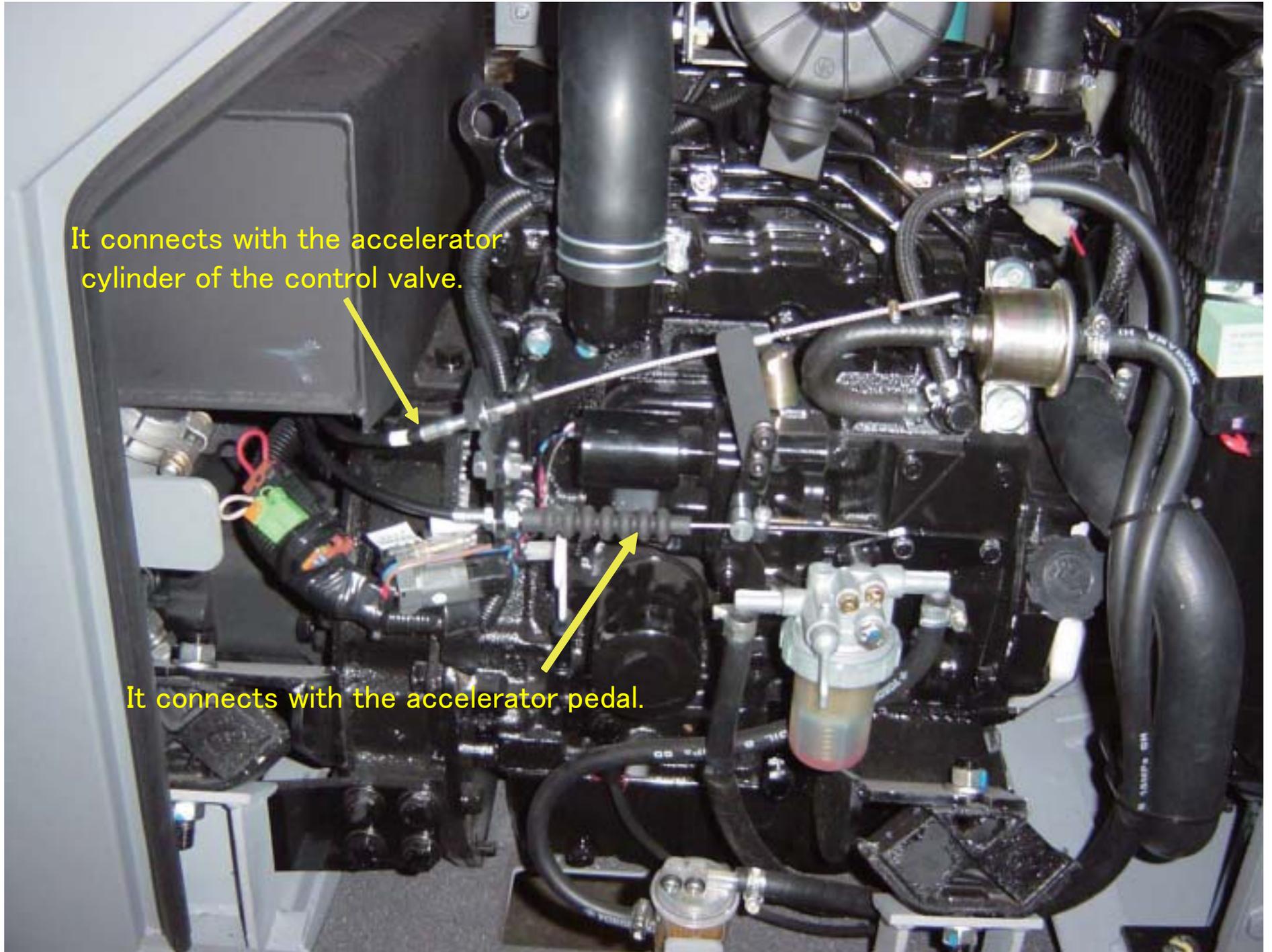


26-15



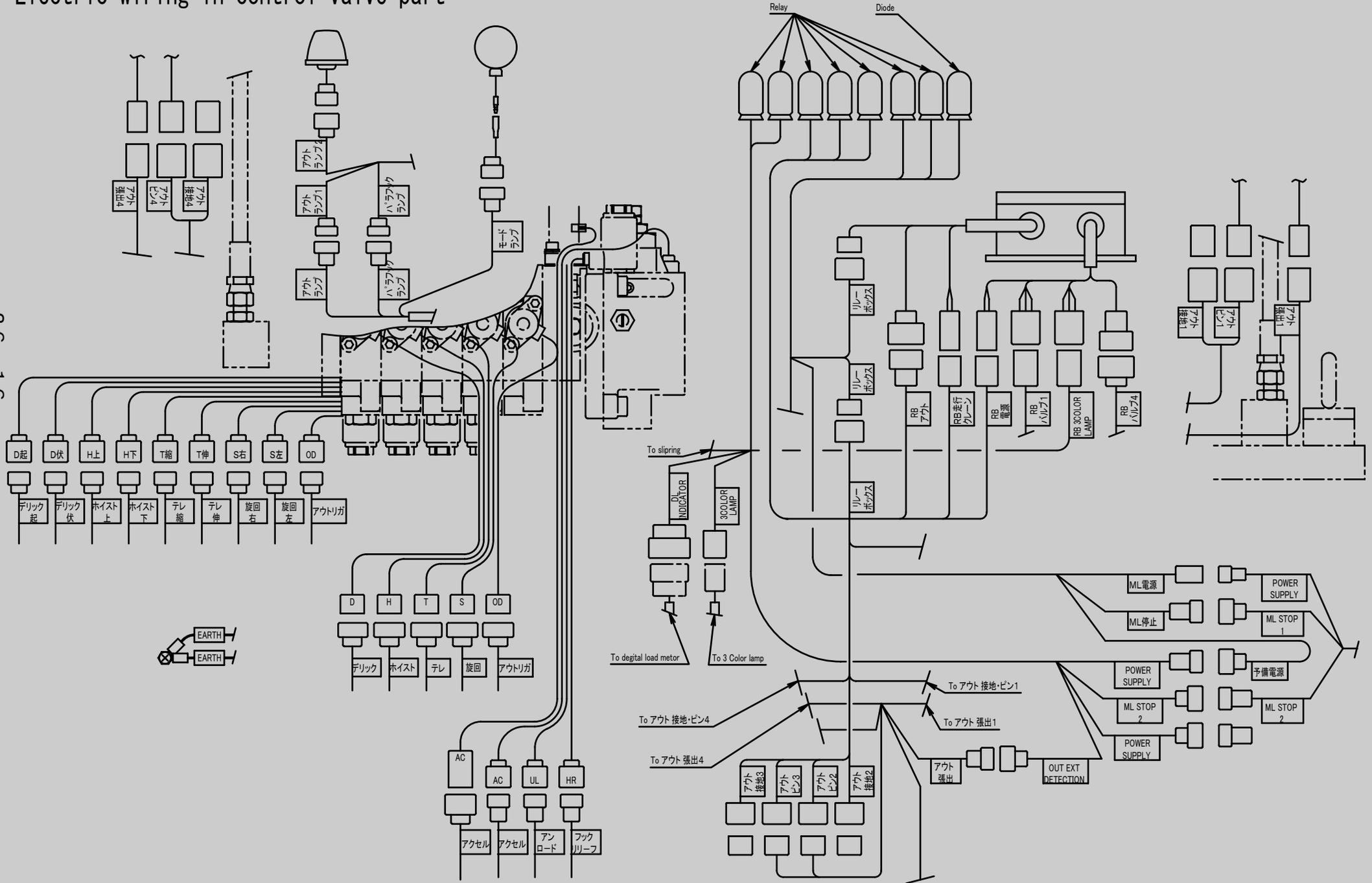
It connects with the accelerator cylinder of the control valve.

It connects with the accelerator pedal.



Electric wiring in control valve part

26-16



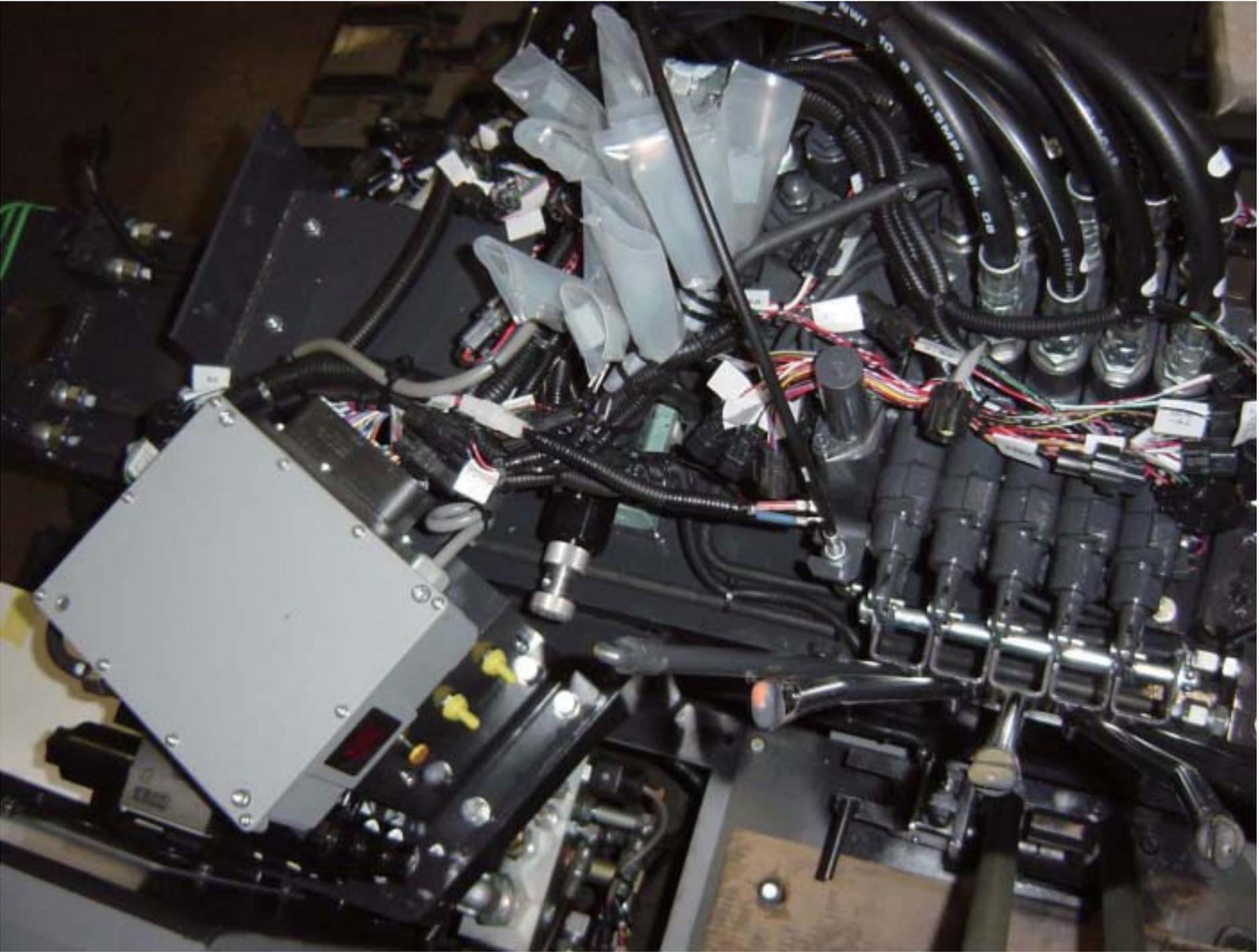
26-17

Sky



Ground

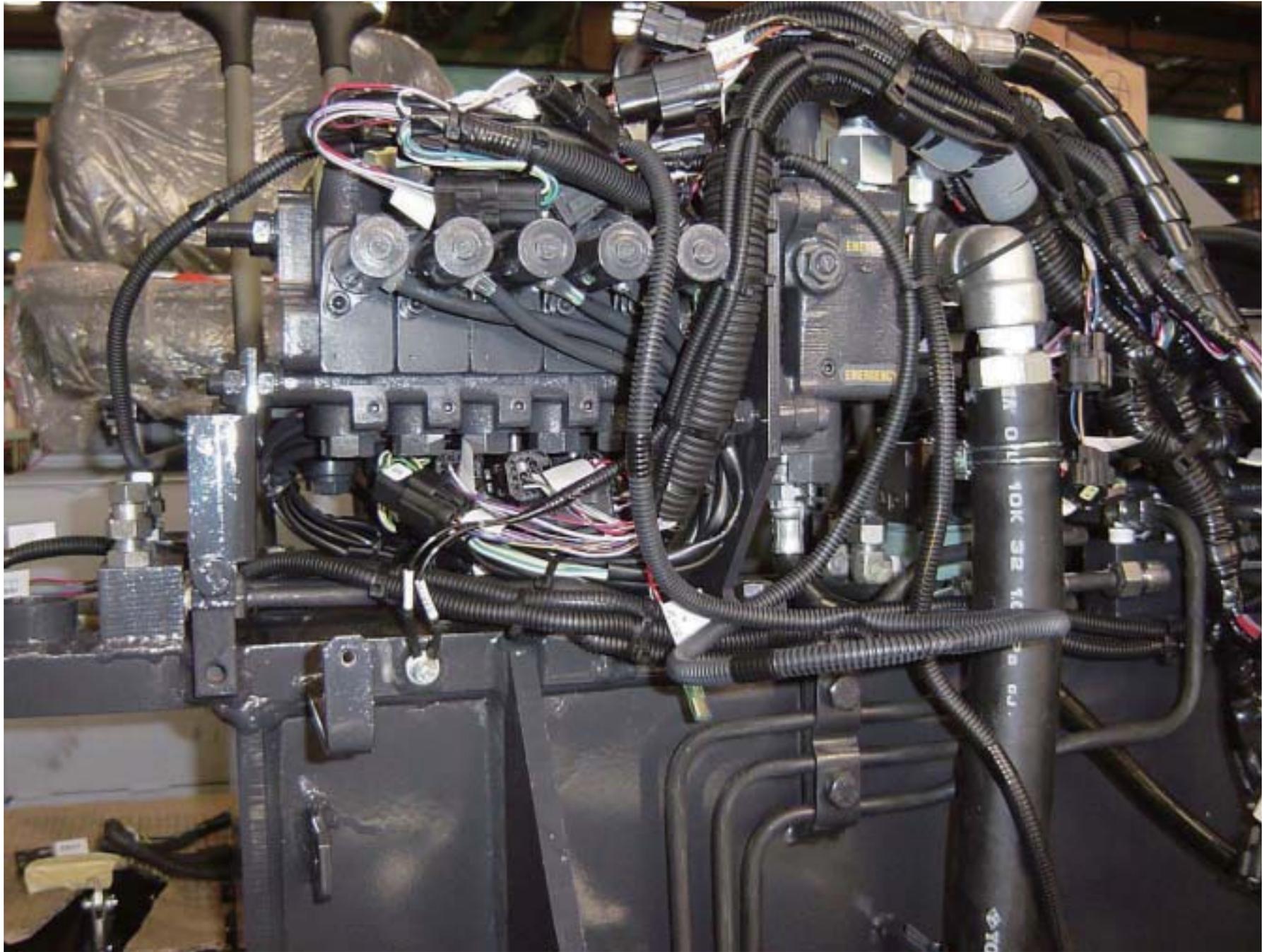




26-19

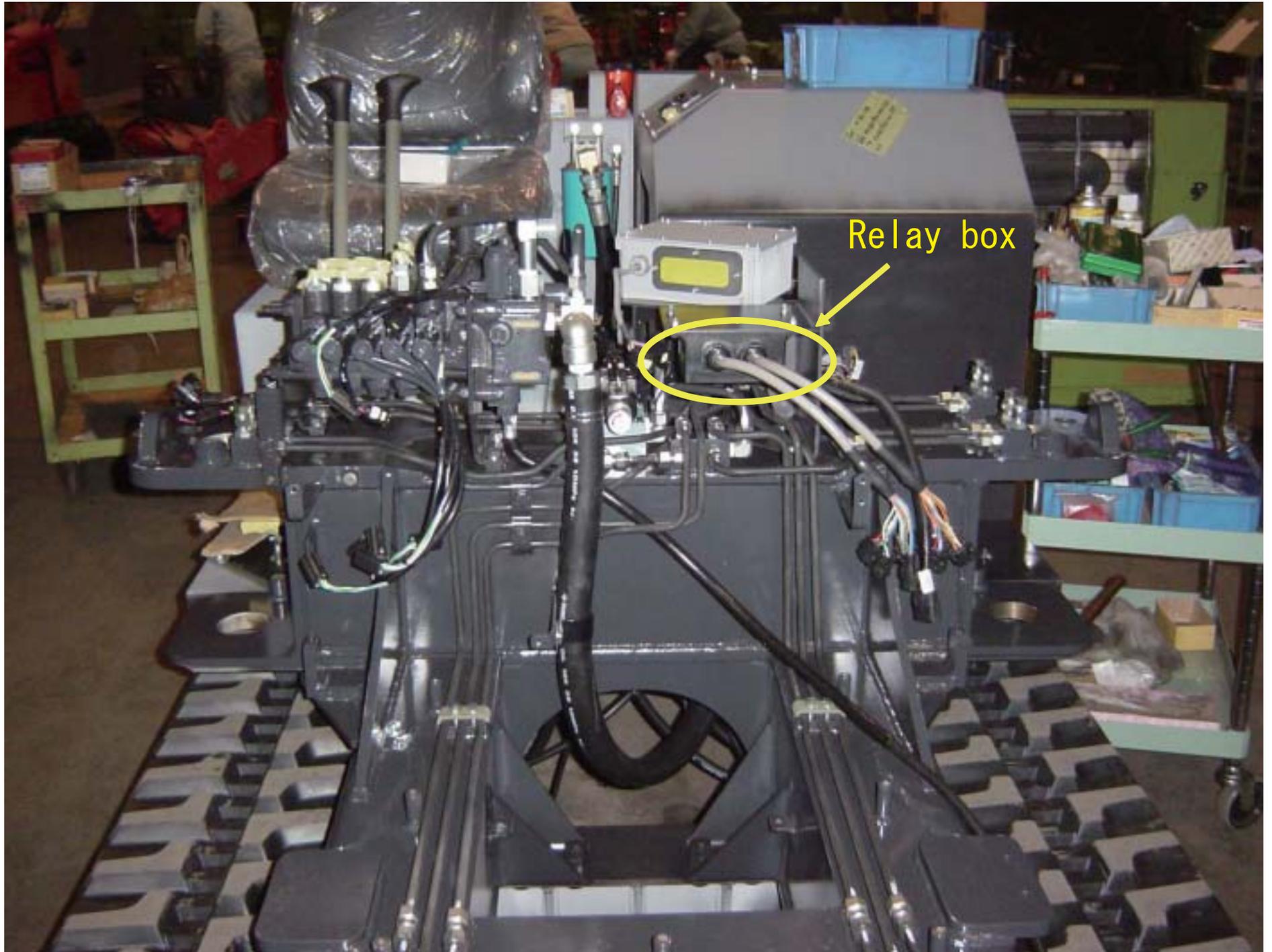
Sky

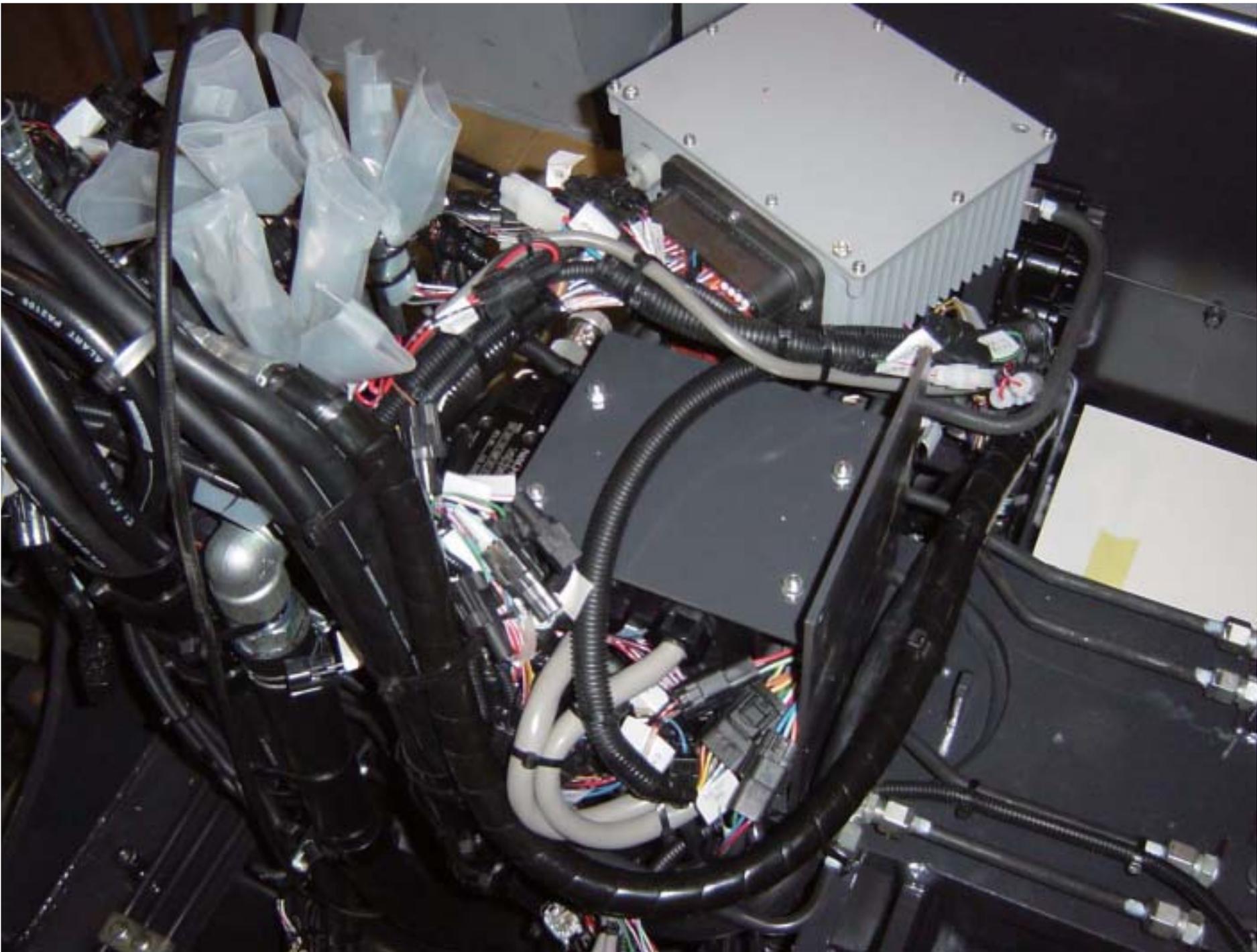
Ground

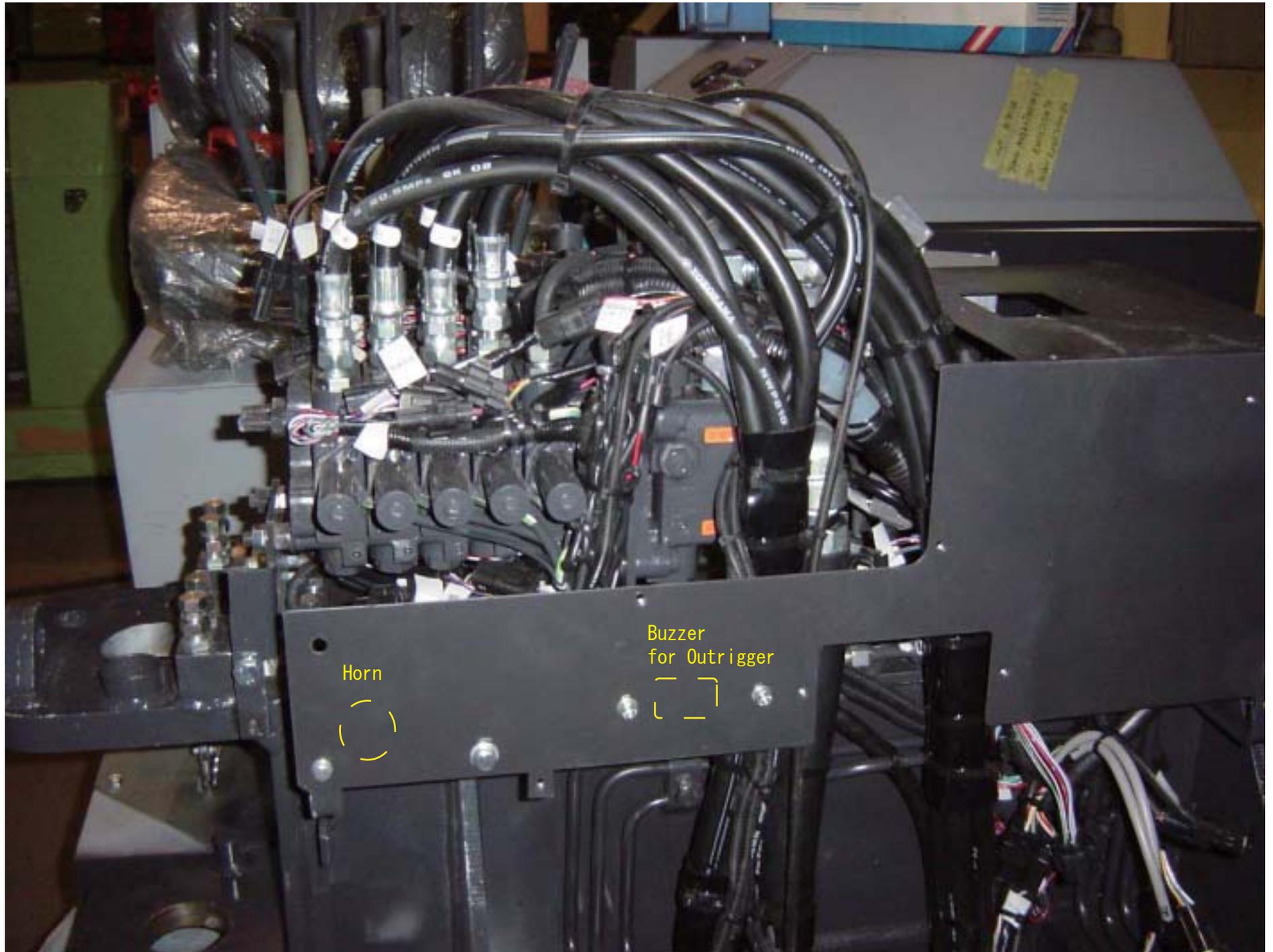


26-20

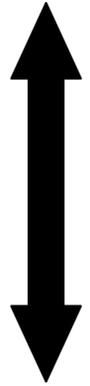
Sky
↑
↓
Ground







Sky



26-22

Ground

Horn



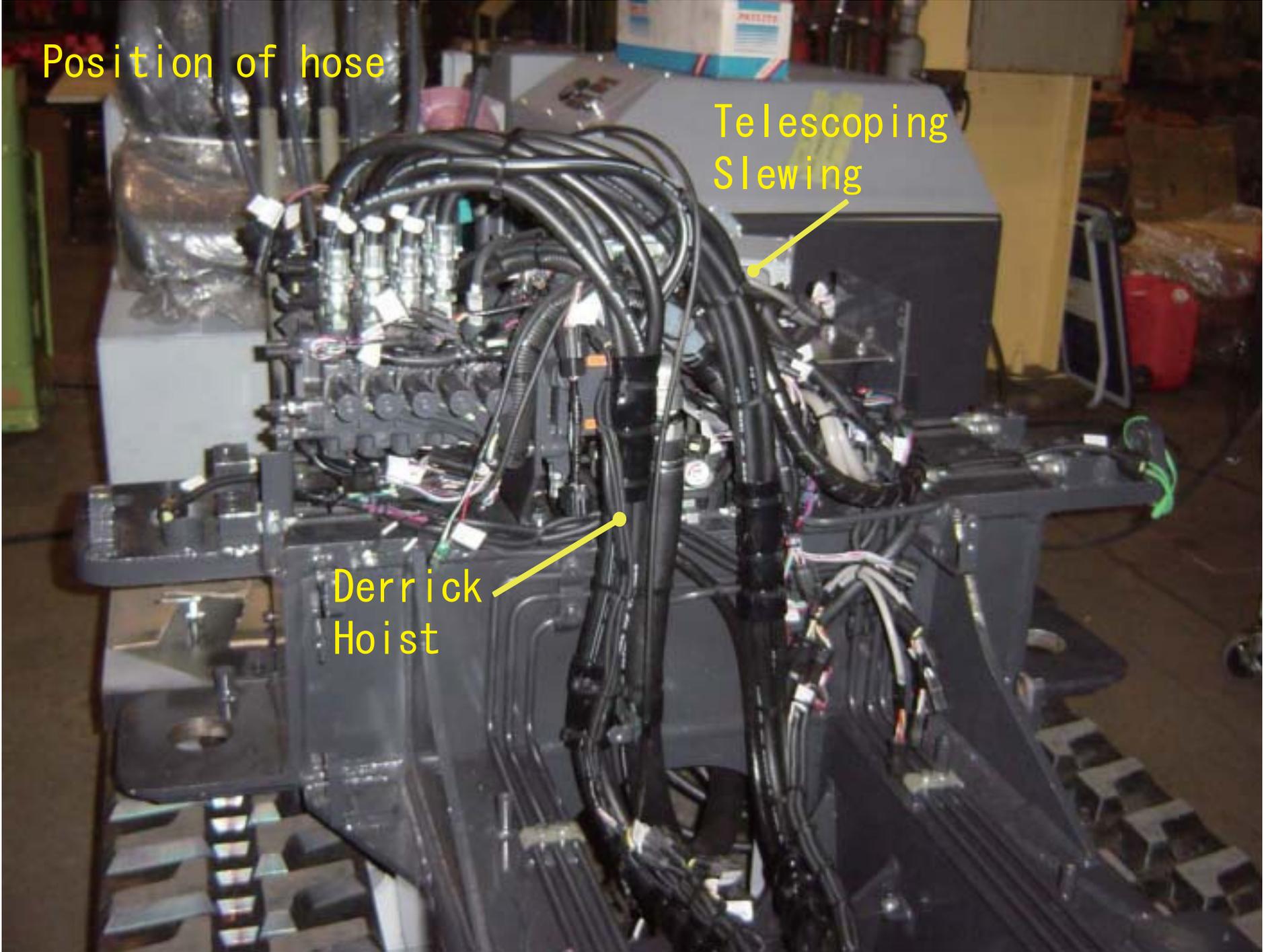
Buzzer
for Outrigger



Position of hose

Telescoping
Slewing

Derrick
Hoist



Engine

Air cleaner element

Fuse box

Solenoid
to stop engine

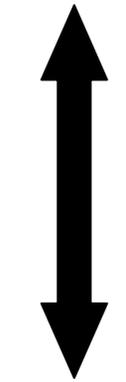
Muffler

Filling
port

Oil filter element

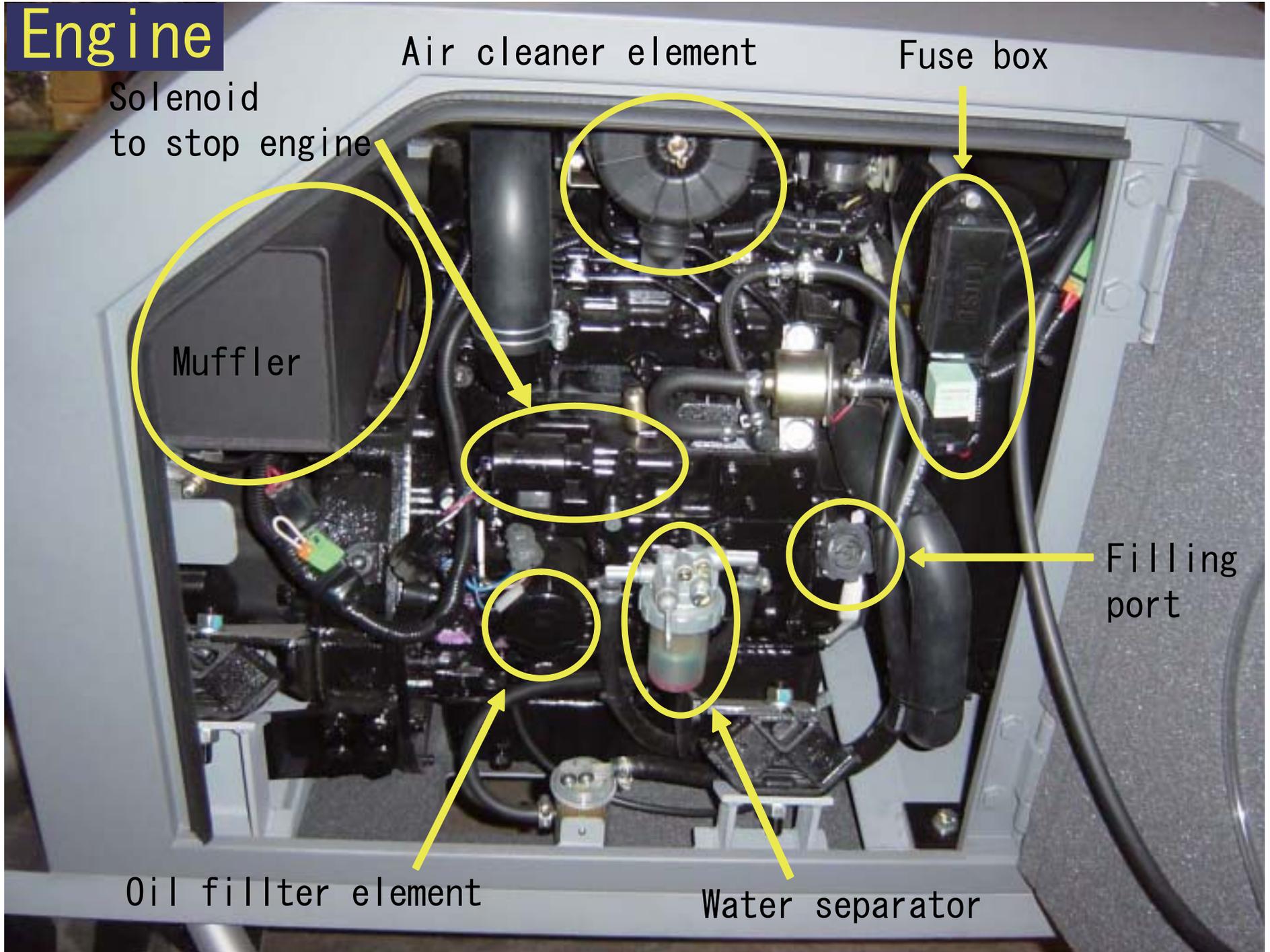
Water separator

Sky



Ground

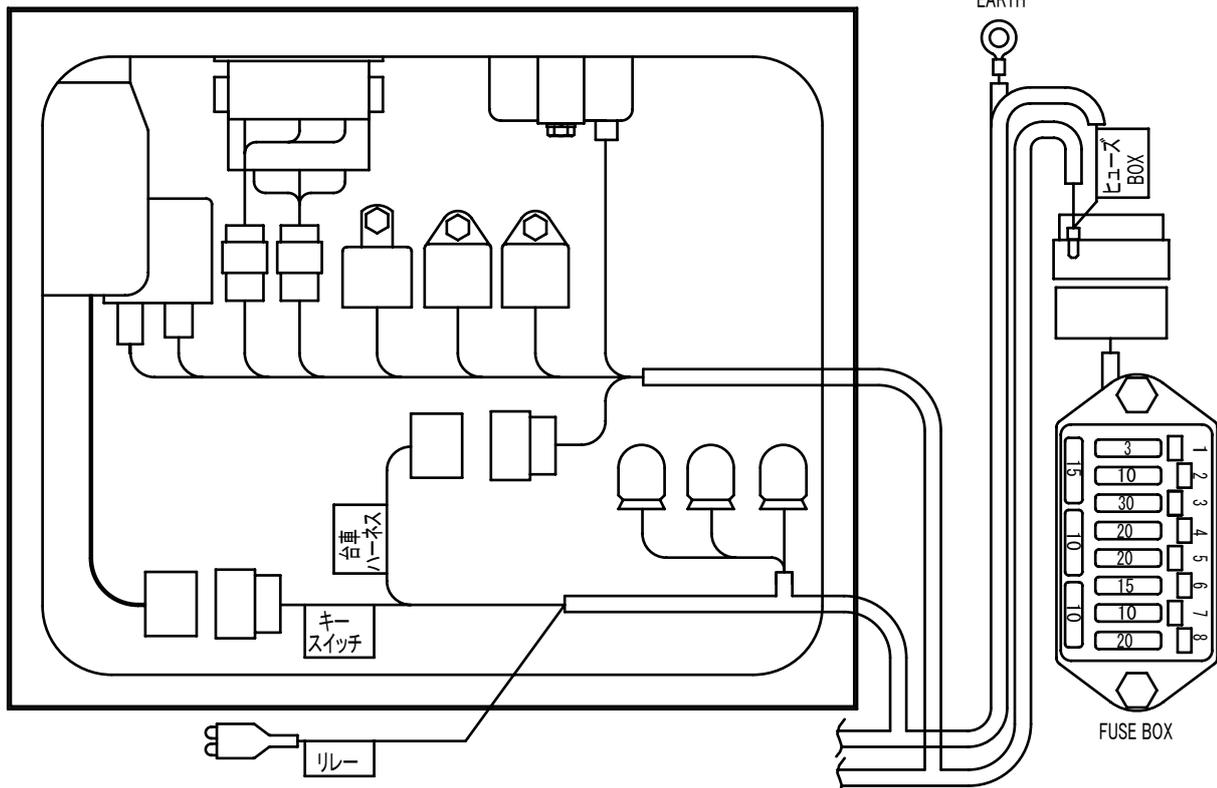
28-1

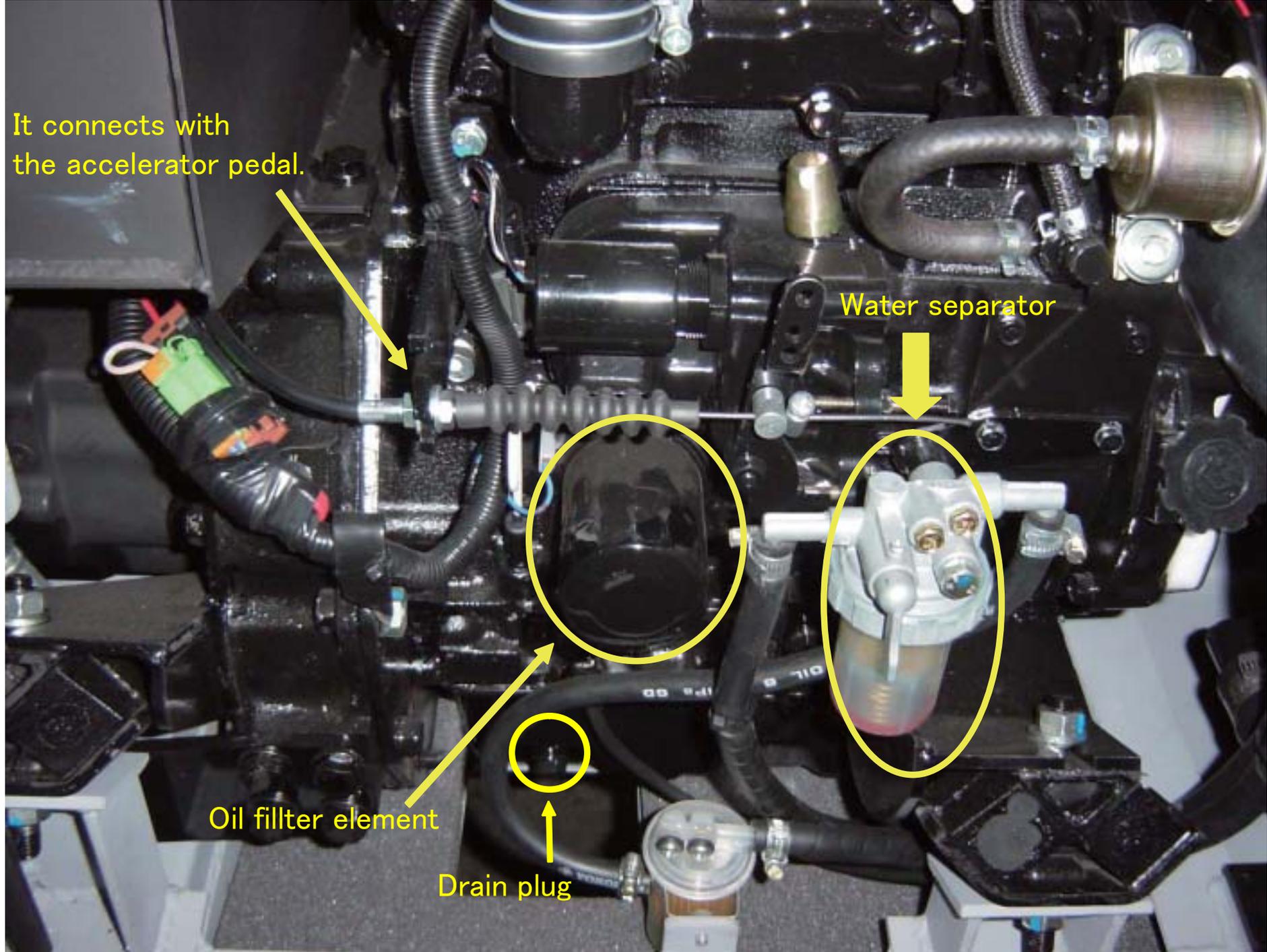


Warning lamp and Fuse box



FUSE BOX





It connects with the accelerator pedal.

Water separator

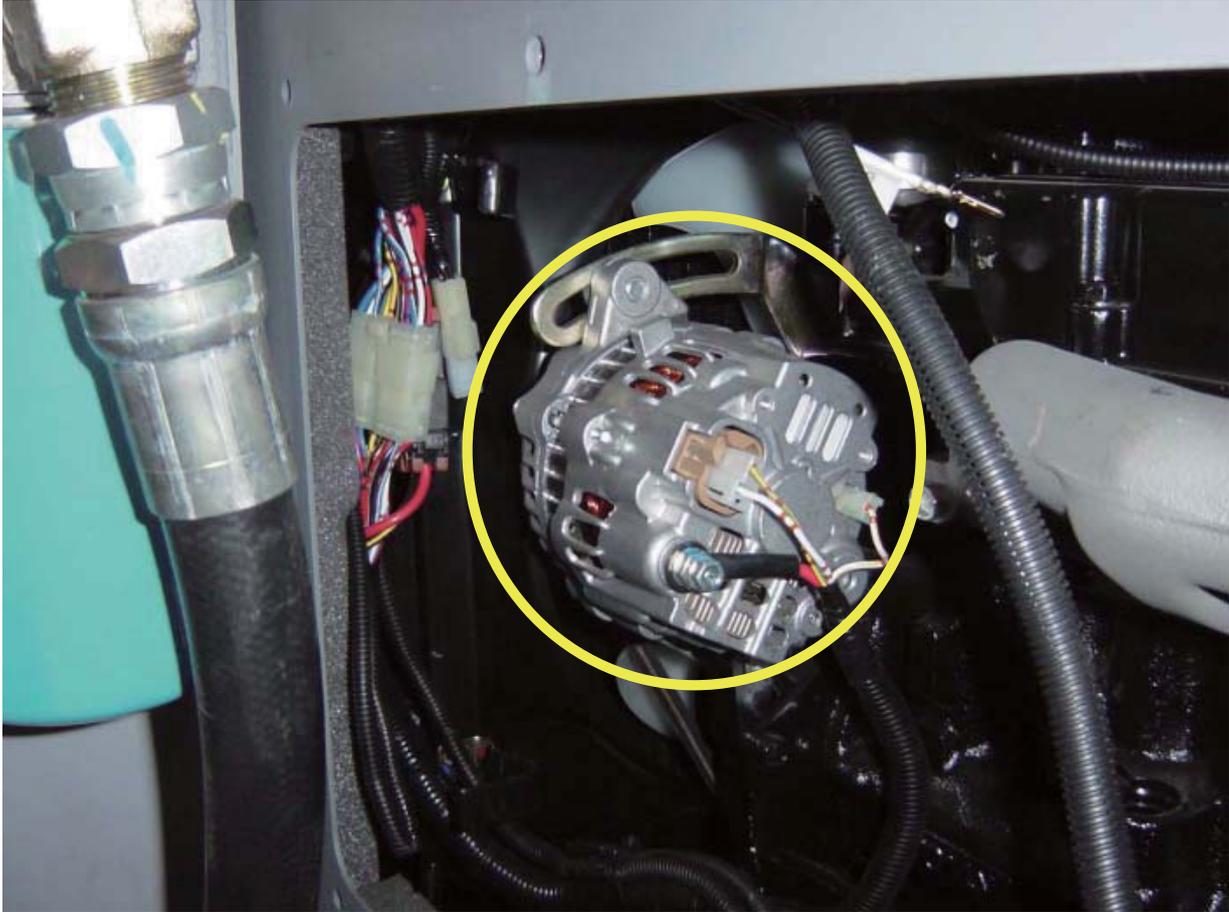
Oil filter element

Drain plug

Air cleaner element



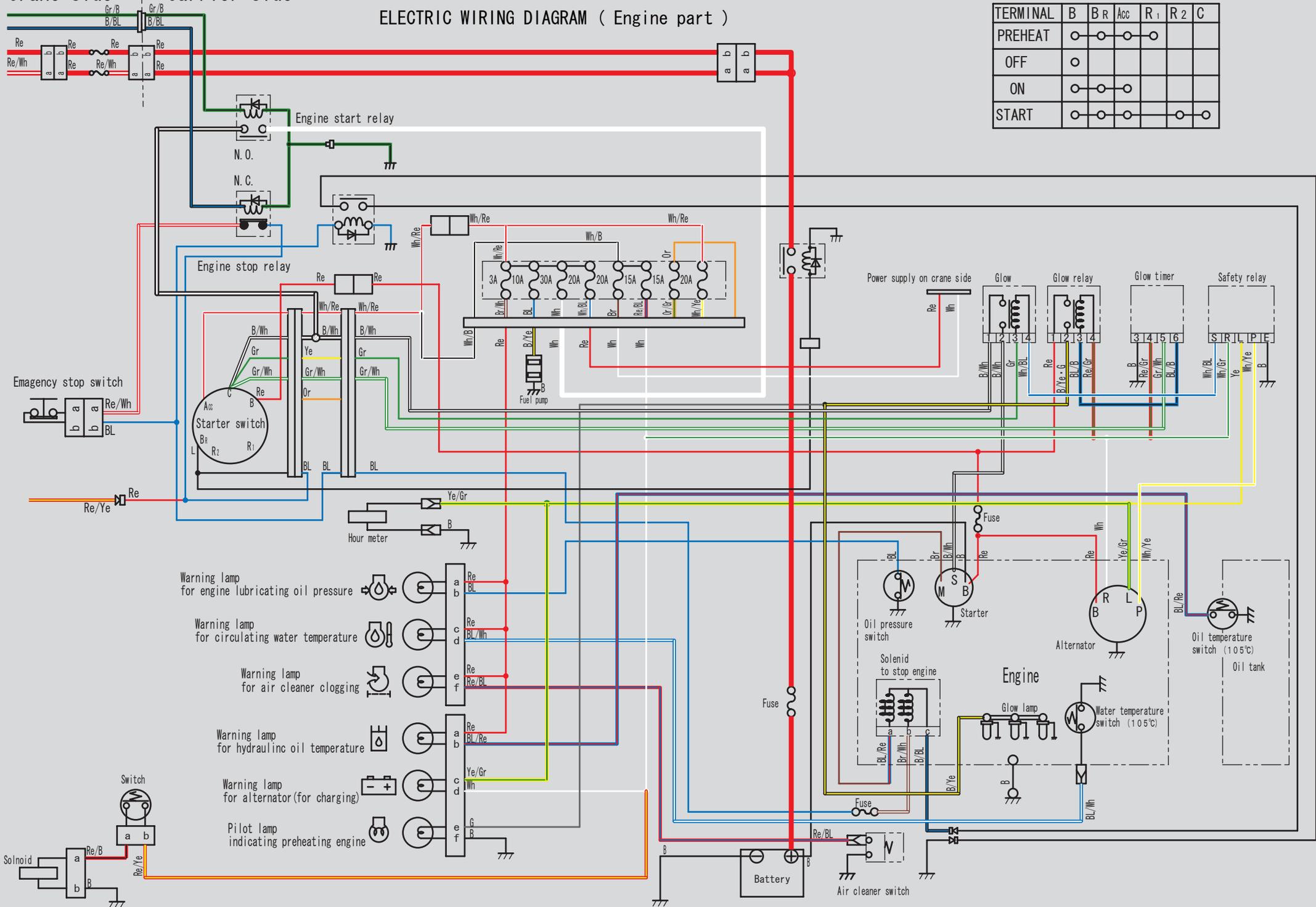
Alternator



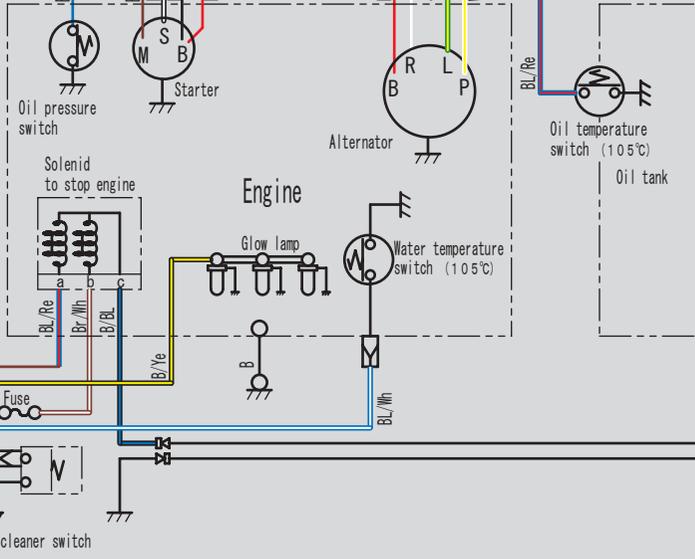
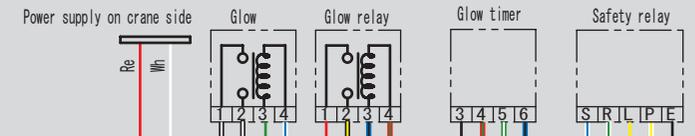
Crane side Carrier side W370CD
ELECTRIC WIRING DIAGRAM (Engine part)

TERMINAL	B	B R	Acc	R ₁	R ₂	C
PREHEAT	○	○	○	○		
OFF	○					
ON	○	○	○			
START	○	○	○	○		

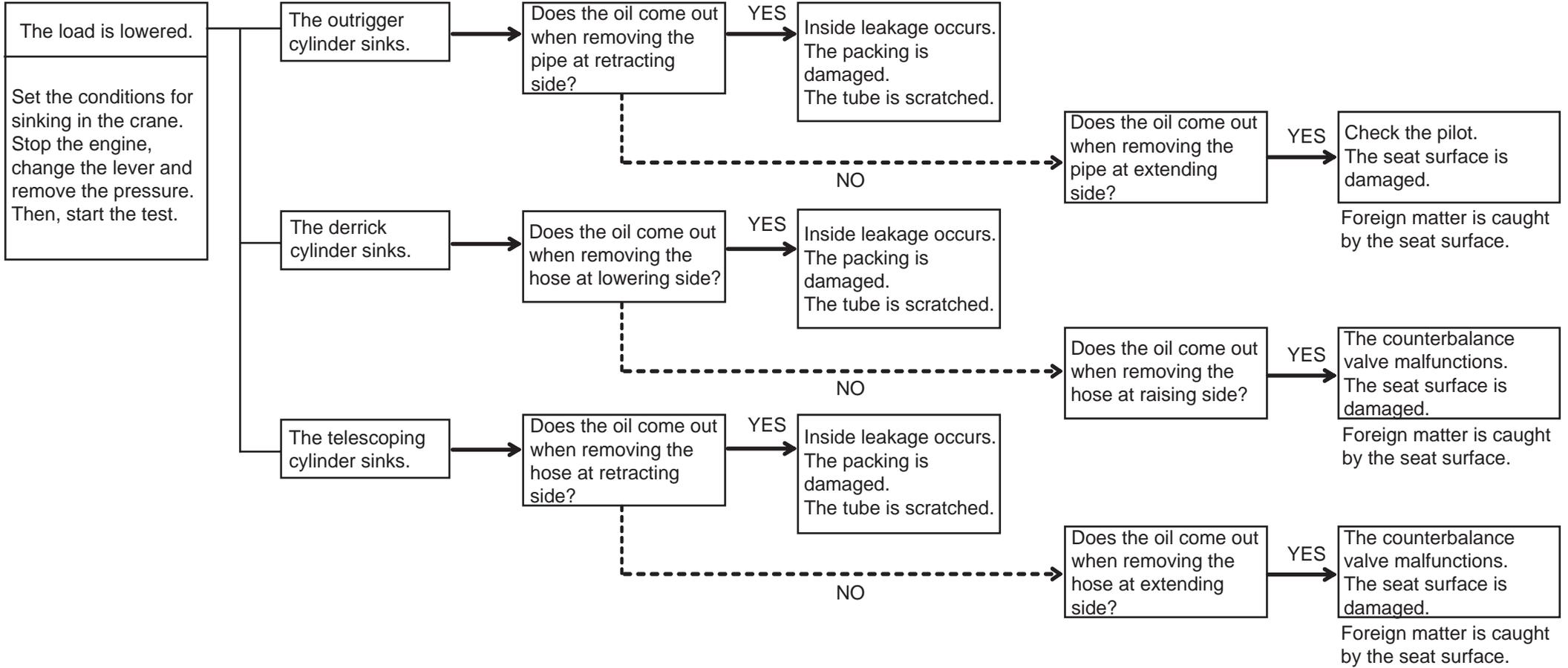
28-5



- Warning lamp for engine lubricating oil pressure
- Warning lamp for circulating water temperature
- Warning lamp for air cleaner clogging
- Warning lamp for hydraulic oil temperature
- Warning lamp for alternator (for charging)
- Pilot lamp indicating preheating engine



30.1 Inspection for sinking of cylinder



30. 2 Inspection of derrick cylinder

(1) Preparation before inspection

- ① Raise booms to an angle of approx. 30° .
- ② Put a mark on the rod with a felt pen (refer to Fig. 1).
- ③ In order to release pressure remained in the derrick system, stop the engine and shift the manual lever for raising/lowering of booms.

(2) Starting inspection

- ④ Remove the lowering hose to check if oil overflows continuously out of the cylinder port of lowering side. At the same time, check also that how far the rod shifts. If no oil flows out of the port of lowering side, the cylinder is normal.
- ⑤ Next, remove the raising hose, and if oil overflows continuously out of counter-balance valve port of raising side, there may be faulty on the seat surface of counter-balance valve (refer to Fig. 3). In addition, check how far the cylinder sinks simultaneously.

Caution:

In order to release pilot pressure in the lowering side, be sure to remove the raising hose after the lowering hose has been removed (refer to Fig. 2).

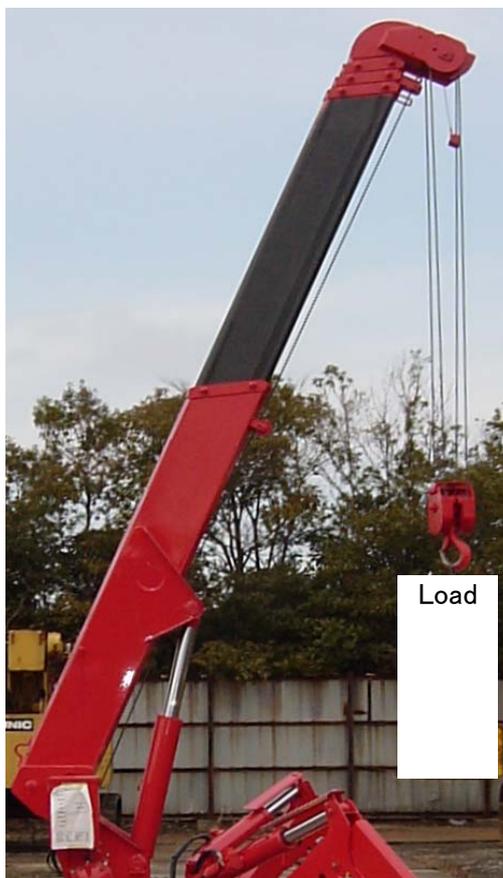
If oil overflows out of the port on lowering side, it suggests internal leakage in the cylinder.

Be sure to measure the how far each boom sinks as it is an important point for judging that it is

Put a mark on the rod with felt pen



Fig2



Counterbalance valve
Fault in seat surface

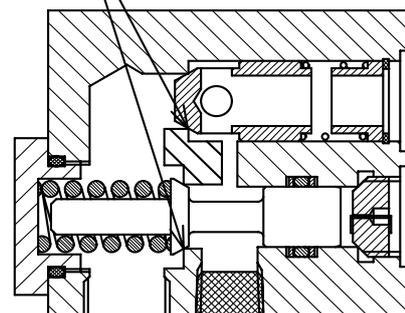


Fig3

30.3 INSUPECTION PROCEDURES WHEN CYLINDER SINKE

Inspection of telescoping cylinder

(1) Preparation before inspection

- ① Allow booms to be horizontal and extend them fully to put a mark on each boom section (refer to Fig. 1).
- ② Raise booms to their maximum to sling a load.
- ③ In order to release pressure remained in the telescoping system, stop the engine and shift the manual lever for telescoping booms.

(2) Starting inspection

- ④ Remove the retraction hose to check if oil overflows continuously out of the cylinder port of retraction side. At the same time, also check that which boom section sinks how far to grasp condition of booms as a whole. If no oil flows out of the port of retraction side, the cylinder is normal.
 - ⑤ Next, remove the extension hose, and if oil overflows continuously out of counter-balance valve port of extension side, there may be faulty on the seat surface of counter-balance valve (refer to Fig. 3).
- In addition, check how far boom3 sinks simultaneously.

Caution:

In order to release pilot pressure in the retraction side, be sure to remove the extension hose after the retraction hose has been removed (refer to Fig. 2).

Since overflowing oil out of the port on retraction side means internal leakage in the cylinder, check tele1 and tele2 separately.

Be sure to measure the how far each boom sinks as it is an important point for judging that it is normal or abnormal.

(3) Inspection of tele1

- ⑥ Extend booms to a position where it is a little bit shorter than 2-section boom to put a mark on the boom (refer to Fig. 4).
 - ⑦ Raise booms to their maximum to sling a load.
 - ⑧ In order to release pressure remained in the telescoping system, stop the engine and shift the manual lever for telescoping booms.
 - ⑨ Remove the retraction hose.
- If oil overflows out of cylinder port of retraction side and boom2 sinks, there may be internal oil leakage in tele1. In addition, check how far boom2 sinks simultaneously.

(4) Inspection of tele2

- ⑩ Allow booms to be horizontal and extend them fully to put a mark on each boom section (refer to Fig. 1).
 - ⑪ Raise booms to their maximum to sling a load.
 - ⑫ In order to release pressure remained in the telescoping system, stop the engine and shift the manual lever for telescoping booms.
 - ⑬ Remove the retraction hose.
- If oil overflows out of cylinder port of retraction side and boom3 sinks, there may be internal oil leakage in tele2. In addition, check how far boom3 sinks simultaneously.

The same procedures in checking boom sinkage are applied for 5-section boom

Be sure to check the boom sections one by one reliably.

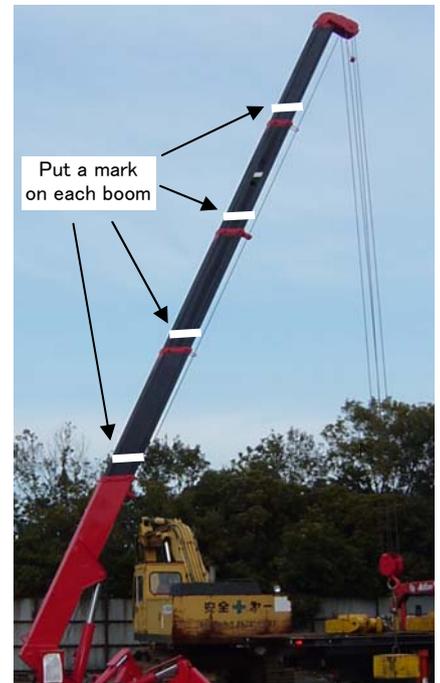


Fig1

Counterbalance valve
Fault in seat surface

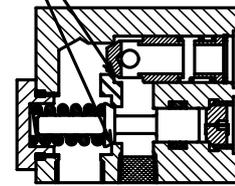


Fig2



Fig3

30.4 Procedures for checking outriggers for sinking

In case where outrigger sinks during crane operation

Test 1

Putting the crane on a solid level ground, extend the outriggers to their extremes and raise the crane mounted vehicle by 50mm from the ground to check the sinking condition.

1. Stop the engine to release pressure remaining in the outrigger circuit.
2. Disconnect all 8 hoses connecting to the W.P. check valve.
3. Mark each rod of 4 outrigger cylinders.
4. Measure the movement of each rod.

Test 2

Exchange the W.P. check valve measuring maximum sinking and the one measuring minimum sinking to repeat the same procedures of "Test 1" above.

Judgment by comparison

When position of sinking is reversed in "Test 1" and "Test 2"; W.P. check valve is faulty.

If in failure, oil continuously comes out of the cylinder for extension.

When position of sinking has not changed; Cylinder is faulty.

Caution

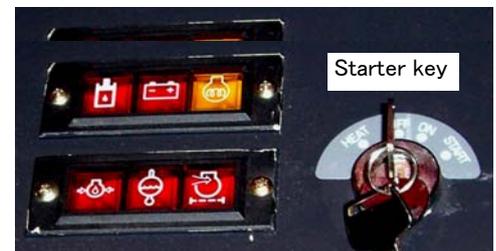
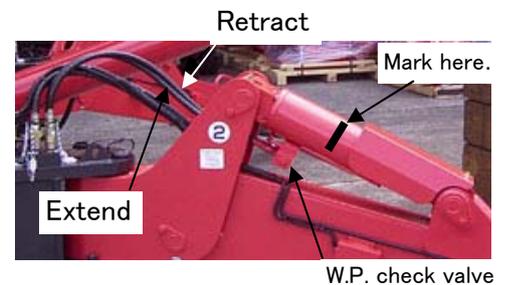
When a cylinder has been replaced of, re-adjustment of the load cell amplifier is needed.

How to release pressure out of outrigger cylinder circuit

Be sure to operate by using the switch and the lever illustrated in the picture.

Even if outriggers are controlled via radio controller, pressure in the circuit will not be released as the engine has been shut off so that oil pressure will not be generated and as a result the lever controlling outrigger will not move.

1. Shift the lever to CRANE position to start the engine.
2. Put the control mode switch at OUTRIGGER position.
3. Extend outriggers to allow each cylinder to extend to its stroke end and relief it.
4. Stop the engine.
5. Turn ON the starter key again to light the outrigger mode indicator lamp. At this time, do not start the engine.
6. Turn outrigger control switches ① through ④ to STORAGE side to throw the outrigger control lever. Release of hydraulic pressure can be felt by holding the hose on extension side.
7. Turn outrigger control switches ① through ④ to EXTENSION side to throw the outrigger control lever. Release of hydraulic pressure can be felt by holding the hose on retraction side.



Outrigger mode indicator lamp



Operation mode switch



Outrigger control switch



31 Replacement of wire rope (for winding-up)

Wire rope is an expendable article and it will be damaged and its strand wires are broken to allow it to be thinner through a long period of operation.

Replace the rope according to following criteria.

◆1. Replacement criteria

1. A rope in which amount of broken strand wires (except filler wires) comes to more than 10% within a pitch of twist.

Replace the wire ropes intended for use with this crane if 13 pieces of strand wire have been broken within a pitch of twist.

2. A rope being kinked.

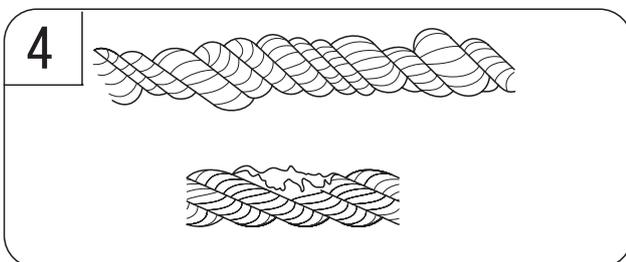
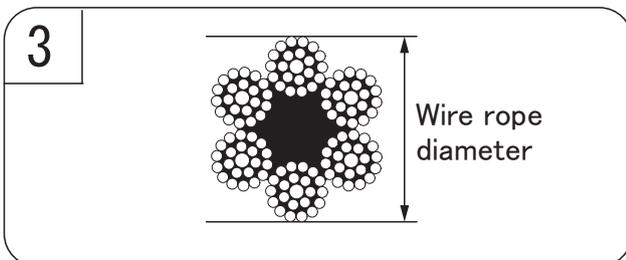
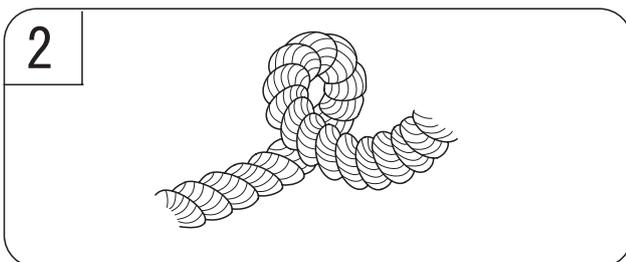
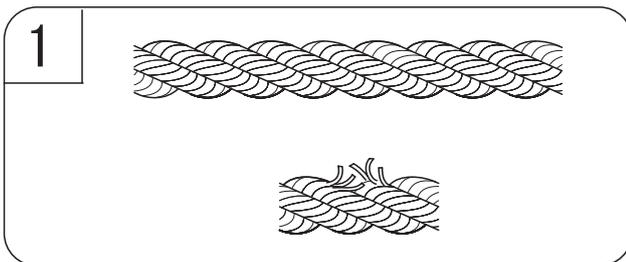
3. A rope from which its diameter has decreased by more than 7% of the nominal diameter.

For example, if wire rope with a nominal diameter of 8mm is used, replace it when the diameter becomes 7.5mm.

Refer to the section 17. MAJOR SPECIFICATIONS, for length and construction of the wire rope for winding-up.

4. A rope which has been deformed and/or corroded excessively.

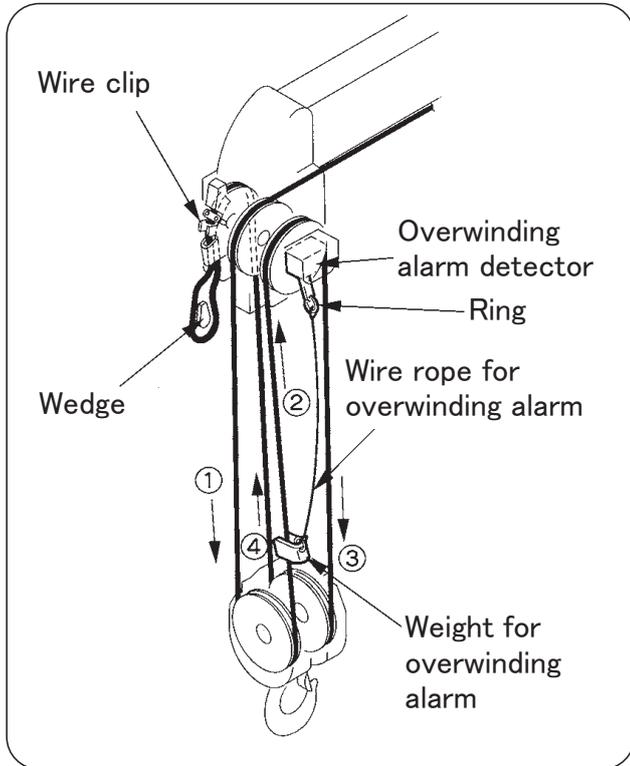
★Be sure to replace a wire rope when it comes under the criteria, item 1 through 4, illustrated above.



 **CAUTION**

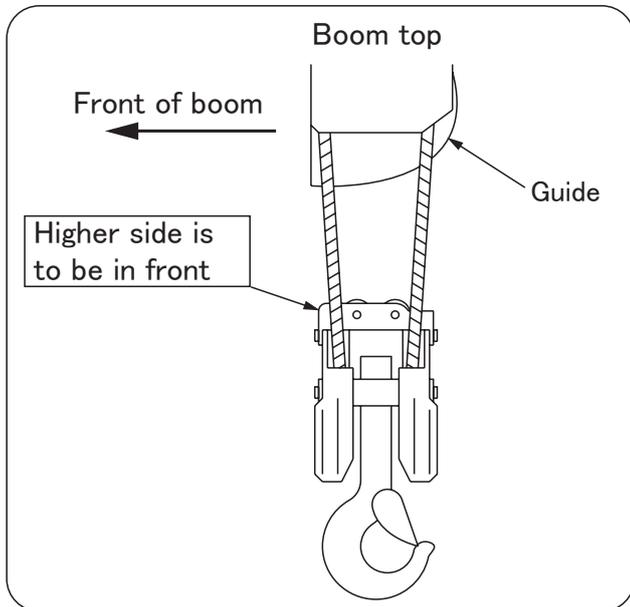
★Wear leather gloves when replacing wire ropes.

MAINTENANCE AND INSPECTION OF CRANE

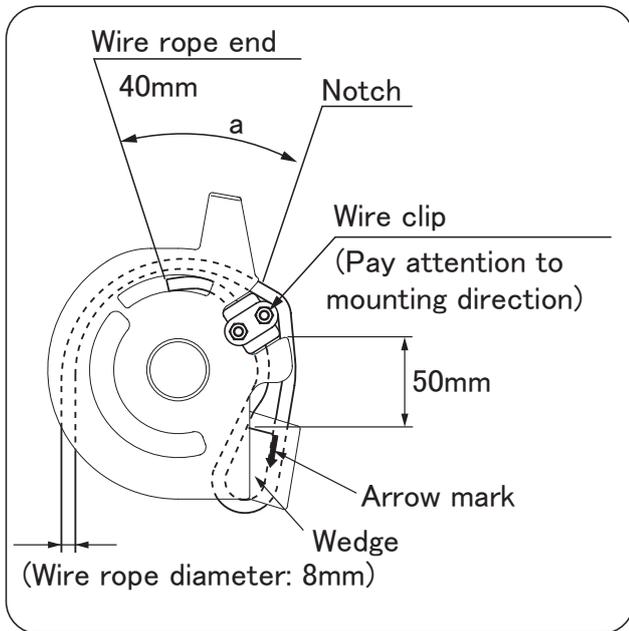


◆2. How to replace wire ropes

1. Refer to the figure in the left for how to hook the wire ropes for winding -up and for where the weight for overwinding alarm is to be mounted.



Refer to the figure in the left for how to attach the hook.

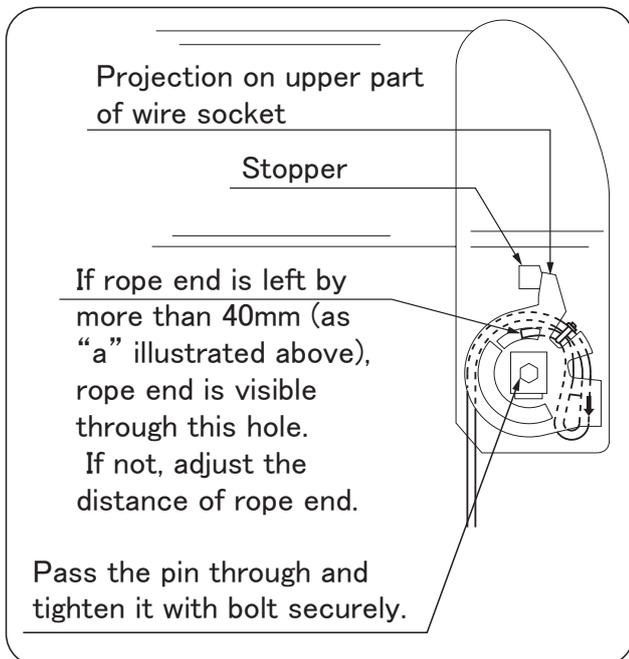


2. How to fix wire rope end

① When passing the wire rope end through the wire socket, be sure to pass it as indicated by the arrow mark on the socket.

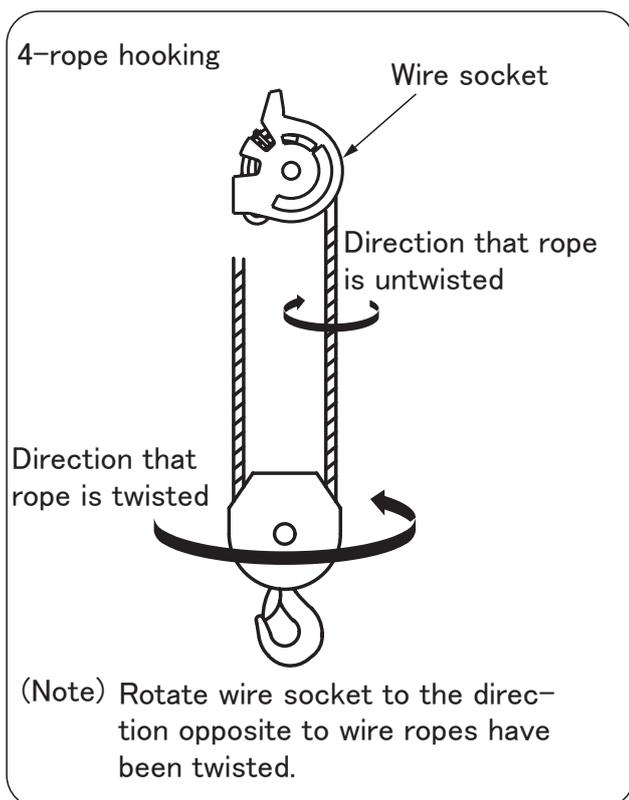
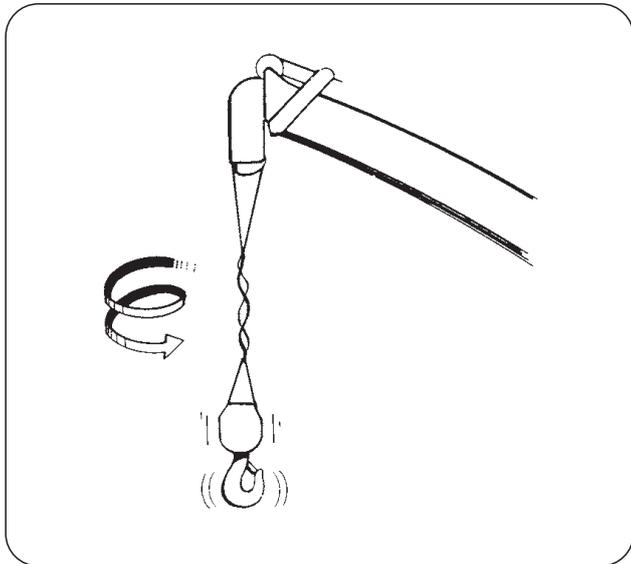
If it is passed from the opposite direction, service life of wire rope shortens as the wire rope is kept bent all the time.

② Do not forget to mount the wedge and the wire clip as illustrated in the figure in the left. Leave the wire rope end to allow a distance from the notch to the rope end by more than 40mm as illustrated in the figure as “a”.



③ Pass the pin through with the wire socket held with your hand and tighten it with the bolt securely.

MAINTENANCE AND INSPECTION OF CRANE



◆3. How to correct twisted wire ropes

Wire ropes tend to turn in untwisting direction when they are under tension.

If two or more wire ropes are hooked together, they tend to be twisted particularly while they are new.

The twist will decrease as the ropes are getting fit to the crane.

If wire ropes are twisted, correct them as follows:

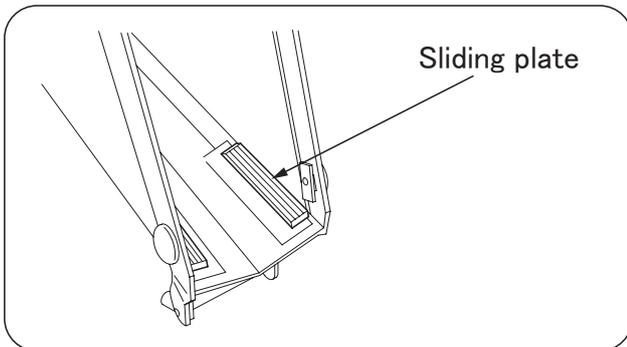
1. Unload the hook.
2. Extend the boom fully.
3. Raise the boom to an angle of approximately 65° .
4. Unwind the hook until it comes close to the ground.
5. Check how many turns the wire rope has been twisted.
6. Wind up the hook and retract the boom to be on a stored condition.
7. Remove the wire socket and turn the socket in the untwisting direction by as many turns as the wire ropes have been twisted multiplied by the number of wire ropes being hooked. However, remember that the wire socket may be turned up to 4 turns at a time.
8. Attach the wire socket and repeat winding up and down the rope 2 or 3 times between both extremes. Then, check if twist of the wire ropes is corrected. If they remain twisted, repeat the procedures shown above.

32 Replacement of expendable parts

◆1. Replacement of gaskets and seals for each cylinder

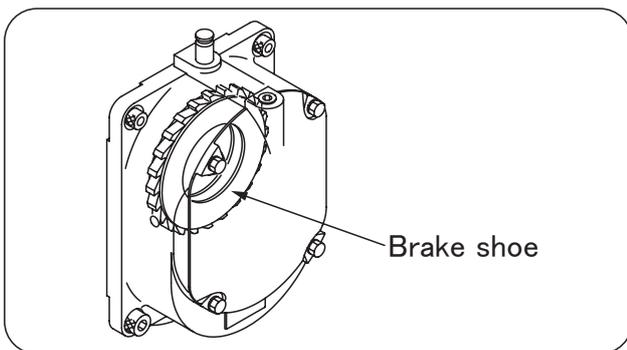
Although timing of replacement of a part varies according to how frequently the crane has been operated, replace gaskets and seals used in each cylinder after every 3 years of operation (period during which crane has not been operated is included) in order to operate the crane safely.

Ask a local UNIC authorized service shop for replacement of gaskets and/or seals.



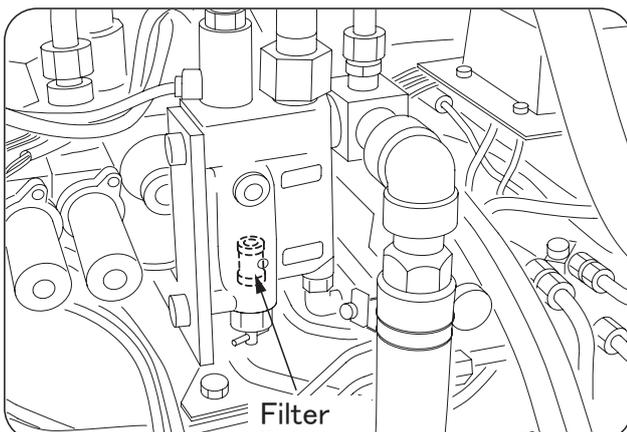
◆2. Replacement of sliding plate of boom

Replace it every 3 years.



◆3. Replacement of brake shoe of hoisting winch

Replace it every 3 years.



◆4. Cleaning and replacement of filter in the control valve

If the filter built in the control valve is clogged up, radio remote control operation and acceleration interlocking operation cannot be carried out.

Clean it by blowing air once after one year of use and replace it if it has been clogged up remarkably or it has been damaged.

2 List of recommended lubricant

◆ 1. Use the engine oils as below:

Classification	Depending on atmospheric temperature							
	-30 (-22)	-20 -4	-10 14	0 32	10 50	20 68	30 86	40 °C 104 °F)
Engine oil	SAE5W			SAE30				
Diesel engine oil of CD class		SAE10W		SAE10W-30				

The selection of engine oil is very important to a diesel engine. If an unsuitable oil is used, or oil change is neglected, it may result in damage, and a shorter engine life. Use oils that meet API Engine Service Classification CD.

◆ 2. Use the recommended grease for lubrication as below.

Chassis grease
 Use NLGI No. 2 grade for most temperatures.
 Use NLGI No. 1 grade for extremely low temperatures.

◆ 3. Use the fuel as specified below. (Diesel fuel oil)

Use ONLY clean, high-quality fuel.
 Use Grade No. 2-D fuel above 4°C(40°F).
 Use Grade No. 1-D fuel below 4°C(40°F).

◆ 4. Use an antifreezing solution for coolant

- Antifreezing solution functions to prevent the water from freezing and the cooling system from rusting.
- Use an antifreezing solution if atmospheric temperature goes below the freezing point.
- Use "Long Life Coolant (LLC)" as the antifreezing solution. The "Long Life Coolant" can be used throughout the year. Replace the "Long Life Coolant" once every other year (in the season of autumn or fall). (Follow the instruction of the manufacturer on how much the antifreezing solution should be mixed with water.)



**★ Use the softened water with less impurity such as tap water for cooling water.
 Do not use well water and river water as cooling water.**

★ Use of coolant which too much of antifreezing solution mixed with water allows the engine to be overheated earlier.

WATER SUPPLY AND LUBRICATION TO CARRIER



- ◆5. Hydraulic oil is the same as the oil used in the crane.
- ◆6. Use the gear oils for the reduction gears of crawling motor .

LUBRICATION TO CRANE

◆ 1. List of recommended lubricants

★ Use the UNIC genuine hydraulic oils listed below as hydraulic oil for the crane.

Use industrial-type hydraulic oil

ISO VG 46 for temperatures above 32F.

ISO VG 32 for temperatures below 32F.

Petroleum Maker	Brand	
	ISO VG 32	ISO VG 46
ESSO	Spinesso 32	Teresso 46
MOBIL	Mobil DTE 32	Mobil DTE Oil Medium
CALTEX	Spindura oil 32	Rando Oil 46
SHELL	Shell Tellus Oil 32	Shell Tellus Oil 46

★ Use the recommended lubricants listed below as gear oil for lubrication.

Aplication	Petroleum Maker	Brand
Reducer for winch	Shell	Shell Spirax EP 90
Reducer for slewing gear	Use API service GL-4 gear oils. (Refer to the followings)	
	ESSO MOBIL CALTEX SHELL	Standard gear oil 90 Mobilube GX 90 Universal Thuban SEA 90 Shell Spirax EP 90

★ Use the recommended greases listed below as grease for lubrication.

(a) Chassis grease

Use NLGI No. 2 grade for most temperatures.

Use NLGI No. 1 grade for extremely low temperatures.

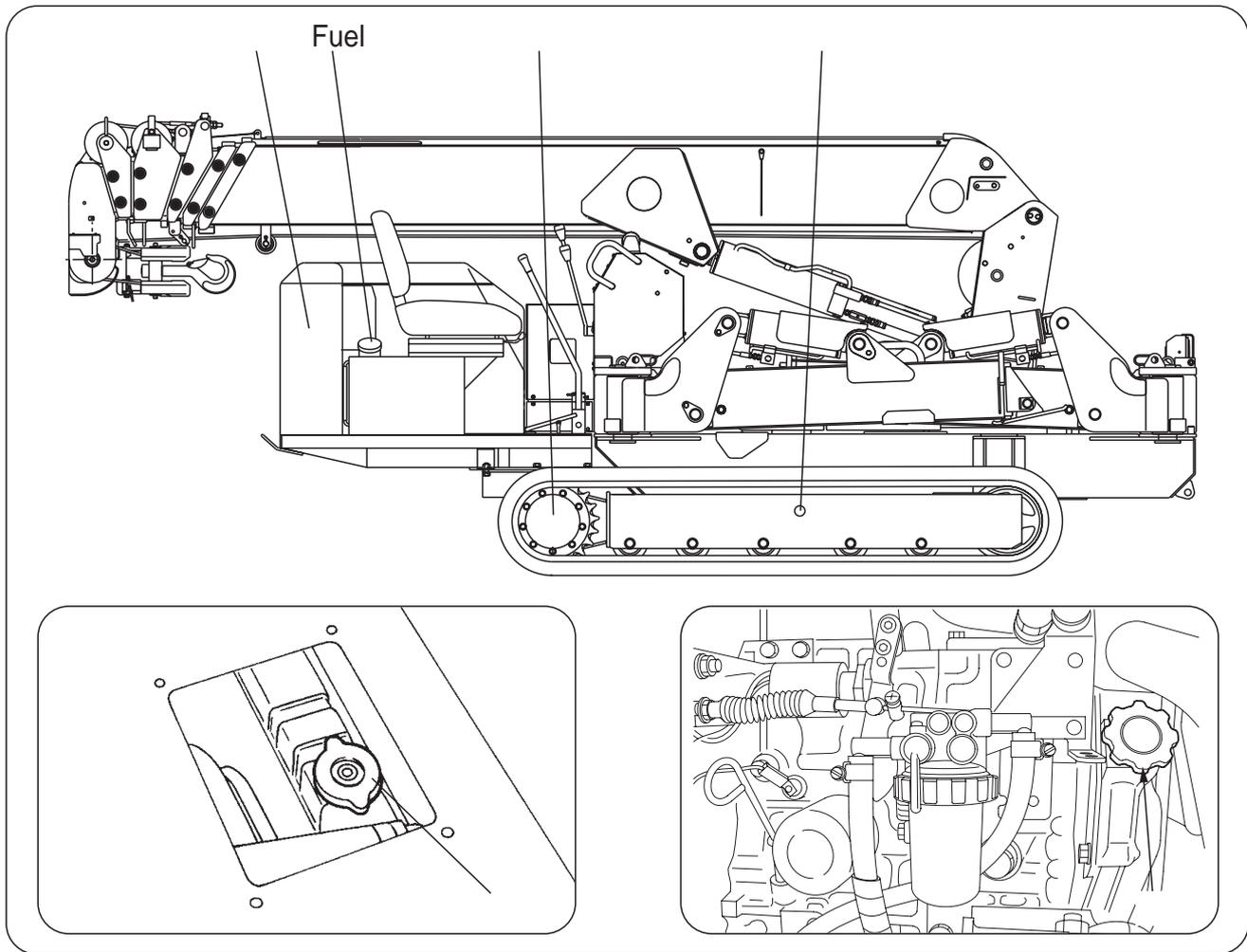
(b) Molybdenum grease

Use NLGI No. 2 grade.

Petroleum Maker	Brand
ESSO	Beacon G2
MOBIL	Mobilplex Special
CALTEX	Molytex Grease EP2
SHELL	Retinax AM

WATER SUPPLY AND LUBRICATION TO CARRIER

34 Filling water and lubrication chart(URW376C)

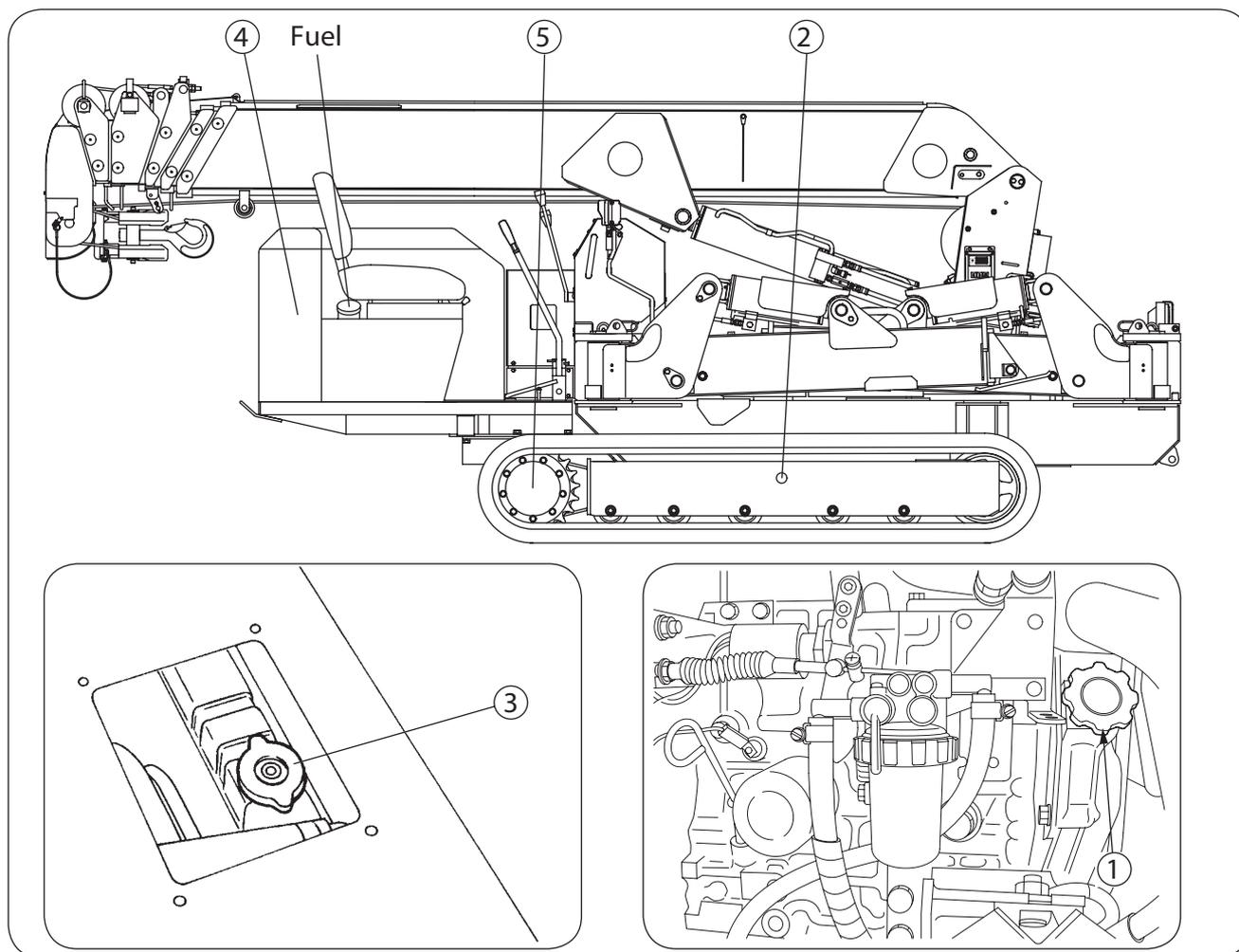


Service interval	Where to lubricate	No. of part	Lubricant	Tool
Initial: Replace after 100 hours After : Replace every 250 hours	Engine (4.0 liters)	1	Engine oil	
Initial : 30 hours, Whenever necessary	Tension adjustment of rubber crawler	2	Chassis grease	Grease pump
Replace antifreezing solution (LLC) every 2 years	Radiator (5.5iters)	1	Antifreezing solution	
Initial: Replace after 3 months After : Replace 2 years	Hydraulic oil tank (70 liters)	1	Hydraulic oil	
Replace every 1000 hours	Reduction gears of crawling motor (0.7 liters)	2 (Right/Left)	Diesel engine oil or Gear oil	

Refer to “MAINTENANCE AND INSPECTION OF CARRIER” for replacement procedures.

Fuel	Light oil
Fuel tank capacity	40 liters

34 Filling water and lubrication chart (URW546C)

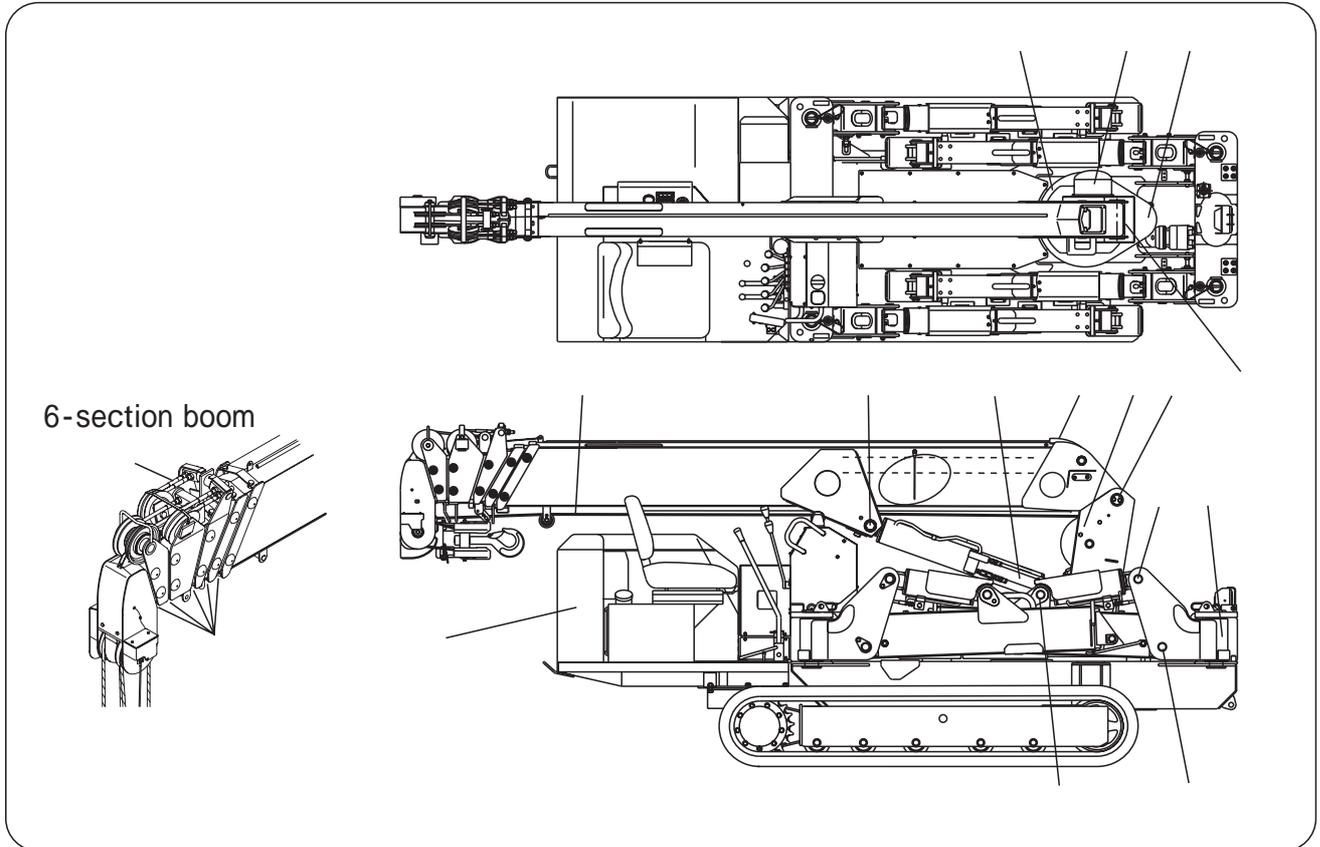


Service interval	Where to lubricate	No. of part	Lubricant	Tool
Initial: Replace after 100 hours After : Replace every 250 hours	Engine 4.0 liters	1	Engine oil	
Initial : 30 hours, Whenever necessary	Tension adjustment of rubber crawler	2	Chassis grease	Grease pump
Replace antifreezing solution (LLC) every 2 years	Radiator 5.5liters	1	Antifreezing solution	
Initial: Replace after 3 months After : Replace 2 years	Hydraulic oil tank 70 liters	1	Hydraulic oil	
Replace every 1000 hours	Reduction gears of crawling motor 0.7 liters	2 (Right/Left)	Gear oil	

Refer to "MAINTENANCE AND INSPECTION OF CARRIER" for replacement procedures.

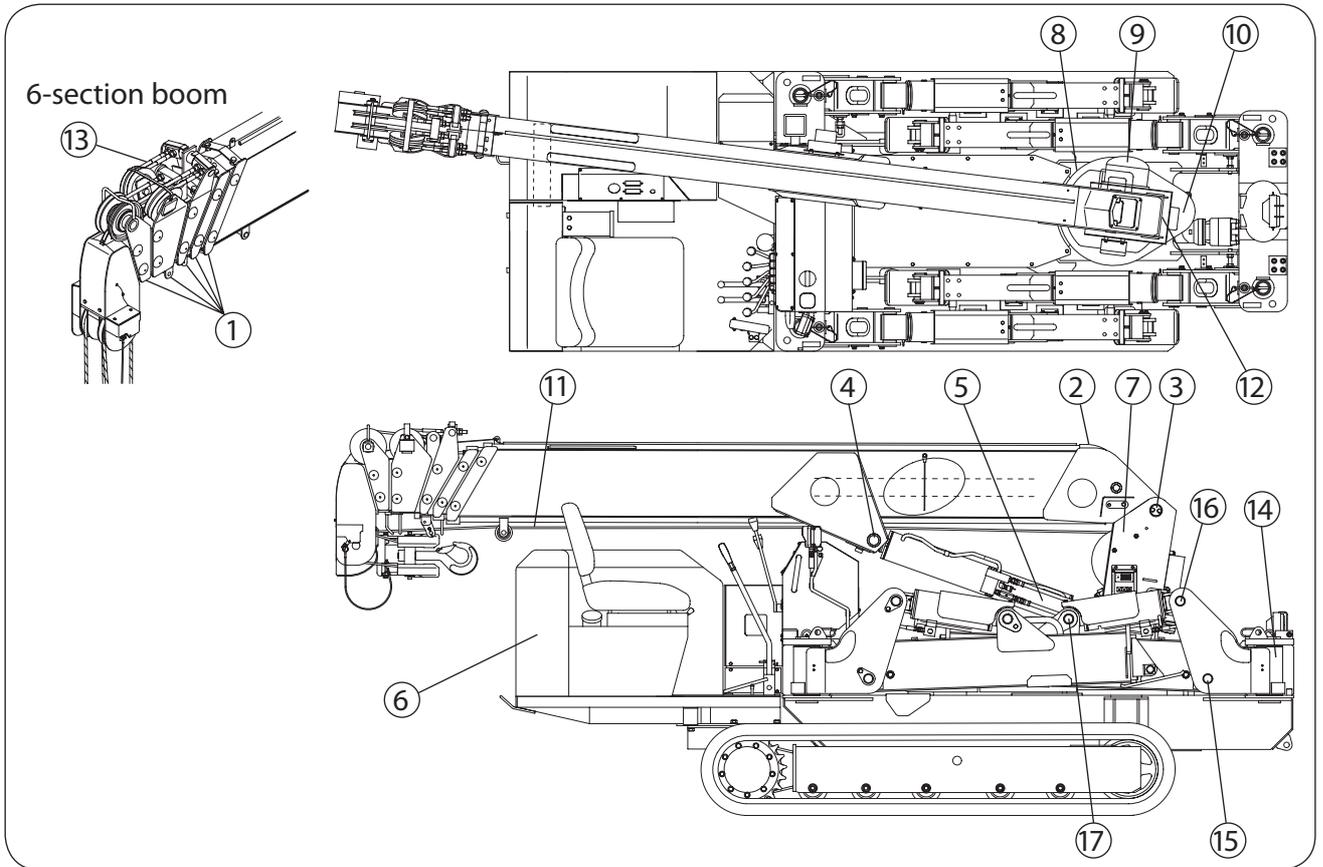
Fuel	light oil
Fuel tank capacity	40 liters

35 1 Lubrication chart(URW376C)



Service interval	Where to lubricate	No. of part	Lubricant	Tool
Daily	Boom slide plate (Underside & side face of boom sections , , and)For 6-section boom	5	Molybdenum grease	Manual application
	Boom slide plate (Upper side of boom section)	2	Molybdenum grease	Grease pump
	Boom foot pin	1	Chassis grease	Grease pump
	Upper support pin of derrick cylinder	1	Chassis grease	Grease pump
	Lower support pin of derrick cylinder	1	Chassis grease	Grease pump
	Oil tank (70 liters)	1	Hydraulic oil(up to middle of level gauge)	
Weekly	Winch drum gears	1	Chassis grease	Grease pump
	Slewing gears	1	Chassis grease	Manual application
Monthly	Winch reduction gears (Approx. 1.0 liter)	1	Gear oil	
	Slewing reduction gears (Approx. 0.7 liters)	1	Gear oil	
	Wire rope	1	Rope grease	Spray gun
	Slewing bearings	2	Chassis grease	Grease pump
	Wire rope for boom extension	1	Rope grease	Spray gun
	Outrigger fulcrum pin	4	Chassis grease	Grease pump
	Outer box support	4	Chassis grease	Grease pump
	Outrigger vertical cylinder (Bracket side)	4	Chassis grease	Grease pump
Outrigger vertical cylinder (Outer box side)	4	Chassis grease	Grease pump	

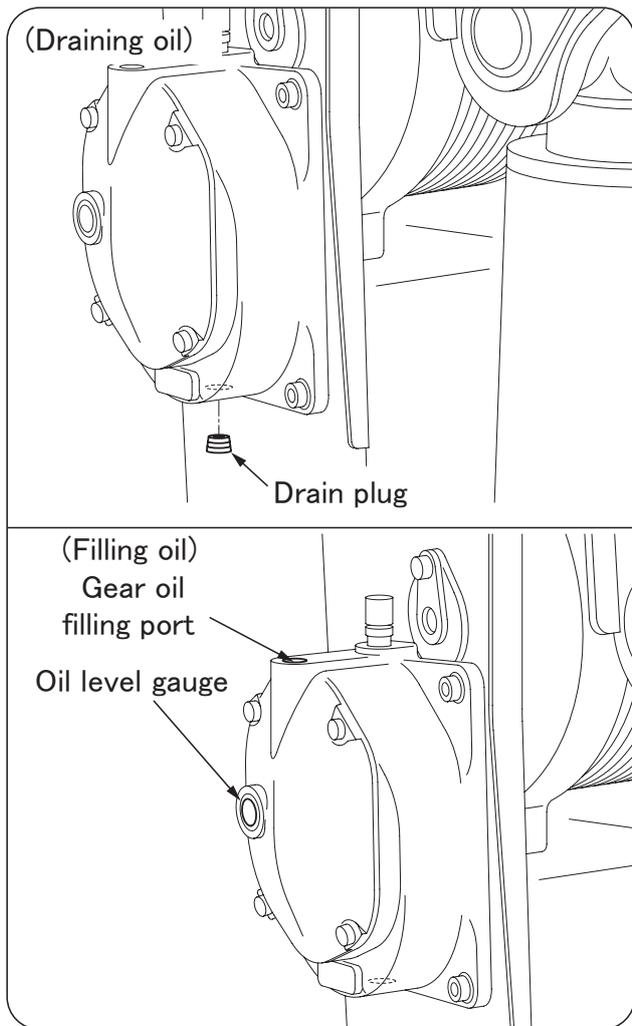
35 Lubrication chart (URW546C)



Service interval	Where to lubricate	No. of part	Lubricant	Tool
Daily	Boom slide plate (Underside & side face of boom sections , , , , and) For 7-section boom	6	Molybdenum grease	Manual application
	Boom slide plate (Upper side of boom section)	2	Molybdenum grease	Grease pump
	Boom foot pin	1	Chassis grease	Grease pump
	Upper support pin of derrick cylinder	1	Chassis grease	Grease pump
	Lower support pin of derrick cylinder	1	Chassis grease	Grease pump
	Oil tank (70 liters)	1	Hydraulic oil (up to middle of level gauge)	
Weekly	Winch drum gears	1	Chassis grease	Grease pump
	Slewing gears	1	Chassis grease	Manual application
Monthly	Winch reduction gears (Approx. 1.0 liter)	1	Gear oil	
	Slewing reduction gears (Approx. 0.7 liters)	1	Gear oil	
	Wire rope	1	Rope grease	Spray gun
	Slewing bearings	2	Chassis grease	Grease pump
	Wire rope for boom extension	1	Rope grease	Spray gun
	Outrigger fulcrum pin	4	Chassis grease	Grease pump
	Outer box support	4	Chassis grease	Grease pump
	Outrigger vertical cylinder (Bracket side)	4	Chassis grease	Grease pump
Outrigger vertical cylinder (Outer box side)	4	Chassis grease	Grease pump	

36 Lubrication

Winch reduction gears



◆1. Replacement of gear oil (Winch reduction gears and Slewing reduction gears)

★Air enters in and out of the gear case so that dirt and moisture are brought in the gear case.

In addition, since hydraulic equipment gradually wears to produce worn particles, replace gear oil 6 months after the start of operation.

★After that, replace gear oil:

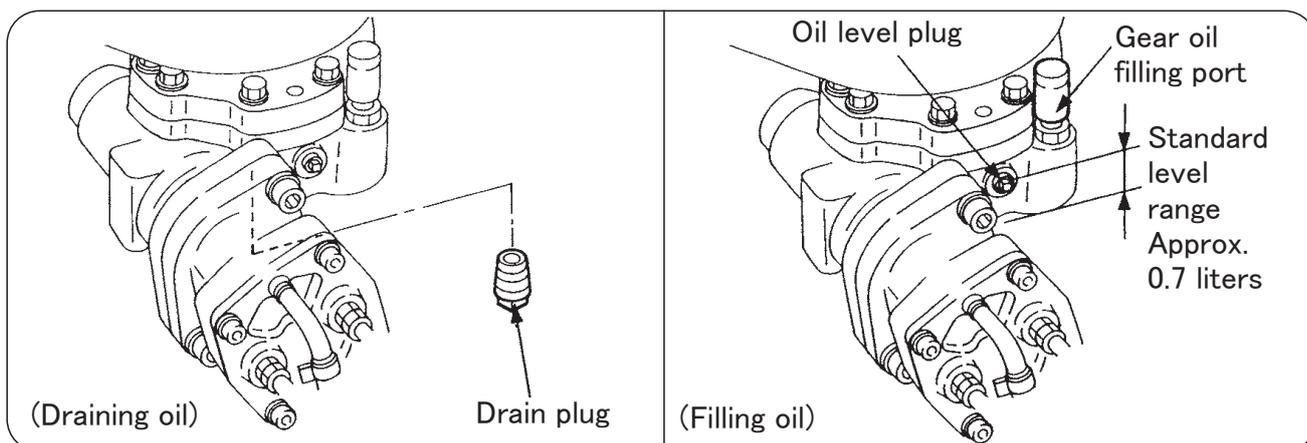
- Once a year for winch reduction gears, and
- Once every 2 years for slewing reduction gears.

CAUTION

★Replace gear oil after oil temperature has dropped.

★Fill the gear oil for winch reduction gear to a middle of oil level gauge (approx. 1.0 liter).

Slewing reduction gears



When carrying out inspection before crane operation, use photocopy of this sheet.

CHART FOR INSPECTION BEFORE STARTING CRANE OPERATION

Date: _____, _____, _____ **Weather: (Fine, Cloudy, Rain, Snow)**
Place _____ **Operator** _____

Device	Inspect for:	Check
Hydraulic pump	Tightness of fitting, Oil leak, unusual noise	
Hydraulic oil tank	Oil level, oil leak	
Outrigger	Gravity-descent, operating condition, Deformation, damage, oil leak, crack	
Hoist winch	Operating condition, braking performance, irregular winding	
Swinging device	Operating condition, oil leak	
Derricking boom	Operating condition, oil leak, fitting of foot-pin	
Telescoping boom	Operating condition, oil leak, deformation, crack, fitting of mounting pin	
Hook	Rotation of hook, operating condition of retainer	
Wire rope	Damage, Fastening at rope end	
Over-winding alarm	Operating condition, alarm sound	
Load meter	Oil leak, operating condition	
Alarm device	Operating condition, alarm sound	
Piping High-pressure hose	Oil leak at each connection, damage	
Automatic storing hook device	Automatic stop and storing operation	

Device	Inspect for:	Check
Frame	Crack, tightness of bolts and missing	
Automatic stop for leaving minimum wire rope	It should make an automatic stop for unwinding when remaining wire rope on the drum come to 3 turns.	
Radio controller	Operating condition,	
Overtum prevention device	Alarm, automatic stop, damage in wiring, tightness of detector	
Digital load meter	Load indication on no-load, damage in wiring	
Overload prevention device	Power lamp should light, error lamp should go off, damage in wiring	
Interlocking device for crane · traveling lever	Crane will not function when selected on traveling side.	
	Traveling will not function when selected on crane side.	
Rubber crawler	Tension, damage, crack	
Wheel sprocket	Tightness of bolts	
Track roller	Tightness of nuts, oil leak	
Engine	Remaining fuel level, draining water, engine oil level, cooling water level, fan belt tension and adjustment, battery liquid level, unusual vibration, unusual noise, tightness and damage in each bolt	

MONTHLY SELF-INSPECTION RECORDS

When carrying out inspection, use photocopy of this sheet.
Keep the inspected results for 3 years.

Check Overhaul
 Replacement
 Repair
 Adjustment
 Tightening
 Oil supply
 Cleaning
 Oil supply
 L

Check point	What to check for:	Checked result		Measures taken	Check point	What to check for:	Checked result		Measures taken
		OK	NG				OK	NG	
1 Engine	Condition of air cleaner element				13 Column	Crack, deformation			
	Contamination of fuel strainer and ignition plug					Tightness of bolts mounting turntable			
	Fuel leak				14 Boom	Telescoping operation, lubrication			
	Battery liquid level					Deformation, crack, wear of sliding plate			
	Engine oil level and deterioration					Tightness of bolts mounting turntable, missing bolts			
	Unusual vibration and noise					Damage, wear, rotation sliding plate, missing bolts			
2 Traveling devices	Tightness of fitting bolts, nuts, and missing					Fitting of support pin, sheave pin			
	Crack, wear, damage in rubber crawler					Tightness of fitting bolts, nuts, pins, and missing			
	Tightness of take-up bolts, nuts, and missing				15 Wire rope	Tightness of telescoping wire, wear, broken strand wire, corrosion			
	Forward · backward operation of traveling lever					Specifications: length, thickness			
	Operation of accelerator lever					Wear, broken strand wire, distortion, kink, corrosion, lubrication			
	Braking performance					Tight connection to wire socket, fastening clip at rope end			
Damage in stand lever and lock lever				Deformation, crack of wire socket					
Oil leak from reduction gear in traveling motor				Tight connection to drum, irregular winding, twist					
3 Frame	Crack in welded section					Fitting of support pin, tightness of bolts and missing			
	Tightness of fitting bolts, nuts, pins, and missing				16 Piping	Oil leak			
4 Hydraulic oil tank	Oil leak, crack						Support of piping		
	Quantity, contamination, and deterioration of hydraulic oil					Damage, aging, crack, twist, dent			
	Contamination of air breather, return filter, suction filter				17 Hook	Wear, deformation, rotation of hook and lubrication			
5 Hydraulic pump	Operation, unusual noise, oil leak					Gauge mark distance of hook			
	Tightness of fitting bolts, nuts, and missing					Damage, wear, rotation of sheave and lubrication			
6 Control valve	Operation, deformation, crack in each lever					Function, deformation, damage in retainer			
	Missing knob, peeled off and deteriorated sticker					Tightness of hook screws and looseness of thrust bearing (worn condition)			
	Oil leak					Tightness of fitting bolts, nuts, pins and missing			
	Tightness of fitting bolts, nuts, pins, and missing				18 Load meter	Function, oil leak, damage			
7 Outriggers	Operation of cylinder, lamp, buzzer				19 Load indicator	Missing pointer, damage in indication plate, function			
	Effect of stopper pin when outriggers are stored and extended, deformation of pins				20 Automatic stop for over-wound alarm	Function, condition of over-wound detection switch and alarm sound			
	Deformation of outer box, inner box, suspending bracket of outrigger body					Winding-up condition of cord reel, damage in cord, broken cord			
	Oil leak from outrigger cylinder, gravity-descent					Damage in weight and sling wire			
	Tightness of fitting bolts, nuts, pins, and missing				21 Level	Setting condition			
8 Swivel joint	Oil leak				22 Alarm	Function, alarm spund			
	Tightness of stopper mounting bolts, deformation of plate				23 Name plate	Fitting, damage, deterioration			
	Tightness of fitting bolts, nuts, and missing				24 Radio remote control	Operation			
Continuity of slip ring, damage in wiring, mounting				Condition of transmitter enclosure					
9 Hoist winch	Operation, unusual noise, oil leak					Cable connections: tightness, contamination, corrosion			
	Damage in air breather					Damage, deterioration, twist of wiring and cables			
	Gear oil quantity, deterioration					Corrosion, deterioration, tightness of contact terminals			
	Crack in drum, lubrication to gears				Oil leak from accelerator cylinder				
10 Swing device	Tightness of fitting bolts, nuts, and missing					Function of each solenoid valve, oil leak			
	Operation, unusual noise, oil leak				25 Overturn prevention	Alarm function when reaction force against outrigger drops			
	Damage in air breather					Crane operation when reaction force against outrigger drops			
	Gear oil quantity, deterioration					Cable connections: tightness, contamination, corrosion			
	Operation of turn-table, unusual noise, lubrication					Damage, deterioration, twist of wiring and cables			
Tightness of fitting bolts, nuts, and missing				Corrosion, deterioration, tightness of contact terminals					
11 Derrick cylinder	Operation					Deformation, wear, damage in load cell			
	Looseness in upper and lower pins of derrick cylinder				26 3-color light	Function			
	Oil leak from derrick cylinder, gravity-descent				27 Automatic stop for leaving minimum wire rope	Function			
Tightness of fitting bolts, nuts, and missing				Mounting of detector switch					
12 Telescoping cylinder	Operation				Remarks to be recorded				
	Oil leak from telescoping cylinder, gravity-descent								
	Fitting of support pins, missing snap ring								
	Tightness of fitting bolts, nuts, and missing								

Operator
 Crane model
 Delivered date
 Inspected date

Company in charge of inspection

Inspected by Signature

ANNUAL SELF-INSPECTION RECORDS

When carrying out inspection, use photocopy of this sheet.
Keep the inspected results for 3 years.

Check Overhaul
 Replacement Repair
 Adjustment Tightening
 A T
 Cleaning Oil supply
 C L

Check point	What to check for:	Checked result		Measures taken	Check point	What to check for:	Checked result		Measures taken	
		OK	NG				OK	NG		
1 Engine	Condition of air cleaner element				14 Boom	Telescoping operation, lubrication				
	Contamination of fuel strainer and ignition plug					Deformation, crack, wear of sliding plate				
	Fuel leak					Tightness of bolts mounting turntable, missing bolts				
	Battery liquid level					Damage, wear, rotation sliding plate, missing bolts				
	Engine oil level and deterioration					Fitting of support pin, sheave pin				
	Unusual vibration and noise					Tightness of fitting bolts, nuts, pins, and missing				
	Tightness of fitting bolts, nuts, and missing					Tightness of telescoping wire, wear, broken strand wire, corrosion				
2 Traveling devices	Crack, wear, damage in rubber crawler				15 Wire rope	Specifications: length, thickness				
	Tightness of take-up bolts, nuts, and missing					Wear, broken strand wire, distortion, kink, corrosion, lubrication				
	Forward · backward operation of traveling lever					Tight connection to wire socket, fastening clip at rope end				
	Operation of accelerator lever					Deformation, crack of wire socket				
	Braking performance					Tight connection to drum, irregular winding, twist				
	Damage in stand lever and lock lever					Fitting of support pin, tightness of bolts and missing				
	Oil leak from reduction gear in traveling motor									
3 Frame	Crack in welded section				16 Piping	Oil leak				
	Tightness of fitting bolts, nuts, pins, and missing					Support of piping				
4 Hydraulic oil tank	Oil leak, crack				17 Hook	Damage, aging, crack, twist, dent				
	Quantity, contamination, and deterioration of hydraulic oil					Wear, deformation, rotation of hook and lubrication				
	Contamination of air breather, return filter, suction filter					Gauge mark distance of hook				
5 Hydraulic pump	Operation, unusual noise, oil leak					Damage, wear, rotation of sheave and lubrication				
	Tightness of fitting bolts, nuts, and missing					Function, deformation, damage in retainer				
6 Control valve	Operation, deformation, crack in each lever					Tightness of hook screws and looseness of thrust bearing (worn condition)				
	Missing knob, peeled off and deteriorated sticker					Tightness of fitting bolts, nuts, pins and missing				
	Oil leak									
	Tightness of fitting bolts, nuts, pins, and missing				18 Load meter	Function, oil leak, damage				
	Set pressure of relief valve				19 Load indicator	Missing pointer, damage in indication plate, function				
7 Outriggers	Operation of cylinder, lamp, buzzer				20 Automatic stop for over-wound alarm	Function, condition of over-wound detection switch and alarm sound				
	Effect of stopper pin when outriggers are stored and extended, deformation of pins					Winding-up condition of cord reel, damage in cord, broken cord				
	Deformation of outer box, inner box, suspending bracket of outrigger body					Damage in weight and sling wire				
	Oil leak from outrigger cylinder, gravity-descent				21 Level	Setting condition				
	Tightness of fitting bolts, nuts, pins, and missing				22 Alarm	Function, alarm sound				
8 Swivel joint	Oil leak				23 Name plate	Fitting, damage, deterioration				
	Tightness of stopper mounting bolts, deformation of plate					24 Radio remote control	Operation			
	Tightness of fitting bolts, nuts, and missing						Condition of transmitter enclosure			
	Continuity of slip ring, damage in wiring, mounting						Cable connections: tightness, contamination, corrosion			
9 Hoist winch	Operation, unusual noise, oil leak						Damage, deterioration, twist of wiring and cables			
	Damage in air breather				Corrosion, deterioration, tightness of contact terminals					
	Gear oil quantity, deterioration				Oil leak from accelerator cylinder					
	Crack in drum, lubrication to gears				Function of each solenoid valve, oil leak					
10 Swing device	Tightness of fitting bolts, nuts, and missing				25 Overturn prevention	Alarm function when reaction force against outrigger drops				
	Operation, unusual noise, oil leak					Crane operation when reaction force against outrigger drops				
	Damage in air breather					Cable connections: tightness, contamination, corrosion				
	Gear oil quantity, deterioration					Damage, deterioration, twist of wiring and cables				
	Operation of turn-table, unusual noise, lubrication					Corrosion, deterioration, tightness of contact terminals				
11 Derrick cylinder	Tightness of fitting bolts, nuts, and missing				26 3-color light	Deformation, wear, damage in load cell				
	Operation					Zero-point adjustment and check for load cell				
	Looseness in upper and lower pins of derrick cylinder					27 Automatic stop for leaving minimum wire rope	Function			
	Oil leak from derrick cylinder, gravity-descent						Mounting of detector switch			
12 Telescoping cylinder	Tightness of fitting bolts, nuts, and missing					28 Load test Test load (ton)	Winding-up capacity, braking with rated load lifted up			
	Operation				Gravity descent of derrick cylinder with rated load lifted up					
	Oil leak from telescoping cylinder, gravity-descent				Gravity descent of outrigger cylinder with rated load lifted					
	Fitting of support pins, missing snap ring				Gravity descent with rated load lifted up when boom extended to its extreme					
13 Column	Tightness of fitting bolts, nuts, and missing				Remarks to be recorded	Swing capacity with rated load lifted up				
	Crack, deformation									
	Tightness of bolts mounting turntable									

Operator
Crane model
Delivered date
Inspected date

Company in charge of inspection

Inspected by Signature

38. PERIODICALLY REPLACING COMPONENTS AND EXPEDABLE PARTS

In order to ensure safe operation of UNIC mini-crawler crane while maintaining its functions and performance, replace components specified as periodical replacement regularly.

In addition, you are requested to replace the expendable components when you have noticed wear and damage as there may be exhausted and/or deteriorated components due to frequency of use and aging deterioration.

In order to use the crane in good condition, we recommend regular replacement of the components as specified in the table below.

Item		Components	Replacement
Crane	Expendable parts	Line filter	Once a year
		Packing and seal for each cylinder	Every 3 years
		Sliding plate of boom	Every 3 years
		Brake shoe of hoist winch	Every 3 years
		Wire rope	Replace according to damage and wear
		Rubber components, wiring, cables	Replace according to damage
		Batteries, bulbs, switches, fuses	Replace according to damage and/or consumption
	Enclosure, switch, lever of transmitter	Replace according to damage and wear	
	Lubrication	Hydraulic oil	Every 2 years
		Gear oil (hoist winch)	Once a year
Gear oil (swinging reduction gear)		Every 2 years	
Other greases		Lubricate according to consumption	
Traveling	Expendable parts	Diesel engine oil (traveling motor reduction gear)	Every 1,000 hours according to hour meter
		Rubber crawler	Replace according to crack/elongation
Engine	Expendable parts	Engine oil	Every 100 hours according to hour meter
		Battery	Replace according to consumption and deterioration
		Rubber components, wiring, cables	Replace according to damage

Note: It is to be charged for replacement of expendable components.

REPLACEMENT OF HYDRAULIC OIL

Air entering in oil tank brings dust and moisture.

Since contaminated and deteriorated hydraulic oil in pump and motor accelerates wear and seizure, replace hydraulic oil periodically in 3 months after start of machine operation and once every 2 years thereafter.

If the periodical replacement has failed to be carried out, warranty repair will not be applied even if it is within warranty period

ONE-YEAR WARRANTY COMPONENTS

In case where it will not impair quality remarkably, rust in sliding part, in fitting part, and that resulted from operation and insufficient lubrication, warranty repair will not be applied.