KOBELCO

SHOP MANUAL

CRAWLER EXCAVATOR

215SR

ACERA
TIER 3

87728457 NA

Issued 01Feb 08

CNH America LLC reserves the right to make improvements in design or changes in specifications at any time without incurring any obligation to install them on units previously sold.

All data given in this publication is subject to production variations. Dimensions and weights are only approximate. Illustrations do not necessarily show products in standard condition. For exact information about any particular product, please consult your Dealer

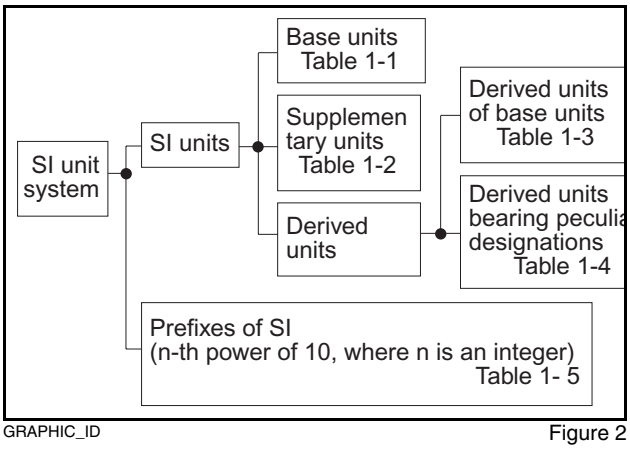
Revision History				
Issue	Issue Date	Applicable Machines	Form Number	Remarks
First Edition	02-2008	215SR ACERA	5-12410	

INTERNATIONAL UNIT SYSTEM

INTRODUCTION

Although this manual uses the SI units system. Outline of SI units system is described here.
Given below are an excerpt of the units that are related to this manual :

1. Etymology of SI Units
   English : International System of units
2. Construction of SI Unit System



GRAPHIC_ID Figure 2

1. Basic Units

Table1-1

QUANTITIES	DESIGNATION	SIGN
Length	Meter	m
Mass	Kilogram	kg
Time	Second	s
Current	Ampere	A
Thermodynamic temperature	Kelvin	K
Gram molecule	Mol	mol
Luminous intensity	Candela	cd

2. Supplementary Units

Table1-2

QUANTITIES	DESIGNATION	SIGN
Plain angle	Radian	rad
Solid angle	Steradian	sr

3. Derived Units of Basic Units

Table1-3

QUANTITIES	DESIGNATION	SIGN
Area	Square meter	m^2
Volume	Cubic meter	m^3
Velocity	Meter per second	m/s
Acceleration	Meter per second / second	m/s^2
Density	Kilogram per cubic meter	kg/m^3

4. Derived Units bearing Peculiar Designations

Table1-4

QUANTITY	UNIT	SYMBOL	FORMULA
Frequency	hertz	Hz	1Hz=1/s
Force	newton	N	$kg \cdot m/s^2$
Pressure and Stress	pascal	Pa	N/m^2
Energy, Work and Quantity of heat	joule	J	N•m
Power	watt	W	J/s
Quantity of electricity	coulomb	C	A•s
Electric potential difference, Voltage, and Electromotive force	volt	V	W/A
Quantity of static electricity and Electric capacitance	farad	F	C/V
Electric resistance	ohm	Ω	V/A
Celcius temperature	celcius degree or degree	°C	(t+273.15)K
Illuminance	lux	lx	$l\ m/m^2$

5. Prefixes of SI

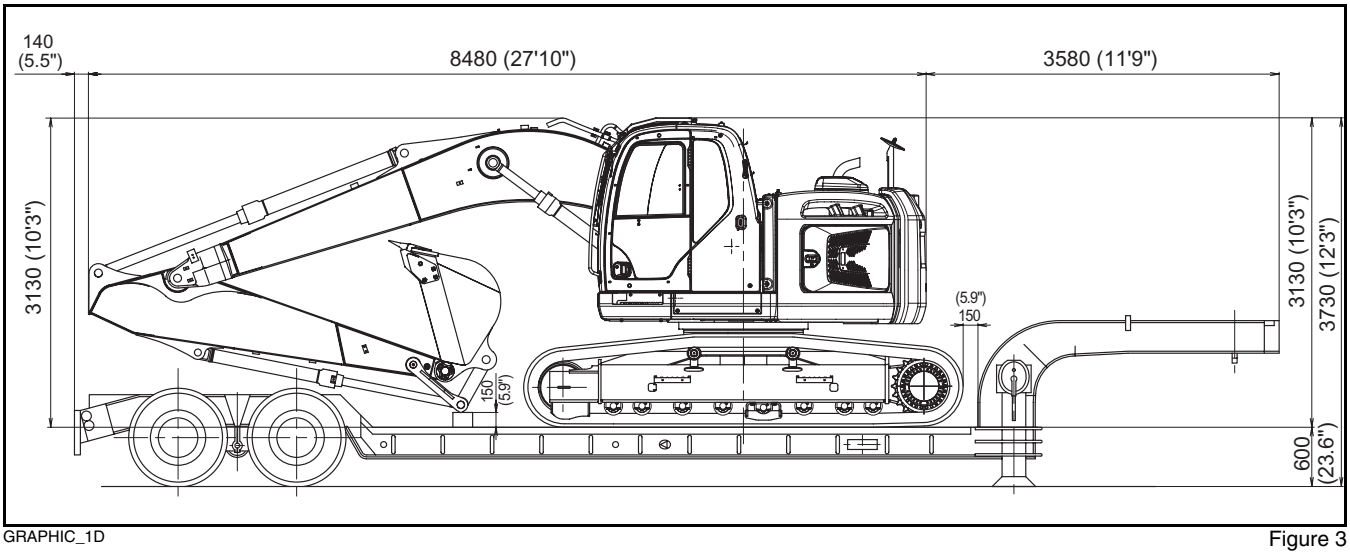
PREFIX		POWER
DESIGNATION	SIGN	
Giga	G	10^9
Mega	M	10^6
Kilo	k	10^3
Hecto	h	10^2
Deca	da	10
Deci	d	10^{-1}
Centi	c	10^{-2}
Milli	m	10^{-3}
Micro	m	10^{-6}
Nano	n	10^{-9}
Pico	p	10^{-12}

TRANSPOTATION

OVERALL DIMENSIONS OF MACHINE ON A TRAILER

5.62m (18ft-5in) Boom+2.87m (9ft-5in) Arm+ 0.80m^3 (1.05 cu/yd) Bucket

Item	Shoe type	800 mm (31.5 in) LC
Width	mm (ft-in)	3,190 (10 ft 6in.)
Weight	kg (lbs)	24,800 kg (54,700 lbs)



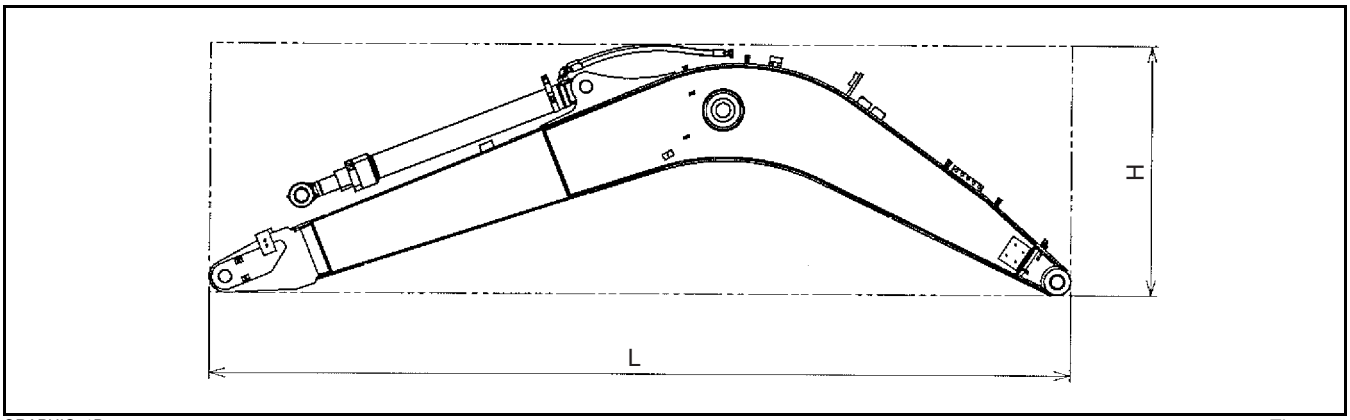
GRAPHIC_1D

Figure 3

DIMENSIONS OF ATTACHMENTS

Boom

Item	Type	5.62m (18ft-5in) Boom
Length× Height× Width L× H× W	m (ft-in)	5.82 × 1.50 × 0.67 (19ft 1in × 4 ft 11in × 2ft 2 in)
Weight	kg (lbs)	1,600 (3,530)



GRAPHIC_1D

Figure 4

CNH America LLC reserves the right to make improvements in design or changes in specifications at any time without incurring any obligation to install them on units previously sold.

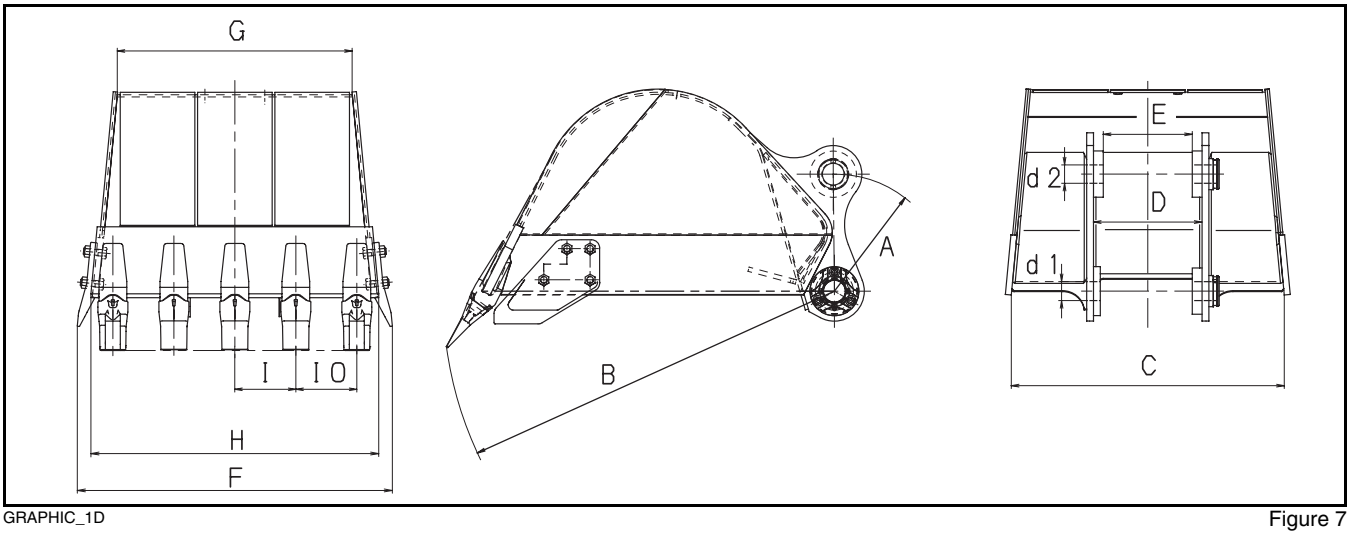
All data given in this publication is subject to production variations. Dimensions and weights are only approximate. Illustrations do not necessarily show products in standard condition. For exact information about any particular product, please consult your Dealer

Revision History				
Issue	Issue Date	Applicable Machines	Form Number	Remarks
First Edition	02-2008	215SR ACERA	5-12440	

BUCKET

Bucket Dimensional Drawing

1. Hoe bucket



GRAPHIC_1D

Figure 7

No.	NAME	No.	NAME
A	Distance between pin and bracket	G	Inner width of bucket bottom
B	Distance between bucket pin and tooth end	H	Bucket outer width of front side
C	Inner width of bucket top end	I	Pitch between teeth
D	Inner width of bracket	Io	Pitch between teeth
E	Inner width of lug	d1	Outer dia. of bushing
F	Outer width of side cutter	d2	Pin dia.

Bucket Dimensional Table

Unit : mm (ft-in)

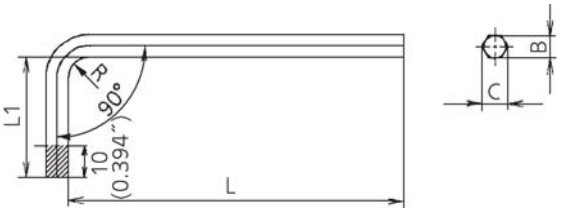
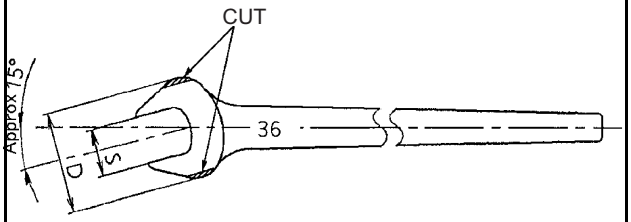
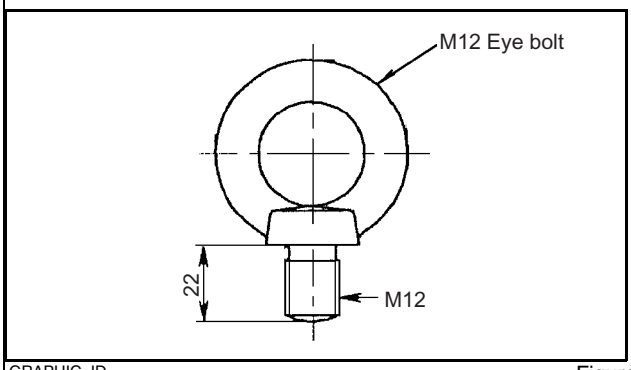
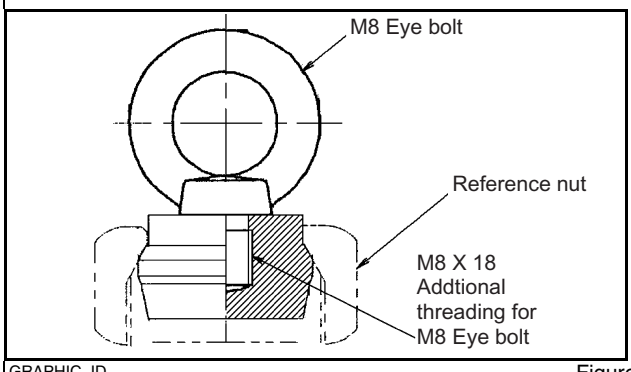
Type	Normal digging				
Capacity	[STD] 0.80 (0.70)m^3	0.51 (0.45)m^3	0.70 (0.61)m^3	0.93 (0.80)m^3	1.05 (0.90)m^3
Part No.	YN61B00317F1	YN61B00191F1	YN61B00160F1	YN61B00158F1	YN61B00159F1
A	R430 (16.9 in)	←	←	←	←
B	R1,440 (4-9)	←	←	←	←
C	1,003 (3-3)	711 (2-4)	922 (3-0.3)	1,173 (3-10)	1,303 (4-3.3)
D	399 (1-3.7)	←	←	←	←
E	327 (12.9 in)	←	←	←	←
F	1,157 (4-0)	870 (2-10.3)	1,080 (3-6.5)	1,330 (4-4.4)	1,460 (4-9.5)
G	863 (34)	572 (1-10.5)	785 (2-6.9)	1,036 (3-4.8)	1,166 (3-9.9)
H	1,057 (3-6)	766 (2-6.2)	979 (3-2.5)	1,230 (4-0.43)	1,360 (4-5.5)
I	224 (8.82 in)	300 (11.8 in)	203 (8.0 in)	266 (10.5 in)	240 (9.45 in)
IO	224 (8.82 in)	300 (11.8 in)	203 (8.0 in)	266 (10.5 in)	238 (9.37 in)
d1	ø 95 (3.74 in)	←	←	←	←
d2	ø 80 (3.15 in)	←	←	←	←

Bucket capacity : SAE heaped (Stuck)

NOTES

SPECIAL TOOLS

Table 4

No.	Tools name	Tools No.	Shape	Applicable
1	Allen wrench Nominal B : 10, C : 11.3	ZT22A10000	 Commercial tool length (L1) - cut length = Required length 40 (1.57") - 10 (0.39") = 30 (1.18") GRAPHIC_ID Figure 27	Pump suction
2	Spanner or socket Nominal B : 17		General tools	Pump install
3	Spanner Nominal S : 36	ZT12A36000	 Commercial tool outer width (D) - cut length = Required length 81 (3.19") - 16 (0.63") = 65 (2.56") GRAPHIC_ID Figure 28	Swing motor A,B port
4	Eye bolt M12×18	ZS91C01200 or commercial equivalent	 GRAPHIC_ID Figure 29	For slinging the swing motor & Flare hose
5	Plug (Nominal tube dia. 22) Reference Eye bolt Nut	ZF83P22000 ZS91C00800 ZF93N22000	 GRAPHIC_ID Figure 30	Flare hose

CNH America LLC reserves the right to make improvements in design or changes in specifications at any time without incurring any obligation to install them on units previously sold.

All data given in this publication is subject to production variations. Dimensions and weights are only approximate. Illustrations do not necessarily show products in standard condition. For exact information about any particular product, please consult your Dealer

Revision History				
Issue	Issue Date	Applicable Machines	Form Number	Remarks
First Edition	02-2008	215SR ACERA	5-12470	

Group		Location	Work to be done	Unit	Remarks	Unit : Hour
04 Travel system	00	Travel relation			See Crawler Removal	
	01	Track link assy	Detach/attach	One side	Include adjustment of tension	1.5
	02	Track link attaching and detaching position	Preparation	One side		0.1
	03	Master pin	Detach/attach	One side		0.5
	04	Track link extending and winding	Detach/attach	One side		0.5
	05	Shoe plate	Replace	1 pc.		0.4
	10	Upper roller relation			See Upper Roller Removal	
	11	Upper roller assy	Detach/attach	1	After removing track link	0.2
	12	Upper roller	O/H	1		1.0
	20	Lower roller relation			See Lower Roller Removal	
	21	Lower roller assy	Detach/attach	1		0.2
	22	Lower roller	O/H	1		1.5
	30	Front idler relation			See Front Idler Removal	
	31	Front idler assy	Detach/attach	One side	After removing track link	0.6
	32	Front idler assy slinging	Detach/attach	One side		0.3
	33	Front idler assy	Detaching	One side		0.3
	34	Idler assy	O/H	One side		1.0
	35	Idler adjuster assy	O/H	One side	Replace spring	2.4
	36	Grease cylinder	O/H	One side		0.6
	40	Sprocket			See Sprocket Removal	
	41	Sprocket	Replace	One side	After removing track link	0.6
	50	Travel motor relation			See Travel Motor Removal	
	51	Travel motor assy	Detach/attach	One side	After removing track link	1.7
	52	Motor cover	Detach/attach	One side		0.1
	53	Hydraulic piping	Detach/attach	One side		0.9
	54	Motor mounting bolts	Detach/attach	One side		0.5
	55	Motor slinging	Detach/attach	One side		0.1
	56	Motor cleaning	Cleaning	One side		0.1
	57	Travel motor	O/H	One side		3.6
	58	Travel reduction gear	O/H	One side		3.6
	60	Swivel joint relation				
	61	Pipe on swivel joint travel side	Detach/attach	1 pc.	See Swivel Joint	0.6
	62	Swivel joint	O/H	1 pc.	See Swivel Joint Construction	3.6
	70	Swing bearing			See Swing Bearing Removal	
	71	Swing bearing assy	Detach/attach	1 pc.	After removing upper frame	0.7
	72	Swing bearing mounting bolts	Detach/attach	1 set		0.5
	73	Swing bearing slinging	Detach/attach	1 pc.		0.3

	Work No.	Work	Work unit	Works	215SR Acera	
					Qty	
					1	Adding hour by 1 each
138	00627	Replacing air intake pipe	One set	Air cleaner to turbo charger	0.4	0.2
139	00675	Replacing silencer body	Completed machine		0.3	0.2
142	00641	Tightening exhaust manifold	Completed machine		0.9	
143	00643	Removal and installing exhaust manifold	Completed machine	With insulator and stud bolt	2.8	
144	00644	Replacing exhaust manifold	Completed machine	Include; Replacing stud bolt with new one and insulator (TI system)	3.0	
145	00645	Replacing exhaust manifold gasket	Completed machine		2.8	
146	00646	Replacing exhaust heat insulator	One side of completed machine	Removal and installing of turbo charger	2.4	
147	00651	Replacing exhaust pipe	One set		0.8	
148	00653	Replacing exhaust pipe gasket	One set		0.6	
164	00686	Removal and installing turbo charger	One set		2.9	
165	00687	Replacing turbo charger	One set	Include; Replacing stud bolt	2.6	
167	00689	Replacing turbo charger oil return pipe	One set	Include; Removal and installing of lower insulator	0.9	
174	00624	Replacing air intake pipe upper (cooler to manifold)	One set		0.4	
188	00701	Removal and installing engine and timing gear cover (fly wheel housing)	Single unit	From engine is removed condition Include; Removal and installing of cylinder head	5.4	
189	00711	Replacing timing gear cover (fly wheel housing)	Single unit	From engine is removed condition Include; Removal and installing of cylinder head	5.4	
190	00712	Replacing timing gear cover gasket (fly wheel housing)	Single unit	From timing gear cover is removed condition	0.7	
191	00713	Replacing timing gear cover plate (rear end plate)	Single unit	From timing gear cover is removed condition	1.0	
192	00714	Replacing timing gear cover plate gasket (rear end plate gasket)	Single unit	From timing gear cover is removed condition	1.0	
193	00725	Replacing idler gear (main)	Single unit	From timing gear cover is removed condition	0.2	
194	00736	Replacing idler gear (sub)	Single unit	From timing gear cover is removed condition	0.1	
195	00726	Replacing idler gear shaft (main)	Single unit	From timing gear cover is removed condition	0.2	
196	00737	Replacing idler gear shaft (sub)	Single unit	From timing gear cover is removed condition	0.1	
197	00724	Replacing crank shaft gear rear	Single unit		0.4	
201	00738	Replacing cam idle gear	Single unit	From timing gear cover is removed condition	0.4	

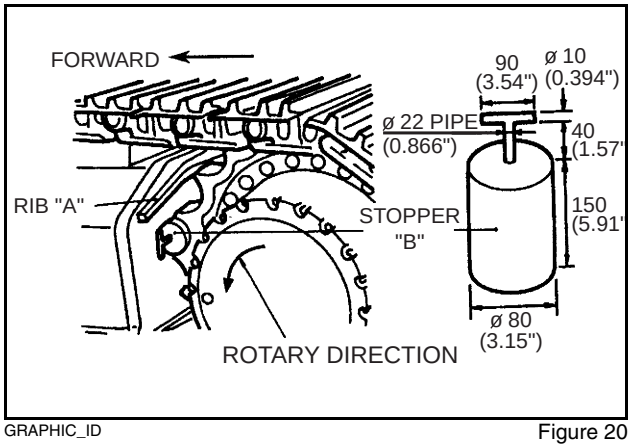
PERFORMANCE INSPECTION STANDARD TABLE

NOTE: *Unless otherwise specified, measure it on "H" mode.*

Inspection Item					Measuring Position			Standard value	Tolerance		Unit	Adjusting Point	Measuring condition
					Position	Size	Port		Hi	Lo			
Standard Measuring condition	Cleanliness of hydraulic oil				Hydraulic oil in tank			NAS 9 or less	—	—	Class	—	Sampling
	Hydraulic oil temperature				Tank surface			50 (122)	+ 5 (41)	- 5 (23)	°C (°F)	—	Atmospheric temp 50°C~-10°C (122°F~14°F)
	Water temperature				Radiator surface			75 (167)	+ 15 (59)	- 15 (5)		—	
	Engine speed	H mode Lo idle			Measure the engine speed at multi display on the gauge cluster, or measure with diesel speed meter.			1000	+ 30	- 30	min^{-1}	Adjustment not required	LOW throttle
		H mode Hi idle						2000	+ 30	- 30			Full throttle (HI idle)
		B mode Hi idle						2000	+ 30	- 30			Perform all measurement with the air conditioner OFF.
		A mode Hi idle						2000	+ 30	- 30			
		Decel						1050	+ 30	- 30			
		S mode Hi idle						1800	+ 30	- 30			
Pilot primary pressure circuit					G pump	PF1/4	a4	5.0 (725)	+ 0.5 (+73)	0	MPa (psi)	PR1	HI idle
High pressure circuit	Main relief valve pressure	ATT		P1	Main pump		a1	34.3 (4970)	+ 0.7 (+100)	- 0.5 (-73)		MR1	Boom up
				P2			a2						
		Boost		P1			a1	37.8 (5480)	+ 1.0 (+145)	- 0.5 (-73)		MR1	—
				P2			a2						
	Over load relief valve pressure	Boom		R			a1	37.8 (5480)	0	- 4.0 (-580)		OR4	Boom down
				H				39.7 (5760)	0	- 5.9 (-855)		OR3	Boom up
		Arm		R			a2	39.7 (5760)	0	- 5.9 (-855)		OR8	Arm out
				H				37.8 (5480)	0	- 4.0 (-580)		OR7	Arm in
		Bucket		R			a1	37.8 (5480)	0	- 4.5 (-640)		OR2	Bucket dump
				H				39.7 (5760)	0	- 5.9 (-855)		OR1	Bucket digging
		Swing		RH			a2	28.5 (4050)	+ 6.0 (+870)	0		OR6	Swing RH
				LH				28.5 (4050)	+ 6.0 (+870)	0		OR5	Swing LH
		Travel	RH	FW			a1	34.3 (4970)	+ 1.7 (+240)	- 0.5 (-73)		—	Simultaneous operation of travel RH and LH
				RV								—	
			LH	FW			a2	34.3 (4970)	+ 1.7 (+240)	- 0.5 (-73)		—	
				RV								—	

Drain Rate of Travel Motor

1. Purpose
   To measure the drain rate of the travel motor and to confirm the performances of the travel motor.
2. Conditions
   Hydraulic oil temperature ;
   45~55°C (113~131°F)
   Engine revolution; Hi idle
3. Preparation
   A. Place a stopper under the RH and LH travel sprockets.
   B. Stop the engine and release pressure from the hydraulic circuit.
   C. Connect a hose with the drain port of the travel motor and take drain in a container.



GRAPHIC_ID Figure 20

LOCATION OF STOPPER APPLIED TO TRAVEL SPROCKET

4. Measurement ; at Travel Lock

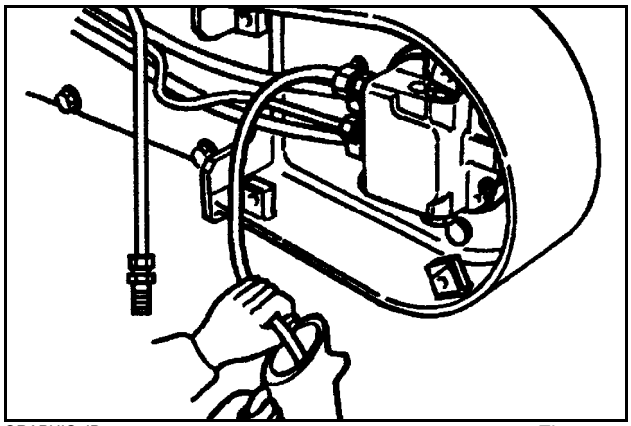
⚠ WARNING ⚠

Unless you observe the rotary force direction at travel lock, rib A may be broken by stopper B in some cases.

   A. Start the engine and relieve pressure at the full stroke of the travel lever.
   B. Measure the drain rate for 30 seconds of relieving.

Drain rate of motor — Unit: L(gal) /30 sec

Measuring position	Standard value	Reference value for remedy	Service limit
Drain rate	9 (2.4)	16 (4.2)	23 (6.1)



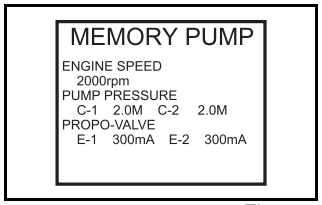
GRAPHIC_ID Figure 21

METHOD OF MEASURING THE DRAIN RATE OF TRAVEL MOTOR

2. Adjustment of pump (B adjustment).

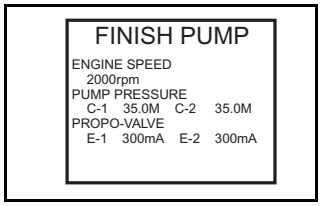
Procedure

1. The adjustment automatically shifts from engine to pump, the speed shifts from LOW idling to HIGH idling. And "MEMORY PUMP" is displayed. And the unloading proportional valve and pump proportional valve actuate, accordingly the loading of pump is increased.
   The "ENGINE SPEED", P1, P2 "PUMP PRESSURE" and P1, P2 pump "PROPO-VALVE" current (command value) are indicated.



GRAPHIC_ID Figure 44

2. After detection of the engine rated speed, the adjustment of pump is automatically completed. And "FINISH PUMP" is displayed.
   (Press the buzzer stop switch on gauge cluster while this display is appeared and the adjustment is completed. The unloading adjustment required later is not performed, and default value is written.)

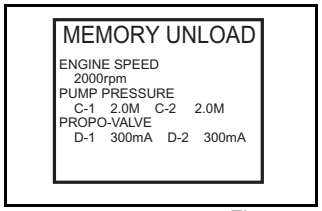


GRAPHIC_ID Figure 45

3. Adjustment of unloading valve (C adjustment)

Procedure

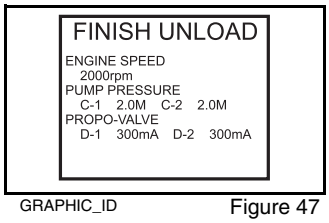
1. The adjustment shifts from pump to unloading, and the unloading valve actuates, accordingly the pump pressure is detected. And "MEMORY UNLOAD" is displayed.
   The "ENGINE SPEED", P1, P2 "PUMP PRESSURE" and P1, P2 "PROPO-VALVE" voltage (command value) are indicated.



GRAPHIC_ID Figure 46

2. When the unloading valve operates to the specified value, the adjustment of unloading proportional valve is automatically terminated. And "FINISH UNLOAD" is displayed.
   The speed is shifted to the speed corresponding to acceleration potentiometer.
   The adjusting current value is indicated on the display of current of P1, P2 unloading proportional valves. The adjusting range is usually 520~635mA.

   Stop the engine. (The adjusted data is automatically stored.)



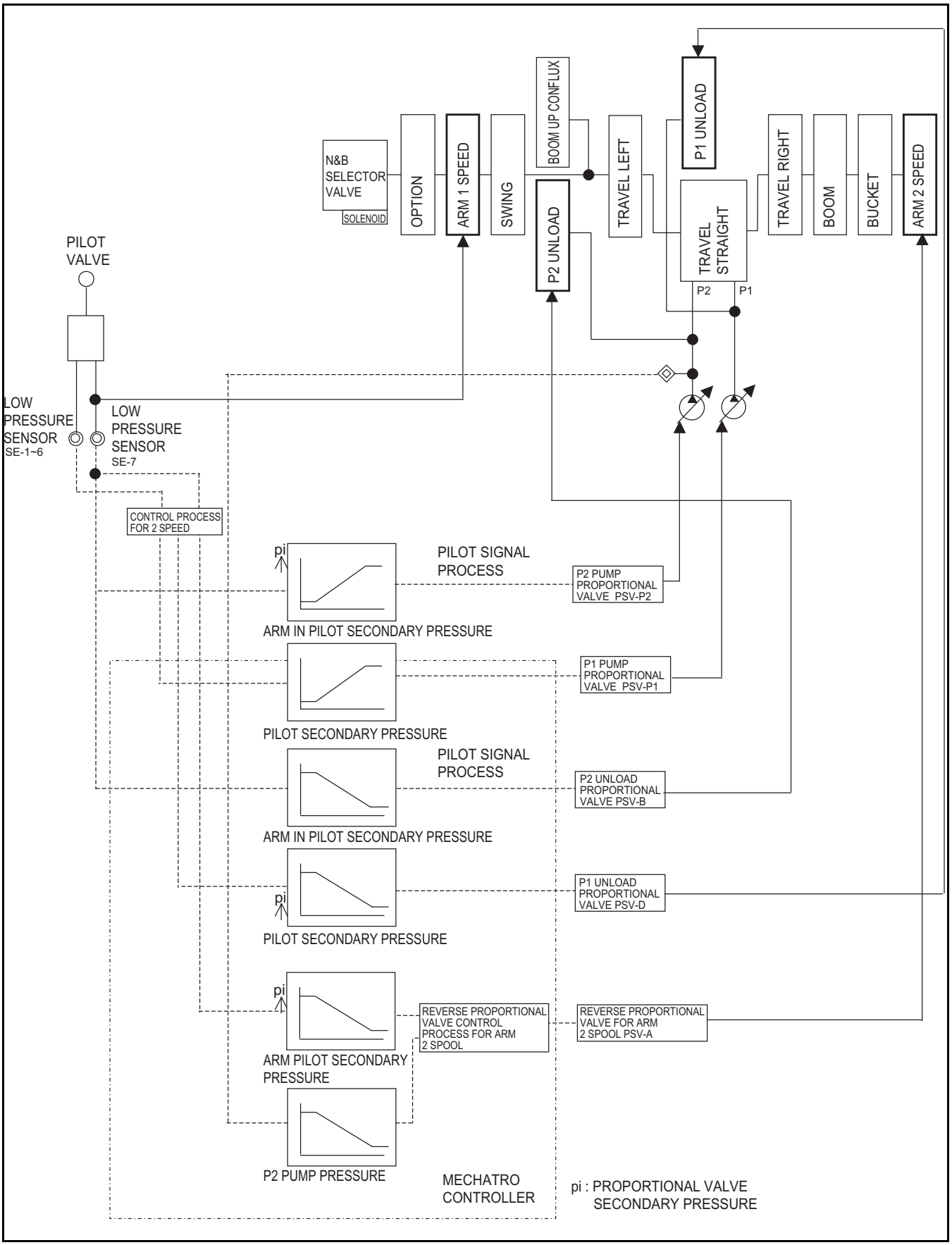
GRAPHIC_ID Figure 47

CNH America LLC reserves the right to make improvements in design or changes in specifications at any time without incurring any obligation to install them on units previously sold.

All data given in this publication is subject to production variations. Dimensions and weights are only approximate. Illustrations do not necessarily show products in standard condition. For exact information about any particular product, please consult your Dealer

Revision History				
Issue	Issue Date	Applicable Machines	Form Number	Remarks
First Edition	02-2008	215SR ACERA	5-12500	

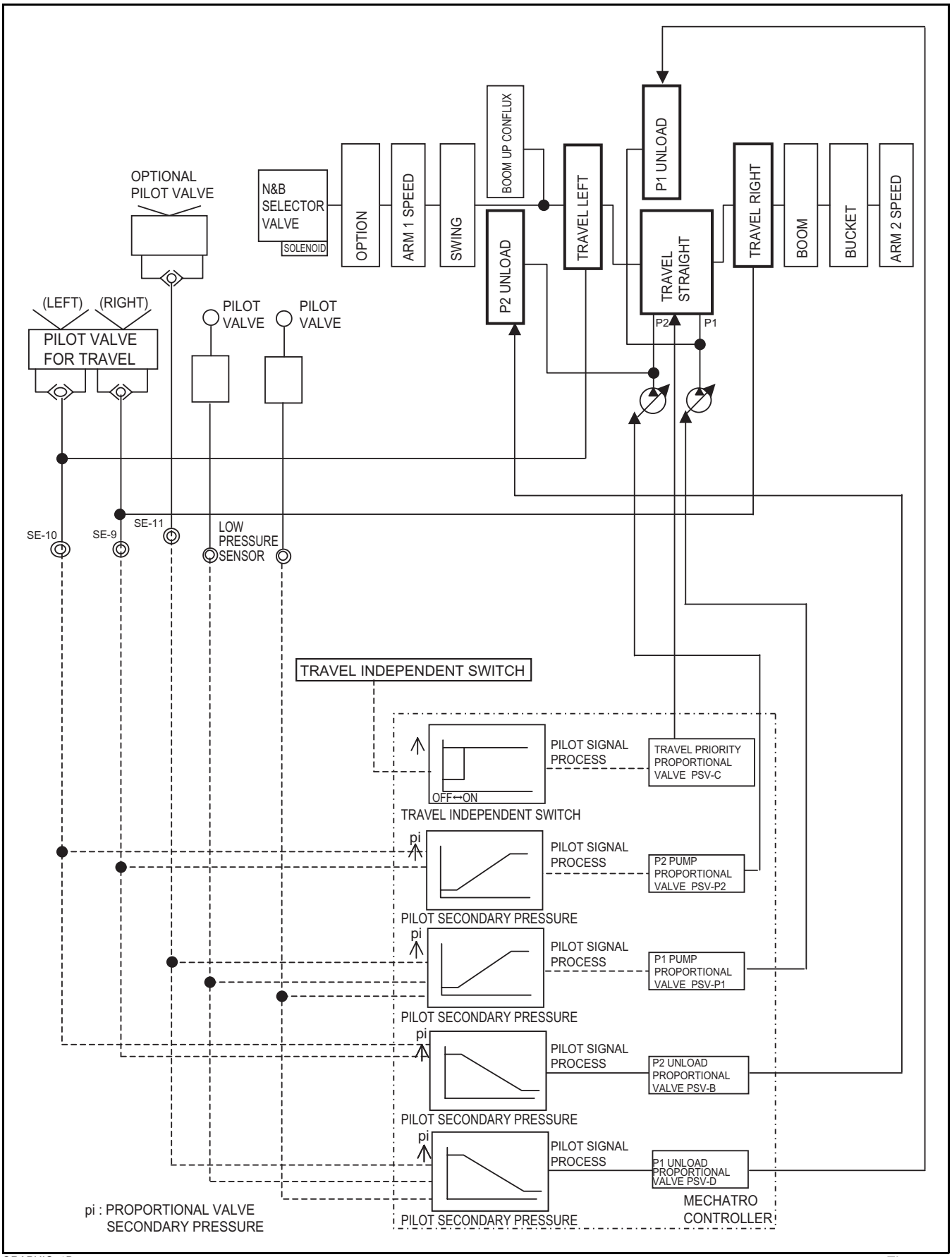
Arm-In Recirculation and Conflux Control



GRAPHIC_1D

Figure 7

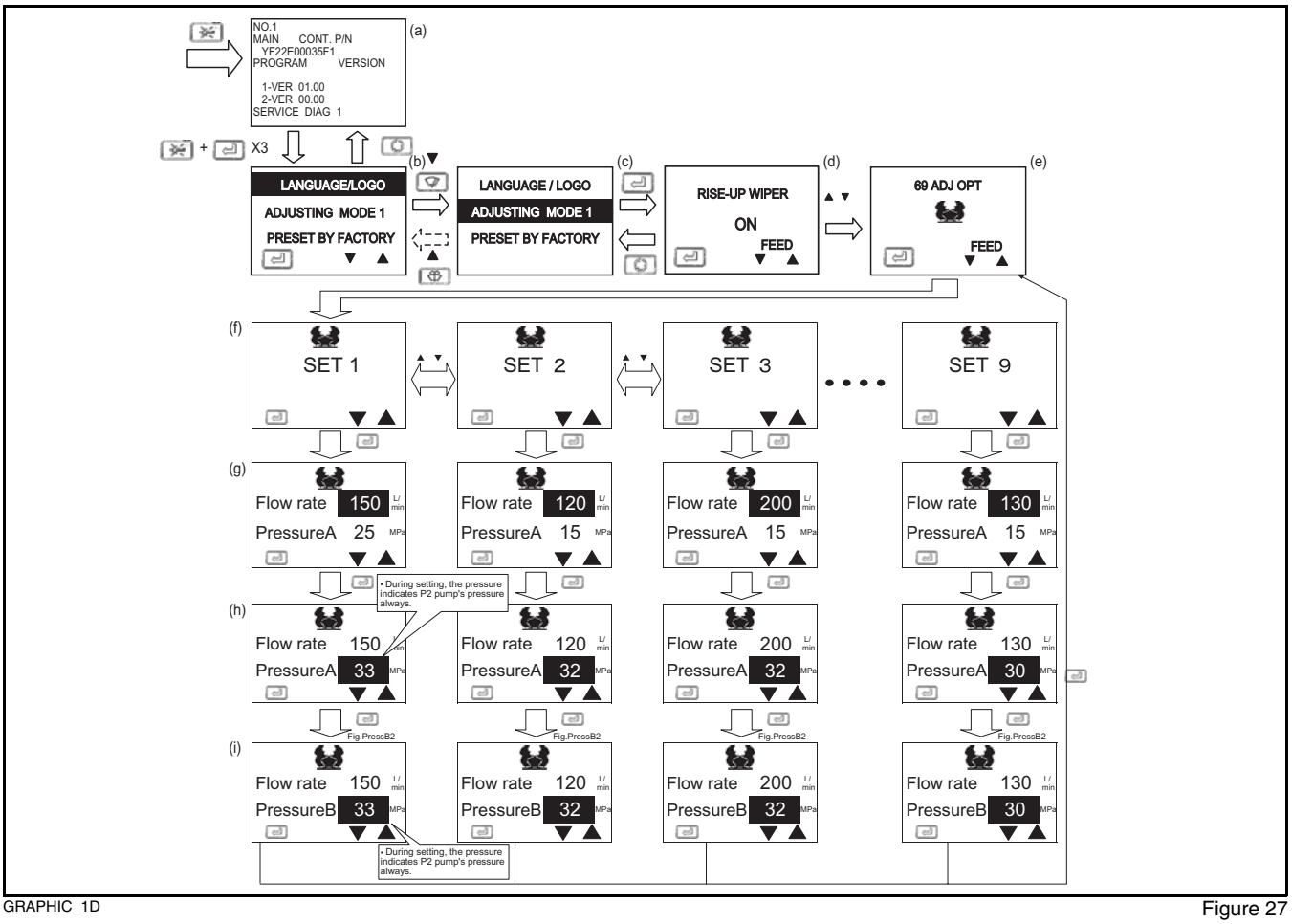
Travel Independent



GRAPHIC_1D

Figure 14

1. When using Nibbler (Crusher)



GRAPHIC_1D

Figure 27

1. Hold buzzer stop switch down and turn starter key switch on, and the service diagnosis mode screen (a) is displayed.
2. Start engine and select work mode **A**.
3. Hold buzzer stop switch down and press select switch 3 times, and the adjusting mode screen (b) is displayed.
4. In operations of UP ARROW (washer switch) and DOWN ARROW (wiper switch), move cursor to ADJUSTING MODE 1 screen (c) and then press select switch and the ADJUSTING MODE 1 (RISE-UP WIPER) screen (d) is displayed.
5. In operations of UP ARROW and DOWN ARROW, move cursor to ADJ OPT (Nibbler) screen (c) and then press select switch and the Nibbler operation relief pressure adjustment (SET 1) screen (g) is displayed.
6. Select the desired setting number (The available setting range is 9 steps from 1 to 9.) and then press select switch and the Flow Rate Adjust Screen (g) is displayed.
7. In operations of UP ARROW and DOWN ARROW, set the flow rate. And press the select switch and then the Pressure (A) adjusting screen (h) is displayed.
8. While depressing the heel of optional right pedal (P2 pump side optional operation), using UP ARROW and DOWN ARROW and adjust the pressure. When desired pressure is indicated, press the select switch to set.
   (*When the select switch is pressed, be careful that 0MPa is usually displayed at time if you do not depress the heel side of right pedal down.)
9. Then Pressure (B) adjusting screen (i) is indicated, and while depressing the toe of optional right pedal, using UP ARROW and DOWN ARROW and adjust the pressure. When desired pressure is indicated, press the select switch to set.
   (*When the select switch is pressed, be careful that 0MPa is usually displayed at time if you do not depress the toe side of right pedal down.)
10. Then the screen returns to ADJ OPT (Nibbler) (e) select screen.

SERVICE DIAGNOSIS DISPLAY FUNCTION

The current service diagnosis is displayed on multi display based on the data received from mechatro controller. This section explains the operating procedure and examples of each screen. The values in display changes according to the conditions like engine speed, attachment position, etc.

Service Diagnosis Display Screen Operating Procedure

1.  Turn starter switch ON keeping buzzer stop switch pressed.
2. After logo mark is displayed, the screen changes in service diagnosis mode.
   The service diagnosis screen Mode No.1, Screen No.1 is displayed first.
   The service diagnosis is classified into three modes, 1, 2, and 3, and the present mode is displayed in Screen No.1.
   The screen number each mode can display differs. The screen number displayed by each mode is as follows.
   Mode No.1 : Screen No.1~No.30
   Mode No.2 : Screen No.1, Screen No.31~No.40
   Mode No.3 : Screen No.1, Screen No.41~No.50
3. The screen changes each time each switch is pressed from now on.
    Washer switch: Screen gains by 1 in order. (No.2→No.3→No.4→..)
    Wiper switch: Screen loses by 1 in order. (No.24→No.23→No.22→..)
    Auto idling switch: Service diagnosis number advances from No.1 to No.3, and then returns to No.1. (No.1→No.2→No.3→No.1→..)
    Travel 1, 2 speed switch: Service diagnosis number advances from No.3 to No.1, and then returns to No.3. (No.3→No.2→No.1→No.3→..)
4. Turn key switch OFF and the display of service diagnosis mode is closed.

TROUBLE HISTORY DIAGNOSIS

The items of error detected by mechatro controller self diagnosis function are stored in mechatro controller as one of history. And the errors are able to be indicated on the multi display.
The warning content is stored partially in Travel history screen.
The error code for self diagnosis is stored.

How to Display

1. Turn starter switch on.
2. Press buzzer stop switch for 10 seconds continuously 5 times and the trouble history screen is displayed.

(Example)

No errors	NO ERROR
Error detected in the past	１０５３０Ｈｒ　Ｆ０２３ ８５００Ｈｒ　Ｇ０３３ ３０００Ｈｒ　Ｐ１２１１ １５００Ｈｒ　Ｃ０１３

GRAPHIC_1D

Figure 44

3. Transmit trouble history data (One or many) and hour meter to gauge cluster.
   Hour meter and 4 failure data are displayed on screen.
   In case of more than 4 failure data, 4 data is displayed at a time for 10 seconds by turns.
4. Paging (Up and down)
   Press washer switch (▲), and the item moves upward.
   Press wiper switch (▼), and the item moves downward.
5. Turn starter switch off, and the display is disappeared.

How to Delete Contents of Trouble History

1. Display trouble history screen.
2. Press work mode change switch and buzzer stop switch simultaneously for 10 seconds or more.
3. When NO ERROR is displayed, the deletion is completed.
4. Turn starter switch off.

NOTE: *All the stored items are erased. It is impossible to erase data partially.*

Connector No.	Pin No.	Port name	Function	Input/putput	Signal level
CN106	1	+24V	Battery relay secondary side	0	20~32V
	2	SHGF			Shield GND
	3	F1+	–	Output	+24V 1.5A
	4	F1-		Output	+24V 1.5A
	5	F2+		Output	+24V 1.5A
	6	F2-		Output	+24V 1.5A
	7	OIL	–	0	
	8	OILG			
	9	D11+	OPT changeable relief 2	Output	+0~800mA
	10	D11-			-0~800mA
	11	D12+	Spare	Output	+0~800mA
	12	D12-			-0~800mA
	13	D13+	Spare	Output	+0~800mA
	14	D13-			-0~800mA
	15	D14+	Spare	Output	+0~800mA
	16	D14-			-0~800mA
	17	GND	Battery (-)		0V
	18	D12+	Spare	Output	+0~800mA
	19	D12-			-0~800mA
	20	E1+	E/G speed sensor	Input	XX~XXVp-p
	21	E1-			0V
	22	SHG3			Shiled GND
	23	CANH2	–		CAN communication
	24	CANL2			CAN communication

Connector No.	Pin No.	Port name	Function	Input/putput	Signal level
CN107	1	DI 3	–	Input	+24V/OPEN
	2	DI 8	Water separetor	Input	GND / OPEN
	3	DI 9	–	Input	GND / OPEN
	4	DI 10	Air filter	Input	GND / OPEN
	5	DI 11	Stroke end check	Input	GND / OPEN
	6	DI 12	KPSS release	Input	GND / OPEN
	7	DI 13	–	Input	GND / OPEN
	8	DI 14	Spare	Input	GND / OPEN
	9	DI 15	Spare	Input	GND / OPEN
	10	DI 20	ECU main relay	Input	GND / OPEN
	11	DI 28	Spare	Input	GND / OPEN
	12	DI 32	Hand control nibbler	Input	GND / OPEN
	13	DI 38	Quick coupler	Input	GND / OPEN
	14	DI 39	Extra pressure	Input	GND / OPEN
	15	DI 40	Spare	Input	GND / OPEN
	16	DI 41	Spare	Input	GND / OPEN
	17		Reserved		

GRAPHIC_1D

Figure 57

CNH America LLC reserves the right to make improvements in design or changes in specifications at any time without incurring any obligation to install them on units previously sold.

All data given in this publication is subject to production variations. Dimensions and weights are only approximate. Illustrations do not necessarily show products in standard condition. For exact information about any particular product, please consult your Dealer

Revision History				
Issue	Issue Date	Applicable Machines	Form Number	Remarks
First Edition	02-2008	215SR ACERA	5-12510	

TRAVEL CIRCUIT

This section describes the following.

1. Travel forward pilot simultaneous operation circuit
2. 2-speed travel solenoid command circuit and auto 1-speed return function
3. Travel main circuit
4. Travel motor function

Travel Forward Pilot Simultaneous Operation Circuit

1. Purpose :
   Light operating force and shockless operation
2. Mechatronics :
   1. If the travel lever with damping mechanism is operated for travel right, left and forward motions, the secondary pilot proportional pressure comes out of the 3, 1 ports of P/V (10). The higher of the pressures is selected, comes out of the 6, 5 ports and acts upon the low pressure sensors (SE9) (SE-10).
   2. The pilot secondary pressure flows to PBr and PBL ports of the control valve (2), moves the travel spool, and switches the main circuit.
   3. The low pressure sensor output voltage is input into mechatro controller. The mechatro controller performs signal processing and outputs current corresponding to the increase of flow rate to P1 pump proportional valve (PSV-P1) and P2 pump proportional valve (PSV-P2), and at the same time the command current is output to P1 unloading valve (PSV-D) and P2 unloading valve (PSV-B).
   4. The secondary pressures output by P1 pump proportional valve (PSV-P1) and P2 pump proportional valve (PSV-P2) exert on pump regulator, actuating the pump on the delivery flow rate increase side.
   5. The secondary pressure delivered in P1 unloading valve (PSV-D) and P2 unloading valve (PSV-B) is fed to PBp1, Pcb, PBp2 and PCa ports provided in control valve (2).
      The secondary pressure from proportional valve which has exerted on PBp1 and PBp2 ports holds the bypass cut spool on CLOSE side, like the operation in the lever neutral position.
      The secondary pressure from proportional valve which has exerted on PCb and PCa ports switches the unloading spool in CLOSE side.

2-speed Travel Solenoid Command Circuit and Auto 1st Speed Return Function

1. Purpose :
   Change travel motor speed with switch.
2. Principle :
   If the switch is turned, an electric signal is issued. It excites the 2-speed travel solenoid which in turn converts the primary pilot pressure and the self pressure to a tilting angle of the variable displacement motor.
3. Operation :
   If the rabbit marked switch on the gauge cluster is pressed, the solenoid (SV-3) of the proportional valve block (13) is excited and changes the proportional valve. Then the solenoid command pressure is issued from port A3, enters the P port of the travel motor (4), opens the oil passage to the 2nd speed select piston, and causes the motor to run in the 2nd speed tilting mode by its self pressure. However, when the main circuit pressure rises above 27.3 MPa (3960 psi), the motor's self pressure pushes the 2nd speed select piston back to the 1st speed.

Travel Main Circuit

1. Operation :
   The delivery oil from Pump A1 and A2 ports by changing the travel spool with the operation of travel pilot flows in each A, B port on the left side of travel motor (4) through C,D ports of swivel joint (8) from BL, BR ports of C/V, and rotates the travel motor.

Travel Motor Function

1. Function :
   1. Prevents the motor from over running on a slope.
   2. Check valve that prevents cavitation of the hydraulic motor.
   3. Shockless relief valve and anti cavitation valve when inertia force stops.
   4. High/Low 2 step speed change mechanism and auto 1st speed return at high load.
   5. Travel parking brake.

Arm Circuit
This section describes the following operations.

1. Arm in, light-load operating pilot circuit
2. Arm in, light-load variable normal recirculation main circuit / internal conflux main circuit

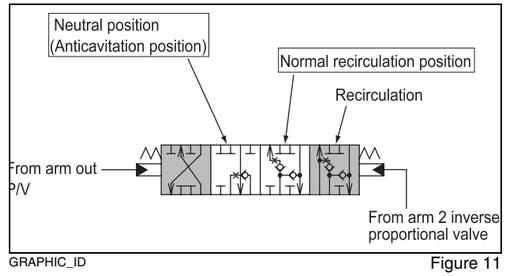
Arm In, Light-Load Operating Pilot Circuit

1. Purpose :
   Speed-up and Anti-cavitation when the arm is at light loaded.
2. Principle :
   The oil returning from the arm cylinder rod (R) is recirculated variably to the head (H) at arm 2 spool in C/V.
3. Operation :
   1. When the arm in operation is performed, the secondary pilot proportional pressure gets out of port 7 of the left pilot valve (9) and acts upon the low pressure sensor (SE-7).
      At the same time, the pressure is branched off in two flows, acts upon the PAa1 port and the PLc2 port, changes over the arm spool and the arm lock valve CRa. releases.
   2. The output voltage by the low pressure sensor is input into mechatro controller, and is pilot signal-processed, and is output to P1, P2 pump proportional valve (PSV-P1), (PSV-P2) and arm 2 inverse proportional valve (PSV-A).
   3. The secondary pressure from pilot proportional valve, which is reduced by arm 2 inverse proportional valve (PSV-A) switches arm 2 spool.

Arm In, Light-Load Variable Normal Recirculation, Internal Conflux Main Circuit

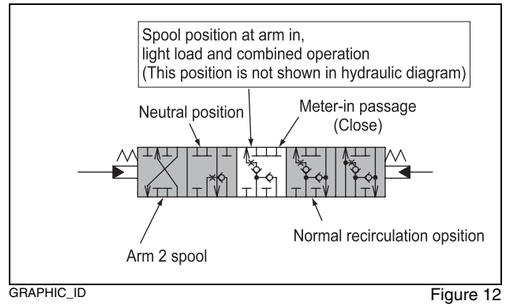
1. Operation :
   1. The P2 pump delivery oil flows in travel left section through P2 port of C/V (2) and is branched off in bypass circuit and parallel circuit, but because arm 1 spool is switched, the delivery oil which goes through parallel circuit opens load check valve LCa and is flowed into arm 1 spool.
   2. On the other hand, P1 pump delivery oil flows in P1 port of C/V (2), and the flows in travel straight section and travel right tandem path. Then because arm 2 spool was switched, the delivery oil opens load check valve LCAT2, goes through arm 2 spool, and confluences with P2 pump delivery oil in the valve section, and then is flowed into arm cylinder head (H) side through Aa port of C/V (2).
   3. The return oil from arm cylinder (R) side flows in Ba port of C/V (2) and passes through the Ba port because the arm lock valve CRa is open, and is flowed into arm 2 spool through arm 1 spool.
   4. Because arm 2 spool is switched to normal recirculation position, causing restriction of passage to tank, the return oil from arm cylinder (R) side flows into arm cylinder (H) side.

      Because, at light load, the pressure in cylinder rod (R) side is higher than that in the head (H) side, it opens the check valve housed-in arm 2 spool and is recirculated in the head (H) side, resulting in the speed up of arm in operation at light load.
   5. Cavitations prevention control in arm in operation
      Command current is output to arm 2 solenoid proportional valve by signal processing of E/G speed and arm in pilot pressure, accordingly the arm 2 spool is switched to neutral (cavitations prevention) position, resulting in cavitations prevention.
      Position of arm 2 spool



GRAPHIC_ID Figure 11

Reference :
In light-load arm in operation (normal recirculation, conflux), when the attachment to which the circuit in P1 pump side is applied is operated, the meter-in path of arm 2 spool is closed, resulting in single flow operation.



GRAPHIC_ID Figure 12

PRESSURE DRAINING (RELEASING) CIRCUIT

This section describes the following operations.

1. Pressure drain (releasing) pilot circuit
2. Pressure drain (releasing) main circuit

Pressure Relieving Pilot Circuit

1. Purpose :
   To release the pressure in main circuit for piping repair works.
2. Principle :
   After the mode is switched to PRESSURE RELIEF MODE with switch on gauge cluster, mechatro controller outputs the following commands.
   1. Minimum tilting command value to pump proportional valve (PSV-P1, PSV-P2).
   2. Output PRESSURE RELIEF CONTROL SPEED COMMAND VALUE at ECU. (Electric system)
   3. Stand-by command value to P1, P2 unloading proportional valves

How to Switch to Pressure Release Mode

1. Select the service diagnosis mode.
   (Keeping pressing of the BUZZER STOP SWITCH [] on gauge cluster, turn the starter key on.)
2. Select the service adjustment mode 1.
   (Under the condition that SCREEN NO.1 of SERVICE DIAGNOSIS MODE 1 is indicated, keeping pressing of the BUZZER STOP SWITCH , press the selector switch [] 3 times. When LANGUAGE/LOGO , ADJUSTING MODE 1 and PRESET BY FACTORY are displayed, press ▲ or ▼switch, and highlight ADJUSTING MODE 1 , and then press Selector Switch again.)
3. When ADJUSTING MODE 1 screen is displayed, press ▲ or ▼ switch, and DRAIN HYD. OFF screen appears.
4. Press Selector Switch and highlight OFF , and press ▲ switch to change to DRAIN HYD. ON , and then press Selector Switch again.

3. Operation :
   1. Pump proportional valve reduces the pump flow rate to the minimum.
   2. Unloading proportional valves (PSV-D, PSV-B) output secondary pressure and the secondary pressure flows in PCb, PCa ports of C/V(2) and switches the P1, P2 unloading valves to OPEN position.

Pressure Release Main Circuit

1. Operation :

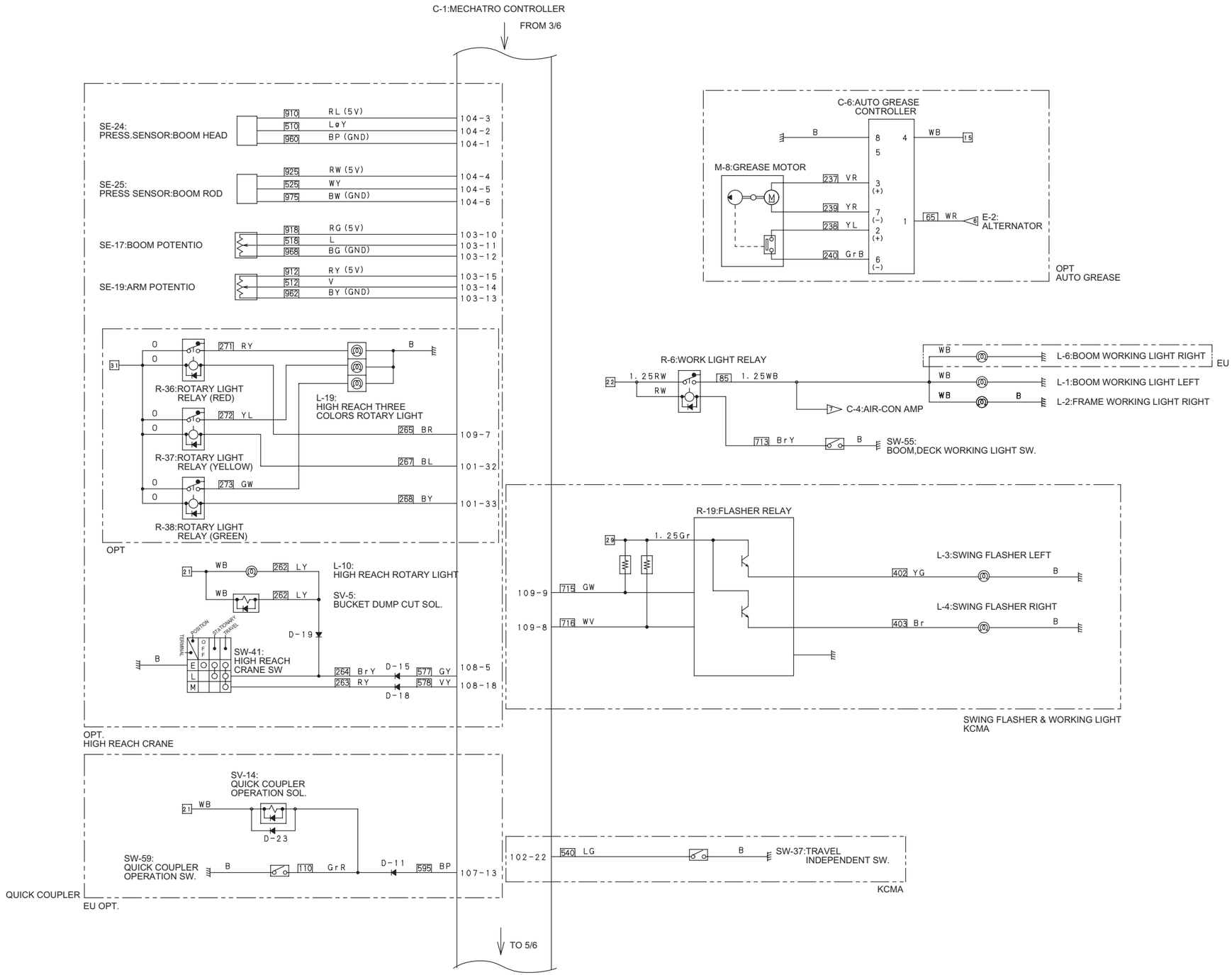
⚠ CAUTION ⚠

When the hydraulic pressure releasing is performed, make sure to place bucket on the ground.

When the operating lever is shifted to neutral during engine running, DRAINING HYD. PRESS. is displayed on the gauge cluster while the mode switch is changed to pressure relieving mode. In this time the intermittent buzzer sounds continuously. When right and left operating levers are operated 4 or 5 times to their full stroke, pressure is relieved.
After draining pressure is completed, turn off the starter key and buzzer sound stops. If the pump pressure is determined to be more than 1 MPa (145 psi) by the output value of the high pressure sensor or the high pressure sensors (SE-22,23) are broken, FAIL DRAIN HYD. PRESS is displayed and the buzzer sounds continuously. In that case, also the buzzer is not stopped unless the engine key is turned to OFF. Repeat the pressure releasing procedure once again.

2. Hydraulics :
   Unload spool is switched to open position, and the oil delivered by each pump is unloaded to the tank passage.
   If the spools are switched by pilot operation, the remaining pressure from the actuators may be relieved to the tank circuit, i.e. the main circuit pressure may be released.

SECTION 3 - SYSTEMS
CHAPTER 3 - ELECTRIC SYSTEM



GRAPHIC_1D

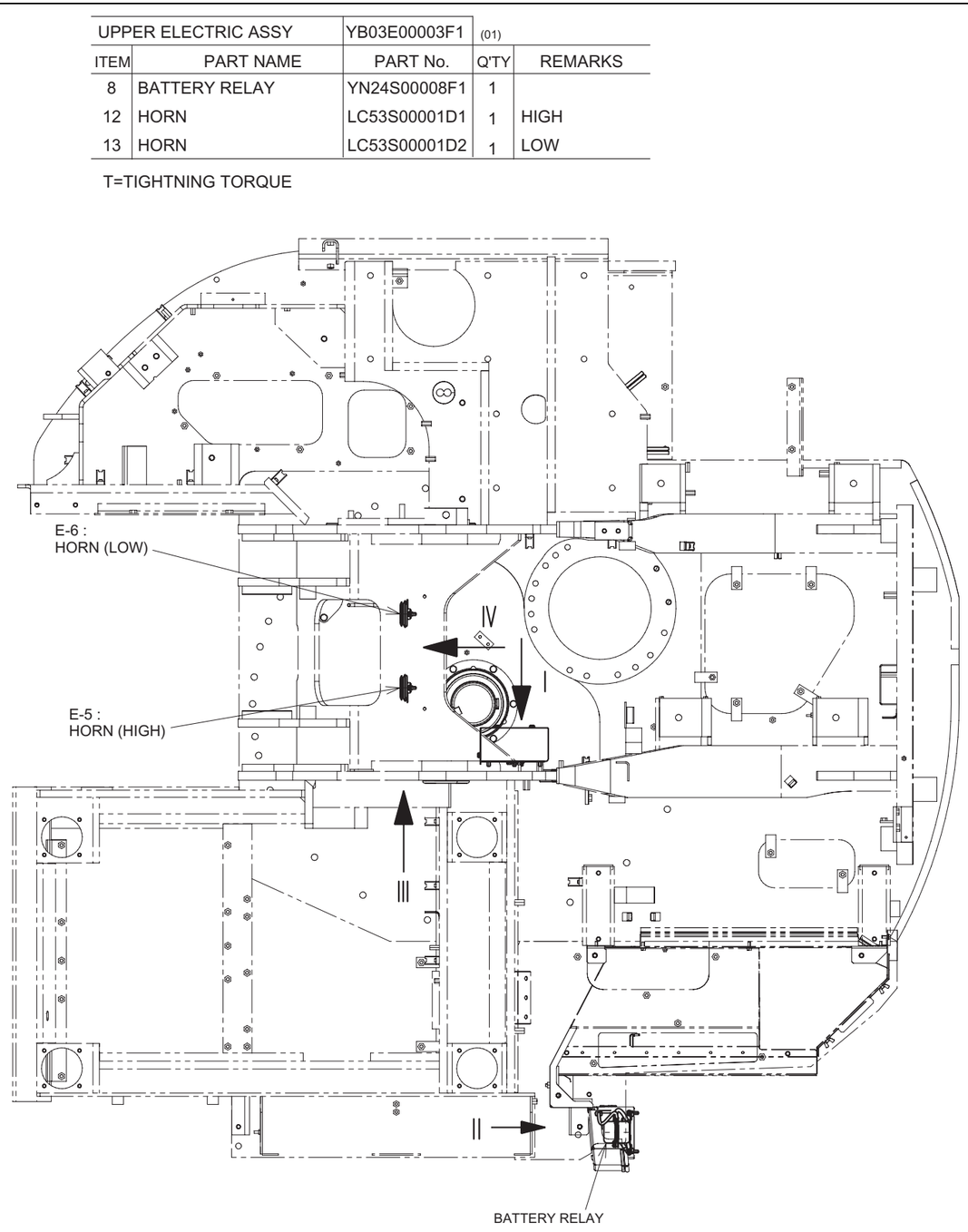
Figure 4

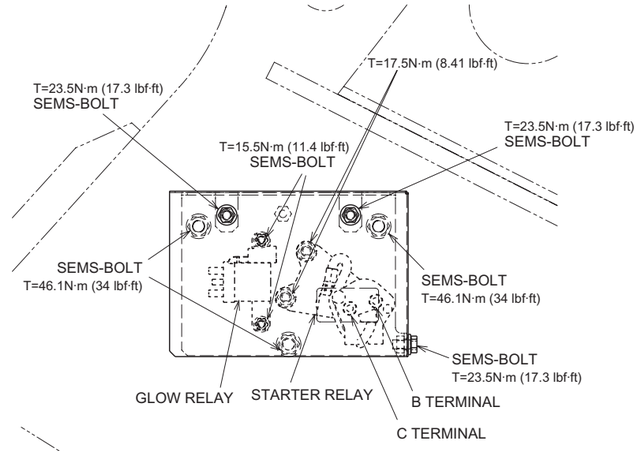
SECTION 3 - SYSTEMS
CHAPTER 3 - ELECTRIC SYSTEM

Upper Electric Assembly

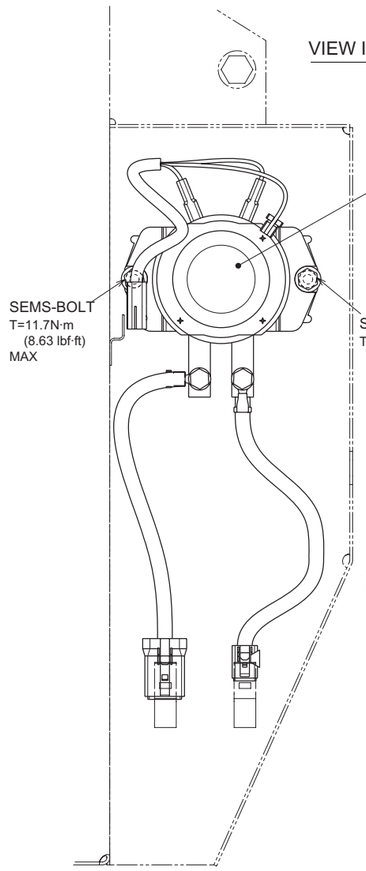
UPPER ELECTRIC ASSY		YB03E00003F1	(01)	
ITEM	PART NAME	PART No.	Q'TY	REMARKS
8	BATTERY RELAY	YN24S00008F1	1	
12	HORN	LC53S00001D1	1	HIGH
13	HORN	LC53S00001D2	1	LOW

T=TIGHTNING TORQUE

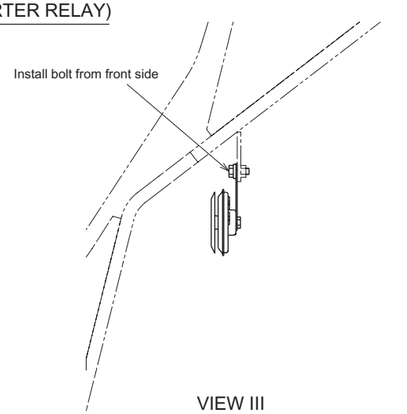




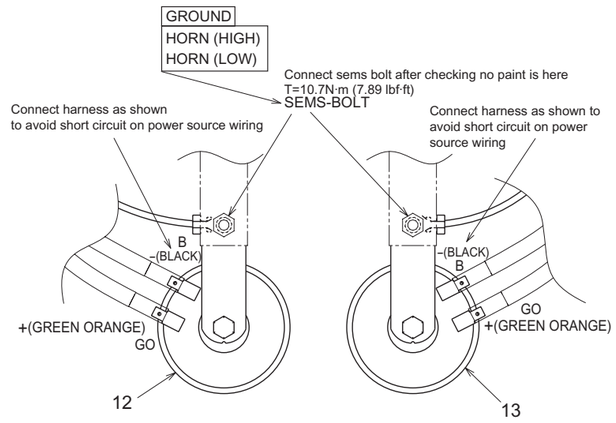
VIEW I (GLOW RELAY, STARTER RELAY)



VIEW II (BATTERY RELAY)



VIEW III



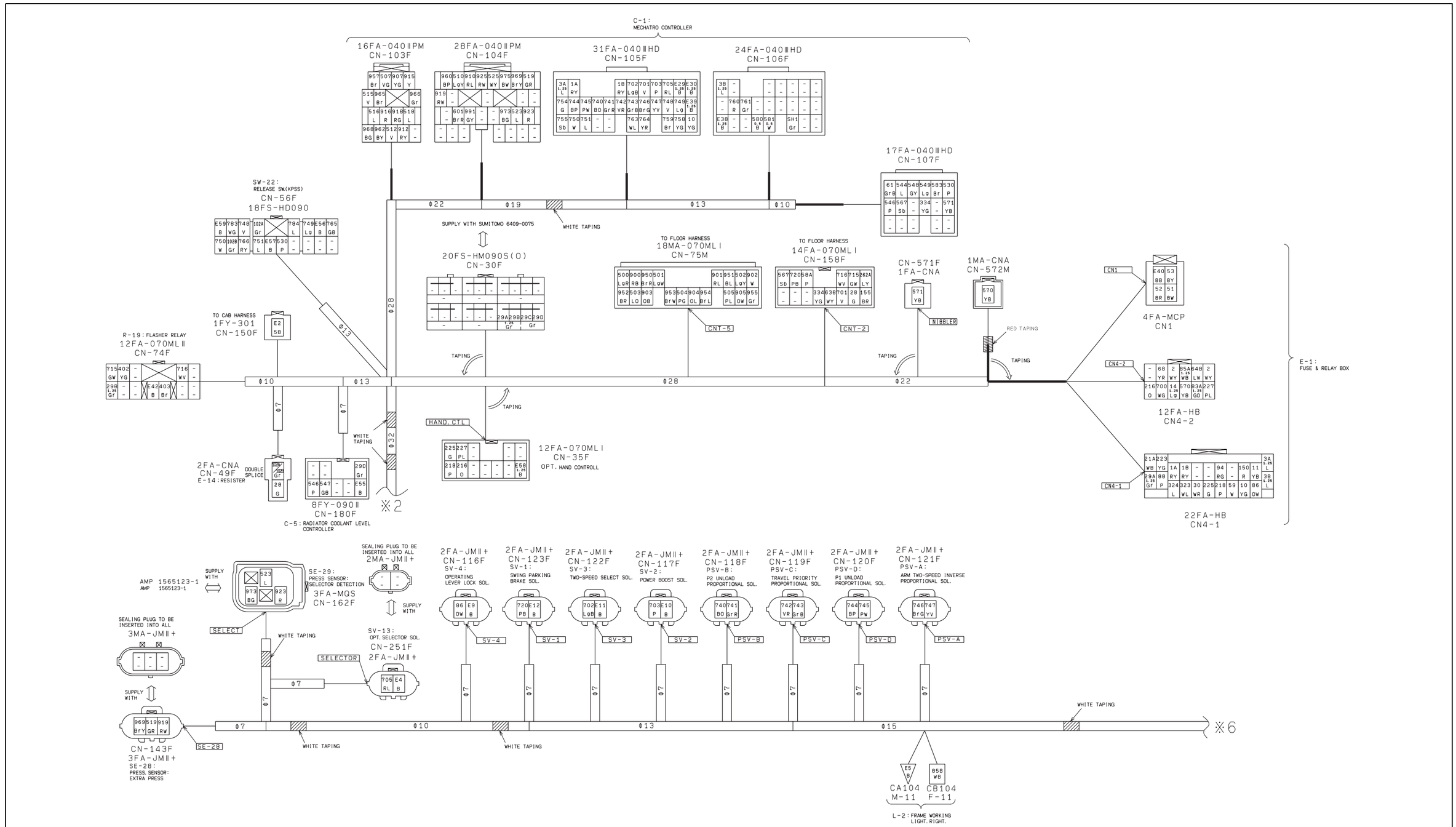
VIEW IV

GRAPHIC_1D

Figure 14

SECTION 3 - SYSTEMS
CHAPTER 3 - ELECTRIC SYSTEM

Upper Harness (3/5) : YB13E01070P4



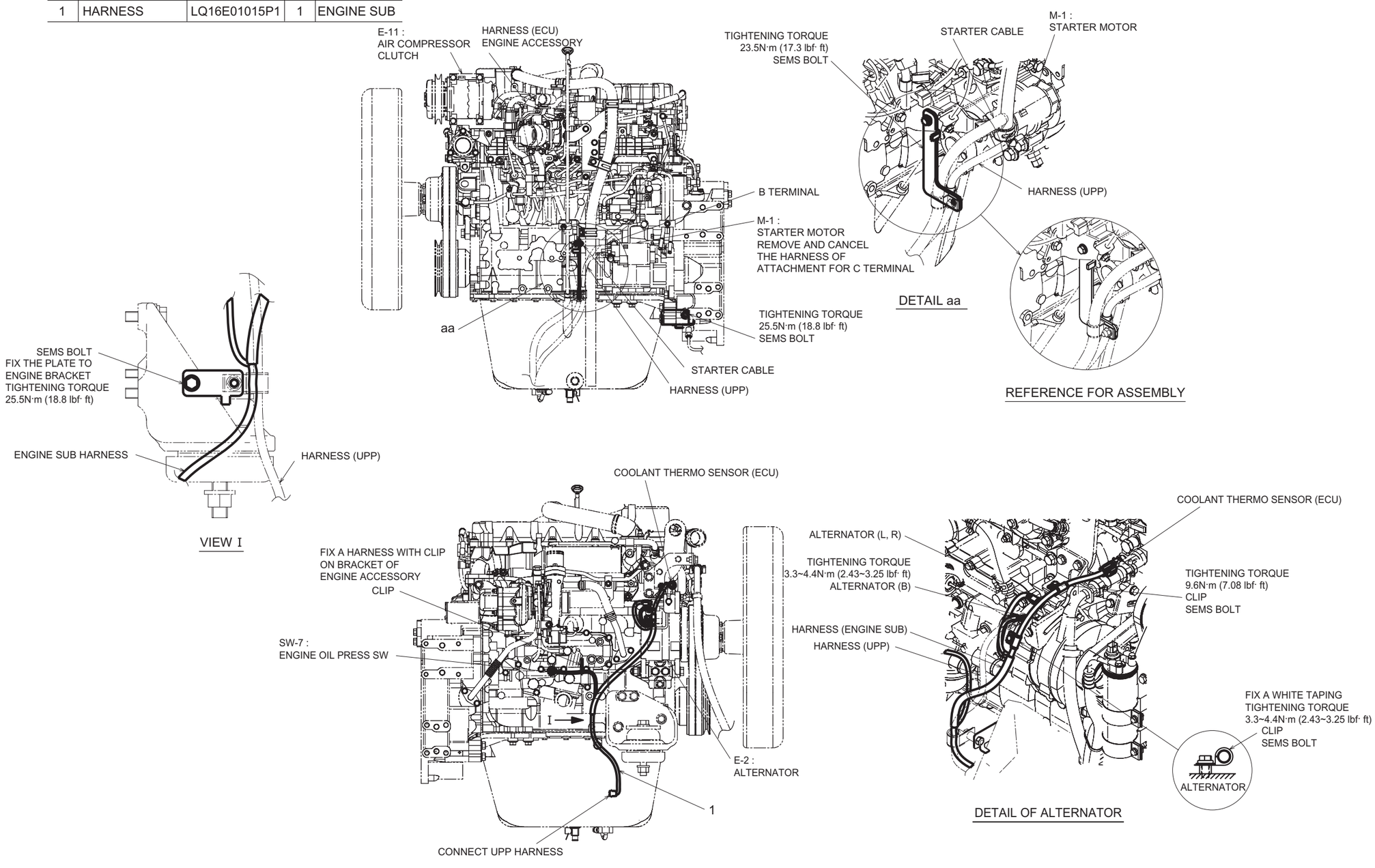
GRAPHIC_1D

Figure 24

SECTION 3 - SYSTEMS
CHAPTER 3 - ELECTRIC SYSTEM

Engine Harness Assembly

ENGINE HARNESS ASSY		YB16E00002F1	(01)	
ITEM	PART NAME	PART No.	Q'TY	REMARKS
1	HARNESS	LQ16E01015P1	1	ENGINE SUB



GRAPHIC_1D

Figure 37

Cab Harness (2/2): YB14E01027P1

7	YL	AVSS0.75sq	F-61		CN-72F
11	YB	AVSS0.75sq	CN-54F		CN-72F
13	YB	AVS0.5sq	CN-600F		CN-72F
18	RG	AVSS0.75sq	CN-72F		CN-500F
19	W	AVS0.5sq	CN-600F		CN-72F
25	WG	AVSS1.25sq	CN-500F		CN-72F
26	RL	AVSS0.75sq	CN-500F		CN-71F
27A	RB	AVSS0.75sq	CN-71F		CN-511F
27B	RB	AVSS0.75sq	CN-71F		CN-37F
65	WR	AVSS0.75sq	CN-607F		CN-72F
80	GrR	AVSS0.75sq	CN-604F		CN-72F
81	GrB	AVSS0.75sq	CN-604F		CN-72F
85	WB	AVSS0.75sq	CN-500F		CN-72F
89	BrL	AVSS0.75sq	CN-501F		CN-71F
90A	RY	AVSS1.25sq	F-1	DOUBLE SPLICE	CN-72F
90B	RY	AVSS1.25sq	F-1	DOUBLE SPLICE	F-3
90C	RY	AVSS0.75sq	F-4		F-3
91	Y	AVSS0.75sq	F-63		CN-71F
92	RW	AVSS1.25sq	F-2		CN-72F
96	WG	AVSS0.75sq	CN-62F		CN-71F
98	LW	AVSS0.75sq	CN-25F		CN-71F
99	Br	AVSS0.75sq	CN-25F		CN-71F
100	LR	AVSS0.75sq	CN-24F		CN-71F
101	OB	AVSS0.75sq	CN-24F		CN-71F
150	BP	AVSS0.75sq	CN-500F		CN-72F
210	LB	AVSS0.75sq	CN-511F		CN-37F
211	LW	AVSS0.75sq	CN-511F		CN-37F
262	LY	AVSS0.75sq	CN-518M		CN-66F
263	RY	AVSS0.75sq	CN-512F		CN-66F
264A	BrY	AVSS0.75sq	CN-512F	DOUBLE SPLICE	CN-66F
264B	BrY	AVSS0.75sq	CN-512F		CN-518M
557	L	AVSS0.75sq	CN-604F		CN-71F
558	G	AVSS0.75sq	CN-604F		CN-71F
559	PB	AVSS0.75sq	CN-60F		CN-71F
564	LY	AVSS0.75sq	CN-504F		CN-71F
578	VY	AVSS0.75sq	CN-518M		CN-66F
713	BrY	AVSS0.75sq	CN-510F		CN-72F
582	W	MVVS0.5sq	CN-600F		CN-71F
770	R	SHIELDED CABLE (3 CORE)	CN-600F		CN-71F
980	B		CN-600F		CN-71F
SH	Gr		UN-CONNECTED		CN-71F

E1	B	AVS0.5sq	CN-600F		CN-605F
E2	B	AVSS0.75sq	CN-501F		CN-605F
E3	B	AVSS0.75sq	CN-512F		CN-605F
E4	B	AVSS1.25sq	CN-500F		CN-605F
E6	B	AVS5sq	P-2	DOUBLE SPLICE	CN-515M
E5	B	AVSS1.25sq	P-2		CN-605F
E7	B	AVSS0.75sq	CN-510F		CN-605F
E20	B	AVSS1.25sq	M-3	DOUBLE SPLICE	CN-605F
E21	B	AVSS0.75sq	M-3		M-4
E8	B	AVSS1.25sq	P-1	DOUBLE SPLICE	CN-605F
E22	B	AVSS1.25sq	P-1		CN-605F
E9	B	AVSS0.75sq	CN-605F		CN-60F
E10	B	AVSS0.75sq	CN-605F		CN-608F
E11	B	AVSS0.75sq	CN-605F		CN-604F
E12	B	AVSS0.75sq	CN-605F		CN-606F
E13	B	AVSS0.75sq	CN-605F		CN-61F
E14	B	AVSS0.75sq	CN-605F		CN-37F
E15	B	AVSS1.25sq	CN-605F		CN-605F
E16	B	AVSS0.75sq	CN-504F		CN-605F
E17	B	AVSS1.25sq	M-1	DOUBLE SPLICE	CN-605F
E18	B	AVSS0.75sq	M-1		M-2
E19	B	AVSS0.75sq	M-63		CN-605F

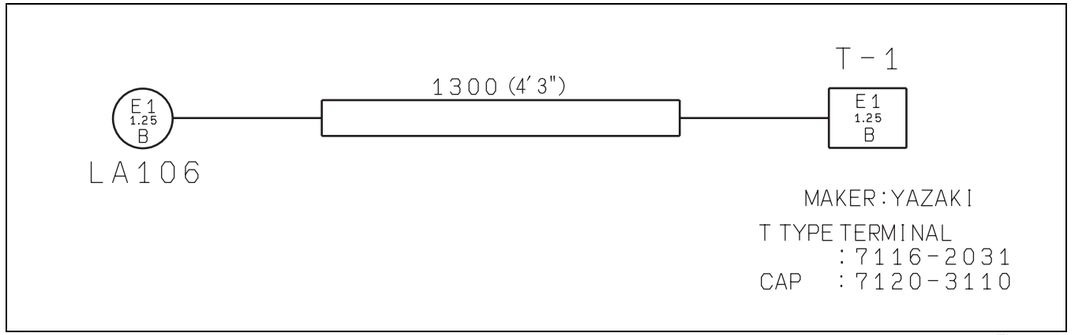
CONNECTORS SELECTION TABLE

CONNECTOR NAME (PIN NUM.)	MANUFUC.	PART. NUMBER	
		HOUSING	TERMINAL
1FA-CNA	AMP	172128-1	170032-2
2FA-CNA	AMP	172130-1	170032-2
3FA-CNA	AMP	172132-1	170032-2
4FA-CNA	AMP	172134-1	170032-2
6FA-CNA	AMP	171898-1	170032-2
3FA-CNA(L)	AMP	172132-5	170032-2
3FA-CNA(G)	AMP	172132-4	170032-2
4FA-CNA(B)	AMP	172134-2	170032-2
8FA-040MLI	AMP	174044-2	173681-2
20FS-HM090S(Gr)	SUMITOMO	6400-0081 6409-0255	6240-4422
CA104	AMP	170002-5	170887-1
CB104	AMP	170003-5	170889-1
1FA-POL	AMP	171809-2	170233-1
6FY-58M	YAZAKI	7123-6060	7116-2871
14FA-070MLI	AMP	173852-1	173631-1 173631-2 (金メッキ)
20FA-070MLI	AMP	174952-1	173631-1 173631-2 (金メッキ)
1MY-301	YAZAKI	7122-3010	7114-3030
4FY-D090A	YAZAKI	7123-7144	7116-1181P
3MA-CNA	AMP	172131-1	170340-1
1FA-HSG	AMP	1-480416-0	170213-2
1FA-205	AMP	4-170823-1	170179-1

GRAPHIC_1D

Figure 48

Key Switch Ground Harness: YN14E01106P1



GRAPHIC_1D

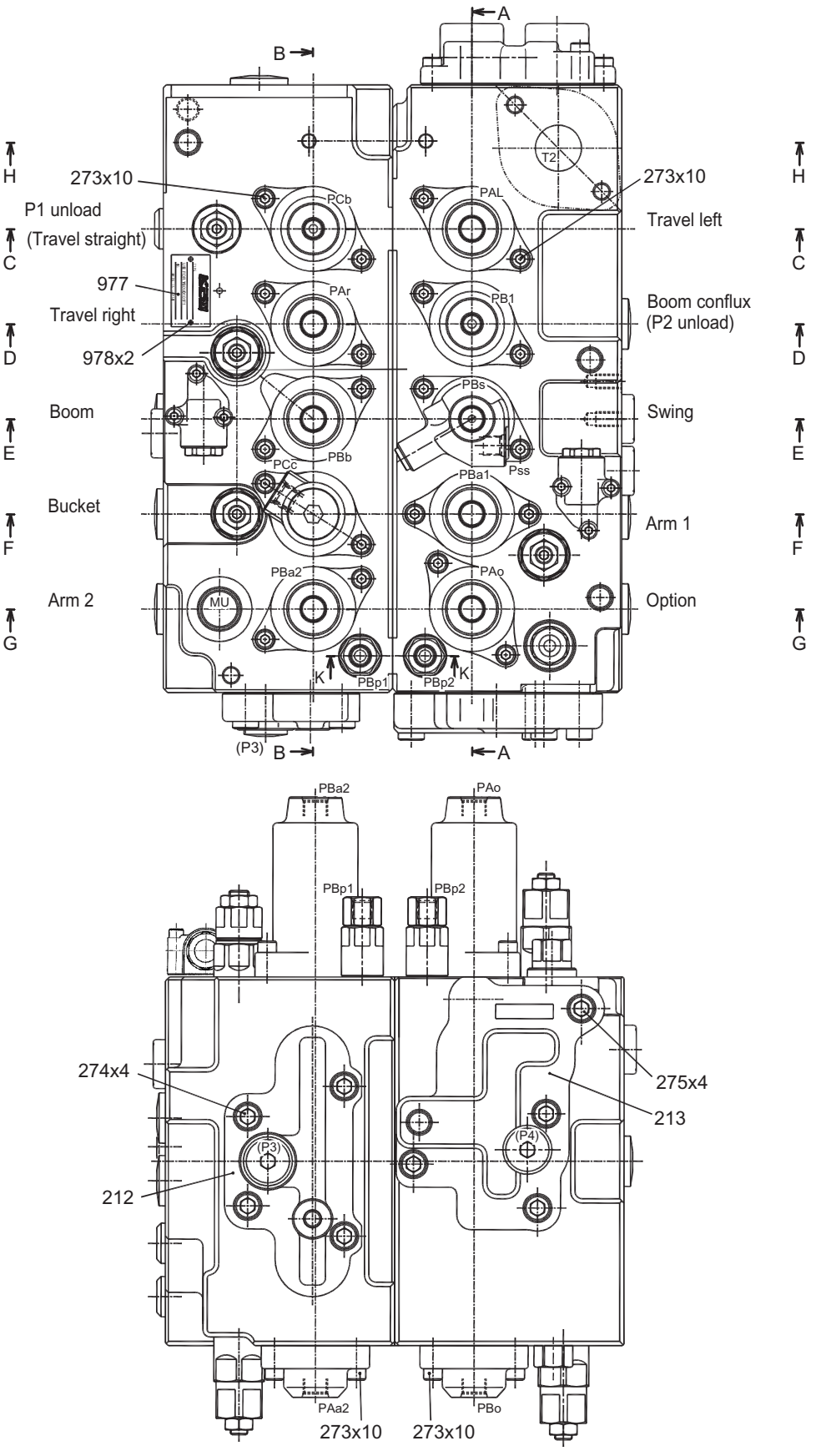
Figure 49

Operation

1. Control function
   Control function …… Electric flow control.
   Positive flow control.
   Total horsepower control.

2. Summary
   The regulator KR3G-0E01-V for the in-line type axial piston pump K3V series is composed of the control mechanism as mentioned below:

   A. Electric flow control and positive flow control
      The tilting angle of the pump (delivery rate) is controlled by controlling the current command value of the solenoid proportional reducing valve attached to the regulator. The regulator makes positive flow control (positive control) that increases the delivery rate as the secondary pressure of the solenoid proportional reducing valve rises. Since this function permits the output power of the pump to be varied, it is possible to attain optimum power according to the operating condition. Also, since the pump delivers only the necessary oil flow, the machine does not consume excessive power.

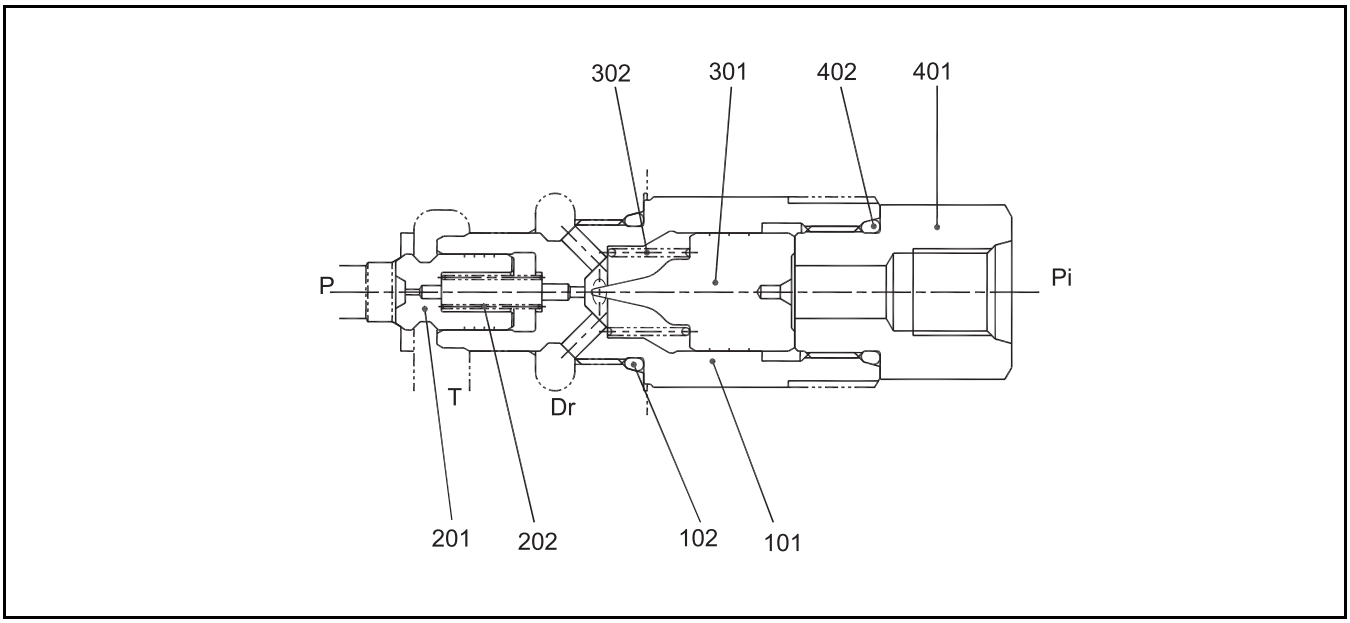


GRAPHIC_1D

Figure 20

SECTION (2/6)

7. Bypass cut valve (606)



GRAPHIC_1D

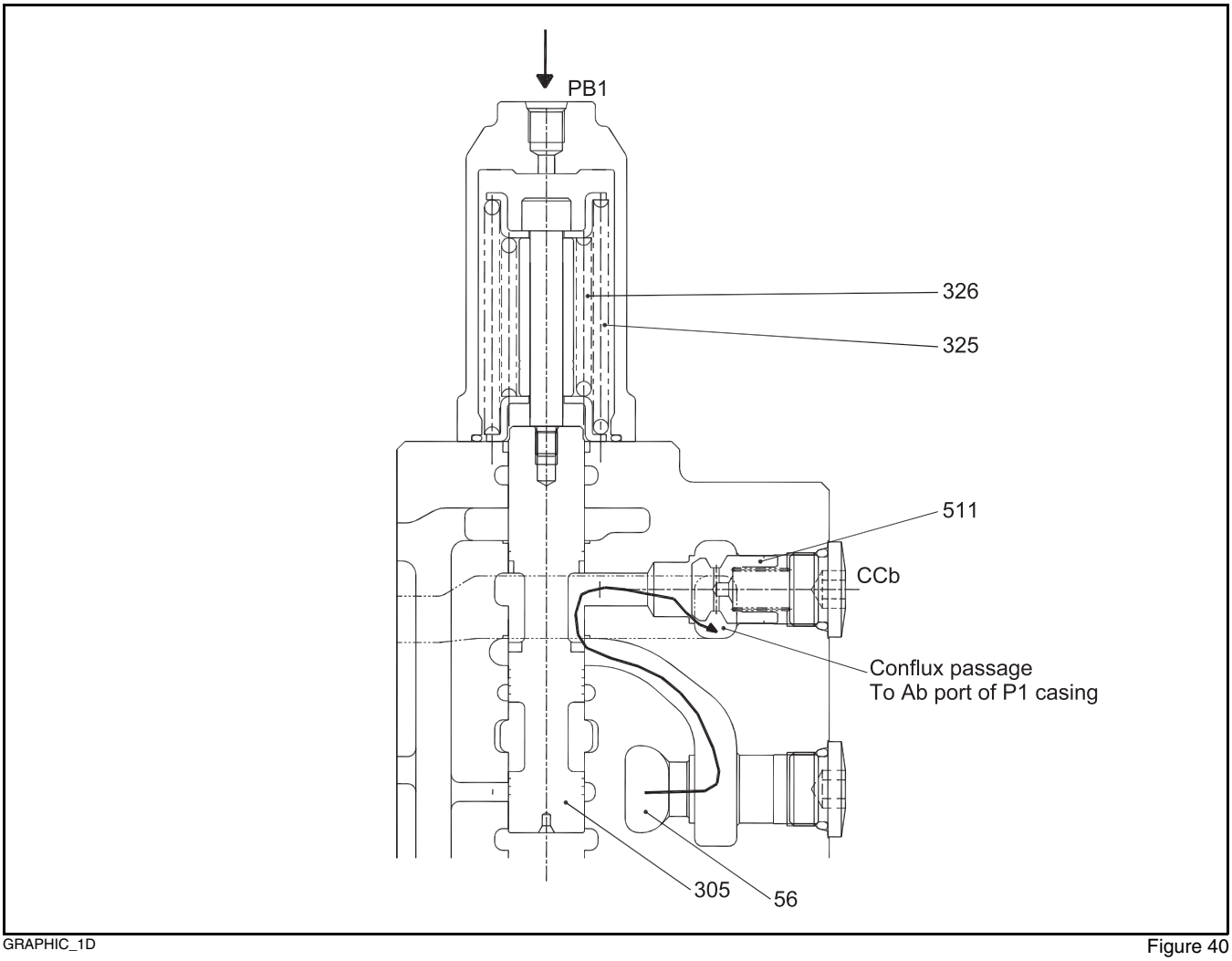
Figure 30

BYPASS CUT VALVE

Tightening torque Nm (pound-ft)	No.	Parts	Qty	Tightening torque Nm (pound-ft)	No.	Parts	Qty
98~120 (72~89)	101	Plug	1		301	Plunger	1
	102	O-ring	1		302	Spring	1
	201	Poppet	1	69~78 (51~58)	401	Plug	1
	202	Spring	1		402	O-ring	1

B. In boom up conflux operation

The hydraulic oil delivered by hydraulic pump P2 passes through travel left spool and enters parallel passage (56), and pushes and opens load check valve CP2, and flows through between the perimeter of boom conflux spool (305) and casing from the A side of U-shaped passage, and pushes and opens conflux check valve CCb (511) and enters port Ab through conflux passage inside of casing and confluents the hydraulic oil from the hydraulic pump P1 side.



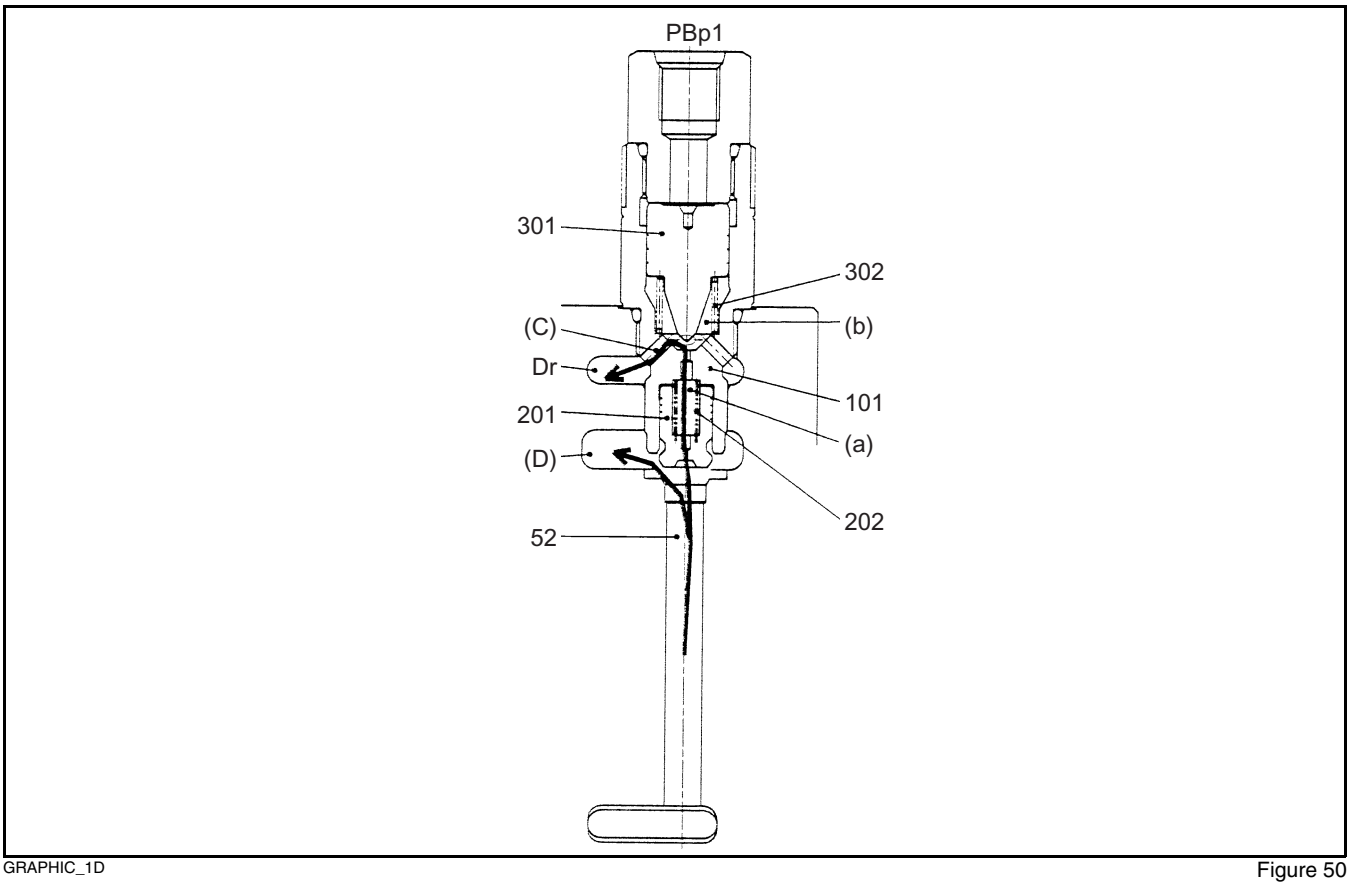
GRAPHIC_1D

Figure 40

B. At the time when failure occurred

When the electric system is failed and consequently the secondary pressure of solenoid proportional valves [X1] and [X2] is not produced, plunger (301) is moved upward by the force of spring (302). Since the taper section at the top end of plunger (301) is lifted up from the seat section of plug (101), spring chamber (a) of poppet (201) and spring chamber (b) of plug (101) are connected each other.

The hydraulic oil from center bypass passage (52) passes through the orifice of poppet (201) and enters spring chamber (a) of poppet (201). Because spring chamber (a) of poppet (201) and spring chamber (b) of plug (101) are connected each other, the hydraulic oil in spring chamber (a) of poppet (201) passes through from seat section of plug (101) to spring chamber (b) and flows into passage (Dr) through passage (c). Consequently the pressure in spring chamber (a) of poppet (201) lowers, poppet (201) receives the pressure of center bypass passage (52) and is lifted up against the force of spring (202), and the hydraulic oil from center bypass passage (52) flows into low pressure passage (D) through poppet (201) of bypass cut valve (606). Therefore when the electric system is failed, P1 unloading spool (309) is shifted to the neutral position and the passage to low pressure passage (D) is cut off, but because center bypass passage (52) is connected to low pressure passage (D) through bypass cut valve (606), the abnormal rise of the pump pressure is prevented.



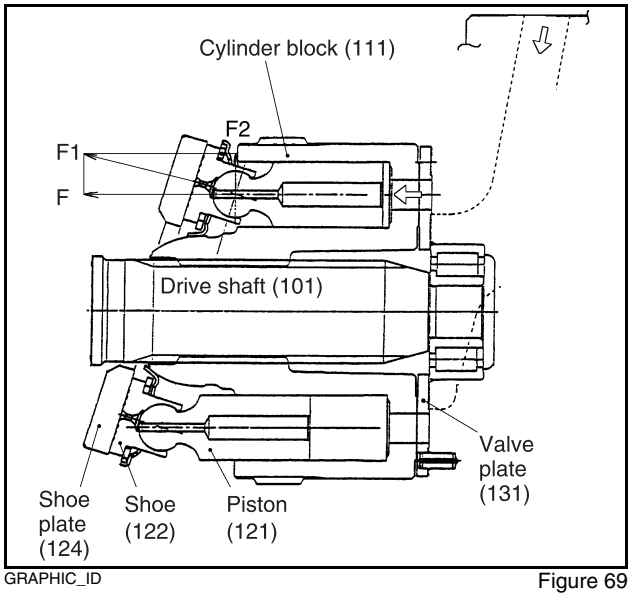
GRAPHIC_1D

Figure 50

4. Operation in the area where the tilting angle of the lever is large.
   (varies with the model)
   If the lever is inclined beyond a certain angle on certain models, the top end of the spool contacts the bottom of the bore of the push rod. This keeps the output pressure connected with the P port pressure.
   Furthermore, on a model in which a spring seat and a spring are built in the push rod, the bottom of the bore of the push rod contacts the spring if the lever is turned beyond a certain angle. This causes the secondary pressure gradient to change by the spring action. Thereafter, the bottom of the bore of the push rod contacts the top end of the spring seat, keeping the output pressure connected with the P port.

Operation Of Hydraulic Motor

If the high pressure oil flows into the cylinder through the inlet port (a) of valve plate (131), as shown on the figure on the right, the hydraulic pressure acts upon piston (121) and creates force F in the axial direction. The force F may be divided into force F1 vertical to shoe plate (124) via shoe (122) and force F2 at right angles with the shaft.
The force F2 is transmitted to cylinder block (111) via pistons (121) and causes drive shaft to turn so as to produce a rotating moment.
The cylinder block (111) has nine pistons equally arranged. Rotating torque is transmitted to drive shaft by turns by pistons connected to inlet port of high pressure oil.



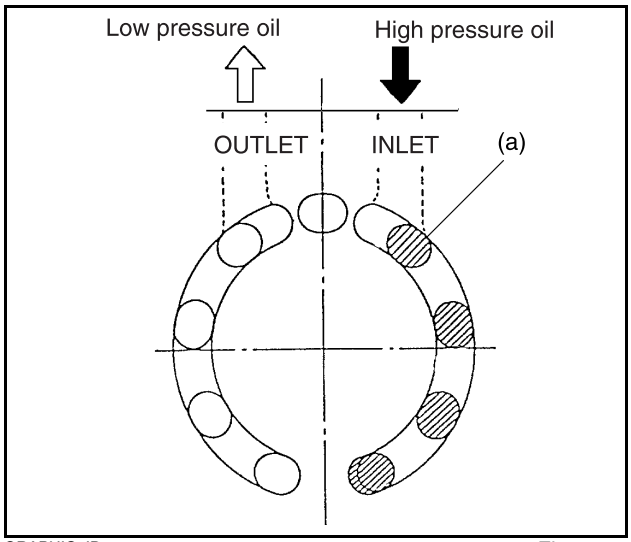
GRAPHIC_ID
Figure 69

If the oil supply and discharge directions are reversed, the drive shaft rotates in the opposite direction.
Theoretical output torque T can be given by the following equation.

$$T = \frac{P \times q}{2 \times \pi}$$

P ; Effective differential pressure MPa
q ; Displacement per revolution cc/rev

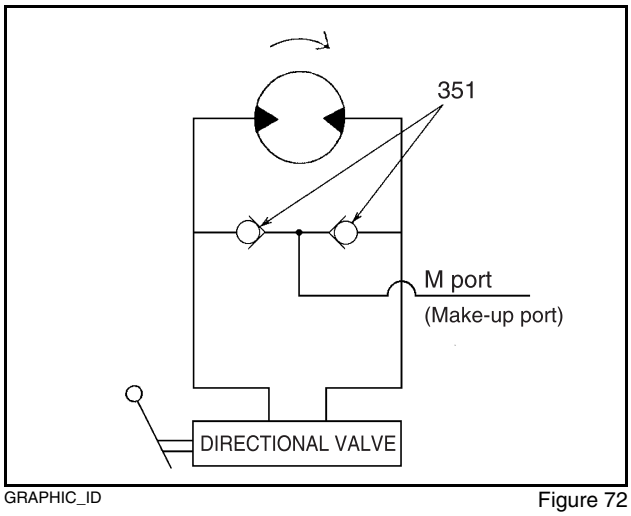
GRAPHIC_ID
Figure 70



GRAPHIC_ID
Figure 71

VALVE CASING SECTION

1. Operation of anti-cavitation check plunger
   Since the system using this type of motor is not equipped with a valve having a counterbalance function, the motor is rotated beyond the oil feed rate in some cases.
   The system has check plunger (351) and sucks in deficient oil, in order to prevent cavitation from occurring due to oil deficiency.



GRAPHIC_ID
Figure 72

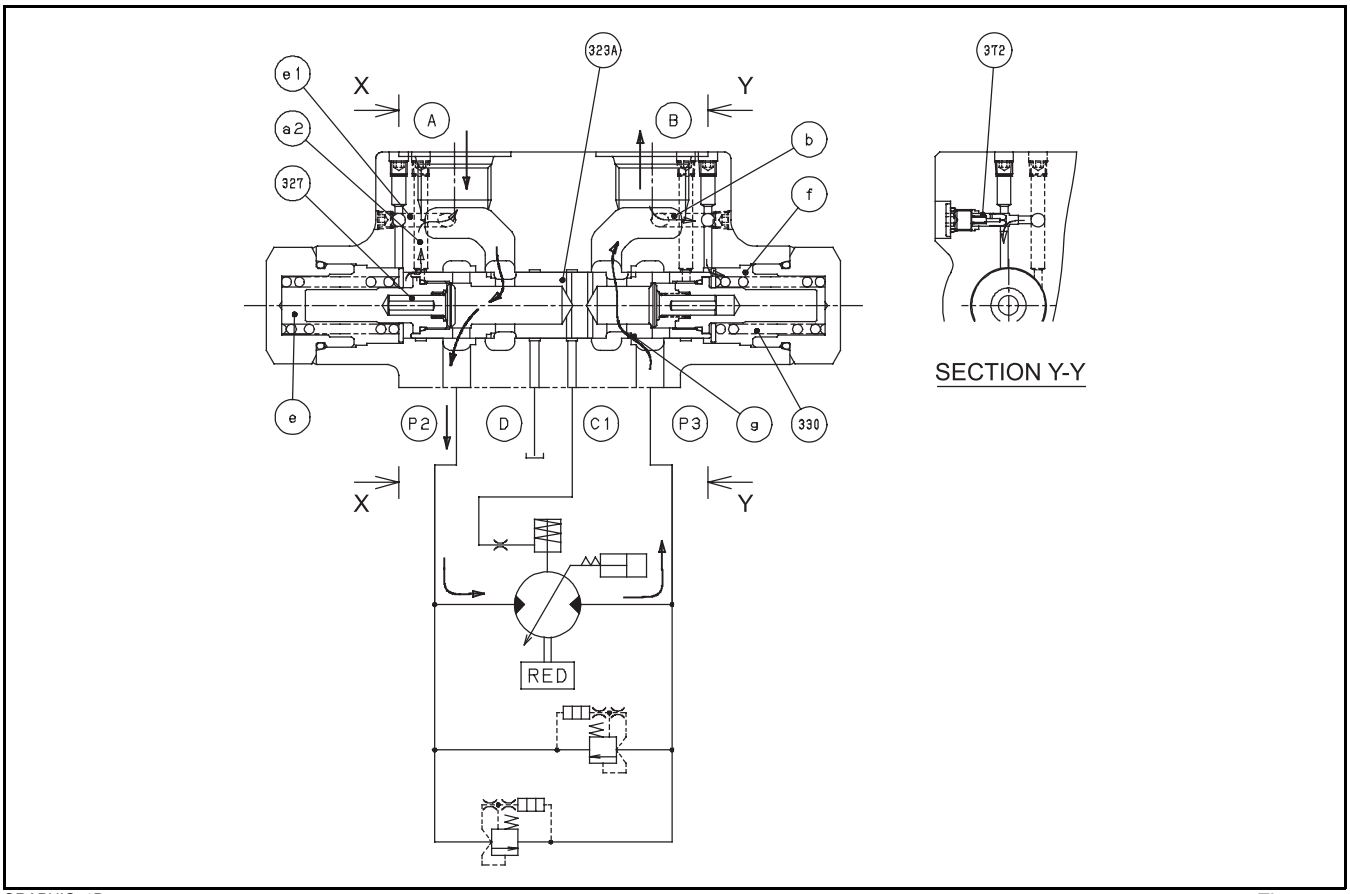
OPERATION OF ANTI-CAVITATION CHECK PLUNGER

B. When slowing down the speed and in traveling down on slope

On reducing the oil flow rate supplied from control valve to port A to slow down the travel speed, the pressure at port A and port P2 lowers because the force of inertia is applied to the hydraulic motor. Consequently the hydraulic pressure which is used to push spool assembly (323A) in chamber (e) is cancelled, and the spool assembly which has been shifted rightward tries to return to the neutral position with the force of spring (330). At this time passage g is restricted and the flow rate from port P3 to port B is limited. With this actuation, the pressure is generated on port P3 and the pressure gives the braking force to the hydraulic motor which is tried to continue rotating with the force of inertia to slow down the speed. When reaching to the target speed, the pressure at port A and port P2 rises and the spool assembly slides rightward to the former position and restores the operation in the former state.

And when the spool assembly tries to return to the neutral position, the hydraulic oil in chamber (e) is discharged into port A side through passage b2. At the same time, the hydraulic oil passes through passage b and pushes and opens orifice (372) located on the section Y-Y and is supplied to chamber (f) to prevent cavitation generating in chamber (f).

On traveling on slope, the force acts on hydraulic motor to increase the speed from the outside. Consequently the pressure at port A and port P2 lowers, like the actuation when slowing down the speed, the hydraulic pressure in chamber (e) is cancelled, and the spool assembly which has been shifted rightward tries to return to the neutral position. At this time passage g is restricted to limit the flow rate from port P3 to port B, and the pressure is generated on port P3 and the braking force is supplied to the hydraulic motor. This braking force resists the external force used to increase the speed of hydraulic motor, and prevents self traveling of hydraulic motor. And also in cases where hydraulic oil is supplied to port B, because the spool assembly which has been pushed leftward tries to return to the neutral position, the braking force is supplied to the hydraulic motor to prevent the speed from slowing down and self traveling.

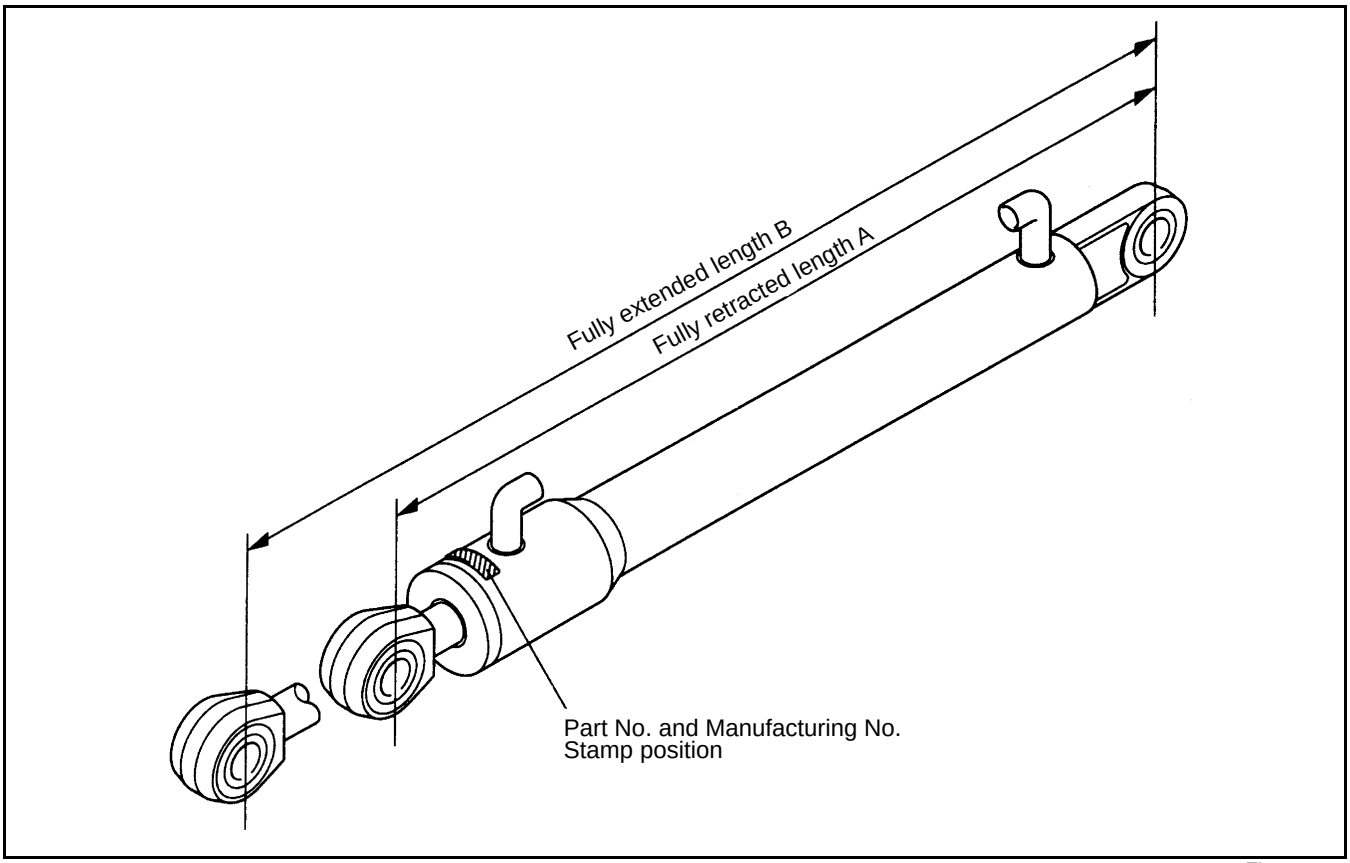


GRAPHIC_1D

Figure 91

CYLINDER

General View



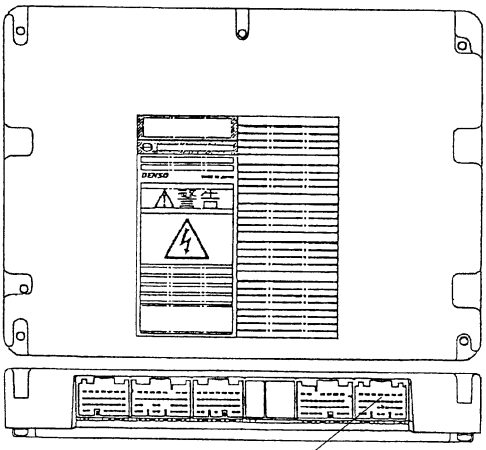
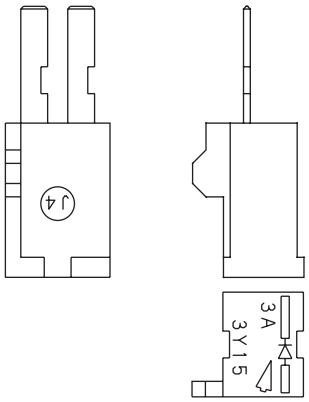
GRAPHIC_1D

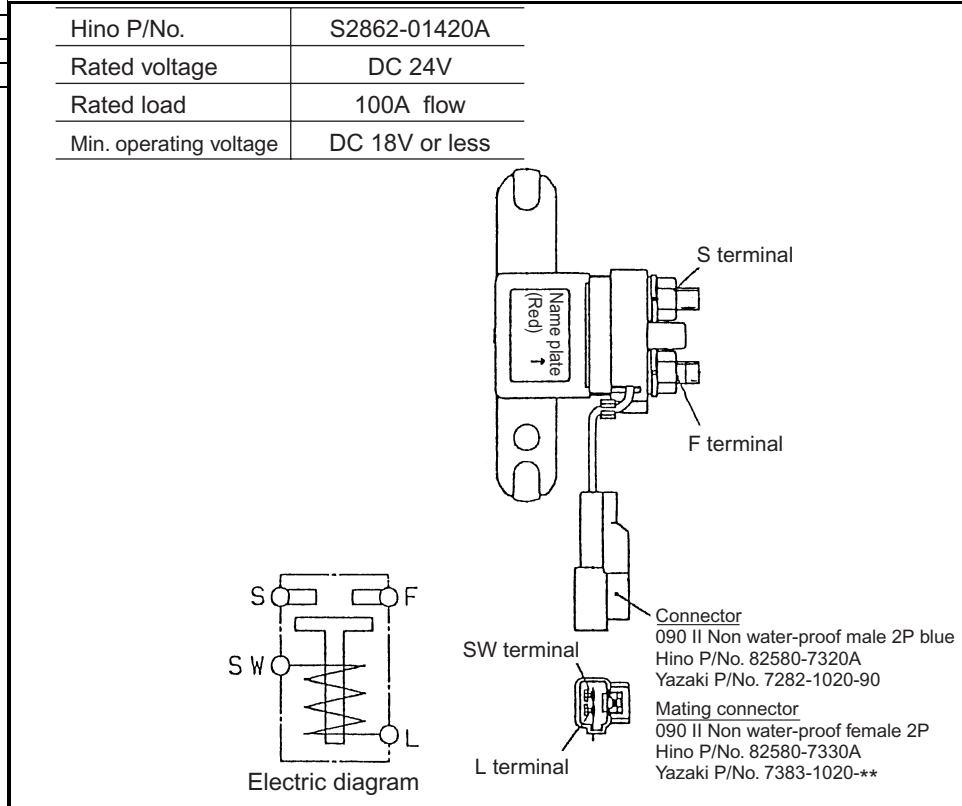
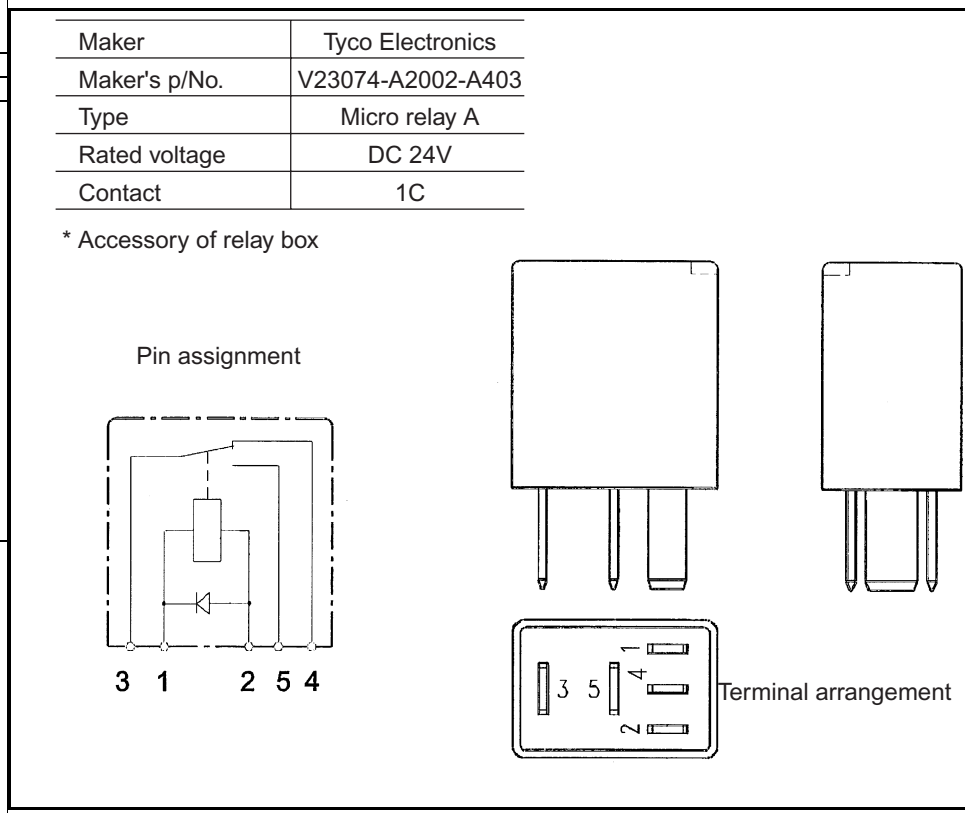
Figure 101

Specifications

Unit : mm (ft-in)

Use	Part No. of cylinder assy	Cylinder bore / Rod Dia.	Stroke	Center distance of pins Full extend B / Full retract A	Cushion	Dry weight kg (lbs)
Boom	YB01V00033F1	ø120 / ø85 (4.72" / 3.34")	1,355 (4-5)	3,199 / 1,844 (10-6 / 6-1)	With cushion on rod side R-50	166 (366)
Arm	YB01V00022F1	ø130 / ø95 (5.12" / 3.74")	1,406 (4-7)	3,328 / 1,922 (10-11 / 6-4)	With cushion on both sides H-40,R-60	224 (494)
Bucket	YB01V00023F1	ø110 / ø80 (4.33" / 3.15")	1,105 (3-8)	2,715 / 1,610 (8-11 / 5-3)	With cushion on rod side R-50	137.5 (303)

File No. Name of part Part No. Use Applicable Machine	Specification	Description
C - 8 Controller VH89661E0010 Engine controller YN11 - 45001 ~ YQ11 - 06001 ~ LC10 - 07001 ~ YC10 - 03501 ~ YF05 - 02001 ~ YU05 - 02001 ~ YB05 - 03001 ~ LA05 - 02001 ~	Maker's P/No. 89661-E0010 Rated voltage 24V (DC) Working voltage 16~32V (DC) Operating voltage (at starter ON) 9~32V (DC) Back-up source (reference value) 5mA MAX (BAT=24V)	 Connector 167 pins Male Hino P/No. S8256-04430 (34P) S8256-04440 (35P) S8256-04420 (32P) S8256-04450 (33P) S8256-04410 (31P)
GRAPHIC_1D		Figure 112
D - 11, 23 Diode YN02D01001P1 Quick coupler YF05 - 02001 ~ YU05 - 02001 ~ YB05 - 03001 ~ LA05 - 02001 ~	Maker' P/No. 7321-9822 Peak backward voltage 400V Average output current 3A Surge current 200A	
GRAPHIC_1D		Figure 113

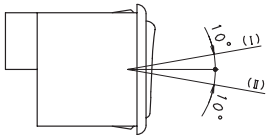
File No. Name of part Part No. Use Applicable Machine	Specification	Description
R - 3 Relay VHS286201420A Glow relay YN11 - 45001 ~ YQ11 - 06001 ~ LC10 - 07001 ~ YC10 - 03501 ~ YF05 - 02001 ~ YU05 - 02001 ~ YB05 - 03001 ~ LA05 - 02001 ~	 GRAPHIC_1D	Figure 138
R - 4,5,6,8,9,11,23, 24,25,26,28,45 Relay YN24S00010P1 Safety relay Horn relay Work light relay Travel alarm relay Cab working light relay Extra dis-press relay Flasher relay Auto idle stop relay 1, 2 Engine emergency stop relay Lever lock relay Alternator relay Boom cyl. working light relay YN11 - 45001 ~ YQ11 - 06001 ~ LC10 - 07001 ~ YC10 - 03501 ~ YF05 - 02001 ~ YU05 - 02001 ~ YB05 - 03001 ~ LA05 - 02001 ~	 GRAPHIC_1D	Figure 139

File No. Name of part Part No. Use Applicable Machine	Specification	Description
SW - 35 Switch YN50S00040D5 Heavy lift YF05 - 02001 ~ YU05 - 02001 ~ YB05 - 03001 ~ LA05 - 02001 ~		

Rated voltage	DC 24V
Type	Single pole single throw (alternate)
Insulation resistance	More than 1MΩ / DC500V megger

Terminal connector

Position \ Connector	1	2	3
(Ⅰ)	○	○	
(Ⅱ)	○		○



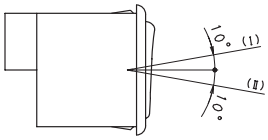
GRAPHIC_1D

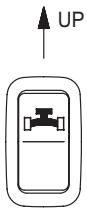
Figure 165

Rated voltage	DC 24V
Type	Single pole single throw (alternate)
Insulation resistance	More than 1MΩ / DC500V megger

Terminal connector

Position \ Connector	1	2	3
(Ⅰ)	○	○	
(Ⅱ)	○		○

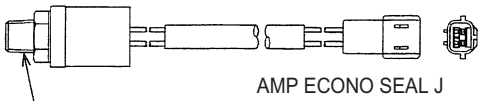




GRAPHIC_1D

Figure 166

Type	Normal open
Specification	ON : 0.6±0.06MPa (85±8.5pis)
	OFF : 0.4±0.04MPa (57±5.7pis)
Insulation resistance	100MΩ or more (500V megger)



AMP ECONO SEAL J
MARK II (M)
HOUSING : 174354-2
TERMINAL : 17166-1

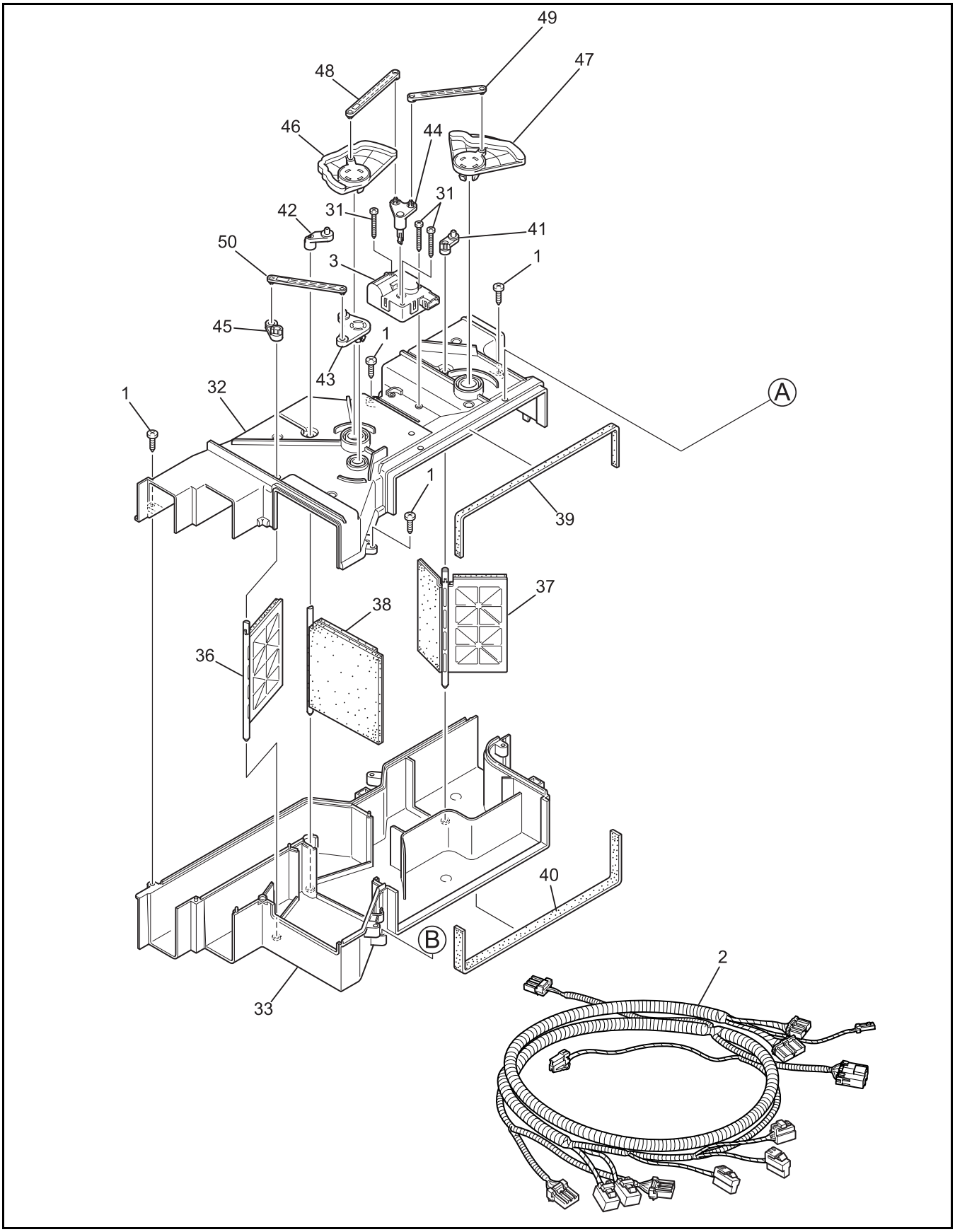
PT1/8
Tightening torque
1.25N·m (12.3 lbf·ft)
Apply seal tape to thread

GRAPHIC_1D

Figure 167

Construction

1. Air conditioner unit (1/2)

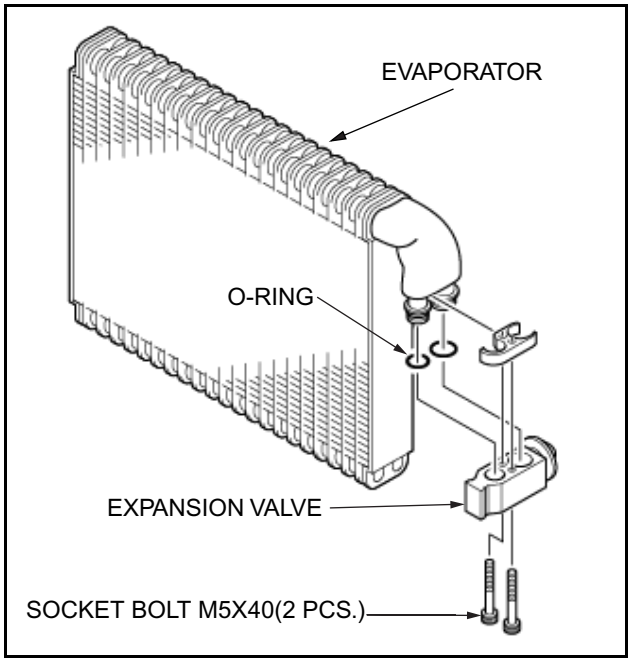


GRAPHIC_1D

Figure 3

Component Parts

1. Evaporator
   The evaporator is an important heat exchanger that absorbs the heat of the compartment air (object) by the utilization of the latent vaporization heat of the low-temperature, low-pressure liquid-state refrigerant. Therefore, it is necessary that satisfactory heat transfer between the object and the refrigerant take place in the evaporator.
   To that end, the evaporator is equipped with fins on the air side in order to increase the heat transfer area of the air side and thereby perform excellent thermal transfer between the refrigerant and the air.
   The humidity in the air condenses as the air cools down and adheres to the outside of the evaporator as water drops. The cooling effect deteriorates if the water drops freeze. Therefore, how to discharge water is an important point.
   The amount of refrigerant supplied to the evaporator is controlled by the expansion valve which is described in the following. In order to attain proper control, it is necessary to reduce the pressure drop of the refrigerant of the evaporator. Accordingly, reducing the pressure drop is one element that makes the evaporator attain its full performances.
2. Expansion Valve
   In order for the evaporator to fulfill its performances, a proper amount of low-pressure low-temperature liquid refrigerant must be fed to the evaporator.
   If the feed rate is too low, the refrigerant completes vaporization early in the evaporator which results in deterioration of the cooling effect. If the feed rate is too high, unvaporized liquid refrigerant returns to the compressor (liquid back). This not only deteriorates the cooling effect, but also damages the compressor valves.
   The expansion valve feeds the flowing high-pressure high-temperature liquid refrigerant to the evaporator as low-pressure low-temperature liquid refrigerant (damp vapor of low dryness). The expansion valve controls the feed rate of the refrigerant at the same time.



GRAPHIC_ID
Figure 12

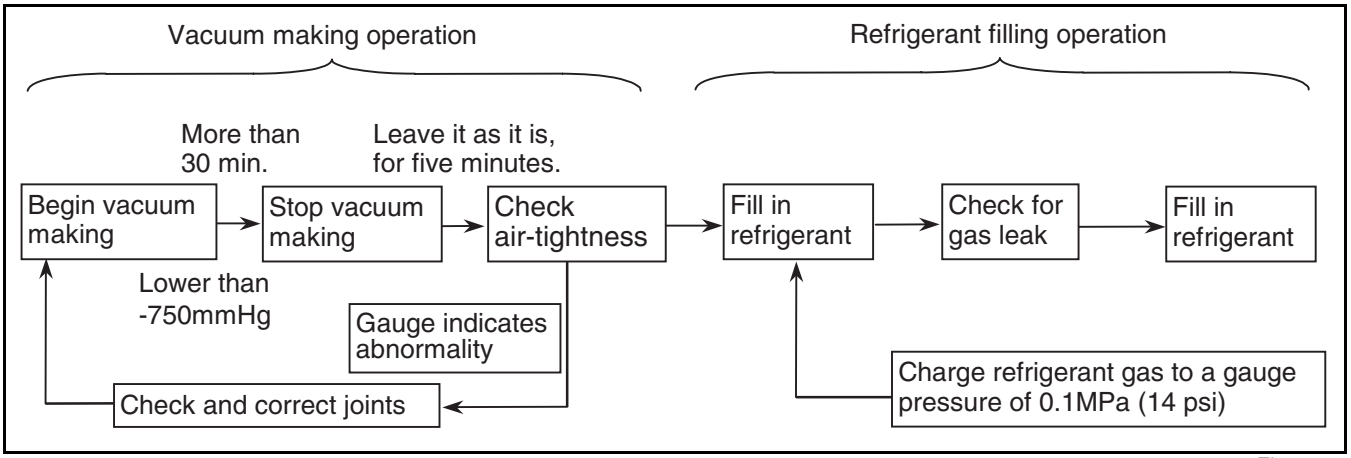
Operating Procedure

1. Refrigerant charge into the air conditioner consists mainly of Vacuum Making Operation and Gas Charge Operation .

   A. The Vacuum Making Operation consists of removing water in the air conditioner circuit. If only a little water remains in the circuit, the small holes of the expansion valve are frozen during operation. This causes the circuit to clog up or rust, resulting in a variety of malfunctions. Therefore, before filling refrigerant in the circuit, make vacuum and allow the water in the circuit to boil and vaporize. Water in the circuit is thus eliminated.

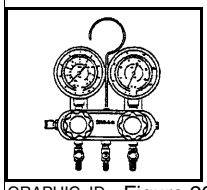
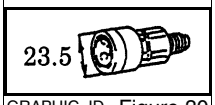
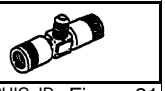
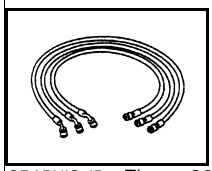
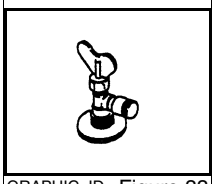
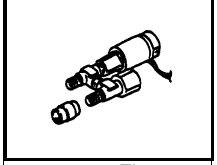
   B. The Gas Charging Operation consists of filling refrigerant in the circuit after forming vacuum. Filling gas not only depends upon the cooling performances of the air conditioner, but also affects the service life of the component parts of the circuit. Extreme overcharge will make the circuit pressure extremely high and causes the cooling performance to deteriorate. On the contrary, undercharge causes poor circulation of the lubricating oil of the compressor and causes seizure of the moving parts of the compressor.
   The gas filling operation involves handling of high pressure gas; filling gas according to incorrect operation procedure is dangerous. Fill refrigerant correctly following the operation procedures and cautions stated in this manual.

2. Operation Chart

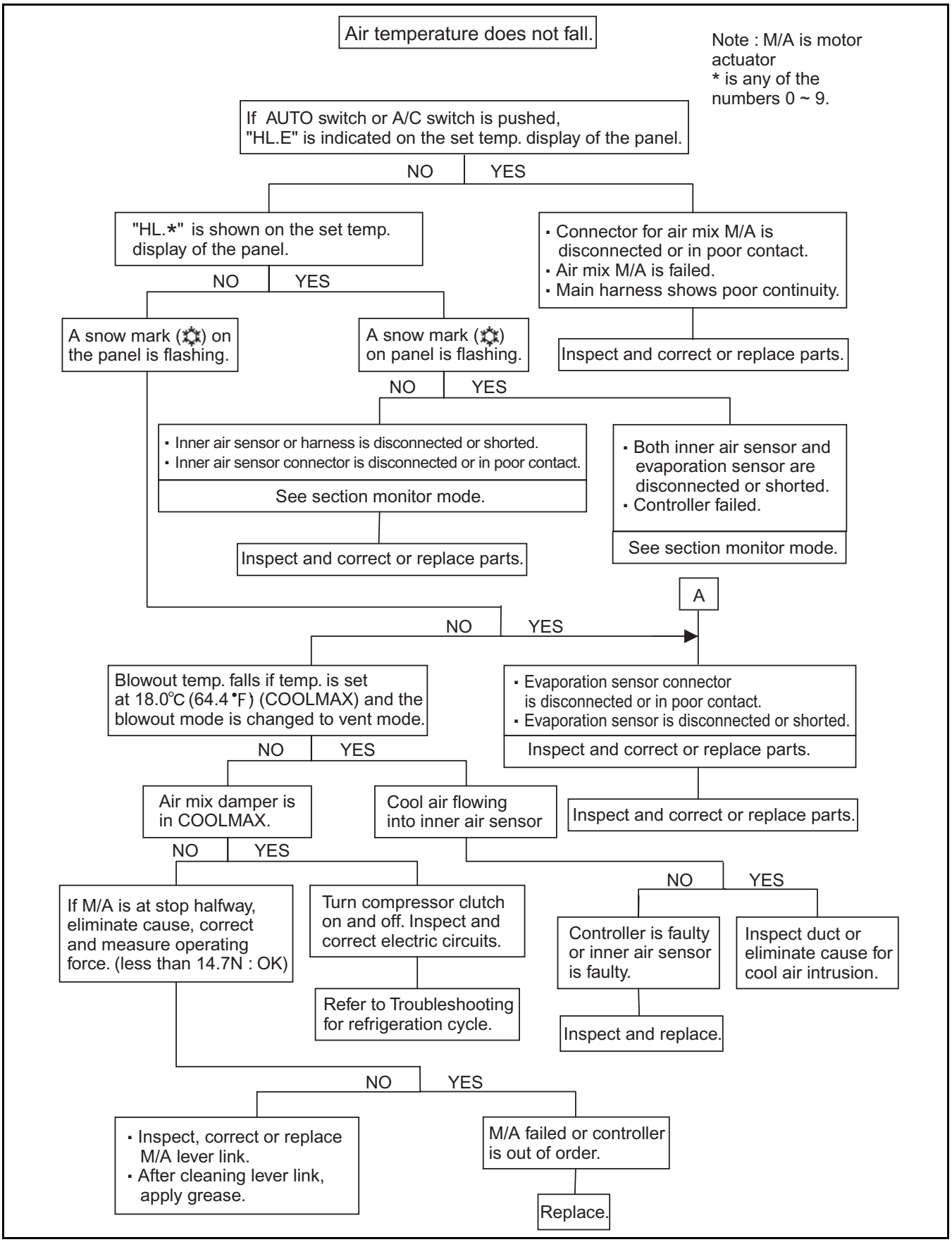


GRAPHIC_1D Figure 28

3. Tools

No.	Parts	Qty	Sketch	Service	No.	Parts	Qty	Sketch	Service
1	Gauge manifold	1	 GRAPHIC_ID Figure 29		4	Quick joint	1	 GRAPHIC_ID Figure 30	Low pressure side
					5	T joint	1	 GRAPHIC_ID Figure 31	For service can valve
2	Chargin g hose	3	 GRAPHIC_ID Figure 32	Red : high pressure side Blue : low pressure side Yellow : vacuum pump side	6	Service can valve	2	 GRAPHIC_ID Figure 33	For service can
3	Quick joint	1	 GRAPHIC_ID Figure 34	High pressure side	7	Vacuum pump adapter	1	 GRAPHIC_ID Figure 35	For vacuum pump

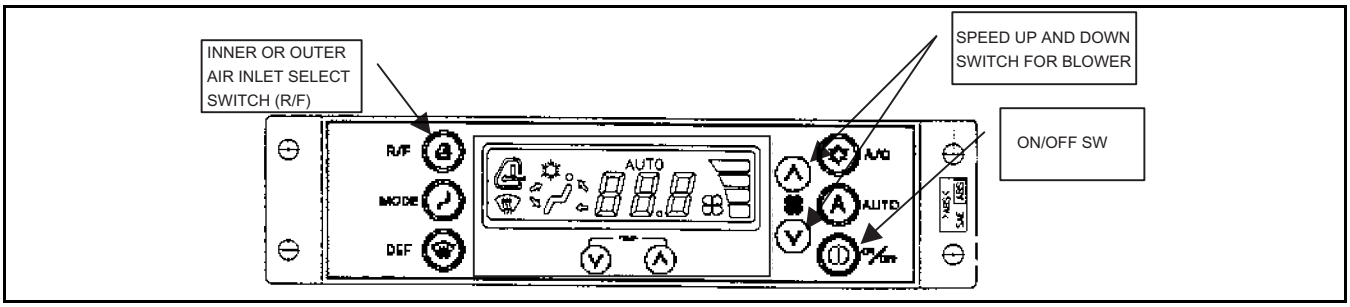
TROUBLESHOOTING



GRAPHIC_1D

Figure 56

2. Operation of monitor mode



GRAPHIC_1D

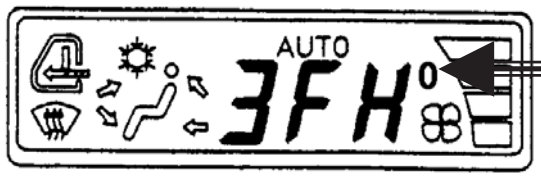
Figure 72

A. Press inner and outer air flow select switch and ON/OFF switch simultaneously for 1 second.

B. Press AUTO switch.
(After all segments are lit on for 1 second, the mode is switched into monitor mode.)

C. Any figures of figures from 0 to 9 or any letters of alphabet from A to F are displayed on the 3rd digit and 2nd digit of segment in three digits. The 1st digit is indicated by **H** .

D. Any digit indicated by one of figures 0 to 2 for the exclusive segment in three digits is selected by pressing UP or DOWN of blower switch, and the required sensor is selected from the list below.



SEGMENT ASSIGNMENT LIST

0	INNER AIR SENSOR
1	EVAPORATOR SENSOR
2	SOLAR RADIATION SENSOR

(Excluding above mentioned indications, for example "from 3 to 9 and from B to F" are not used at service work.)

GRAPHIC_1D

Figure 73

E. The monitor display is terminated by pressing the inner and outer air flow select switch (R/F) and ON/OFF switch for 1 second again, or turning off the main switch of excavator.

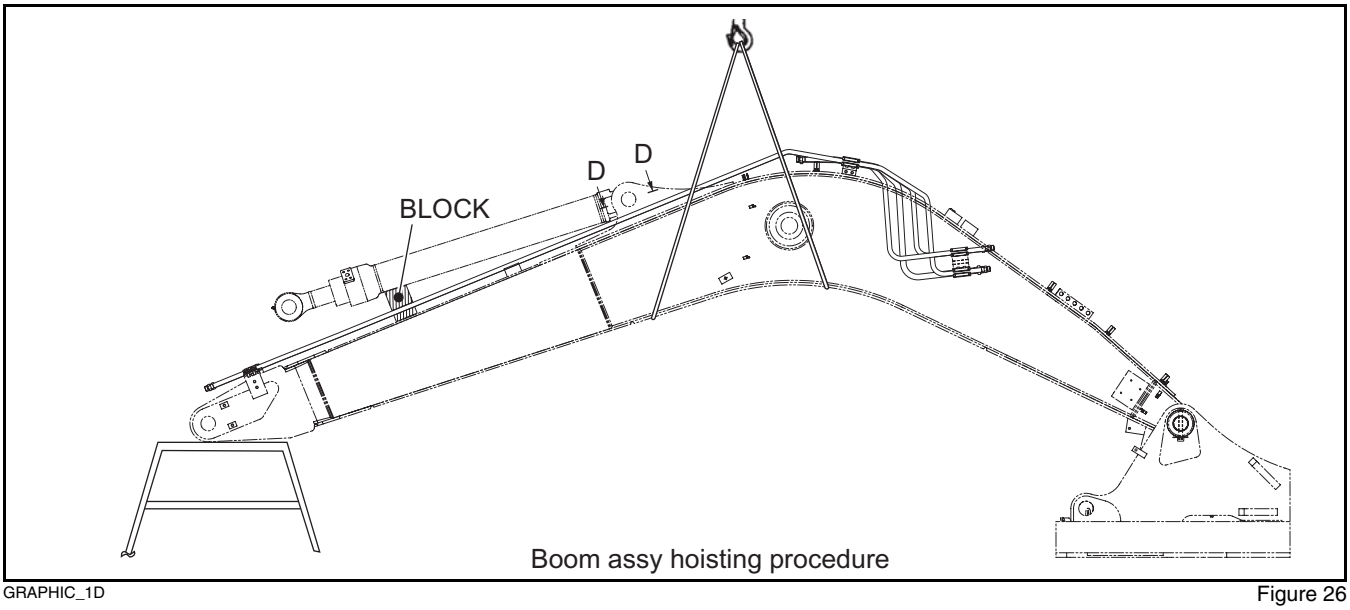
NOTE: *The air conditioner is turned off while the monitor mode is in operation, and all switches are not available for operation and setting until the monitor mode is cancelled.*

NOTE: *Even if each sensor is corrected while the monitor mode is in operation, the error display is memorized. Therefore turn on ON/OFF switch again, and the error display is disappeared.*

NOTES

8. Hoisting boom
   Hoist and remove boom .

   Weight of single boom : 1,320 kg (2,910 lbs)



GRAPHIC_1D

Figure 26

9. Completion of removal of front attachments
   When the removing and attaching of cylinder are not required, the work is finished.

10. Removing and installing arm cylinder

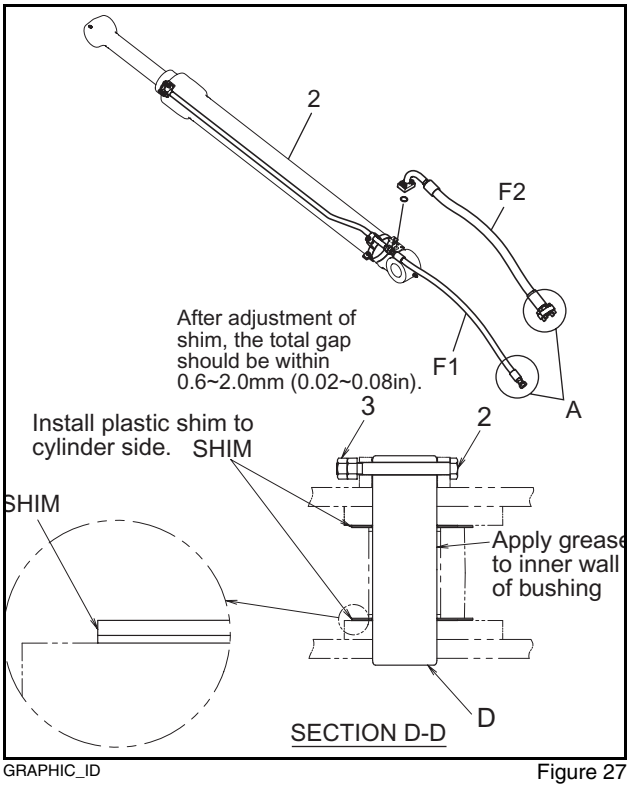
    A. Lift up arm cylinder (2) with nylon sling so that the head of cylinder is not loaded.

    B. Disconnect hose (F1) and (F2) at position A. After disconnection of hose, plug both ends of hose.

       Plug : TOOLS
       (4) Plugs for ORS fitting
       (5) Plugs for half clamp

    C. Removing arm cylinder head pin (D)
       Loosen nut (3), remove capscrew M16×140 (2) and pull out pin (D).

    D. Removing arm cylinder (2)
       Weight of arm cylinder : 220 kg (485 lbs)

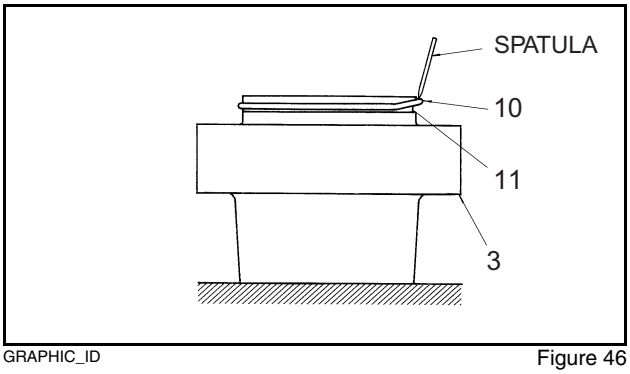


GRAPHIC_ID

Figure 27

Disassembling Rod Cover

1. Remove O-ring (10) and backup ring (11). Remove backup ring (11) and O-ring (10) in that order. Remove backup ring (11) and O-ring (10) by pulling and stretching them with an spatula like earpick.

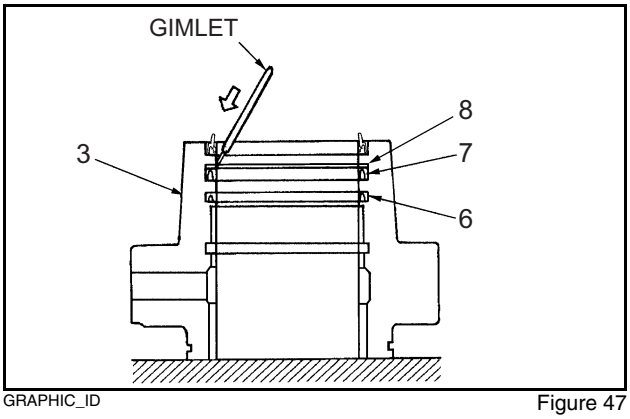


GRAPHIC_ID Figure 46

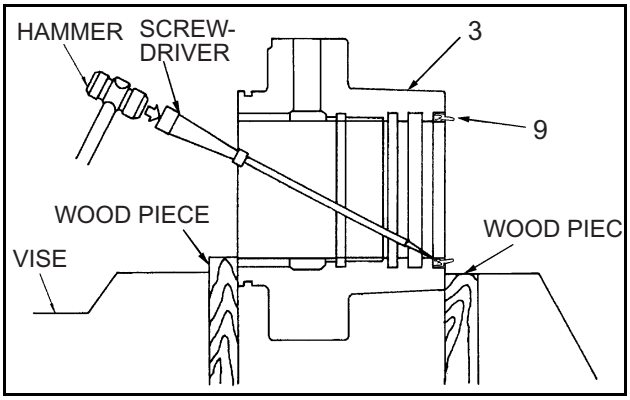
2. Remove buffer ring (6), U-ring (7) and backup ring (8). Each seal is fixed in the groove on the bore and removing in flawless is impossible. Stab each seal with a gimlet and pull it out of the groove.

WARNING: *Take care in this operation not to damage the grooves.*

3. Remove wiper ring (9). When taking out wiper ring (9), fix rod cover (3) in a vise.



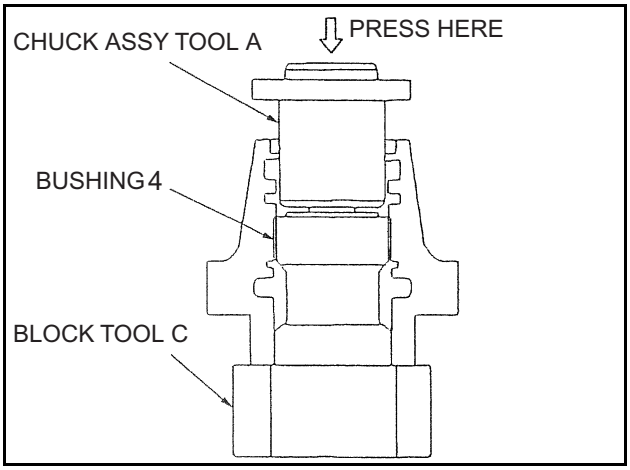
GRAPHIC_ID Figure 47



GRAPHIC_ID Figure 48

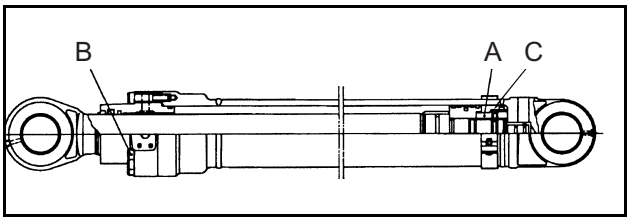
4. Remove snap ring (5) and bushing (4). Remove snap ring (5) first, and remove bushing (4). But the bushing (4) is press fitted in rod cover (3), so push it out by press with jig as shown in the figure.

IMPORTANT: *Center the work on a lathe sufficiently so the bushing may be shave on a lathe as thin as possible.*



GRAPHIC_ID Figure 49

Tightening Torque



GRAPHIC_ID Figure 71

Unit: Nm (pound-ft)

Cylinder	A	B	C
	Piston nut or (Piston)	Socket bolt	Setscrew
Boom	5460 (4030)	267 (200)	56.9 (42)
Arm	7690 (5670)	367 (270)	56.9 (42)
Bucket	5020 (3700)	171 (126)	31.5 (23)

Volume Of Oil Leak

The oil leak rates as mentioned in 1.6 (2) of Inspection after Assembly are as shown in INSPECTION AFTER ASSEMBLY.

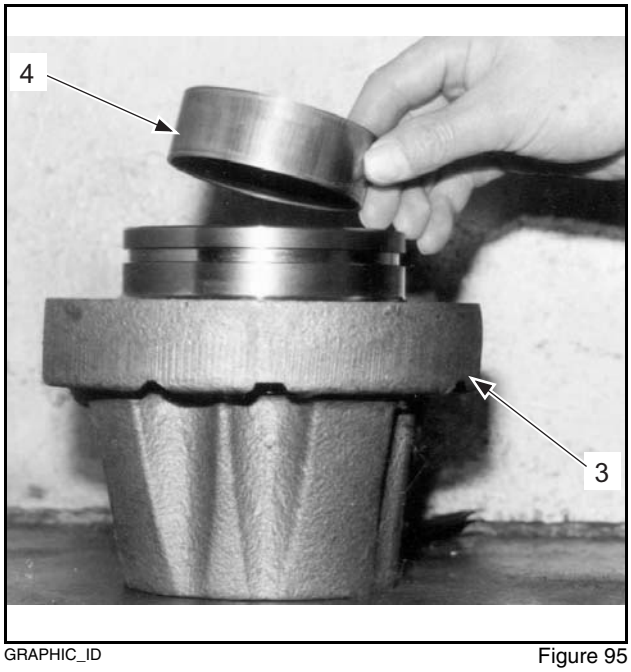
Cylinder	Volume of Internal Oil Leak
Boom	1.0cc (0.06 cu/in) or below / 10min
Arm	1.0cc (0.06 cu/in) or below / 10min
Bucket	1.0cc (0.06 cu/in) or below / 10min

Rod cover bushing press-fitting procedure

1. Temporary setting of head bushing
   Put rod cover (3) on the press-working bench directing the tube connection upward.

   Set bushing (4) on the inner surface of rod cover (3) temporarily.

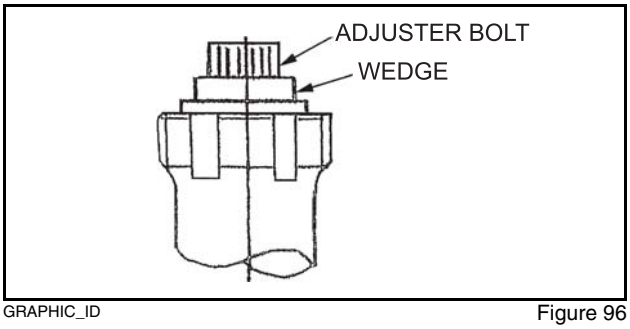
   Make sure that the inner and outer surfaces of bushing (4) are free from foreign matter.



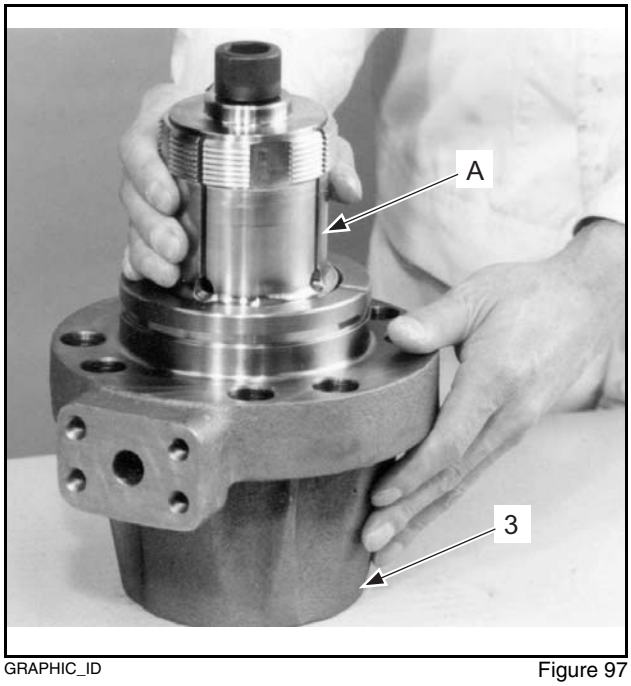
GRAPHIC_ID Figure 95

2. Setting chuck assy tool (A)
   Insert the chuck assy tool (A) in temporary-set bushing (4) directing the flange downward, and set it on rod cover (3).

   Be sure that the adjuster bolt is tightened to the extent that there is no gap between adjuster of chuck assy (A) and wedge.



GRAPHIC_ID Figure 96



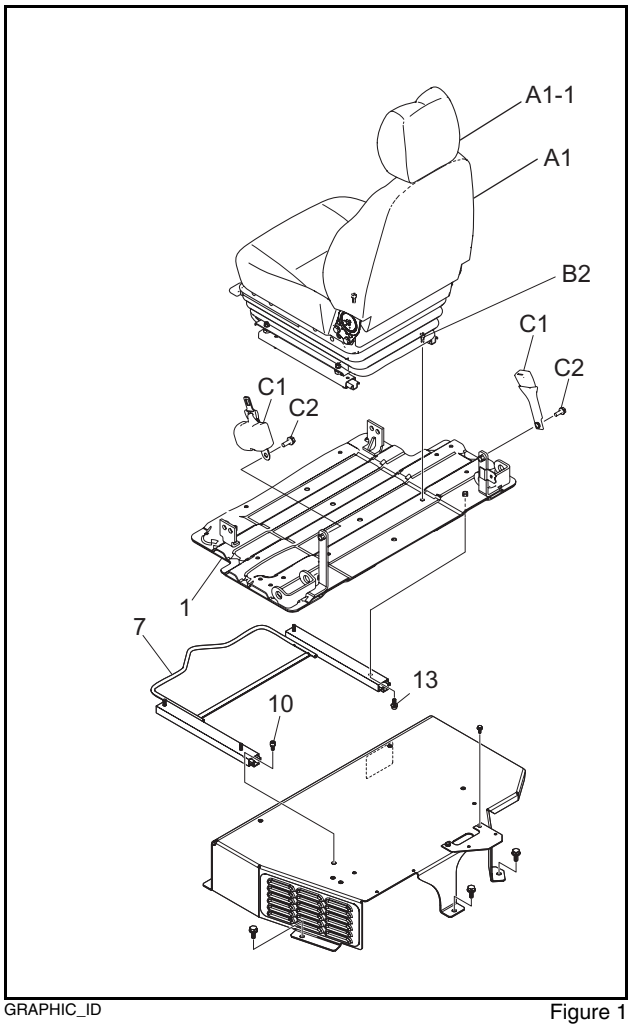
GRAPHIC_ID Figure 97

REMOVING AND INSTALLING

OPERATOR SEAT

Removal

1. Preparation for removal
   A. Remove the head rest (A1-1) of the operator's seat (A1) to ease handling.
   B. Move the whole control stand to its foremost position.
   C. Move the operator's seat to its forward end.
   D. Incline the reclining seat as forward as possible.
2. Remove operator's seat. (Include upper rail.)
   A. With the above-mentioned condition, remove two cap screws (B2) M8× 20 from the upper rail. Then move the control stand to its rear most end and remove two capscrews (B2) M8× 20.
   B. Remove the operator's seat. about 28kg (62 lbs).
   Carry out the following operations as required.
   C. Remove seat belt (C1).
   D. Remove armrest (A3)(A4).
   E. Remove bracket assy (1), rail (7).



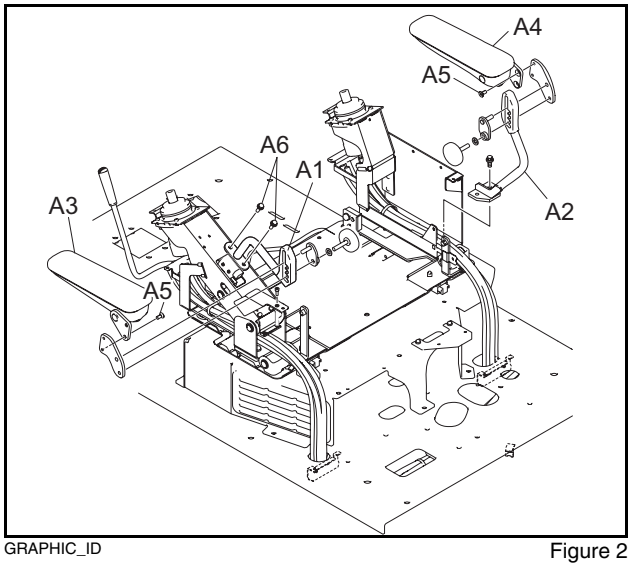
GRAPHIC_ID Figure 1

Installation

Install it in reverse procedure of removing according to the tightening torque table.

Tightening position	Allen wrench Hex (mm)	Tightening torque Nm (pound-feet)
Capscrew (B2)	6	23.5 (17.3)
Sems bolt (C2)	17	46.1 (34)
Capscrew (A5)	13	23 (17)
Sems bolt (A6)	13	23 (17)

Reference : Movement on rail
Upper rail …… Fixed on lower surface of seat
[Forward 80mm (0.26in), backward 80mm (0.26in)]
Lower rail …… Fixed on seat stand.
[Forward 60mm (0.19in), backward 60mm (0.19in)]
Amount of adjustment of seat height
[Up; 23mm (0.07in), down; 37mm (0.16in)]
Suspension stroke
[Up; 37.5mm (1.48in), down; 37.5mm (1.48in)]



GRAPHIC_ID Figure 2

17. Duct (B2) removal

A. Preparation

1.Remove counterweight.

2.Remove hydraulic oil hose which connects to top of radiator oil cooler.

B. Push filter assemblies (26) in the direction of arrow, and remove them.

C. Remove air cleaner hose (2) (7) and air cleaner assy (1).

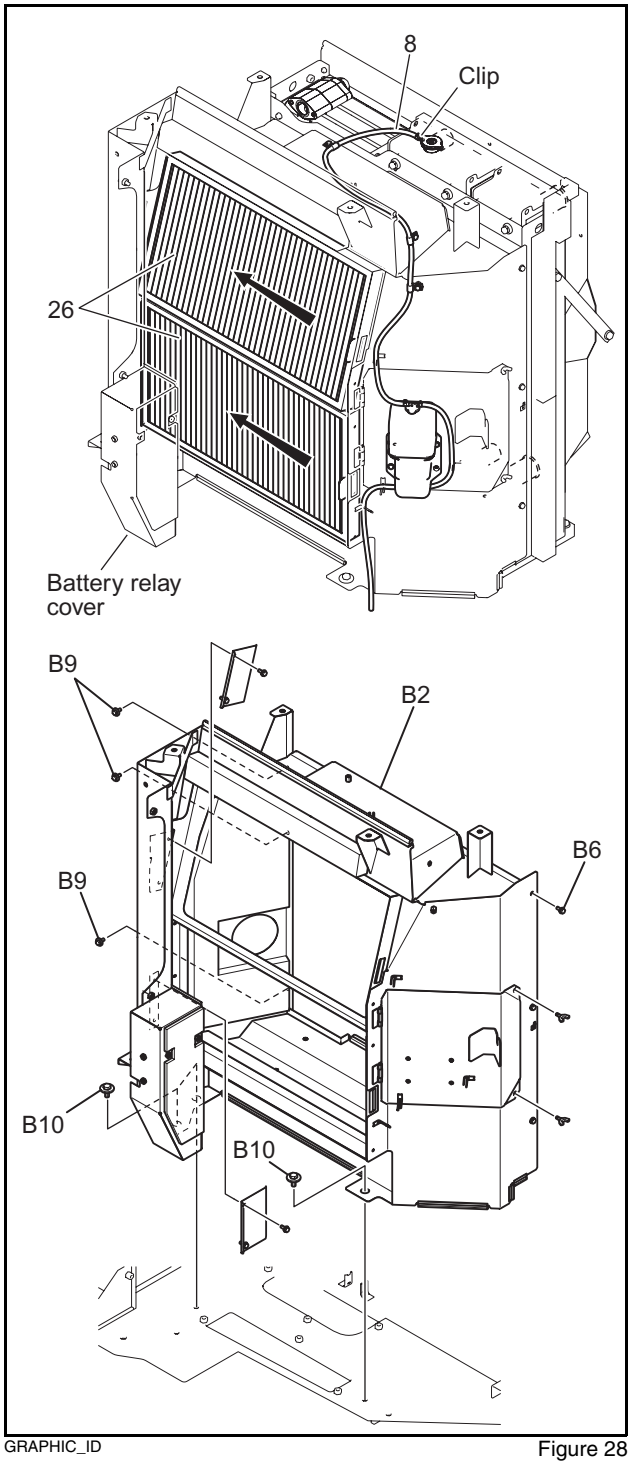
D. Remove battery relay from battery cover. In this time, disconnect battery relay which has remained harness connection with the battery relay.
(See Detail of battery relay of Electric System)

E. Remove clip at side of radiator cap and remove hose (8) of sub tank.

F. Remove 3 sems bolts (B6) M8×20, and remove 3 capscrews (9) M8×20.

G. Remove 6 capscrews (B10) M12×30.

H. Sling duct (B2) to hoist and remove the duct. Weight : 51 kg (112 lbs).



GRAPHIC_ID

Figure 28

Installation

Installing is done in the reverse order of removing.

Tightening torque

Unit: Nm (pound-ft)

Size	Capscrew	Sems bolt
M8	35.6 (26)	23 (17)
M10	46.5 (34)	46.5 (34)
M12	121 (90)	80 (59)

6. Remove main pump

A. Put a wire sling on the hydraulic pump and tension the wire sling a little. Loosen 8 capscrews (4) M10×30.

B. Draw out the power take-off assy from the flywheel housing slowly, adjusting the tension of the wire rope.
On that occasion, the assembly is drawn out with the insert NA (2-3) remaining on the flywheel side.

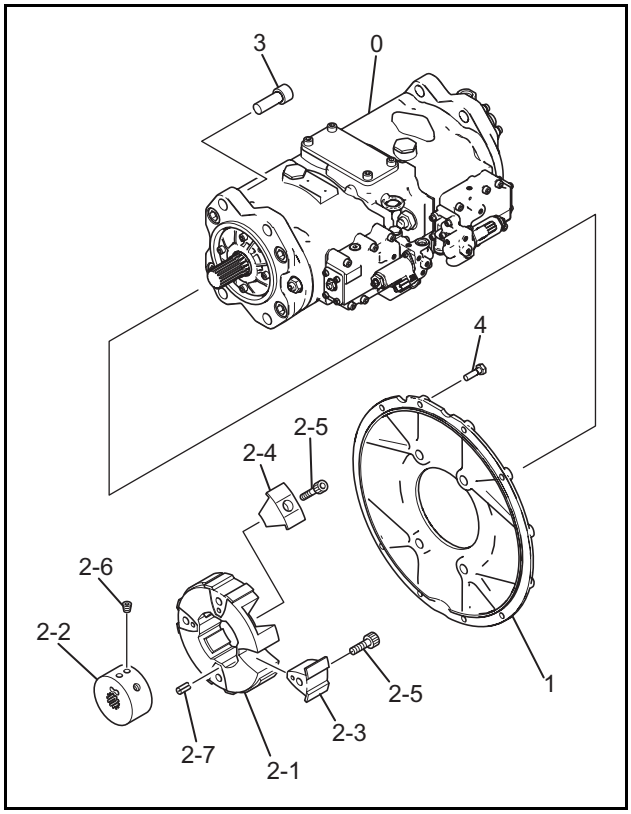
C. Remove element (2-1) from the tip of the spline shaft.

D. Remove 4 capscrews (2-5) M16×50 that fasten insert R (2-4) and remove insert R (2-4).

E. Remove hub (2-2)
If you loosen 2 set screws (2-6) M16×22, hub comes off from the spline shaft of the pump.

F. Remove 4 capscrews (2-5) M16×45 that fasten the insert NA (2-3) with the engine side flywheel, as necessary. Then remove and spring pin (2-7) from insert NA (2-3).

G. Removing bracket (1)
Loosen 2 capscrews (3) M20×55, and remove bracket (4) from pump (0).

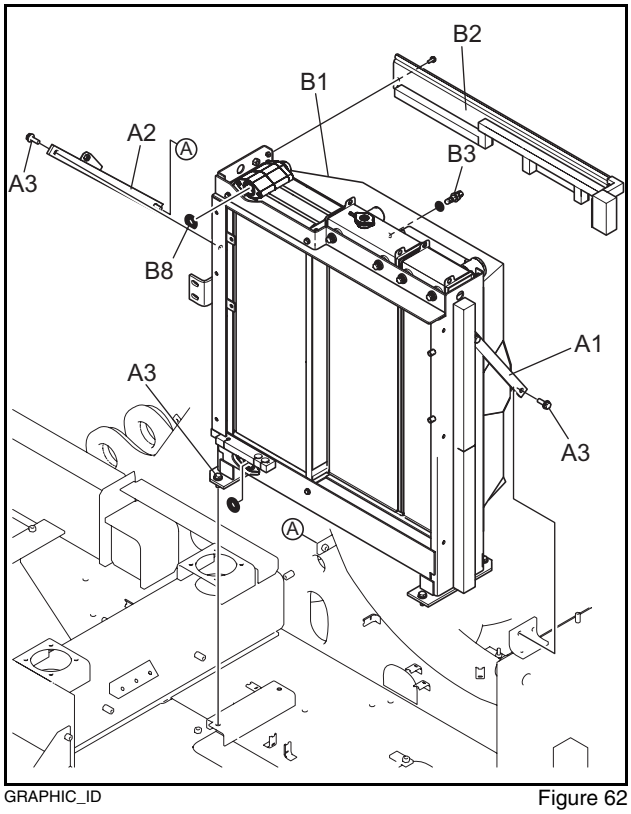


GRAPHIC_ID

Figure 44

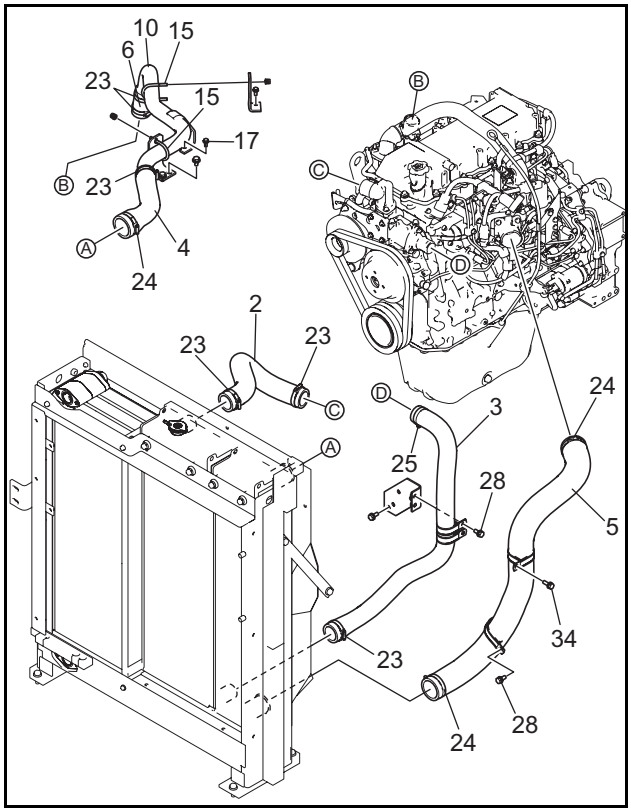
Removal

1. Remove radiator stay (A1), (A2).
   A. Remove 4 sems bolts (A3) M12×35.
   B. Remove 2 stays (A1), (A2).
2. Remove water hose (2),(3)
   A. Loosen the 2 hose bands (23) for water hose (2).
   B. Remove hose (2).
   C. Loosen hose band (23), (25) on water hose (3) and remove capscrew (28) M10×25.
   D. Remove hose (3).



GRAPHIC_ID Figure 62

3. Remove hoses (4)(5) for inter-cooler
   A. Remove a fixing U-bolt (15) from tube (10).
   B. Loosen sems bolt (17) M8×20.
   C. Loosen tow hose bands (23), (24) and remove hose (4).
   D. Loosen hose bands (23) and remove hose (6).
   E. Loosen capscrews (28) M10x25 and (34) M10x30
   F. Loosen 2 hose bands (24) and remove hose (5).



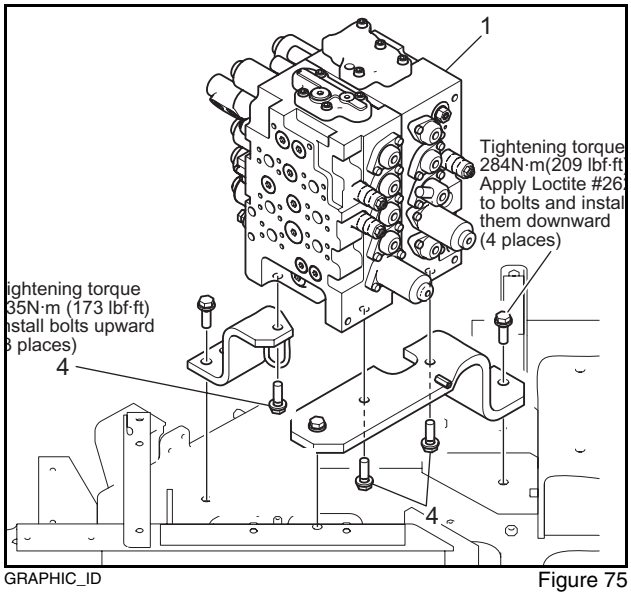
GRAPHIC_ID Figure 63

CONTROL VALVE

Preparation For Removing

1. Remove cover assy (A7)
2. Remove plate (A6), panel assy (A2).
3. Remove panel assy (A1), bracket (A12), box (B1).
4. Install the suction stopper to the hydraulic oil tank.
5. Remove the hoses.

NOTE: *Mark each hose with a port name before removing it.*



GRAPHIC_ID

Figure 75

Removal

Remove 3 capscrews (4) M16× 45, and remove control valve (1) by hoist.

Weight :Approx. 232 kg (512 lbs)

Installation

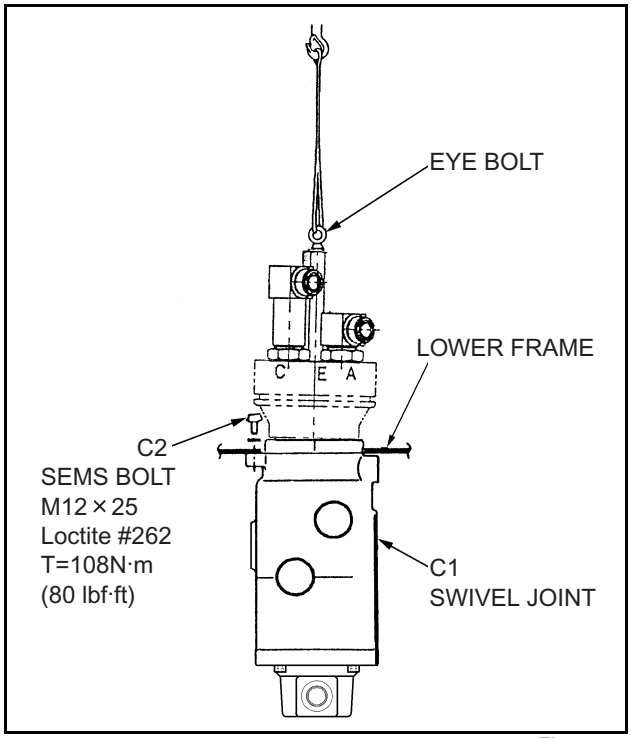
1. Installing is done in the reverse order of remove.
   A. Install control valve by tightening 3 capscrews (4) M16× 45.

      Tightening torque : 235 Nm (173 pound-ft)

Thread size	Ports	Connector / Bolt			Hose nut		Remarks
		Name	Opposing flats	Tightening torque Nm (pd-ft)	Opposing flats	Tightening torque Nm (pd-ft)	
PF 1/4	Pss, PLc2, PBp1. PBp2, PL, PB1, PTb, PGa. PGb, PGc	ORS Joint	19	36 (27)	19	29 (21)	
PF 3/8	PAa1, PBa1, Pab, PBb, Pac, PBc,PAL, PBL, Par, PBr, Pas, PBs, PAa2, PBa2,Pao, Pbo, DR		22	74 (55)	22	49 (36)	
PF 3/4	MU		36	162 (119)	36	118 (87)	
M10	Ar,Br,AL,BL,As,Bs,Aa,Ba,Ac,Bc	Sems bolt	14	42.4 (31)	-	-	
	Ab, Bb		14	57 (42)	-	-	
M12	P1, P2		17	62.2 (45)	-	-	
	T1, T2		17	96 (70)	-	-	

2. Check for oil leak and operation.

6. Remove sems bolts for installation
   Attach eye bolt, lift it up temporarily, and remove 3 sems bolts (C2) M12×25.
   (See SPECIAL TOOLS No.9 Plug)
7. Slinging the swivel joint
   Weight : Approx. 28kg (62 lbs)



GRAPHIC_ID Figure 90

Installation

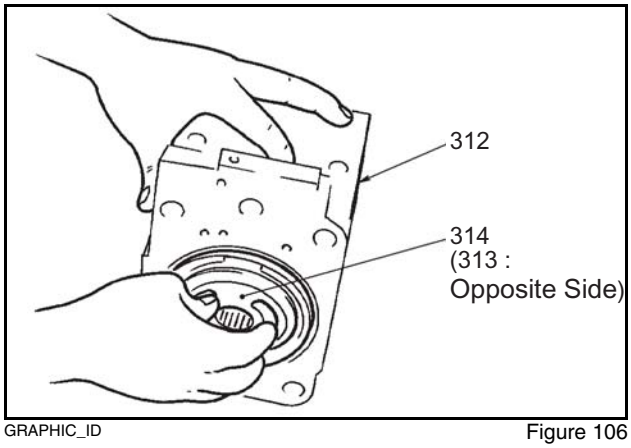
1. Installing is done in the reverse order of removing.
   Piping tightening torque

Size PF	Tool Hex	Tightening torque: Nm (pound-ft)	
		O-ring type connector	Hydraulic hose
1/4	19	36 (27)	29 (22)
3/8	22	74 (54)	49 (36)
1/2	27	108 (80)	78 (58)
3/4	36	162 (120)	116 (87)
1	41	255 (180)	137 (100)
1-3/16-12UN	36	-	177 (130)

2. Check for oil leak and the hydraulic oil level.
3. Check for operating.

12. Remove valve plate
    Remove valve plate (313, 314) from valve block (312).

    The valve plate may come off during the operation under (6).



GRAPHIC_ID Figure 106

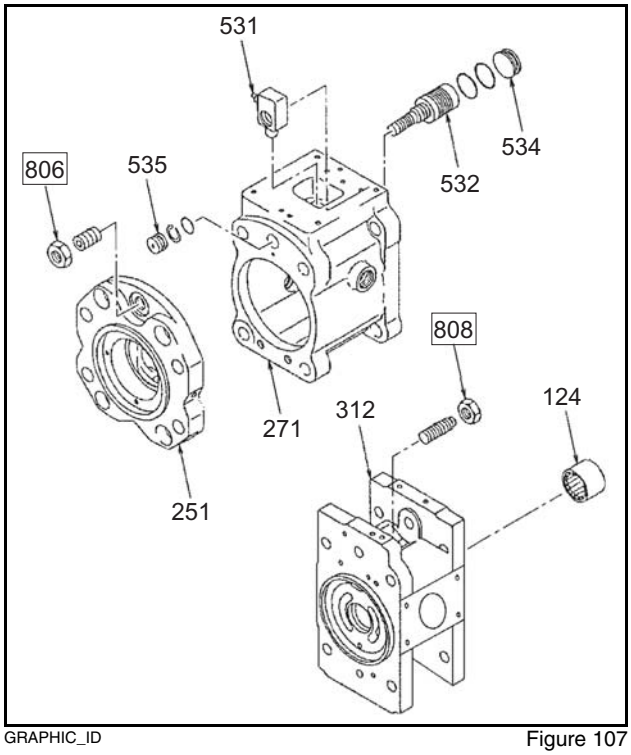
13. Remove other parts
    If necessary, remove stopper (L) (534), stopper (S) (535), servo piston (532) and tilting pin (531) from pump casing (271), and remove needle bearing (124) from valve block (312).

    When removing the tilting pin, use care so as not to score the head of the tilting pin, using a jig.

    It is hard to separate the tilting pin from the servo piston in some cases as Loctite is coated on the mating part between them. Use care so as not to score the servo piston by applying undue force.

    Do not draw out needle bearings except when their service life has ended.

    Do not loosen hex nuts (806),(808) of valve block (312) and swash plate support (251). A set flow rate changes.



GRAPHIC_ID Figure 107

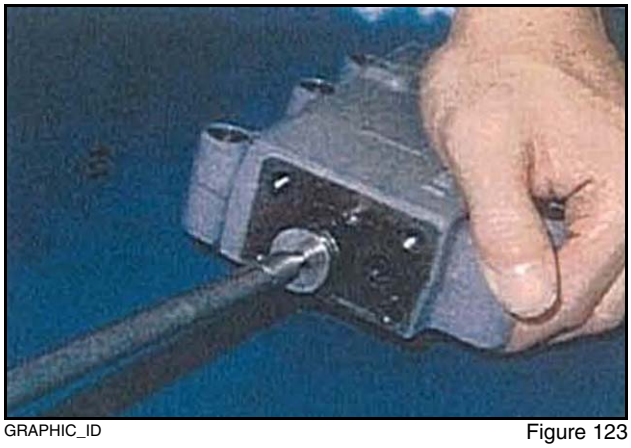
9. Remove plunger, pilot spring and spring seat
   Draw out plunger (627). Then take out pilot spring (646) and spring (624).

NOTE: *The plunger comes off easily if an M4 bolt is used.*

10. Drawing out the check valve
    The disassembly is complete when the check valve [seat (541), ball (545), and stopper (543)] have been drawn out.

NOTE: *The check valves are placed on two places; the mating surface of the pump casing and on the matching surface of the valve casing.*

IMPORTANT: *Do not lose the parts because they are small.*



GRAPHIC_ID

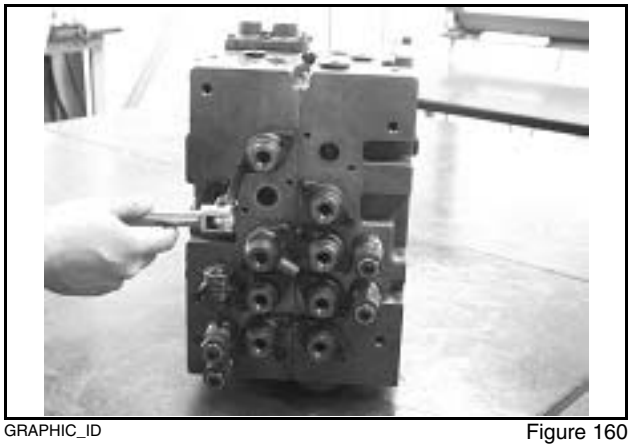
Figure 123

Tightening torque Nm (pound-ft)	No.	Parts	Qty	Tightening torque Nm (pound-ft)	No.	Parts	Qty
	101	Casing A	1		321	Spring	5
	102	Casing B	1		322	Spring	4
220~250(162~184)	154	Plug PF3/4	3		323	Spring	3
110~130(81~96)	155	Plug PF1/2	2		324	Spring	3
20~24(15~18)	159	Plug PT1/4 (Capsule coating)	1		325	Spring	1
7.8~9.8(5.8~7.2)	160	Plug PT1/16 (Capsule coating)	5		326	Spring	1
	161	O-ring	7		327	Spring	3
	162	O-ring	15		328	Spring	1
	163	O-ring	11		329	Spring	3
	164	O-ring	19		331	Spring seat	24
	169	O-ring	2	16~18(11~13) Loctite #262	333	Spacer bolt	12
	201	Cover	5		336	Stopper	10
	202	Cover	4		339	Stopper	1
	203	Cover	1		340	Stopper	1
	204	Cover sub	1		511	Poppet	11
	205	Cover	7		512	Poppet	2
	206	Cover	1		514	Poppet	2
	207	Back pressure check valve cover	1		515	Poppet	1
	209	Cover	1		517	Poppet	1
9.8~14(7.2~13)	211	Lock valve selector sub	2		518	Poppet	1
	212	Plate	1		521	Spring	11
	213	Plate	1		522	Spring	2
	216	Piston	1		523	Spring	1
	261	O-ring	12		524	Spring	2
	264	O-ring	10		527	Spring	1
	266	O-ring	4		528	Spring	1
25~34(18~25)	273	Socket bolt	40	230~260(170~192)	551	Plug	13
98~120(72~89)	274	Socket bolt	4	130~150(96~111)	552	Plug	2
98~120(72~89)	275	Socket bolt	4	230~260(170~192)	556	Plug	3
25~34(18~25)	278	Socket bolt	5		562	O-ring	2
	301	Boom spool sub	1	69~78(51~58)	601	Main relief valve	1
	302	Arm 1 spool	1	69~78(51~58)	602	Over load relief valve	2
	303	Swing spool	1	69~78(51~58)	603	Over load relief valve	3
	304	Bucket spool	1	69~78(51~58)	604	Plug assy for relief valve hole	2
	305	Boom conflux spool	1	69~78(51~58)	605	Over load relief valve	1
	306	Travel spool	2	98~120(72~89)	606	By-pass cut valve	2
	307	Travel straight spool	1	140~180(103~133)	973	Socket bolt	8
	308	Arm 2 spool sub	1	140~180(103~133)	974	Socket bolt	2
	309	P1 unload spool	1		977	Name plate	1
	310	P2 unload spool	1		978	Pakerrizing rivet	2
	311	Option spool	1				

Removing Spool Covers

1. Travel, boom, bucket, arm 1, arm 2 and option
   Loosen socket bolts (273) and remove spool cover (205) and O-ring (264).

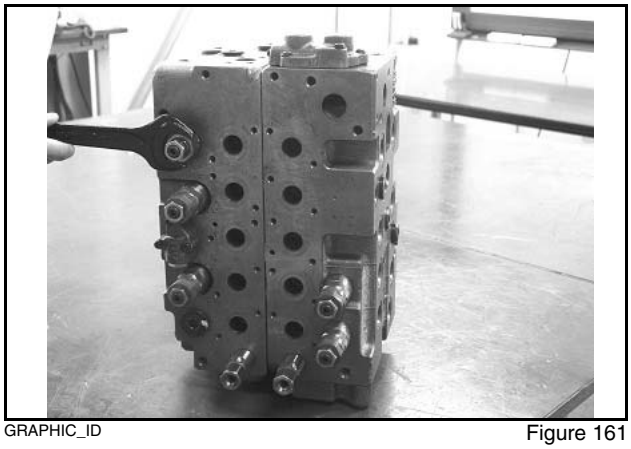
2. Swing
   Loosen socket bolts (273) and remove spool cover (206) and O-ring (264), (266). Do not disassemble spool cover (206) further unless there is special reason.



GRAPHIC_ID Figure 160

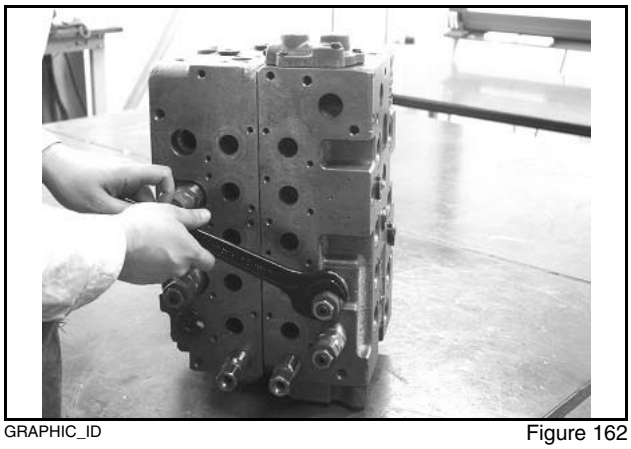
Removing Relief Valve and Plug Assembly for Relief Valve Hole

1. Remove the main relief valve (601) and overload relief valve (602), (603) and (605) from the casing.



GRAPHIC_ID Figure 161

IMPORTANT: *Distinguish overload relief valve between (602), (603) and (605) with a tag to prevent them from being confused during reassembly, as they are the same in appearance and shape but differ in pressure setting.*



GRAPHIC_ID Figure 162

Troubleshooting

1. If an abnormal condition is noticed, check to see if the problem is with the control valve itself, one of the main pumps, the gear pump, or a circuit. To this end, you will need to measure pilot pressure, pump delivery pressure, load pressure, etc. If any part of the system is to be disassembled for inspection, follow the disassembly and reassembly procedures in this manual.
2. Dust is the enemy of hydraulic components. Pay strict attention to protection from dust. If any part of the system is to be disassembled, take dust protection measures beforehand.
3. Moving parts must be handled with care. If they are damaged, smooth the damage using an oil stone or the like.
4. Take care not to damage the contact face of O-rings. A damaged contact face will certainly cause oil leaks.

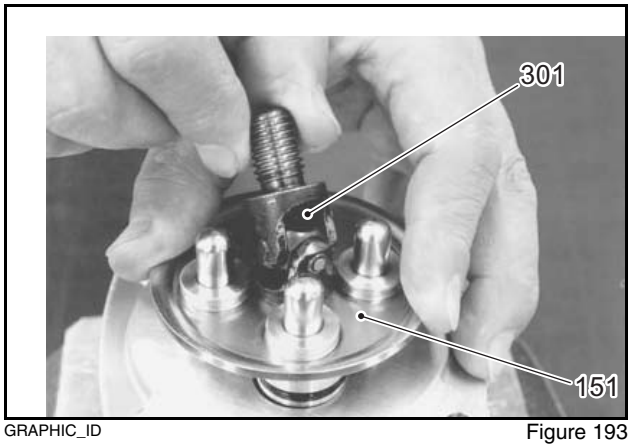
Control Valve

Trouble	Cause	Remedy
1. Travel does not occur. Slow to start up (or poor power). Slow response.	1) Malfunctioning main relief valve. Foreign matter between main poppet and seat. Foreign matter between poppet and seat. Sticking main poppet. Broken or deformed spring. Clogged main poppet throttle. Loosened adjusting screw.	1) Check travel relief valve pressure Disassemble and clean. If damaged heavily, replace the assy as a unit. Same as above. Correct sticking part with oil stone. Replace spring. Remove foreign matter. Readjust, and tighten lock nut to specified torque.
2. Machine does not move straight during simultaneous operation of travel and attachment.	1) Malfunctioning travel straight valve. Sticking spool. Broken or deformed spring. Clogged small hole in spool.	1) Check pilot pressure. Correct sticking part with oil stone. Replace spring. Remove foreign matter.
	2) Malfunctioning main relief valve.	2) Remove main relief valve.
3. Excessive natural falls of attachment under its own weight when spool is in neutral.	1) Excessive clearance between casing and spool.	1) Replace spool.
	2) Spool is not completely in neutral position. Foreign matter between casing and spool, or sticking spool. Broken or deformed spring. Clogged pilot circuit.	2) Check secondary pilot pressure. Disassemble, clean and smooth sticking part with oil stone. Replace spring. Remove foreign matter.
	3) Malfunctioning overload relief valve. Refer to item 1. 1) above. Foreign matter between valve seat and casing.	3) Check overload relief valve pressure. Clean and check damage on seat surface.
	4) Lock valve function is faulty. (Arm, boom) Foreign matter between poppet seat and casing. Poppet is stuck. Broken or deformed spring. Selector spool is stuck.	4) Replace Disassemble, clean. Correct stuck part with oil stone or replace. Replace spring. Replace lock valve selector assy.
4. When raising attachment, at first it drops.	1) Malfunctioning load check valve. Foreign matter between poppet and casing. Sticking poppet. Broken or deformed spring.	1) Disassemble and clean. If heavily damaged, replace control valve. Correct sticking part with oil stone. Replace spring.

B. When the force of spring (221) is strong, attach plate (151) and press 4 push rods by hand at the same time, and tighten joint (301) temporarily.

Install spool (201) straight and evenly into the hole of casing (101).

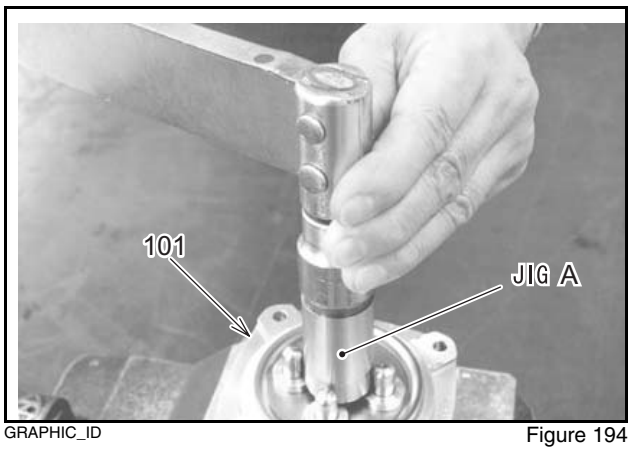
Take care so that plug (211) and plate (151) do not jump out of casing (101).



GRAPHIC_ID Figure 193

7. Install joint (301) on casing (101) with jig A securely.

Tightening torque : 47.1 Nm (35 pound-ft)

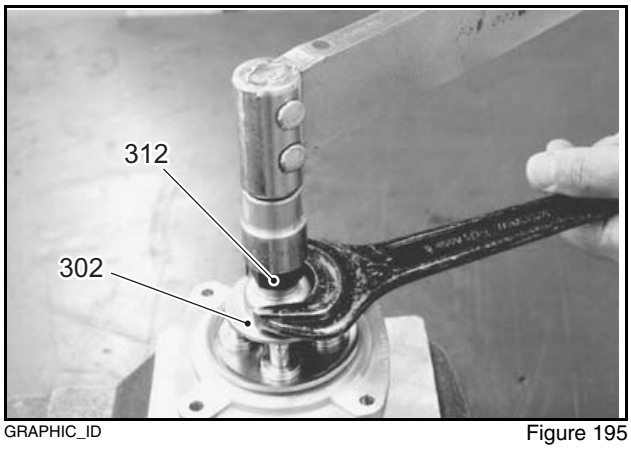


GRAPHIC_ID Figure 194

8. Install circular plate (302) to joint (301)

IMPORTANT: *Screw it in until it comes in contact with 4 push rods (212) equally.*

Exceeding this point may cause malfunction of machine.



GRAPHIC_ID Figure 195

2.Unscrew the screw using a 3mm socket wrench.

Assembly :

A.Apply a droplet of Loctite #262 on the screw thread

B.Screw on until it sets just above the body.

3.Unscrew the throttle using a 3mm socket wrench.

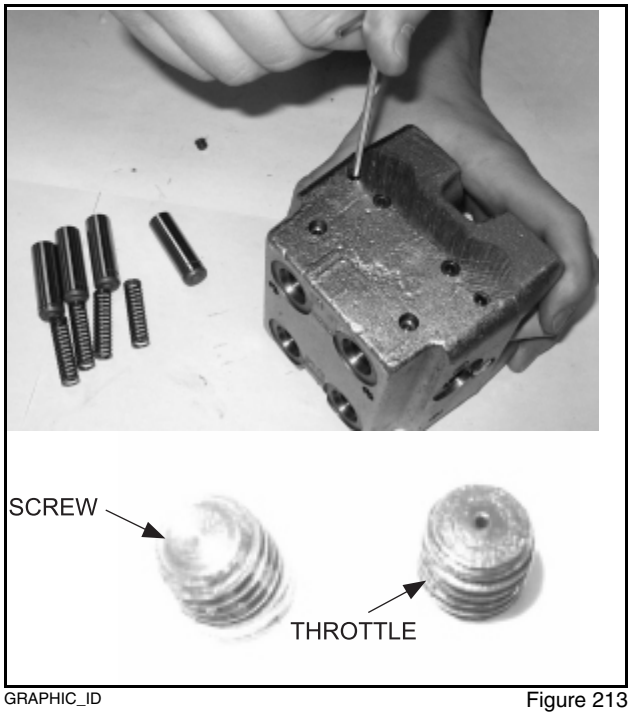
Assembly :

A.Torque :4 Nm (3 pound-ft)

4.Repeat the operation for the other 3 assemblies.

5.Replace with new screws and new throttles.

6.Assemble parts in reverse order.



GRAPHIC_ID Figure 213

8. Shuttle valve kit removal

1.Remove the pilot control unit from the machine

NOTE: *The pilot control unit does not need to be disassembled to perform this operation.*

2.Unscrew the shuttle valve using a 4mm socket wrench.

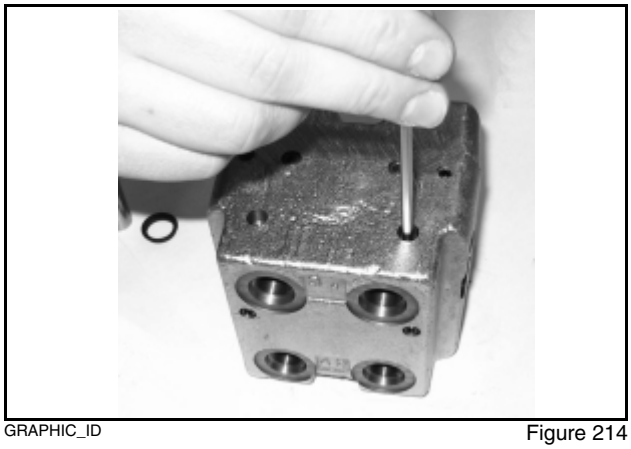
Assembly :

A.Clean the body to remove any trace of loctite.

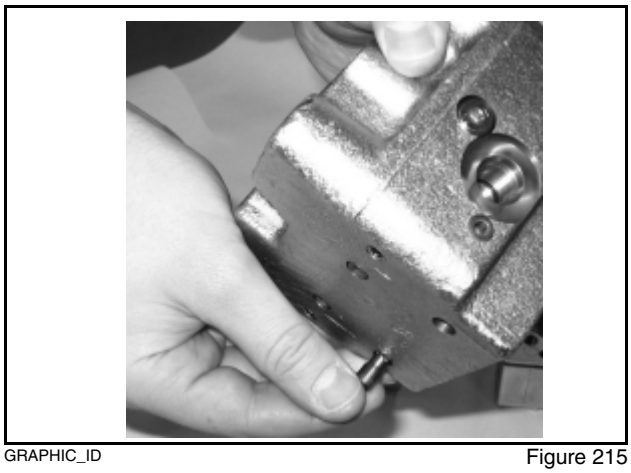
B.Apply a droplet of Loctite #242 on the shuttle valve thread.

C.Torque : 4 Nm (3 pound-ft)

ATTENTION: *Wait for 8 hours before using the machine to let the Loctite #242 dry completely.*



GRAPHIC_ID Figure 214



GRAPHIC_ID Figure 215

Assembly Procedure

General precautions

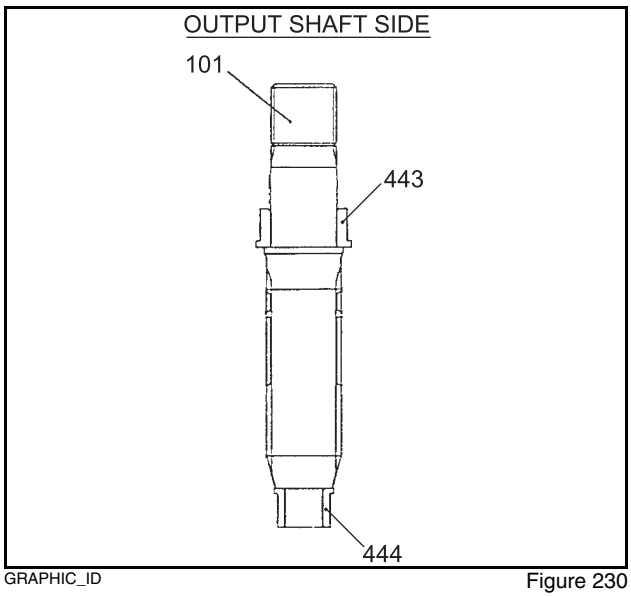
1. Repair those parts damaged after disassembly and prepare replacement parts beforehand.
2. Clean all parts in cleaning oil and dry them with jet air.
3. Always coat the moving parts with clean hydraulic oil, before assembly.
4. Replace such seals as O-ring and oil seal in principle.
5. Tighten socket bolts and plugs to specified torques, using a torque wrench.

Assembly procedure
The figures in parentheses after part names in this manual represent those item numbers.

1. Preparation for assembly
   Place casing (301) on a proper bench so its valve casing (303) faces upward.

   This operation is necessary only when the roller bearing is removed.

2. Shrinkage fit the inner race of roller bearing (443) into drive shaft (101).



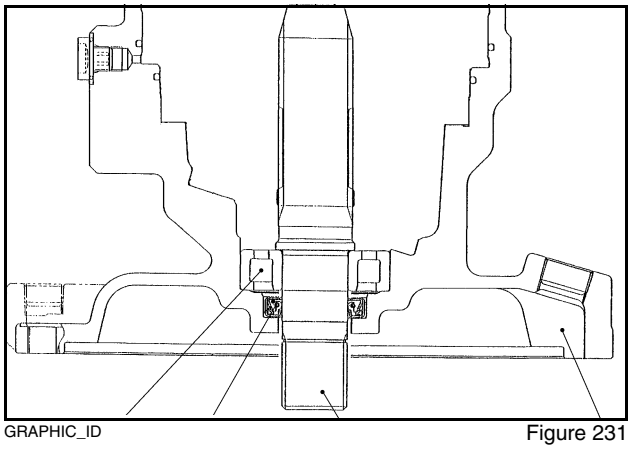
GRAPHIC_ID
Figure 230

3. Shrinkage fit the inner race of roller bearing (444) to drive shaft (101).

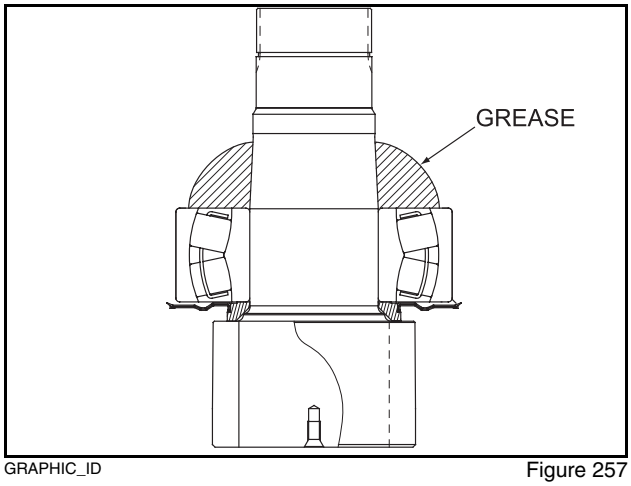
   This operation is necessary only when the oil seal is removed.
   Fit oil seal (491) to casing (301). On that occasion, coat the lip of the oil seal with grease and check the direction of it, before fixing it.

4. Assemble the outer race of roller bearing (443) into casing (301), by lightly tapping the steel rod.

5. Attach drive shaft (101) to casing (301).


GRAPHIC_ID
Figure 231

5. Apply sufficient grease to the pinion shaft assy.
   Grease : Lithium extreme-pressure grease (SHELL Albania EP2 or equivalent)

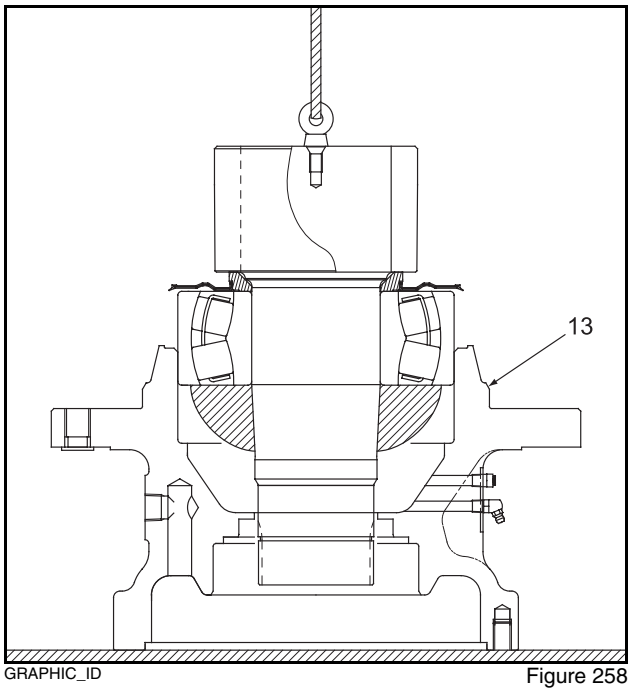


GRAPHIC_ID Figure 257

Placing pinion shaft assy in

1. Place housing (13) on level bench.
2. Attach eye bolt to screw (M10) at the axis end of pinion shaft assy, and perpendicularly hang up pinion shaft assy and place it in the housing.

   Horizontally orient the outer race of spherical bearing and insert it in by striking lightly.
   If the outer race is tilted, it is hard to insert even if striking. Then do not force to insert it in, but take it away once and horizontally orient the outer race twice and insert it in again.



GRAPHIC_ID Figure 258

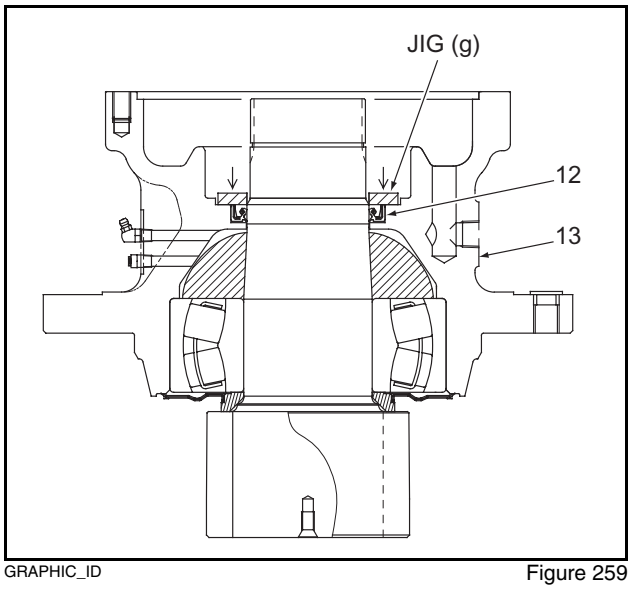
3. Set housing assy so that the pinion directs downward.

4. Fit oil seal (12) in housing (13) by means of jig (g).

   Apply Loctite #515 to the perimeter of oil seal.

   Fill one third (1/3) of the space of the groove-shaped section provided on the oil seal (12) lip with grease.

   Insert it horizontally giving attention to the lip of oil seal so as not be damaged.



GRAPHIC_ID Figure 259

5. The swing motor drifts much.
   Check the drain rate of the hydraulic motor. If it is less than 4 L/min (1.1 gal/min), you should think that the motor is not faulty.

Trouble	Cause	Remedy
The swing motor drifts much when it is actuated by external torques. (e.g. Machine is on a slope.)	1.Relief valve malfunctions. Same as (1). 2. Plunger seat is faulty. 3. Seat of the anti-reaction valve is no good. 4. Seat of bypass valve is no good.	1. Replace. Same as (1). 2. Replace. 3. Replace the anti-reaction valve cartridge or block. 4. Replace.

6. Oil leaks

   A. Oil leak from oil seal

Trouble	Cause	Remedy
Oil leaks from oil seal	1. Lip of seal catches contaminant and damaged. 2. Shaft is damaged or worn. 3. Casing inner pressure has risen abnormally high, with the result that lip of oil seal is flipped. 4. Shaft is rusted.	1. Replace oil seal. 2. Shift the lip and shaft positions or replace oil seal. 3. Repair drain piping if clogged up. 4. Disassemble and correct.

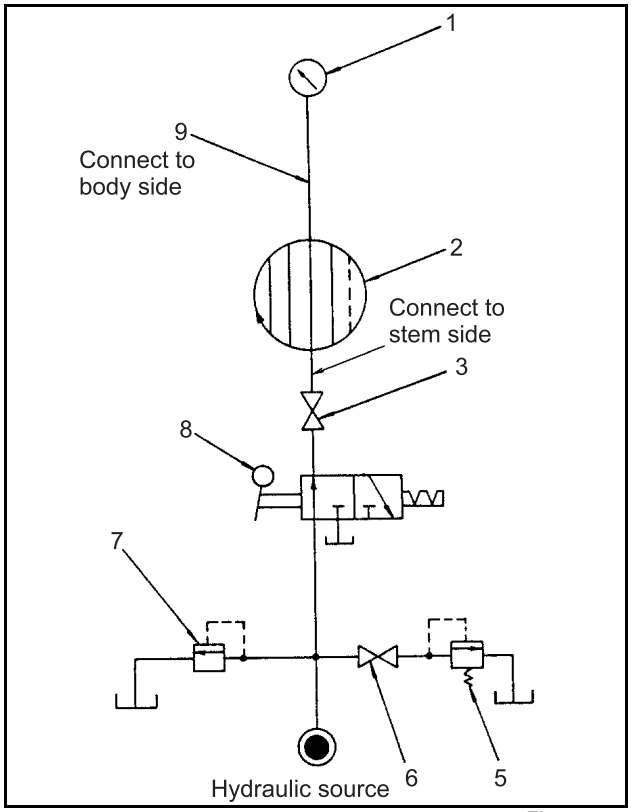
   B. Oil leak from matching surface

Trouble	Cause	Remedy
Oil leak from matching surface	1. O-ring is missing. 2. O-ring has a scratch. 3. Seal surface has a scratch. 4. Bolt is loose or damaged.	1. Set O-ring correctly and assemble it. 2. Replace. 3. Disassemble and correct. 4. Tighten to specified torque or replace.

Inspection After Assembly

After completion of assembly, inspection for oil leakage, pressure resistance, etc., using a device as shown.

1. High pressure port (A,B,C,D and F port)
   Install a directional valve and pressure gauge to the stem side port and body side port respectively, and while watching the pressure gauge (for high pressure) installed on the body side and also by regulating high pressure relief valve (7), gradually increase the pressure and when the pressure has reached 1.5 times the maximum working pressure, close stop valve (3) and lock in the hydraulic oil in the swivel. Keep stop valve (6) on the low pressure relief valve side closed at this time.
   Check that it is free from looseness, deformation, breakage, etc. under three minutes pressurizing.
   And, the oil leakage must be checked for the first 1 minute, and if there be a pressure drop for any reason, the pressure drop should be in 10% of the trapped pressure.
   This checking must be carried out for every circuit.



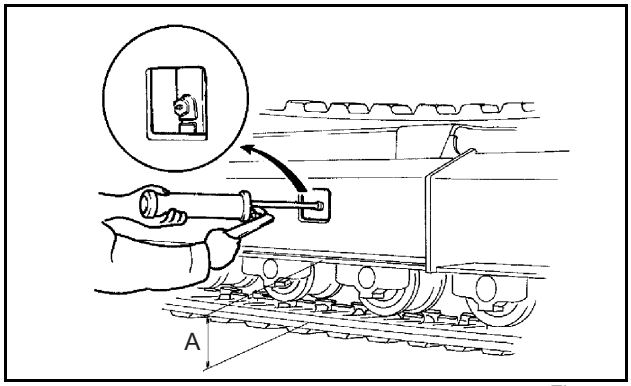
GRAPHIC_ID Figure 292

2. Low pressure port (E port)
   Similar to the high pressure port, install a directional valve and pressure gauge on each port of the stem side and body side.
   Open stop valve (6) on the side of low pressure relief valve (5) and while watching the pressure gauge (for low pressure) connected to the body side and also by regulating low pressure relief valve (5), gradually increase the pressure and check for outside leakage with a color check at a pressure of 0.49MPa (71psi).

Item	Description	Remarks
1	Pressure gauge	high and low pressures are required
2	Swivel joint	
3	Stop valve	
5	Relief valve for low pressure	Setting Pressure: 0.49 MPa (71 psi)
6	Stop valve	
7	Relief valve for high pressure	Setting Pressure: (working pressure x 1.5)

5. Adjusting crawler tension
   After installing, adjust tension of crawler.

	Standard dimension A
Dimension of iron crawler in a max. slackened condition	320 - 350 mm (12.6 - 13.8 in.)



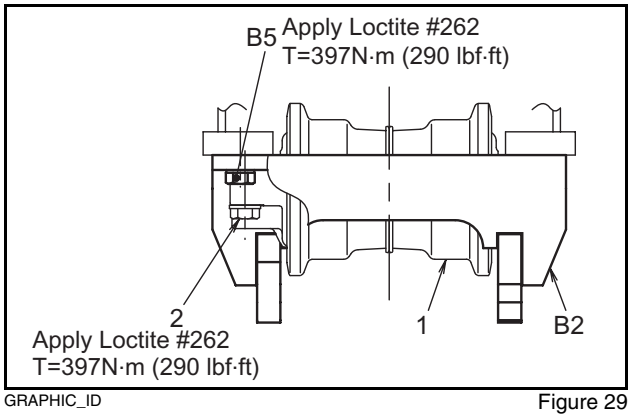
GRAPHIC_ID

Figure 8

LOWER ROLLER

Lower Roller Assembly

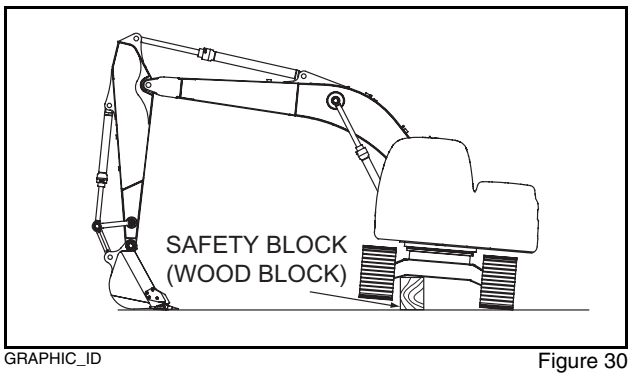
Roller Assembly		YF64D00002F1	
Item	Name	Qty	Remarks
1	Lower Roller	16	YF64D00001F1
2	Capscrew	64	M18X80 (P=1.5)



GRAPHIC_ID Figure 29

Removal

1. Preparation for removal
   A. Loosen the tension of the crawler, lift up the lower frame by the front attachment and stop the engine in that condition.
   B. Place a safety block (wood) at the front and back of the lower frame.

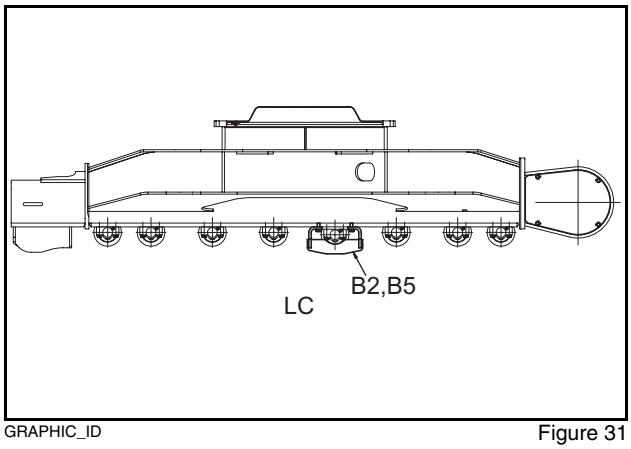


GRAPHIC_ID Figure 30

2. Removing track guide

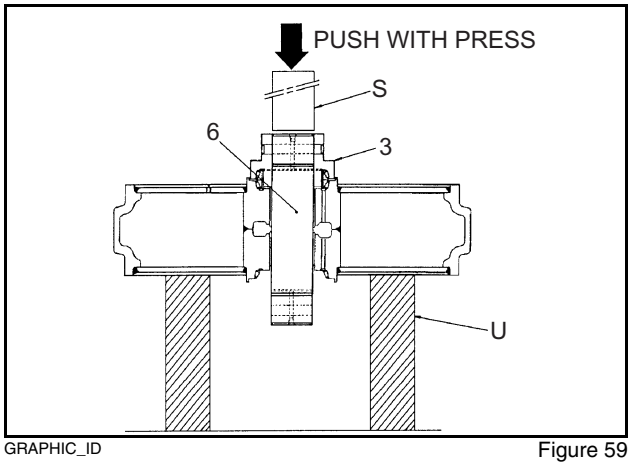
   Remove capscrews (B5) and remove track guide (B2).

   Weight of track guide: Approx. 25 kg (55lbs)



GRAPHIC_ID Figure 31

4. Removing collar (3) from shaft (6)
   If removal of collar (3) on the opposite side is required, turn over front idler and proceed with the procedure described in Par. 3.

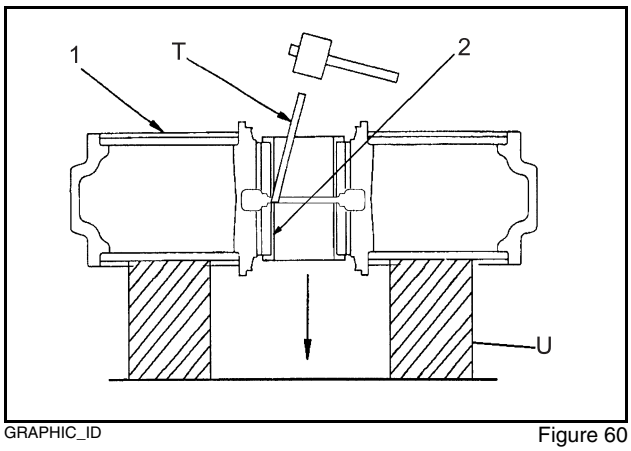


GRAPHIC_ID Figure 59

5. Removing bushing (2)
   With idler (1) mounted on the stand, tap bushing (2) lightly by hammer, while placing the bushing drawing rod (T) against the end face of bushing (2) evenly all round, till it comes out.

6. Removing floating seals (4)
   Take out floating seals (4) from idler (1), collar (3). If you intend to re-use floating seals (4), confirm that there is no scoring and rusting on the contact surface and store the floating seals in pairs by placing card board between the sealing faces.

7. Removing O-ring (7)
   Separate O-ring (7) from shaft (6).



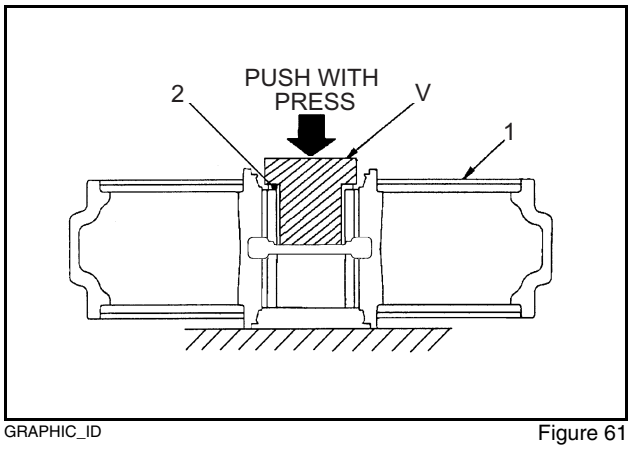
GRAPHIC_ID Figure 60

Assembly

1. Pressing in bushing (2)
   Align inner hole of idler (1) and bushing (2) and press fit it vertically with press so that jig (V) for bushing press-fitting is inserted into bushing (2).

2. Installing O-ring (7)
   Fit O-ring (7) to O-ring groove on shaft (6).

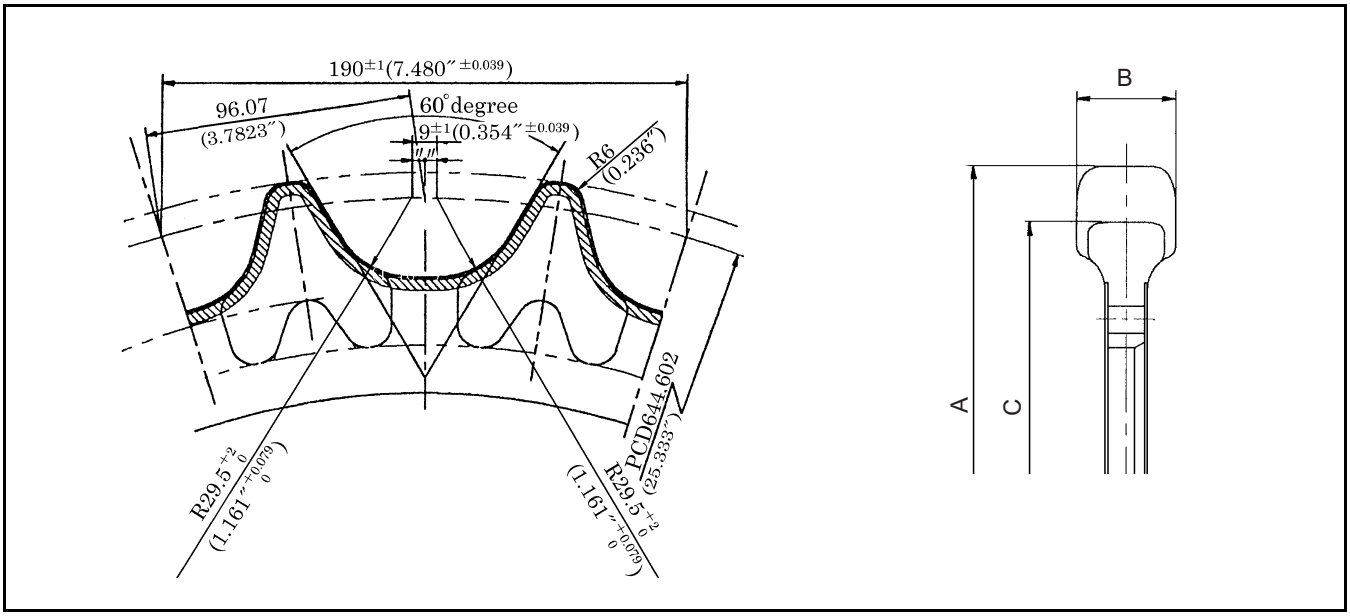
   Apply grease to O-ring



GRAPHIC_ID Figure 61

Maintenance Standard

SPECIFICATION	PITCH	96.07 mm (3.78 in)		NUMBER OF TEETH	21
	ROLLER DIA.	ø58.72 mm (2.31 in)		PITCH DIA.	644.602 (25.333 in)



GRAPHIC_1D

Figure 87

SPROCKET

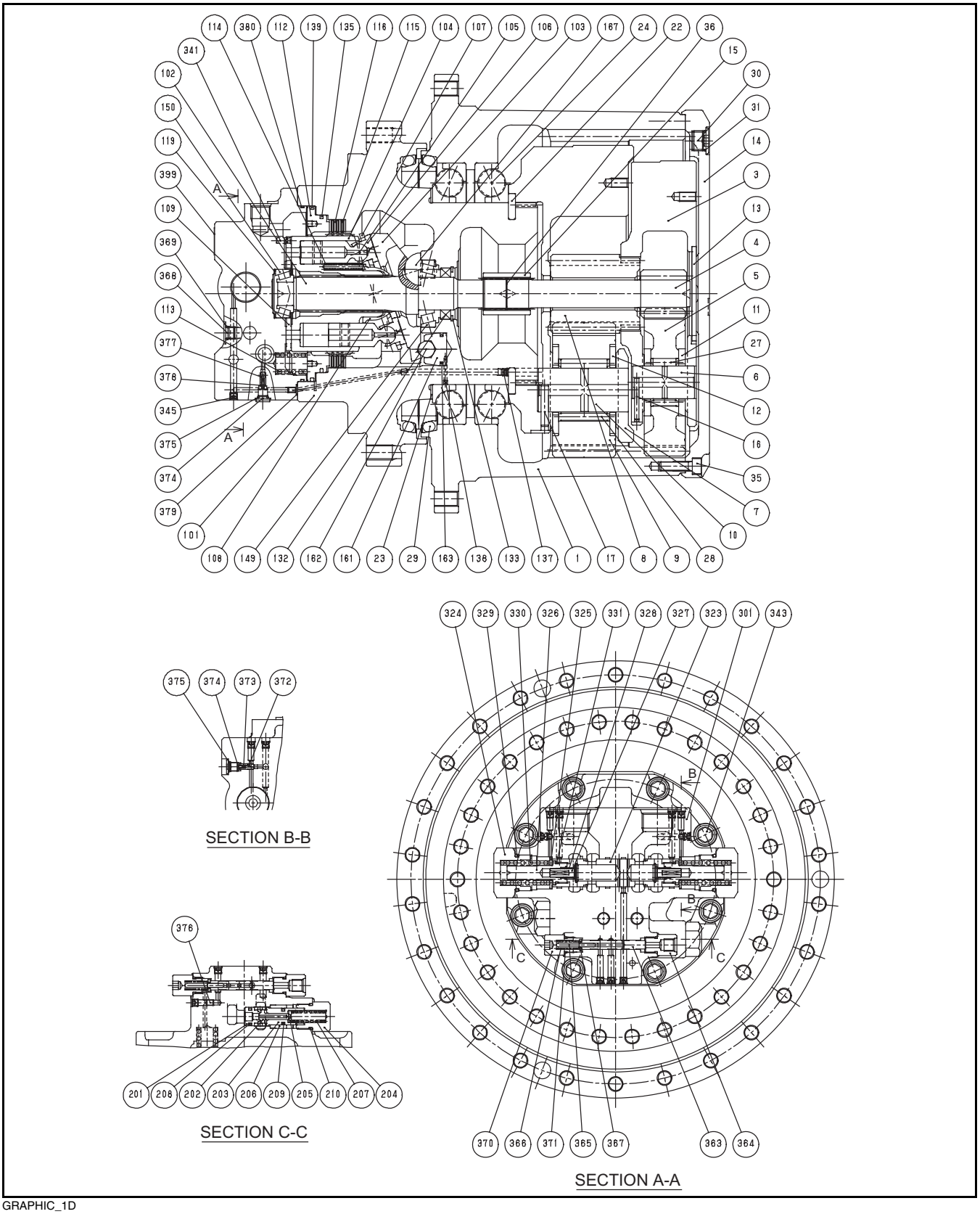
Unit:mm (in)

No.	NAME	STANDARD VALUE	REPAIRABLE LEVEL	SERVICE LIMIT	REMEDY
A	O.D. of sprocket	ø 659 (25.9)	ø 651 (25.6)	ø 649 (25.6)	Reinforcement weld, repair or replace.
B	Width of sprocket teeth	66 ± 2 (2.52 ± 0.079)	60 (2.36)	58 (2.28)	Replace.
C	O.D. of sprocket bottom	ø 586 (23.1)	ø 578 (22.8)	ø 576 (22.7)	Reinforcement weld, repair or replace.

TRAVEL MOTOR UNIT

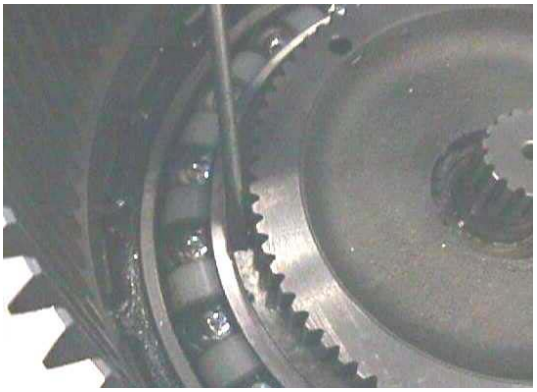
CONSTRUCTION OF TRAVEL MOTOR

Cross-sectional View of Travel Motor Assembly



GRAPHIC_1D

3. Apply flat-blade driver or equivalent to the space between two lock washers (22) and remove it while striking the driver obliquely downward.



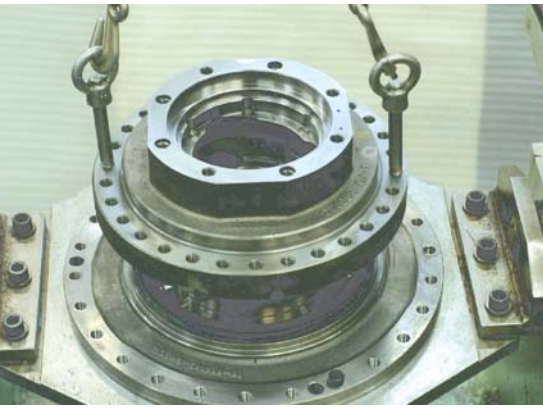
GRAPHIC_ID Figure 121

Removing spindle

1. Direct the spindle side upward.
2. Remove the special jig used to secure hub and spindle.
3. Attach eye bolt to spindle and lift the spindle by hoist.

⚠ WARNING ⚠

Slowly lift the spindle in parallel with the shaft of hub. If the spindle is obliquely lift, a large force which might cause the breakage of the hoisting accessory, eye bolt, etc. is applied resulting in injury by being hit by the hoisting accessory. When it is hard to pull it out, do not be forced to lift, but use press, etc. to pull it out safely.



GRAPHIC_ID Figure 122

Removing floating seal

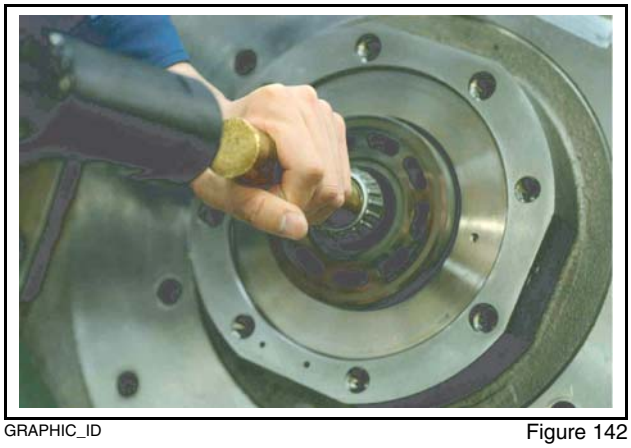
1. Touch the inner side of floating seal (29) by hand, and remove it pushing upward.

   NOTE: *There is a case where the edge of floating seal cuts your finger. We recommend using glove when removing it. And when it is stuck due to the intrusion of mud, remove it using screw driver as a lever.*

GRAPHIC_ID Figure 123

Assembling taper roller bearing

1. Push taper roller bearing (150) on which the outer ring has been removed against shaft (102), and then apply metal bar to the inner race and insert it while striking the bar with a hammer.

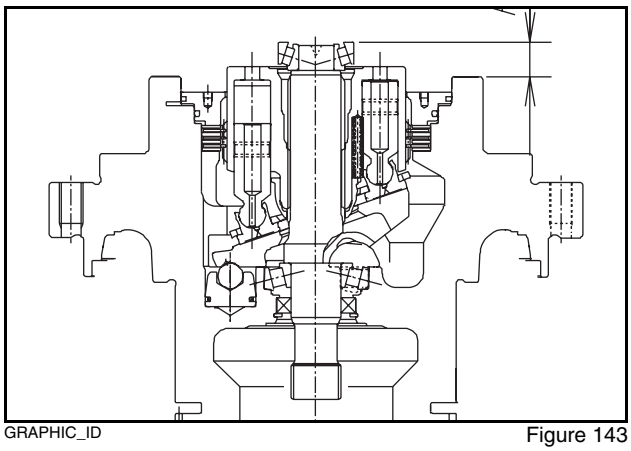


GRAPHIC_ID Figure 142

Adjusting clearance of taper roller bearing

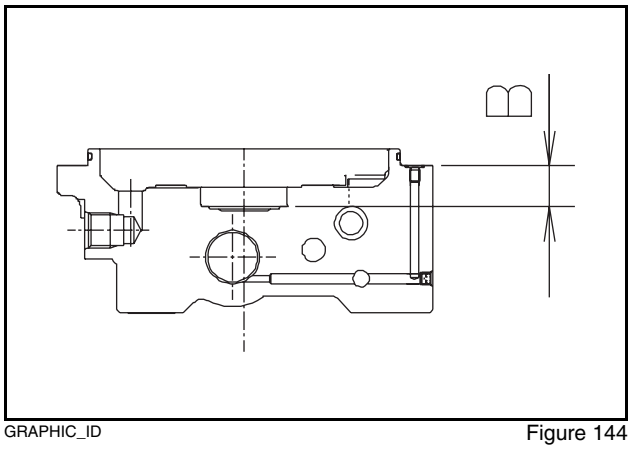
NOTE: *When spindle (101), shaft (102), rear flange (301) or taper roller bearing (149) (150) is replaced, adjust the clearance of taper roller bearing. When the clearance is improper, the life of taper roller bearing might be shortened.*

1. Direct the mating surface with the rear flange of spindle (101) upward.
2. Press taper roller bearing (150) into shaft (102) while striking it with plastic hammer.
3. Measure dimension A.



GRAPHIC_ID Figure 143

4. Measure dimension B of rear flange (301).
5. Subtract dimension A from dimension B, and select shim (119) which makes the clearance to 0~0.17mm (0~0.0067in).



GRAPHIC_ID Figure 144

CNH America LLC reserves the right to make improvements in design or changes in specifications at any time without incurring any obligation to install them on units previously sold.

All data given in this publication is subject to production variations. Dimensions and weights are only approximate. Illustrations do not necessarily show products in standard condition. For exact information about any particular product, please consult your Dealer

Revision History				
Issue	Issue Date	Applicable Machines	Form Number	Remarks
First Edition	02-2008	215SR ACERA	5-12590	

Error Code	Trouble	Described page
B173	Disconnection of P2 side optional pressure sensor	28
B174	Short-circuit of P2 side optional pressure sensor	28
C012	Incorrect output of P1 pump pressure sensor	29
C013	Disconnection of P1 pump pressure sensor	29
C014	Short-circuit of P1 pump pressure sensor	30
C022	Incorrect output of P2 pump pressure sensor	30
C023	Disconnection of P2 pump pressure sensor	31
C024	Short-circuit of P2 pump pressure sensor	31
C033	Disconnection of boom head pressure sensor	32
C034	Short-circuit of boom head pressure sensor	32
C043	Disconnection of boom rod pressure sensor	33
C044	Short circuit of boom rod pressure sensor	33
D012	Failure of output transistor ON at P1 unload proportional valve	34
D013	Disconnection of P1 unload proportional valve	34
D022	Failure of output transistor ON at P2 unload proportional valve	35
D023	Disconnection of P2 unload proportional valve	35
D032	Failure of output transistor ON at travel straight proportional valve	36
D033	Disconnection of travel straight proportional valve	36
D042	Failure of output transistor ON at boom cushion proportional valve	37
D043	Failure of output transistor ON at boom cushion proportional valve	37
D062	Failure of output transistor ON at arm in high speed proportional valve	38
D063	Disconnection of arm in high speed proportional valve	38
E012	Failure of output transistor ON at P1 pump proportional valve	39
E013	Disconnection of P1pump proportional valve	39
E022	Failure of output transistor ON at P2 pump proportional valve	40
E023	Disconnection of P2 pump proportional valve	40
E032	Failure of output transistor ON at OPT relief 1 proportional valve	41
E033	Disconnection of OPT relief 1 proportional valve	41
E042	Failure of output transistor ON at OPT relief 2 proportional valve	42
E043	Disconnection of OPT relief 2 proportional valve	42
F011	Failure of output transistor OFF and GND short of attachment boost SOL valve	43
F013	Failure of output transistor ON and disconnection of attachment boost SOL valve	43
F021	Failure of output transistor OFF and GND short of swing parking SOL valve	44
F023	Failure of output transistor ON and disconnection of swing parking SOL valve	44
F031	Failure of output transistor OFF and GND short of travel 1-2 speed SOL valve	45
F033	Failure of output transistor ON and disconnection of travel 1-2 speed SOL valve	45
F041	Failure of output transistor OFF and GND short of optional selector SOL valve	46
F043	Failure of output transistor ON and disconnection of optional selector SOL valve	46
G032	Overrun of speed sensor of direct input Mechatro-controller	47
G033	Disconnection of speed sensor of direct input Mechatro-controller	47
G042	Overrun of speed sensor of direct input Mechatro-controller and received data from E/G controller.	48
G043	Disconnection of speed sensor of direct input Mechatro-controller and received data from E/G controller.	48
H013	Disconnection of acceleration potentio	49

Table 18

Error code	B042		
Trouble	Arm-in pressure sensor outputs error		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the arm-in pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The arm-in operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	5	B-4 ARM IN
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Arm-in pressure sensor SE-7		When B042 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between arm-in pressure sensor and controller CN-130F CN-101F		When B042 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table 19

Error code	B043		
Trouble	Arm-in pressure sensor's wiring is disconnecting.		
Judging condition	The input voltage from arm-in pressure sensor is 0.1V or less.		
Symptom	Cavitation occurs at independent work of arm-in. Arm horizontal arm pulling can be barely done but if attachment is pulled in the air, arm falls first. Bucket can drag under the condition that the bucket bottom put on the ground.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 and P2 unload proportional valve to 0mA. (Valve emergency mode) Set output of arm 2 arm-in proportional valve to 200mA.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	5	B-4 ARM IN
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Arm-in pressure sensor SE-7		When B043 is cancelled and other error occurs after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between arm-in pressure sensor and controller CN-130F CN-101F		When B043 is displayed after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table 38

Error code	B162		
Trouble	P1 side option pressure sensor outputs error		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the P1 side option pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The P1 side option operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	6	B-16 P1 OPT.
	Screen No.		
	Screen No.		

Checking object		Checking contents and remedy
1	• P1 side option pressure sensor SE-20	When B162 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P1 side option pressure sensor and controller CN-304F CN-102F	When B162 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table 39

Error code	B163		
Trouble	P1 side option pressure sensor's wiring is disconnected.		
Judging condition	The input voltage from P1 side option pressure sensor is 0.1V or less.		
Symptom	The P1 side option does not work.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 unload proportional valve to 0mA. (Valve emergency mode) But normal control is done when the left control pedal selection is ON.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	6	B-16 P1 OPT.
	Screen No.		
	Screen No.		

Checking object		Checking contents and remedy
1	• P1 side option pressure sensor SE-20	When B163 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P1 side option pressure sensor and controller CN-304F CN-102F	When B163 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table 58

Error code		D032		
Trouble		Travel straight proportional valve and output transistor ON are failure.		
Judging condition		The feed-back value from proportional valve is 1000mA or more.		
Symptom		Travel deviation occurs by combined operation of travel and attachment.		
Control in the event of failure		Set Travel straight proportional valve output to 0mA.		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	8	D-3 S-TRAVEL
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• Travel straight proportional valve PSV-C			When D032 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between Travel straight proportional valve and controller CN-119F CN-105F			When D032 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table 59

Error code		D033		
Trouble		Travel straight proportional valve's wiring is disconnected.		
Judging condition		The feed-back value from proportional valve is 100mA or less. (If output is 100mA or less, judging is not done.)		
Symptom		Travel deviation occurs by combined operation of travel and attachment.		
Control in the event of failure		Set Travel straight proportional valve output to 0mA.		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	8	D-3 S-TRAVEL
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• Travel straight proportional valve PSV-C			When D033 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between Travel straight proportional valve and controller CN-119F CN-105F			When D033 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table 78

Error code		F041		
Trouble		Option selector solenoid valve and output transistor OFF are failure, and grounding is short-circuit.		
Judging condition		The feed-back signal is grounding level while exciting command is output.		
Symptom		Option selector valve does not change to breaker side.		
Control in the event of failure		Normal control		
Returned in normal condition		The feed-back signal is ground level while exciting command is output.		
Service diagnosis checking screen		Screen No.	11	F-4 OPT SELECT
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• Option selector solenoid valve SV-13			When F041 is cancelled and other error occurs by exchanging the connector for other solenoid valve. Check solenoid valve unit for possible failure. If failure found, replace it.
2	• Wiring between option selector solenoid valve and controller CN-251F CN-105F			When F041 is displayed after the connector is exchanged with other solenoid valve. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table 79

Error code		F043		
Trouble		Option selector solenoid valve and output transistor ON are failure, and disconnection.		
Judging condition		The feed-back signal is 24V level while exciting command is not output.		
Symptom		Option selector valve does not change to breaker side or it does not change from breaker to nibbler.		
Control in the event of failure		Normal control		
Returned in normal condition		The feed-back signal is ground level while exciting command is not output.		
Service diagnosis checking screen		Screen No.	11	F-4 OPT SELECT
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• Option selector solenoid valve SV-13			When F043 is cancelled and other error occurs by exchanging the connector for other solenoid valve. Check solenoid valve unit for possible failure. If failure found, replace it.
2	• Wiring between option selector solenoid valve and controller CN-251F CN-105F			When F043 is displayed after the connector is exchanged with other solenoid valve. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table 98

Error code	R034		
Trouble	Wiper motor reverse rotation relay error		
Judging condition	The Mechatro controller output line to wiper motor reverse rotation relay is short-circuited with the power source.		
Symptom	Wiper does not move after forward rotation.		
Control in the event of failure	Relay output is stopped.		
Returned in normal condition	When the power is OFF		
Service diagnosis checking screen	Screen No.	25	CCW MOTOR RLY
	Screen No.		
	Screen No.		

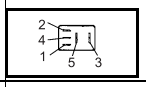
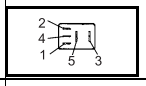
Checking object		Checking contents and remedy
1	• Wiper motor reverse rotation relay R-30	When error is cancelled after removing wiper motor reverse rotation relay, check relay unit for failure, replace it with new one if failed. When resistance between relays (1) and (2) is 0 Ω, it is in abnormal condition. 
2	• Wiring between wiper motor forward rotation relay and controller CN-109F, CN2-1 •Fuse & relay box E-1	When R034 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line according to the wiring checking procedure and replace it if necessary. When no failure found after checking on wiring and R034 is left displayed Replace fuse/relay box.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table 99

Error code	R044		
Trouble	Washer motor relay error		
Judging condition	The Mechatro controller output line to washer motor relay is short-circuited with the power source.		
Symptom	Washer motor does not move.		
Control in the event of failure	Relay output is stopped.		
Returned in normal condition	When the power is OFF		
Service diagnosis checking screen	Screen No.	25	MOTOR RELAY
	Screen No.		
	Screen No.		

Checking object		Checking contents and remedy
1	• Washer motor relay R-32	When error is cancelled after removing washer motor relay, check relay unit for failure, replace it with new one if failed. When resistance between relays (1) and (2) is 0Ω, it is in abnormal condition. 
2	• Wiring between washer motor relay and controller CN-112F, CN2-1 •Fuse & relay box E-1	When R044 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line according to the wiring checking procedure and replace it if necessary. When no failure found after checking on wiring and R044 is left displayed Replace fuse/relay box.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

1. All controls do not function/slow

No.	Sections	Contents/normal value		Corrective action, others
1	Fuse	Check fuse No.4 (10A)		If the fuse is blown out, check on the short-circuited section.
2	Safety lever lock switch	Carry out service diagnosis	No.4 K-4 switch: Push down the lever and it turns on, push up and it turns off.	Check action of switch by tester, or check that the power voltage is lowered by pushing the lever down.
3	Safety lever lock switching	Check that the solenoid is switched correctly	Measure both terminals of solenoid connector. 24V by pushing the lever down, 0V by pushing it up	Check solenoid unit for possible failure. Check harness for possible failure.
4	Safety lever lock relay	Carry out service diagnosis	No.4 K-4 lock lever: Push down the lever and it turns off, push up and it turns on.	Check action of relay by tester
5	Pilot pressure sensor		Stop engine stop and key is on position. All pilot low pressure sensors are 0 MPa to 0.1 MPa.	Check 5V power for controller
6	Solenoid valve for safety lock lever	Measure pressure of solenoid A1 port	About 0 MPa by pushing the lever up, and 4 MPa or more by push it down.	Replace solenoid valve
7	Pilot line filter	Disassemble and check it visually	Check filter for clogging	Clean filter
8	Pilot gear pump	Measure pilot primary pressure at gear pump	Check that it is 4 MPa or more in high idling	Check gear pump and the relief valve for possible failure
9	Multi control valve (in case that travel is operable)	Change position	Since all are blocked due to poor switching performance, check that the lever select pattern is set to the proper position.	
10	Actual measuring current value of P1/P2 unload proportional valve	Carry out service diagnosis	No.8 D-1 P1 unload valve (cut valve) D-1 P2 unload valve (cut valve) See Service Diagnosis Data List Operation No.3 Boom up full lever & relief	In case where the reading is largely differed from the actually measured value, check proportional valve and controller for possible failure.
11	Secondary pressure of P1, P2 unload proportional valve	Measure the proportional valve secondary pressure directly at the ports A7 and A5 of 8 sections solenoid block	Check that P1/P2 unload secondary pressures are within the range of 0.5 to 1.2 MPa in boom up full lever and high idling operation	Replace proportional valve
12	Actual measuring current value of P1/P2 pump proportional valve	Carry out service diagnosis.	No.9 E-1 P1 pump E-2 P2 pump See Service Diagnosis Data List Operation No.18 Travel right full lever & idling Operation No.19 Travel left full lever & idling	In case where the reading is largely differed from the actually measured value, check proportional valve and controller for possible failure.
13	Secondary pressure of pump proportional valve	Measure the pump proportional valve secondary pressure directly in idling operation. (Ports a3, a4)	Check that pump proportional valve secondary pressure is 2.7 MPa or more in right (left) travel full lever and high idling operation Right travel: P1 pump proportional valve Left travel: P2 pump proportional valve	Replace proportional valve

8. Slow independent arm out (in the air)

No.	Sections	Contents/normal value		Corrective action, others
1	Arm out pressure sensor	Carry out service diagnosis	See Service Diagnosis Data List Operation No.8 arm out full lever and relief	Check and replace pressure sensor Check remote control valve
2	Remote control valve	Measure directly remote control pressure of arm out	Check that pressure is 3.0 MPa or more in arm out full lever and high idling operation	Check remote control valve When equipped with multi control valve, check it while changing lever pattern
3	Pump pressure sensor	Carry out service diagnosis for P1, P2 pump pressures in operation.	See Service Diagnosis Data List Operation No.9 arm out full lever and in operation	When there is difference between P1 and P2 pump pressures, check high pressure sensor
4	Actual measuring current value of P1/P2 unload proportional valve	Carry out service diagnosis	No.8 D-1 P1 unload valve (cut valve) D-1 P2 unload valve (cut valve) See Service Diagnosis Data List Operation No.8 Arm out full lever & relief	In case where the reading is largely differed from the actually measured value, check proportional valve and controller for possible failure.
5	Secondary pressure of P1, P2 unload proportional valve	Measure the proportional valve secondary pressure directly at the ports A7 and A5 of 8 sections solenoid block	Check that P1/P2 unload secondary pressures are within the range of 0.5 to 1.2 MPa in arm out full lever and high idling operation	Replace proportional valve
6	Actual measuring current value of P1/P2 pump proportional valve	Carry out service diagnosis	No.9 E-1 P1 pump E-2 P2 pump See Service Diagnosis Data List Operation No.9 Arm out full lever & in operation	In case where the reading is largely differed from the actually measured value, check proportional valve and controller for possible failure.
7	Secondary pressure of P1, P2 pump proportional valve	Measure the pump proportional valve secondary pressure directly (Ports a3, a4)	Check that P1/P2 pump proportional valve pressures are within the range of 1.5 to 2.7 MPa in arm out full lever and high idling operation (Secondary pressure is affected by oil temperature and attachment weight)	Replace proportional valve
8	Actual measuring current value of travel straight proportional valve	Carry out service diagnosis	Check that the value is not change regardless of operation See Service Diagnosis Data List Operation No. 1 Operation is nil Operation No.18 Travel right full lever & idling Operation No.19 Travel left full lever & idling	Check pressure sensor of travel In case where the reading is largely differed from the actually measured value, check proportional valve and controller for possible failure.
9	Secondary pressure of travel straight proportional valve	Measure directly the proportional valve secondary pressure at the ports A6 (travel straight) of 8 sections solenoid block	0.8 MPa or less in high idling operation regardless of neutral/ operation	Replace proportional valve
10	Remote control valve	Check targeted remote control valve	Check that spool is free from abnormal damage and spring is free from breakage	Replace
11	Main relief valve <Trouble> Relief pressure is low.	Check set pressure	See Service Diagnosis Data List Operation No.3 boom up full lever and relief	Reset or replace

No.	Sections	Contents/normal value		Corrective action, others
9	Remote control valve	Check targeted remote control valve	Check that spool is free from abnormal damage and spring is free from breakage Check sealing ability of shuttle valve and entry of dust in orifice	Replace
10	Travel straight spool <Trouble> P1 pressure is high.	Visual check	When removing, free from abnormal resistance against sliding Free from abnormal damage, etc on outside surface Spring is free from breakage.	Replace (Check on the casing side for damage)
11	Travel spool <Trouble> Pump pressure is high.	Visual check of targeted spool	When removing, free from abnormal resistance against sliding Free from abnormal damage, etc on outside surface Spring is free from breakage.	Replace (Check on the casing side for damage)
12	Travel motor relief valve	Check set pressure	Check P1 and P2 pump pressures are 32 MPa or more in right and left travel levers full lever (relief operation at locked crawler belt) and high idling	If P1 is low, right travel motor Åfs relief valve is failed. If P2 is low, left travel motor Åfs relief valve is failed.
13	Travel motor	Visual check	Inner parts (piston, cylinder block, valve plate, brake valve spool) are to be free from abnormal resistance against sliding. Free from abnormal damage, etc on outside surface (brake plate etc)	Replace
14	Parking brake in travel motor	Visual check	When removing, free from abnormal resistance against sliding No sticking on friction plate and separator plate	Replace
15	Travel reduction gear oil	Take sample oil from travel reduction gear drain	Sampling oil does not include a lot of metal powder.	Disassemble and inspect reduction gear
16	Travel reduction	Visual check	Tooth surface is not worn abnormally and is not chipped.	Replace

Trouble

1. Engine does not stop.
2. CPU DATA COMMUNICATION ERROR is displayed on multi display.
3. Auto accel does not actuate. (The engine speed does not automatically slow down.)
4. Auto accel does not actuate. (The engine speed does not automatically speed up.)
5. Wiper does not function.

1. Engine does not stop.

No.	Sections	Contents/normal value		Corrective action, others
1	Starter key switch	Check signal of starter key switch ON by carrying out service diagnosis.	No.4 K-3 Key switch OFF at starter key switch OFF position ON at starter key switch ON position	Check continuity between terminals of starter switch using tester
2	Engine forcible stop relay	When ON is displayed with the starter switch OFF, then pull out R-25 engine forcible stop relay and carry out the service diagnosis.	No.4 K-3 Key switch OFF at starter key switch OFF position ON at starter key switch ON position	Check on engine forcible stop relay
3	Wiring	Voltage between line No.62 among starter switch, engine forcible stop relay, mechatro controller and the body grounding	0V when starter switch is OFF	Check harness Check diode D-9 between starter switch and auto idling stop relay 1

2. CPU DATA COMMUNICATION ERROR is displayed on multi display.

No.	Sections	Contents/normal value		Corrective action, others
1	Fuse	No.1 fuse (5A)	Not blown fuse	Check harness Replace fuse
2	Mechatro controller	Accel control	Engine speed varies according to accel potentiometer operation. (Use remote control because the auto accel function is working.)	Check mechatro controller and replace as necessary
3	Wiring	Transmission circuit line No.770 from mechatro controller to gauge cluster	See WIRING CHECKING PROCEDURE	Repair wiring
4	Gauge cluster	Gauge cluster		Replace gauge cluster