FIAT KOBELCO COMPACT LINE

E30SR EVOLUTION
E35SR EVOLUTION

WORKSHOP MANUAL
ENGLISH

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EVOLVING TECHNOLOGY

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3. SPCIFICATIONS AND PERFORMANCE

■ SPEED AND GRADEABILITY

Model	*E30SR EVOLUTION*				*E35SR EVOLUTION*			
Item \ Shoe Type	Rubber shoe		Steel shoe (OPT)		Rubber shoe		Steel shoe (OPT)	
Slewing Speed	9.0 rpm				8.6 rpm			
Travel Speed km/h	Low (1st)	High (2nd)	Low (1st)	High (2nd)	Low (1st)	High (2nd)	Low (1st)	High (2nd)
	2.6 (1.6)	4.5 (2.8)	2.5 (1.6)	4.3 (2.7)	2.5 (1.6)	4.5 (2.8)	2.5 (1.6)	4.4 (2.7)
Gradeability % (degree)	58 % (30˚)				58 % (30˚)			

■ SIDE DIGGING & DOZER

Type		Boom swing by hydraulic cylinder	Boom swing by hydraulic cylinder
Boom Swing Angle	Right	60˚	60˚
	Left	CANOPY:80˚ / CAB:70˚	CANOPY:80˚ / CAB:70˚
Stroke of Dozer(above/below) ㎜(in)		305 / 390 (12.0 / 15.4)	330 / 390 (13.0 / 15.4)

■ ENGINE

Model	YANMAR 3TNE82A - YBC	YANMAR 3TNE82A - YBD
Type	Water-cooled, 4-cycle type Swirl chamber type diesel engine	
Number of cylinders-Bore x Stroke	3 - 82mm X 84mm (3.23in X 3.31in)	
Total Displacement	1.33 liters (81.1 cu.in)	
Output Rating	23PS / 2,300rpm {16.9kW / 2,300min^{-1}}	24PS / 2,400rpm {17.7kW / 2,400min^{-1}}
Maximum Torque	8.1kgf·m / 1,400rpm {59lbf·ft/1,400rpm}	8.1kgf·m / 1,500rpm {59lbf·ft/1,500rpm}
Starting Motor	12V / 1.2 kW	
Generator	12V / 40 A	

■ HYDRAULIC COMPONENTS

Hydraulic Pump	Variable displacement axial piston + gear pump
Hydraulic Motor	Axial piston
Hydraulic Motor w/Reducer (Travel)	2-Axial piston, 2-Speed motor
Control Valve	10-spool multiple control valve
Cylinder (Boom, Arm, Swing, Bucket, Dozer, Frame width)	Double action cylinder
Return Filter	Safety valve containing / Filter Type (30㎛)

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Part I: REMOVING AND INSTALLING ASSY

1. ATTACHMENT ASSY AND NAME

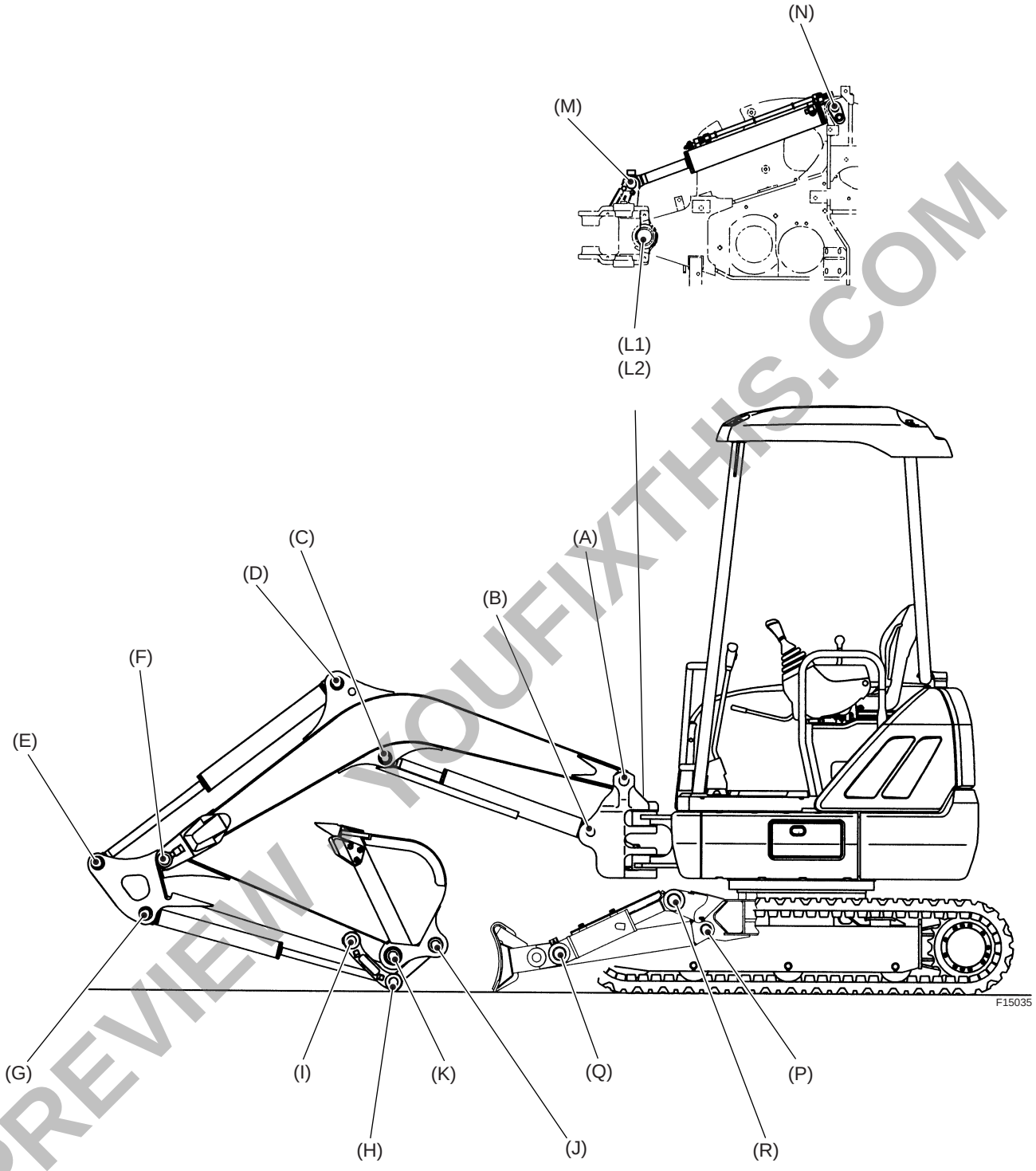


Fig. 1-1 Attachment name and position

(A) Boom foot pin
(B) Boom cylinder head pin
(C) Boom cylinder rod pin
(D) Arm cylinder head pin
(E) Arm cylinder rod pin
(F) Boom top pin
(G) Bucket cylinder head pin
(H) Bucket cylinder rod pin
(I) Idler link pin
(J) Bucket drive pin
(K) Bucket attaching pin
(L1) Swing center pin (upper)
(L2) Swing center pin (lower)
(M) Swing cylinder rod pin
(N) Swing cylinder head pin
(P) Dozer pin
(Q) Dozer cylinder head pin
(R) Dozer cylinder rod pin

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2. BUCKET

2.1 REMOVAL OF BUCKET

(1) Operate the operating lever and place the bucket on the ground, so the bucket and arm connecting pins are not loaded.
(2) Move the O-rings (3) toward the bucket bosses using a spatula.
(3) In order to remove pin (K) which links arm and bucket, remove the ring (2) and the pin (3) by means of straight driver, and draw out pin (K).
- If the pin does not come off easily, the pin is loaded. Take off the load by manipulating the operating lever.
- Take care so the dust seal between the arm and the bucket bosses is not damaged.

(4) Adjust the bucket by manipulating the operating lever so the pin (J) between the bucket link and the bucket is not loaded.
(5) Remove the ring (2) and pin (1) then pull out the pin (J).
(6) Remove bucket assy.
Weight: 89 kg (196 lb) *E30SR EVOLUTION*
92 kg (203 lb) *E35SR EVOLUTION*

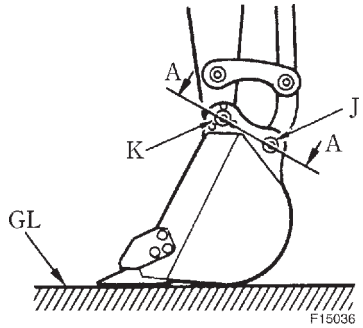


Fig. 2-2 To place bucket on ground

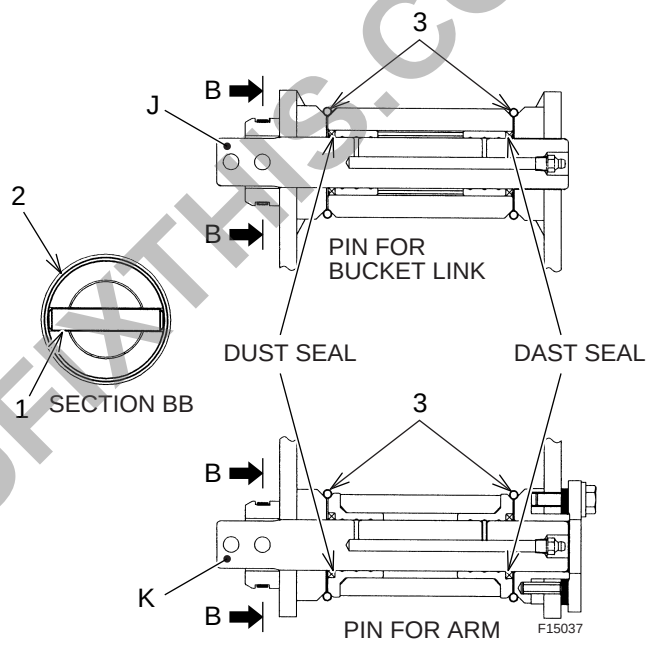


Fig. 2-3 Assembly of pin (SECTION A-A)

2.2 INSTALLATION OF BUCKET

Installation is performed in the reverse order of removal, including the following workings:

WARNING

When aligning the pin borees, do not put your finger in the pin holes in any circumstances, but align them visually.

(1) Clean the welded part of the structures and check that there is no crack on the part.
(2) Check that the dust seal is not damaged, and replace a faulty one if necessary.
(3) Adjust the clearance between the bucket and the arm according to Item 2.3.
(4) Replace the worn pins and bushings according to the section "ATTACHMENT DIMENSIONS" of "SPECIFICATIONS".
(5) When inserting the pin, coat the shaft with grease.
- The bucket can be mounted easily if the bucket link is installed in the beginning.

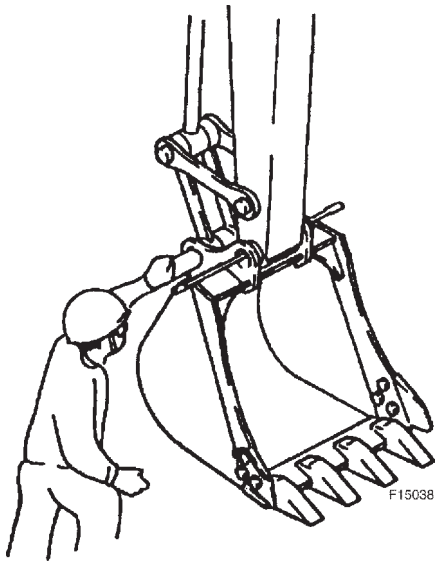


Fig. 2-4 Installation of bucket

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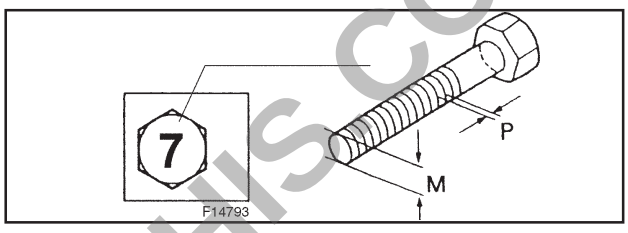
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1. TORQUE SPECIFICATIONS FOR CAPSCREWS AND NUTS

The following Torque Specifications are provided for use when actual torque value of a fastener is not known. Check the capscrews and nuts for their looseness and dropping off before the start of daily work and at the periodical maintenance. Retighten the loosened ones, and install new ones for the dropped off. For the new machine, the check and retightening of them must be carried out at first 50 hours operation. For the replacement of them, make sure to use the same size of genuine parts.

Refer to the table below for the tightening and retightening of capscrews.

- The table below is not applicable for the capscrews to fix the cover, etc., made of plastic. For the tightening torque for such capscrews, consult with an authorized Distributor. Over-tightening may cause damages on the parts to be fixed.
- In case that the tightening torque is specified in the manual, use such torque values regardless to the table below.
- Numerical indication on the capscrew head shows the classification for strength (e.g., 7 = 7 T). No indication is provided for smaller size of capscrews, M 5 or less.



1.Metric caorse thread standard tightening torque values. Make certain to tighten all capscrews & nuts to proper torque values.

Classification	4.8 T		7 T		10.9 T	
NOMINAL SIZE	NO LUBRICATION	OIL LUBRICATION	NO LUBRICATION	OIL LUBRICATION	NO LUBRICATION	OIL LUBRICATION
M6 P=1	0.45±0.05(3.2±0.4)	0.38±0.04(2.7±0.3)	0.98±0.1(7.1±0.7)	0.83±0.08(6.0±0.6)	1.77±0.18(12.8±1.3)	1.5±0.15(10.8±1.1)
M8 P=1.25	1.09±0.11(7.9±0.8)	0.92±0.09(6.6±0.7)	2.4±0.2(17.3±1.4)	2.0±0.2(14.4±1.4)	4.3±0.4(31±2.9)	3.6±0.4(26±2.9)
M10 P=1.5	2.2±0.2(15.9±1.4)	1.83±0.18(13.2±1.3)	4.7±0.5(34±3.6)	4.0±0.4(29±2.9)	8.5±0.9(61±6.5)	7.2±0.7(52±5.1)
M12 P=1.75	3.7±0.4(27±2.9)	3.2±0.3(23±2.2)	8.1±0.8(59±5.8)	6.8±0.7(49±5.1)	14.6±1.5(105±10.8)	12.3±1.2(89±8.7)
M14 P=2	5.9±0.6(43±4.3)	5.0±0.5(36±3.6)	12.8±1.3(93±9.4)	10.8±1.1(78±7.9)	23±2(166±14.5)	19.5±1.9(140±13.7)
M16 P=2	9.0±0.9(65±6.5)	7.6±0.7(55±5.1)	19.5±2(140±14.4)	16.4±1.6(118±11.5)	35±4(252±29)	29±3(209±22)
M18 P=2.5	12.4±1.2(90±8.7)	10.5±1.0(76±7.2)	27±3(195±22)	23±2(166±14.5)	49±5(354±36)	41±4(296±29)
M20 P=2.5	17.5±1.7(126±12.3)	14.7±1.4(106±10.1)	38±4(274±29)	32±3(231±22)	68±7(491±51)	57±6(412±43)
M22 P=2.5	23±2(166±14.5)	19.6±2(142±14.5)	51±5(368±36)	43±4(310±29)	92±9(665±65)	77±8(557±58)
M24 P=3	30±3(217±22)	24±3(173±22)	65±7(470±51)	53±5(383±36)	118±12(852±87)	93±10(673±72)
M27 P=3	44±4(318±29)	36±3(260±22)	96±10(694±72)	78±8(563±58)	173±17(1250±123)	140±14(1010±100)
M30 P=3.5	60±6(433±43)	50±5(361±36)	131±13(948±94)	110±11(796±79)	235±24(1700±174)	198±20(1430±145)
M33 P=3.5	81±8(585±58)	68±7(491±51)	176±18(1270±130)	148±15(1070±110)	317±32(2290±230)	266±27(1920±195)
M36 P=4	105±10(758±72)	88±9(636±65)	227±23(1640±170)	190±19(1370±140)	409±41(2960±300)	343±34(2480±250)

TORQUE VALUE UNIT-kgf·m (lbf·ft)

2.Metric fine thread standard tightening torque values. Make certain to tighten all capscrews ans nuts to proper torque values.

Classification	4.8 T		7 T		10.9 T	
NOMINAL SIZE	NO LUBRICATION	OIL LUBRICATION	NO LUBRICATION	OIL LUBRICATION	NO LUBRICATION	OIL LUBRICATION
M8 P=1.0	1.15±0.11(8.3±0.8)	0.97±0.1 (7.0±0.7)	2.5±0.2 (18.0±1.4)	2.1±0.2 (15.2±1.4)	4.5±0.4 (33±2.9)	3.8±0.4 (27±2.9)
M10 P=1.25	2.3±0.2 (16.6±1.4)	1.91±0.19(13.8±1.4)	4.9±0.5 (35±3.6)	4.2±0.4 (30±2.9)	8.9±0.9 (64±6.5)	7.5±0.7 (54±5.1)
M12 P=1.25	4.0±0.4 (29±2.9)	3.4±0.3 (25±2.2)	8.7±0.9 (63±6.5)	7.3±0.7 (53±5.1)	15.7±1.6 (114±11.6)	13.2±1.3 (95±9.4)
M16 P=1.5	9.4±0.9 (68±6.5)	7.9±0.8 (57±5.8)	20±2 (144±14.5)	17.2±1.7 (124±12.3)	37±4 (268±29)	31±3 (224±22)
M20 P=1.5	19±1.9 (137±13.7)	15.8±1.6 (114±11.6)	41±4 (296±29)	34±3 (246±22)	74±7 (535±51)	62±6 (448±43)
M24 P=2	32±3 (231±22)	27±3 (195±22)	70±7 (506±51)	58±6 (420±43)	126±12 (911±87)	105±10 (759±72)
M30 P=2	65±6 (470±43)	54±5 (391±36)	142±14(1030±100)	118±12 (852±87)	255±26 (1840±188)	212±21 (1530±150)
M36 P=3	109±11 (788±79)	91±9 (658±65)	238±23(1720±166)	198±20 (1430±145)	428±43 (3100±310)	357±36 (2580±260)

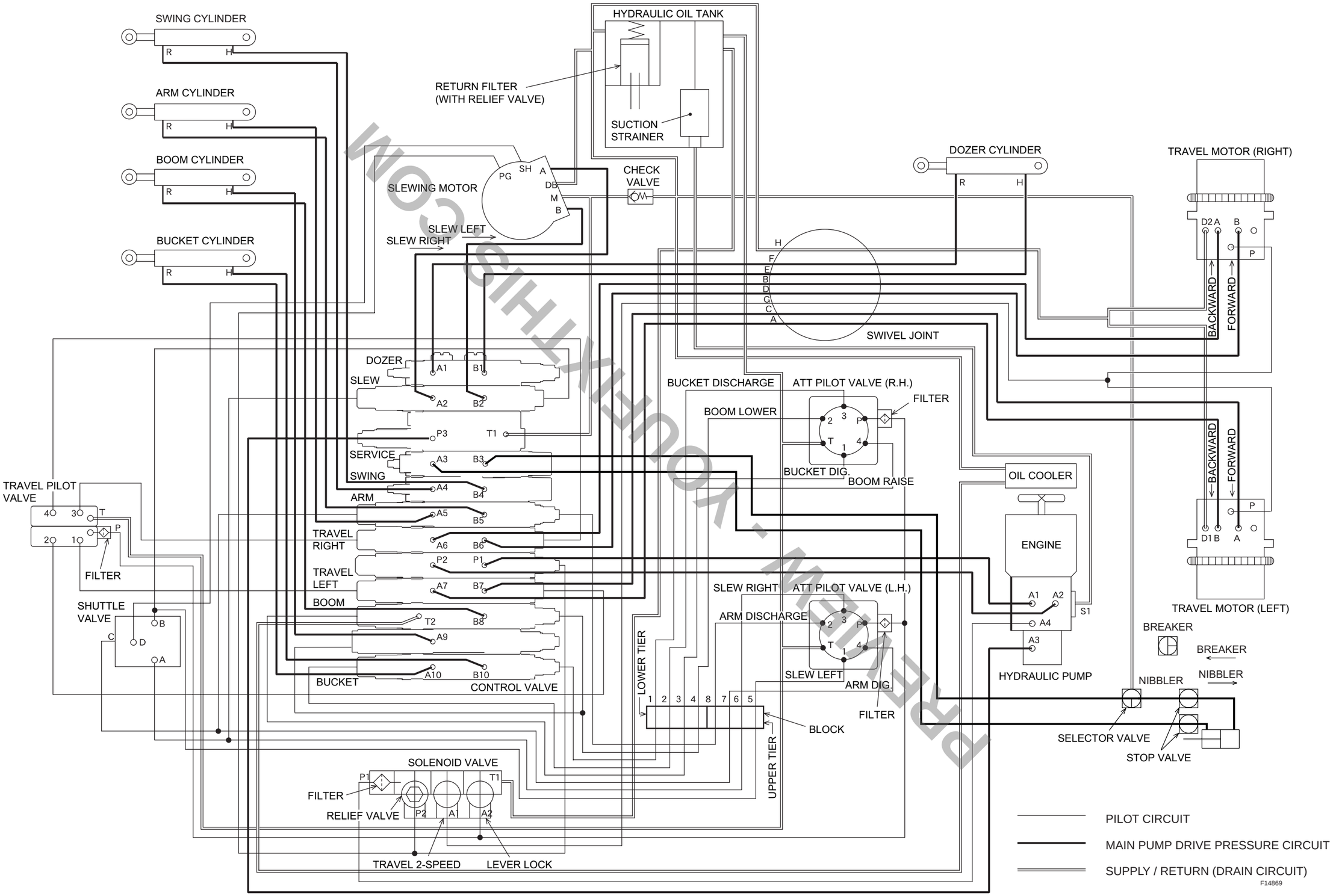
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TORQUE VALUE UNIT-kgf·m (lbf·ft)

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4. SCHEMATIC PIPING FOR HYDRAULIC SYSTEM



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2.1 HYDRALIC CIRCUIT DIAGRAM

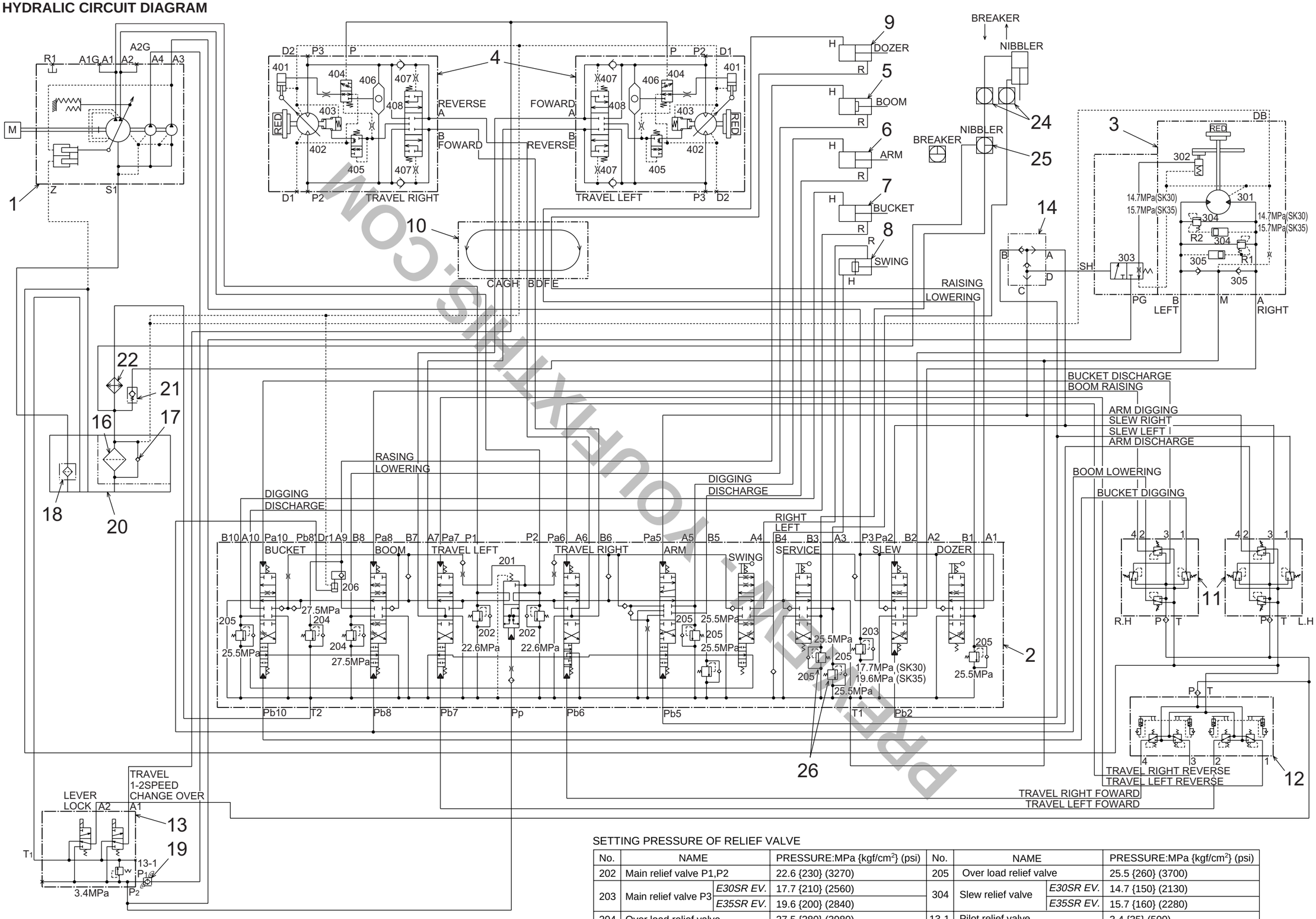


Fig. 1 Hydraulic circuit diagram

SETTING PRESSURE OF RELIEF VALVE

No.	NAME		PRESSURE:MPa {kgf/cm²} (psi)	No.	NAME		PRESSURE:MPa {kgf/cm²} (psi)
202	Main relief valve P1,P2		22.6 {230} (3270)	205	Over load relief valve		25.5 {260} (3700)
203	Main relief valve P3	*E30SR EV.*	17.7 {210} (2560)	304	Slew relief valve	*E30SR EV.*	14.7 {150} (2130)
		E35SR EV.	19.6 {200} (2840)			*E35SR EV.*	15.7 {160} (2280)
204	Over load relief valve		27.5 {280} (3980)	13-1	Pilot relief valve		3.4 {35} (500)

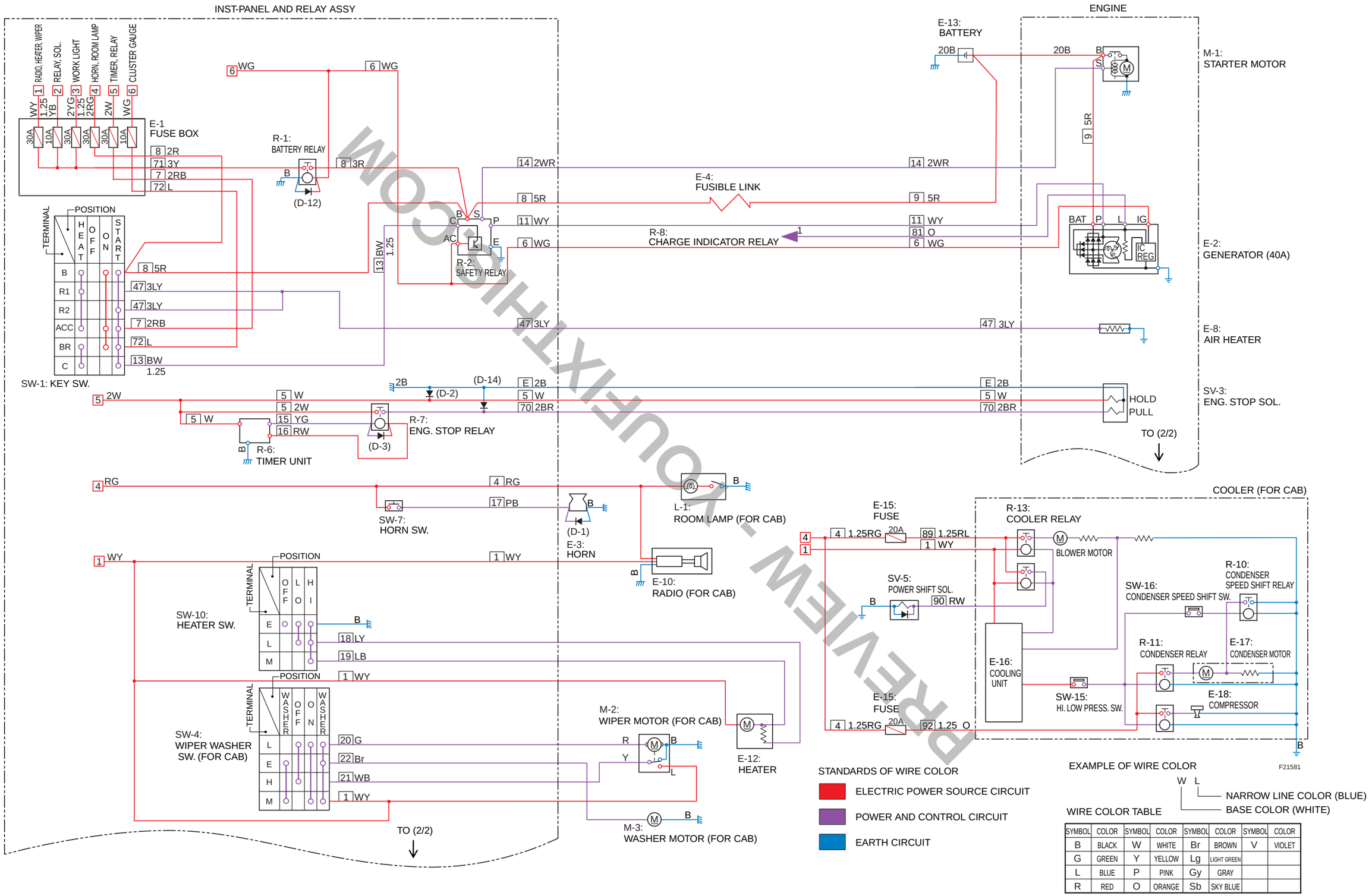
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2. ELECTRIC CIRCUIT DIAGRAM

2. ELECTRIC CIRCUIT DIAGRAM (1/2)



STANDARDS OF WIRE COLOR

- ELECTRIC POWER SOURCE CIRCUIT
- POWER AND CONTROL CIRCUIT
- EARTH CIRCUIT

EXAMPLE OF WIRE COLOR

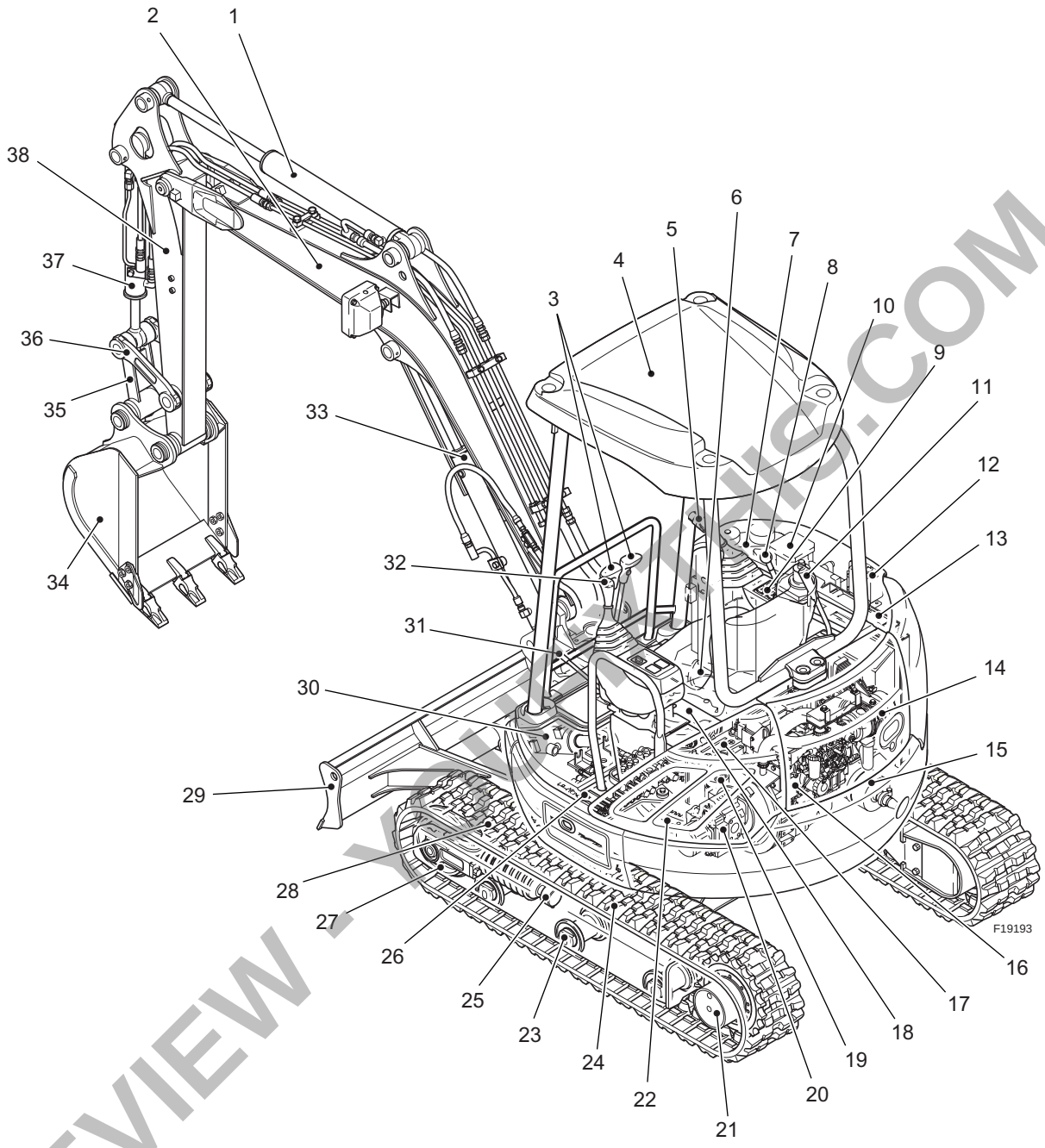
W L — NARROW LINE COLOR (BLUE) / BASE COLOR (WHITE)

WIRE COLOR TABLE

SYMBOL	COLOR	SYMBOL	COLOR	SYMBOL	COLOR	SYMBOL	COLOR
B	BLACK	W	WHITE	Br	BROWN	V	VIOLET
G	GREEN	Y	YELLOW	Lg	LIGHT GREEN		
L	BLUE	P	PINK	Gy	GRAY		
R	RED	O	ORANGE	Sb	SKY BLUE		

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1. COMPONENTS NAME



1. Arm cylinder
2. Boom
3. Travel lever
4. Canopy
5. Right operating lever
6. Swing cylinder
7. Fuel tank
8. Dozer lever
9. Monitor panel
10. Hydraulic tank
11. Throttle lever
12. Reservoir tank
13. Radiator
14. Air cleaner
15. Muffler
16. Engine
17. Battery
18. Slewing motor
19. Swivel joint
20. Hydraulic pump
21. Travel motor
22. Slewing bearing
23. Lower roller
24. Rubber crawler shoe
25. Idler adjuster
26. Control valve
27. Idler
28. (Shoe slide)
29. Dozer blade
30. Dozer blade cylinder
31. Safety lock lever
32. Left operating lever
33. Boom cylinder
34. Bucket
35. Bucket link
36. Idler link
37. Bucket cylinder
38. Arm

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2. TROUBLE DIAGNOSIS: HYDRAULIC

Classification	Reference No.		Causes / Phenomenon	Pump			Valve								Actuator		
				Main pump	Trochoid pump	Gear pump	Travel & ATT main R/V	Main gear pump R/V	Each over load R/V	Travel straight valve	Travel spool	Attachiment spool	Check valve	Shuttle valve	Slewing motor unit	Travel motor unit	Hydraulic cylinder
Attachment	1	(1)	Attachment operational failure (excluding swing and dozer operation)	○							○	○					
		(2)	Travel speed is slow.	○								○					○
		(3)	Attachment operating power is low.				○		○								○
		(4)	Malfunction of attachment							○		○					○
Travel operation	2	(1)	Travel operational failure	○							○					○	
		(2)	Travel speed is slow.	○							○					○	
		(3)	Travel operating power is low.				○									○	
		(4)	It deviates in travel independent operation.	○						○	○					○	
Swing operation	3	(1)	Slewing operational failure									○			○		
		(2)	Slewing speed is slow.			○											
		(3)	Slewing operating power is low.					○	○						○		
		(4)	Malfunction of slewing operation									○		○	○		
Pump	4	(1)	Engine speed is reduced due to pump load.	○													
		(2)	Malfunction of pump	○	○	○											

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Abbreviation

E/G: Engine
SOL: Solenoid
SW: Switch
ATT: Attachment
C/V: Control valve
R/V: Relief valve
V: Valve

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2. PERFORMANCE INSPECTION STANDARD TABLE

2.1 STANDARD VALUE TABLE

Table 1 (1/2)

Model					*E30SR EVOLUTION*		*E35SR EVOLUTION*	
Applicable machines								
Div.	Item			Unit	Standard value	Standard value for repair	Standard value	Standard value for repair
Measuring condition	Hyd. oil cleanliness			Class	8 ± 1	–	8 ± 1	–
	Hyd. oil temperature (Tank surface)			°C (°F)	50~60 (122~140)	–	50~60 (122~140)	–
	Coolant temperature (Radiator surface)				60~90 (140~194)	–	60~90 (140~194)	–
Engine speed	Low idle			rpm	1150 ± 50	–	1150 ± 50	–
	High idle				2450 ± 50	–	2540 ± 50	–
	Deceleration (OPT)				1150 ± 50	–	1150 ± 50	–
Main relief valve pressure	Boom • Bucket • Travel (LH)		P1	kgf/cm² (psi)	230^{+5}_{0} (3270^{+70}_{0})	–	230^{+5}_{0} (3270^{+70}_{0})	–
	Arm • Swing • Travel (RH)		P2		230^{+5}_{0} (3270^{+70}_{0})	–	230^{+5}_{0} (3270^{+70}_{0})	–
	Dozer • *1 Slew • Service		P3		180^{+5}_{0} (2560^{+70}_{0})	–	200^{+5}_{0} (2840^{+70}_{0})	–
Pilot relief valve pressure	Pilot Line		–		35^{+5}_{-3} (500^{+70}_{-40})	–	35^{+5}_{-3} (500^{+70}_{-40})	–
Port (Over load) relief valve pressure	Boom		Head Rod	kgf/cm² (psi)	280 (3980)	–	280 (3980)	–
	Arm		Head Rod		260 (3700)	–	260 (3700)	–
	Bucket		Head		260 (3700)	–	260 (3700)	–
	Dozer		Head		260 (3700)	–	260 (3700)	–
	*1 Slew		LH RH		150^{+31}_{0} (2130^{+440}_{0})	–	160^{+44}_{0} (2280^{+630}_{0})	–
Travel	Travel Speed (5 rev.)	Rubber crawler	Low	sec.	30.8 ± 1.5	39	$32.6^{+1.7}_{-1.5}$	42
			High		17.8 ± 0.9	23	18.8 ± 0.9	24
		Steel crawler	Low		31.5 ± 1.5	40	$33.3^{+1.7}_{-1.5}$	43
			High		18.2 ± 0.9	23	19.2 ± 0.9	25
	Travel Speed 10m (32.8 ft)	Rubber crawler	Low	sec.	14.3 ± 1.1	18	14.3 ± 0.7	18
			High		8.3 ± 0.4	11	8.3 ± 0.4	11
		Steel crawler	Low		14.9 ± 1.2	19	14.8 ± 0.7	19
			High		8.7 ± 0.4	11	8.6 ± 0.4	11
	Travel deviation			mm (in)	140^{0}_{-140} ($5.5^{0}_{-5.5}$)	280 (11.0)	140^{0}_{-140} ($5.5^{0}_{-5.5}$)	280 (11.0)
	Drift due to gravity		w / P.B.		0	–	0	–

*1: The pressure for slew is controlled by the relief valve attached to the slew motor.

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AVOID ACCIDENTS

Most accidents, whether they occur in industry, on the farm, at home or on the highway, are caused by the failure of some individuals to follow simple and fundamental safety rules or precautions. For this reason MOST ACCIDENTS CAN BE PREVENTED by recognising the real cause and doing something about it before the accident occurs.
Regardless of the care used in the design and construction of any type of equipment there are conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient operation.
Carefully read indications, cautions and safety warning quoted in the "SAFETY RULES" section.
A careful operator is the best insurance against an accident.
The complete observance of one simple rule would prevent many thousand serious injuries each year.
That rule is:
Never attempt to clean, oil or adjust a machine while it is in motion.

ATTENTION

On machines having hydraulically, mechanically and/or cable controlled equipment (such as showels, loaders, dozers, scrapers etc.) be certain the equipment is lowered to the ground before servicing, adjusting and/or repairing.
If it is necessary to have the equipment partially or fully raised to gain access to certain items, be sure the equipment is suitably supported by means other than the hydraulic lift cylinders, cable and/or mechanical device used for controlling the equipment.

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3.2 DETAIL DIMENSIONAL DRAWINGS OF LUG SECTION

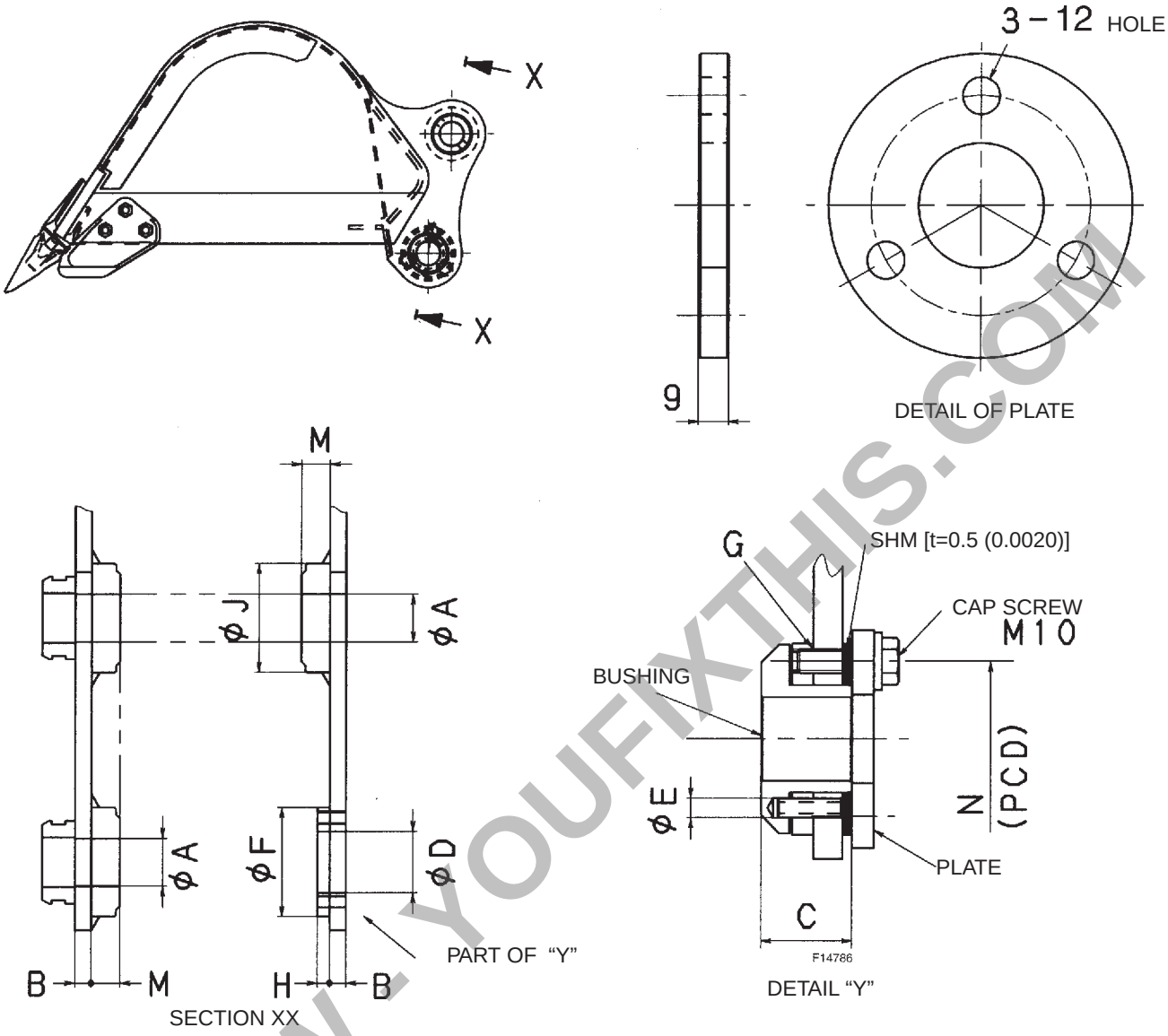


Fig. 3-2 Dimension of lug section

Table 3-2 Unit: mm (in)

Portion / Model	Pin bore dia.	Lug plate thickness	Bushing length	Bore dia.	Spring pin dia.	Plate outer dia.	Screw size	Plate thickness	Boss outer dia.	Boss thickness	Capscrew P.C.D.
	øA	B	C	øD	øE	øF	G	H	øJ	M	øN
E30SR EVOLUTION *E35SR EVOLUTION*	ø40 $^{+0.15}_{0}$ (1.578 $^{+0.0059}_{0}$)	14 (0.551)	45 (1.77)	ø50 (1.97)	ø8 (0.315)	ø95 (3.74)	M10	9 (0.35)	ø85 (3.35)	26 (1.02)	ø75 (2.95)

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NOTE:
Standard bucket.

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3.3 TRAVEL OPERATING CIRCUIT

Pilot oil hydraulic system with operating valve

3.3.1 2nd speed operating circuit

(Independent-forward travel)

(1) Pilot circuit

1) Shifting signal for 2nd speed travel
When the "Rabbit and Tortoise" mark (at the power cut-off, it automatically takes back for 1st speed) on the nob of travel right lever is pushed down, it actuates the 1st and 2nd speed travel shifting valve of solenoid valve (13). The pressurized oil signal for 2nd speed is discharged from the A1 port of solenoid valve(13), and led to the P port on travel motor (4) through swivel joint (10), and shifts the 2-speed shifting valve (404).

2) Changing travel valve spool
The pilot secondary pressure is discharged from pilot valve (12) by the operation for travel forward. The pressurized oil is led to the Pb7 and Pb6 ports on control valve (2) to shift the travel valve spool.

(2) Main circuit

1) Circuit up to travel motor (4)
The discharged oil from A1 and A2 ports on variable pump enters into the P1 and P2 ports of control valve (2), and led to the B6 and B7 ports through the travel valve. Then it is led to the A and B ports on left and right travel motors respectively through the swivel joint (10).

2) Travel motor

■ The pressurized oil supplied to the travel motor shifts the spool in counter balance valve [brake valve] (408), and opens the oil line that is being closed by the check valve (407), releases parking brake (403), then rotates the travel motor. When the 2nd speed signal is given, the pressurized oil passed through the 2-speed shifting valve (404) shifts shuttle valve (406) to high pressure, and actuates 2-speed shifting piston (401), and then makes the motor high speed with low torque.

■ When the motor reaches near to a self-running condition (over-running) at going down a slope and so on, the oil pressure of supply side gets down to lower pressure, and the counter balance valve [brake valve] (408) spool moves to the neutral position with the spring force. As the results, the passage in return oil side is throttled, and the motor speed is suppressed by a back-pressure, then the motor is controlled to the speed corresponding to the supplied oil volume of the pump.

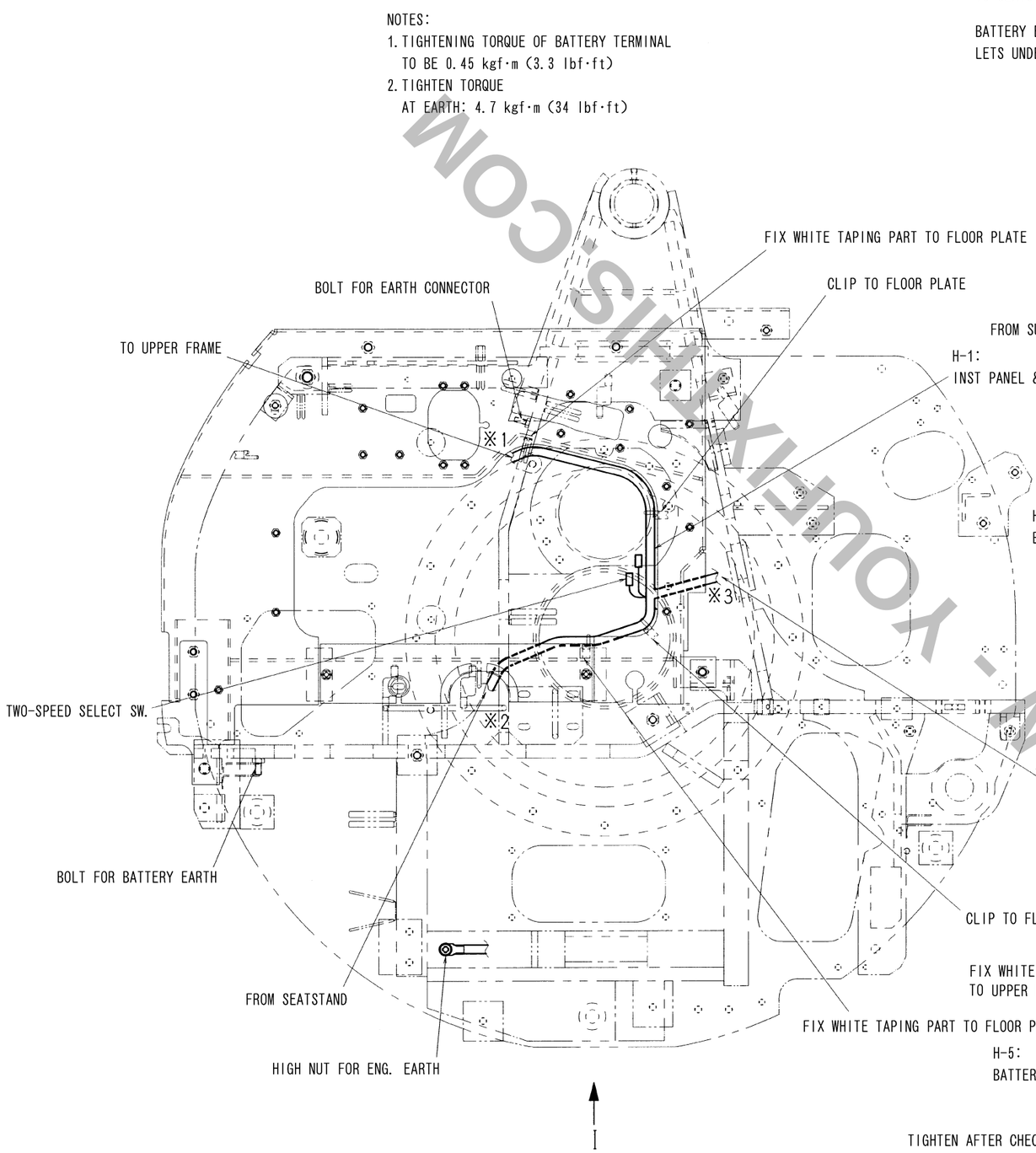
■ The counter balance valve spool is so designed that it is gradually shifted by a throttle effect to stop or start the motor absorbing shock at the start and stop of the machine.

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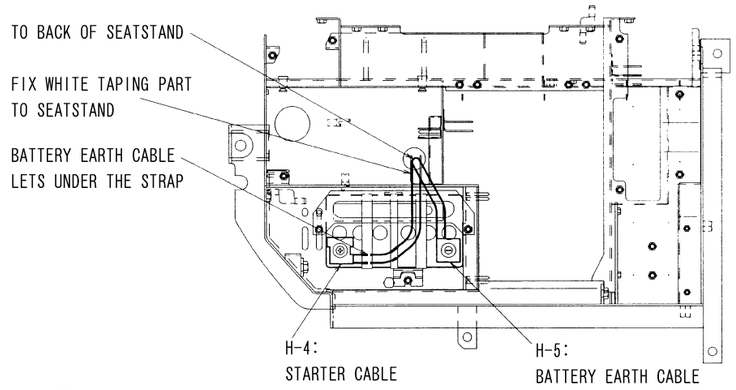
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4.3 COMPONENTS AND HARNESS ARRANGEMENT

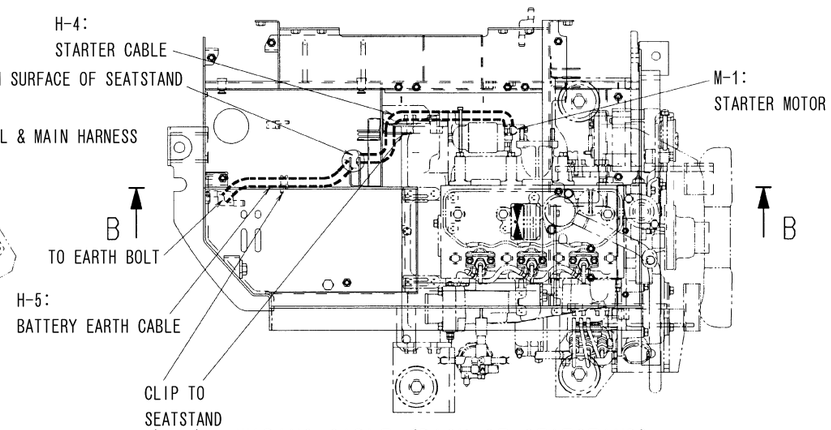
4.3.1 Upper frame portion (1/5)



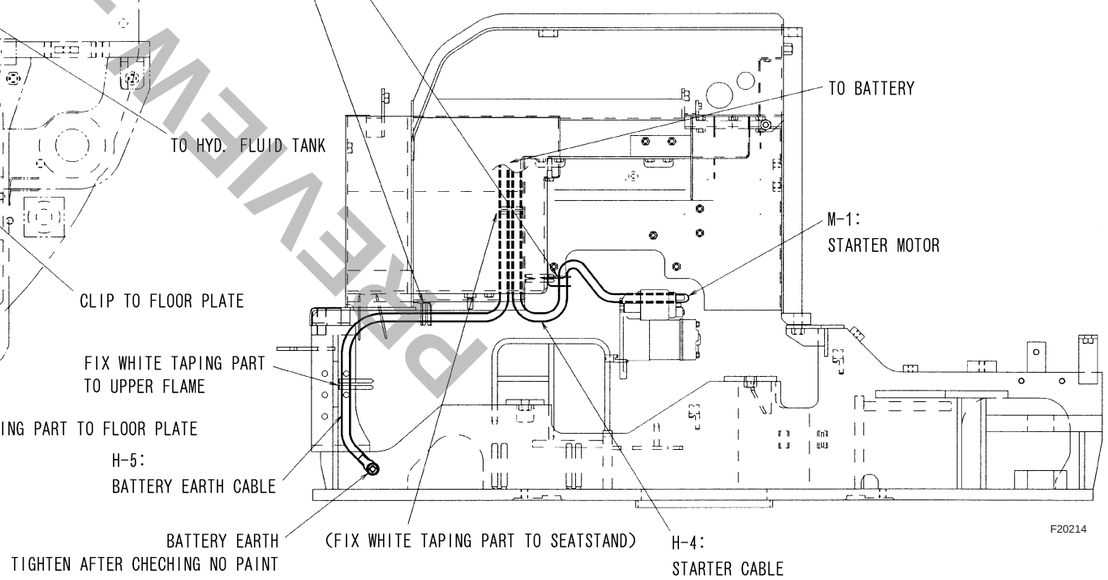
WIRING TO FLOOR PLATE



WIRING CABLE (SURFACE OF SEATSTAND)



WIRING CABLE (BACK OF SEATSTAND)



SECTION BB

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(6) Function of Lock Valve

1) Piston Holding

When the boom spool is at neutral position, the pilot piston chamber (a) is connected to the drain path through the pilot port (Pb8') for relasing lock valve. And the piston chamber (b) is also connected to the drain path through the drain port (Dr1).

Therefore the piston (A) is held at the position shown in the sketch.

And the hydraulic pressure to hold the boom cylinder is applied to the lock valve chamber as shown in the sketch, pressing the needle valve and lock valve to their seats respectively. Then it prevents leakage on the head side of boom cylinder, and also prevents the arm cylinder from its movement due to leakage.

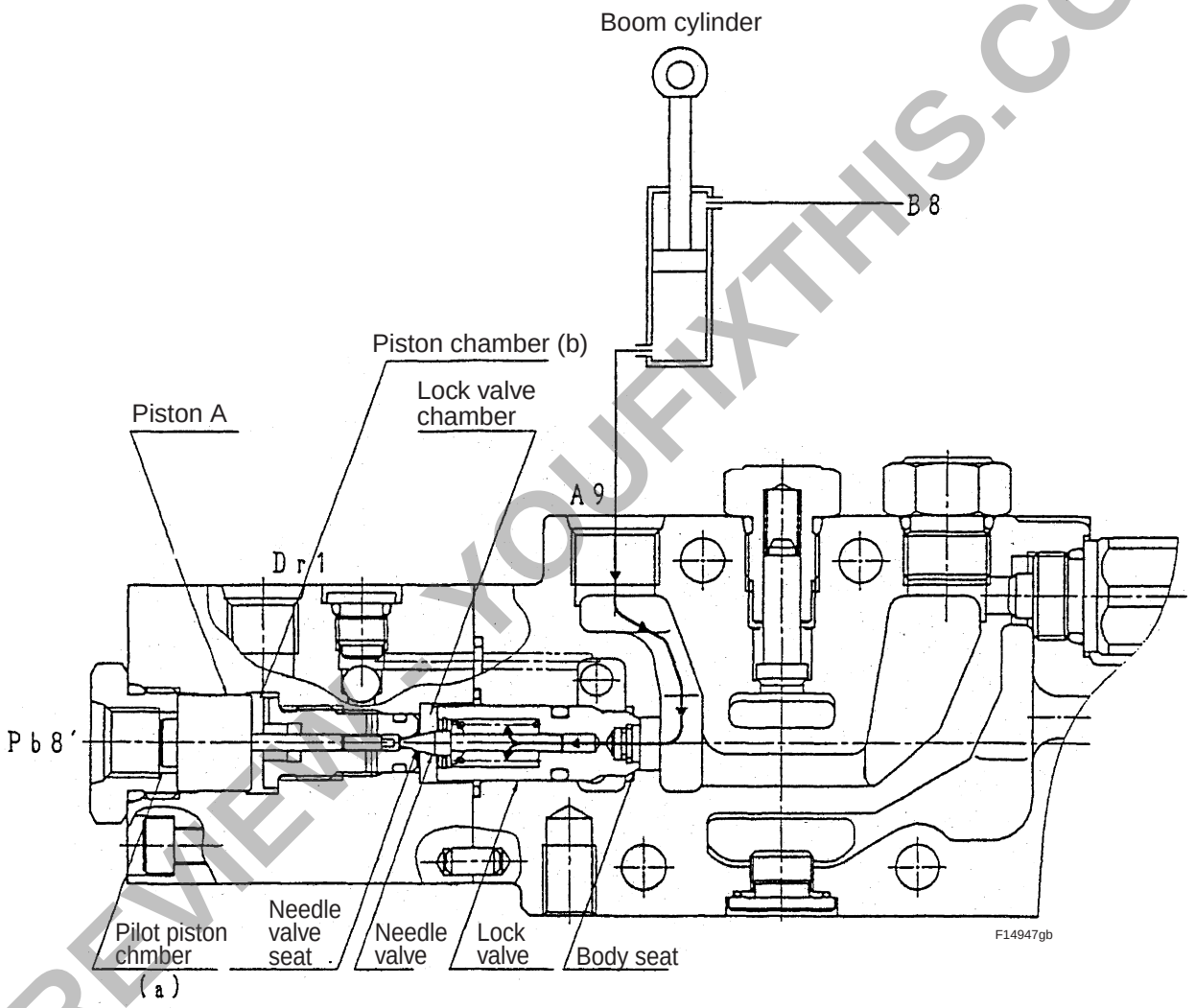


Fig. 4-20 Function of Lock Valve (piston holding)

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Code No. Parts Name Use	Specifications	Description
SV-5 Solenoid Power shift (Cooler spec.)	Type: AGCD Rated voltage: DC12V Capacity: 12W Operating pressure: 50kgf/cm^2 (710psi) Max. flow: 160ℓ/min (42gal/min) CIRCUIT DIAGRAM	BROWN + WHITE − SUMITONO DENSO CONNECTOR 090 TYPE M (2P) HOUSING M 6187−2311 TERMINAL 1500−0105 RUBBER CAP 7160−8234 VIEW A 3−PF1/4
SV-9, 10 Solenoid	Rated voltage: DC12V Consumption power: 12W Rated pressure: 50kgf/cm^2 (710psi) HYDRAULIC CIRCUIT	A1 B1 SOL. A SOL. B AMP Conector Housing : 174354-2 Terminal : 173706-1
SV-12 Solenoid	Rated voltage: DC12V Consumption power: 12W Rated pressure: 50kgf/cm^2 (710psi)	B1 B2 SUMITOMO Connector HW090 (2P) Housing : 6181-0070 Terminal : 1500-0105 A1 A2

F15006gb

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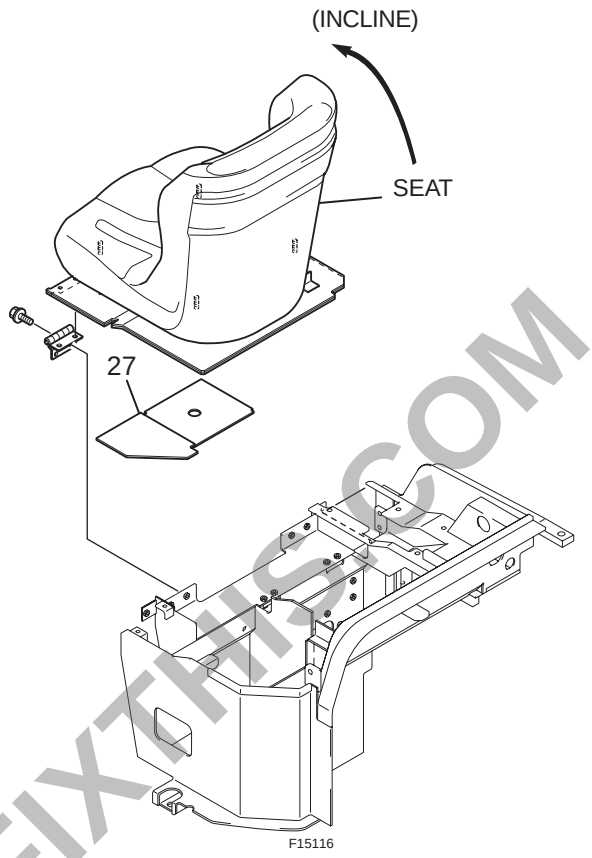
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4. BATTERY

4.1 REMOVAL PREPARATION

(1) Incline the seat forward and remove the cover (27).



• The figure shows before BU.
Fig. 4-1 Removal preparation

4.2 REMOVAL

(1) Disconnect the minus side terminal of the cable.

(2) Then, disconnect the plus side terminal of the cable
: 12 mm

WARNING

Follow the removal procedure of battery cable. Firstly disconnect the grounding side cable. Connect the grounding side finally. Failure to do so may result in dangerous situation due to spark.

(3) Unscrew the nut (4) to remove the bracket (2) and the rod (3).

(4) Take out the battery holding the straps attached to it.

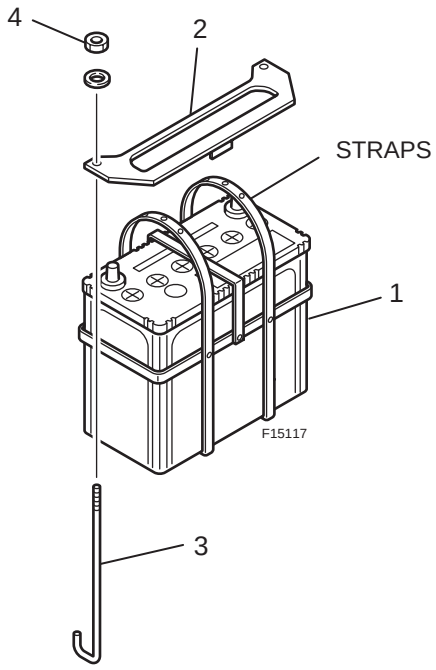


Fig. 4-2 Battery removal

4.3 INSTALLATION

Install the battery in reverse order of the removal.

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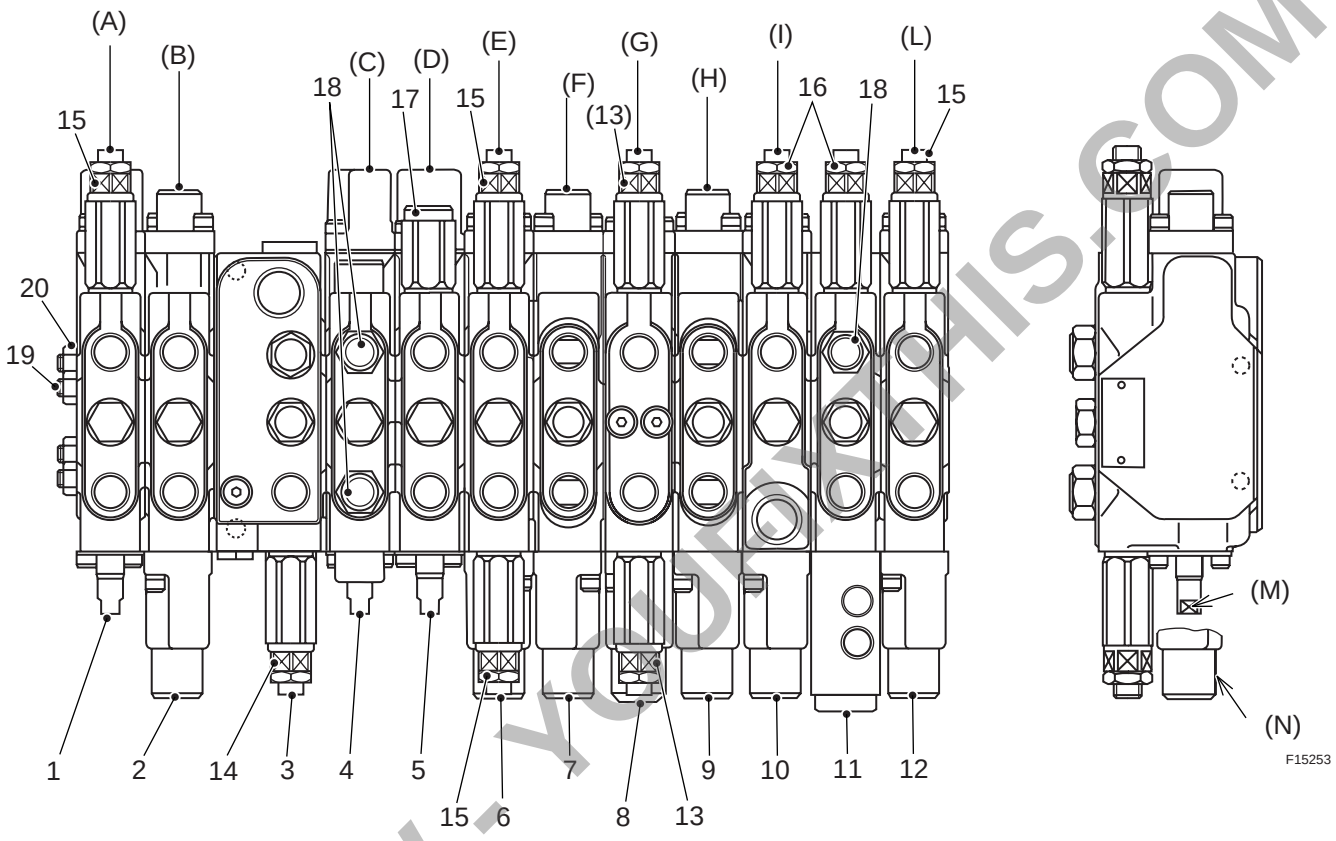
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2. CONTROL VALVE

2.1 ASSEMBLY DRAWING

(1) -1 Outside view



(A) Dozer
(B) Slewing
(C) Service (N&B)
(D) Swing
(E) Arm
(F) Travel right
(G) Travel straight
(H) Travel left
(I) Boom
(L) Bucket
(M) Manual operate
(N) Pilot operate

Table. 2-1

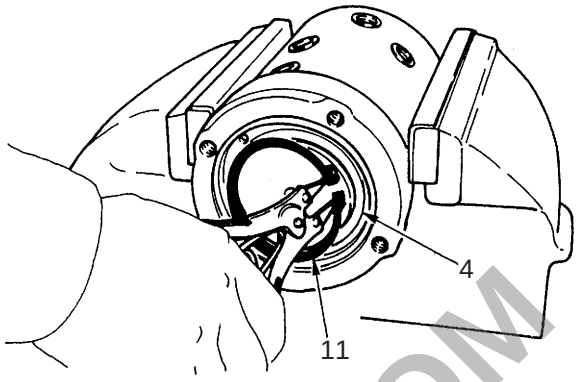
No.	SECTION	Q'TY	No.	SECTION	Q'TY	No.	NAME	Q'TY
1	Dozer section	1	8	P1,P2 inlet & Travel straight	1	15	Over load relief valve	4
2	Slewing	1	9	Travel (left)	1	16	Over load relief valve	2
3	P3 inlet	1	10	Boom	1	17	Anti cavitation valve	1
4	Service	1	11	Boom lock	1	18	Plug assy	3
5	Swing	1	12	Bucket	1	19	Tie bolt	4
6	Arm	1	13	P1,P2 Main relief valve	2	20	Nut	4
7	Travel (right)	1	14	P3 Main relief valve	1			

F15254gb

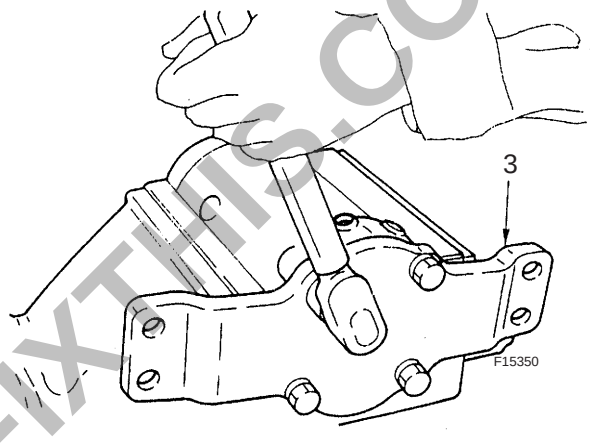
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(4) Fit thrust ring (4) and snap ring (11).
- Fit the snap ring in the groove accurately.



(5) Fit O-ring (8) and install flange (3).



(6) Install spring washer (14) and bolt (12).
: 17 mm
or
: 17 mm

- Tightening torque: 5.3~5.8 kgf·m (38~42 lbf·ft)
- Put pipe through the locking pin of the shaft, and check that the shaft rotates smoothly at torque approx.8 to 11 kgf·m (58~80 lbf·ft)

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2) Remove two stoppers (225) and two springs (228) from the rear flange (201).

3) Remove the spool (223) from the rear flange (201).

   • To remove the spool (223), place your hand on one part of the plug port of the rear flange (201) and tilt it down. Then the spool (223) falls down. Hold the tip and remove it.

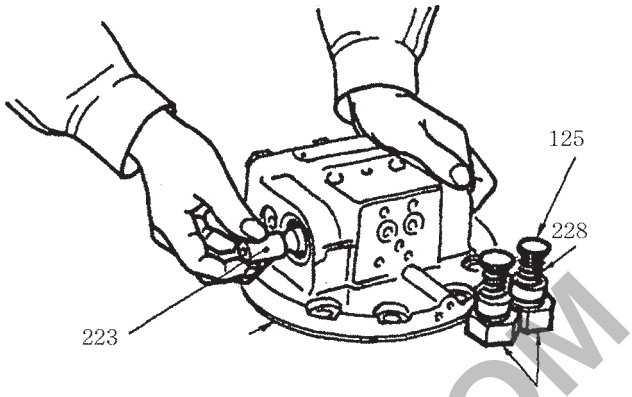


Fig. 1-32 Removing stopper (225), spring (228) and spool (223)

4) Remove two plugs (226) from the rear flange (201).

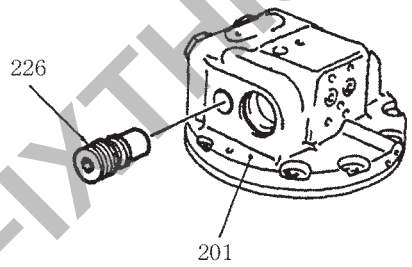


Fig. 1-33 Remove the plug (226)

5) Remove two springs (230) and two valves (227) from the rear flange (201).

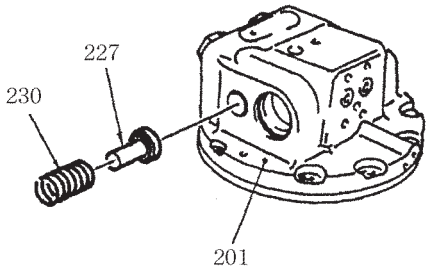


Fig. 1-34 Removing spring (230) and valve (227)

6) Remove O-ring (236) from plug (224).

   • Do not reuse the removed O-ring (236).

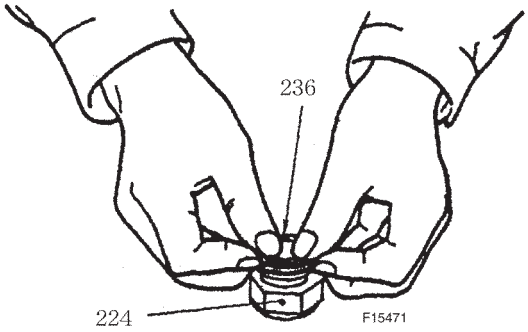


Fig. 1-35 Removing O-ring (236)

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E35SR EVOLUTION

SECTION 44 TROUBLESHOOTING (ENGINE)

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1. Trouble diagnosis: engine 44-1

2. Troubleshooting 44-2

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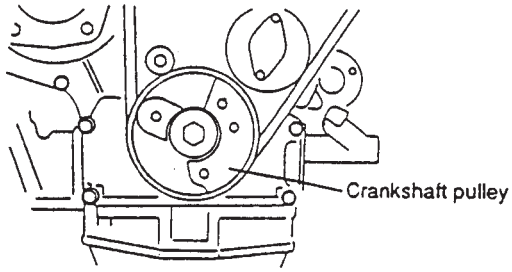
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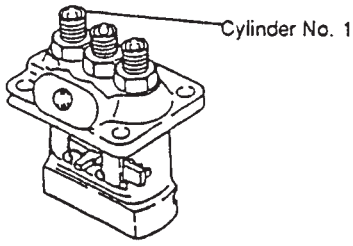
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6.5 CHECKING AND ADJUSTAMENT THE FUEL INJECTION TIMING

1. Indirect Injection system

(1) Using the crankshaft pulley, turn the engine in the specified direction. Check the injection timing at the delivery valve of the fuel injection pump for cylinder No.1. (Cylinders are numbered sequentially from cylinder No. 1 from the flywheel side).

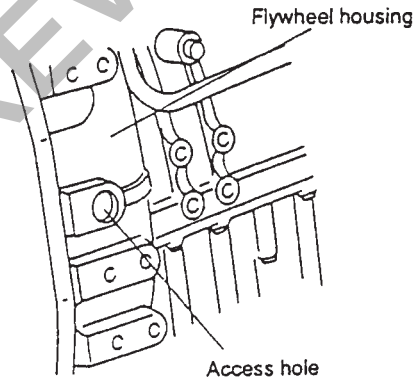


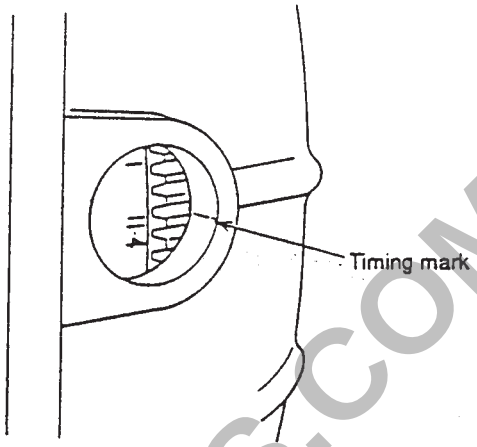


(2) When the crankshaft is turned in the specified direction, oil level rises at the tip of the delivery valve spring holder. At that time, stop the crankshaft.

(3) Identify the timing mark stamped on the flywheel through the access hole of the flywheel housing.

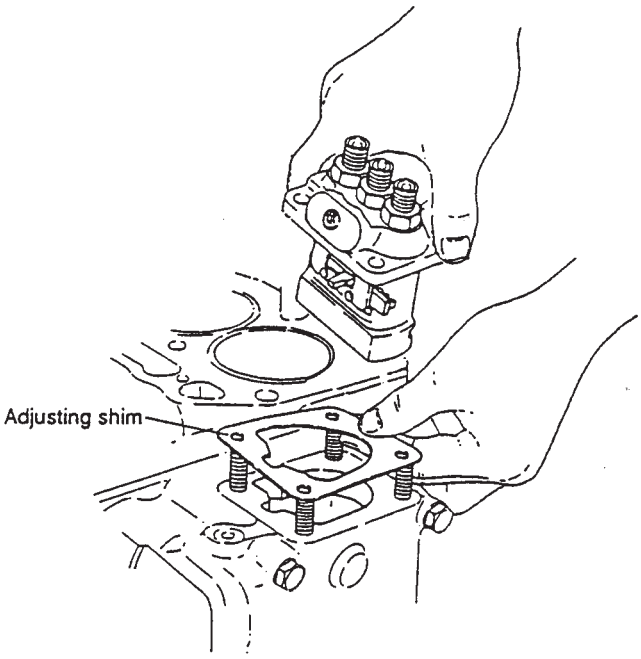
* : *For the fuel injection timing of each engine model, refer to Chapter 1, Specifications and Performance.*





(4) If the present injection timing differs from the specified timing, remove the fuel injection pump, and adjust the timing by increasing or decreasing the adjusting shim thickness between the fuel injection pump and gear case.

- Increase the shim thickness to delay the injection timing.
- Decrease the shim thickness to advance the injection timing.



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9.6 CONNECTING ROD

(Unit: mm)

Item \ Model		2/3TNE68		3TNE74		3TNE78A 3TNE82A		3/4TNE82, 3/4TNE84(T), 3/4TNE88	
		Standard	Wear limit	Standard	Wear limit	Standard	Wear limit	Standard	Wear limit
Crankpin side	Crankpin bushing inside dia.	39.000 ~39.016	—	43.000 ~43.016	—	46.000 ~46.016	—	51.000 ~51.010	—
	Crankpin metal thickness	1.487 ~1.500	—	1.487 ~1.500	—	1.487 ~1.500	—	1.492 ~1.500	—
	Crankpin outside dia.	35.970 ~35.980	35.91	39.970 ~39.980	39.91	42.952 ~42.962	42.91	47.952 ~47.962	47.91
	Oil clearance	0.033 ~0.059	0.15	0.033 ~0.059	0.15	0.038 ~0.090	0.16	0.038 ~0.074	0.16
Piston pin side	Piston pin bushing inside dia.	20.025 ~20.038	20.10	21.025 ~21.038	21.10	23.025 ~23.038	23.10	26.025 ~26.038	26.10
	Piston pin outside dia.	19.991 ~20.000	19.90	20.991 ~21.000	20.90	22.991 ~23.000	22.90	25.987 ~26.000	25.90
	Oil clearance	0.025 ~0.047	0.2	0.025 ~0.047	0.2	0.025 ~0.047	0.2	0.025 ~0.051	0.2
Twist and parallelism		Less than 0.03 per 100 mm	0.08	Less than 0.03 per 100 mm	0.08	Less than 0.03 per 100 mm	0.08	Less than 0.03 per 100 mm	0.08

9.7 CAMSHAFT

(Unit: mm)

Item \ Model		2/3TNE68		3TNE74		3TNE78A/82A, 3/4TNE82, 3/4TNE84(T), 3/4TNE88	
		Standard	Wear limit	Standard	Wear limit	Standard	Wear limit
Gear side	Camshaft journal outside dia.	35.940 ~35.960	35.85	39.940 ~39.960	39.85	44.925 ~44.950	44.85
	Oil clearance	0.040 ~0.085	—	0.040 ~0.085	—	0.040 ~0.130	—
Intermediate	Camshaft journal outside dia.	35.910 ~35.935	35.85	39.910 ~39.935	39.85	44.910 ~44.935	44.85
	Oil clearance	0.065 ~0.115	—	0.065 ~0.115	—	0.065 ~0.115	—
Flywheel side	Camshaft journal outside dia.	35.940 ~35.960	35.85	39.940 ~39.960	39.85	44.925 ~44.950	44.85
	Oil clearance	0.040 ~0.125	—	0.040 ~0.125	—	0.050 ~0.100	—

9.8 CRANKSHAFT

(Unit: mm)

Item \ Model		2/3TNE68		3TNE74		3TNE78A 3TNE82A		3/4TNE82, 3/4TNE84(T), 3/4TNE88	
		Standard	Wear limit	Standard	Wear limit	Standard	Wear limit	Standard	Wear limit
Crank journal	Crankshaft journal outside dia.	39.970 ~39.980	39.90	43.970 ~43.980	43.90	46.952 ~46.962	46.91	53.952 ~53.962	53.91
	Bearing metal thickness	1.487 ~1.500	—	1.987 ~2.000	—	1.987 ~2.000	—	1.995 ~2.000	—
	Crank journal and bushing oil clearance	0.033 ~0.059	0.15	0.033 ~0.059	0.15	0.038 ~0.093	0.25	0.038 ~0.068	0.15
Bend		0.02 or less	—	0.02 or less	—	0.02 or less	—	0.02 or less	—

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