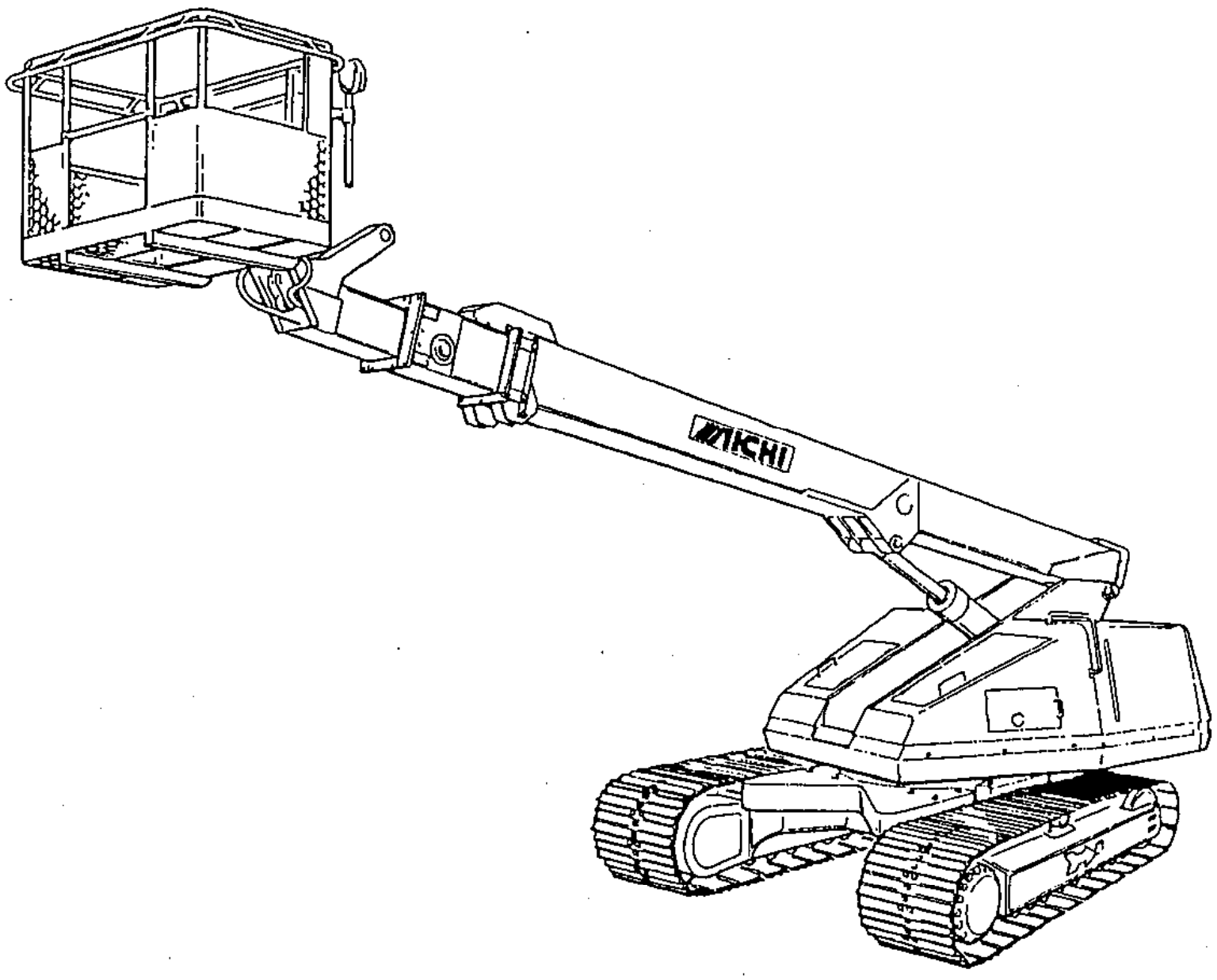
SME-113 D

SERVICE MANUAL

SELF-PROPELLED AERIAL PLATFORM

SR-210



Applied to Specification :

E1, F1.

ICHI
CORPORATION

1152, RYOKE, AGEO, SAITAMA, JAPAN.

INTRODUCTION

This manual describes correct adjustment and servicing procedures for SR210 Self-propelled aerial platform in order to ensure the most effective use of superb performance and excellent features for your satisfaction.

Read this manual carefully and understand the descriptions correctly before making any repair or maintenance works.

Always be sure of the following items when conducting repair or maintenance works.

※ Use only the spare parts approved by the manufacturer, particularly for load-supporting and safety-related components.
※ Do not make any modifications to the machine without obtaining the manufacturer's approval.
※ The design check, the manufacturing check as well as the practical test should be conducted by the approved agent, if the modification which would affect the stability, strength or performance of the machine is made.

Please, note that the numerical values in this manual may be subject to change due to engineering improvement.

Customer Service Division
AICHI CORPORATION

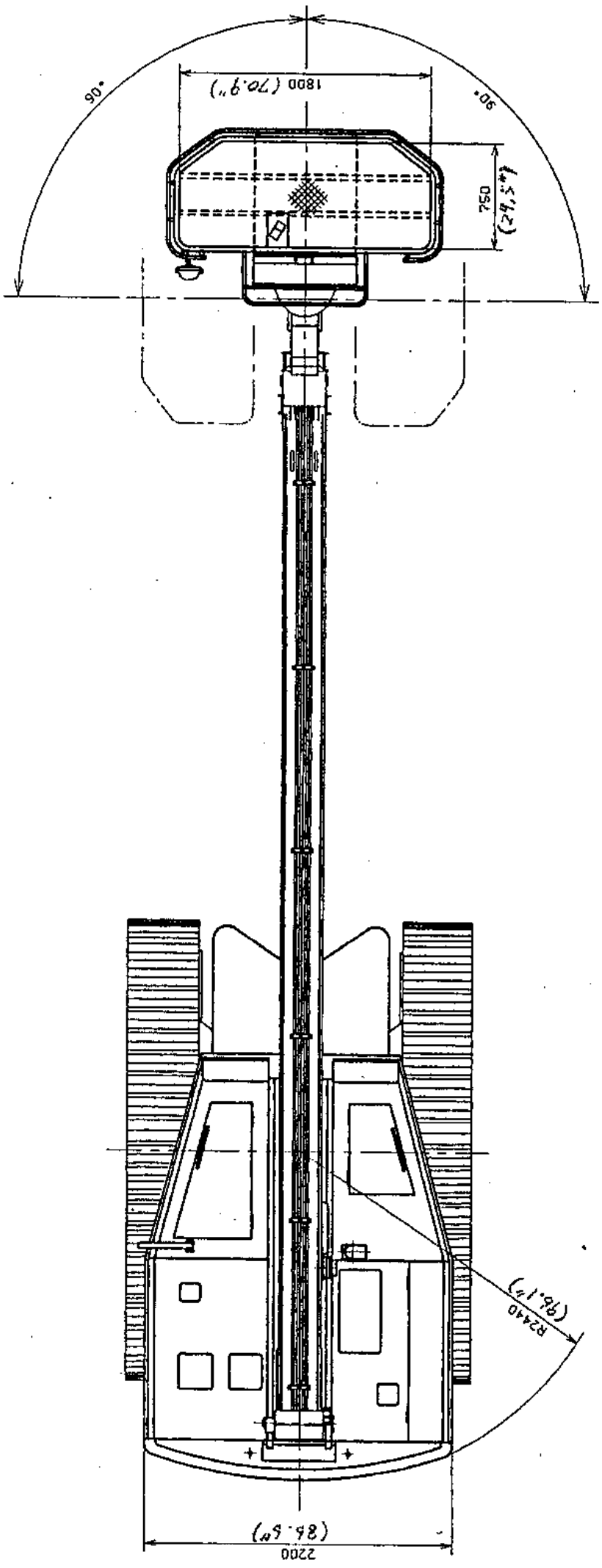
I N D E X

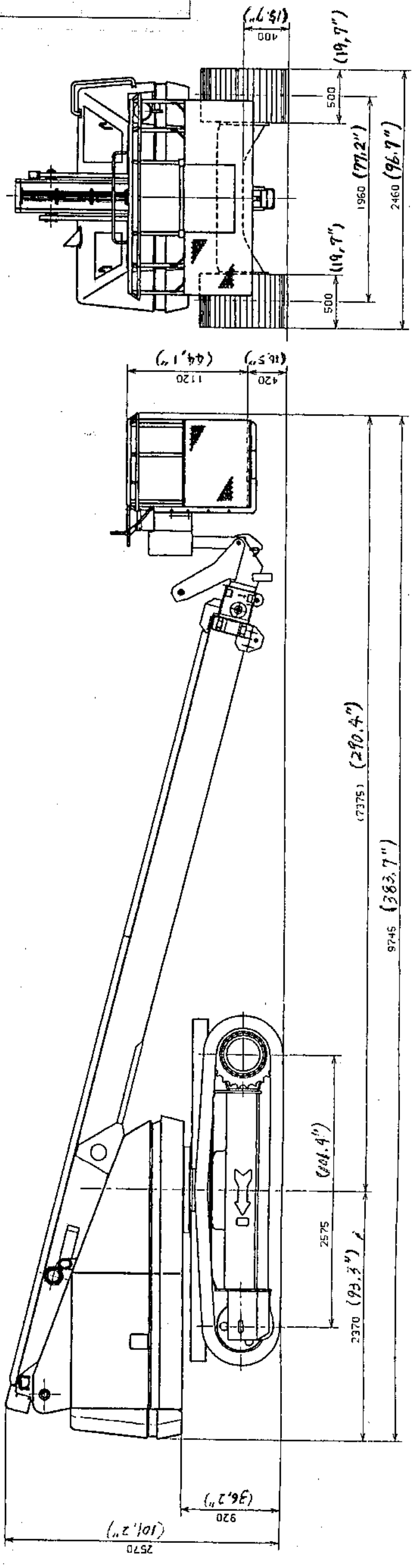
1

GENERAL INFORMATION

OVERALL DIMENSIONS

Crawler : Komatsu PC100-6



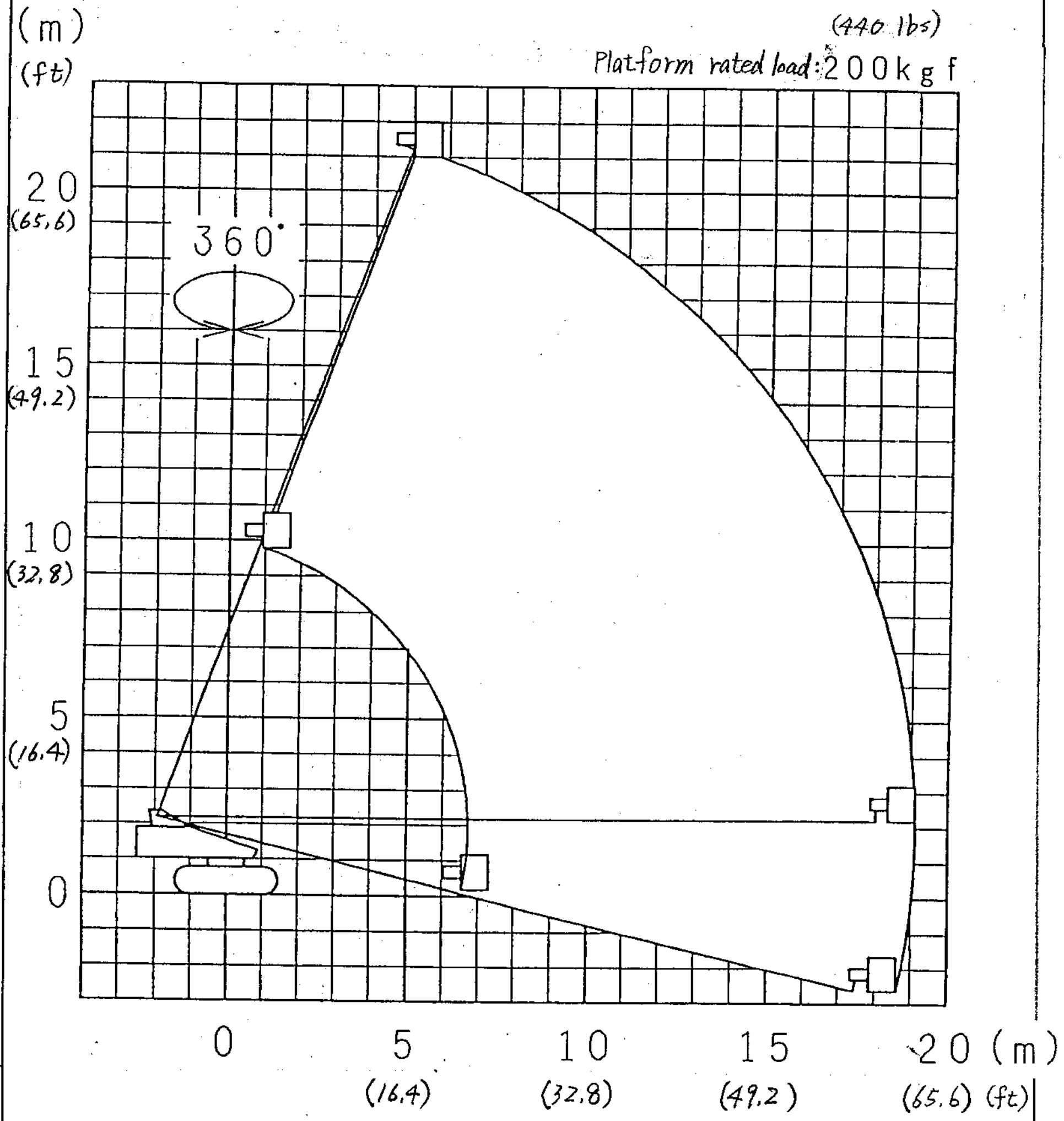


SPECIFICATIONS

Model			SR-210	ISR-700
Weight	Overall weight		13,500 kgf	29,760 lbs
	Max. ground contact pressure		0.78 kgf/㎠	11 psi
Engine	Model		A-4BG1T-PB04	←
	Total displacement		4,329 cc	264 in^3
	Output power		100 ps/2,000 rpm	73.6 kw/2,000 rpm
	Output torque		36.5 kgf-m/1,400 rpm	264 ft-lb/1,400 rpm
	Engine oil capacity		13 liters	3.43 gals
	Cooling water capacity		16,5 liters	4.36 gals
	Fuel tank capacity		230 liters	60.8 gals
	Engine speed		1,200～2,300 rpm	←
	Battery		DC 12v / 70 AH×2	←
Platform	Rated load		200 kgf or 2 persons + Tools (40 kgf)	440 lbs or 2 persons + Tools (88 lbs)
	Max. allowable side force		41 kgf (400N)	90 lbs
	Inner dimensions		1,800×750×1,120 mm	5'11"×2'6"×3 ft 8 in
	Rotation angle		180°	←
	Maximum floor height		20.8 meters	68 ft 9 in
	Maximum working radius		19.0 meters	62 ft 4 in
Boom	Boom length		8.28～19.96 meters	27 ft 2 in~65 ft 6 in
	Boom angle		-20～70 degrees	←
	Rotation angle		360° continuously	←
Operational Speed	Elevation	UP	50±8 seconds / stroke	←
		DOWN	55±8 seconds / stroke	←
	Extension	OUT	45±7 seconds / stroke	←
		IN	40±6 seconds / stroke	←
	Rotation	C. W.	75±8 seconds / 1 turn	←
		C. C. W.	75±8 seconds / 1 turn	←
	Travelling	High speed Forward	15 $^{+3}_{-0}$ seconds / 10 m	14 $^{+3}_{-0}$ seconds / 10 yards
		High speed Reverse	15 $^{+3}_{-0}$ seconds / 10 m	14 $^{+3}_{-0}$ seconds / 10 yards
		Mid speed Forward	30 $^{+10}_{-0}$ seconds / 10m	27 $^{+9}_{-0}$ seconds / 10 yards
		Mid speed Reverse	30 $^{+10}_{-0}$ seconds / 10m	27 $^{+9}_{-0}$ seconds / 10 yards
		Low speed Forward	60 $^{+10}_{-0}$ seconds / 10m	55 $^{+9}_{-0}$ seconds / 10 yards
		Low speed Reverse	60 $^{+10}_{-0}$ seconds / 10m	55 $^{+9}_{-0}$ seconds / 10 yards
	Platform rotation	Right	20±4 seconds / stroke	←
		Left	20±4 seconds / stroke	←

Maximum allowable slope			5 degrees	←
Gradeability			22 degrees (40%)	←
Hydraulic system	Hydraulic oil	Tank capacity	250 liters	66 gals
		Recommended oil	Shell Tellus oil 32	←
	Hydraulic pump	Type	Gear pump (Double)	←
		Discharge volume	40 + 40 cc/rev.	2.4 + 2.4 in^3/rev
		Pump speed	1,200~2,300 rpm	←
	Rated pressure	Main system (Elevation, Extension Rotation & Travelling)	210 $^{+5}_{-0}$ kgf/cm^2	3,000 $^{+70}_{-0}$ psi
		Sub system (Platform rotation)	140 $^{+5}_{-0}$ kgf/cm^2	2,000 $^{+70}_{-0}$ psi

WORKING RANGE CHART



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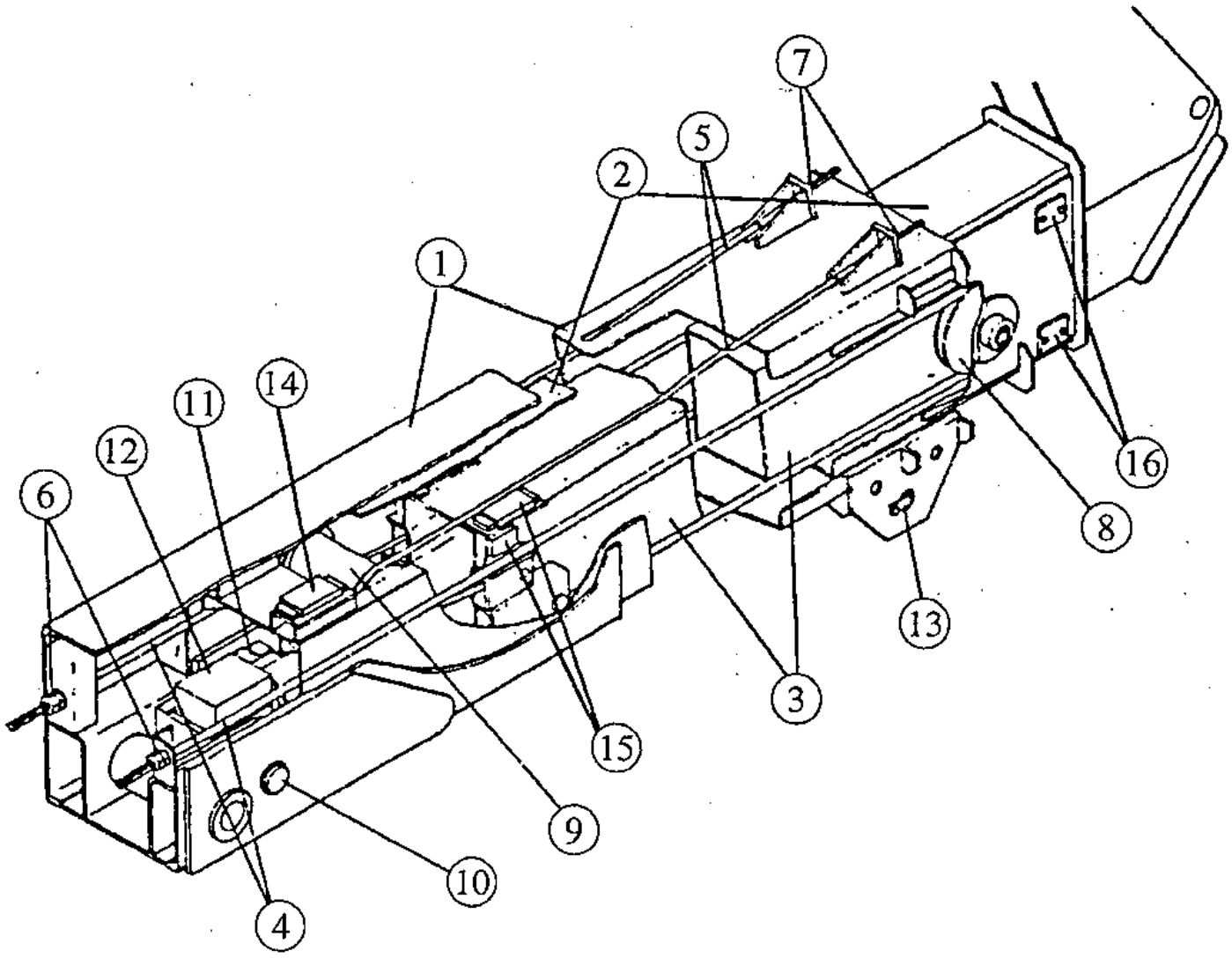
MECHANICAL SECTION

BOOM

The boom Assy consists of 1st boom, 2nd boom, 3rd boom, extension cylinder, extension/retraction wire ropes, hydraulic plumbings, electric cables and their sheaves.

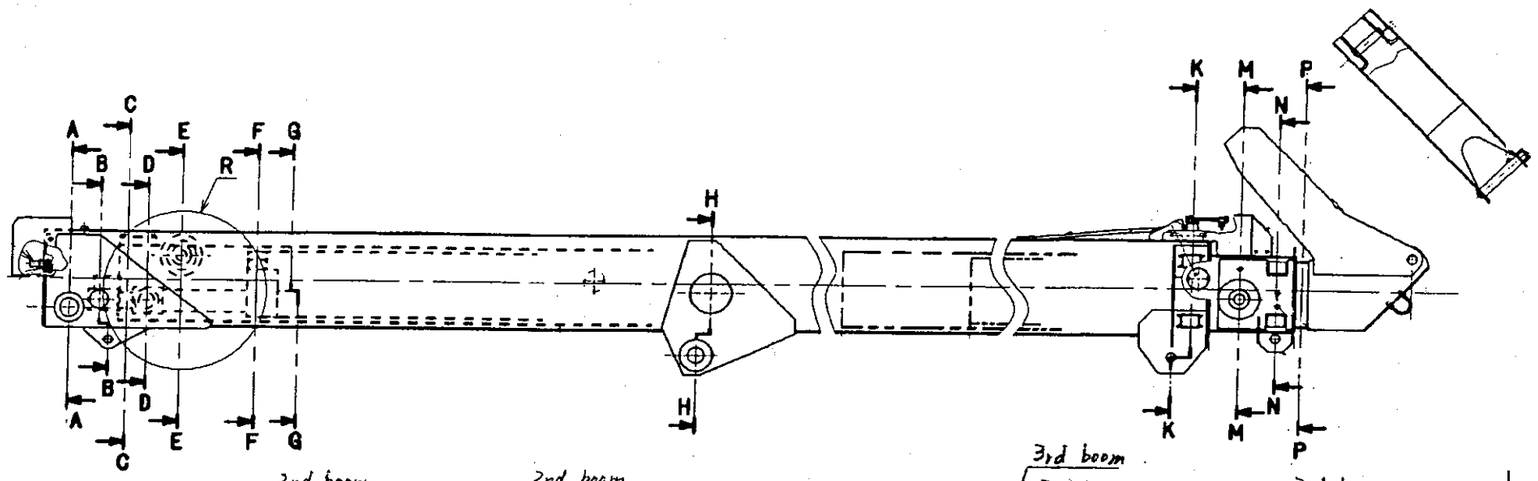
The 2nd boom is extended or retracted by the Extension cylinder directly. However, the 3rd boom is telescoped by the movement of 2nd boom through extension/retraction wire ropes.

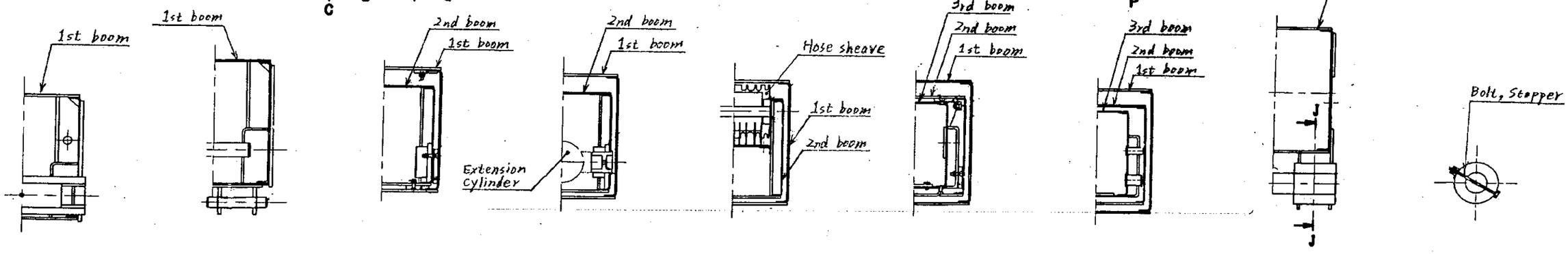
Fig:1



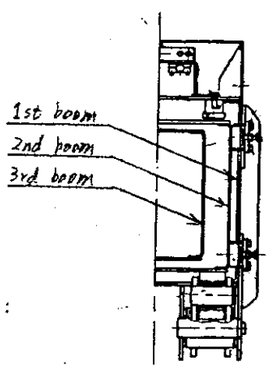
1. 1st boom.
2. 2nd boom.
3. 3rd boom.
4. Extension wire rope.
5. Retraction wire rope.
6. Lock-nut & Adjust-nut NO.1.
7. Lock-nut & Adjust-nut NO.2.
8. Sheave A.
9. Sheave B.
10. Set pin A. (for Extension cylinder)
11. Set pin B. (for Extension cylinder)
12. Extention cylinder.
13. Set pin. (for Roller)
14. Slider.
15. Slider.
16. Slider.

1. Sectional drawings

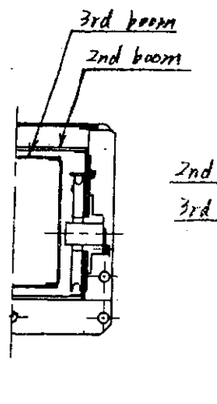




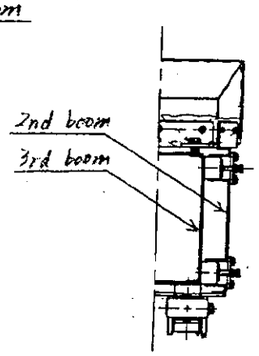
A-A B-B C-C D-D E-E F-F G-G H-H J-J



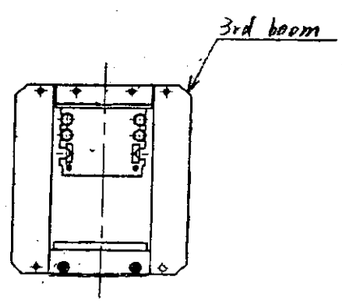
K-K



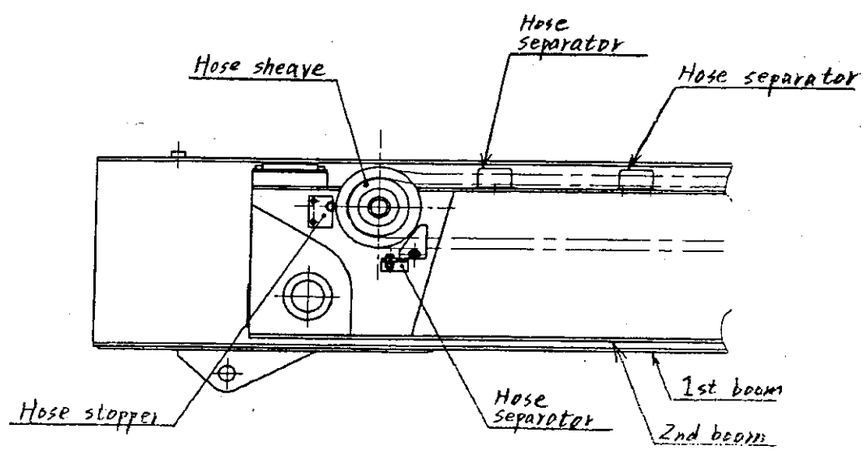
M-M



N-N



P-P



R

2. Inspection procedures

The boom is to be disassembled for a detailed inspection every 4 years.

1. Clearance between each boom section.
   1) Check the clearance between each slider and boom section.
      * Specific clearance : 2.0mm or less. (0.08" or less)
   2) If the clearance is not adequate, adjust the clearance by adding or reducing the spacers installed under the each slider or by adjusting the screws.

NOTE:

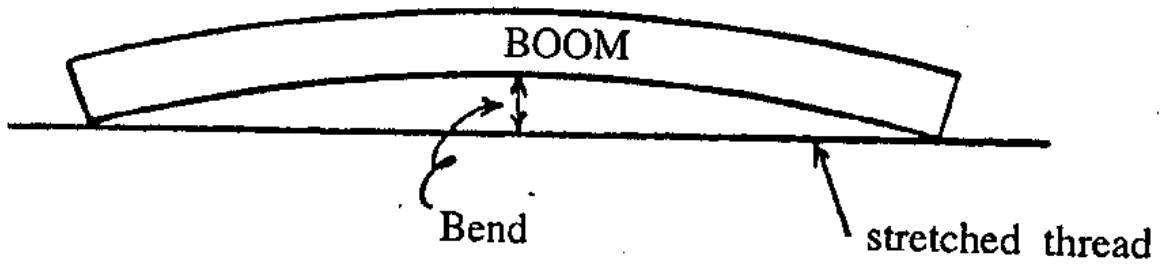
* Check each slider for wear, and replace if necessary.
* Apply a thread lock agent to the thread of each set screw for sliders before setting.

  Recommended thread lock agent : 3 Bond. 1374.

2. Bend of boom
   1) Set the boom horizontally and extend it fully.
   2) Visually check the bend of each boom.
   3) If the bend seems to be excessive, stretch a thread over the boom and measure the bend accurately as shown in the figure below.

NOTE: If the bend measured exceeds the serviceable limit (9.5mm, 0.37"), replace the boom.

Fig:2



3. Dents, scratches.

   Check the each boom for both dents and scratches thoroughly.
   If any dent or scratch which exceeds the serviceable limit
   (Length : 50mm or more, Depth : 2mm or more) exsists, replace the boom.
   (1.97") (0.08")

4. Cracks.

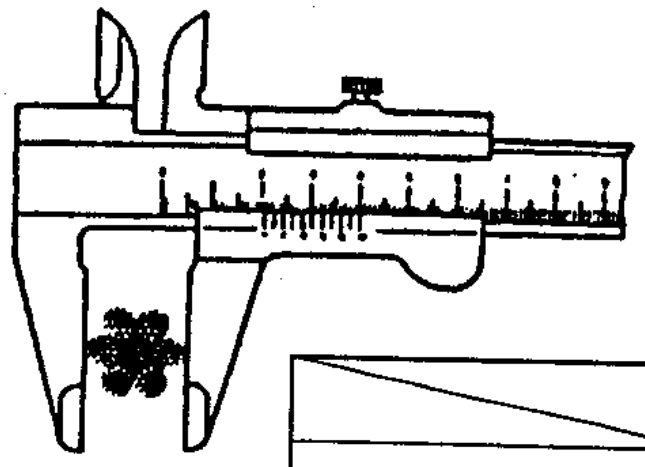
   Check each boom thoroughly for cracks.
   For fine cracks, use "COLOR CHECK" or penetrant check.
   * Pay special attention, when checking each pin boss and welded part.

3. Extension/Retraction wire ropes

After disassembling the boom, inspect extension and retraction wire ropes as follows.

1) Measure the diameter of both the extension and retraction wire ropes with slide calipers. Replace the rope if the decrease in the diameter is more than 3% of the nominal diameter.

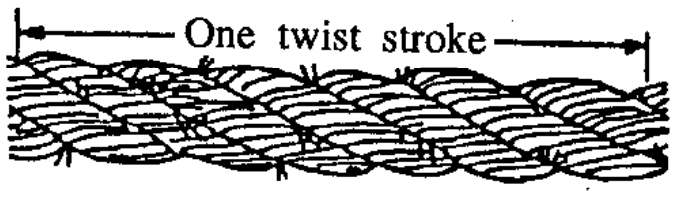
Fig:3



	Nominal diameter	Serviceable limit
Retraction wire rope	ϕ 8mm (0.315")	ϕ 7.76mm (0.306") or less
Extension wire rope	ϕ 12mm (0.472")	ϕ 11.64mm (0.458") or less

2) Check for broken wires.
If 3 or more wires of a wire rope are broken in a twist stroke, replace the wire rope.

Fig:4

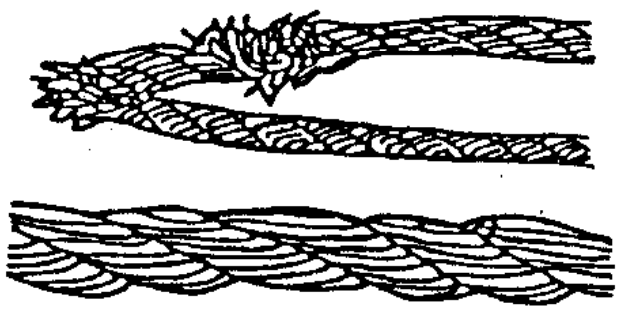


3) Check wire ropes for rust.
If rust is evident around the inside of the wire rope, replace it.

Fig:5

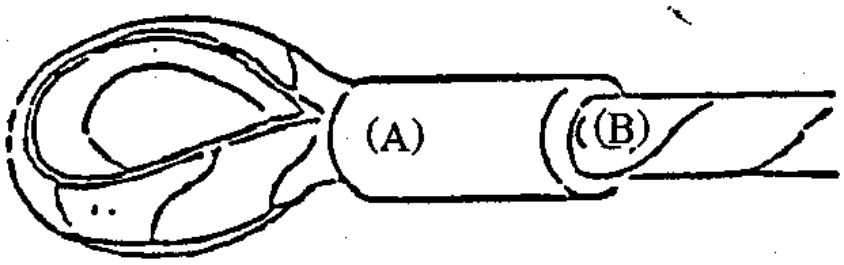
4) If any kinks are observed, replace the wire rope.
Also, an extremely deformed wire rope requires replacement.

Fig:6



5) Carefully check the end sections of a wire rope, especially sections A and B. Replace the wire rope if any defects are found.

Fig:7

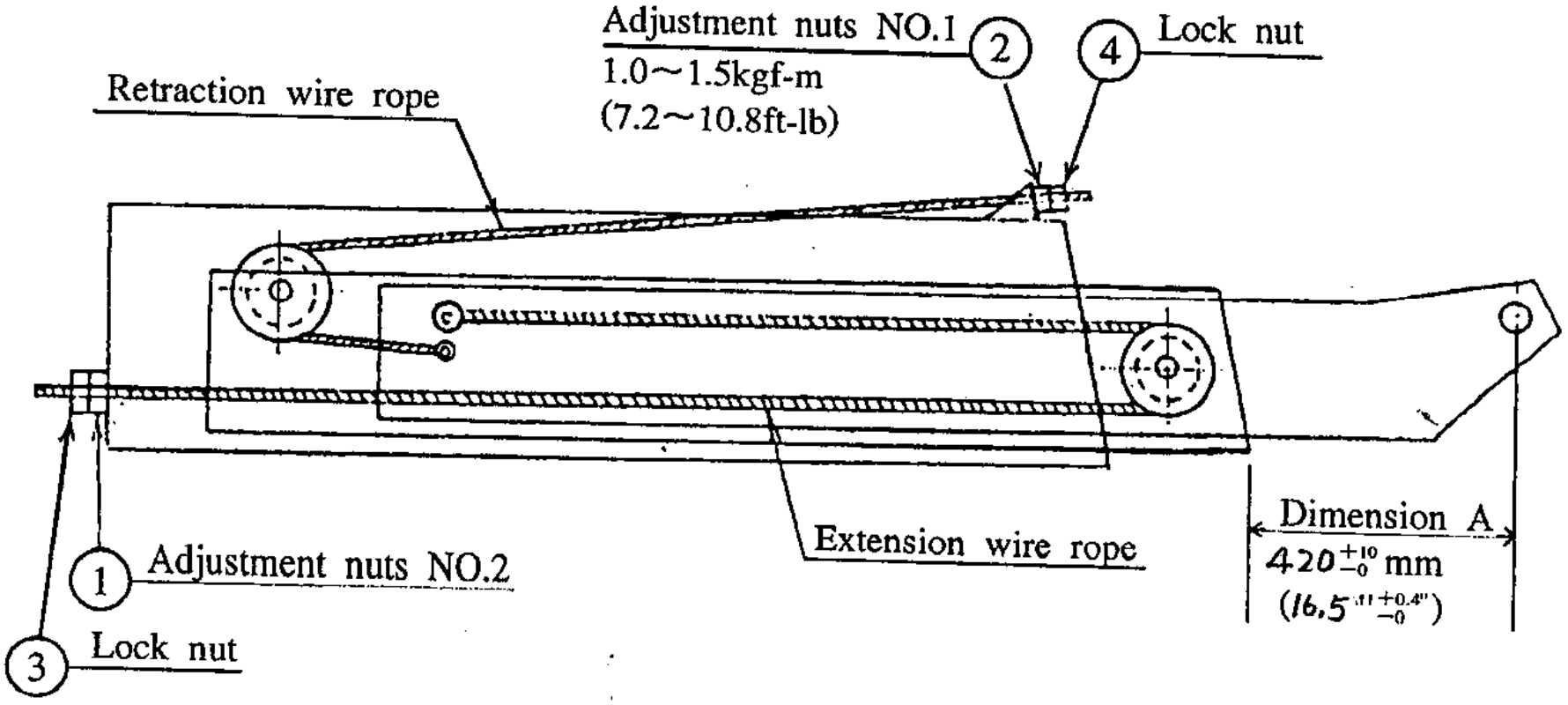


4. Tension of wire ropes

Extend/retract the boom for a full stroke, check for any jerky movements caused by loose or stretched extension/retraction wire ropes.
If the wire ropes are loose, adjust their tensions as follows.

1) Retract boom fully and set it horizontally.
2) Loosen both the lock-nuts and the Adjustment nuts NO.1② , which are located on both sides of the top part of the 1st boom.
3) Lubricate the Adjustment nuts NO.1 with machine oil, and make sure that the nuts turn smoothly on the threads.
4) Tighten both of the Adjustment nuts NO.1 . Do this alternatly using a torque wrench, until the specified tightening torque is reached.
   Specified tightening torque of Adjustment nuts NO.1:1.0~1.5kgf-m(7.2～10.8ft-1b)
5) Check dimension A shown in the figure below, and make sure that it is 420^{+10}_{-0}mm. ($16.5^{+0.4}_{-0}$")
   If the mesurement of dimension A is less than 420mm (16.5") :
   - Screw out Adjustment nuts NO.1 ② and screw in Adjustment nuts NO.2 ① until the specified dimension A is obtained.

   If the mesurement of dimension A is more than 430mm (16.9") :
   - Screw out Adjustment nuts NO.2 ① and screw in Adjustment nuts NO.1 ② until the specified dimension A is obtained.
6) Extend/retract boom several times for a full stroke, and recheck the tightening torque of Adjustment nuts NO.1, and dimension A, then secure the Adjustment nuts with lock-nuts.

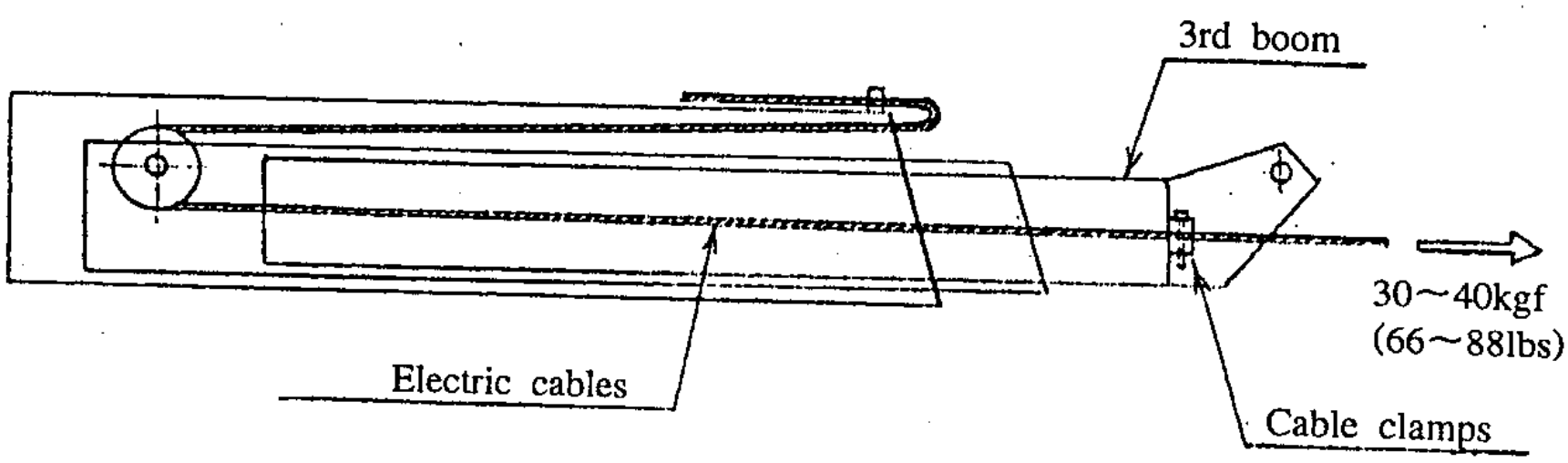


Note : Adjust the tension of wire ropes every 6 months.

5. Tension of electric cable

Apply tension on the each electric cable after adjusting the tension of "Extension/Retraction wire ropes as follows.
It is advisable to apply the tension on each electric cable every 6 months or 600 working hours.

1) Position the boom horizontally, retract it fully, and check the tension of the "Extension/Retraction wire ropes."
   (Adjust the tension if necessary.)
2) Loosen the cable clamps at the top of the 3rd boom.
3) Pull each electric cable by applying 30~40kgf, (66~88lbs) and lock the cable with the cable clamp.

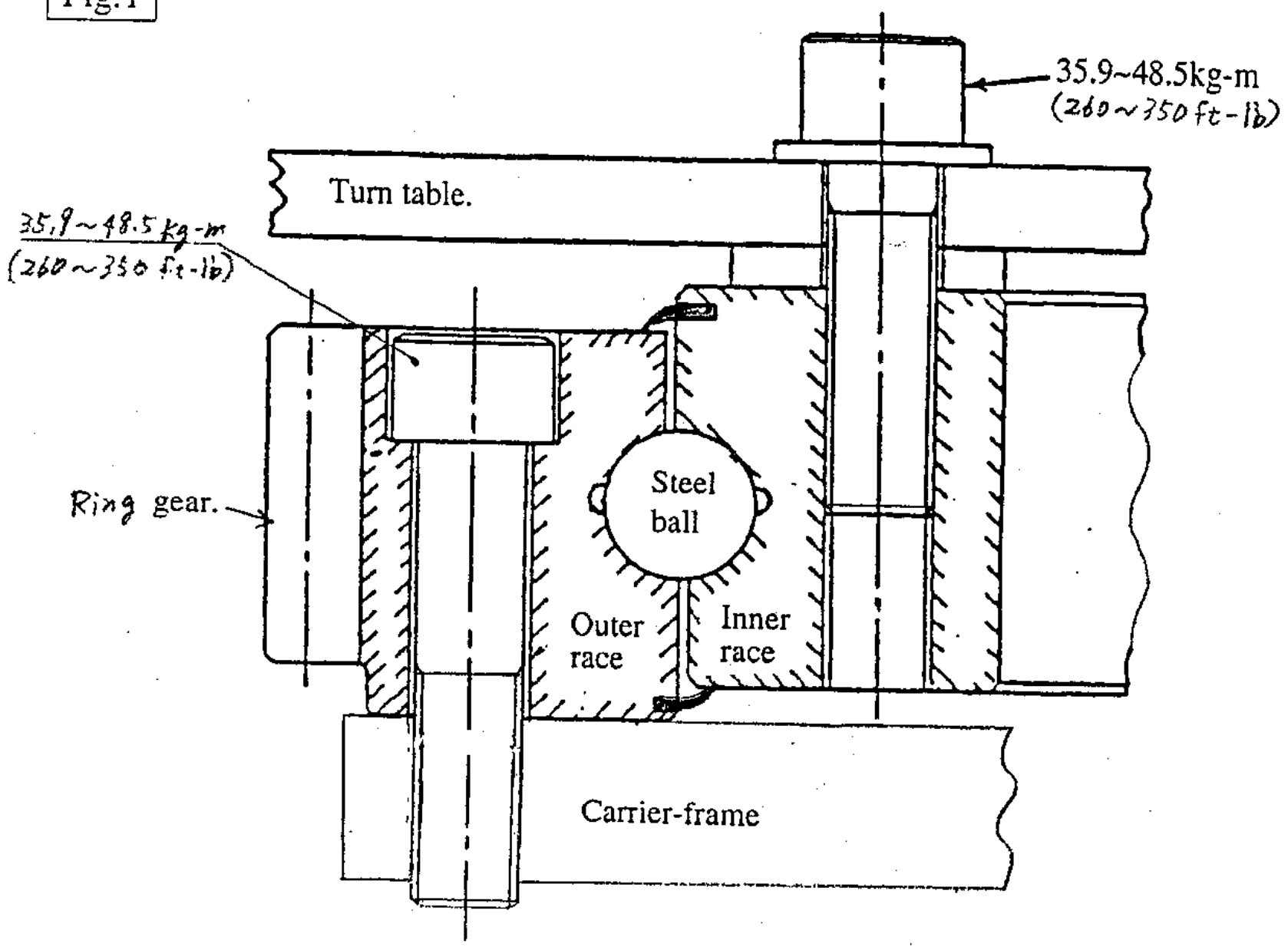


Note : Apply tension to the cables every 6 months.

TURNTABLE BEARING

The T.T.B. is mounted between the carrier-frame and the turn-table, it enables the turn-table to rotate freely over the carrier-frame.

Fig:1



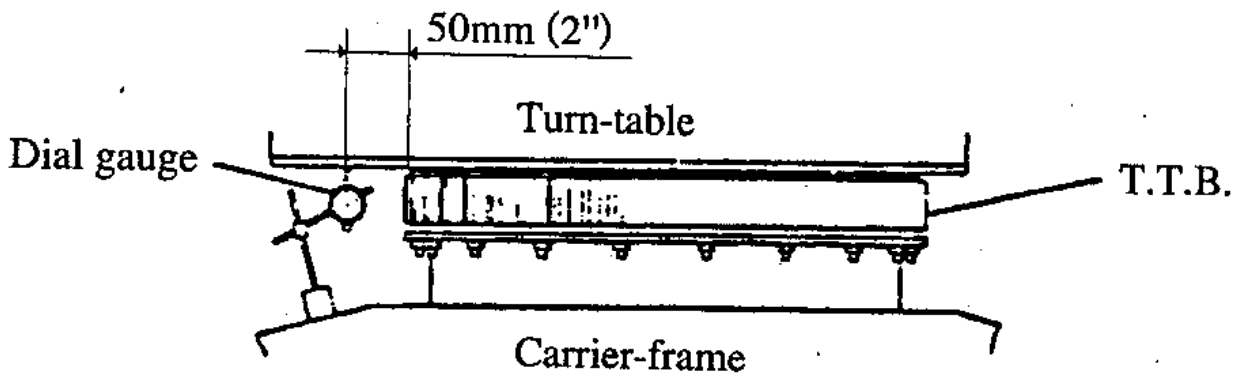
1. Inspection procedures.

1. Check anchor bolts and nuts for any looseness, omissions or any other damage.
   a. Loose bolts should be removed and checked for damaged threads and deformation.
   b. When resetting anchor bolts or nuts, apply thread lock agent to the threads.
   -Recommended thread lock agent : 3 Bond 1374.
   c. Tighten anchor bolts and nuts to the specified tightening torque.
   -Specified tightening torque : 35.9-48.5 kg-m (260~350 ft-lb).

NOTE : Before removing anchor bolts or nuts, use a gas bunner to heat them until they are red hot. This will remove the thread lock agent applied on the thread of each bolt and nut.

2. Check ring gear for cracks, scorings and any other damage.
   For any fine cracks, use a penetrant check such as a color check.
3. Check the back-lash between the ring gear of T.T.B. and the drive pinion of Rotation gear box.
   -Standerd back-lash : 0.6mm (0.024") or less.
   NOTE : To measure the value of back-lash, rotate turn-table and crush a lead-wire between the ring gear and the drive pinion, then measure the thickness of the crushed lead-wire.
   When the back-lash is not within the the tolerance, adjust it by moving the position of rotation gear box.
4. Check the free-play between inner and outer races of T.T.B..
   To check the free-play, use the following steps.

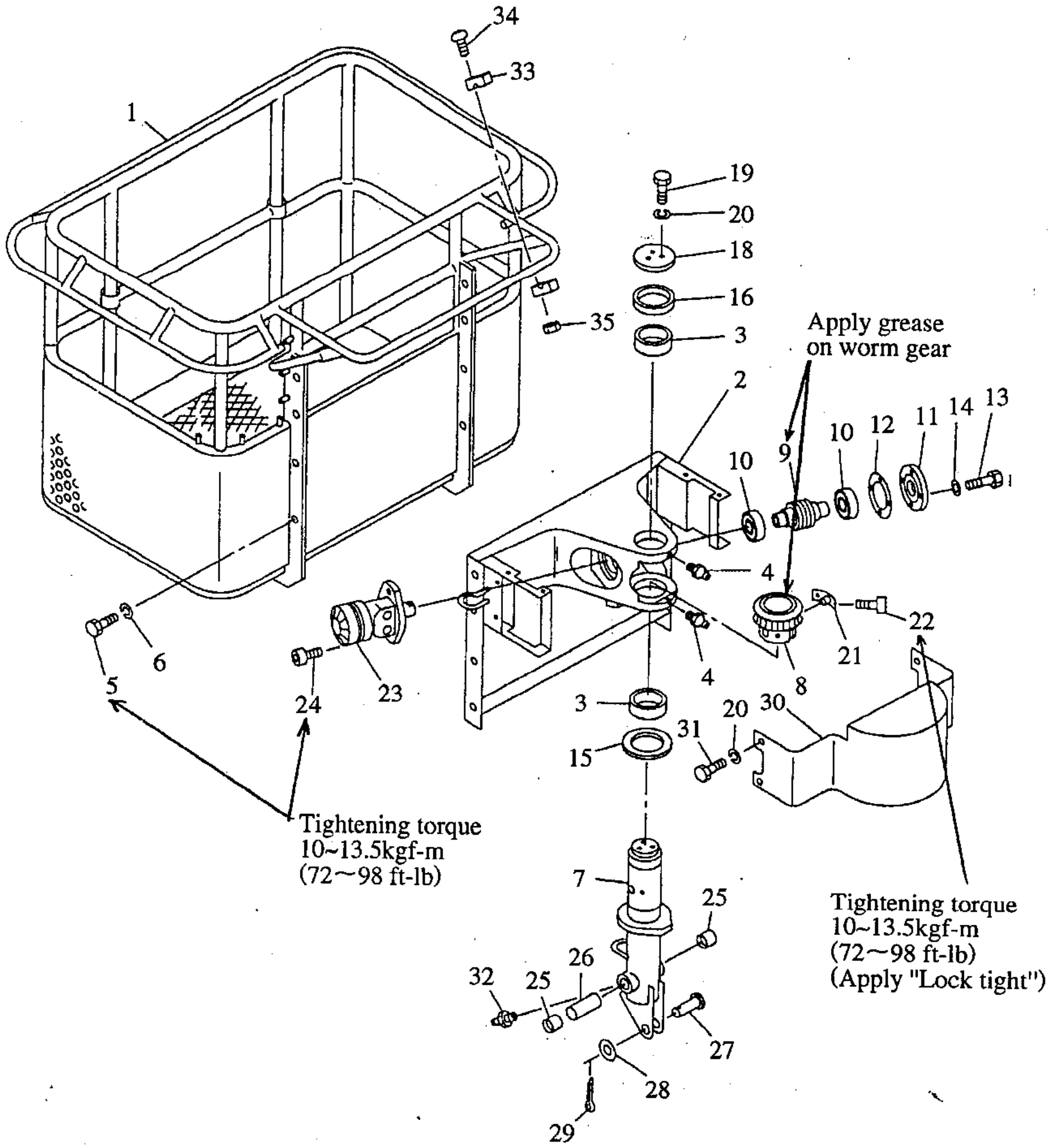
Fig:2



a. Set a dial gauge between the turn-table and the carrier-frame, as shown in Fig : 2.
b. Retract and raise the boom fully (with minimum boom length and maximum boom angle), and set the pointer of the dial gauge at "ZERO".
c. Lower the boom, set it horizontally and extend it fully, then re-check the dial gauge.
   The reading of the dial gauge is the value of free-play.
   -Standard free-play : 0.9mm (0.035").
   -Limit of free-play : 3.0mm (0.118").

NOTE :
The T.T.B. with free-play in excess of the limit 3.0mm (0.118") should be replaced.

PLATFORM ROTATION MECHANISM



3

HYDRAULIC SECTION

NOTE ON OVERHAULING HYDRAULIC SYSTEM

When repairing, servcing or overhauling the hydraulic system, take the following into consideration.

1. When disconnecting plumbing.
   a. Prepare a suitable container to catch the draining oil.
   b. Put "MATCH MARKS" on each part before disconnecting. This will make recoginition on the time of reconnection easier.
   c. Use double spanners as not to damage the plumbing and components.
   d. Clean the plumbing or components out before disconnection, to prevent foreign particles from entering into the hydraulic system.
   e. Install proper plugs to the disconnected plumbing or components, to prevent foreign particles from entering into the hydraulic system.
2. When connecting the plumbing.
   a. Check the "MATCH MARKS" made on disconnection to avoid incorrect connections.
   b. Clean the connecting plumbing, to prevent foreign particles from entering into the hydraulic system.
   c. When connecting the TP adaptors, wind seal-tape at least one and a half times around the threads.
   d. Use double spanners when tightening the connectors.
3. When assembling or disassembling hydraulic components.
   a. Put proper plugs onto the openings of oil passages to prevent foreign particles entering into the components.
   b. Before disassembling, clean the component thoroughly with a solvent and compressed air.
   c. Clean each disassembled part with solvent thoroughly. This will ensure easier check-up procedures, and prevent the introduction of foreign particles.
   d. When assembling 0 rings or packings, apply a little grease or lubricate them with hydraulic oil.
   e. When installing taper plugs, wind seal-tape at least one and a half times around the threads.

HYDRAULIC OIL

It should be noted that hydraulic system failures are often caused by defective hydraulic oil which in turn is caused by improper maintenance.

To insure maximum utilization, the followings should be observed.

1) Oil temperature should be below 70°c and ideally below 60°c (140°F), as heat causes earlier oxidation.
   On the other hand when the oil is very cold, a warm-up period is recommended before operation.
2) Regularly check for contaminants in the hydraulic oil.
   Contaminants in the oil may speed up the oxidation process.
3) Avoid introduction of water into the hydraulic system, as water will cause additives to deteriorate and if the amount of water is sufficiently large, it will cause the oil to emulsify.
4) As a rule, do not mix oils from different maufacturers.
   Furthermore, do not mix oils of the same make if they have different product names or viscosity differences.
   Improper mixing will cause the additives to deteriorate.
5) Eliminate oil leakage as much as possible from the hydraulic component and its plumbings.
6) Make it a habit to check the oil regularly.

Guidelines for oil change.

An oil change should be carried out every 1,200 working hours or on an annual basis.

(For new Machine : After 300 working hours or 3 months use.)

In the meantime, take a small amount of oil from the oil reservoir, and conduct the following inspections and tests.

1) Visually compare the sample taken from the oil reservoir, and a fresh, unused sample.

   - Color -

   As the oil deteriorates, the color becomes darker and less clear.
   If the oil is milky, let it settle for about 10 hours, then observe.

   a) If there is little or no change to the milky oil, the cause is water mixed into the oil.
      In this case a complete oil-change is necessary.

b) If the oil and water seperate, this indicates that the water has been introduced to the hydraulic system a short time ago. It can be reused after taking out water.

c) If the oil becomes clear with no water at the bottom of the container, it is an indication that air has been mixed into the oil.
   - Access the cause of the air.

- Smell -

If the oil has a strong pungent odor, it is an indication that the deterioration has progressed to a point where an oil-change is needed.

- Contaminants -

If suspended contaminants are introduced to the hydraulic oil, leave the sample for 1 to 2 days and gather sediments for further tests of the development of contaminants.

2) Analytical tests.

Test the hydraulic oil for viscosity, water content, oxidation, contaminants, etc.

Test for	Shell Tellus 32	Shell Tellus T15
Contamination	Within NAS Class 12.	
Water content (%)	Less than 0.5%.	
Oxidation (mgKOH/g)	0.4mgKOH/g.	
Viscosity (cst) (at 40°c)	32 cst.	15 cst.

Suction strainer.

Be sure to clean suction strainer at the time of an oil change.
Wash and clean the strainer in kerosene or a similar solvent, then air-blast it from the inside.

Oil filters.

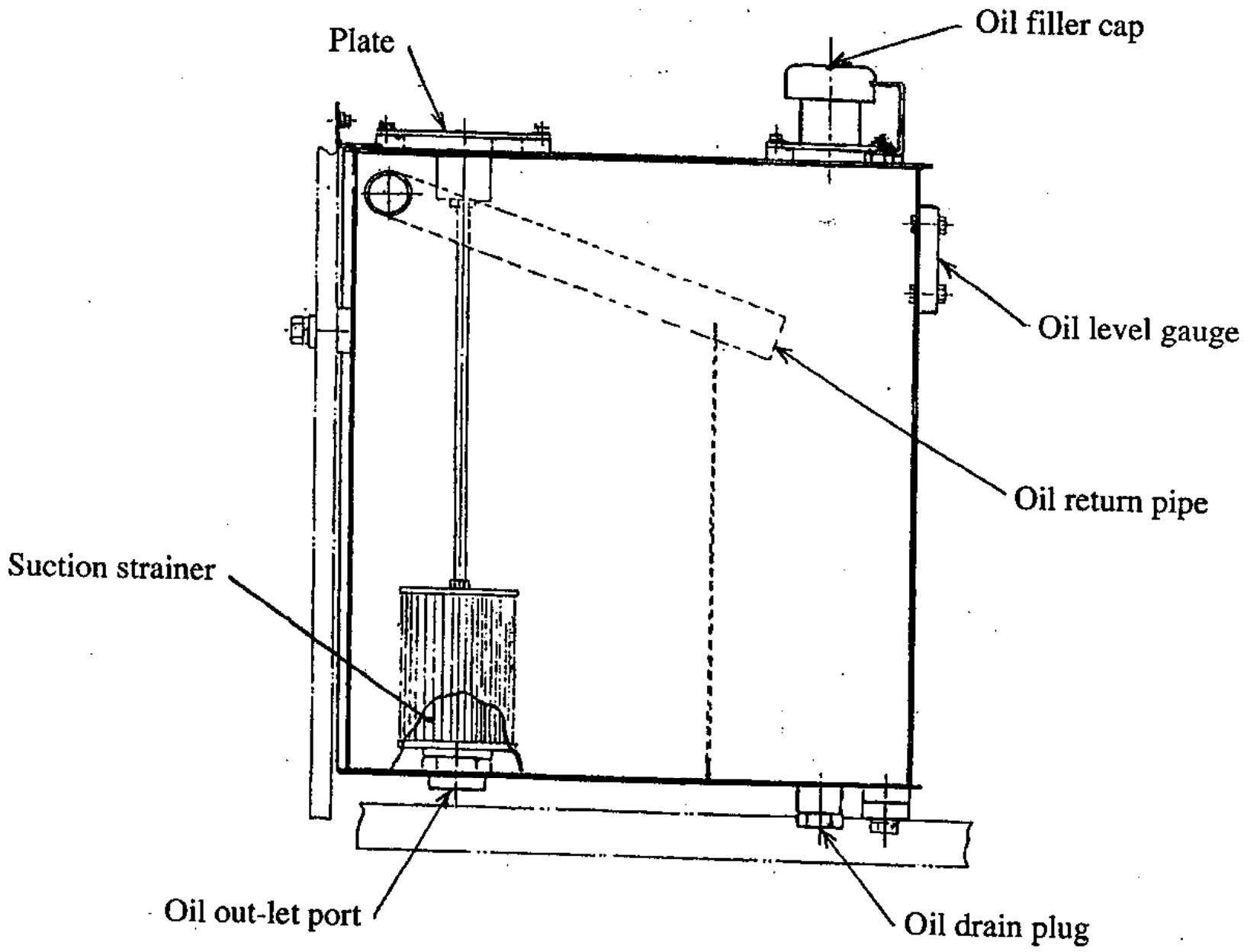
Regulary replace the filter element. If the machine is new, replace the element after 300 working hours or 3 months use.
Thereafter, replace it every 1,200 working hours or on an annual basis.
(The element should also be replaced at the time of an oil change.)

OIL RESERVOIR

The oil reservoir consists of such components as shown in the figure below, and supplies hydraulic oil to the whole hydraulic system.

Capacity ..... 250 liters (66 gals)

Recommended oil ..... Shell Tellus oil 32



Oil change interval

- Every 1,200 hours or annually
- For a new machine, the first oil change should be carried out after 300 hours or 3 months use.

Note

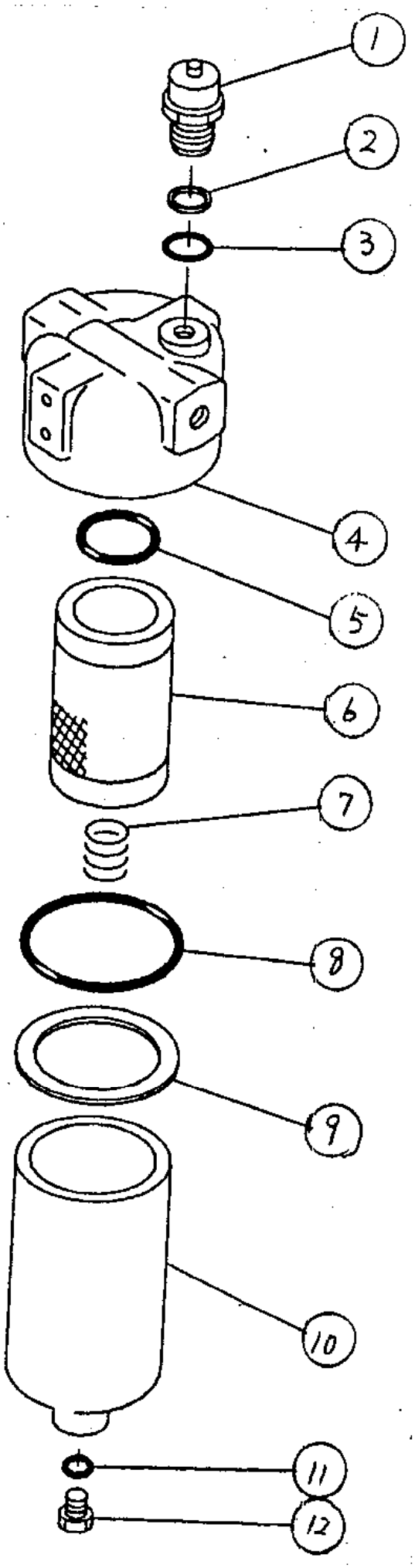
- When checking oil level, retract and lower the boom fully.
- Clean "Suction strainer" and replace "In-line filter", when changing the hydraulic oil.

IN-LINE FILTER

The in-line filter is installed at the outlet line of the hydraulic pump to eliminate the contaminants contained in the hydraulic oil.

Replacement interval : Every 1,200 working hours or annually.
(of filter element)

NOTE : The first replacement of the filter element for new machine should be carried out after 300 working hours or 3 months use.



1	Indicator
2	Back up ring
3	O ring
4	Body
5	O ring
6	Paper element
7	Spring
8	O ring
9	Back up ring
10	Case
11	O ring
12	plug

NOTE : Do not reuse "Oring" and "Back up ring", when removed once.

HYDRAULIC PUMP

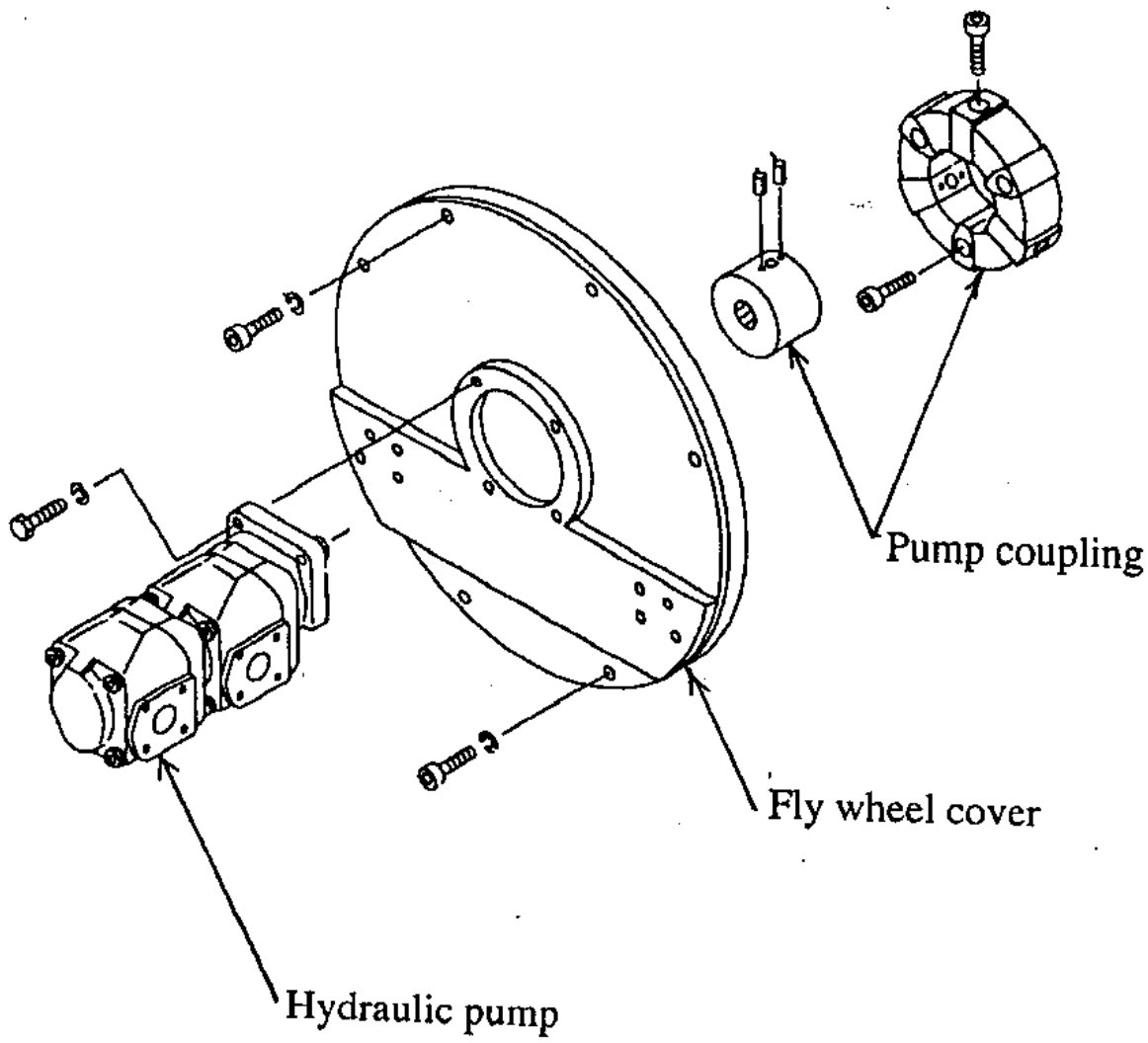
The pump is driven by engine directly, and supplies pressurized oil to hydraulic system

Type ..... Gear pump (Double)

Discharge volume ..... 40 + 40 cc/rev (2.4 + 2.4 in^3/rev)

Rated pressure ..... 210kgf/cm^2 (3,000 PSI)

Rotating direction ..... Clock wise



MAIN CONTROL VALVE NO.1 & NO.2

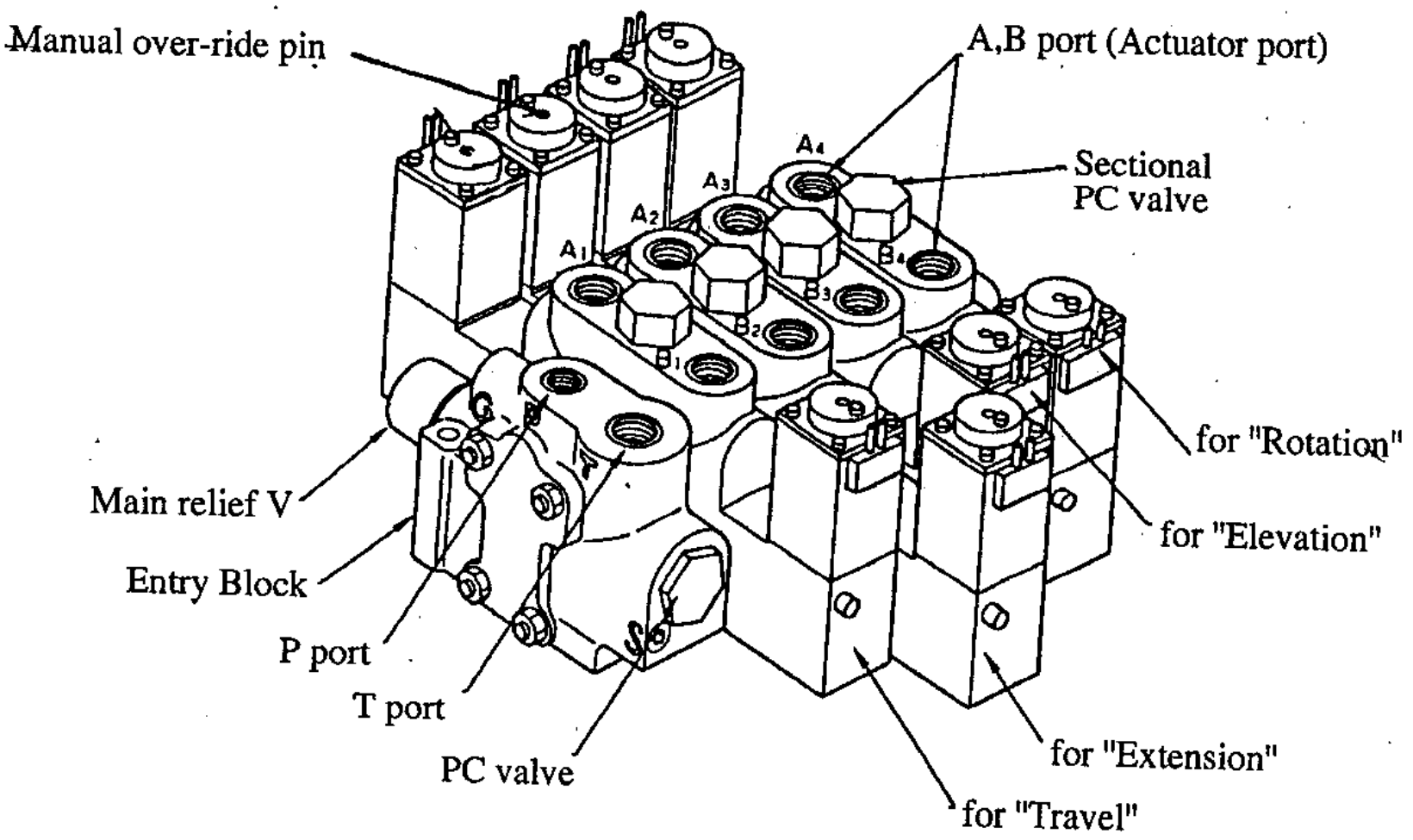
The main control valve is a "Soleniod Operated Proportional Type" and controls the following hydraulic systems.

1. Elevation system.
2. Extension system.
3. Rotation system.
4. Travel system.

When the main control valve is operated by the control levers (or Potentio meters) located at upper control box, the main spools of the valve are shifted proportionally in accordance with the operated value of the control levers.
Thus, the flow which is supplied to the each hydraulic actuator is controlled proportionally.

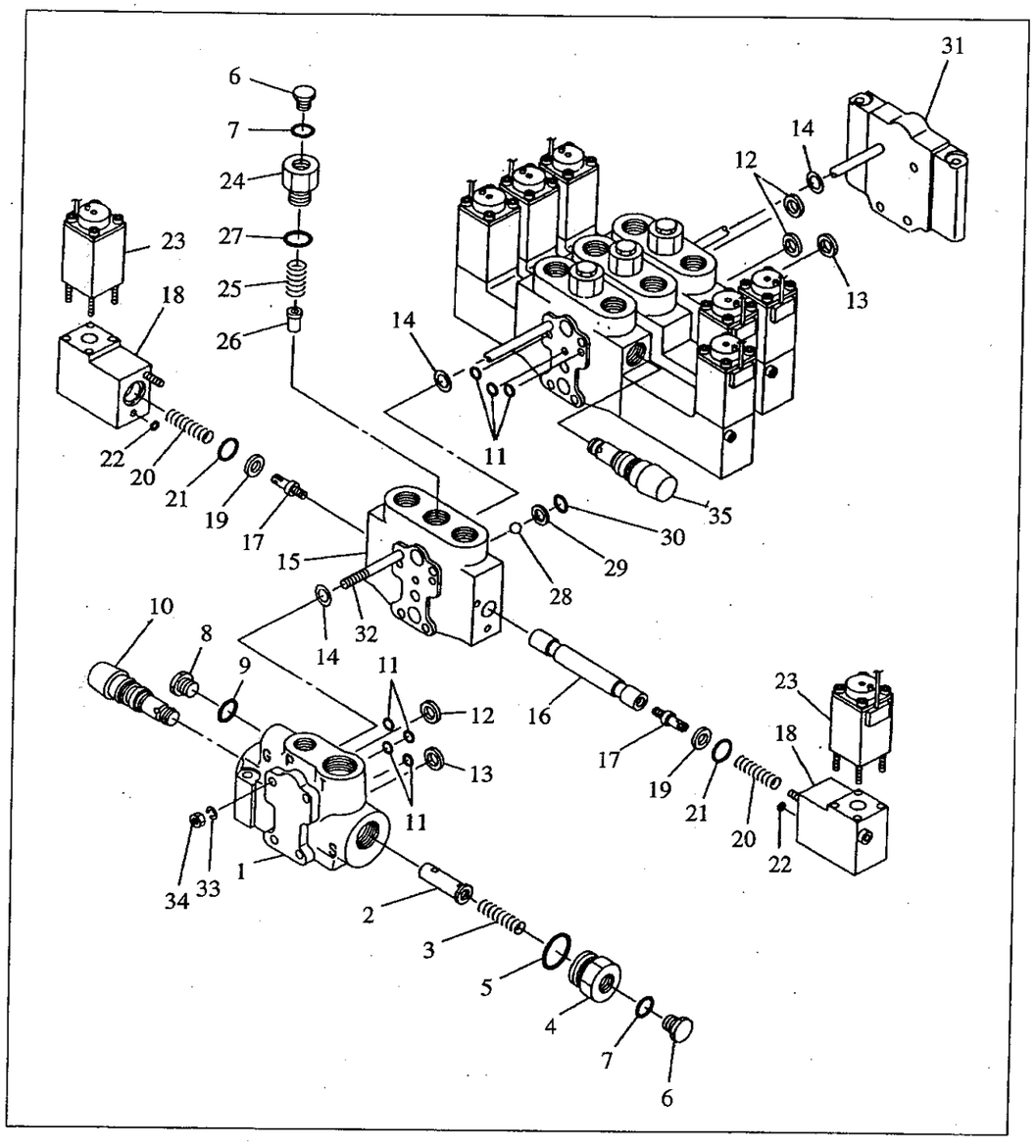
On the other hand, when the main control valve is operated by the control switches located at the lower control box, the valve is operated as a conventional solenoid valve.

* Rated pressure.
  - at P, A, B ports : 250 kg/cm². (3,555 PSI)
  - at T port : 10 kg/cm². (140 PSI)
* Solenoid.
  - Rated voltage : DC 24 V
  - Rated current : 650 mA
  - Resistance : 30 Ω

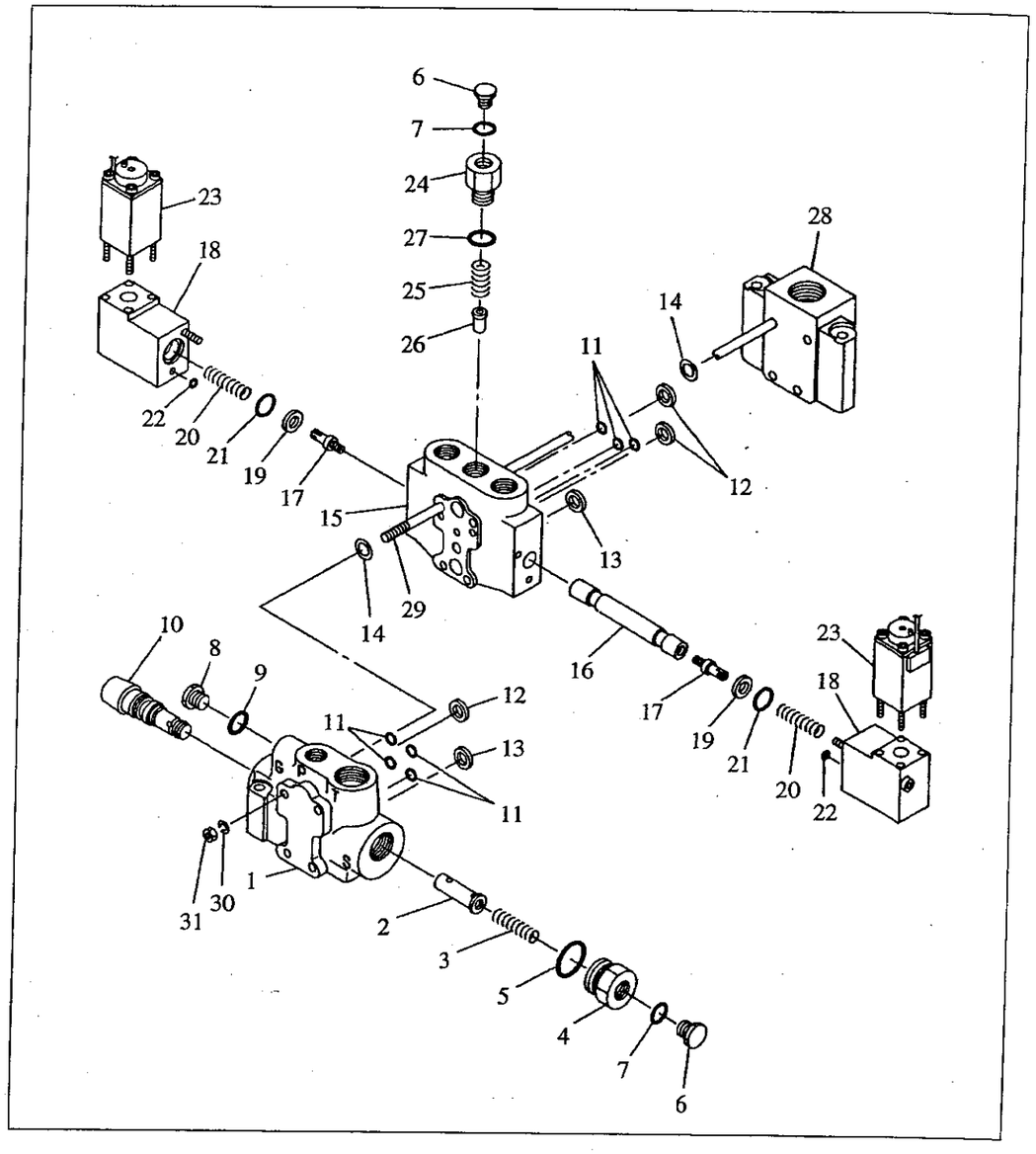


1. Illustrations

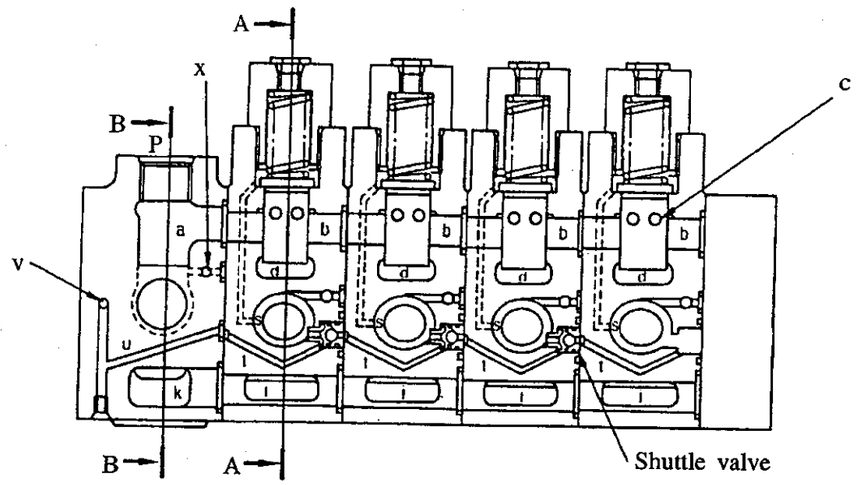
Main control valve NO.1 (R12-R2035)

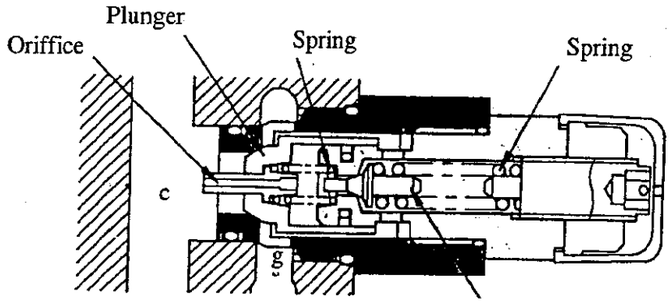


Main control valve NO.2 (R12-R2036)

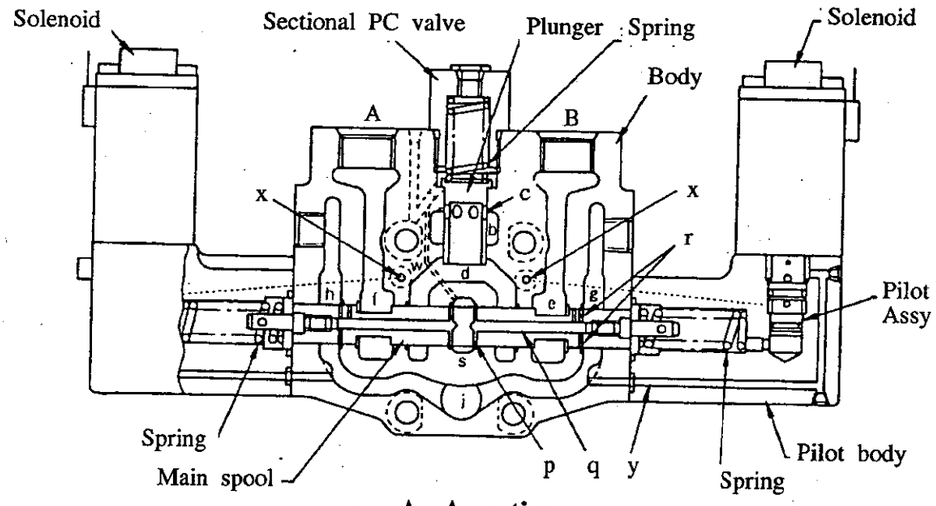


2. Sectional drawings

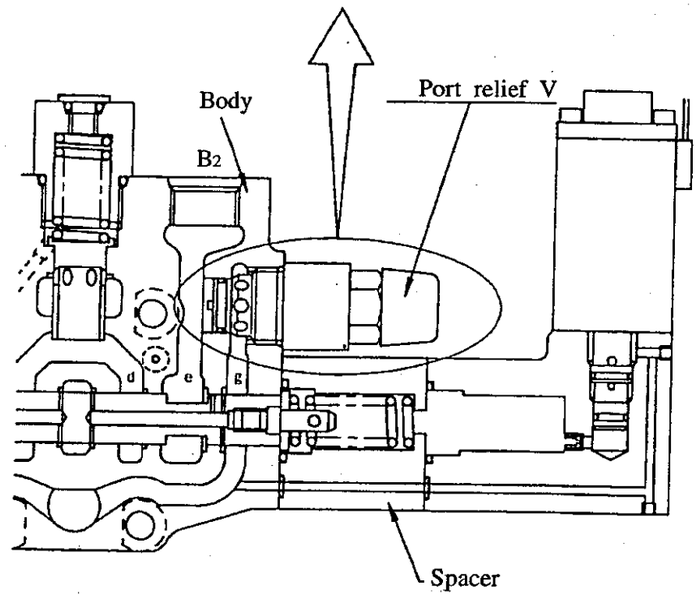


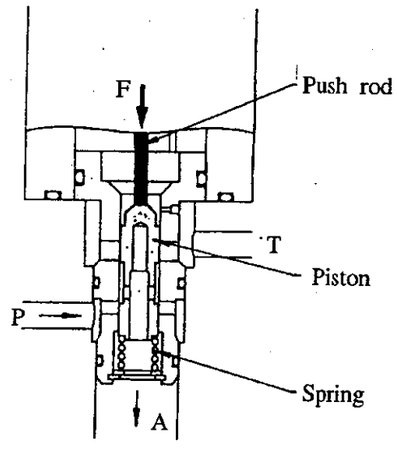


Detail of port relief V

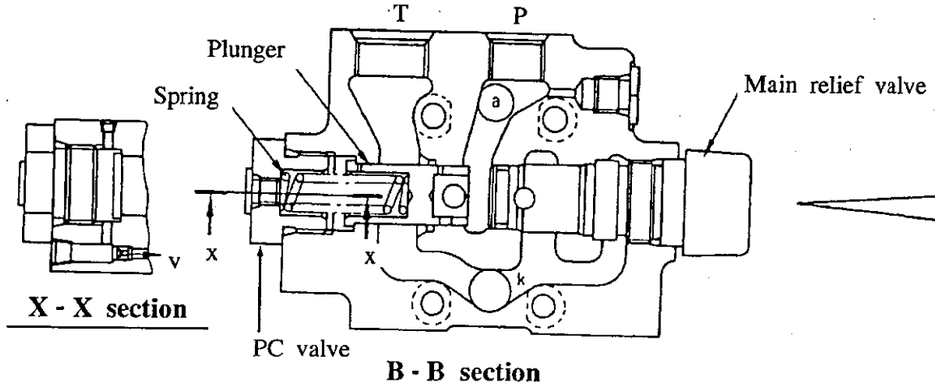


A - A section



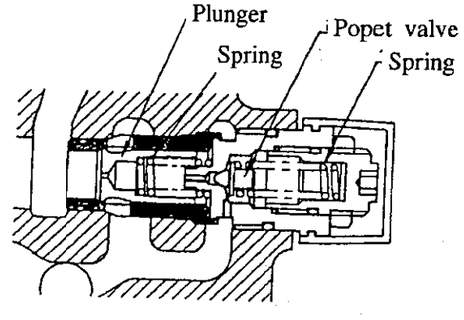


Detail of pilot valve



X - X section

B - B section



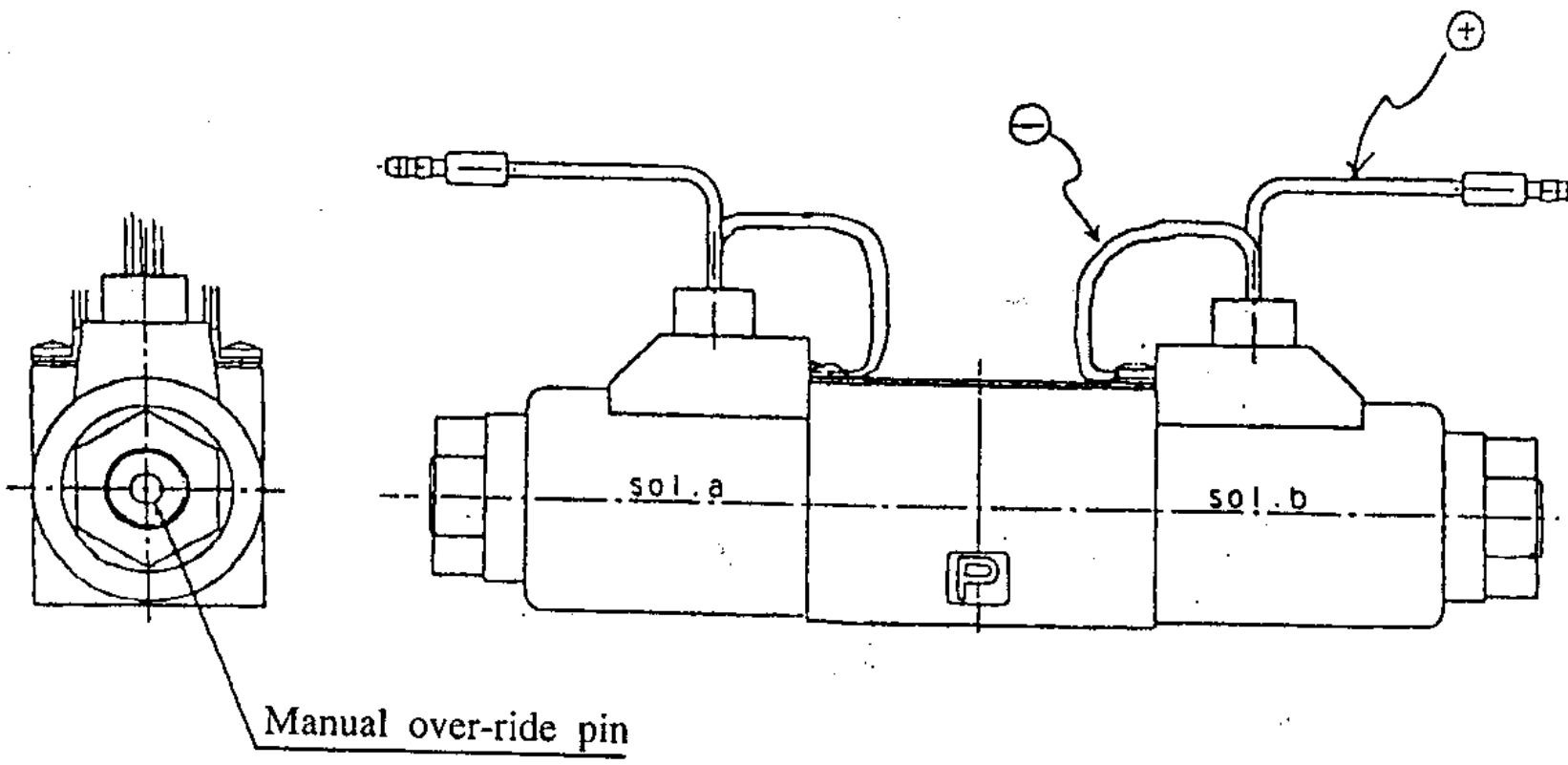
Detail of Main relief V

3. Trouble shooting

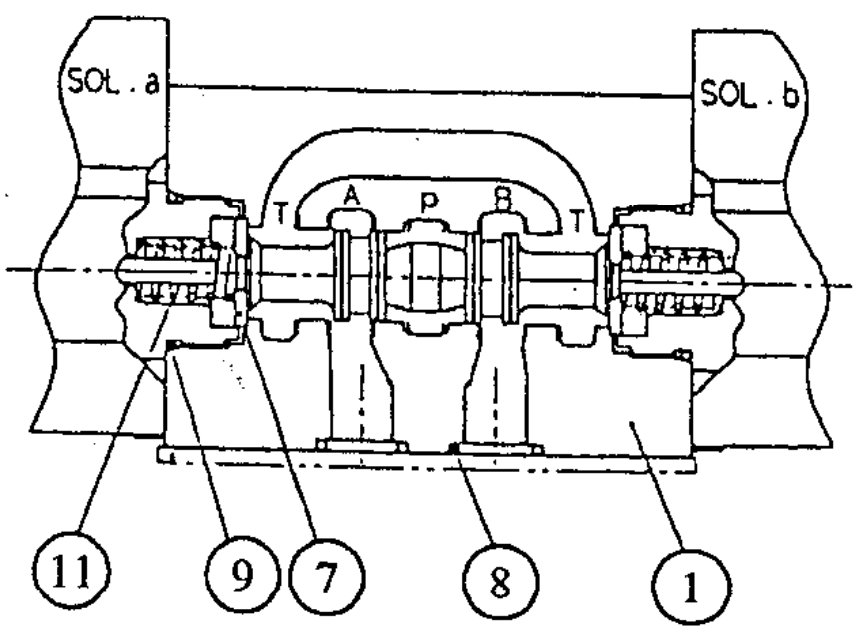
Trouble	Check point	Result	Cause	Remedy
Inoperative actuator or Operational speed of the actuator is too slow.	Check the "GAIN voltage" at "Valve control unit".	No "GAIN voltage" is obtained.	Defective "Potentio meter" or "Control switch".	Replace the "Potenio meter" or "Control switch".
			Inadequate adjustment of "GAIN voltage".	Readjust the "GAIN voltage" at the "Valve control unit".
			Defective "Valve control unit".	Replace the "Valve control unit".
			Defective electric wirings.	Repair the electric wirings.
		"GAIN voltage" is too low.	Battery voltage is too low.	Charge or replace the battery.
			Inadequate adjustment of "GAIN voltage".	Readjust the "GAIN voltage" at the "Valve control unit".
	In case the "GAIN voltage" is normal, press the "Manual over-ride pin" installed on "Solenoid".	Actuator is operative.	Defective solenoid.	Replace the solenoid.
			Sticked "Piston" in "Pilot valve" installed under the "Solenoid".	Clean or replace the "Pilot valve".
		Actuator is not operative.	Sticked "Main spool" or "Valves" caused by contaminated hydraulic oil.	Clean the hydraulic system, and replace the hydraulic oil.
			"PC valve" is sticked and the unloading pressure is not obtained.	Clean or replace the "PC valve".
			Sticked "Pilot valve" installed under the "Solenoid".	Clean or replace the "Pilot valve".
			Sticked "Main spool".	Clean or replace the "Main control valve Assy".
			Sticked "Sectional PC valve".	Clean or replace the "Sectional PC valve".
			Defective "Springs".	Replace the "Springs".
			Clogged "Orifice".	Clean or replace the "Orifice".
			Distorted "Valve body" caused by improper mounting.	Remount or replace the "Main control valve".
Operational speed is too fast, when operating control lever slightly.	Check the "NULL voltage" at "Valve control unit".	"NULL voltage" is too high.	Inadequate adjustment of "NULL voltage".	Readjust the "NULL voltage" at the "Valve control unit".
Actuator haunts, after overhauling hydraulic system.			Air is in the hydraulic system.	Bleed air by operating actuator several times".
				Loosen the "Air bleed screw" installed on "Solenoid", and bleed air.
Actuator is powerless.	Check the "MAX. pressure".	"MAX. pressure" is too low.	Improper adjustment of "Relief valve".	Readjust the "Relief valve".
			"PC valve" is loose.	Tighten the "PC valve".
Erratic hydraulic pressure, or higher pressure is not achieved.	Disassemble the "Relief & PC valves".		Defective spring.	Replace the spring.
			Worn out "Poppet" or "Poppet seat".	Replace the "Relief" or "PC valve".
			Sticked "Plunger".	Clean or replace the "Relief" or "PC valve".

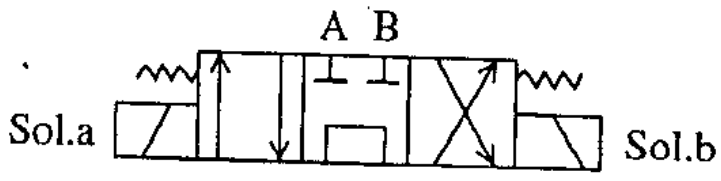
PLATFORM ROTATION SOLENOID VALVE

This valve is controlled electrically by the platform rotation switch located at the upper control box.



①	Body
⑦	Spring seat
⑧	O−ring
⑨	O−ring
⑪	Spring



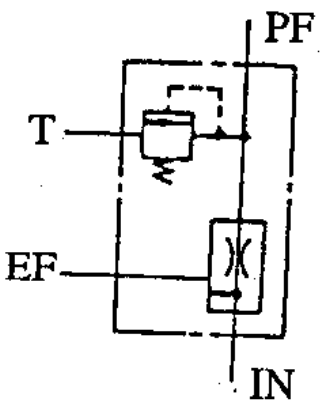


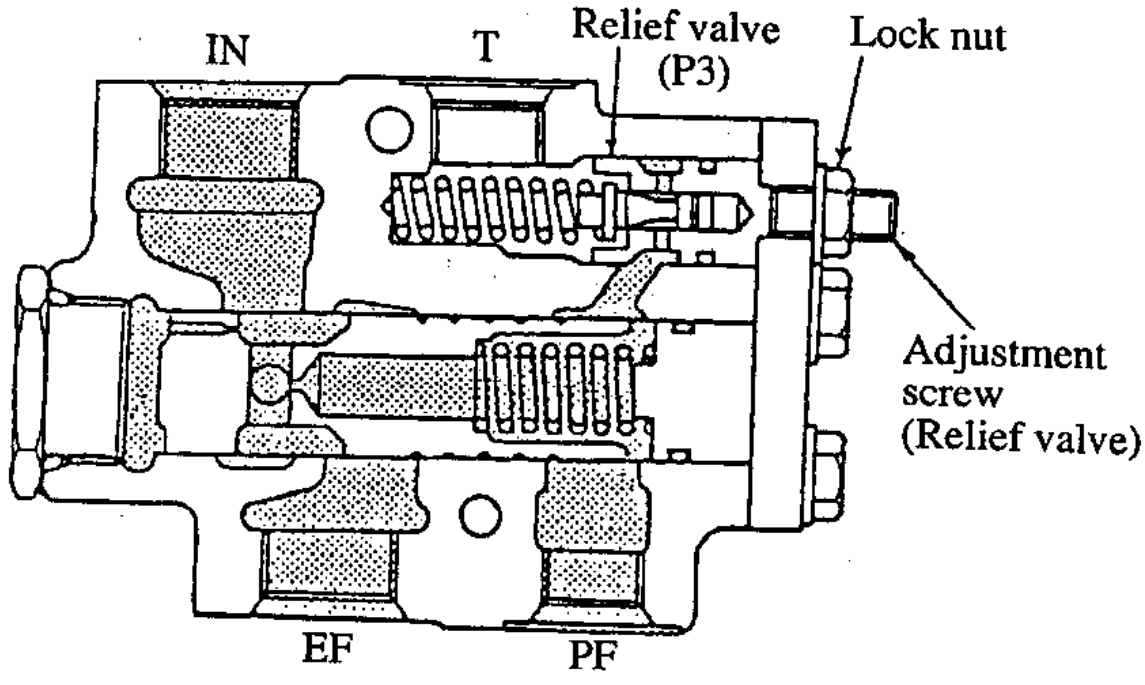
PRIORITY VALVE

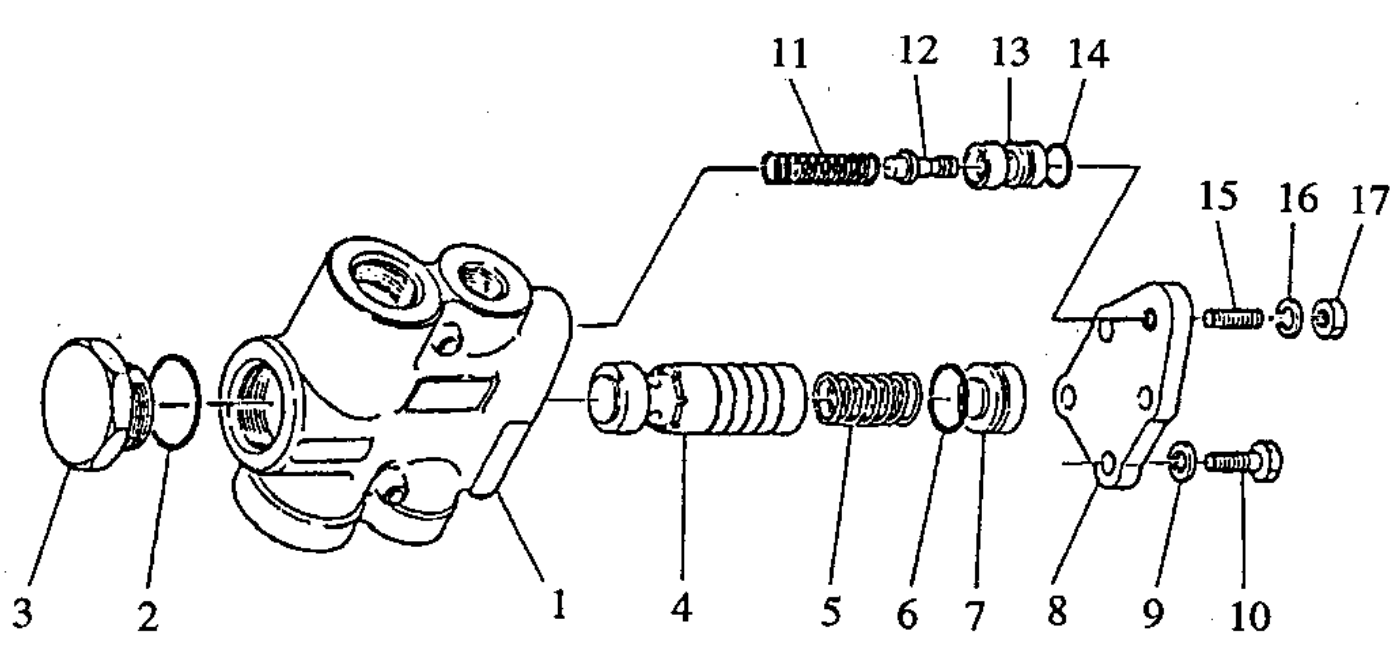
The priority valve maintains the flow which comes out of the "PF port" at the constant level, regardless of any variation to the volume of pump discharge. While the rest of the pump discharge volume is by-passed through the "EF port". The relief valve incorporated in the valve is for limiting the maximum hydraulic pressure for the "PF port".

For SR-123, the flow and the maximum hydraulic pressure of the Platform swing system are both limited by the priority valve. This is because the system is supplied with hydraulic power through the "PF port".

* Rated pressure : 140 kg/cm². (2,000 PSI)
* Constant flow : 8 liters/min. (2.1 gals/min)
  (at PF port)
* Relief valves (P3)
  Adjustable pressure range : 90~140 kg/cm². (1,280~2,000 PSI)
  Pre-set pressure : 140 kg/cm². (2,000 PSI)





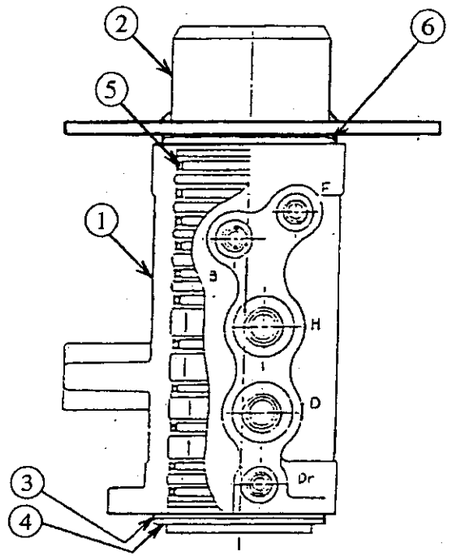


NOTE : Refer to ADJUSTMENT SECTION to adjust the Relief valve.

SWIVEL JOINT

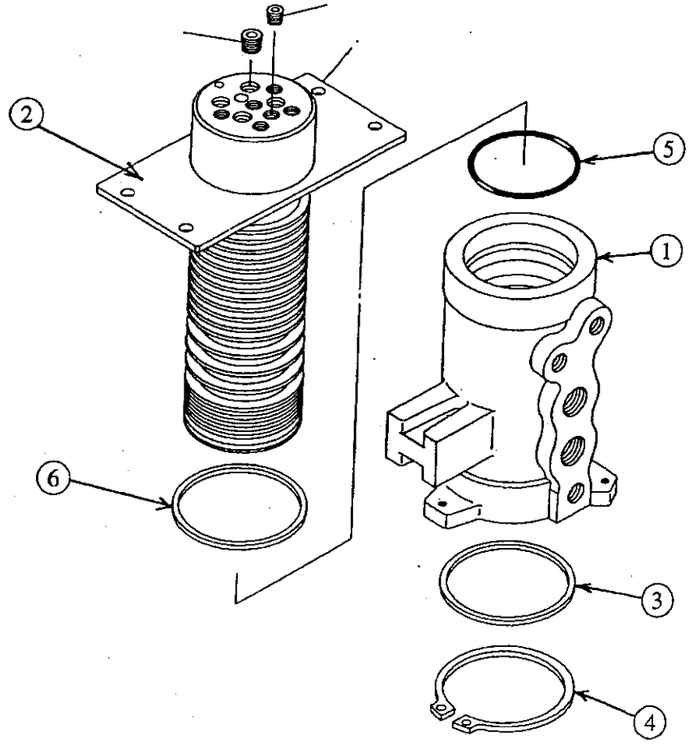
The swivel joint is installed at the rotation center of the turntable to supply pressurized oil to the "Travel motors".

Fig:1



1	Case
2	Shaft
3	Spacer
4	Snap ring
5	O ring
6	Spacer

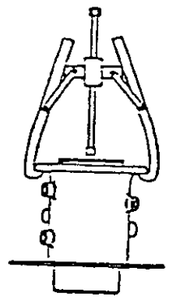
Fig:2



Disassembly

1. Remove snap ring ④ and spacer ③.
2. Press out the shaft ② from the case ① using a hydraulic press.
   (or pull the shaft ② out of the case ① using gear puller as shown in Fig:3.)

Fig:3



3. Remove the spacer ⑥ from the shaft.
4. Remove all of the O rings from the shaft.

Inspection

1. Check case ① and shaft ② for excessive wear, cracks, scorings, and any other damage.
2. Check the clearance between case ① and shaft ②.
   -If the clearance exceeds the limit, replace the shaft or the case.
   Limit of clearance : 0.4mm (0.016").
3. Check each groove on case ① and shaft ② for ridges, and sharp edges.
   -Ridges and sharp edges should be removed before installing O rings, as such faults may cause damage to the O rings.

Assembly

Assemble in the reverse order of disassembly, paying particular attention to the following points.

-Do not reuse O rings.

-Apply a slight amount of grease to O rings before installation.

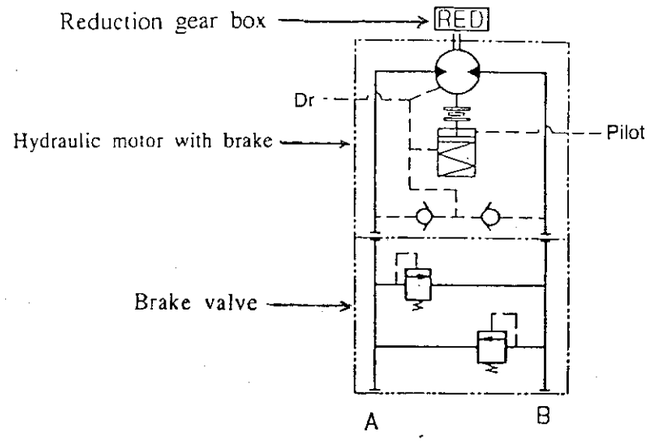
ROTATION MOTOR UNIT

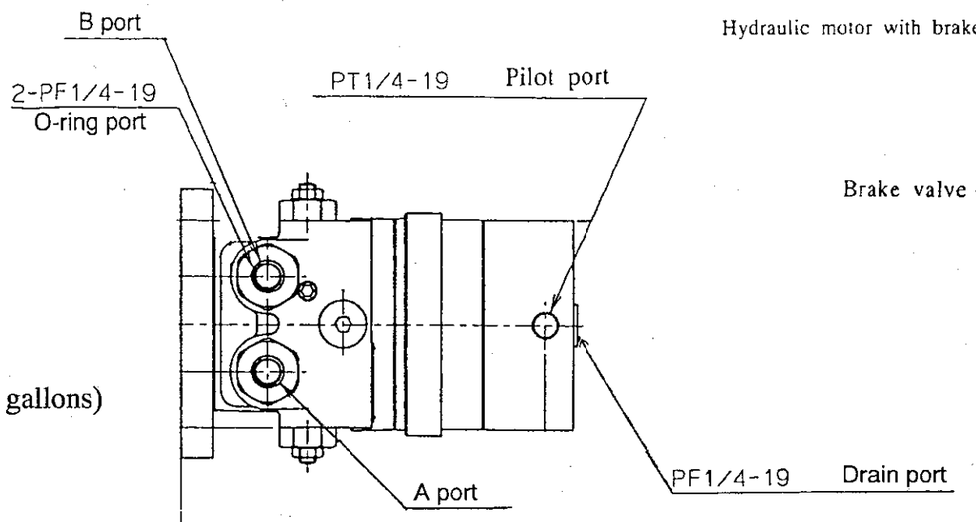
This unit consists of such major component as a hydraulic motor with brake, a brake valve and a reduction gear box as shown in the figure.

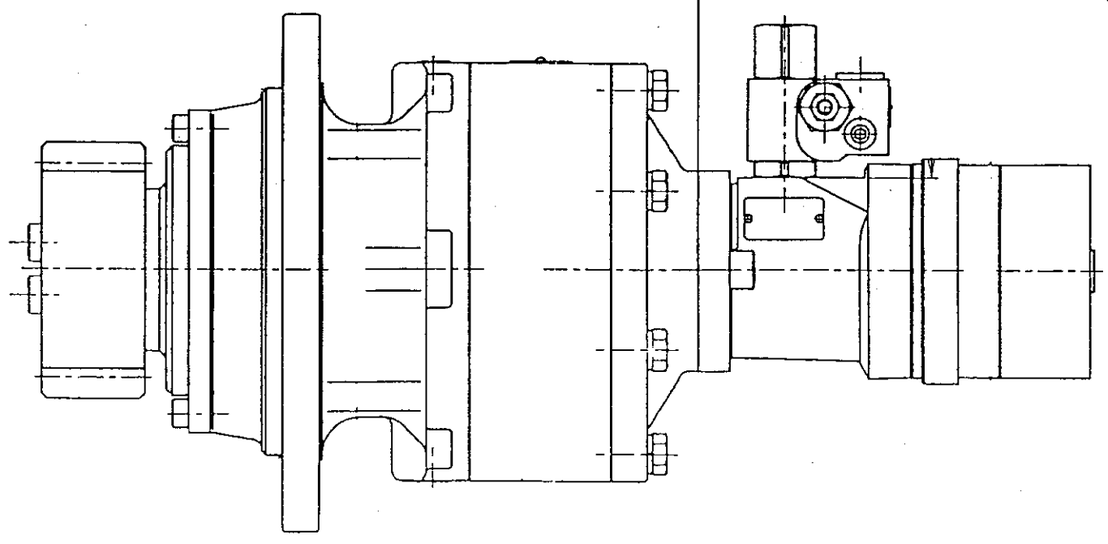
※ Hydraulic motor
- Type.....Orbit type
- Rated pressure.....210 kgf/㎠ (3000 psi)
- Discharge volume.....159 cm^3/rev. (9.7 in^3/rev.)

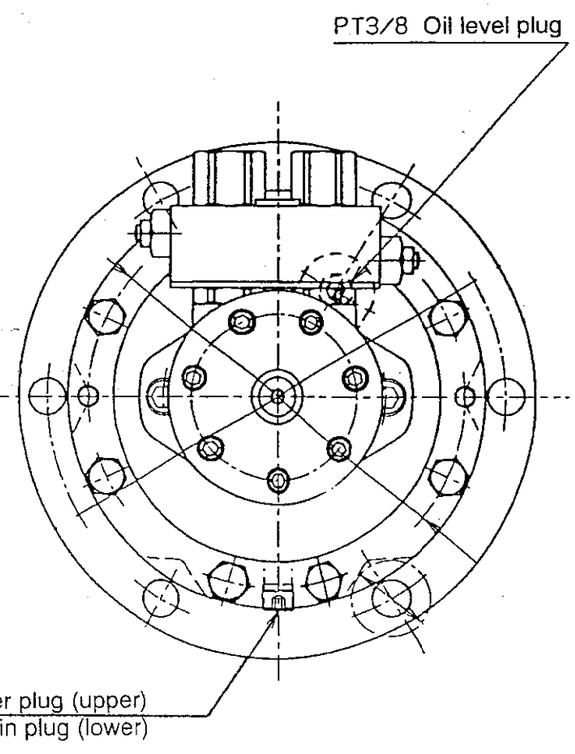
※ Reduction gear box
- Type.....Planetary gear
- Reduction ratio.....1/29.368
- Gear oil.....ISO VG100~150 --- 0.6 litters (0.16 gallons)

※Brake valve
- Preset pressure.....50 kgf/㎠ (700 psi)









TRAVEL MOTOR UNIT

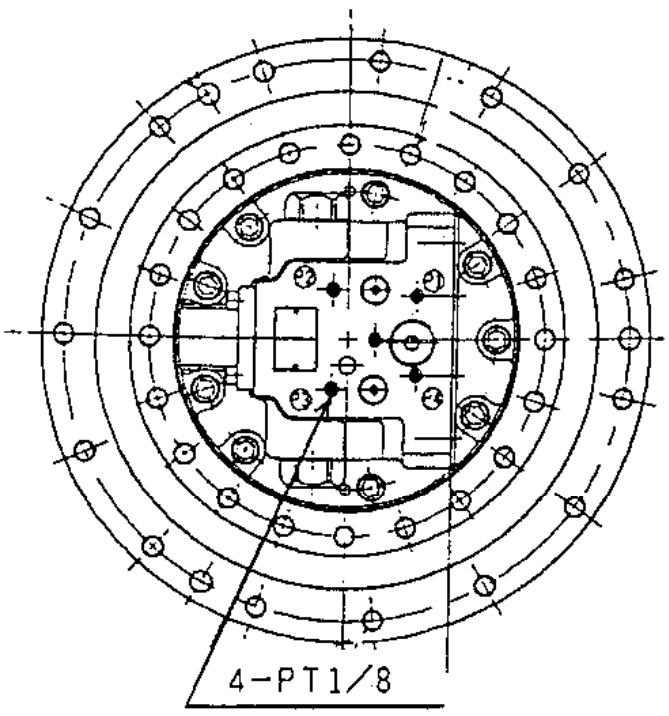
This unit consists of such major components as the hydraulic motor, the reduction gear box, the counterbalance valve and the parking brake as shown in the figure below.

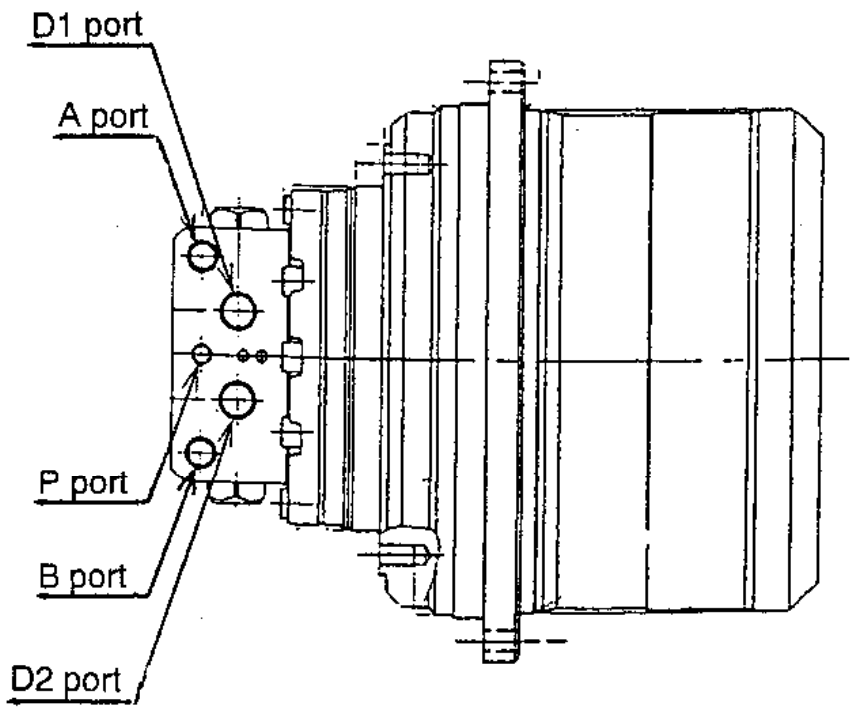
※ Hydraulic motor

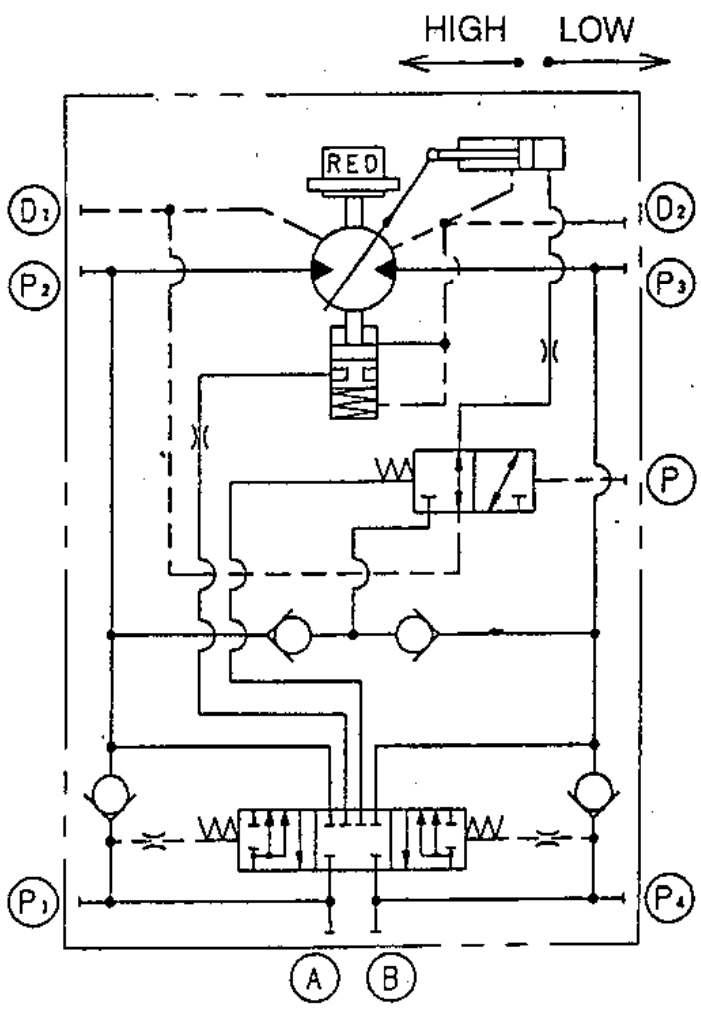
Type.....Plunger type
Rated pressure.....210 kgf/㎠ (3000 psi)
Discharge volume.....104.8/51.1 cc/rev. (6.39/3.12 in^3/rev.)
Speed selection.....2 stages

※ Reduction gear box

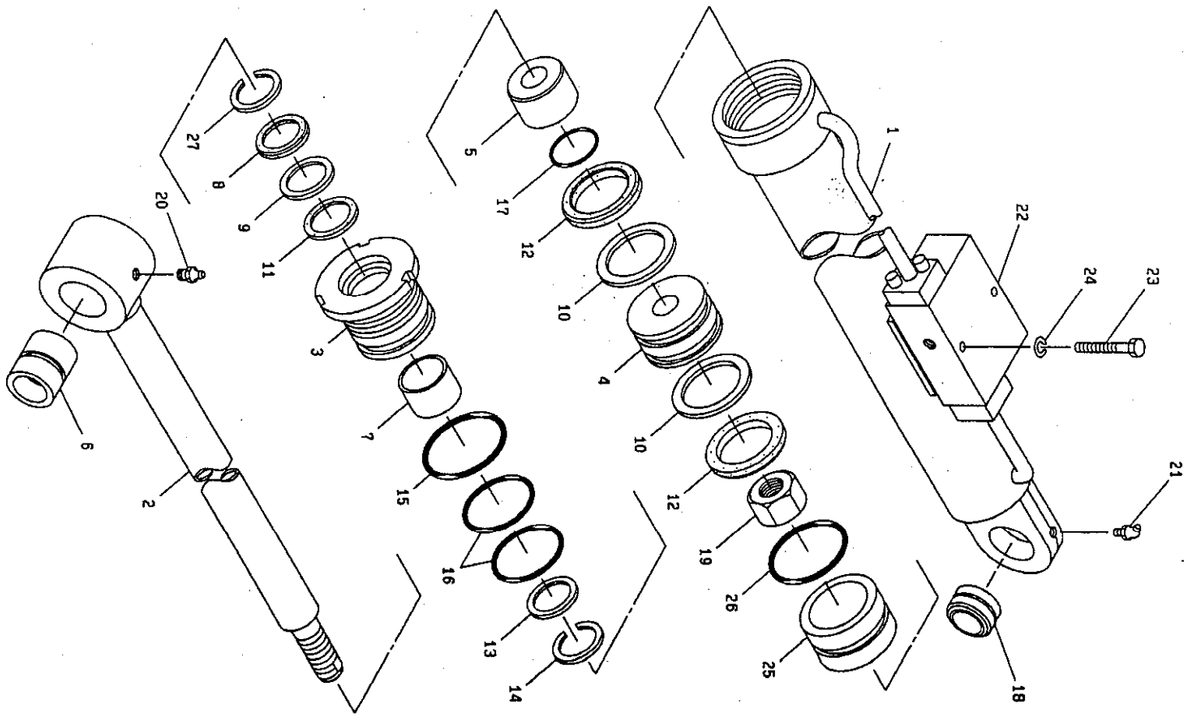
Type.....Planetary gear
Reduction ratio.....74.2
Gear oil.....SAE 90 --- 4.7 litters (1.24 gallons)

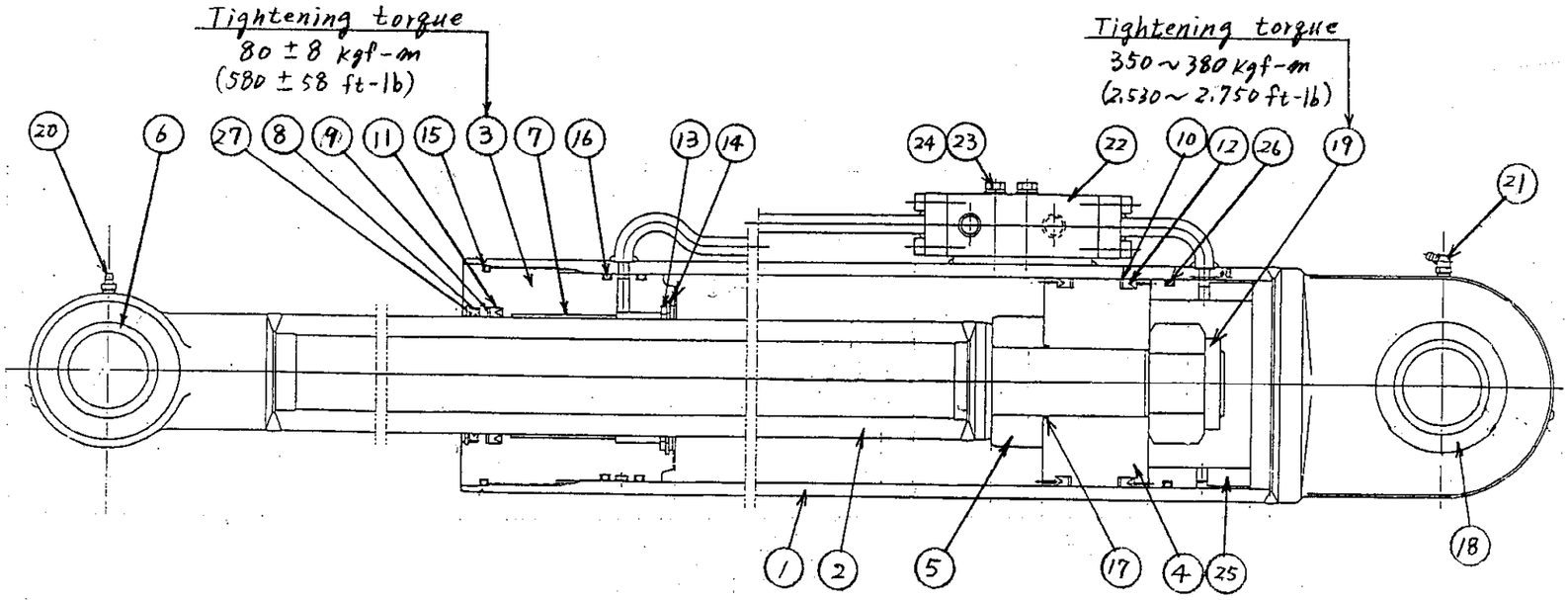






ELEVATION CYLINDER





1	Cylinder tube	10	Back-up ring	19	Self-lock nut
2	Piston rod	11	U ring	20	Grease fitting
3	Cylinder head	12	U ring	21	Grease fitting
4	Piston	13	Cushion ring	22	Single holding valve
5	Cushion collar	14	Snap ring	23	Bolt
6	Bushing	15	O ring	24	Spring washer
7	Bushing	16	O ring	25	Collar
8	Dust seal	17	O ring	26	O ring
9	Back-up ring	18	Spherical bearing	27	Snap ring

SINGLE HOLDING VALVE (for Elevation Cylinder)

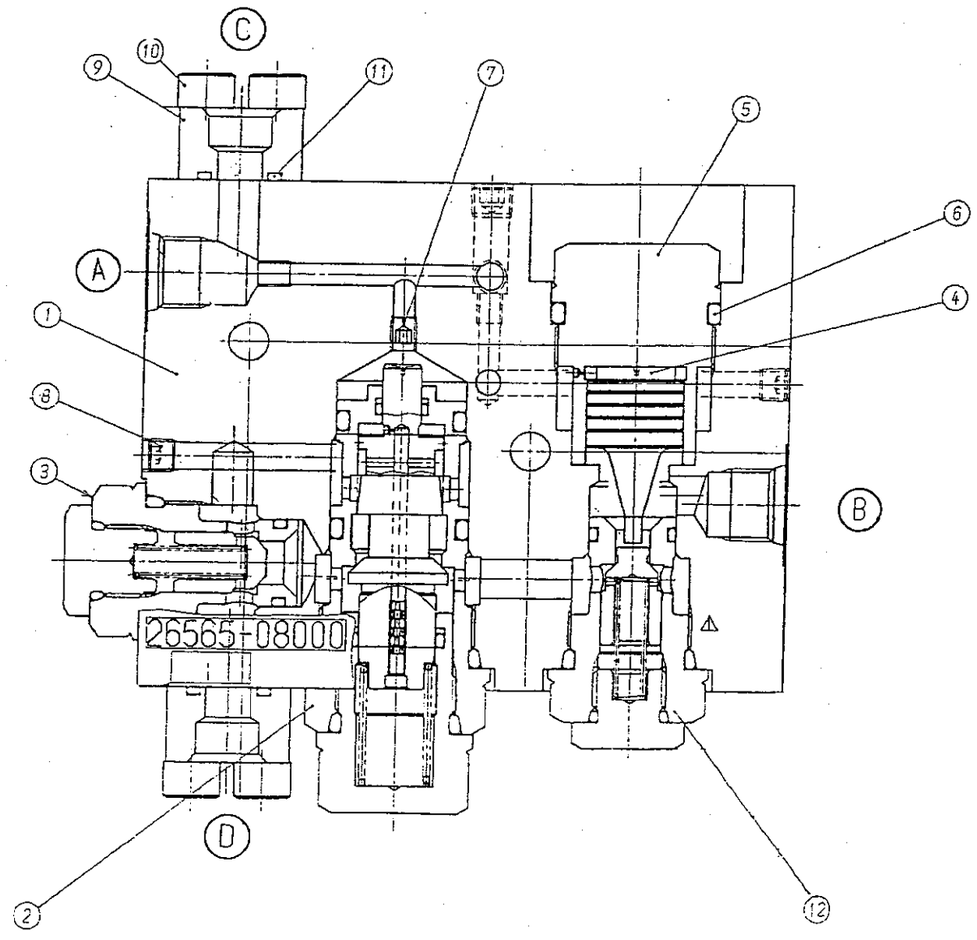
This valve is mounted on the Elevation Cylinder to prevent "Natural descent" of the cylinder caused by the gravity of boom and platform.

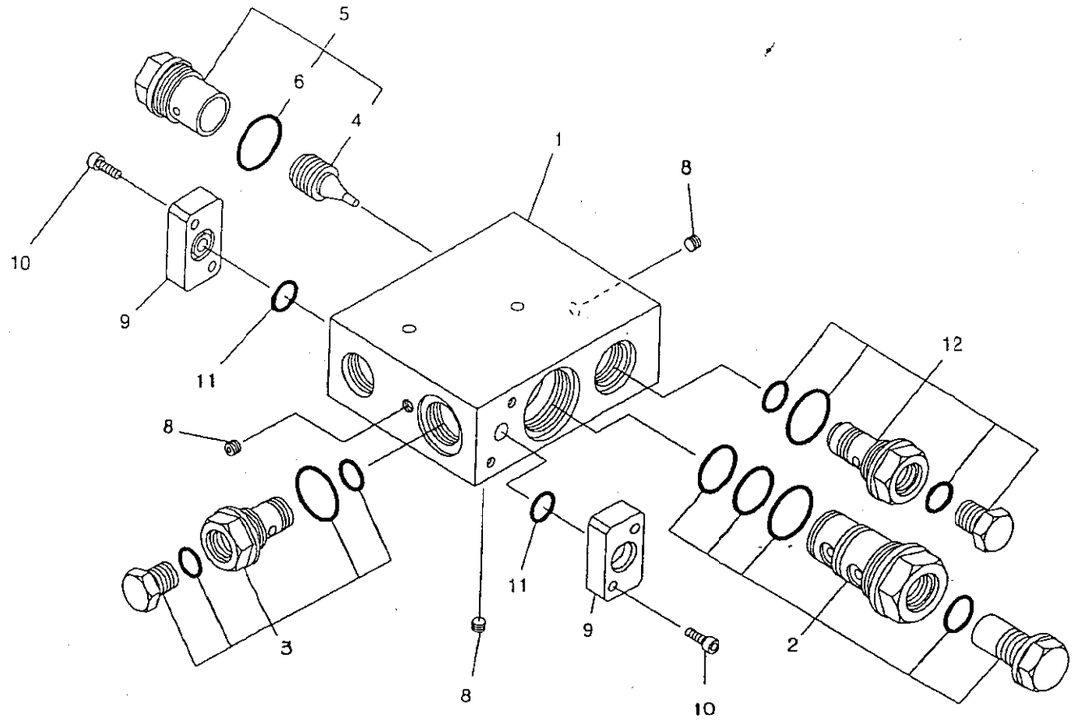
NOTE : "Natural descent of the cylinder" is a phenomenon that the hydraulic cylinder is extended or retracted due to the external force exerted.

Max. allowable pressure : 250 kgf/㎠ (3555 psi)

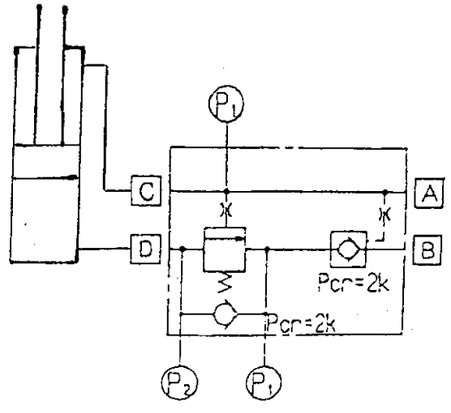
Maximum flow : 60 L / m (15.8 gallon / m)

Check valve cracking pressure : 2 kgf/㎠ (18 psi)





No.	Description	No.	Description
1	Body	7	Orifice
2	Holding valve	8	Plug
3	Check valve	9	Flange
4	Piston	10	Cap screw
5	Piston assembly	11	O-ring
6	O-ring	12	Pilot check valve

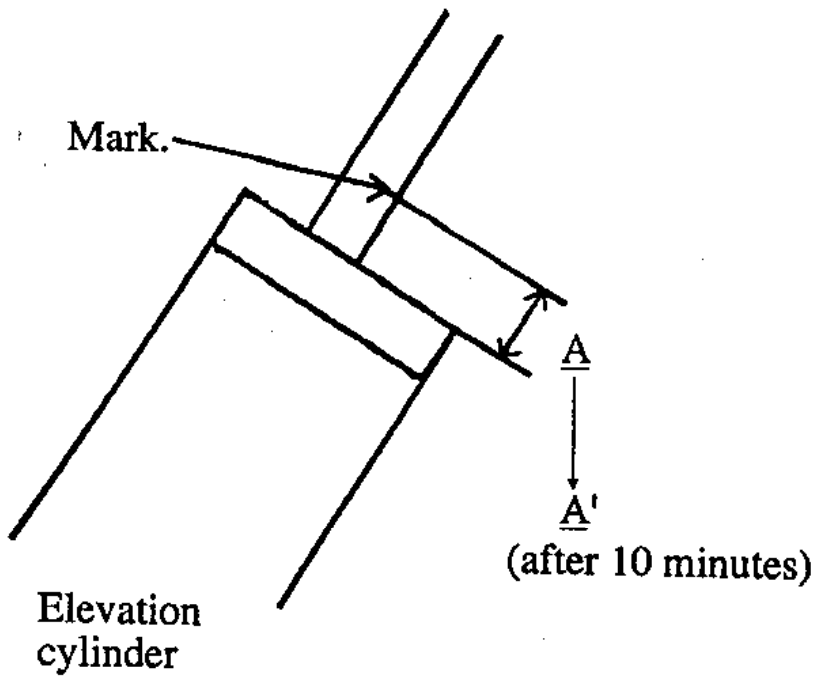


1. Inspection procedures

1. Check the external oil leakage thoroughly.
2. Check the internal oil leakage, using the following steps.
   (Internal oil leakage can be inspected by checking the "Natural descent" of the elevation cylinder.)
   1) Park the machine on an area of firm level ground.
   2) Start the machine, and position the boom, so that the boom angle is set at around 45degrees.
   3) Stop the engine, then put a mark on the piston rod of elevation cylinder as shown in Fig : 2.

Caution : Take care when marking the piston rod so as not to damage it.

Fig:2



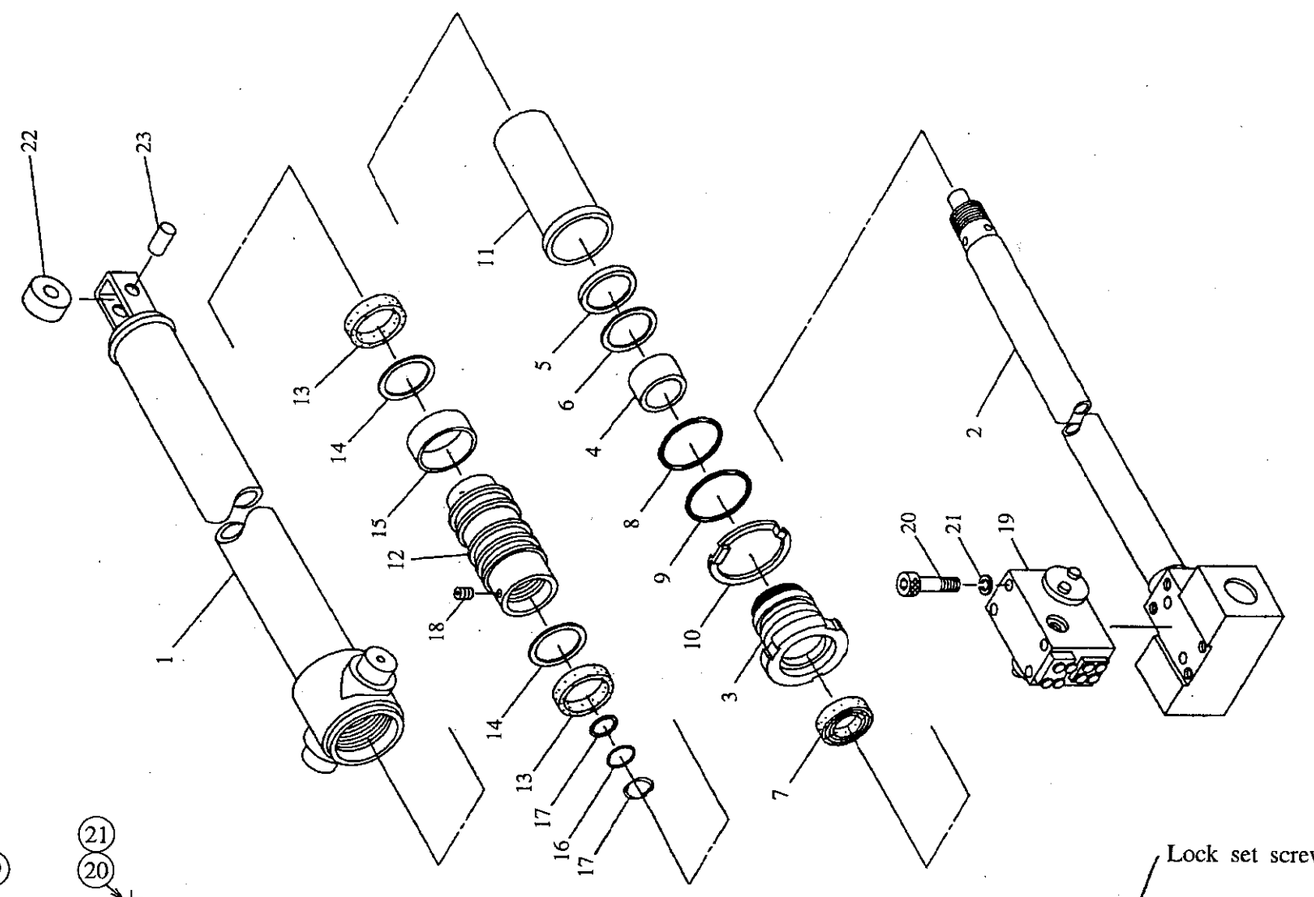
   4) After marking the rod, measure the dimension A (as shown in Fig : 2), then leave it for 10 minutes.
   5) After 10 minutes, measure the dimension A' between the mark made in step 3 and the edge of cylinder tube as shown in Fig : 2.
      A—A'=Natural descent of elevation cylinder.
      Serviceable limit·····2mm/10minutes. (0.08"/10min)
   6) If the "Natural descent" exceeds the limit (2mm/10min), check the single holding valve and the elevation cylinder for internal oil leakage.

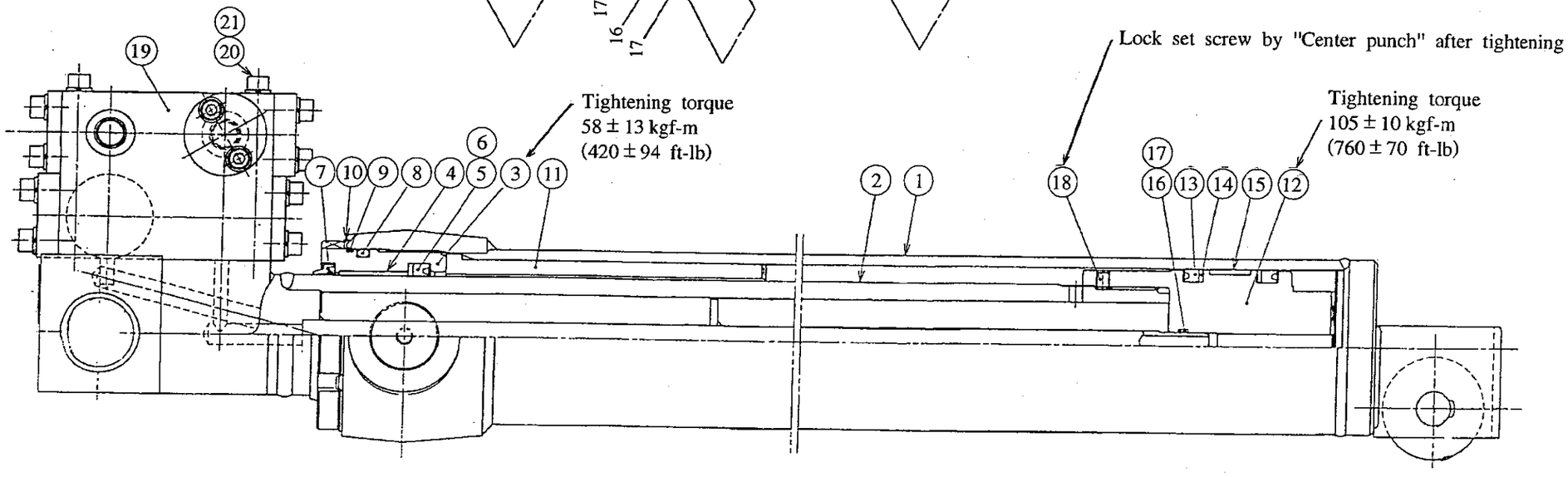
NOTE : To indentify which has internal oil leakage (the single holding valve or the elevation cylinder), reter to the following steps.

1) Under the condition that the elevation cylinder is loaded with the gravities of boom and platform, disconnect the hydraulic hose connected to port—A at the single holding valve.
2) If hydraulic oil drips continuously from port—A of the single holding valve, this indicates internal oil leakage from the single holding valve.
However, if the oil-drips stop after a while, this indicates that elevation cylinder has internal oil leakage.

Caution : Before disconnecting the hydraulic hose, make sure to support the boom using such as crane to prevent the boom from unexpected descent.

EXTENSION CYLINDER



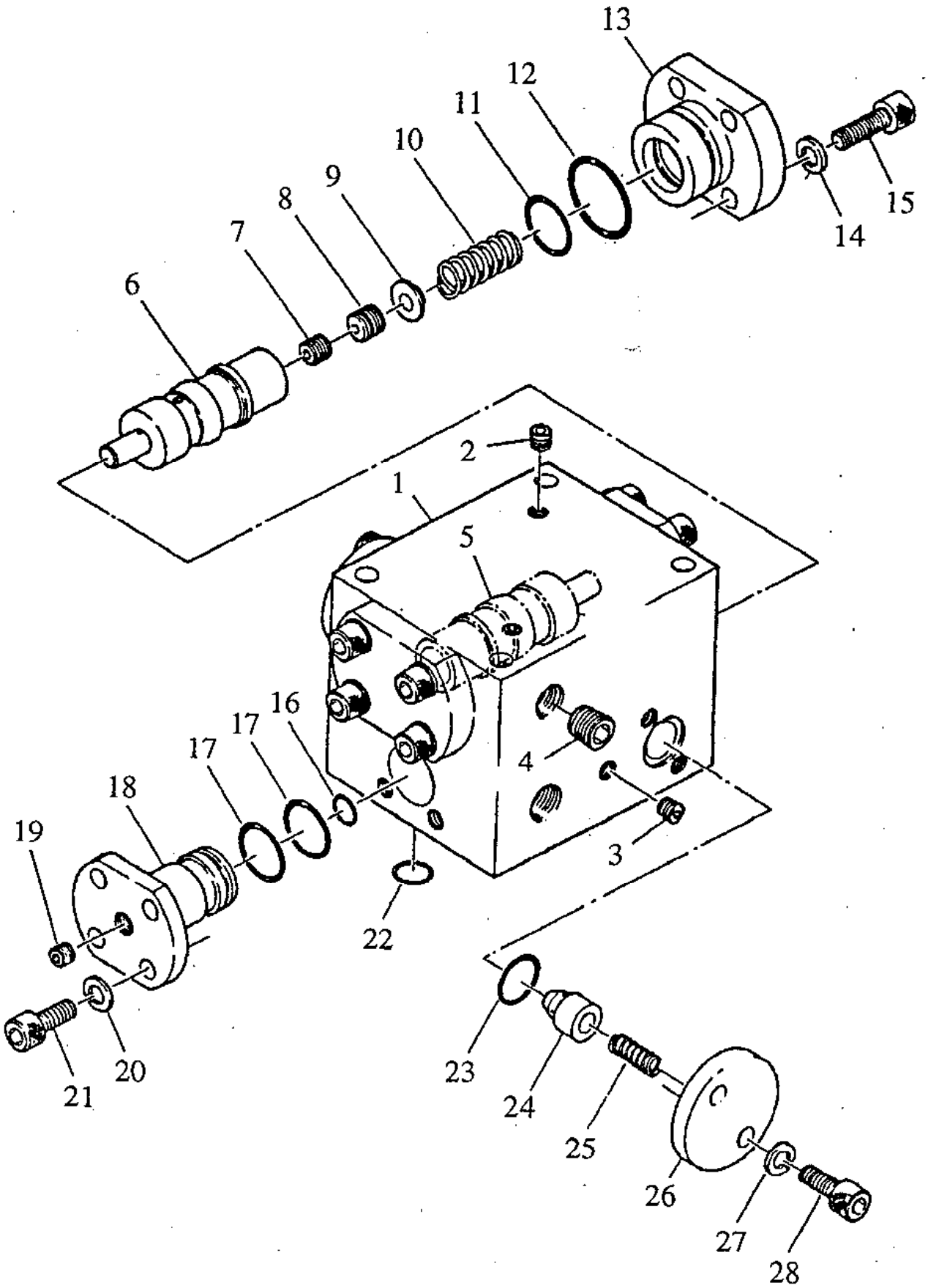


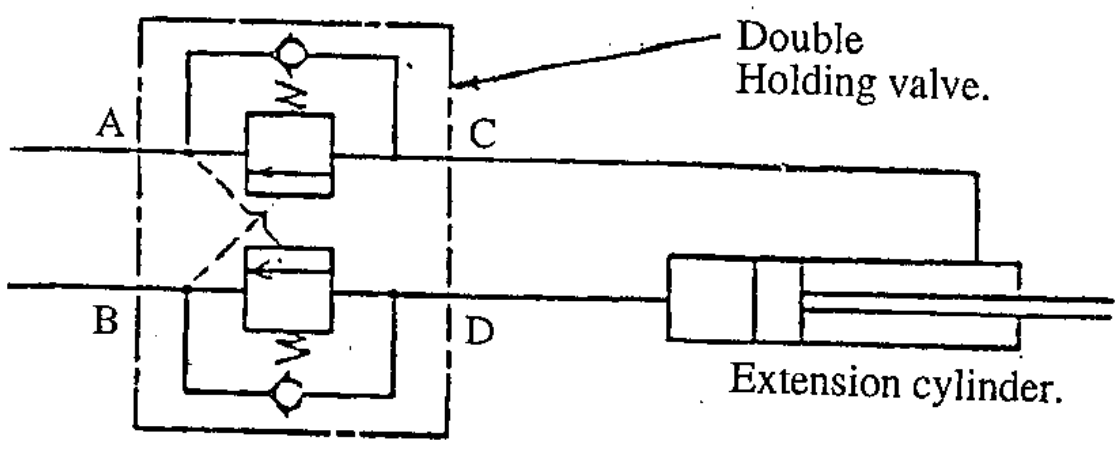
1	Cylinder tube
2	Piston rod
3	Cylinder head
4	Bushing
5	U ring
6	Back-up ring
7	Dust seal
8	O ring
9	O ring
10	Lock plate
11	Spacer
12	Piston
13	U ring
14	Back-up ring
15	Wear ring
16	O ring
17	Back-up ring
18	Set screw
19	Double holding valve
20	Bolt
21	Spring washer

DOUBLE HOLDING VALVE (for Extension Cylinder)

The double holding valve is mounted on the Extension cylinder, since the cylinder tends to extend or retract due to the gravities of boom and platform.

Fig:1

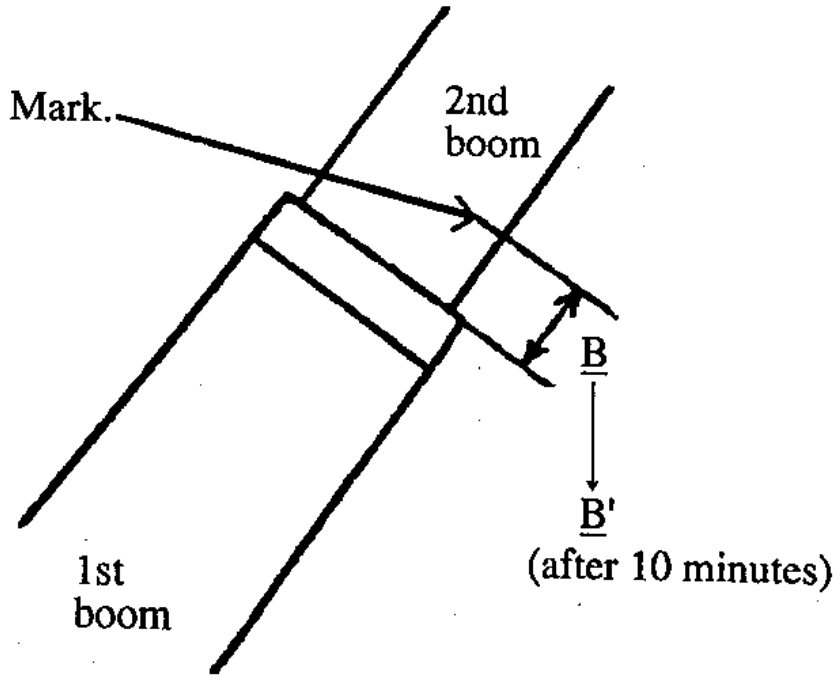




1. Inspection procedures

1. Check the external oil leakage thoroughly.
2. Check the internal oil leakage, using the following steps.
   (Internal oil leakage is inspected by checking the "Natural descent" of the Extension cylinder.)
   1) Park the machine on an area of firm level ground.
   2) Extend the boom by about 1 meter, and raise it fully.
   3) Stop the engine, and put a mark on the 2nd boom as shown in fig : 2 below.

Fig:2



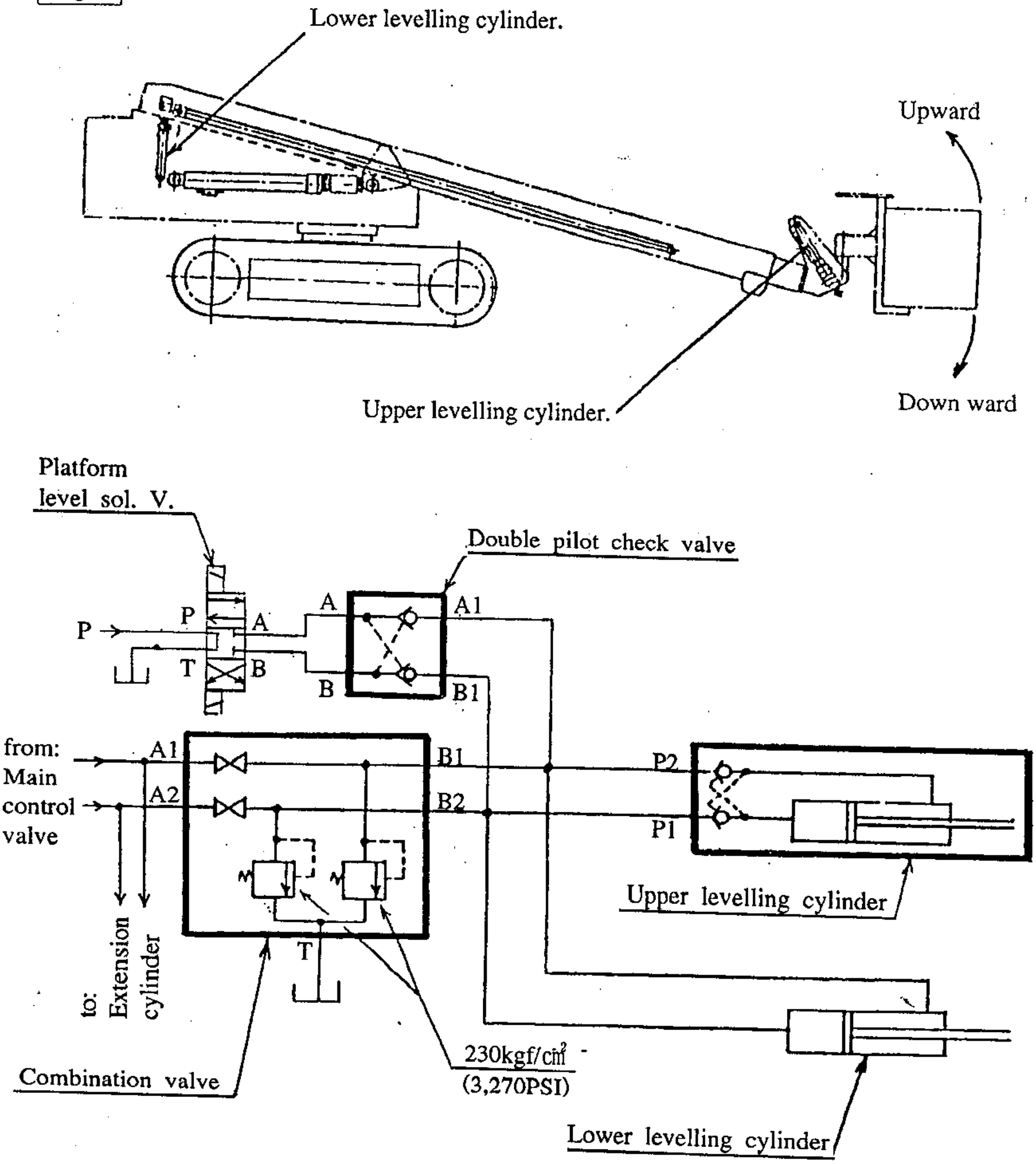
   4) Measure the Dimension B as shown in Fig : 2 above.
      then, leave it for 10 minutes.
   5) After 10 minutes, measure the Dimension B' as shown in Fig : 2.
      * B—B'=Natural descent of extension cylinder.
      * Serviceable limit·····2mm/10min. (0.08"/10min)
   6) If the "Natural descent" exceeds the Serviceable limit, further check the internal oil leakage of the Double holding valve or Extension cylinder by refering to the clause of SINGLE HOLDING VALVE. (for Elevation cylinder)

PLATFORM LEVELING SYSTEM

The system maintains the platform at its level position automatically, regardless of boom's vertical movements.

It consists of Upper, and lower levelling cylinders, Double pilot check valve, Platform level solenoid valve, and Combination valve as shown in the figure below.

Fig:1



1. Note on function

Two levelling cylinders are in place, as shown in Fig : 1.
When the boom is lowered, the Lower levelling cylinder is retracted and the hydraulic oil in the bottom room of the cylinder flows into the bottom room of Upper levelling cylinder.
The sizes of the both levelling cylinders are exactly same.
Therefore, the Upper levelling cylinder extends simultaneously with the retraction of the Lower levelling cylinder.
Thus, the platform is balanced by the "Levelling cylinders" to maintain its level, as the boom is lowered.
When the boom is raised, the levelling cylinders work in an exactly opposite fashion to that described above.

2. Inspection procedures

1. Tilt of platform.
   Perform elevation and extension operations several times, and check that the platform always stays level.
   If the platform does not stay level, check the levelling system as follows.
   1) Thoroughly check the system for external oil leakage.
   2) Bleed air from the platform levelling system. (refer to the "Air bleeding procedures" on the next page.)
   3) Check the internal oil leakage of the "Combination valve".
      Make sure the two stop valves on the combination valve are closed firmly.
   4) Check the internal oil leakage of the "Double pilot check valve".
   5) Check the internal oil leakage of the "Upper and Lower levelling cylinders."

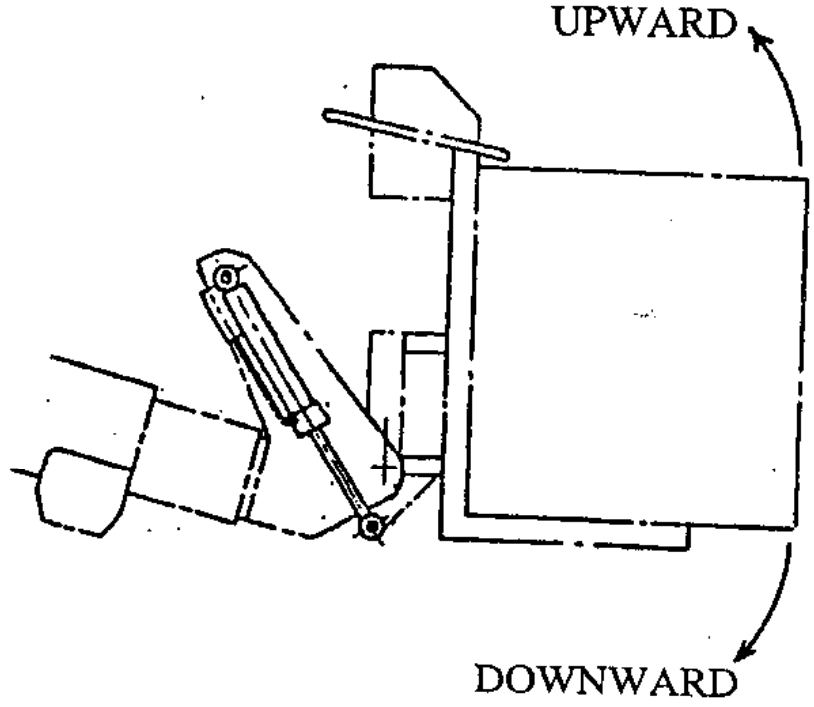
2. Natural descent.
   Load the platform with its maximum load (200kg), then visually check for any sign of the platform tilting downward. (440lbs)
   If the platform descends naturally, thoroughly check the levelling system for external oil leakage, Then check for internal oil leakage in the components listed below.
   - Double pilot check valve.
   - Combination valve.
   - Upper and lower levelling cylinders.

3. Adjustment of platform level

CAUTION:

* Do not attempt the following procedures, when the platform is loaded.
* Operated the machine at the "Lower control", when carrying out the adjustment.

Fig:3



1. If the platform is tilted downward.
   1) Retract boom fully, and set it horizontally.
   2) Open the two "Stop valves" located at "Lower control".
   3) Operate the "Extension switch" to "IN", and move the platform upward.
   4) When the platform gets its level, return the control switch to its neutral, and close the "Stop valves" firmly.
   5) Operate the machine thoroughly at the "Lower control", and make certain that the platform always stays level.
2. If the platform is tilted upward.
   1) Retract boom fully, and set it horizontally.
   2) Open the two "Stop valves" located at "Lower control".
   3) Operate the "Extension switch" to "OUT", and move the platform downward.
   4) When the platform gets its level, return the control switch to its neutral, and close the "Stop valves" firmly.
   5) Operate the machine thoroughly at the "Lower control", and make certain that the platform always stays level.

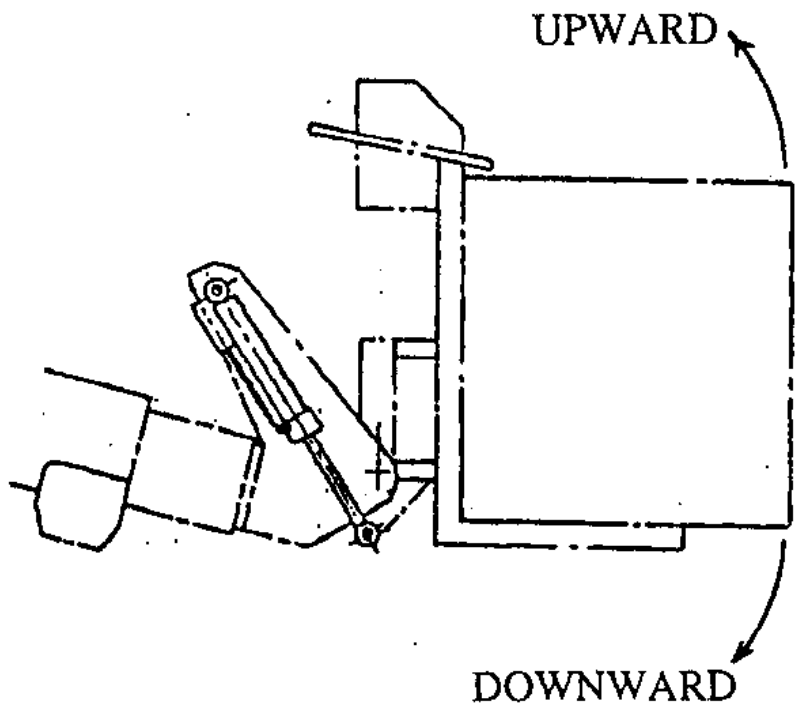
4. Air bleeding procedures

Caution:

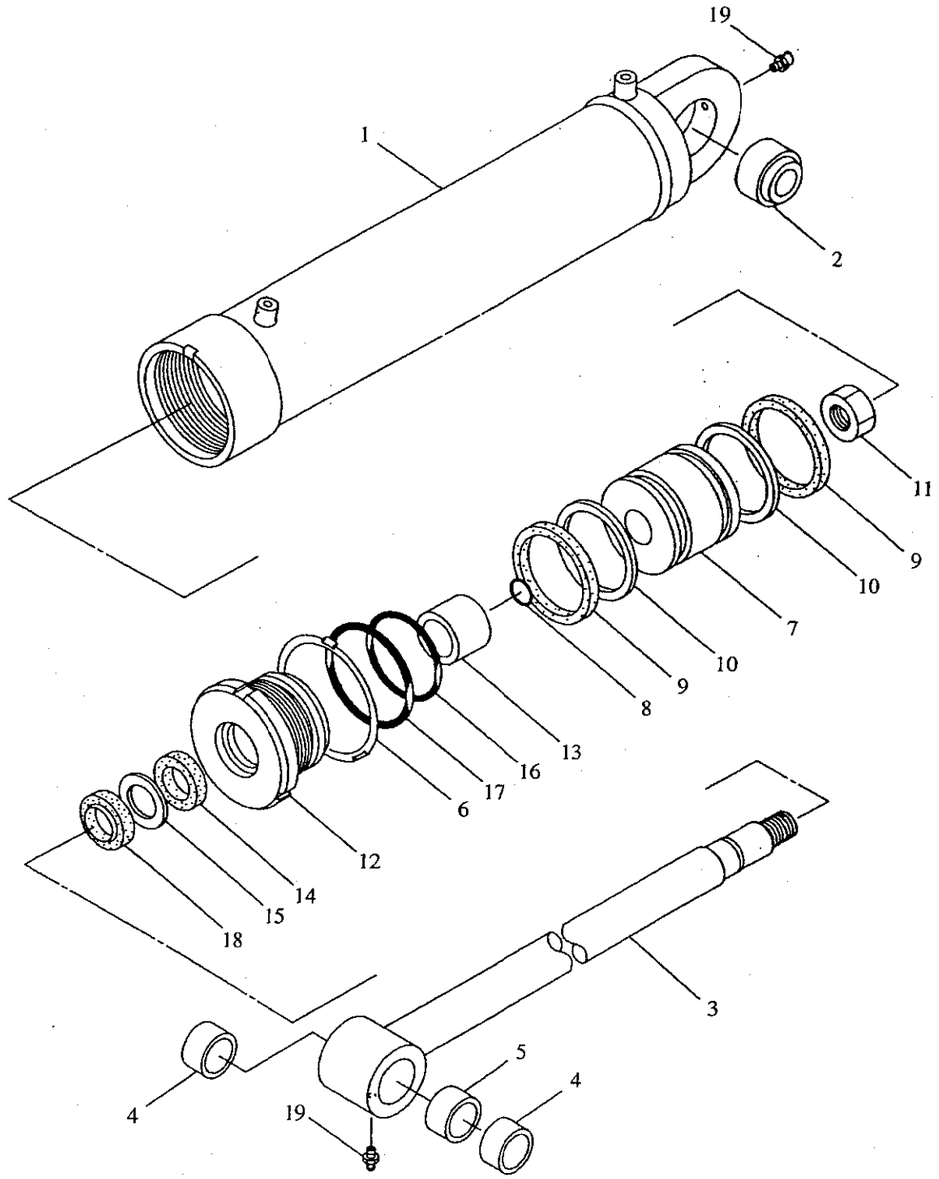
* When bleeding air, always operate the machine from the lower control panel.
* Always unload the platform completely, before carrying out these procedures.

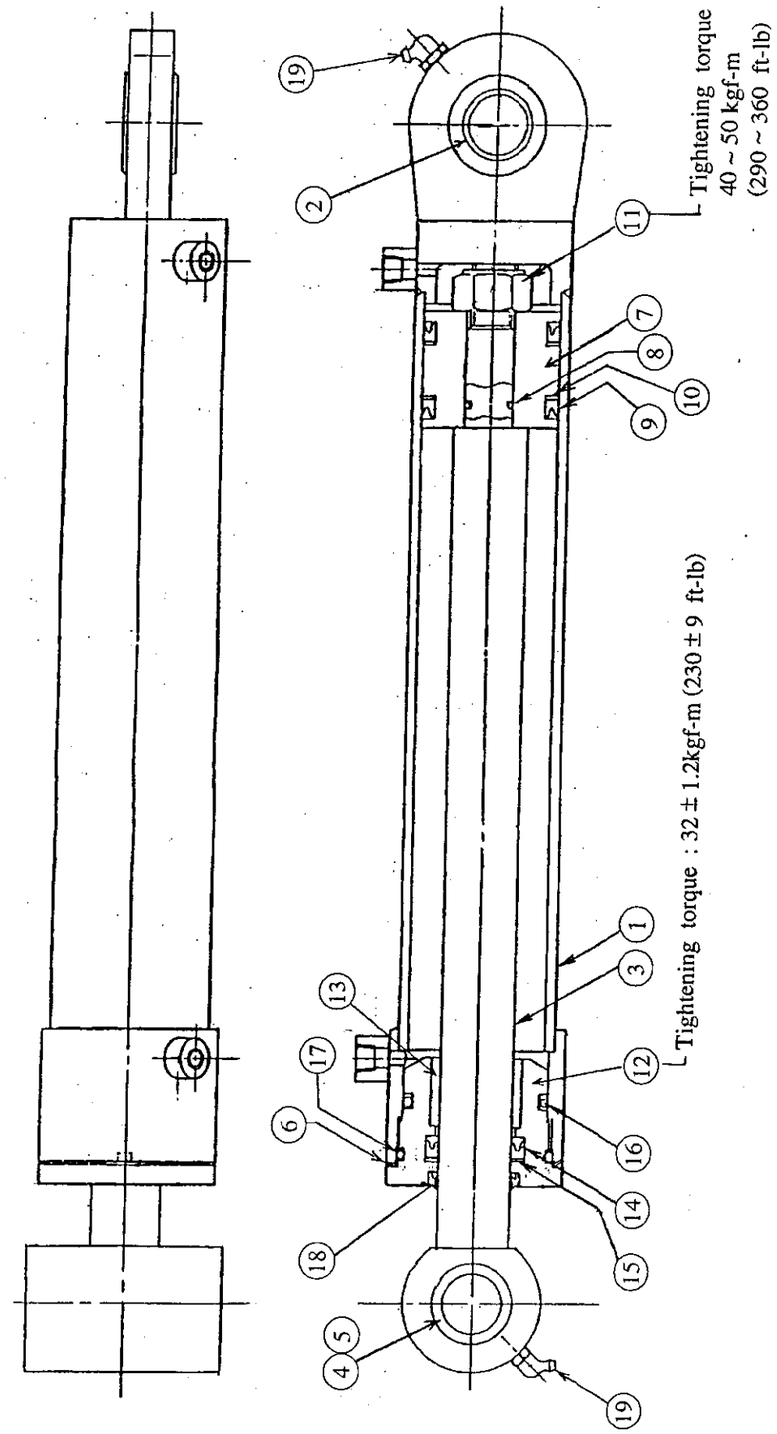
1. Retract the boom fully and position it horizontally.
2. Fully open the two stop valves installed on the combination valve.
3. Switch the "Extension switch" to "IN" and tilt the platform fully upward.
4. Now switch the "Extension switch" to "OUT" and tilt the platform fully downward.
5. Perform the above steps 3 and 4 several times (3～4times).
6. Return the platform to its level position, and firmly close the two stop valves.

Fig:3



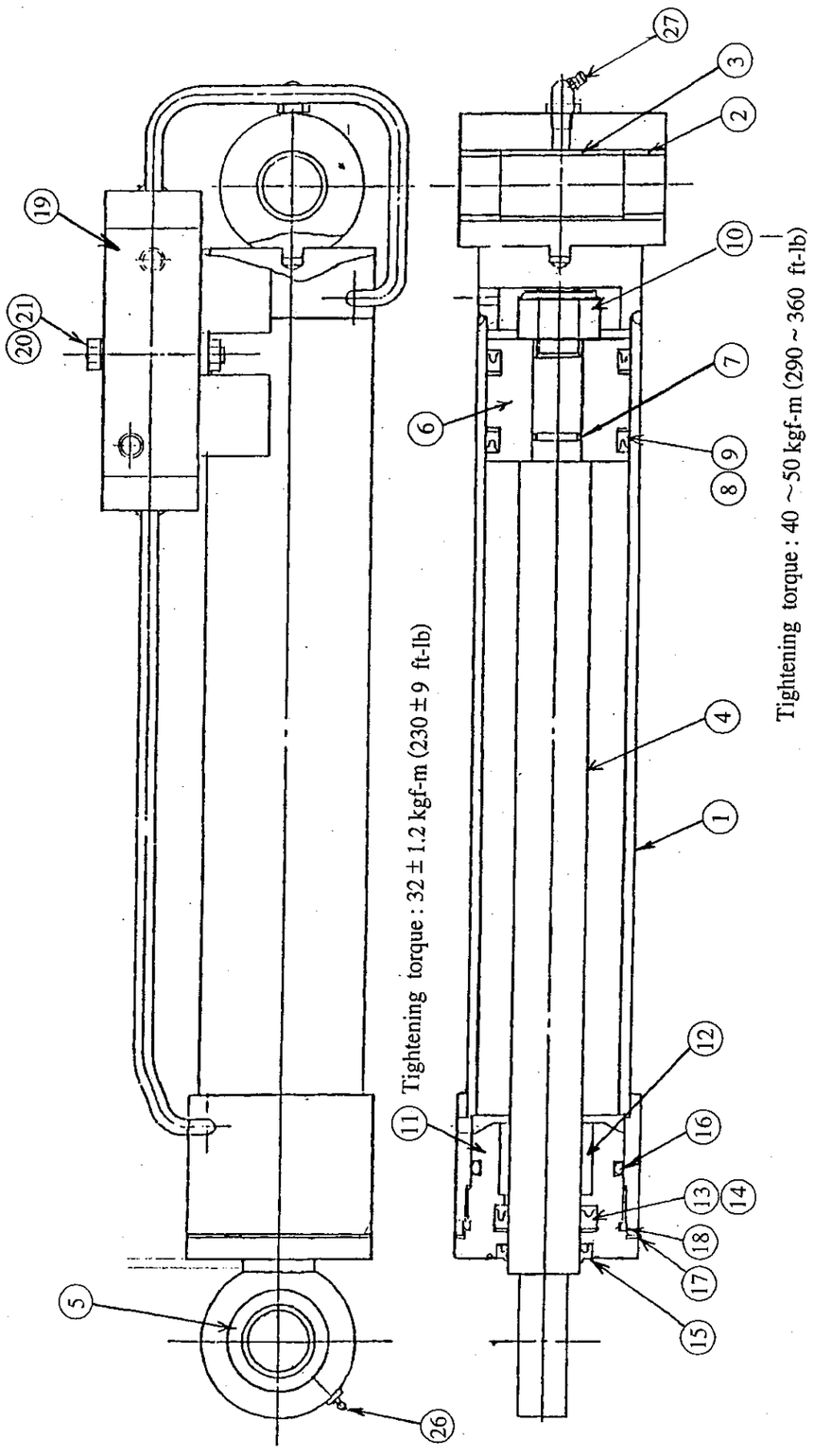
LOWER LEVELING CYLINDER

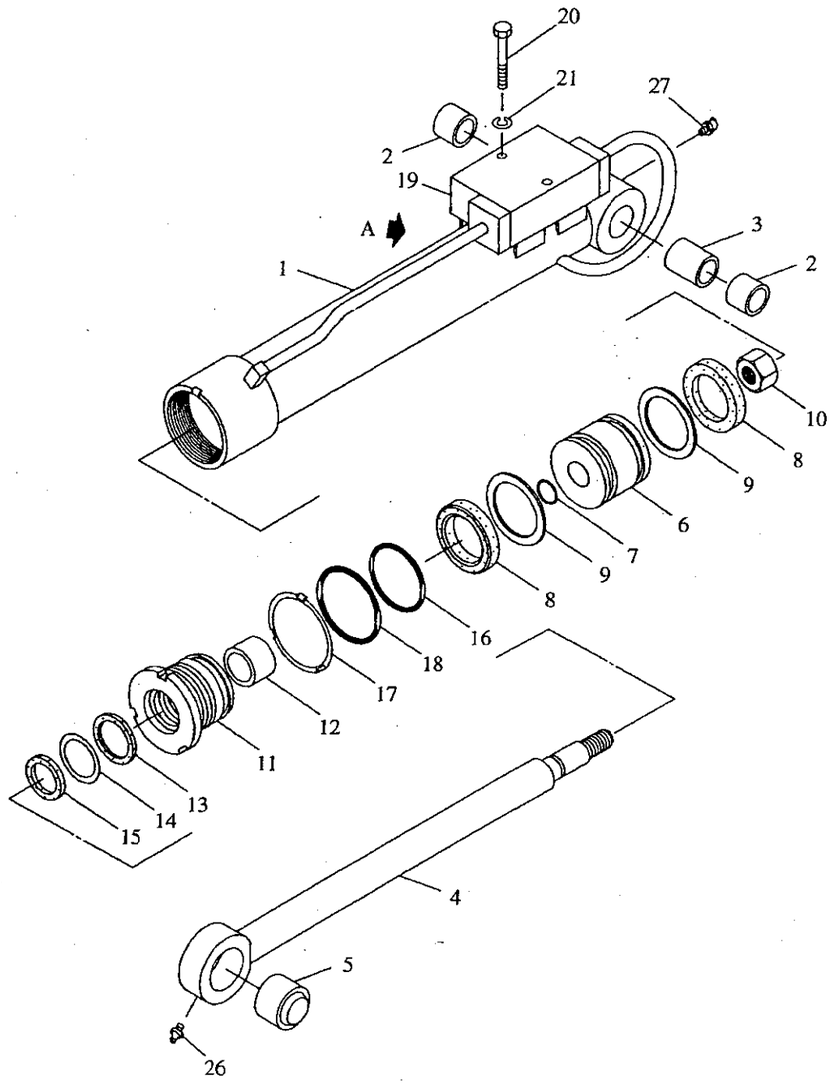




1	Cylinder tube	8	O ring	15	Back-up ring
2	Bushing	9	U ring	16	O ring
3	Piston rod	10	Back-up ring	17	O ring
4	Bushing	11	Self-lock nut	18	Dust seal
5	Bushing	12	Cylinder head	19	Grease fitting
6	Lock plate	13	Bushing	—	———
7	Piston	14	U ring	—	———

UPPER LEVELING CYLINDER

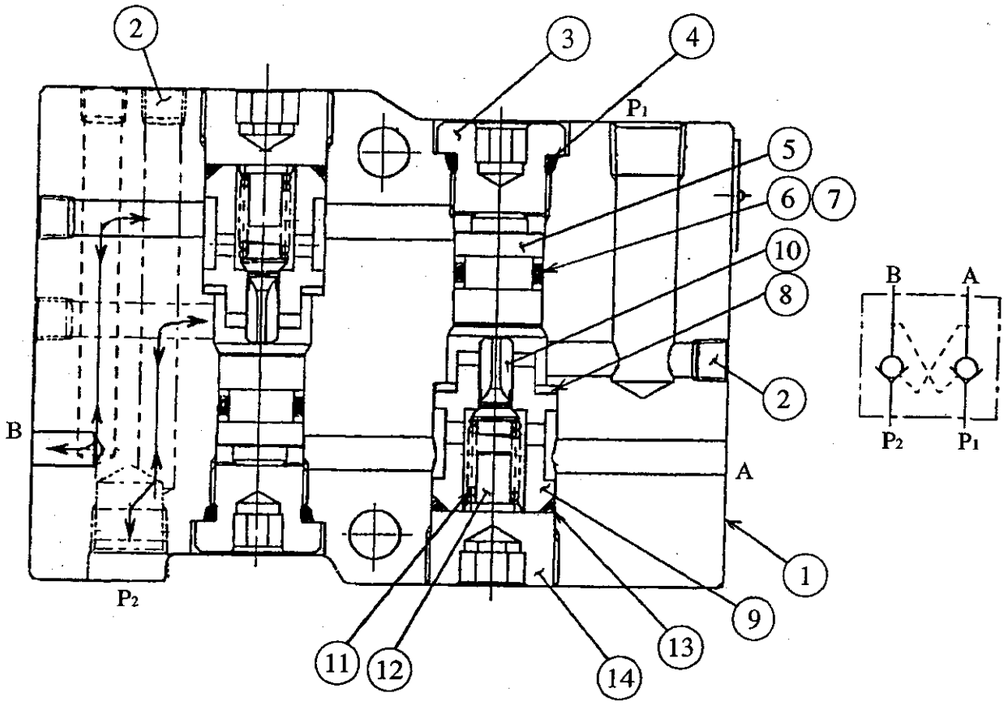




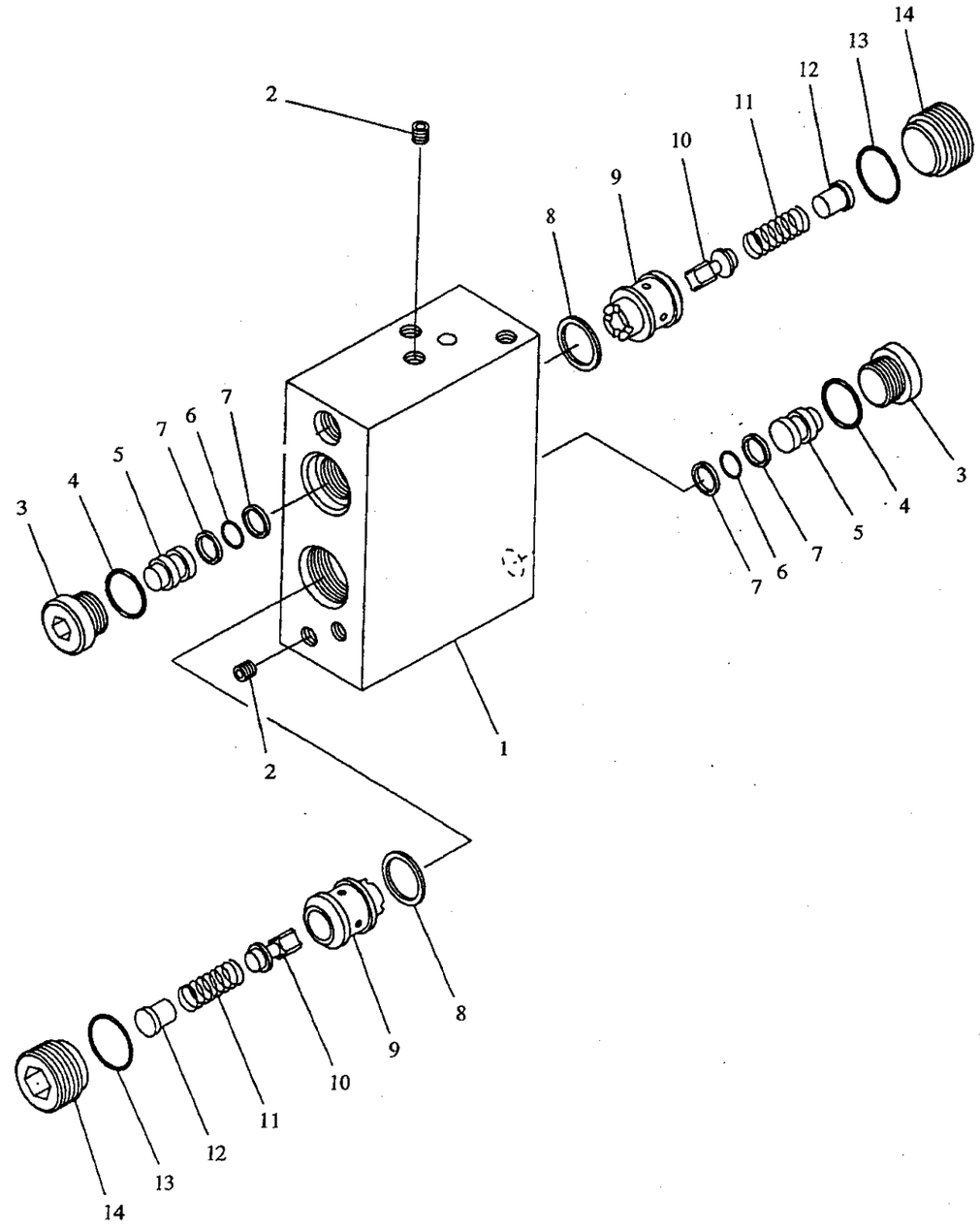
1	Cylinder tube	8	U ring	15	Dust seal		
2	Bushing	9	Back-up ring	16	O ring		
3	Collar	10	Self-lock nut	17	Lock plate		
4	Piston rod	11	Cylinder head	18	O ring		
5	Bushing	12	Bushing	19	Double pilot check valve		
6	Piston	13	U ring	20	Bolt		
7	O ring	14	Back-up ring	21	Spring washer		

DOUBLE PILOT CHECK VALVE (for Upper Leveling Cylinder)

This valve is mounted on the Upper levelling cylinder.
It confines the hydraulic oil into the Upper levelling cylinder to keep the platform level in an emergency situation such as hydraulic line failure.

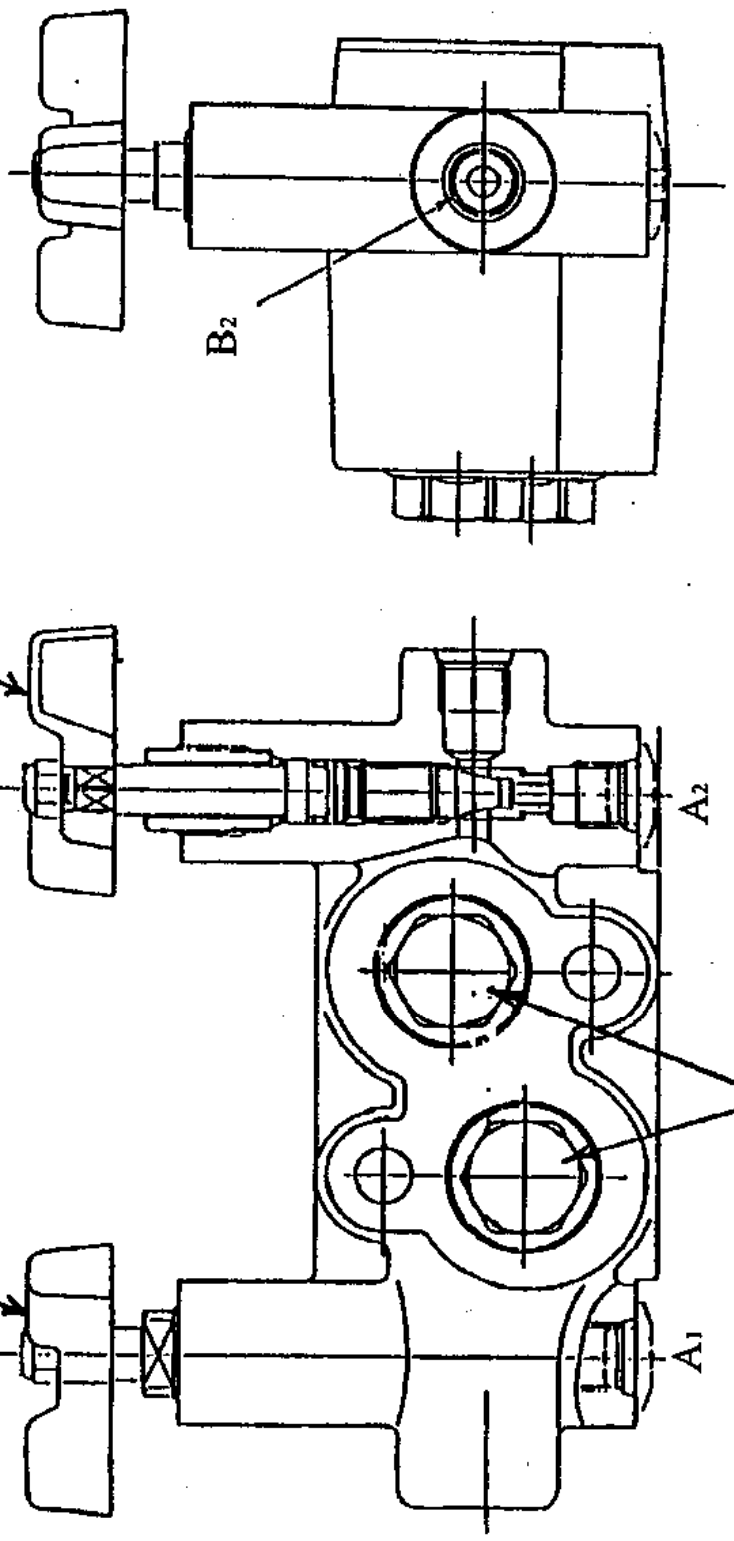


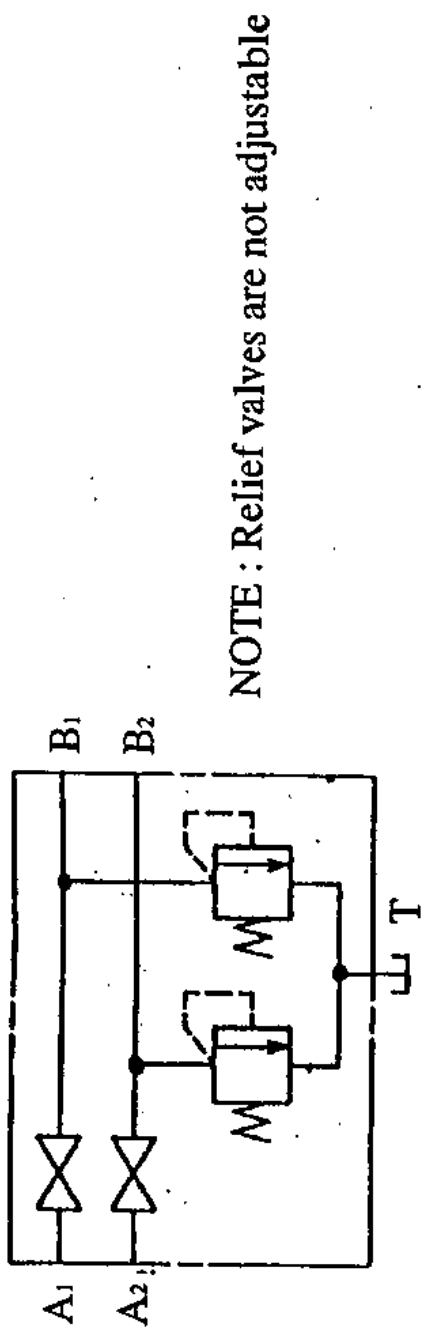
1	Valve housing	6	O ring	11	Spring
2	Plug	7	Back - up ring	12	Spring guide
3	Plug	8	Gasket	13	O ring
4	O ring	9	Valve seat	14	Plug
5	Piston	10	Check valve	15	Plug



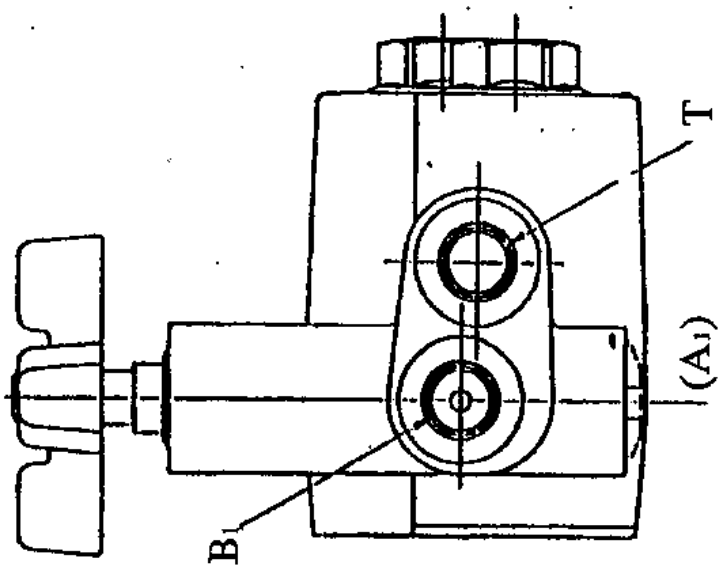
COMBINATION VALVE (for Platform Leveling system)

This valve consists of two Stop valves used for adjusting platform level, and two Relief valves which release excessively high pressure built up in the hydraulic circuit of the levelling system.



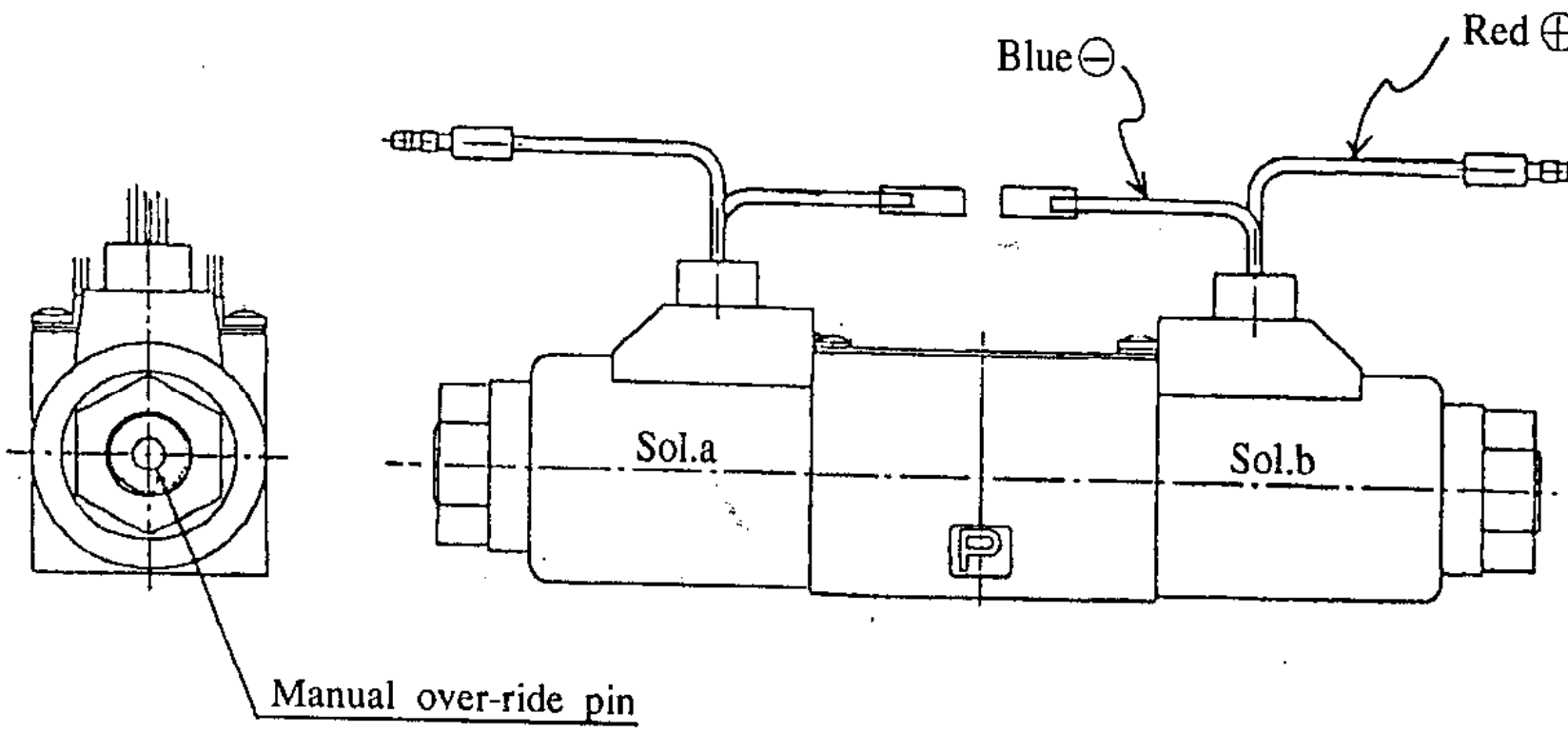


NOTE : Relief valves are not adjustable

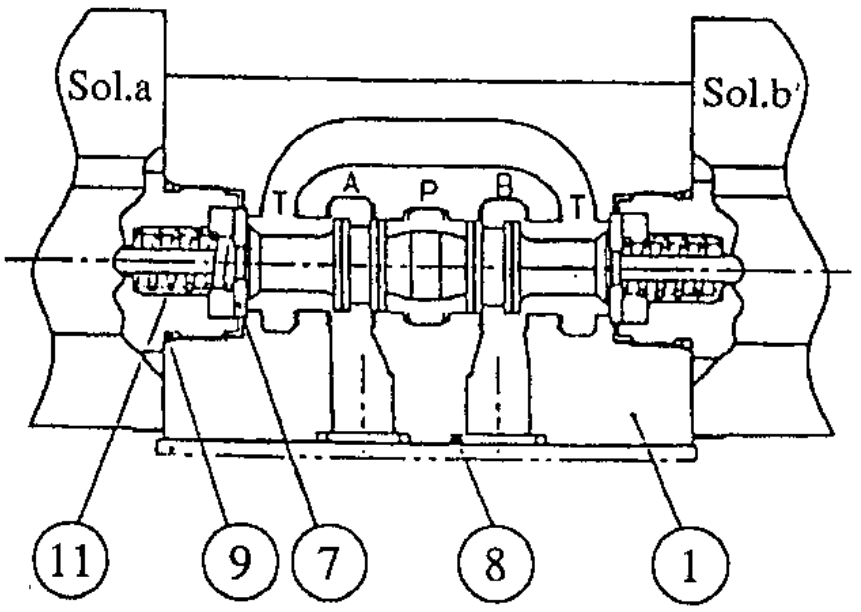


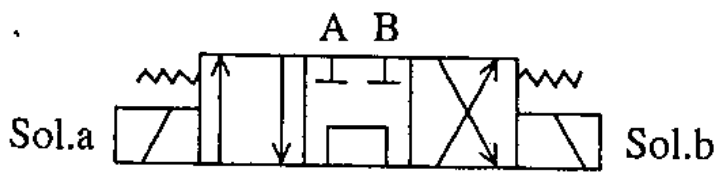
PLATFORM LEVEL SOLENOID VALVE

This valve is operated by the platform level switch to adjust the level of the platform.



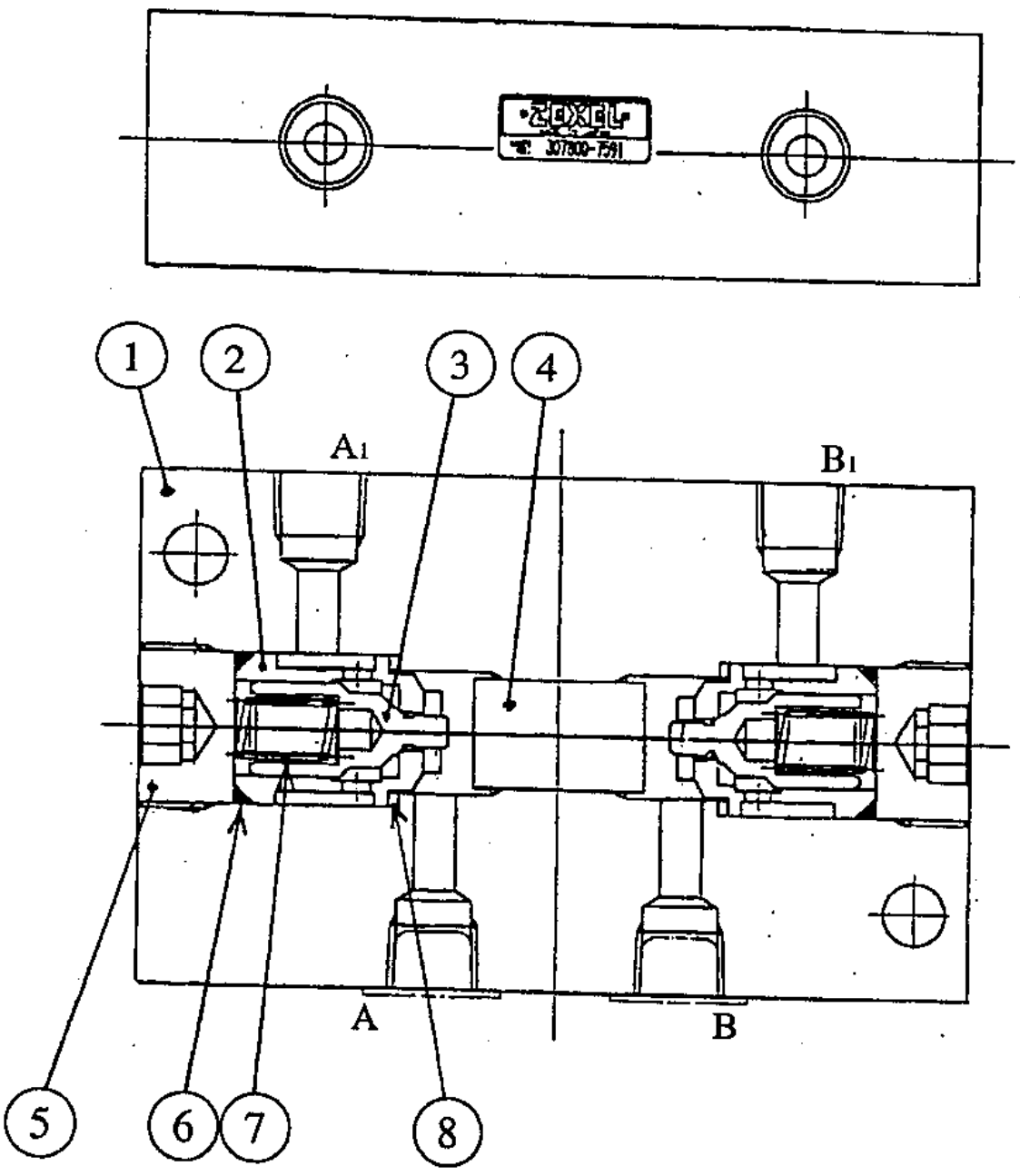
①	Body
⑦	Spring seat
⑧	O−ring
⑨	O−ring
⑪	Spring

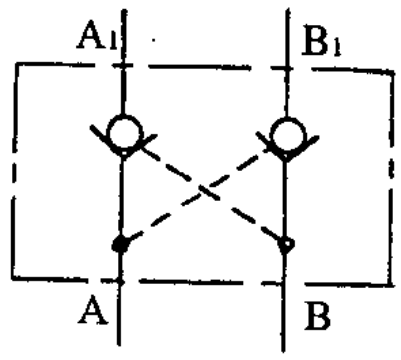


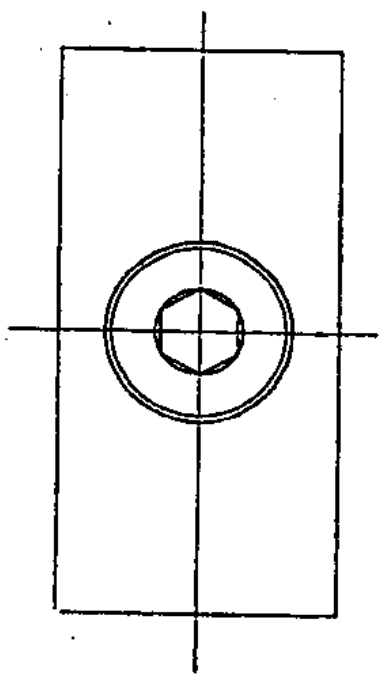


DOUBLE PILOT CHECK VALVE (for Platform Leveling System)

This valve confines the hydraulic oil to the platform levelling system to maintain the level of platform.



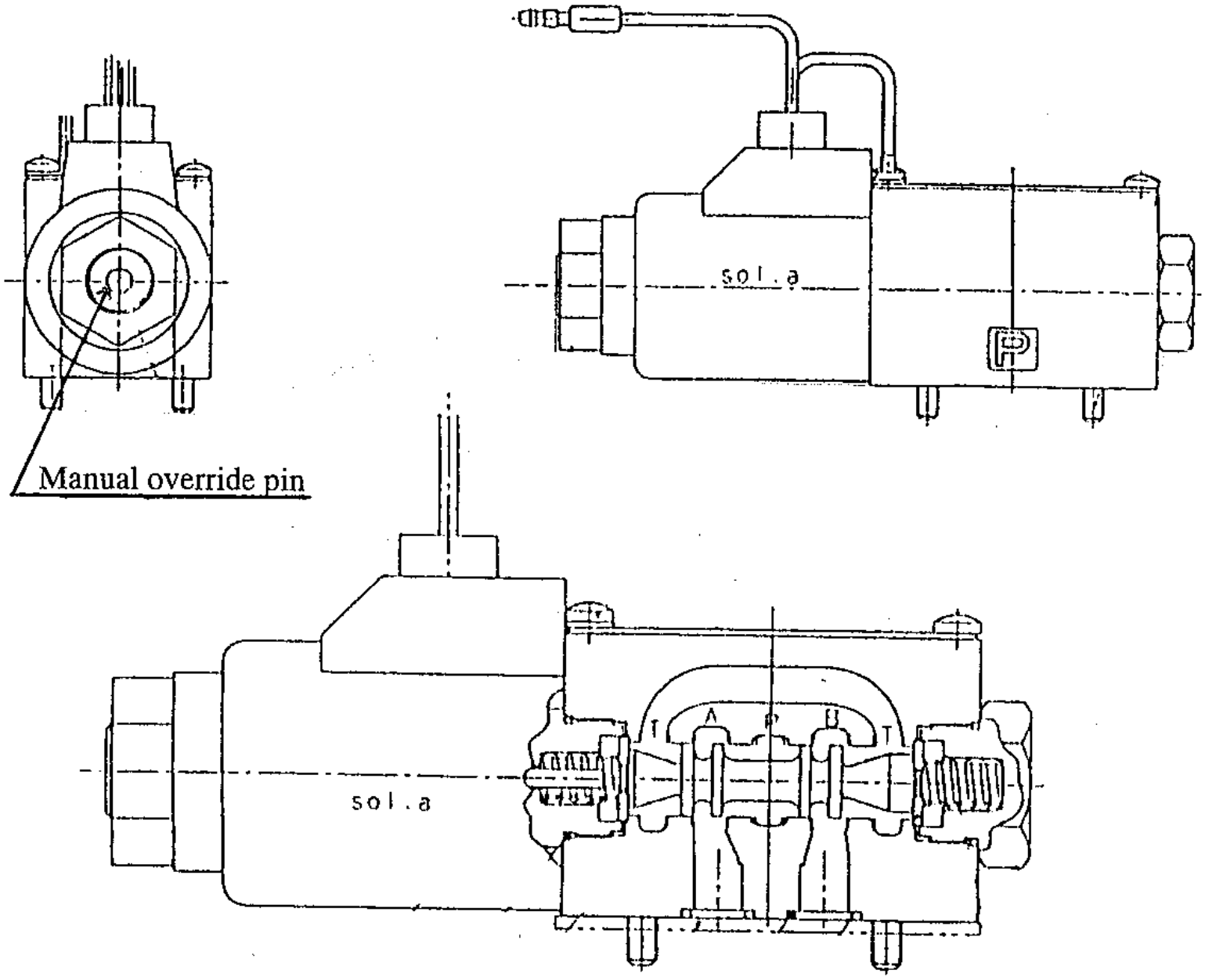


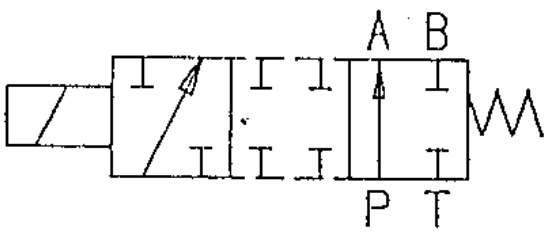


1	Valve housing
2	Valve seat
3	Check valve
4	Piston
5	Plug
6	O ring
7	Spring
8	Gasket

TRAVEL SPEED SELECTOR VALVE

This valve is operated by solenoid, and is controlled electrically by the accelerator switch located at the upper control box.
When the switch is positioned to "High", this valve is switched over and hydraulic pressures are led to the travel motor to make it travel at "High speed".



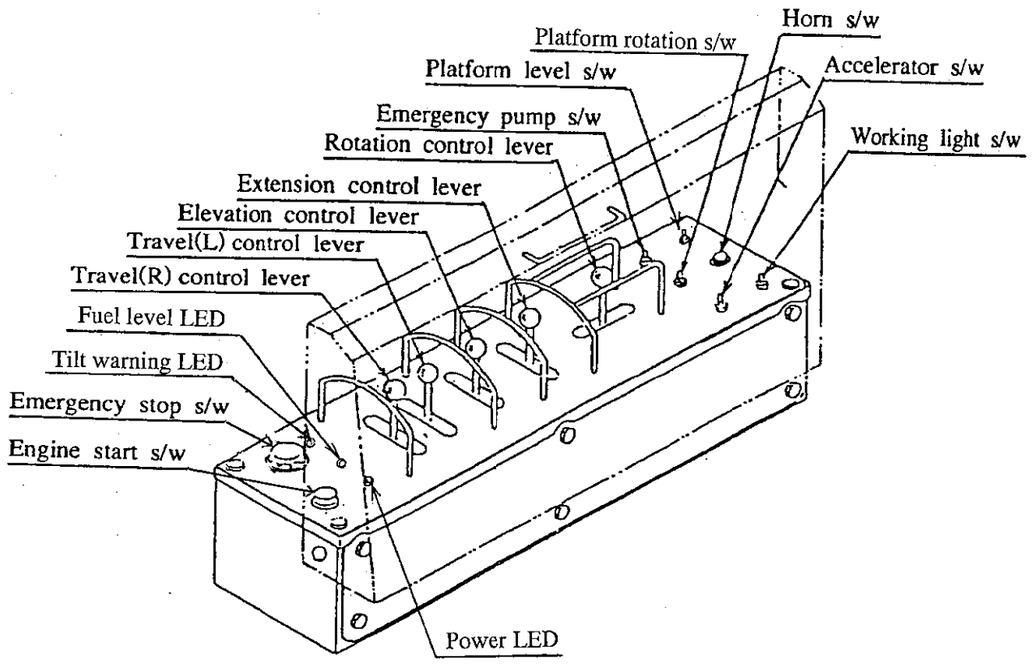


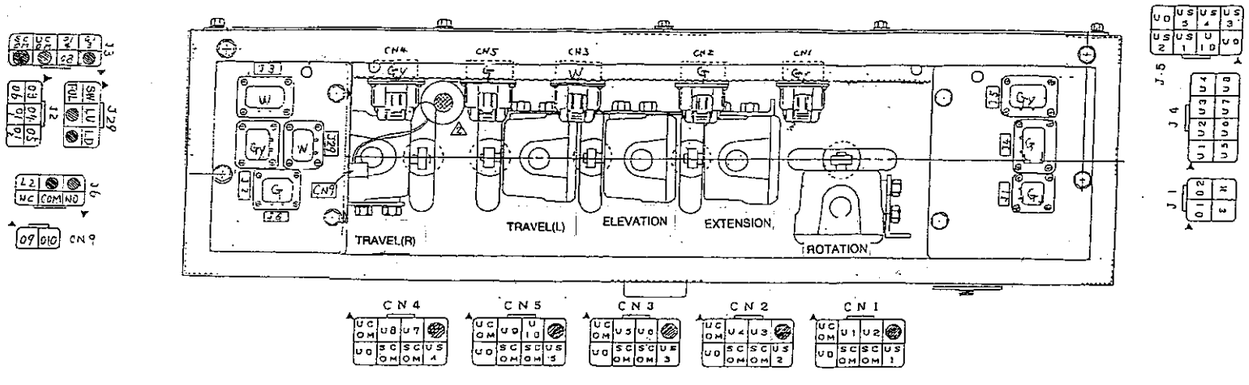
WITH CROSSOVER POSITION

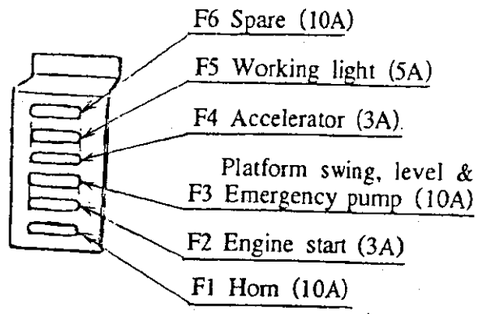
4

ELECTRIC SECTION

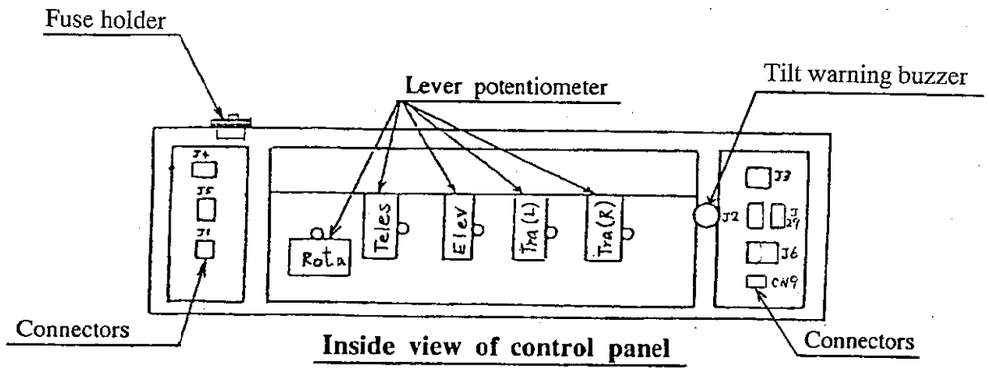
UPPER CONTROL BOX



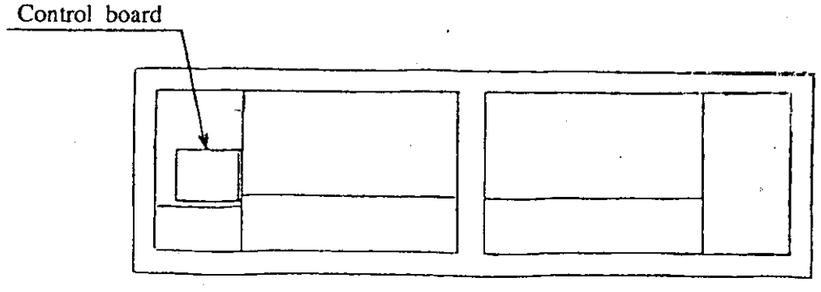




Fuse Holder Detail

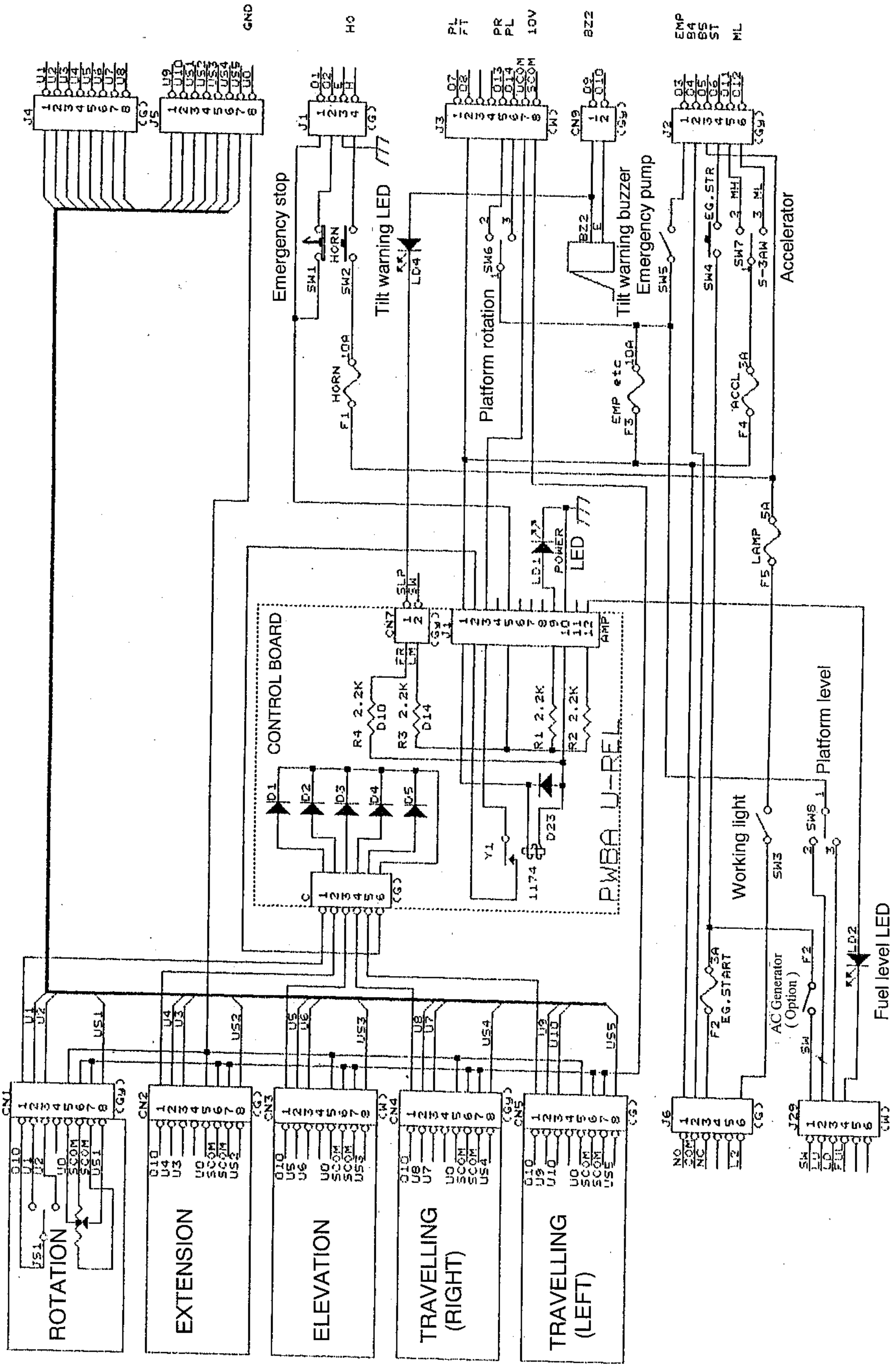


Inside view of control panel



Inside view of back panel

1. Electric circuit

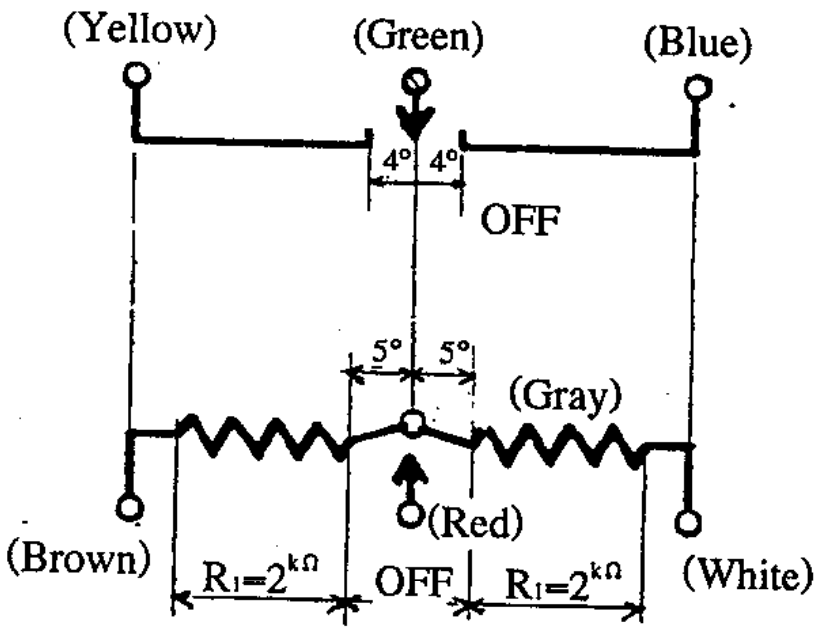


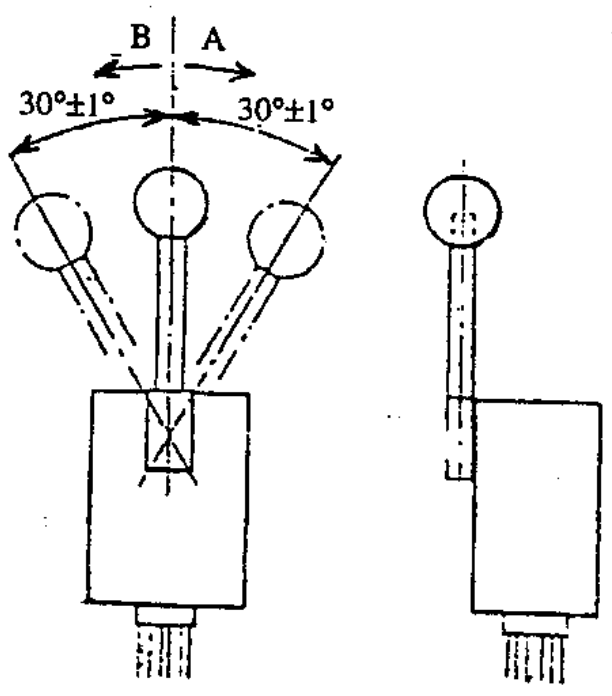
LEVER POTENTIOMETER

The lever potentiometer consists of two parts. One which functions as a switch and one which controls variations of resistance. These two parts are operated simultaneously by the control lever.

The "OFF" section of the switch extends 4° to either side of the lever's central position. The switch will be turned "ON" when the lever is inclined in excess of 4° to either side.

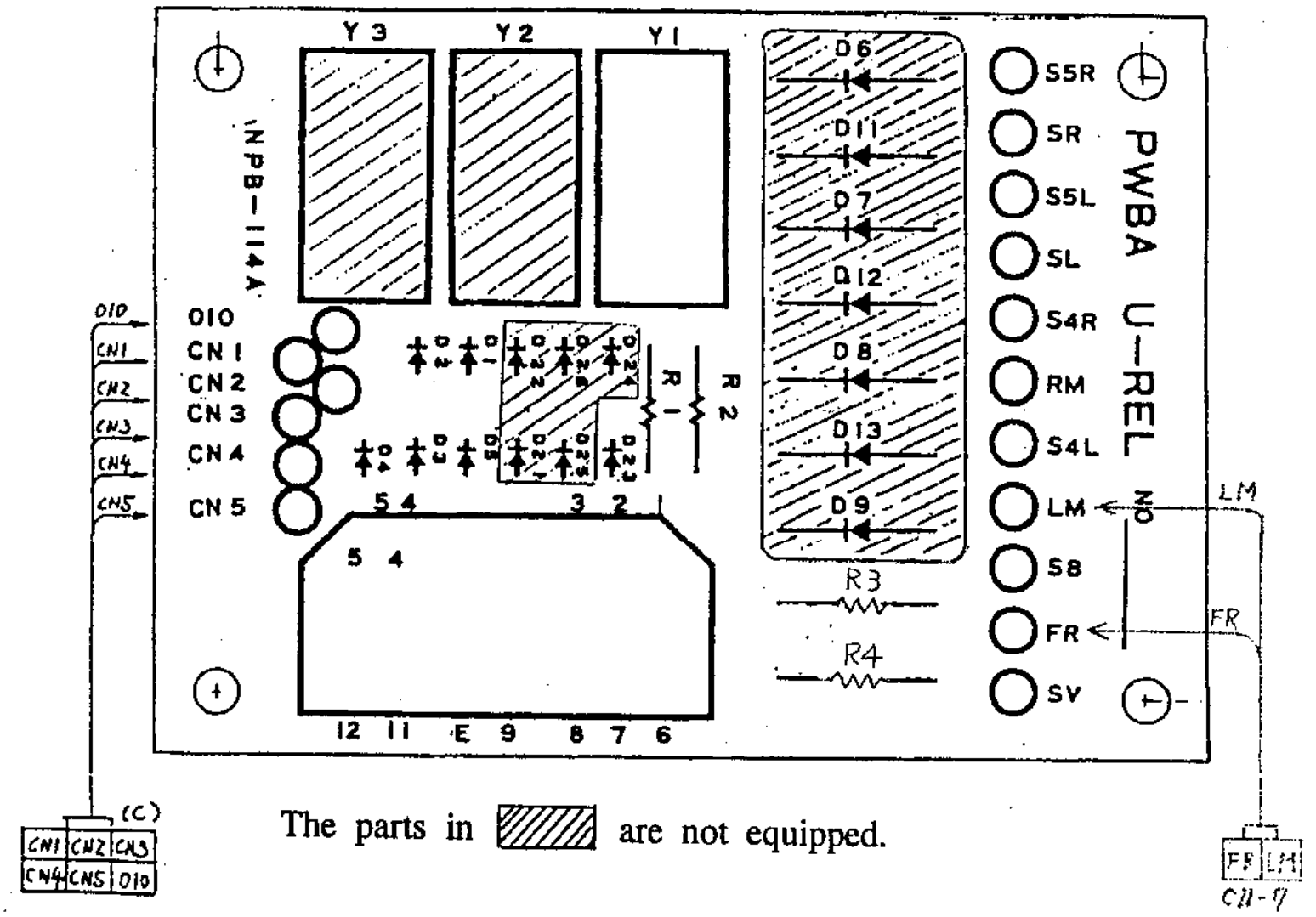
The "OFF" section of the resistance control extends 5° to either side, and from there the resistance (2kΩ) is varied as the control lever is inclined.



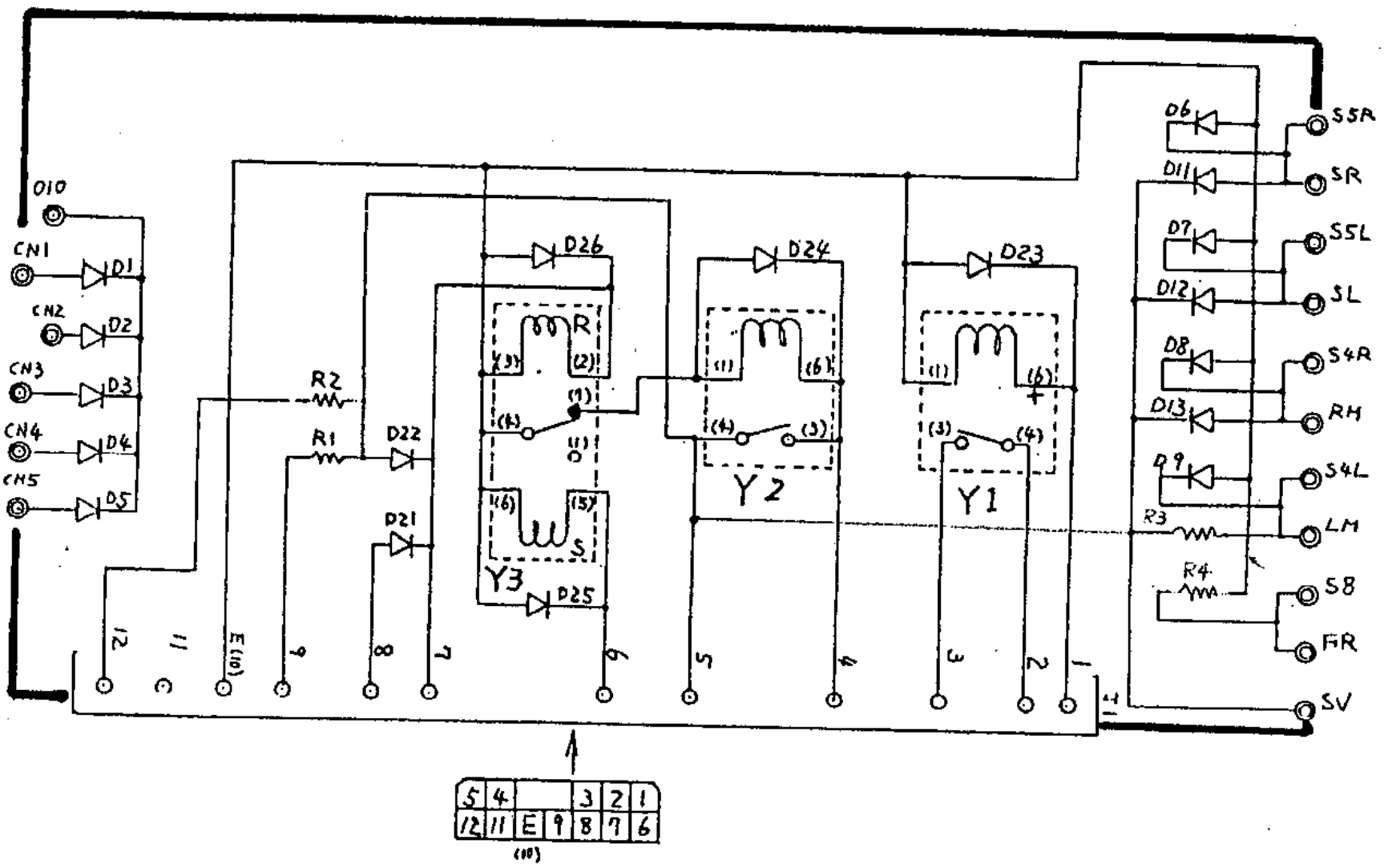


CONTROL BOARD

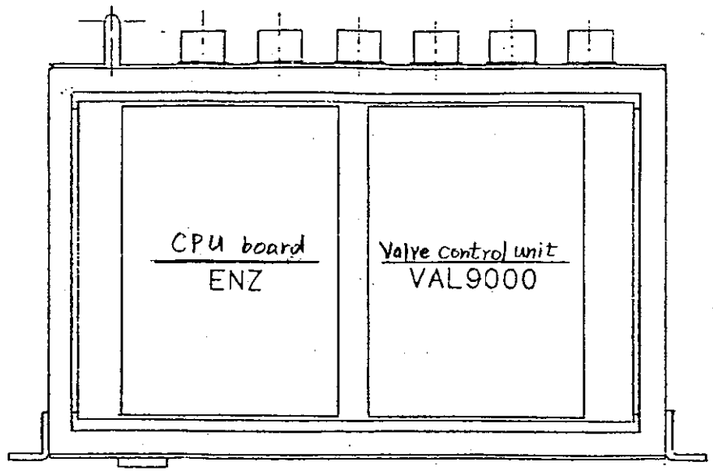
The board is installed in the "Upper control box".



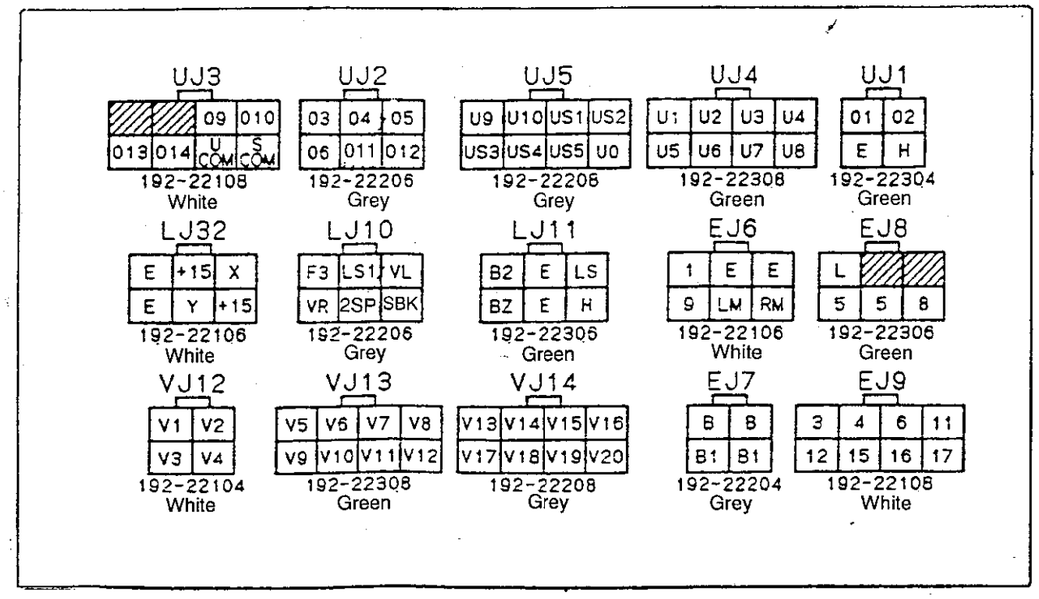
The parts in ▨ are not equipped.



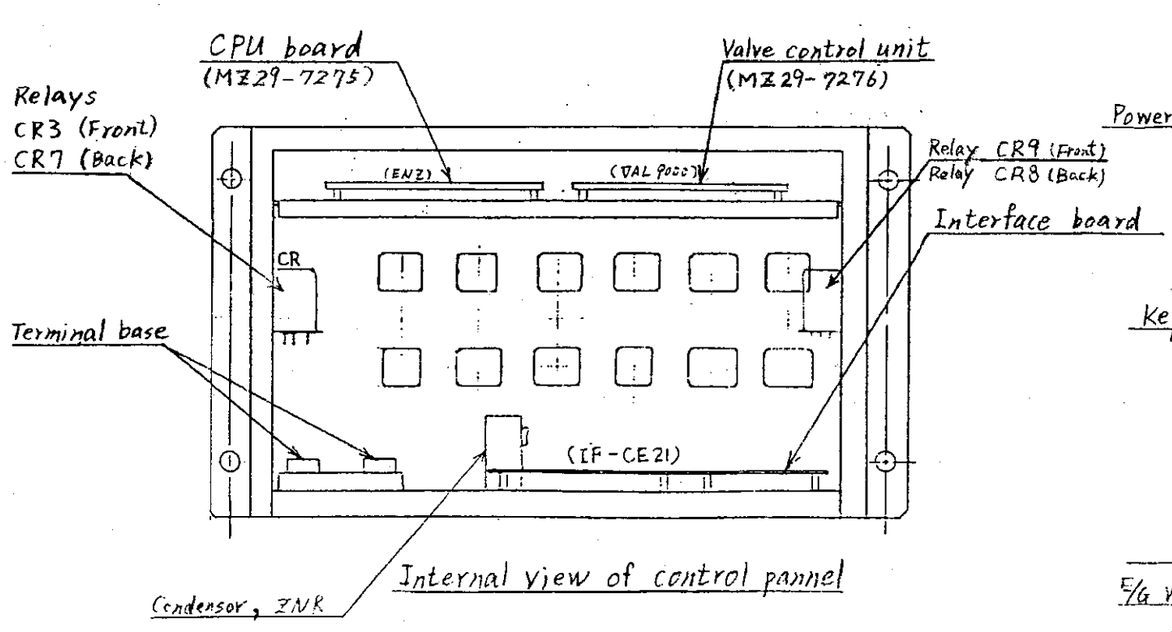
LOWER CONTROL BOX



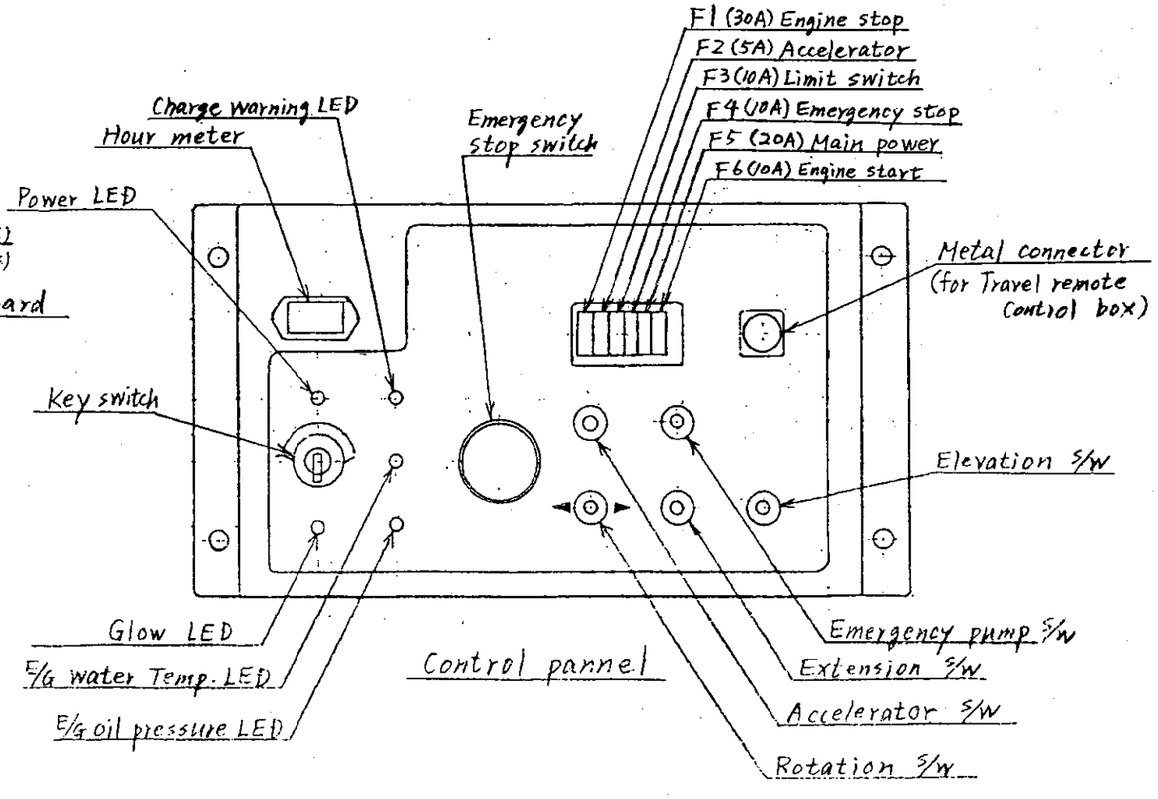
Internal view of Upper pannel



Connector Detail

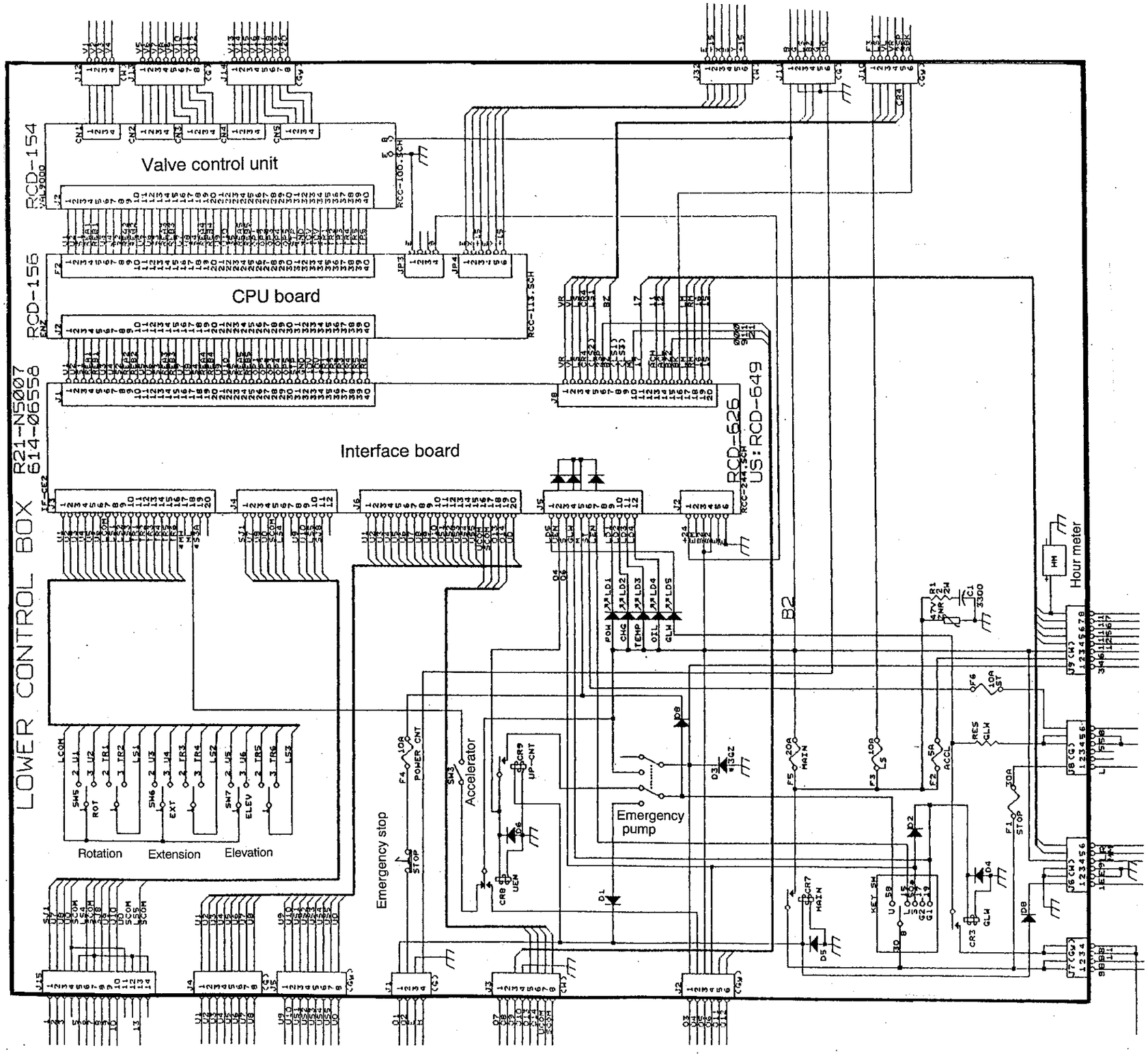


Internal view of control pannel



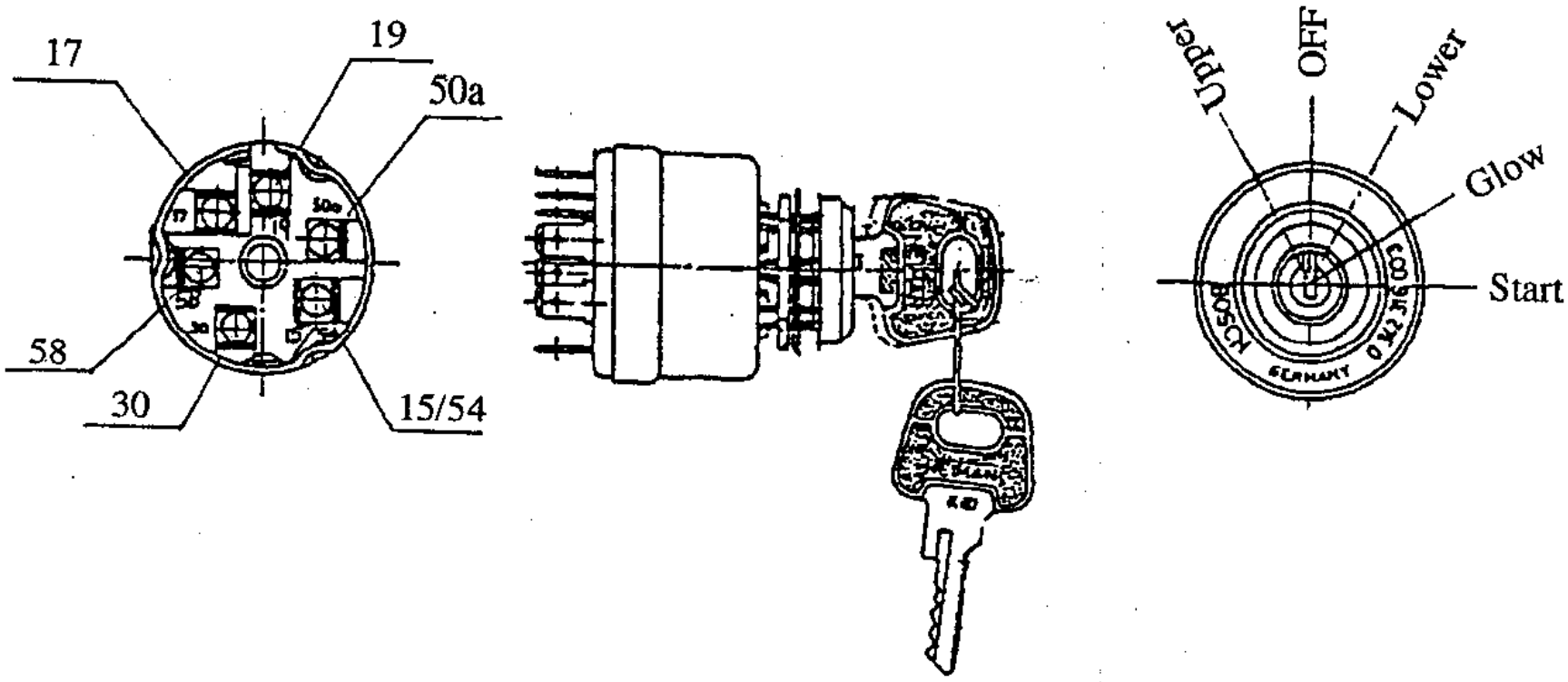
Control pannel

1. Electric circuit



MAIN KEY SWITCH

The main key switch is located on the Lower control box. This supplies power to the "Upper" or "Lower" control.



Key position and ON/OFF conditions of each terminal

Key position	Terminal NO. 30	15/54	58	19	17	50a
OFF	○					
Upper	○	○	○			
Lower	○	○				
Glow	○			○		
Start	○				○	○

INTERFACE BOARD

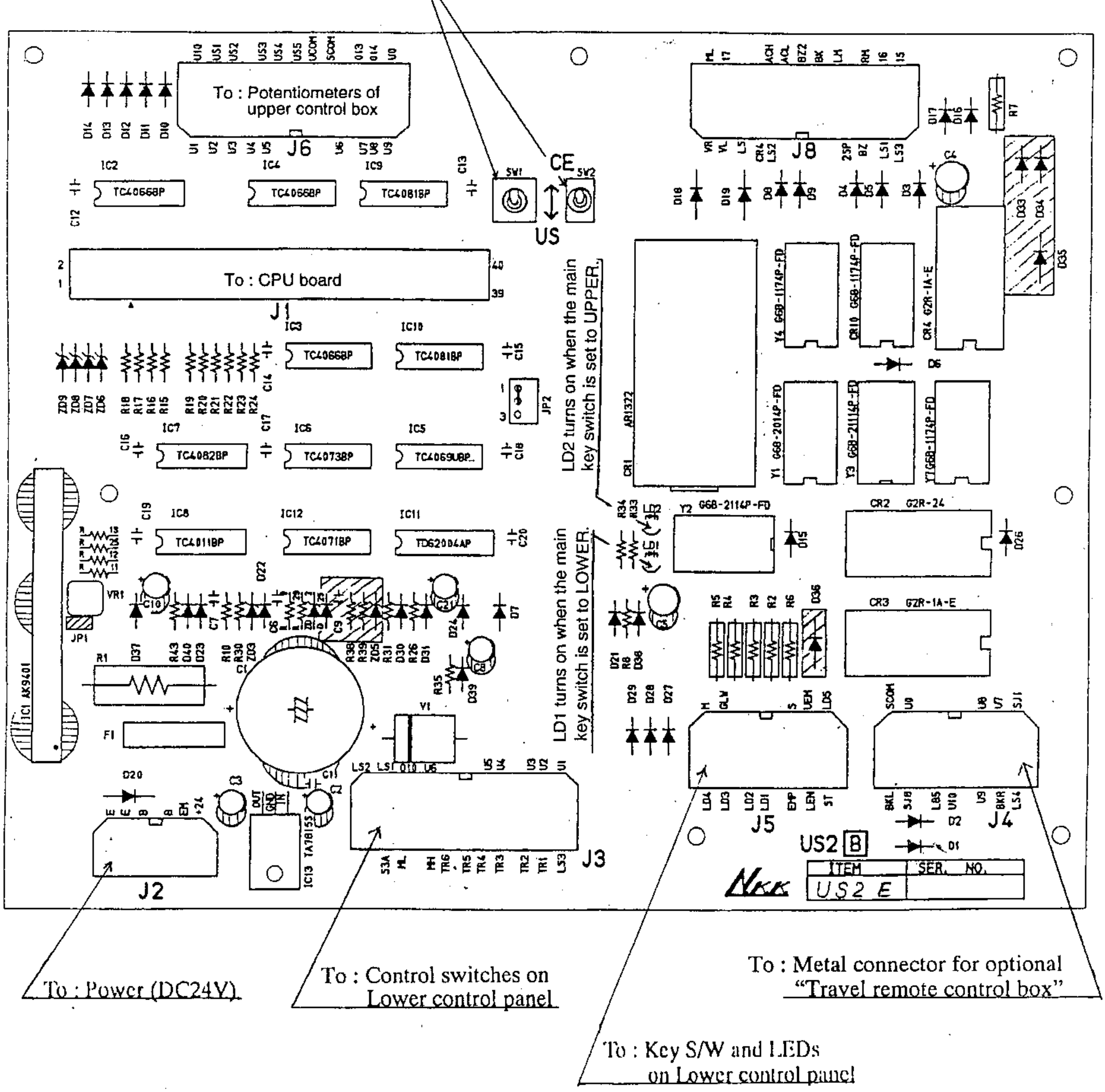
(with CE/US selector switch)

The interface board is located in the lower control box to control the electric system.

Set the switches, SW1 and SW2 according to the machine as follows.

Machine for CE (Europe) ⟶ Set the switches to CE side.

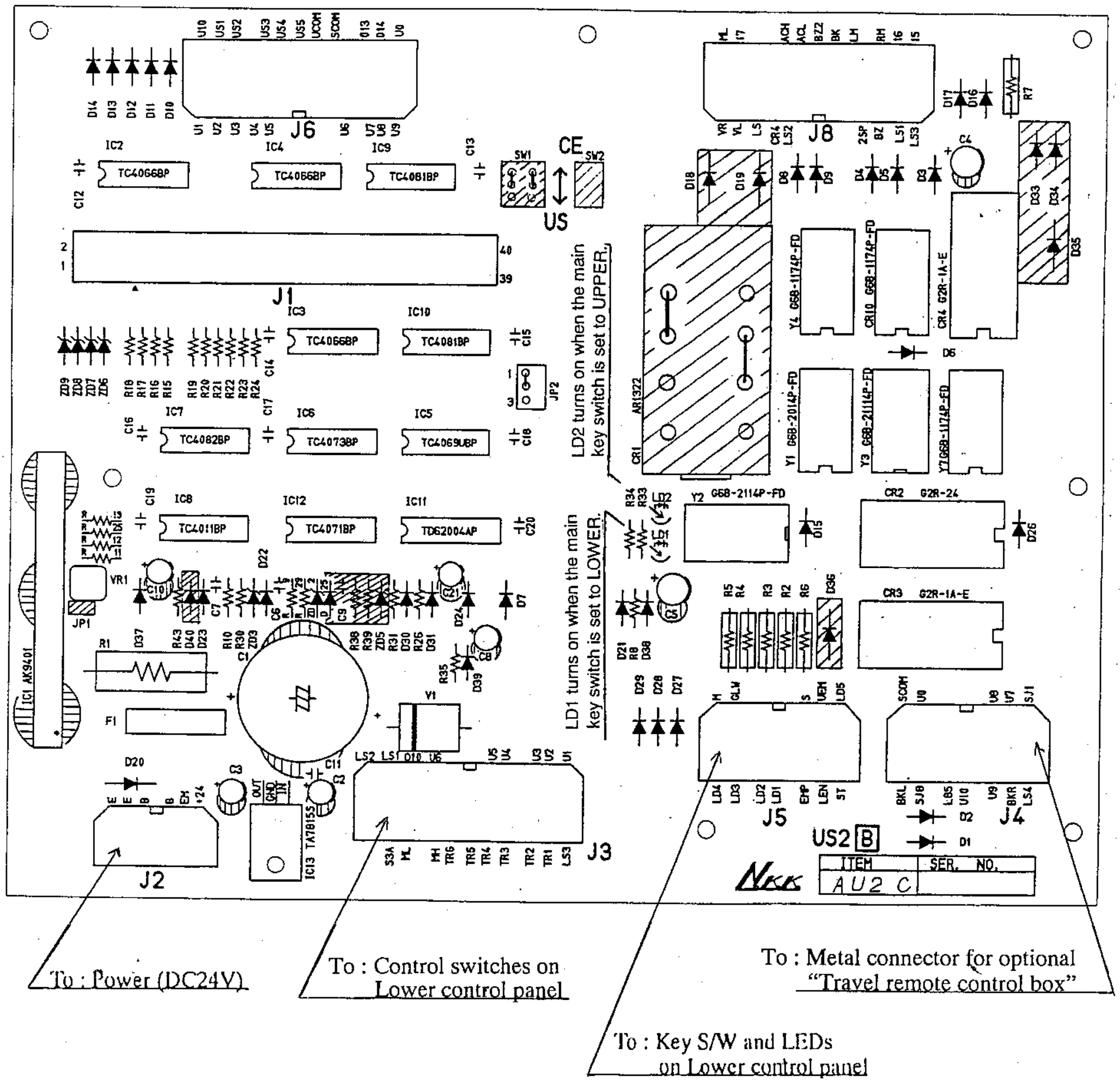
Machine for USA & AUS ⟶ Set the switches to US side.



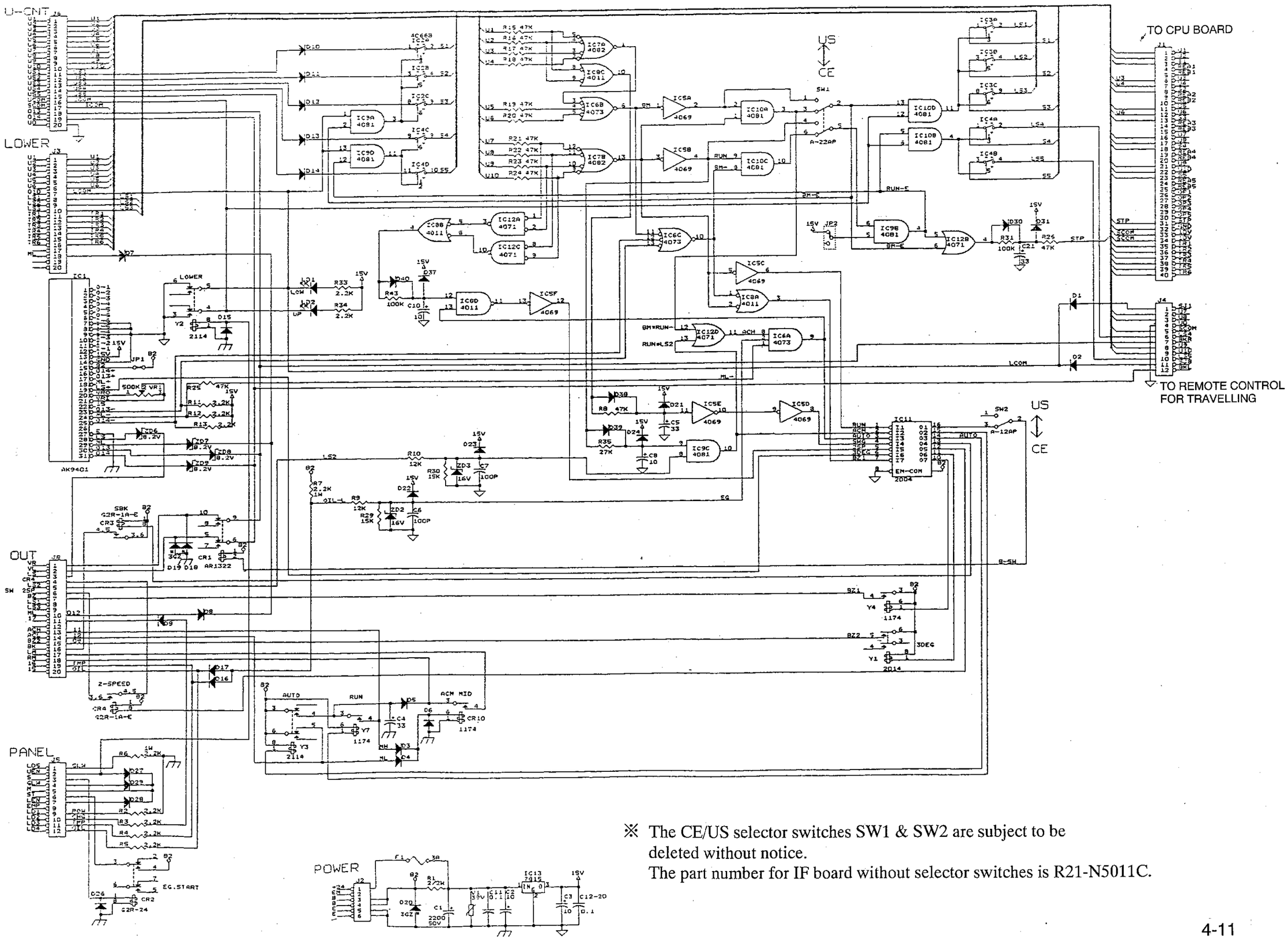
INTERFACE BOARD

(without CE/US selector switch)

The interface board is located in the lower control box to control the electric system.



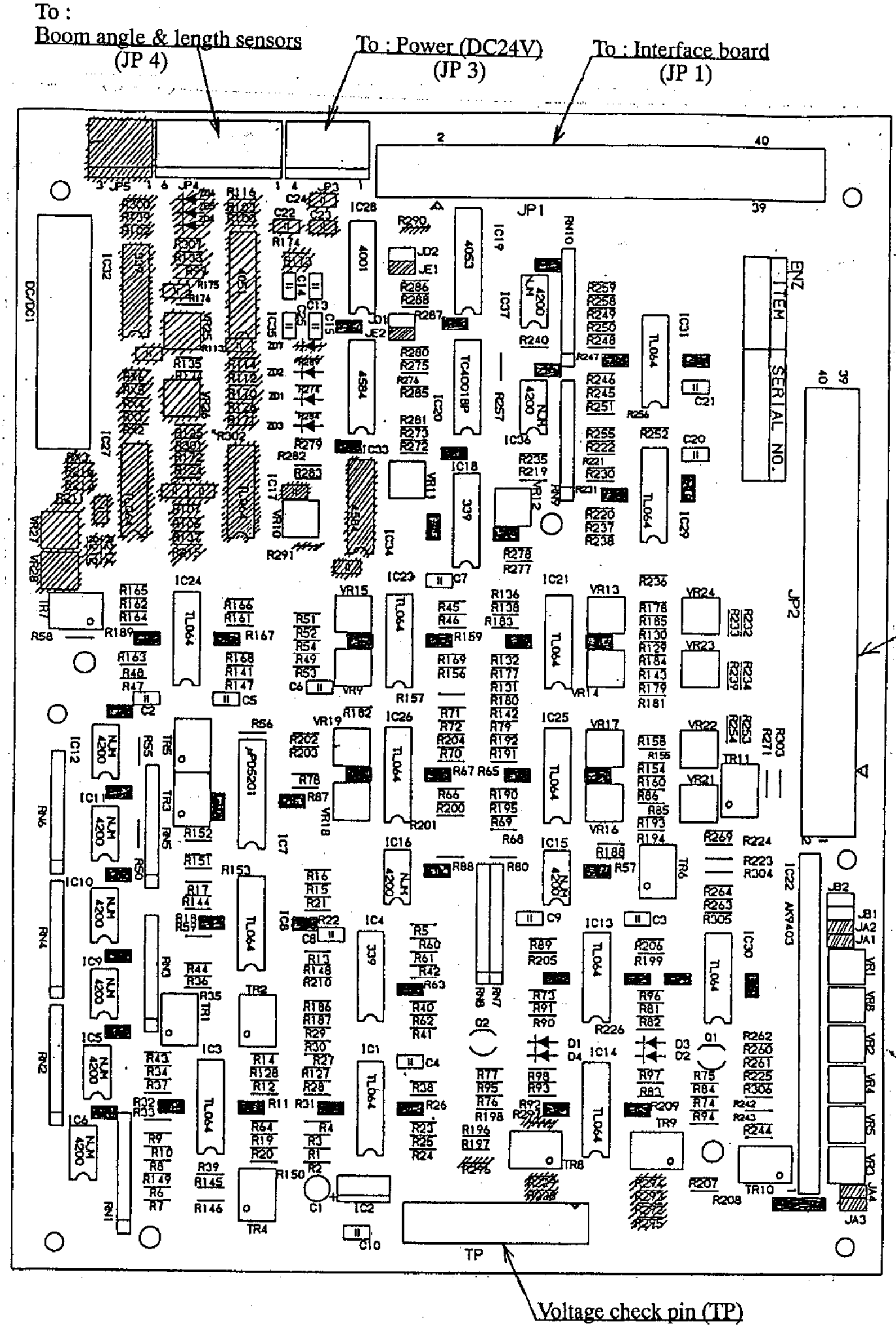
1. Electric circuit



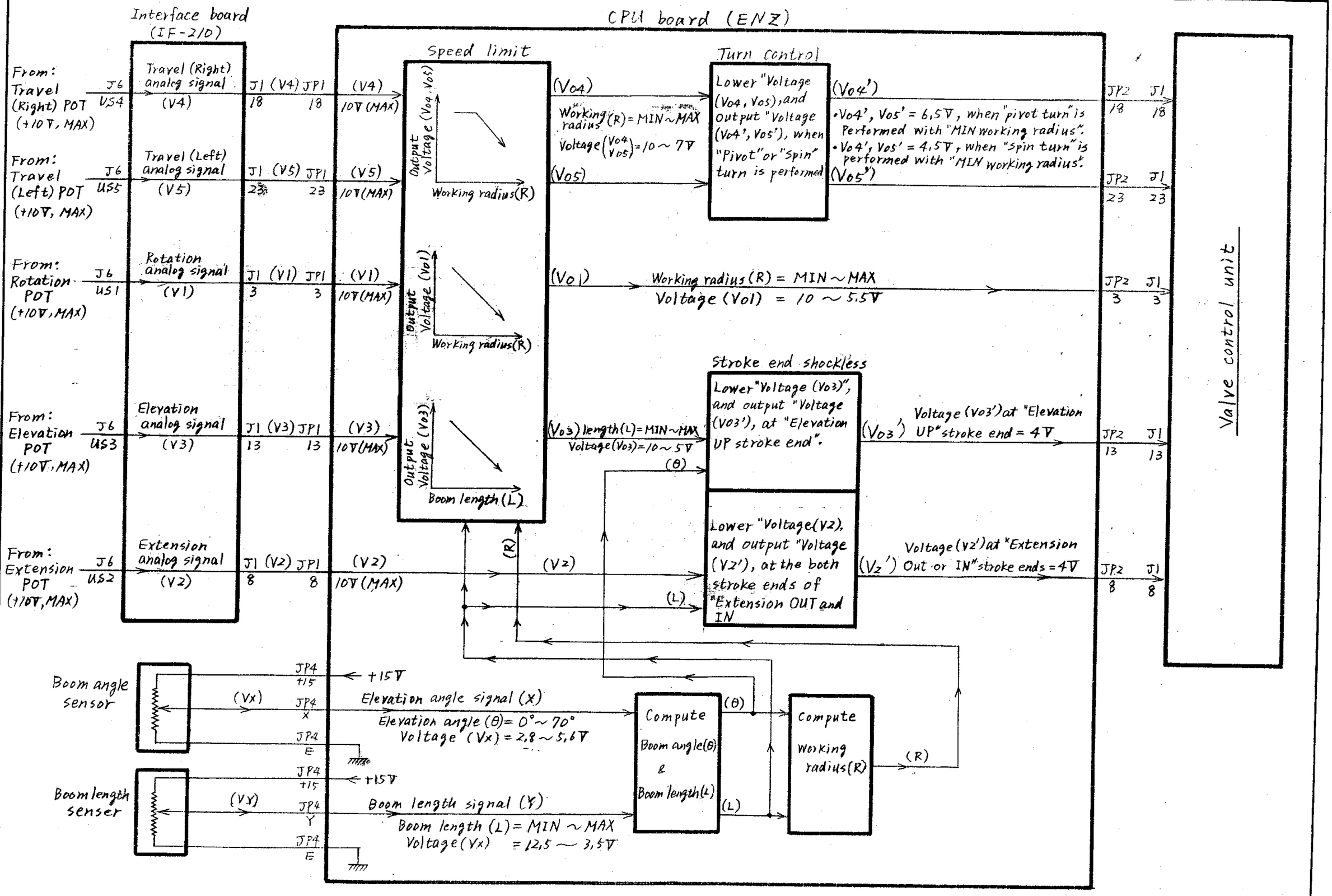
※ The CE/US selector switches SW1 & SW2 are subject to be deleted without notice.
The part number for IF board without selector switches is R21-N5011C.

CPU BOARD

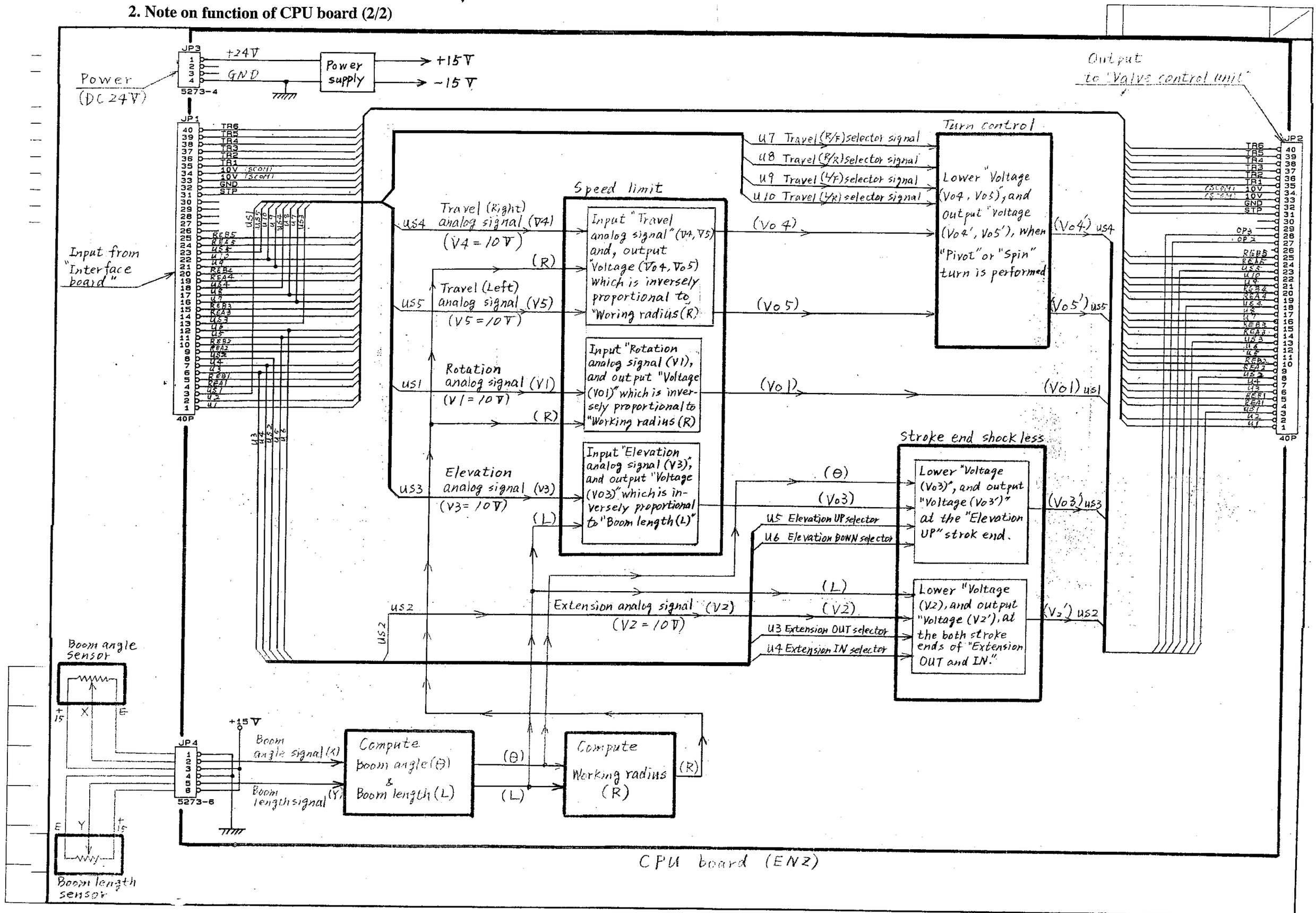
The CPU board incorporated in the lower control box automatically controls the actuating speed of "Elevation", "Extension", "Rotation" and "Travelling" according to the signals sent form the boom angle and length sensors.



1. Note on function of CPU board (1/2)



2. Note on function of CPU board (2/2)



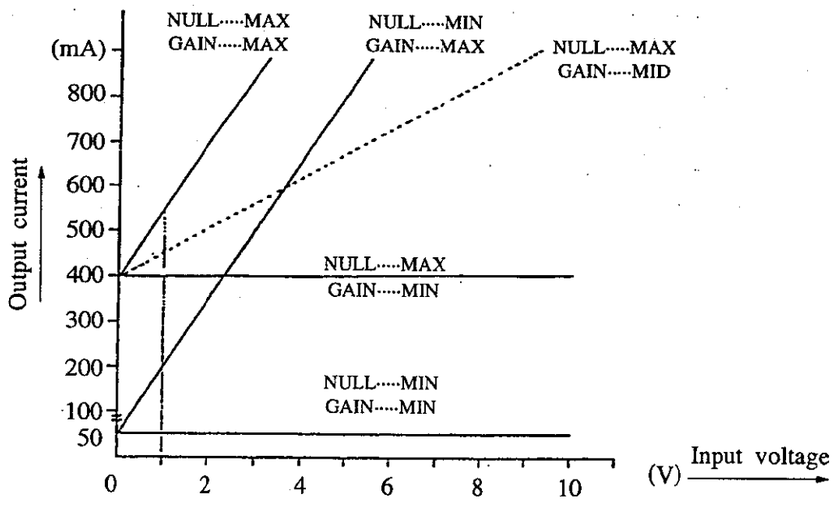
VALVE CONTROL UNIT

The Valve control unit is installed within the electric circuit between the "Potentio meters" (or control switches) and the "Solenoids" of the main control valve.
When the Valve control unit inputs "Voltage variation" (sent from Potentiometer), it converts this "Voltage variation" into the "Ampare variation", and outputs it to the "Solenoids" of the main control valve.
Thus, the proportional operation of main control valve is achieved, when the potentio meter is operated at the upper control.
However, in case the "Control switch" is operated at the lower control, the main control valve is actuated as a conventional solenoid valve, since the control switch does not output "Voltage variation", which is necessary for proportional operation.

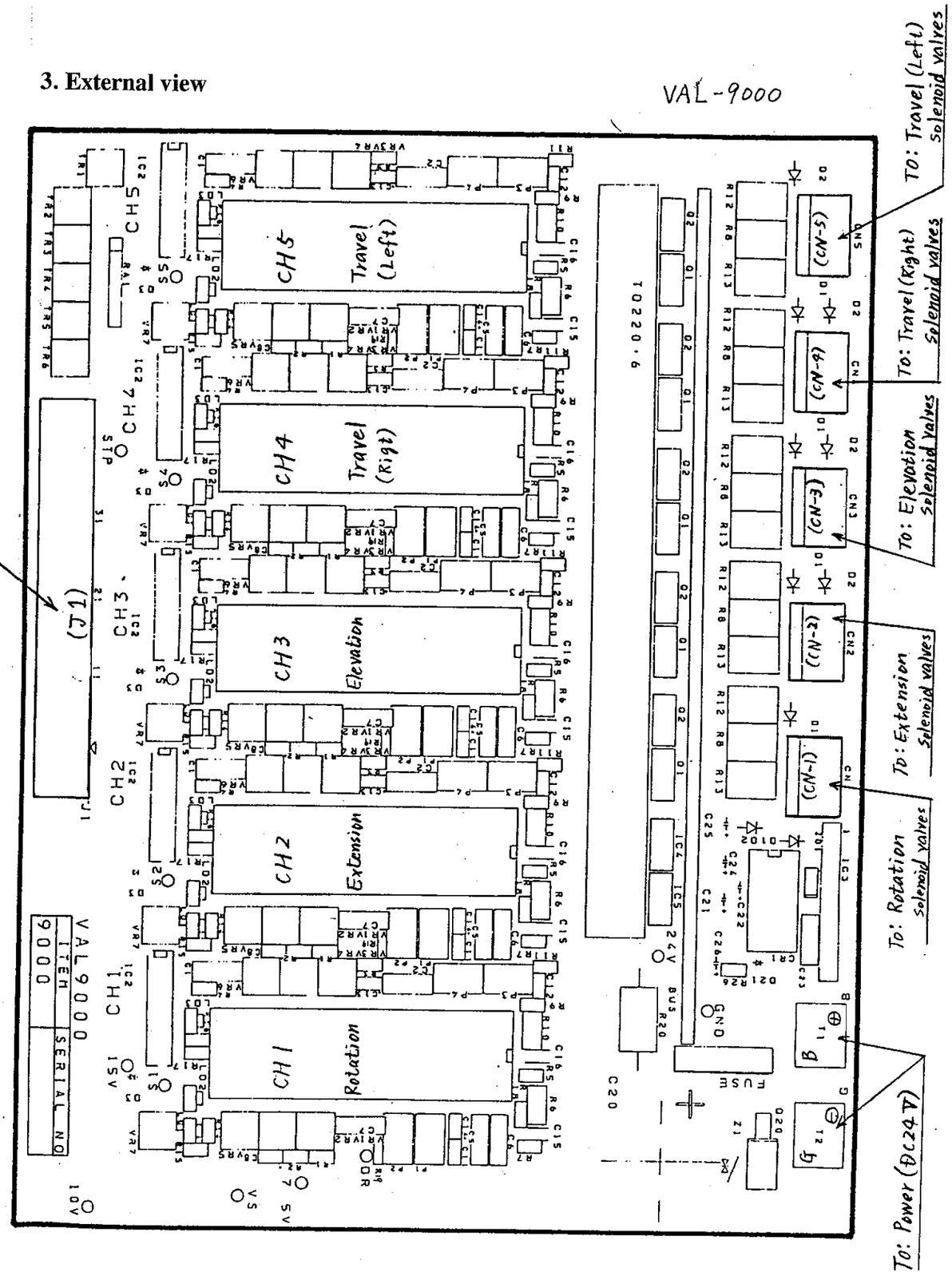
1. Specification

Rated voltage	DC-24V
Input voltage	DC0~10V
Output current	0~800mA
Delay(Ramp)	0~7seconds(when input voltage is 10V)
Dither	50Hz

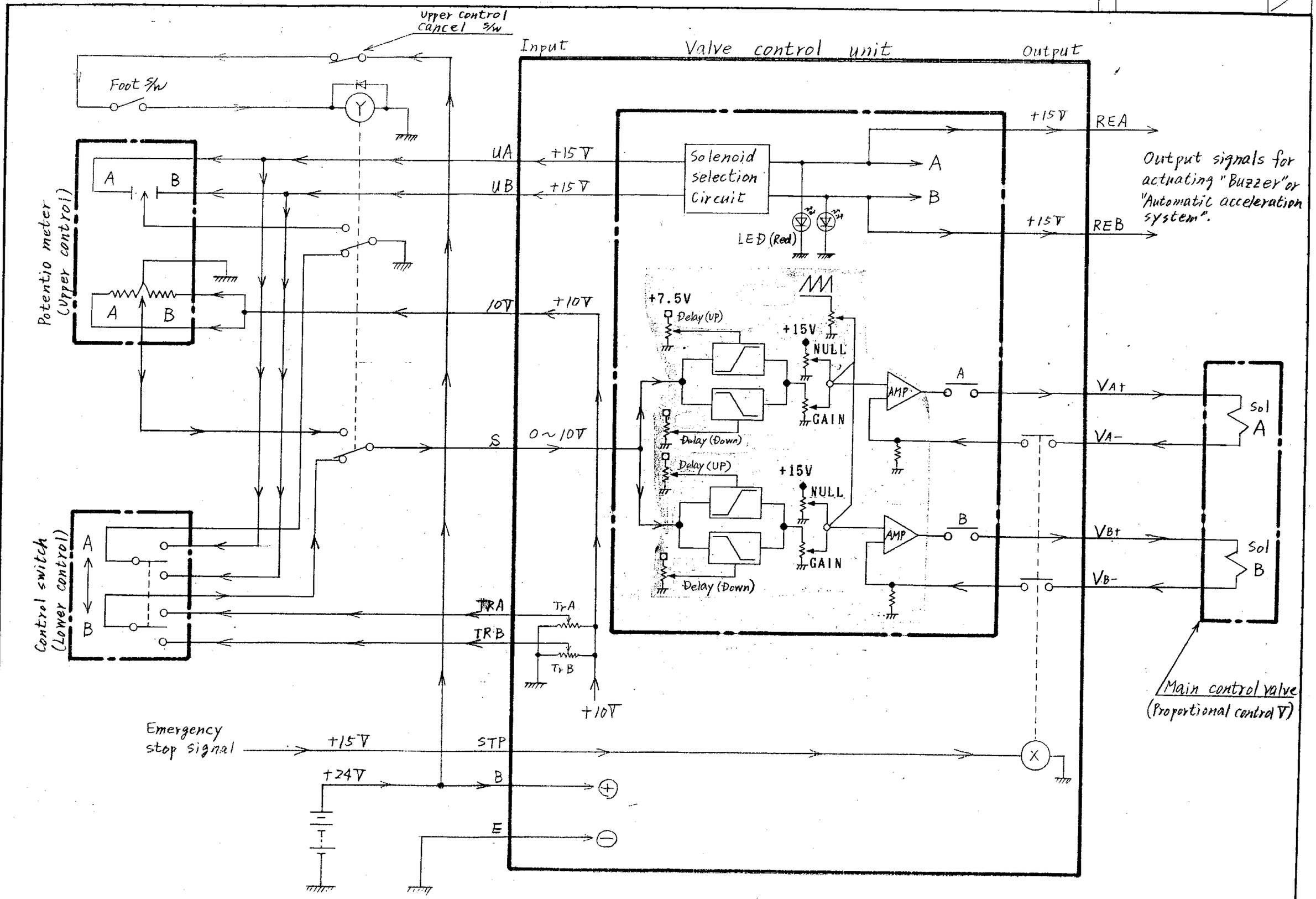
2. Input / Output characteristic



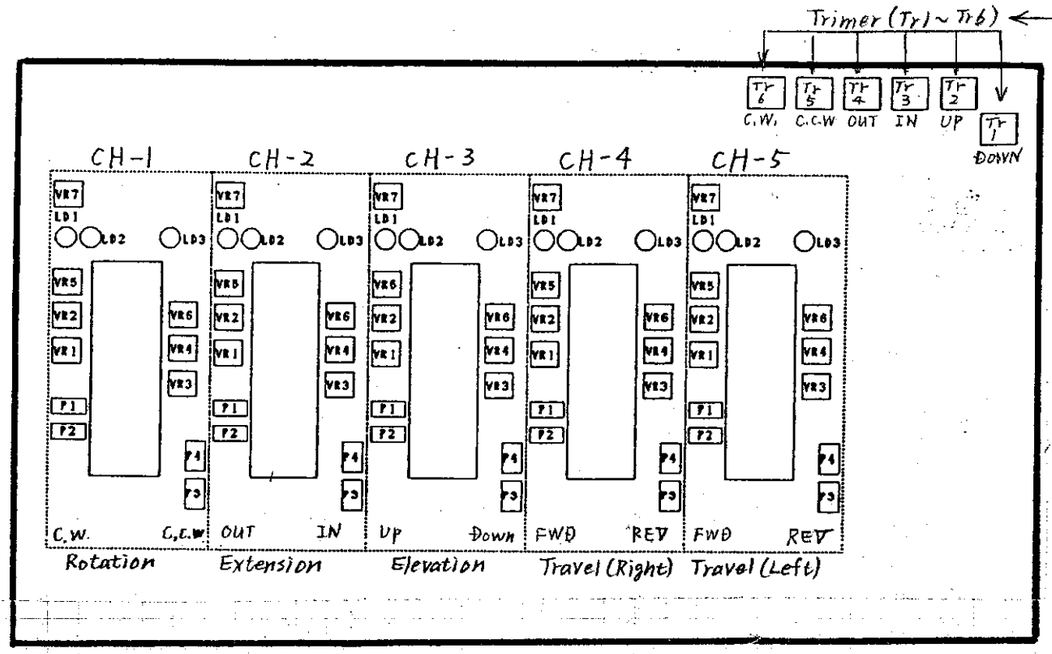
3. External view



4. Function of valve control unit



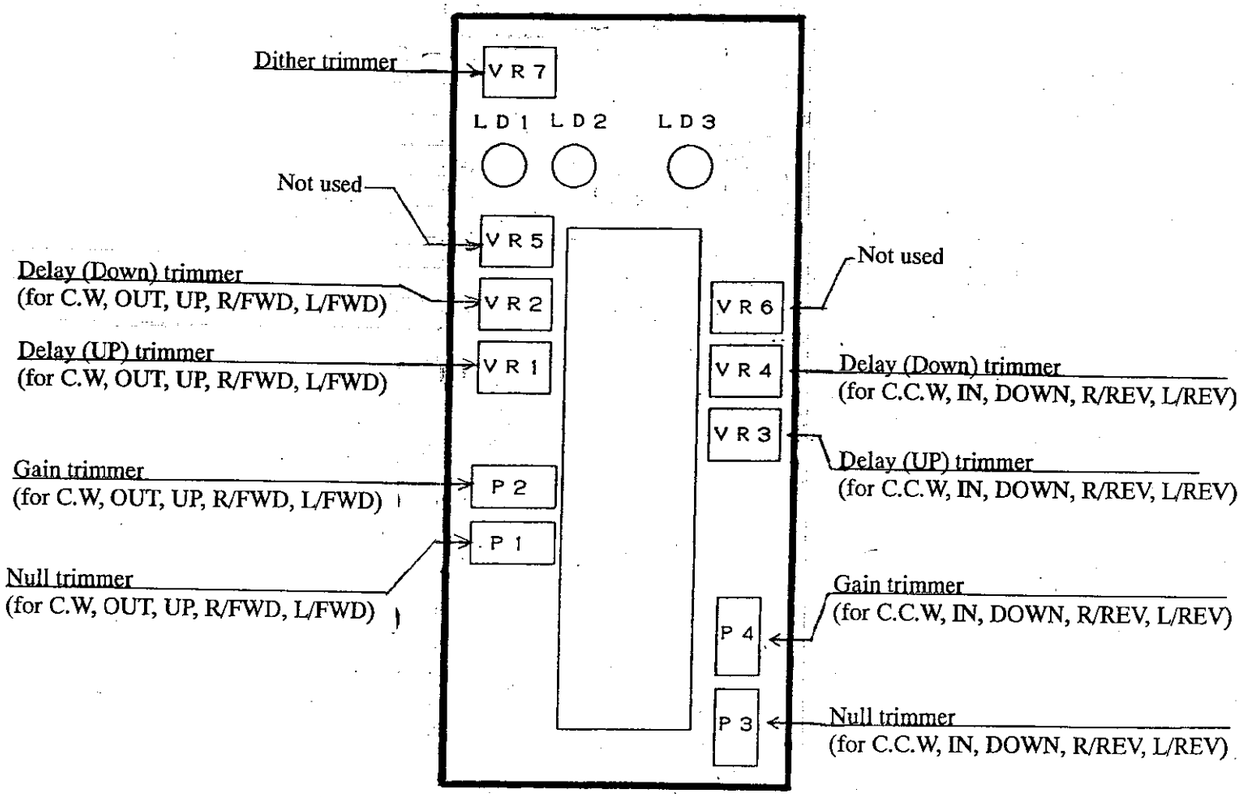
5. Function of trimmers and LEDs



Trimmers for adjusting "Operational speed" obtained when the "Control switches" on the "Lower control" are operated.

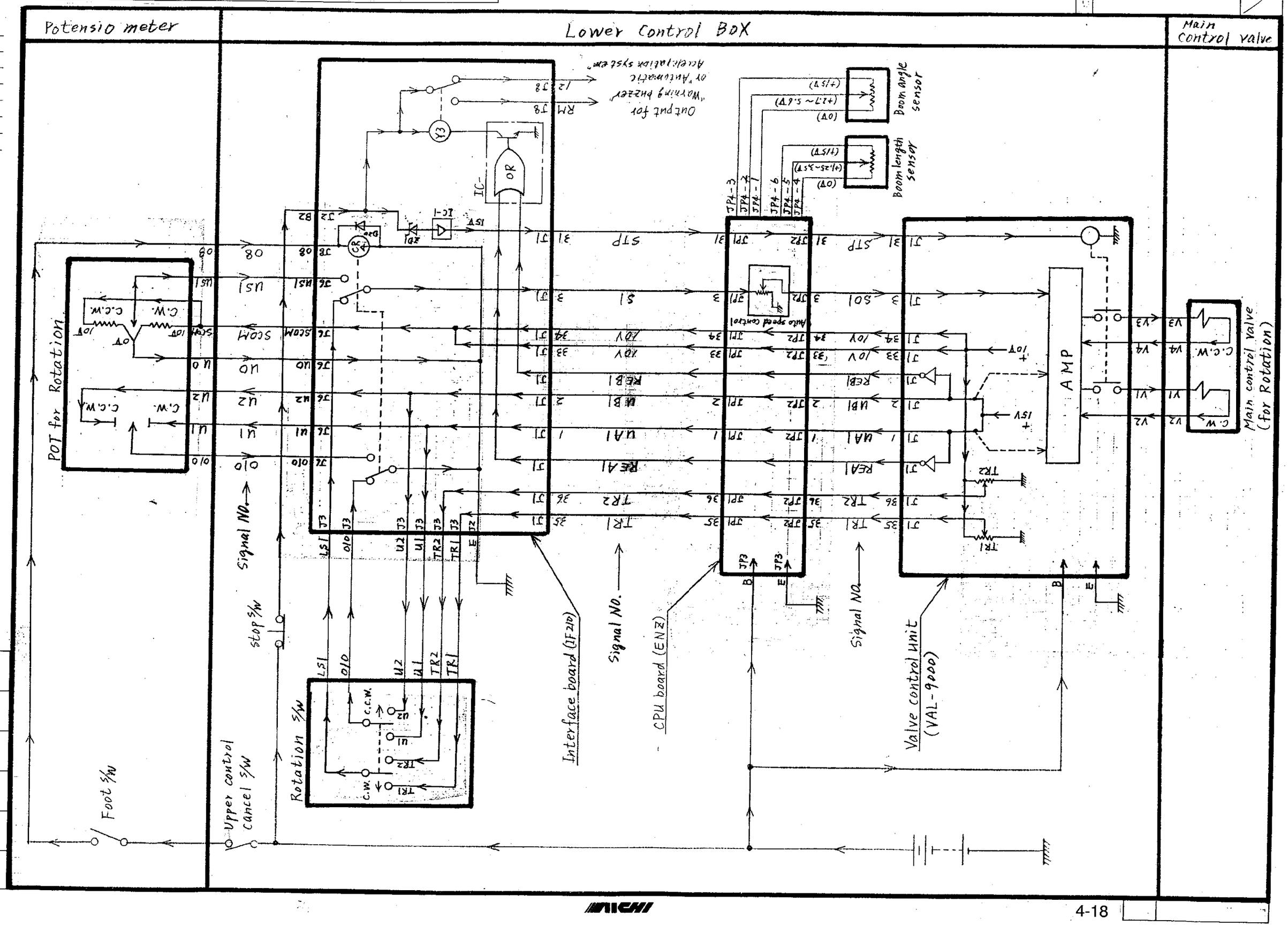
The LEDs on "Valve control unit" turns ON/OFF as shown in the table below.

Channel NO.	LED NO.	Color	ON/OFF Conditions	Remarks
CH-1	LD 1	Red	ON, when "Rotation C.W." selector input signal	LEDs for "Input selector signals"
	LD 2	Red	ON, when "Rotation C.C.W.", selector input signal exists.	
CH-2	LD 1	Red	ON, when "Extetion OUT", selector input signal exists.	
	LD 2	Red	ON, when "Extetion IN", selector input signal exists.	
CH-3	LD 1	Red	ON, when "Elevation UP", selector input signal exists.	
	LD 2	Red	ON, when "Elevation DOWN", selector input signal exists.	
CH-4	LD 1	Red	ON, when "Travelling (Right) FWD" selector input signal exists.	
	LD 2	Red	ON, when "Travelling (Right) REW" selector input signal exists.	
CH-5	LD 1	Red	ON, when "Travelling (Left) FWD" selector input signal exists.	
	LD 2	Red	ON, when "Travelling (Left) REW" selector input signal exists.	
CH-1	LD 3	Yellow	Output lines to "Rotation solenoids" are Normal → ON / Faulty → OFF	LEDs are turned off, in case the solenoids or electric lines to the solonoids get short circuit. (LEDs for "Output")
CH-2	LD 3	Yellow	Output lines to "Extension solenoids" are Normal → ON / Faulty → OFF	
CH-3	LD 3	Yellow	Output lines to "Elevatin solenoids" are Normal → ON / Faulty → OFF	
CH-4	LD 3	Yellow	Output lines to "Travel (Right) solenoids" are Normal → ON / Faulty → OFF	
CH-5	LD 3	Yellow	Output lines to "Travel (Left) solenoids" are Normal → ON / Faulty → OFF	



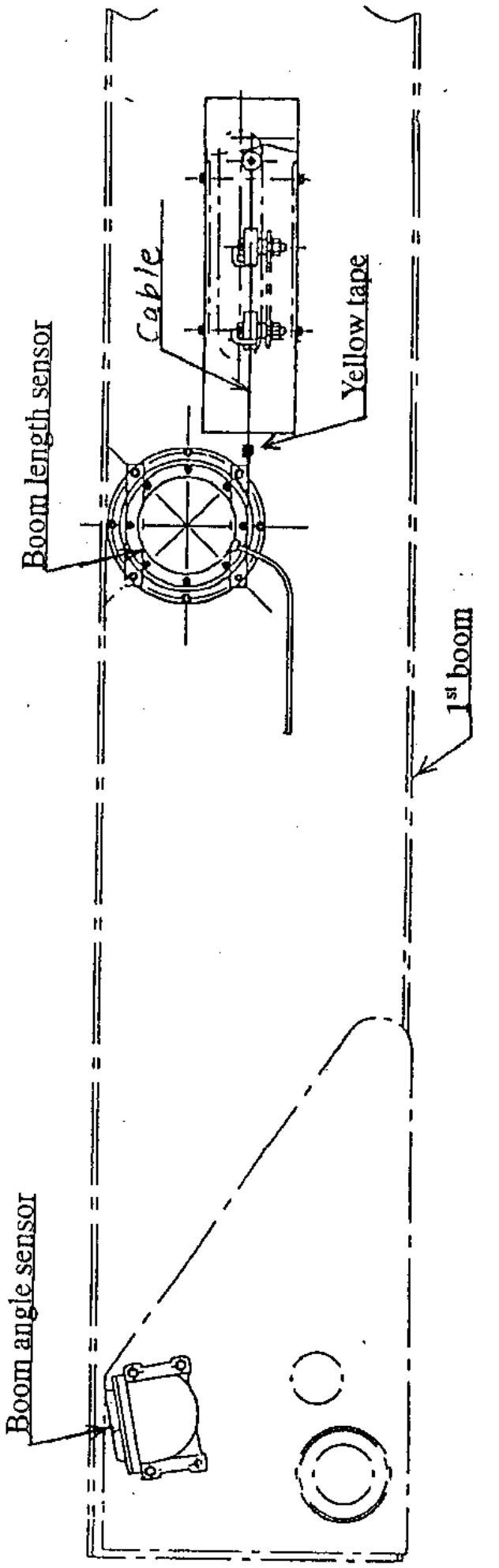
Detail of each channel

FUNCTION OF LOWER CONTROL BOX



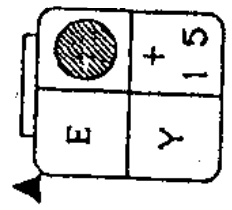
BOOM ANGLE & LENGTH SENSORS

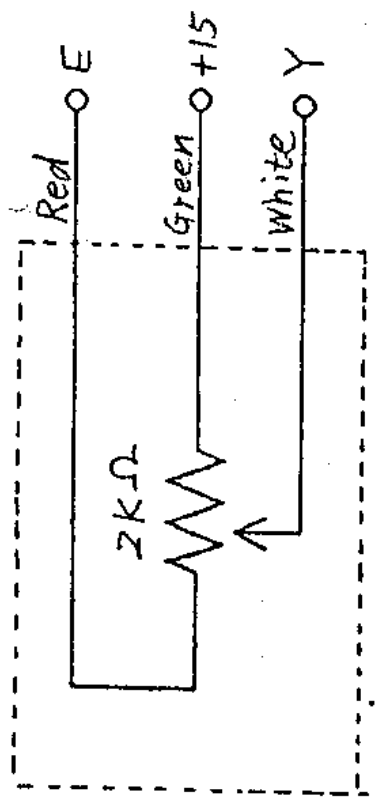
The sensors are installed on the side of the 1st boom. They detect the boom angle and the boom length respectively.



Boom length sensor (382-00751A)

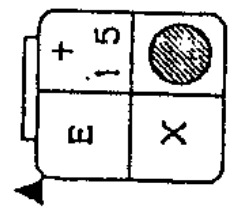
Boom length	MIN ~ MAX
Resistance between Green and white wires	0.3 ~ 1.5 KΩ





Boom angle sensor (382-00527)

Boom angle	0° ~ 70°
Resistance between Black and white wires	2.2 ~ 4.4 Ω

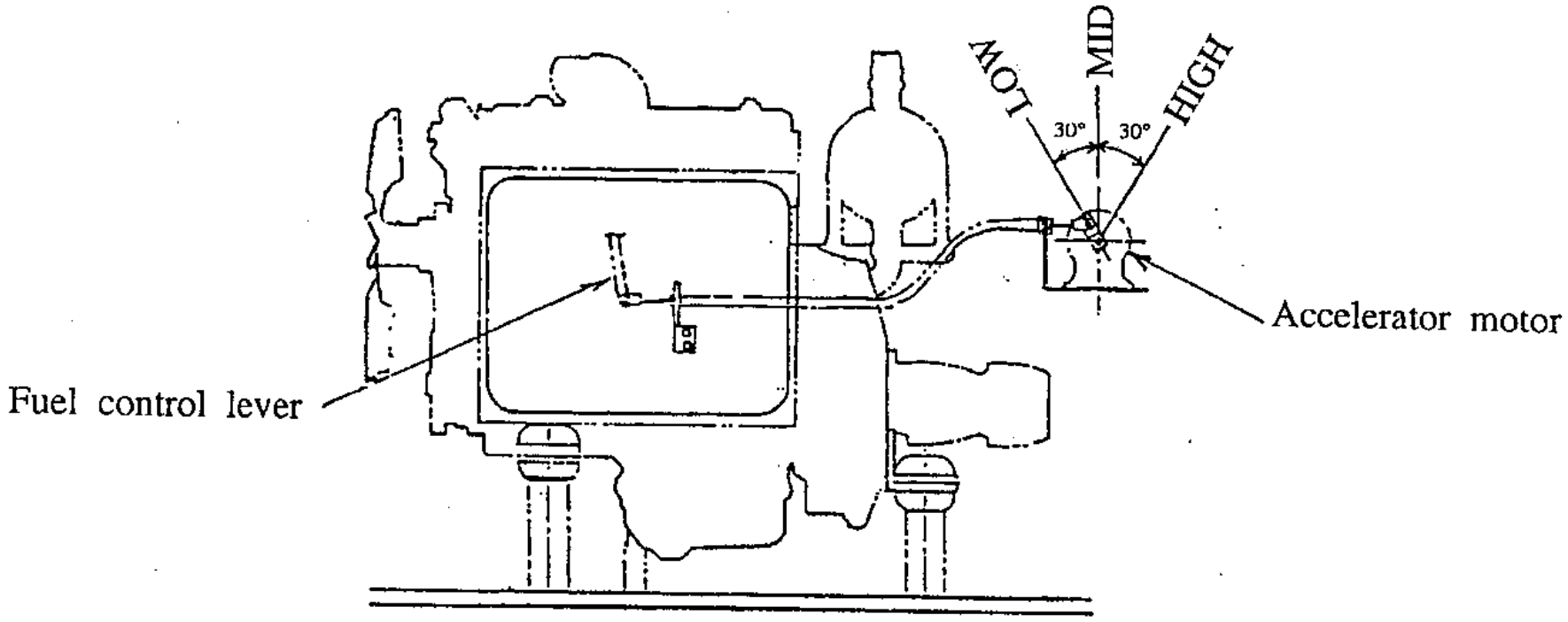


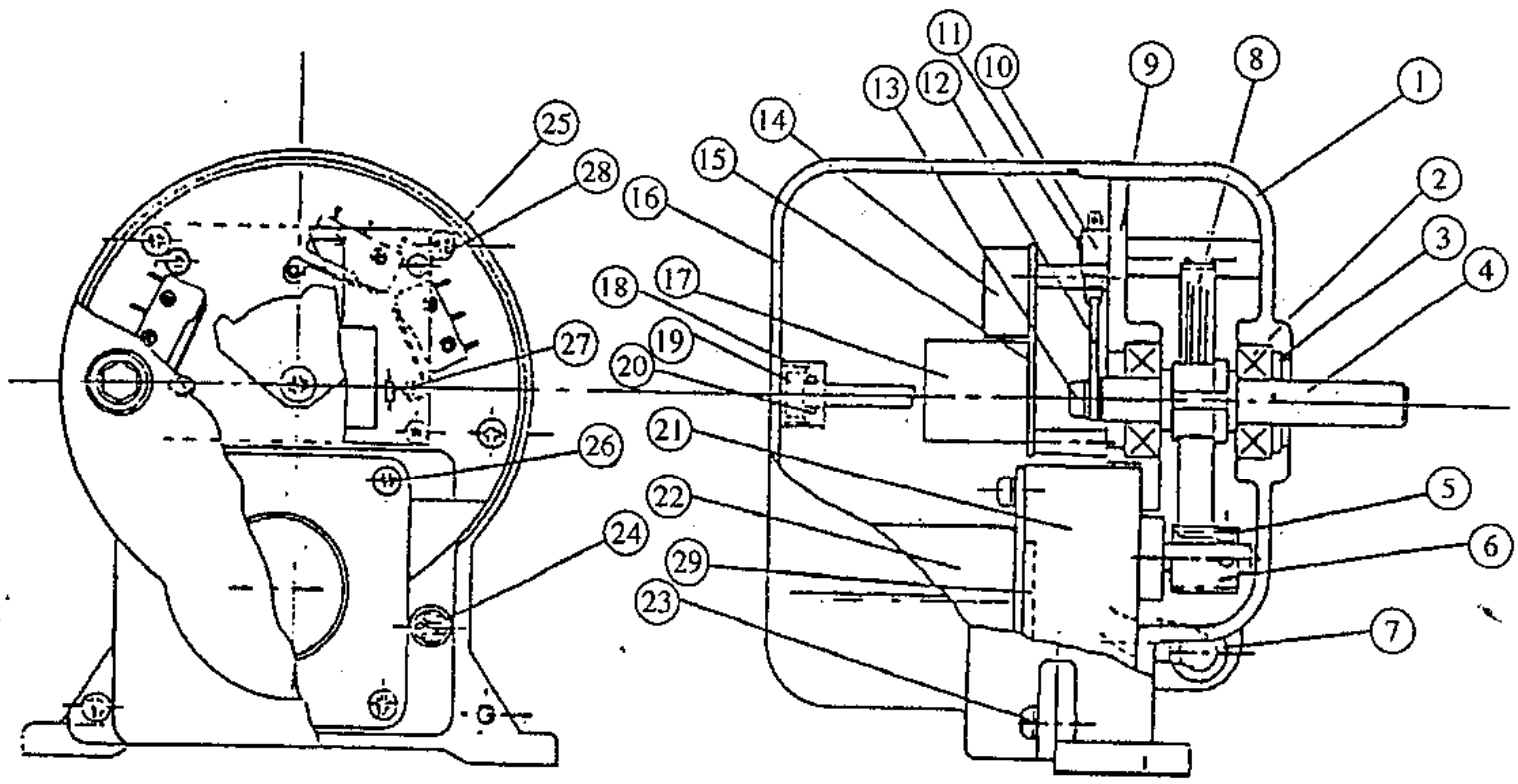
Caution on installing "Boom length sensor" :
Retract the boom fully, and adjust the length of the "Cable", so that the "Yellow tape" on the cable is positioned as shown figure above.

ACCELERATOR MOTOR

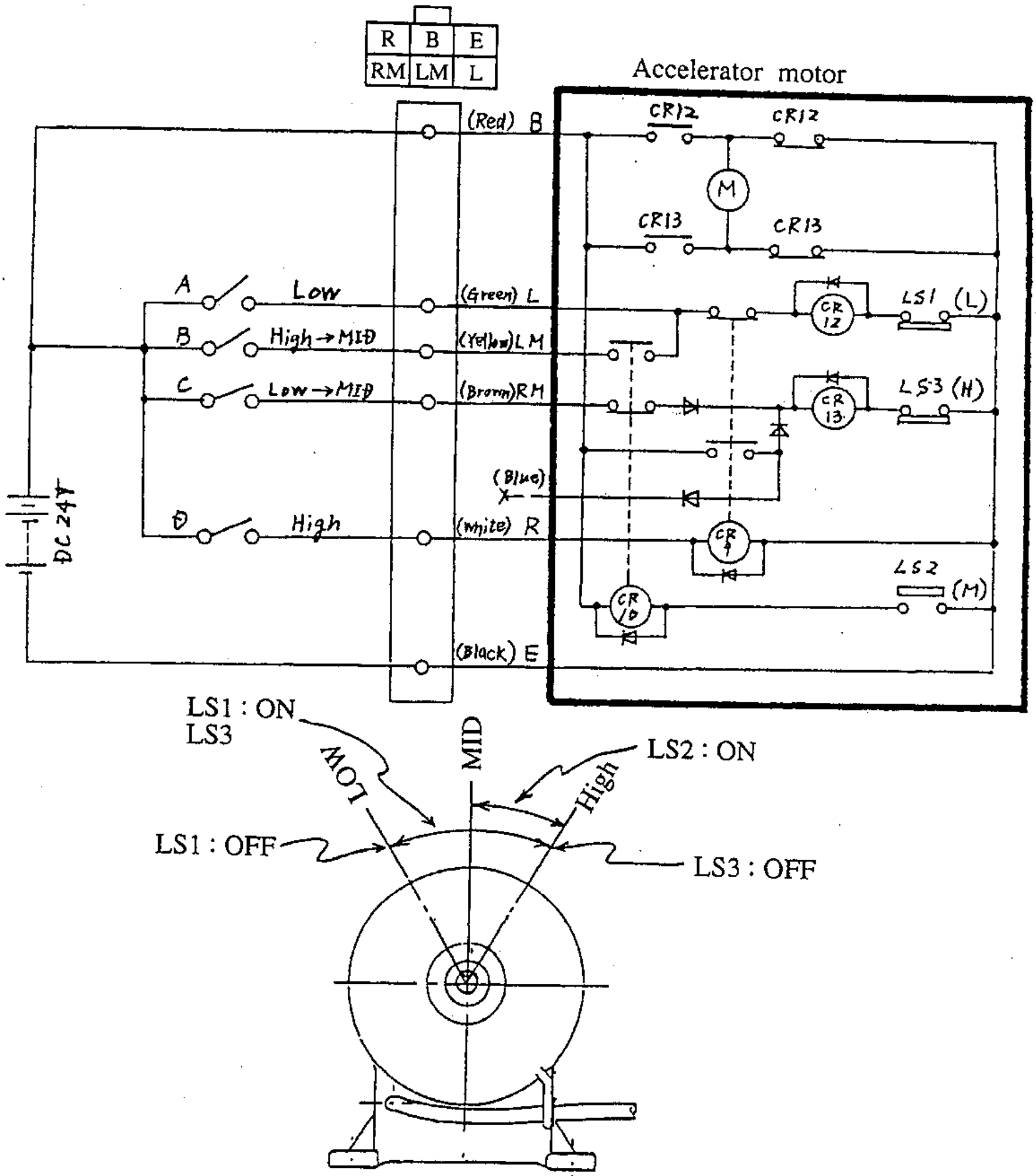
The output shaft of "Accelerator motor" is connected to the "Fuel control lever" of "Injection pump", and control the engine rpm into 3 speeds.

Low speed(Idling)——1.200rpm
Mid speed————1.800rpm
High speed————2.300rpm





1. Electric circuit



2. Inspection

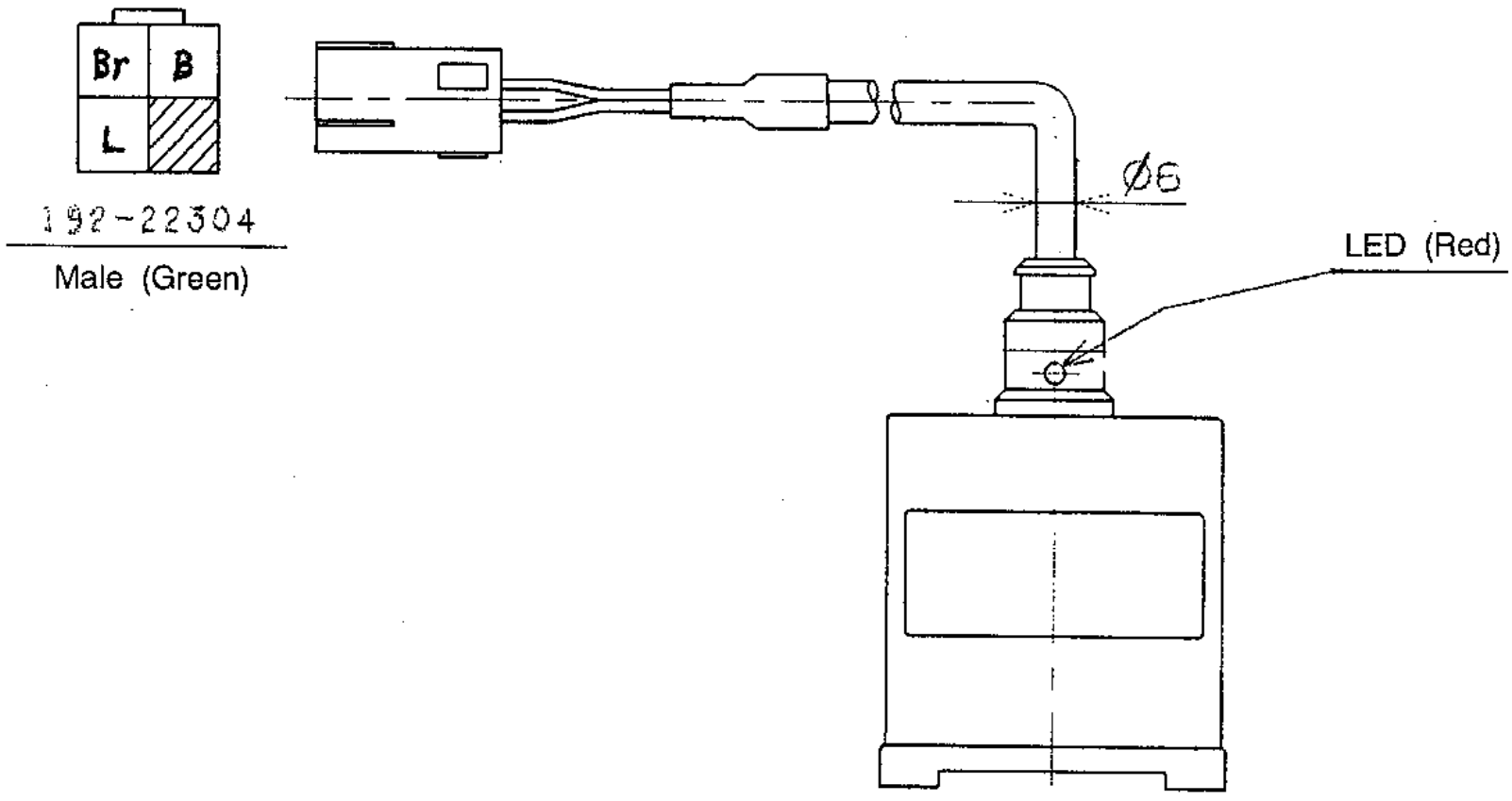
Check the function of "Accelerator motor" as follows refering above chart.

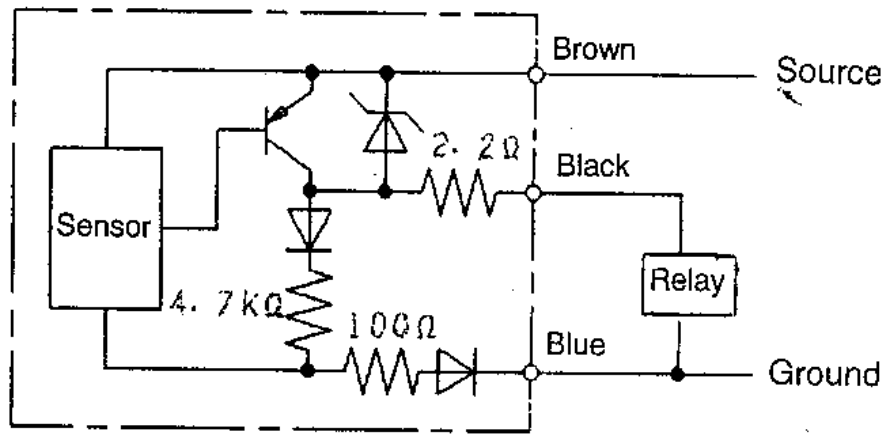
No.	Inspection Procedures
1	Turn on "Switch D", and make sure the motor rotates clockwise, then stops at "High" position.
2	Turn on "Switch B", and make sure the motor rotates counter clockwise, then stops at "MID" position.
3	Turn on "Switch A", and make sure the motor rotates counter clockwise, then stops at "LOW" position.
4	Turn on "Switch C", and make sure the motor rotates clockwise, then stops at "MID" position.

TILT SENSOR

This sensor (installed on the turntable) detects a tilt angle of the machine caused by a slope and stops its output power (DC 24v) to activate a tilt warning buzzer and lamp, in case the machine is inclined 5 degrees or more.

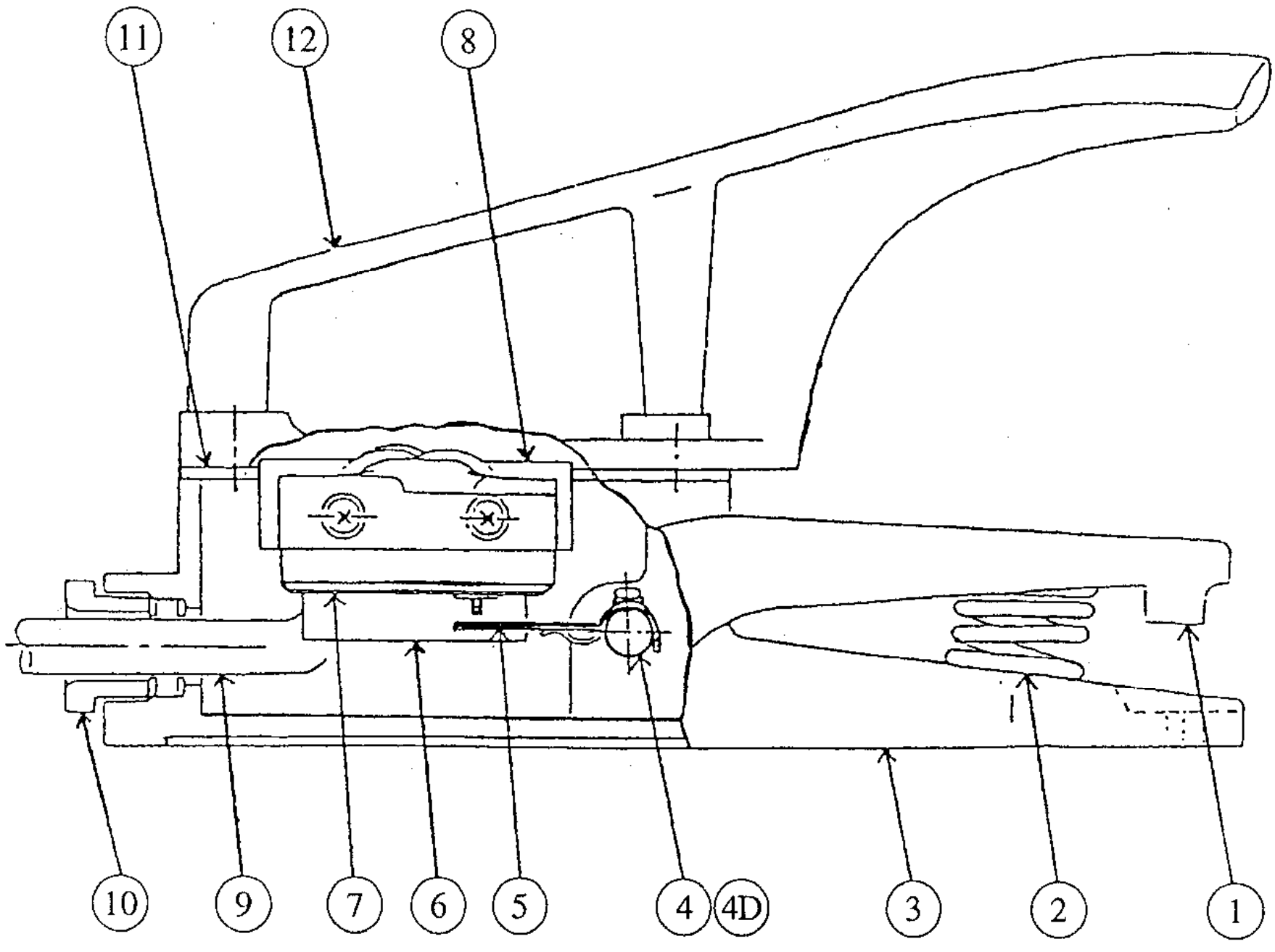
Rated voltage	DC 18~30
Preset angle	5 degrees
Output current	200 mA / DC 30v

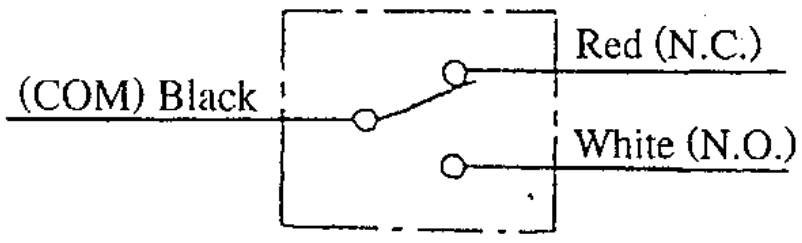




FOOT SWITCH

The foot switch is installed on the platform floor to stop the functions of Upper control levers and switches.
This will happen when the switch is not pressed down.

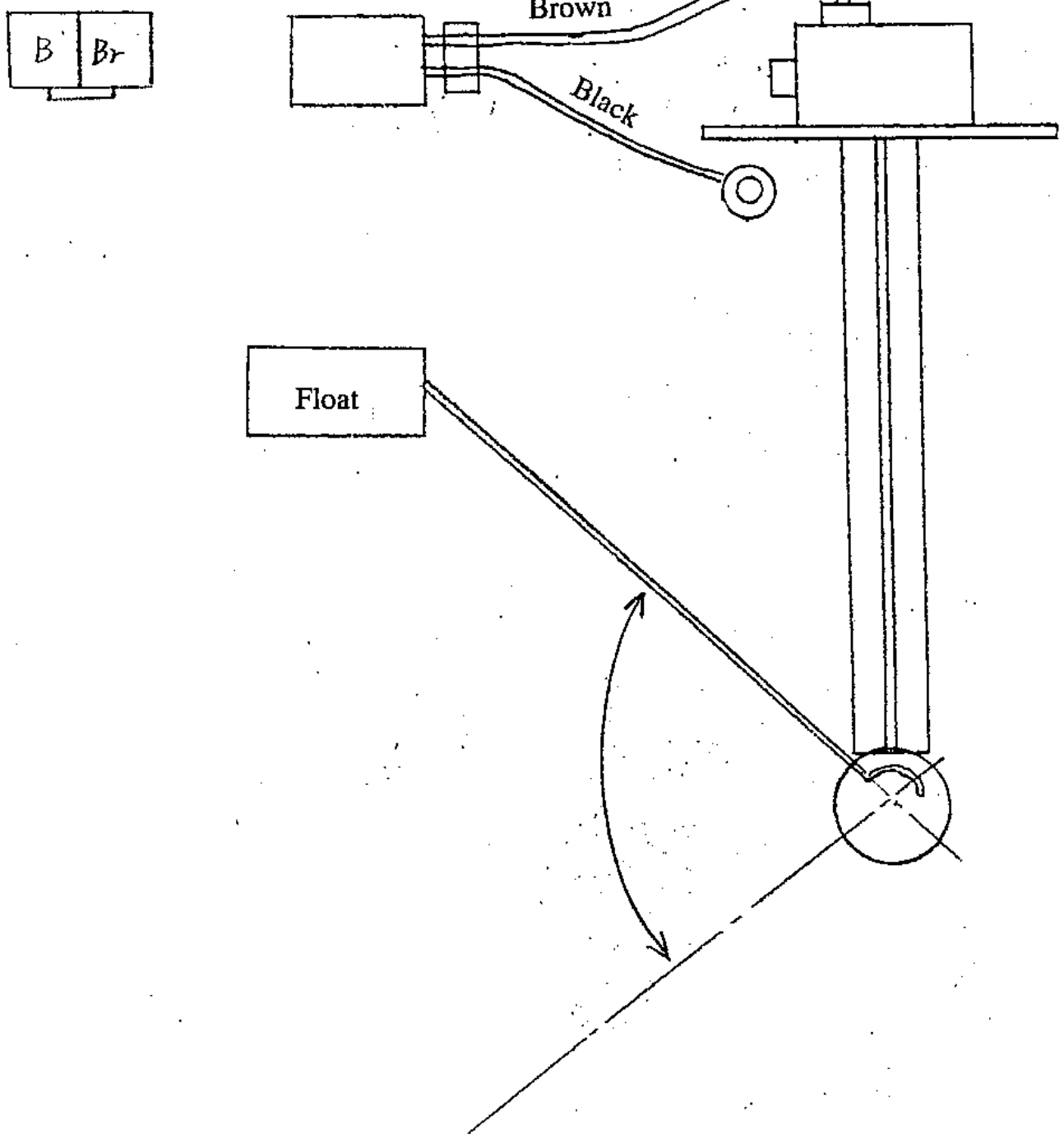


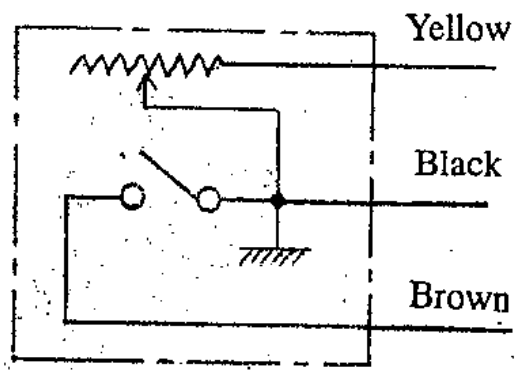


FUEL LEVEL SENSOR

R21-C0001

The sensor is installed in the"Fuel tank" and turn on the "Fuel warning LED", when the fuel level is low.

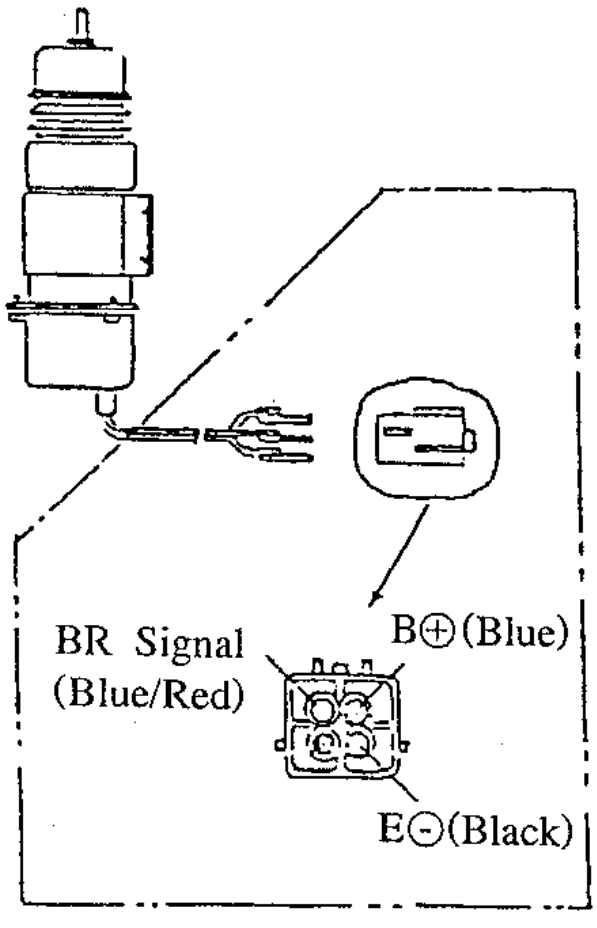




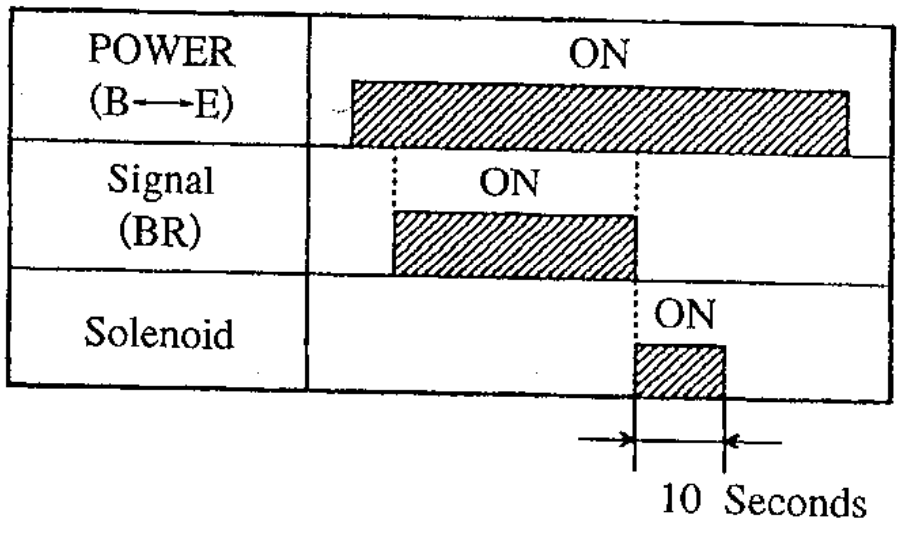
ELECTRIC COMPONENTS attached to Engine

1. Engine stop solenoid

Rated voltage	DC24V
Rated current	10A or less
Actuating time	10 seconds after switching off



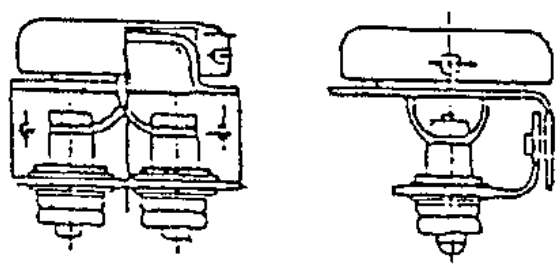
Function chart



The solenoid is switched on for about 10 seconds, when the power(+24V) applied on "Signal Line" is turned off, and switches off automatically after 10 seconds.

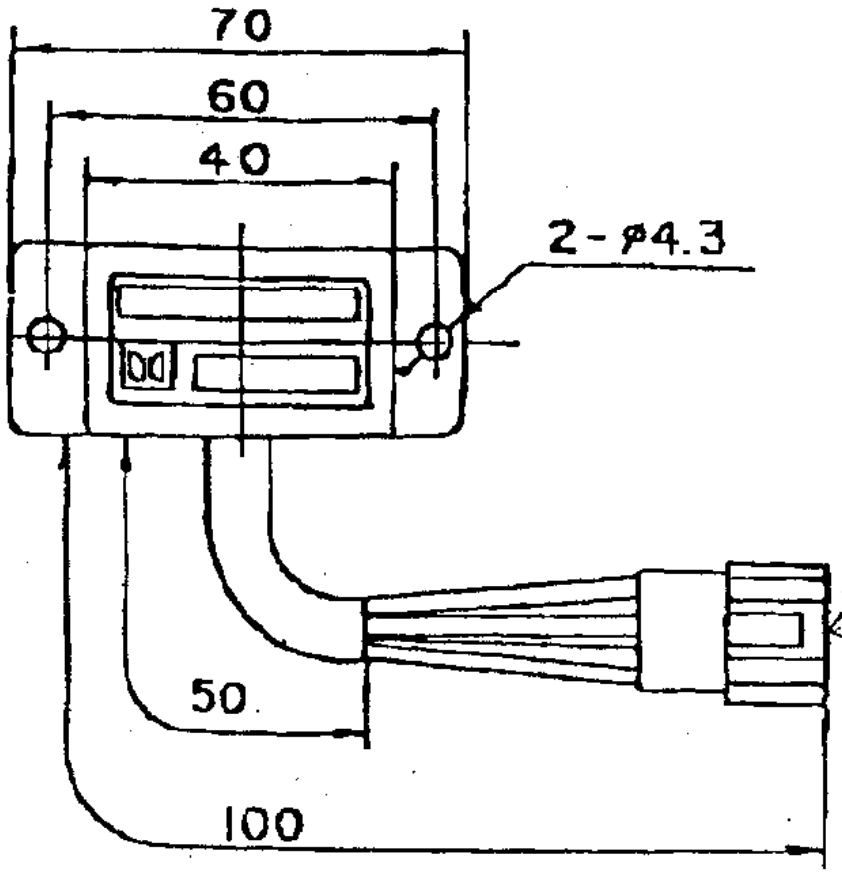
2. Glow indicator

Rated voltage	DC24V
Rated current	16.4A
Resistance	0.054Ω
Time reaches to 800℃	20~25 seconds



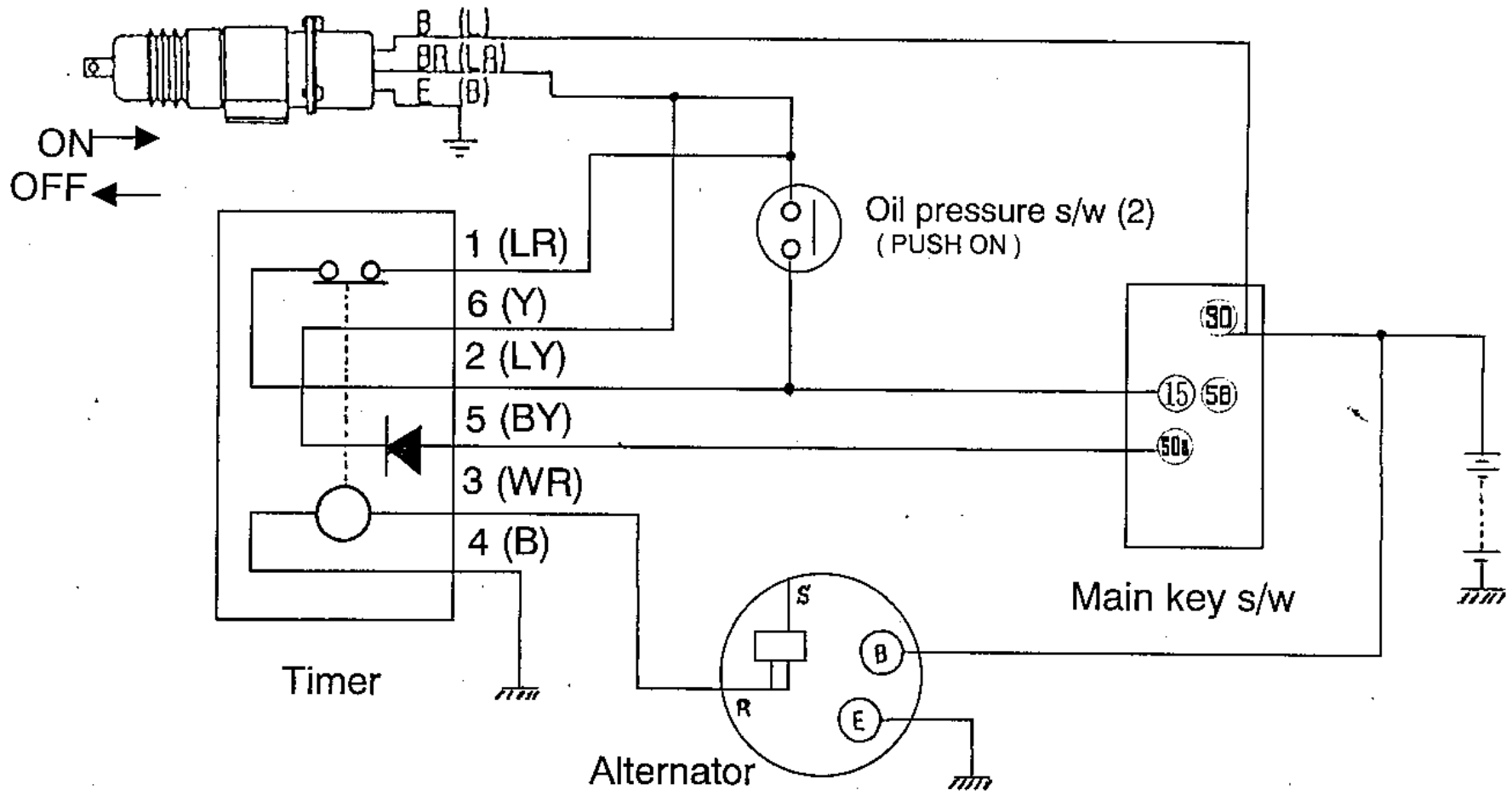
3. Timer

Rated voltage	DC 24 v
Delayed time	5 ± 2 sec (The relay contact opens in 5 ± 2 sec after 24 ± 1 v are applied to the terminal No.3.)
Contact load	0.5 Ampere
Weight	80 gram



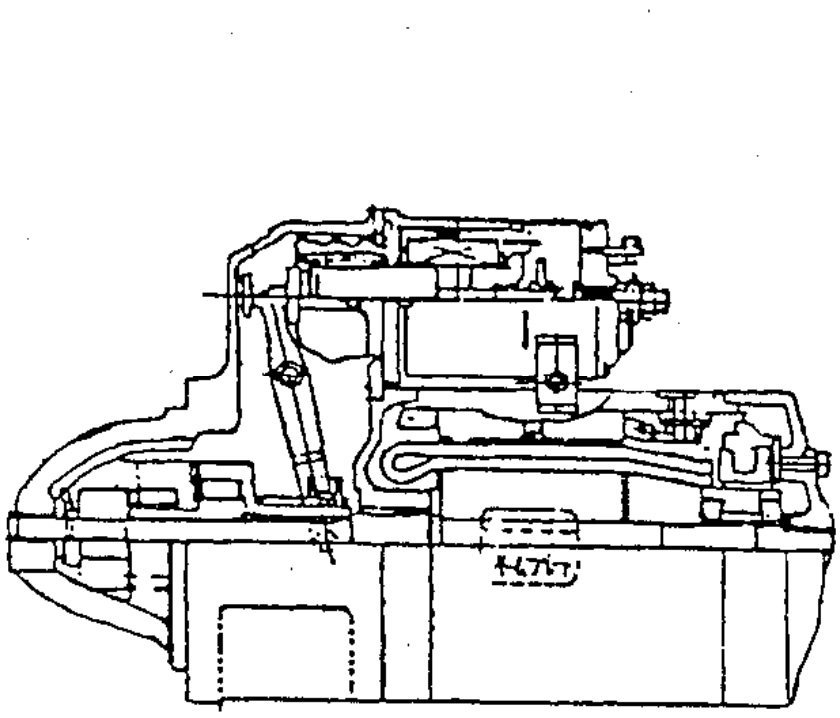
No.	Color code
1	Blue/red
2	Blue/yellow
3	White/red
4	Black
5	Black/yellow
6	Yellow

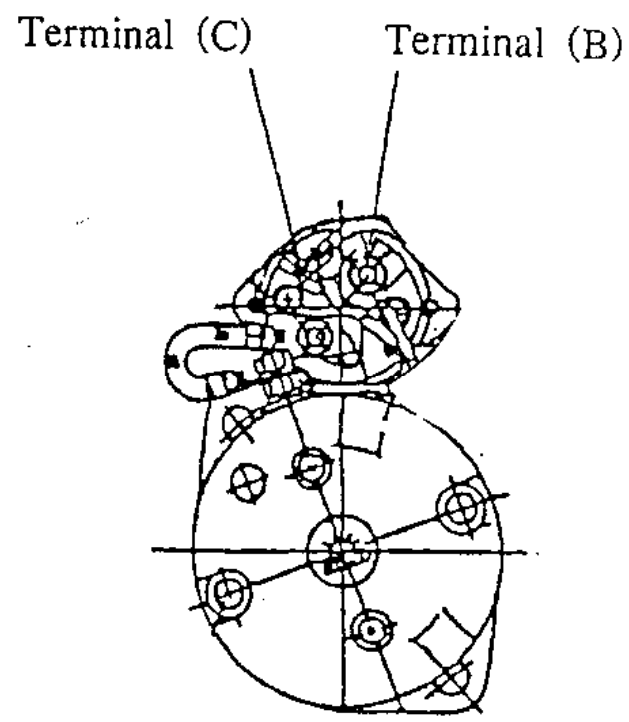
Engine stop solenoid

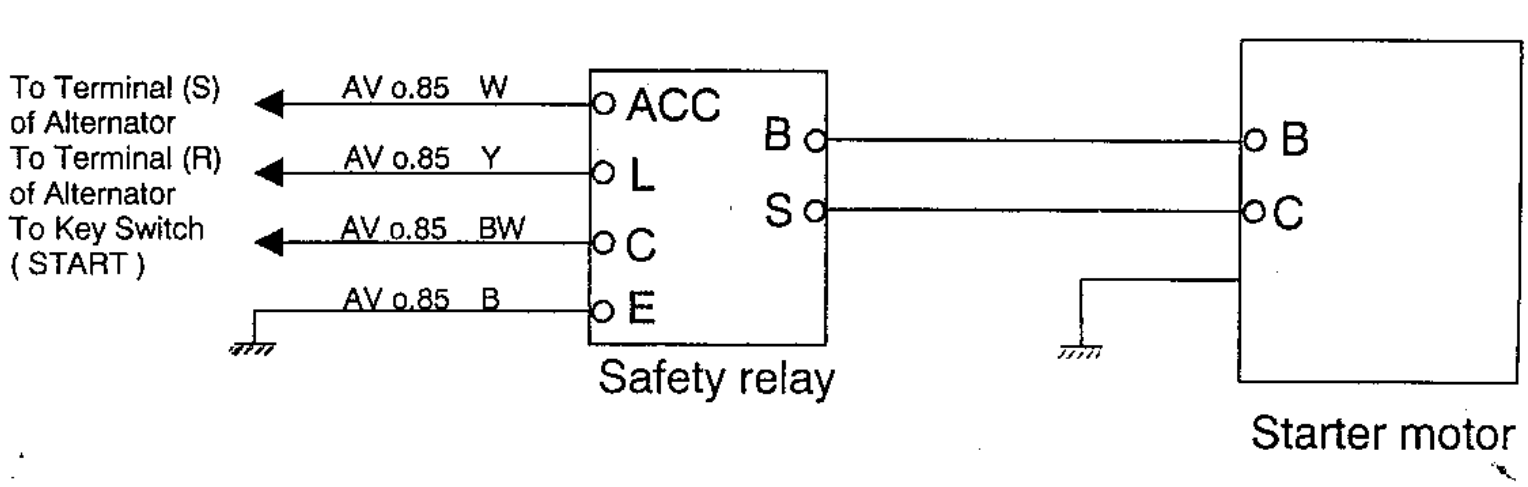


4. Starter motor

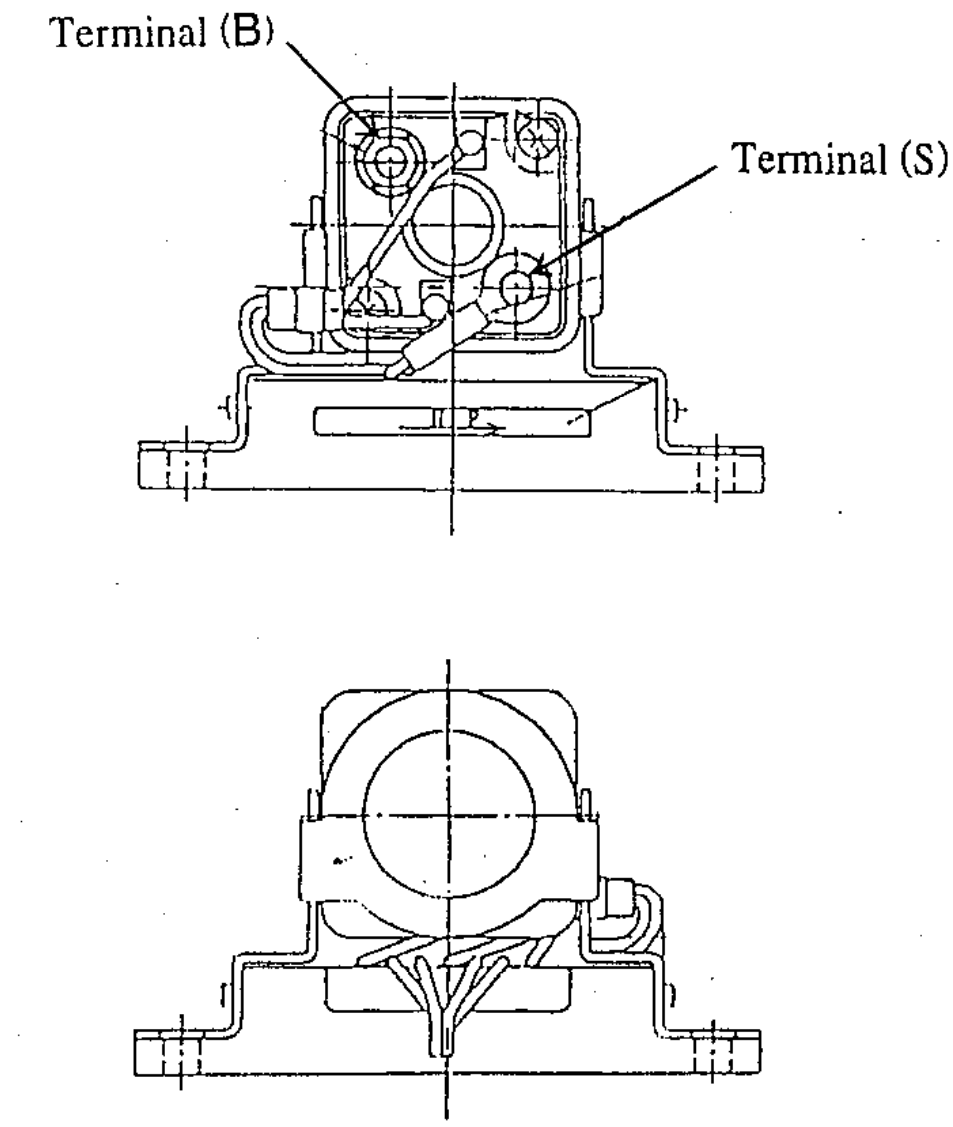
Rated voltage	DC24V
Rated output	3.5Kw

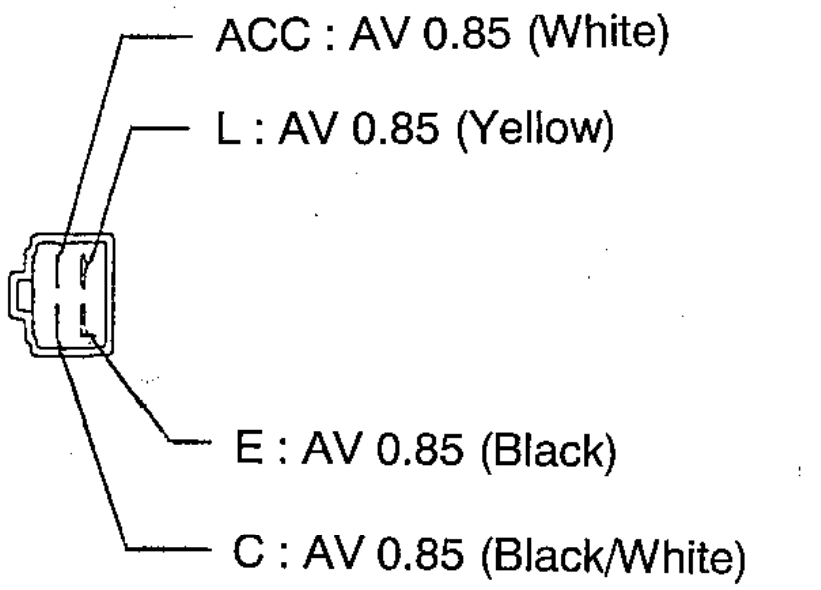


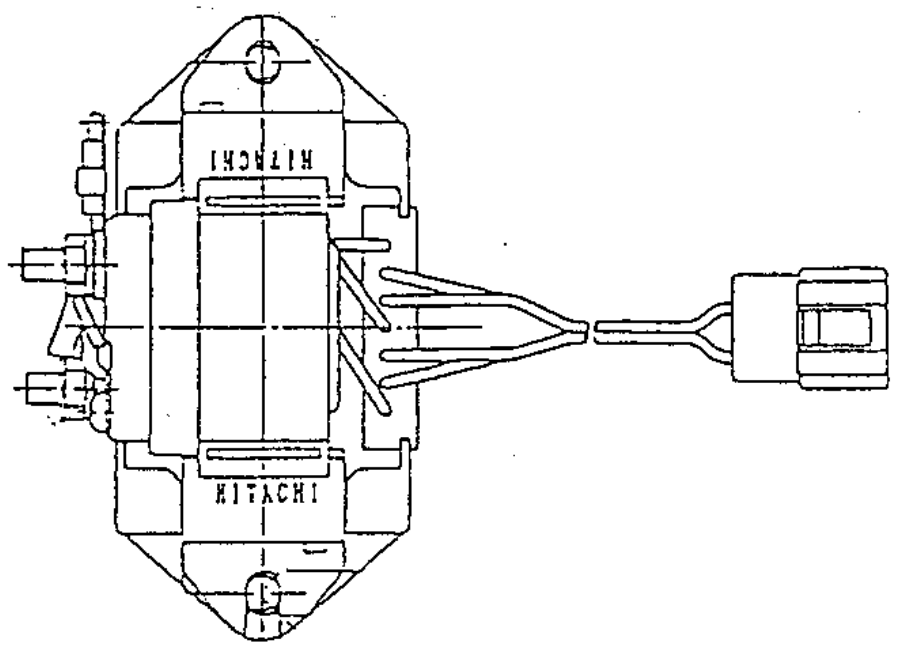


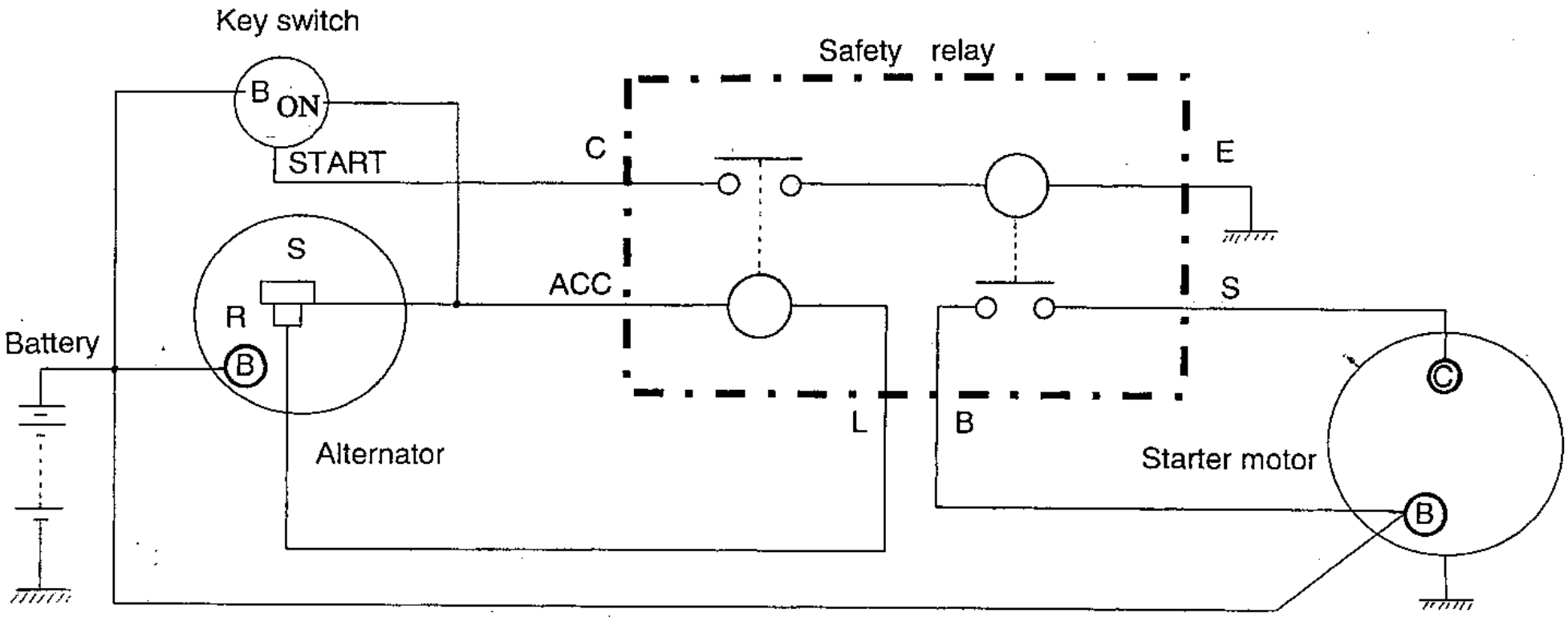


5. Safety relay



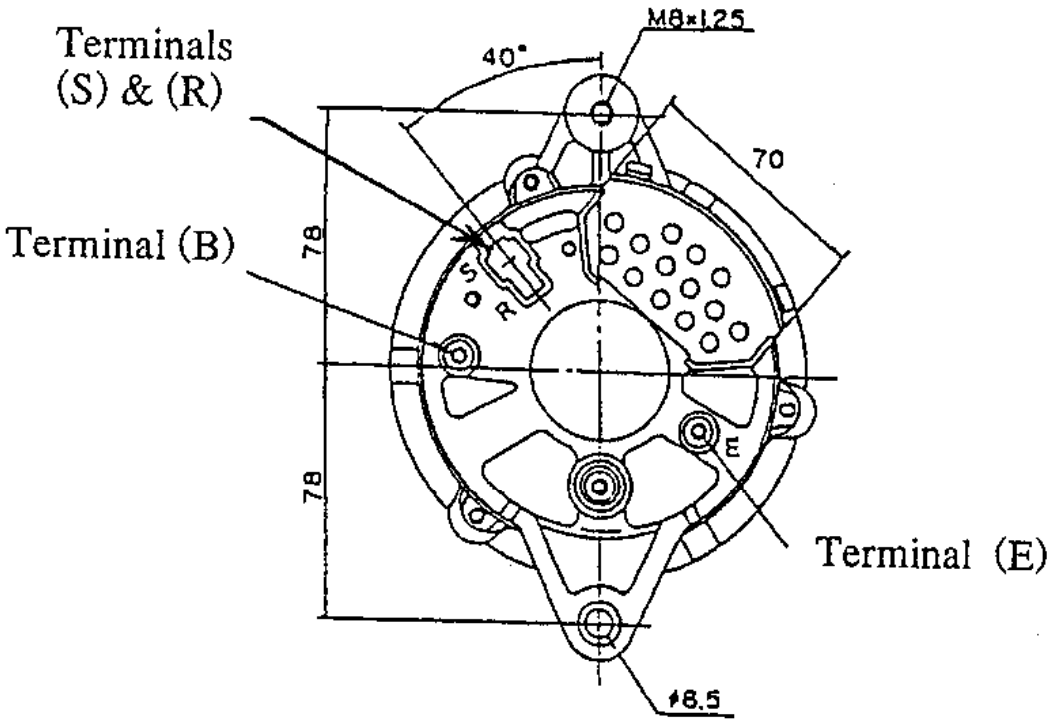


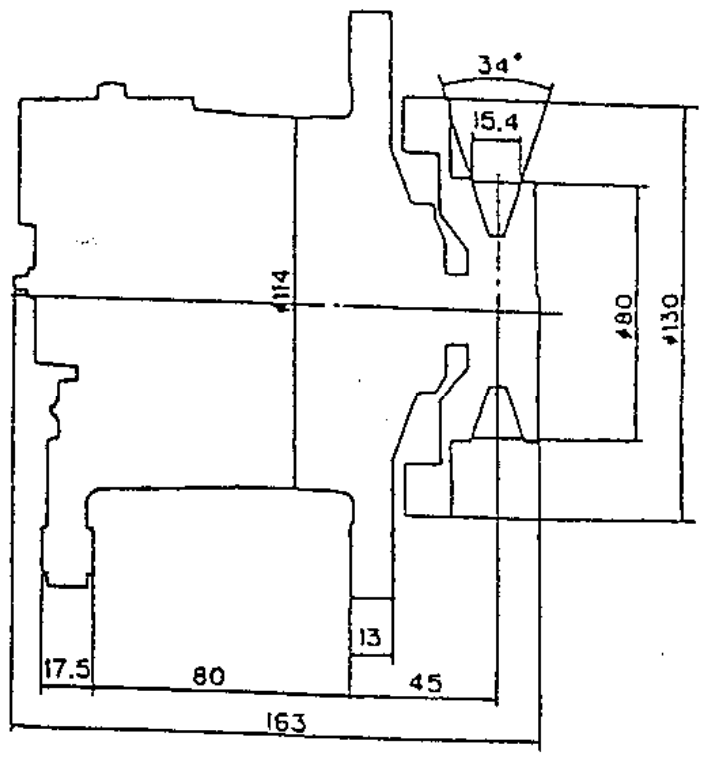


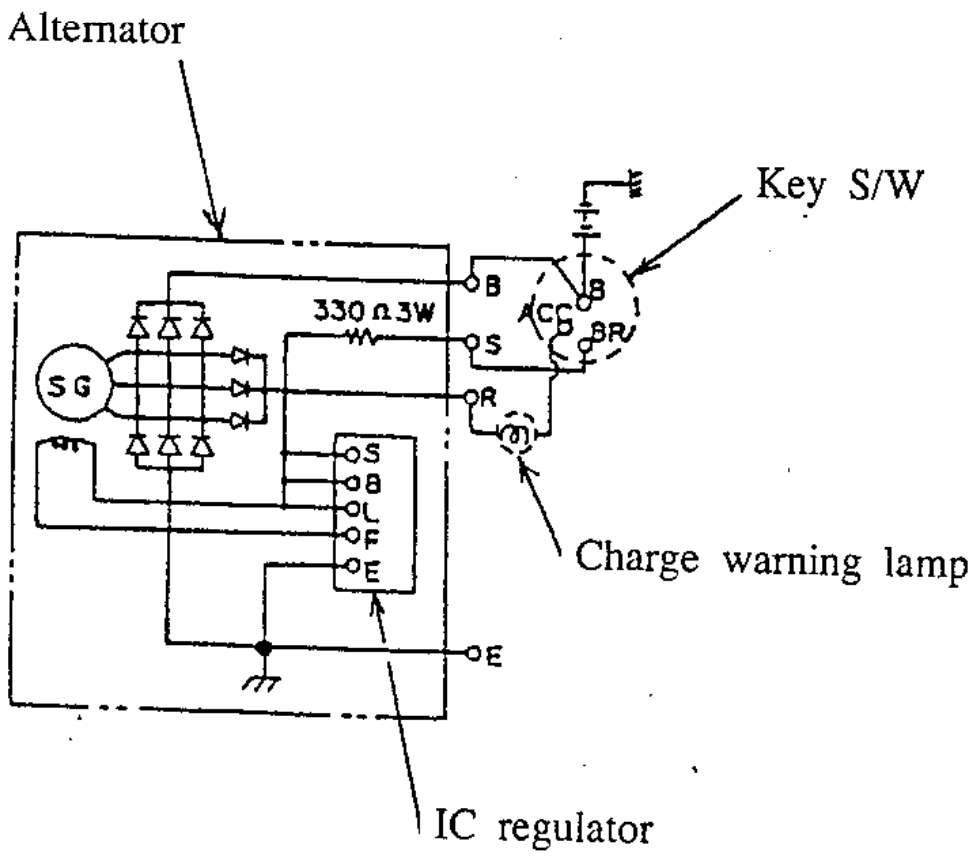


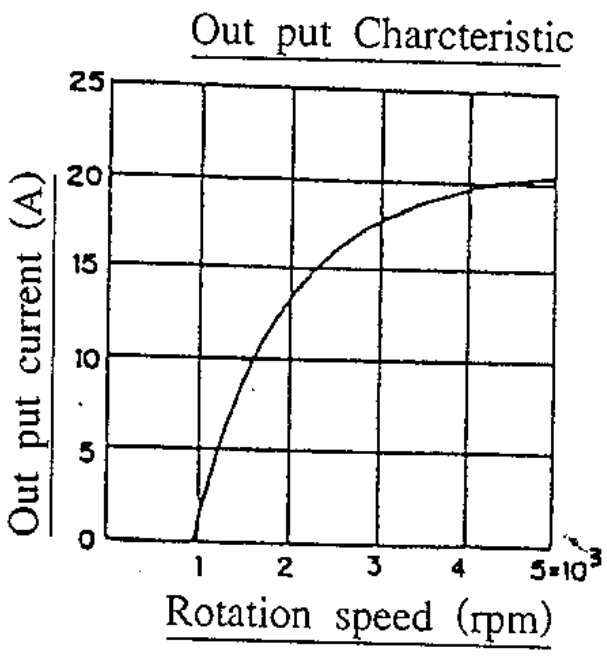
6. Alternator

Rated voltage	DC24V
Out-put current	20A



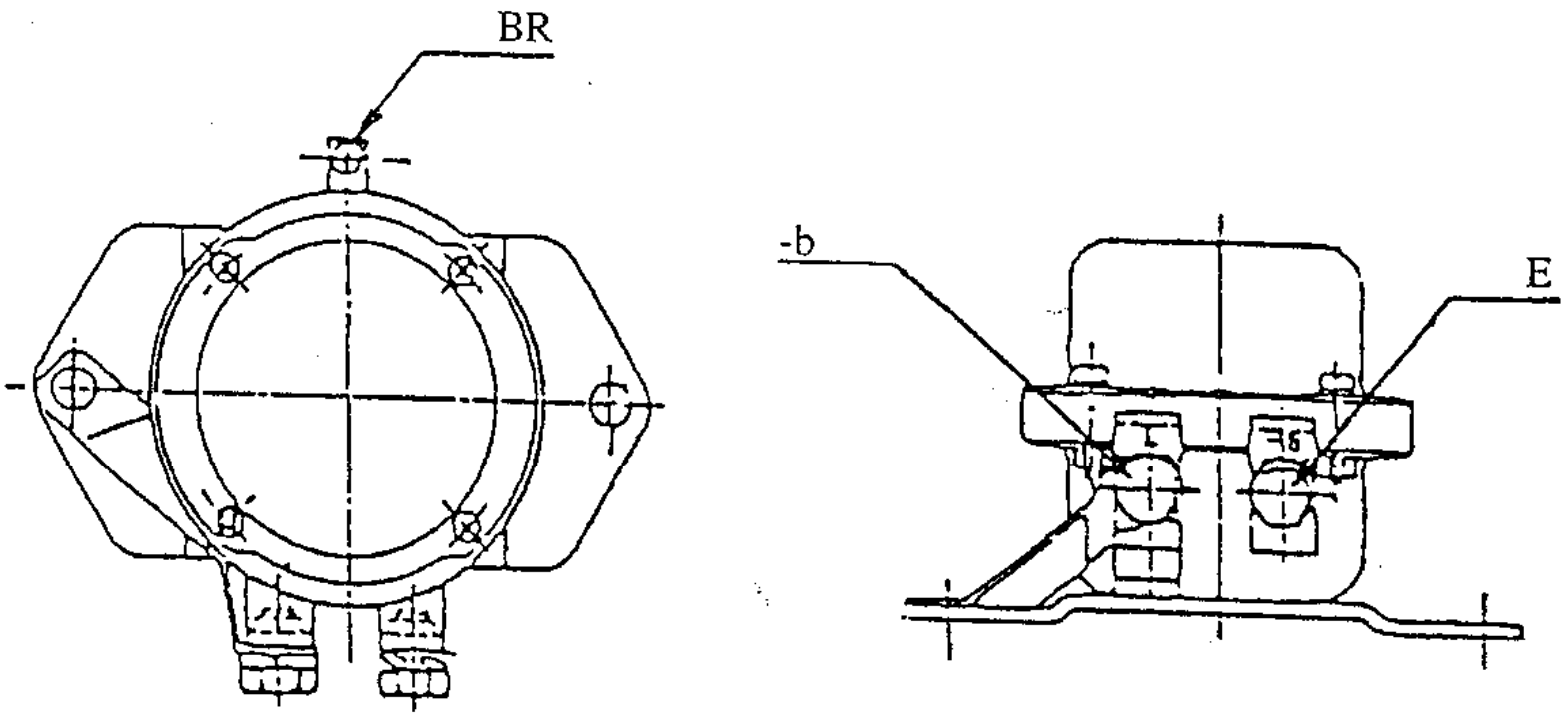


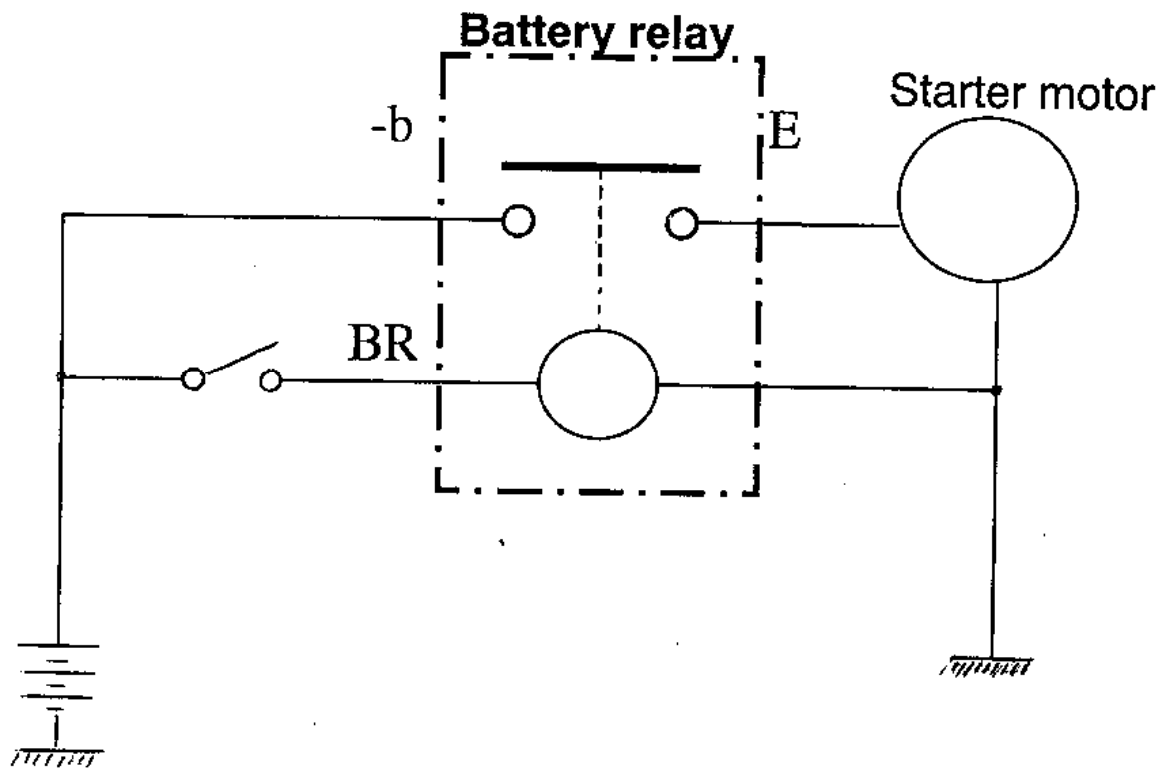




7. Battery relay

Rated voltage	DC24V
Rated current	100A(continuously), 1.000A(30 seconds)

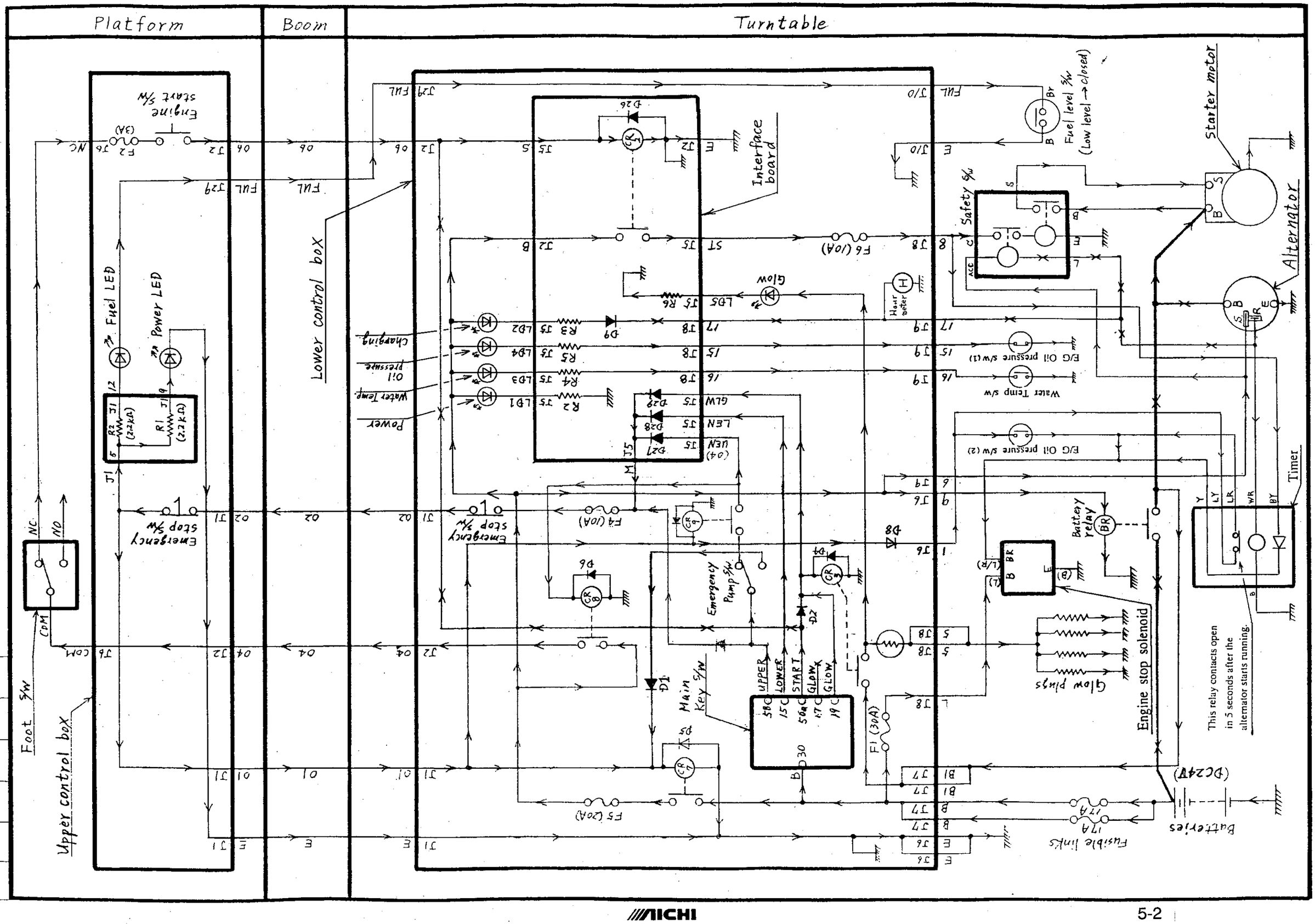




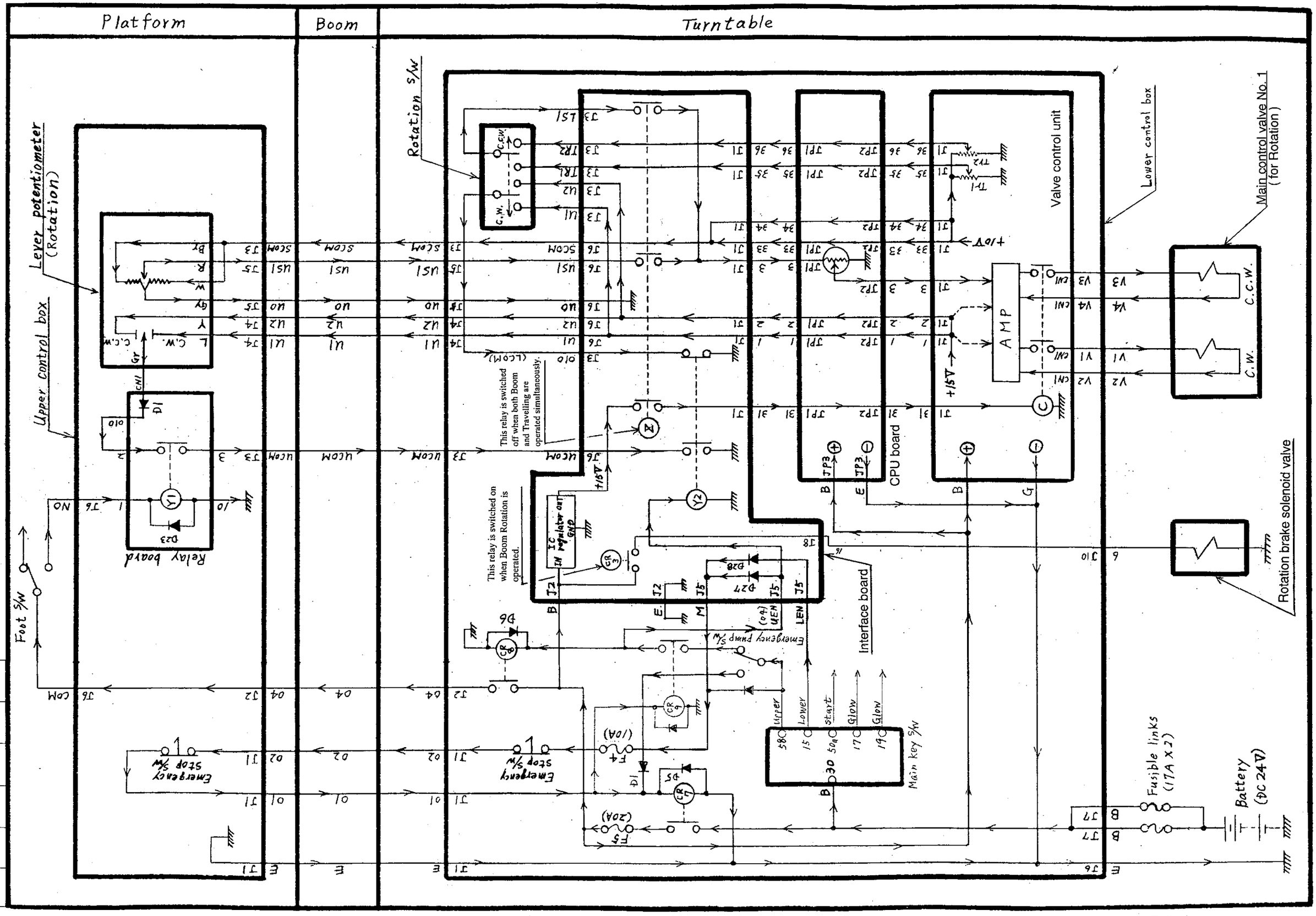
5

ELECTRIC CIRCUIT for INDIVIDUAL SYSTEM

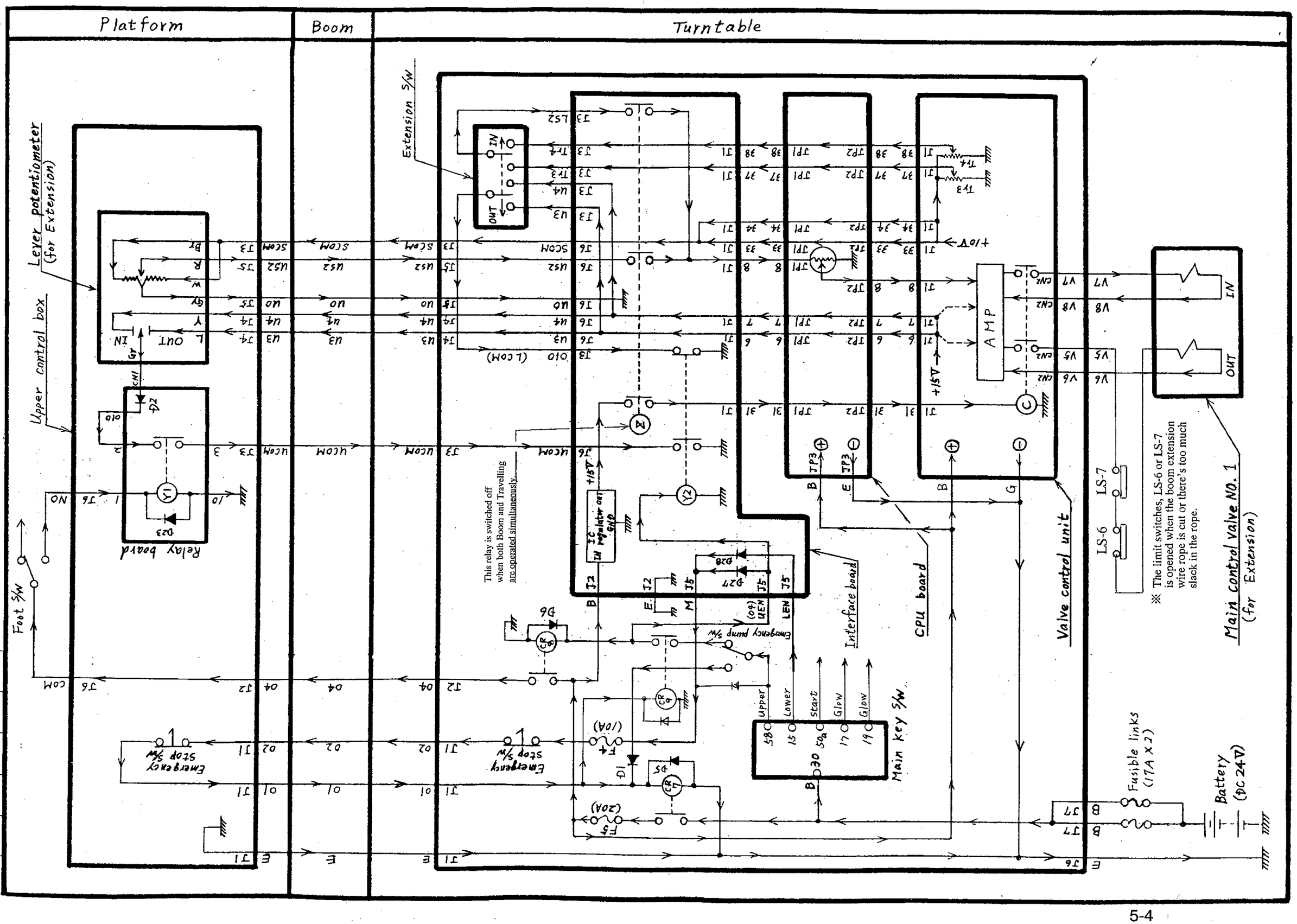
ENGINE CONTROL SYSTEM



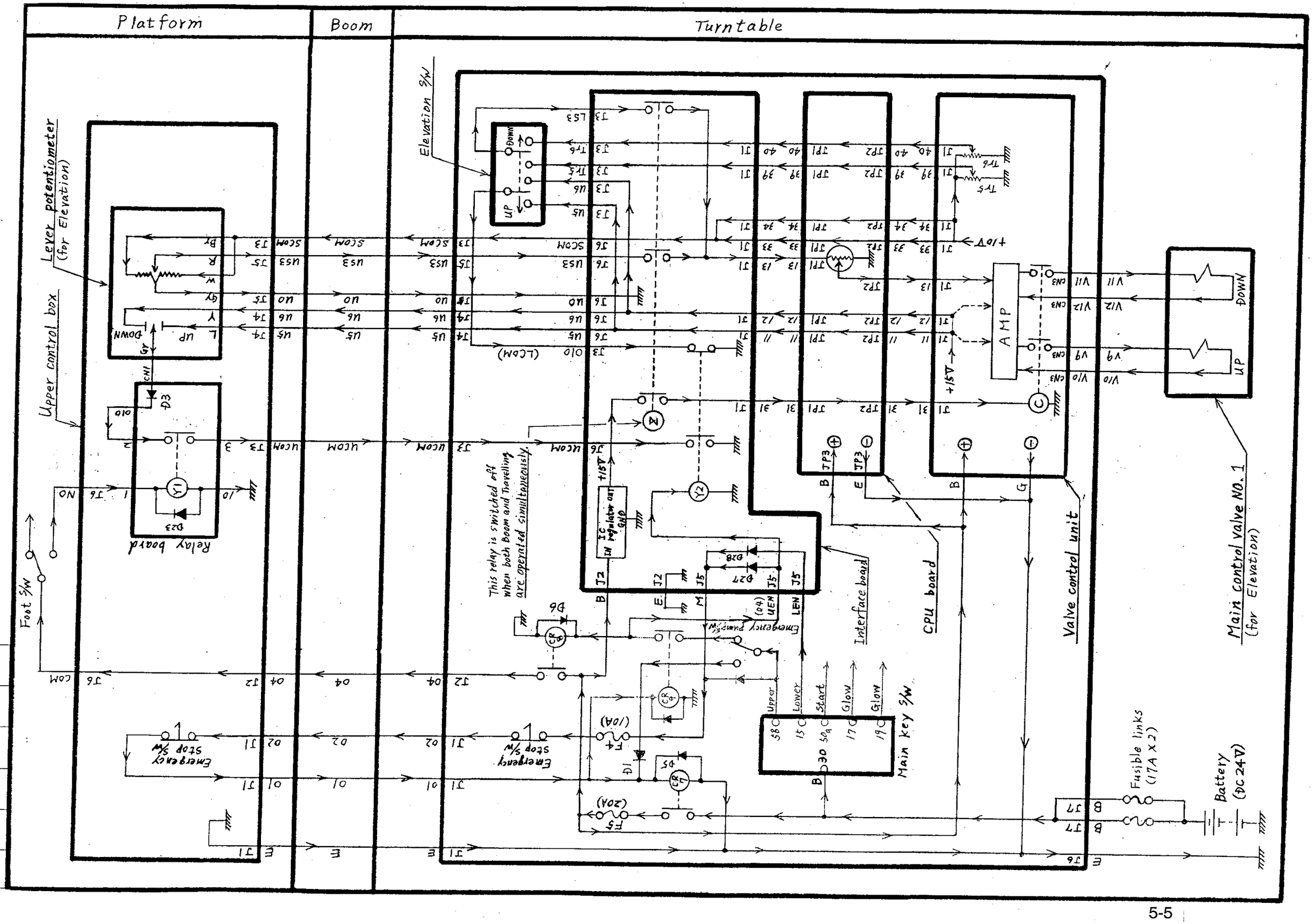
ROTATION SYSTEM



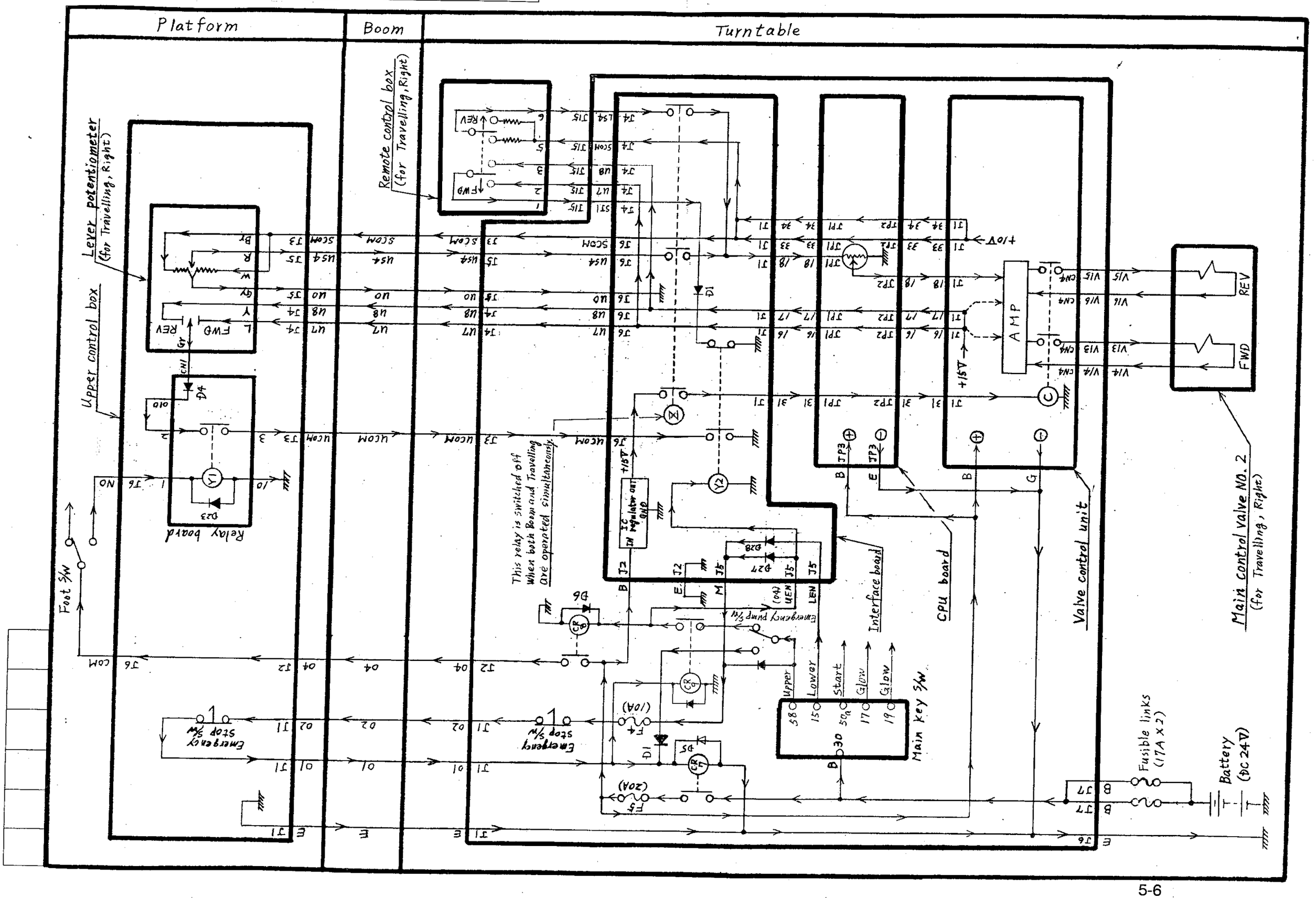
EXTENSION SYSTEM



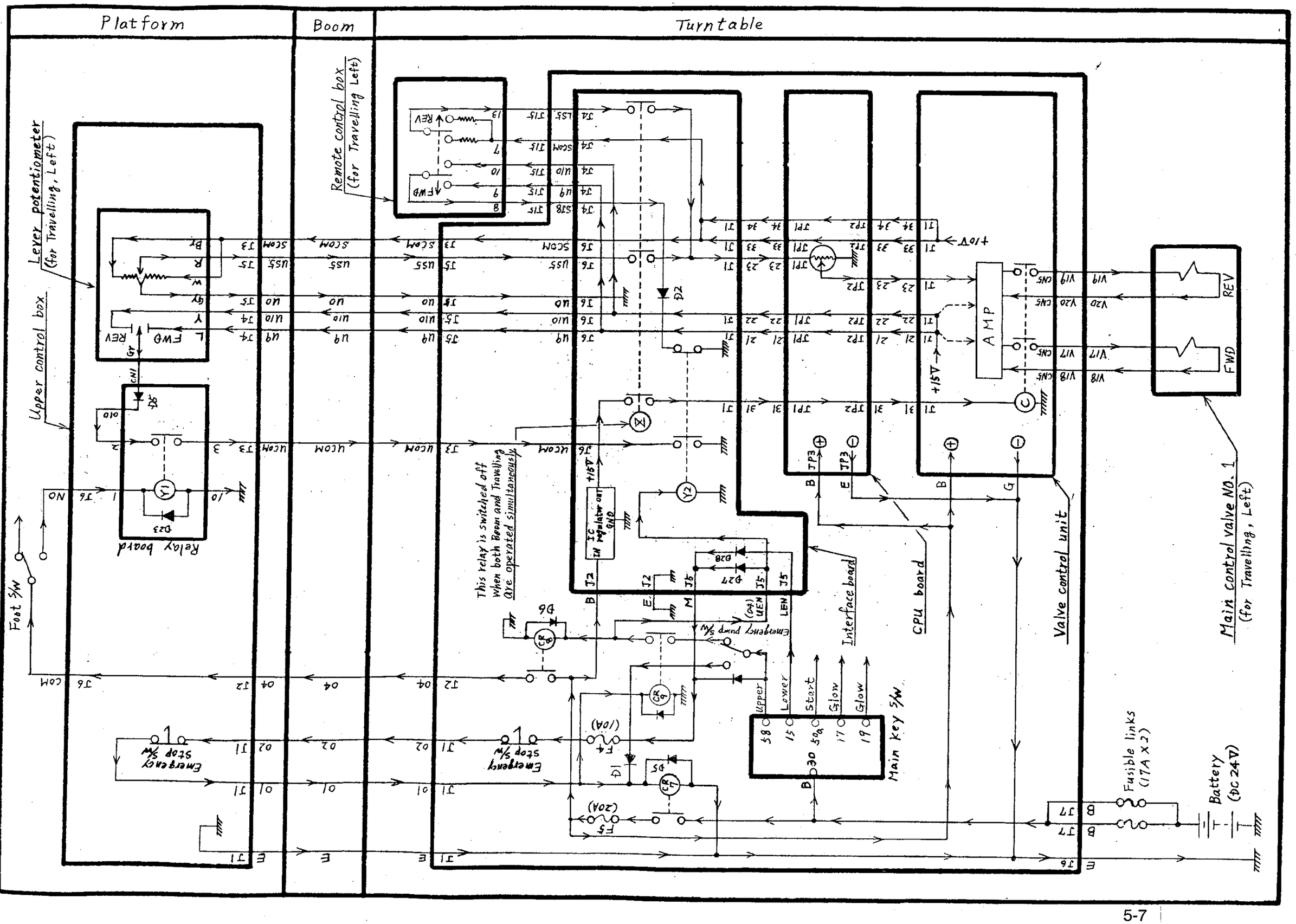
ELEVATION SYSTEM



TRAVEL (RIGHT) SYSTEM



TRAVEL (LEFT) SYSTEM



ACCELERATOR SYSTEM

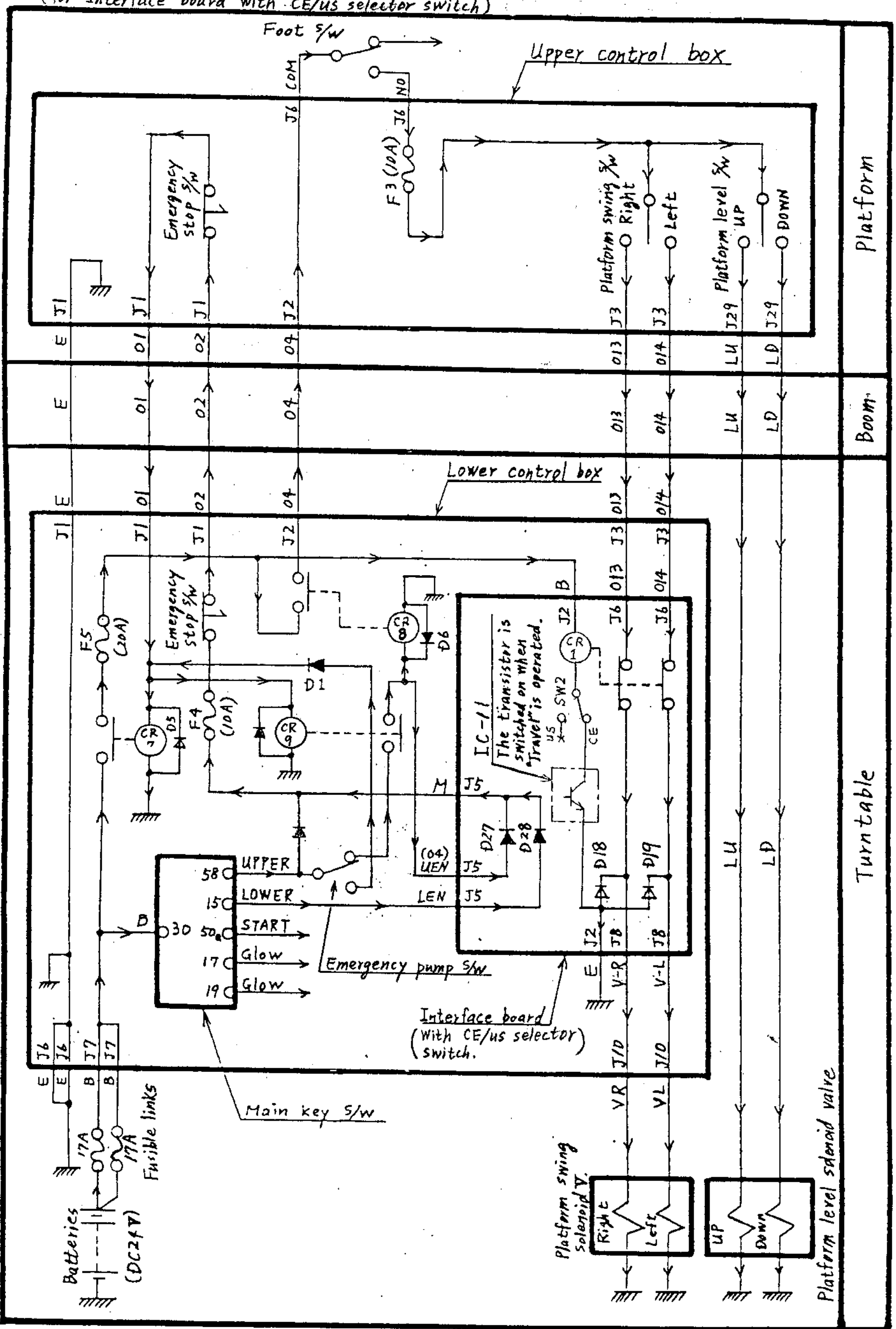
Platform | Boom | Turntable

※ The Tr1 and Tr2, ICs are switched on or off according to the various conditions as shown in the table below to control the engine speed to Low, Mid and High.
※ Both of the transistors (Tr1 & Tr2) are switched off and the engine speed stays Low, if either the engine oil pressure switch (1) or the water temp. switch is turned on.

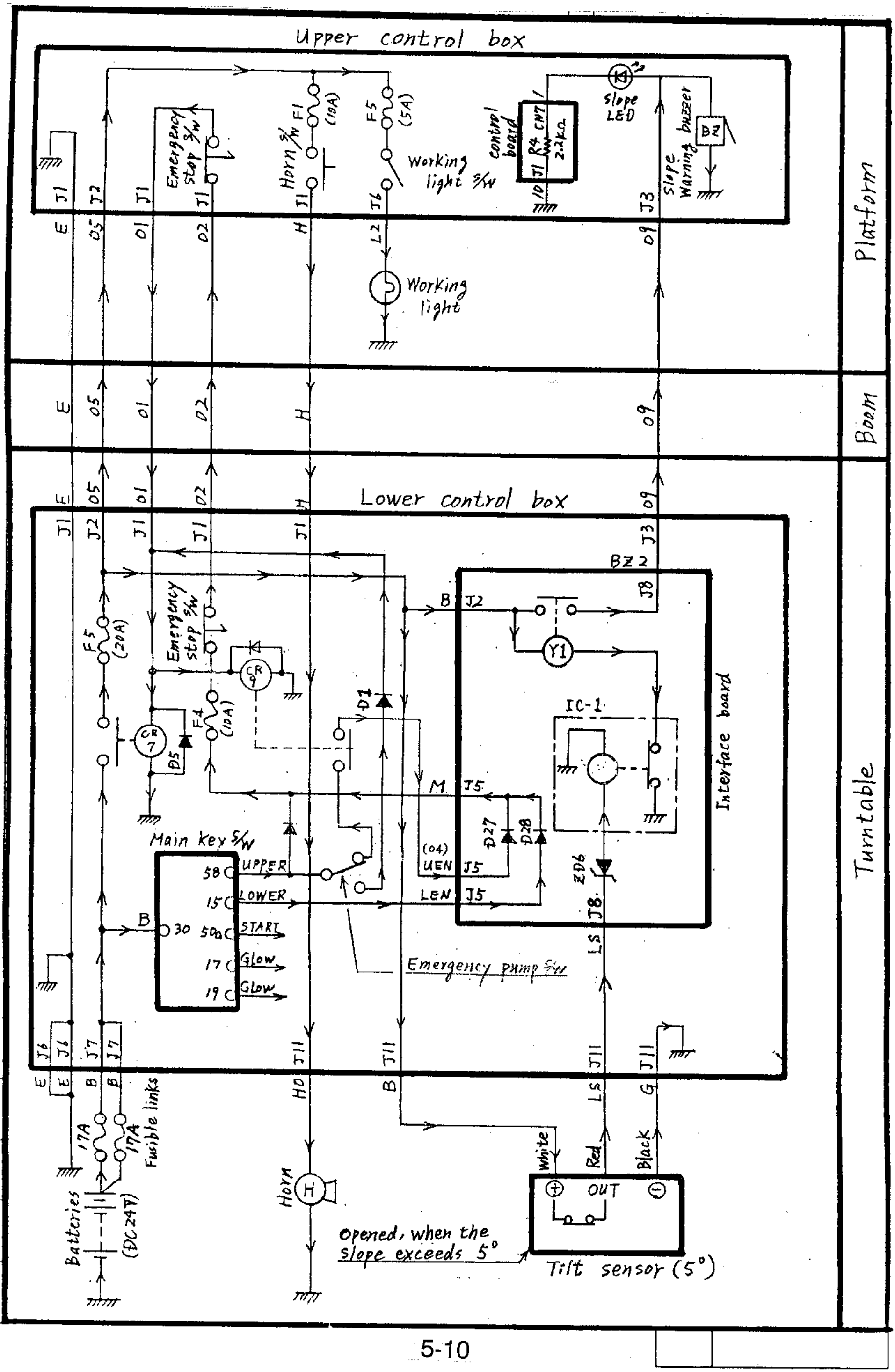
Position of accelerator switch	Status of boom	Operation performed	Tr 1	Tr 2	Engine speed
Low	Any status	Boom	Off	Off	Low
		Travel	Off	Off	Low
Auto/High	Any status	Boom	Off	On	Mid
	Boom angle : Under the horizontal (and) Boom length : Fully retracted	Travel	On	On	High
	Boom angle : Over the horizontal (or) Boom length : Extended	Travel	Off	Off	Low

PLATFORM ROTATION & PLATFORM LEVEL SYSTEM

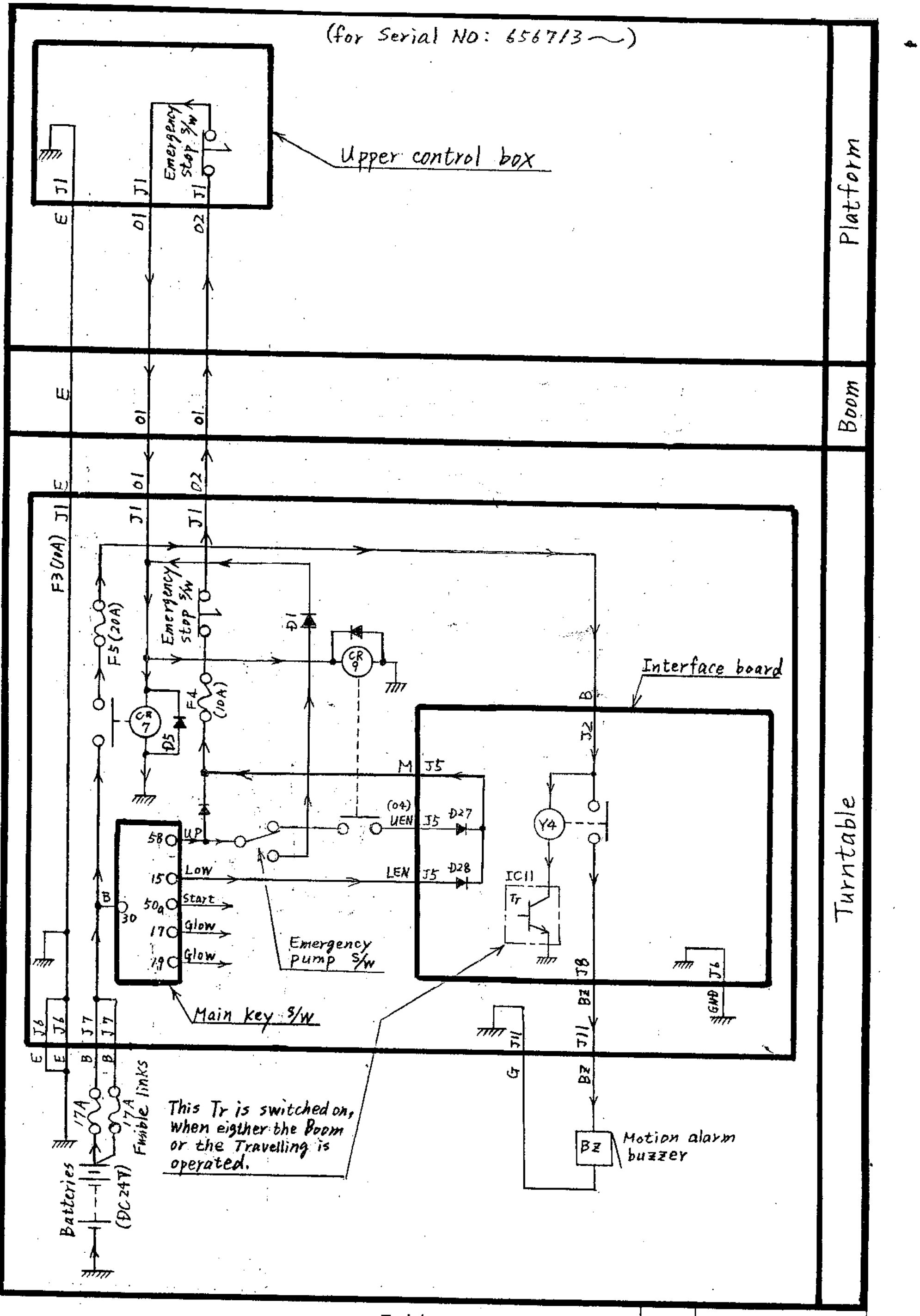
(for Interface board with CE/US selector switch)



TILT WARNING, HORN & WORKING LIGHT SYSTEM

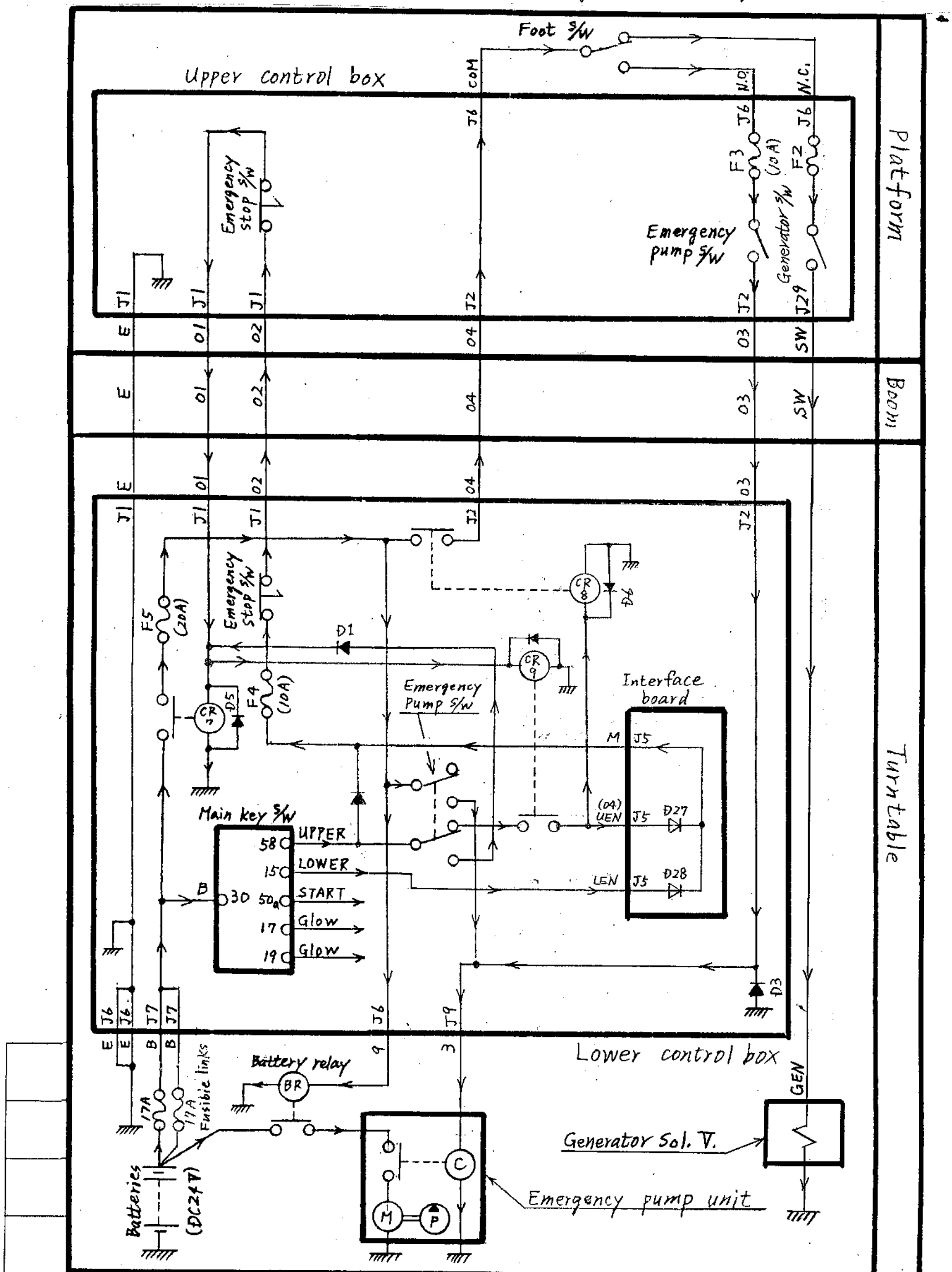


MOTION ALARM SYSTEM



EMERGENCY PUMP SYSTEM

Optional Hydraulic generator (USA only)



6

ADJUSTMENT SECTION

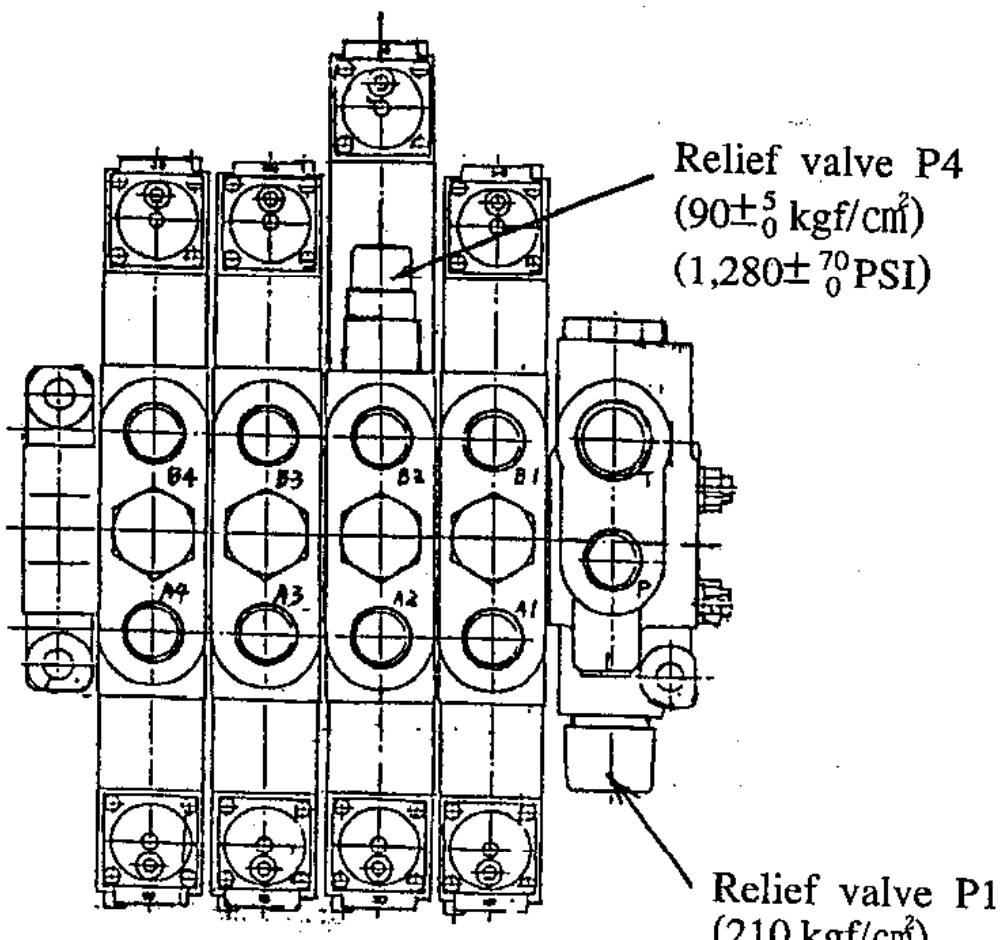
RELIEF VALVE P1 and P4

Adjust the "Preset pressure" of "Relief valves P1 and P4" installed on the "Main control valve No.1" as follws.

Preset pressure

Relief valve P1 ---------- $210 \pm {}^{5}_{0}$ kgf/cm² ($3{,}000 \pm {}^{70}_{0}$PSI)

Relief valve P4 ---------- $90 \pm {}^{5}_{0}$ kgf/cm² ($1{,}280 \pm {}^{70}_{0}$PSI)



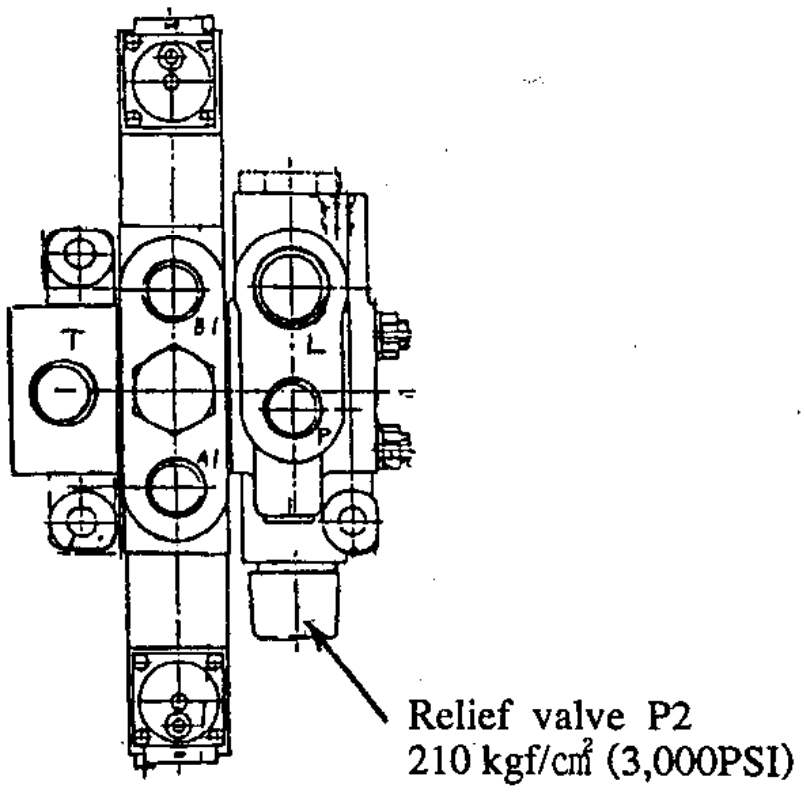
Main control valve NO.1

1. Remove the plug on "Pressure test port" installed on the out - let line of "Pump NO.1", and set a "Pressure gauge" onto the pressure test port.
2. Start engine, retract boom fully, and hold the "Extension switch" at "IN" to actuate "Relief valve P1".
3. Read the pressure gauge while "Relief valve P1" is active, and adjust the pressure to $210 \pm {}^{5}_{0}$kgf/cm² ($3{,}000 \pm {}^{70}_{0}$PSI) by turning "Adjust screw of "Relief valve P1".
4. Extend boom fully, and hold the "Extension switch" at "OUT" to actuate "Relief valve P4"
5. Read the pressure gauge while "Relief valve P4" is active, and adjust the pressure to $90 \pm {}^{5}_{0}$kgf/cm² ($1{,}280 \pm {}^{70}_{0}$PSI) by turning "Adjust screw of "Relief valve P4".

RELIEF VALVE P2

To adjust the "Preset pressure" of Relief valve P2 installed on the Main control valve No.2, take the following steps.

Preset pressure·····210^{+5}_{0} kgf/cm² ($3,000^{+70}_{0}$ PSI)



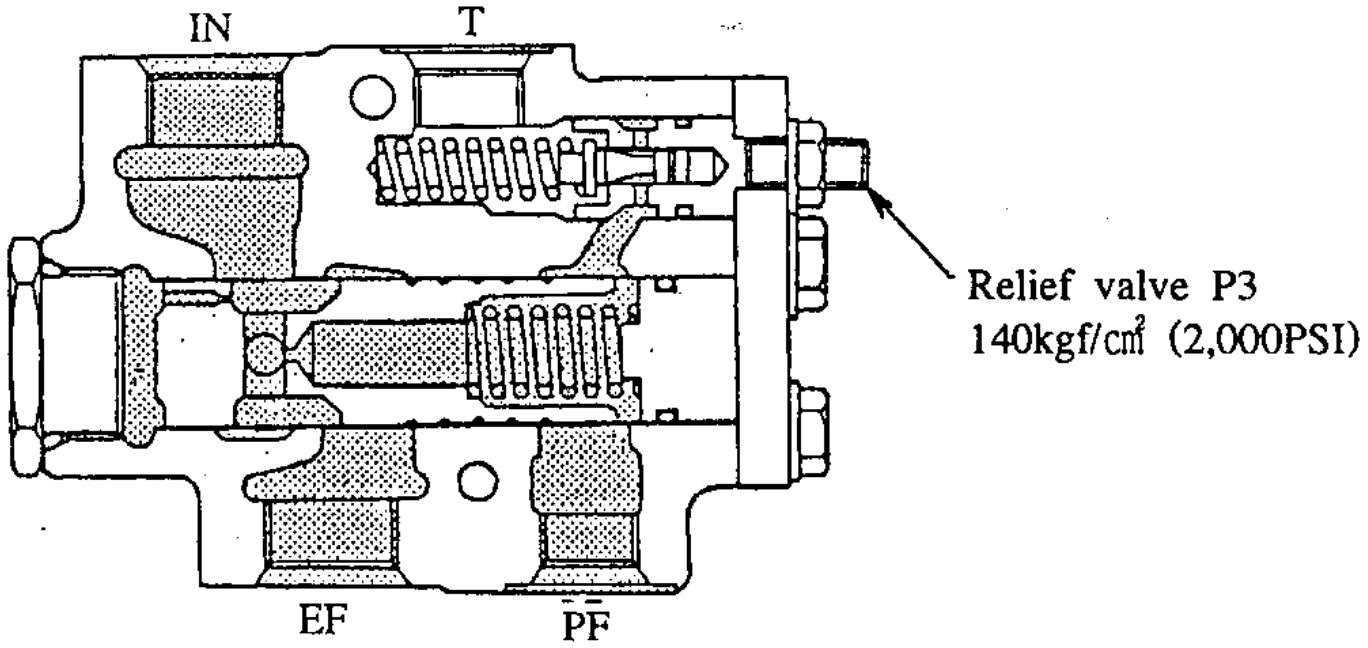
Main control valve NO.2

1. Remove the plug from the Pressure test port installed on the out - let line of Pump NO.2, and set a Pressure gauge onto the pressure test port.
2. Start engine, and insert something such as a Steel shaft between Drive sproket and the Track links on the right side travel motor to stop the rotation of travel motor.
3. Perform Travelling (Right) operation and actuate the Relief valve P2.
4. Read the pressure gauge while the Relief valve P2 is active, and adjust the pressure to 210^{+5}_{0} kgf/cm² ($3,000^{+70}_{0}$ PSI) by turning the adjustment screw of Relief valve P2.

RELIEF VALVE P3

To adjust the Preset pressure of Relief valve P3 installed on the Priority valve, take the following steps.

Preset pressure·····140^{+5}_{0} kgf/cm² ($2,000^{+70}_{0}$ PSI)



Priority valve

1. Remove the plug from the Pressure test port installed on the out - let line of Pump NO.2, and set a Pressure gauge onto the pressure test port.
2. Start engine, swing the Platform fully to the "Right", and hold the Platform swing switch at "Right" to actuate the Relief valve P3.
3. Read the Pressure gauge while Relief valve P3 is active, and adjust the pressure to 140^{+5}_{0} kgf/cm² ($2,000^{+70}_{0}$ PSI) by turning the Adjustment screw of Relief valve P3.

OPERATIONAL SPEED

The adjustment of the operational speed is to be carried out under the conditions listed below and by referring to the clauses of "Measurement of operational speed", "Adjustment of valve control unit" and "Adjustment of CPU board" shown in the following pages.

1. Set the machine on firm level ground.

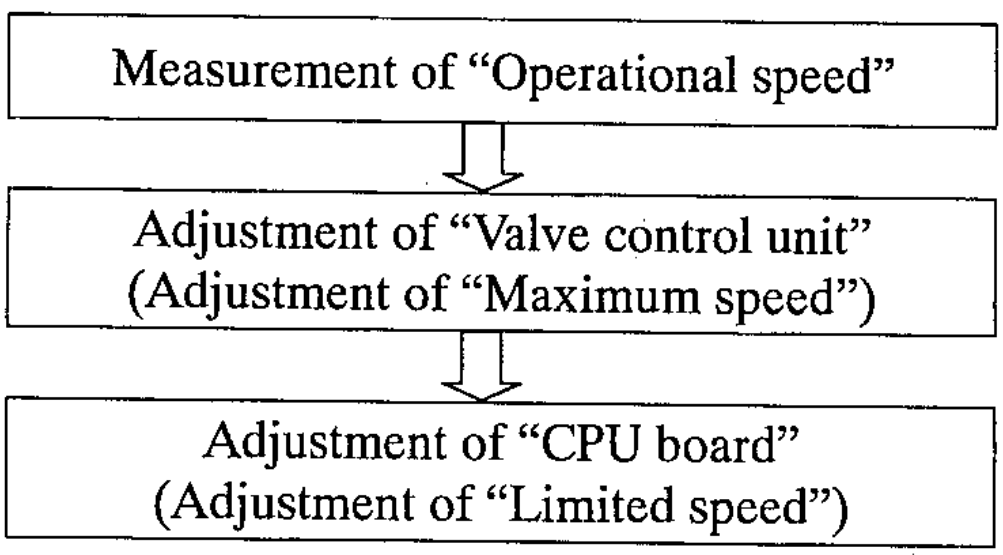
2. Platform load : No load or One operator.

3. Engine speed : Low (Idling).....1,200 $^{+50}_{-0}$ rpm

Mid ..... 1,800 $^{+0}_{-50}$ rpm

High .....2,300 $^{+50}_{-0}$ rpm

4. Adjust the speed in the sequence listed below.



1. Measurement procedures of Maximum Operational Speed

	Item		Specific Max. Speed	Measurement procedures	Remarks
Maximum speed	Rotation	C.W.	75± 8sec / 1turn	Rotate the turn table by 1 full turn with the "Minimum boom length" and the "Maximum boom angle", and measure the rotation speed (seconds / 1 turn).	
		C.C.W.			
	Extension	OUT	45± 7sec / stroke	Extend / Retract the boom for its full stroke with the "Maximum boom angle", and measure the "OUT" and "IN" speed (seconds / stroke).	
		IN	40± 6sec / stroke		
	Elevation	UP	50± 8sec / stroke	Raise / Lower the boom for its full stroke with the "Minimum boon length", and measure the "UP" and "DOWN" speed (seconds / stroke).	
		DOWN	55± 8sec / stroke		
	Travelling	FWD	15 $^{+3}_{-0}$ sec/10 m (14 $^{+3}_{-0}$ sec/10 yards)	Travel "Foward" and "Reverse" by exactly 10 meters with the "Minimum boom length" and the "Boom angle: 0° or less", and measure the "FWD" and "REV" speed (seconds / 10m).	
		REV			
		Pivot turn	18± 2sec / 90°	Perform "Pivot " and "Spin" turn by 90° with the "Minimum boom length" and the "Boom angle: 0° or less", and measure the "Pivot" and "Spin" turn speed (seconds / 90°).	
		Spin turn			
Limited speed	Rotation	C.W.	50± 10sec / 45°	Rotate the turn-table by 45° with the "Boom angle: horizontal" and the "Maximum boom length", and measure the rotation speed (seconds / 45°).	
		C.C.W.			
	Elevation	UP	75± 15sec / stroke	Raise / Lower the boom for its full stroke with the "Maximum boom length", and measure the "UP" and "DOWN" speed (seconds / stroke).	
		DOWN			
	Travelling	FWD	30± 5sec / 5 m (27±4.5sec / 5 yards)	Travel "Foward" and "Reverse" by exactly 5m with the "Boom angle: horizontal" and the "Maximum boom length", and measure the "FWD" and "REV" speed (seconds / 5m).	
		REV			
		Pivot turn	50± 10 sec/ 90°	Perform "Pivot" and "Spin" turn by 90° with the "Boom angle: under horizontal" and the "Maximum boom length", and measure the "Pivot" and "Spin" turn speed (seconds /90°).	
		Spin turn			

Caution :

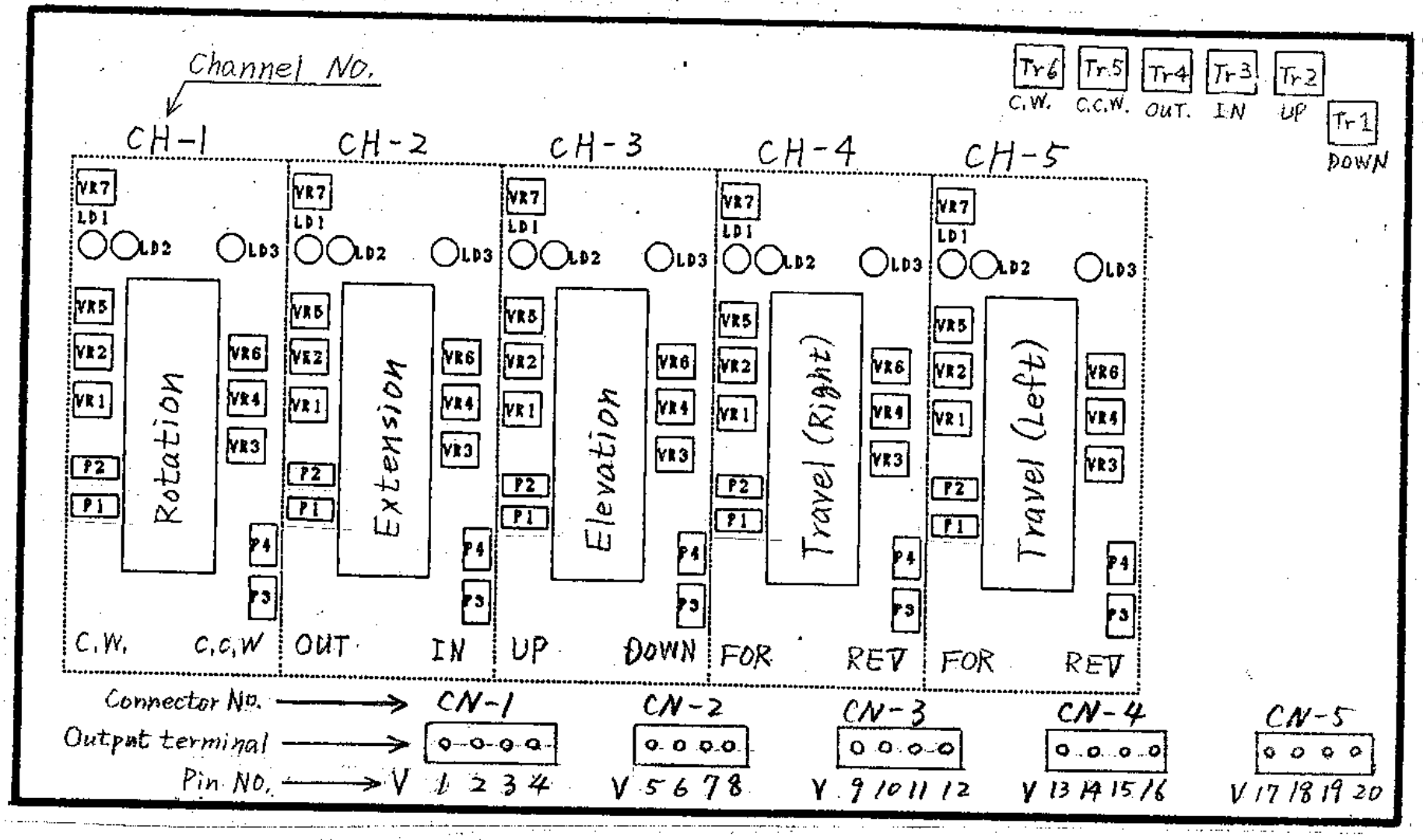
1. The operational speeds obtained by operating "Upper" and "Lower" controls are the same value.
2. Set the "Accelerator switch" to "Auto position" for boom and "High position" for travel speed.
3. Operate each "Control lever" fully to its stroke end at "Upper" control when measuring the speed.

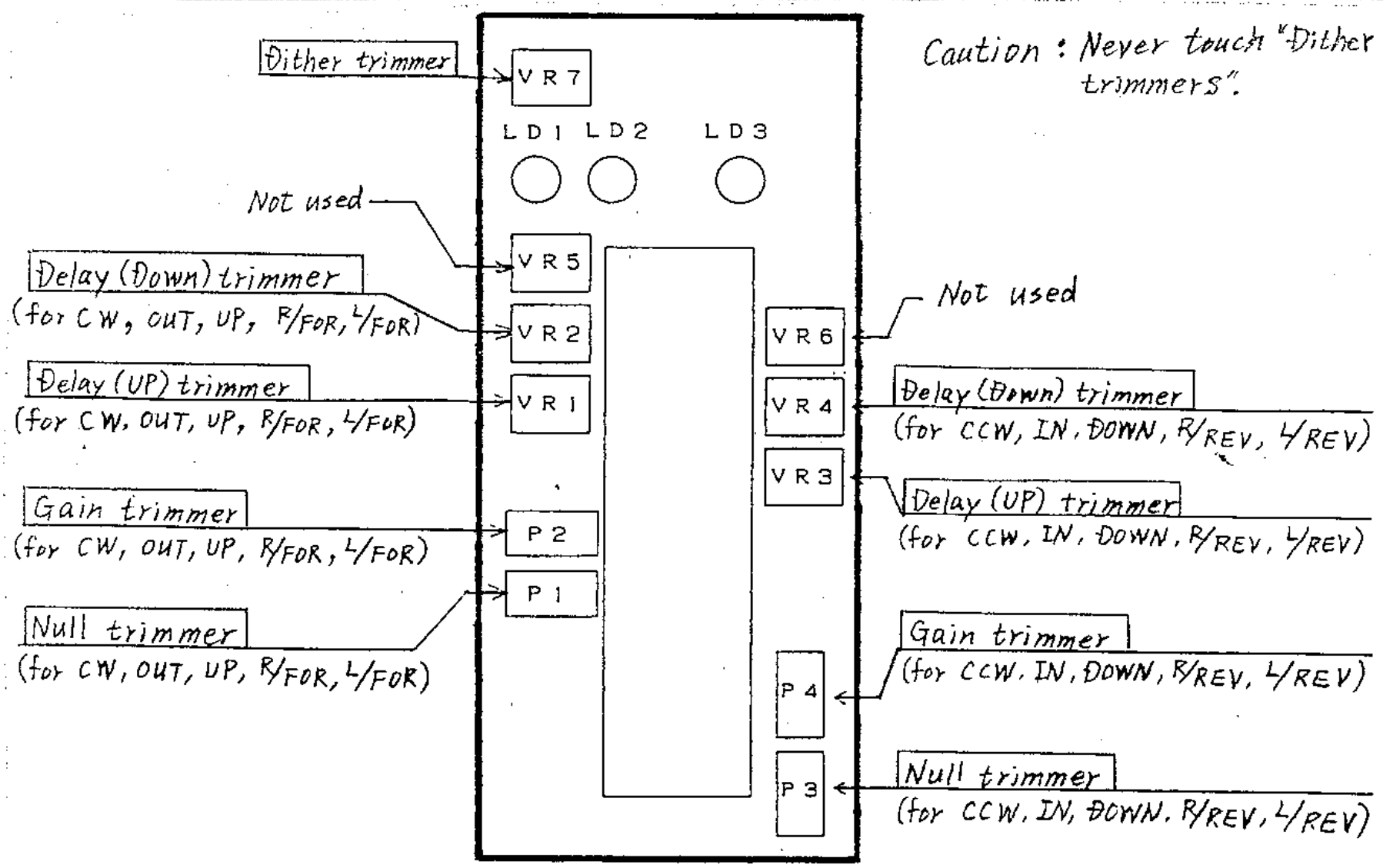
2. Adjustment procedures of Operational Speed

The adjustment is to be carried out by turning each "trimmer" on the valve control unit following the sequence outlined below.

NULL voltage (Min. speed) ⇒ GAIN voltage (Max. speed) ⇒ Actuating voltage for "Lower control" (Max. speed for Lower control)

⇒ Time delay





Caution : Never touch "Dither trimmers".

Detail of each channel

1. Adjustment of "Null voltage" (Minimum speed)

The minimum operational speed obtained when operating the "Control lever" slightly at the "Upper control" can be adjusted by varying the "Null voltage" as follows.

<table>
<tr><th>No.</th><th>Procedures</th><th>Remarks</th></tr>
<tr><td>1.</td><td>Lower the platform close to ground, and open the "Lower control box".</td><td rowspan="2"></td></tr>
<tr><td>2.</td><td>Stop the engine, and set the "Key switch" in "UP" position.</td></tr>
<tr><td>3.</td><td>Set a "Digital voltmeter" between each "Pin" ⊕ on the "Valve control unit" (listed below) and "Body earth" ⊖.
<table>
<tr><th colspan="2">Operation</th><th>Pin No.</th><th>Wire color</th><th>Connector No.</th></tr>
<tr><td rowspan="2">Rotation</td><td>C.W.</td><td>V2</td><td>Red</td><td rowspan="2">CN-1</td></tr>
<tr><td>C.C.W.</td><td>V4</td><td>Black</td></tr>
<tr><td rowspan="2">Extension</td><td>OUT</td><td>V6</td><td>Red</td><td rowspan="2">CN-2</td></tr>
<tr><td>IN</td><td>V8</td><td>Black</td></tr>
<tr><td rowspan="2">Elevation</td><td>UP</td><td>V10</td><td>Red</td><td rowspan="2">CN-3</td></tr>
<tr><td>DOWN</td><td>V12</td><td>Black</td></tr>
<tr><td rowspan="2">Travelling (right)</td><td>FWD</td><td>V14</td><td>Red</td><td rowspan="2">CN-4</td></tr>
<tr><td>REV</td><td>V16</td><td>Black</td></tr>
<tr><td rowspan="2">Travelling (Left)</td><td>FWD</td><td>V18</td><td>Red</td><td rowspan="2">CN-5</td></tr>
<tr><td>REV</td><td>V20</td><td>Black</td></tr>
</table></td><td></td></tr>
<tr><td>4.</td><td>Operate each "Control lever" slightly until the red "LED" on valve control unit turns on, then read the "Digital voltmeter".
※ The reading on the digital voltmeter is the NULL voltage.
※ The higher the Null voltage, the faster the minimum operational speed.
※ The reference value of each "Null voltage" is shown in the table below.
<table>
<tr><th colspan="2">Operation</th><th>Null voltage</th><th>Null trimmer</th><th>Channel No.</th></tr>
<tr><td rowspan="2">Rotation</td><td>C.W.</td><td>0.37V</td><td>P1</td><td rowspan="2">CH-1</td></tr>
<tr><td>C.C.W.</td><td>0.37V</td><td>P3</td></tr>
<tr><td rowspan="2">Extension</td><td>OUT</td><td>0.34V</td><td>P1</td><td rowspan="2">CH-2</td></tr>
<tr><td>IN</td><td>0.34V</td><td>P3</td></tr>
<tr><td rowspan="2">Elevation</td><td>UP</td><td>0.33V</td><td>P1</td><td rowspan="2">CH-3</td></tr>
<tr><td>DOWN</td><td>0.33V</td><td>P3</td></tr>
<tr><td rowspan="2">Travelling (right)</td><td>FWD</td><td>0.36V</td><td>P1</td><td rowspan="2">CH-4</td></tr>
<tr><td>REV</td><td>0.36V</td><td>P3</td></tr>
<tr><td rowspan="2">Travelling (Left)</td><td>FWD</td><td>0.36V</td><td>P1</td><td rowspan="2">CH-5</td></tr>
<tr><td>REV</td><td>0.36V</td><td>P3</td></tr>
</table></td><td>Set the boom as shown in the table below, when measuring the "Null Voltage".
<table>
<tr><th></th><th>Boom angle</th><th>Boom length</th></tr>
<tr><td>Rotation</td><td>Maximum</td><td>Minimum</td></tr>
<tr><td>Extension</td><td>Under horizontal</td><td>Extend about 1m</td></tr>
<tr><td>Elevation</td><td>Under horizontal</td><td>Minimum</td></tr>
<tr><td>Travelling (right)</td><td rowspan="2">Under horizontal</td><td rowspan="2">Minimum</td></tr>
<tr><td>Travelling (Left)</td></tr>
</table>
Operate both of the "Travel control levers" slightly in the same direction, when measuring the "Null voltage" for Travelling.</td></tr>
<tr><td>5.</td><td>Adjust each "Null trimmer" listed in the table above, so that each hydraulic actuator is about to move, when each control lever is operated slightly.
※ To increase each "Null voltage" or "Minimum operational speed", turn each trimmer clockwise.</td><td>※ If the NULL voltage is too high, it will cause excessive time delay, when stopping operation.
※ If the NULL voltage is too low, it will cause excessively low speed in the "Stroke end shockless range".</td></tr>
</table>

2. Adjustment of "Gain voltage" (Maximum speed)

The maximum operational speed obtained when operating the "Control lever" fully at the "Upper control" can be adjusted by varying the "Gain voltage" as follows.

<table>
<tr><th>No.</th><th>Procedures</th><th>Remarks</th></tr>
<tr><td>1.</td><td>Lower the platform close to ground, and open the "Lower control box".</td><td rowspan="2"></td></tr>
<tr><td>2.</td><td>Stop the engine, and set the "Key switch" in "UP" position.</td></tr>
<tr><td>3.</td><td>Set a"Digital voltmeter" between each "Pin" ⊕ on the "Valve control unit" (listed below) and "Body earth" ⊖.
<table>
<tr><th colspan="2">Operation</th><th>Pin No.</th><th>Wire color</th><th>Connector No.</th></tr>
<tr><td rowspan="2">Rotation</td><td>C.W.</td><td>V2</td><td>Red</td><td rowspan="2">CN-1</td></tr>
<tr><td>C.C.W.</td><td>V4</td><td>Black</td></tr>
<tr><td rowspan="2">Extension</td><td>OUT</td><td>V6</td><td>Red</td><td rowspan="2">CN-2</td></tr>
<tr><td>IN</td><td>V8</td><td>Black</td></tr>
<tr><td rowspan="2">Elevation</td><td>UP</td><td>V10</td><td>Red</td><td rowspan="2">CN-3</td></tr>
<tr><td>DOWN</td><td>V12</td><td>Black</td></tr>
<tr><td rowspan="2">Travelling (right)</td><td>FWD</td><td>V14</td><td>Red</td><td rowspan="2">CN-4</td></tr>
<tr><td>REV</td><td>V16</td><td>Black</td></tr>
<tr><td rowspan="2">Travelling (Left)</td><td>FWD</td><td>V18</td><td>Red</td><td rowspan="2">CN-5</td></tr>
<tr><td>REV</td><td>V20</td><td>Black</td></tr>
</table></td><td></td></tr>
<tr><td>4.</td><td>Operate each "Control lever" fully, then read the "Digital voltmeter".
※ The reading on the digital voltmeter is the "Gain voltage.
※ The higher the "Gain voltage", the faster the maximum operational speed.
※ The reference value of each "Gain voltage" is shown in the table below.
<table>
<tr><th colspan="2">Operation</th><th>Gain voltage</th><th>Gain trimmer</th><th>Channel No.</th></tr>
<tr><td rowspan="2">Rotation</td><td>C.W.</td><td>0.55V</td><td>P2</td><td rowspan="2">CH-1</td></tr>
<tr><td>C.C.W.</td><td>0.55V</td><td>P4</td></tr>
<tr><td rowspan="2">Extension</td><td>OUT</td><td>0.50V</td><td>P2</td><td rowspan="2">CH-2</td></tr>
<tr><td>IN</td><td>0.50V</td><td>P4</td></tr>
<tr><td rowspan="2">Elevation</td><td>UP</td><td>0.51V</td><td>P2</td><td rowspan="2">CH-3</td></tr>
<tr><td>DOWN</td><td>0.51V</td><td>P4</td></tr>
<tr><td rowspan="2">Travelling (right)</td><td>FWD</td><td>0.57V</td><td>P2</td><td rowspan="2">CH-4</td></tr>
<tr><td>REV</td><td>0.57V</td><td>P4</td></tr>
<tr><td rowspan="2">Travelling (Left)</td><td>FWD</td><td>0.57V</td><td>P2</td><td rowspan="2">CH-5</td></tr>
<tr><td>REV</td><td>0.57V</td><td>P4</td></tr>
</table></td><td>Set the boom as shown in the table below, when measuring the "GAIN Voltage.
<table>
<tr><th></th><th>Boom angle</th><th>Boom length</th></tr>
<tr><td>Rotation</td><td>Maximum</td><td>Minimum</td></tr>
<tr><td>Extension</td><td>Under horizontal</td><td>Extend about 1m</td></tr>
<tr><td>Elevation</td><td>Under horizontal</td><td>Minimum</td></tr>
<tr><td>Travelling (right)</td><td rowspan="2">Under horizontal</td><td rowspan="2">Minimum</td></tr>
<tr><td>Travelling (Left)</td></tr>
</table>
Operate both of the "Travel control levers" slightly in the same direction, when measuring the "Gain voltage" for Travelling.</td></tr>
<tr><td>5.</td><td>Adjust each "Gain trimmer" listed in the table above, so that each "Maximum operational speed" becomes the specific speed".
※ To increase each "Gain voltage" or "Minimum operational speed", turn each trimmer clockwise.</td><td>※ For "Specific speed", refer to the clause of "Measurement of operational speed."</td></tr>
</table>

3. Adjustment of "Actuating voltage for Lower control"

(Maximum speed for Lower control)

The "Maximum operational speed" obtained by actuating the "control switched" on the "Lower control box" can be adjusted by means of varying the "Actuating voltage".

<table>
<tr><th>No.</th><th>Procedures</th><th>Remarks</th></tr>
<tr><td>1.</td><td>Lower the platform close to ground, and open the "Lower control box".</td><td rowspan="2"></td></tr>
<tr><td>2.</td><td>Stop the engine, and set the "Key switch" in LOW position.</td></tr>
<tr><td>3.</td><td>Set a "Digital voltmeter" between each "Pin" ⊕ on the "Valve control unit" (listed below) and "Body earth" ⊖.
<table>
<tr><th colspan="2">Operation</th><th>Pin No.</th><th>Wire color</th><th>Connector No.</th></tr>
<tr><td rowspan="2">Rotation</td><td>C.W.</td><td>V2</td><td>Red</td><td rowspan="2">CN-1</td></tr>
<tr><td>C.C.W.</td><td>V4</td><td>Black</td></tr>
<tr><td rowspan="2">Extension</td><td>OUT</td><td>V6</td><td>Red</td><td rowspan="2">CN-2</td></tr>
<tr><td>IN</td><td>V8</td><td>Black</td></tr>
<tr><td rowspan="2">Elevation</td><td>UP</td><td>V10</td><td>Red</td><td rowspan="2">CN-3</td></tr>
<tr><td>DOWN</td><td>V12</td><td>Black</td></tr>
</table></td><td></td></tr>
<tr><td></td><td>Operate each "Control switch" at the "Lower control box", then read the "Digital voltmeter".
※ The reading on the digital voltmeter is the "Actuating voltage".
※ The higher the actuating voltage, the faster the maximum operational speed.
※ The reference value of each "Actuating voltage" is shown in the table below.
<table>
<tr><th colspan="2">Operation</th><th>Actuating voltage</th><th>Tr. trimmer</th></tr>
<tr><td rowspan="2">Rotation</td><td>C.W.</td><td>0.55V</td><td>Tr. 6</td></tr>
<tr><td>C.C.W.</td><td>0.55V</td><td>Tr. 5</td></tr>
<tr><td rowspan="2">Extension</td><td>OUT</td><td>0.50V</td><td>Tr. 4</td></tr>
<tr><td>IN</td><td>0.50V</td><td>Tr. 3</td></tr>
<tr><td rowspan="2">Elevation</td><td>UP</td><td>0.51V</td><td>Tr. 2</td></tr>
<tr><td>DOWN</td><td>0.51V</td><td>Tr. 1</td></tr>
</table></td><td>Set the boom as shown in the table below, when measuring the "Actuating Voltage".
<table>
<tr><th></th><th>Boom angle</th><th>Boom length</th></tr>
<tr><td>Rotation</td><td>Maximum</td><td>Minimum</td></tr>
<tr><td>Extension</td><td>Under horizontal</td><td>Extend about 1m</td></tr>
<tr><td>Elevation</td><td>Under horizontal</td><td>Minimum</td></tr>
</table></td></tr>
<tr><td>5.</td><td>Adjust each trimmer listed in the table above, so that each maximum speed becomes the specific speed.
※ To increase the "Actuating voltage" or "Maximum speed", turn each trimmer clockwise.</td><td>※ For the specific speed, refer to the clause of "Measurement procedures of Operational speed".</td></tr>
</table>

4. Adjustment of "Time Delay"

The "Time Delay" is adjusted by each "Delay trimmer" to start or stop operation more gradually or quickly.

Operation		Delay UP trimmer	Delay Down trimmer	Channel NO.	Boom condition, when adjusting
Rotation	C.W.	VR-1	VR-2	CH-1	Boom length: MIN Boom angle: Horizontal
	C.C.W.	VR-3	VR-4		
Extension	OUT	VR-1	VR-2	CH-2	Boom length: Extend about half way Boom angle: MAX
	IN	VR-3	VR-4		
Elevation	UP	VR-1	VR-2	CH-3	Boom length: MIN Boom angle: 45° Approximately
	DOWN	VR-3	VR-4		
Travelling (right)	FWD	VR-1	VR-2	CH-4	Boom length: MIN Boom angle: Horizontal
	REV	VR-3	VR-4		
Travelling (Left)	FWD	VR-1	VR-2	CH-5	
	REV	VR-3	VR-4		

※ To start operation more gradually, turn the "Delay UP trimmer" clockwise.

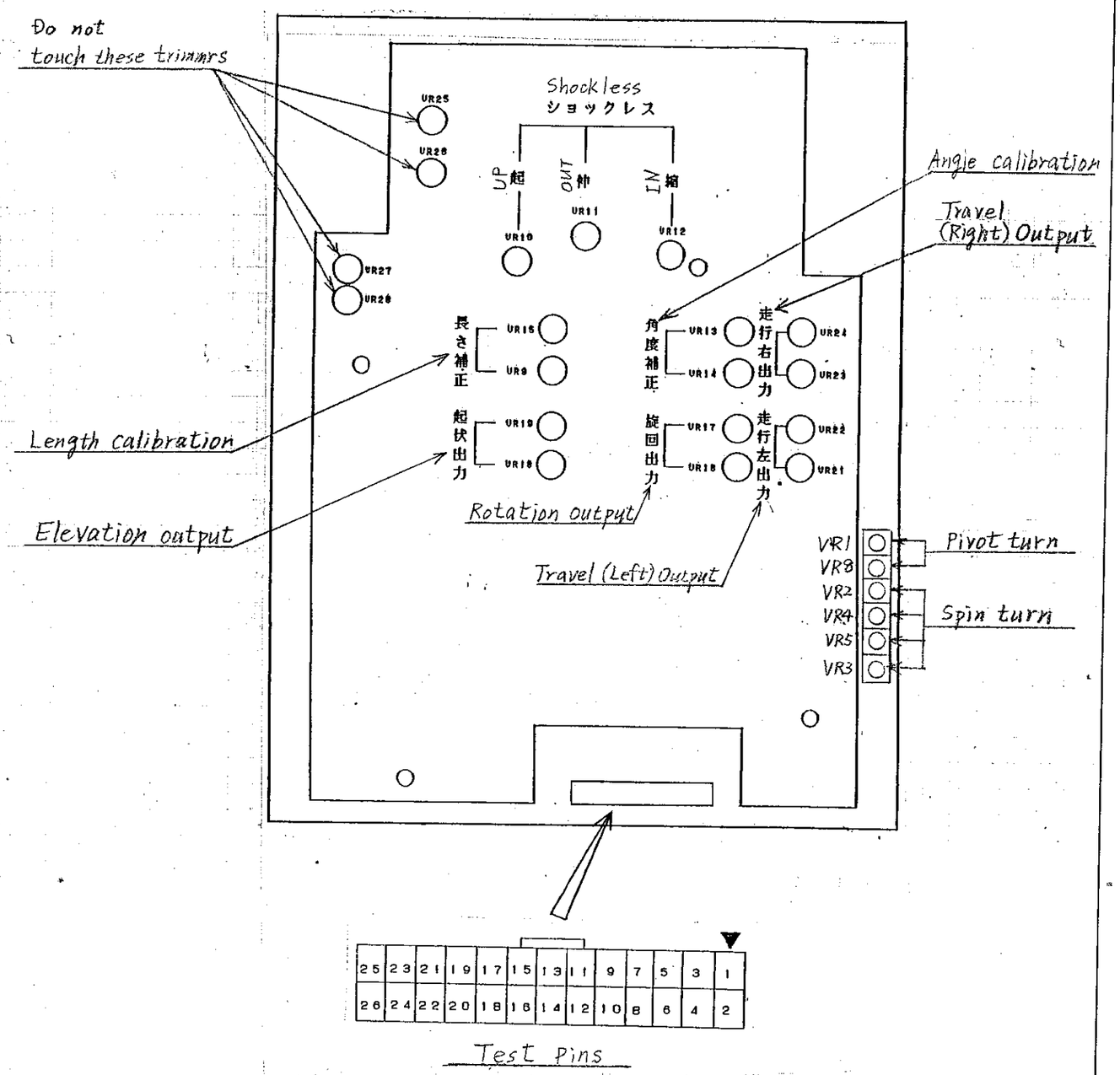
※ To stop operation more gradually, turn the "Delay DOWN trimmer" clockwise.

ADJUSTMENT of CPU BOARD

The adjustment is carried out by turning each trimmer on the "CPU board" in the sequence outlined below.

1. Calibration of "Boom angle and length sensors"
2. Adjustment of "Limited Rotation speed"
3. Adjustment of "Limited Elevation speed"
4. Adjustment of "Limited Travel speed"
5. Adjustment of "Stroke end shockless range"
6. Adjustment of "Travel Pivot turn speed"
7. Adjustment of "Travel Spin turn speed"

Note: The Adjustment should be carried out with the machine set on firm level ground.



1. Calibration of Boom Angle and Length Sensors

	Adjusting procedures
Boom Angle sensor	1) Set a "Digital voltmeter" between "Test pin (19)"⊕ and "Body earth"⊖.
	2) Set the boom horizontally (Boom angle: 0°), and adjust the voltage to 0±0.2V by turning "Angle calibration trimmer (VR-13)".
	3) Set the boom at the maximum boom angle (70°), and adjust the voltage to 7±0.2V by turning "Angle calibration trimmer (VR-14)".
	4) Repeat the steps 2), 3) above, and make sure that each voltage is within the allowable range.
Boom length sensor	1) Set a "Digital voltmeter" between "Test pin (14)"⊕ and "Body earth ⊖."
	2) Extend the boom fully, and adjust the voltage to 10±0.2V by turning "Length calibration trimmer (VR-9)".
	3) Retract the boom fully, and adjust the voltage to 4.15±0.2V by turning "Length calibration trimmer (VR-15)".
	4) Repeat the steps 2), 3) above, and make sure the each voltage is within the allowable range.

2. Adjustment of Limited Rotation Speed

	Adjusting procedures
Maximum speed (Output)	1) Retract the boom fully, and set it at the maximum boom angle (70°). (Working radius → Minimum)
	2) Set a "Digital voltmeter" between "Test pin (11)"⊕ and "Body earth"⊖, and adjust the voltage to 9.5~10V by turning "Rotation output trimmer (VR-17)".
	3) Set a "Digital voltmeter" between "Test pin (8)"⊕ and "Body earth"⊖, and operate the "Rotation lever" fully to C.W. or C.C.W. side.
	4) Under the conditions outlined above, make sure the voltage is 9.5~10V.
Limited speed (Output)	1) Set the boom horizontally, and extend it fully. (Working radius → Maximum)
	2) Set a "Digital voltmeter" between "Test pin (8)"⊕ and "Body earth"⊖.
	3) Operate the "Rotation lever" fully C.W. or C.C.W. and adjust the voltage to 5.5V by turning "Rotation output trimmer (VR-16)".
	4) Operate "Rotation" from the Upper control, and make sure the "Limited Rotation speed" is 50±10 sec/45° . ※ The higher the voltage, the faster the limited speed.

3. Adjustment of Limited Elevation Speed

	Adjusting procedures
Maximum speed (Out put)	1) Retract the boom fully. (Boom length → Minimum)
	2) Set a "Digital voltmeter" between "Test pin (15)" ⊕ and "Body earth" ⊖, and adjust the voltage to 9.5～10V by turning "Elevation output trimmer (VR-19)".
	3) Set a "Digital voltmeter" between "Test pin (13)" ⊕ and "Body earth ⊖", and operate the "Elevation lever" fully to "UP" or "DOWN".
	4) Under the conditions outlined above, make sure the voltage is 9.5～10V.
Limited speed (Out put)	1) Extend the boom fully. (Boom length → Maximum)
	2) Set a "Digital voltmeter" between "Test pin (13)" ⊕ and "Body earth" ⊖.
	3) Operate the "Elevation lever" fully to "UP" or "DOWN" side, and adjust the voltage to 5.0V by turning "Elevation output trimmer (VR-18)".
	4) Perform "Elevation UP" operation with the boom fully extended, and make sure the "Limited Elevation UP speed" is 75±15 seconds/stroke. * The higher the voltage, the faster the speed.

4. Adjustment of Limited Travel Speed

Maximum speed (out put)

Adjusting Procedures

1) Extend the boom by about 2 meters, and set it under the horizontal level.

2) Set a "Digital voltmeter" onto the test pins as listed below.

Travelling (Right) :	"Test pin (1)"⊕ ⟷ "Body earth" ⊖
Traveling (Left) :	"Test pin (2)"⊕ ⟷ "Body earth" ⊖

3) Adjust the voltage on "Test pin (1)" and "Test pin (2)" to 9.5～10V by turning "Travel (Right) output trimmer (VR-23)" and "Travel (Left) output trimmer (VR-21)" respectively.

Travelling (Right)	Test pin (1)	Trimmer (VR-23)	9.5～10V
Travelling (Left)	Test pin (2)	Trimmer (VR-21)	9.5～10V

4) Set a "Digital voltmeter" onto the test pins as listed below.

Travelling (Right) :	"Test pin (6)" ⊕ ⟷ "Body earth" ⊖
Travelling (Left) :	"Test pin (4)" ⊕ ⟷ "Body earth" ⊖

5) Operate both of the "Travel (right) and (Left) levers" fully to "FWD" or "REV", and make sure the voltage is 9.5～10V respectively.

Travelling (Right) :	Test pin (6)	9.5～10V
Travelling (Left) :	Test pin (4)	9.5～10V

⟷

Note: operate both of the "Travel levers" fully in the same direction when checking the voltage.

Limited speed (out put)

1) Set the boom horizontally, and extend it fully. (Working radius → Maximum)

2) Set a "Digital voltmeter" onto the test pins as listed below.

Travelling (Right) :	Test pin (6) ⊕	⟷	Body earth ⊖
Travelling (Left) :	Test pin (4) ⊕		Body earth ⊖

3) Operate both of the "Travel control levers" fully to "FWD", and adjust the voltage on "Test pin (6)" and "Test pin (4)" to 7±0.2V by turning "Travel (Right) output trimmer (VR-24)" and "Travel (Left) output trimmer (VR-22)" respectively.

Travelling(Right) :	Test pin (6)	Trimmer (VR-24)	7±0.2V
Travelling (Left) :	Test pin (4)	Trimmer (VR-22)	7±0.2V

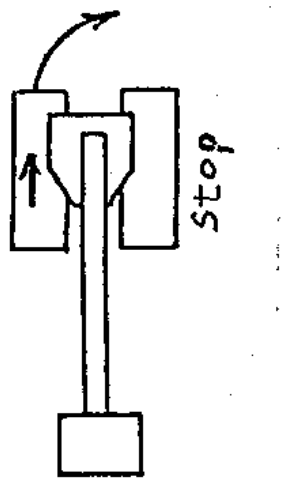
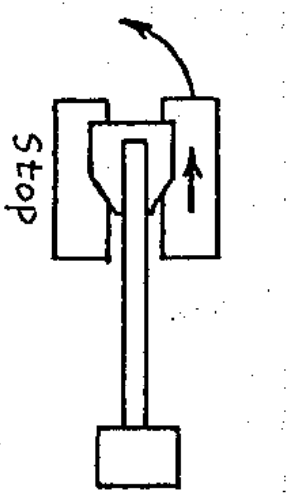
4) Perform "Travel FWD" or "Travel REV" operations with the "maximum working radius", and make sure the "Limited Travel speed" is 30±5 seconds / 5 meters.

※ The higher the voltage, the faster the speed.

5. Adjustment of Stroke End Shockless Range

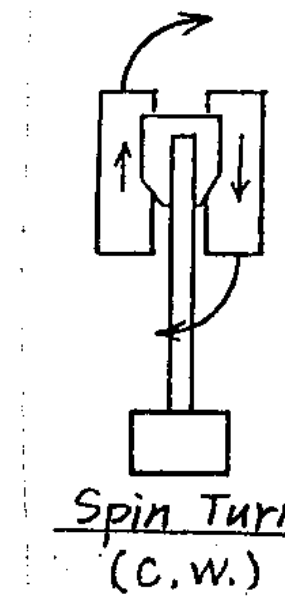
	Adjustment procedures
"Elevation UP" stroke end shockless.	1) Retract the boom fully.
	2) Set a "Digital voltmeter between "Test Pin(25)" ⊕ and "Body earth" ⊖,and adjust the voltage to 6.75V by turning "Shockless UP trimmer" (VR-10).
	3) Perform "Elevation UP" operation, and make sure the "Elevation UP" speed is reduced, when the boom angle reaches 3° before the stroke end.
	4) In case the "Shockless range" is not adequate, repeat the steps 2),3) above. ● To obtain a larger "Shockless range", increase the voltage of "Test pin (25)" by turning "Shockless UP trimmer (VR-10)". ● To adjust the speed in the Shockless range, adjust the "Null voltage of Elevation UP " at the "Valve control unit" as refering to "Adjustment of valve control unit". ● The higher the NULL voltage, the faster the speed.
"Extension OUT" stroke end shockless.	1) Set the boom at the "Maximum boom angle"(70°).
	2) Set a "Digital voltmeter" between "Test pin (23)" ⊕ and "Body earth" ⊖,and adjust the voltage to 9.75V by turning "Shockless OUT trimmer (VR-11)".
	3) Perform "Extension OUT" operation, and make sure the "Extension OUT" speed is reduced, when the boom length reaches about 30cm before the stroke end.
	4) In case the "Shockless range" is not adequate, repeat the steps 2), 3) above. ● To obtain a larger "Shockless range", increase the voltage of "Test pin (23)" by turning "Shockless OUT trimmer (VR-11)". ● To adjust the speed in the shockless range, adjust the "Null voltage of Extension OUT" at the "Valve control unit" by refering to "Adjustment of valve control unit". ● The higher the NULL voltage, the faster the speed.
"Extension IN" stroke end shockless.	1) Set the boom at the "Maximum boom angle" (70°).
	2) Set a "Digital voltmeter" between "Test pin (21)"⊕ and "Body earth"⊖, and adjust the voltage to 4.35V by turning "Shockless IN trimmer (VR-12)".
	3) Perform "Extension IN" operation, and make sure the "Extension IN" speed is reduced, when the boom length reaches about 30cm before the stroke end.
	4) If the "Shockless range" is not adequate, repeat the steps 2),3) above. ● To obtain a larger "Shockless range", increase the voltage of "Test pin (21)" by turning "Shockless IN trimmer (VR-12)". ● To adjust the speed in the shockless range, adjust the "Null voltage of Extension IN" at the "Valve control unit" by refering "Adjustment of valve control unit". ● The higher the NULL voltage, the faster the speed.

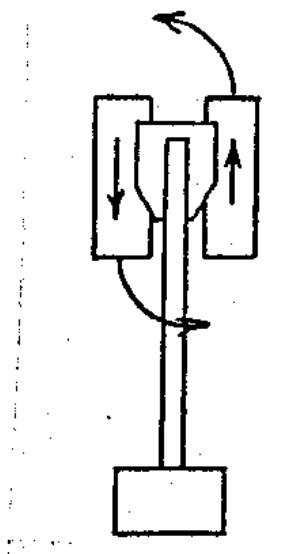
6. Adjustment of Pivot Turn Speed

	Adjusting procedures	Remarks
Pivot turn (C.W.)	1) Set the boom under the horizontal, and retract it fully.	 Pivot Turn C.W.
	2) Set a "Digital voltmeter" between "Test pin (10)"⊕ and "Body earth"⊖.	
	3) Operate the "Travel (Left) lever" fully to "FWD", and adjust the voltage to 6.5V by turning "Pivot turn trimmer (VR-8)"	
	4) Perform "Pivot turn (C.W.)" operation with the fully retracted boom, and make sure the speed is 18 ± 4 seconds/90° * The higher the voltage, the faster the speed.	
Pivot turn (C.C.W)	1) Set the boom under the horizontal, and retract it fully.	 Pivot Turn C.C.W.
	2) Set a "Digital voltmeter" between "Test pin(12)"⊕ and "Body earth" ⊖.	
	3) Operate the "Travel (Right) lever" fully to "FWD", and adjust the voltage to 6.5V by turning "Pivot turn trimmer (VR-1)".	
	4) Perform "Pivot turn (C.C.W.)" operation with the fully retracted boom, and make sure the speed is 18 ± 4 seconds/90°. * The higher the voltage, the faster the speed.	

7. Adjustment of Spin turn Speed

No	Adjusting procedures
1	Set the boom under the horizontal, and retract it fully.
2	Set a "Digital voltmeter" between "Test pin (12)"⊕ and "Body earth"⊖.
3	Operate the "Travel (Left) lever" slightly to "REV", and the "Travel (Right) lever" fully to "FWD"
4	Hold the "Travel levers " at the positions above, and adjust the "Voltage (V1)" to 6.5V by turning "Spin turn trimmer(VR-5)"
5	Operate the "Travel (Left) lever" fully to "REV", and the "Travel (Right) lever" fully to "FWD".
6	Hold the "Travel levers" at the positions above, and adjust the "Voltage (V2)" to 4.5V by turning "Spin turn trimmer(VR-3)".
7	Set a "Digital voltmeter" between "Test pin(10)"⊕ and "Body earth"⊖.
8	Operate the "Travel (Right) lever" slightly to "REV", and the "Travel (Left) lever" fully to "FWD".
9	Hold the "Travel levers " at the positions above, and adjust the "Voltage (V3)" to 6.5V by turning "Spin turn trimmer (VR-4)"
10	Operate the "Travel (Right) lever" fully to "REV", and the "Travel (Left) lever fully to "FWD".
11	Hold the "Travel levers" at the positions above, and adjust the "Voltage (V4)" to 4.5V by turning "Spin turn trimmer (VR-2)."
12	Perform "SPIN turn " C.W. and C.C.W. operations with the fully retracted boom, and make sure the speed is 18±4seconds/90° ● The higher the voltage (V2) and (V4), the faster the spin turn speed.





ADJUSTMENT DATA SHEET

Date:		Serial NO.:		Name:	

Valve Comtrol Unit

Operation			Rotation		Extension		Elevation		Travelling(Right)		Travelling(Left)	
			C.W.	C.C.W.	OUT	IN	UP	DOWN	FWD	REV	FWD	REV
MAX.SPEED			75±8		45±7	40±6	50±8	55±8	15 $^{+3}_{-0}$ sec/10 m			
Channel NO.			CH-1		CH-2		CH-3		CH-4		CH-5	
Voltage check pin NO.			V2	V4	V6	V8	V10	V12	V14	V16	V18	V20
NULL	Trimmer		P1	P3	P1	P3	P1	P3	P1	P3	P1	P3
	Voltage	Reference	0.37V	0.37V	0.34V	0.34V	0.33V	0.33V	0.36V	0.36V	0.36V	0.36V
		before adjustment										
		after adjustment										
GAIN	Trimmer		P2	P4	P2	P4	P2	P4	P2	P4	P2	P4
	Voltage	Reference	0.55V	0.55V	0.50V	0.50V	0.51V	0.51V	0.57V	0.57V	0.57V	0.57V
		before adjustment										
		after adjustment										
DELAY	UP trimmer		VR-1	VR-3	VR-1	VR-3	VR-1	VR-3	VR-1	VR-3	VR-1	VR-3
	DOWN trimmer		VR-2	VR4	VR-2	VR4	VR-2	VR4	VR-2	VR4	VR-2	VR4
Actuating voltage for Lower control	Trimmer		TR-6	TR-5	TR-4	TR-3	TR-2	TR-1				
	Voltage	Reference	0.55V	0.55V	0.50V	0.50V	0.51V	0.51V				
		before adjustment										
		after adjustment										

CPU Board

Adjustment Item		Boom condition	Voltage Test pin	Trimmer	Voltage Reference	Voltage Befor adjustment	Voltage After adjustment	Limited Speed
Calibration	Boom Angle sensor	Boom Angle:0°	TP19	VR-13	0±0.2V			✕
		Boom Angle:MAX		VR-14	7±0.2V			
	Boom Length sensor	Boom Length:MAX	TP14	VR- 9	10±0.2V			
		Boom Length:MIN		VR-15	4.15±0.2V			
Limited Rotation speed	Working radius MIN	Boom Angle:MAX BoomLength :MIN	TP11	VR-17	9.5～10V			✕
	Working radius MAX	Boom Angle:0° Boom Length:MAX	TP8	VR-16	5.5±0.2V			50±10 sec/90°
Limited Elevation speed	Boom Length:MIN	Boom Length:MIN	TP15	VR-19	9.5～10V			✕
	Boom Length:MAX	Boom Length:MAX	TP13	VR-18	5.0±0.2V			70±8 sec/stroke
Limited Travel speed Travel(Right)	Working radius MIN	Boom Angle:0° Boom Length:Extend 2m	TP1	VR-23	9.5～10V			30±5sec/5m (27±4.5sec/5yds) When "Working radius"is MAX.
	Working radius MAX	Boom Angle:0° Boom Length:MAX	TP6	VR-24	7±0.2V			
Travel(Left)	Working radius MIN	Boom Angle:0° Boom Length:Extend 2m	TP2	VR-21	9.5～10V			
	Working radius MAX	Boom Angle:0° Boom Length:MAX	TP4	VR-22	7±0.2V			
Stroke end shockless	Elevation UP	Boom Length:MIN	TP25	VR-10	6.75V			✕
	Extention OUT	Boom Angle:MAX	TP23	VR-11	9.75V			
	Extention IN	Boom Angle:MAX	TP21	VR-12	4.35V			
Travel Pivot turn	C.W.	Boom Length:MIN	TP10	VR-8	6.5V			18±2sec/90°
	C.C.W.	Boom Length:MIN	TP12	VR-1	6.5V			
Travel Spin turn		Refer to "7. Adjustment of Spin turn speed."						18±2sec/90°

Engine speed	ITEM	Specific rpm	Before adjustment	After Adjustment
	Low(Idling)	1,200 $^{+50}_{-0}$ rpm		
	Mid	1,800 $^{+0}_{-50}$ rpm		
	High	2,300 $^{+50}_{-0}$ rpm		

Relief valve setting pressure	Relief valve	Specific pressure	Before adjustment	After Adjustment
	P1	210 $^{+10}_{-0}$ kg/cm^2 (3,000PSI)		
	P2	210 $^{+10}_{-0}$ kg/cm^2 (3,000PSI)		
	P3	140 $^{+10}_{-0}$ kg/cm^2 (2,000PSI)		

Cylinder Drift	ITEM	Serviceable limit	Inspection data
	Elevation cylinder	2mm(0.08")/10min	
	Extention cylinder	2mm(0.08")/10min	
	Levelling cylinder	2mm(0.08")/10min	

Relief valve setting Pressure	Relief valve	Specific pressure	Before adjustment	After adjustment
	P1	210 $^{+5}_{-0}$ kgf/cm^2 (3,000 psi)		
	P2	210 $^{+5}_{-0}$ kgf/cm^2 (3,000 psi)		
	P3	140 $^{+5}_{-0}$ kgf/cm^2 (2,000 psi)		
	P4	90 $^{+5}_{-0}$ kgf/cm^2 (1,280 psi)		

7

APPENDIX

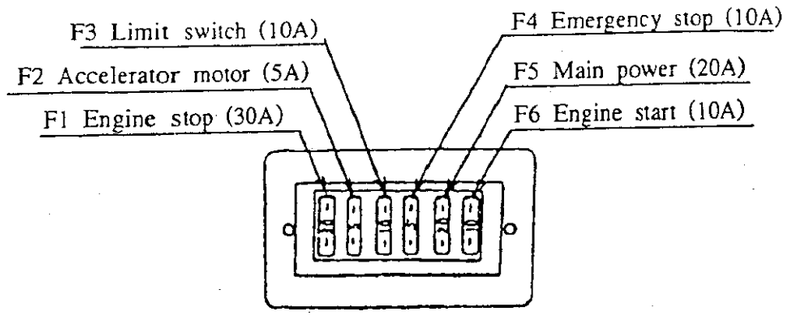
TROUBLE SHOOTING

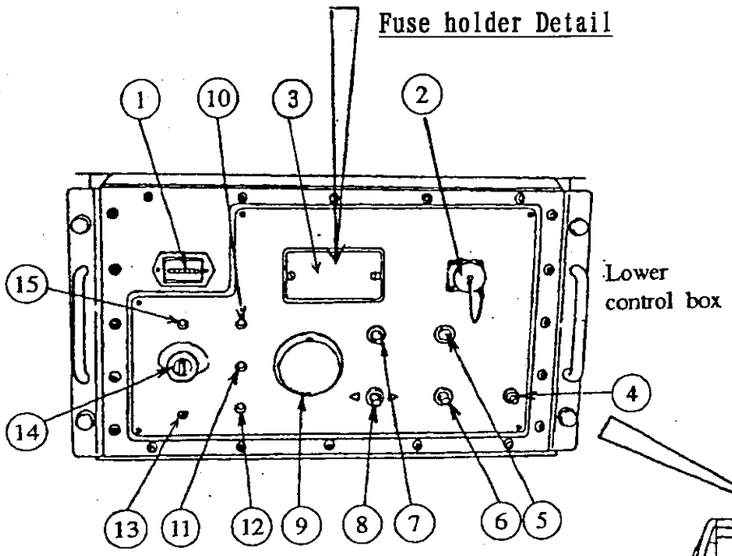
NO.	Problem	Cause	Remedy
1.	"Starter motor" does not run on either Upper or Lower control.	1)"Emergency stop s/w" on Lower or Upper control box is pressed. (Both Power lamps on "Lower" and "Upper" controls turn off.)	Pull the Emergency stop s/w to turn on Power lamps.
		2)"Emergency stop fuse F4 (10A)" in Lower contorol box has blown. (Power lamps turn off.)	Replace the fuse.
		3)"Main fuse F5 (20A)" in Lower contorol box has blown. (Power lamps turn off.)	Replace the fuse.
		4)"Engine start fuse F6 (10A)" in Lower contorol box has blown. (Power lamps turn on.)	Replace the fuse.
		5)"Fusible link" (17A) has blown.	Release the fusible link.
2.	"Starter motor" does not run at Upper control.	1)"Foot S/W" is pressed.	Release the foot switch and press the "Engine start switch".
		2)"Engine start fuse F2 (3A)" in Upper control box has blown.	Replace the fuse.
3.	"Starter motor" runs, but engine does not start.	1) Fuel tank is empty.	Fill fuel, bleed air, and start engine.
		2) Engine is cool.	Preheat "Glow plugs", and start engine.
4.	Engine does not stop.	1)"Engine stop fuse F1 (30A)" in Lower control box has blown.	Replace the fuse.
5.	Engine stopped naturally, and does not start again.	2) Fuel tank is empty.	Fill fuel, bleed air, and start engine.

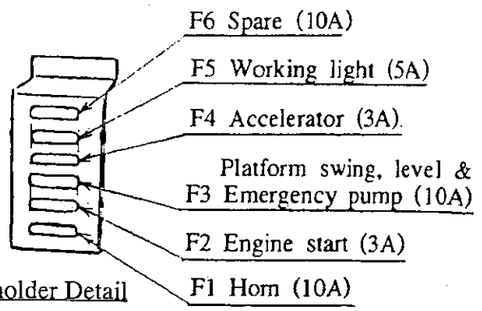
TROUBLE SHOOTING

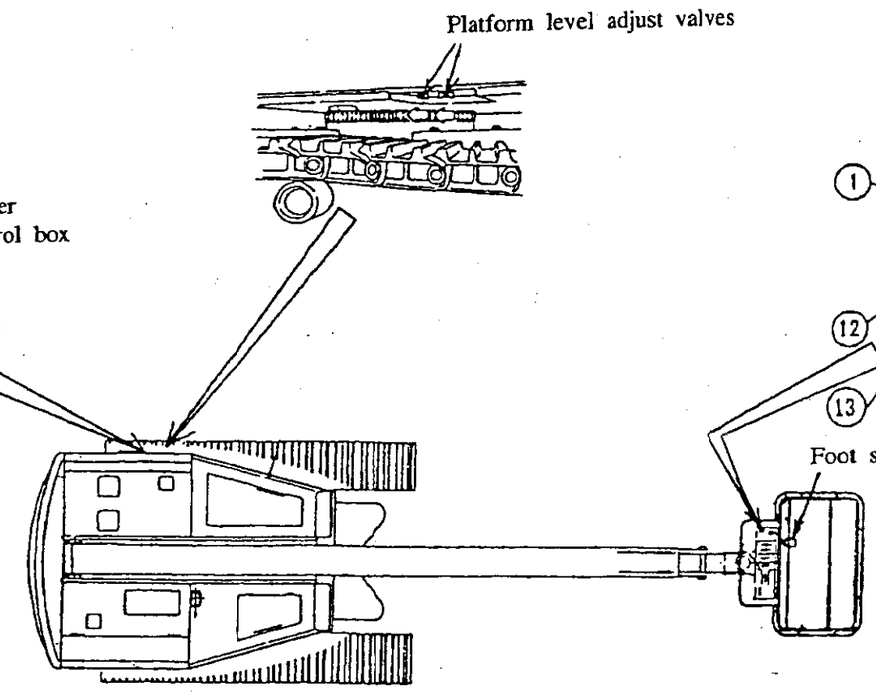
NO.	Problem	Cause	Remedy
6.	The upper control is non-operational, except for the "Horn" and "Working light".	1)"Foot switch" is not pressed.	Press Foot switch, and operate.
		2)"Main key switch" is set at "Lower" position.	Set the key switch to the "Upper" position.
7.	"Elevation", "Extension", "Rotation" and "Travel" operations are not functioning either "Lower" or "Upper" control.	"Fuse" on Valve control unit installed in Lower control box has blown.	Replace the fuse.
8.	Platform swing, level, and Emergency pump operation on Upper control are not functioning.	"Platform swing, level, & Emergency pump fuse F3 (10A)" in Upper control box has blown.	Replace the fuse.
9.	"Accelerator motor" does not work from either the "Upper" or "Lower" control.	"Accelerator motor Fuse F2 (5A)" in Lower control box has blown.	Replace the fuse.
10.	"Accelerator s/w" on Upper control does not work.	"Accelerator fuse F4 (3A)" in Upper control box has blown.	Replace the fuse.
11.	"Horn" does not work.	"Horn fuse F1 (10A)" has blown in Upper control box.	Replace the fuse.
11.	"Working light" does not work.	"Working light fuse F5 (5A)" in Upper control box has blow.	Replace the fuse.
12.	"Buzzer" sounds at Upper control.	Machine is inclined 5° or more due to slope.	Lower the platform, and set the machine on level ground.
13.	Platform loses level quite often.	"Platform level adjustment valves" are not closed firmly.	Close the valves firmly.

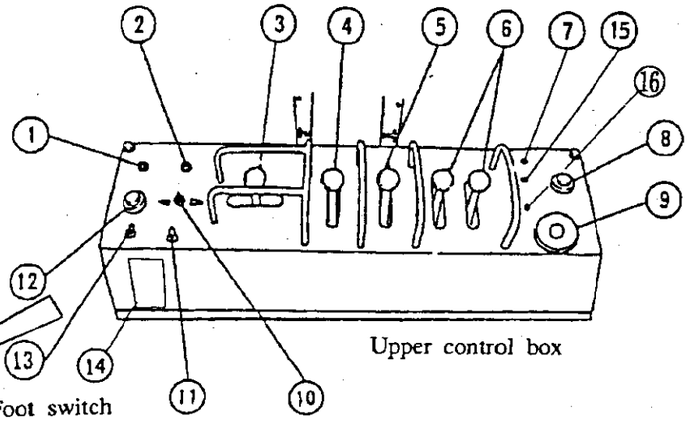
IDENTIFICATIONS OF CONTROL DEVICES & FUSES

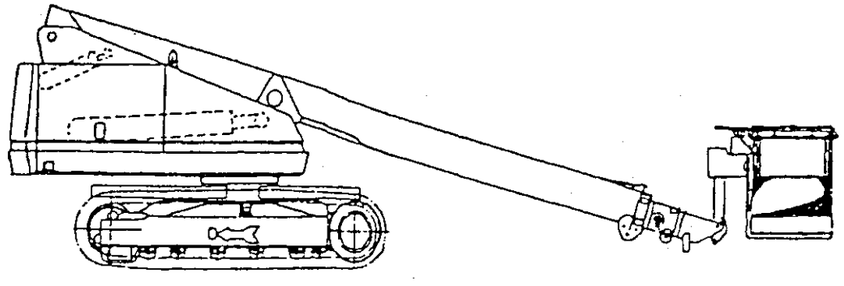












1	Hour meter
2	Metal connector(for Optional Remote control)
3	Fuse holder
4	Elevation switch
5	Emergency pump switch
6	Extension switch
7	Accelerator switch
8	Rotation switch
9	Emergency stop switch
10	Charge warning lamp
11	Engine water temp lamp
12	Engine oil pressure lamp
13	Glow indicator lamp
14	Main key switch
15	Power lamp

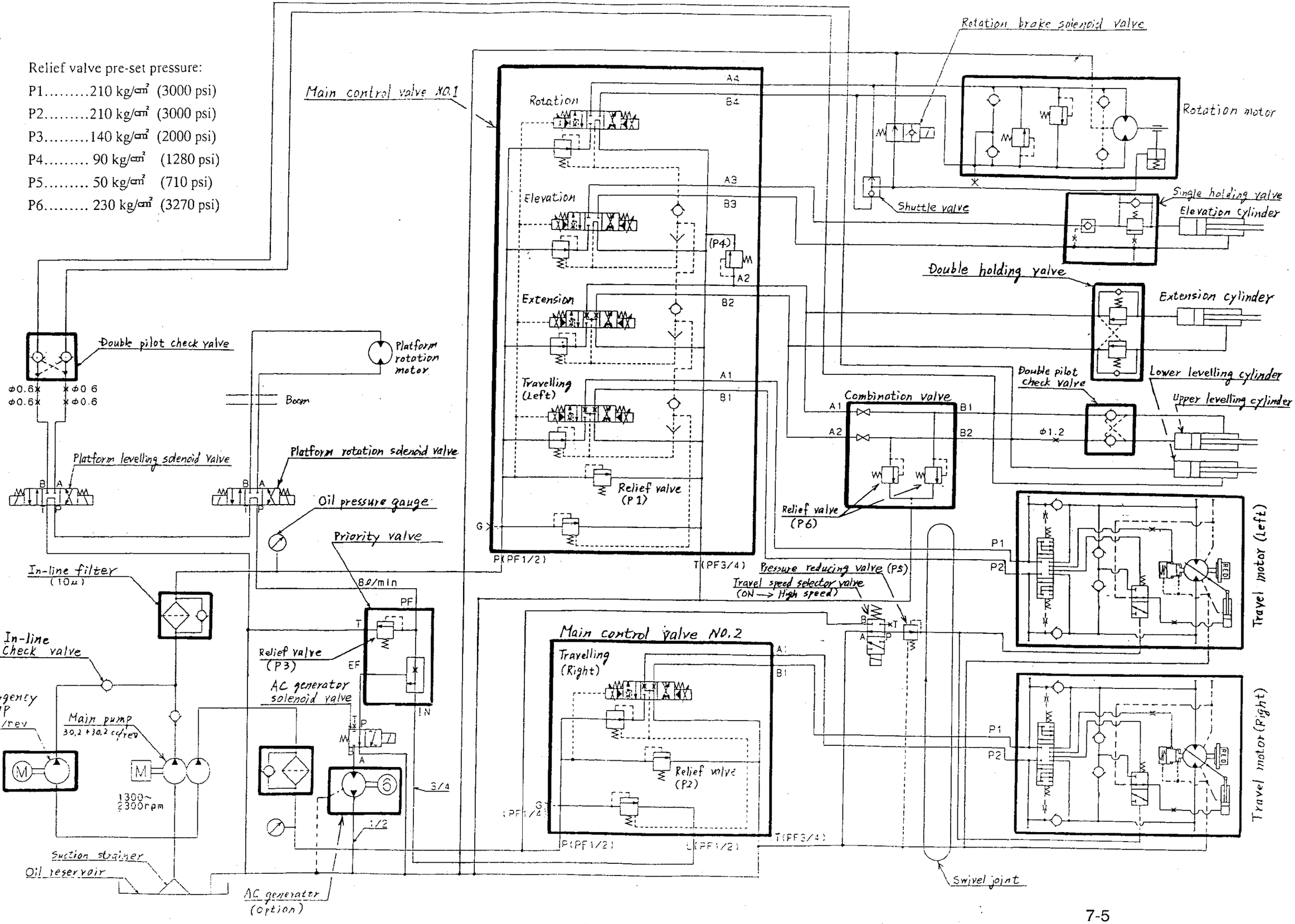
No.	Name
1	Working light switch
2	Accelerator switch
3	Boom rotation control lever
4	Boom extension control lever
5	Boom elevation control lever
6	Travel control lever
7	Power indicator lamp
8	Engine start switch
9	Stop switch
10	Platform rotation switch
11	Emergency pump switch
12	Horn switch
13	Platform level adjust switch
14	Fuse holder
15	Fuel level warning lamp
16	Tilt warning lamp

HYDRAULIC CIRCUIT DIAGRAM

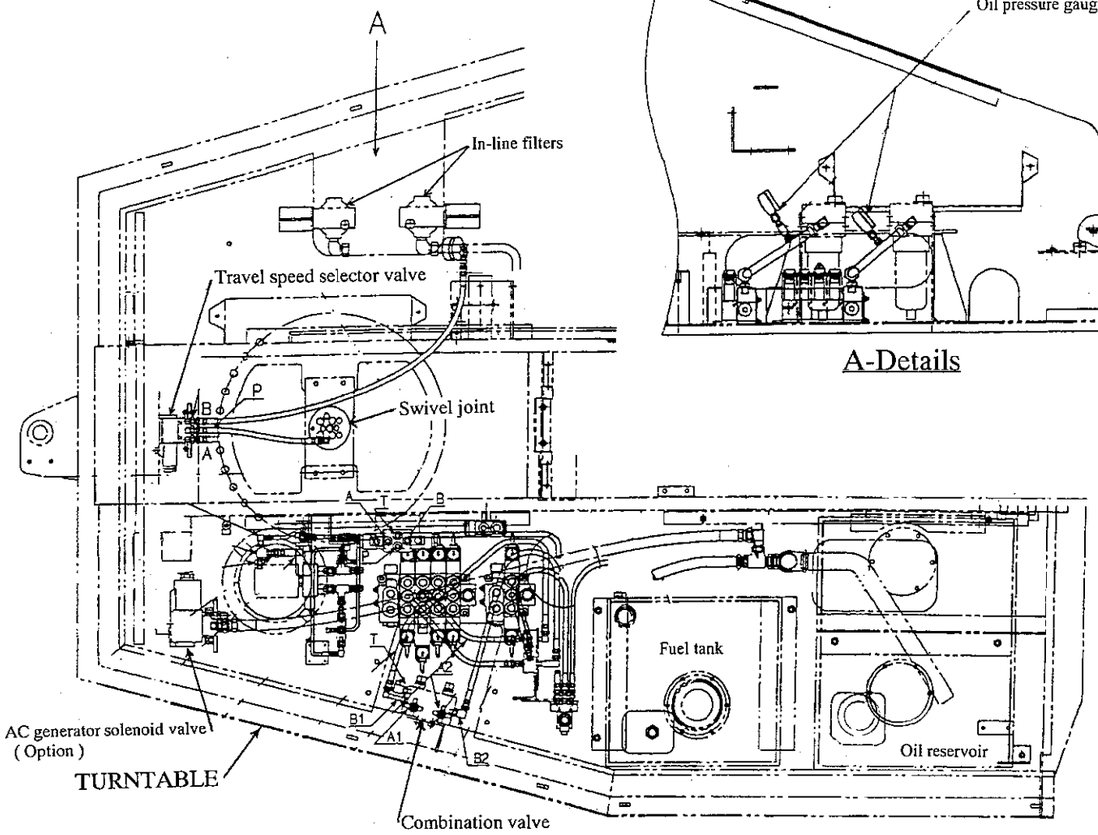
601-14405

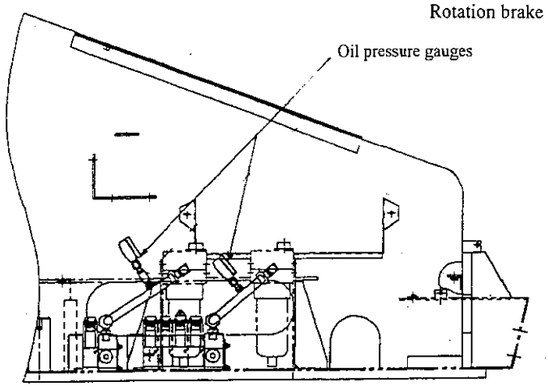
Relief valve pre-set pressure:

P1.....210 kg/cm² (3000 psi)
P2.....210 kg/cm² (3000 psi)
P3.....140 kg/cm² (2000 psi)
P4..... 90 kg/cm² (1280 psi)
P5..... 50 kg/cm² (710 psi)
P6..... 230 kg/cm² (3270 psi)



IDENTIFICATIONS OF HYDRAULIC COMPONENTS





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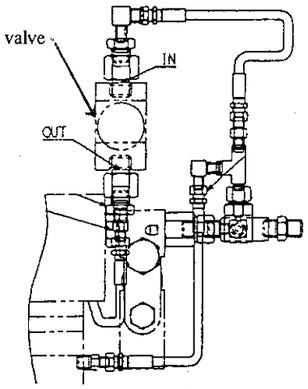
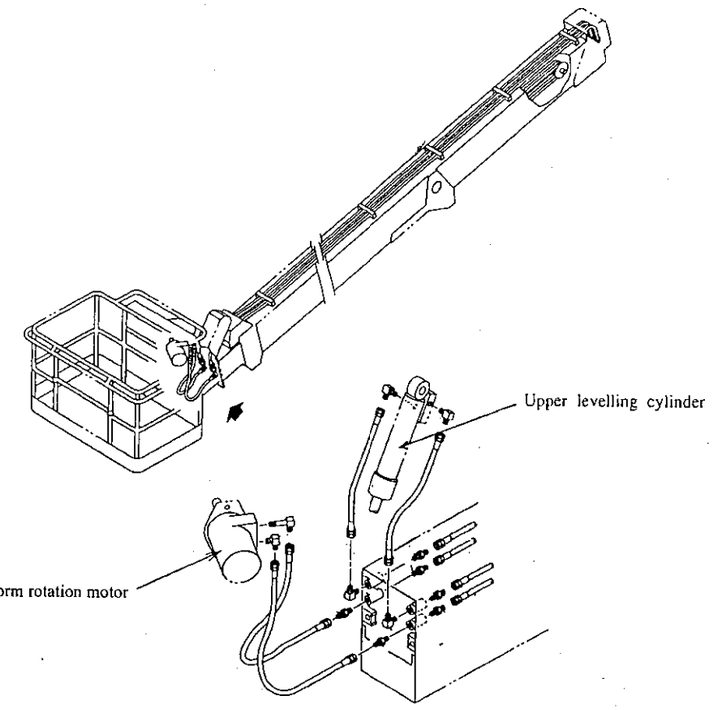
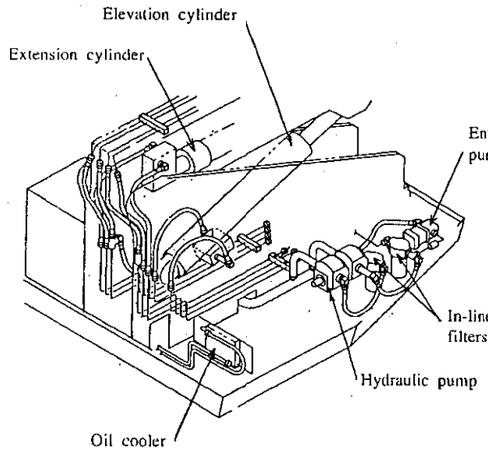
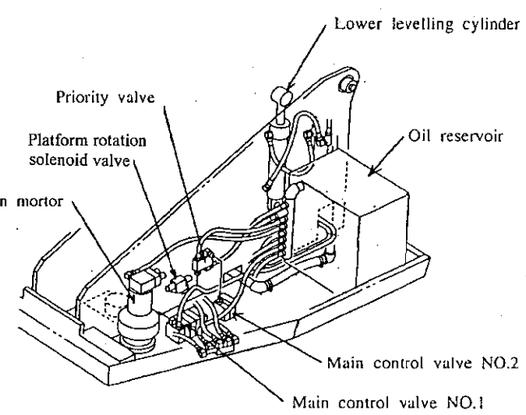
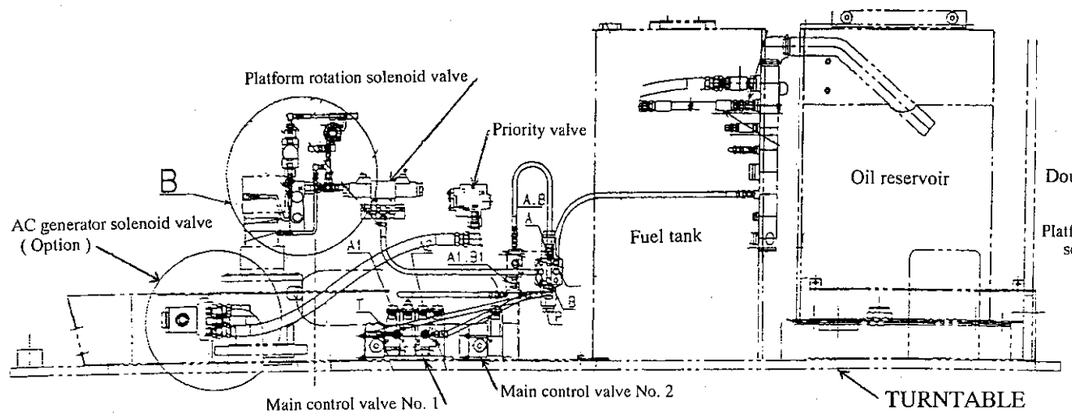


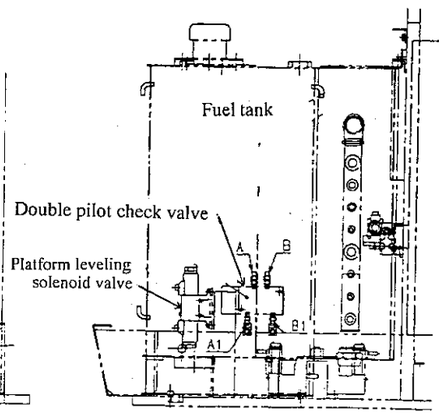
B-Details

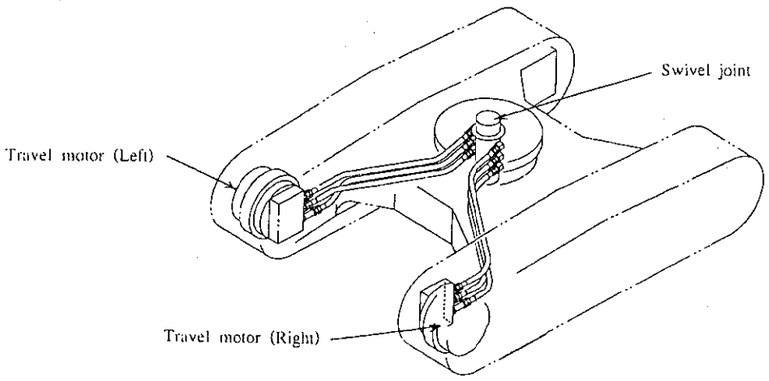




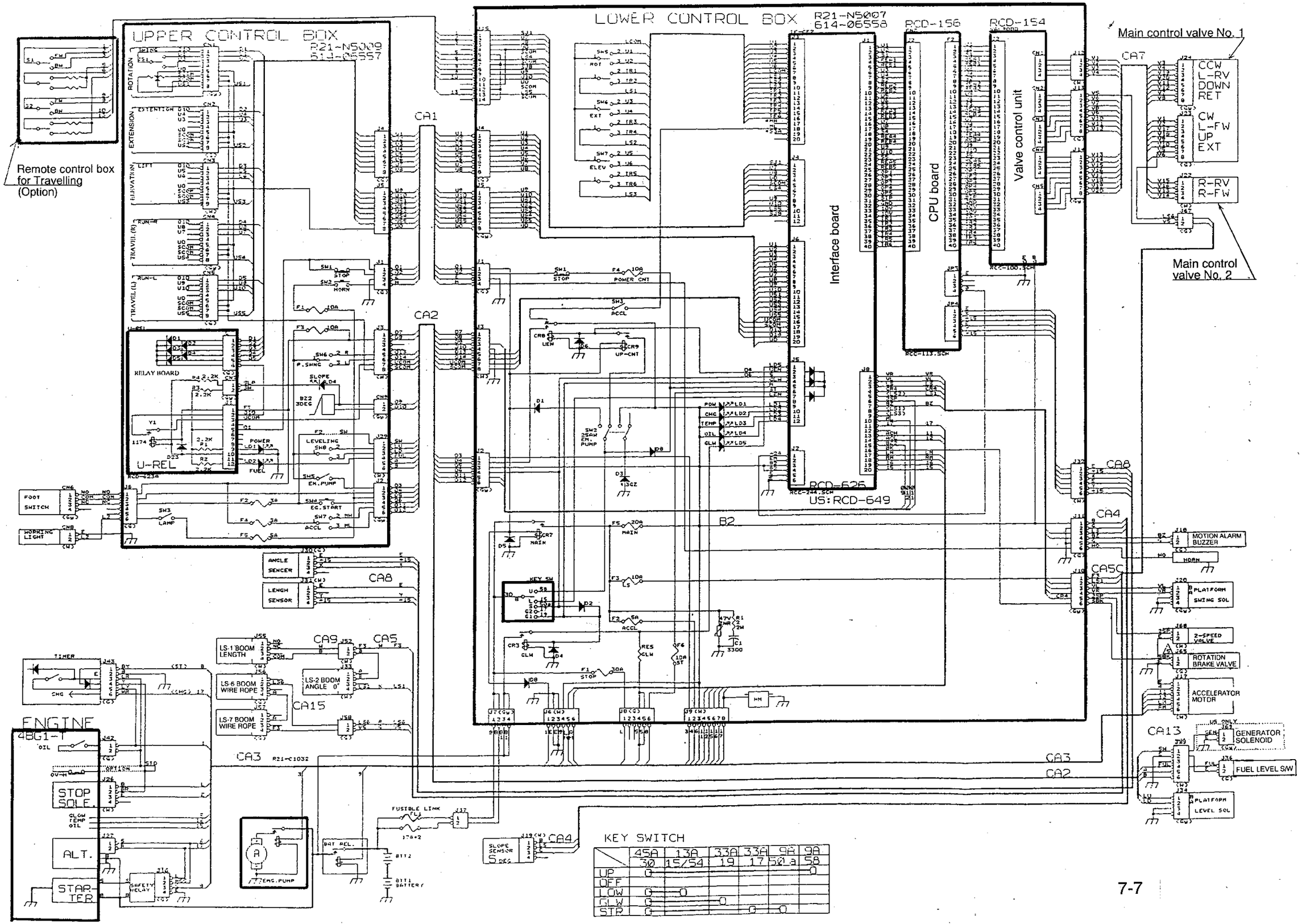








ELECTRIC CIRCUIT DIAGRAM



ELECTRIC WIRE HARNESS

17.CHG(Y)
6 :M (W)
8 :C (BK/W)
E :E (BK)

SAFETY RELAY

6P(G)

8 :C (B/Y)
E :E (BK)
Br1:OUT(L/R)
81:D-K(Y)
1 :Br (L/Y)
17:CHG(W/R)

4P(G)

J16

J43

TIMER RELAY

EARTH

(L)
(R)
S
B

STARTER MOTOR

ENGINE STOP SOLENOIDE

J26

EARTH

ACCELARATOR MOTOR

EARTH

J17

:PLUG
4 :B (R)
11:R (BK)
12:L (W)

4P(W)

(BT-1)

EMERGENCY PUMP

EARTH WIRE

3

WATER TEMP.SW

16
15

J28

OIL PRESS. SW(1)

(R)
B

J27

(BK)
E

ALTERNATOR

(BE)
(R)

J37

BT-4

FUSIBLE LINK

BATTERY RELAY

J42

OIL PRESS. SW(2)

5

GLOW PLUGS

BATTERIES

BT-5

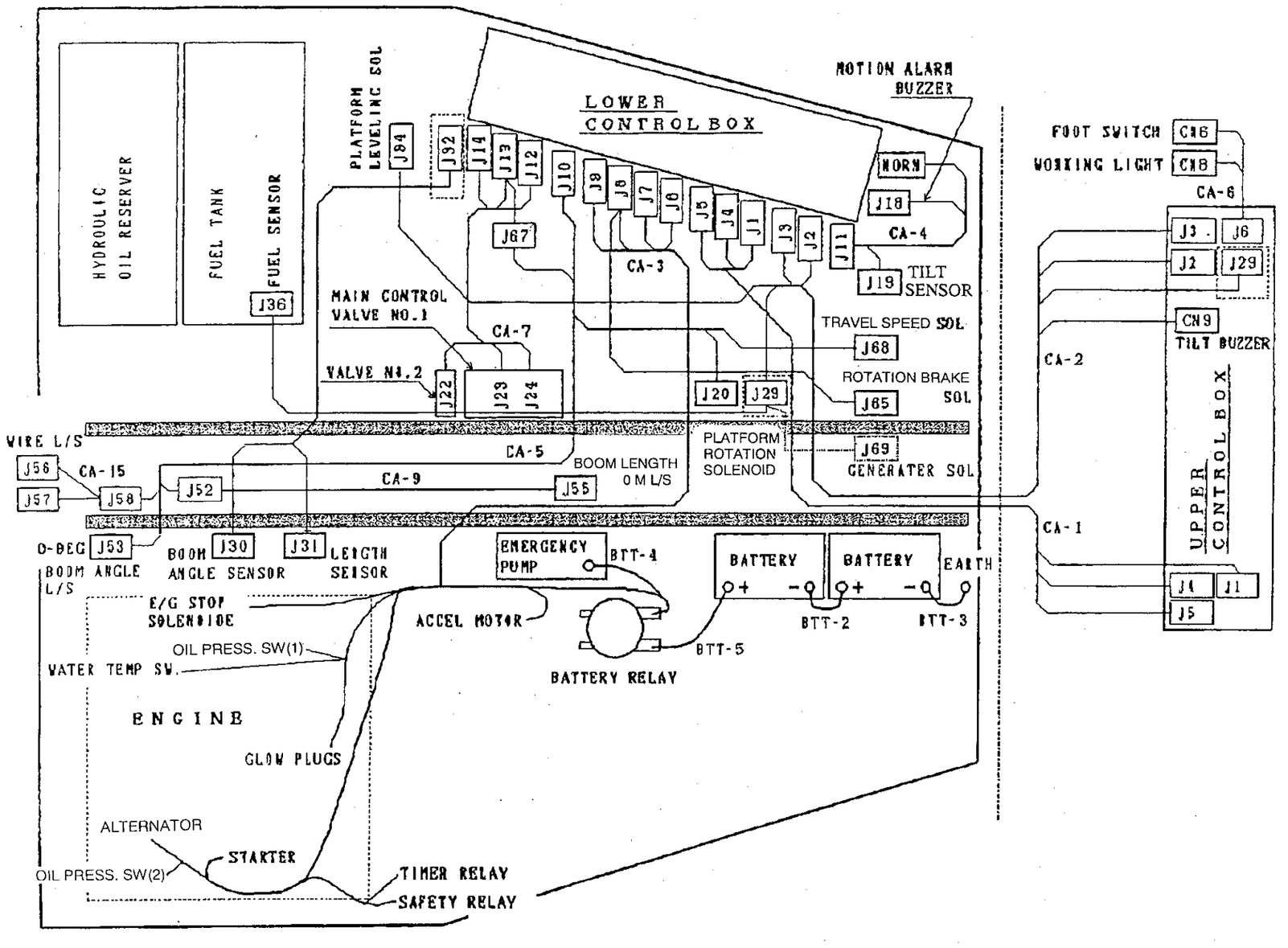
BT-3

EARTH

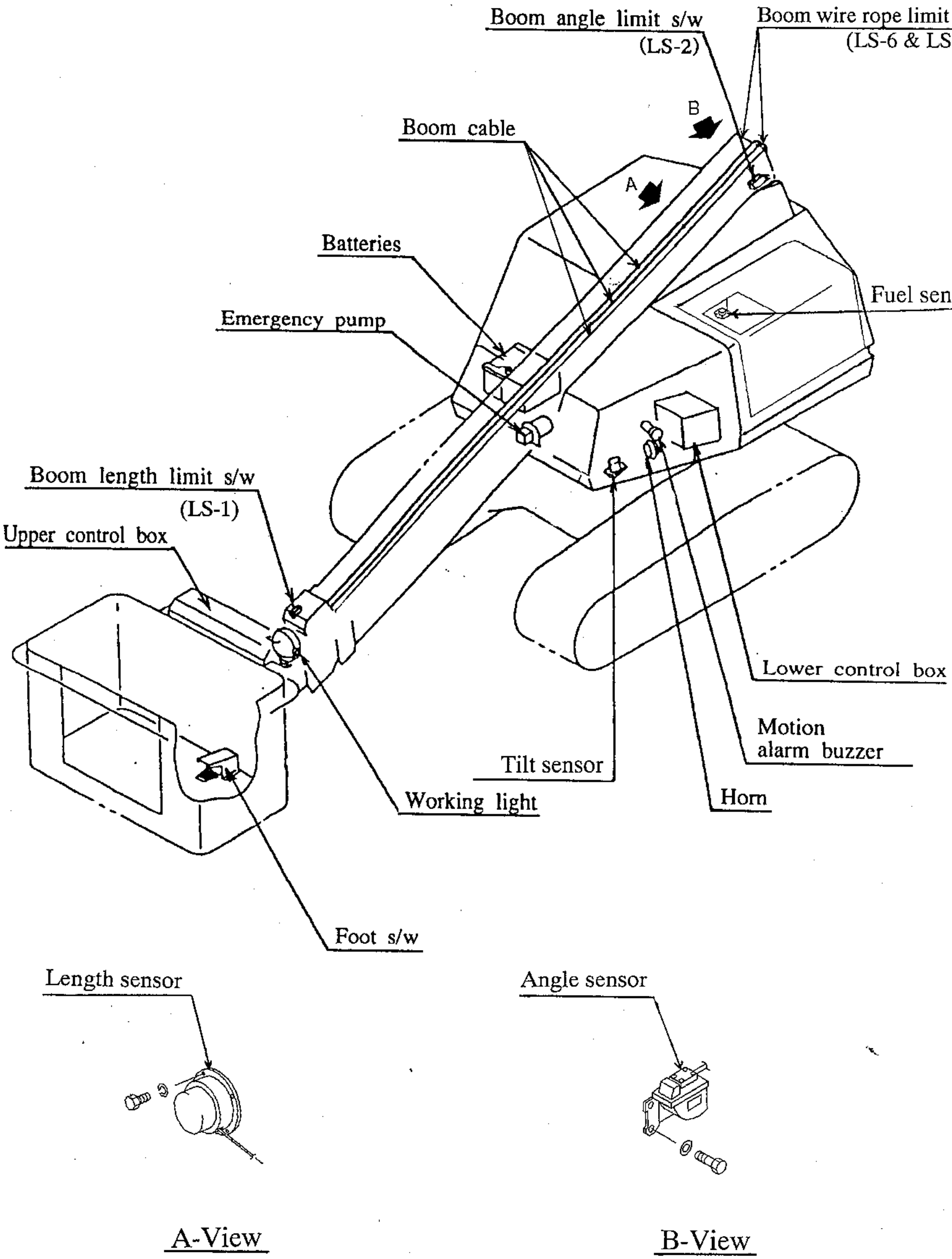
(G)

J6 6P (W) TO: LOWER CONTROL
J7 4P (Gy)
J8 6P (G)
J9 8P (W)

J6 (W)
J7 (G)
J8 (G)
J9 (W)



IDENTIFICATIONS OF ELECTRIC COMPONENTS



TIGHTENING TORQUE STANDARD

1) Hexagon Bolts and Nuts (8.8T)
Material : S45C

Tensile strength : 80 kgf/㎟
Yield point : 64 kgf/㎟
Brinell hardness : 225 ~ 300

Size mm	Pitch mm	Tightening torque	
		kgf - m	ft - lb
6	1.0	0.68 ~ 0.92	5 ~ 7
8	1.25	1.63 ~ 2.21	12 ~ 16
10	1.5	3.22 ~ 4.36	23 ~ 32
12	1.75	5.60 ~ 7.57	41 ~ 55
14	2.0	8.92 ~ 12.1	65 ~ 88
16	2.0	13.7 ~ 18.5	99 ~ 134
18	2.5	18.1 ~ 24.5	131 ~ 177
20	2.5	25.3 ~ 34.2	183 ~ 247
22	2.5	34.2 ~ 46.2	247 ~ 334
24	3.0	43.7 ~ 59.2	316 ~ 428
27	3.0	63.4 ~ 85.8	459 ~ 621
30	3.5	86.3 ~ 116.8	624 ~ 845
33	3.5	116.5 ~ 157.6	843 ~ 1140
36	4.0	150.2 ~ 203.3	1086 ~ 1471
39	4.0	193.1 ~ 261.2	1397 ~ 1889
42	4.5	214.5 ~ 290.2	1552 ~ 2099
45	4.5	266.2 ~ 360.2	1926 ~ 2605
48	5.0	321.4 ~ 434.8	2325 ~ 3145
52	5.0	412.7 ~ 558.4	2985 ~ 4039

2) Hexagon Socket Head Cap Screws (10.9T)
Material : SCM435

Tensile strength : 100 kgf/㎟
Yield point : 90 kgf/㎟
Brinell hardness : 280 ~ 365
Color : Black

Size mm	Pitch mm	Tightening torque	
		kgf - m	ft - lb
6	1.0	1.22 ~ 1.65	9 ~ 12
8	1.25	2.94 ~ 3.98	21 ~ 29
10	1.5	5.80 ~ 7.84	42 ~ 57
12	1.75	10.1 ~ 13.6	73 ~ 98
14	2.0	16.1 ~ 21.7	116 ~ 157
16	2.0	24.6 ~ 33.2	178 ~ 240
18	2.5	32.6 ~ 44.1	236 ~ 319
20	2.5	45.6 ~ 61.6	330 ~ 445
22	2.5	61.5 ~ 83.2	445 ~ 602
24	3.0	78.7 ~ 106.5	569 ~ 770
27	3.0	114.1 ~ 154.4	825 ~ 1116
30	3.5	155.4 ~ 210.2	1124 ~ 1570
33	3.5	209.6 ~ 283.6	1515 ~ 2050
36	4.0	270.4 ~ 365.9	1955 ~ 2645
39	4.0	347.5 ~ 470.2	2512 ~ 3340
42	4.5	386.1 ~ 522.4	2792 ~ 3777
45	4.5	479.2 ~ 648.3	3465 ~ 4687
48	5.0	578.5 ~ 782.7	4183 ~ 5659
52	5.0	742.6 ~ 1011	5369 ~ 7310

SME-906

INSPECTION MANUAL

SELF PROPELLED AERIAL PLATFORM

SP,SR SERIES

IICHI
CORPORATION

1152, RYOKE, AGEO, SAITAMA, JAPAN.

I N D E X

All of the results of inspections and tests should be recorded in the inspection check sheet and kept for three years.

The inspection and the function test should be conducted by the qualified personnel.

PROCEDURES OF DAILY INSPECTION

The inspection is to be carried out on firm level ground.

POWER UNIT

UNIT	ITEM	DESCRIPTION
Radiater.	Cooling water level.	Remove radiator cap and check the cooling water level.
Battery.	Electrolyte level.	Remove filler caps and check the electrolyte level.
Oil pan.	Engine oil level.	Check oil level.
Fuel tank.	Fuel level.	Check fuel level.
Hydraulic oil reservoir.	Hydraulic oil level.	Retract and lower boom fully, then check the oil level.

CARRIER

Tyre.	Excessive wear, cuts	Check tyres for excessive wear and cuts.
Wheel nuts.	Looseness.	Check wheel nuts for looseness.
Steering linkages.	Deformation, cracks.	Check steering linkages for deformation and cracks.
Travel motor unit.	Oil leakage.	Check the unit for oil leakage.
Carrier frame.	Deformation, cracks.	Check carrier frame for deformation and cracks.
Crawler.	Track link, shoes. (Excessive wear, tension.)	Check track link and shoes for excessive wear and abnormal tension.

Turn table

Rotation gear box.	Function.	Retract and raise boom fully, run Rotation gear box using the lower control, and check for any abnormal noises and any function faults.

CONTROL SYSTEM

Control levers, switches.	Function.	Test all control levers and switches, then check they are functioning correctly.
	Excessive free play.	Test all of the control levers and switches, then check for excessive free play.

BOOM

Boom.	Deformation, cracks.	Extend boom fully, set it horizontally, and check for cracks and any deformations.
Boom pivot pin.	Any damage.	Check boom pivot pin for any damage.
Extension, Elevation cylinders.	Oil leakage.	Operate the cylinder several times, and check for oil leakage.
	Natural descent.	1) Operate and set each cylinder, so that the cylinder is loaded by the weight of boom. 2) Stop engine. 3) Check if each cylinder retracts itself due to the weight of boom.

PLATFORM

UNIT	ITEM	DESCRIPTION
Platform leveling system.	Function.	Operate the boom by the lower control, and check that the platform always keeps its level position.
Platform Swing device	Deformation, cracks, wear.	Check platform swing device for deformation, cracks, and wear.

SAFETY DEVICE

Engine start stop system.	Function.	Test the engine start/stop switches at upper control and check they function correctly.
Emergency pump.	Function.	Stop engine, operate boom by emergency pump and check it functions correctly.
Foot switch.	Function.	Operate the machine using the upper control, release foot switch, and check if all of the function stops immediately.
Slope warning buzzer.	Function.	Turn on main key switch and make sure the slope warning buzzer sounds for a second just after turning on.
Alarm horn.	Function.	Press horn switch at upper control, and check it functions correctly.
Motion alarm buzzer	Function.	Operate the control levers, and switches then check that the motion alarm buzzer sounds.
Safety switch	Function.	Operate the safety switch, and check that the engine stops and that the power lamps turn off.
Working range controller. Moment limitter.	Function.	Operate the boom using the lower control, and check that it functions correctly.

DAILY INSPECTION CHECK SHEET

POWER UNIT

UNIT	ITEM	RESULTS
(DATE) ⟶		
Radiater.	Cooling water level.	
Battery.	Electrolyte level.	
Oil pan.	Engine oil level.	
Fuel tank.	Fuel level.	
Hydraulic oil reservoir.	Hydraulic oil level.	

CARRIER

Tyre.	Excessive wear, cuts	
Wheel nuts.	Looseness.	
Steering linkages.	Deformation, cracks.	
Travel motor unit.	Oil leakage.	
Carrier frame.	Deformation, cracks.	
Crawler.	Track link, shoes. (Wear, tension.)	

TURNTABLE

Rotation gear box.	Function.	

CONTROL SYSTEM

Control levers, switches.	Function.	
	Free play.	

BOOM

Boom.	Deformation, cracks.	
Boom pivot pin.	Any damage.	
Extension, Elevation cylinder.	Oil leakage.	
	Natural descent.	

PLATFORM

Platform leveling system.	Function.	
Platform & swing device.	Deformation, cracks, wear.	

SAFETY DEVICE

UNIT	ITEM	RESULTS
(DATE) ⟶		
Engine start, stop system.	Function.	
Emergency pump.	Function.	
Foot switch.	Function.	
Slope warning buzzer.	Function.	
Alarm horn.	Function.	
Motion alarm buzzer.	Function.	
Safety switch.	Function.	
Working range controller, Moment limitter.	Function.	

PROCEDURES OF PERIODICAL INSPECTION

Carry out both descriptions of Monthly and Annual inspections when conducting Annual inspection.

		DESCRIPTION	
UNIT	ITEM	MONTHLY INSPECTION	ANNUAL INSPECTION
Engine	Water, oil leakage.	Thoroughly check for water and oil leakage.	←
	Radiator.	Check for water level, contamination and replenish or change the water if necessary.	←
		Check the radiator cap is functioning correctly and also for any possible damage to the radiator.	
	Air filter.	Check the air filter and clean or replace the element, if necessary.	←
	Water separator.	Drain water from water separator.	Disassemble and clean thoroughly. (Cleaning interval ; Every 6 months.)
	Fuel filter.	Check filter for fuel leakage.	Replace the element. (Replacement interval ; Every 600 hours.)
	Battery.	Check for electrolyte level and clean battery terminals.	←
	Fan belt.	Check for wear and tension.	←
	Alternator, starter.	Check the function.	←
	Valve clearance.		Remove tappet cover and adjust valve clearances. (Adjustment interval ; Every 1,200 hours.)
	Engine oil.	Check oil level and also for contamination.	Change engine oil. (Oil change interval ; Every 200 hours.)
	Oil filter.	Check filter for oil leakage.	Replace the element. (Replacement interval ; Every 400 hours.)
	Fuel tank.	Check tank for cracks and deformations.	Drain fuel and clean the tank.
Hydraulic oil reservoir	Oil leakage.	Check for oil leakage.	←
	Anchor bolts.	Check anchor bolts for looseness.	←
	Stop valve.	Check stop valves for oil leakage and any other damage.	←
	Oil level, contamination, viscosity, water content, oxidation.	Check oil level.	Stir oil in the reservoir, take a sample(60cc) and check the following items.

UNIT	ITEM	MONTHLY INSPECTION	ANNUAL INSPECTION
Hydraulic oil reservoir			–Contamination ; Within NAS class 12. –Viscosity ; Within 10% ± Standard. –Water content ; Less than 0.5%. –Oxidation ; Less than 0.4mgKOR/g. (Oil change interval ; 1,200 hours orAnnually)
Hydraulic filter.	Oil leakage, any other damage.	Check filters for oil leakage.	←
	Replacement of filter element.		Replace the element. (Replacement interval ; 1200 hours or Annualy)
Hydraulic pump.	Abnormal noise, excessive heat.	Run the pump and check for the items.	←
	Oil leakage.	Run the pump with max-imum pressure and check for oil leakage.	←
	Pump bracket, anchor bolts.	Check pump bracket for cracks, deformation, and anchor bolts for looseness.	
Wheels (SP series)	Tyre.	Check for excessive wear and cuts.	←
	Wheel nuts.	Check for looseness. Tightening torque ; 25-30kg-m.(180~220ft-lb)	←
Crawler. (SR series)	Track shoe, link.	Check for tension, and wear.	←
	Drive sprocket, Idle wheel.	Check for excessive wear and cracks.	←
	Track roller, carrier roller.	Check for wear and oil leakage.	←
Travel motor unit	Oil leakage, external damages.	Check for the items.	←
	Gear oil.	Check oil level.	Change gear oil. (Oil change interval; 1,200 hours or Annualy)
	Abnormal noise, excessive heat.	Run the motor and check the motor, gear box for the items.	←
	Bolts, nuts.	Check for looseness.	←

UNIT	ITEM	MONTHLY INSPECTION	ANNUAL INSPECTION
Steering mechanism. (SP serise)	Linkages.	Check for deformation, cracks.	←
	Wheel bearings.		Jack up the machine and check the wheel bearings for excessive free play and any other damage.
	Steering cylinder.	Operate the cylinder and check for oil leakage, abnormal function.	←
	Lubrication.	Supply grease to each grease fitting.	←
Travel speed limit system.	Travel speed.	Perform travelling operation with extended boom or setting boom over the horizontal and make sure the travelling speed is LOW.	←
	Flow divider valve.	Check the valves for oil leakage.	←
	Travel speed select solenoid valve.	Check the solenoid valve for oil leakage.	←
	Limit switch.	Check the limit switches for any damage.	←
Carrier, frame	Deformation, cracks.	Check the frame for the items.	←
Turntable.	Deformation, cracks.	Check turntable for the items.	←
	Anchor bolts.		Check anchor bolts for looseness.
T.T.B. (Turn Table Bearing)	Ring gear.	Check ring gear for excessive wear, cracks.	←
	Bearings.	Rotate T.T.B. and check for abnormal noise and any other fault.	Check the T.T.B. for free play. serviceable limit ; 3 mm(0.12 in)
	Anchor bolts.	Check bolts for looseness.	←
	Lubrication.	Supply grease to each grease fitting.	←
Rotation motor, gear box.	Oil leakage.	Check gear box and motor for oil leakage.	←
	Abnormal noise, excessive heat.	Run the motor and check for the items.	←
	Bolts, nuts.	Check bolts, and nuts for looseness.	←

UNIT	ITEM	MONTHLY INSPECTION	ANNUAL INSPECTION
Rotation motor, gear box.	Pinion gear.	Check pinion gear for wear, and cracks.	←
	Back-lash between pinion & T.T.B.		Check the back-lash between the pinion and ring gear of T.T.B. (Standard back-lash ; 0.6 mm (0.02in) or less)
	Gear oil.	Check oil level.	Change gear oil. (Oil change interval ; 1,200 hours or Annually)
Swivel joint.	Oil leakage.	Apply the maximum pressure, and check for oil leakage.	←
	Anchor bolts, stopper.	Check for looseness.	←
	Slip rings, carbon brushes.		Remove the cover or carbon brush holder and check for excessive wear, corrosion.
	Lubrication.	Supply grease to grease fitting.	←
Control system.	Control levers, switches, cables, linkages.	Test all of the control levers, switches and check the correct function, and any excessive free play.	←
	Instruments.	Check for the function.	←
	Relief valve.	Actuate relief valve, and check for abnormal noise, oil leakage.	Set a pressure gauge, measure the preset pressure of relief valve.
	Control valves.	Operate control valves, and check for oil leakage, any other fault.	←
	Name plates, Decals.	Check for legibility and any damage.	←
	Accelerator.	Operate accelerator switch either at lower or upper control and check for the function.	Check accelerator motor, limit switches, cams, wires for any damage.
Boom.	Bend, distortion, dent, crack, scratch.	Extend boom fully and check for the items. (The limit of bend ; —Vertically— 0,15% of the boom length. —Horizontally— 0.1% of the boom length.)	←
	Pivot pin.	Check boom pivot pin for excessive wear and any other damage. (The limit of clearance between pin and bushing ; 0.6 mm (0.024in))	←

UNIT	ITEM	MONTHLY INSPECTION	ANNUAL INSPECTION
Boom.	Wear pads, rollers.	Check each wear pad and roller for wear, cracks.	Check the clearance between each boom section and wear pad.
	Telescoping function.	Extend/retract the boom several times, and check for any abnormal function.	←
	Wire ropes.	Check wire ropes for excessive wear, breakage, corrosion.	Wire ropes should be checked in detail, when boom is disassembled for inspection every 4 years.
		Check turn buckles and wire end fittings for any damage.	
		Check the tension of wire rope.	
	Hydraulic hoses.	Check hydraulic hoses for oil leakage and any damage.	←
	Sheaves.	Check sheaves for excessive wear, free play.	←
	Lubrication.	Lubricate the sliding parts with grease.	←
Extension, Elevation, Platform swing cylinders.	Piston rod, cylinder tube.	Check for cracks, deformations, scratches.	←
	Oil leakage, faulty function.	Extend/retract the cylinders, and check for oil leakage, any faulty function.	←
	Anchor pins.	Check anchor pins for wear.	←
	Lubrication.	Supply grease to each grease fitting.	←
Platform leveling system.	Function.	Operate the boom thoroughly and ensure the platform keeps its level position.	←
	Levelling cylinder.	Check for oil leakage.	←
	Relief valve.	Check for oil leakage.	←
	Stop valve.	Check for oil leakage.	←
Platform.	Cracks, deformations.	Check for the items.	←
	Platform anchor bolts.	Check for looseness.	←
	Hook for safety belt.	Check for cracks, deformations.	←
Hydraulic plumbings.	Oil leakage, any damage.	Check hydraulic hoses, pipes for oil leakage and any other damage.	←

UNIT	ITEM	MONTHLY INSPECTION	ANNUAL INSPECTION
Auxiliary devices.	Engine start, stop system.	Check the function at both upper and lower controls.	Check the solenoid and linkages for any damage.
	Emergency pump.	Stop engine, operate the boom using the pump and check that it functions correctly.	Check the pump for oil leakage.
	Emergency stop.	Check for the function.	←
	Slope warning buzzer.	Turn on main key switch and make sure the warning buzzer sounds for a second just after turning on the switch.	Remove slope sensor, incline it about 3°, and check if the warning buzzer sounds.
			Check slope sensor and buzzer for any damage.
	Hydraulic outlets.	Check the self-seal couplings for oil leakage.	Using a pressure gauge, check the preset pressure.
	Receptacles. (AC 100 volts.)	Check for any damage.	←
	Alarm horn.	Check for function.	Check the switch and horn for any damage.
	Working range controller, Moment limitter.	Check for the function.	Check each sensor for any damage.
			Check each limited working radius.
			Check that the speed control system is functioning correctly.
	Motion alarm buzzer.	Check for function.	←
	Safety switch.	Check for function.	←
	Foot switch.	Check for function.	←

PROCEDURES OF FUNCTION TEST

–The following tests are to be conducted annually.
–All of the tests are to be carried out on firm level ground.

<table>
<tr><th>TEST</th><th>ITEM</th><th>DESCRIPTION</th></tr>
<tr><td>Load test.</td><td>Function.</td><td>1. Load platform with the rated load.
2. Operate the machine using the lower controls and check that the function is correct.</td></tr>
<tr><td>Natural descent test.</td><td>Extension, Elevation cylinders.</td><td>1. Set boom as listed below to check the natural descent of each cylinder.
<table>
<tr><th></th><th>Boom angle</th><th>Boom length</th></tr>
<tr><td>Extension cylinder</td><td>MAX.</td><td>Extend 1 meter</td></tr>
<tr><td>Elevation cylinder</td><td>45°</td><td>MIN</td></tr>
</table>
2. Stop engine and leave it for ten minutes.
3. Check the elevation, and extension cylinders for Natural descent.
–The limit of Natural descent ; 2 mm (0.08in)/10 minutes.</td></tr>
<tr><td rowspan="6">Operational speed test.</td><td>Elevation speed.
(UP, DOWN)</td><td>Raise/lower boom to its full stroke with the minimum boom length, and measure the UP and DOWN speed (seconds/stroke).</td></tr>
<tr><td>Extension speed.
(IN, OUT)</td><td>Extend/retract boom to its full stroke with the maximum boom angle, and measure the OUT and IN speed (seconds/stroke).</td></tr>
<tr><td>Rotation speed.
(C.W., C.C.W.)</td><td>Rotate turntable 360° with the maximum boom angle and minimum boom length, and measure the C.W. and C.C.W. speed (seconds/360°).</td></tr>
<tr><td>Travel speed.
(FOR., REV.)</td><td>Retract boom fully, set it at an angle less than horizontal, perform travel operation and measure the FWD and REV speed (seconds/10 meter).</td></tr>
<tr><td>Platform swing speed.
(RIGHT, LEFT)</td><td>Swing platform to its full stroke, and measure the RIGHT and LEFT motion speed (seconds/stroke).</td></tr>
<tr><td>Fly jib speed
(UP, DOWN)</td><td>Raise/lower fly jib to its full stroke and measure the Up and Down speed (second/stroke)</td></tr>
<tr><td>Brake test</td><td>Braking distance</td><td>Drive the machine at high speed on the slope which is equivalent to the specific maximum tilt angle and make sure that the braking distance is shorter than the specific numerical value.</td></tr>
</table>

PERIODICAL INSPECTION CHECK SHEET

		DATE	
CUSTMER		PHONE NO.	
ADDRESS			
MODEL		SERIAL NO.	
HOUR METER		INSPECTOR	

The marks (*) are the items to be inspected only on the annual inspection.

UNIT	ITEM	CHECK MARKS	REMARKS
Engine.	Water, oil leakage.		
	Radiator. (Water level, contamination, any damage.)		
	Air filter. (Cleaning.)		
	Water separator. (Draining water.)		Cleaning interval; Every 6 months.
	(*)(Cleaning.)		
	Fuel filter. (Oil leakage) (*)(Replacement.)		Replacement interval; Every 600 hours.
	Battery. (Electrolyte level, Battery terminals.)		
	Fan belt. (Tension, wear)		
	Alternator, starter. (Function.)		
	Valve clearance. (*)(Adjustment.)		Adjuatment interval; Every 1,200 hours.
	Engine oil (Oil level, contamination.)		Oil change interval; Every 200 hours.
	(*)(Oil change.)		
	Oil filter. (Oil leakage.) (*)(Replacement.)		Replacement interval; Every 400 hours.
	Fuel tank. (Cracks, deformation.) (*)(Cleaning.)		
Hydraulic oil reservoir.	Oil leakage.		
	Anchor bolts. (Looseness.)		
	Stop valve. (Oil leakage.)		
	Oil level, contamination, (*)water content, oxidation.		Oil change interval; (1,200 hours or Annually)

UNIT	ITEM	CHECK MARKS	REMARKS
Hydraulic fillter.	Oil leakage.		
	(*)Repllacement of filter element.		Replacement interval; 1,200 hours or Annually.
Hydraulic pump.	Abnormal noise, excessive heat.		
	Oil leakage.		
	Pump bracket, anchor bolts. (Cracks, deformation, looseness.)		
Wheels. (SP series.)	Tyre. (Wear, cuts)		
	Wheel nuts. (Looseness.)		
Crawler. (SR series.)	Track shoe, link. (Tension, wear.)		
	Drive sprocket, idle wheel. (Wear, Cracks.)		
	Track roller, carrier roller. (Wear, Oil leakage.)		
Travel motor unit	Oil leakage, Oil level.		
	(*)Change gear oil.		Oil change interval; 1,200 hours or Annually.
	Abnormal noise, excessive heat.		
	Bolts, nuts. (Looseness.)		
Steering mechanism. (SP series.)	Linkages. (Deformation, Cracks.)		
	(*)Wheel bearing. (Excessive free play, any damage.)		
	Steering cylinder. (Oil leakage, abnormal function.)		
	Lubrication.		
Travel speed limit system.	Travel speed limit system. (Function.)		
	Flow divider valve. (Oil leakage.)		
	Travel speed select solenoid valve. (Oil leakage.)		
	Limit switch. (Any damage.)		
Carrier frame.	Deformation, cracks.		

UNIT	ITEM	CHECK MARKS	REMARKS
Turn table.	Deformation, cracks.		
	Anchor bolts. (Looseness.)		
T.T.B. (Turn Table Bearing.)	Ring gear. (Excessive wear, cracks.)		
	Bearings. (Abnormal noise.)		
	(*)(Free play.)		
	Anchor bolts. (Loosensee.)		
	Lubrication.		
Rotation motor, gear box.	Oil leakage.		
	Abnormal noise, excessive heat.		
	Bolts nuts. (Looseness.)		
	Pinion gear. (Excessive wear, cracks.)		
	Back-lash between pinion and ring gear.		
	Gear oil. (Oil level.)		Oil change interval; 1,200 hours or Annually.
	(*)(Oil change.)		
Swivel joint.	Oil leakage.		
	Anchor bolts, stopper. (Looseness.)		
	(*)Slip rings, carbon brushes. (Excessive wear, corrosion.)		
	Lubrication.		
Control system.	Control lever, switch, cable, linkage. (Function, excessive free play.)		
	Instruments. (Function.)		
	Relief valves. (Noise, Oil leakage.) (*)(Pre-set pressure.)		
	Control valves. (Oil leakage.)		
	Name plates, Decals. (Legibility, any damage.)		
	Accelerator. (Function.)		
	(*)(Any damage of the components.)		

UNIT	ITEM	CHECK MARKS	REMARKS
Boom.	Bend, distortion, dent, cracks.		
	Anchor pins. (Excessive wear.)		
	(*)Wear pads, rollers. (Excessive wear, cracks.)		
	Telescoping function.		
	Wire ropes. (Excessive wear, corrosion, tension.)		Wire ropes should be inspected in detail, when boom is disassembled for inspection every 4 years.
	Hydraulic hoses. (Oil leakage, any damage.)		
	Sheaves. (Excessive wear, free play.)		
	Lubrication.		
Extension, Elevation, cylinders.	Piston rod, cylinder tube. (Cracks, deformation, scratches.)		
	Oil leakage, faulty function.		
	Anchor pins. (Wear.)		
	Lubrication.		
Platform leveling system.	Function.		
	Levelling cylinders. (Oil leakage.)		
	Relief valves. (Oil leakage.)		
	Stop valves. (Oil leakage.)		
Platform.	Cracks, deformation.		
	Anchor bolts. (Looseness.)		
	Hook for safety belt. (Cracks, deformation.)		
Hydraulic plumbings.	Oil leakage, any damage.		
Auxiliary devices.	Engine start stop system. (Function.)		
	(*)(Any damage of the components.)		

UNIT	ITEM	CHECK MARKS	REMARKS
Auxiliary devices.	Emergency pump. (Function.)		
	(*)(Any damage of the components.)		
	Emergency stop. (Function.)		
	Hydraulic out-lets. (Oil leakage.)		
	(*)(Pre-set pressure.)		
	Receptacles. (Any damage.)		
	Alarm horn. (Function.)		
	(*)(Any damage of the components.)		
	Working range controller. Moment limitter. (Function.)		
	(*)(Sensors for any damage, Limited working radius, Controlled speed.)		
	Motion alarm buzzer. (Function.)		
	Safety switch. (Function.)		

The following tests are to be carried out annually.

Function test.

TEST	ITEM	CHECK MARKS	REMARKS
Load test.	Function.		
Natural descent test.	Extension cylinder.		Sevviceable limit; 2 mm (0.08in)/10 minutes.
	Elevation cylinder.		
Operational speed test.	Elevation speed.		
	Extension speed.		
	Rotation speed.		
	Travel speed.		
	Platform swing speed.		
	Fly jib speed		
Brake test	Braking distance		

REMARKS

Major alteration and Repair

SHOP MANUAL

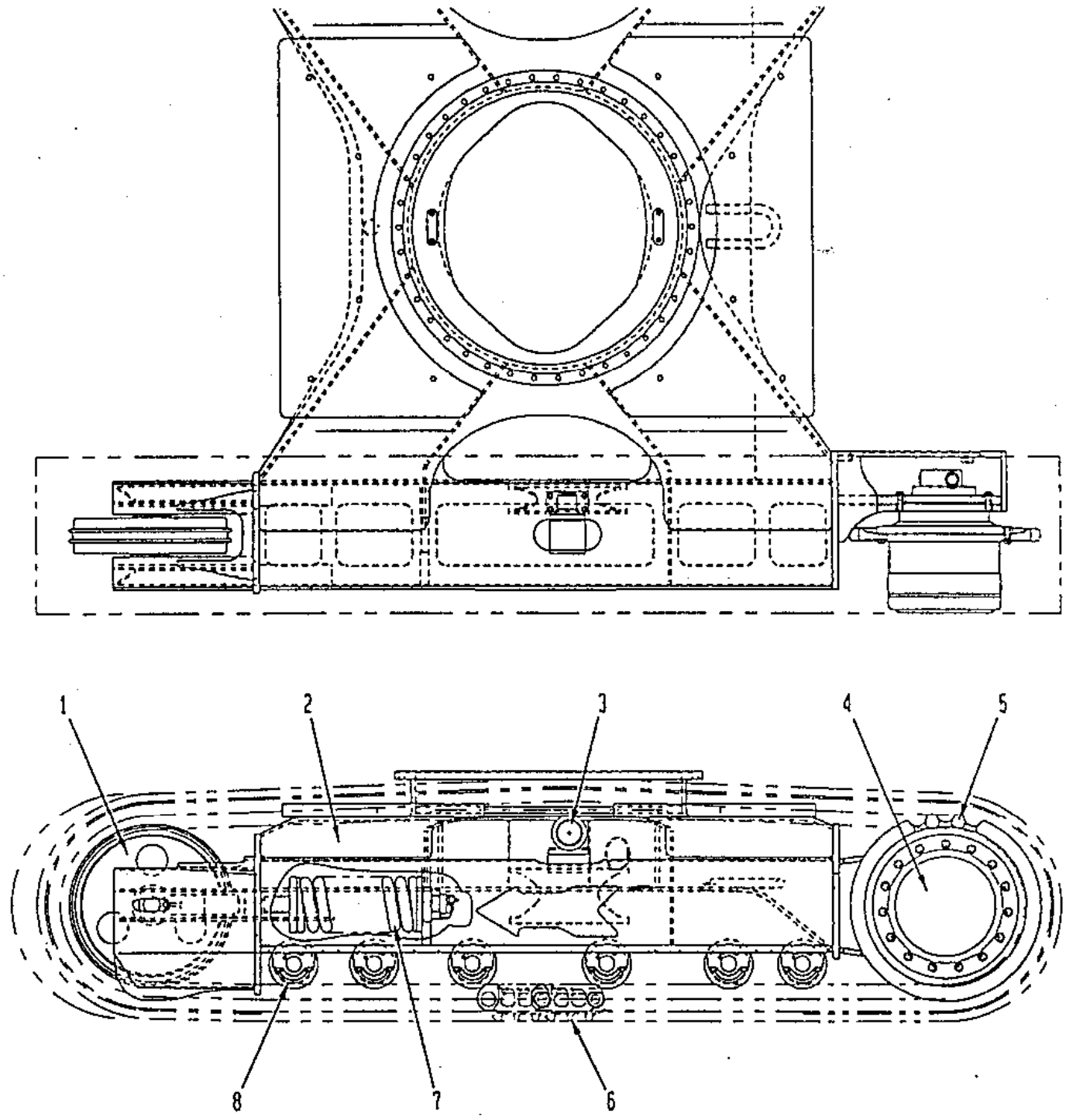
KOMATSU CRAWLER TRACK
(PC100-6 Aichi Corp.)

SR210/
ISR700

KOMATSU

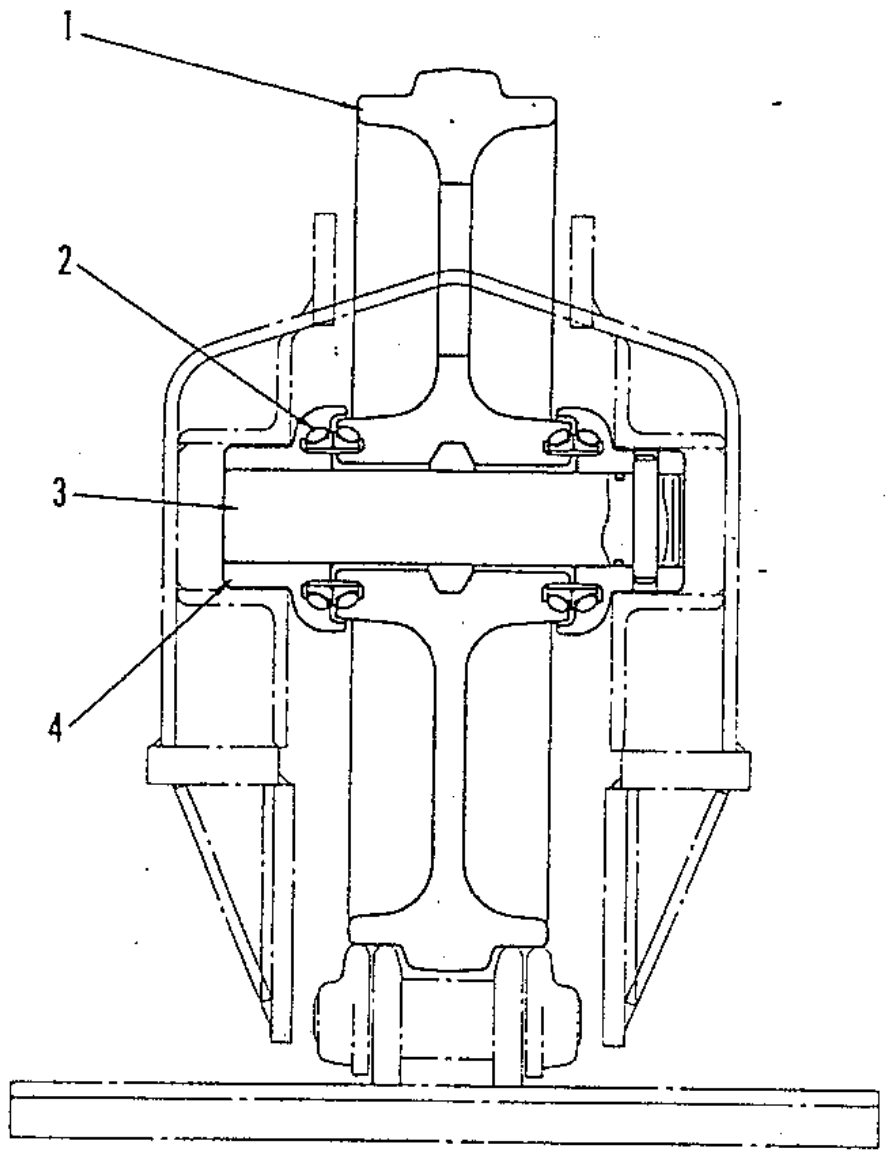
CONTENTS

TRACK FRAME



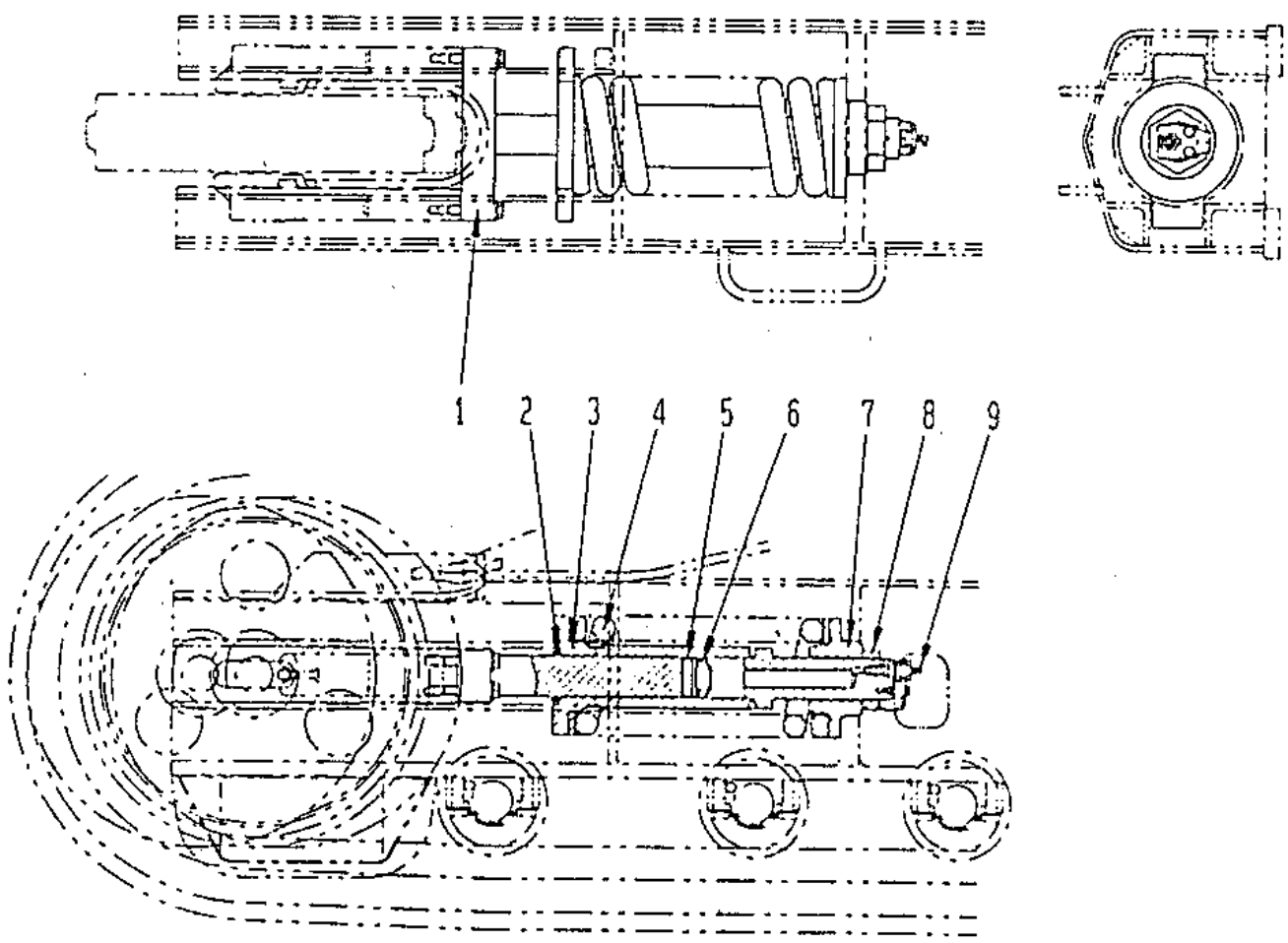
1. Idler
2. Track frame
3. Carrier roller
4. Travel motor
5. Sprocket
6. Track shoe
7. Idler cushion
8. Track roller

IDLER



1. Idler
2. Floating seal
3. Shaft
4. Support

IDLER CUSHION

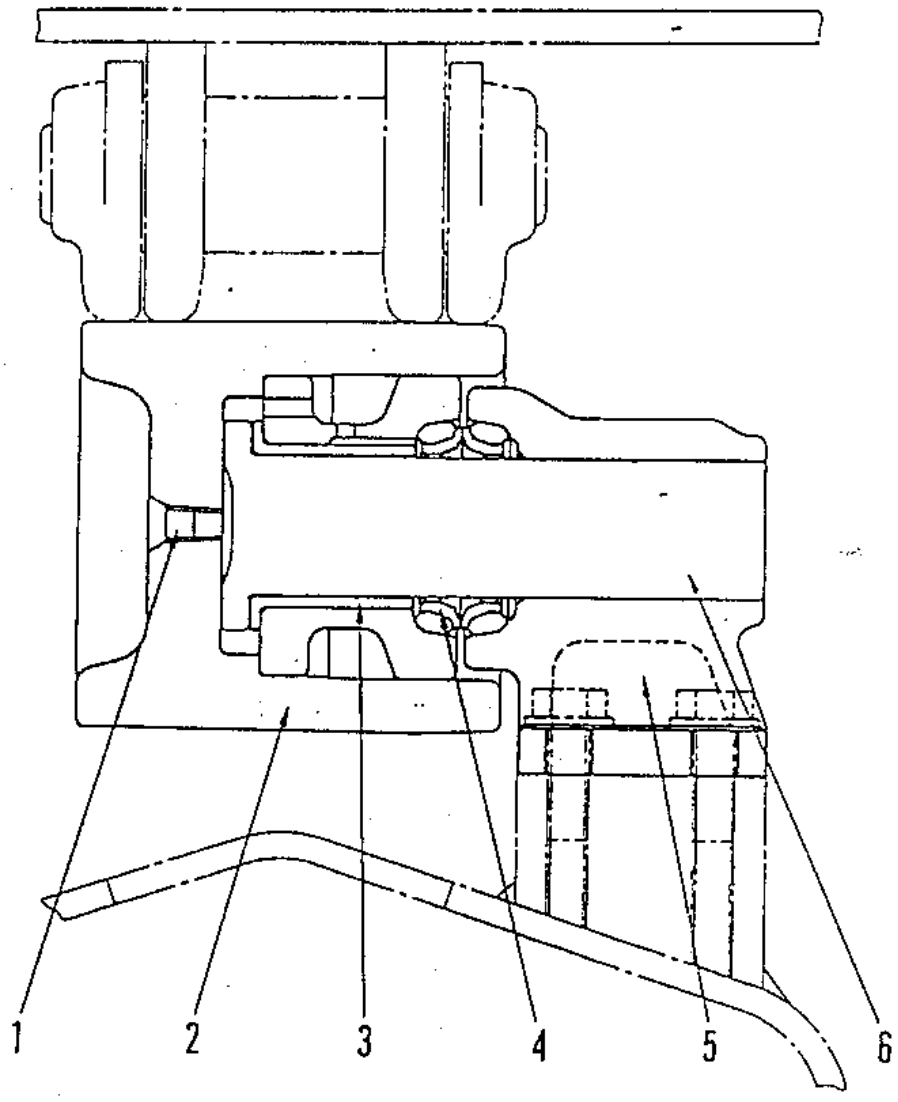


1. Yoke
2. Seal
3. Front support (cylinder)
4. Recoil spring
5. Wear ring
6. Packing
7. Rear support
8. Nut
9. Lubricator

SPECIFICATION

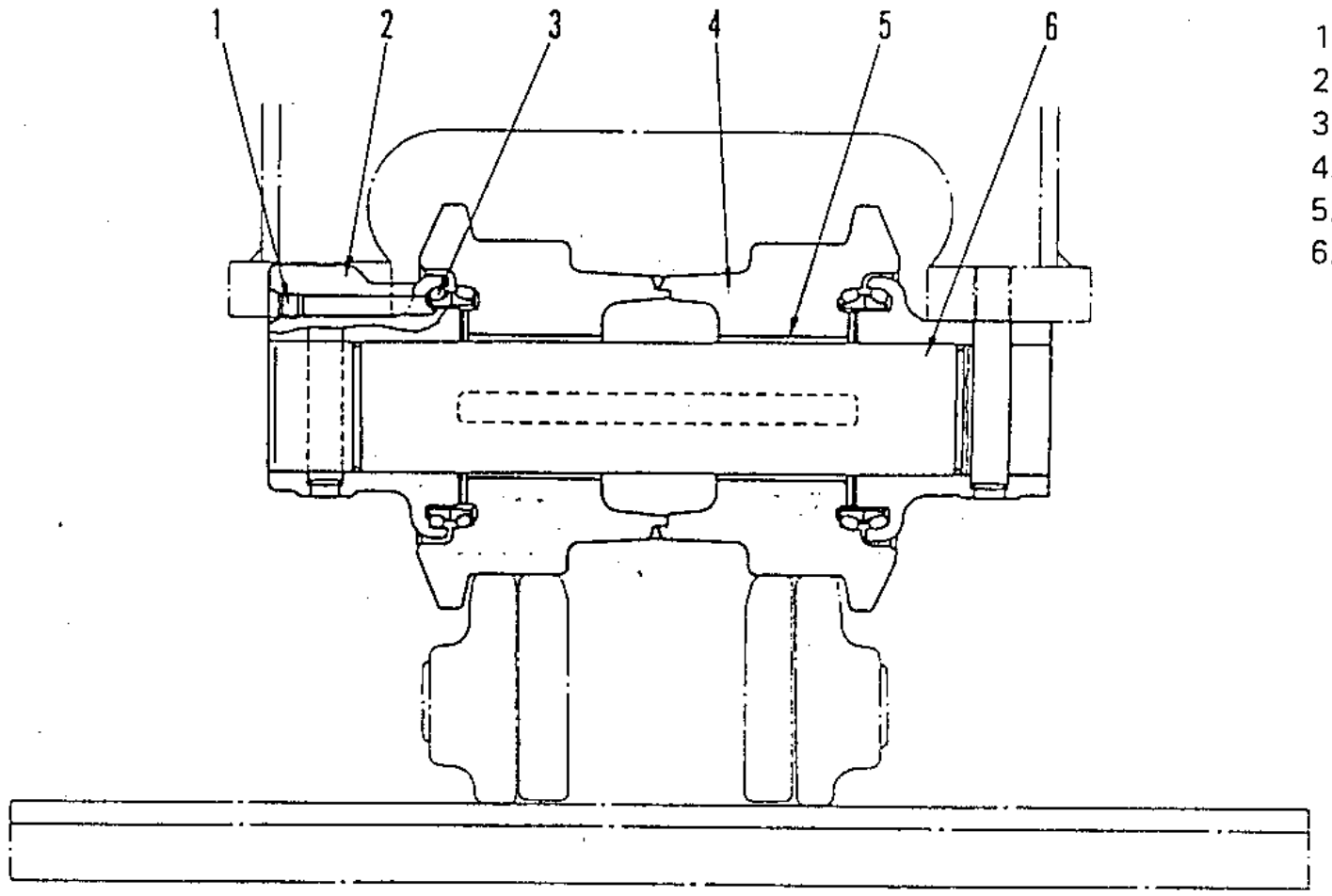
Amount of grease (when applying track tension):
Approx. 140 cc (G2-LI)

CARRIER ROLLER



1. Oil filler plug
2. Roller
3. Bushing
4. Floating seal
5. Collar
6. Shaft

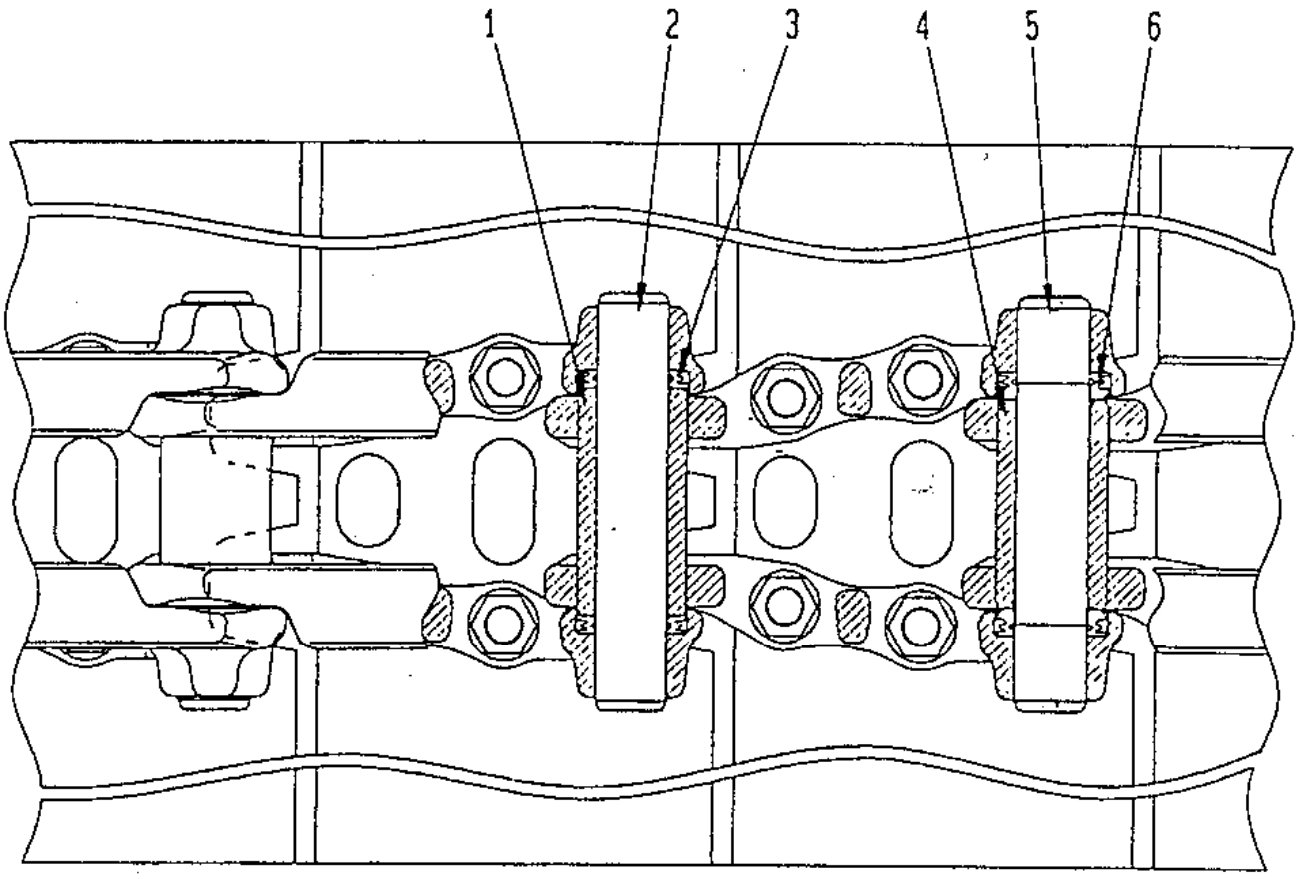
TRACK ROLLER

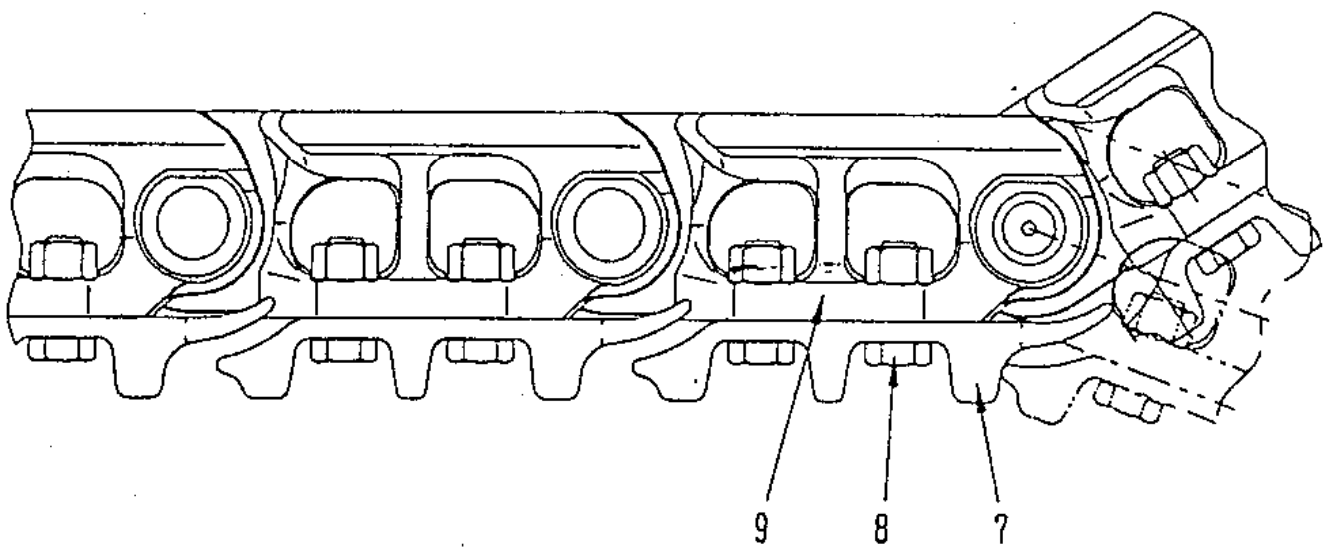


1. Oil filler plug
2. Collar
3. Floating seal
4. Roller
5. Bushing
6. Shaft

TRACK SHOE

TRIPLE GROUSER SHOE





1. Regular bushing
2. Regular pin
3. Regular dust seal
4. Master bushing
5. Master pin
6. Master dust seal
7. Shoe
8. Shoe bolt
9. Link

SPECIFICATIONS

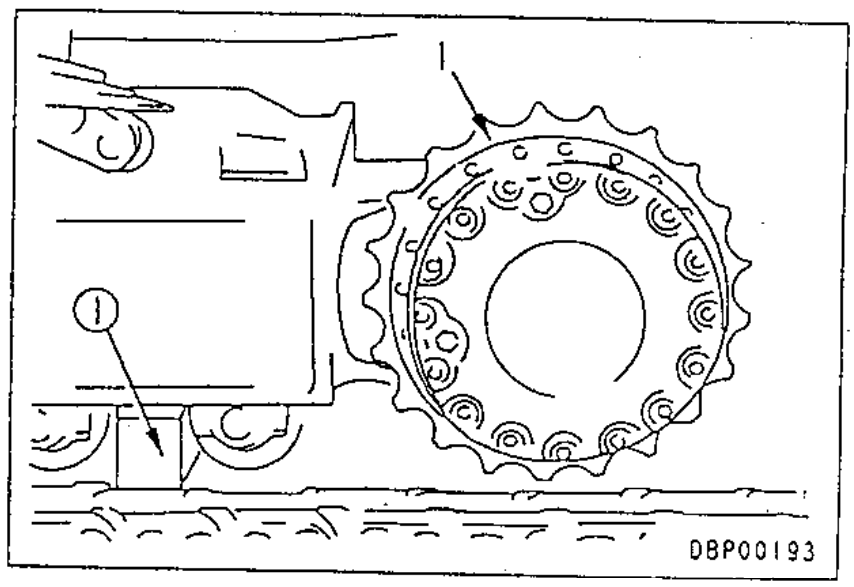
Link pitch: 175 mm
No. of shoes: 40 on each side

REMOVAL OF SPROCKET

1. Remove track shoe assembly.
   For details, see REMOVAL OF TRACK SHOE ASSEMBLY.

2. Swing work equipment 90°, then push up chassis with work equipment and set block ① between track frame and track shoe.

3. Lift off sprocket (1). ※1



INSTALLATION OF SPROCKET

- Carry out installation in the reverse order to removal.

※1

Thread of sprocket mounting bolt :
Thread tightener (LT-2)

Sprocket mounting bolt :
343.2±19.6 Nm(35±2 kgm)

REMOVAL OF TRAVEL MOTOR ASSEMBLY

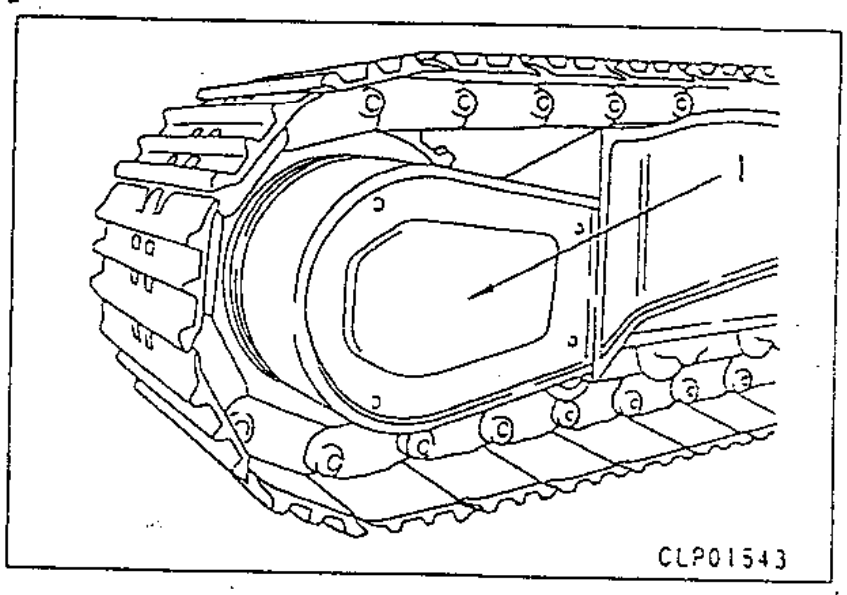
1. Remove sprocket.
   For details, see REMOVAL OF SPROCKET.

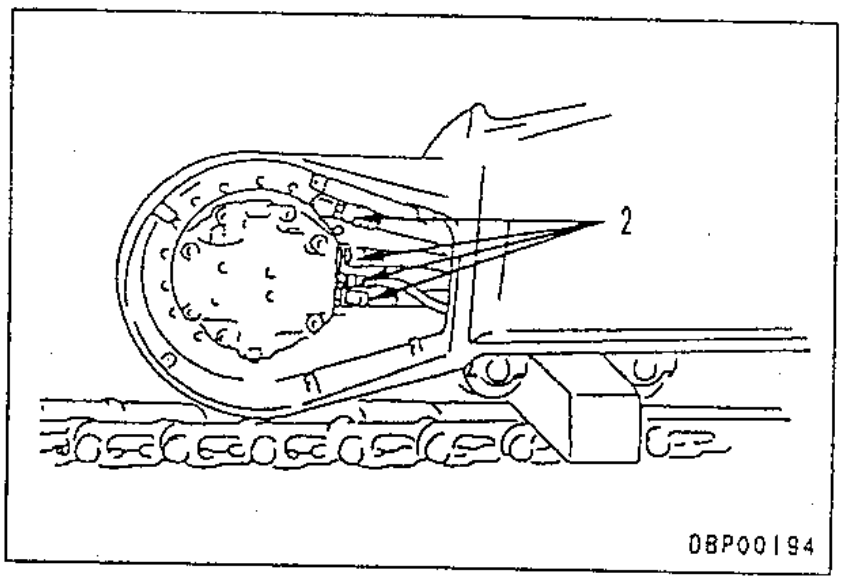
   ⚠ Lower the work equipment completely to the ground and stop the engine. Then loosen the oil filler cap slowly to release the pressure inside the hydraulic tank.

2. Remove cover (1).

3. Disconnect 4 travel motor hoses (2), and lift off travel motor assembly (3). ※1
   ★ Be extremely careful not to damage the nipple tool surface of the hose mount.

   kg Travel motor assembly: 230 kg





INSTALLATION OF TRAVEL MOTOR ASSEMBLY

- Carry out installation in the reverse order to removal.

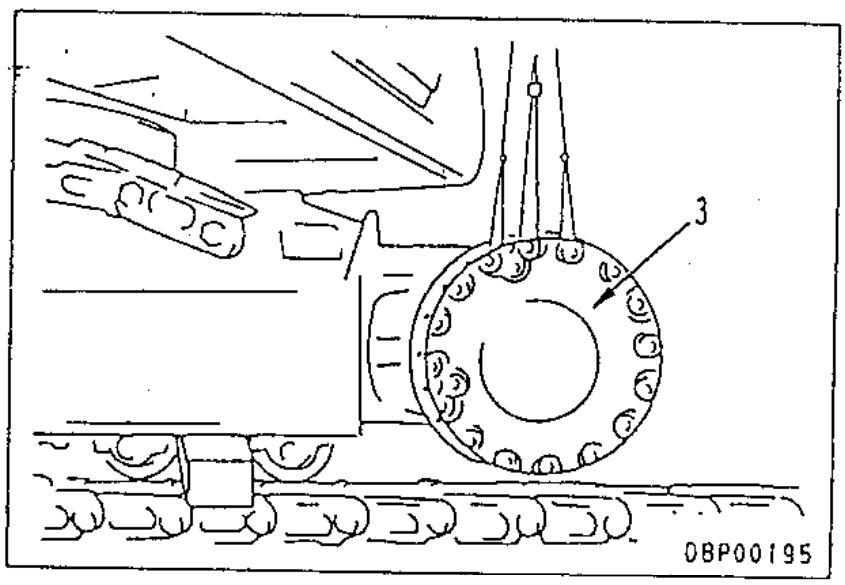
※1

Thread of travel motor mounting bolt :
Thread tightener (LT-2)

kgm Travel motor mounting bolt :
277.0±31.9 Nm (28.25±3.25 kgm)

★ Bleed the air from the travel motor.
For details, see TESTING AND ADJUSTING, Bleeding air from travel motor.

- Refilling with oil (hydraulic tank)
  ★ Add oil through the oil filler to the specified level.
  Run the engine to circulate the oil through the system. Then check the oil level again.



REMOVAL OF IDLER • RECOIL SPRING ASSEMBLY

1. Remove track shoe assembly.
   For details, see REMOVAL OF TRACK SHOE ASSEMBLY.

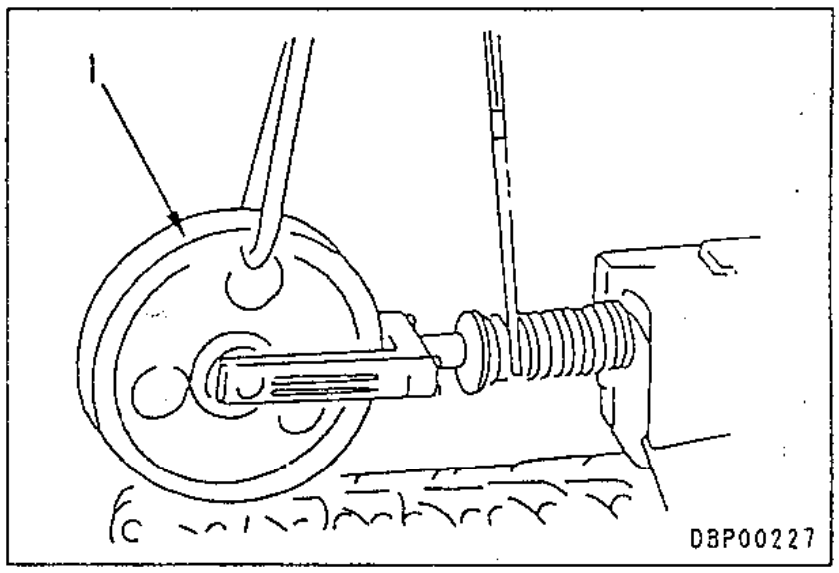
2. Sling idler and recoil spring assembly (1), and pull out to the front to remove.

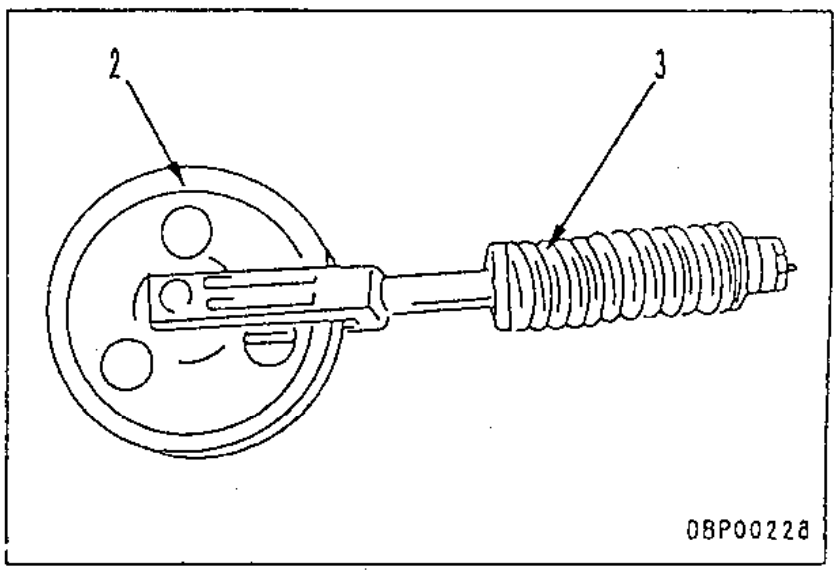
   kg Idler, recoil spring assembly : 155 kg

3. Disconnect recoil spring assembly (3) from idler assembly (2). ※1

   kg Idler assembly : 80 kg

   kg Recoil spring assembly : 75 kg





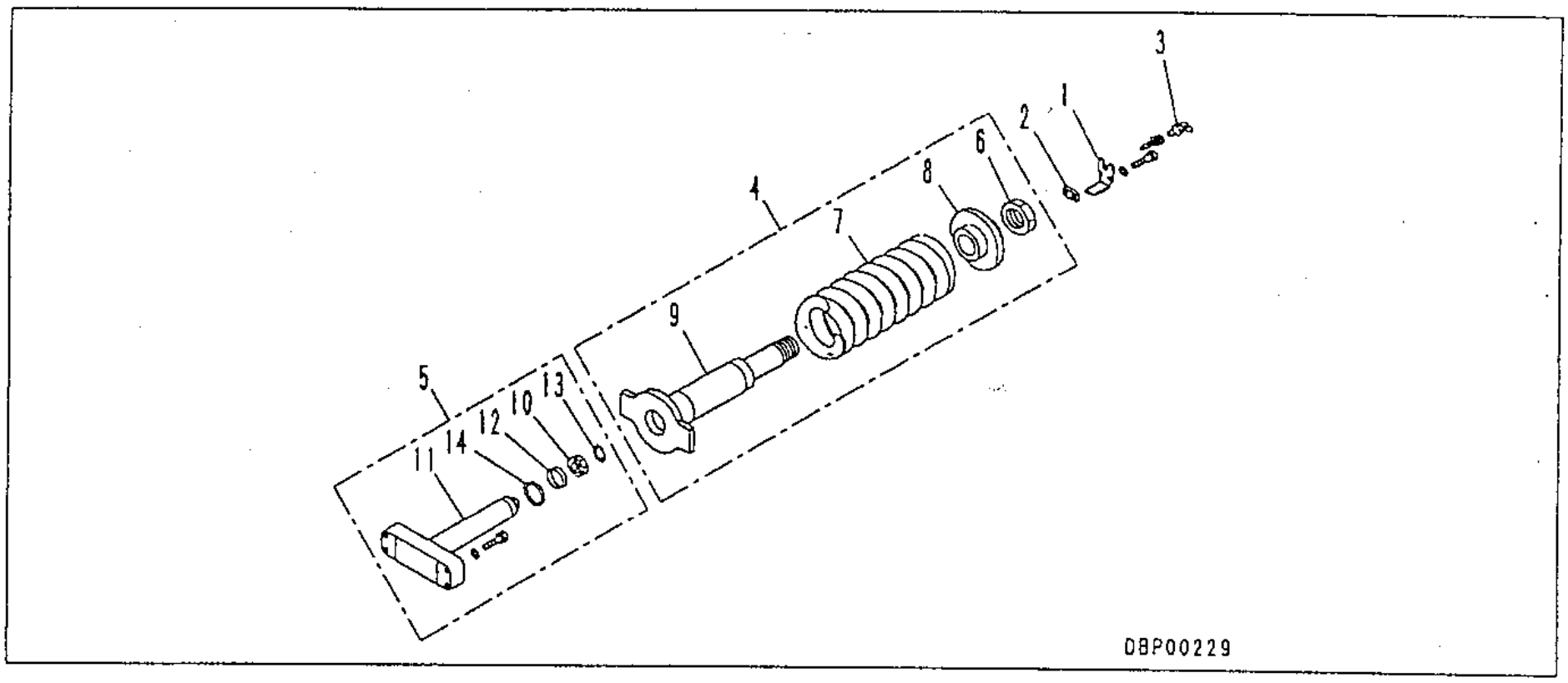
INSTALLATION OF IDLER • RECOIL SPRING ASSEMBLY

- Carry out installation in the reverse order to removal.

※1

Thread of recoil spring assembly mounting bolt : Thread tightener (LT-2)

DISASSEMBLY OF RECOIL SPRING ASSEMBLY



1. Remove lock plate (1), then remove seat (2) and valve (3).

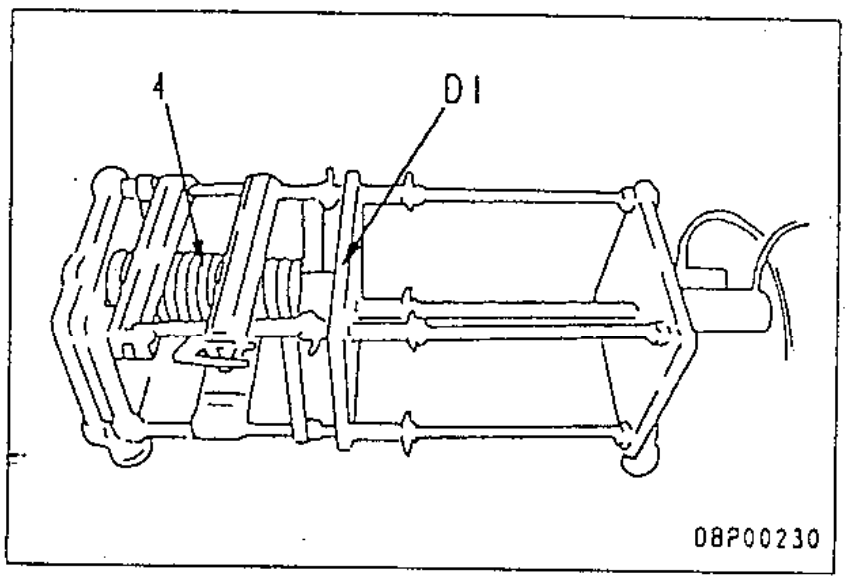
2. Remove yoke piston assembly (5) from recoil spring assembly (4).

3. Disassembly of recoil spring assembly
   1) Set recoil spring assembly (4) to tool D1.

   ⚠ The recoil spring is under large installed load, so be sure to set the tool properly. Failure to do this is dangerous.

   ★ Installed load of spring :
   78.4 kN(8,000 kg)
   2) Apply hydraulic pressure slowly to compress spring, then remove nut (6).
   ★ Compress the spring to a point where the nut becomes loose.
   ★ Release the hydraulic pressure slowly and release the tension of the spring.
   ★ Remove pilot (8), cylinder (9), and dust seal (10) from spring (7).

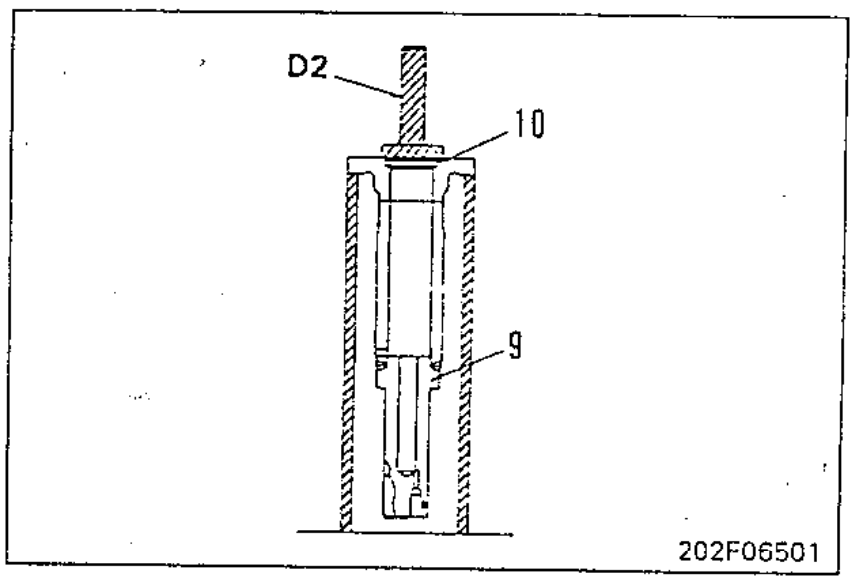
4. Disassembly of yoke piston assembly
   1) Remove wear ring (12) from yoke piston (11).
   2) Remove snap ring (13), then remove U-packing (14).



ASSEMBLY OF RECOIL SPRING ASSEMBLY

1. Assembly of yoke piston assembly
   1) Assemble U-packing (14) to yoke piston (11), and secure with snap ring (13).
   2) Assemble wear ring (12).

2. Assembly of recoil spring assembly
   1) Using tool D2, install dust seal (10) to cylinder (9).
   2) Assemble cylinder (9) and pilot (8) to spring (7), and set in tool D1.
   3) Apply hydraulic pressure slowly to compress spring, and tighten nut (6) so that installed length of spring is dimension "a".
      ★ Installed length "a" of spring : 390 mm
   4) Remove recoil spring assembly (4) from tool D1.



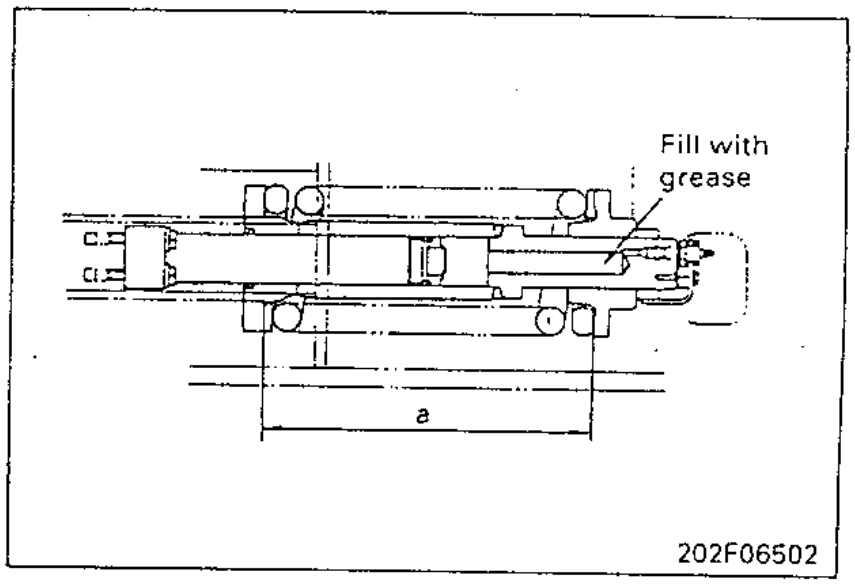
3. Fill inside of cylinder with at least 120 cc of grease.

   Inside of cylinder :
   Grease (G2-LI) (Min. 120 cc)

4. Assemble yoke piston assembly (5) to recoil spring assembly (4).

   Sliding portion of yoke piston, wear ring : Grease (G2-LI)

5. Fit valve (3) and seat (2), and secure with lock plate (1).
   ★ Install the valve so that the fitting faces the outside.

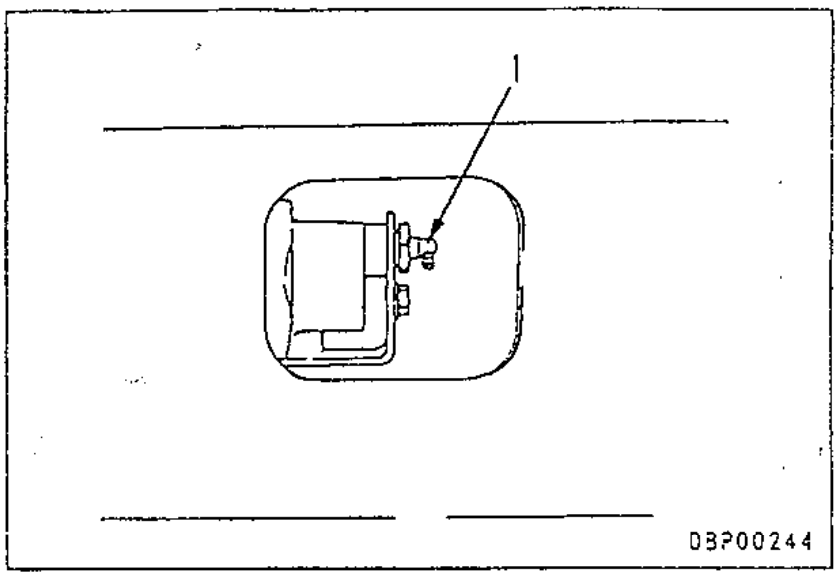


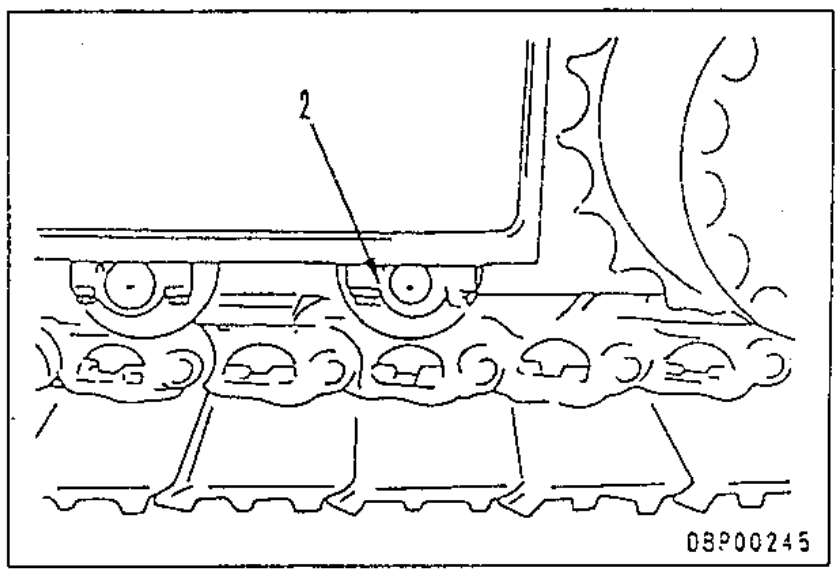
REMOVAL OF TRACK ROLLER ASSEMBLY

1. Lower work equipment, then loosen lubricator (1), and relieve track tension. ※1

   ⚠ The adjustment cylinder is under extremely high pressure. Never loosen the lubricator more than one turn. If the grease does not come out easily, move the machine backwards and forwards.

2. Remove mounting bolts of track roller, then swing work equipment 90°, jack up machine, and remove track roller assembly (2) towards outside of machine. ※2





INSTALLATION OF TRACK ROLLER ASSEMBLY

- Carry out installation in the reverse order to removal.

※1

★ Adjust the track tension.
For details, see TESTING AND ADJUSTING, Testing and adjusting track tension.

※2

Thread of track roller assembly mounting bolt : Thread tightener (LT-2)

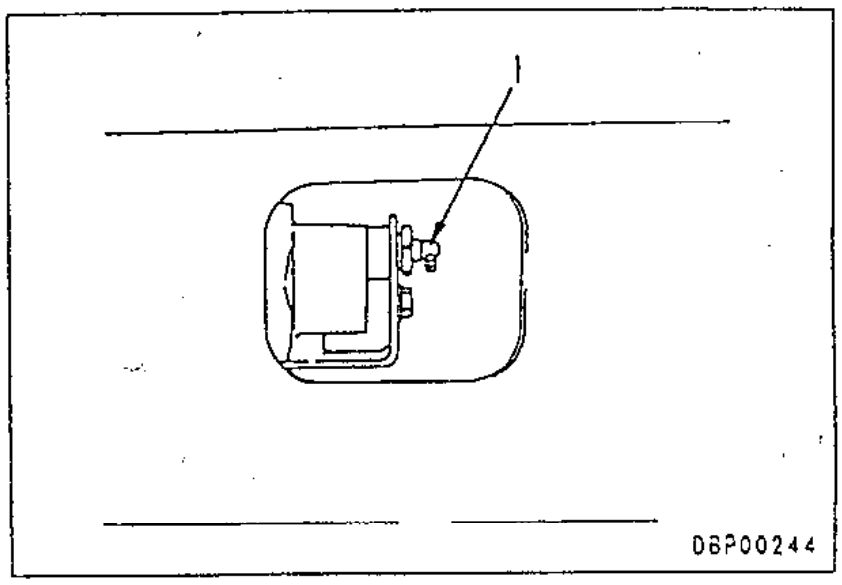
★ Place the plug on the outside of the chassis, and set the track roller assembly in the mounting position.
★ Operate the work equipment levers to lower the machine slowly, then tighten the mounting bolts temporarily.
★ Operate the work equipment levers to lower the machine completely to the ground, then tighten the mounting bolts fully.

REMOVAL OF CARRIER ROLLER ASSEMBLY

1. Lower work equipment, then loosen lubricator (1), and relieve track tension.

   ⚠ The adjustment cylinder is under extremely high pressure. Never loosen the lubricator more than one turn. If the grease does not come out, move the machine backwards and forwards.

2. Using block ① and hydraulic jack ②, push up track to a position where carrier roller assembly can be removed, then remove carrier roller assembly (2). ※1

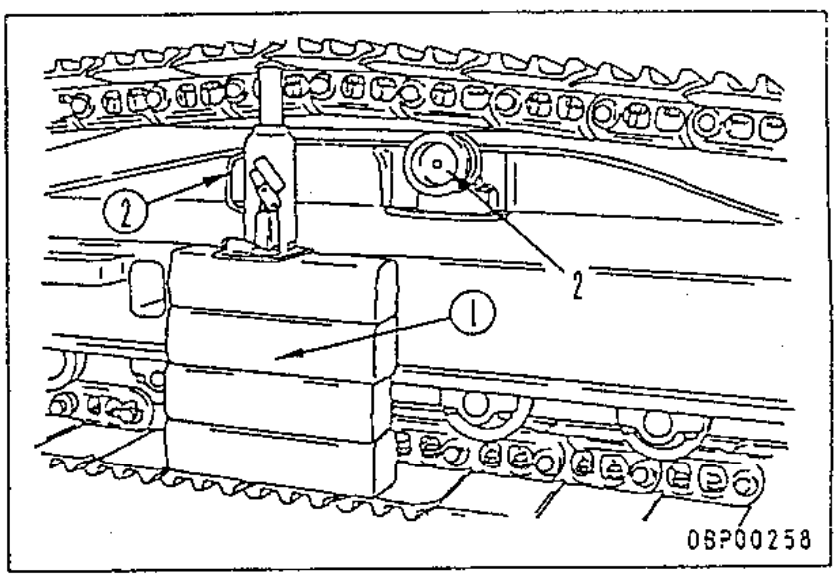


INSTALLATION OF CARRIER ROLLER ASSEMBLY

- Carry out installation in the reverse order to removal.

※1

Thread of carrier roller assembly mounting bolt : Thread tightener (LT-2)



REMOVAL OF TRACK SHOE ASSEMBLY

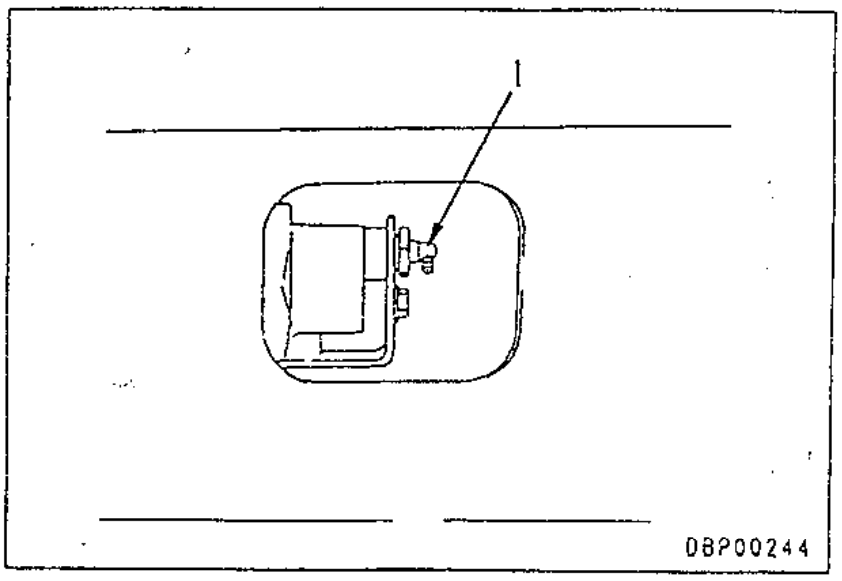
1. Lower work equipment, then loosen lubricator (1), and relieve track tension. ※1

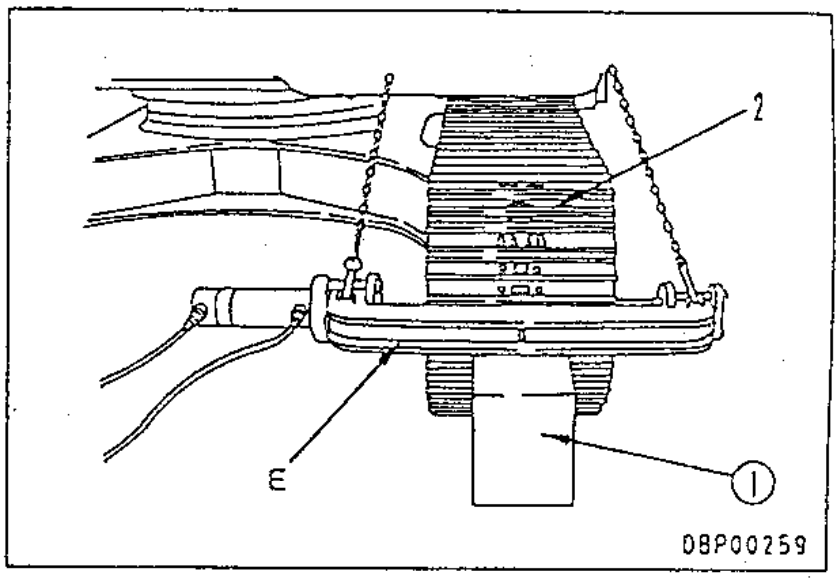
⚠ The adjustment cylinder is under extremely high pressure. Never loosen the lubricator more than one turn. If the grease does not come out, move the machine backwards and forwards.

2. Move machine forward so that position of master pin is at front of idler, and set block ① in position.

3. Using tool E, pull out master pin. ※2

4. Remove tool E, and pull out temporary pin, and remove dust seal, then drive machine in reverse to lay out track (2). ※3





INSTALLATION OF TRACK SHOE ASSEMBLY

※1

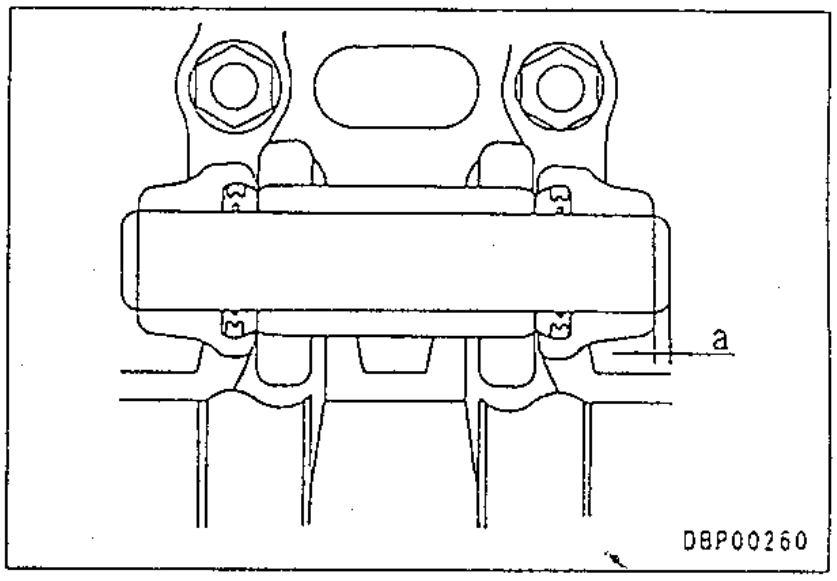
★ Adjust the track tension.
For details, see TESTING AND ADJUSTING, Testing and adjusting track tension.

※2

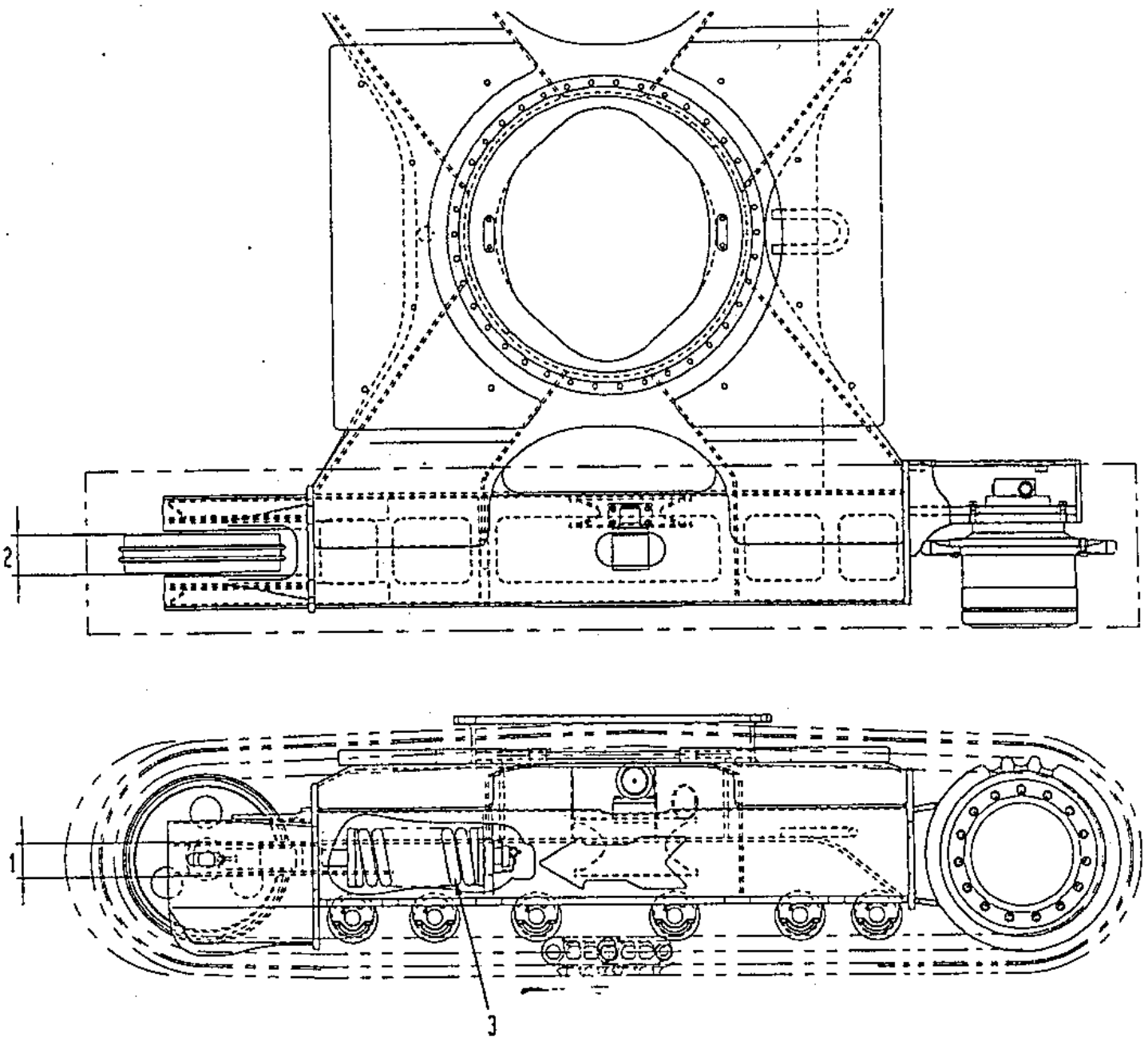
★ Use tool E and press fit so that the protrusion of the master pin is dimension "a".
Protrusion "a" of master pin : 5.5±2 mm

※3

★ When assembling the dust seal, coat the bushing contact surface with grease (G2-LI).



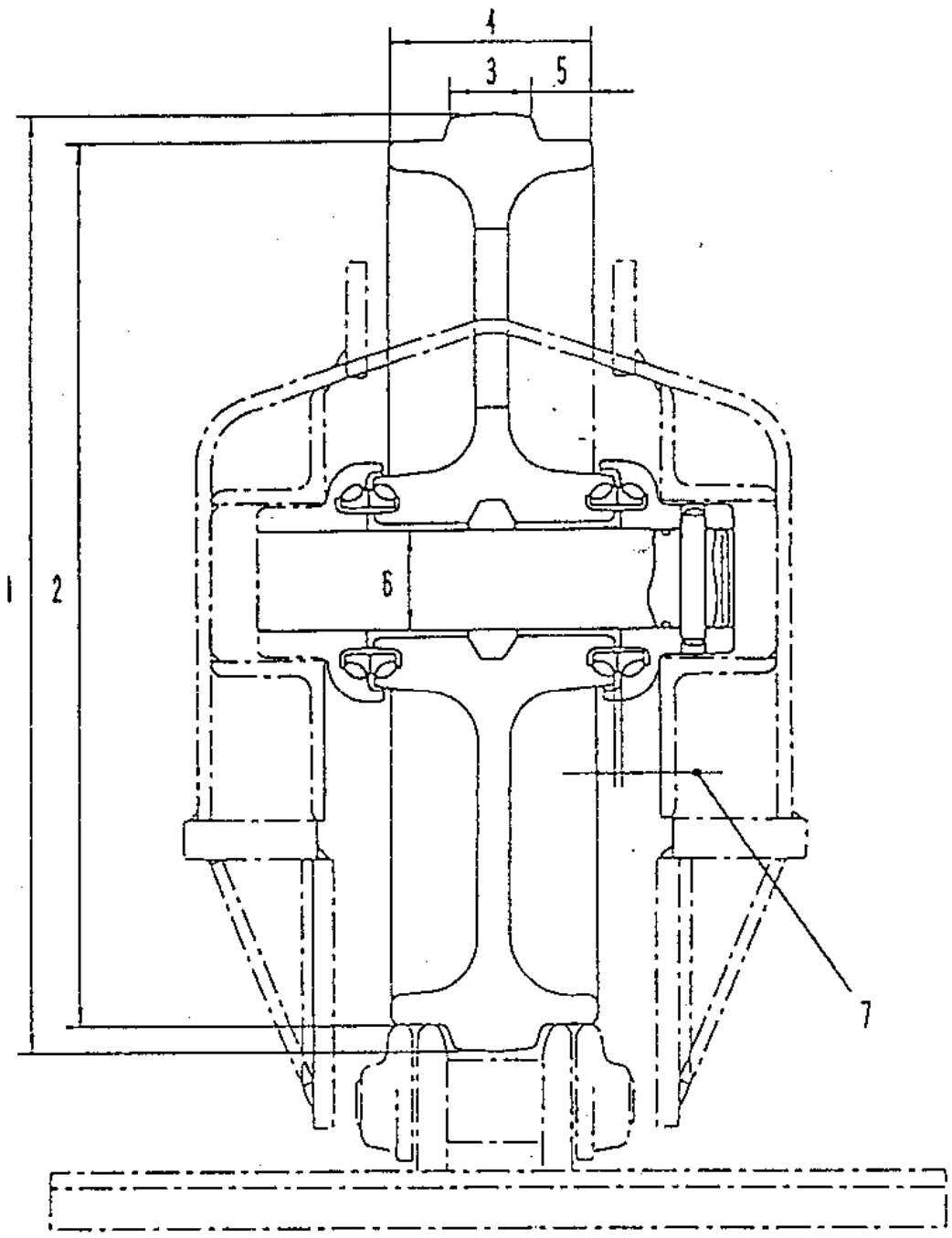
TRACK FRAME



Unit: mm

No.	Check item	Criteria			Remedy
1	Vertical width of idler guide.		Standard clearance	Clearance limit	Rebuild
		Track frame	84	89	
		Idler	82	77	Rebuild or replace
2	Horizontal width of idler guide.	Track frame	185	193	Rebuild
		Idler	183	175	Rebuild or replace
3	Recoil spring.	Standard size			Repair limit		Replace
		Free length	Installed length	Installed load	Free length	Installed load	
		505	390	78.4 kN (8,000 kg)	494	69.8 kN (7,120 kg)	

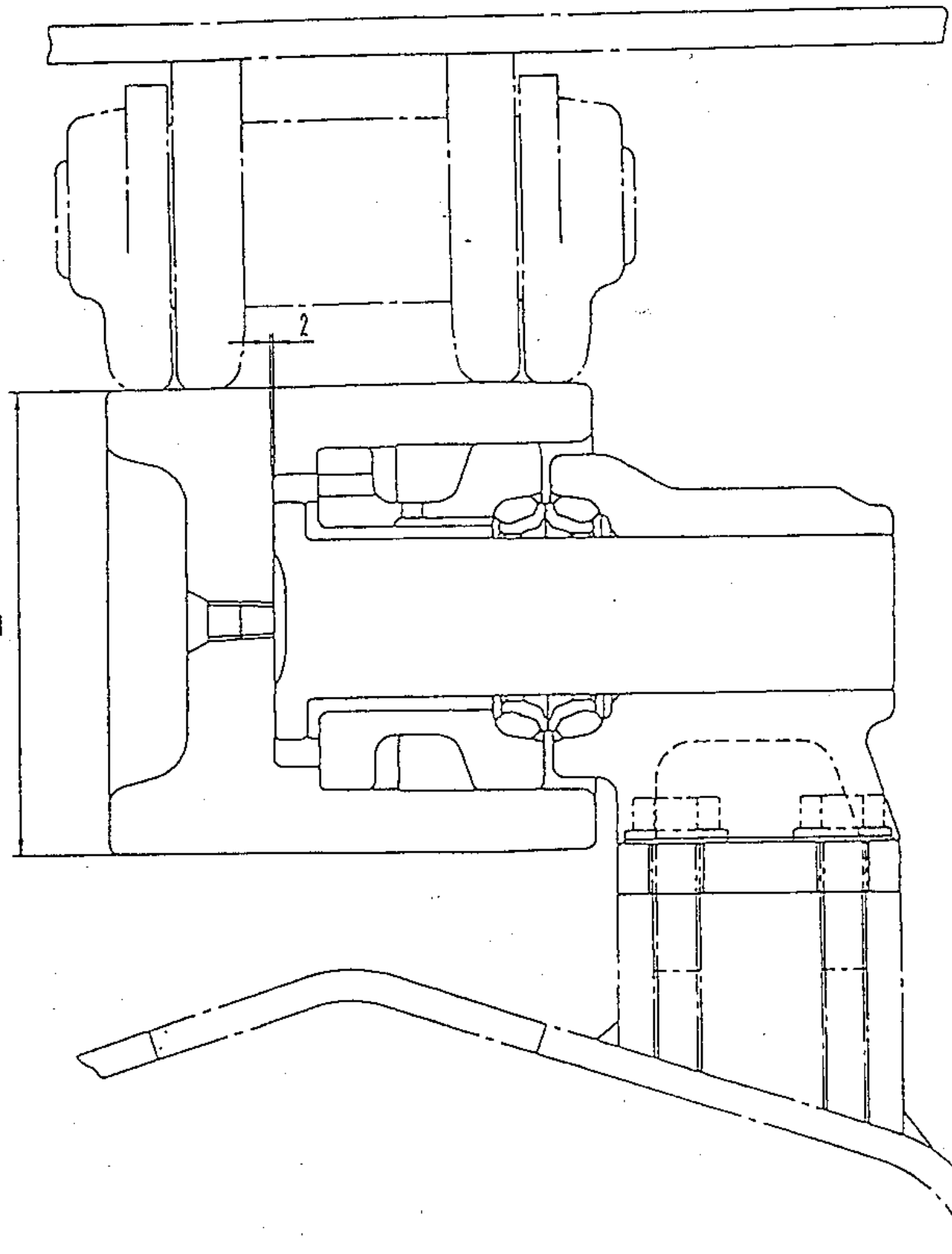
IDLER



Unit: mm

No.	Check item	Criteria					Remedy
1	Outside diameter of protrution.	Standard size		Repair limit			Rebuild or replace
		527		517			
2	Outside diameter of tread.	489		477			
3	Width of protrution.	52		42			
4	Total width.	115		107			
5	Width of tread.	31.5		36.5			
6	Clearance between shaft and bushing.	Standard size	Tolerance		Standard clearance	Clearance limit	Replace
			Shaft	Hole			
		54	−0.250 −0.280	+0.074 0	0.250− 0.354	1.5	
7	End play of idler shaft.	Standard clearance		Clearance limit			
		1.049−3.25		1.5			

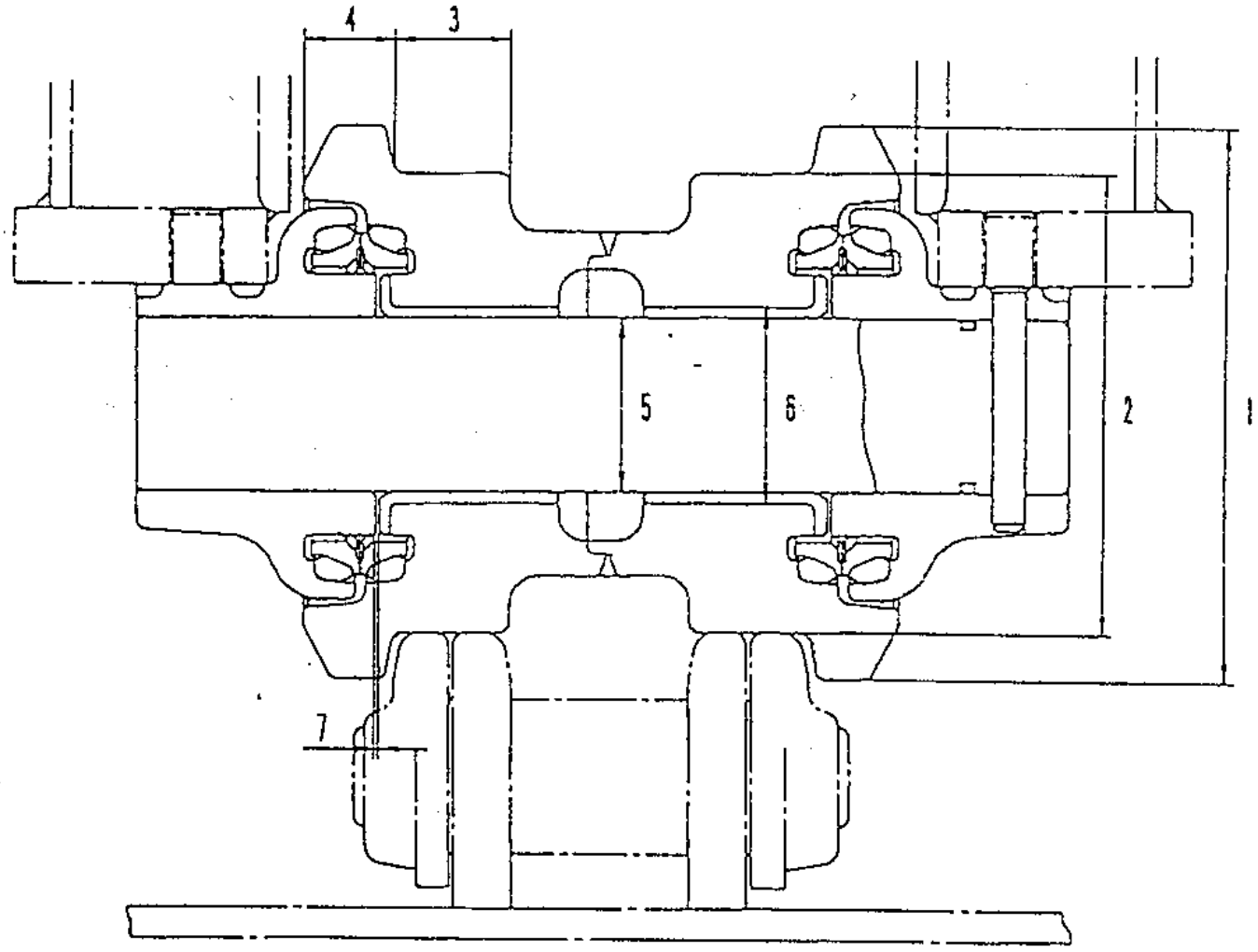
CARRIER ROLLER



Unit: mm

No.	Check item	Criteria		Remedy
1	Outside diameter of tread.	Standard size	Repair limit	Rebuild or replace
		116	106	
2	End play of roller.	Standard clearance	Clearance limit	Replace
		0.363—0.537	1.5	

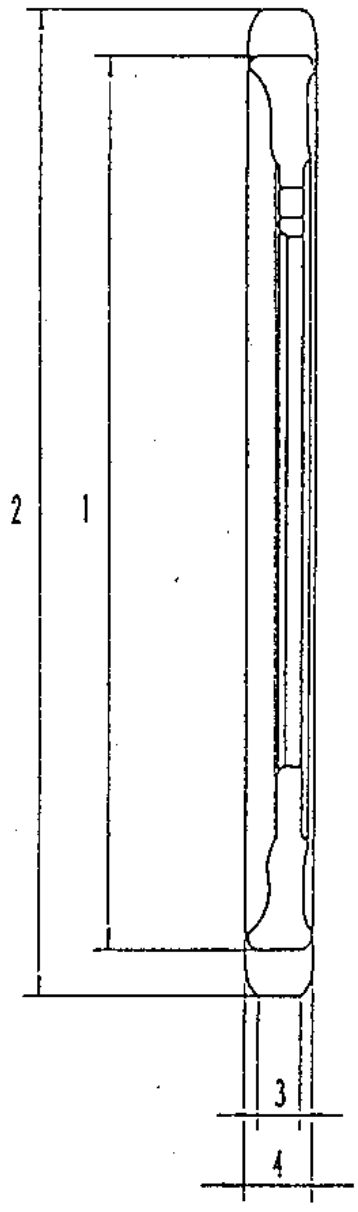
TRACK ROLLER

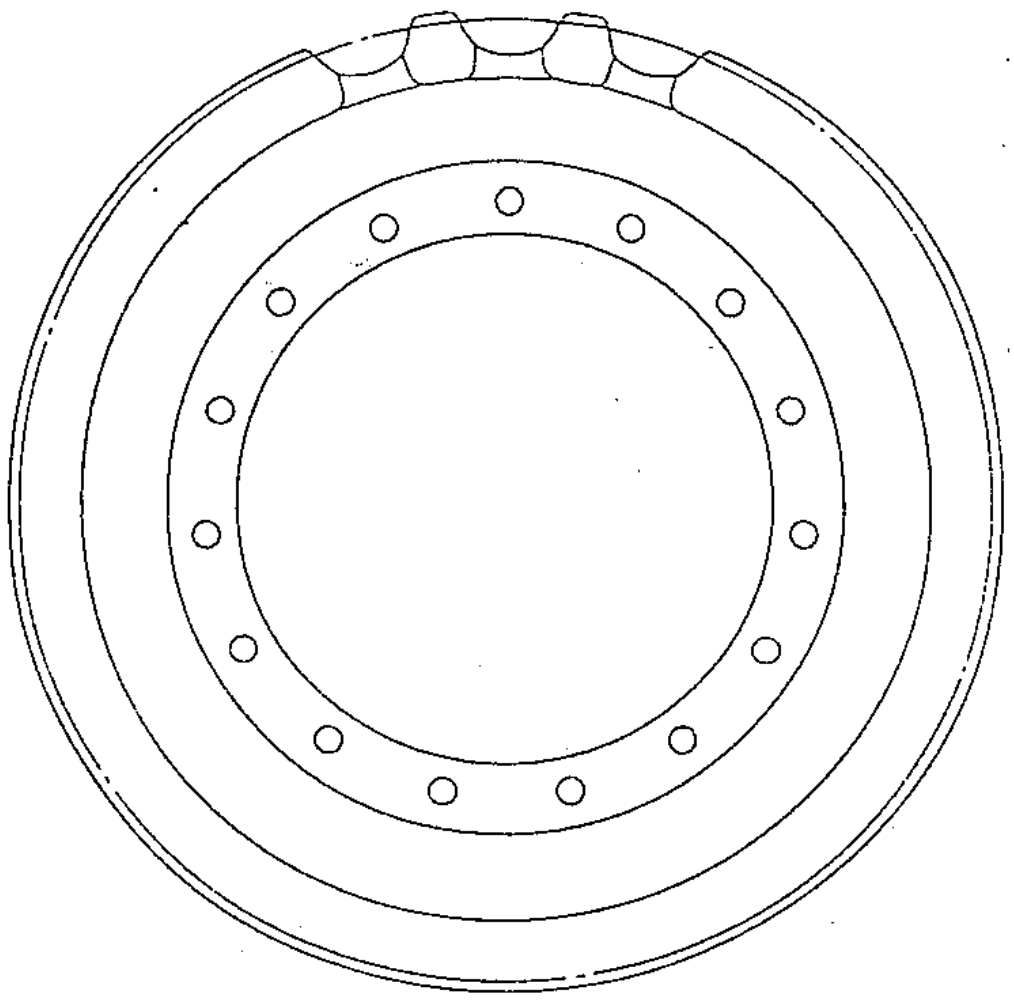


Unit: mm

No.	Check item	Criteria				Remedy
1	Outside diameter of flange.	Standard size		Repair limit		Rebuild or replace
		158		148		
2	Outside diameter of tread.	130		125		
3	Width of tread.	35		30.5		
4	Width of flange.	26.5		—		
5	Clearance between shaft and bushing.	Standard size	Tolerance		Standard clearance	Clearance limit	Replace bushing
			Shaft	Hole			
		50	−0.250 −0.270	+0.187 −0.025	0.225− 0.457	1.5	
6	Interference between roller and bushing.	Standard size	Tolerance		Standard interference	Interference limit	
			Shaft	Hole			
		57	+0.190 +0.110	+0.009 +0.060	0.020− 0.130	—	
7	Side clearance of roller (each).	Standard clearance		Clearance limit		Replace
		0.31—0.69		1.5		

SPROCKET



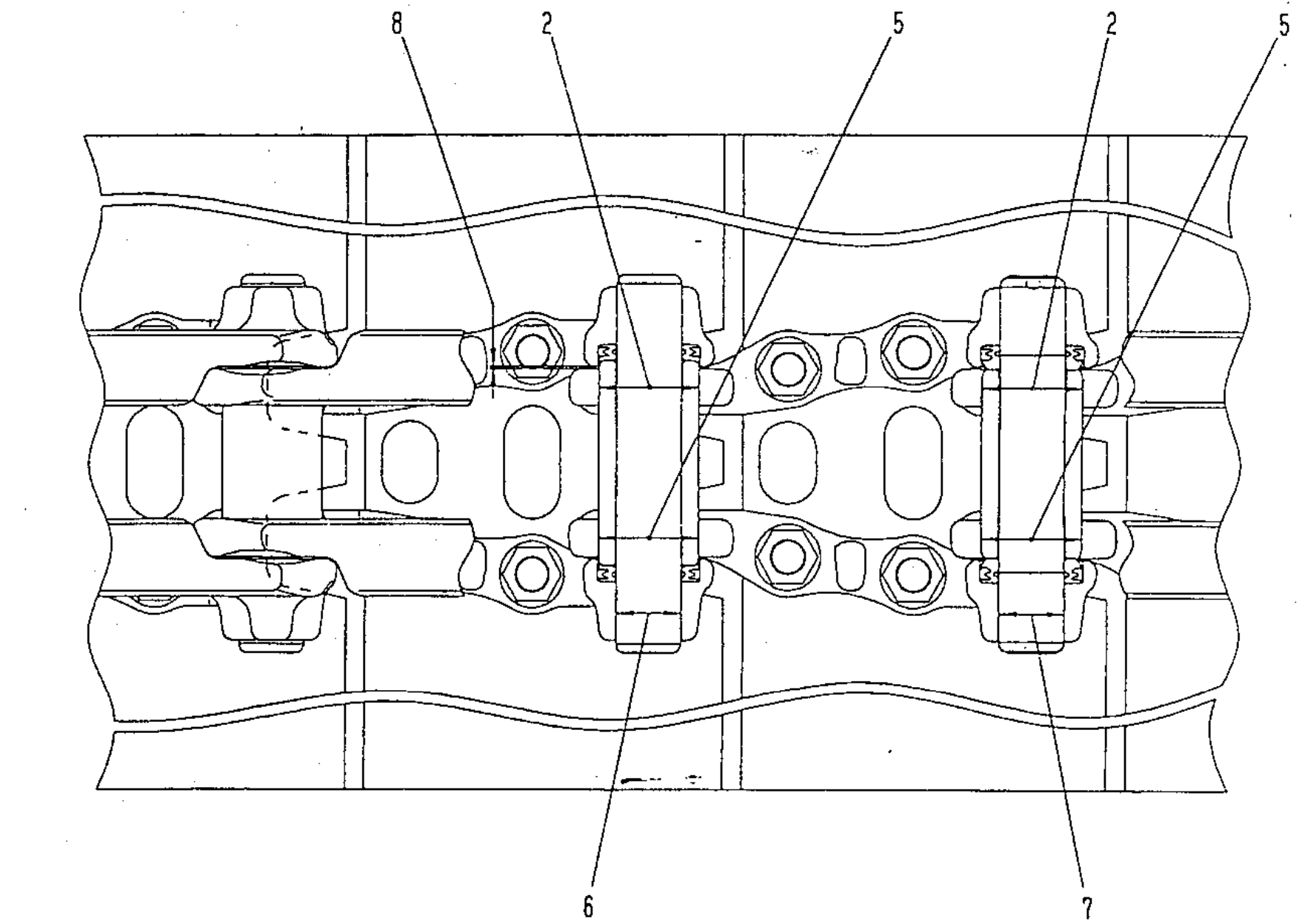


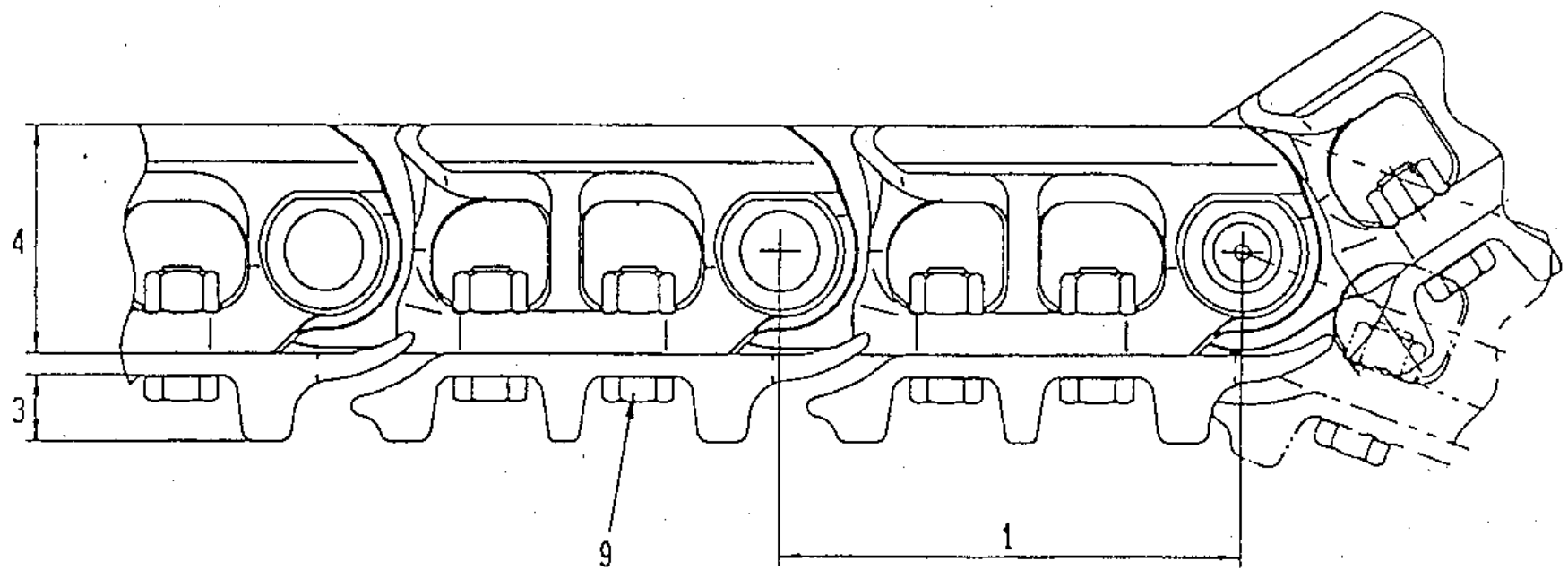
Unit: mm

No.	Check item	Criteria			Remedy
		Standard size	Tolerance	Repair limit	
1	Wear in diameter of sprocket tooth root.	547.4	+1.0 −2.0	535	Rebuild or replace
2	Wear in diameter of sprocket tooth top.	607	—	595	
3	Wear in width of sprocket tooth top.	27	—	22	
4	Wear in width of sprocket tooth root.	42	±1.5	39	

TRACK SHOE

TRIPLE-GROUSER SHOE





Unit: mm

No.	Check item		Criteria				Remedy
1	Link pitch.		Standard size: 175.25		Repair limit: 178.25		Turn or replace
2	Outside diameter of bushing.		46.4		42.4		
3	Height of grouser	Triple	25		15		Lug welding, rebuild or replace
4	Height of link.		86.0		81.0		
5	Interference between bushing and link.		Standard size: 46	Tolerance: Shaft +387 +347 / Hole +0.062 0	Standard interference: 0.285 – 0.387	Interference limit: 0.100	Replace
6	Interference between regular pin and link.		30	+0.150 0	−0.198 −0.250	0.198 – 0.400	0.140
7	Interference between master pin and link.		30	±0.020	−0.198 −0.250	0.178 – 0.270	0.078	Replace with over size
8	Protrusion of bushing.		3.75				Adjust
9	Tightening torque of shoe bolt.		294~363Nm(30~37Kgm)				Tighten