A17

# SERVICE MANUAL

# MST SERIES

## RUBBER CRAWLER CARRIER

| MACHINE MODEL | SERIAL No. |
|---|---|
| MST-500 | 50101 and up |
| MST-600 | 1601 and up |
| MST-700 | 70101 and up |
| MST-800 | 866 and up |
| MST-1100 | M01101 and up |
| MST-1100 | K 11101 and up |
| MST-1500 | 15001 and up |
| MST-2000 | M02107 and up |
| MST-2000 | K 20101 and up |
| MST-2200 | 22001 and up |
| MST-2500 | 25101 and up |

MORooka

# INTRODUCTION

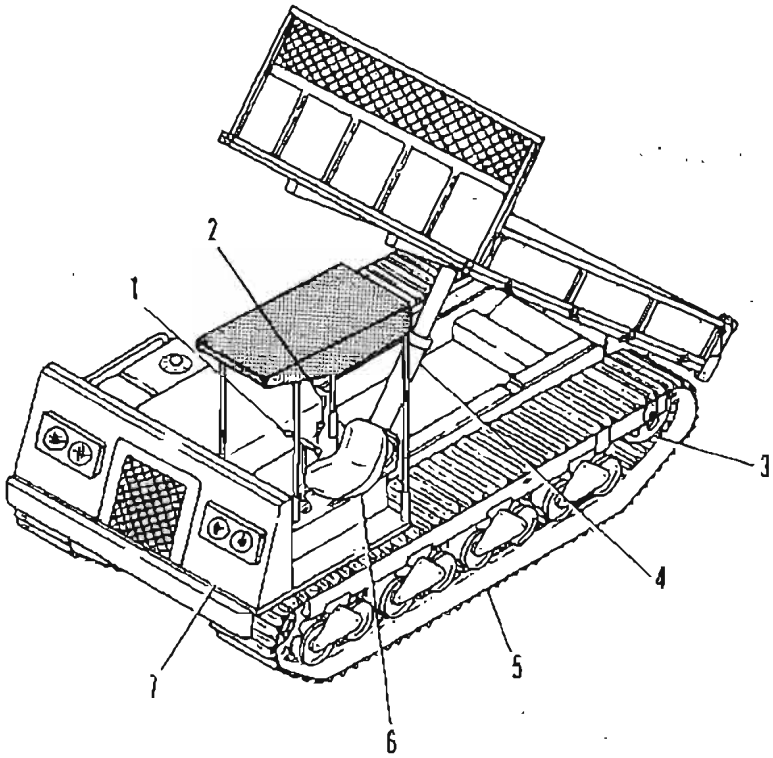
To allow the machine to maintain its performance over a long period, and to prevent breakdowns or trouble before they occur, it is important to carry out suitable operation, maintenance and inspection, troubleshooting, and repair work.
This service manual gives details of the **GENERAL, STRUCTURE AND FUNCTION, TESTING AND ADJUSTING, AND TROUBLESHOOTING** for the machine that are needed to carry out this work, in particular, inspection, troubleshooting, and repair work.
For details of the engine, see the shop manual for engine.

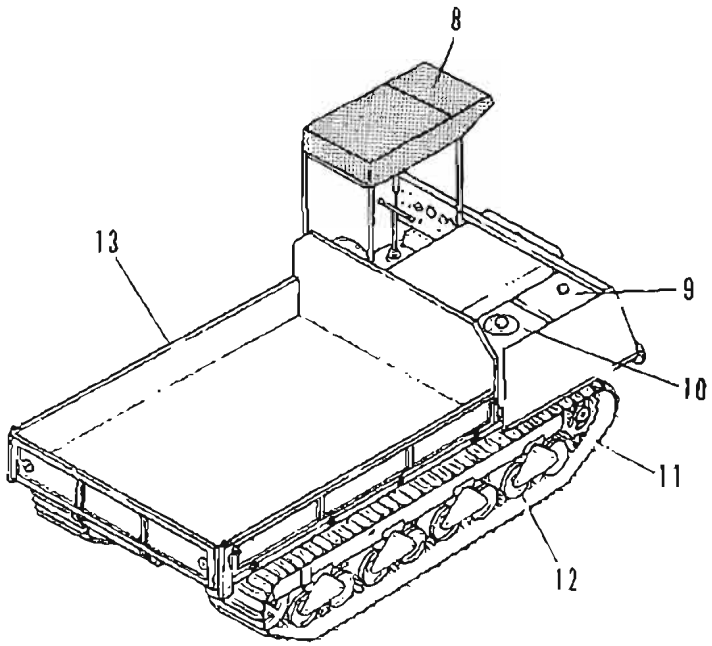
This service manual has been prepared to help you to improve the quality of your repairs by giving correct knowledge of the product and correct methods of repair, and by enabling you to carry out correct judgment.
Please read the contents thoroughly and make good use of them in your work.

We are constantly trying to improve the contents of our service manuals, so if you have any opinions or suggestions about the manual, please do not hesitate to contact us.

# 01 GENERAL

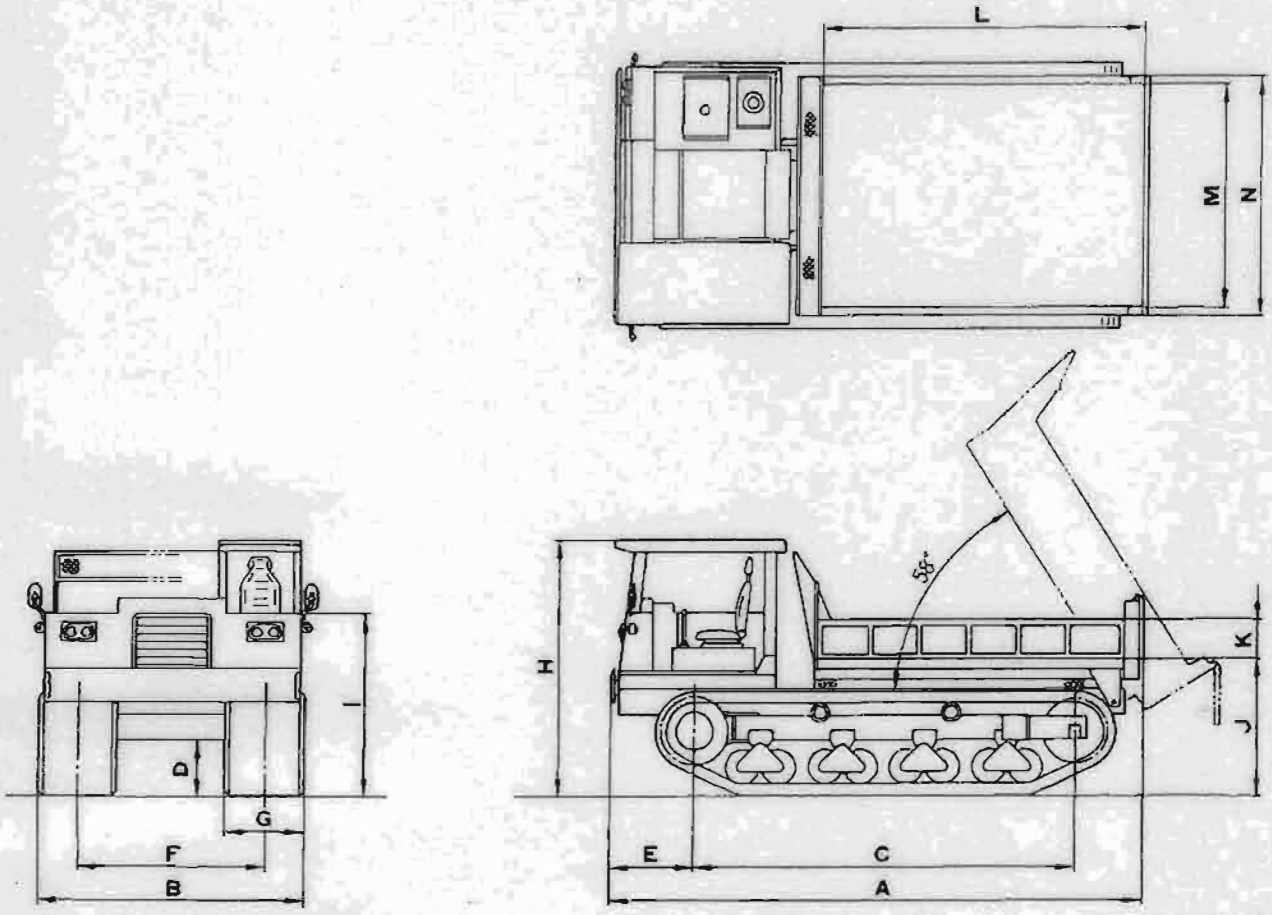
# GENERAL VIEW




1. Travel control lever
2. Dump control lever
3. Rear idler
4. Dump cylinder
5. Rubber crawler
6. Operator's seat
7. Head lamp
8. Hood
9. Fuel tank
10. Hydraulic oil tank
11. Drive sprocket
12. Track roller
13. Carrier

# ASSEMBLY DRAWING



# DIMENSION TABLE

| MODEL | MST-500 | MST-600 | | MST-700 | MST-800 | |
|---|---|---|---|---|---|---|
| Serial No. | 50101 and up | 1601–2700 | 2701 and up | 70101 and up | 866–2500 | 2501 and up |
| A | 3,600 | 3,840 | 3,830 | 4,200 | 4,500 | 4,365 |
| B | 1,850 | 2,000 | 2,000 | 2,150 | 2,300 | 2,300 |
| C | 2,450 | 2,930 | 2,930 | 2,930 | 3,160 | 3,130 |
| D | 350 | 355 | 355 | 355 | 440 | 470 |
| E | 500 | 500 | 500 | 500 | 580 | 636 |
| F | 1,400 | 1,500 | 1,500 | 1,600 | 1,700 | 1,700 |
| G | 450 | 500 | 500 | 550 | 600 | 600 |
| H | 2,150 | 2,200 | 2,200 | 2,250 | 2,300 | 2,343 |
| I | 1,400 | 1,425 | – | 1,500 | 1,550 | – |
| J | 900 | 940 | 940 | 1,028 | 1,140 | 1,160 |
| K | 350 | 350 | 350 | 350 | 350 | 350 |
| L | 2,150 | 2,250 | 2,250 | 2,550 | 2,600 | 2,600 |
| M | 1,650 | 1,700 | 1,700 | 1,850 | 2,000 | 1,950 |
| N | 1,800 | 1,880 | – | 1,950 | 2,100 | – |

| MODEL | MST-1100 | MST-1500 | MST-2000 | MST-2200 | MST-2500 | |
|---|---|---|---|---|---|---|
| Serial No. | 11101 and up | 15001 and up | 20101 and up | 22001 and up | 25101 and up | |
| A | 4,875 | 5,245 | 5,430 | 5,850 | 6,500 | |
| B | 2,400 | 2,500 | 2,700 | 2,750 | 3,000 | |
| C | 3,160 | 3,952 | 4,136 | 3,840 | 4,650 | |
| D | 440 | 530 | 540 | 500 | 600 | |
| E | 600 | 490 | 840 | 930 | 900 | |
| F | 1,700 | 1,800 | 1,900 | 2,000 | 2,100 | |
| G | 700 | 700 | 800 | 750 | 900 | |
| H | 2,300 | 2,440 | 2,500 | 2,600 | 2,700 | |
| I | 1,550 | 1,760 | 1,800 | – | 2,000 | |
| J | 1,140 | 1,280 | 1,350 | 1,385 | 1,550 | |
| K | 350 | 350 | 400 | 400 | 450 | |
| L | 2,850 | 3,100 | 3,400 | 3,600 | 4,000 | |
| M | 2,100 | 2,200 | 2,250 | 2,450 | 2,450 | |
| N | 2,200 | 2,300 | 2,400 | – | 2,650 | |

# SPECIFICATIONS

| | Model | | MST-500 | MST-600 | | MST-700 |
|---|---|---|---|---|---|---|
| | Serial No. | | 50101 and up | 1601 – 2700 | 2701 and up | 70101 and up |
| Machine weight | | (kg) | 3,890 | 3,900 | 3,900 | 5,210 |
| Performance | Max. loading capacity | (kg) | 2,500 | 3,000 | 3,000 | 3,500 |
| | Dump body capacity (Struck) | ($m^3$) | 1.2 | 1.4 | 1.4 | 1.5 |
| | Min. turning radius | (m) | 1.9 | 2.0 | 2.0 | 2.2 |
| | Grade ability | (Deg) | 35 | 35 | 35 | 35 |
| | Travel speed | (km/h) | 0 – 11 | 0 – 12 | 0 – 12 | 0 – 10 |
| Dimensions | Overall length | (mm) | 3,600 | 3,840 | 3,840 | 4,200 |
| | Overall width | (mm) | 1,850 | 2,000 | 2,000 | 2,150 |
| | Overall height (To the top of hood) | (mm) | 2,150 | 2,200 | 2,200 | 2,250 |
| | Track gauge | (mm) | 1,400 | 1,500 | 1,500 | 1,600 |
| | Track shoe width | (mm) | 450 | 500 | 500 | 550 |
| | Number of links | | 65 | 78 | 78 | 76 |
| | Link pitch | (mm) | 100 | 90 | 90 | 100 |
| | Ground pressure (Without load) | ($kg/cm^2$) | 0.12 | 0.11 | 0.11 | 0.12 |
| | Ground clearance (To the under surface of cross tube) | (mm) | 350 | 312 | 312 | 355 |
| | Dump body width | (mm) | 1,600 | 1,700 | 1,700 | 1,850 |
| | Dump body length | (mm) | 2,150 | 2,250 | 2,250 | 2,550 |
| | Dump body height | (mm) | 350 | 350 | 350 | 350 |

| MST-800 | | MST-1100 | MST-1100 | MST-1500 | MST-2000 |
|---|---|---|---|---|---|
| 866 – 2400 | 2401 and up | M01101 and up | K11101 and up | 15001 and up | M02101 and up |
| 5,740 | 5,740 | 6,300 | 6,300 | 7,500 | 11,370 |
| 4,000 | 4,000 | 5,000 | 5,000 | 6,000 | 8,000 |
| 1.9 | 1.9 | 2.1 | 2.1 | 2.4 | 3.0 |
| 2.4 | 2.4 | 2.5 | 2.5 | 2.7 | 2.8 |
| 35 | 35 | 35 | 35 | 35 | 35 |
| 0 – 13 | 0 – 13 | 0 – 10 | 0 – 10 | 0 – 12 | 0 – 10 |
| 4,500 | 4,500 | 4,875 | 4,875 | 5,245 | 5,430 |
| 2,300 | 2,300 | 2,400 | 2,400 | 2,500 | 2,700 |
| 2,300 | 2,300 | 2,300 | 2,300 | 2,440 | 2,500 |
| 1,700 | 1,700 | 1,700 | 1,700 | 1,800 | 1,900 |
| 600 | 600 | 700 | 700 | 700 | 800 |
| 80 | 80 | 80 | 80 | 98 | 80 |
| 100 | 100 | 100 | 100 | 100 | 125 |
| 0.13 | 0.13 | 0.12 | 0.12 | 0.12 | 0.14 |
| 440 | 440 | 440 | 440 | 530 | 540 |
| 2,000 | 2,000 | 2,100 | 2,100 | 2,200 | 2,250 |
| 2,600 | 2,600 | 2,850 | 2,850 | 3,100 | 3,300 |
| 350 | 350 | 350 | 350 | 350 | 400 |

# SPECIFICATIONS

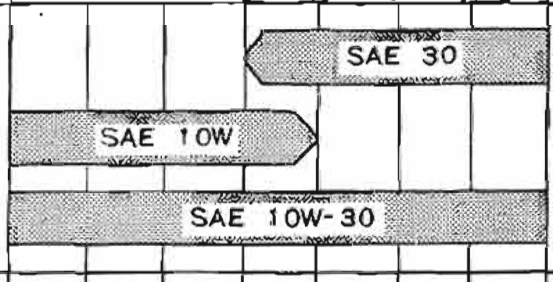
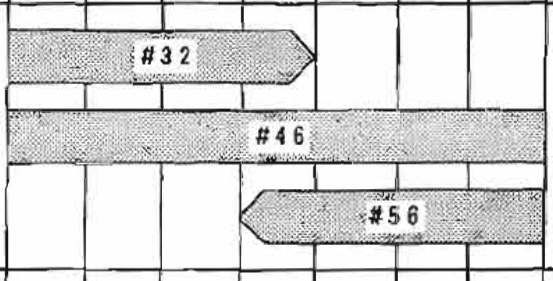
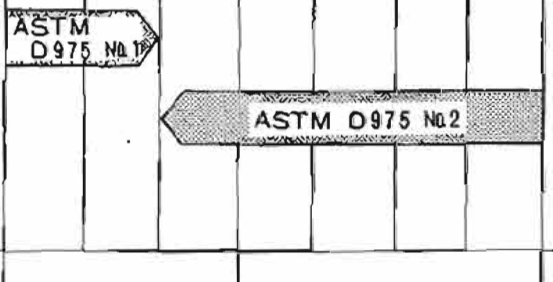
| | Model | | MST-2000 | MST-2200 | MST-2500 |
|---|---|---|---|---|---|
| | Serial No. | | K20101 and up | 22001 and up | 25101 and up |
| Machine weight | | (kg) | 11,370 | 12,250 | 14,500 |
| Performance | Max. loading capacity | (kg) | 8,000 | 10,000 | 10,000 |
| | Dump body capacity (Struck) | ($m^3$) | 3.0 | 3.52 | 4.4 |
| | Min. turning radius | (m) | 2.8 | 3.23 | 3.4 |
| | Grade ability | (Deg) | 35 | 35 | 35 |
| | Travel speed | (km/h) | 0 – 10 | 0 – 14.5 (tow stage) | 0 – 12 (two stage) |
| Dimensions | Overall length | (mm) | 5,430 | 5,850 | 6,500 |
| | Overall width | (mm) | 2,700 | 2,928 | 3,000 |
| | Overall height (To the top of hood) | (mm) | 2,500 | 2,600 | 2,700 |
| | Track gauge | (mm) | 1,900 | 2,000 | 2,100 |
| | Track shoe width | (mm) | 800 | 750 | 900 |
| | Number of links | | 80 | 66 | 80 (Serial No. 25101–25106)<br>74 (Serial No. 25107 and up) |
| | Link pitch | (mm) | 125 | 150 | 150 |
| | Ground pressure (Without load) | ($kg/cm^2$) | 0.14 | 0.17 | 0.15 |
| | Ground clearance (To the under surface of cross tube) | (mm) | 540 | 500 | 600 |
| | Dump body width | (mm) | 2,250 | 2,450 | 2,450 |
| | Dump body length | (mm) | 3,300 | 3,600 | 4,000 |
| | Dump body height | (mm) | 400 | 400 | 450 |

| | Model | | MST-500 | MST-600 | | MST-700 |
|---|---|---|---|---|---|---|
| | Serial No. | | 50101 and up | 1601 – 2700 | 2701 and up | 70101 and up |
| Engine | Engine model | | KOMATSU 4D95L-1 | MITSUBISHI 4D31 | MITSUBISHI 4D31T | KOMATSU S4D95L-1 |
| | Type | | 4-cycle, straight vertical, water cooling, direct injection type | 4-cycle, straight vertical, water cooling, direct injection type | 4-cycle, straight vertical, water cooling, direct injection type, turbocharged | 4-cycle, straight vertical, water cooling, direct injection type, turbocharged |
| | No. of cylinders – bore x stroke | (mm) | 4 – 95 x 115 | 4 – 100 x 105 | 4 – 100 x 105 | 4 – 95 x 115 |
| | Piston displacement | (cc) | 3,260 | 3,298 | 3,298 | 3,260 |
| | Flywheel horsepower | (HP/rpm) | 77/2,800 | 74/2,800 | 87/2,800 | 87/2,500 |
| | Max. torque | (kgm/rpm) | 22/1,600 | 21/1,600 | 28/2,200 | 29/1,600 |
| | Fuel consumption ratio | (g/PSh) | 164 | 170 | 158 | 155 |
| | Starting motor | | 24V, 2.8kW | 24V, 3.2kW | 24V, 3.2kW | 24V, 2.8kW |
| | Alternator | | 24V, 15A | 24V, 25A | 24V, 25A | 24V, 15A |
| | Battery | | 12V, 70Ah x 2 | 12V, 100Ah x2 | 12V, 100Ah x2 | 12V, 100Ah x 2 |
| Power train | Type | | HST | HST | HST | HST |
| | Main pump: Delivery | (cc/rev) | 43.0 | 51.6 | 51.6 | 51.6 |
| | Max. hydraulic pressure | ($kg/cm^2$) | 280 | 315 | 315 | 350 |
| | Brake system | | Service/parking | Service/parking | Service/parking | Service/parking |
| | Caution pressure of hydraulic charging | ($kg/cm^2$) | Max. 9.5 | Max. 9.5 | Max. 9.5 | Max. 9.5 |
| Work equipment hydraulic system | Charging pump: Delivery | (cc/rev) | 20.5 | 20.0 | 20.0 | 20.0 |
| | Max. hydraulic pressure | ($kg/cm^2$) | 175 | 175 | 165 | 175 |
| | Dump control valve | | Single-train spool | Single-train spool | Single-train spool | Single-train spool |
| | Dump cylinder | | Double-acting, piston type x 1 | Double-acting, piston type x 1 | Double-acting, piston type x 1 | Double-acting, piston type x 2 |
| | Cylinder stroke | | 600 | 600 | 600 | 600 |
| | Cylinder bore | | 90 | 90 | 90 | 90 |
| | Piston rod O.D. | | 45 | 45 | 45 | 45 |

| | Model | | MST-800 | | MST-1100 | MST-1100 |
|---|---|---|---|---|---|---|
| | Serial No. | | 866 – 2400 | 2401 and up | M01101 and up | K11101 and up |
| Engine | Engine model | | MITSUBISHI 4D31T | MITSUBISHI 4D34T | MITSUBISHI 6D14 | KOMATSU S6D95L-1 |
| | Type | | 4-cycle, straight vertical, water cooling, direct injection type, turbocharged | 4-cycle, straight vertical, water cooling, direct injection type, turbocharged | 4-cycle, straight vertical, water cooling, direct injection type | 4-cycle, straight vertical, water cooling, direct injection type, turbocharged |
| | No. of cylinders – bore x stroke | (mm) | 4 – 100 x 105 | 4 – 104 x 115 | 6 – 110 x 115 | 6 – 95 x 115 |
| | Piston displacement | (cc) | 3,298 | 3,907 | 6,557 | 4,890 |
| | Flywheel horsepower | (HP/rpm) | 99/3,000 | 114/3,000 | 116/2,500 | 132/2,500 |
| | Max. torque | (kgm/rpm) | 28/2,100 | 33/1,800 | 39/1,600 | 45/1,600 |
| | Fuel consumption ratio | (g/PSh) | 160 | 162 | 170 | 155 |
| | Starting motor | | 24V, 3.2kW | 24V, 5.0kW | 24V, 4.5kW | 24V, 5.5kW |
| | Alternator | | 24V, 25A | 24V, 30A | 24V, 30A | 24V, 15A |
| | Battery | | 12V, 100Ah x 2 | 12V, 100Ah x 2 | 12V, 100Ah x 2 | 12V, 100Ah x 2 |
| Power train | Type | | HST | HST | HST | HST |
| | Main pump: Delivery | (cc/rev) | 51.6 | 51.6 | 51.6 | 51.6 |
| | Max. hydraulic pressure | ($kg/cm^2$) | 350 | 350 | 385 | 385 |
| | Brake system | | Service/parking | Service/parking | Service/parking | Service/parking |
| | Caution pressure of hydraulic charging | ($kg/cm^2$) | Max. 9.5 | Max. 9.5 | Max. 9.5 | Max. 9.5 |
| Work equipment hydraulic system | Charging pump: Delivery | (cc/rev) | 20.0 | 20.0 | 20.0 | 20.0 |
| | Max. hydraulic pressure | ($kg/cm^2$) | 165 | 165 | 165 | 165 |
| | Dump control valve | | Single-train spool | Single-train spool | Single-train spool | Single-train spool |
| | Dump cylinder | | Double-acting, piston type x 2 | Double-acting, piston type x 2 | Double-acting, piston type x 2 | Double-acting, piston type x 2 |
| | Cylinder stroke | | 600 | 600 | 710 | 710 |
| | Cylinder bore | | 90 | 90 | 100 | 100 |
| | Piston rod O.D. | | 45 | 45 | 60 | 60 |

| MST-1500 | MST-2000 | MST-2000 | MST-2200 | MST-2500 |
|---|---|---|---|---|
| 15001 and up | M02101 and up | K20101 and up | 22001 and up | 25101 and up |
| MITSUBISHI 6D14T | MITSUBISHI 6D16T | KOMATSU SA6D110-1 | CATERPILAR 3306DIT | MITSUBISHI 6D22T |
| 4-cycle, straight vertical, water cooling, direct injection type, turbocharged | 4-cycle, straight vertical, water cooling, direct injection type, turbocharged | 4-cycle, straight vertical, water cooling, direct injection type, turbocharged | 4-cycle, straight vertical, water cooling, direct injection type, turbocharged | 4-cycle, straight vertical, water cooling, direct injection type, turbocharged |
| 6 – 95 x 115 | 6 – 118 x 115 | 6 – 110 x 125 | 6 – 121 x 152 | 6 – 130 x 140 |
| 6,557 | 7,545 | 7,130 | 10,500 | 11,149 |
| 152/2,500 | 197/2,500 | 233/2,600 | 251/2,200 | 296/2,200 |
| 51/1,400 | 67/1,600 | 81.5/1,800 | 99/1,400 | 117/1,400 |
| 165 | 150 | 160 | 162 | 155 |
| 24V, 4.5kW | 24V, 4.5kW | 24V, 7.5kW | 24V, 7.5kW | 24V, 5.5kW |
| 24V, 30A | 24V, 30A | 24V, 25A | 24V, 35A | 24V, 30A |
| 12V, 120Ah x 2 | 12V, 120Ah x 2 | 12V, 120Ah x 2 | 12V, 120Ah x 2 | 12V, 120Ah x 2 |
| HST | HST | HST | HST | HST |
| 69.8 | 89.0 | 89.0 | 110.9 | 125.0 |
| 385 | 350 (Serial No. M02105 and up)<br>385 (Serial No. M02101–02104) | 350 (Serial No. K20129 and up)<br>385 (Serial No. K20101–20128) | 325 | 350 |
| Service/parking | Service/parking | Service/parking | Service/parking | Service/parking |
| Max. 9.5 | Max. 9.5 | Max. 9.5 | Max. 9.5 | Max. 9.5 |
| 20.0 | 36.0 | 36.0 | 56.0 | 63.0 (Serial No. 25101–25106)<br>45.0 (Serial No. 25107 and up) |
| 165 | 165 | 165 | 165 | 165 |
| Single-train spool | Single-train spool | Single-train spool | Single-train spool | Single-train spool |
| Double-acting, piston type x 2 | Double-acting, piston type x 2 | Double-acting, piston type x 2 | Double-acting, piston type x 2 | Double-acting, piston type x 2 |
| 700 | 1,000 | 1,000 | 1,000 | 1,000 |
| 110 | 130 | 130 | 130 | 130 |
| 80 | 70 | 70 | 70 | 70 |

# TABLE OF LUBRICANT AND WATER

| RESERVOIR | KIND OF FLUID | AMBIENT TEMPERATURE | CAPACITY (ℓ) | |
|---|---|---|---|---|
| | | | Specified amount | Refill capacity |
| Engine oil pan | Engine oil |   | MST-500 : 9.0<br>MST-600 : 7.0<br>MST-700 : 9.0<br>MST-800 : 7.0<br>MST-1100: 12.5<br>MST-1500: 20.0<br>MST-2000: 24.0<br>MST-2200: 27.0<br>MST-2500: 31.0 | 7.5<br>6.0<br>7.5<br>6.0<br>10.5<br>18.0<br>22.0<br>25.0<br>27.0 |
| Hydraulic tank | Hydraulic oil |   | MST-500 : 53<br>MST-600 : 53<br>MST-700 : 63<br>MST-800 : 73<br>MST-1100: 73<br>MST-1500: 74<br>MST-2000: 74<br>MST-2200: 120<br>MST-2500: 120 | 50<br>50<br>60<br>70<br>70<br>70<br>70<br>110<br>110 |
| Fuel tank | Diesel fuel |   | MST-500 : 60<br>MST-600 : 60<br>MST-700 : 60<br>MST-800 : 80<br>MST-1100: 80<br>MST-1500: 120<br>MST-2000: 145<br>MST-2200: 170<br>MST-2500: 210 | – |
| Cooling system | Water | Add antifreeze | MST-500 : 9.0<br>MST-600 : 13.5<br>MST-700 : 9.0<br>MST-800 : 13.5<br>MST-1100: 21.0<br>MST-1500: 21.0<br>MST-2000: 27.0<br>MST-2200: 30.0<br>MST-2500: 36.0 | – |

ASTM: American Society of Testing and Material
SAE: Society of Automotive Engineers
API: American Petroleum Institute
Specified capacity: Total amount of oil including oil for components and oil in piping.
Refill capacity: Amount of oil needed to refill system during normal inspection and maintenance.

NOTE:

(1) When fuel sulphur content is less than 0.5%, change oil in the oil pan every periodic maintenance hours described in this manual.
Change oil according to the following table if fuel sulphur content is above 0.5%.

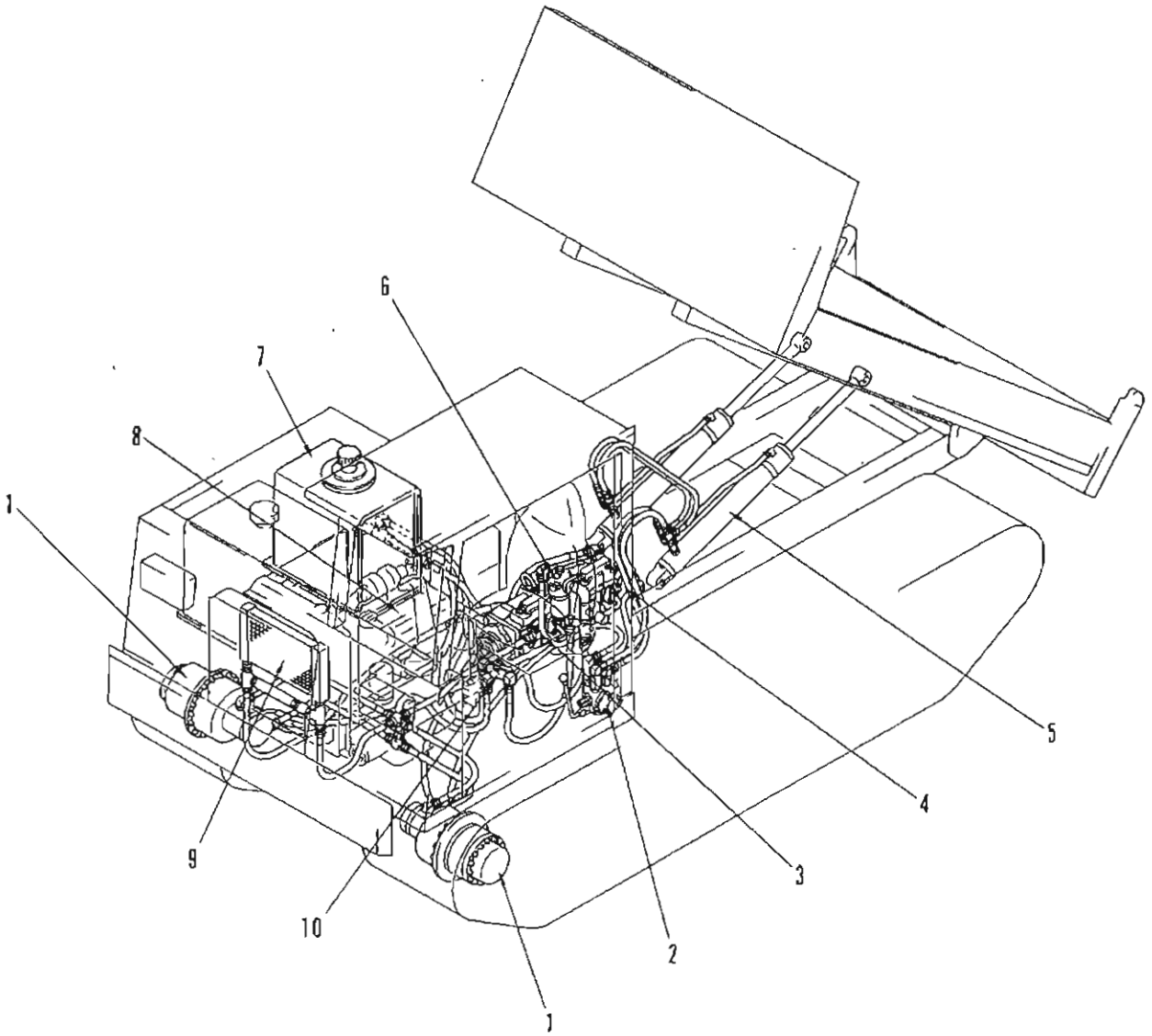
| Fuel sulphur content | Change interval of oil in engine oil pan |
|---|---|
| 0.5 to 1.0% | 1/2 of regular interval |
| Above 1.0% | 1/4 of regular interval |

(2) When starting the engine in an atmospheric temperature of lower than 0°C, be sure to use engine oil of SAE10W, SAE10W-30 and SAE15W-40, even though an atmospheric temperature goes up to 10°C more or less in the day time.

(3) Use API classification CD as engine oil and if API classification CC, reduce the engine oil change interval to half.

# 10 STRUCTURE AND FUNCTION

# HYDRAULIC PIPING




1. Travel motor
2. Dump control valve
3. Main pump
4. Charging pump
5. Dump cylinder
6. Hydraulic line filter
7. Hydraulic oil tank
8. Engine
9. Oil cooler
10. Parking brake valve

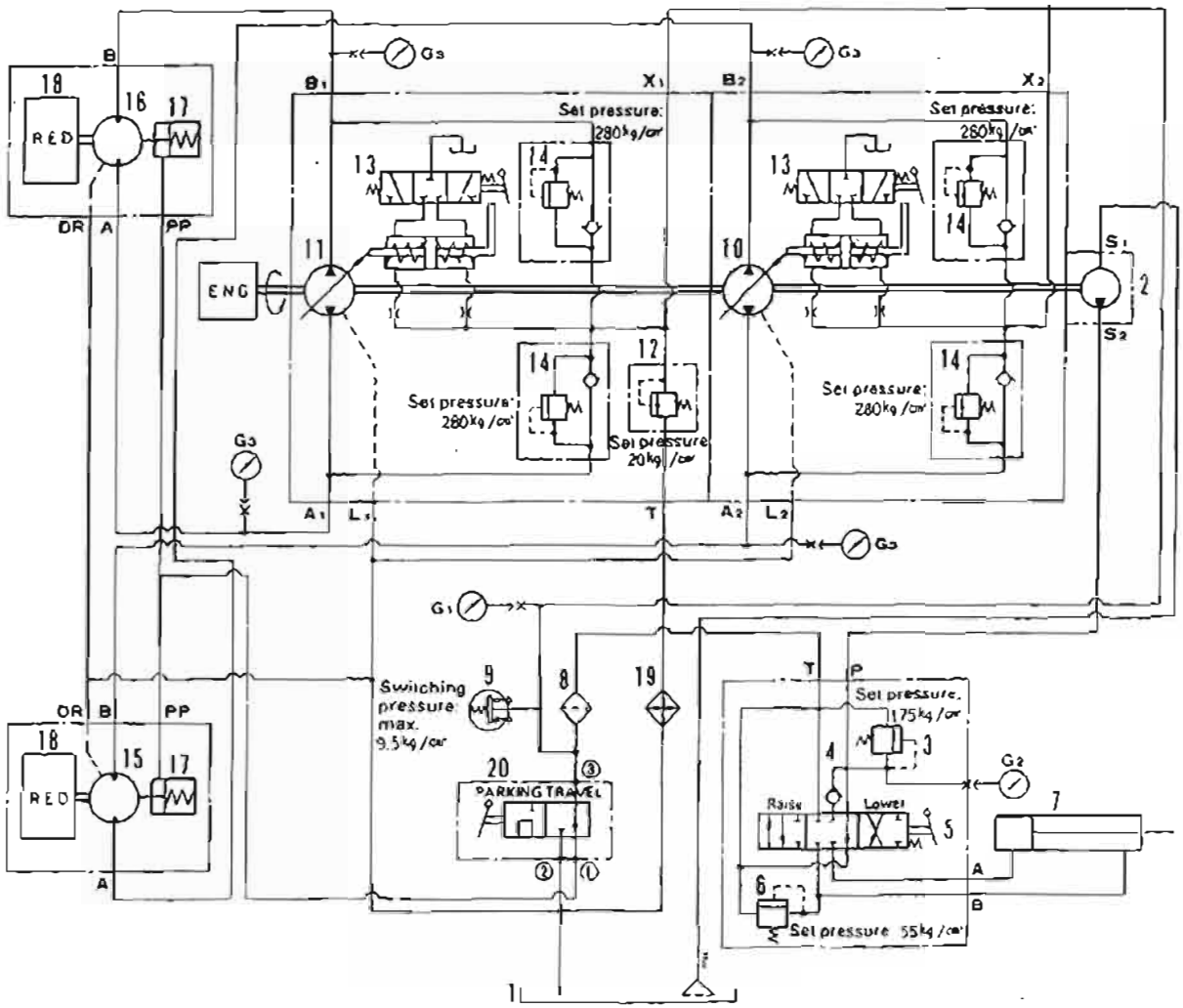
## GENERAL

- The MST series adopt the HST (HydroStatic Transmission) by swash plate hydraulic pumps and motors. Therefore, they can withstand high-speed, high-pressure service conditions.
  In particular not only sufficient strength is achieved against torsional vibration of the engine or sudden fluctuations in the engine load but also stable performance is obtained througout the engine speed range.
  In addition, the volumetric efficiency is so high that there is scarcely any oil leakage and the efficiency does not drop even if the oil temperature rises.
  The original servo transmission mechanism which is adopted facilitates the forward/neutral/reverse lever operation.
  In addition to above, the HST is of a maniblock type, which eliminates the piping of servo valves, relief valves, etc., so that it is easy to disassemble and reassemble.
  Furthermore, the travel motor of the MST-2200 and MST-2500 has a high/low speed selector mechanism, so it is possible to select a speed to match the change in the load.

## OUTLINE OF HYDRAULIC CONSTITUTION

- There are basically 2 hydraulic circuits, i.e., the HST to generate traveling power and the work equipment circuit to control the dump body.
  The HST has a pump charging circuit with 2 sets each of hydraulic variable pumps and hydraulic motors at the center of the circuit. The 2 sets of tandem hydraulic pumps are equipped with a charging pump in the rearmost section.
  The power train is connected directly to the engine.
  The 2 sets of hydraulic motors are equipped with a final reduction gear and a parking brake; they are mounted in the right and left front.
  The work equipment circuit consists of a dump control valve and a dump cylinder.
  The dump control valve is of a single-train spool system for all models.
  A double-acting, piston-type dump cylinder is adopted. One set are used in the MST-500 and 600. Two sets are used in the MST-700, 800, 1100, 1500, 2000, 2200 and 2500.
  In addition to the above hydraulic equipment, the MST-2200 and 2500 are also equipped with a high-low 2-speed travel motor which can be switched between high and low speed by a solenoid valve operated by a switch in the operator's compartment.

# HYDRAULIC CIRCUIT DIAGRAM (MST-500)



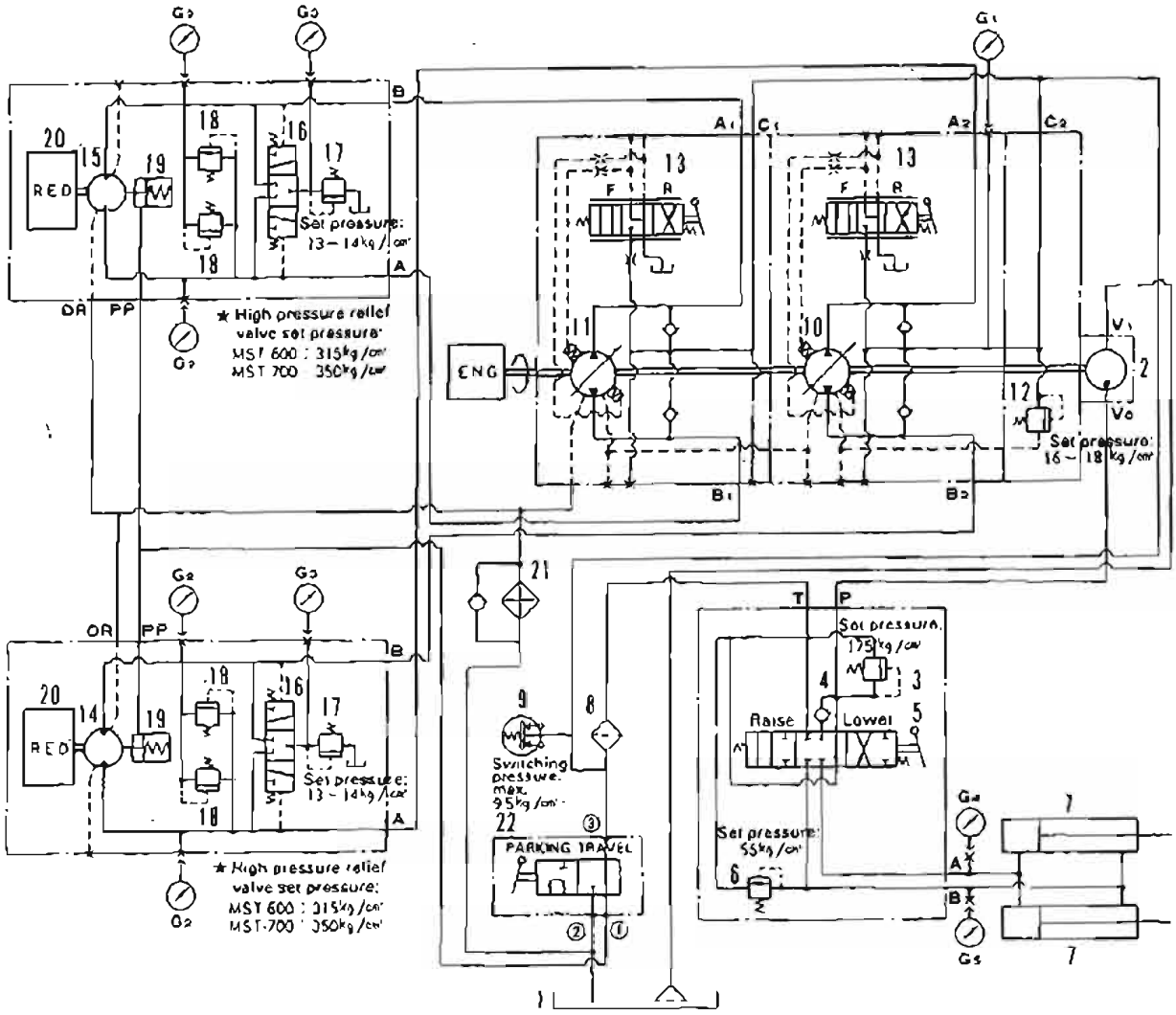

1. Hydraulic oil tank
2. Charging pump
3. Main relief valve
4. Check valve
5. Dump control valve
6. Over-load relief valve (Lower side)
7. Dump cylinder
8. Hydraulic line filter
9. Low pressure switch
10. Rear main pump (for left traveling)
11. Front main pump (for right traveling)
12. Charging relief valve
13. Pump control valve
14. High-pressure relief valve
15. Travel motor (for left traveling)
16. Travel motor (for right traveling)
17. Parking brake
18. Final drive
19. Oil cooler
20. Parking brake valve

$G_1$. Plug for charging pressure of main pump
$G_2$. Plug for main relief pressure of dump circuit
$G_3$. Plug for high-pressure of main pump

## OIL FLOW

- Oil in the hydraulic oil tank (1) is sucked up by charging pump (2) and enters port P of the control valve (5).
  If the control valve (5) is at the "HOLD" position, the oil which entered port P goes out of port T and flows completely to the HST circuit.
  If the control valve (5) is in an operating condition, it flows to the dump cylinder circuit.
- If the dump lever is at the "RAISE" or "LOWER" position, oil of the dump cylinder circuit opens the check valve (4), comes out of port A or B through the spool, enters bottom side or head side of the dump cylinder (7) and makes the dump body raise or lower. The oil which is returned to the cylinder is cleaned as it passes port T and the line filter (8) and flows to the HST circuit. The dump body raising pressure is set to 175 kg/cm$^2$ by the main relief valve (3).
  The dump body lowering circuit pressure is set to 55 kg/cm$^2$ by the over-load relief valve (6).
- If the control valve (5) is at the "HOLD" position, oil of the HST circuit flows completely through two circuits of the pump charging and parking brake release.
- The oil which flowed into the parking brake release circuit enters port (3) of the parking brake valve (20). If the parking brake lever is at the "TRAVEL" position, the oil which entered port (3) comes out of port (1), enters the brake port provided in the right and left travel motors and "releases" the parking brake (17).
  If the parking brake lever is at the "PARK" position, the port (3) and port (1) of the parking brake valve close and the port (1) and port (2) open to return the oil at the brake ports in the motors to the hydraulic oil tank.
- The oil which flowed into the pump charging circuit enters port $X_2$ of the rear pump and then port $X_1$ of the front pump through the pump's piping and supplies the amount of oil required by the main pump.
  The hydraulic pressure in the charging circuit is set to 20 kg/cm$^2$ by the charge relief valve (12) built into the main pump.
  If the pump charging circuit pressure drops below 9.5 kg/cm$^2$, the low-pressure switch (9) is activated to warn the operator by flashing the warning lamp in order to prevent pump seizure
- The main pumps (10) and (11) change the swash plate angle by means of the pump control valve (13) interlocked with the travel lever to adjust forward, reverse, and discharge, and send oil to the traveling motors.
  A high-pressure relief valve (14) is built into the main pump to set the main pump's discharging pressure to 280 kg/cm$^2$.
- The travel motors (15) and (16) turn according to the amount of oil sent from the main pump and their speed is reduced by the reduction gear (18) to drive the sprocket for running or turning the vehicle.

# HYDRAULIC CIRCUIT DIAGRAM (MST-600, 700)




1. Hydraulic oil tank
2. Charging pump
3. Main relief valve
4. Check valve
5. Dump control valve
6. Over-load relief valve (Lower side)
7. Dump cylinder
8. Hydraulic line filter
9. Low-pressure switch
10. Rear main pump (for left traveling)
11. Front main pump (for right traveling)
12. Charging relief valve
13. Pump control valve
14. Travel motor (for left traveling)
15. Travel motor (for right traveling)
16. Shuttle valve
17. Motor charging relief valve
18. High-pressure relief valve
19. Parking brake
20. Final drive
21. Oil cooler
22. Parking brake valve

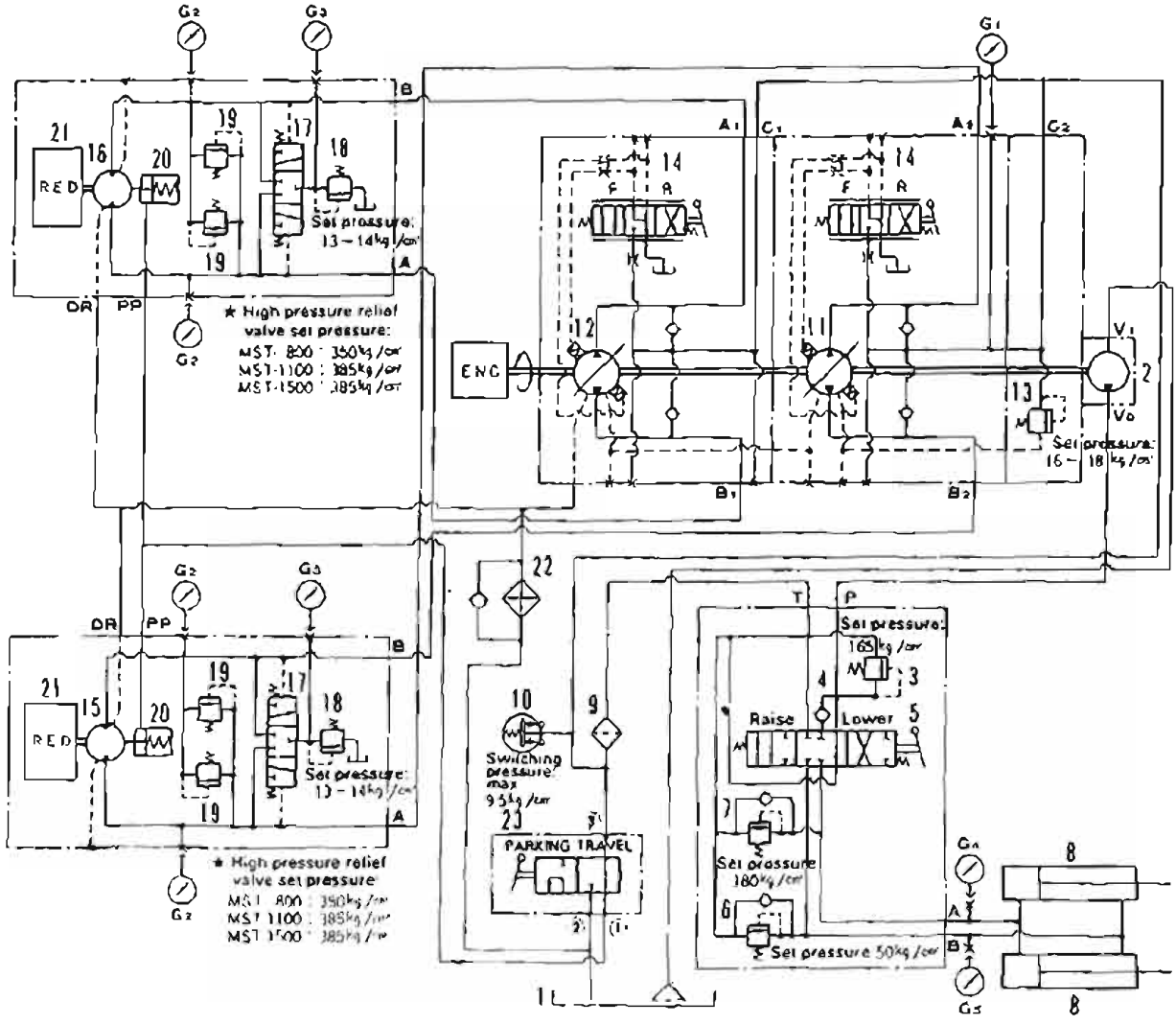
$G_1$. Plug for charging pressure of main pump
$G_2$. Plug for high pressure of main pump
$G_3$. Plug for charging pressure of travel motor
$G_4$. Plug for main relief pressure of dump circuit
$G_5$. Plug for over-load relief pressure of dump circuit

## OIL FLOW

- Oil in the hydraulic oil tank (1) is sucked up by charging pump (2) and enters port P of the control valve (5).
  If the control valve (5) is at the "HOLD" position, the oil which entered port P goes out of port T and flows completely to the HST circuit.
  If the control valve (5) is in an operating condition, it flows to the dump cylinder circuit.
- If the dump lever is at the "RAISE" or "LOWER" position, oil of the dump cylinder circuit opens the check valve (4), comes out of port A or B through the spool, enters bottom side or head side of the dump cylinder (7) and makes the dump body raise or lower. The oil which is returned to the cylinder is cleaned as it passes port T and the line filter (8) and flows to the HST circuit. The dump body raising pressure is set to 175 kg/cm$^2$ by the main relief valve (3).
  The dump body lowering circuit pressure is set to 55 kg/cm$^2$ by the over-load relief valve (6).
- If the control valve (5) is at the "HOLD" position, oil of the HST circuit flows completely through two circuits of the pump charging and parking brake release.
- The oil which flowed into the parking brake release circuit enters port (3) of the parking brake valve (22). If the parking brake lever is at the "TRAVEL" position, the oil which entered port (3) comes out of port (1), enters the brake port provided in the right and left travel motors and "releases" the parking brake (19).
  If the parking brake lever is at the "PARK" position, the port (3) and port (1) of the parking brake valve close and the port (1) and port (2) open to return the oil at the brake ports in the motors to the hydraulic oil tank.
- The oil which flowed into the pump charging circuit enters port $C_2$ of the rear pump and then port $C_1$ of the front pump through the pump's piping and supplies the amount of oil required by the main pump.
  The hydraulic pressure in the charging circuit is set to 16 – 18 kg/cm$^2$ by the charge relief valve (12) built into the main pump.
  If the pump charging circuit pressure drops below 9.5 kg/cm$^2$ the low-pressure switch (9) is activated to warn the operator by flashing the warning lamp in order to prevent pump seizure.
- The main pumps (10) and (11) change the swash plate angle by means of the pump control valve (13) interlocked with the travel lever to adjust forward, reverse, and discharge, and send oil to the traveling motors.
- The travel motors (14) and (15) turn according to the amount of oil sent from the main pump and their speed is reduced by the reduction gear (20) to drive the sprocket for running or turning the vehicle. A high-pressure relief valve (18) is built into the travel motor to set the main pump's discharging pressure.
  In addition, a flushing valve (combination of a shuttle valve (16) and a charge relief valve (17)) is built into the MST-600, and 700. It relieves the oil of the circuit which became the travel motor's discharging side (low-pressure side) to the oil cooler (21) to prevent overheating and clean hydraulic oil of the HST circuit.

# HYDRAULIC CIRCUIT DIAGRAM (MST-800 — 1500)

MST-800 Serial No. 866 –
MST-1100 Serial No. M01101 –, K11101 –
MST-1500 Serial No. 15001 – 15093




1. Hydraulic oil tank
2. Charging pump
3. Main relief valve
4. Check valve
5. Dump control valve
6. Over-load relief valve (Lower side)
7. Over load relief valve (Raise side)
8. Dump cylinder
9. Hydraulic line filter
10. Low-pressure switch
11. Rear main pump (for left traveling)
12. Front main pump (for right traveling)
13. Charging relief valve
14. Pump control valve
15. Travel motor (for left traveling)
16. Travel motor (for right traveling)
17. Shuttle valve
18. Motor charging relief valve
19. High-pressure relief valve
20. Parking brake
21. Final drive
22. Oil cooler
23. Parking brake valve

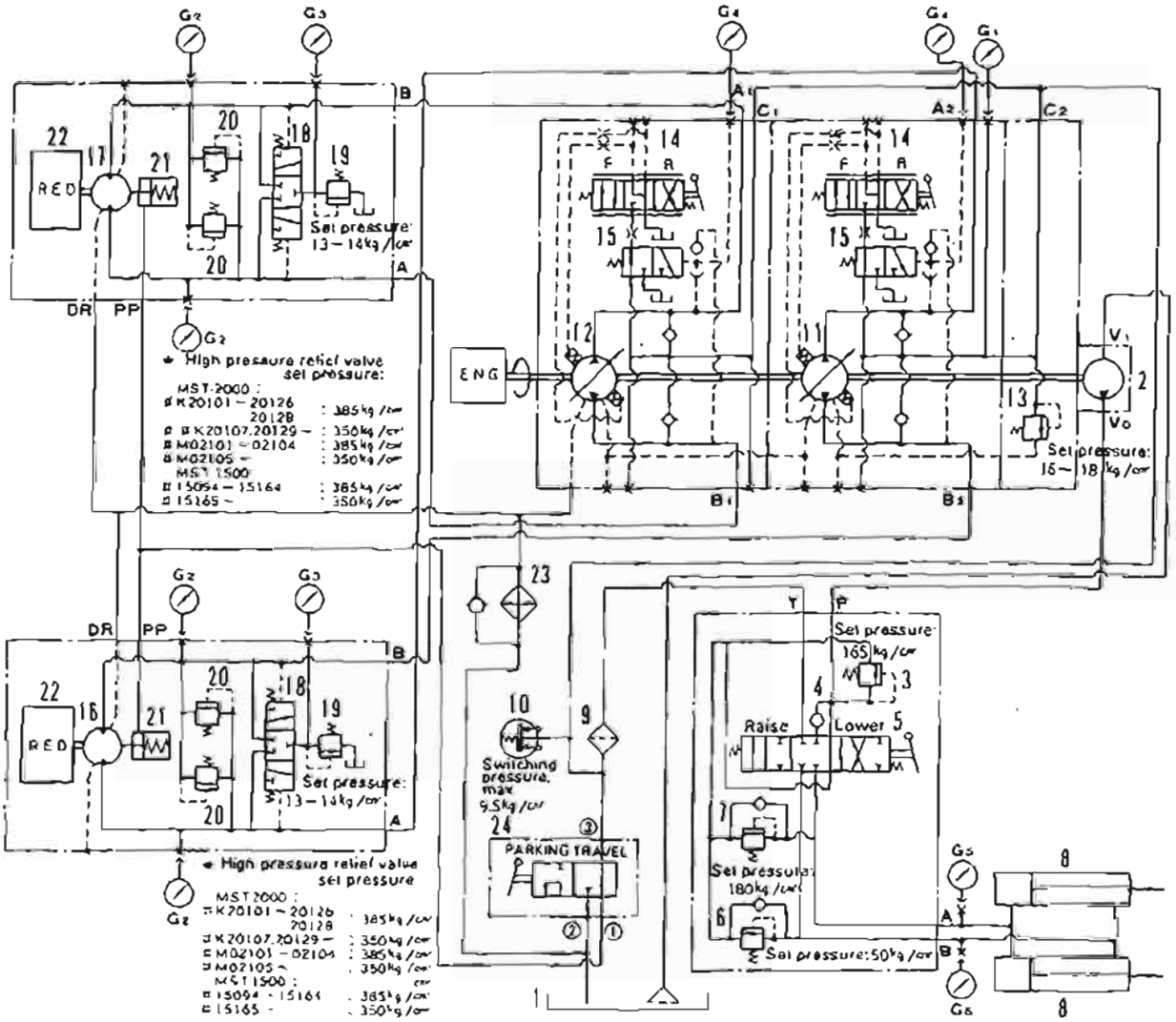
$G_1$. Plug for charging pressure of main pump
$G_2$. Plug for high-pressure of main pump
$G_3$. Plug for charging pressure of travel motor
$G_4$. Plug for main relief pressure of dump circuit
$G_5$. Plug for over-load relief pressure of dump circuit

## OIL FLOW

- Oil in the hydraulic oil tank (1) is sucked up by charging pump (2) and enters port P of the control valve (5).
  If the control valve (5) is at the "HOLD" position, the oil which entered port P goes out of port T and flows completely to the HST circuit.
  If the control valve (5) is in an operating condition, it flows to the dump cylinder circuit.
- If the dump lever is at the "RAISE" or "LOWER" position, oil of the dump cylinder circuit opens the check valve (4), comes out of port A or B through the spool, enters bottom side or head side of the dump cylinder (8) and makes the dump body raise or lower. The oil which is returned to the cylinder is cleaned as it passes port T and the line filter (9) and flows to the HST circuit. The dump body raising pressure is set to 165 kg/cm$^2$ by the main relief valve (3).
  The dump body lowering pressure is set to 50 kg/cm$^2$ by the over-load relief valve (6).
- If the control valve (5) is at the "HOLD" position, oil of the HST circuit flows completely through two circuits of the pump charging and parking brake release.
- The oil which flowed into the parking brake release circuit enters port (3) of the parking brake valve (23). If the parking brake lever is at the "TRAVEL" position, the oil which entered port (3) comes out of port (1), enters the brake port provided in the right and left travel motors and "releases" the parking brake (20).
  If the parking brake lever is at the "PARK" position, the port (3) and port (1) of the parking brake valve close and the port (1) and port (2) open to return the oil at the brake ports in the motors to the hydraulic oil tank.
- The oil which flowed into the pump charging circuit enters port $C_2$ of the rear pump and then port $C_1$ of the front pump through the pump's piping and supplies the amount of oil required by the main pump.
  The hydraulic pressure in the charging circuit is set to 16 – 18 kg/cm$^2$ by the charge relief valve (13) built into the main pump.
  If the pump charging circuit pressure drops below 9.5 kg/cm$^2$, the low-pressure switch (10) is activated to warn the operator by flashing the warning lamp in order to prevent pump seizure.
- The main pumps (11) and (12) change the swash plate angle by means of the pump control valve (14) interlocked with the travel lever to adjust forward, reverse, and discharge, and send oil to the travelling motors.
- The travel motors (15) and (16) turn according to the amount of oil sent from the main pump and their speed is reduced by the reduction gear to drive the sprocket for running or turning the vehicle. A high-pressure relief valve (19) is built into the travel motor to set the main pump's discharging pressure.
  In addition, a flushing valve (combination of a shuttle valve (17) and a charge relief valve (18)) is built into the MST-800, 1100, and 1500. It relieves the oil of the circuit which became the travel motor's discharging side (low-pressure side) to the oil cooler (22) to prevent overheating and clean hydraulic oil of the HST circuit.

# HYDRAULIC CIRCUIT DIAGRAM (MST-1500, 2000)

**MST-1500 Serial No. 15093 –**
**MST-2000 Serial No. M02101 –, K20101 –**



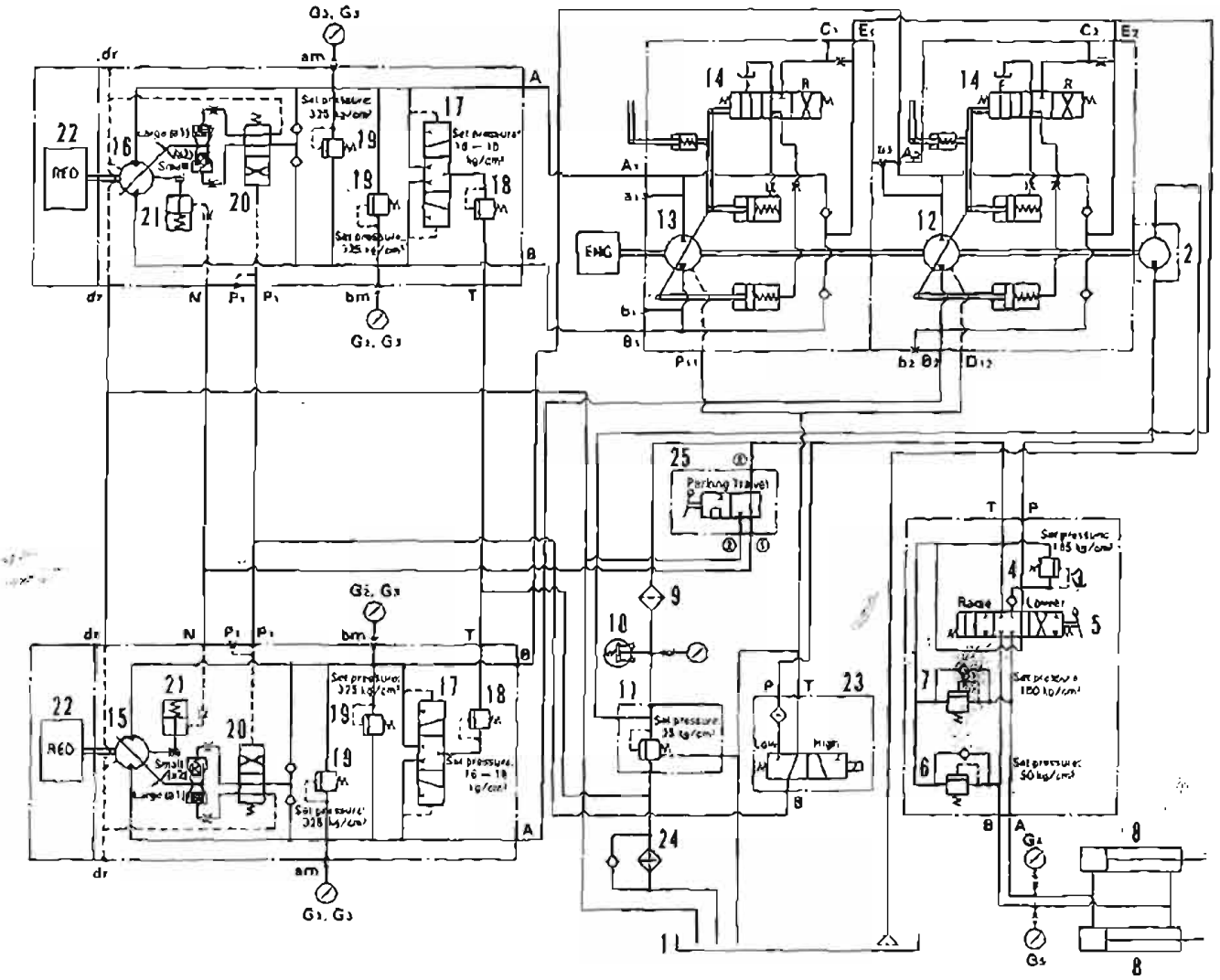

1. Hydraulic oil tank
2. Charging pump
3. Main relief valve
4. Check valve
5. Dump control valve
6. Over-load relief valve (Lower side)
7. Over-load relief valve (Raise side)
8. Dump cylinder
9. Hydraulic line filter
10. Low-pressure switch
11. Rear main pump (for left traveling)
12. Front main pump (for right traveling)
13. Charging relief valve
14. Pump control valve
15. Pressure override valve
16. Travel motor (for left traveling)
17. Travel motor (for right traveling)
18. Shuttle valve
19. Charging relief valve
20. High-pressure relief valve
21. Parking brake
22. Final drive
23. Oil cooler
24. Parking brake valve

$G_1$. Plug for charging pressure of main pump
$G_2$. Plug for high-pressure of main pump
$G_3$. Plug for charging pressure of travel motor
$G_4$. Plug for charging pressure of pressure override valve
$G_5$. Plug for main relief pressure of dump circuit
$G_6$. Plug for over-load relief pressure of dump circuit

## OIL FLOW

- Oil in the hydraulic oil tank (1) is sucked up by charging pump (2) and enters port P of the control valve (5).
  If the control valve (5) is at the "HOLD" position, the oil which entered port P goes out of port T and flows completely to the HST circuit.
  If the control valve (5) is in an operating condition, it flows to the dump cylinder circuit.
- If the dump lever is at the "RAISE" or "LOWER" position, oil of the dump cylinder circuit opens the check valve (4), comes out of port A or B through the spool, enters bottom side or head side of the dump cylinder (8) and makes the dump body raise or lower. The oil which is returned to the cylinder is cleaned as it passes port T and the line filter (9) and flows to the HST circuit. The dump body raising pressure is set to 165 kg/cm$^2$ by the main relief valve (3).
  The dump body lowering circuit pressure is set to 50 kg/cm$^2$ by the over-load relief valve (6).
- If the control valve (5) is at the "HOLD" position, oil of the HST circuit flows completely through two circuits of the pump charging and parking brake release.
- The oil which flowed into the parking brake release circuit enters port ③ of the parking brake valve (24). If the parking brake lever is at the "TRAVEL" position, the oil which entered port ③ comes out of port ①, enters the brake port provided in the right and left travel motors and "releases" the parking brake (21).
  If the parking brake lever is at the "PARK" position, the port ③ and port ① of the parking brake valve close and the port ① and port ② open to return the oil at the brake ports in the motors to the hydraulic oil tank.
- The oil which flowed into the pump charging circuit enters port $C_1$ of the rear pump and then port $C_2$ of the front pump through the pump's piping and supplies the amount of oil required by the main pump.
  The hydraulic pressure in the charging circuit is set to 16 – 18 kg/cm$^2$ by the charge relief valve (13) built into the main pump.
  If the pump charging circuit pressure drops below 9.5 kg/cm$^2$, the low-pressure switch (10) is activated to warn the operator by flashing the warning lamp in order to prevent pump seizure.
- The main pumps (11) and (12) change the swash plate angle by means of the pump control valve (14) interlocked with the travel lever to adjust forward, reverse, and discharge, and send oil to the traveling motors.
  A pressure override valve (15) is built into the main pump. In the case of the main pump's discharging pressure reaching a continuous high-pressure relief condition, it shuts the oil flow to pump control valve (14) to return the main pump's swash plate angle to the neutral position. As the discharging pressure drops, the HST circuit is protected.
- The travel motors (16) and (17) turn according to the amount of oil sent from the main pump and their speed is reduced by the reduction gear to drive the sprocket for running or turning the vehicle. A high-pressure relief valve (20) is built into the travel motor to set the main pump's discharging pressure.
  In addition, a flushing valve (combination of a shuttle valve (18) and a charge relief valve (19)) is built into the MST-1500 and 2000. It relieves the oil of the circuit which became the travel motor's discharging side (low-pressure side) to the oil cooler (23) to prevent overheating and clean hydraulic oil of the HST circuit.

# HYDRAULIC CIRCUIT DIAGRAM (MST-2200)



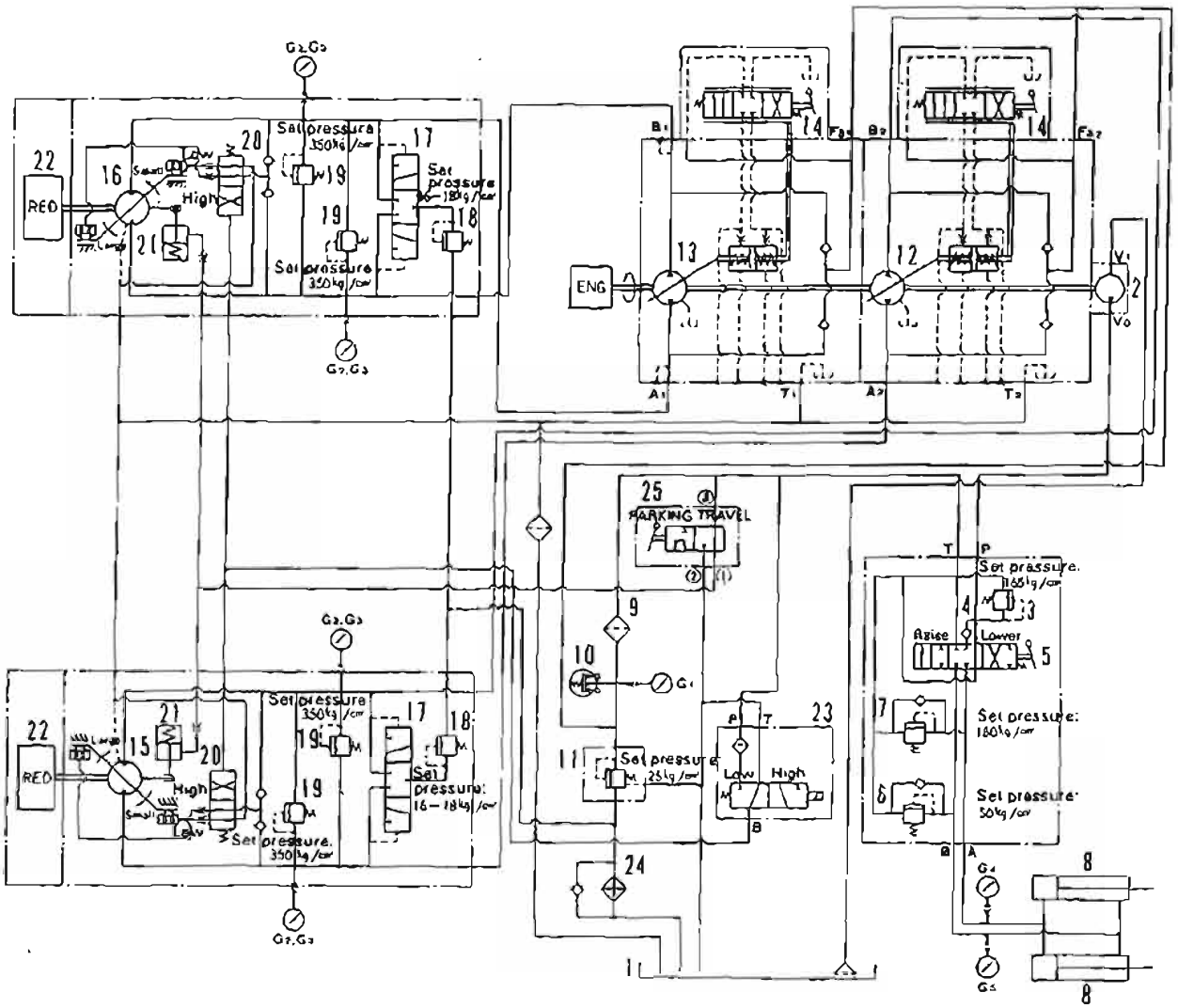
1. Hydraulic oil tank
2. Charging pump
3. Main relief valve
4. Check valve
5. Dump control valve
6. Over-load relief valve (Lower side)
7. Over-load relief valve (Raise side)
8. Dump cylinder
9. Hydraulic line filter
10. Low-pressure switch
11. Charging relief valve
12. Rear main pump (for left traveling)
13. Front main pump (for right traveling)
14. Pump control valve
15. Travel motor (for left traveling)
16. Travel motor (for right traveling)
17. Shuttle valve
18. Charging relief valve
19. High-pressure relief valve
20. H-L speed changing valve
21. Parking brake
22. Final drive
23. H-L speed changing solenoid valve
24. Oil cooler
25. Parking brake valve

$G_1$. Plug for charging pressure of main pump
$G_2$. Plug for high-pressure of main pump
$G_3$. Plug for charging pressure of travel motor
$G_4$. Plug for main relief pressure of dump circuit
$G_5$. Plug for over load relief pressure of dump circuit

## OIL FLOW

- Oil in the hydraulic oil tank (1) is sucked up by charging pump (2) and enters port P of the control valve (5).
  If the control valve (5) is at the "HOLD" position, the oil which entered port P goes out of port T and flows completely to the HST circuit.
  If the control valve (5) is in an operating condition, it flows to the dump cylinder circuit.
- If the dump lever is at the "RAISE" or "LOWER" position, oil of the dump cylinder circuit opens the check valve (4), comes out of port A or B through the spool, enters bottom side or head side of the dump cylinder (8) and makes the carrier raise or lower.
  The oil which is returned to the cylinder is cleaned as it passes port T and the line filter (9) and flows to the HST circuit. The dump body raising pressure is set to 165 kg/cm$^2$ by the main relief valve (3).
  The dump body lowering pressure is set to 50 kg/cm$^2$ by the over-load relief valve (6).
- When control valve (5) is at the "HOLD" position, the oil in the HST circuit is all divided into three circuits and flows through the pump charge, travel motor high/low speed selector, and parking brake release circuits.
- The oil which flowed into the parking brake release circuit enters port (3) of the parking brake valve (25). If the parking brake lever is at the "TRAVEL" position, the oil which entered port (3) comes out of port (1), enters the brake port provided in the right and left travel motors and "releases" the parking brake (21)
  If the parking brake lever is at the "PARK" position, the port (3) and port (1) of the parking brake valve close and the port (1) and port (2) open to return the oil at the brake ports in the motors to the hydraulic oil tank.
- The oil flowing through the travel motor high/low speed selector circuit enters port P of solenoid selector valve (23).
  If the high/low speed selector switch in the operator's compartment is at the LOW SPEED position, the solenoid selector valve is not actuated. The circuit of ports P and B is closed, so the oil entering port P flows to other circuits. At the same rime, the solenoid selector valve opens the circuit of ports B and T, so the pilot pressure (oil) at high/low speed selector valve (20) inside the motor is returned to the hydraulic tank, and the motor runs at low speed
  When the high/low speed selector switch in the operator's compartment is at the HIGH SPEED position, the solenoid selector valve is actuated, the circuit of ports P and B is opened, and the circuit of ports B and T is closed. When this happens, the oil entering port P flows from port P to port B, and becomes the pilot pressure of the high/low speed selector valve inside the travel motor. This switches the valve, and the motor runs at high pseed.
  In other words, the solenoid selector valve switches the pilot pressure that controls the high/low speed selector valve inside the travel motor, and the high/low speed selector valve inside the travel motor switches the high pressure oil from the main pump and controls the swash plate angle of the travel motor.
- The oil flowing to the pump charge circuit passes through pump charge relief valve (11) at the rear of the operator's compartment, enters port $E_2$ of the rear pump, then enters port $E_1$ of the front pump, and supplies the required amount of oil for the main pump.
  The pressure in the charge circuit is set to 25 kg/cm$^2$ by the charge relief valve.
  If the pressure in the pump charge circuit drops below 9.5 kg/cm$^2$, low pressure switch (10) is actuated, and the caution lamp lights up to prevent seizure of the pump.
- The swash plate angle of main pumps (12) and (13) is changed by pump control valve (14) that is interconnected with the travel lever. It adjusts the direction of rotation (normal or reverse), and the discharge amount, and sends the oil to the travel motor.
- Travel motors (15) and (16) rotate in accordance with the amount of oil sent from the main pumps. This rotation is reduced by the reduction gear, and goes on to drive the sprocket to drive or turn the machine. Furthermore, high/low speed selector valve (20) is built into the travel motor. It is actuated by the pilot pressure from high/low speed solenoid selector valve (23), sends the oil at the high pressure side of the travel motor to the swash plate angle selector cylinder, and changes the swash plate angle of the travel motor to set the maximum level for the rotating speed. In other words, the travel motor has two stages.
  In addition, the travel motor also has a built-in flushing valve (a combination of shuttle valve (17) and charge relief valve (18)), and this relieves the oil in the circuit at the discharge side (low pressure side) of the travel motor, sends it to oil cooler (24), and cleans the oil in the HST circuit while preventing the oil from overheating.

# HYDRAULIC CIRCUIT DIAGRAM (MST-2500)



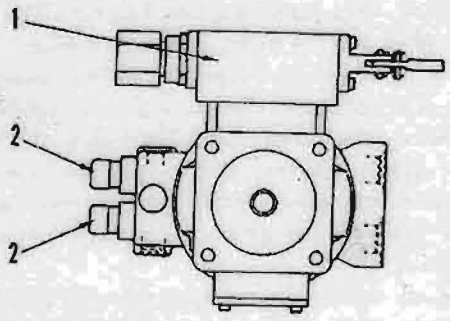

1. Hydraulic oil tank
2. Charging pump
3. Main relief valve
4. Check valve
5. Dump control valve
6. Over-load relief valve (Lower side)
7. Over-load relief valve (Raise side)
8. Dump cylinder
9. Hydraulic line filter
10. Low-pressure switch
11. Charging relief valve
12. Rear main pump (for left traveling)
13. Front main pump (for right traveling)
14. Pump control valve
15. Travel motor (for left traveling)
16. Travel motor (for right traveling)
17. Shuttle valve
18. High-pressure relief valve
19. Charging relief valve
20. H-L speed changing valve
21. Parking brake
22. Final drive
23. H-L speed changing solenoid valve
24. Oil cooler
25. Parking brake valve

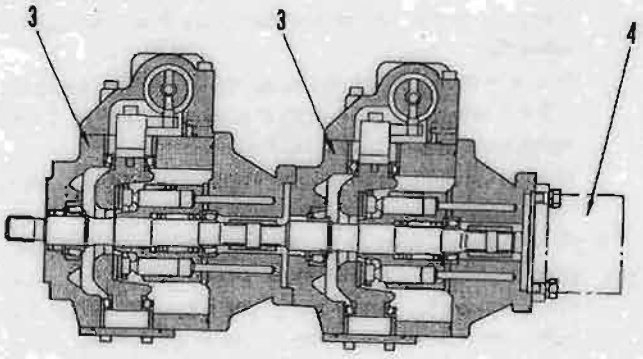
$G_1$. Plug for charging pressure of main pump
$G_2$. Plug for high-pressure of main pump
$G_3$. Plug for charging pressure of travel motor
$G_4$. Plug for main relief pressure of dump circuit

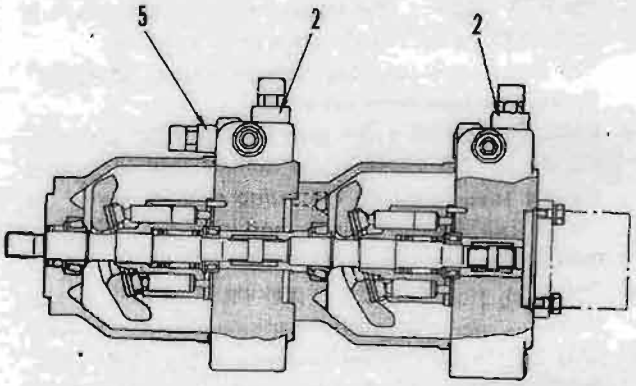
## OIL FLOW

- Oil in the hydraulic oil tank (1) is sucked up by charging pump (2) and enters port P of the control valve (5).
  If the control valve (5) is at the "HOLD" position, the oil which entered port P goes out of port T and flows completely to the HST circuit.
  If the control valve (5) is in an operating condition, it flows to the dump cylinder circuit.
- If the dump lever is at the "RAISE" or "LOWER" position, oil of the dump cylinder circuit opens the check valve (4), comes out of port A or B through the spool, enters bottom side or head side of the dump cylinder (8) and makes the carrier raise or lower.
  The oil which is returned to the cylinder is cleaned as it passes port T and the line filter (9) and flows to the HST circuit. The dump body raising pressure is set to 165 kg/cm$^2$ by the main relief valve (3).
  The dump body lowering pressure is set to 50 kg/cm$^2$ by the over-load relief valve (6).
- When control valve (5) is at the "HOLD" position, the oil in the HST circuit is all divided into three circuits and flows through the pump charge, travel motor high/low speed selector, and parking brake release circuits.
- The oil which flowed into the parking brake release circuit enters port (3) of the parking brake valve (25). If the parking brake lever is at the "TRAVEL" position, the oil which entered port (3) comes out of port (1), enters the brake port provided in the right and left travel motors and "releases" the parking brake (21).
  If the parking brake lever is at the "PARK" position, the port (3) and port (1) of the parking brake valve close and the port (1) and port (2) open to return the oil at the brake parts in the motors to the hydraulic oil tank.
- The oil flowing through the travel motor high/low speed selector circuit enters port P of solenoid selector valve (23).
  If the high/low speed selector switch in the operator's compartment is at the LOW SPEED position, the solenoid selector valve is not actuated. The circuit of ports P and B is closed, so the oil entering port P flows to other circuits. At the same time, the solenoid selector valve opens the circuit of ports B and T, so the pilot pressure (oil) at high/low speed selector valve (20) inside the motor is returned to the hydraulic tank, and the motor runs at low speed.
  When the high/low speed selector switch in the operator's compartment is at the HIGH SPEED position, the solenoid selector valve is actuated, the circuit of ports P and B is opened, and the circuit of ports B and T is closed. When this happens, the oil entering port P flows from port P to port B, and becomes the pilot pressure of the high/low speed selector valve inside the travel motor. This switches the valve, and the motor runs at high pseed.
  In other words, the solenoid selector valve switches the pilot pressure that controls the high/low speed selector valve inside the travel motor, and the high/low speed selector valve inside the travel motor switches the high pressure oil from the main pump and controls the swash plate angle of the travel motor.
- The oil flowing to the pump charge circuit passes through pump charge relief valve (11) at the rear of the operator's compartment, enters port $Fa_2$ of the rear pump, then enters port $Fa_1$ of the front pump, and supplies the required amount of oil for the main pump.
  The pressure in the charge circuit is set to 25 kg/cm$^2$ by the charge relief valve.
  If the pressure in the pump charge circuit drops below 9.5 kg/cm$^2$, low pressure switch (10) is actuated, and the caution lamp lights up to prevent seizure of the pump.
- The swash plate angle of main pumps (12) and (13) is changed by pump control valve (14) that is interconnected with the travel lever. It adjusts the direction of rotation (normal or reverse), and the discharge amount, and sends the oil to the travel motor.
- Travel motors (15) and (16) rotate in accordance with the amount of oil sent from the main pumps. This rotation is reduced by the reduction gear, and goes on to drive the sprocket to drive or turn the machine. Furthermore, high/low speed selector valve (20) is built into the travel motor. It is actuated by the pilot pressure from high/low speed solenoid selector valve (23), sends the oil at the high pressure side of the travel motor to the swash plate angle selector cylinder, and changes the swash plate angle of the travel motor to set the maximum level for the rotating speed. In other words, the travel motor has two stages.
  In addition, the travel motor also has a built-in flushing valve. (a combination of shuttle valve (17) and charge relief valve (18)), and this relieves the oil in the circuit at the discharge side (low pressure side) of the travel motor, sends it to oil cooler (24), and cleans the oil in the HST circuit while preventing the oil from overheating.

# HYDRAULIC PUMP (MST-500)




1. Pump control valve
2. High-pressure relief valve
3. Main pump
4. Charging pump
5. Charging relief valve

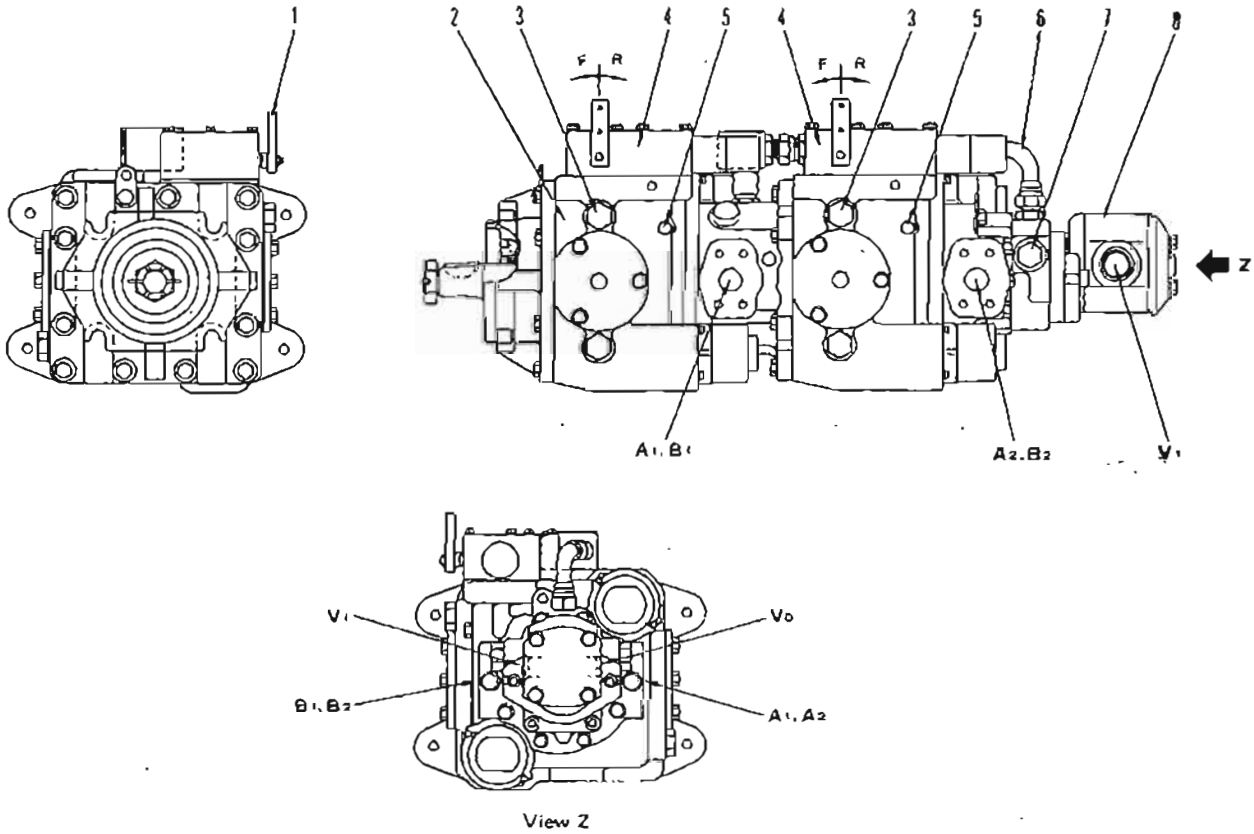
## GENERAL

- The hydraulic pumps are mounted in the rear part of the engine via a rubber coupling; they are 2 sets of tandem main pumps and a gear-type pump to supply oil to the charging and work equipment circuits, making up triple pumps.
  Swash plate-type main pumps are adopted.
- The table below shows the main pump's discharging and charging pressure.

| Model | Pump discharge (cc/rev) | Charging pressure ($kg/cm^2$) |
|---|---|---|
| MST-500 | 43.0 | 20 |

# HYDRAULIC PUMP (MST-600 — 1500)

MST-600 Serial No. 1601 –
MST-700 Serial No. 70101 –
MST-800 Serial No. 866 –
MST-1100 Serial No. M01101 –, K11101 –
MST-1500 Serial No. 15001 – 15093




View Z

1. Control lever
2. Main pump
3. Drain plug (7/8-14UNF)
4. Pump control valve
5. Plug for charging pressure (7/16-20UNF)
6. Tube (connecting front and rear charging ports)
7. Plug (right side is charging relief valve)
8. Charging pump

$A_1$. To port B of right travel motor (Forward)
$B_1$. To port A of right travel motor (Reverse)
$A_2$. To port B of left travel motor (Forward)
$B_2$. To port A of left travel motor (Reverse)
$V_0$. To main pump charging and dump circuits
$V_1$. From hydraulic tank

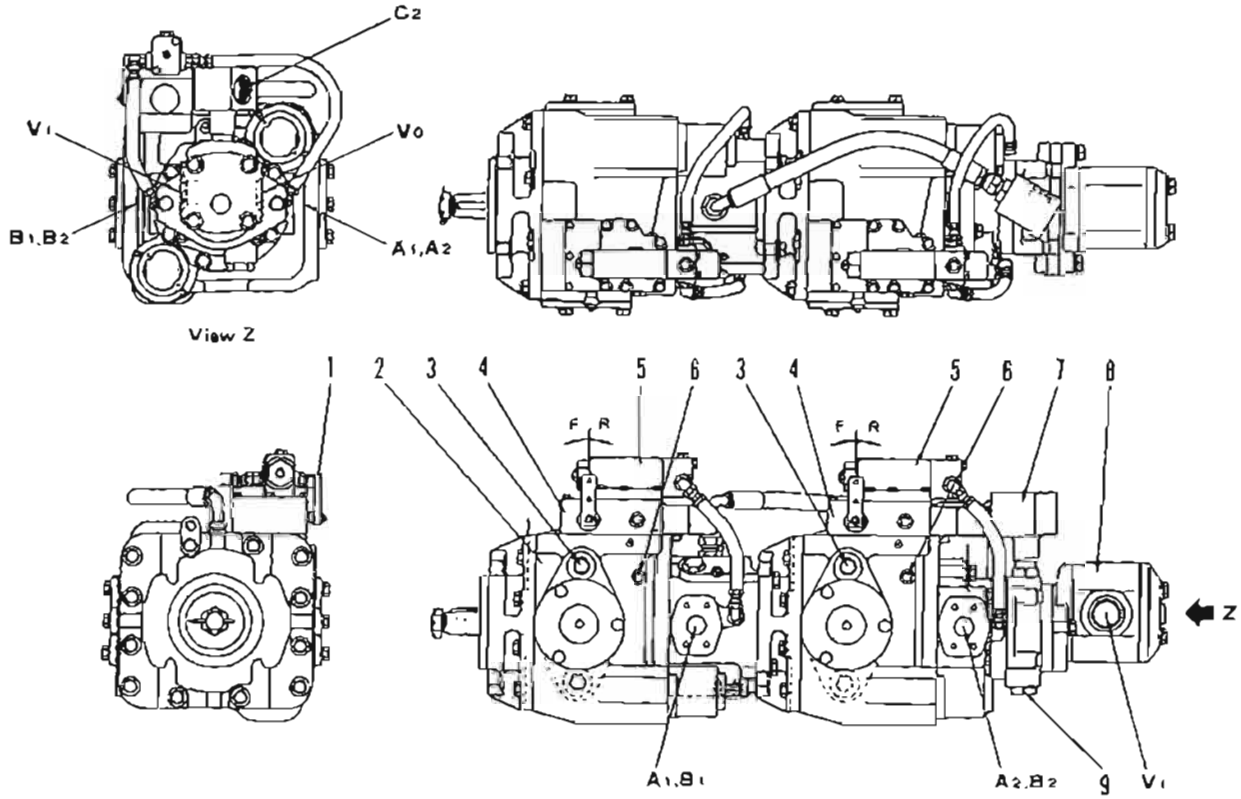
## GENERAL

- The hydraulic pumps are mounted in the rear part of the engine via a rubber coupling; they are 2 sets of tandem main pumps and a gear-type pump to supply oil to the charging and work equipment circuits, making up triple pumps.
  Swash plate-type main pumps are adopted.
- The table below shows the main pump's discharging and charging pressure.

| Model | Pump discharge (cc/rev) | Charging pressure (kg/cm²) |
|---|---|---|
| MST-600 | 51.6 | 16–18 |
| MST-700 | 51.6 | 16–18 |
| MST-800 | 51.6 | 16–18 |
| MST-1100 | 51.6 | 16–18 |
| MST-1500 | 69.8 | 16–18 |

# HYDRAULIC PUMP (MST-1500, 2000)

MST-1500 Serial No. 15094 –
MST-2000 Serial No. M02101 –, K20101 –




1. Control lever
2. Main pump
3. Drain plug (7/8-14UNF)
4. Pump control valve
5. Pressure override valve
6. Plug for charging pressure (7/16-20UNF)
7. Tube (connecting front and rear charging ports)
8. Charging pump
9. Charging relief valve

$A_1$. To port B of right travel motor (Forward)
$B_1$. To port A of right travel motor (Reverse)
$A_2$. To port B of left travel motor (Forward)
$B_2$. To port A of left travel motor (Reverse)
$V_0$. To main pump charging and dump circuits
$V_1$. From hydraulic tank

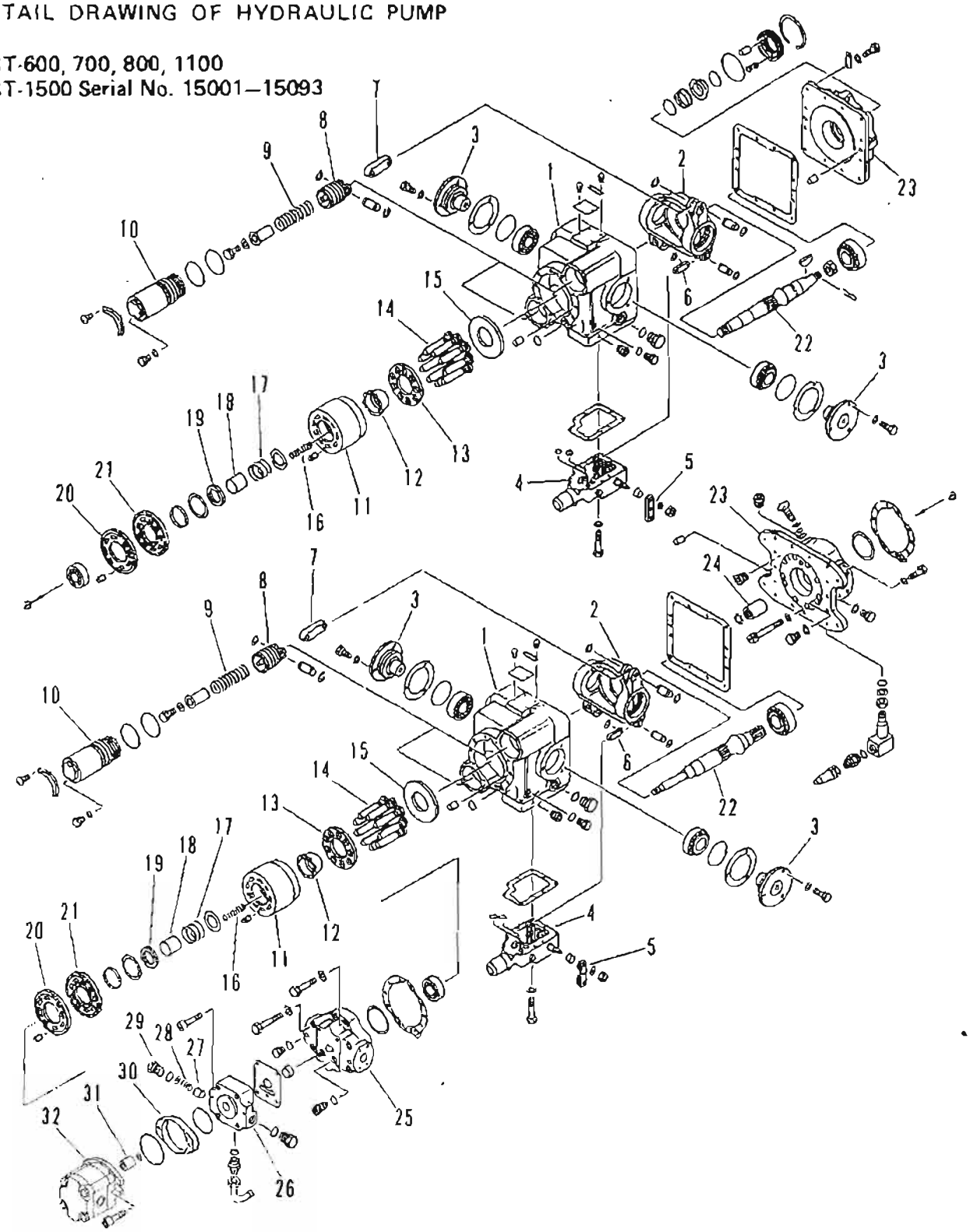
## GENERAL

- The hydraulic pumps are mounted in the rear part of the engine via a rubber coupling; they are 2 sets of tandem main pumps and a gear-type pump to supply oil to the charging and work equipment circuits, making up triple pumps.
  Swash plate-type main pumps are adopted.
  The pressure override valve is provided in the circuit between the charge relief valve and the pump control valve. If the main pump discharging pressure becomes continuously high, it shuts the oil flow to the pump control valve to return the pump's swash plate angle to the "NEUTRAL" position. As the main pump's discharge is stopped, the pressure drops to protect the traveling motors and the piping from abnormally high pressure.
- The table below shows the main pump's discharge and charging pressure.

| Model | Pump discharge (cc/rev) | Charging pressure ($kg/cm^2$) |
|---|---|---|
| MST-1500 | 69.8 | 16–18 |
| MST-2000 | 89.0 | 16–18 |

## DETAIL DRAWING OF HYDRAULIC PUMP

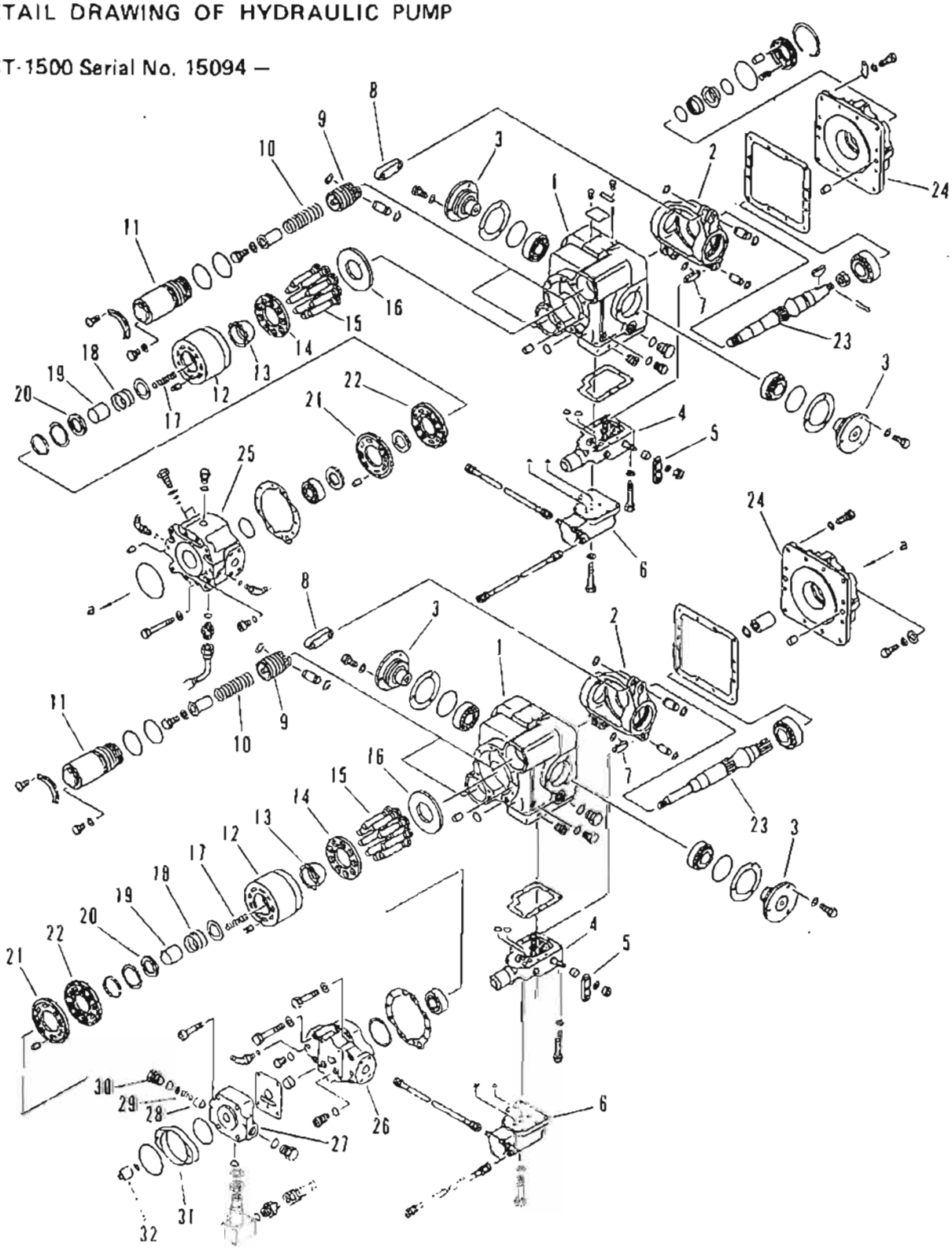
**MST-600, 700, 800, 1100**
**MST-1500 Serial No. 15001—15093**



1. Housing
2. Yoke
3. Trunnion
4. Control valve
5. Control lever
6. Link
7. Link
8. Yoke
9. Spring
10. Sleeve
11. Cylinder block
12. Guide
13. Retainer
14. Piston
15. Thrust plate
16. Spring
17. Spring
18. Guide
19. Retainer
20. Swash plate
21. Bearing plate
22. Drive shaft
23. Housing
24. Coupling
25. Housing
26. Housing
27. Charging valve poppet
28. Spring
29. Spring
30. Support
31. Coupling
32. Charging pump

## DETAIL DRAWING OF HYDRAULIC PUMP

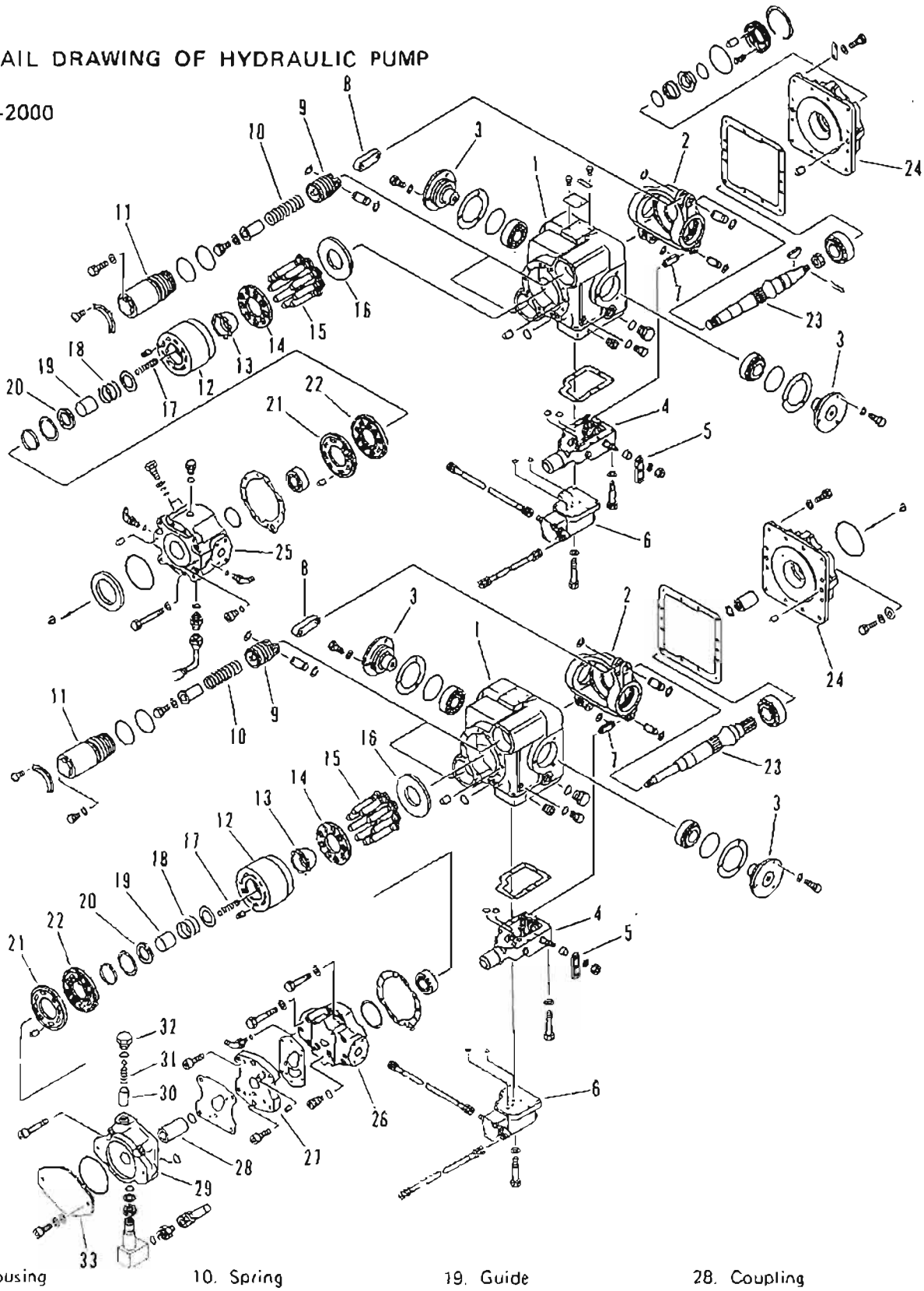
MST-1500 Serial No. 15094 —



1. Housing
2. Yoke
3. Trunnion
4. Control valve
5. Control lever
6. Pressure override valve
7. Link
8. Link
9. Yoke
10. Spring
11. Sleeve
12. Cylinder block
13. Guide
14. Retainer
15. Piston
16. Thrust plate
17. Spring
18. Spring
19. Guide
20. Retainer
21. Swash plate
22. Bearing plate
23. Drive shaft
24. Housing
25. Housing
26. Housing
27. Housing
28. Charging valve poppet
29. Spring
30. Plug
31. Support
32. Coupling

## DETAIL DRAWING OF HYDRAULIC PUMP

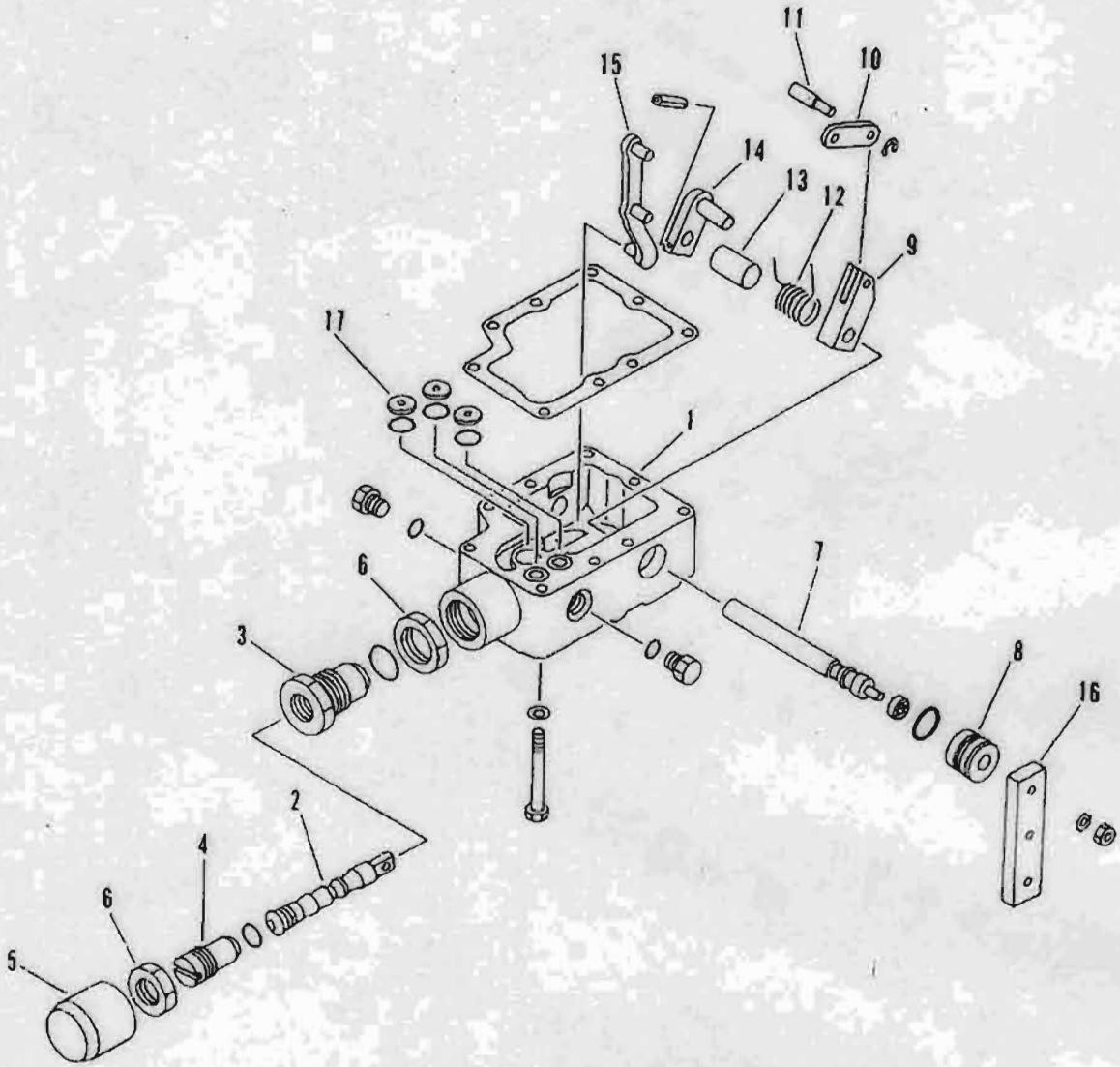
MST-2000



1. Housing
2. Yoke
3. Trunnion
4. Control valve
5. Control lever
6. Pressure override valve
7. Link
8. Link
9. Yoke
10. Spring
11. Sleeve
12. Cylinder block
13. Guide
14. Retainer
15. Piston
16. Thrust plate
17. Spring
18. Spring
19. Guide
20. Retainer
21. Swash plate
22. Bearing plate
23. Drive shaft
24. Housing
25. Housing
26. Housing
27. Plate
28. Coupling
29. Housing
30. Charging valve popper
31. Spring
32. Plug
33. Cover

## DETAIL DRAWING OF PUMP CONTROL VALVE

★ The diagram shows the MST-600, 700, 800, 1100, 1500 and 2000.

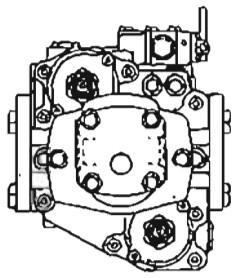



1. Valve housing
2. Valve spool
3. Sleeve
4. Adjustment screw
5. Cap
6. Lock nut
7. Shaft
8. Sleeve
9. Lever
10. Link
11. Shaft
12. Spring
13. Collar
14. Lever
15. Lever
16. Control lever
17. Orifice

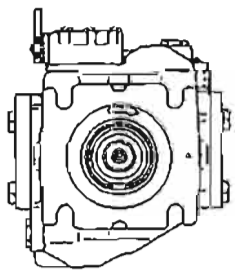
### GENERAL

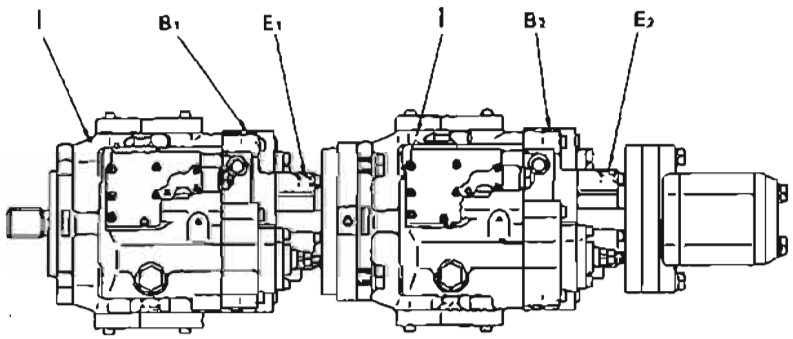
- The pump control valve is mounted in the upper part of either of the front or rear main pumps. Interlocked with the linkage from the steering lever, it controls the main pump's swash plate angle to control the vehicle's traveling speed and turning motion.
  The control valve switches the oil from the charging pump.

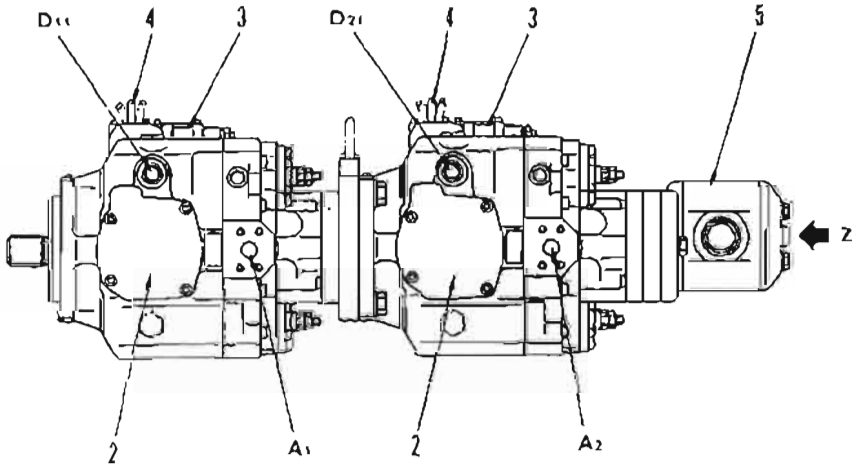
# HYDRAULIC PUMP (MST-2200)



View Z






1. Main pump
2. Servo cylinder
3. Pump control valve
4. Control lever
5. Charging pump

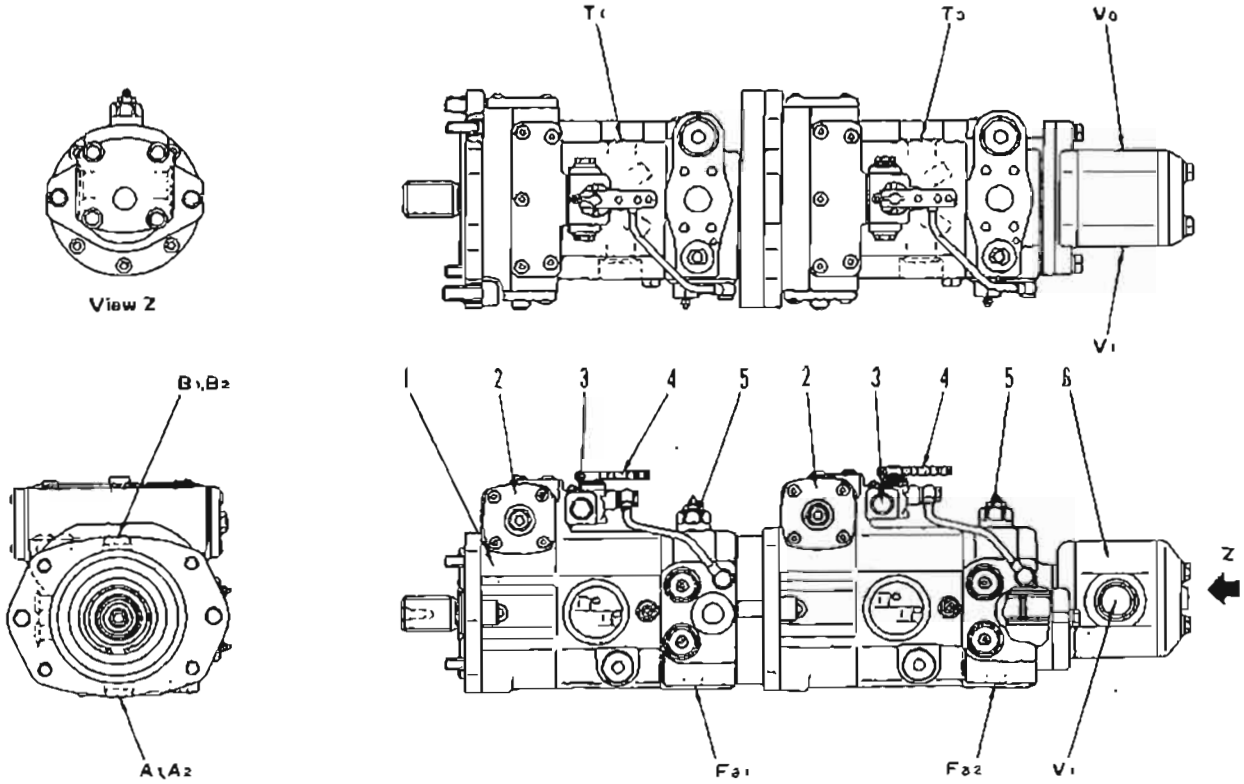
$A_1$. To port B of right travel motor (Forward)
$B_1$. To port A of right travel motor (Reverse)
$A_2$. To port B of left travel motor (Forward)
$B_2$. To port A of left travel motor (Reverse)
To main pump charging and dump circuits
From hydraulic tank
$E_1$. From charging pump
$E_2$. From charging pump
$D_{11}$. To hydraulic tank
$D_{21}$. To hydraulic tank

## GENERAL

- The hydraulic pumps are mounted in the rear part of the engine via a rubber coupling; they are 2 sets of tandem main pumps and a gear-type pump to supply oil to the charging and work equipment circuits, making up triple pumps.
  Swash plate-type main pumps are adopted.
  Charge relief valve installed to the main pump has its actual function stopped, and the charge relief valve installed at the rear of the operator's compartment sets the pressure of the charge circuit.
- The table below shows the main pump's discharge and charging pressure.

| Model | Pump discharge (cc/rev) | Charging pressure ($kg/cm^2$) |
|---|---|---|
| MST-2200 | 110.9 | 25 |

# HYDRAULIC PUMP (MST-2500)




1. Main pump
2. Servo cylinder
3. Pump control valve
4. Control lever
5. Charging relief valve
6. Charging pump

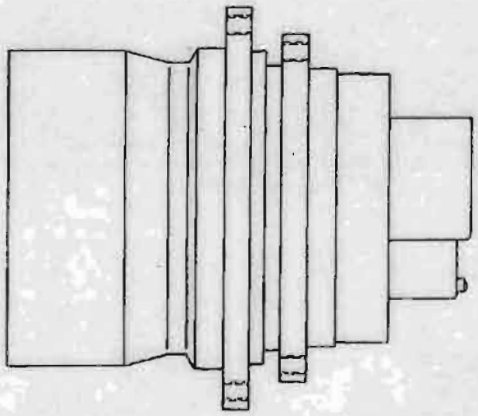
$A_1$. To port B of right travel motor (Forward)
$B_1$. To port A of right travel motor (Reverse)
$A_2$. To port B of left travel motor (Forward)
$B_2$. To port A of left travel motor (Reverse)
$V_0$. To main pump charging and dump circuits
$V_1$. From hydraulic tank
$Fa_1$. From charging pump
$Fa_2$. From charging pump
$T_1$. To hydraulic tank
$T_3$. To hydraulic tank

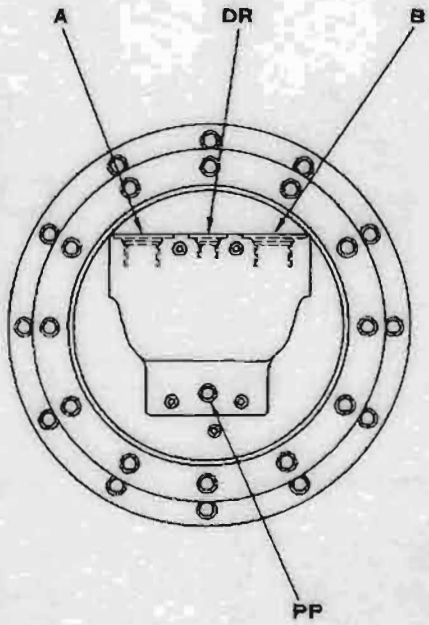
## GENERAL

- The hydraulic pumps are mounted in the rear part of the engine via a rubber coupling; they are 2 sets of tandem main pumps and a gear-type pump to supply oil to the charging and work equipment circuits, making up triple pumps.
  Swash plate-type main pumps are adopted.
  Charge relief valve (5) installed to the main pump has its actual function stopped, and the charge relief valve installed at the rear of the operator's compartment sets the pressure of the charge circuit.
- The table below shows the main pump's discharge and charging pressure.

| Model | Pump discharge (cc/rev) | Charging pressure ($kg/cm^2$) |
|---|---|---|
| MST-2500 | 125 | 25 |

# TRAVEL MOTOR (MST-500)





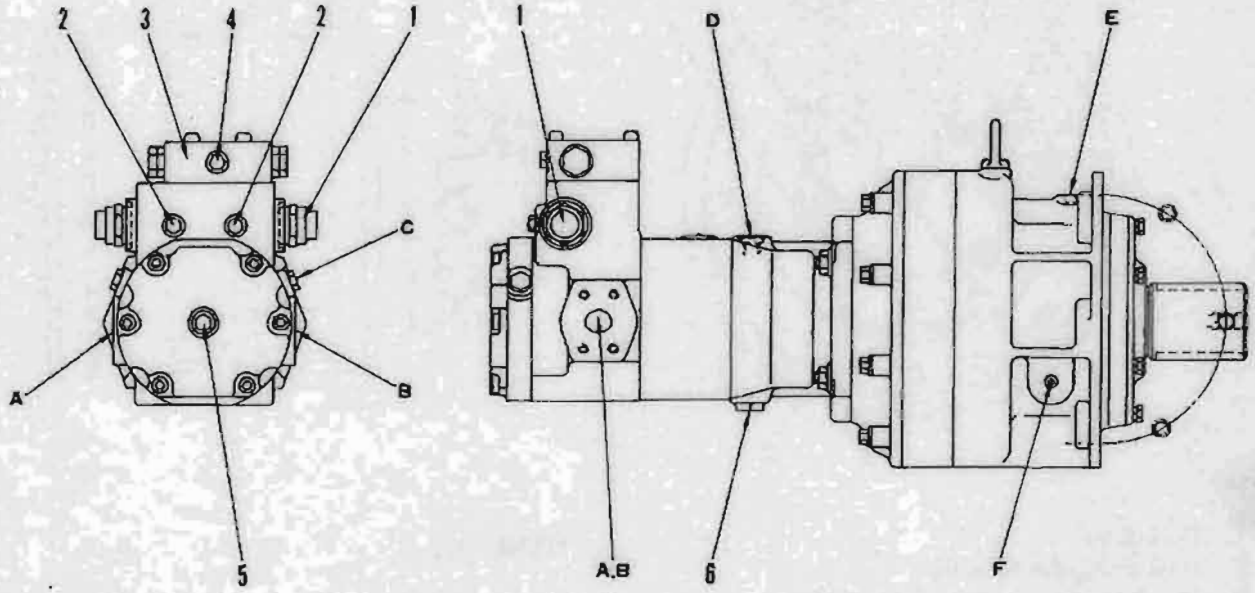

A. From port A1 or A2 of main pump (Forward)
B. From port B1 or B2 of main pump (Reverse)
DR. To hydraulic tank
PP. Port for parking brake

## GENERAL

- The travel motors are mounted in the right and left front of the main frame. They drive the sprocket to run or turn the vehicle.
  Swash plate-type travel motors are adopted.
  A parking disc brake and a planetary reduction gear are mounted.
- The table below shows the travel motor's discharge and high pressure relief pressure.

| Model | Motor discharge (cc/rev) | Relief pressure ($kg/cm^2$) | Max. output speed (rpm) | Brake pressure ($kg/cm^2$) |
|---|---|---|---|---|
| MST-500 | 39.0 | 280 | 9.4 | 18 |

# TRAVEL MOTOR (MST-600)




1. High-pressure relief valve
2. Plug for high-pressure (7/16-20UNF)
3. Flushing valve
4. Plug for charging pressure (7/16-20UNF)
5. Plug for disengaged parking brake
6. Drain plug

A. From port B1 or B2 of main pump (Forward)
B. From port A1 of A2 of main pump (Reverse)
C. Port for parking brake
D. Drain port
E. Plug for oil supply (3/4-16UNF)
F. Plug for oil check (PT1/8)

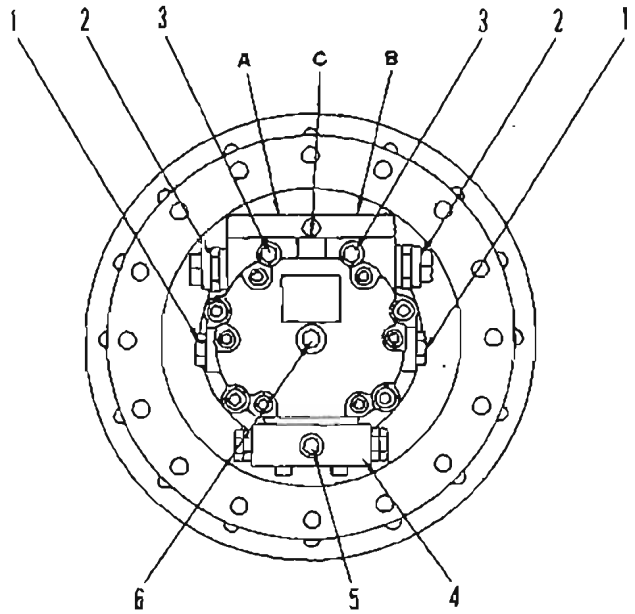
## GENERAL

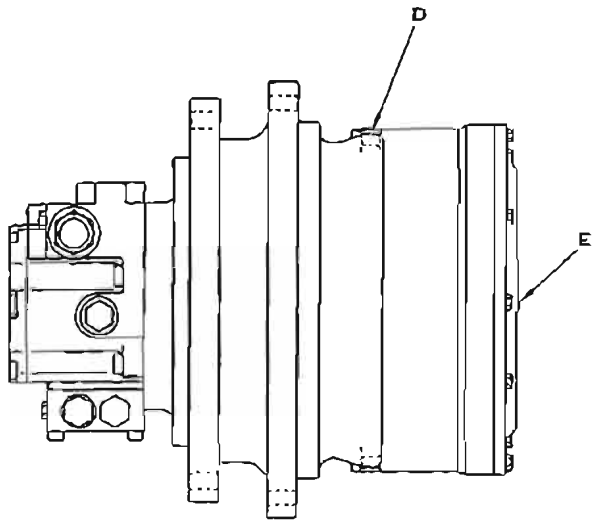
- The travel motors are mounted in the right and left front of the main frame. They drive the sprocket to run or turn the vehicle.
  Swash plate-type travel motors are adopted.
  A parking disc brake and a planetary reduction gear are mounted.
- The table below shows the travel motor's discharge and high-pressure relief pressure.

| Model | Motor discharge (cc/rev) | Relief pressure ($kg/cm^2$) | Max. output speed (rpm) | Brake pressure ($kg/cm^2$) |
|---|---|---|---|---|
| MT-600 | 51.6 | 315 | 130 | 9.5 |

* The pressure at high pressure relief is 7 times the total of the last two digits on the model name plate stuck to the motor.

# TRAVEL MOTOR (MST-700 — 2000)




1. Drain plug
2. High-pressure relief valve
3. Plug for high-pressure (7/16-20UNF)
4. Flushing valve
5. Plug for charging pressure (7/16-20UNF)
6. Plug for disengaged parking brake

A. From port B1 or B2 of main pump (Reverse)
B. From port A1 of A2 of main pump (Forward)
C. Port for parking-brake
D. Plug for oil supply (3/4-16UNF)
E. Plug for oil check (PT1/8)

## GENERAL

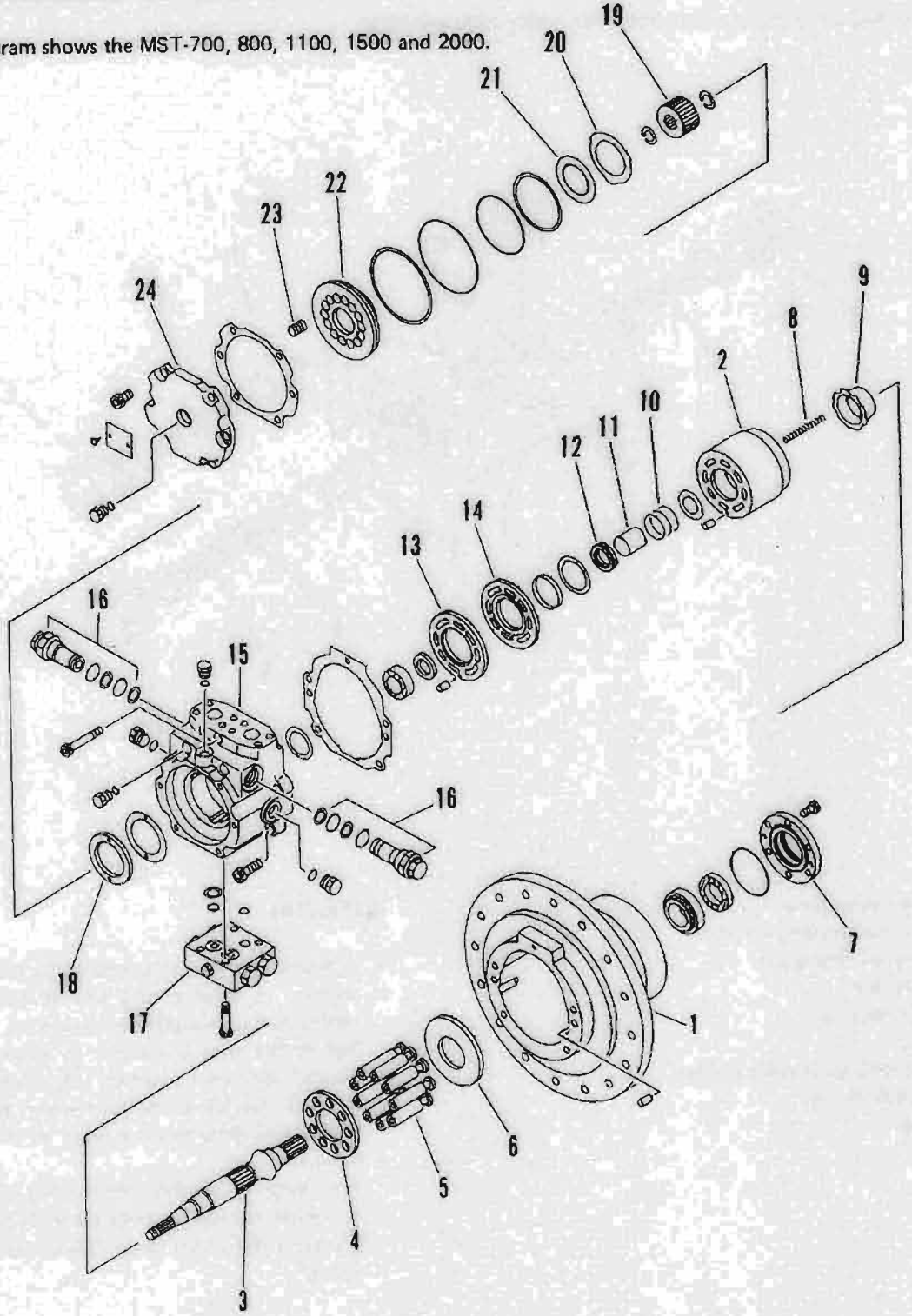
- The travel motors are mounted in the right and left front of the main frame. They drive the sprocket to run or turn the vehicle.
  Swash plate-type travel motors are adopted.
  A parking disc brake and a planetary reduction gear are mounted.
- The table below shows the travel motor's discharge and high-pressure relief pressure.

| Model | Motor discharge (cc/rev) | Relief pressure (kg/cm²) | Max. output speed (rpm) | brake pressure (kg/cm²) |
|---|---|---|---|---|
| MST-700 | 51.6 | 350 | 40.0 | 9.0 |
| MST-800 | 51.6 | 350 | 40.0 | 9.0 |
| MST-1100 | 69.8 | 385 | 54 9 | 9.0 |
| MST-1500 (15001—15164) | 69.8 | 385 | 54 9 | 9.0 |
| MST-1500 (15165 and up) | 69.8 | 350 | 54 9 | 9.0 |
| MST-2000 (K20101—20128) (M02101—02104) | 89.0 | 350 ~~385~~ | 54 9 | 9 0 |
| MST-2000 (K20129 and up) (M02105 and up) | 89 0 | 350 | 54.9 | 9.0 |

- Stamped mark: A figure indicating the pressure is stamped on the head of the plug of the high pressure relief valve.
  (Example: 50, 55 (if the stamped mark is "50," the pressure is 7 times this value, so it is 350 kg/cm²; if the stamped mark is "55," the pressure is 7 times this, so it is 385 kg/cm².)

## DETAIL DRAWING OF TRAVEL MOTOR

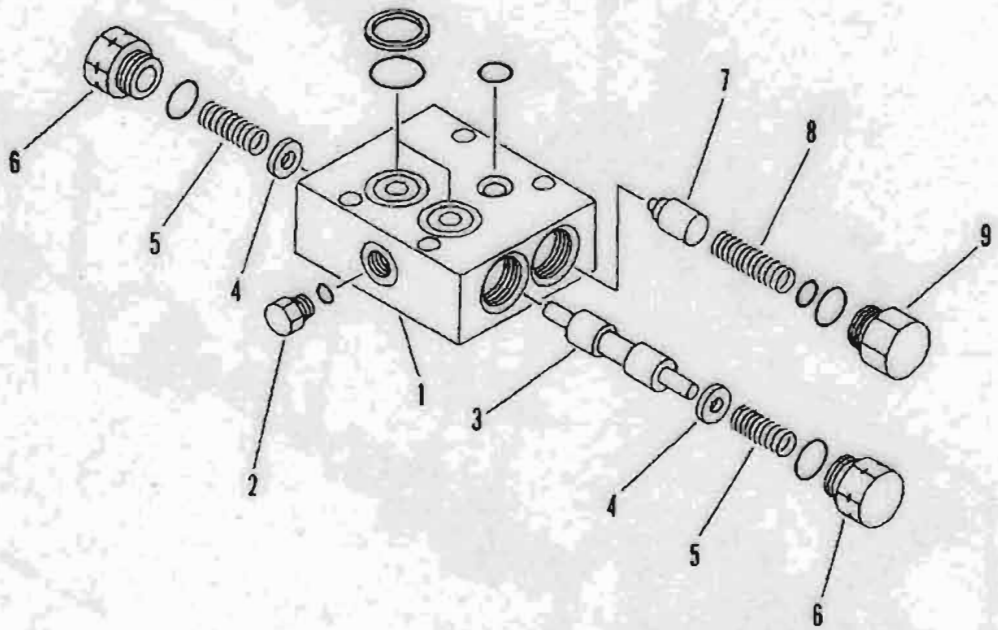
★ The diagram shows the MST-700, 800, 1100, 1500 and 2000.




1. Housing
2. Cylinder block
3. Output shaft
4. Retainer
5. Piston
6. Thrust plate
7. Seal cover
8. Spring
9. Guide
10. Spring
11. Guide
12. Retainer
13. Swash plate
14. Bearing plate
15. End cap
16. High-pressure relief valve
17. Flushing valve
18. Stopper
19. Brake hub
20. Brake plate
21. Brake disc
22. Brake piston
23. Return spring
24. Brake cover

## DETAIL DRAWING OF FLUSHING VALVE

★ The diagram shows the MST-700, 800, 1100, 1500 and 2000.



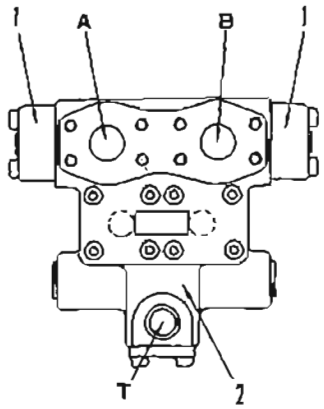

1. Valve housing
2. Plug for charging pressure
3. Shuttle valve spool
4. Retainer
5. Valve spring
6. Plug
7. Charging relief valve poppet
8. Poppet spring
9. Plug

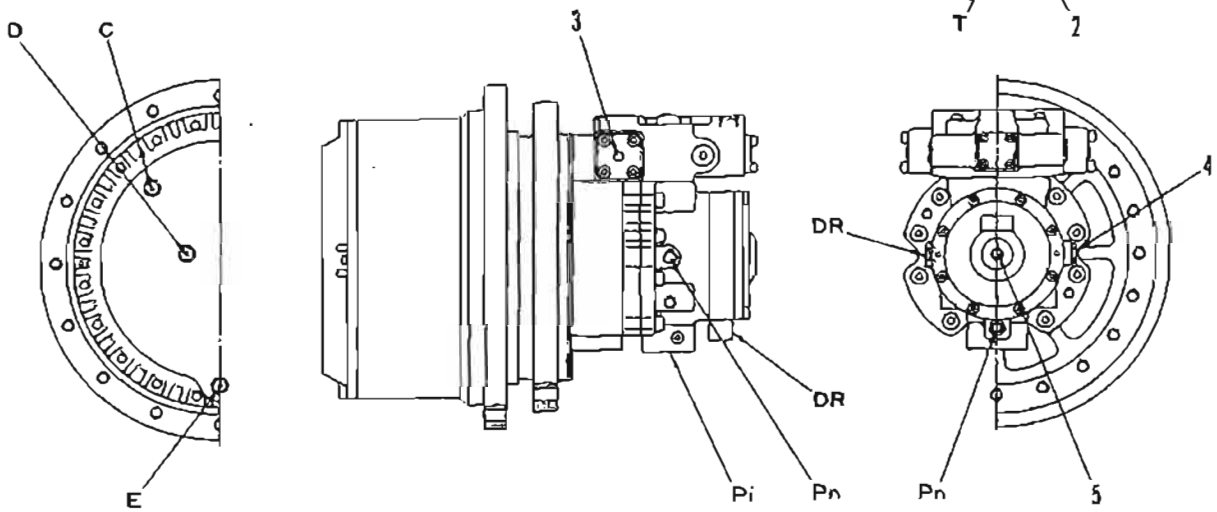
### GENERAL

- A flushing valve is mounted in the lower part of each motor. It consists of 2 sets of shuttle and charge relief valves having different functions.
  The shuttle valve is actuated by oil at the port which became the motor's suction side (high-pressure side). It sends the oil at the port which became the discharge side (low-pressure side) to the charge relief valve inlet.
  The charge relief valve release oil to the oil cooler circuit when the low-pressure oil from the shuttle valve is pressurized above the specified pressure of 13 – 14 kg/cm$^2$.

# TRAVEL MOTOR (MST-2500)

MST-2500 Serial No. 25134 – 25186




1. High-pressure relief valve
2. Flushing valve
3. Plug for high-pressure
4. Drain plug
5 Plug for disengaged parking brake

A. From port B1 or B2 of main pump
B. From port A1 or A2 of main pump
Pn. From parking brake valve
Pi. From H-L speed changing solenoid valve
DR. To hydraulic tank
T. To oil cooler
C. Plug for oil supply (PT 1/2)
D. Plug for oil check (PT 1/2)
E Plug for oil drain (PT 1/2)

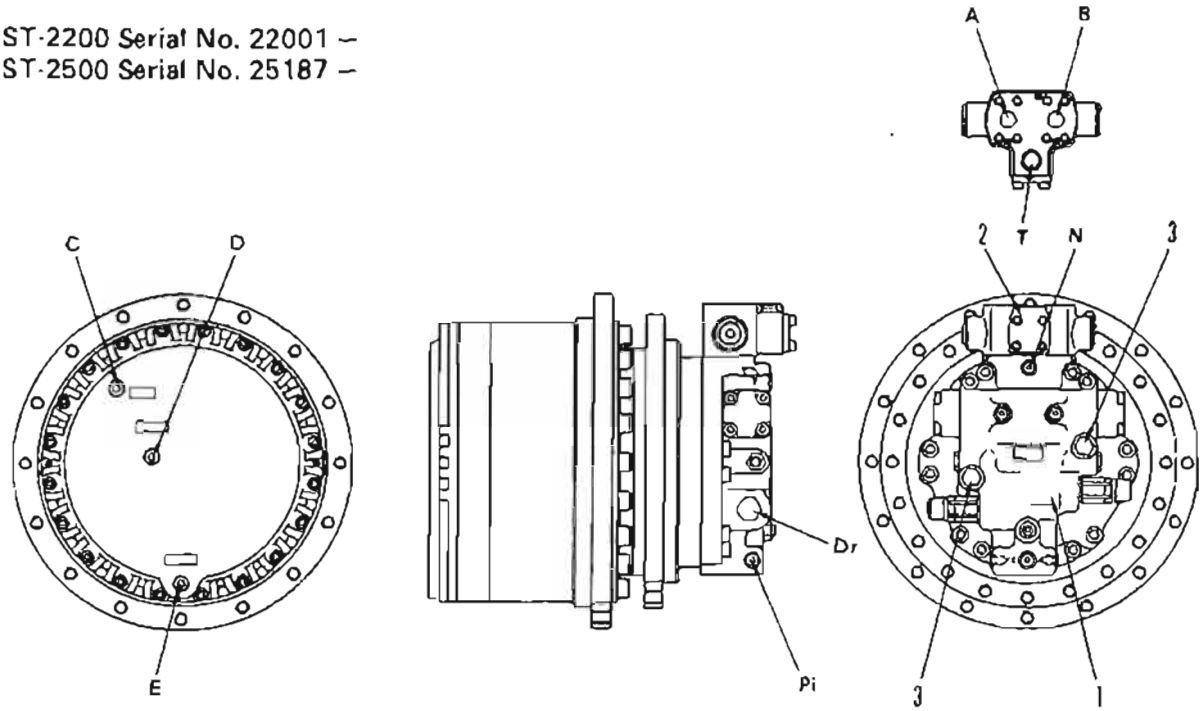
## GENERAL

- The travel motors are mounted in the right and left front of the main frame. They drive the sprocket to run or turn the vehicle.
  Swash plate-type travel motors are adopted.
  A parking disc brake and a planetary reduction gear are mounted.
  There is a high/low speed selector mechanism installed to the travel motor. This is actuated by the high/low speed selector switch in the operator's compartment, and provides two-stage selection of the swash plate angle to allow selection of a travel speed to match the load of the operation.
  The high/low speed selector mechanism consists of the high/low speed selector valve and cylinder that switches the swash plate inside the travel motor, the high/low speed solenoid selector valve outside the travel motor that sends the pilot pressure to the high/low speed selector valve, and the switch in the operator's compartment.
  The pressure of the pilot circuit is set to 25 kg/cm$^2$ by the charge relief valve at the rear of the operator's compartment.
- The table below shows the travel motor's discharge and high-pressure relief pressure.

| Model | Motor discharge (cc/rev) | Relief pressure (kg/cm$^2$) | Max. output speed (rpm) | H-L changing pressure (kg/cm$^2$) | Brake pressure (kg/cm$^2$) |
|---|---|---|---|---|---|
| MST-2500 | 172/123 | 350 | 54/75 | 15.0 | 13.1 |

# TRAVEL MOTOR (MST-2200, 2500)

MST-2200 Serial No. 22001 –
MST-2500 Serial No. 25187 –




1. High-pressure relief valve
2. Flushing valve
3. Plug for disengaged parking brake

A. From port B1 or B2 of main pump
B. From port A1 of A2 of main pump
N. From parking brake valve
Pi. From H-L speed changing solenoid valve
DR. To hydraulic tank
T. To oil cooler
C Plug for oil supply (PT 1/2)
D. Plug for oil check (PT 1/2)
E. Plug for oil drain (PT 1/2)

## GENERAL

- The travel motors are mounted in the right and left front of the main frame. They drive the sprocket to run or turn the vehicle.
  Swash plate-type travel motors are adopted.
  A parking disc brake and a planetary reduction gear are mounted.
  There is a high/low speed selector mechanism installed to the travel motor. This is actuated by the high/low speed selector switch in the operator's compartment, and provides two-stage selection of the swash plate angle to allow selection of a travel speed to match the load of the operation.
  The high/low speed selector mechanism consists of the high/low speed selector valve and cylinder that switches the swash plate inside the travel motor, the high/low speed solenoid selector valve outside the travel motor that sends the pilot pressure to the high/low speed selector valve, and the switch in the operator's compartment.
  The pressure of the pilot circuit is set to 25 kg/cm$^2$ by the charge relief valve at the rear of the operator's compartment.
- The table below shows the travel motor's discharge and high-pressure relief pressure.

| Model | Motor discharge (cc/rev) | Relief pressure (kg/cm$^2$) | Max. output speed (rpm) | H-L changing pressure (kg/cm$^2$) | Brake pressure (kg/cm$^2$) |
|---|---|---|---|---|---|
| MST-2200 | 172/105 | 350 | 58/94 | 15.0 | 13.1 |
| MST-2500 | 172/123 | 350 | 54/75 | 15.0 | 13.1 |

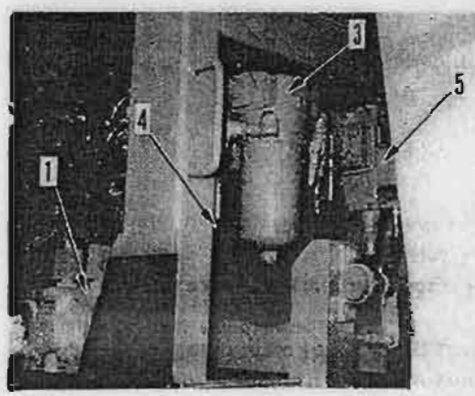
# TRAVEL MOTOR SPEED CHANGING CIRCUIT (MST-2200, 2500)

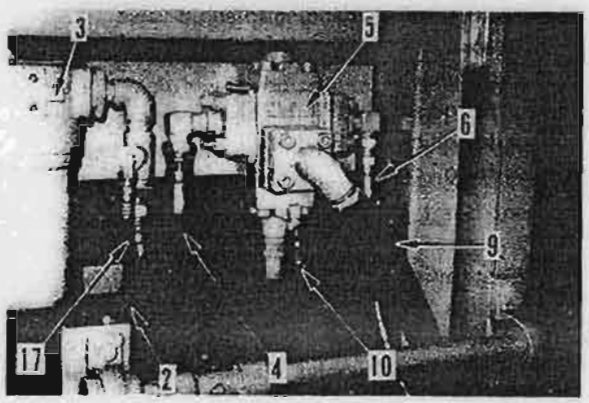
## OUTLINE

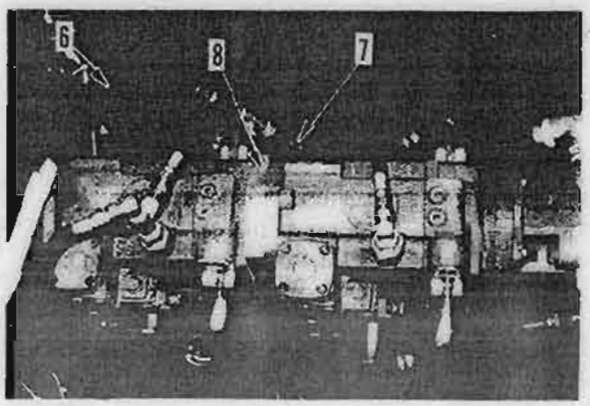
- The high/low speed selector circuit of the travel motor consists of the high/low speed selector valve (built into the travel motor) and piston cylinder that switches the swash plate angle of the travel motor, the high/low speed solenoid selector valve installed on top of the travel motor that sends the pilot pressure to the high/low speed selector valve, and the switch inside the operator's compartment. The pressurized oil in the circuit is supplied from the main pump charge circuit.

## OIL FLOW

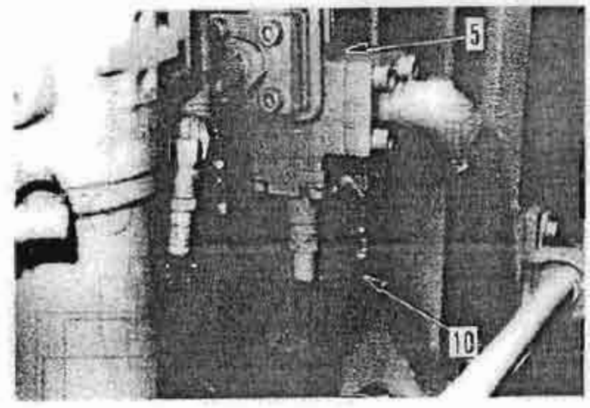
- The pressurized oil for the travel motor high/low speed selector circuit is supplied from the main pump charge circuit, so the explanation will start from the flow of the oil in the main pump charge circuit.
  The pressurized oil in the parking brake circuit is also supplied from the main pump charge circuit.
- The oil in the hydraulic tank is sucked up by the charge pump, passes through main control valve (1), and hose (2), and then enters hydraulic line filter (3) at the rear of the operator's cab.
  The oil is cleaned by the line filter, then passes through hose (4) and enters main pump charge relief valve (5). After being set to 20 kg/cm$^2$, it passes through hoses (6) and (7), and flows to the charge port of main pump (8).
  Hose (9) takes the oil relieved by the charge relief valve through the oil cooler back to the hydraulic tank. This explains the flow of the oil in the main pump charge circuit.
  Hose (17) connected to the inlet port of hydraulic line filter (3) takes oil to the parking brake valve installed in the operator's cab, and when the parking brake lever is set to the TRAVEL position, the oil is then sent to the brake port of the travel motor from hose (17) to release the parking brake.
  In other words, hose (17) sends pressurized oil to the parking brake circuit.

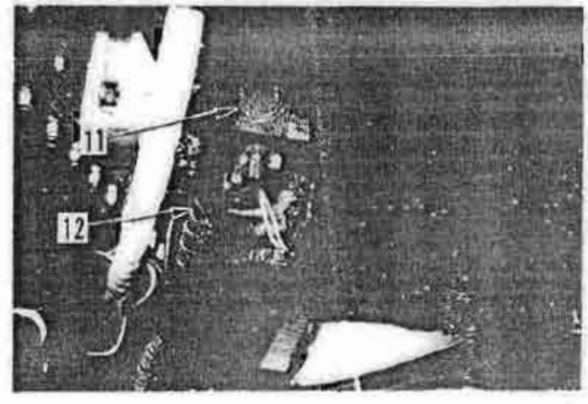


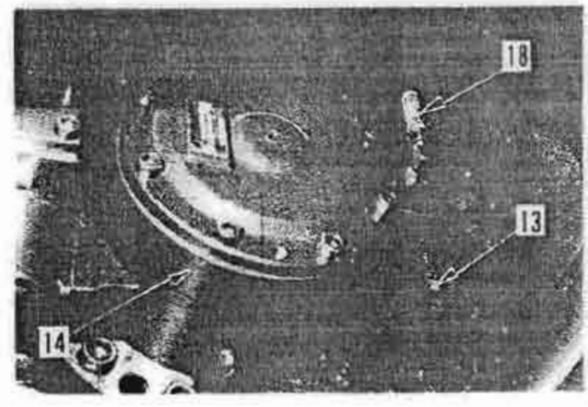



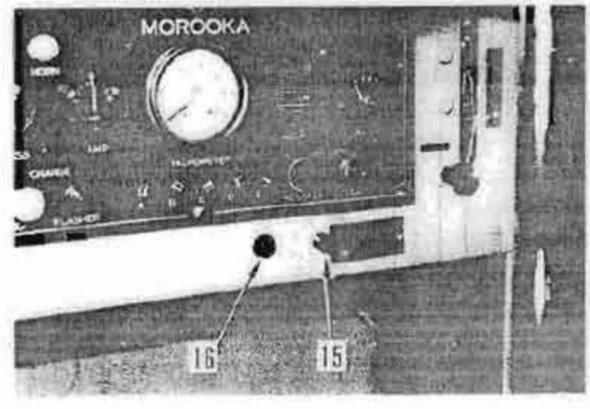



- The high-low speed selector circuit of the travel motor takes its hydraulic power from the oil coming from hose (10) connected to main pump charge relief valve (5).
- The oil passing through hose (10) flows to high-low speed solenoid selector valve (11) on top of the left travel motor.
  The flow of the oil is switched according to the operation of high-low speed selector switch (15) in the operator's compartment.
  If the high-low speed selector switch is at the low position, the solenoid selector valve is not actuated, and the high pressure oil passing through hose (10) does not flow beyond the solenoid selector valve.
  At the same time, the pilot pressure bearing on the travel motor passes through hose (12) and returns to the solenoid selector valve. It is then returned to the hydraulic tank and the travel motor is set in the low speed condition. If the high-low speed selector switch is set to the high position, the solenoid selector valve is actuated, and the high pressure oil passing through hose (10) goes out from hose (12) and is divided to the left and right. It passes through hose (13) and becomes the pilot pressure for the high-low speed selector valve inside travel motor (14), switches the valve, and sets the travel motor to the high speed condition.
  In other words, the high-low speed solenoid selector valve switches the pilot pressure operating the high-low speed selector valve built into the travel motor. The high-low speed selector valve switches the high pressure oil from the main pump and sends it to the piston cylinder that operates the swash plate angle of the travel motor.
  When the high-low speed selector switch is at the high position, the above actuation is carried out. At the same time, high speed indicator lamp (16) beside the switch lights up to inform the operator that the machine is in the high speed condition.



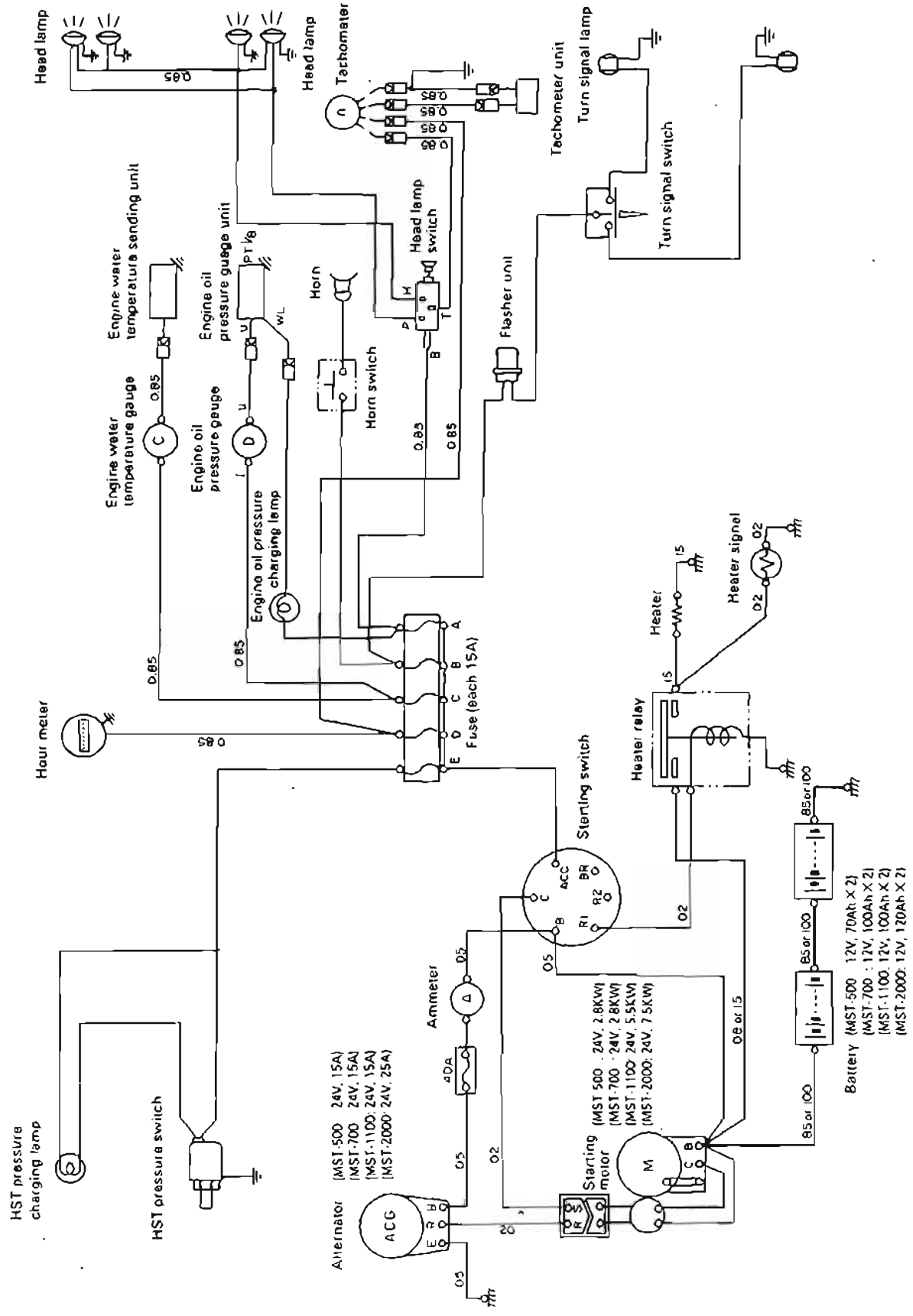



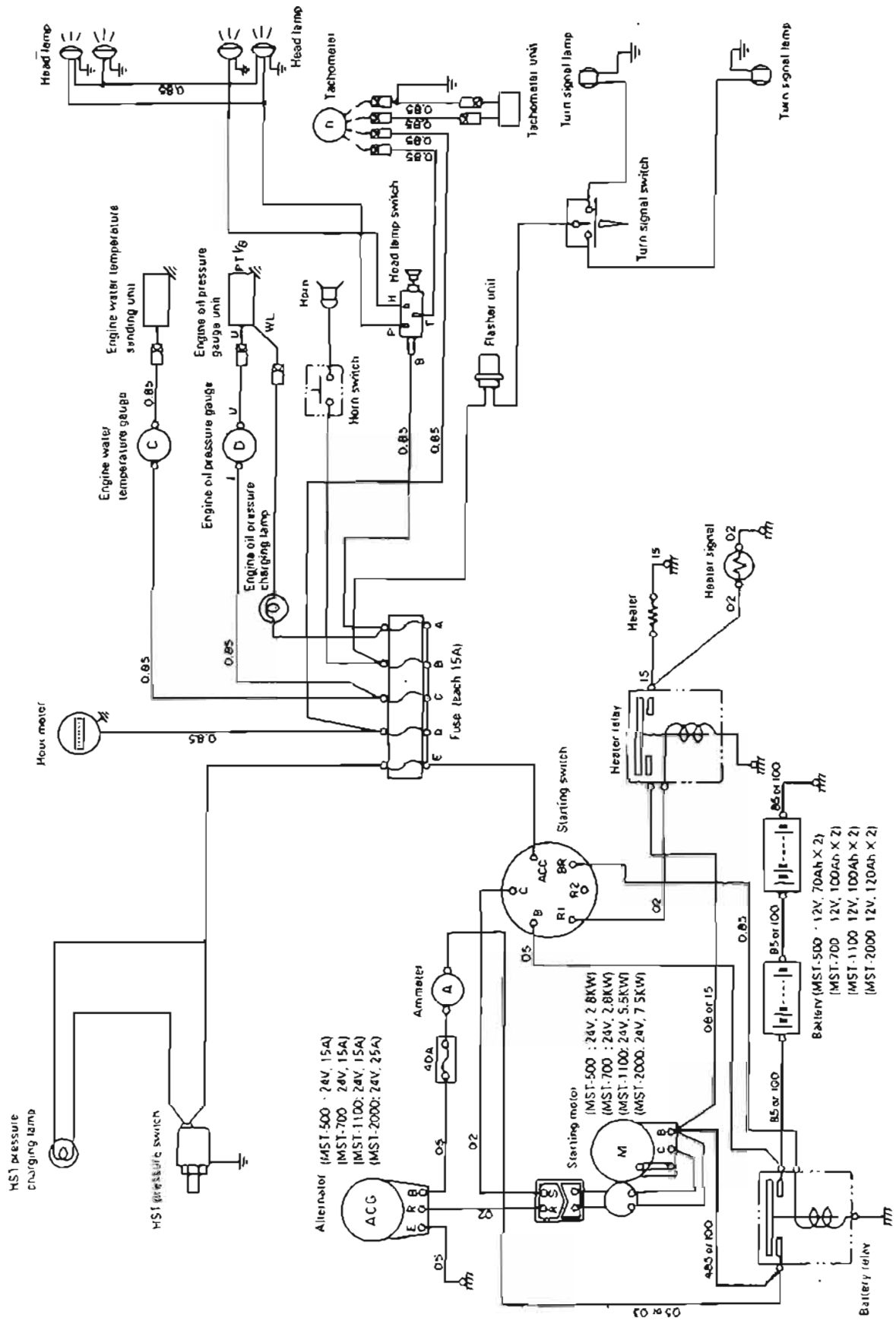
# ELECTRICAL CIRCUIT DIAGRAM (MST-500, 700, 1100, 2000)

| | |
|---|---|
| MST-500 | Serial No. 50133 – |
| MST-700 | Serial No. 70279 – 70767 |
| MST-1100 | Serial No. 11272 – 11789 |
| MST-2000 | Serial No. 20160 – |
| MST-2000 | Serial No. 20160 – 20488 |



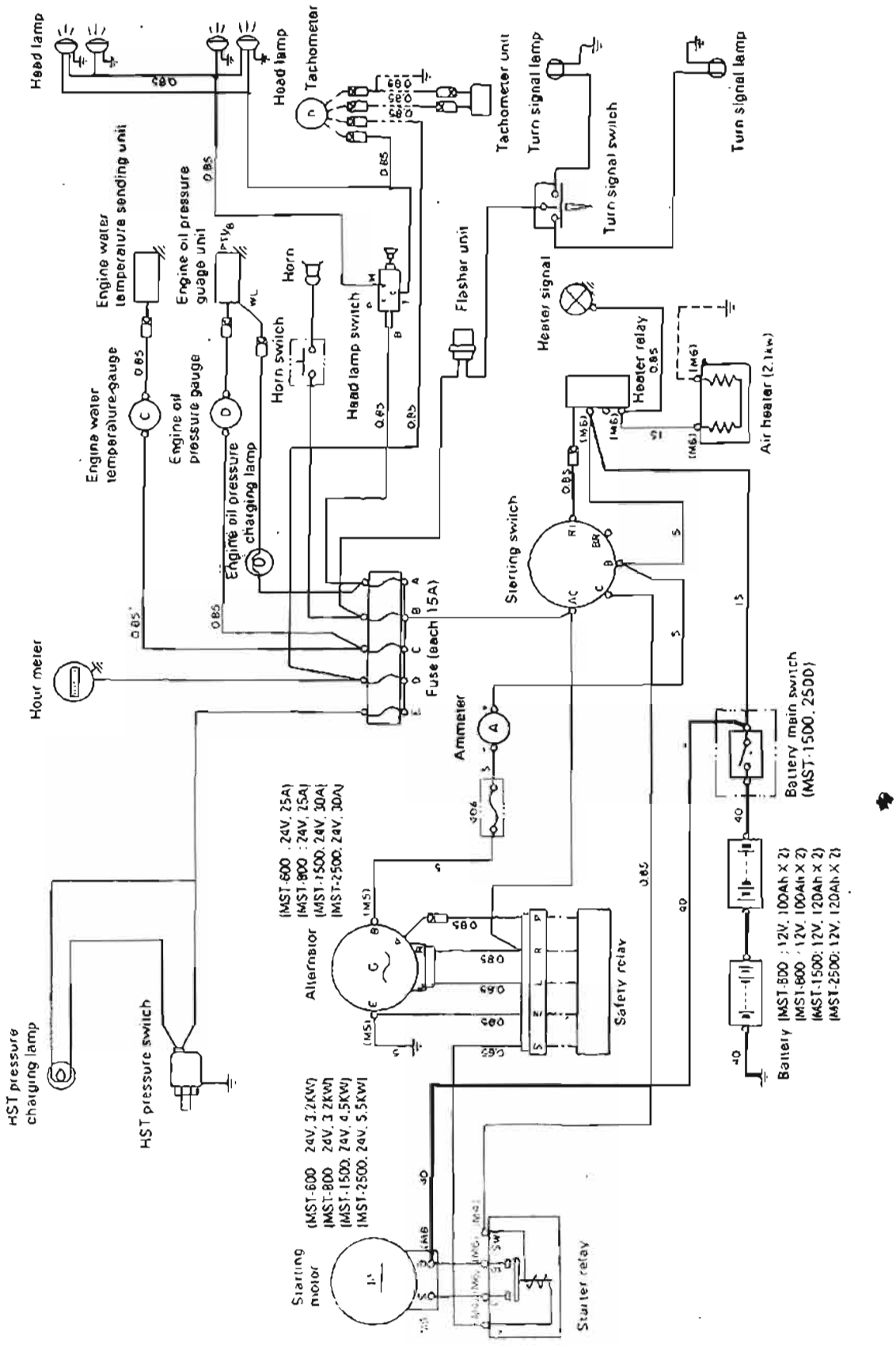
# ELECTRICAL CIRCUIT DIAGRAM (MST-500, 700, 1100, 2000)

MST-700 Serial No. 70768 –
MST-1100 Serial No. 11790 –
MST-2000 Serial No. 20489 –



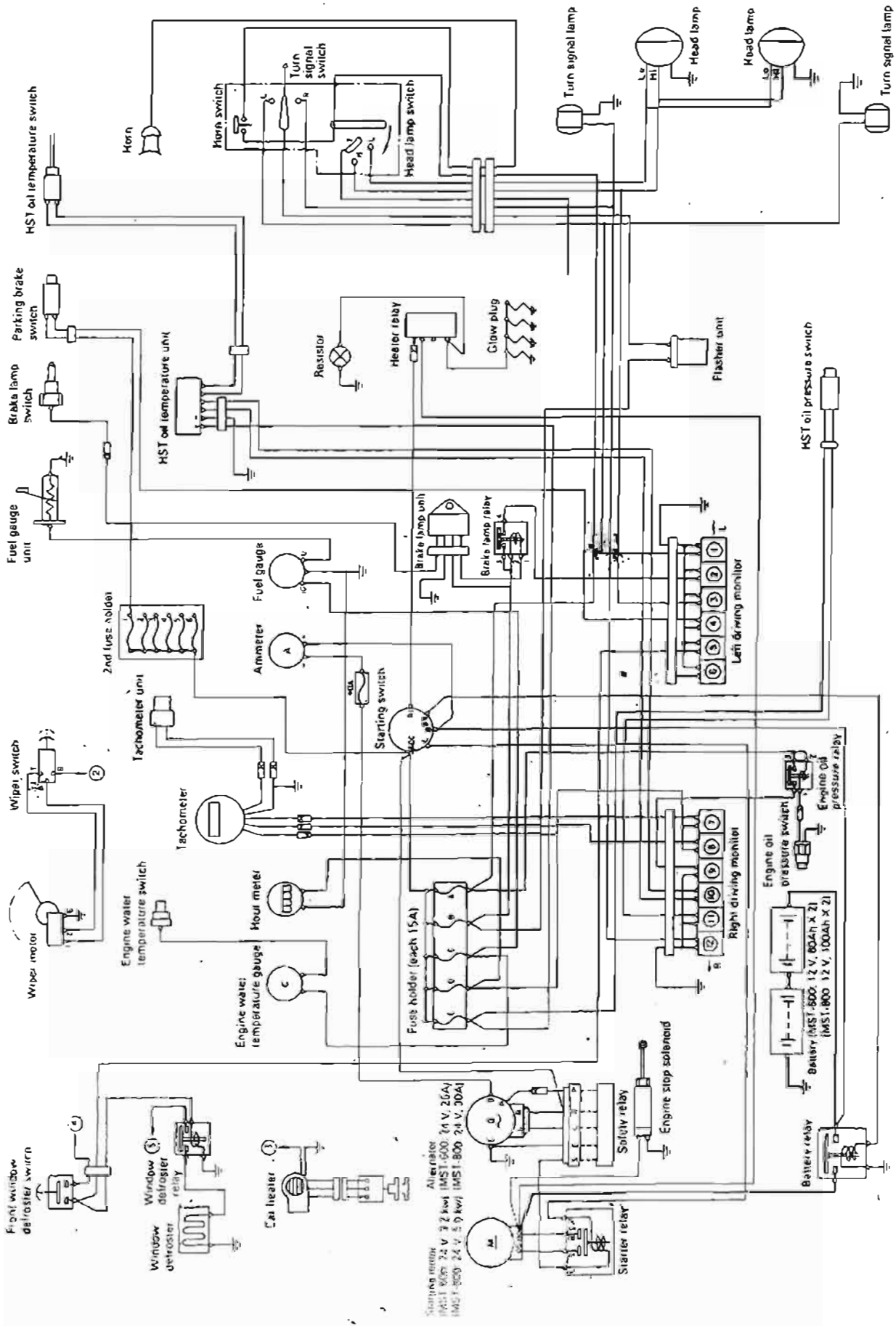
# ELECTRICAL CIRCUIT DIAGRAM (MST-600, 800, 1500, 2500)

| | |
|---|---|
| MST-600 | Serial No. 1995 – 2700 |
| MST-800 | Serial No. 1347 – 2400 |
| MST-1500 | Serial No. 15061 – |
| MST-2500 | Serial No. 25134 – |

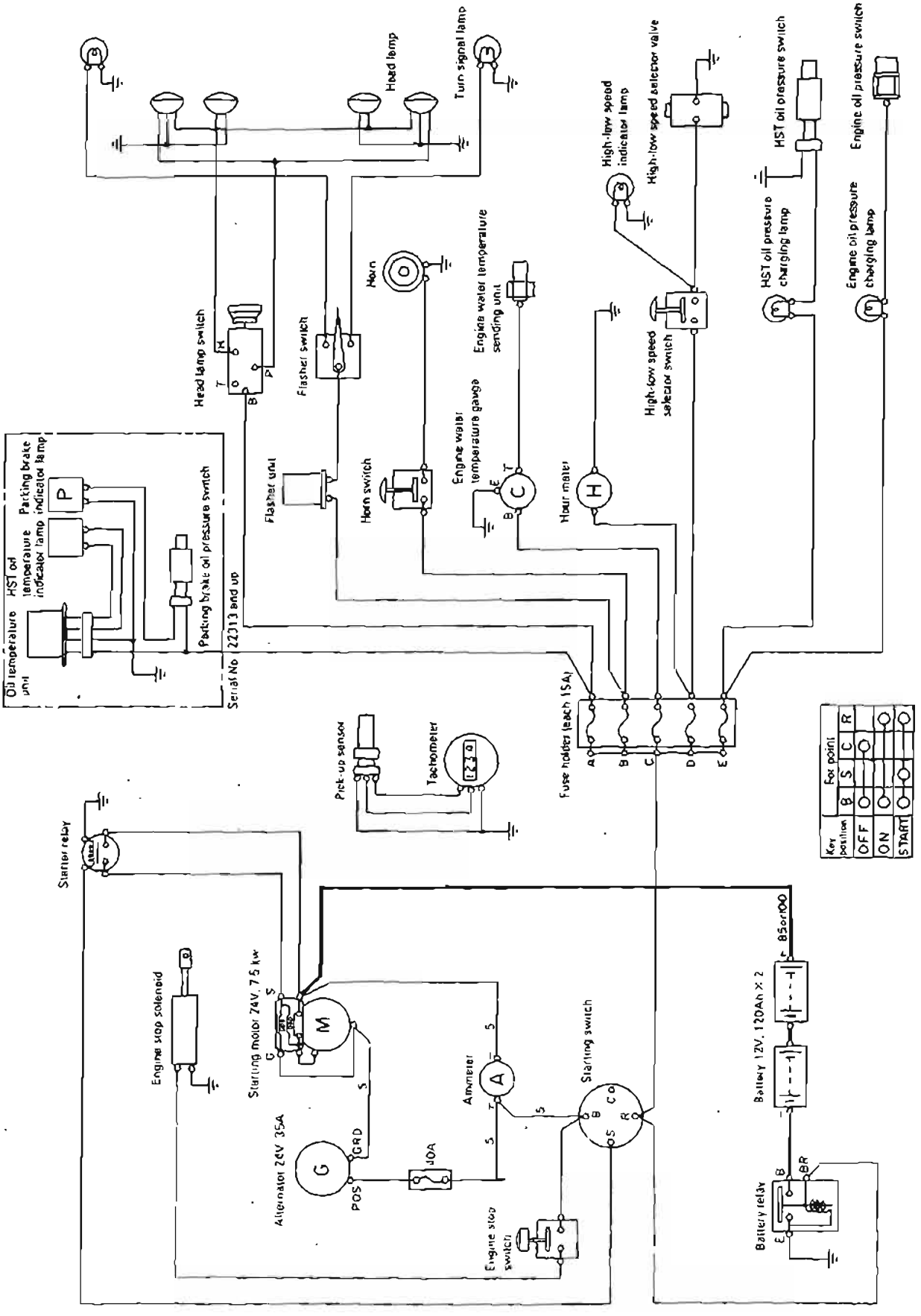


# ELECTRICAL CIRCUIT DIAGRAM (MST-600, 800)

MST-600 Serial No. 2701 –
MST-800 Serial No. 2401 –



# ELECTRICAL CIRCUIT DIAGRAM (MST-2200)



# 20 TESTING AND ADJUSTING

# STANDARDS OF TESTING AND ADJUSTING

## MST-500

| Category | Check item | Measuring conditions | | Unit | Standard value for new car | Judgement criteria |
|---|---|---|---|---|---|---|
| HST | Main pump charging pressure | · At engine high idling | | kg/cm² | 20 | |
| | Travel motor relief pressure | · Vehicle fixing device used<br>· Vehicle running, turning condition | | | 280 | |
| | Traveling speed | · Time required for traveling 20 m after approach run of at least 10 m on flat ground | | seconds | 6.5 ± 0.5 | |
| Work equipment | Control valve main relief pressure | · Cylinder stroke end | | kg/cm² | 175 | |
| | Dump body operating speed | · Rated engine speed<br>· No load | Raise | seconds | 4.5 | |
| | | | Down | | 4.5 | |
| | Natural fall of dump body | · Amount of fall from max. raise position of dump body after 5 minutes | | mm | 20 | |

## MST-600

| Category | Check item | Measuring conditions | | Unit | Standard value for new car | Judgement criteria |
|---|---|---|---|---|---|---|
| HST | Main pump charging pressure | · At engine low idling | | kg/cm² | 13 – 14 | |
| | | · At engine high idling | | | 16 – 18 | |
| | Travel motor relief pressure | · Vehicle fixing device used<br>· Vehicle running, turning condition | | | 315 | |
| | Travel motor charging pressure | · Vehicle running, turning condition | | | 12 – 13 | |
| | Traveling speed | · Time required for traveling 20 m after approach run of at least 10 m on flat ground | | seconds | 6.0 ± 0.5 | |
| Work equipment | Control valve main relief pressure | · Cylinder stroke end | | kg/cm² | 175 | |
| | Dump body operating speed | · Rated engine speed<br>· No load | Raise | seconds | 4.5 | |
| | | | Down | | 4.5 | |
| | Natural fall of dump body | · Amount of fall from max. raise position of dump body after 5 minutes | | mm | 20 | |

MST-700

| Category | Check item | Measuring conditions | | Unit | Standard value for new car | Judgement criteria |
|---|---|---|---|---|---|---|
| HST | Main pump charging pressure | · At engine low idling | | kg/cm² | 13 – 14 | |
| | | · At engine high idling | | | 16 – 18 | |
| | Travel motor relief pressure | · Vehicle fixing device used<br>· Vehicle running, turning condition | | | 350 | |
| | Travel motor charging pressure | · Vehicle running, turning condition | | | 12 – 13 | |
| | Traveling speed | · Time required for traveling 20 m after approach run of at least 10 m on flat ground | | seconds | 6.0 ± 0.5 | |
| Work equipment | Control valve main relief pressure | · Cylinder stroke end | | kg/cm² | 175 | |
| | Dump body operating speed | · Rated engine speed<br>· No load | Raise | seconds | 9.0 | |
| | | | Down | | 12.0 | |
| | Natural fall of dump body | · Amount of fall from max. raise position of dump body after 5 minutes | | mm | 20 | |

MST-800

| Category | Check item | Measuring conditions | | Unit | Standard value for new car | Judgement criteria |
|---|---|---|---|---|---|---|
| HST | Main pump charging pressure | · At engine low idling | | kg/cm² | 13 – 14 | |
| | | · At engine high idling | | | 16 – 18 | |
| | Travel motor relief pressure | · Vehicle fixing device used<br>· Vehicle running, turning condition | | | 350 | |
| | Travel motor charging pressure | · Vehicle running, turning condition | | | 12 – 13 | |
| | Traveling speed | · Time required for traveling 20 m after approach run of at least 10 m on flat ground | | seconds | 6.0 ± 0.5 | |
| Work equipment | Control valve main relief pressure | · Cylinder stroke end | | kg/cm² | 165 | |
| | Dump body operating speed | · Rated engine speed<br>· No load | Raise | seconds | 9.0 | |
| | | | Down | | 10.0 | |
| | Natural fall of dump body | · Amount of fall from max. raise position of dump body after 5 minutes | | mm | 20 | |

1 kg/cm2 = 14.22 PSI =

## MST-1100

| Category | Check item | Measuring conditions | | Unit | Standard value for new car | Judgement criteria |
|---|---|---|---|---|---|---|
| HST | Main pump charging pressure | · At engine low idling | | kg/cm² | 13 – 14 | |
| | | · At engine high idling | | | 16 – 18 | |
| | Travel motor relief pressure | · Vehicle fixing device used<br>· Vehicle running, turning condition | | | 385 | |
| | Travel motor charging pressure | · Vehicle running, turning condition | | | 12 – 13 | |
| | Traveling speed | · Time required for traveling 20 m after approach run of at least 10 m on flat ground | | seconds | 7.8 ± 0.5 | |
| Work equipment | Control valve main relief pressure | · Cylinder stroke end | | kg/cm² | 165 | |
| | Dump operating speed | · Rated engine speed<br>· No load | Raise | seconds | 13.0 | |
| | | | Down | | 14.5 | |
| | Natural fall of dump body | · Amount of fall from max. raise position of dump body after 5 minutes | | mm | 20 | |

## MST-1500

| Category | Check item | Measuring conditions | | Unit | Standard value for new car | Judgement criteria |
|---|---|---|---|---|---|---|
| HST | Main pump charging pressure | · At engine low idling | | kg/cm² | 13 – 14 | |
| | | · At engine high idling | | | 16 – 18 | |
| | Travel motor relief pressure | · Vehicle fixing device used<br>· Vehicle running, turning condition | | | 385 (#15001 –15164)<br>350 (#15165– ) | |
| | Pressure overdrive valve switching pressure | · Vehicle fixing device used<br>· Vehicle running condition | | | 370 (#15094 –15164)<br>350 (#15165– ) | |
| | Travel motor charging pressure | · Vehicle running, turning condition | | | 12 – 13 | |
| | Traveling speed | · Time required for traveling 20 m after approach run of at least 10 m on flat ground | | seconds | 6.0 ± 0.5 | |
| Work equipment | Control valve main relief pressure | · Cylinder stroke end | | kg/cm² | 165 | |
| | Dump operating speed | · Rated engine speed<br>· No load | Raise | seconds | 15.0 | |
| | | | Down | | 10.5 | |
| | Natural fall of dump body | · Amount of fall from max. raise position of dump body after 5 minutes | | mm | 20 | |

## MST-2000

| Category | Check item | Measuring conditions | | Unit | Standard value for new car | Judgement criteria |
|---|---|---|---|---|---|---|
| HST | Main pump charging pressure | · At engine low idling | | kg/cm² | 13 ~ 14 | |
| | | · At engine high idling | | | 16 – 18 | |
| | Travel motor relief pressure | · Vehicle fixing device used<br>· Vehicle running, turning condition | | | 385<br>(#M02101–M02104)<br>(#K20101–K20128)<br>350<br>(#M02105– )<br>(#K20129– ) | |
| | Pressure overdrive valve switching pressure | · Vehicle fixing device used<br>· Vehicle running condition | | | 370<br>(#M02101–M02104)<br>(#K20101–K20128)<br>350<br>(#M02105– )<br>(#K20129– ) | |
| | Travel motor charging pressure | · Vehicle running, turning condition | | | 12 – 13 | |
| | Traveling speed | · Time required for traveling 20 m after approach run of at least 10 m on flat ground | | seconds | 7.2 ± 0.5 | |
| Work equipment | Control valve main relief pressure | · Cylinder stroke end | | kg/cm² | 165 | |
| | Dump operating speed | · Rated engine speed<br>· No load | Raise | seconds | 18.0 | |
| | | | Down | | 12.0 | |
| | Natural fall of dump body | · Amount of fall from max. raise position of dump body after 5 minutes | | mm | 20 | |

## MST-2200

| Category | Check item | Measuring conditions | | Unit | Standard value for new car | Judgement criteria. |
|---|---|---|---|---|---|---|
| HST | Main pump charging pressure | · At engine 1000 rpm | | kg/cm² | 25 | |
| | Travel motor relief pressure | · Vehicle fixing device used<br>· Vehicle running, turning condition | | | 325 | |
| | Travel motor charging pressure | · Vehicle running, turning condition | | | 16 – 18 | |
| | Traveling speed | · Time required for traveling 20 m after approach run of at least 10 m on flat ground | | seconds | 6.3 ± 0.5 | |
| Work equipment | Control valve main relief pressure | · Cylinder stroke end | | kg/cm² | 165 | |
| | Dump operating speed | · Rated engine speed<br>· No load | Raise | seconds | 12.5 | |
| | | | Down | | 13.0 | |
| | Natural fall of dump body | · Amount of fall from max. raise position of dump body after 5 minutes | | mm | 20 | |

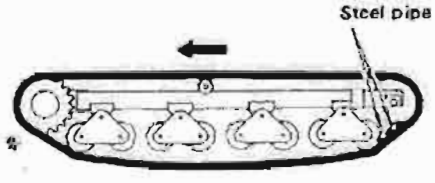
**MST-2500**

| Category | Check item | Measuring conditions | Unit | Standard value for new car | Judgement criteria |
|---|---|---|---|---|---|
| HST | Main pump charging pressure | · At engine 1000 rpm | kg/cm² | 25 | |
| | Travel motor relief pressure | · Vehicle fixing device used<br>· Vehicle running, turning condition | | 350 | |
| | Travel motor charging pressure | · Vehicle running, turning condition | | 16 – 18 | |
| | Traveling speed | · Time required for traveling 20 m after approach run of at least 10 m on flat ground | seconds | 6.3 ± 0.5 | |
| Work equipment | Control valve main relief pressure | · Cylinder stroke end | kg/cm² | 165 | |
| | Dump operating speed | · Rated engine speed<br>· No load — Raise | seconds | 15.5 | |
| | | · Rated engine speed<br>· No load — Down | | 11.0 | |
| | Natural fall of dump body | · Amount of fall from max. raise position of dump body after 5 minutes | mm | 20 | |

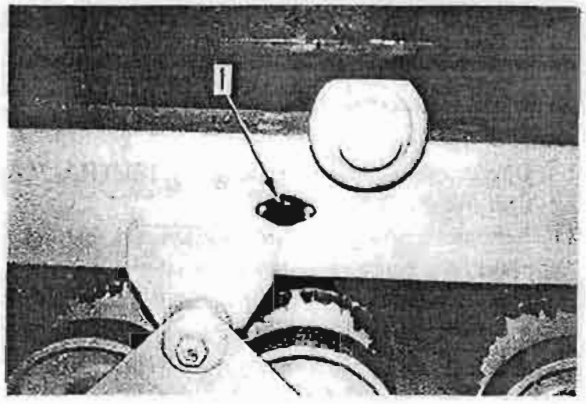
# ADJUSTING RUBBER CRAWLER

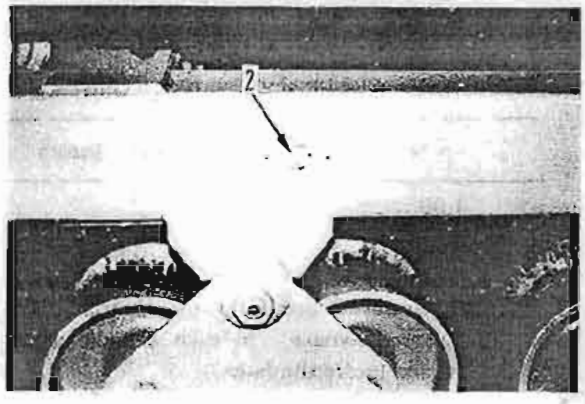
- If the rubber crawler comes off or its tension must be adjusted, it should be remounted and adjusted as follows.

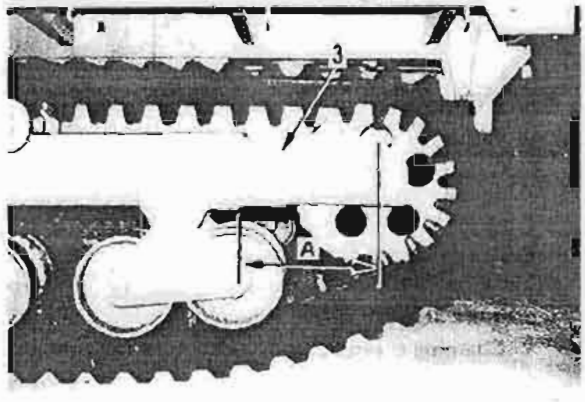
1. Apply jacks to the front and rear of the main frame and lift the relevant side. Then put a support under the frame.
   ★ Confirm that the support is supporting the body securely.
2. Remove the cover (1) and loosen the lubricator (2) to purge the cylinder interior or grease.
   ★ Never remove the lubricator.
3. Push in the idler holder (3) towards the body front.
4. Engage the rubber crawler first with the front sprocket and then with the idler in the rear part.
   ★ Take sufficient care because the rubber crawler is very heavy.
5. Push in the rubber crawler while turning the sprocket.
6. Set steel pipes, etc., in the rubber crawler, and turn the sprocket gain.
   ★ The sprocket must be turned in the direction shown in the diagram below.




   ★ Check that the rubber crawler is securely engaged with the sprocket and the rear idler.
7. Tighten the lubricator (2), feed grease under pressure with a grease pump, and adjust dimension A from the rear end of the truck frame to the rear idler center to the standard value.
8. Install the grease cover (1).
9. Check that the rubber crawler is securely engaged with the sprocket and the rollers and that its tension is sufficient, and then lower the body.




★ Dimension A

Unit: mm

| Model | Standard value |
|---|---|
| MST-500 | 290 ± 5 |
| MST-600 | 215 ± 5 |
| MST-700 | 335 ± 5 |
| MST-800 | 315 ± 5 |
| MST-1100 | 305 ± 5 |

Unit: mm

| Model | Standard value |
|---|---|
| MST-1500 | 440 ± 5 (Serial No. 15001 — 15150)<br>370 ± 5 (Serial No. 15151 and up) |
| MST-2000 | 470 ± 5 |
| MST-2200 | 435 ± 5 |
| MST-2500 | 600 ± 5 (Serial No. 25101 — 25106)<br>550 ± 5 (Serial No. 25107 and up) |

# MEASURING HYDRAULIC PRESSURE

## MEASURING MAIN PUMP CHARGING PRESSURE

★ Applicable to MST-500

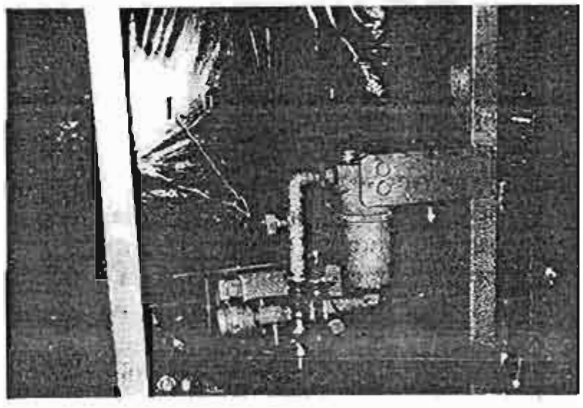
1. Operate the travel lever to the "NEUTRAL" position and stop the engine.
2. Remove the low-pressure switch (1) behind the operator's seat and install the oil pressure gauge (50 kg/cm²).
   ★ Low-pressure switch screw size: PT 1/4
3. Operate the travel lever to the "NEUTRAL" position and start the engine. Measure the charging pressure when the engine speed is 1,000 rpm and 2,000 rpm.
   ★ Charging pressure

Unit: kg/cm²

| Engine | Charging pressure |
|---|---|
| 1,000 rpm | 20 |
| 2,000 rpm | 21 |

★ If the pressure is below 10 kg/cm², there may be a fault somewhere. In such a case, stop the engine and locate the fault.

★ For MST-500




★ Applicable to MST-600, 700, 800, 1100, 1500 and 2000

1. Operate the travel lever to the "NEUTRAL" position and stop the engine.
2. Remove the plug (1) of the charging pressure port and install the oil pressure gauge (50 kg/cm²).
   ★ Plug screw size: 7/16–20 UNF
3. Operate the travel lever to the "NEUTRAL" position and start the engine. Measure the charging pressure at low idling and high idling.
   ★ Charging pressure

Unit: kg/cm²

| | Engine speed | Charging pressure |
|---|---|---|
| Unload | Low idling | 13 – 14 |
| | High idling | 16 – 18 |
| On load | Low idling | 11 – 13 |
| | High idling | 14 – 16 |

★ If the pressure is below 10 kg/cm², there may be a fault somewhere. In such a case, stop the engine and locate the fault.

★ For MST-1100

★ Applicable to MST-2200 and MST-2500

1. Operate the travel lever to the "NEUTRAL" position and stop the engine.
2. Remove the low-pressure switch (1) behind the operator's seat and install the oil pressure gauge (50 kg/cm$^2$)
   ★ Low-pressure switch part: Quick coupler
3. Operate the travel lever to the "NEUTRAL" position and start the engine. Measure the charging pressure when the engine speed is 1,000 rpm.
   ★ Charging pressure

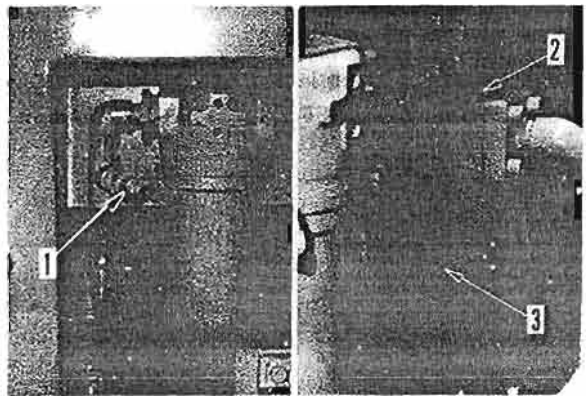
Unit: kg/cm$^2$

| Engine | Charging pressure |
|---|---|
| 1,000 rpm | 25 |

★ If the pressure is below 10 kg/cm$^2$, there may be a fault somewhere. In such a case, stop the engine and locate the fault.

★ If the pressure of pump charge relief valve (2) does not reach 25 kg/cm$^2$, remove cap (3) of the valve, loosen the locknut, and adjust the pressure with the adjustment screw.

★ For MST-2500



## MEASURING PRESSURE OVERRIDE SWITCHING PRESSURE

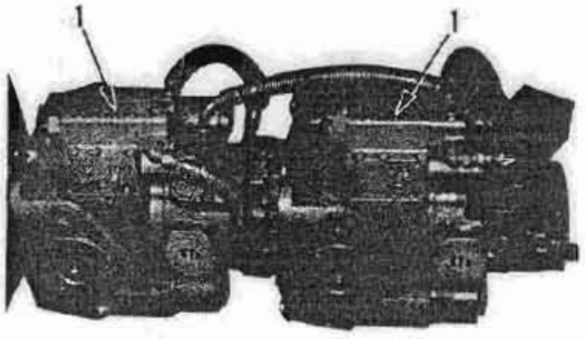
★ **Applicable to MST-1500 Serial No. 15094 and up, and MST-2000**

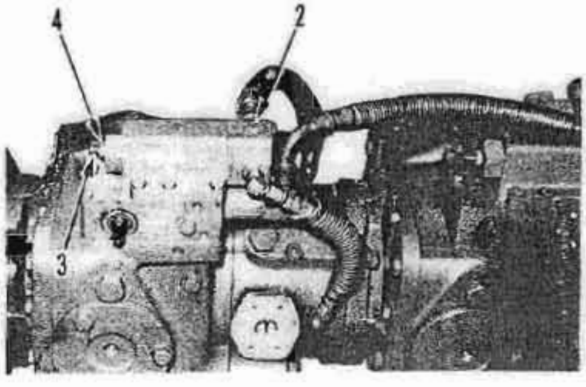
1. Operate the travel lever to the "NEUTRAL" position and stop the engine.
2. Remove the plug (2) of the main pump's pressure override valve (1) and install the oil pressure gauge (600 kg/cm$^2$ or 470 kg/cm$^2$).
   ★ Plug screw size: 7/16-20UNF
3. To prevent the vehicle from running away during the hydraulic pressure measurement, connect it to firm fixtures such as fixed concrete blocks, etc., by wire ropes.
   ★ The fixtures must be strong enough to not break by the vehicle's tractive power. In addition, use rather big wire ropes.
4. Operate the travel lever to the "NEUTRAL" position and start the engine. Start the vehicle by operating the lever and measure the pressure when the vehicle enters the shoe slipping condition due to the fixtures.
   ★ Pressure override switching pressure.

Unit: kg/cm$^2$

| Model | •Switching pressure |
|---|---|
| MST-1500 (#15094 – 15164) | 370 |
| MST-1500 (#15165 and up) | 350 |
| MST-2000 (#M02101 – 02104) (#K20101 – 20128) | 370 |
| MST-2000 (#M02105 and up) (#K20129 and up) | 350 |

   ★ If the pressure is below the standard value, there may be a fault somewhere. In such a case, stop the engine and locate the fault.
5. If there is no fault, adjust the pressure using the adjustment screw (3).
   To adjust, loosen the locknut (4) and screw in the adjustment screw (3).
   ★ The pressure increases/decreases 70kg/cm$^2$ when the adjustment screw is turned one complete turn.



## MEASURING TRAVEL MOTOR RELIEF PRESSURE

★ **Applicable to MST-500, 600, 700, 800, 1100 and MST-1500 Serial No. 15001 – 15093**

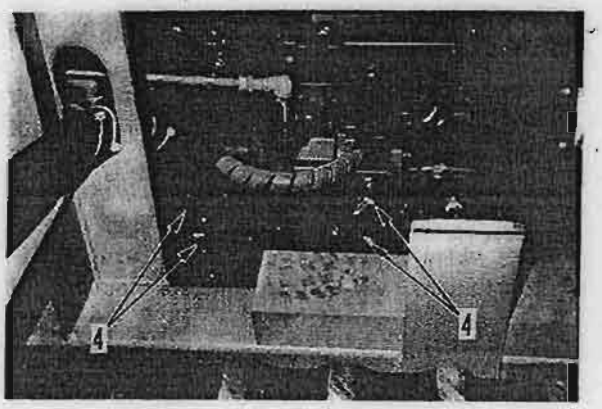
1. Operate the travel lever to the "NEUTRAL" position and stop the engine.
2. Remove the plug (2) of the travel motor's high-pressure port and install the oil pressure gauge (600 kg/cm$^2$ or 470 kg/cm$^2$).
   - ★ Applicable to MST-600, 700, 800, 1100 and 1500.
     Plug screw size: 7/16-20 UNF
   - ★ The MST-500 doesn't have the pressure detection port mentioned above. Therefore, put an adaptor, etc., between the elbow (4) of the high-pressure hose connecting the main pump and the travel motor and the main pump and install the oil pressure gauge.
     - ★ Main pump discharge port screw size: PT3/4
3. To prevent the vehicle from running away during the hydraulic pressure measurement, connect it to firm fixtures such as fixed concrete blocks, etc., by wire ropes.
   - ★ The fixtures must be strong enough not to be broken by the vehicle's tractive power. In addition, use rather big wire ropes.
4. Operate the travel lever to the "NEUTRAL" position and start the engine. Start the vehicle by operating the lever and measure the pressure when the vehicle enters the shoe slipping condition due to the fixtures.
   - ★ Relief pressure

Unit: kg/cm$^2$

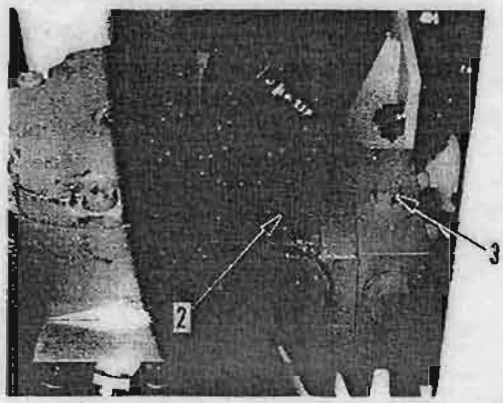
| Model | Relief pressure |
|---|---|
| MST-500 | 280 |
| MST-600 | 315 |
| MST-700 | 350 |
| MST-800 | 350 |
| MST-1100 | 385 |
| MST-1500 | 385 |

- ★ If the pressure is below the standard value, there may be a fault somewhere. In such a case, stop the engine and locate the fault.

★ For MST-500




★ For MST-600




★ For MST-700, 800, 1100 and 1500

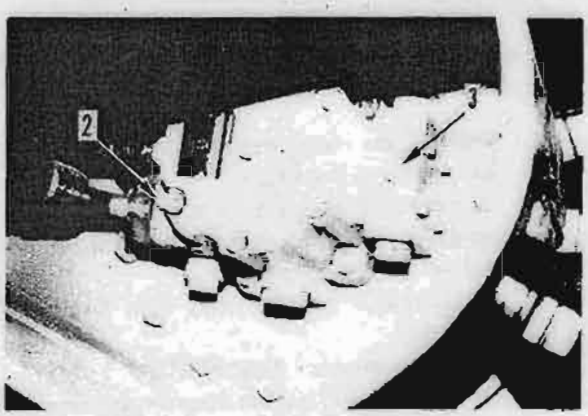
★ **Applicable to MST-1500 Serial No. 15094 and up, and MST-2000**

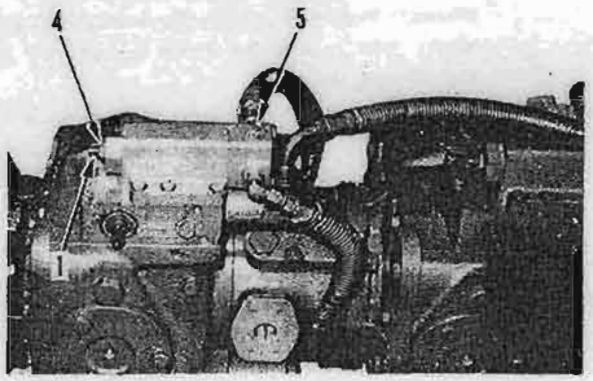
1. Operate the travel lever to the "NEUTRAL" position and stop the engine.
2. Remove the plug (2) of the travel motor's high-pressure port and install the oil pressure gauge (600 kg/cm$^2$ or 470 kg/cm$^2$).
   ★ Plug screw size: 7/16-20 UNF
3. To prevent the vehicle from running away during the hydraulic pressure measurement, connect it to firm fixtures such as fixed concrete blocks, etc., by wire ropes.
   ★ The fixtures must be strong enough not to be broken by the vehicle's tractive power. In addition, use rather big wire ropes.
4. When measuring high-pressure, screw adjustment screw (1) of the pressure override valve to one turn. After adjusting high-pressure, return adjustment screw (1) and lock with locknut (4).
5. Operate the travel lever to the "NEUTRAL" position and start the engine. Start the vehicle by operating the lever and measure the pressure when the vehicle enters the shoe slipping condition due to the fixtures.
   ★ Relief pressure

Unit: kg/cm$^2$

| Model | Relief pressure |
|---|---|
| MST-1500 | 350 |
| MST-2000<br>(# M02101 – 02104)<br>(# K20101 – 20125) | 385 |
| MST-2000<br>(# M02105 and up)<br>(# K20129 and up) | 350 |

★ If the pressure is below the standard value, there may be a fault somewhere. In such a case, stop the engine and locate the fault.



★ Applicable to MST-2200 and 2500

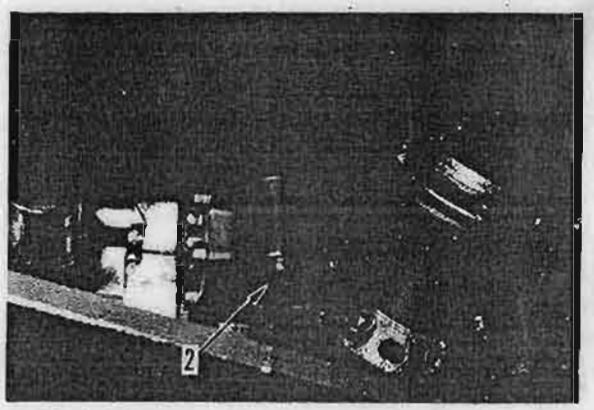
1. Operate the travel lever to the "NEUTRAL" position and stop the engine.
2. Remove the plug (2) of the travel motor's high-pressure port and install the oil pressure gauge (600 kg/cm$^2$ or 470 kg/cm$^2$).
   ★ Applicable to MST-2500 Serial No. 25101 – 25186.
3. Remove the plug (2) of the main pump's high-pressure port and install the oil pressure gauge (600 kg/cm$^2$ or 470 kg/cm$^2$).
   ★ Plug screw size: PF 1/4
   ★ Applicable to MST 2200 and MST-2500 Serial No. 25187 and up.
4. To prevent the vehicle from running away during the hydraulic pressure measurement, connect it to firm fixtures such as fixed concrete blocks, etc., by wire ropes.
   ★ The fixtures must be strong enough not to be broken by the vehicle's tractive power. In addition, use rather big wire ropes.
5. Operate the travel lever to the "NEUTRAL" position and start the engine. Start the vehicle by operating the lever and measure the pressure when the vehicle enters the shoe slipping condition due to the fixtures.
   ★ Relief pressure

Unit: kg/cm$^2$

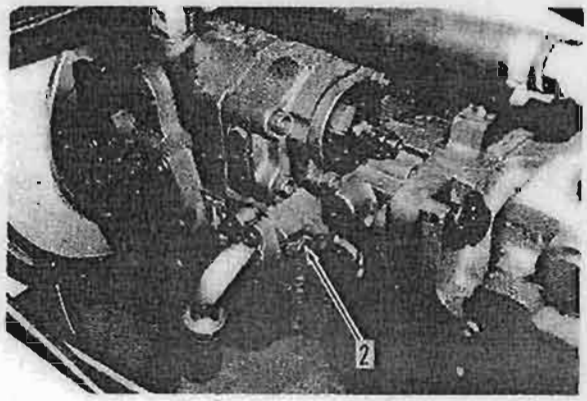
| Model | Relief pressure |
|---|---|
| MST-2200 | 325 |
| MST-2500 | 350 |

★ If the pressure is below the standard value, there may be a fault somewhere. In such a case, stop the engine and locate the fault.

★ For MST-2500 Serial No. 25101 – 25186




★ For MST-2200 and 2500 Serial No. 25187 –

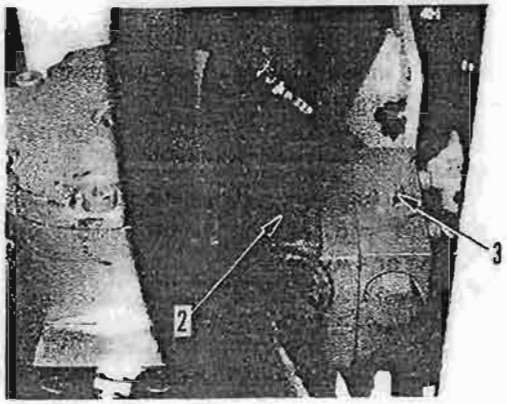


## MEASURING TRAVEL MOTOR CHARGING PRESSURE

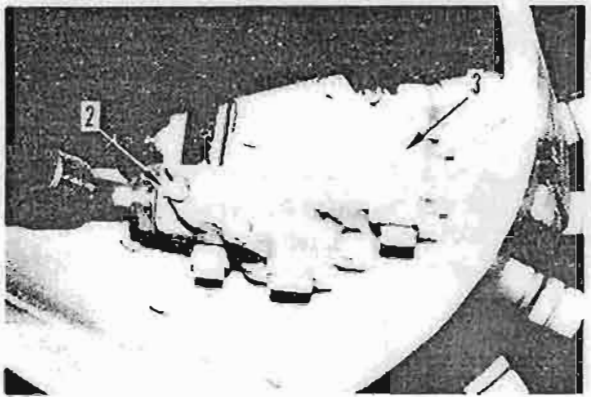
★ **Applicable to MST-600, 700, 800, 1100, 1500 and 2000**

1. Operate the travel lever to the "NEUTRAL" position and stop the engine.
2. Remove the plug (3) of the charging pressure port and install the oil pressure gauge (50 kg/cm$^2$).
   ★ Plug screw size: 7/16–20UNF
3. Operate the travel lever to the "NEUTRAL" position and start the engine. Measure the charging pressure when the vehicle is started by operating the lever.
   ★ The charging pressure is common to the models. 12 – 13 kg/cm$^2$
   ★ If the pressure is below 10 kg/cm$^2$, there may be a fault somewhere. In such a case, stop the engine and locate the fault.

★ For MST-600




★ For MST-1100



## MEASURING MAIN RELIEF PRESSURE OF DUMP CYLINDER CIRCUIT

★ **Applicable to MST-500, 600 and 700**

1. Operate the travel lever and dump lever to the "NEUTRAL" position and stop the engine.
2. Remove plug (1) of dump control valve and install the oil pressure gauge (470 kg/cm$^2$).
   ★ Plug screw size: PT 1/8
3. Operate the travel lever to the "NEUTRAL" position and start the engine. Raise the dump body by operating the dump lever and measure the pressure when the dump body (dump cylinder) is brought to the stroke end.
   ★ Main relief pressure

Unit: kg/cm$^2$

| Model | Main relief pressure |
|---|---|
| MST-500 – 700 | 175 |

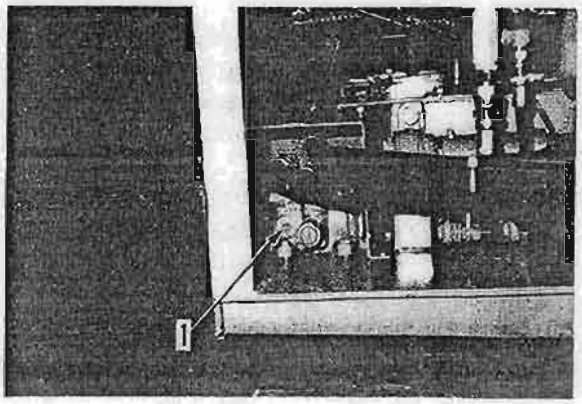
★ **Applicable to MST-800, 1100, 1500, 2000, 2200 and 2500**

1. Operate the travel lever and dump lever to the "NEUTRAL" position and stop the engine.
2. Remove plug (1) of the adapter on the dump control valve and install the oil pressure gauge (470 kg/cm$^2$).
   ★ Applicable to MST-800, 1100 and 1500.
   Plug screw size: PT 3/8
   ★ Applicable to MST-2000, 2200 and 2500.
   Plug screw size: PT 1/2
3. Operate the travel lever to the "NEUTRAL" position and start the engine. Raise the dump body by operating the dump lever and measure the pressure when the dump body (dump cylinder) is brought to the stroke end.
   ★ Main relief pressure

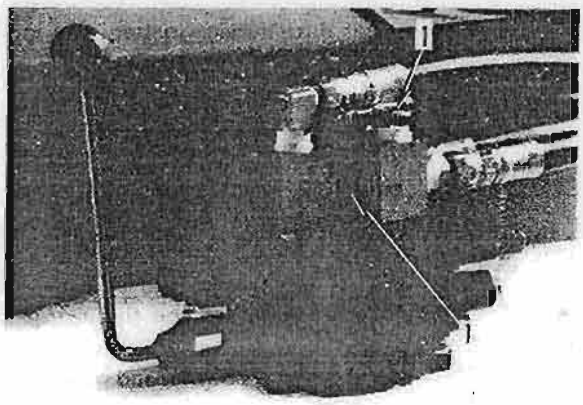
Unit: kg/cm$^2$

| Model | Main relief pressure |
|---|---|
| MST-800 – 2500 | 165 |

★ For MST-500




★ For MST-1500



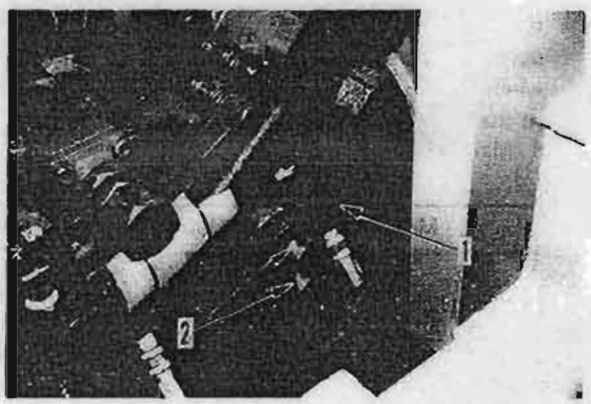
# CHECKING MAIN PUMP PARTS

## CHECKING CHARGE RELIEF VALVE AND HIGH-PRESSURE RELIEF VALVE

★ **Applicable to MST-500**

- **If the oil pressure warning lamp on the instrument panel lights up or in the event of such trouble as the vehicle does not move, lacks power, and so on, check the main pump's charge relief valve and high-pressure relief valve as follows.**
- **The MST-500 high-pressure relief valve is mounted on the main pump unlike in other models.**

1. **Operate the travel lever to the "NEUTRAL" position and stop the engine.**
2. **Check the charge relief valve**
   **Remove the charge relief valve (1) and check it for catching dust, foreign matter, etc., spring breakdown or dilation, the seat abrasion, etc.**
3. **Check the high-pressure relief valve**
   **Remove the high-pressure relief valve (2) and check it for biting-in of dust, foreign matter, etc., spring breakdown or dilation, seat abrasion, etc.**

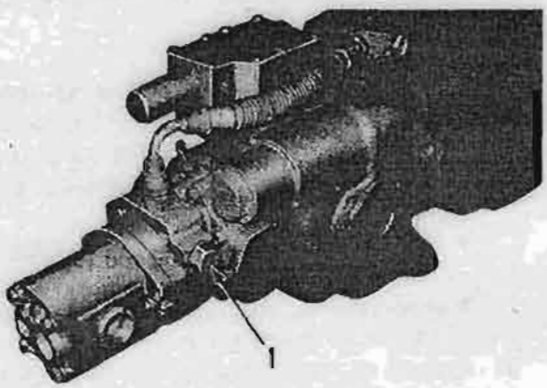


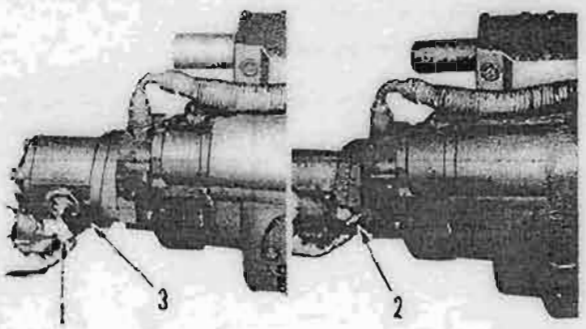

## CHECKING CHARGE RELIEF VALVE

★ **Applicable to MST-600, 700, 800, 1100, 1500 and 2000.**

- **If the oil pressure warning lamp on the instrument panel lights up or in the event of such trouble as the vehicle does not move, lacks power, and so on, check the main pump's charge relief valve as follows.**

1. **Operate the travel lever to the "NEUTRAL" position and stop the engine.**
2. **Check the charge relief valve**
   **Remove the plug (1) and draw out the poppet (2) and check the charge relief valve for biting-in of dust, foreign matter, etc., seat abrasion, spring (3) breakdown or dilation, etc.**



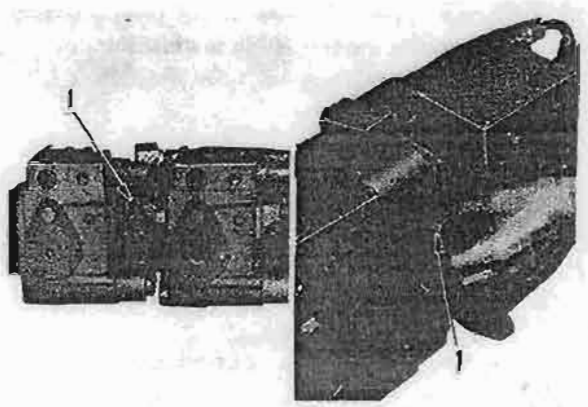



## CHECKING CHECK VALVE

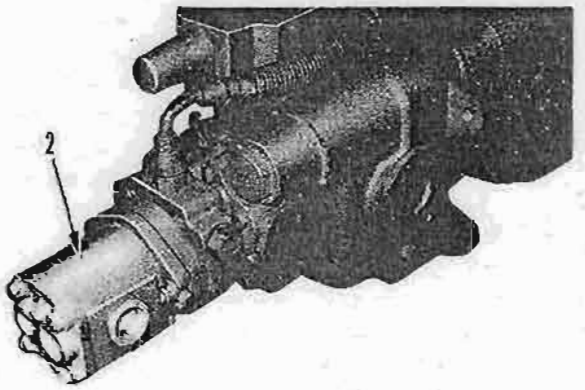
★ **Applicable to MST-600, 700, 800, 1100, 1500 and 2000**

- In the event of such trouble as the vehicle does not move, lacks power, and so on, check the main pump's check valve as follows.

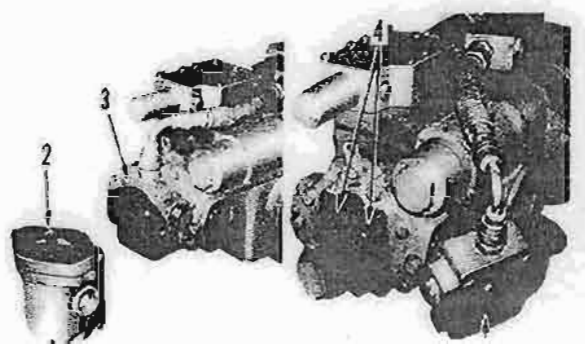
1. Operate the travel lever to the "NEUTRAL" position and stop the engine.
2. **Check the front pump check valve**
   Remove the check valve (1) and check it for catching of dust, foreign matter, etc., the ball and sleeve seat abrasion, etc.




3. **Check the rear pump check valve**
   1) Disconnect the hydraulic piping and remove the charging pump (2) by removing 2 bolts.




   2) Disconnect the charging port block (3).
   3) Remove 2 sets of check valves (4) and check them for biting-in of dust, foreign matter, etc., spring breakdown or dilation, ball abrasion, etc.

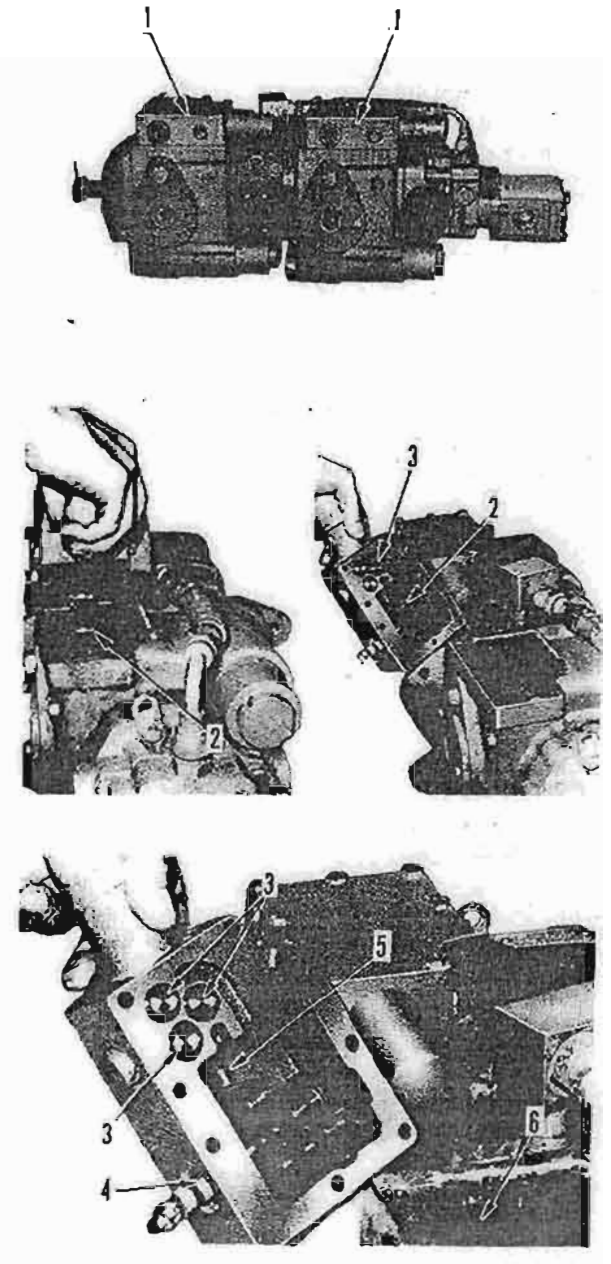


## CHECKING PUMP CONTROL VALVE

★ Applicable to MST-600, 700, 800, 1100, 1500 and 2000

- In the event of such trouble as the vehicle does not move, forward/reverse shifting malfunction, etc., the main pump's pump control valve must be checked. Check it as follows.

1. Operate the travel lever to the "NEUTRAL" position and stop the engine.
2. Disconnect the travel lever's control linkage on the pump side.
3. Remove the main pump's pump control valve (1) by removing its fixing bolts.
   - ★ The control valve is connected to the servo cylinder in the main pump. Remove it, therefore, after drawing out the pin of the lever (2) on the valve side from the hole in the link on the cylinder side while lifting the valve a little.
   - ★ The control valve is equipped with 3 sets of orifices. When removing the valve, therefore, hold down the orifice (3) and the O-ring with your finger taking care not to let them drop into the pump interior.
4. Check the control valve for the following.
   1) Is the orifice (3) hole clogged?
   2) Is the control shaft's (4) spring pin broken?
   3) Does the valve spool (5) move smoothly?
   4) Has the E-ring of the link (6) on the servo cylinder side fallen off?

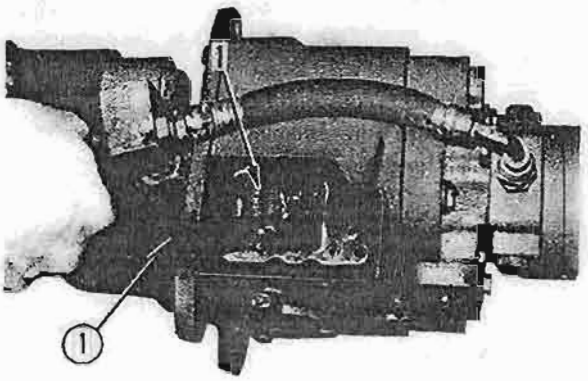


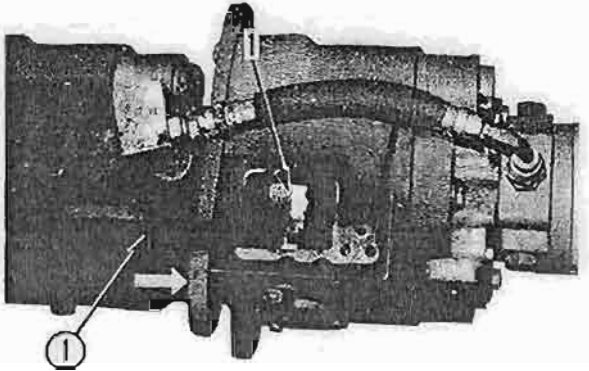
## RVO CYLINDER

★ Applicable to MST-600, 700, 800, 1100, 1500 and 2000

- In the event of such trouble as the vehicle does not move, forward/reverse shifting malfunction, etc., check the functioning of the servo cylinder in the main pump as follows.

1. Operate the travel lever to the "NEUTRAL" position and stop the engine.
2. Disconnect the travel lever's control linkage on the pump side.
3. Remove the valve referring to the item on the checking pump control valve.
4. Insert a bar ① , etc., between the servo cylinder (1) and the pump body and engage the tip of the bar with the servo cylinder.
5. Check whether the servo cylinder (1) moves smoothly or not by trying to move it back and forth using the bar ① as a lever the fulcrum of which is the pump body.
   - ★ If the operating force is too light, the cylinder piston spring may break.
   - ★ If the operating force is too heavy, the servo cylinder may possibly seize up or make a one-sided contact.



## REPLACING AND ADJUSTING PUMP CONTROL VALVE

★ **Applicable for MST-2500**

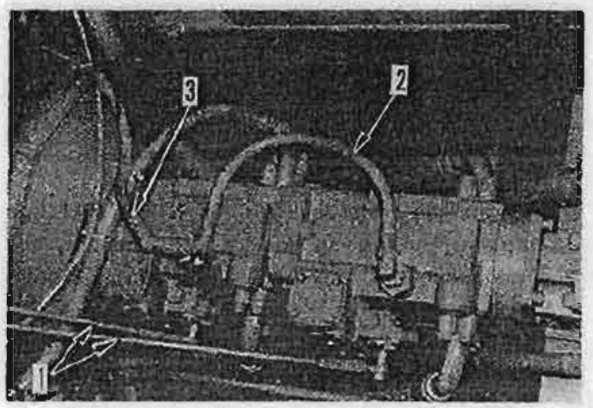
• If the machine does not move, or trouble such as failure to switch between forward and reverse has occurred, the control valve on top of the main pump must be checked and then replaced.
The procedure for replacing the control valve and adjusting after replacement is as follows.

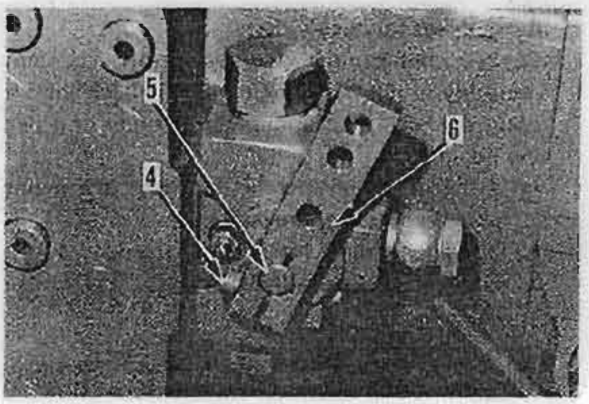
**1. Removal of control valve**

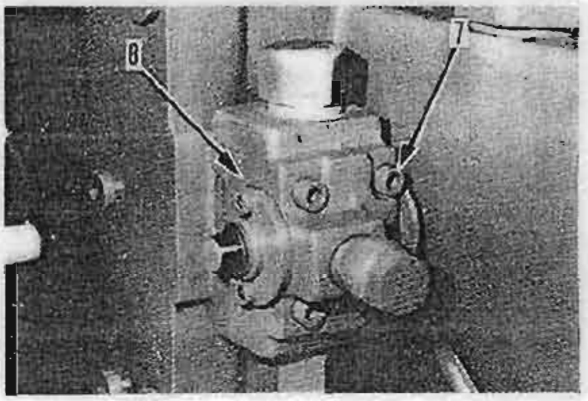
1) Set the travel lever at neutral and stop the engine.
2) Disconnect control linkage (1) for the travel lever at the pump end.
3) Disconnect rubber hoses (2) and (3).
   ★ Put blind plugs in the hoses after disconnecting them.
4) Remove mounting bolt (4), then remove lever (6) from shaft (5).
   ★ Mounting bolt: Hexagon socket head screw (M5 x 20)
5) Remove 4 mounting bolts (7), then remove control valve (8) from the pump housing.
   ★ Mounting bolt: Hexagon socket head screw (M6 x 20)

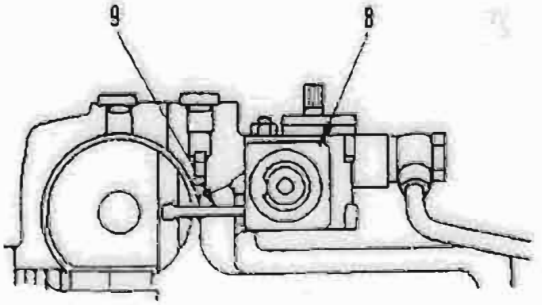
**2. Installing control valves**

1) Insert rod (9) in the groove of the servo cylinder, install control valve (8) to the pump housing, then tighten 4 mounting bolts (7).
   ★ Tightening torque: 1.2 – 1.5 kgm
2) Install lever (6) to shaft (5), then tighten mounting bolt (4) temporarily.
   ★ Tighten the mounting bolt fully after adjusting the zero point.
3) Connect rubber hoses (3) and (2).
4) Connect control linkage (1) of the travel lever.



3. **Bleeding air from servo cylinder**

After replacing the control valve, always bleed the air from the servo cylinder as follows.

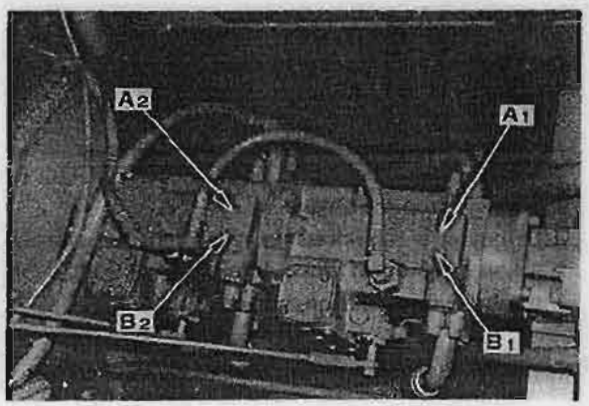
1) Start the engine and run at approx. 1000 rpm.
2) With the parking brake lever engaged, operate the steering lever 4 – 5 times between forward and reverse.

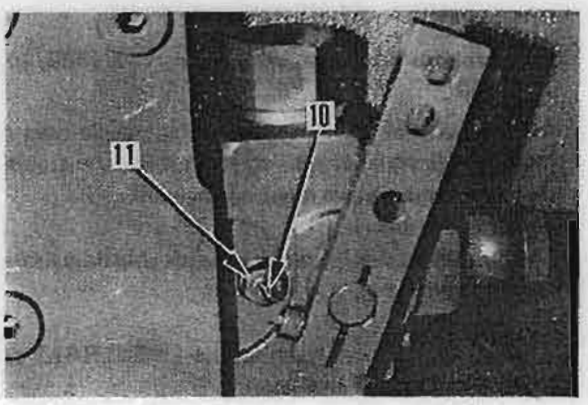
4. **Adjustment method (Adjustment of zero point)**

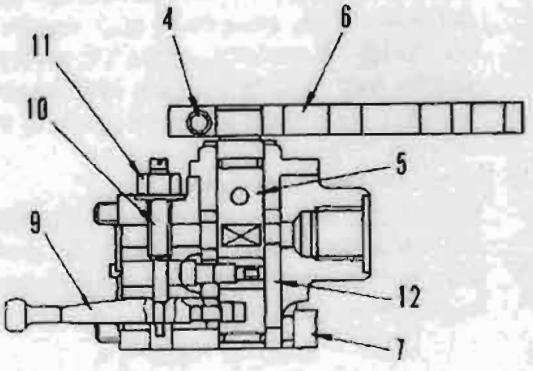
Adjust as follows.

1) Install hydraulic gauges (500 kg/cm$^2$) to main pump ports A1 and B1 (or A2 and B2).
   - ★ Screw size of ports A1 and B1: M18 x 1.5
   - ★ Using an Uchida Yuatsu bushing (Part No.: 110076195), make the screw size PT 3/8.
3) Start the engine and run at approx. 1000 rpm, then adjust with adjustment screw (10) of the control valve so that the pressure gauges at both ports A1 and B1 are approx. 20 kg/cm$^2$.
   - ★ Loosen nut (11), screw in adjustment screw fully, then turn it back one turn. (The adjustment can be made within one turn.)
4) When ports A1 and B1 are the same pressure, lock adjustment screw (10) with nut (11).
   - ★ Tightening torque of nut: 1.0 kgm
5) Remove the pressure gauges and bushing, and install blind plugs in ports A1 and B1.

★ This is the method for adjusting the zero point of shaft (5) and barrel (12), and the zero point of the pump angle. Always carry out this adjustment when the control valve has been replaced.




4. Lever mounting bolt
5. Shaft
6. Lever
7. Valve mounting bolt
9. Rod
10. Adjustment screw
11. Locknut
12. Barrel

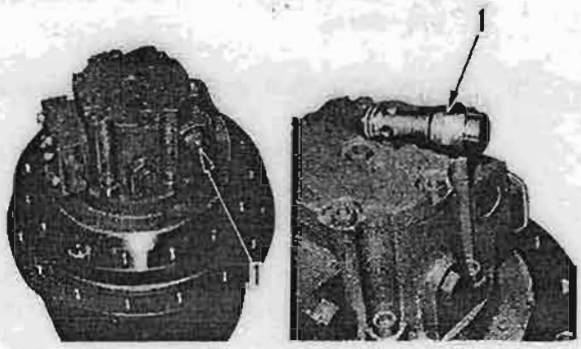
# CHECKING TRAVEL MOTOR PARTS

## CHECKING HIGH-PRESSURE RELIEF VALVE

★ Applicable to MST-600, 700, 800, 1100, 1500 and 2000

- In the event of such trouble as the vehicle does not move, lacks power, etc., check the traveling motor's high-pressure relief valve as follows.

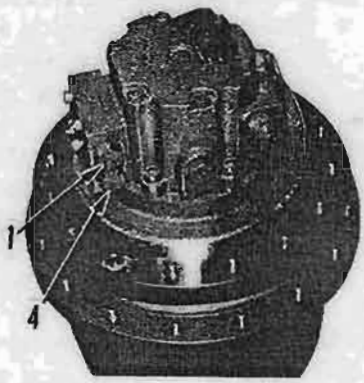
1. Operate the travel lever to the "NEUTRAL" position and stop the engine.
2. Remove the high-pressure relief valve (1) and check it for catching of dust, foreign matter, etc., spring breakdown or dilation, seat abrasion, etc.



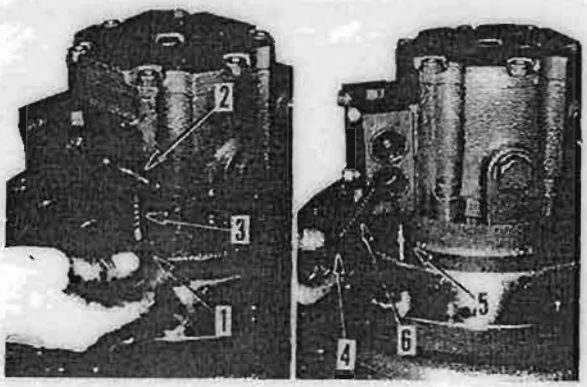

## CHECKING FLUSHING VALVE

★ Applicable to MST-600, 700, 800, 1100, 1500, 2000 and 2500

- In the event of such trouble as the vehicle does not move, the hydraulic oil overheats, etc., the traveling motor's flushing valve must be checked.
  Check it as follows.
- The flushing valve is equipped with shuttle valve and charge relief valve.




1. Operate the travel lever to the "NEUTRAL" position and stop the engine.
2. **Check the shuttle valve**
   Remove the plug (1) and draw out the shuttle valve and check it for biting-in of dust, foreign matter, etc., spool (2) abrasion, spring (3) breakdown or dilation, etc. In addition, check whether the shuttle valve operates smoothly or not by pushing the spool with your finger.
3. **Check the charge relief valve**
   Remove the plug (4) and draw out the poppet (5) and check the charge relief valve for catching of dust, foreign matter, etc., seat abrasion, spring (6) breakdown or dilation, etc.

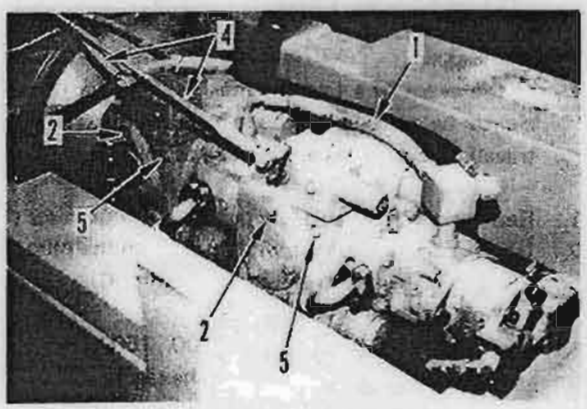


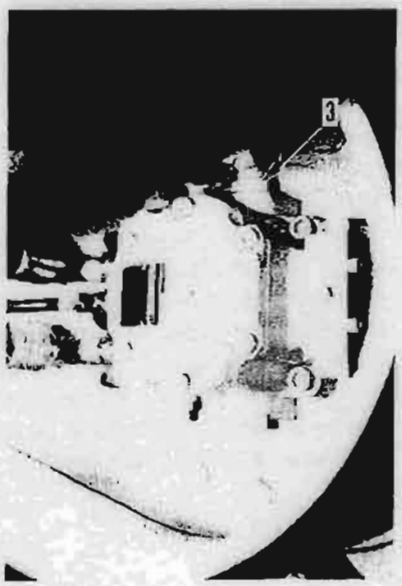
# TEST RUN OF HST

★ Applicable to MST-600, 700, 800, 1100, 1500 and 2000

★ Test run the HST as follows whenever a hydraulic motor, travel motor, piping etc., is replaced.

1. Fill the hydraulic oil tank with oil and check that oil flows out by loosening the sucking part of the charging port piping (1). Then, tighten the piping.
   ★ If oil is put into the hydraulic oil tank, air in the circuit escapes and the oil is sucked into the case.
2. Remove the front and rear main pump case drain plugs (2) and the right and left travel motor drain plugs (3), fill each case with oil and connect the piping.
3. The main pump must be left at the "NEUTRAL" position and the control linkage (4) must be left disconnected.
4. Connect each piping securely.
5. Remove the main pump housing's charging pressure port plug (5) and install the oil pressure gauge (50 kg/cm$^2$).
   ★ Plug screw size: 7/16–20 UNF
6. Start the engine and run it at the lowest possible speed and check that the charging pressure is at least 10 kg/cm$^2$.
   ★ Never raise the engine speed before the HST circuit is filled sufficiently with oil, or seizure will result.
7. Raise the engine speed to about 1,000 rpm and check that the charging pressure is within the range of 13 – 14 kg/cm$^2$.
8. Stop the engine and connect the control linkage (4).
   ★ Check the lever on the pump side, which must be at the "NEUTRAL" position.
9. Set the travel lever to the "NEUTRAL" position and restart the engine. Raise the speed to 1,500 – 2,000 rpm and run for several minutes under no load.
   ★ The main pump is run in order to bleed the circuit completely of air.
10. Operate the travel lever slowly to the forward/reverse position and check that it interlocks with the direction of rotation of the motor.
    ★ The charging pressure reading is 16 – 18 kg/cm$^2$ while the main pump is running.
11. Apply load gradually after checking that no bubbles enter the hydraulic oil tank.
    ★ Check the oil level in the hydraulic oil tank and add oil, if necessary, up to the specified level. Tighten the cap securely after adding oil.
    ★ If bubbles in the tank don't disappear and the oil is turbid and white, air must have been sucked in from the suction side. In such a case, check.



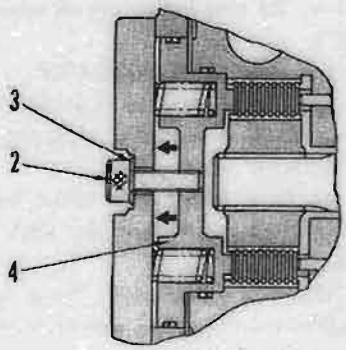



# HOW TO RELEASE PARKING BRAKE

★ **Excluding MST-500**

- In the event of a fault in the HST and for the vehicle to be transported to a safe place, release the traveling motors' parking brake as follows.

1. Remove the right and left traveling motor plugs (1).
2. Insert a bolt (2) and a washer (3) into the plug hole and screw them into the brake piston (4).
   - ★ Bolt size and type:
     - MST-600, 700, 800, 1100, 1500 and 2000: M10 x 25, Pitch = 1.5, hexagon socket head cap screw
     - MST-2200 and 2500: M10 x 65, Pitch = 1.5, hexagon socket head cap screw
3. As you turn the bolt (2) about twice, the brake piston (4) is pulled towards the cover side and the parking brake is released.
4. Connect hoses between the travel motor's high-pressure and low-pressure sides.
   - ★ For a short circuit, one side of the hose connected to the motor should be disconnected and the pump side of the remaining side should be disconnected and then connected to the motor. Carry it out on either of the right or left sides.
   - ★ After manually releasing the parking brake, the vehicle must not be moved a long distance. Rather it must be moved just several meters to a safe place, or the HST will break.

# 30 TROUBLESHOOTING

# TROUBLESHOOTING PROCEDURE

Carry out troubleshooting in the following order.

1. If a request for repairs has been received, first ask about the following items.
   - Name of customer
   - Model and serial number of machine
   - Details of jobsite, etc.
2. Get an outline of the problem.
   - Symptoms of failure
   - Details of work being carried out when problem occurred
   - Operating environment
   - Previous repairs, details of maintenance, etc.
3. Prepare the necessary tools.
   - Jigs, testers, hydraulic kits, etc.
4. Try to re-enact the problem.
   - Operate the machine in the same way (travel, work) to check the symptoms.
5. Use the CHECKS BEFORE TROUBLESHOOTING TABLE to locate simple problems, and carry out repairs.
   - Checks before starting
   - Other check items
6. Carry out troubleshooting (full troubleshooting)
   - Select troubleshooting item that matches symptoms, and carry out troubleshooting.

Method of using troubleshooting chart

1. Select the problem symptoms from the troubleshooting Table of Contents.
2. First, carry out the checks written under the problem, then carry out troubleshooting according to the troubleshooting flow.
3. If the result of the inspection or measurement inside ☐ is YES, go to the ☐ on the upper and if it is NO, go to the ☐ below.
4. The Action column on the right side gives the action to take for the result of the inspection or measurement.
5. The precaution items for troubleshooting are marked ★ under the frame.

# CHECKS BEFORE TROUBLESHOOTING TABLE

| | Item | Action |
|---|---|---|
| Checks before starting | 1. Check fuel level | Add fuel |
| | 2. Check for impurities in fuel | Clean, drain |
| | 3. Check hydraulic oil level | Add oil |
| | 4. Check hydraulic strainer | Clean, drain |
| | 5. Check engine oil level | Add oil |
| | 6. Check coolant level | Add water |
| | 7. Check dust indicator | Clean, replace |
| | 8. Check for loose or corroded wiring of electrical equipment | Tighten, replace |
| Other check items | 1. Abnormal noise or smell from pump, motor | Repair |
| | 2. Check for leakage of oil from equipment or hydraulic piping | Repair, replace |
| | 3. Check charge line filter | Clean, replace |
| | 4. Bleeding of air | Bleed air |
| | 5. Check battery voltage (20 – 30V) | Charge, replace |
| | 6. Check battery electrolyte level | Add, replace |
| | 7. Check electrical wiring | Repair, replace |
| | 8. Check for blown or corroded fuses | Replace |

## 1. Machine does not move in any direction, and dump cylinder also does not move.

**Ask the operator the following points.**

- Did the machine suddenly stop moving? Yes = Component seized or broken
- Was there any abnormal noise when the machine stoppped moving? (From what area?) Yes = Component broken.

**Checks before troubleshooting**

- Is oil level in hydraulic tank correct?
- Is there interference or disconnection of steering control linkage?
- Is there damage or leakage from piping between charge pump and dump control valve?

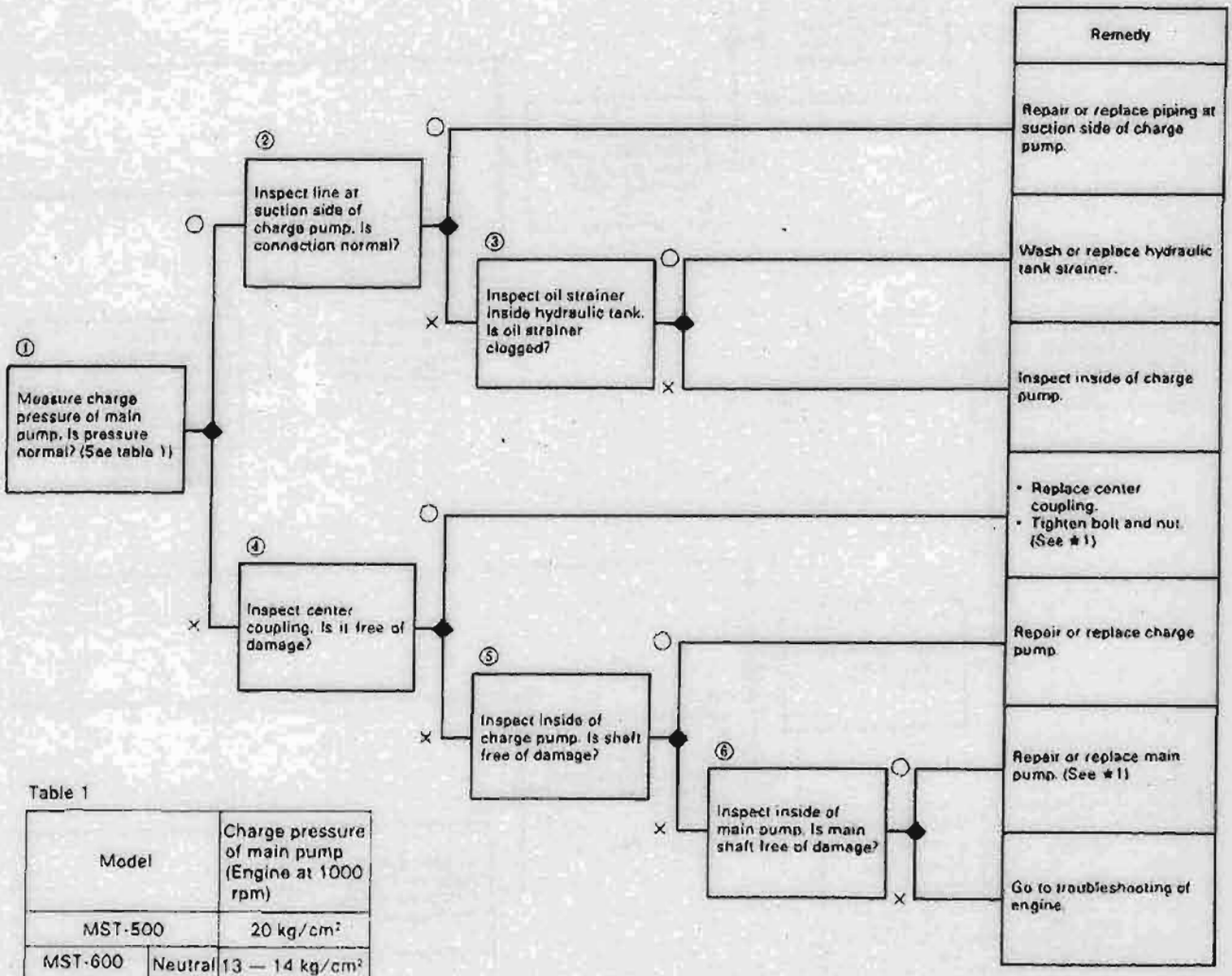



Table 1

| Model | | Charge pressure of main pump (Engine at 1000 rpm) |
|---|---|---|
| MST-500 | | 20 kg/cm² |
| MST-600 — MST-2000 | Neutral | 13 — 14 kg/cm² |
| | On load | 11 — 13 kg/cm² |
| MST-2200, 2500 | | 25 kg/cm² |

★1. When replacing the main pump, tighten the mounting nut of the center coupling securely.

kgm Mounting nut: 20 – 24 kgm (MST-600 – MST-1500)
51 – 59 kgm (MST-2000)

## 2. Machine does not move in any direction, but dump cylinder moves.

**Ask the operator the following points.**

- Did the machine suddenly stop moving? Yes = Component seized or broken
- Was there any abnormal noise when the machine stoppped moving? (From what area?) Yes = Component broken.

**Checks before troubleshooting**

- Is oil level in hydraulic tank correct?
- Is there interference or disconnection of steering control linkage?
- Is there damage or leakage from piping between dump control valve and main pump?
- Is there damage or leakage from piping between main pump and travel motor?
- Is there damage or leakage from parking brake piping?

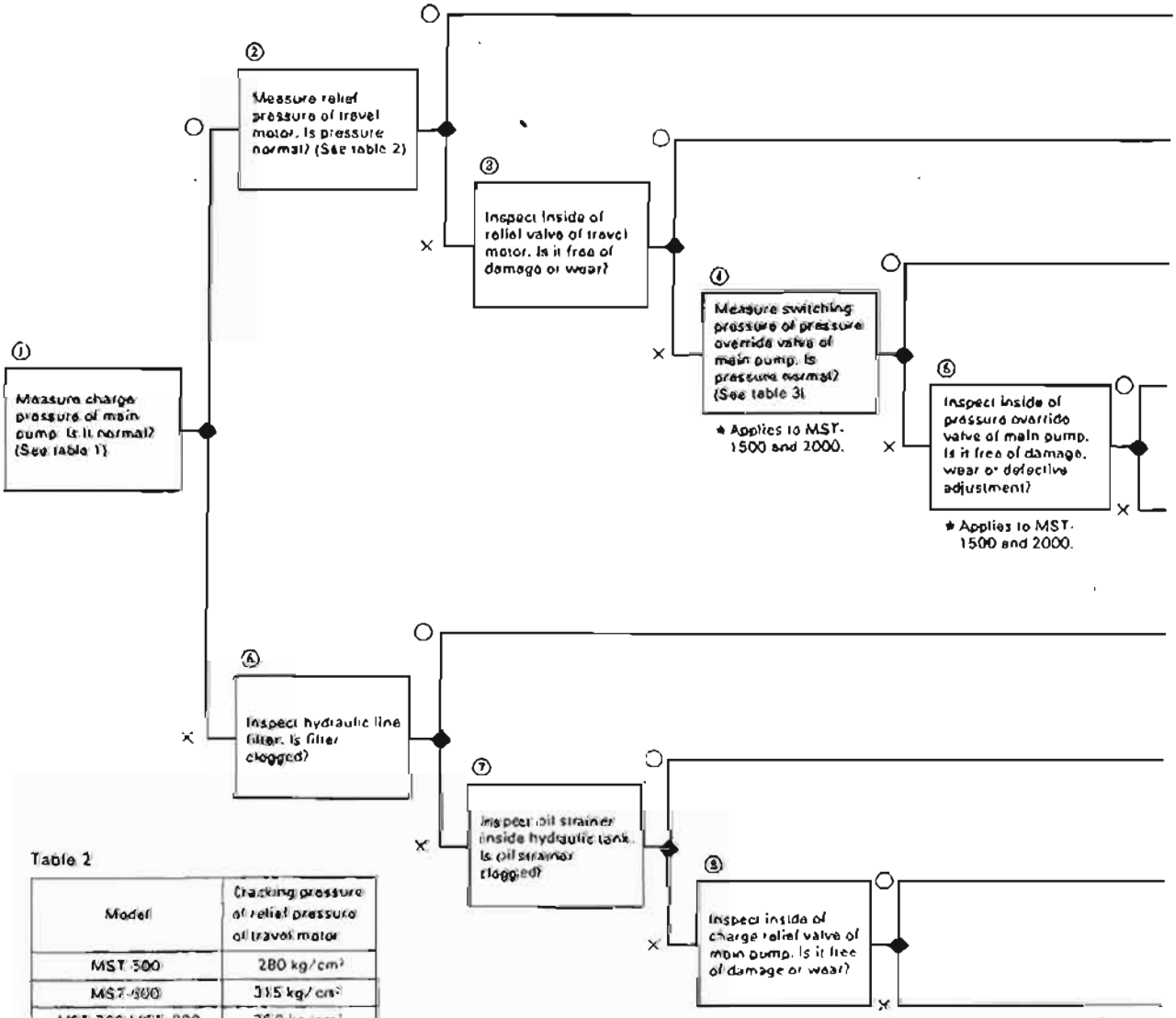



Table 2

| Model | Cracking pressure of relief pressure of travel motor |
|---|---|
| MST-500 | 280 kg/cm² |
| MST-600 | 315 kg/cm² |
| MST-700, MST-800 | 350 kg/cm² |
| MST-1100 | 385 kg/cm² |
| MST-1500 (#15003—15164) | 385 kg/cm² |
| MST-1500 (#15165—) | 350 kg/cm² |
| MST-2000 (#K20101—20126, 20128) (#M02101—02104) | 385 kg/cm² |
| MST-2000 (#K20127, 20129—) (#M02105—) | 350 kg/cm² |
| MST-2200 | 325 kg/cm² |
| MST-2500 | 350 kg/cm² |

Table 1

| Model | | Charge pressure of main pump (Engine at 1000 rpm) |
|---|---|---|
| MST-500 | | 20 kg/cm² |
| MST-600 | Neutral | 13 — 14 kg/cm² |
| MST-2000 | On load | 11 — 13 kg/cm² |
| MST-2200, 2500 | | 25 kg/cm² |

Table 3

| Model | Cracking pressure of pressure override valve |
|---|---|
| MST-1500 (#15094—15164) | 370 kg/cm² |
| MST-1500 (#15165—) | 350 kg/cm² |
| MST-2000 (#K20101—20126, 20128) (#M02103—02104) | 370 kg/cm² |
| MST-2000 (#K20127, 20129—) (#M02105—) | 350 kg/cm² |

| | Remedy |
|---|---|
| | Replace the travel motor, and if the condition does not return to normal, inspect the main pump. |
| | Repair or replace relief valve of travel motor. (See ★2) |
| | Replace the travel motor, and if the condition does not return to normal, inspect the main pump. |
| | Repair or replace pressure override valve of main pump. (See ★2) |
| | Replace the travel motor, and if the condition does not return to normal, inspect the main pump. (See ★1) |
| | Replace element of hydraulic line filter. |
| | Wash or replace oil strainer inside hydraulic tank. |
| | Repair or replace charge relief valve of main pump. (See ★2) |
| | Go to No. 2 of troubleshooting. |

★1: When replacing the main pump, tighten the mounting nut of the center coupling securely.

Mounting nut: 20 – 24 kgm (MST-600 – MST-1500)
51 – 59 kgm (MST-2000)

★2: When checking or replacing any valve, always check that there is no dirt or dust caught in it.

## 3. Dump cylinder does not move, or does not move properly, but machine moves.

Ask the operator the following points.

- Did the cylinder suddenly stop moving? .Yes = Component seized or broken
- Was there any abnormal noise when the cylinder stoppped moving? (From what area?) Yes = Component broken.
- Was the speed of the carrier slow before? Yes = Parts worn

Checks before troubleshooting

- Is oil level in hydraulic tank correct?
- Is there excessive play, breakage at dump lever pin?
- Is there damage or leakage from piping between dump control valve and dump cylinder?

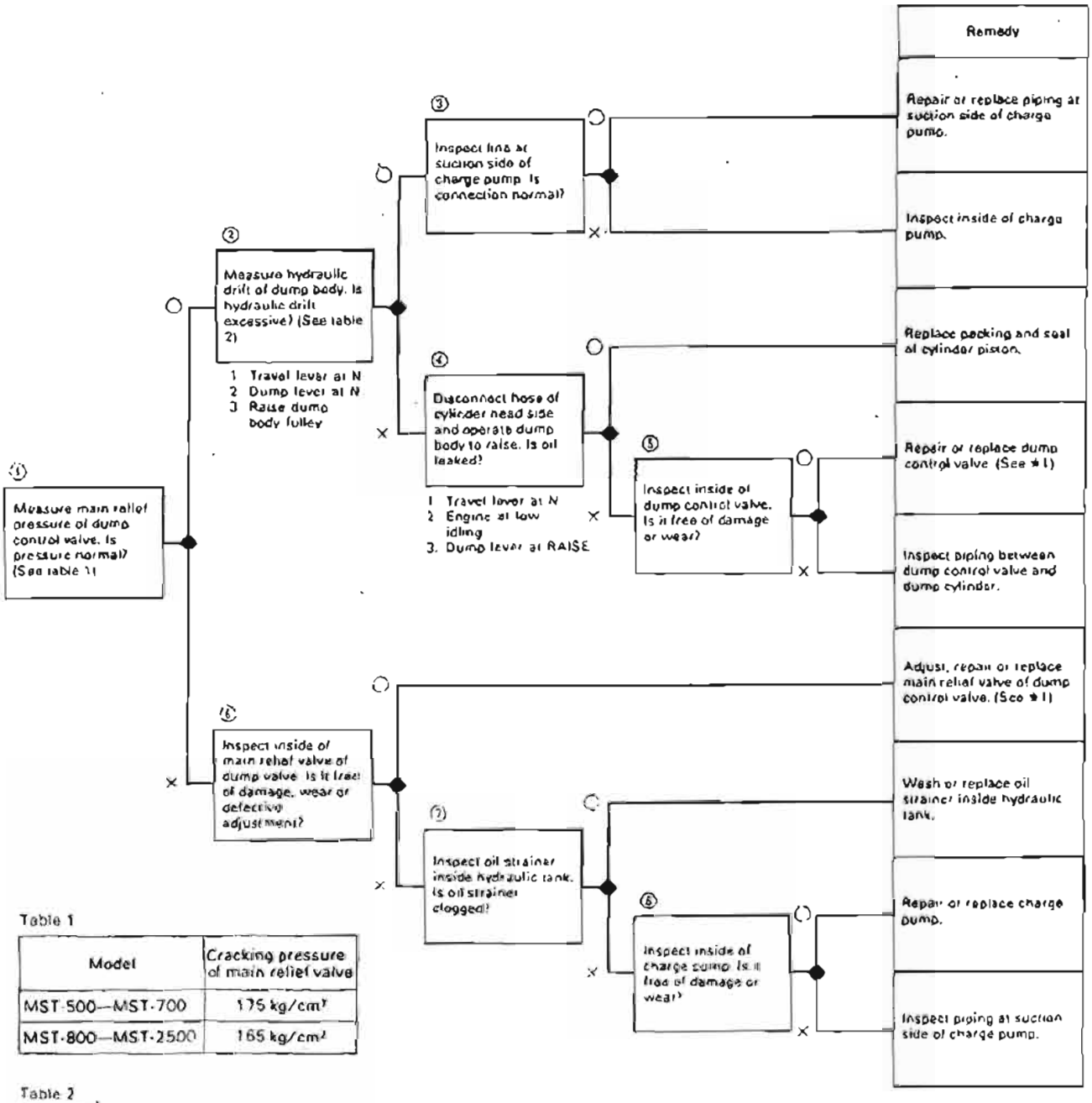



Table 1

| Model | Cracking pressure of main relief valve |
|---|---|
| MST-500—MST-700 | 175 kg/cm² |
| MST-800—MST-2500 | 165 kg/cm² |

Table 2

| Model | Hydraulic drift |
|---|---|
| All models | 20 mm (5 min.) |

★1: When checking or replacing any valve, always check that there is no dirt or dust caught in it

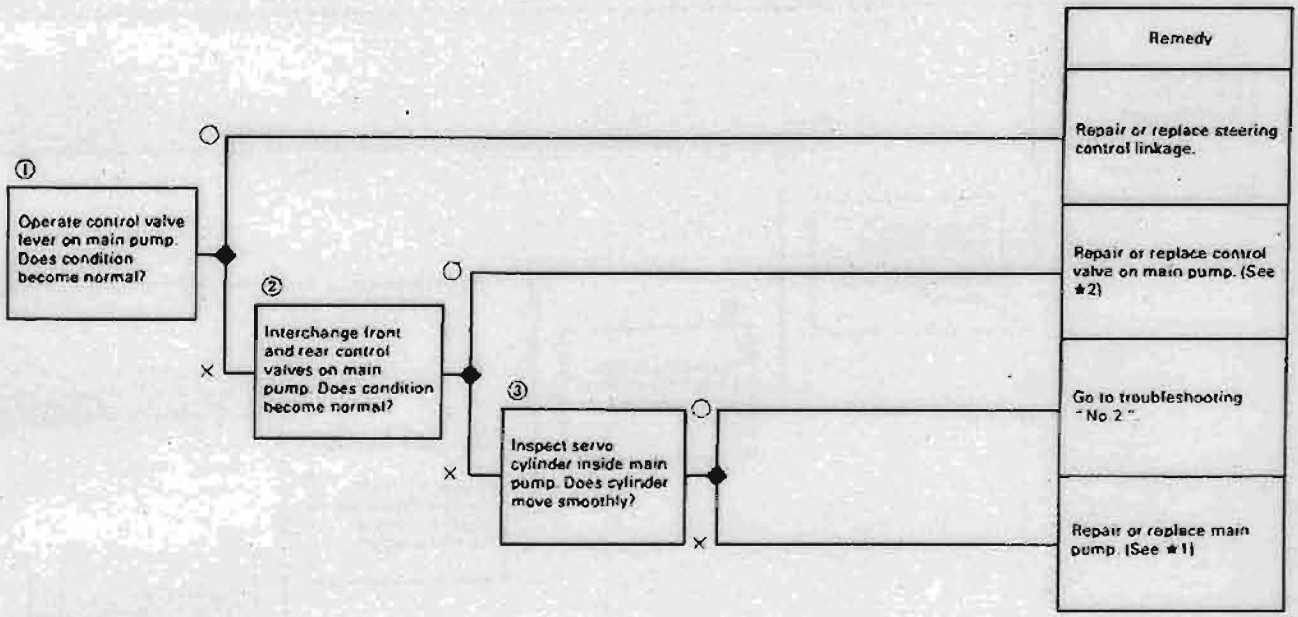
## 4. Left (right) travel motor does not move at all.

**Ask the operator the following points.**

- Did the motor suddenly stop moving? Yes = Component seized or broken
- Was there any abnormal noise when the motor stoppped moving? (From what area?) Yes = Component broken.

**Checks before troubleshooting**

- Is oil level in hydraulic tank correct?
- Is there interference or disconnection of steering control linkage?
- Is there damage or leakage from piping between main pump and travel motor?
- Is there damage or leakage from parking brake piping?




★1: When replacing the main pump, tighten the mounting nut of the center coupling securely.

Mounting nut: 20 – 24 kgm (MST-600 – MST-1500)
51 – 59 kgm (MST-2000)

★2: When checking or replacing any valve, always check that there is no dirt or dust caught in it.

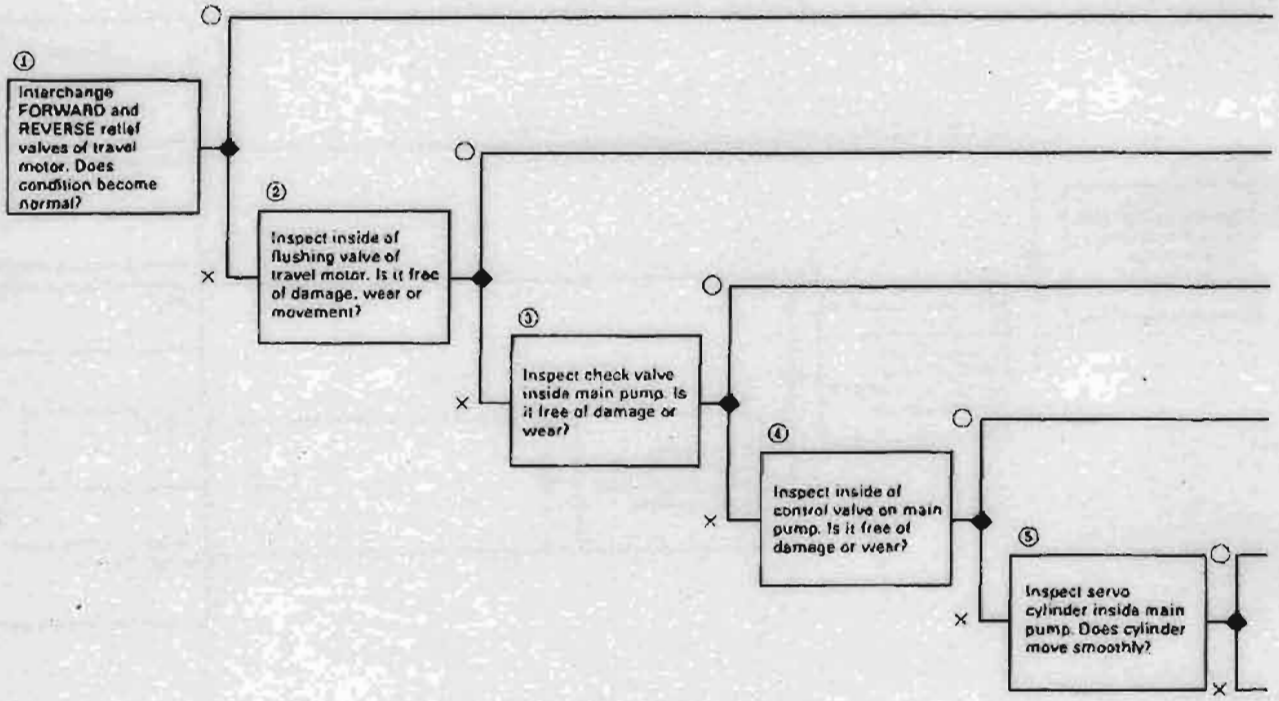
## 5. Left (right) travel motor does not move in forward (reverse) direction.

**Ask the operator the following points.**

- Did the motor suddenly stop moving? Yes = Component seized or broken
- Was there any abnormal noise when the motor stoppped moving? (From what area?) Yes = Component broken.

**Checks before troubleshooting**

- Is oil level in hydraulic tank correct?
- Is there interference or disconnection of steering control linkage?
- Is there damage or leakage from piping between main pump and travel motor?
- Is there damage or leakage from parking brake piping?



| | Remedy |
|---|---|
| | Repair or replace relief valve of travel motor. (See ★2) |
| | Repair or replace flushing valve inside travel motor. (See ★2) |
| | Repair or replace check valve inside main pump. (See ★2) |
| | Repair or replace control valve on main pump. (See ★2) |
| | Replace the travel motor, and if the condition does not return to normal, inspect the main pump. |
| | Replace the travel motor, and if the condition does not return to normal, inspect the main pump. |

★1: When replacing the main pump, tighten the mounting nut of the center coupling securely.

Mounting nut: 20 – 24 kgm (MST-600 – MST-1500)
51 – 59 kgm (MST-2000)

★2: When checking or replacing any valve, always check that there is no dirt or dust caught in it.

6. **When steering lever is set at neutral, steering does not return to neutral.**

7. **Machine travels only in forward (reverse) direction.**
   **(Does not go into neutral or travel in opposite direction.)**

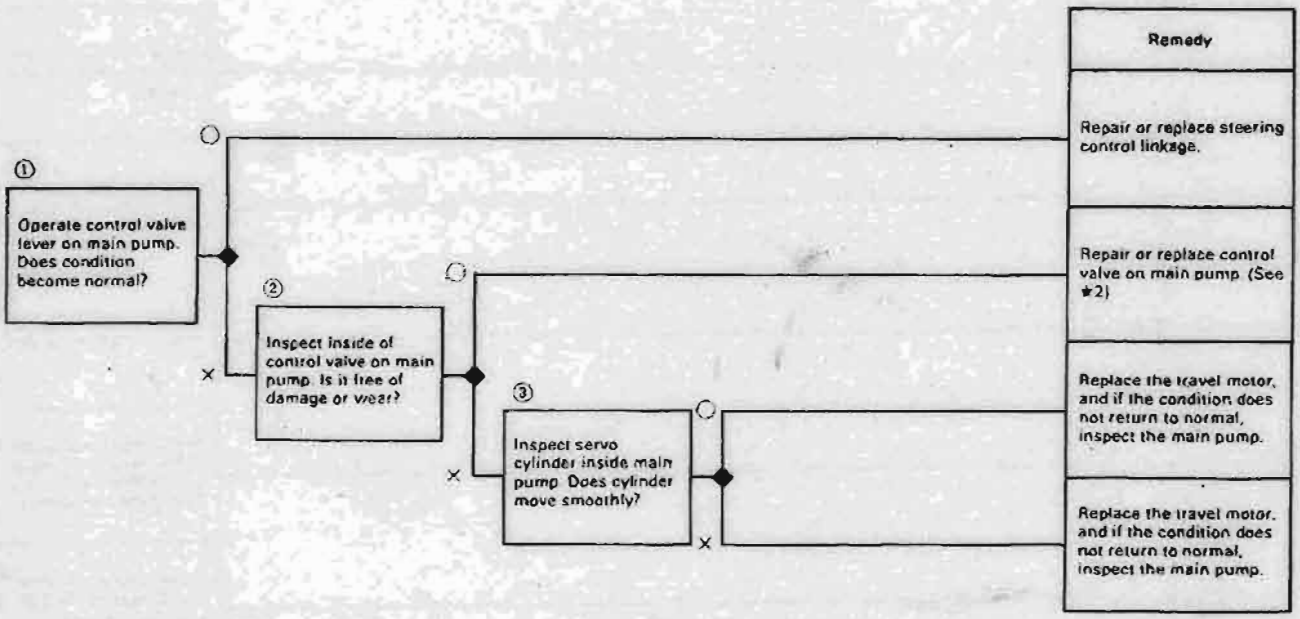
8. **Machine steers to one side, and does not travel in a straight line.**

**Ask the operator the following points.**

- Did the problem appear suddenly? Yes = Component seized or broken
- Was there any abnormal noise when the problem appeared? (From what area?) Yes = Component broken.

**Checks before troubleshooting**

- Is oil level in hydraulic tank correct?
- Is there interference or disconnection of steering control linkage?
- Is there damage or leakage from piping between main pump and travel motor?




★1: When replacing the main pump, tighten the mounting nut of the center coupling securely.

kgm Mounting nut: 20 – 24 kgm (MST-600 – MST-1500)
51 – 59 kgm (MST-2000)

★2: When checking or replacing any valve, always check that there is no dirt or dust caught in it.

## 9. Engine stops.

★ This is frequently caused by problems with the engine.

**Ask the operator the following points.**

- Did the engine suddenly stop? Yes = Component seized or broken
- Was there any abnormal noise when the engine stopped? (From what area?) Yes = Component broken.
- Check nature of operation (amount of load), jobsite conditions. Is machine being overloaded?

**Checks before troubleshooting**

- Is oil level in hydraulic tank correct?
- Is there interference or disconnection of engine control linkage?
- Is there damage or leakage from parking brake piping?
- Is the parking brake applied?

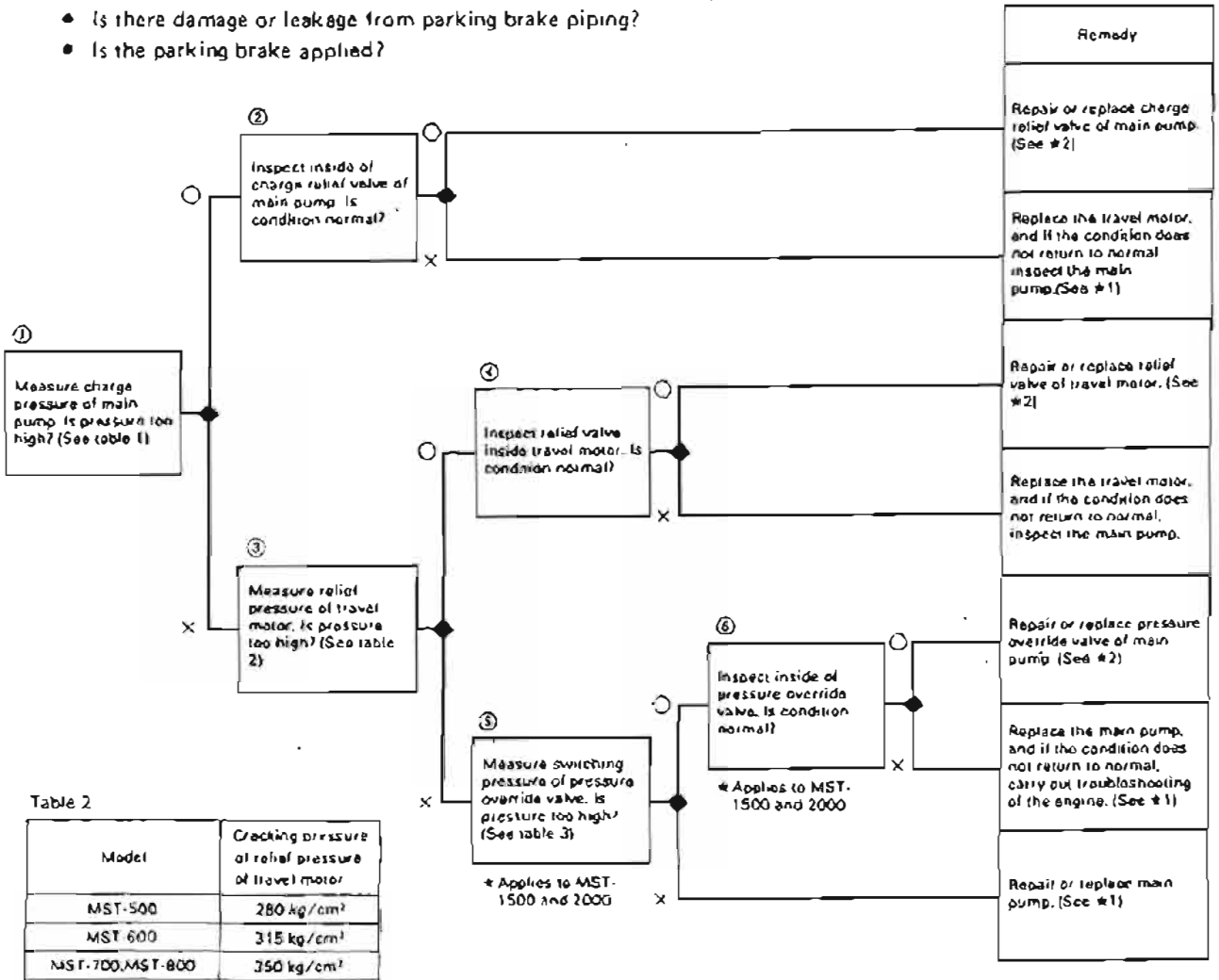



Table 2

| Model | Cracking pressure of relief pressure of travel motor |
|---|---|
| MST-500 | 280 kg/cm² |
| MST-600 | 315 kg/cm² |
| MST-700,MST-800 | 350 kg/cm² |
| MST-1100 | 385 kg/cm² |
| MST-1500 (#15001—15164) | 385 kg/cm² |
| MST-1500 (#15165— ) | 350 kg/cm² |
| MST-2000 (#K20101—20125, 20128) (#M02101—02104) | 385 kg/cm² |
| MST-2000 (#K20127, 20129— ) (#M02105— ) | 350 kg/cm² |
| MST-2200 | 325 kg/cm² |
| MST-2500 | 350 kg/cm² |

Table 1

| Model | | Charge pressure of main pump (Engine at 1000 rpm) |
|---|---|---|
| MST-500 | | 20 kg/cm² |
| MST-600 — MST-2000 | Neutral | 13 — 14 kg/cm² |
| | On load | 11 — 13 kg/cm² |
| MST-2200, 2500 | | 25 kg/cm² |

Table 3

| Model | Cracking pressure of pressure override valve |
|---|---|
| MST-1500 (#15094—15164) | 370 kg/cm² |
| MST-1500 (#15165— ) | 350 kg/cm² |
| MST-2000 (#K20101—20126, 20128) (#M02101—02104) | 370 kg/cm² |
| MST-2000 (#K20127, 20129— ) (#M02105— ) | 350 kg/cm² |

★1: When replacing the main pump, tighten the mounting nut of the center coupling securely.

Mounting nut: 20 – 24 kgm (MST-600 – MST-1500)
51 – 59 kgm (MST-2000)

★2: When checking or replacing any valve, always check that there is no dirt or dust caught in it.

## 10. Machine lacks power.

★ This is frequently caused by problems with the engine.

**Ask the operator the following points.**

- Did the problem appear suddenly? Yes = Component seized or broken
- Was there any abnormal noise when the problem appeared? (From what area?) Yes = Component broken.
- Check nature of operation (amount of load), jobsite conditions. Is machine being overloaded?

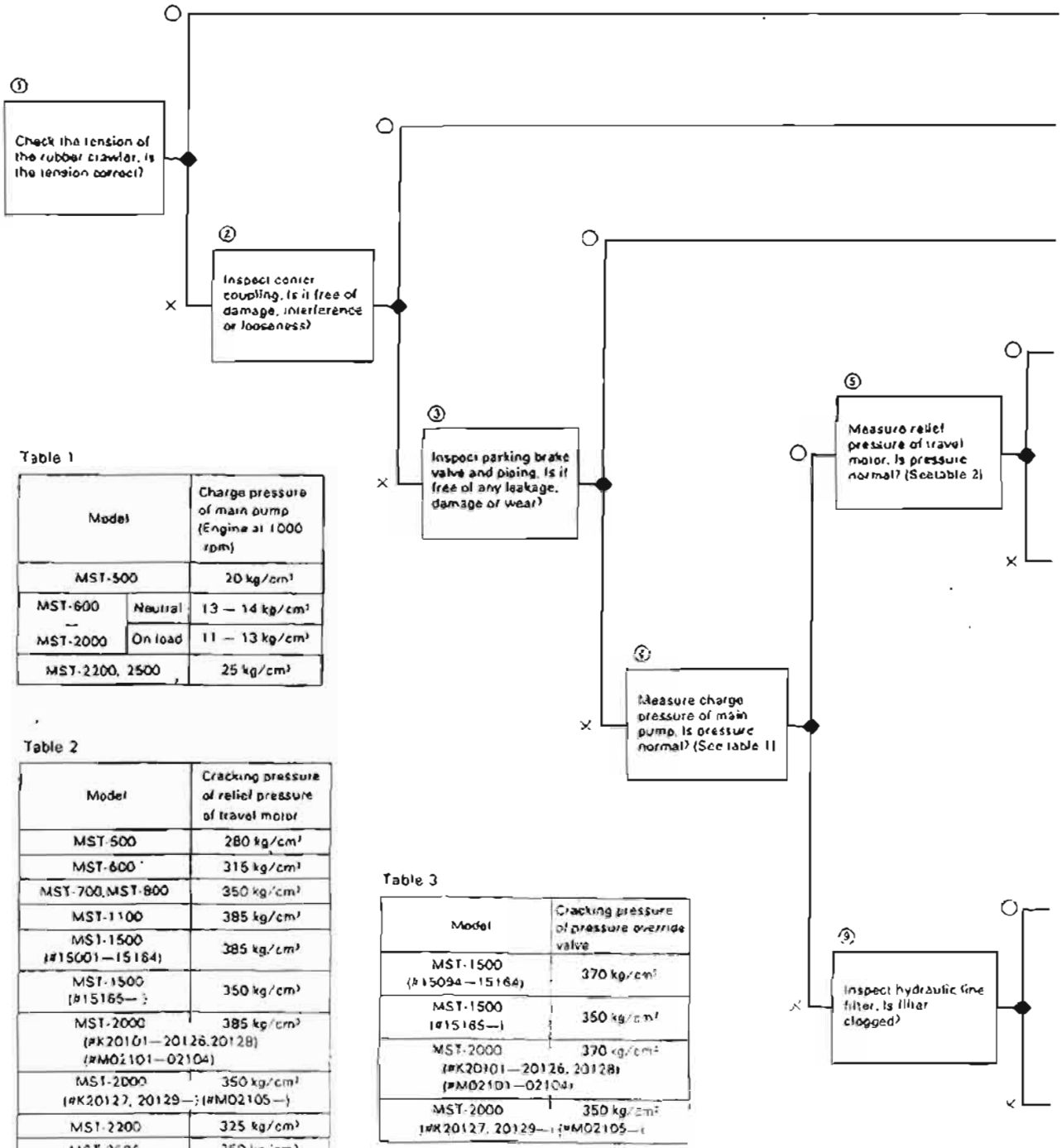



Table 1

| Model | | Charge pressure of main pump (Engine at 1000 rpm) |
|---|---|---|
| MST-500 | | 20 kg/cm² |
| MST-600 | Neutral | 13 — 14 kg/cm² |
| — MST-2000 | On load | 11 — 13 kg/cm² |
| MST-2200, 2500 | | 25 kg/cm² |

Table 2

| Model | Cracking pressure of relief pressure of travel motor |
|---|---|
| MST-500 | 280 kg/cm² |
| MST-600 | 315 kg/cm² |
| MST-700, MST-800 | 350 kg/cm² |
| MST-1100 | 385 kg/cm² |
| MST-1500 (#15001—15184) | 385 kg/cm² |
| MST-1500 (#15185— ) | 350 kg/cm² |
| MST-2000 (#K20101—20126, 20128) (#M02101—02104) | 385 kg/cm² |
| MST-2000 (#K20127, 20129— ) (#M02105— ) | 350 kg/cm² |
| MST-2200 | 325 kg/cm² |
| MST-2500 | 350 kg/cm² |

Table 3

| Model | Cracking pressure of pressure override valve |
|---|---|
| MST-1500 (#15094—15184) | 370 kg/cm² |
| MST-1500 (#15185— ) | 350 kg/cm² |
| MST-2000 (#K20101—20126, 20128) (#M02101—02104) | 370 kg/cm² |
| MST-2000 (#K20127, 20129— ) (#M02105— ) | 350 kg/cm² |

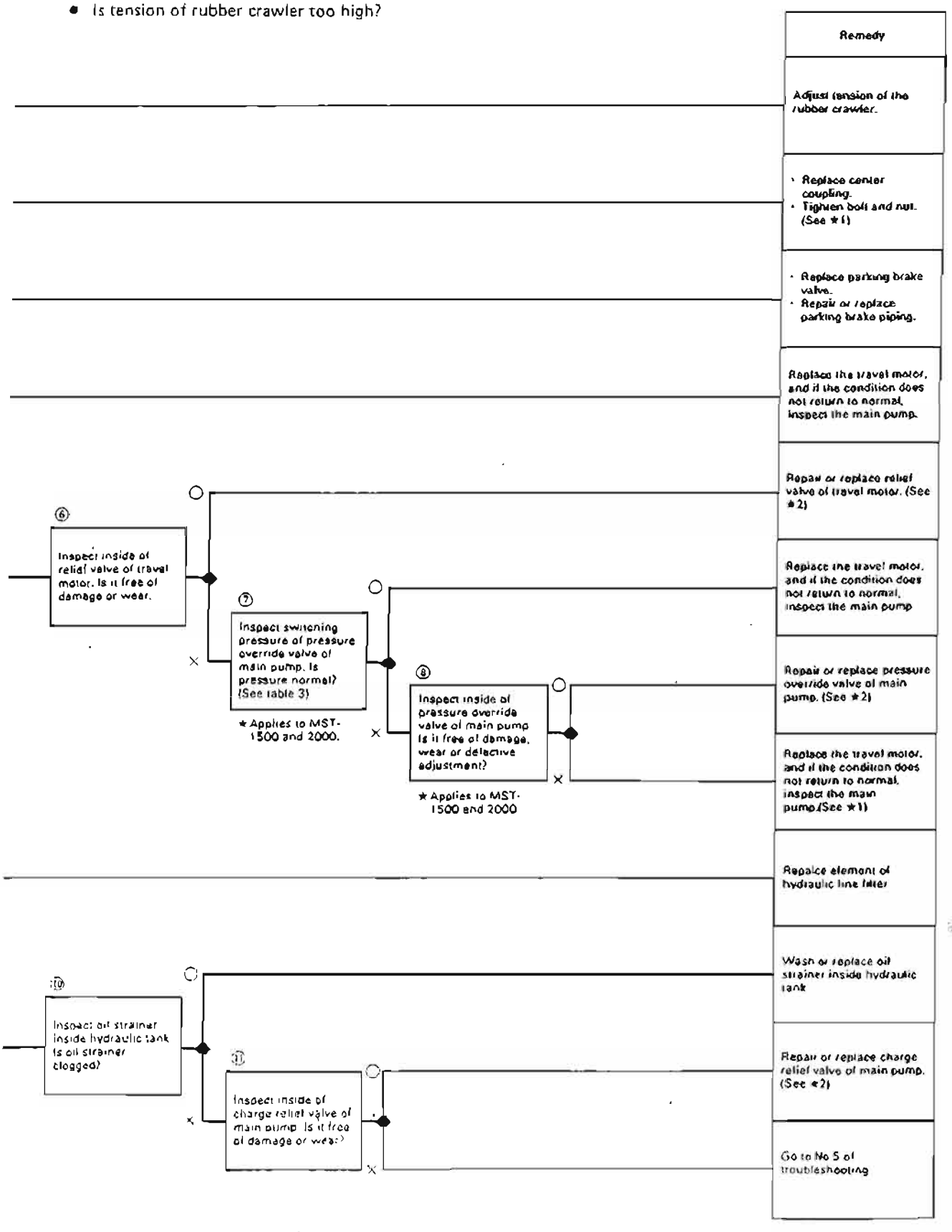
*1. When replacing the main pump, tighten the mounting nut of the center coupling securely.

Mounting nut: 20 – 24 kgm (MST-600 – MST-1500)
51 – 59 kgm (MST-2000)

*2: When checking or replacing any valve, always check that there is no dirt or dust caught in it.

Checks before troubleshooting

- Is oil level in hydraulic tank correct?
- Is there interference or disconnection of steering control linkage?
- Is there damage or leakage from hydraulic piping?
- Is there damage or leakage from parking brake piping?
- Is the parking brake applied?
- Is tension of rubber crawler too high?



11. Machine sometimes does not move.

12. When traveling at low speed, the machine jerks.

Ask the operator the following points.

- Check nature of operation (amount of load), jobsite conditions. Is machine being overloaded?

Checks before troubleshooting

- Is oil level in hydraulic tank correct?
- Is there interference or disconnection of steering control linkage?
- Is there damage or leakage from parking brake piping?
- Is the parking brake applied?
- Is there damage or linkage from piping between main pump and travel motor?

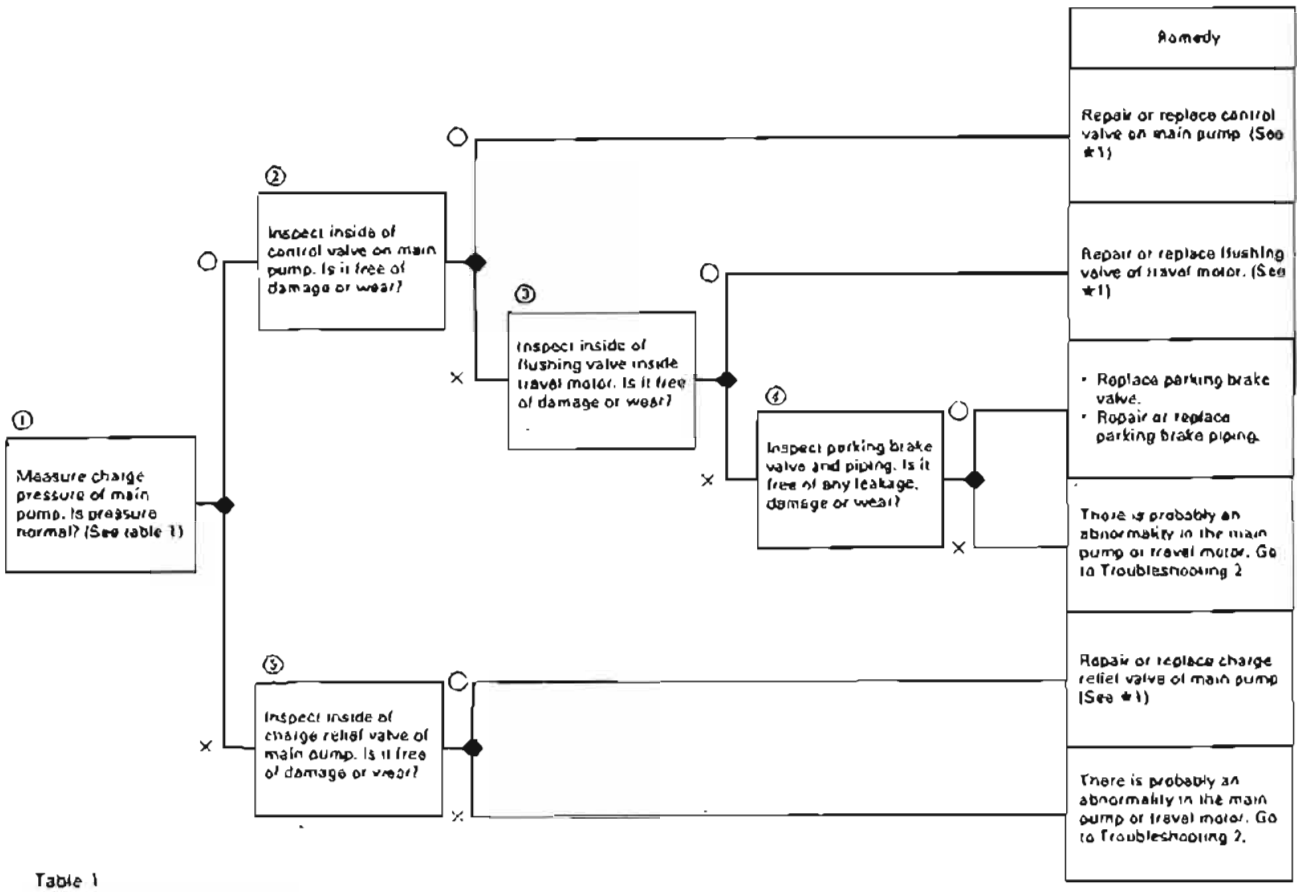



Table 1

| Model | | Charge pressure of main pump (Engine at 1000 rpm) |
|---|---|---|
| MST-500 | | 20 kg/cm² |
| MST-600 — MST-2000 | Neutral | 13 — 14 kg/cm² |
| | On load | 11 — 13 kg/cm² |
| MST-2200, 2500 | | 25 kg/cm² |

*1: When checking or replacing any valve, always check that there is no dirt or dust caught in it.

## 13. Response of steering lever is poor.

## 14. Operating force for steering lever is abnormally heavy.

**Ask the operator the following points.**

- Did the response suddenly become poor? Yes = Component seized or broken
- Did the operating force suddenly become heavy? Yes = Component seized or broken
- Was there any abnormal noise when the problem occurred? (From what area?) Yes = Component broken.

**Checks before troubleshooting**

- Is oil level in hydraulic tank correct?
- Is there interference or disconnection of steering control linkage?
- Is there damage or leakage from parking brake piping?

**Checking for abnormalities**

- Operate the steering lever and see the actual condition to judge how serious the problem is.

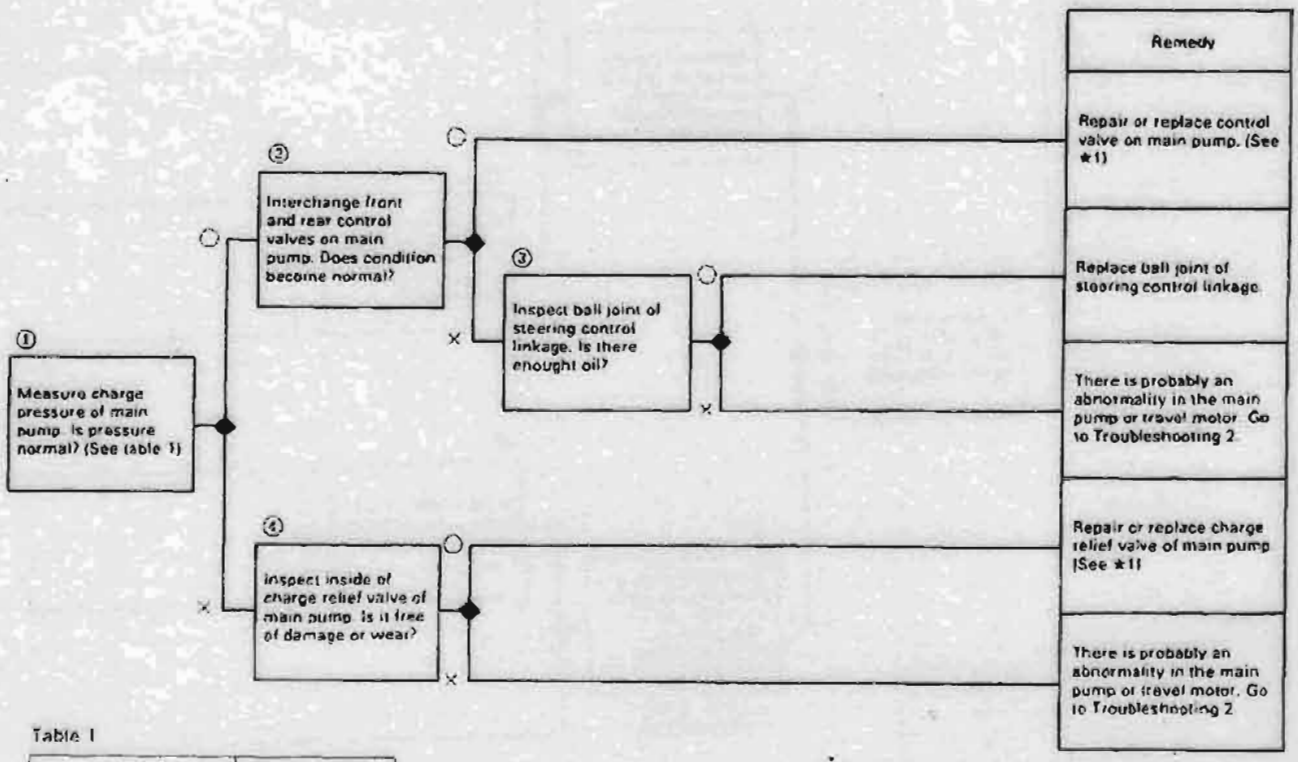



Table 1

| Model | | Charge pressure of main pump (Engine at 1000 rpm) |
|---|---|---|
| MST-500 | | 20 kg/cm² |
| MST-600 | Neutral | 13 — 14 kg/cm² |
| — | | |
| MST-2000 | On load | 11 — 13 kg/cm² |
| MST-2200, 2500 | | 25 kg/cm² |

★1: When checking or replacing any valve, always check that there is no dirt or dust caught in it.

## 15. Hydraulic oil overheats.

**Ask the operator the following points.**

- Check nature of operation (amount of load), jobsite conditions. Is machine being overloaded?

**Checks before troubleshooting**

- Is oil level in hydraulic tank correct?
- Is the fan belt tension correct?

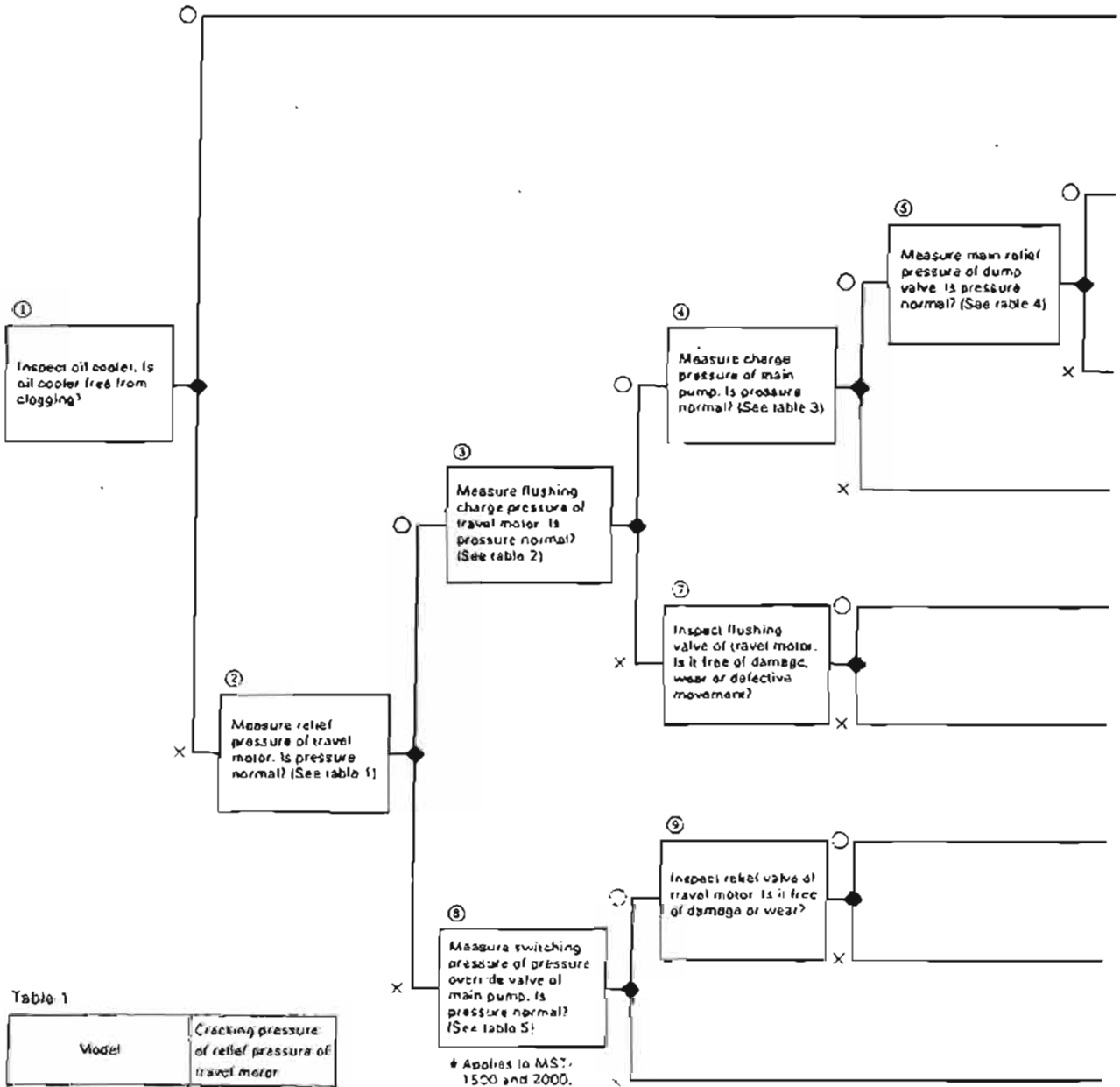



Table 1

| Model | Cracking pressure of relief pressure of travel motor |
|---|---|
| MST-500 | 280 kg/cm² |
| MST-600 | 315 kg/cm² |
| MST-700, MST-800 | 350 kg/cm² |
| MST-1100 | 385 kg/cm² |
| MST-1500 (#15001—15164) | 385 kg/cm² |
| MST-1500 (#15165—) | 350 kg/cm² |
| MST-2000 (#K20101—20126, 20128) (#M02101—02104) | 385 kg/cm² |
| MST-2000 (#K20127, 20129—) (#M02105—) | 350 kg/cm² |
| MST-2200 | 325 kg/cm² |
| MST-2500 | 350 kg/cm² |

Table 2

| Model | Cracking pressure of travel motor flushing charge |
|---|---|
| All models | 12—13 kg/cm² |

Table 3

| Model | | Charge pressure of main pump (Engine at 1000 rpm) |
|---|---|---|
| MST-500 | | 30 kg/cm² |
| MST-600 | Neutral | 13 — 14 kg/cm² |
| MST-2000 | On load | 11 — 13 kg/cm² |
| MST-2200, 2500 | | 25 kg/cm² |

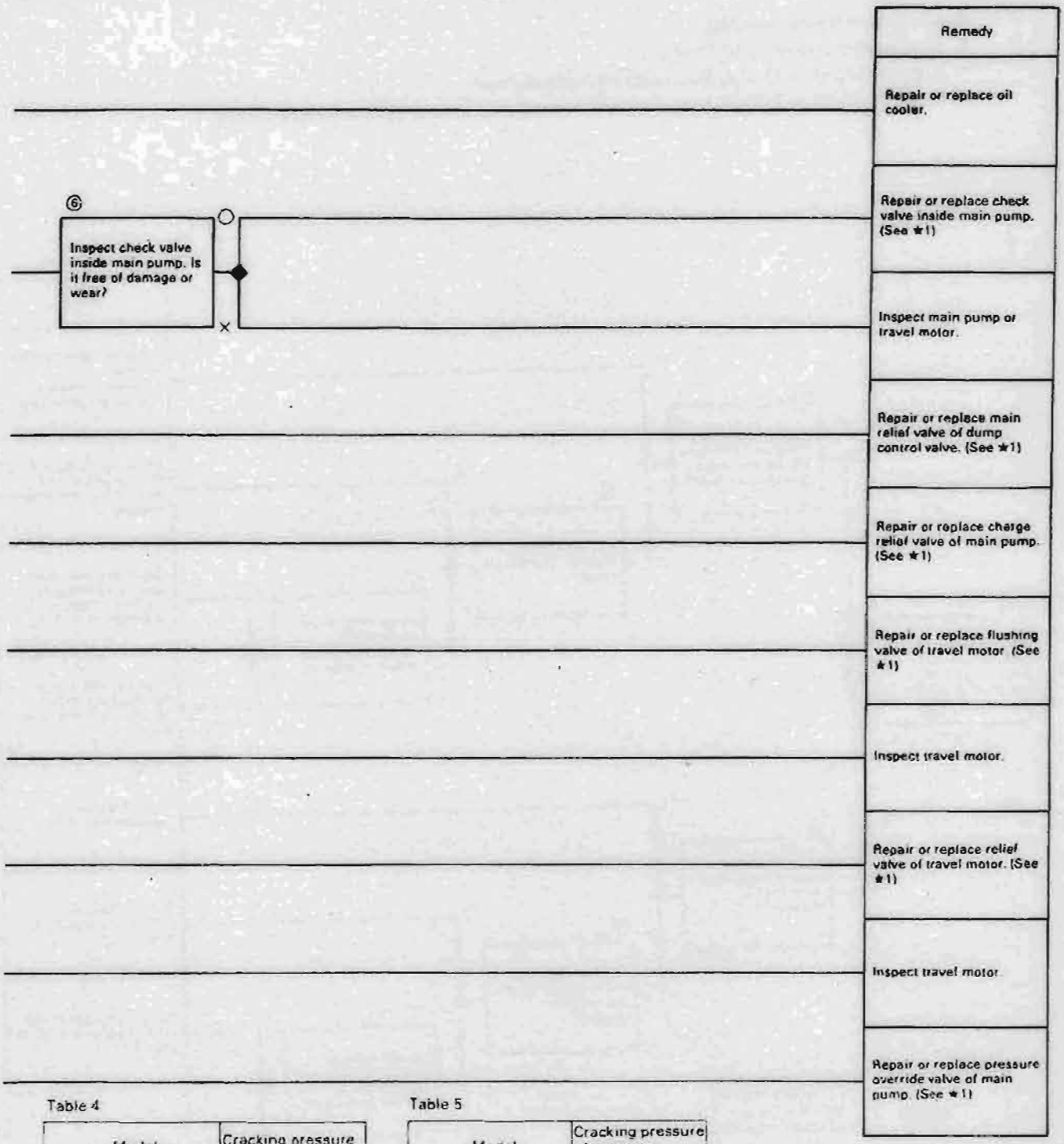



Table 4

| Model | Cracking pressure of main relief valve |
|---|---|
| MST-500—MST-700 | 175 kg/cm² |
| MST-800—MST-2500 | 165 kg/cm² |

Table 5

| Model | Cracking pressure of pressure override valve |
|---|---|
| MST-1500 (#15094—15164) | 370 kg/cm² |
| MST-1500 (#15165—) | 350 kg/cm² |
| MST-2000 (#K20101—20126, 20128) (#M02101—02104) | 370 kg/cm² |
| MST-2000 (#K20127, 20129—) (#M02105—) | 350 kg/cm² |

★1: When checking or replacing any valve, always check that there is no dirt or dust caught in it.

## 16. Parking brake cannot be released.

Ask the operator the following points.

- Did the problem appear suddenly? Yes = Component seized or broken
- Was there any abnormal noise when the problem appeared? (From what area?) Yes = Component broken.

Checks before troubleshooting

- Is oil level in hydraulic tank correct?
- Is there damage or leakage frompparking brake piping?
- Is there damage or leakage from piping between dump control valve and main pump?

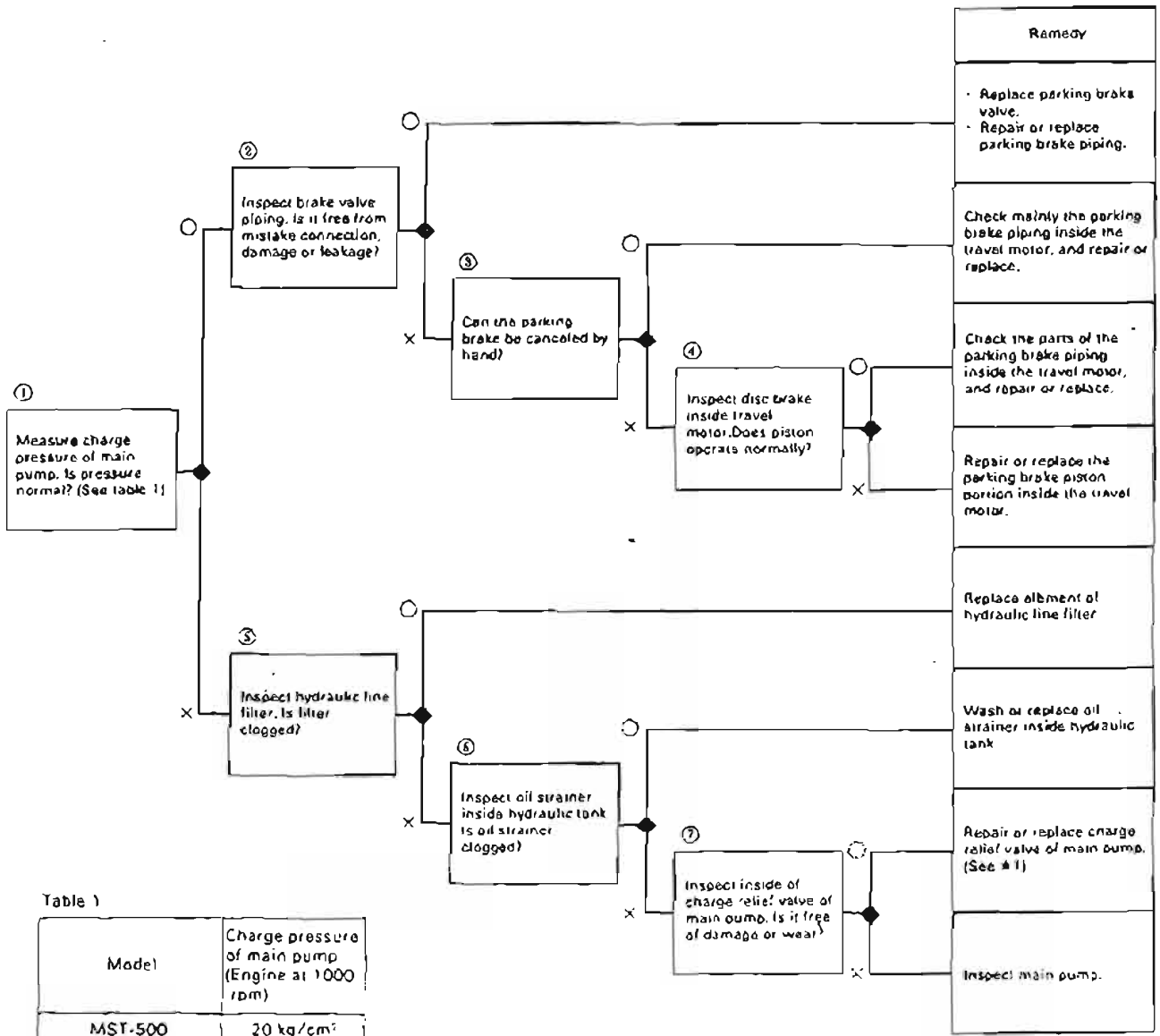



Table 1

| Model | | Charge pressure of main pump (Engine at 1000 rpm) |
|---|---|---|
| MST-500 | | 20 kg/cm² |
| MST-600 | Neutral | 13 — 14 kg/cm² |
| MST 2000 | On load | 11 — 13 kg/cm² |
| MST-2200, 2500 | | 25 kg/cm² |

*1: When checking or replacing any valve, always check that there is no dirt or dust caught in it.

## 17. Parking brake does not take effect.

**Ask the operator the following points.**

- Did the problem appear suddenly? Yes = Component seized or broken
- Was there any abnormal noise when the problem appeared? (From what area?) Yes = Component broken.

**Checks before troubleshooting**

- Is oil level in hydraulic tank correct?
- Is the parking brake piping incorrectly connected?

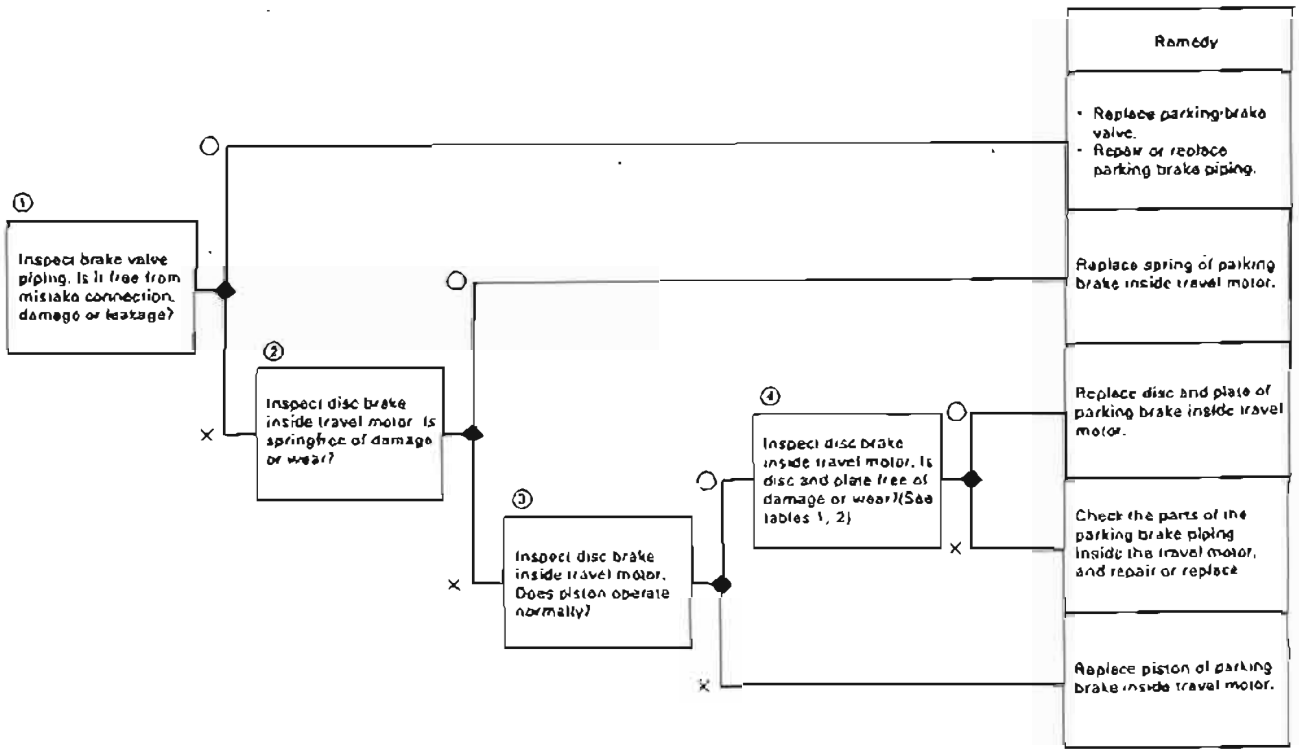



Table 1. ★ Applied to MST-600, 700, 800, 1100, 1500 and 2000

- The thickness of a new brake disc of the MST-600 to 2000 is 1.7 mm, and that of a plate is 1.4 mm.

| | Number of discs | Number of plates | Total thickness | Tolerance | Service limit |
|---|---|---|---|---|---|
| MST-600 | 6 | 7 | 20.3 | −0.5 to 1.0 | −1.9 |
| MST-700 – 1500 | 8 | 9 | 26.2 | −0.5 to 1.0 | −2.3 |
| MST-2000 | 11 | 12 | 35.5 | −0.5 to 1.0 | −3.0 |
| | | | | | |

Table 2. ★ Applied to MST-2200 and 2500.

- For the MST-2200 and 2500, the brake plate is a plate type, so judge it as an individual part.

| | Number used | Standard thickness (each) | Repair limit (each) |
|---|---|---|---|
| Disc | 8 | 2.6 mm | 2.4 mm |
| Plate | 9 | 1.2 mm | 1.1 mm |

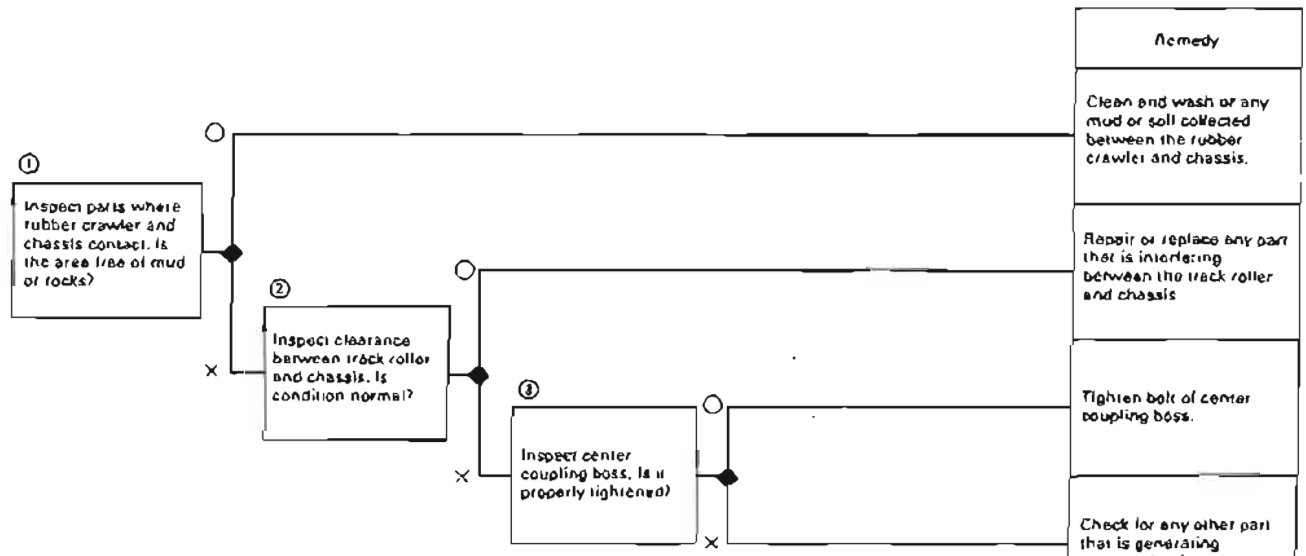
★ Even if the brake disc and plate are within the standard values given below, replace them if there is uneven wear, damage, or discoloration.

## 18. Abnormal noise generated.

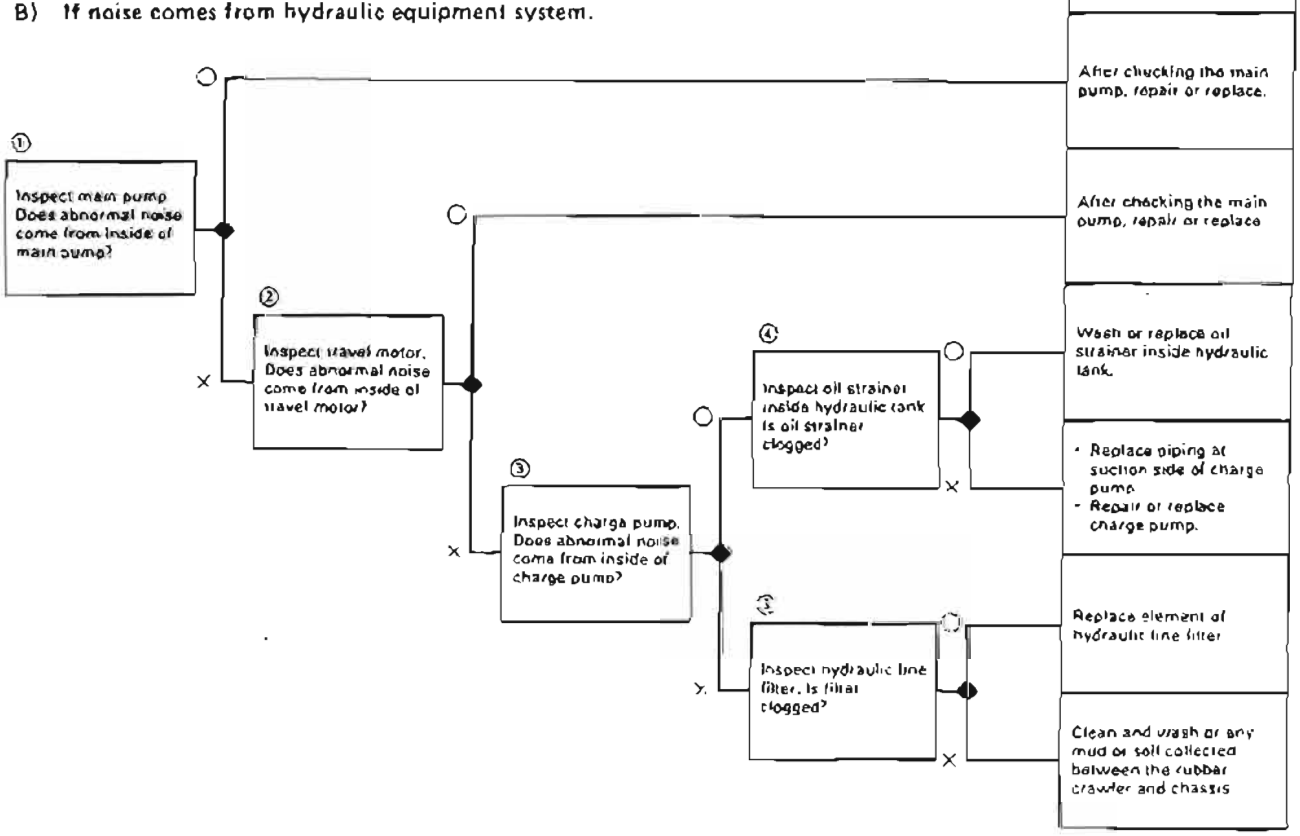
Ask the operator the following points.

- Where does the abnormal noise come from? What kind of noise is it?
- Did the abnormal noise suddenly start? Yes = Component broken or fallen out.
- ★ Carry out the troubleshooting from the area where the operator said he heard abnormal noise.

**A) If the sound was like two parts twisting against each other.**



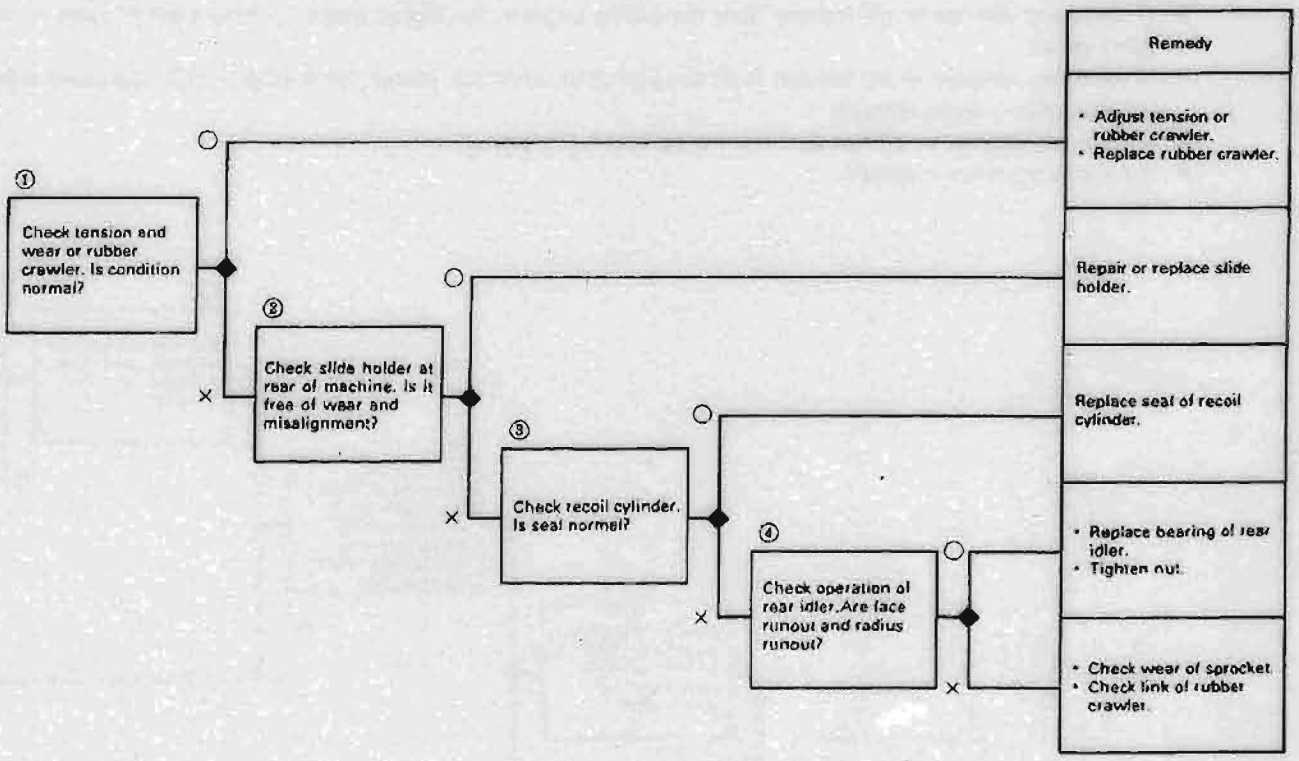

**B) If noise comes from hydraulic equipment system.**



## 21. Rubber crawler often comes off.

**Ask the operator the following points.**

- Check nature of operation (amount of load), jobsite conditions. Is the method of operation correct?



## 19. Hydraulic hose vibrates.

★ The cause is air in the hydraulic oil.

**Checks before troubleshooting**

- Is the oil level in the hydraulic tank correct?
- Is there damage or leakage from each piping?

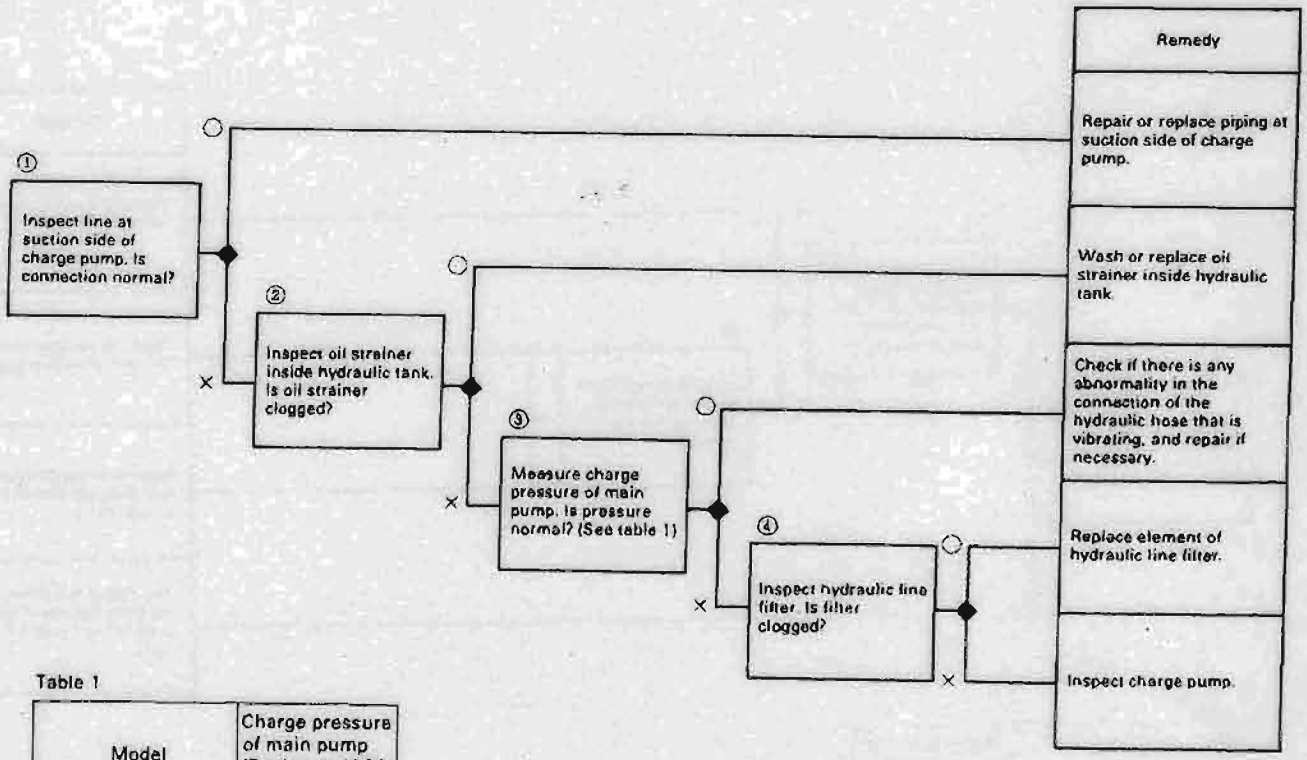



Table 1

| Model | | Charge pressure of main pump (Engine at 1000 rpm) |
|---|---|---|
| MST-500 | | 20 kg/cm² |
| MST-600 — MST-2000 | Neutral | 13 — 14 kg/cm² |
| | On load | 11 — 13 kg/cm² |
| MST-2200, 2500 | | 25 kg/cm² |

## 20. Hydraulic charge lamp in operator's compartment lights up.

**Checks before troubleshooting**

- Is oil level in hydraulic tank correct?
- Is there damage or leakage from piping between hydraulic tank and charge pump?
- Is there damage or leakage from piping between charge pump – dump control valve – main pump charge port?

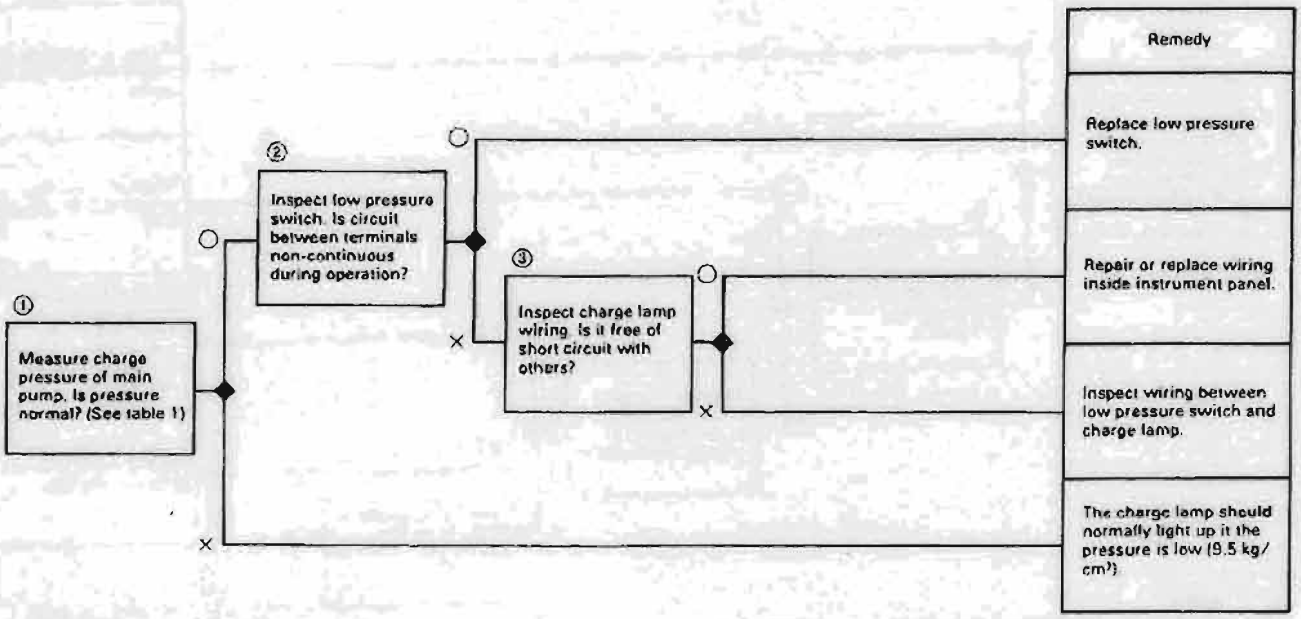



Table 1

| Model | | Charge pressure of main pump (Engine at 1000 rpm) |
|---|---|---|
| MST-500 | | 20 kg/cm² |
| MST-600 — MST-2000 | Neutral | 13 — 14 kg/cm² |
| | On load | 11 — 13 kg/cm² |
| MST-2200, 2500 | | 25 kg/cm² |

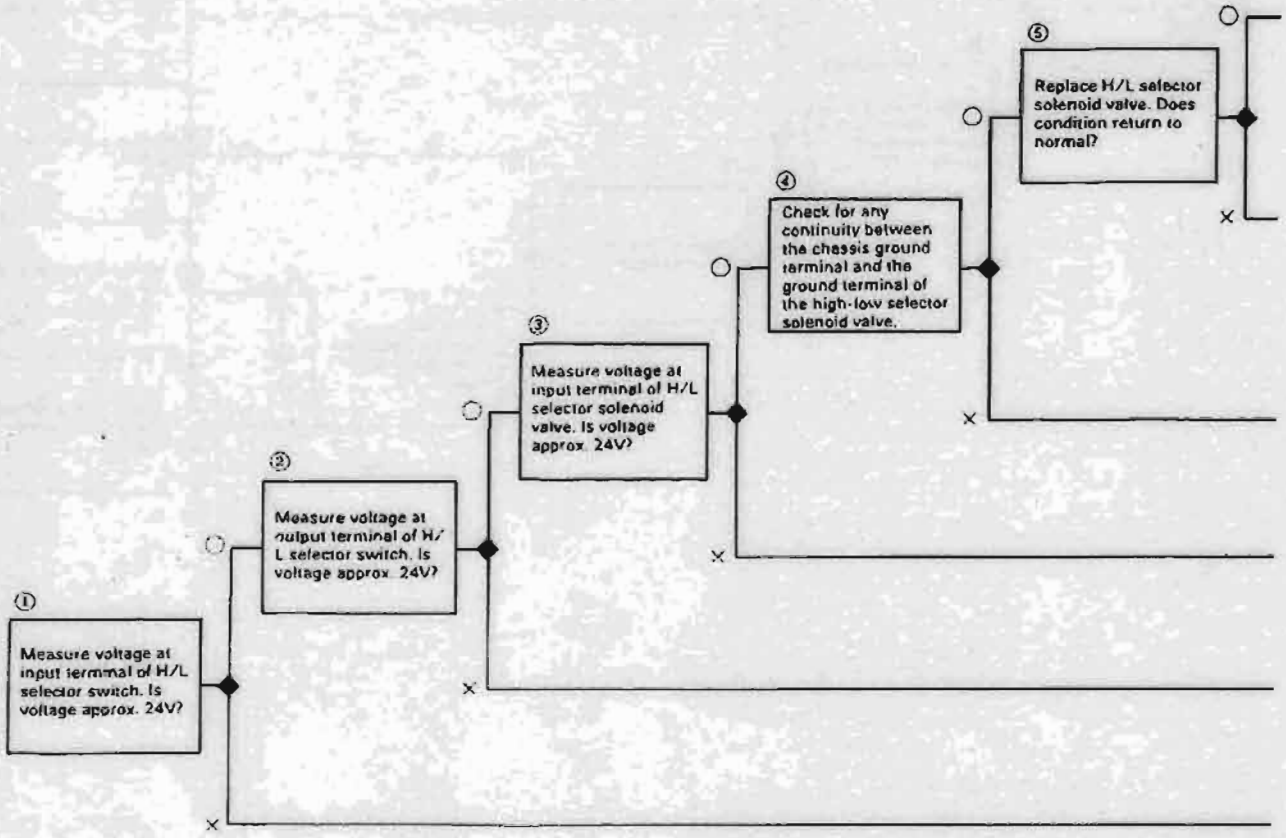
## 22. Even when the low/high speed selector switch is set to HIGH, speed does not change. [Applies to MST-2500]

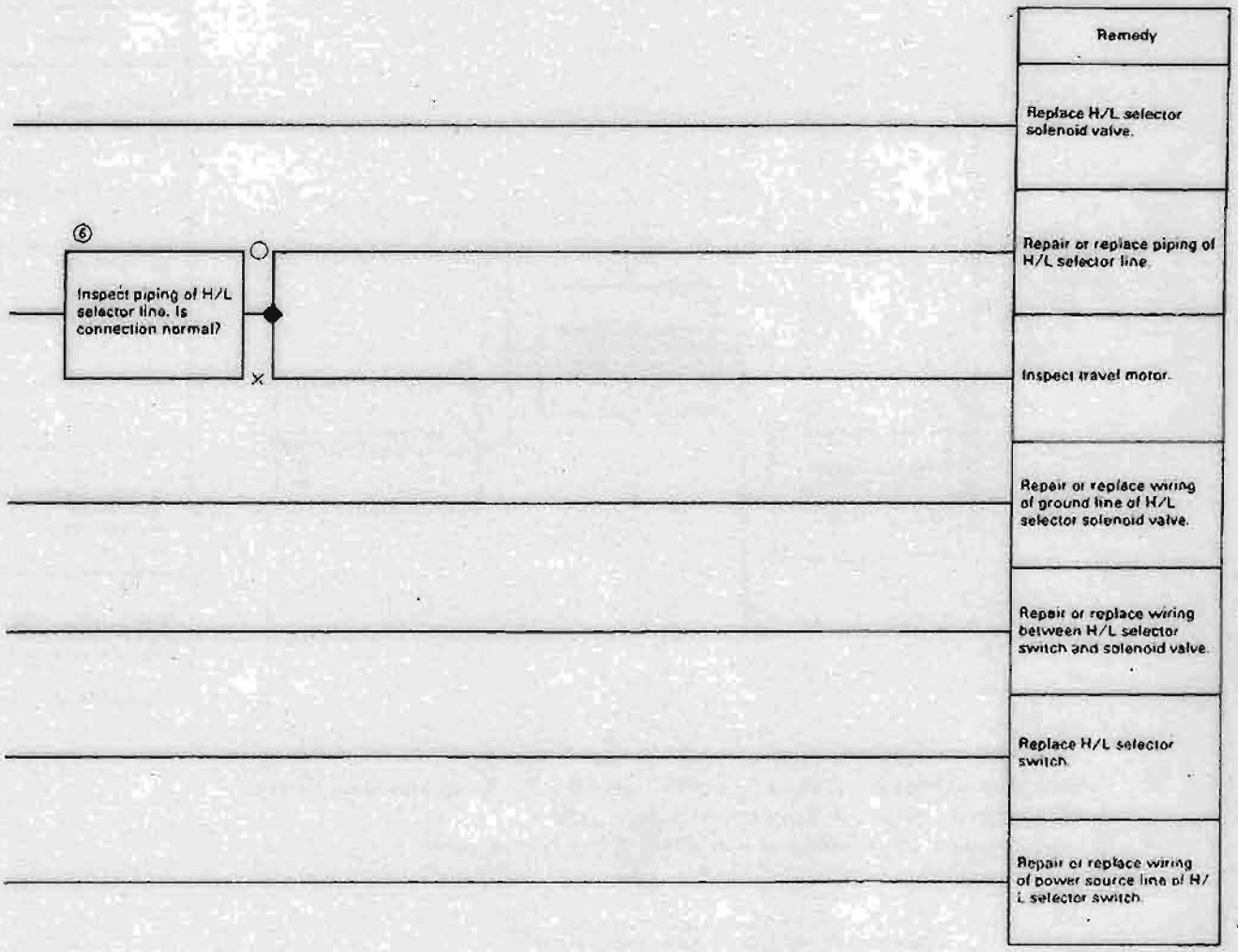
**Ask the operator the following points.**

- Did the problem suddenly occur? Yes = Seized or damaged equipment
- Was there any abnormal noise when this happened (from which area)? Yes = Broken equipment

**Checks before troubleshooting**

- Is the oil level in the hydraulic tank correct?
- Is the battery properly charged?
- Is there any damage or oil leakage from the piping between the hydraulic tank and charge pump?
- Is there any damage or oil leakage from the piping between the charge pump – dump control valve – charge relief valve?
- Is there any damage or oil leakage from the piping between the charge relief valve – high/low speed solenoid selector valve – travel motor?
- Is there any damage or oil leakage from the parking brake piping?
- Is the parking brake applied?




Remedy
Replace H/L selector solenoid valve.
⑥
Inspect piping of H/L selector line. Is connection normal?
○
×
Repair or replace piping of H/L selector line.
Inspect travel motor.
Repair or replace wiring of ground line of H/L selector solenoid valve.
Repair or replace wiring between H/L selector switch and solenoid valve.
Replace H/L selector switch.
Repair or replace wiring of power source line of H/L selector switch.

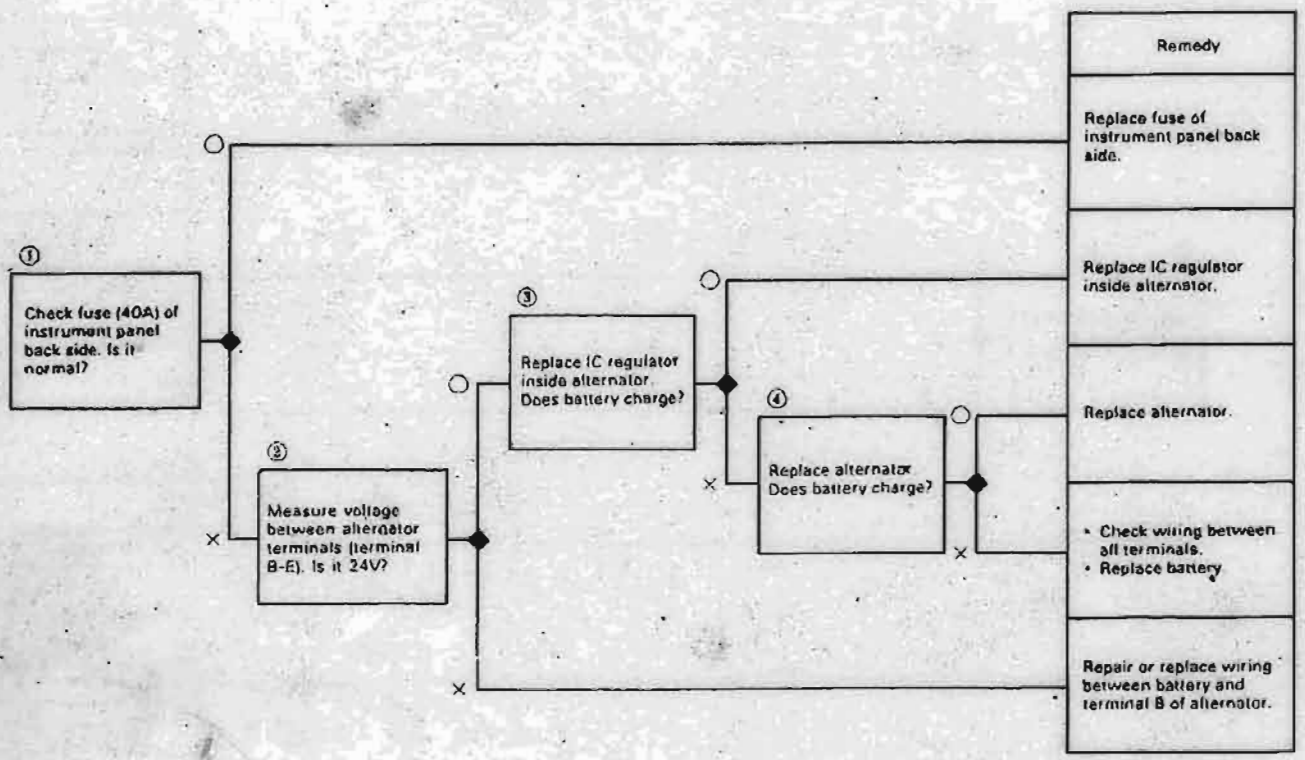
## 23. Battery does not charge.

**Ask the operator the following points.**

- Did the battery suddenly stop charging? Yes = Alternator broken, disconnection

**Checks before troubleshooting**

- Is there any disconnection in fuse (40A) of instrument panel back side?
- Is there any disconnection in wiring between battery, starting switch, alternator, ammeter?
- Is level, specific gravity of electrolyte in battery correct? Is voltage correct (20 – 30V)? Is battery broken?
- Is tension of alternator V-belt insufficient?




★1: The location of the control panel fuse differs according to the machine serial number.

- Old location: Fuse E at front face of control panel
- New location: Inside wiring harness at rear face of control panel

| | Old location serial No. | New location serial No. |
|---|---|---|
| MST-500 | 50101—50132 | 50133— |
| MST-600 | 1601—1994 | 1995— |
| MST-700 | 70101—70278 | 70279— |
| MST-800 | 866—1346 | 1347— |
| MST-1100 | 11101—11271 | 11272— |
| MST-1500 | 15009—15060 | 15061— |
| MST-2000 | 20101—20159 | 20160— |
| MST-2500 | — | 25134— |

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