



SERVICE MANUAL

This Manual has been prepared for and is considered part of -

TMS500E Preliminary

Crane Model Number

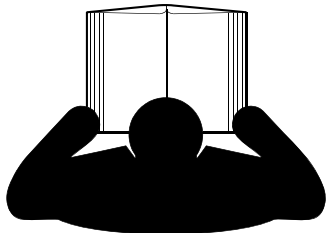
This Manual is Divided into the following Sections:

SECTION 1	INTRODUCTION
SECTION 2	HYDRAULIC SYSTEM
SECTION 3	ELECTRIC SYSTEM
SECTION 4	BOOM
SECTION 5	HOISTS
SECTION 6	SWING
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SECTION 8	UNDERCARRIAGE
SECTION 9	LUBRICATION

NOTICE

The crane serial number is the only method your distributor or the factory has of providing you with correct parts and service information.

The crane serial number is identified on the builder's decal attached to the operator's cab. *Always furnish crane serial number* when ordering parts or communicating service problems with your distributor or the factory.



WARNING

TO PREVENT DEATH OR SERIOUS INJURY:

- Avoid unsafe operation and maintenance.
- This crane must be operated and maintained by trained and experienced personnel. Manitowoc is not responsible for qualifying these personnel.
- Do not operate or work on this crane without first reading and understanding Operator's Manual and Rating Plate supplied with crane.
- Store Operator's Manual in holder provided on crane.
- Attach laminated Capacity Charts supplied with crane to chain in operator's cab.
- If Operator's Manual or Capacity Charts are missing from cab, contact your distributor for new ones.

SECTION 1 INTRODUCTION

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DIRECTIONAL CONTROL VALVES

Description

The directional control valves direct and control hydraulic oil flow from the pumps to the boom lift and telescope cylinders, each hoist motor, and the swing motor.

The swing directional control valve (Figure 2-11) and the boom/lift/telescope/hoist directional control valve (Figure 2-12) are located on the outside of the right superstructure side plate. Each valve bank is removed and installed as an assembly.

The boom lift/telescope/hoist directional control valve (Figure 2-12) is a sectional, hydraulic remote pilot actuated three position four way, pressure compensated, closed center directional valves. The inlet section contains a pump unloading valve and load sense relief valve set at 24132 kPa/241.3 bar (3500 psi) protecting the main and auxiliary hoist and boom lift sections. The unloading valve has a 2069 kPa/21 bar (300 psi) standby or pump margin pressure setting. The boom lift retract has a thermal relief set at 25500 kPa/255 bar (3700 psi). The telescope section has port relief's set at 20690 kPa/207 bar (3000 psi) for extend and 18621 kPa/186 bar (2700 psi) for retract. All working sections have a two position two way solenoid LMI lockout valve in each pilot end cap.

The swing valve is a sectional, hydraulic remote pilot actuated three position four way open center directional control valve. The inlet section has a 12066 kPa/120.6 bar (1750 psi) relief valve. Both working sections have anti void check valves to provide make-up oil to the swing motor for motor over-run when the valve is centered.

Maintenance

Swing Valve Bank Removal

1. Tag and disconnect the hydraulic lines from the valves. Cap or plug the lines and ports.
2. Remove the screws and washers securing the valve bank and remove the valve bank.

Swing Valve Bank Installation

1. Place the valve bank on the turntable upright and secure it with the screws and washers. Torque the screws 40.6 to 43.3 Nm (30 to 32 pounds-foot).
2. Connect the hydraulic lines to the valves as tagged during removal.

Hoist/Lift/Telescope Valve Bank Removal

1. Tag and disconnect the hydraulic lines from the valves. Cap or plug the lines and ports.
2. Tag and disconnect electrical connectors from the valve.
3. Remove the three bolts, flat washers, and lockwashers securing the valve bank and remove the valve bank.

Hoist/Level/Telescope Valve Bank Installation

1. Place the valve bank on the turntable upright and fasten it with the bolts, flat washers, and lockwashers. Torque the bolts 97.6 to 105.7 Nm (72 to 78 pounds-foot).
2. Connect the electrical connectors to the valve as tagged during removal.
3. Connect the hydraulic lines to the valves as tagged during removal.

Functional Check (All Valve Banks)

1. Start the engine and run it at normal speed.
2. Operate the control levers of the valve bank(s). Check for smooth operation of cylinders and motors.
3. Check the valve bank(s) and lines for leakage. Make repairs as needed.

Function Check - LMI Lockout Valves

1. Remove circuit breaker F11 from the circuit breaker panel in the superstructure cab. This cuts off power to the LMI.
2. Start the engine.
3. Try to telescope the boom out, lower the boom, hoist up the main hoist, and hoist the auxiliary hoist up (if installed). Verify none of these functions work.
4. Shut down the engine. Reinstall F11.
5. Telescope the boom out, lower the boom, hoist up the main hoist, and hoist the auxiliary hoist up (if installed). Verify all of these functions work.
6. Check for leaks. Make repairs as needed.

RELIEF VALVE (CENTER FRONT STABILIZER)

Description

The relief valve for the center front stabilizer (Figure 2-23) is installed inline on the right side next to the No. 2 hydraulic pump. The purpose of the valve is to protect the center front stabilizer from over pressurization. The valve has a setting of 2070 kPa (20.7bar) (300 psi).

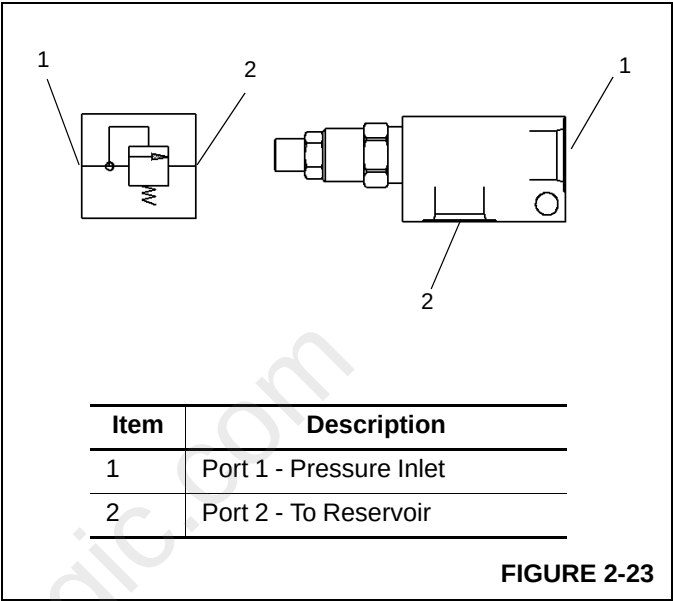
Maintenance

Removal

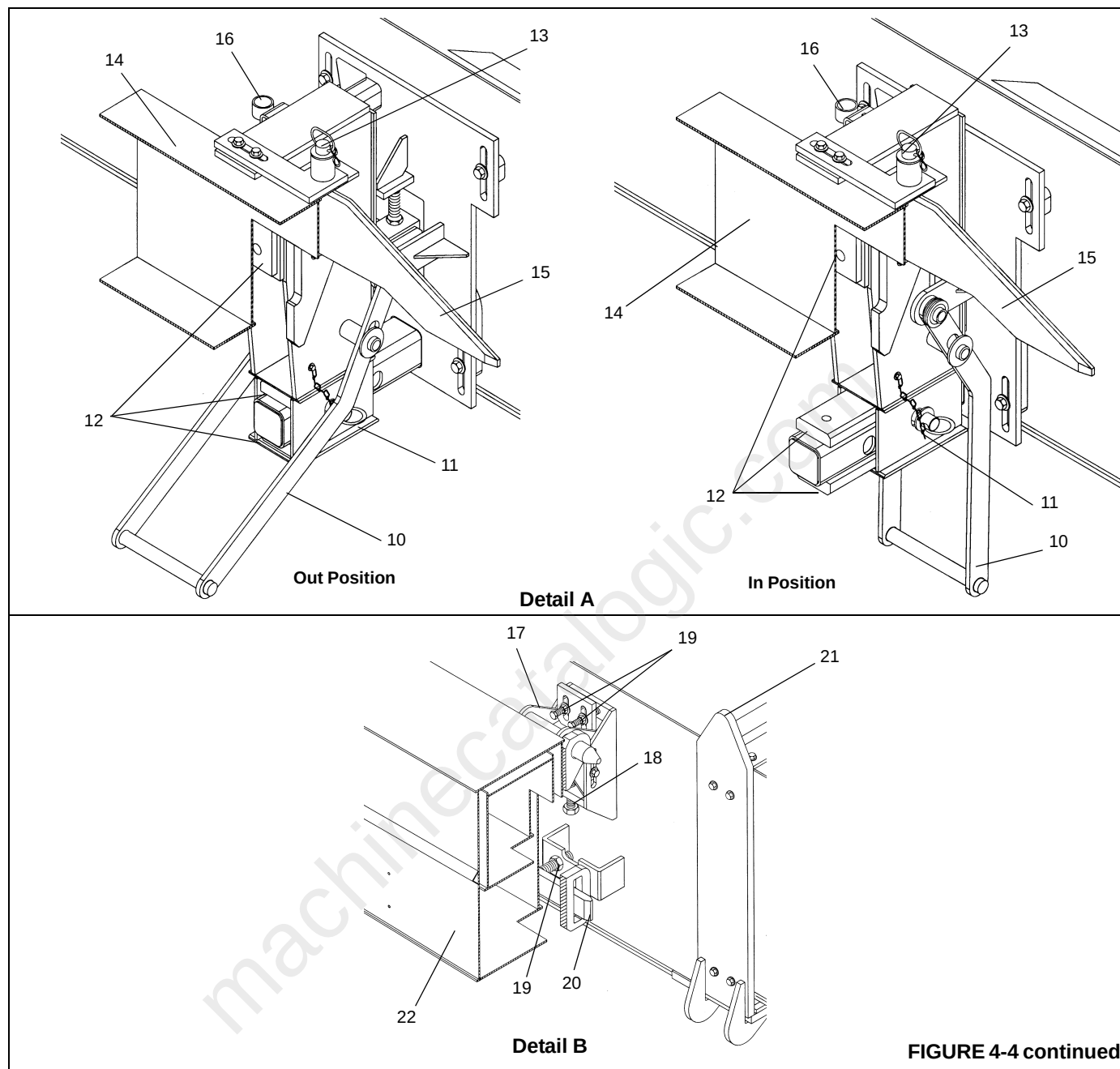
- 1. Tag and disconnect the hydraulic lines from the valve. Cap or plug all openings.
- 2. Remove the valve.

Installation

- 1. Position the valve in line and connect the hydraulic lines to the valve as tagged during Removal.



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Item	Description
10	Handle
11	Retainer Pin
12	Wear Pads
13	Retainer Pin and Hitch Pin
14	Swingaway
15	Sliding Support and Ramp
16	Stowage Lug for Item 13

Item	Description
17	Hanger Weld
18	Vertical Adjustment Bolt
19	Horizontal Adjustment
20	Lower Support Weld
21	Base Boom Section
22	Swingaway

MAINTENANCE

Troubleshooting

Symptom	Probable Cause	Solution
1. Boom swing operation erratic in either direction.	a. Damaged relief valve.	a. Replace relief valve.
	b. Swing brake dragging (not releasing properly).	b. Readjust and/or replace necessary parts.
	c. Low engine rpm.	c. Increase engine rpm to obtain smooth swing operation.
	d. Low hydraulic oil.	d. Replenish hydraulic oil to proper level.
	e. Improper movement of control to neutral.	e. Feather controls to neutral to maintain smooth stopping action.
	f. Insufficient lubricant on swing bearing.	f. Lubricate bearing properly. Refer to Section 9 - LUBRICATION.
	g. Crane not level.	g. Level crane using outriggers.
	h. Damaged swing motor.	h. Repair or replace swing motor.
	i. Excessive overload.	i. Reduce load. Refer to load capacity chart.
	j. Restricted or partly clogged hydraulic hose or fittings.	j. Replace hose or fittings.
	k. Pump cavitation in swing section.	k. Tighten suction hose or replace any damaged fitting. Check hydraulic tank level.
	l. Improperly torqued turntable bolts.	l. Torque turntable bolts evenly.
	m. Excessive preload on upper and lower pinion shaft bearing.	m. Adjust as necessary.
	n. Improperly torqued swing motor attachment bolts.	n. Torque swing motor attachment bolts.
	o. Malfunction of the swing box.	o. Remove swing box and make necessary repairs.
	p. Worn or damaged pump.	p. Repair or replace damaged pump.
	q. Damaged swing directional control valve.	q. Repair or replace swing directional control valve.
2. Boom swing operation erratic in one direction only.	r. Damaged swing pinion.	r. Replace pinion.
	s. Damaged turntable bearing.	s. Replace turntable bearing.
	a. Crane not level.	a. Level crane using outriggers.
	b. Turntable bearing binding due to continuous limited swing. (Example: concrete pourer.)	b. Rotate machine 360 degrees in both directions several times and lubricate bearing.
	c. Restricted hose or fitting.	c. Replace hose or fitting.
	d. Damaged swing directional control valve.	d. Replace swing directional control valve.
	e. Damaged swing pinion.	e. Replace pinion.
	f. Damaged turntable bearing.	f. Replace turntable bearing.

ENGINE COOLING SYSTEM

Description

The cooling system consists (Figure 7-14) of the radiator, coolant expansion tank, engine cooling system, and the connecting hoses. The cooling system is pressurized with a shunt line that runs from the expansion tank to the water pump. The purpose of the shunt line is to provide a constant flow of coolant to the water pump and prevent cavitation. The cooling system capacity is approximately 35 liters (37 quarts) and the system is controlled by a 82° C (180° F) thermostat which is located at the top front of the engine.

The water pump is located on the right side of the engine and is belt driven by the crankshaft pulley. Coolant enters the pump from the bottom inlet hose, bypass hose, or shunt line. Coolant flows from the water pump to the cylinder block, cylinder head, and into the thermostat housing. If the thermostat is closed the coolant enters the bypass hose and flows back to the water pump. If the thermostat is open, the bypass hose is blocked and most of the coolant flows back to the radiator.

At all times, the antifreeze/coolant should be properly inhibited against corrosion. It is recommended that a mixture of 50 percent low silicate, ethylene glycol antifreeze/coolant and 50 percent soft water be used at all times. Failure to use soft water in the antifreeze/coolant mixture will neutralize the corrosion inhibitor components.

The radiator assembly consists of the engine water cooler and charge air cooler.

A sight gauge is installed in the expansion tank to visually check coolant level. A coolant level sensor is also located in the expansion tank. Coolant level high/low signals are supplied to the engine ECM.

The crane is equipped with cab hot water heaters. Hot water is supplied by the engine coolant system through cable operated shutoff valves to each heater. The hot water to the superstructure heater also passes through an electrical motor driven pump, a strainer, and two port water swivel. The pump is located on the center front side of the front outrigger box. The strainer is a cleanable type and is located on the left side of the carrier frame to the rear of the front outrigger box. Refer to Section 9 - LUBRICATION for service of the strainer.

Maintenance

General

The cooling system includes the radiator, coolant expansion tank, thermostat, the fan, and water pump. Radiator hoses are also included in this group.

The cooling system is often neglected because the effects or damage that result from an improperly maintained cooling system usually occur gradually. The cooling system needs to be maintained with the same attention as other systems.

The circulation of water through the cooling system relies entirely upon the water pump. The water pump draws water from the radiator and forces it through the water jackets and cylinder head. There it accumulates heat and flows to the upper radiator tank. Then the water flows down through the radiator core where it is cooled by air from the fan. This process of removing heat from water as it circulates holds the engine to its efficient operating temperature.

The following paragraphs point out several facts about cooling system components, the effects of cooling system neglect, and procedures to be followed for cooling system maintenance.

Effects Of Cooling System Neglect

Whenever an engine does not perform at top efficiency, a neglected cooling system may be at fault even though the engine part directly responsible is not a part of the cooling system. Most of these problems can be traced to overheating; however, an engine that is running too cold can be just as troublesome.

Overheating

An engine that is overheating can lead to the following:

- a. Low power
- b. Burned valves
- c. Pinging or knocking
- d. Excessive fuel consumption
- e. Poor lubrication - increased engine wear
- f. Sticking valves
- g. Short injector life
- h. Engine hot spots.
- i. Need for higher grade fuel.

Overcooling

An engine that is overcooled can lead to the following:

- a. Excessive fuel consumption.
- b. Sludge formation in crankcase.
- c. Corrosive acids formed in crankcase.
- d. Excessive fuel deposits in the exhaust system

Rust Prevention

To keep engines operating at newness efficiency, all forms of rust formation must be prevented. The formation of rust in the cooling system is a result of the interaction of water, iron, and oxygen, and can only be prevented by maintaining full strength corrosion protection at all times.

For maximum rust, freeze, and boiling point protection, a 50/50 mixture of antifreeze and soft water should be maintained

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Testing Pilot Operated Check Valve For Leakage

1. Fully extend and set the outriggers.

CAUTION

When performing step number 2, remove hose to adapter connection slowly. Trapped pressure may exit between the outrigger cylinder and the work port pilot operated check valves in the outrigger selector valve.

2. Remove the piston side cylinder hose from the suspected leaking stabilizer cylinder (Figure 8-55). Oil will flow until the cavity in the cylinder port block empties. Once the port block cavity empties, oil should stop flowing from the piston side port.
 - a. If oil stops flowing, the cylinder's pilot operated check valve is sealing properly.
 - b. If oil continues to flow out the piston port, the cylinder's pilot operated check valve is leaking.

If oil flow is not noticed from either port, the cylinder and pilot operated check valve are functioning properly, and any cylinder contraction during normal operation can be attributed to thermal contraction of the oil.

OUTRIGGER SYSTEM VALVES**Description**

There are five valve assemblies responsible for controlling the outrigger system, the integrated outrigger valve, the front and rear outrigger control manifolds, the center front stabilizer circuit relief valve, and the pilot operated check valves.

NOTE: For a more detailed DESCRIPTION and MAINTENANCE of the valves, refer to VALVES in Section 2 - HYDRAULIC SYSTEM.

Pilot Operated Check valve

The pilot operated check valves are located in the outrigger stabilizer port blocks. The check valve provides two functions; the first function is a holding valve, the second function provides a thermal relief of the stabilizer.

Integrated Outrigger Valve

The integrated outrigger is mounted on the rear face of the carrier frame front cross member forward of the swivel. The valve consists of an enable solenoid valve, a three position

four-way solenoid controlled directional control valve, a main relief valve, and two thermal relief valves.

Outrigger Control Manifold

The front and rear outrigger control manifolds are located inside the frame near their respective outrigger box. The rear manifold consists of four 12 volt solenoid valves and an assembly mounting kit. The front manifold consists of five 12 volt solenoid valves and an assembly mounting kit.

Center Front Stabilizer Circuit Relief Valve

The center front stabilizer circuit relief valve is installed inline on the right side next to No.2 hydraulic pump. The valve prevents over pressurization of the center front stabilizer circuit.

CENTER FRONT STABILIZER CYLINDER**Description**

The center front stabilizer cylinder (Figure 8-56) has a 8.9 cm (4.0 in) diameter bore and is the double acting type. The cylinder is pinned into a tube which is welded onto a special crossmember on the front end of the carrier frame. A port block is welded to the end of the cylinder rod and a pilot operated check valve is threaded into the port block. Internal seals are used within the cylinder to prevent internal and external leakage. A wiper ring is mounted to the front of the cylinder barrel to wipe dirt from the rod as it is retracted.

The cylinder weighs approximately 46 kg (100 pounds).

Maintenance

NOTE: Refer to CYLINDERS in Section 2 for Disassembly and Assembly of the cylinder.

Removal

1. Remove the capscrews, washers, flatwashers, and nuts securing the float plate. Remove the plate.
2. Remove the capscrews, washers, locknuts, and bushings securing the float pad to the cylinder ball and remove the float pad.
3. Remove the cylinder cap.
4. Tag, disconnect, and cap the hydraulic lines to the cylinder.
5. Place a jack capable of supporting the weight of the stabilizer cylinder at the base of the cylinder barrel. Jack up the cylinder just enough to relieve any pressure on the cylinder retaining pin.

Full Version Available

Grove TMS500E Truck Crane Service Manual

Grove TMS500E truck crane service manual with repair procedures, adjustments and troubleshooting for the main systems. Searchable PDF. Instant PDF download.

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