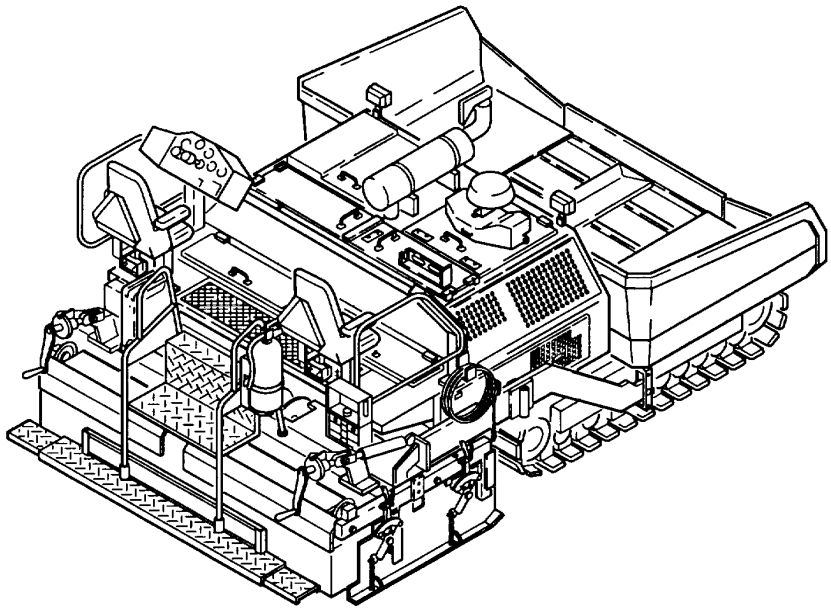
TECHNICAL MANUAL

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL



**PAVING MACHINE,
BITUMINOUS MATERIAL;
CRAWLER MOUNTED,
DIESEL ENGINE DRIVEN
NSN 3895-01-379-1102
END ITEM CODE (EIC: E47)**

**INGERSOLL-RAND COMPANY
MODEL 780T
CONTRACT NUMBER DAAE07-93C-0501**

HEADQUARTERS, DEPARTMENT OF THE ARMY **1 FEBRUARY 1996**

TECHNICAL MANUAL
TM 5-3895-373-34

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 1 FEBRUARY 1996

TECHNICAL MANUAL
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MAINTENANCE MANUAL

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REPORTING OF ERRORS

Reporting Errors and Recommending Improvements. You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publication and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U. S. Army Tank-automotive and Armaments Command, AMSTA-IM-MMAA, Warren, Ml 48397-5000. A reply will be furnished to you.

DISTRIBUTION RESTRICTION STATEMENT A. Approved for Public Release; Distribution Is Unlimited.

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HOW TO USE THIS MANUAL

This manual provides troubleshooting and task-oriented maintenance procedures authorized for use by Direct Support and General Support level maintenance personnel by the Maintenance Allocation Chart (MAC) in TM 5-3895-373-20.

The front cover includes a quick reference index of important topics and all maintenance sections in the manual. The pages that cover a topic listed in this index have a black tab in line with the index block. Thumb through the manual to find the related pages. An alphabetical index is provided at the back of the manual, as well as at the start of each maintenance section. A malfunction symptom index is located at the start of the troubleshooting section to help you locate a troubleshooting procedure quickly.

Use the troubleshooting section to locate the cause of failed electric and/or hydraulic equipment functions. Electrical and hydraulic foldout schematics are located at the back of the troubleshooting section for convenient reference.

When mechanical equipment failures are found or reported, refer to the related Functional Group in the MAC. The MAC will quickly indicate whether the appropriate repair task is located in TM 5-3895-373-20 or in this manual. Some equipment repair actions are authorized at the Unit level, and will not be found in this manual.

Each authorized maintenance task is preceded by a task summary. The task summary lists the tools, materials, equipment, and personnel required to perform the task. Using the task summary as a check list, make sure that you have all the tools, materials, and assistance required before starting the task.

CHAPTER 1

INTRODUCTION

SECTION I. GENERAL INFORMATION

1.1 SCOPE.

a. Type of Manual: Direct Support and General Support Maintenance.

b. Model Number and Equipment Name: Ingersoll-Rand Company Model 780T Crawler Mounted, Diesel Engine Driven, Bituminous Material Paving Machine, NSN 3895-01-379-1102.

c. Purpose of Equipment: The Paving Machine is used to repair and maintain damaged or worn landing pads, airfields, taxiways, roads, and parking areas in combat related facilities, as well as new road construction. The paving machine will also be used to construct extensions to existing facilities such as roads, airfields, and taxiways.

1.2 MAINTENANCE FORMS, RECORDS, AND REPORTS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, The Army Maintenance Management System.

1.3 CORROSION PREVENTION AND CONTROL (CPC).

Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problem be reported so the problem can be corrected and improvements can be made to prevent the problem in the future.

While corrosion is typically associated with the rusting of metals, it also includes the deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling or breaking of these materials may indicate a corrosion problem.

If a corrosion problem is identified, report it using an SF 368, Product Quality Deficiency Report. Completed forms should be submitted to the address specified in DA PAM 738-750. Use of key words such as "corrosion", "rust", "deterioration" and "cracking" will ensure the information is identified as a CPC problem.

1.4 DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

Procedures for destruction of Army materiel to prevent enemy use are listed in TM 750-244-6.

1.5 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If the Paving Machine needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to: Commander, U. S. Army Tank-automotive and Armaments Command, Attn: AMSTA-TR-E/MPA, Warren, MI 48397-5000.

1.6 WARRANTY INFORMATION.

The Paving Machine warranty is detailed in Warranty Technical Bulletin (WTB) number TB 5-3895-373-14.

1.7 OFFICIAL NOMENCLATURE.

This list provides a cross-reference between the nomenclature used in the manual and the nomenclature specified in the Repair Parts and Special Tools List (RPSTL).

Nomenclature Cross-Reference List

Manual Nomenclature	Official Nomenclature
Paving Machine	780T Bituminous Asphalt Paving Machine
Screed	Hydraulic Vibratory Extendable Screed, ES-80 (Diesel)
Hopper	Aggregate Feeder
Hopper Wing	Aggregate Feeder
Auger	Screw Conveyor
Flashing	Solid Rubber Sheet
Dipstick	Liquid Gauge Rod-cap
Bendix	Electric Engine Drive
Coolant Temperature Sensor	Thermostatic Switch
Hydraulic Oil Temperature Sensor	Thermostatic Switch
Hemi Auger Flight	Screw Conveyor Auger
Quarter Auger Flight	Screw Conveyor Auger
Sound Foam	Sound Control Batten
Alternator	Engine AC Generator
Latch	Pawl Fastener
Fuel/Water Separator	Fuel Filter
Fuel Spray Wand Assembly	Nozzle and Hose Assembly
Pump Drive Gearbox	Angle Drive Unit
Speed Reduction Gearbox	Speed Gear Assembly

1.8 USE OF METRIC UNITS.

The equipment described herein contains metric components and requires metric common tools. Therefore, metric units are used for components or systems that are metrically dimensioned and no U. S. standard unit is applicable. In all other situations, U. S. standard units and metric units are both referenced.

1.9 PREPARATION FOR STORAGE OR SHIPMENT.

Requirements, including packaging and administrative, will be carried out in accordance with the Paving Machine Organizational Maintenance Manual, TM 5-3895-373-20.

1.10 CALIBRATION.

Items requiring calibration are to be calibrated in accordance with applicable procedures as described in or referenced by this manual.

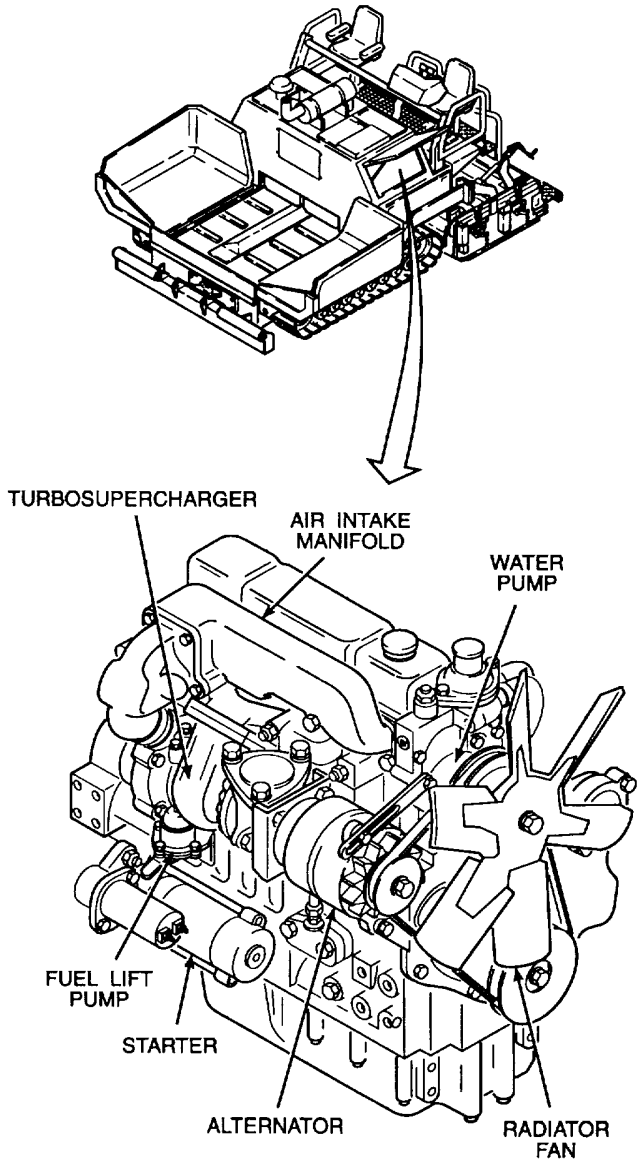
a. Fuel injection pump
b. Fuel injectors
c. Main control handle subassembly

SECTION II. EQUIPMENT DESCRIPTION AND DATA

1.11 DIESEL ENGINE.

The diesel engine is Perkins model T4.236 turbo-supercharged, liquid-cooled, four-stroke cycle, vertical in-line four cylinder, with overhead valves. The engine has a 236.0 cubic inch (3,86 ℓ) displacement with a horsepower rating of 102 bhp (76 kW) at 2600 rpm. The engine has a direct fuel-injection system and a 24 volt electric starter. The turbosupercharged engine increases the power output rating by 26%, and is configured with piston cooling jets. The engine provides the power required to operate the paving machine.

The engine main components are identified and located, as shown.



a. Turbosupercharger: The turbosupercharger is located on the right side of the engine, mounted on the engine exhaust manifold outlet, and is connected to the air intake manifold. The turbosupercharger is lubricated by engine oil. The air intake manifold draws air into the diesel engine turbo-supercharger.

b. Air Intake Manifold: The air intake manifold is located on the right side of the engine, mounted on the cylinder head air intake and connected to the turbosupercharger.

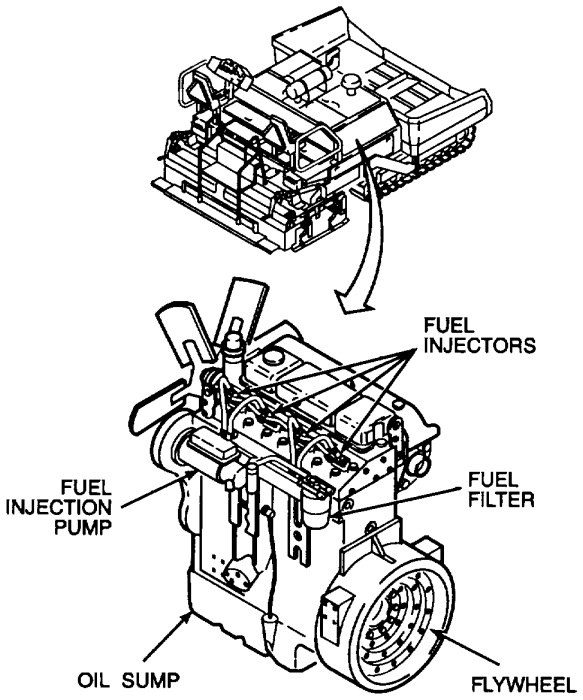
c. Water Pump: The water pump is located on the front face of the engine block, mounted on a vertical outlet behind the fan assembly. The water pump circulates coolant through the engine and radiator. The water pump is a centrifugal, impeller-driven unit. It is linked to the fan assembly and has self-lubricating bearings. An external bypass system is used on turbosupercharged engines.

d. Radiator Fan Assembly: The fan assembly is located on the front of the engine, mounted on the water pump pulley. The fan has six blades for maximum air cooling circulation.

e. Alternator: The alternator is located on the right side of the engine, mounted on the belt adjusting arm and a support bracket. The alternator operates at 24 volts DC and is negative-grounded. The alternator has an open, ventilated enclosure and a fan on the alternator pulley for air circulation through the unit. Operating amperage for the alternator is 45 amps.

f. Starter: The 24 V starter is located on the right side of the engine, mounted on the forward side of the flywheel housing. The starter operates on a 24 volt DC current drawn from two batteries wired in series. The starter has a maximum current rating of 900 amps. The drive pinion assembly is self-indexing to ensure a smooth engagement between the bendix and the flywheel spur gear teeth before the starter motor begins to turn.

g. Fuel Lift Pump: The fuel lift pump is located on the right side of the engine, mounted on the engine block below the turbosupercharger. The fuel lift pump is an eccentric-on-camshaft type. The fuel lift pump draws fuel from the fuel tank and sends it through the fuel filter to the fuel injection pump and turbosupercharger.



h. Fuel Injectors: The fuel injectors are located on the top left side of the engine, mounted on the cylinder head with vertical fuel injection lines. The fuel injectors are configured with a four-hole injector nozzle for maximum fuel flow.

i. Fuel Filter: The fuel filter is located on the left side of the engine, mounted on the cylinder head in line between the fuel injection pump and the fuel tank. The cartridge type filter element removes particles from the fuel system.

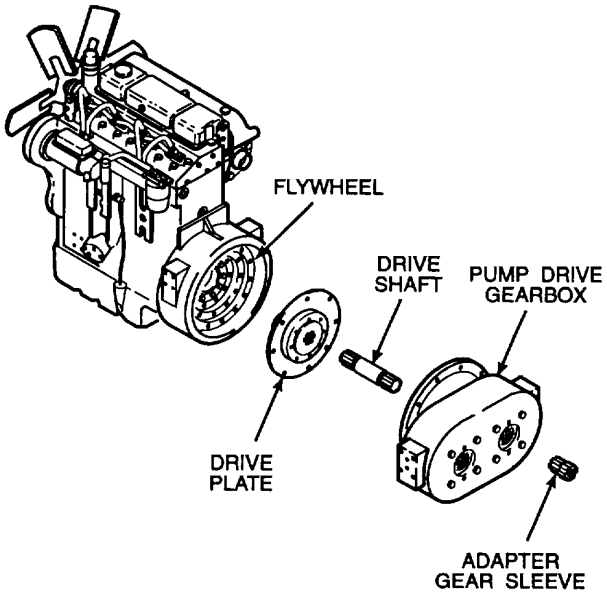
j. Flywheel: The flywheel is located on the back of the engine. The flywheel is held in place on the crankshaft with six bolts with washers. The flywheel transmits power from the crankshaft to an attached pump drive gearbox through the drive plate.

k. Oil Sump: The oil sump is located on the bottom of the engine block. Engine oil is circulated by a gear-type oil pump driven from the rear of the front-mounted balancer unit, located inside the oil sump. The oil sump drain is connected to a hose for remote draining.

l. Fuel Injection Pump: The fuel injection pump is located on the left side of the engine, mounted on the back of the engine timing housing. The pump is a mechanical governor type, configured with a D.P.A. distributor. The fuel injection pump is connected to the engine camshaft by a gear. The fuel injection pump sends fuel into the engine cylinders for combustion. The engine cold-starting induction heater is also fed by the fuel injection pump, through the fuel filter. Fuel input is adjusted by a transfer pressure screw on the injection pump.

1.12 PUMP DRIVE GEARBOX.

The pump drive gearbox links the engine to the two hydraulic propulsion pumps. A drive plate and drive shaft connect the engine flywheel to the gearbox. An adapter gear sleeve links the gearbox to each hydraulic propulsion pump. The pump drive gearbox has a 1:1 ratio and is lubricated by gear oil. Two horizontal output gears are driven by one central input gear inside the gearbox housing. An oil drain hose and plug are attached to the bottom of the gearbox housing.



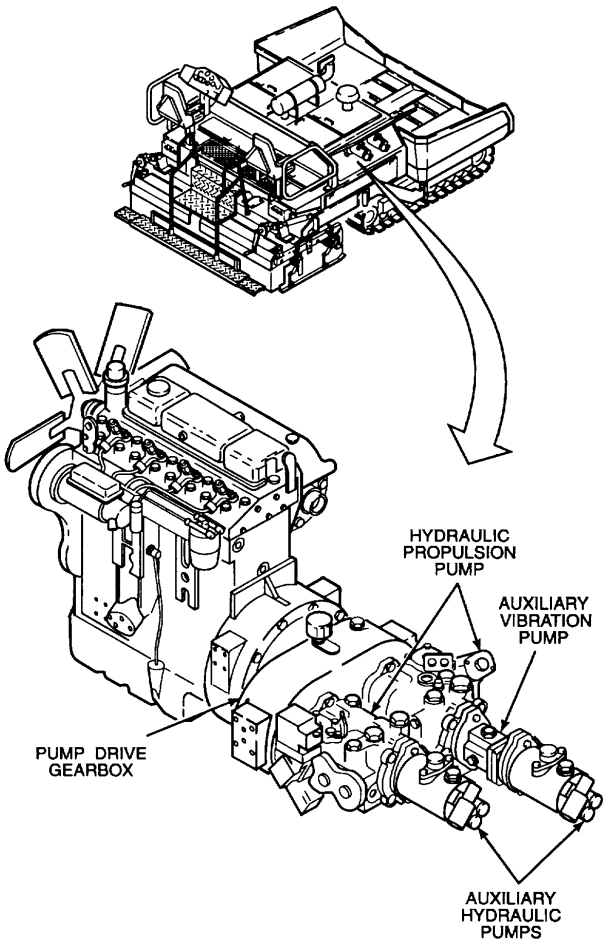
1.13 HYDRAULIC PROPULSION PUMPS.

Two separate variable displacement hydraulic propulsion pumps are directly coupled to the pump drive gearbox. The propulsion pumps are identical models and are used to drive the left and right hydraulic propulsion motors. Each includes an electric displacement control pump pilot control valve that provides a continuously variable displacement.

1.14 AUXILIARY HYDRAULIC PUMPS.

Three separate auxiliary hydraulic pumps are attached to the hydraulic propulsion pumps. Two identical 2500 psi (17 237 kPa) auxiliary hydraulic pumps power the auger/ conveyor assemblies, tow point cylinders, screed, and stack valve. Displacement for the two pumps is 0.70 cubic inches (11,5 mℓ) in front and 0.58 cubic inches (9,5 mℓ) in rear.

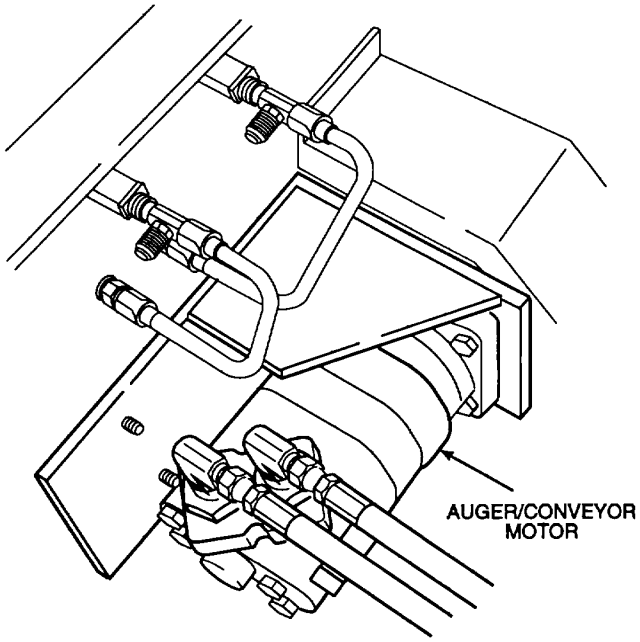
A 2500 psi (17 237 kPa) hydraulic auxiliary vibration pump supplies additional power to the screed vibration system. The auxiliary vibration pump has a displacement per revolution of 0.24 cubic inches (3,9 mℓ). Each pump is mechanically linked by spline shafts to the hydraulic propulsion pumps.

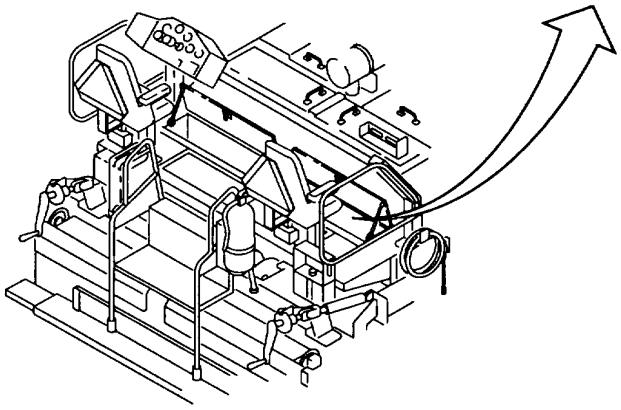


1.15 AUGER/CONVEYOR MOTOR.

The paving machine uses two auger/conveyor motors. A separate motor is used for right and left side of the paving machine and are independently controlled. The motors are powered by the left and right auxiliary hydraulic pumps. The following description applies to either motor.

The auger/conveyor motor is a gear rotor type, low speed, high torque hydraulic motor. The motor is mounted on the main frame weldment inside the paving machine, above the auger/conveyor assemblies. It has a displacement of 19.9 cubic inches (326,4 mℓ) per revolution and operates at 2750 psi (18 961 kPa). The fixed-displacement motor is reversible and is lubricated by the hydraulic oil flowing through it. Oil flows through the gear rotor to the internal gear assembly. The internal gear assembly drives the multiple gear shaft. An internal check valve regulates case pressure. The motor drive shaft is mounted in two tandem roller bearings for a high radial load capacity and smooth operation.



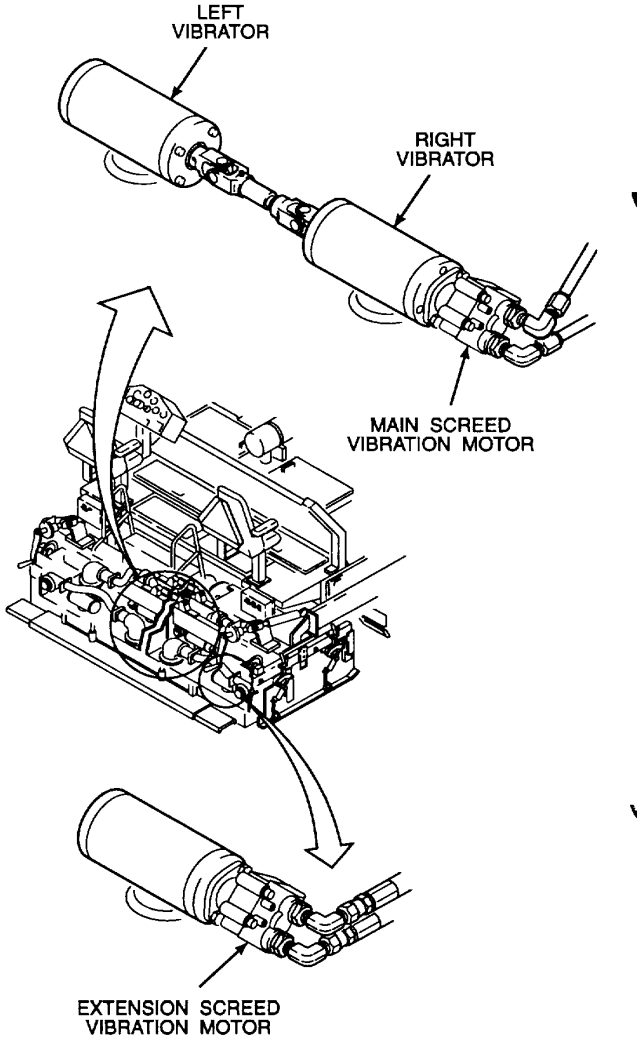


1.16 SCREED VIBRATION MOTORS.

There are two different screed vibration motors, described as follows:

a. Main screed vibration motor. The main screed vibration motor is a gear-type, fixed displacement, bi-directional hydraulic motor. It is located on the main screed and provides power to both the left and right main screed vibrators. The motor has a displacement of 0.45 cubic inches (7,37 mℓ) per revolution and operates at 2000 psi (13 790 kPa). It is powered by the left auxiliary hydraulic pump and the auxiliary vibration pump. Hydraulic oil flows through a gerotor to power the drive shaft. The motor is equipped with a check valve to regulate case pressure. A two-bolt motor mount connects the hydraulic motor to the right vibrator on the main screed. The left vibrator is driven by the right vibrator through a drive shaft.

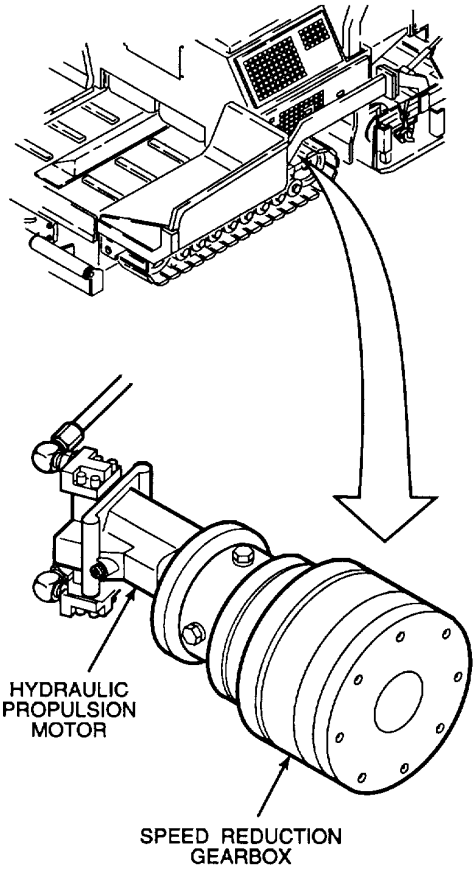
b. Extension screed vibration motors. The extension screed vibration motors are gear-type, fixed displacement, bi-directional hydraulic motors. The left extension screed vibration motor is located on the left extension screed. The right extension screed vibration motor is located on the right extension screed. Hydraulic oil flowing out of the main screed vibration motor is directed to the extension screed vibration motors. A 50/50, spool-type flow divider splits hydraulic oil between the two extension screed vibration motors. A two-bolt motor mount connects each motor to the offset vibrators. Each motor has a displacement of 0.218 cubic inches (3,57 mℓ) per revolution and operates at 2000 psi (13 790 kPa). A gerotor powers the drive shaft on each motor. Each motor is equipped with a check valve to regulate case pressure.

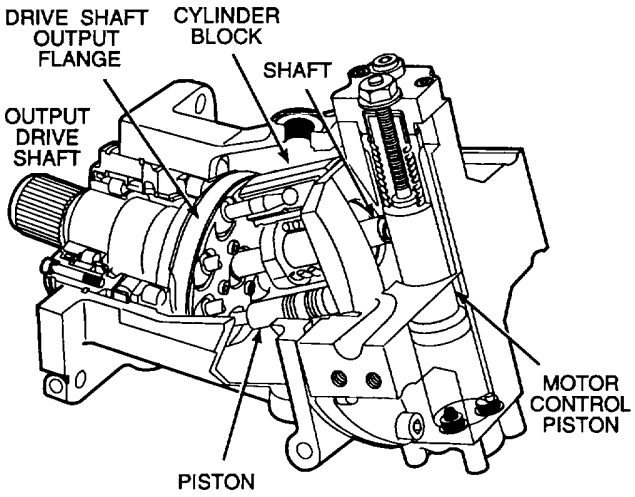


1.17 HYDRAULIC PROPULSION MOTOR.

The paving machine uses two hydraulic propulsion motors. A separate motor is used for the right and left side. The left motor is powered by the left hydraulic propulsion pump and the right motor is powered by the right hydraulic propulsion pump. The following description applies to either motor.

The hydraulic propulsion motor is a bent axis, piston type, high torque, variable speed, bi-directional motor. It has a maximum displacement of 3.05 cubic inches (49,98 mℓ) and a minimum displacement of 1.13 cubic inches (18,52 mℓ) per revolution. Operating pressure is 5000 psi (34 475 kPa). The charge pump in the left propulsion pump provides flow and pressure, 350 psi (2413 kPa), to the high speed shift valve. The high speed shift valve controls the paving speed and travel speed of the propulsion motors.





Oil flow through the high speed shift valve positions the motor control piston. The control piston is linked by a shaft to the cylinder block and sets the angle at which the cylinder block turns. The greater the angle of the cylinder block, the slower the motor turns; the lesser the angle, the greater the speed output.

The cylinder block contains seven pistons. Each piston applies force, through a connecting rod, to the drive shaft output flange causing the output flange to rotate. High pressure oil forces the pistons out, which causes a downward rotation on the output flange. Rotation of the output flange produces a rotation of the output drive shaft. Meanwhile, pistons on the opposite side of the flange are retracting, forcing the oil out at low pressure, back to the reservoir.

The propulsion motors are cooled by controlled fluid leakage. A three-way, pressure driven, flushing valve allows heated hydraulic oil to exit the system and return to the hydraulic reservoir.

1.18 SPEED REDUCTION GEARBOX.

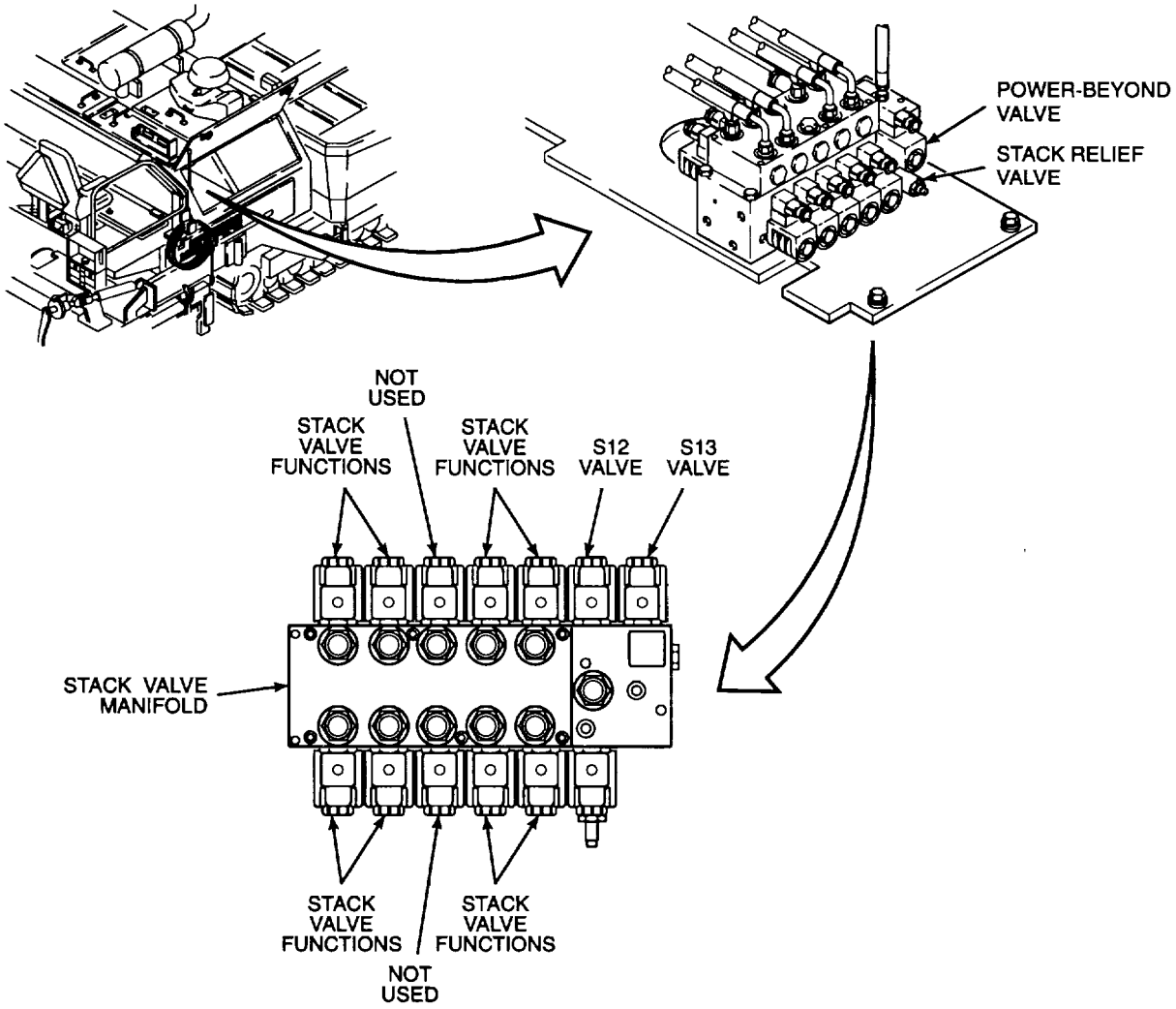
The speed reduction gearbox links the hydraulic propulsion motors to the track hubs and drive sprocket gears. There is one reduction gearbox for each track. The reduction gearbox is a triple-stage unit with a reduction ratio of 65:6:1 and a continuous operating torque of 4700 lb-ft (6372 N•m).

1.19 STACK VALVE.

The stack valve is located on the right side of the valve panel assembly. It consists of 13 separate valves. Three valves control hydraulic flow to and from the stack valve. Eight valves control screed extension cylinders and hopper lift cylinders. Two valves are not used. The stack valve operates at a maximum pressure of 2500 psi (17 237 kPa). Hydraulic oil for the stack valve is supplied by the right auxiliary hydraulic pump. Each valve in the stack valve is controlled by a 12 volt DC electric coil.

Three valves control oil flow to the hydraulic stack valve as follows:

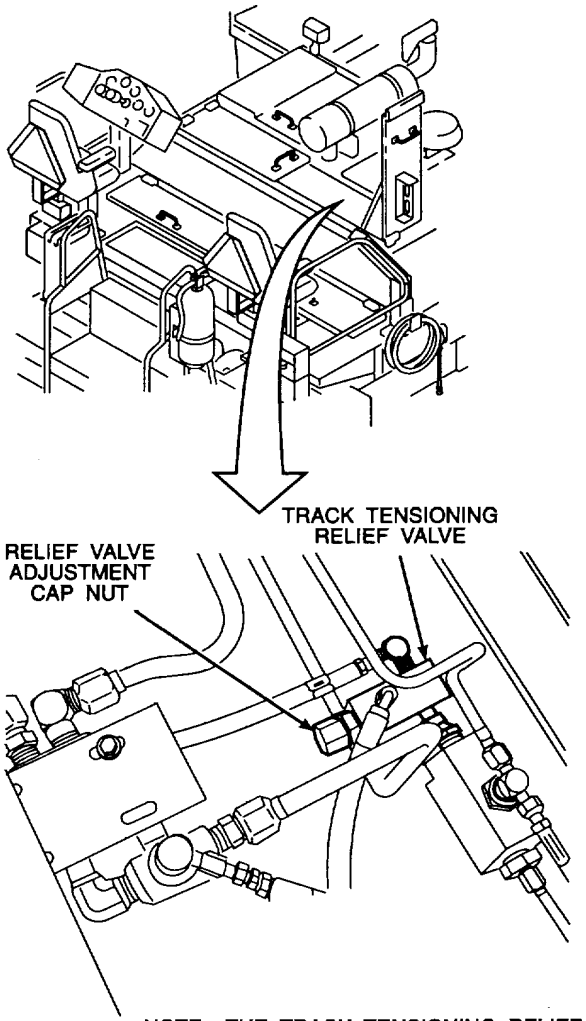
a. The power-beyond valve is a two-way valve that switches hydraulic oil flow from the track tensioning cylinders to the stack valve. It is normally open. When a cylinder function is being controlled through the stack valve, the power-beyond valve closes, turning off oil flow to the track tensioning cylinders. When the stack valve controlled cylinders are not operating, a coil spring opens the power-beyond valve, turning on the oil flow to the track tensioning cylinders. The - V power-beyond valve has a nominal flow of 2.5 gallons (9,4 ℓ) per minute. Maximum internal leakage is 5.0 cubic inches (81,9 mℓ) per minute.



b. The S12 valve is a three-way, two-position spooled valve that switches hydraulic flow from the stack valve to the screed lift cylinders. The valve is normally open to allow oil flow to remain in the stack valve. When the screed lift system is activated, S12 diverts flow from the stack valve to the screed lift cylinders. When deactivated, a coil spring returns the spool to the normally-open position, allowing flow into the stack valve. The valve has a nominal flow of 2.5 gal. (9,4 ℓ) per minute. Maximum internal leakage is 5.0 cubic inches (81,9 mℓ) per minute.

c. The S13 valve is a two-way, pilot-operated poppet valve that is normally closed. Opening the valve allows oil from the screed lift cylinders to return to the hydraulic reservoir, lowering the screed. When de-energized, a coil spring closes the valve. Nominal flow through the valve is 5.0 gal. (18,9 ℓ) per minute. Internal leakage is 0-5 drops per minute.

Eight identical four-way, two-position directional control valves govern cylinder extend and retract functions. Left and right screed extension and hopper lift cylinders are each controlled by two valves. Each valve cartridge spool is opened by an electric coil, and closed by a spring. The valves have a nominal flow of 1.75 gal. (6,62 ℓ) per minute. Maximum internal leakage is 5.0 cubic inches (81,9 mℓ) per minute.



NOTE: THE TRACK TENSIONING RELIEF VALVE IS ILLUSTRATED AS A TYPICAL EXAMPLE OF RELIEF VALVES LOCATED THROUGHOUT THE PAVING MACHINE.

1.20 RELIEF VALVES.

Relief valves are direct-acting, one-way poppet valves that protect components from excessive hydraulic pressure. Relief valves are located near track tensioning cylinders, propulsion pumps, auxiliary pumps, propulsion motors, auger/conveyor motors, and the stack valve assembly. Relief valves are equipped with an adjusting screw located underneath a hex head adjustment cap nut. The adjustment increases or decreases spring pressure on the internal valve, which changes the pressure at which the valve opens. Relief valves are closed until the adjusted pressure setting is exceeded. When the pressure setting is exceeded, the relief valve opens and excess oil flows through the return manifold back to the hydraulic reservoir. Relief valves in the paving machine have a nominal flow of 6.0 gal. (22,7 ℓ) per minute.