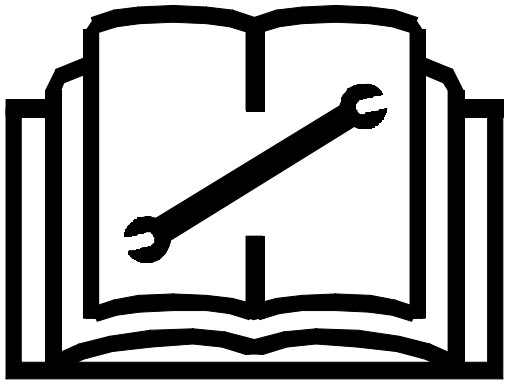
Vermeer®

T855 Commander®
Trencher



Service Handbook

T855_S1_00
Serial No. 101 -
Order No. 105400AC8

Chapter 1: General Information

INTRODUCTION

USING THE MANUAL

This manual provides information and service procedures based upon current machine knowledge and configuration at the time the manual was written. The instructions, illustrations and specifications are based on the latest information available at the time of publication. Due to ongoing efforts to continuously improve the equipment, there may be changes on the machine not yet reflected in this manual.

IMPORTANT: The content of this manual is based upon information for machines with serial numbers 101 through current. Although your particular machine may use the same information, its direct application is not guaranteed.

Vermeer Corporation reserves the right to make changes at any time without notice or obligation.

Procedures given in this manual provide one method for completing a given task. Additional information may be available through Vermeer Service Support resources.

Additional copies of this manual are available through the Vermeer Parts Center. Use the reorder number on the front cover to order additional manuals.

Operating instructions are found in the T855 Trencher *Operator's Manual*. Lubrication and maintenance procedures are found in the T855 Trencher *Maintenance Manual*. Refer to "Reference Publications," page **1-2** for ordering information.

NOTE: Bleeder tabs located at the edge the page aid in quickly locating information.

CV19 . . . Machine Tilt Right Inlet Check
CV20 . . . Machine Tilt Right Load Sense Check
CV21 . . . Track Level Right Inlet Check
CV22 . . . Track Level Right Load Sense Check
CV23 . . . Track Level Left Port Inlet Check
CV24 . . . Track Level Left Port Inlet Check
CV25 . . . Port Inlet Check
CV26 . . . Port Inlet Check
CV27 . . . Port Inlet Check
CV28 . . . Port Inlet Check
CV29 . . . Track Level Left Port Inlet Check
CV30 . . . Track Level Left Port Inlet Check
CV31 . . . Left Machine Tilt Cylinder Port Inlet Check
CV32 . . . Left Machine Tilt Cylinder Port Inlet Check
CV33 . . . Right Machine Tilt Cylinder Port Inlet Check
CV34 . . . Right Machine Tilt Cylinder Port Inlet Check
CV35 . . . Cab Lift Cylinder Port Inlet Check
CV36 . . . Cab Lift Cylinder Port Inlet Check
CV37 . . . Trench Cleaner Fold Cylinder Port Inlet Check
CV38 . . . Conveyor Fold Cylinder Port Inlet Check
CV39 . . . Dirt Drags Cylinders Counterbalance Check
CV40 . . . Boom Lift Counterbalance Check
CV41 . . . Boom Lift Port Inlet Check
CV42 . . . Boom Lift Port Inlet Check
CV43 . . . Rock Cutter Stabilizers Counterbalance Check
CV44 . . . Rock Cutter Stabilizers Port Inlet Check
CV45 . . . Rock Cutter Stabilizers Port Inlet Check
CV78 . . . Machine Tilt Sequence Valve Bypass Check
CY2 . . . . Rock Cutter Stabilizer Cylinder
CY3 . . . . Rock Cutter Stabilizer Cylinder
CY4 . . . . Trench Cleaner Fold Cylinder
CY5 . . . . Boom Lift Cylinder (Left)
CY6 . . . . Boom Lift Cylinder (Left)
CY7 . . . . Conveyor Fold Cylinder
CY8 . . . . Conveyor Fold Cylinder

Continued on next page...

PV40 . . . Attachment Charge Relief (Top Left)

S7 . . . . . Attachment 2-Speed Switch

S33 . . . . Attachment Control Switch

SV1 . . . . Attachment Motor Hot Oil Shuttle

Diagrams and Schematics

Functional diagrams, including schematics, and wire harness diagrams, are located throughout the manual. The diagrams represent subsystem circuitry and components.

Chapter Organization

Chapter 1 In addition to the General Information chapter, the manual is divided up into chapters based on the following subsystems:

Chapter 2 The Power subsystem consists of the engine, pump drive and associated components. This subsystem also includes the electrical circuits, safety interlocks, and components necessary for the development and distribution of operating current required by all the machine's electrical functions along with optional cab controls.

Chapter 3 The Fluid Conditioning subsystem consists of the hydraulic components that are common to all machine subsystems. These components are involved in the supply, filtering, cooling, and return of the oil required by the hydraulic circuits.

Chapter 4 The Implement subsystem consists of the circuits and components necessary to operate the trencher boom lift, hydraulic dirt drags, conveyor fold, conveyor shift, trench cleaner fold, front attachment, coulter wheel, and machine leveling functions.

Chapter 5 The Ground Drive subsystem consists of the circuits and components necessary for left and right track FORWARD and REVERSE propel functions.

Chapter 6 The Attachment subsystem consist of the circuits and components necessary to operate the trencher drive function.

Chapter 7 The Auxiliary Hydraulics subsystem consists of the circuits and components necessary to drive and control auxiliary hydraulic components

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Chapter 2: Power Subsystem

OVERVIEW

The Power subsystem consists of the engine ENG1 and batteries BT1 and BT2 along with ignition, charging, and interlock components.

Circuits/Components

Circuits

This chapter consists of the following circuits:

- Power Distribution Circuit
- Grounding Circuit
- TEC 2000.2 Circuit - Tractor Controller
- TEC 2000.2 Circuit - Trencher Controller
- Starting Circuit
- Starting Circuit - Cold Start Aid
- Warning and Gauges Circuit

Components

The tractor circuits include the following components:

- Electrical Components, which include:
  - Battery BT1
  - Battery BT2
  - Alternator ALT1
  - Throttle Position Sensor R10
  - Left Track PPU B2
  - Right Track PPU B3
  - Engine PPU B4
  - Starter Motor M1
- Assemblies, which include:
  - Attachment Control Assembly A1
  - Propel Control Assembly A2
  - Steering Control Assembly A3
  - TEC 2000.2 Tractor Control Module A4

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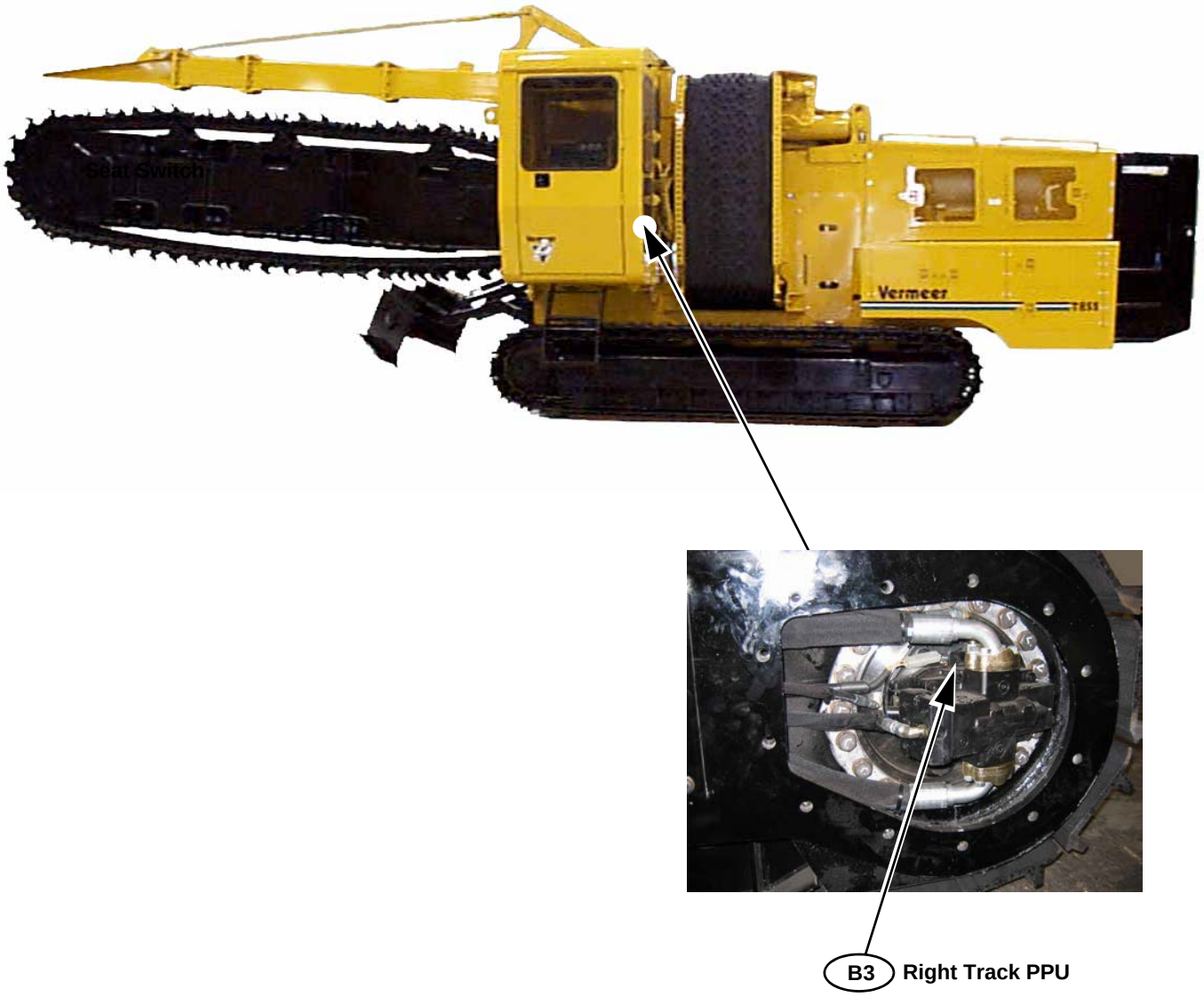

B3 Right Track PPU

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Power Distribution - Key ON

Power to the ignition key is provided through the main circuit breaker CB1 which also supplies power to the switched contacts of main power relays K1 and K2. When the ignition switch is in ‘run’ or ‘start’ current is supplied to the relay coils. The relays then switch to provide power to the fuse. Main power relay K1 provides power to fuses
F1–F4. Main power relay K2 provides power to fuses F5–F10.

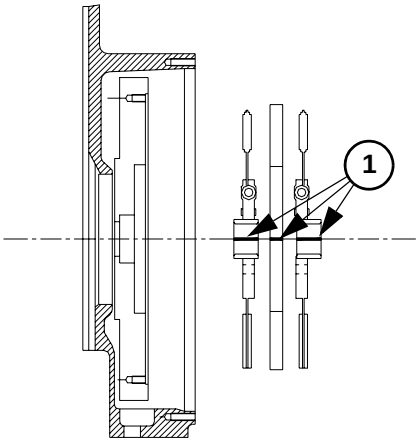
WARNING: Machine or attachment could move if neutral start interlock failed. Clear area of all unnecessary persons. Death or serious injury is possible if entangled or crushed. Be prepared to stop machine and shut off engine if motion occurs.

Circuit Specifications	Pre-Operating Conditions	Operation/ Performance Checks	Expected Result
NOTE: Checking for start DISable is a separate test from checking for start ENable. Interlock circuits have a positive function of preventing machine starting or operation under prohibited conditions. Always ensure that both start ENable and start DISable functions are working correctly.			
24 volts nominal	•Ground disconnect switch S3 closed •Emergency stop switch S2 UP (‘run’ position) •Auto plunge switch S10 OFF •Cross conveyor controls OFF (switch S12) •Auxiliary conveyor controls OFF (switch S13)	**Check operation of TEC2000.2 neutral interlocks.** Attempt to start engine while placing the following controls in the position indicated (return control to NEUTRAL each time): •Ground drive control FORWARD and REVERSE • park brake OFF •Attachment drive out of NEUTRAL	Machine must not start when controls are moved out of NEUTRAL interlock position. If machine starts, troubleshoot/test the circuit. See *"Troubleshooting,"* **page 2-38**.
24 volts nominal	•Ground disconnect switch S3 closed •Emergency stop switch S2 UP (‘run’ position) •Auto plunge switch S10 OFF •Cross conveyor controls OFF (switch S12) •Auxiliary conveyor controls OFF (switch S13)	**Check operation of electrical neutral interlocks.** Attempt to start engine while placing the following controls in the position indicated (return control to NEUTRAL each time): •Emergency stop switch S3 DOWN (‘off’ position) •Auto plunge switch S10 ON •Cross conveyor controls ON (switch S12) •Auxiliary conveyor controls ON (switch S13)	Machine must not start when controls are moved out of neutral interlock position. If machine starts, troubleshoot/test the circuit. See *"Troubleshooting,"* **page 2-38**.

Remove Clutch.

NOTE: Assembled flywheel weighs approximately 150 lb (68 kg).

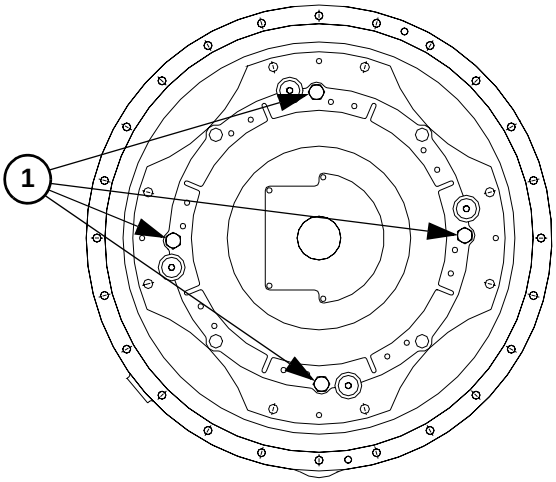
1. Remove clutch from flywheel.
2. Mark edges **(1)** of component discs for realignment when reinstalling.



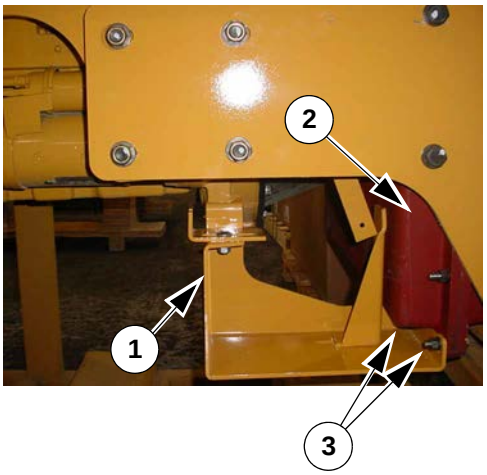
Secure Clutch.

Locate four 7/16 UNC x 1-3/4″ bolts. Install them in four cover holes **(1)** and turn them finger-tight.

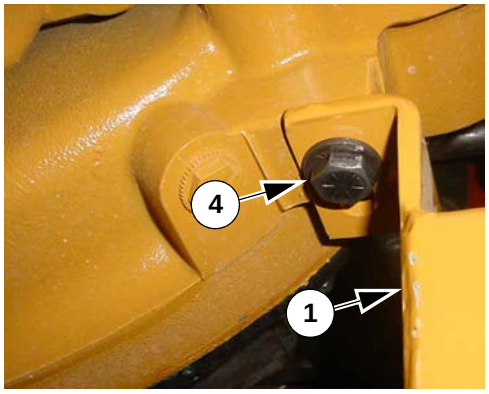
(These four bolts are referred to as “shipping bolts” in following modules.)



19. Install cable mount **(1)** onto bottom left corner of gearbox **(2)** using gearbox hardware **(3)**.



20. Install cable mount to bottom of engine using 1/2-13 x 1-1/4″ Grade 5 bolt **(4)** and washer.



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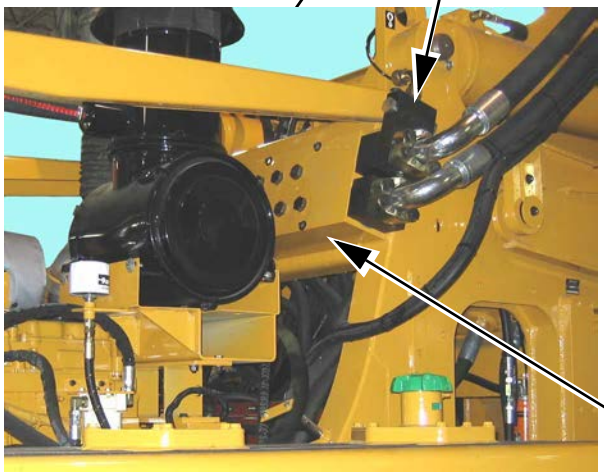
A39 Attachment Charge Boost Block



A15 Hot Oil Shuttle Assembly

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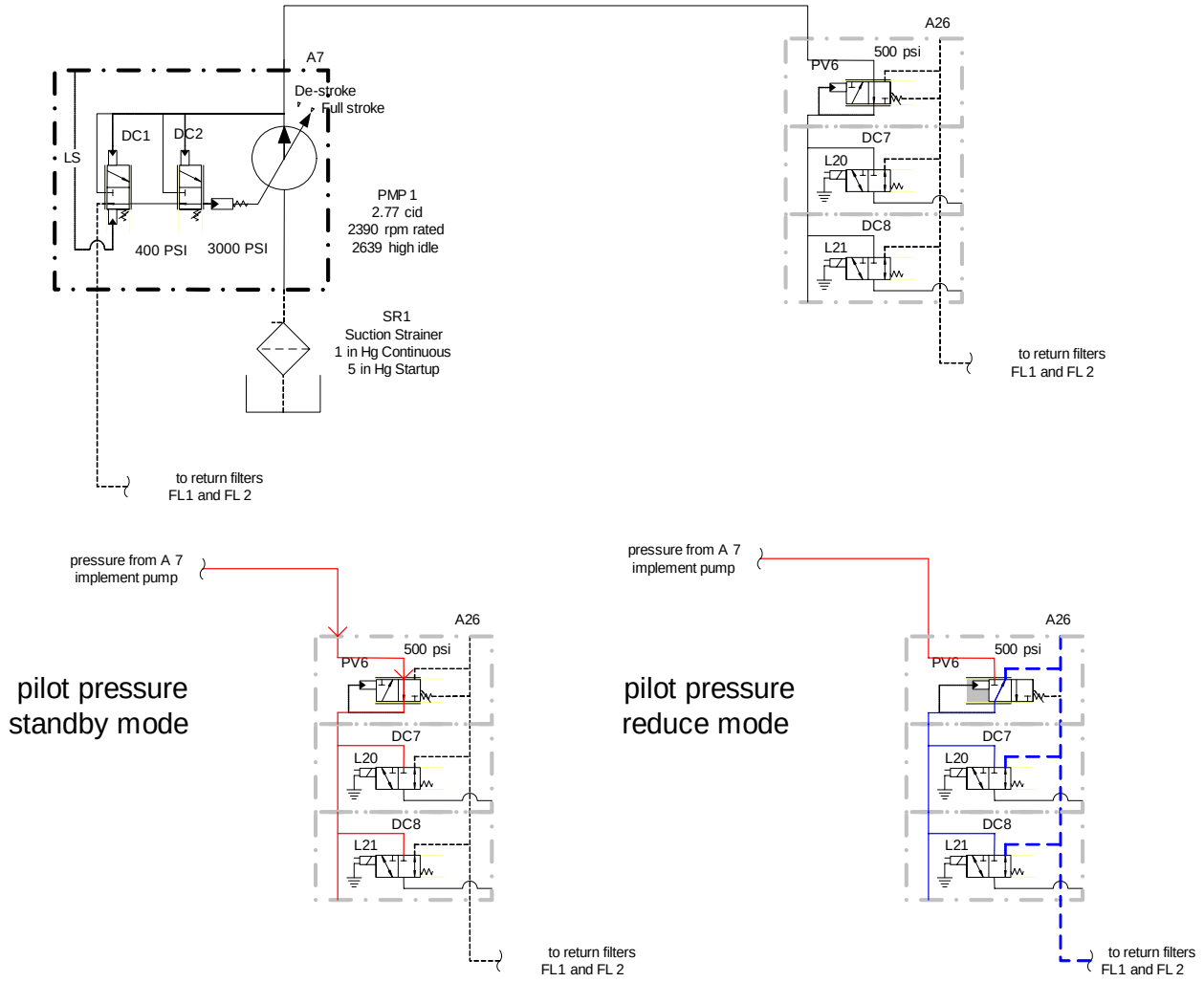
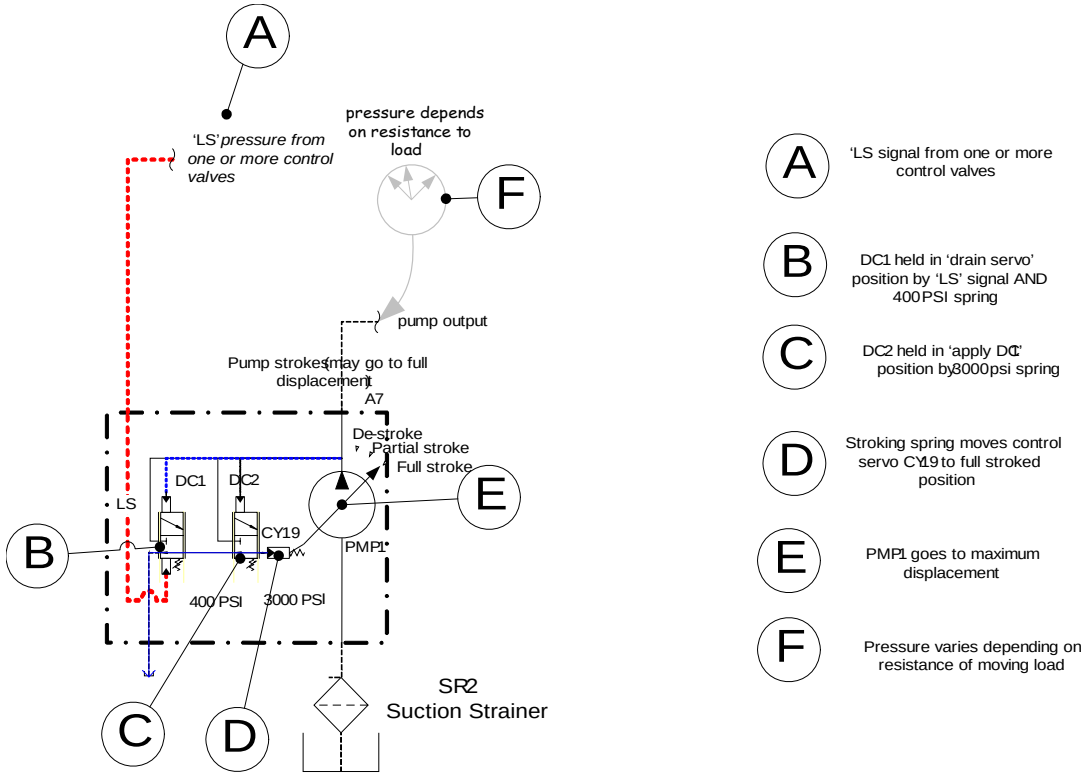
PILOT PRESSURE THEORY OF OPERATION



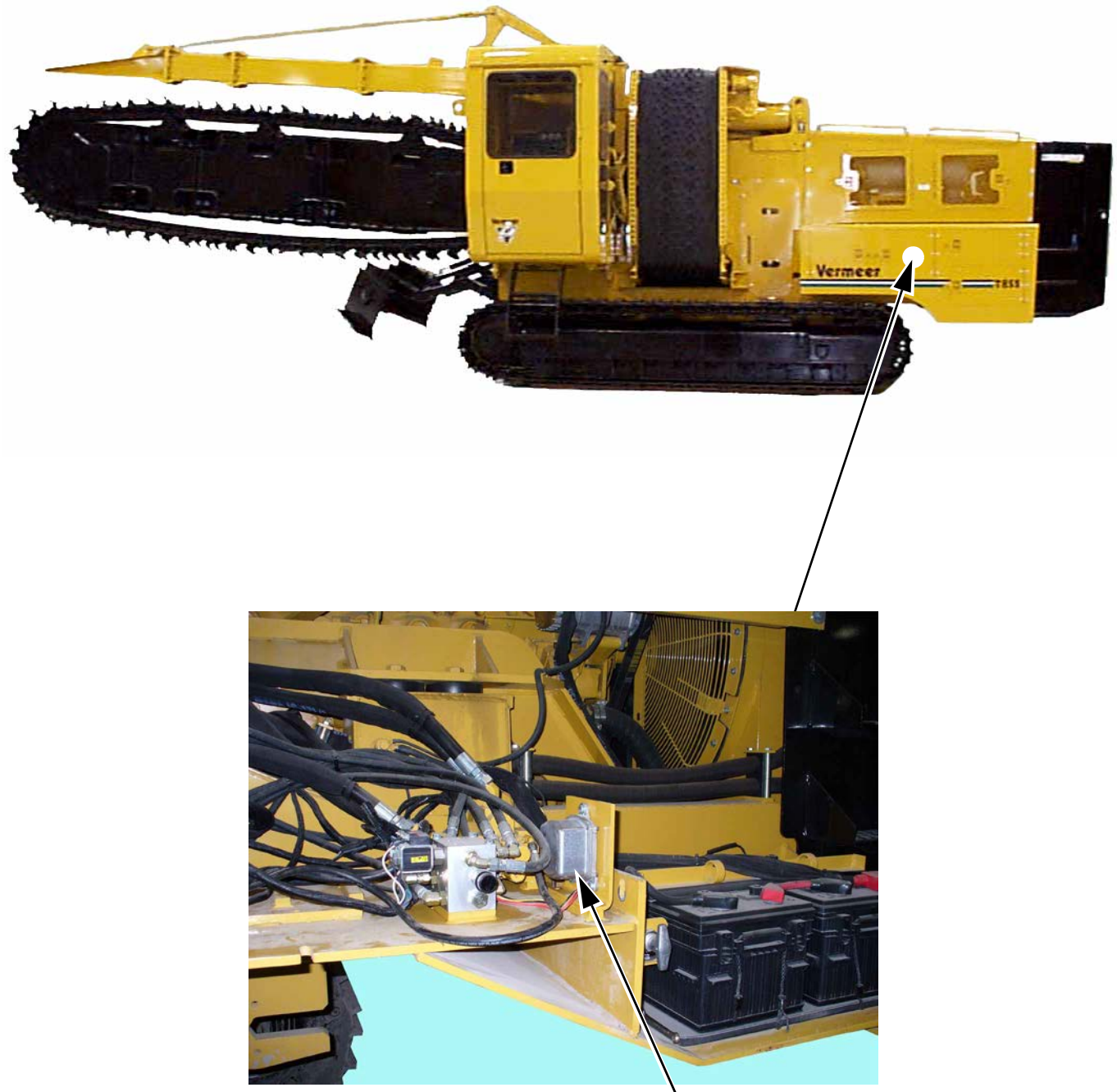
Pilot Pressure

- Pilot pressure is supplied to the track brake release cylinders and to the attachment 2-speed shift servo. Reduced pressure at 500 psi (34.5 bar) or less is required for these functions. Implement pump assembly A7 oil is supplied to the pilot pressure manifold A26. When the implement pump is on standby and no load sensing hydraulic functions have been activated, pump pressure will be approximately 400 psi (27.6 bar) which is sufficient for pilot pressure use. When an implement function is activated, the load sense pump responds with increased flow and pressure up to the system limit pressure of 2500 psi (172 bar). The pressure reducing valve PV6 in the pilot pressure manifold responds to the increased pressure by modulating towards the vent position. This maintains pilot pressure to the brake release and 2-speed functions between 400 psi (27.6 bar) and 500 psi (34.5 bar) regardless of higher implement pressure.

Load Sense Function - Full Demand Mode



Circuit Specifications	Pre-Operating Conditions	Operation/ Performance Checks	Expected Result
Pump displacement 26 gpm (98 L/min)	Install flow meter in pump outlet. Engine running at full throttle (2100 rpm). All controls in NEUTRAL Operator seated	Operate boom lift/lower control. Check reading on flow meter.	Flow should read approximately 27 gpm (102 L/min). If not, troubleshoot/ test the circuit. See *"Troubleshooting,"* page **3-29**.



Auto Tilt Control Assembly A23

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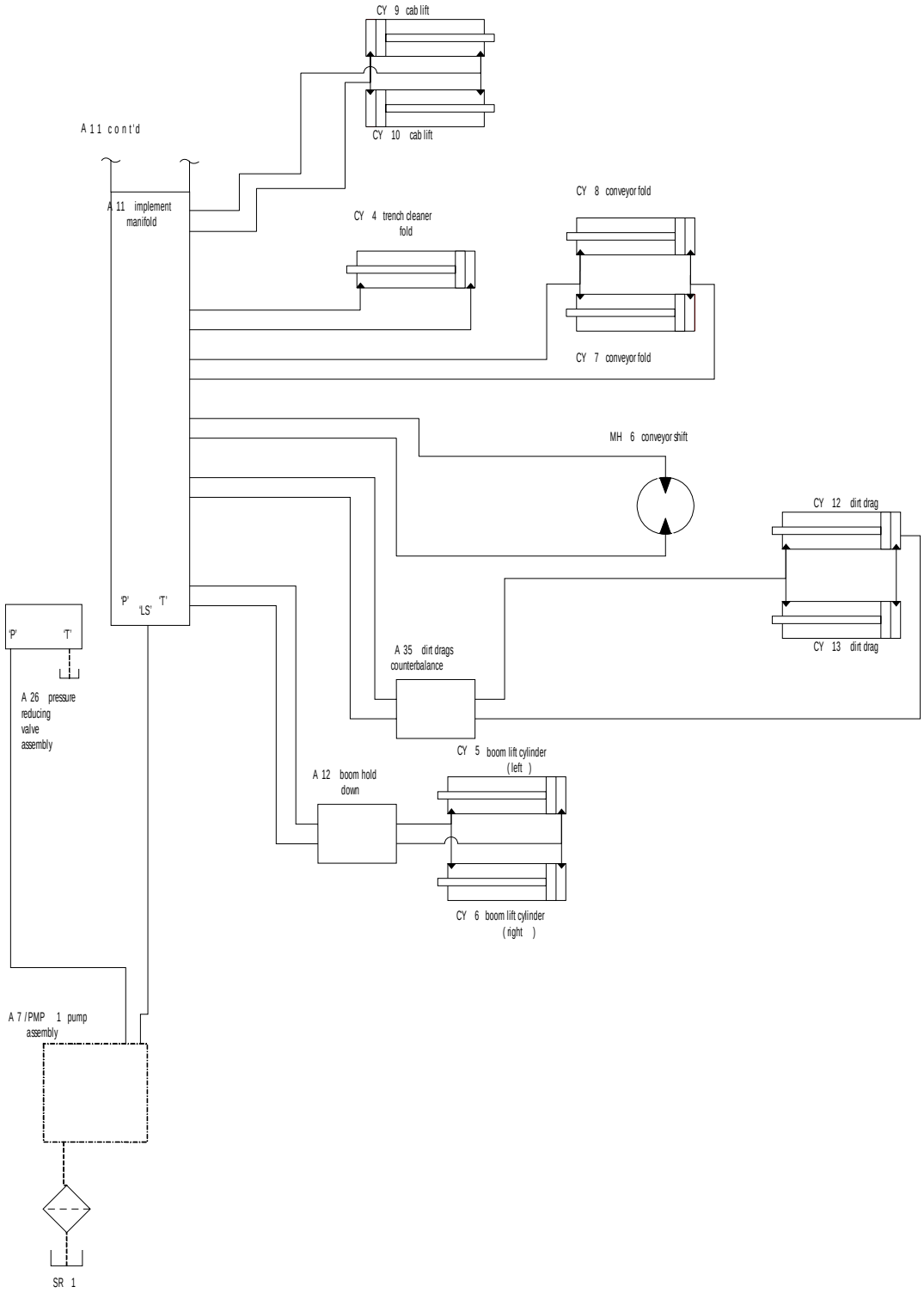
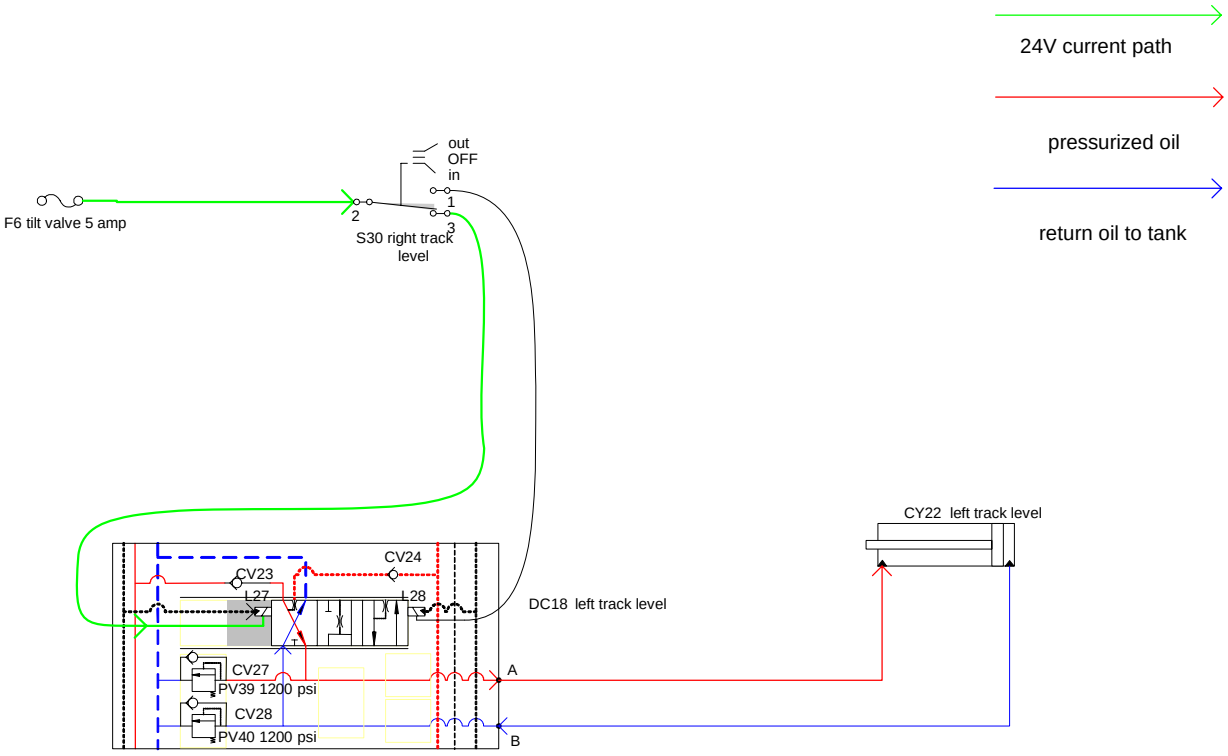
Subsystem Schematic

The following schematics show the Implement subsystem except for the Auto Tilt components. Refer to Chapter 3 for details of the fluid supply and conditioning functions.



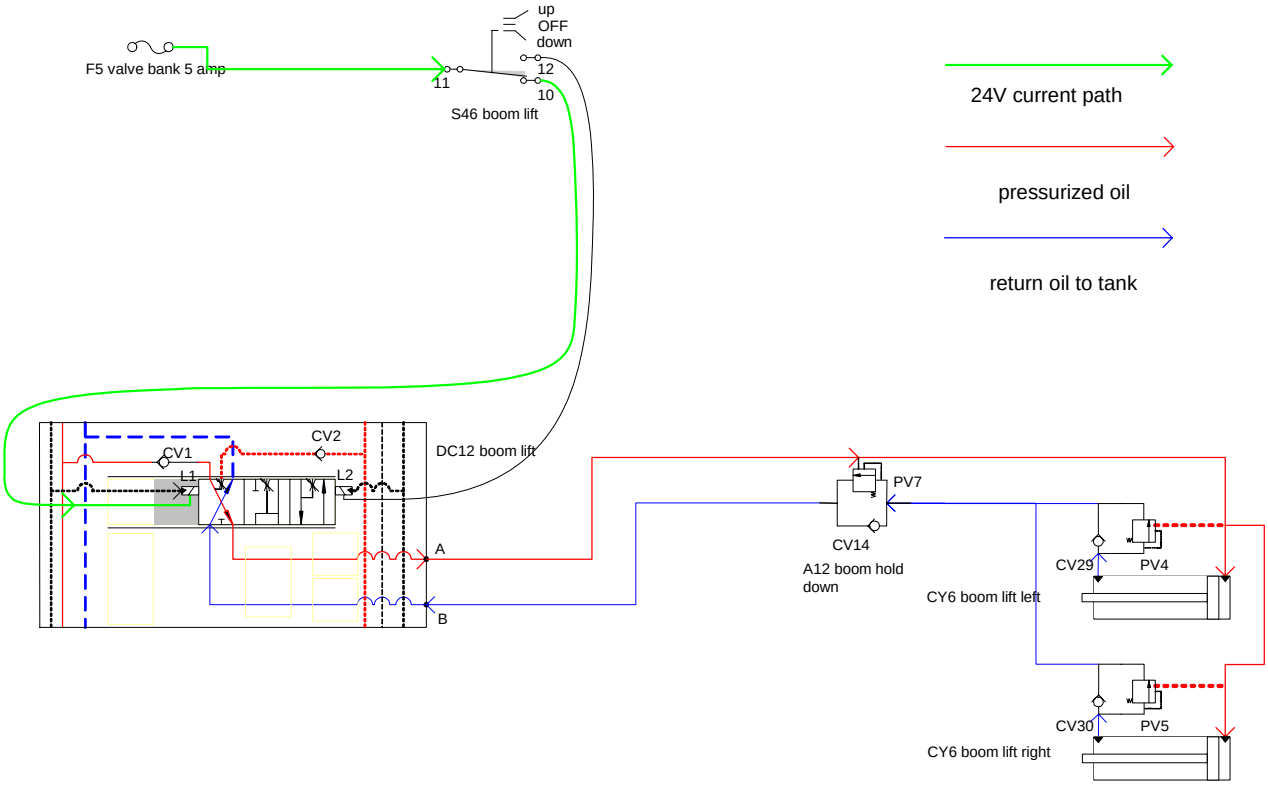
Track Level Function - Left Track In Mode



Circuit Specifications	Pre-Operating Conditions	Operation/ Performance Checks	Expected Result
Standby pressure 400 psi (27.6 bar); high pressure limit 2500 psi (172 bar) DC 24 volts nominal	Engine running full throttle All controls in NEUTRAL	Push left level switch S39 UP.	Top of left track should move IN. If not, troubleshoot/test the circuit. See *"Troubleshooting,"* page **4-56**.

Circuit Specifications	Pre-Operating Conditions	Operation/ Performance Checks	Expected Result
Standby pressure 400 psi (27.6 bar); high pressure limit 2500 psi (172 bar) DC 24 volts nominal	Engine running full throttle All controls in NEUTRAL. Set Auto Tilt switch S4 ON.	Drive left track onto planking or ramp.	Machine should tilt to level with left track on ramp. If not, troubleshoot/test the circuit. See *"Troubleshooting,"* page **4-56**.

Implement Subsystem - Boom Lift Function - Lower Boom Mode



Circuit Specifications	Pre-Operating Conditions	Operation/ Performance Checks	Expected Result
Standby pressure 400 psi (27.6 bar); high pressure limit 2500 psi (172 bar) DC 24 volts nominal	Engine started. Operator seated. Engine speed at full throttle	Move boom lift switch S46 DOWN.	Boom should lower. If not, troubleshoot/ test the circuit. See *"Troubleshooting,"* page **4-56**.

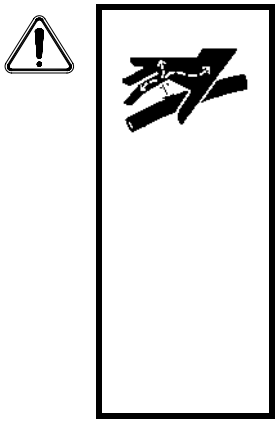
REPAIR

This section consists of repair procedures including removal, replacement, installation, and adjustments of those components responsible for Implement subsystem.

Hydraulic Repair

Cleanliness is extremely important when replacing or repairing hydraulic components. Work in a clean area. Before disconnecting hoses, thoroughly clean the port areas of valves, motors, and cylinders to be removed. Thoroughly clean outside of each component to be reinstalled.

Take an oil sample from system whenever replacing components or before setting relief valves.



WARNING: Pressurized fluid can penetrate body tissue and result in serious injury or death. Leaks can be invisible. Keep away from any suspected leak. Relieve pressure in the hydraulic system before searching for leaks, disconnecting hoses, or performing any other work on the system. If you must pressurize the system to find a suspected leak, use an object such as a piece of wood or cardboard rather than your hands. When loosening a fitting where some residual pressure may exist, slowly loosen the fitting until oil begins to leak. Wait for leaking to stop before disconnecting the fitting. Fluid injected under the skin must be removed immediately by a surgeon familiar with this type of injury.

Relieve all hydraulic system pressure before disconnecting lines, hoses, or performing other work. Ensure all connections are tight, and that hoses and lines are in good condition before applying pressure to system.

1. Follow *"Shutdown Procedure,"* page **1-24**.
2. Loosen hose fitting to release any remaining line pressure **before** removing hose.

NOTE: Remove all lines as though there is hydraulic pressure in lines.

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Circuit Specifications	Pre-Operating Conditions	Operation/ Performance Checks	Expected Result
System limiter pressure 5000 psi (345 bar)	Engine running at 2100 rpm All controls in NEUTRAL Track speed switch HI Track steering control knob centered Park brake OFF	Pull ground drive lever back.	Machine should move backwards evenly. If not, troubleshoot/test the circuit. See *"Troubleshooting,"* page **5-22**.

Charge Pressure Specifications

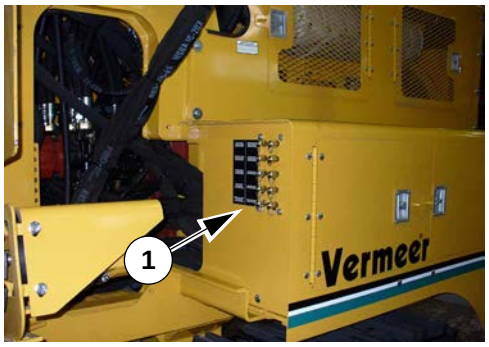
- 350 psi (24 bar) ± 10 psi (0.69 bar) at 2100 rpm with pump in NEUTRAL
- 310 psi (21.4 bar) ± 20 psi (1.38 bar) at 2100 rpm with pump stroked and brake ON

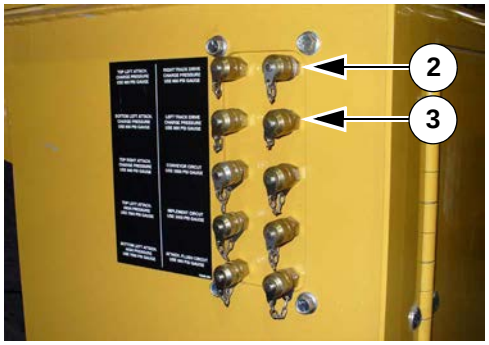
Locations **only** for checking charge pressures are discussed. Complete procedures for checking charge pressures are not specified.

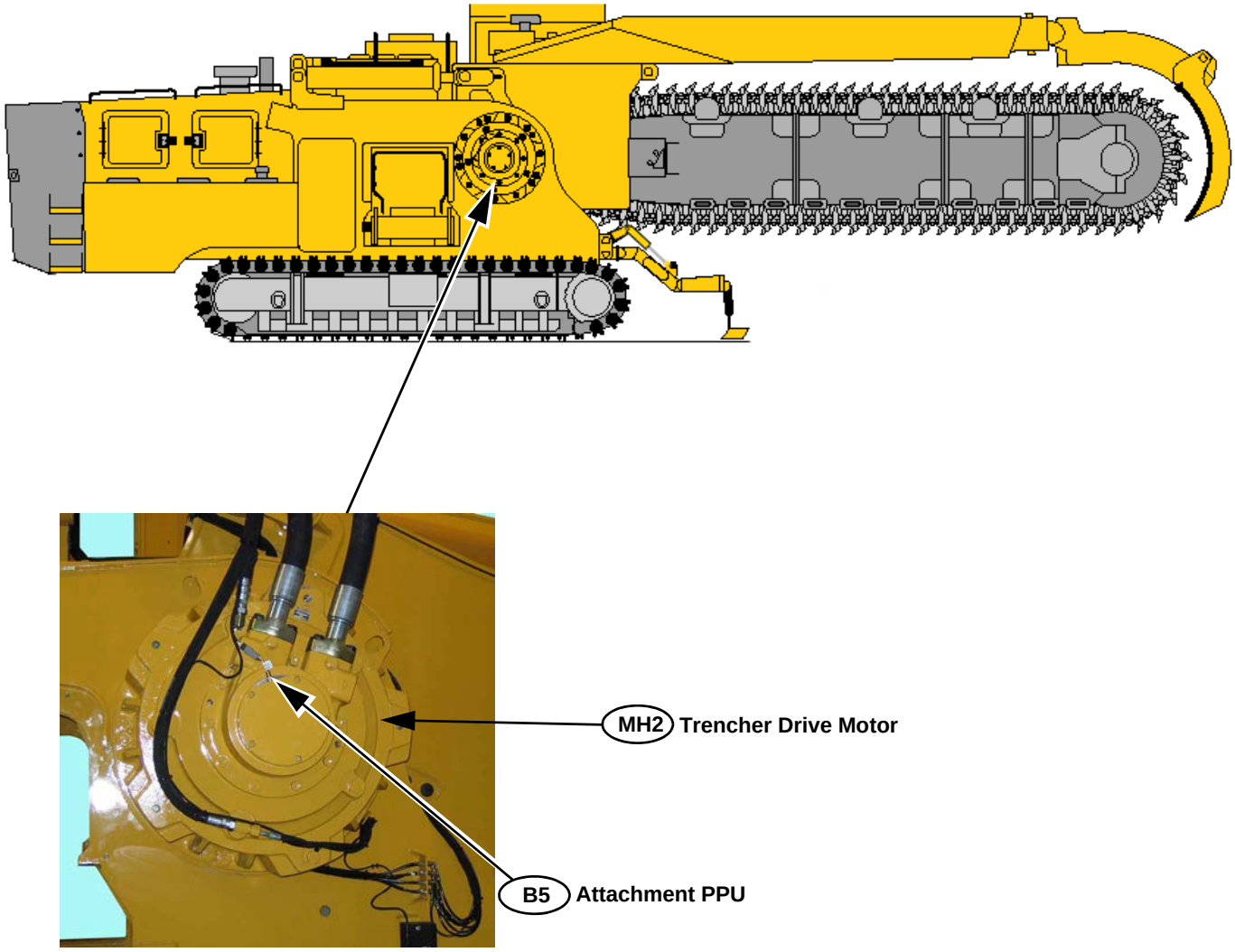
Check Charge Pressures

Left Track Pump: Charge pressure is checked using a pressure gauge capable of 360 psi (24.8 bar) on port **(3)** of diagnostic manifold **(1)**.

Right Track Pump: Charge pressure is checked using a pressure gauge capable of 360 psi (24.8 bar) on port **(2)**.






MH2 Trencher Drive Motor
B5 Attachment PPU

REPAIR

This section consists of repair procedures including removal, replacement, installation, and adjustments of those components responsible for operation of Attachment subsystem.

Hydraulic Repair

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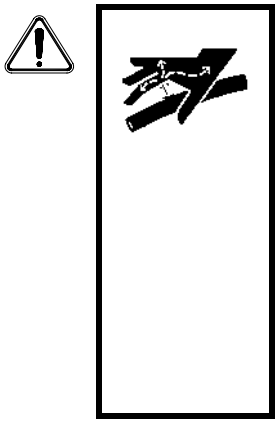

WARNING: Pressurized fluid can penetrate body tissue and result in serious injury or death. Leaks can be invisible. Keep away from any suspected leaks. Relieve pressure in the hydraulic system before searching for leaks, disconnecting hoses, or performing any other work on the system. If you must pressurize the system to find a suspected leak, use an object such as a piece of wood or cardboard rather than your hands. When loosening a fitting where some residual pressure may exist, slowly loosen the fitting until oil begins to leak. Wait for leaking to stop before disconnecting the fitting. Fluid injected under the skin must be removed immediately by a surgeon familiar with this type of injury.

Relieve all hydraulic system pressure before disconnecting lines, hoses, or performing other work. Ensure all connections are tight, and that hoses and lines are in good condition before applying pressure to system.

1. Follow *"Shutdown Procedure,"* page **1-24**.
2. Loosen hose fitting to release any remaining line pressure **before** removing hose.

NOTE: Remove all lines as though there is hydraulic pressure in lines.

General Guidelines When Servicing Hydrostatic Drive

Hydrostatic drive components are precision-built to very close tolerances and operate at very high pressures. Cleanliness is extremely important when servicing a hydrostatic system. **Do not** allow dirt, dust, or debris to enter hydraulic system. Contaminated oil will ruin pump and motor in a short amount of time.

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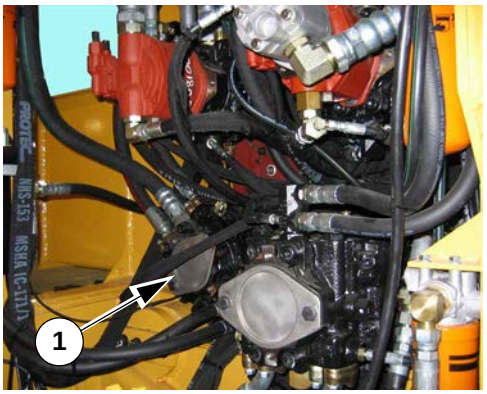
Auxiliary Pump

Pump Location

Auxiliary pump (not shown) is mounted onto rear of bottom left attachment pump **(1)**.



System Relief Pressure Specification

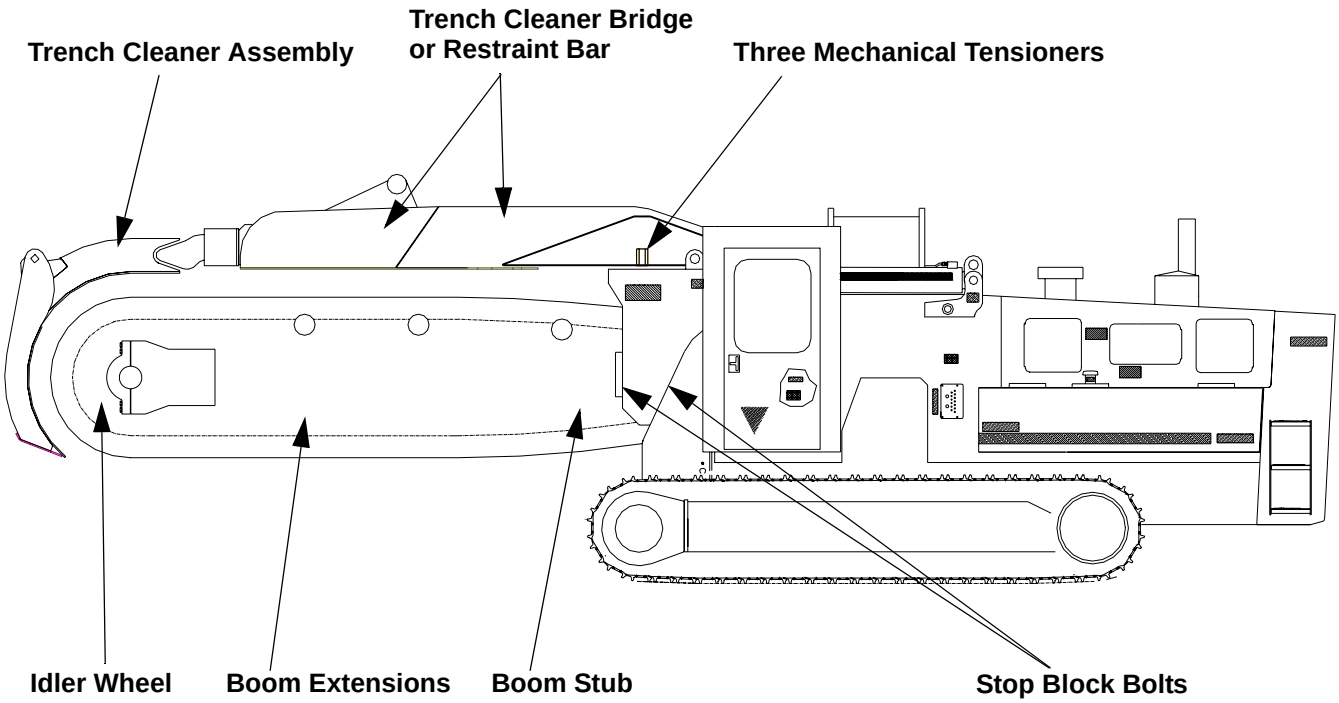
- High Pressure Compensator Setting: 2500 psi (172 bar) at 2100 rpm
- Standby Setting: 400 psi (27.6 bar)

Check System Pressure

Location **only** for checking system pressure is discussed. Complete procedure for checking system pressure is not specified.

System pressure is checked using a pressure gauge capable of 2500 psi (172 bar) on diagnostic port of auxiliary valve. Open valve box door on battery/ tool box assembly to access auxiliary valve.

Trencher Component Locations



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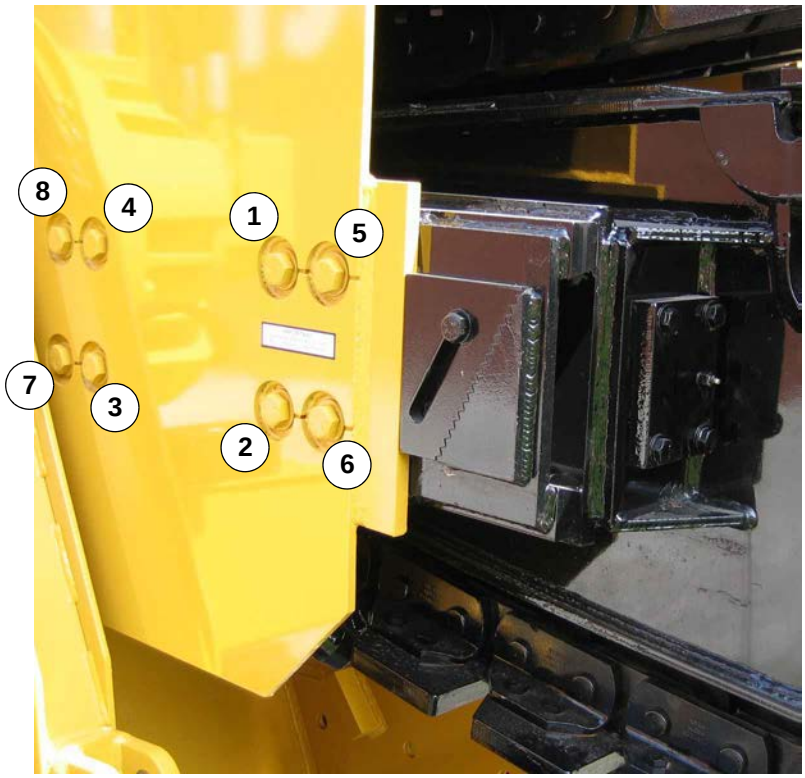


9. Torque all bolts to 850 ft-lb (1150 Nm) in specified sequence shown in photo.

10. Lower and raise boom two times, each time raising track slightly. With boom horizontal, check all bolt torques. Torques must be no less than 800 ft-lb (1085 Nm).

11. Adjust trench cleaner. Refer to page 6-40.

Special Tools and Materials

Parts Needed	P/N	Qty/Comments
Bearing	112799-001	1 per side
O-ring (Large Diameter)	112795-001	2 per side
O-ring (Small Diameter)	111680-001	1 on motor side
O-ring (Small Diameter)	112794-001	1 per side
Duo-Cone Seals	111681-001	2 sets needed for motor side; 1 set for non-motor side; lint free cloth is used to clean metal surfaces contacting bearings
Special Tools Needed	**P/N**	**Comments**
Torque Wrenches	Obtain locally	Capable of 35 ft-lb (47.5 Nm) and 90 ft-lbs (120 Nm)
Seal Install Tool	604142-001	Refer to Install Duo-Cone Seals.
Bearing Install Tool	Obtain locally	Tubing with ID slightly larger than OD of shaft at bearing location and long enough to extend beyond end of shaft
Two Pipe Clamps	Obtain locally	Used to seat parts with Duo-Cone seals together
Fabricated Headshaft Stand	Obtain locally	Tubing, with ID slightly larger than OD of trencher motor shaft end, welded to plate that will hold shaft in a vertical position for assembly
Fabricated Plate	Obtain locally	Plate with ID of center hole slightly larger than OD of trencher motor shaft end and OD same as OD of seal retainer
Induction Heater (Preferred) or Bearing/Oil Heating Pan	Obtain locally	Use to heat and expand bearing to slide over shaft Wide & deep enough to suspend bearing 1" (2.5 cm) from bottom and cover with oil. Need a safe method and location for heating oil to 275°F (135°C).
Accurate Thermometer	Obtain locally	Used to check temperature of heated oil
Clean (New) Leather Gloves	Obtain locally	For handling hot bearing
Isopropyl Alcohol	Obtain locally	To degrease surfaces contacting seals and lubricate seals for installation
Loctite 242	Obtain locally	To retain cap screws

Heat Bearings

Induction Method

1. Ensure all tools are on hand.
2. Heat bearing with an induction heater to 275°F (135°C).

Hot Oil Method

WARNING: Hot oil splashed onto exposed skin or clothing can result in serious burns. Wear face shield and protective clothing when working with hot oil. Never reach into hot oil with gloves on. Use a tool to lift bearings from hot oil.

1. Suspend new bearing in heating container. **Do not** let bearing's surface touch bottom or sides of pan. Cover bearing with hydraulic oil and heat pan and oil to 275°F (135°C). Use thermometer to monitor temperature. If oil is too cool, bearing will not expand sufficiently. If it becomes too hot, bearing can be damaged. When heated, use a tool to pull bearing out of hot oil. Wear clean leather gloves to handle hot bearing.
2. Using clean leather gloves to protect your hands, slide bearing onto shaft as quickly as possible.

   Put bearing install tool (tube) over shaft, and tap end of tool to drive bearing fully against its landing.

   Shaft will act as a heat sink so bearing will cool quickly.
3. When bearing is cool to touch, remove clamps from bearing retainer. Rubber seals will press retainer against bearing.

Duo-Cone Seals

Special Tools and Materials

- CAT Installation Tool (CAT P/N 1U-6439) for Headshaft
- CAT Installation Tool (CAT P/N 1U-6443) for End Idler Hub

TROUBLESHOOTING

Review information in the General Information chapter under *"Troubleshooting Guidelines,"* page **1-23**.

NOTE: If multiple subsystems have failed, investigate the components that are common (shared) by all subsystems.

If a malfunction does occur, first do the following visual checks to inspect for obvious signs of failures before any extensive troubleshooting or testing is performed. If nothing is found, refer to the circuit schematics on the previous pages and continue troubleshooting/testing the function(s) affected.

Visual Inspection

Look for obvious signs of cylinder failure such as bending, binding, breakage, and excessive external leakage.

On all hydraulic circuits/components:

- Check for any failures such as broken, kinked, loose, or leaking hoses and fittings on supply, pressure, and return to hydraulic components.
- Check level of hydraulic fluid in hydraulic tank. Low fluid can cause erratic behaviors in hydraulic circuits. Correct level is visible on sight gauge. If needed, add new fluid that has been filtered through a 10-micron filter.

Correct any problems found during the inspection. Operate machine to verify the malfunction is fixed.

TROUBLESHOOTING

Review information in the General Information chapter under *"Troubleshooting Guidelines,"* page **1-23**.

NOTE: If multiple subsystems have failed, investigate the components that are common (shared) by all subsystems.

If a malfunction does occur, first do the following visual checks to inspect for obvious signs of failures before any extensive troubleshooting or testing is performed. If nothing is found, refer to the circuit schematics on the previous pages and continue troubleshooting/testing the function(s) affected.

Visual Inspection

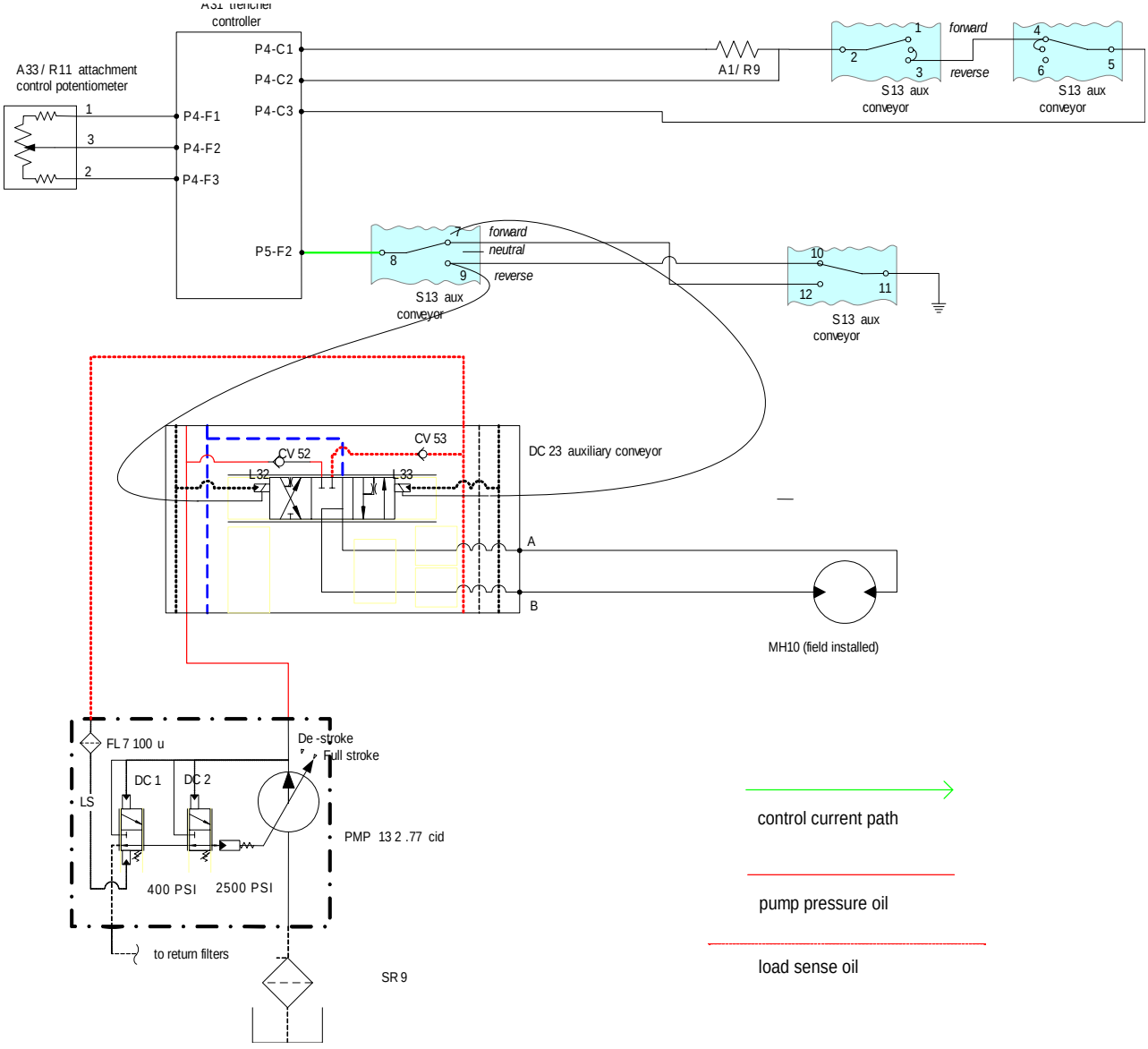
On all hydraulic circuits/components:

- Check for any failures such as broken, kinked, loose, or leaking hoses and fittings on supply, pressure, and return to hydraulic components.
- Check level of hydraulic fluid in hydraulic tank. Low fluid can cause erratic behaviors in hydraulic circuits. Correct level is visible on sight gauge. If needed, add new fluid that has been filtered through a 10-micron filter.

Correct any problems found during the inspection. Operate machine to verify the malfunction is fixed.

THEORY OF OPERATION/SUBSYSTEM SCHEMATIC

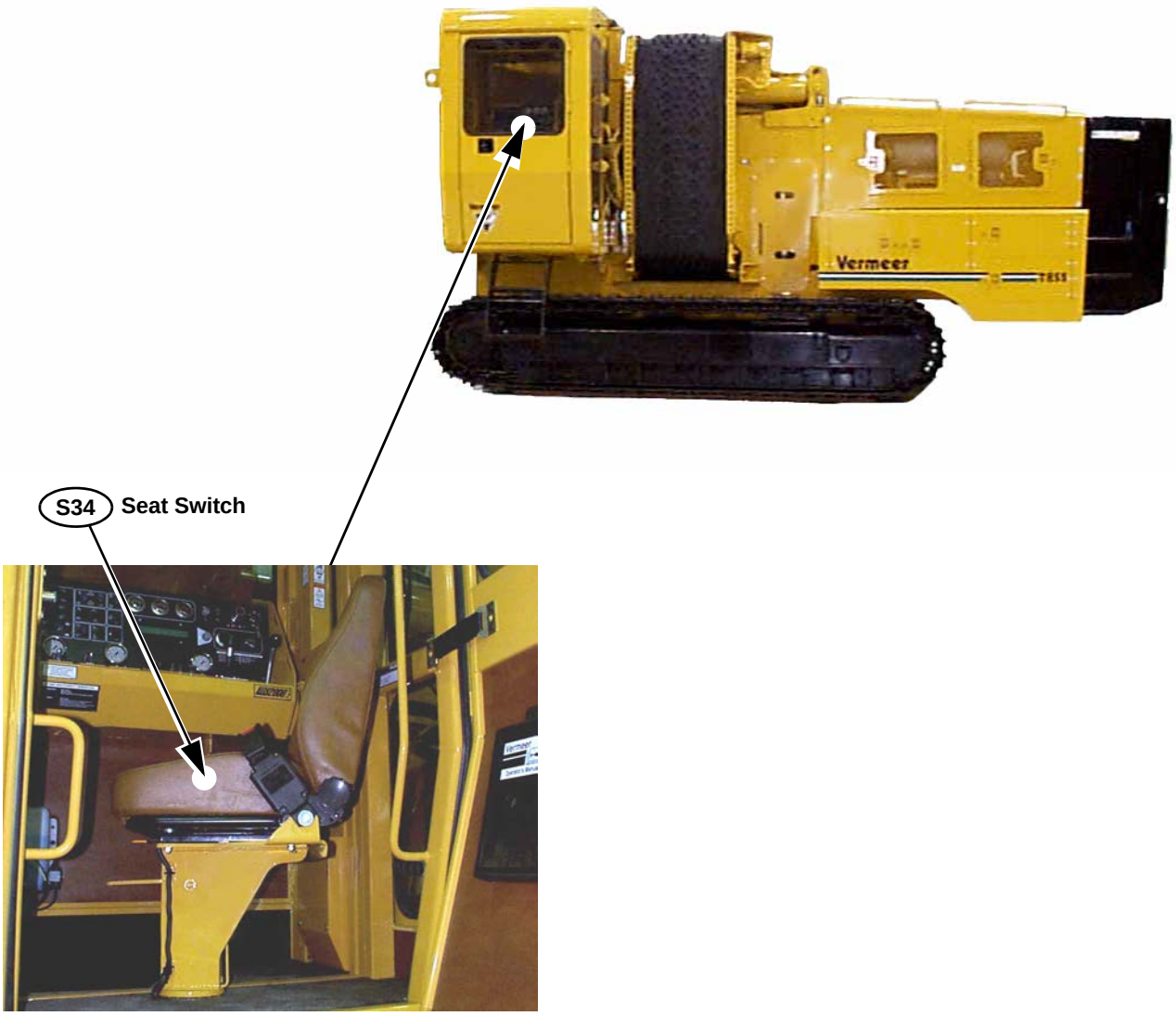
The following schematic shows the Conveyor subsystem. Refer to Chapter 3 for details of the fluid supply and conditioning functions



Operation

Auxiliary conveyor pump PMP13 is a pressure and flow compensated variable displacement pump which functions the same as the implement pump. Pressurized oil at 400 psi (27.6 bar) is present at auxiliary control valve DC23. The auxiliary conveyor control is used to signal the trencher controller A31 which sends a control signal to L32 or L33 to operate the conveyor. Pump output and pressure is controlled by the load sense signal.

Component Locations



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