

# Section 7.1

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## Wheel Drive Circuit - General System

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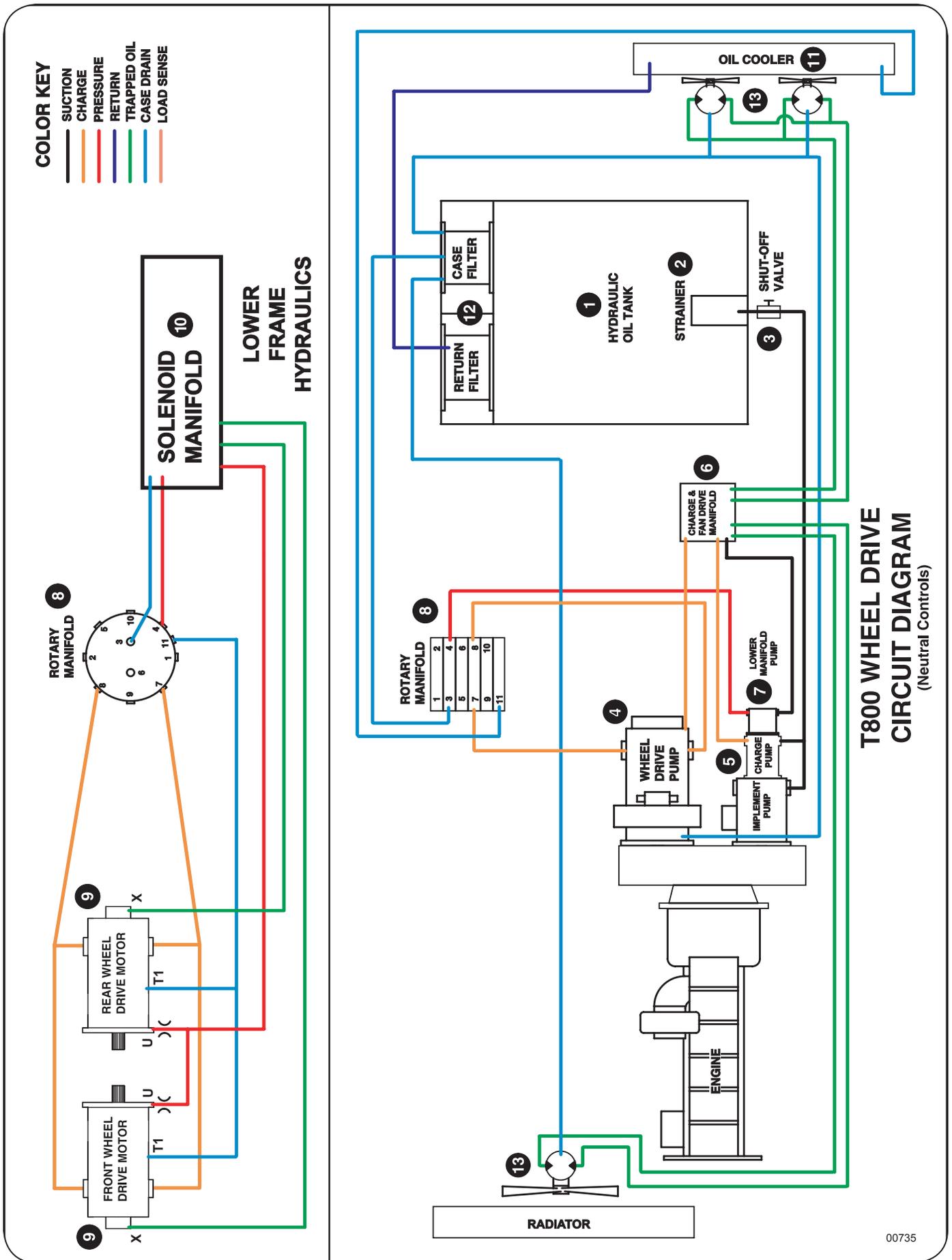
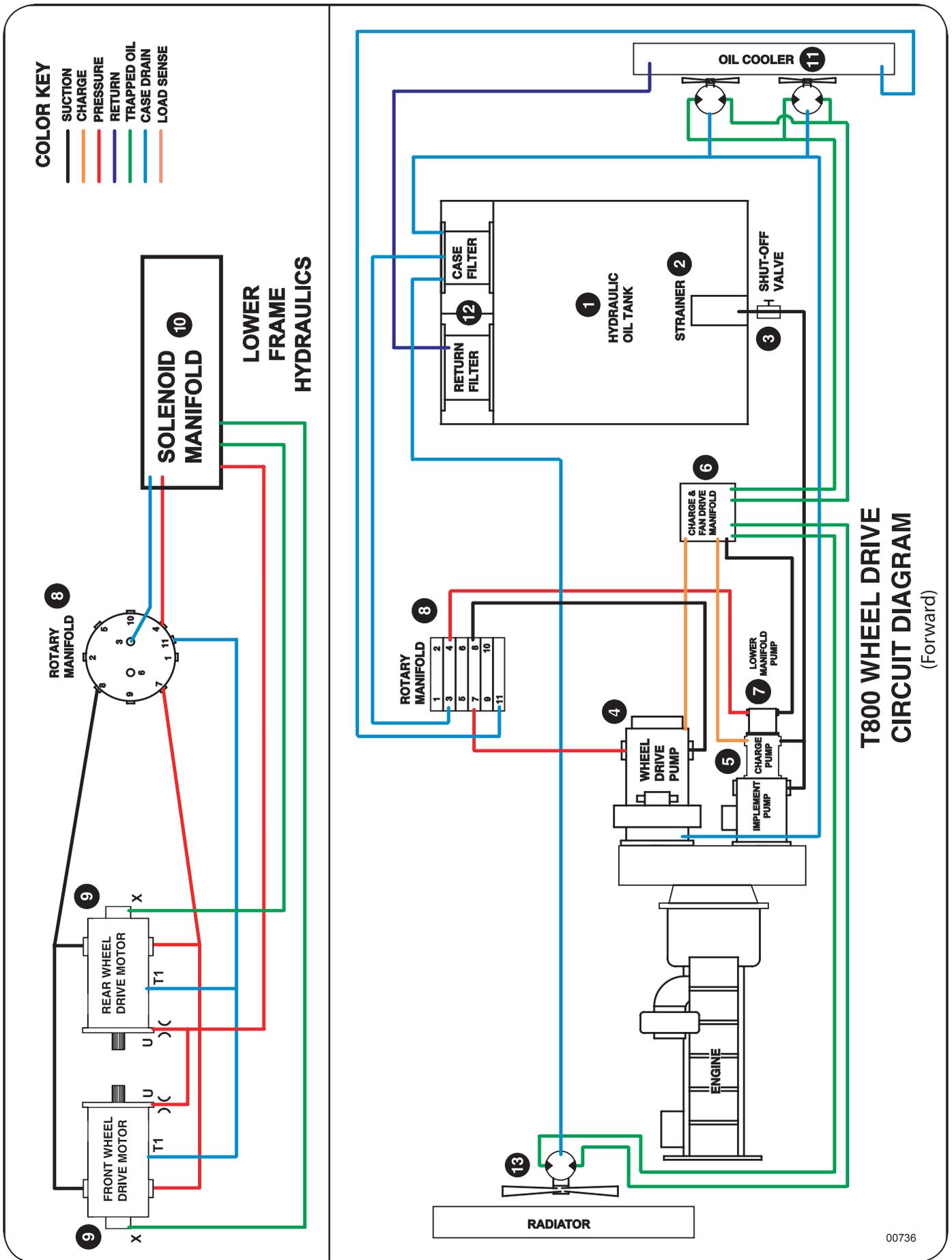


Figure 1: Simplified Travel Circuit Diagram - NEUTRAL CONTROLS (Dual Wheel Drive Motors)

## General (See Figures 1, 2 & 3)

The wheel drive, or travel circuit, is a closed loop hydrostatic system made up of the following main components:

- 1) 60 gal. (227 liter) hydraulic oil tank for storage and cooling of the hydraulic oil. See Section 3.2 in this manual for important information on the hydraulic tank and its components.
- 2) 100-mesh implement suction strainer w/ magnetic stem.
- 3) Suction line shut-off valve.
- 4) Rexroth AA4VG125/3.2 series variable displacement, over-center, axial piston wheel drive pump.
- 5) Charge pump piggy-back mounted to the Implement pump. The charge pump is a 52cc pump. Charge pressure is controlled by the charge pressure manifold/filter assembly (Ref #6). The purpose of the charge pump is to provide make-up oil for the closed loop hydrostatic travel circuit. Flushing orifices in the pump and motors (and natural internal leakage) allow a small amount of oil to bleed from the hydrostatic loop. This leakage is replenished by the charge pump. A filter in the charge pressure manifold/filter assembly (Ref #6) cleans the charge oil before it enters the hydrostatic loop.
- 6) The charge pressure manifold/filter assembly contains the charge pressure relief and the charge oil filter. A sequence cartridge is used because the downstream pressure does not effect the valve pressure setting. Any increase of pressure downstream will not be additive to the charge pressure. This makes the charge pressure setting more constant. Charge pressure also provides stroke control for the wheel drive pump, swing brake release pressure, and controls the hydraulic cooler and radiator fans.
- 7) Lower Manifold Supply pump piggy-back mounted to the Charge pump. The Lower Manifold Supply pump is a 10cc pump and supplies oil that is used in the lower manifold.
- 8) 14-port rotary manifold for 360° continuous rotation swing. In the wheel drive circuit it provides the hydrostatic link to the wheel drive motors, brake connections to the axles, and shift connections to the transfer case.
- 9) Rexroth AA6VM160 variable displacement wheel drive motor(s). Standard configuration for a TF 830 is dual motors matched to a 2-speed gearbox. A single motor installation matched to a 2-speed gearbox is standard for a TB 630.  
  
The speed and drawbar pull of the machine is varied by automatically changing the displacement of the wheel drive motor(s) according to system pressure.  
  
The Motors can manually be controlled by using the “motor shift switch” (figure #8) located on the right handcontrol panel.  
  
In high range (fast speed - less drawbar) the motor(s) are at minimum displacement.  
  
In medium range or “Down Hill setting” (TF 830 only) the machine will lock one motor into Max displacement and leave one in Min displacement. This will stop the machine from being able to “Over-Speed” when traveling down hills or steep terrain.  
  
In low range (low speed - high drawbar) the motor(s) are at maximum displacement.
- 10) Lower Manifold is used to operate things like the brakes, gear box, motor shift, differential lock, frame lock and is also used to flush hot oil from the wheel drive motors.
- 11) High capacity oil cooler with a 120°-140°F (49°-60°C) thermal bypass and 50 psi (3,45 kPa) back pressure bypass.
- 12) Return and case drain filters in the hydraulic tank. See Section 2.2 in this manual for important information on the hydraulic tank and its components.
- 13) Fixed displacement, bi-directional, gear motors that turn the cooling fans for the engine radiator and hydraulic oil cooler.



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Figure 2: Simplified Travel Circuit Diagram - FORWARD TRAVEL (Dual Wheel Drive Motors)

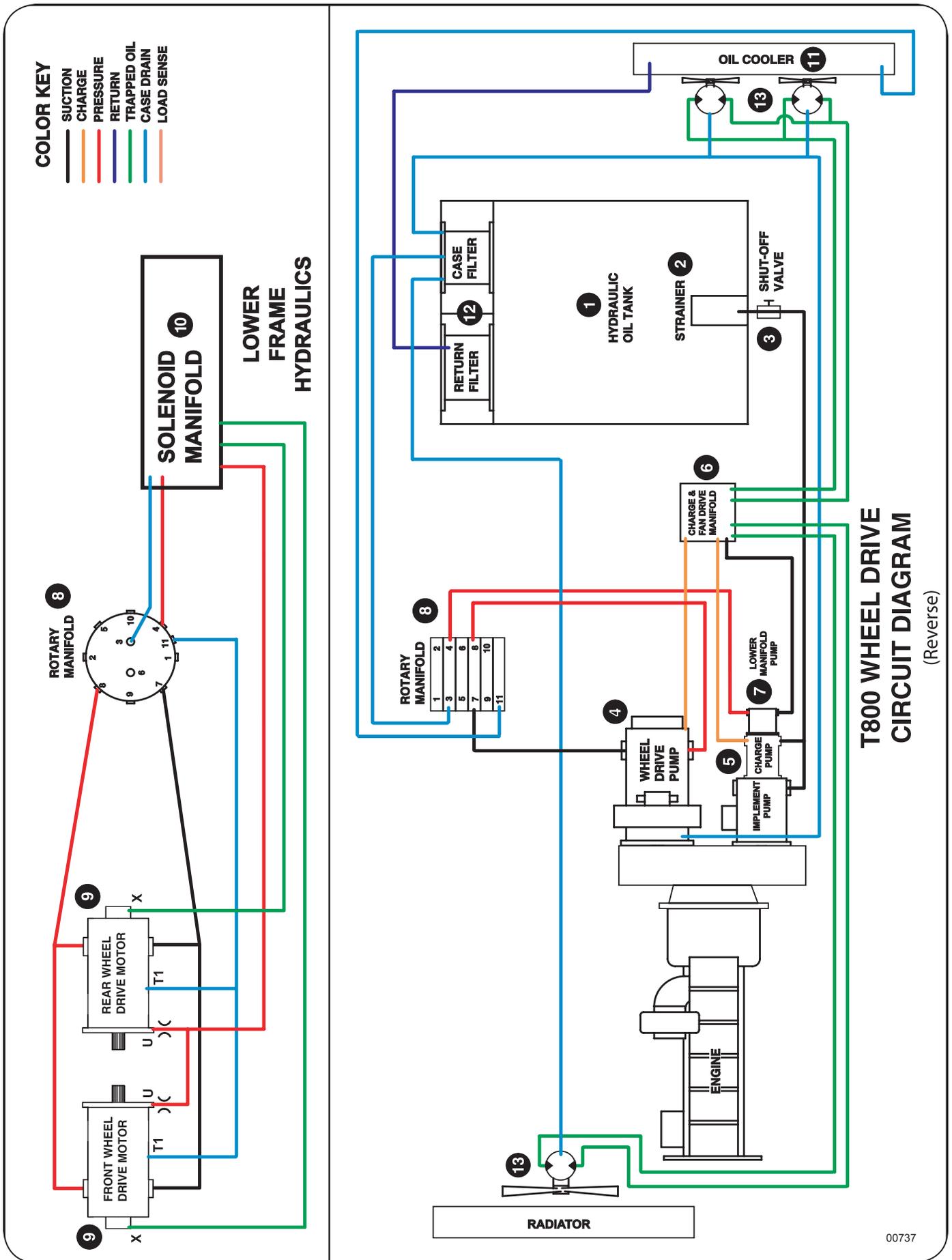


Figure 3: Simplified Travel Circuit Diagram - REVERSE TRAVEL (Dual Wheel Drive Motors)

# Wheel Drive Circuit

## General

The TF 830/840 machine uses a dedicated pump and a 2-speed gearbox powered by dual hydraulic motors for the wheel drive (travel) circuit. The TB 630 configuration uses a 2-speed gearbox and a single motor.

The circuit type is a closed loop hydrostatic system. The directional changes in machine movement are controlled by swiveling the pump rotating group from a centered, neutral position to either forward or reverse. This is controlled by an electrical signal sent from a travel pedal actuated by the operator.

## Description

A Rexroth 125cc AA4VG3.2 series pump is used on all configurations. This pump are referred to as a over-center pump. This means that the rotary group, which provides oil flow around the hydrostatic loop, can travel over-center on either side of the neutral swash plate position. This allows oil flow to be reversed in the hydrostatic loop. The direction of machine travel is controlled by the angle of the pump swash plate to either side of neutral.

The 125cc wheel drive pump is driven through a gearbox with a 1.38 speed increaser. Doing so allows the top engine RPM to be reduced from 2200 to 2000(which is the peak torque level of the Cummins QSC8.3 engine). This is being done to reduce the fuel required and reduce the noise level in the cab.

One or two Rexroth AA6VE series variable displacement motors which are mated to a 2-speed gearbox. The motors are set for different displacements to optimize the performance of the machine. These motors also utilize a 3-speed auto-shift mechanism as well as having case flushing orifices installed.

## Mechanics

When the operator activates the travel pedal for the forward direction, an electrical signal is sent to the pump controller via the IQAN digital control system.

The electrical signal activates the solenoid on the pump controller, which in turn moves a small control spool that allows command oil to the pump servo. The pump servo is connected directly to the swash plate in the pump and when it is shifted, strokes up the pump in the desired direction and forces the pump to produce flow to the motors via the rotary manifold. When changing directions, the swash plate goes to the opposite side of neutral to change the direction of oil flow.

The oil returning from the motors is then routed through the rotary manifold to the opposite work port on the pump. This oil is then reused by the pump and sent back down to the motors.

## Charge Pump

Because of the cooling requirements of the wheel drive circuit, it is necessary to push oil through flushing circuits to keep the pump and motors cool. The charge pump provide the make-up oil for cooling the closed loop hydrostatic pump/motors and to provide pump control pressure. The pump and motors have a natural manufacturing leakage which cannot be eliminated. This leakage must be made up or the closed loop system would run dry of oil. The charge system continually feeds oil into the low pressure side of the closed hydrostatic loop.

The maximum pressure setting of the charge circuit is regulated by a charge sequence valve located on the hydraulic tank support. Charge pressure is set at 400-425 PSI (27.6-29 bar) at 1500 RPM with a screw-type adjustment cartridge. Charge pressure also is used to release the swing brake, supply the pilot pressure manifold, and as make-up oil for the implement valve to prevent cavitation.

## **POR (Pressure Override)**

The pressure override valve is unique in that it can limit the maximum allowed pump pressure without putting high pressure oil over a relief. See Figure 5.

When the machine encounters a condition where the drive pressure starts to exceed the maximum setting, the POR valve senses this. The POR valve then dumps the command oil that controls the pump servo to case. This allows the swash plate to move back towards the neutral position and reduce the pump flow to an amount that is enough to maintain the maximum allowed pressure.

The POR valve is adjustable and is set at 6000 PSI (413.7 bar) at 1500 RPM. See Section 7.2 in this manual for adjustment procedures.

## **High Pressure Relief Valves**

The high pressure reliefs perform two important functions:

- 1) Prevent system or machine damage by venting oil from the hydrostatic loop should the machine stall against an immovable object. In this situation, a pressure spike is created in the circuit which could damage components. The high pressure reliefs sense this pressure spike and, if it exceeds the relief setting, vents oil from the hydrostatic loop into the charge system. This allows the pressure spike to dissipate without causing damage.

Venting oil through a high pressure relief also generates an excessive amount of heat, so it is important that they are adjusted properly. The high pressure reliefs are like a safety relief and are seldom active in a properly designed and adjusted circuit.

The high pressure reliefs are adjustable and are set at 6400 PSI (441 bar) at 1500 RPM. See Section 7.2 in this manual for adjustment procedures.

- 2) A high pressure relief, when located on the low pressure side of the hydrostatic loop, also acts as a check valve to allow charge oil to replenish the hydrostatic loop oil volume. This is required because of internal leakage in the pump and motors. If the leakage oil is not replaced, the hydrostatic loop would run low on

oil and component damage would occur.

## **Case Flushing Orifices**

Both the pump and motors are equipped with case flushing orifices. The purpose of these orifices is to help keep the hydrostatic loop cool.

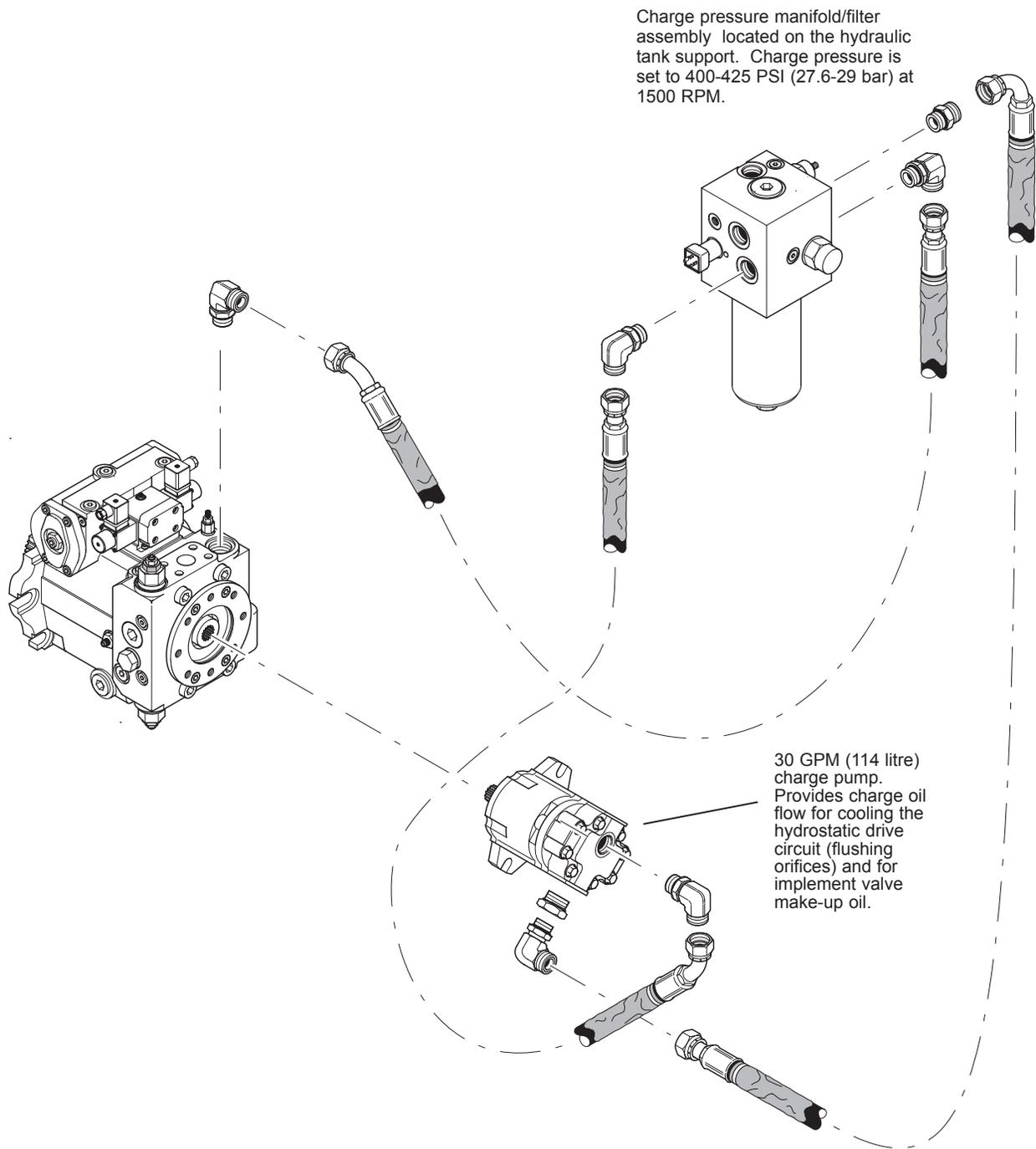
Hot oil in the hydrostatic loop is vented through the case flushing orifices into the case drains and then routed through the oil cooler. The vented loop oil is replaced by cool charge oil. This is very important, overheating would occur without the constant removal and replacement of a small amount of loop oil.

### **Pump Case Flushing Orifice**

The pump case flushing orifice is located in the head of the pump and is part of the charge pressure spike relief. The charge spike relief protects the charge oil circuit from high pressure spikes.

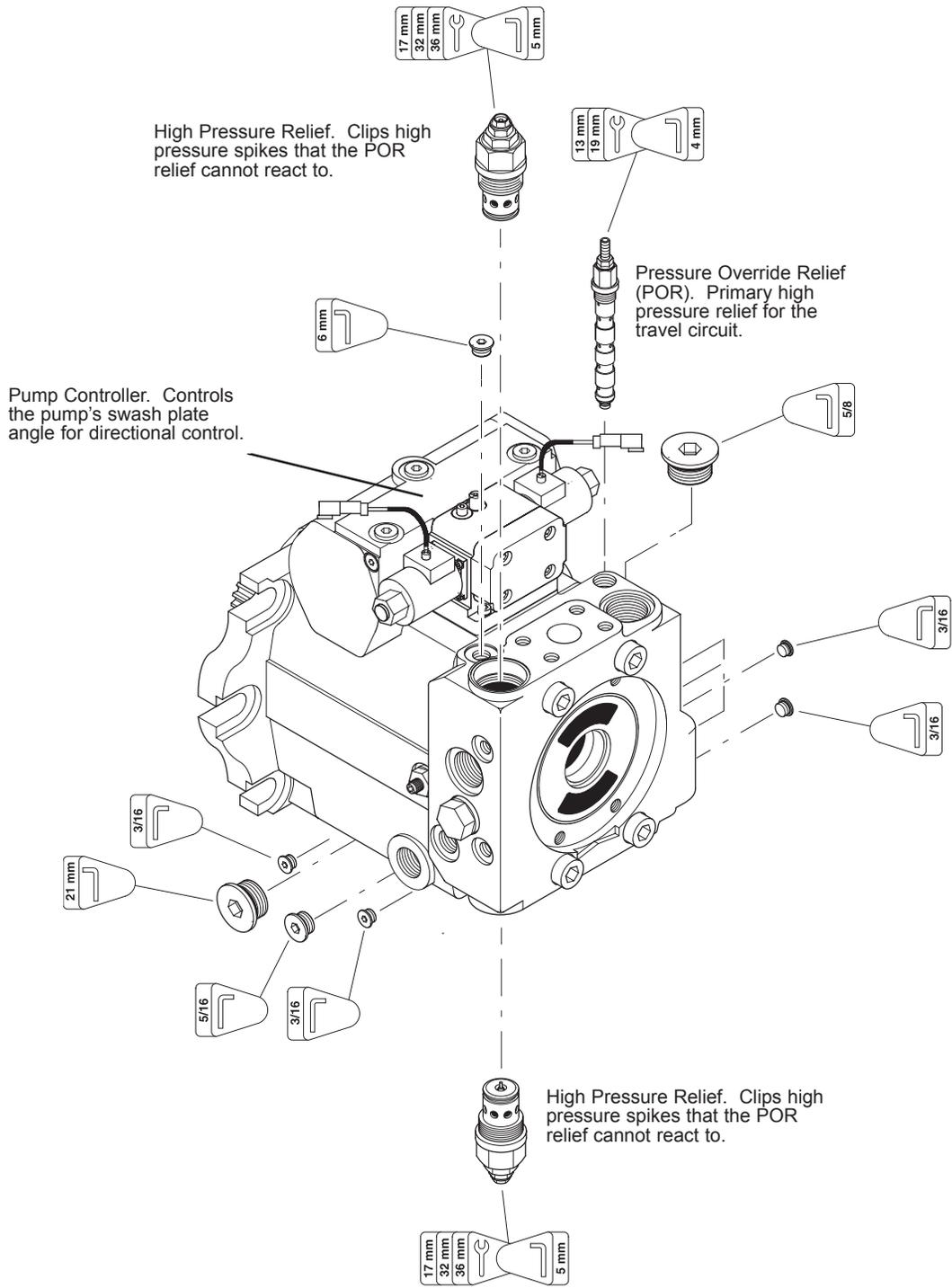
### **Motor Case Flushing Orifice**

The motor case flushing orifice is located in the control head of the motor.



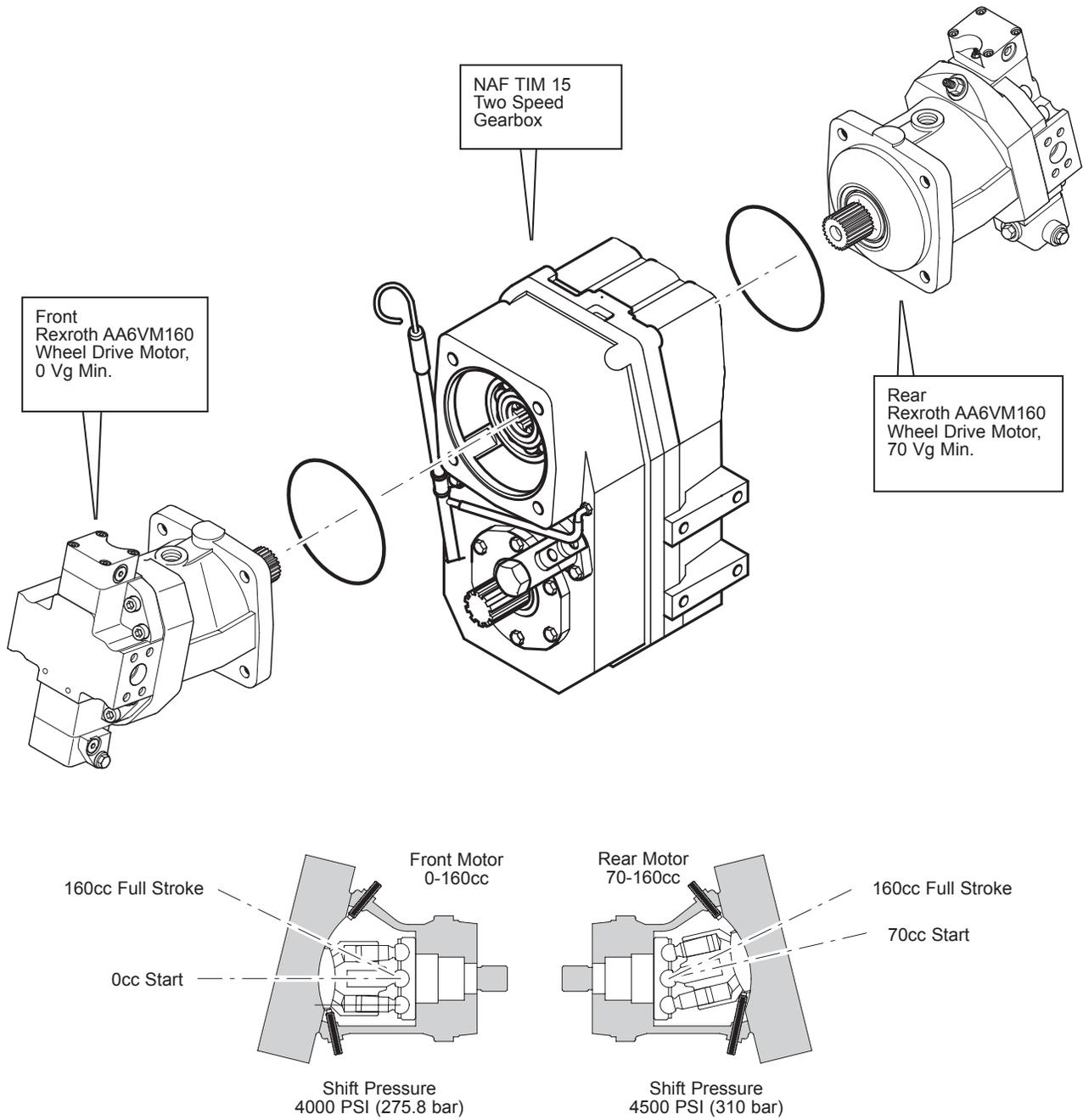
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Figure 4: Charge Circuit Diagram



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Figure 5: Wheel Drive Pump Breakdown



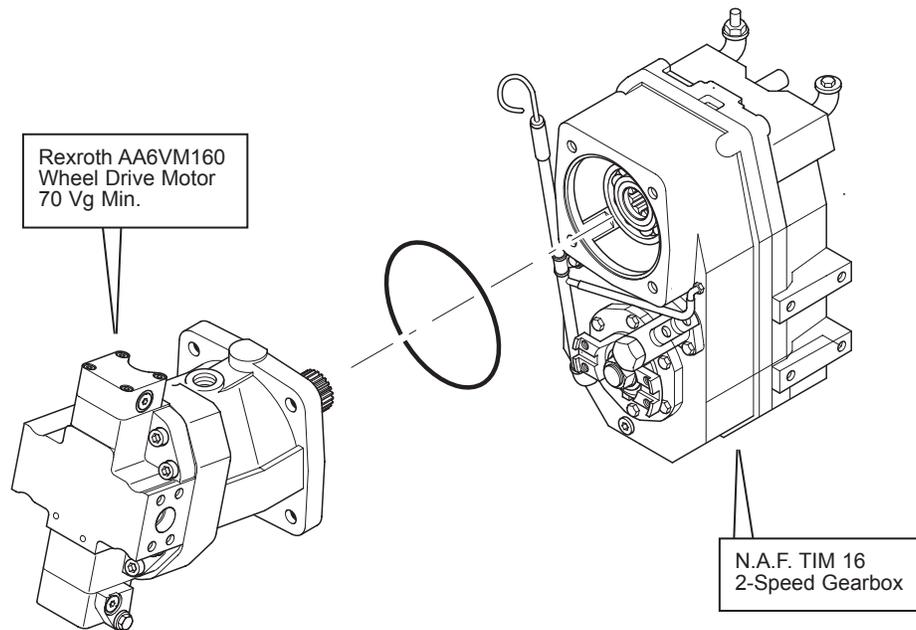
### Wheel Drive Motors & Gearbox (Dual Motor Configuration)

Dual wheel drive motor configurations use dual Rexroth axial piston drive motors bolted to a NAF two speed gear reduction box. This motor/gearbox combination can be located in the rear frame. The front and rear motors are different from each other in starting displacements and shift pressure settings. It is very important to replace the motor back with the same type if one should have to be replaced or removed.

**IMPORTANT:** The front motor S/N# tags are all stamped 0 Vg Min and the rear motors are stamped 70 Vg Min.

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Figure 6: Wheel Drive Motor Installation (Dual Motor Configuration)(Typical)



### Wheel Drive Motor & Gearbox (Single Motor Configuration)

The TB 630 configurations are equipped with a single Rexroth axial piston drive motor bolted to a NAF 2-speed gear reduction box. This motor/gearbox combination is also located in the rear frame.

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Figure 7: Wheel Drive Motor Installation (Single Motor Configuration)(Typical)

## Mechanics Of Operation

Oil flow is controlled by engine speed or RPM of the pump. The wheel drive motor(s), being driven by the pump, change displacement automatically depending on the drawbar requirements.

In a no load situation, the front motor is set at 0cc displacement and the rear motor is set at a minimum displacement of 70cc. When the machine starts to move and the pressure reaches 4000 PSI (275.8 bar) the front motor begins to shift. It will go from 0cc displacement all the way to the maximum displacement of 160cc. In this condition, when the pressure required to move the load reaches 4500 PSI (310 bar), the rear motor starts to shift off its minimum displacement of 70cc.

With the flow produced by the 125cc wheel drive pump at 2000 RPM feeding two 160cc motors, it would take more than 260 HP to reach the pump POR setting of 6000 PSI (414 bar).

Because of the HP requirement, it is very important to back off on the foot pedal to maintain engine RPM when a tough pull is encountered. By backing off on the pedal, the displacement of the pump is reduced allowing the engine to maintain its RPM while holding pressure to keep moving the load at the sacrifice of speed. The reason it is so important to maintain engine RPM is because when the engine is slowing under heavy load there is more heat being generated and without RPM the engine fan and water pump slow down, not giving the cooling efficiencies required.

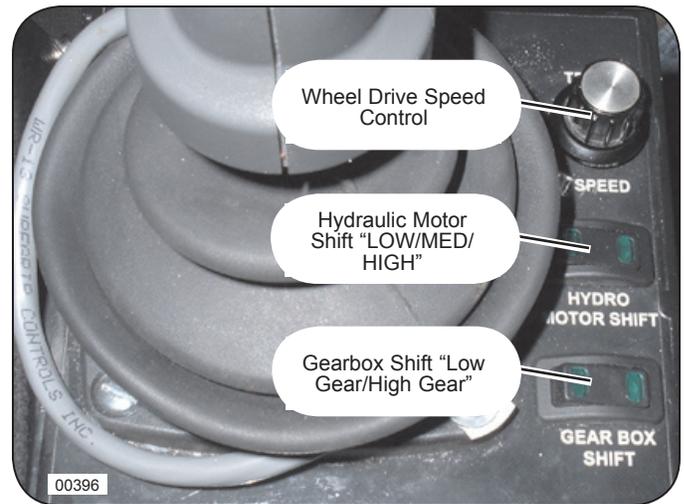


Figure 8: Right Hand Control Panel  
(Wheel Drive Function Switches)

When maximum drawbar is required for a tough pull, a rocker switch on the right hand control panel can be used to lock the wheel drive motor(s) in maximum displacement (low speed). See Figure 8.