

Hydraulic Circuit Explanation

Neutral Circuits: Open Center and Open Center

Power Beyond

Open Center

- Simplest, most economical system
- Uses a fixed displacement pump
- In neutral position pump and tank are connected
- Most suitable on smaller type vehicles

Open Center Power Beyond

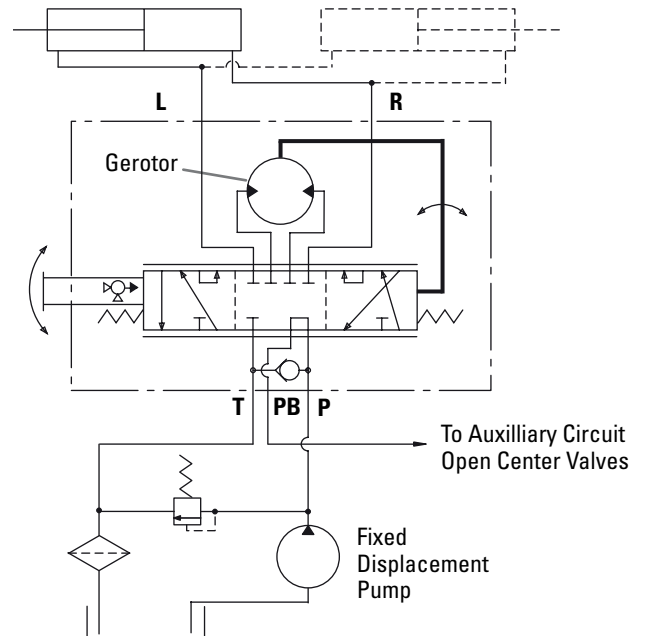
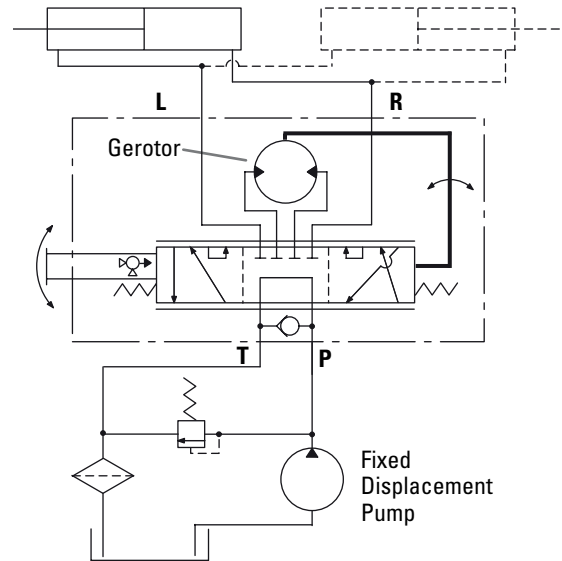
The power beyond steering control unit supplies steering and auxiliary valve functions. The power beyond unit is used on medium pressure, open center (fixed displacement pump) systems. When not steering, the power beyond unit directs all inlet flow to the auxiliary circuit. However once steering is initiated, part of the auxiliary flow is diverted to steering. Since steering has priority, all flow, if required, will be diverted to steering. The tank port of the steering unit has flow only when steering is operated. Thus, flow out of the auxiliary ("PB") port and the tank port will fluctuate or stop depending on steering input.

The following special considerations should be addressed when applying power beyond steering:

- Auxiliary valves (connected to PB) must be open center type. Slight bump or kick may be felt in steering wheel when auxiliary functions are activated during steering operations.
- Pump flow not used for steering is available at power beyond (PB) outlet, except at steering stops where total pump flow goes over the system relief valve. Avoid auxiliary functions that require constant flow while steering.
- Flow is only directed to the tank port when steering is operated. Avoid systems where return flow from tank port is used for auxiliary functions.
- Inlet pressure to the steering unit will be the higher of steering system pressure or auxiliary valve pressure.
- Generally avoid systems where heavy use of auxiliary functions occur while steering.

Applications

- Lawn and Garden Equipment
- Utility Vehicles

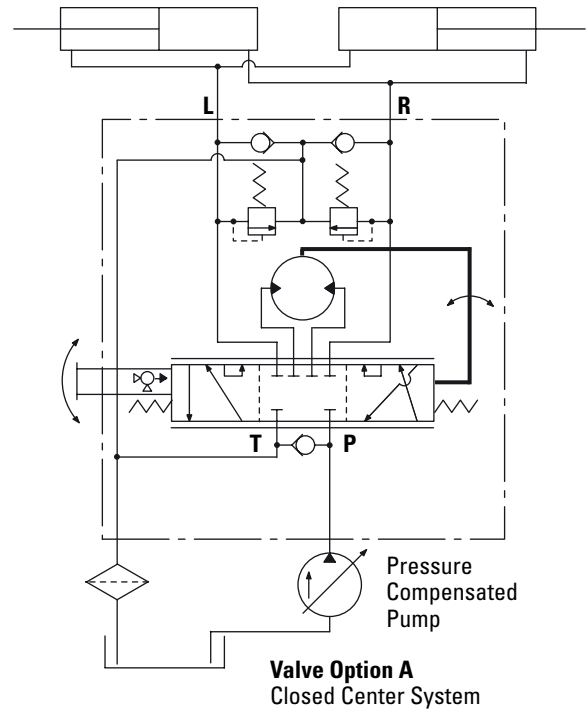


Hydraulic Circuit Explanation

Neutral Circuits: Closed Center

Closed Center

- Uses a pressure compensated variable displacement pump
- In neutral position pump and tank are disconnected
- Most suitable on large construction equipment



Closed Center with Neutral Bleed

Neutral Bleed Feature

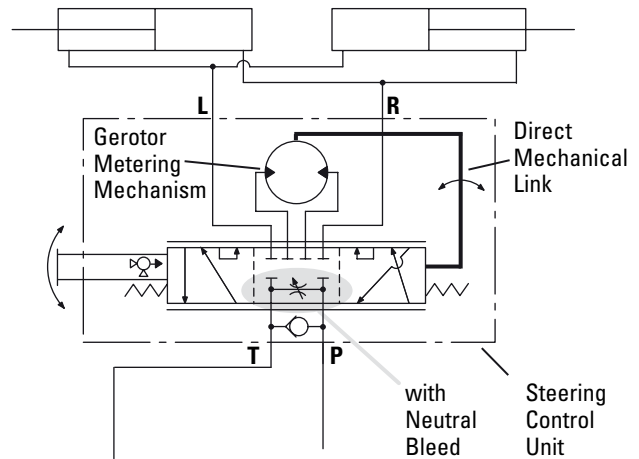
Closed Center Steering Control Units are available with and without neutral bleed feature. Most applications may not require the bleed feature, however, the maximum temperature differential between components within the steering circuit must not exceed specification (50° F or 28° C). Order unit with the bleed feature if the temperature differential may exceed this limit. The neutral bleed feature allows a small flow of fluid to pass through the unit when in neutral to reduce the thermal differential.

Typical applications where neutral bleed is required are:

- Remote steering position from power source.
- Extended engine idle operation when vehicle is parked.
- High duty cycle operation sharing a common reservoir with the steering circuit.

Applications

- Construction Industry



Hydraulic Circuit Explanation

Neutral Circuits: Load Sensing

Load Sensing Circuits

Char-Lynn load sensing power steering uses conventional or load sensing power supplies to achieve load sensing steering. The use of a load sensing steering unit and a priority valve in a normal power steering circuit offers the following advantages:

- Provides smooth pressure compensated steering because load variations in the steering circuit do not affect axle response or maximum steering rate.
- Provides true power beyond system capability by splitting the system into two independent circuits. Pressure transients are isolated in each circuit. Only the flow required by the steering maneuver goes to the steering circuit. Flow not required for steering is available for use in the auxiliary circuits.
- Provides reliable operation because the steering circuit always has flow and pressure priority.

Char-Lynn load sensing steering control units and priority valves can be used with open center, closed center or load sensing systems. Use in an open center system with a fixed displacement pump or a closed center system with a pressure compensated pump, offers many of the features of a load sensing system. Excess flow is available for auxiliary circuits

Listed below are the components of a typical load sensing control circuit and a brief application description.

Pump—May be fixed displacement, pressure compensated, or flow and pressure compensated design.

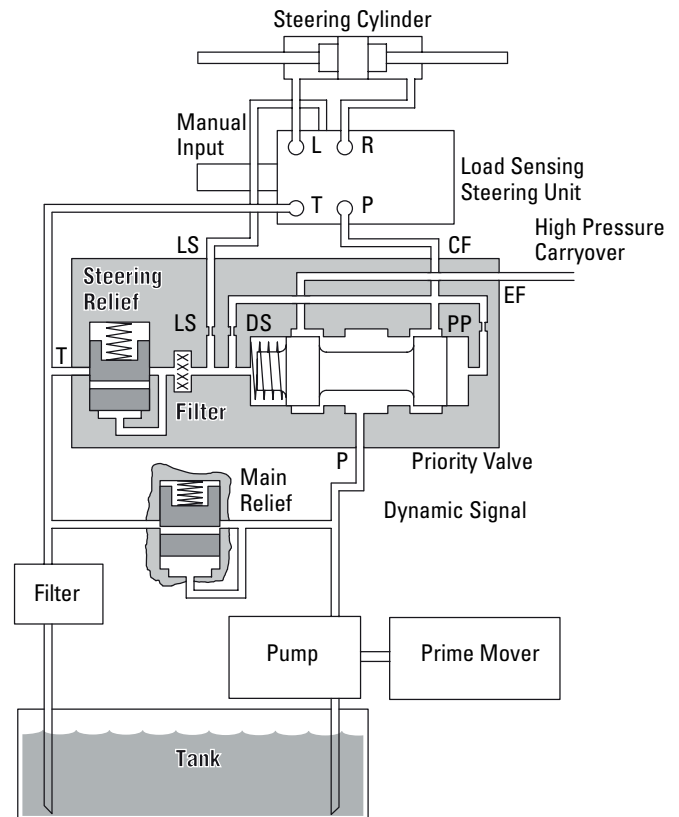
Priority Valve—Sized for design pressure drop at maximum pump output flow rate and priority flow requirements. The minimum control pressure must assure adequate steering flow rate and must be matched with the steering control unit. A dynamic signal priority valve must be used with a dynamic signal steering control unit.

Steering Control Unit—Designed for specific rated flows and control pressures. It must be matched with a control pressure in the priority valve to obtain maximum steering rates. Higher flow rates require higher control pressures. Neutral internal bleed assures component temperature equalization.

LS Line—A LS line is always needed to sense pressure downstream from the variable control orifice in the steering control unit. This is balanced by an internal passage to the opposite side of the priority control spool. The total system performance depends on careful consideration of the control pressure chosen and pressure drop in the CF line.

Steering Relief Valve—Must be factory set at least 10 bar [145 PSI] above the maximum steering cylinder pressure requirement. Most of the flow will be directed to the auxiliary circuit (EF) when the relief setting is exceeded.

System Main Relief Valve—A pressure relief valve for the auxiliary circuit and/or a main safety valve for the protection of the pump is recommended and sized for the maximum pump output flow rate. If a main relief valve is used, it must be set above the priority circuit steering relief valve pressure setting.



- LS**— Load Sensing
- DS**— Dynamic Signal
- PP**— Pilot Pressure
- CF**— Control Flow
- EF**— Excess Flow

Hydraulic Circuit Explanation

Neutral Circuits: Load Sensing

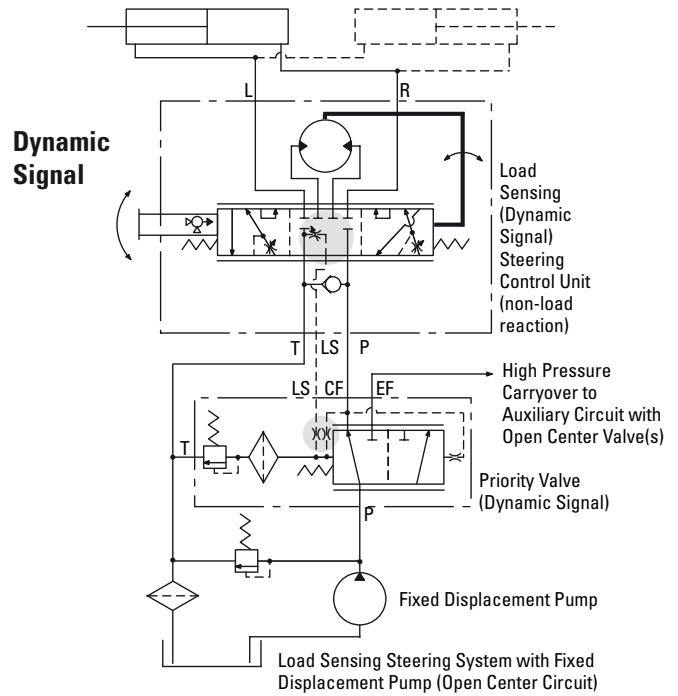
Load Sensing Circuits—Signal Systems

Two types of load sensing signal systems are available—Dynamic and Static.

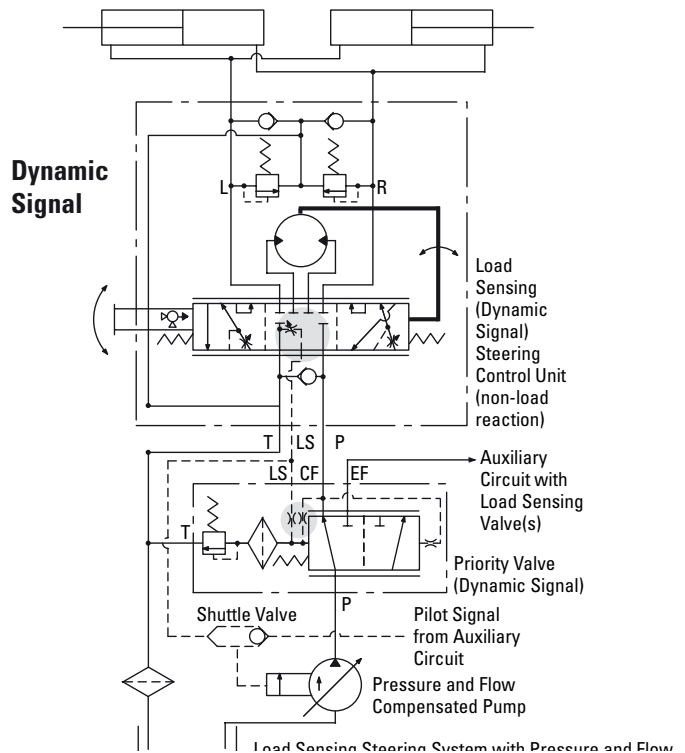
Dynamic Signal—Used for more difficult applications. The dynamic signal systems offer the following benefits:

- Faster steering response.
- Improved cold weather start-up performance.
- Increased flexibility to solve problems related to system performance and stability.

Dynamic Signal—Open Center Pump



Dynamic Signal—Load Sensing Pump

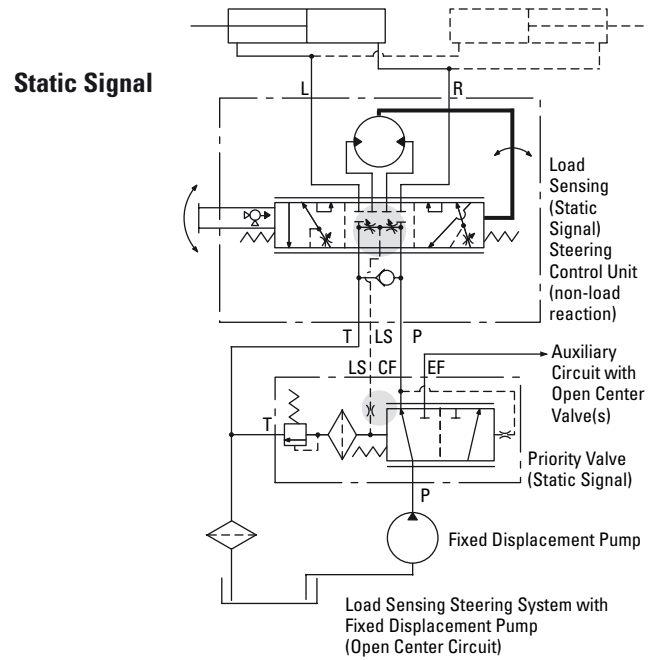


Hydraulic Circuit Explanation

Neutral Circuits: Load Sensing

Static Signal—Open Center Pump

Static Signal—Used for conventional applications where response or circuit stability is not a problem. The load sensing pilot line should not exceed 2 meters [6 feet] in length.

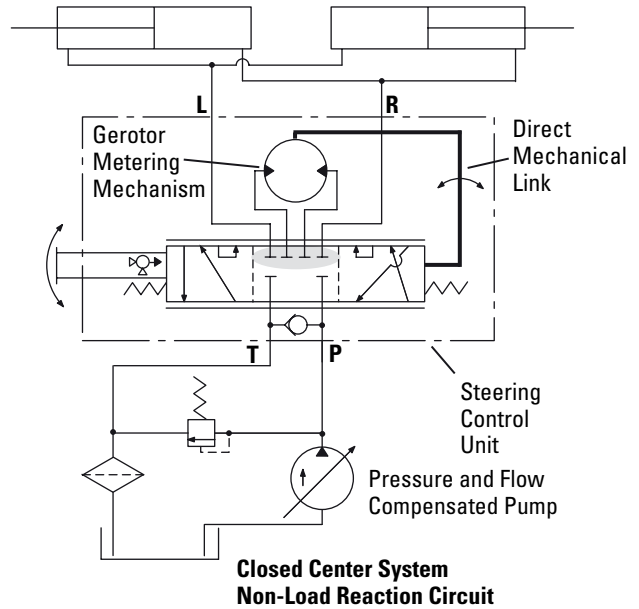


Hydraulic Circuit Explanation

Work Circuits: Non-Load Reaction and Load Reaction

Non-Load Reaction

A non-load reaction steering unit blocks the cylinder ports in neutral, holding the axle position whenever the operator releases the steering wheel.



Load Reaction

A load reaction steering unit couples the cylinder ports internally (in the neutral position) with the meter gear set. Axle forces are then allowed to return the steering wheel to its approximate original position. Comparable to automobile steering, gradually releasing the wheel mid turn will allow the steering wheel to spin back as the vehicle straightens.

The cylinder system used with load reaction units **must have equal oil volume** displaced in both directions. The cylinders should be a parallel pair (as shown) or one double rod end unit. **Do not use with a single unequal area cylinder system.**

