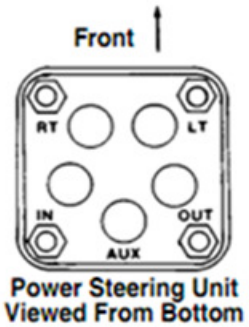
7/10/2011
John Unterwagner (midnight pumpkin)

Adapting Sunstar power steering to a Power Max series tractor.

The Sunstar series tractors used a hydraulic power steering system powered from the main hydro pump. The system is based on an Orbitrol rotary steering control valve. It is connected in the hydraulic system in series with, but before the spool valve for the lift cylinders. The rotary valve is a 5 port valve, the layout of the ports is shown below.



Power Steering Unit
Viewed From Bottom

The IN port is connected to the main hydro power beyond output port.
The AUX port is connected to the original input port on the spool valve.
The OUT port is T'd into the oil cooler along with the return line from the spool valve.
The RT port connects to the steering cylinder to turn right.
The LT port connects to the steering cylinder to turn left.

This valve controls hydraulic fluid going to the steering cylinder, it also acts as a pump, when no hydraulic pressure is available (engine not running) so that the tractor can be steered with the engine off.

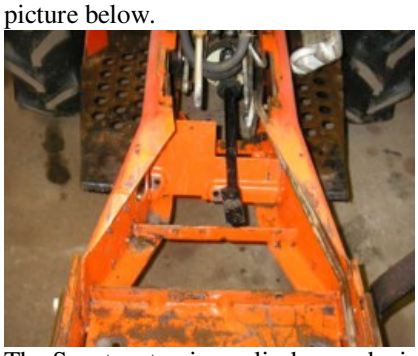
The following parts were salvaged from the donor Sunstar.

1. The rotary valve.
2. The mounting bracket for the rotary valve.
3. The steering cylinder and hydraulic hoses.
4. The T fitting for the oil return line going to the oil cooler.

My goal was to adapt the power steering without substantial modifications to the tractor, so that the original mechanical steering could be restored.

The first step is to remove the original steering box, pitman arm, and drag link from the Powermax. See

picture below.



The Sunstar steering cylinder can be installed with or without the front plow/snow blower bracket, which is shown in the picture below.

A new mounting bracket for the steering cylinder was fabricated using 3x3 angle iron. This bracket bolts over the plow bracket using the lower two bolts that attach the plow bracket. This configuration was chosen to allow the cylinder sufficient clearance when the axle is pivoted to it's extreme positions.

I used a pair of ½ drive socket U-joints to replace the massive U-joints used in steering shaft of the original tractor. This was done to reduce the length of the joints. The control valve shaft has to be cut off as short as possible to allow room for the hoses to come out the bottom of the valve.

Here is the modified bracket from the Sunstar used to mount the control valve in the Powermax. The bracket is bolted to the Powermax frame with two ¼ -20 bolts. Excess material was trimmed from the bracket and the front side was cut to allow the valve to slide into the bracket.

Next the input shaft to the control valve has to be cut off short to allow room. I cut the shaft and outer housing off at the length I wanted the shaft to be and then cut the outer housing. There is a plastic support bushing and a rubber seal that are re-installed from the cut off portion of the shaft.

Here is an original valve before the input shaft was cut off.

Here is the bottom of the valve with fittings installed. I used eight 90 degree swivel fittings, two 45 degree swivel fittings, and a tubular 90 degree swivel fitting to get everything connected and clear the bottom pan, drive shaft, and clutch assembly. This picture is looking up from the bottom of the tractor.

Here are the cylinder hoses connected.

Here is a picture of the return hoses from the control valve and the spool valve T'd together and routed to the oil cooler. The T fitting is from the Sunstar.

Here is the new hose going from the power beyond port to the IN port on the control valve.