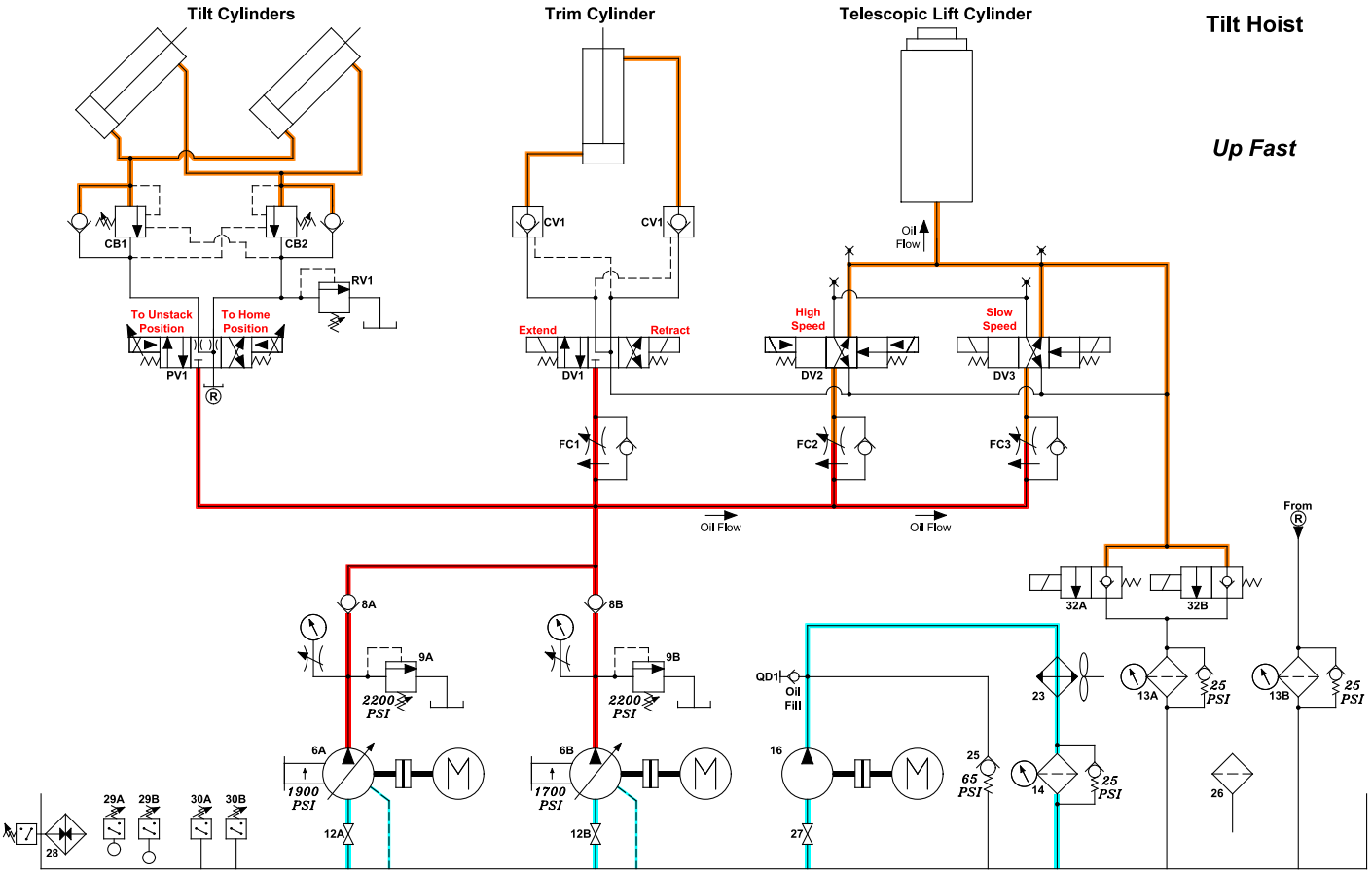
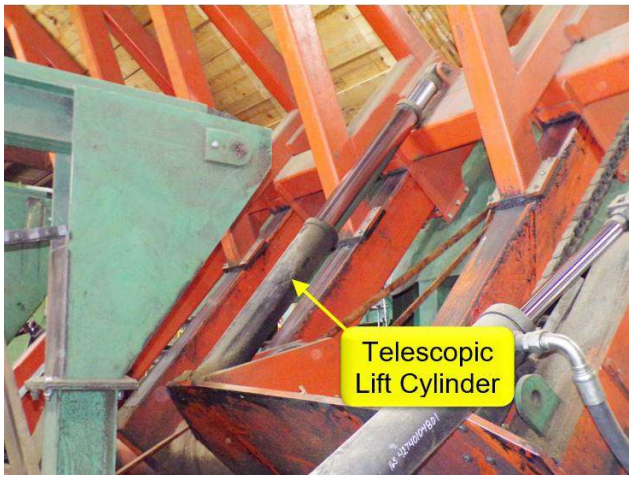
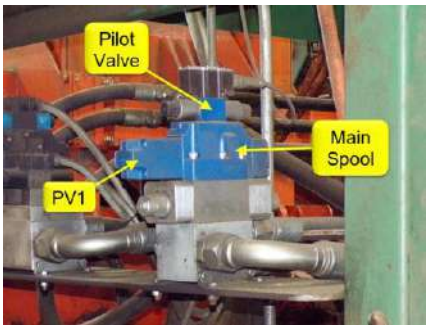
UNIVERSAL SERVO GROUP

www.universalservo.com

Troubleshooting Tilt Hoist Hydraulics







follow us on LinkedIn

Company Name And Logo Here

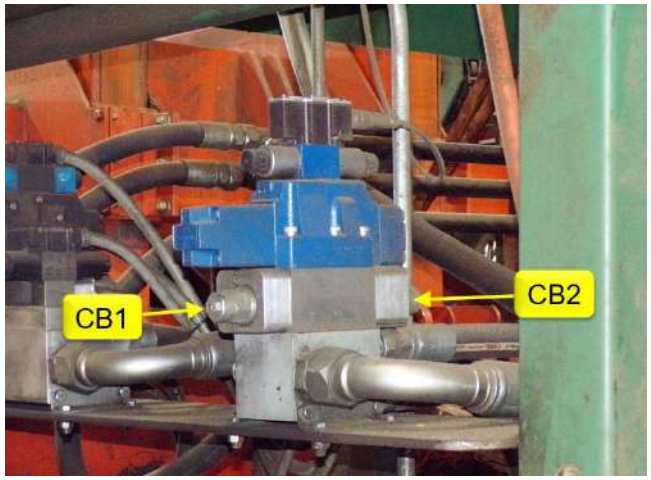
TABLE OF CONTENTS

Tilt Hoist

Symbol Description

CB1 Counterbalance Valve

This valve serves two purposes in this circuit. The first purpose of the valve is to lock oil in the full piston sides of the cylinders when the hoist is in the Unstack position. This prevents the hoist from moving once the PV1 proportional valve spool is shifted into the center position. The second purpose is to keep the cylinders from free falling when returning the hoist to the Home position. When the command is given to return the hoist to the Home position, the proportional valve is shifted into the “B” position to direct pilot pressure for shifting the valve into the open position. Oil is simultaneously ported to the rod sides of the hoist cylinders in this mode. The oil exhausting from the full piston sides of the cylinders will then flow through the valve and back to tank through the proportional valve. If the cylinders start retracting faster than oil is supplied into the rod sides, pressure will drop in the pilot line. This will allow the valve to shift into the partially closed position, restricting the flow out of the cylinders. When moving the hoist to the Unstack position, oil will free flow through the internal bypass check valve. If the hoist free falls when moving to the Home position, then the counterbalance or check valve may be stuck open. This valve is located in a sandwich block beneath the PV1 proportional valve.



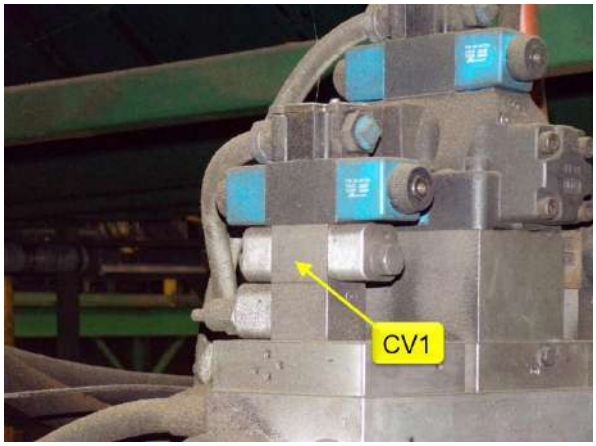
CB1 & CB2 Counterbalance Valves

CB2 Counterbalance Valve

This valve serves two purposes in this circuit. The first purpose of the valve is to lock oil in the rod sides of the cylinders when the hoist is in the Home position. This prevents the hoist from moving once the PV1 proportional valve spool is shifted into the center position. The second purpose is to keep the cylinders from free falling when moving the hoist to the Unstack position. When the command is given to move the hoist to the Unstack position, the proportional valve is shifted into the "A" position to direct pilot pressure for shifting the valve into the open position. Oil is simultaneously ported to the full piston sides of the hoist cylinders in this mode. The oil exhausting from the rod sides of the cylinders will then flow through the valve and

back to tank through the proportional valve. If the cylinders start extending faster than oil is supplied into the full piston sides, pressure will drop in the pilot line. This will allow the valve to shift into the partially closed position, restricting the flow out of the cylinders. When returning the hoist to the Home position, oil will free flow through the internal bypass check valve. If the hoist free falls when moving to the Unstack position, then the counterbalance or check valve may be stuck open. This valve is located in a sandwich block beneath the PV1 proportional valve.

CV1 Pilot Operated Check Valves



CV1 Pilot Operated Check Valves

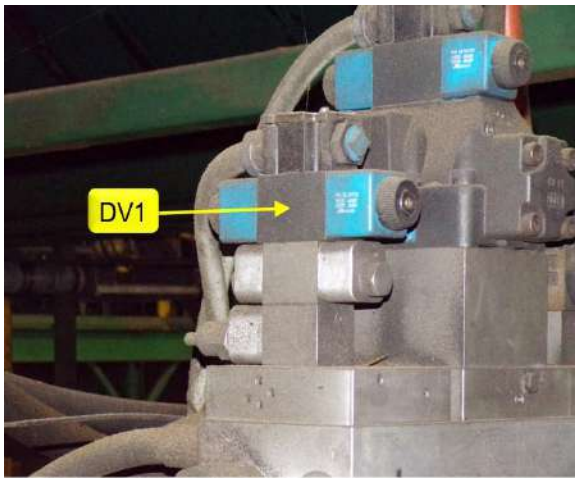
These check valves are used to lock oil in both sides of the Trim Cylinder. The valves have virtually no internal leakage. Therefore, the cylinder will not move once the DV1 directional valve solenoids are de-energized. Oil will free flow through the check valve when ported into the cylinder. At the same time, pressure will build up in the pilot line of the check valve in the opposite line. Approximately 1/3 of the pressure is required to open the valve with the pilot line than is locked in the cylinder. For example, if 900 PSI is

locked in one side of the cylinder, then 300 PSI of pilot pressure will be required to open the valve. Once the valve is open, the oil can exhaust out of the cylinder and return to the tank. Use extreme caution when removing the lines between the check valves and cylinder, as pressure will be maintained in the lines. If the cylinder drifts when the directional valve is de-energized, then one check valve may be stuck open or there may be trash in the pilot line. The cylinder's piston seals may also be bad. These valves are located in a sandwich block beneath the DV1 directional valve.

DV1 Directional Valve

To extend the Trim Cylinder, a voltage is applied to the "A" solenoid on this valve. A plunger is pulled in by magnetism to move a pushpin, which shifts the spool into the "A" (straight arrows) position. Oil is directed through the "P" and "A" ports of the spool then into the full piston side of the cylinder. The oil that exhausts out of the rod side returns to the tank through the "B" and "T" ports of the valve. To retract the cylinder, a voltage is applied to the "B" solenoid on this valve. A plunger is pulled in by magnetism to move a pushpin, which shifts the spool into the "B" (crossed arrows) position. Oil is directed through the "P" and "B" ports of the spool then into the rod side of the cylinder. The oil that exhausts out of the full piston side returns to the tank through the "A" and "T" ports of the valve.

When the solenoids are de-energized, the spool will spring center to the float center position. This allows oil in the "A" and "B" lines to drain from the pilot lines of the CV1 check valves, allowing the check valves to close and lock the oil in the cylinder.



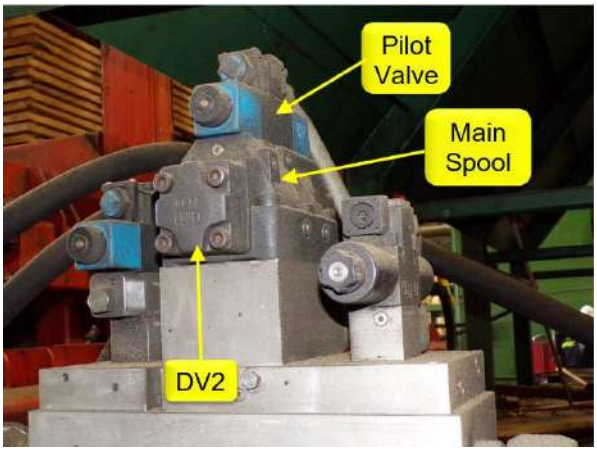
DV1 Directional Valve

Each solenoid has a manual override on the end of the housing. Prior to actuating the overrides, make sure all personnel are clear of the machine. The resistance of each coil can be checked to verify if it is good. A reading

below 50 ohms (but not zero) normally means that the coil is good. If infinity is read, the coil wires are open. If zero resistance is indicated, then the coil wires are shorted out to each other. This valve is a float center, three position, four-way, double solenoid, spring centered directional control.

DV2 Directional Valve

To raise the Hoist at fast speed, a voltage is applied to the “B” coil on the pilot valve. Pilot pressure is directed internally into one side of the main spool. The main spool then shifts into the “B” (crossed arrows) position. System volume flows through the “P” and “B” ports then into the Telescopic Lift Cylinder.



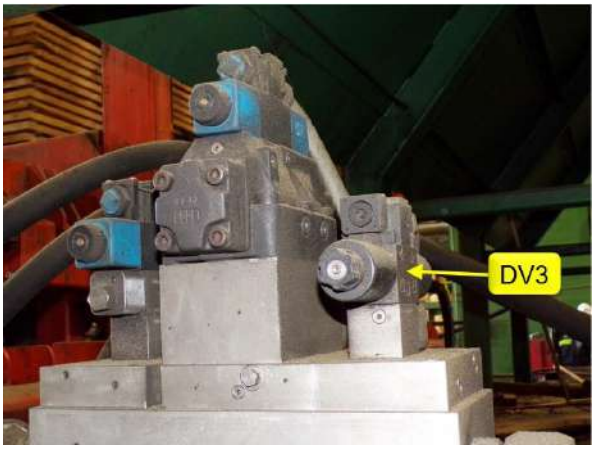
DV2 Directional Valve

Each solenoid has a manual override on the end of the housing. Prior to actuating the overrides, make sure all personnel are clear of the machine. The resistance of each coil can be checked to verify if it is good. A reading below 50 ohms (but not zero) normally means that the coil is good. If infinity is read, the coil wires are open. If zero resistance is indicated, then the coil wires are shorted out to each other. This valve is a closed center, three position, four-way, double solenoid, internally piloted and drained, spring centered directional control. When replacing the valve, make sure the part numbers match exactly as one letter or one number may mean that the new valve has a different piloting and draining arrangement or a different spool.

DV3 Directional Valve

To raise the hoist at slow speed, a voltage is applied to the “B” solenoid on the valve. A plunger is pulled in by magnetism to move a pushpin, which shifts the spool into the “B” (crossed arrows) position.

Oil is directed through the "P" and "B" ports of the spool then into the Telescopic Lift Cylinder.

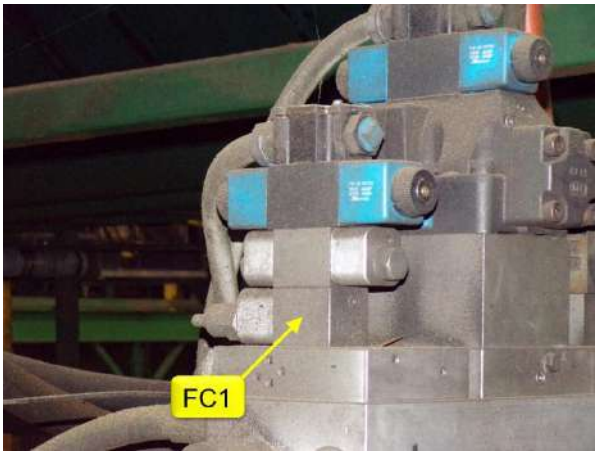


DV3 Directional Valve

Each solenoid has a manual override on the end of the housing. Prior to actuating the overrides, make sure all personnel are clear of the machine. The resistance of each coil can be checked to verify if it is good. A reading below 50 ohms (but not zero) normally means that the coil is good. If infinity is read, the coil wires are open. If zero resistance is indicated, then the coil wires are shorted out to each other. This valve is a closed center, three position, four-way, double solenoid, spring centered directional control.

FC1 Flow Control Valve

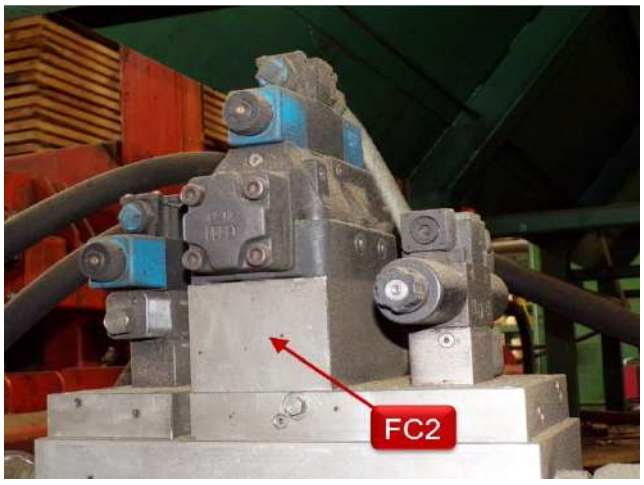
This valve controls the speed at which the which the Trim Cylinder extends and retracts. The valve is connected in a meter in type arrangement. This valve will maintain a constant volume of oil through the orifice regardless of any pressure fluctuations. If the cylinder is moving too slowly, then the orifice may be contaminated. Rotate the valve adjustment several turns CCW then alternately energize the DV1 directional valve solenoids. Many times the contaminants will be flushed from the orifice. If the wrong type flow control is installed, then the cylinder speed will vary depending on the load. This valve is located in a sandwich block beneath the DV1 directional valve.



FC1 Flow Control Valve

FC2 Flow Control Valve

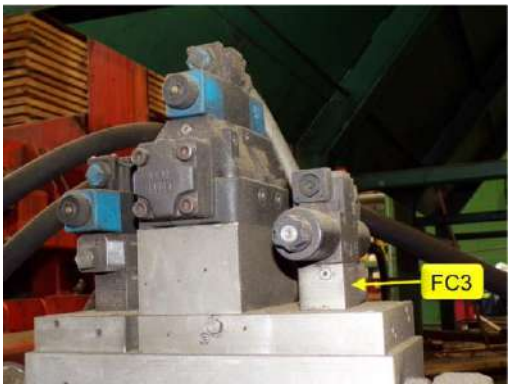
This valve controls the speed at which the which the hoist raises when in the Up Fast mode of operation. The valve is connected in a meter in type arrangement. This valve will maintain a constant volume of oil through the orifice regardless of any pressure fluctuations. If the hoist is raising too slowly in the Up Fast mode of operation, then the orifice may be contaminated. Rotate the valve adjustment several turns CCW then energize the “B” solenoid on the DV2 directional valve several times. Many times the contaminants will be flushed from the orifice. If the wrong type flow control is installed, then the hoist raise speed will vary depending on the load. This valve is located in a sandwich block beneath the DV2 directional valve.



FC2 Flow Control Valve

FC3 Flow Control Valve

This valve controls the speed at which the which the hoist raises when in the Up Slow mode of operation. The valve is connected in a meter in type arrangement. This valve will maintain a constant volume of oil through the orifice regardless of any pressure fluctuations. If the hoist is raising too slowly in the Up Slow mode of operation, then the orifice may be contaminated. Rotate the valve adjustment several turns CCW then energize the “B” solenoid on the DV3 directional valve several times. Many times the contaminants will



FC3 Flow Control Valve

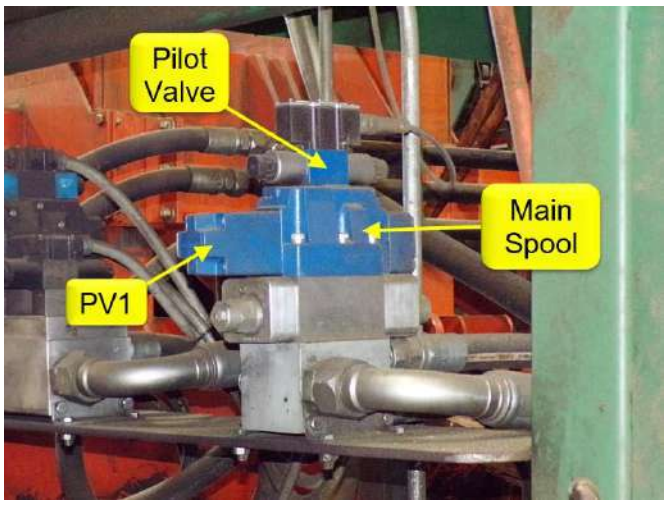
be flushed from the orifice. If the wrong type flow control is installed, then the hoist raise speed will vary depending on the load. This valve is located in a sandwich block beneath the DV3 directional valve.

PV1 Proportional Valve

This valve is used to control the direction and speed of the Tilt Cylinders. The voltage to operate the valve is a positive and negative 0-10 volts D.C. To extend the cylinders and tilt the hoist to the Unstack Position, a command voltage is applied to the on-board amplifier. An electrical current is applied to the "A" pilot valve coil and pilot pressure is directed into one side of the main spool. The pilot pressure is determined by the applied D.C. voltage signal and the electrical current to the coil. The main spool will then shift into the "A" (straight arrows) position directly proportional to the pilot pressure applied to the spool. The higher the voltage, the higher the pilot

pressure and the more the main spool will shift. The more the spool shifts, the higher the flow of oil that is directed to extend the cylinders.

To retract the cylinders and return the hoist to the Home Position, a command voltage of the opposite polarity is applied to the on-board amplifier. An electrical current is applied to the "B" pilot valve coil and pilot pressure is directed into one side of the main spool. The valve operates the same as described above only this time shifting the main spool into the "B" (crossed arrows) position.



PV1 Proportional Valve

When there is no voltage to either coil the main spool will spring return to the center position. The oil in the pilot lines to the CB1 and CB2 counterbalance valves is then ported back to tank through the valve spool. This allows the counterbalance valves to shift closed.

If the tilt function of the hoist is not operating properly, then the command signal from the PLC can be checked. This can be done by connecting a suitable test box between the PLC and proportional valve. Depending on the type box used, the command signal may be displayed. A potentiometer may be available on the box to drive the valve separate of the signal from the PLC.

The valve operates on a 24-volt signal from the power supply. This can be checked by removing the cable to the valve and connecting the red lead of a multi-tester to the “A” socket and the black lead to the “B” socket. With the cable removed, the command voltage can also be checked at the “D” and “E” sockets.

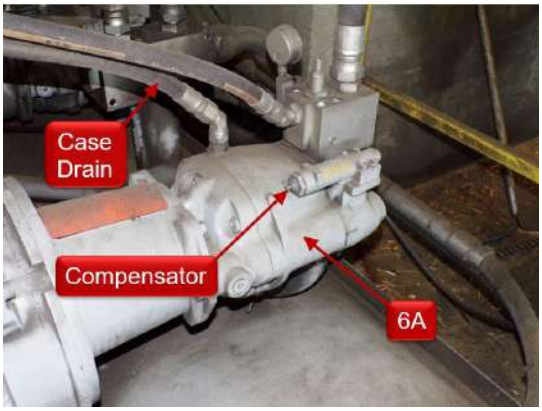
Each solenoid has a manual override on the end of the housing. Prior to actuating the overrides, make sure all personnel are clear of the machine. This valve is internally piloted and drained. When replacing the valve, make sure the part numbers match exactly as one letter or one number may mean that the new valve has a different piloting and draining arrangement or a different spool.

QD1 Quick Disconnect

This quick disconnect may be used for filling the reservoir.

6A Pump

This 63 GPM, variable displacement, externally drained, pressure compensating piston pump supplies a volume of oil to the Tilt Hoist system. There is a maximum volume stop on the pump to limit the maximum flow that the pump can deliver. Turning the adjustment clockwise reduces the maximum flow, turning the adjustment counterclockwise increases the maximum volume. The pump will deliver the maximum adjusted flow whenever pressure in the system is below the setting of the compensator. When the pressure reaches the compensator setting, the pump will de-stroke to deliver only the



No. 6A Pump

amount of oil necessary to maintain the compensator setting in the line. The compensator should be adjusted to 1900 PSI. If the compensator is set too low, the hoist will stall under heavy loads. A setting that is too high will result in shock and perhaps damage to the machine.

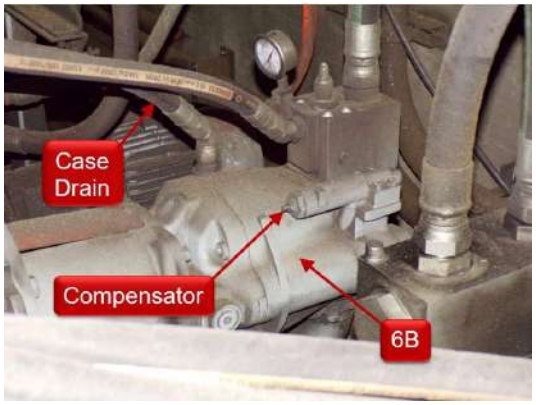
The compensator valve can fail either open or closed. If the valve fails open, the pump will be de-stroked to a near 0 GPM flow rate and the pressure at the outlet port will be very low. If the valve fails closed, the pump will never compensate, causing the pump to deliver maximum flow at all times. Whenever the full pump volume is not being used, pressure will build to the No. 9A relief valve setting and return to tank at high pressure, generating heat. If either problem exists, turn the pump off and make sure the pressure at the outlet port is 0 PSI. Remove the compensator from the pump and take it apart. Inspect the hollow orifices in the valve spool for contamination. Make sure that there are no contaminants inside the compensator housing. Verify that the spring is not bent, broken or rusted. Re-assemble the compensator and attempt to reset the spring to the proper setting.

Oil that bypasses internally across the tight clearances in the pump will drain back to tank through the case drain line to prevent pressure from building against the shaft seal. As the pump wears, these clearances become greater resulting in higher case drain flow. Therefore, case drain flow will increase as the pump becomes more worn. The most effective way to track pump wear is by measuring the amount of case drain flow. When the pump is relatively new, case drain flow should be approximately 1 – 3% of the total output, or about .63 to 1.9 GPM. If case drain flow increases to as much as 10% of the total pump volume, or about 6.3 GPM, the pump should be replaced. To check the case drain flow, first lock and tag out the motor and verify that the pressure is 0 PSI. Try to start the pump as a safety precaution. The case drain line can then be removed and a

flow meter installed to check the flow rate. A flow meter can be permanently installed in the case drain line for convenient regular measurement of case drain flow.

6B Pump

This 63 GPM, variable displacement, externally drained, pressure compensating piston pump supplies a volume of oil to the Tilt Hoist system. There is a maximum volume stop on the pump to limit the maximum flow that the pump can deliver. Turning the adjustment clockwise reduces the maximum flow, turning the adjustment counterclockwise increases the maximum volume. The pump will deliver the maximum adjusted flow whenever pressure in the system is below the setting of the compensator. When the pressure reaches the compensator setting, the pump will de-stroke to deliver only the amount of oil necessary to maintain the compensator setting in the line. The compensator should be adjusted to 1700 PSI. If the compensator is set too low, the hoist will stall under heavy loads. A setting that is too high will result in shock and perhaps damage to the machine.



No. 6B Pump

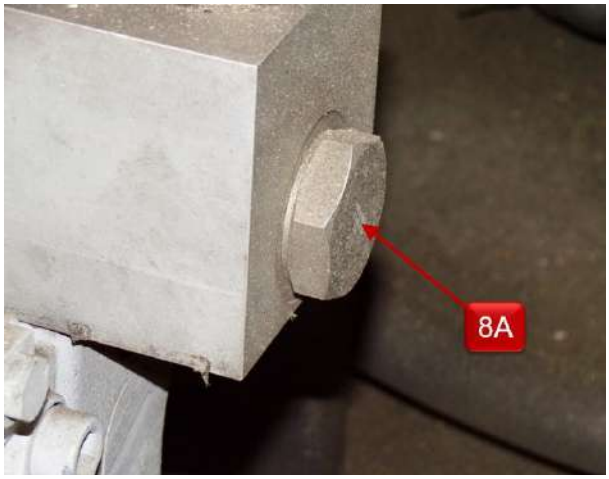
The compensator valve can fail either open or closed. If the valve fails open, the pump will be de-stroked to a near 0 GPM flow rate and the pressure at the outlet port will be very low. If the valve fails closed, the pump will never compensate, causing the pump to deliver maximum flow at all times. Whenever the full pump volume is not being used, pressure will build to the No. 9B relief valve setting and return to tank at high pressure, generating heat. If either problem exists, turn the pump off and make sure the pressure at the outlet port is 0 PSI. Remove the compensator from the pump and take it apart. Inspect the hollow orifices in the valve spool for contamination. Make sure that there are no contaminants inside the compensator housing. Verify that the spring is not bent, broken or rusted.

Re-assemble the compensator and attempt to reset the spring to the proper setting.

Oil that bypasses internally across the tight clearances in the pump will drain back to tank through the case drain line to prevent pressure from building against the shaft seal. As the pump wears, these clearances become greater resulting in higher case drain flow. Therefore, case drain flow will increase as the pump becomes more worn. The most effective way to track pump wear is by measuring the amount of case drain flow. When the pump is relatively new, case drain flow should be approximately 1 – 3% of the total output, or about .63 to 1.9 GPM. If case drain flow increases to as much as 10% of the total pump volume, or about 6.3 GPM, the pump should be replaced. To check the case drain flow, first lock and tag out the motor and verify that the pressure is 0 PSI. Try to start the pump as a safety precaution. The case drain line can then be removed and a flow meter installed to check the flow rate. A flow meter can be permanently installed in the case drain line for convenient regular measurement of case drain flow.

8A Check Valve

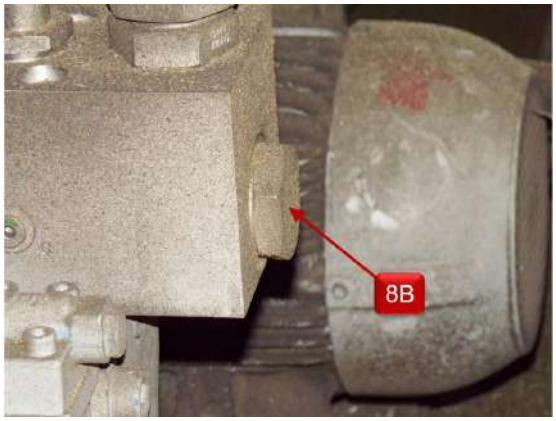
This check valve serves two purposes. During normal system operation, pressure spikes may occur in the lines. The check valve prevents these pressure spikes from damaging the No. 6A pump. The check valve also maintains oil in the lines when the pump is turned off. This prevents air from entering the lines between the check valve and downstream components.



No. 8A Check Valve

8B Check Valve

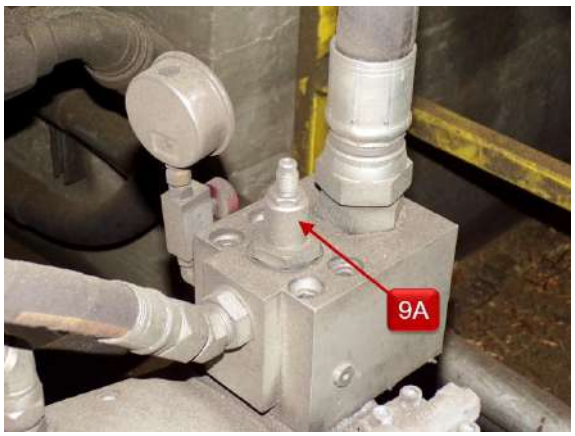
This check valve serves two purposes. During normal system operation, pressure spikes may occur in the lines. The check valve prevents these pressure spikes from damaging the No. 6B pump. The check valve also maintains oil in the lines when the pump is turned off. This prevents air from entering the lines between the check valve and downstream components.



No. 8B Check Valve

9A Relief Valve

This valve is used as an extreme safety device. In the event the No. 6A pump compensator was to fail closed, the valve would open and dump any excess volume through the valve spool and back to the tank. The tank line of this valve will be hot if this were to occur. The recommended setting of this relief valve is 2200 PSI. It is important that this valve be set above the setting of the compensator. If the relief valve is set below the compensator, the pump will deliver maximum volume at all times. This means that any oil that the pump is delivering that the system does not require will return to tank through the relief valve spool. Heat will once again be generated when this occurs.

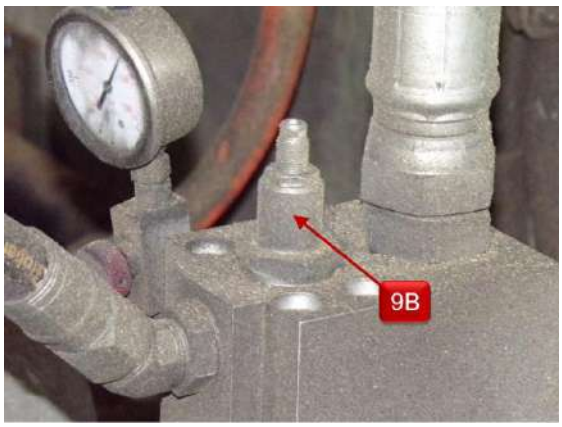


No. 9A Relief Valve

If this valve were to fail in the open position, then the circuits would operate more slowly or possibly not at all. To check the valve, turn the pump off then lock and tag out the electric motor. Verify that the pressure is 0 PSI. Disassemble the relief valve and inspect it for contamination and broken springs. Some relief valves have a small orifice in the valve spool that, when contaminated, will allow the valve to open at approximately 25 PSI. Inspect the seals to make sure they are not heat hardened, cut or otherwise damaged.

9B Relief Valve

This valve is used as an extreme safety device. In the event the No. 6B pump compensator was to fail closed, the valve would open and dump any excess volume through the valve spool and back to the tank. The tank line of this valve will be hot if this were to occur. The recommended setting of this relief valve is 2200 PSI. It is important that this valve be set above the setting of the compensator. If the relief valve is set below the compensator, the pump will deliver maximum volume at all times. This means that any oil that the pump is delivering that the system does not require will return to tank through the relief valve spool. Heat will once again be generated when this occurs.



No. 9B Relief Valve

If this valve were to fail in the open position, then the circuits would operate more slowly or possibly not at all. To check the valve, turn the pump off then lock and tag out the electric motor. Verify that the pressure is 0 PSI. Disassemble the relief valve and inspect it for contamination and broken springs. Some relief valves have a small orifice in the valve spool that, when contaminated, will allow the valve to open at approximately 25 PSI. Inspect the seals to make sure they are not heat hardened, cut or otherwise damaged.

12A Hand Valve

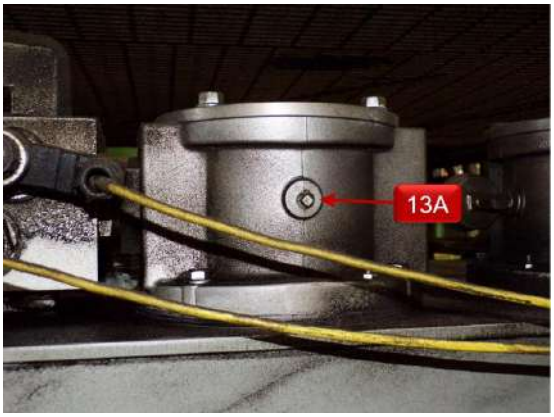
This hand valve may be closed when necessary to service the No. 6A pump. The valve must remain open during normal operation.

12B Hand Valve

This hand valve may be closed when necessary to service the No. 6B pump. The valve must remain open during normal operation.

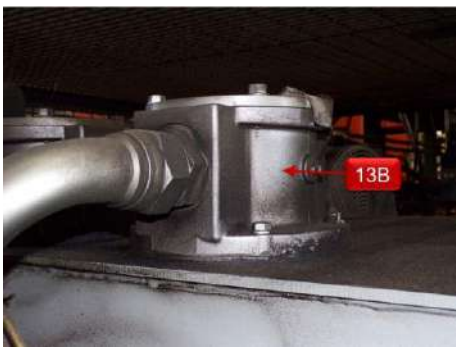
13A Return Filter

When lowering the hoist or operating the Trim Cylinder, the oil that exhausts out of the No. 32A and 32B valves' tank lines is ported through this 5-micron filter before returning to the tank. The element's condition should be checked regularly with the visual indicator. The element should also be changed on a regularly scheduled basis. This schedule can be established by an oil analysis program. If the element becomes contaminated and the inlet pressure reaches the internal check valve's setting (25 PSI), unfiltered oil will bypass the element.



No. 13A Return Filter

13B Return Filter



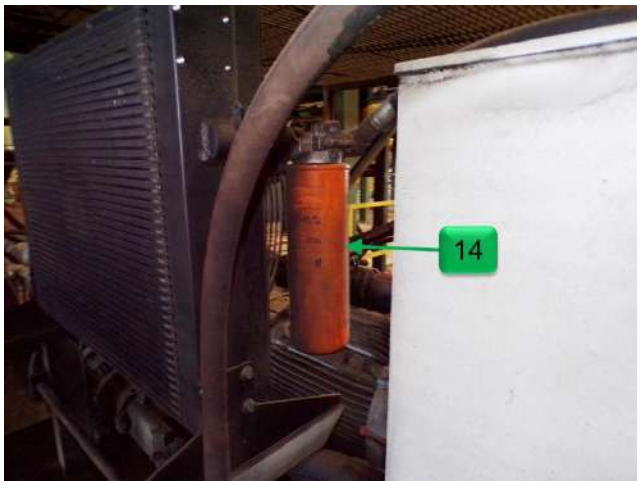
No. 13B Return Filter

The oil that exhausts out of the PV1 proportional valve's tank line is ported through this 5-micron filter before returning to the tank. The element's condition should be checked regularly with the visual indicator. The element should also be changed on a regularly scheduled basis. This schedule can be

established by an oil analysis program. If the element becomes contaminated and the inlet pressure reaches the internal check valve's setting (25 PSI), unfiltered oil will bypass the element.

14 Recirculation Filter

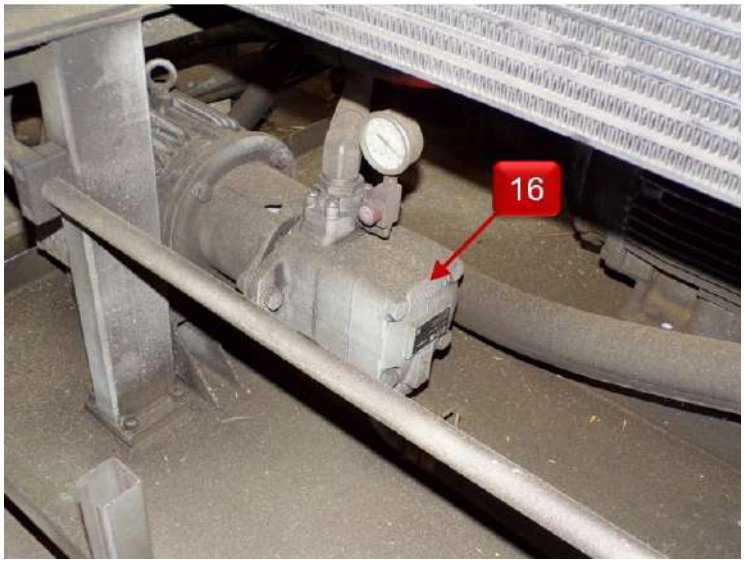
The oil that exhausts out of the No. 16 pump is ported through this 6-micron filter before returning to the tank. The element's condition should be checked regularly with the visual indicator. The element should also be changed on a regularly scheduled basis. If the element becomes contaminated and the inlet pressure reaches the 25 PSI setting of the internal check valve, unfiltered oil will bypass the element.



No. 14 Recirculation Filter

16 Pump

This 37.5 GPM, fixed displacement, vane type pump is used to constantly re-circulate the oil in the reservoir through the No. 23 heat exchanger and No. 14 recirculation filter. The maximum pressure at the pump outlet port is limited to 65 PSI by the No. 25 check valve.



No. 16 Pump

23 Heat Exchanger

The oil that exhausts out of the No. 16 pump is ported through this air type heat exchanger before returning to the tank through the No. 14 recirculation filter. The fins should be cleaned regularly to remove dust, dirt and greasy deposits. A stiff brush or air nozzle can be used for loose dirt removal. Be careful not to bend the fins when cleaning. If the fins are bent use a “comb” for straightening to insure a good flow of air.

To clean deposits from the outside of the core, remove the core and tank assembly and plug all openings. Use a mildly organic solution such as Fine Organics 2223 or Keychem 06000. Mix 10% of the solution with water and, if possible, heat to 160° to 180°F. Agitating the core will help in removing the contaminants. Ultrasonic equipment is effective in breaking up the deposits. Once a year, the piping should be disconnected and either of the above-mentioned solutions used to clean the internal tubes. When flushing, circulate the oil in the opposite direction of the normal oil flow. Once cleaning is complete, flush the unit with oil to avoid rust formation on the internal surfaces. The heat exchanger fan should be turned on at approximately 115°F. This is usually done by a temperature switch on the reservoir.

No. 23 Heat Exchanger

25 Check Valve

This check valve is used to limit the maximum pressure at the outlet of the No. 16 recirculation pump. The rating of the spring (65 PSI) will determine the maximum pressure. In the event the No. 23 heat exchanger was to become contaminated, then the No. 16 pump volume would return to tank through this check valve.

No. 25 Check Valve

26 Breather Filter

This breather filter prevents airborne water and particulate contamination from entering the reservoir. The element's condition should be checked regularly with the electric indicator. If the pressure drop across the filter reaches approximately 1 PSI, a red LED will flash indicating the filter should be changed.

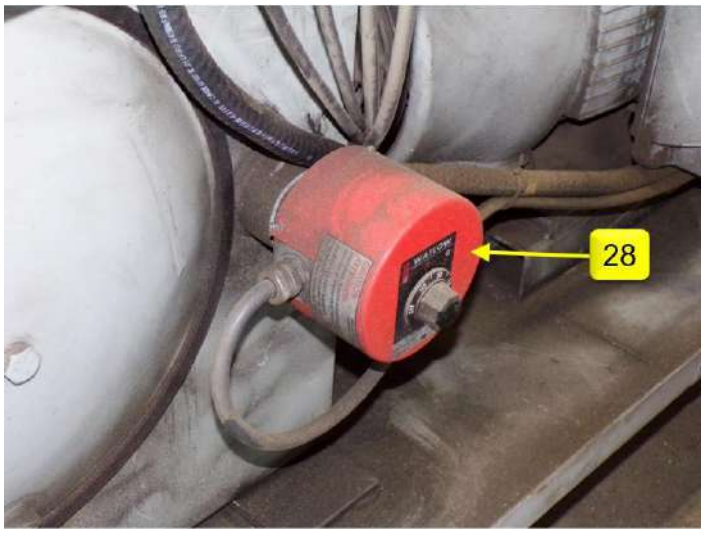
No. 26 Breather Filter

27 Hand Valve

This hand valve may be closed when necessary to service the No. 16 pump. The valve must remain open during normal operation.

28 Immersion Heater

This 5 kW, 480V single phase, thermostatically controlled heater maintains the oil at a set minimum temperature.



No. 28 Immersion Heater

29A Level Switch

This normally closed switch is used to electrically indicate a low oil level. The switch will open when the oil level is normal. Depending on the electrical programming, an alarm may occur if this switch is made.

No. 29A & 29B Level Switches

29B Level Switch

This normally open switch is used to electrically indicate a critically low oil level. The switch will close when this critically low oil level occurs. Depending on the electrical programming, an alarm or shutdown may occur if this switch is made.

30A Temperature Switch

This dual setpoint switch is made when the oil reaches a preset temperature. Depending on the electrical programming, an alarm or shutdown may occur when this switch is made.

No. 30A & 30B Temperature Switches

30B Temperature Switch

This dual setpoint switch is made when the oil reaches a preset temperature. Depending on the electrical programming, an alarm or shutdown may occur when this switch is made.

32A Directional Valve

When there is no voltage applied to the solenoid on this cartridge type valve, the valve blocks flow from the Telescopic Lift Cylinder to the tank. A spring acts on the back side of a plunger to shift and maintain a poppet in the closed position. When the command is given to lower the hoist, the solenoid is energized. A magnetic field is generated to retract the plunger. This allows the poppet to shift open, allowing oil through the valve. When the solenoid is de-energized, the spring will once again shift the plunger into the closed position.

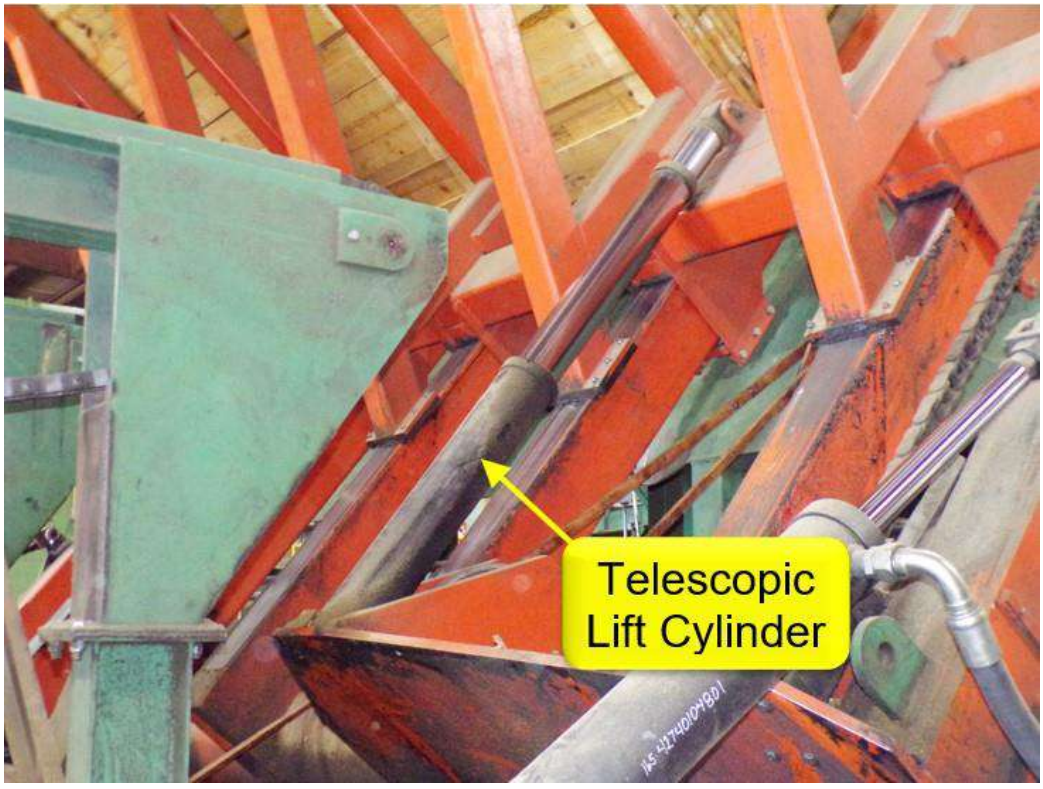
The resistance of the coil can be checked to verify if it is good. A reading below 50 ohms (but not zero) normally means that the coil is good. If infinity is read, the coil wires are open. If zero resistance is indicated then the coil wires are shorted out to each other. This valve is a normally closed, two position, two-way, single solenoid, spring returned directional valve.

No. 32A & 32B Directional Valves

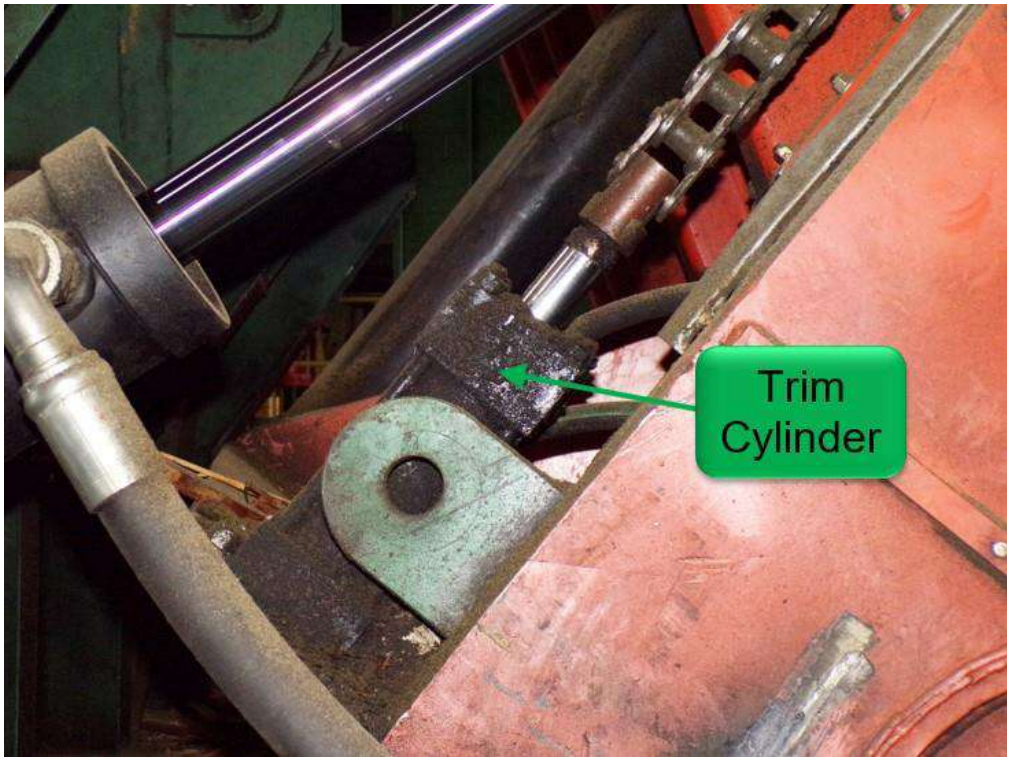
32B Directional Valve

When there is no voltage applied to the solenoid on this cartridge type valve, the valve blocks flow from the Telescopic Lift Cylinder to the tank. A spring acts on the back side of a plunger to shift and maintain a poppet in the closed position. When the command is given to lower the hoist at fast speed, the solenoid is energized. A magnetic field is generated to retract the plunger. This allows the poppet to shift open, allowing oil through the valve. When the solenoid is de-energized, the spring will once again shift the plunger into the closed position.

The resistance of the coil can be checked to verify if it is good. A reading below 50 ohms (but not zero) normally means that the coil is good. If infinity is read, the coil wires are open. If zero resistance is indicated then the coil wires are shorted out to each other. This valve is a normally closed, two position, two-way, single solenoid, spring returned directional valve.

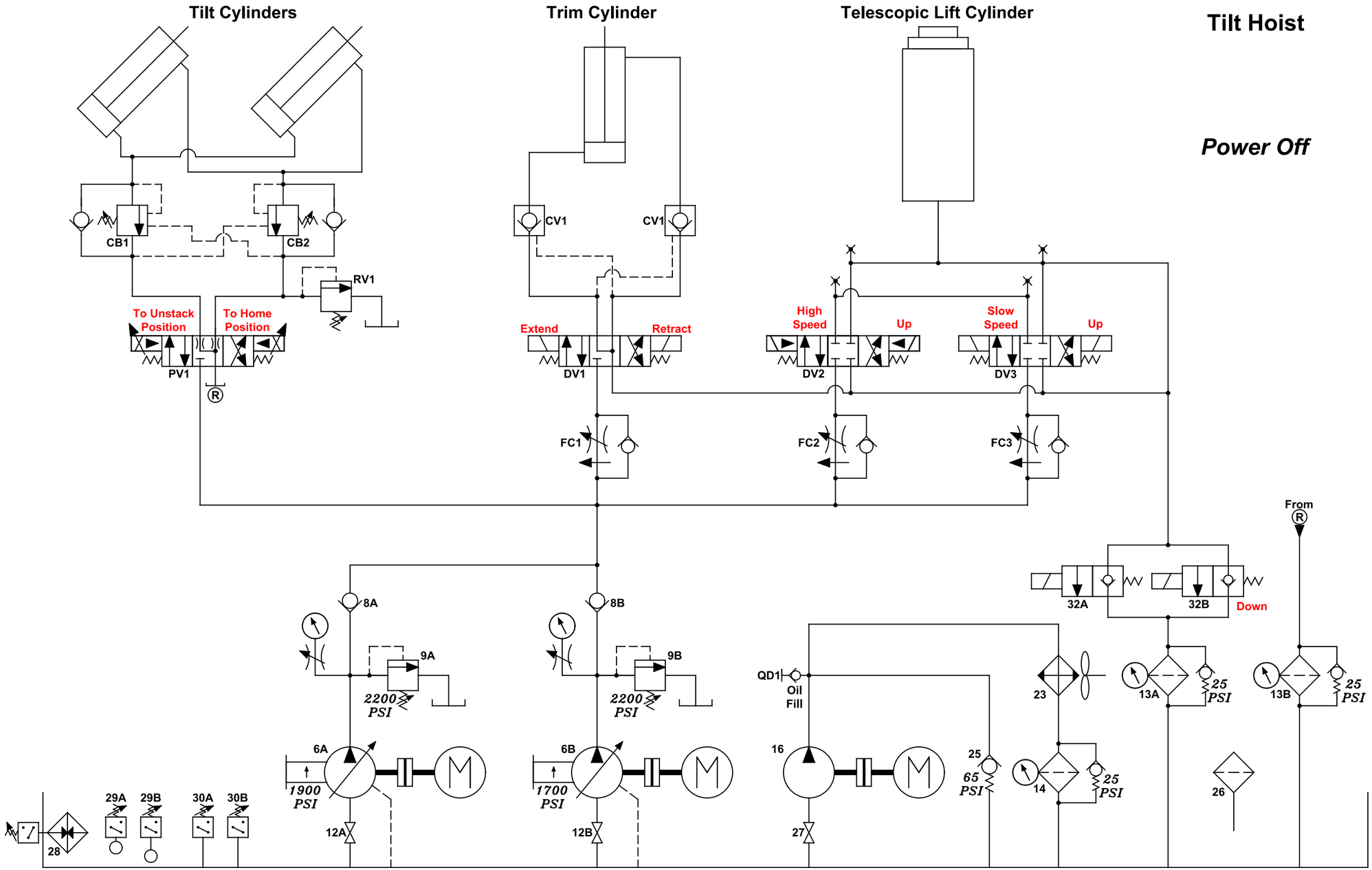


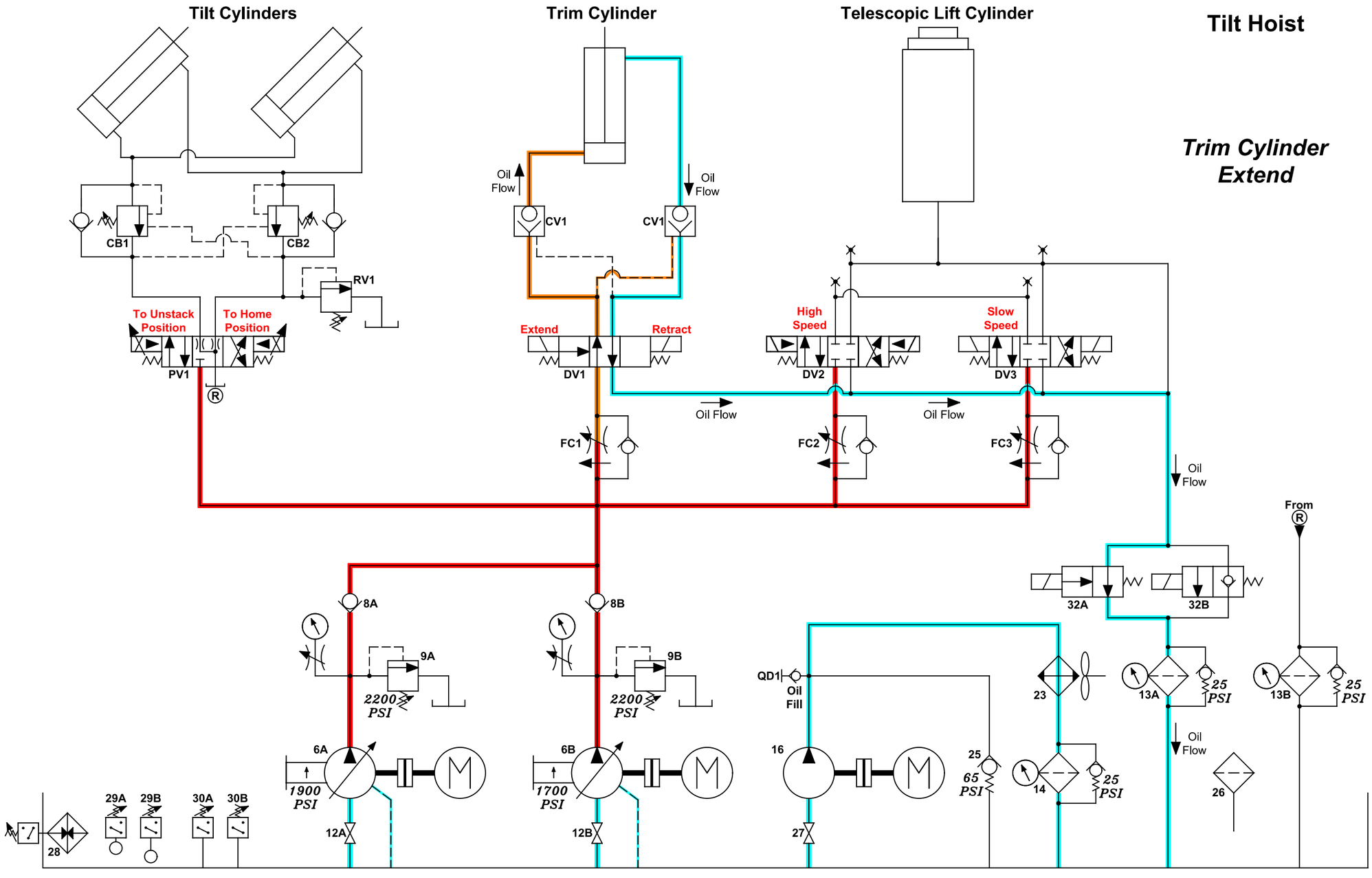

Tilt
Cylinder


Trim
Cylinder

Tilt Hoist

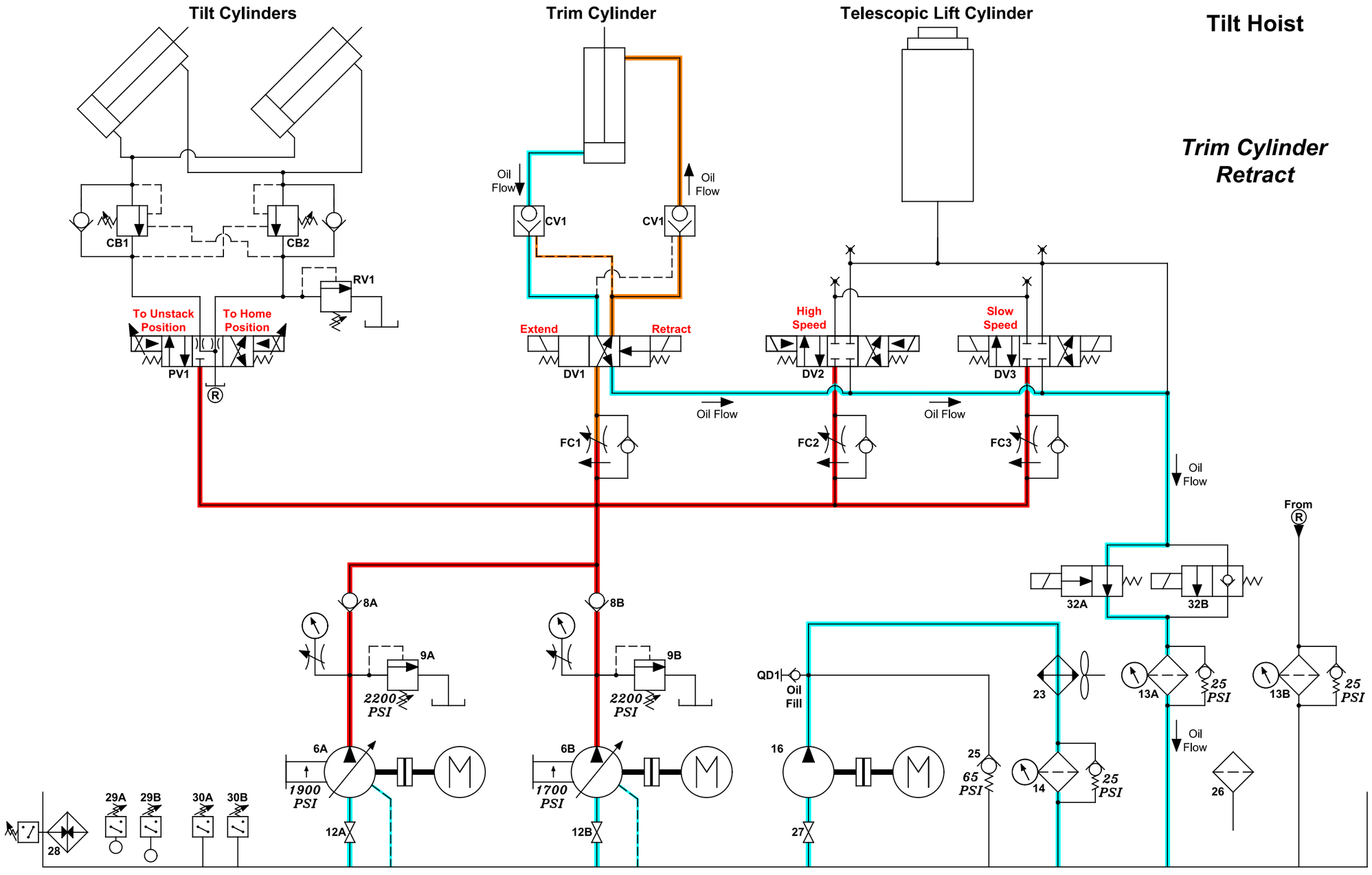
Power Off





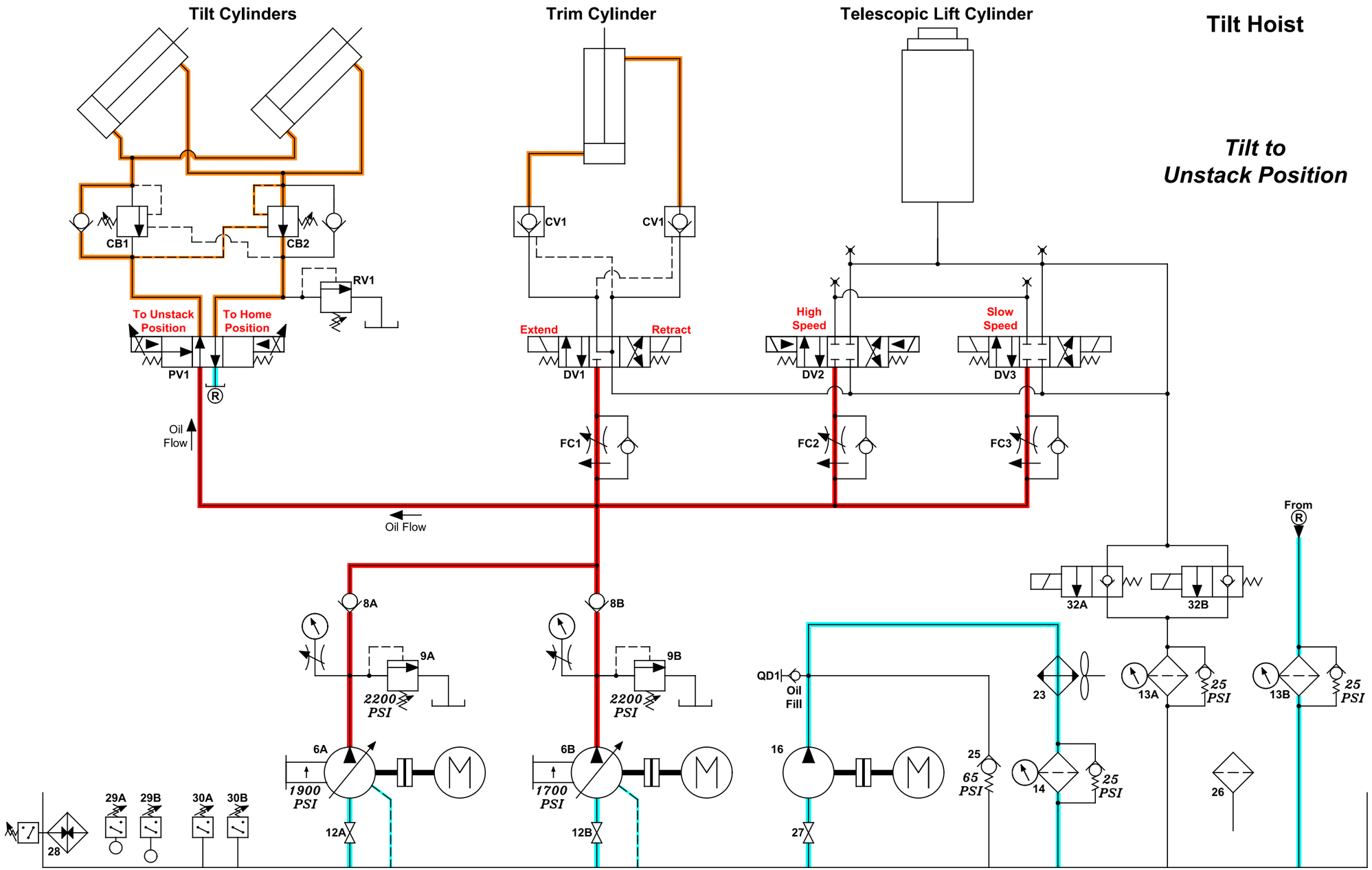
Tilt Hoist

Trim Cylinder Extend



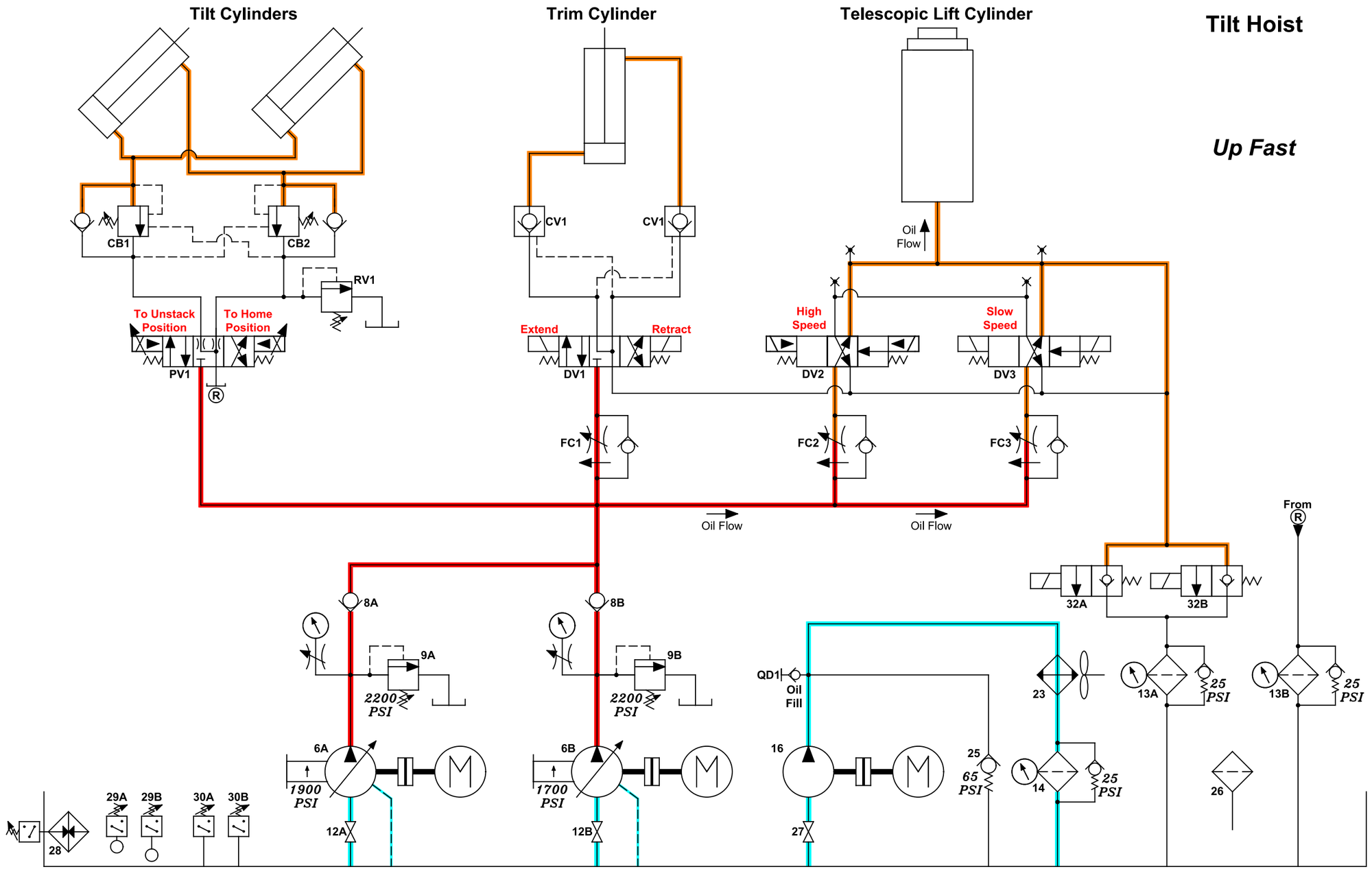
Tilt Hoist

Trim Cylinder Retract


Tilt Cylinders
Trim Cylinder
Telescopic Lift Cylinder
Tilt Hoist
Tilt to Unstack Position
CB1
CB2
RV1
To Unstack Position
To Home Position
PV1
Oil Flow
CV1
CV1
Extend
Retract
DV1
FC1
High Speed
Slow Speed
DV2
DV3
FC2
FC3
Oil Flow
8A
8B
9A
9B
2200 PSI
2200 PSI
6A
6B
1900 PSI
1700 PSI
12A
12B
QD1
Oil Fill
16
27
32A
32B
From
23
13A
13B
25 PSI
25 PSI
25
65 PSI
14
25 PSI
26
28
29A
29B
30A
30B

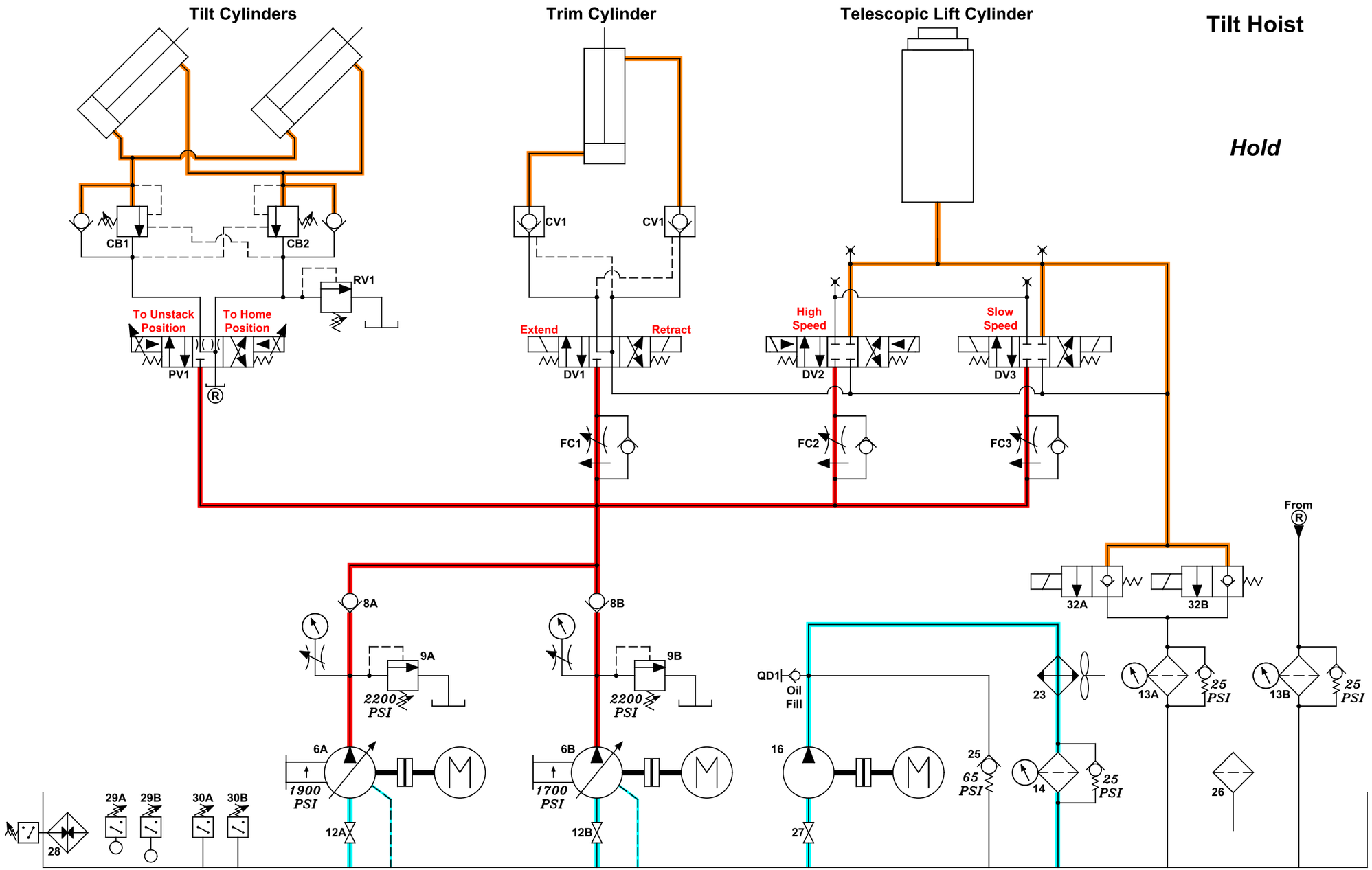
Tilt Hoist

Up Fast



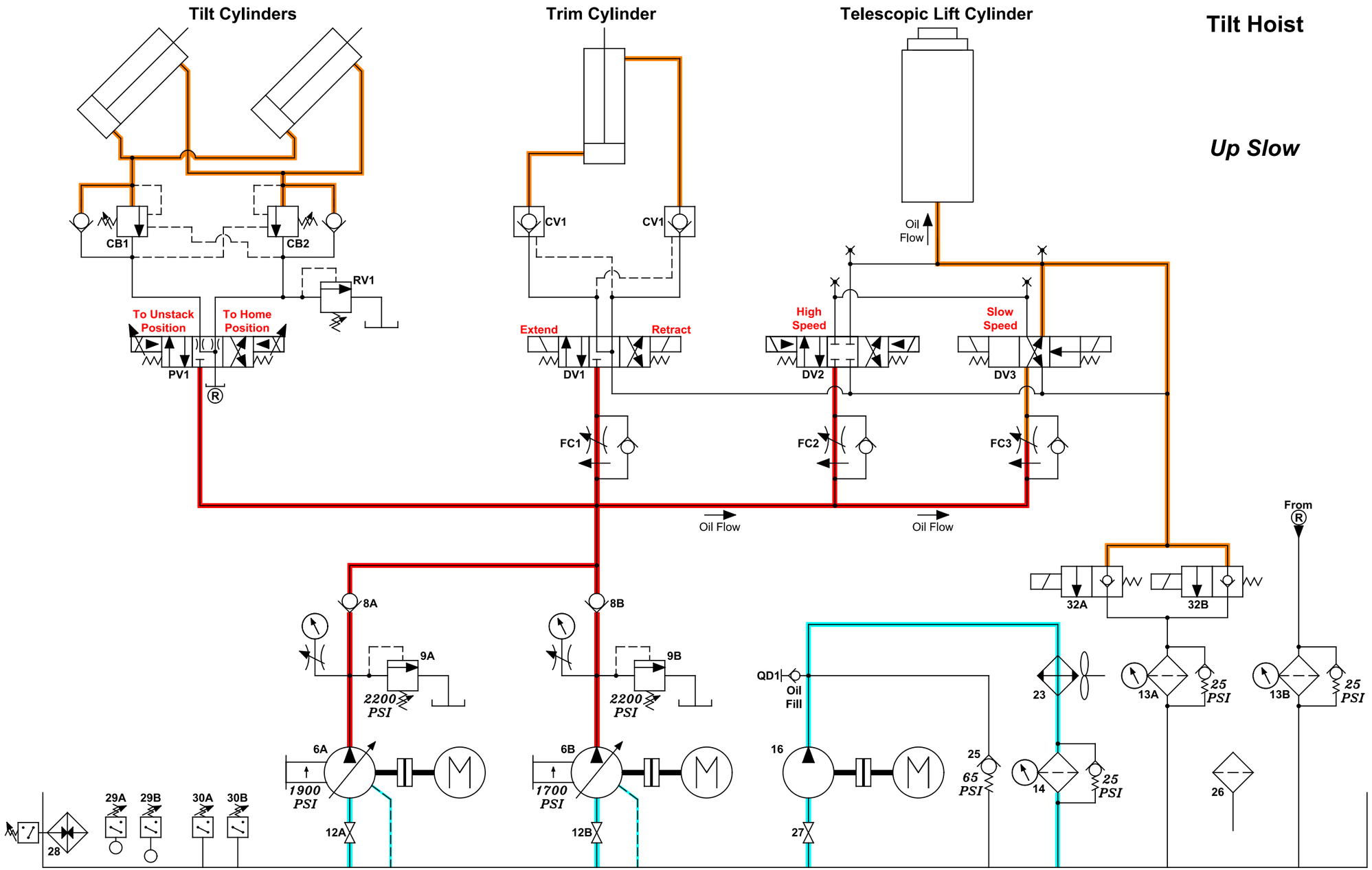
Tilt Hoist

Hold



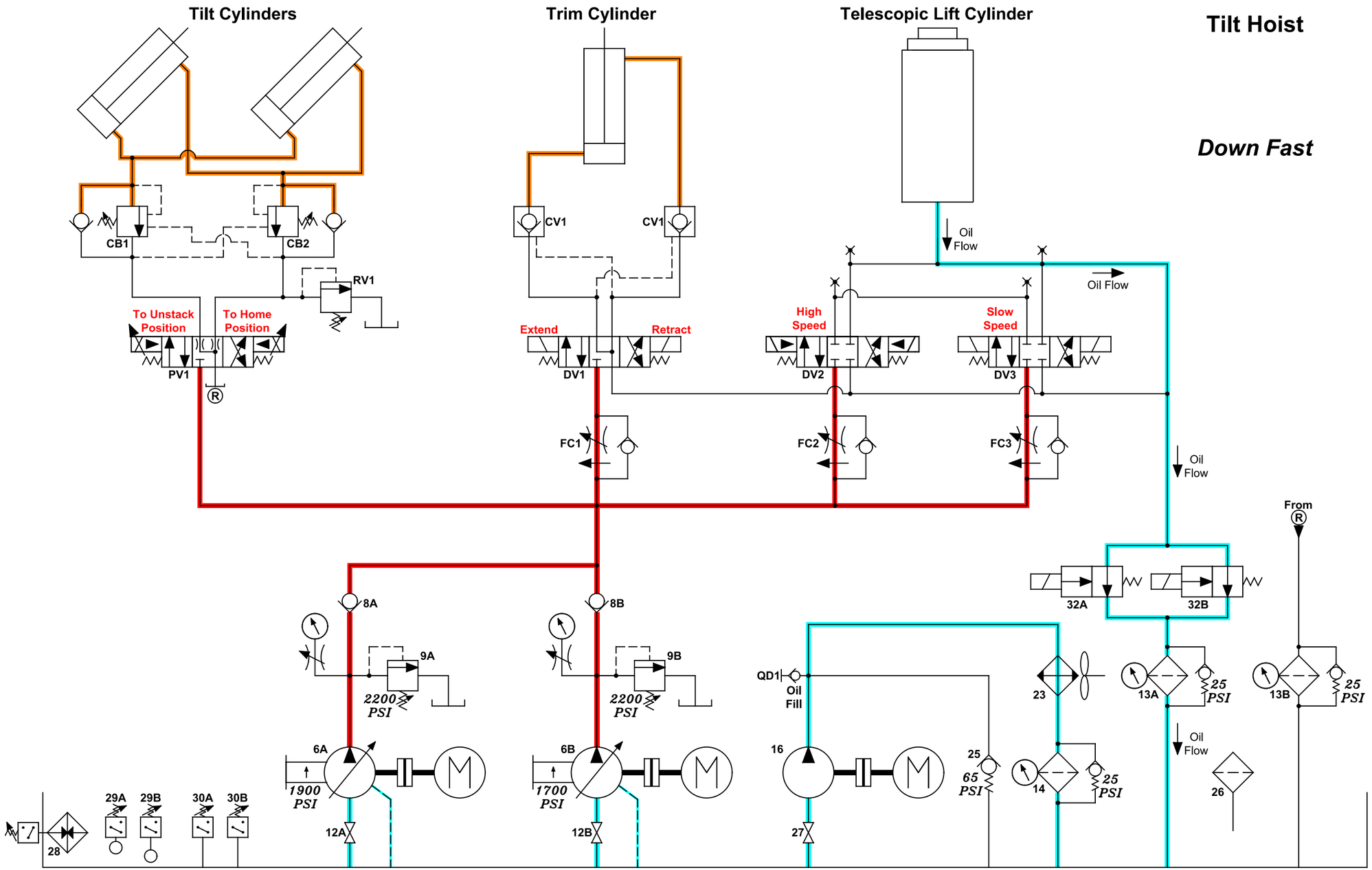
Tilt Hoist

Up Slow



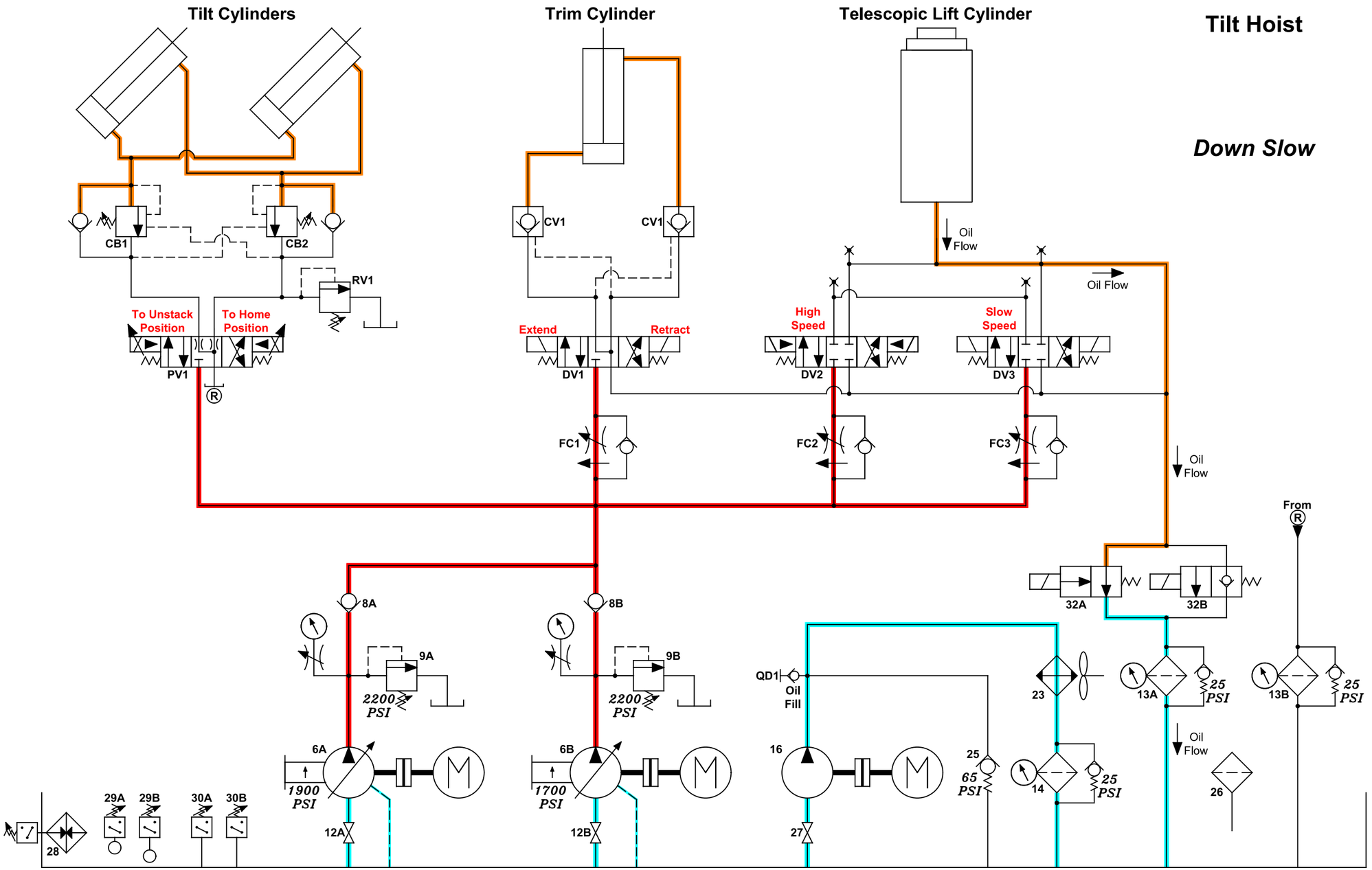
Tilt Hoist

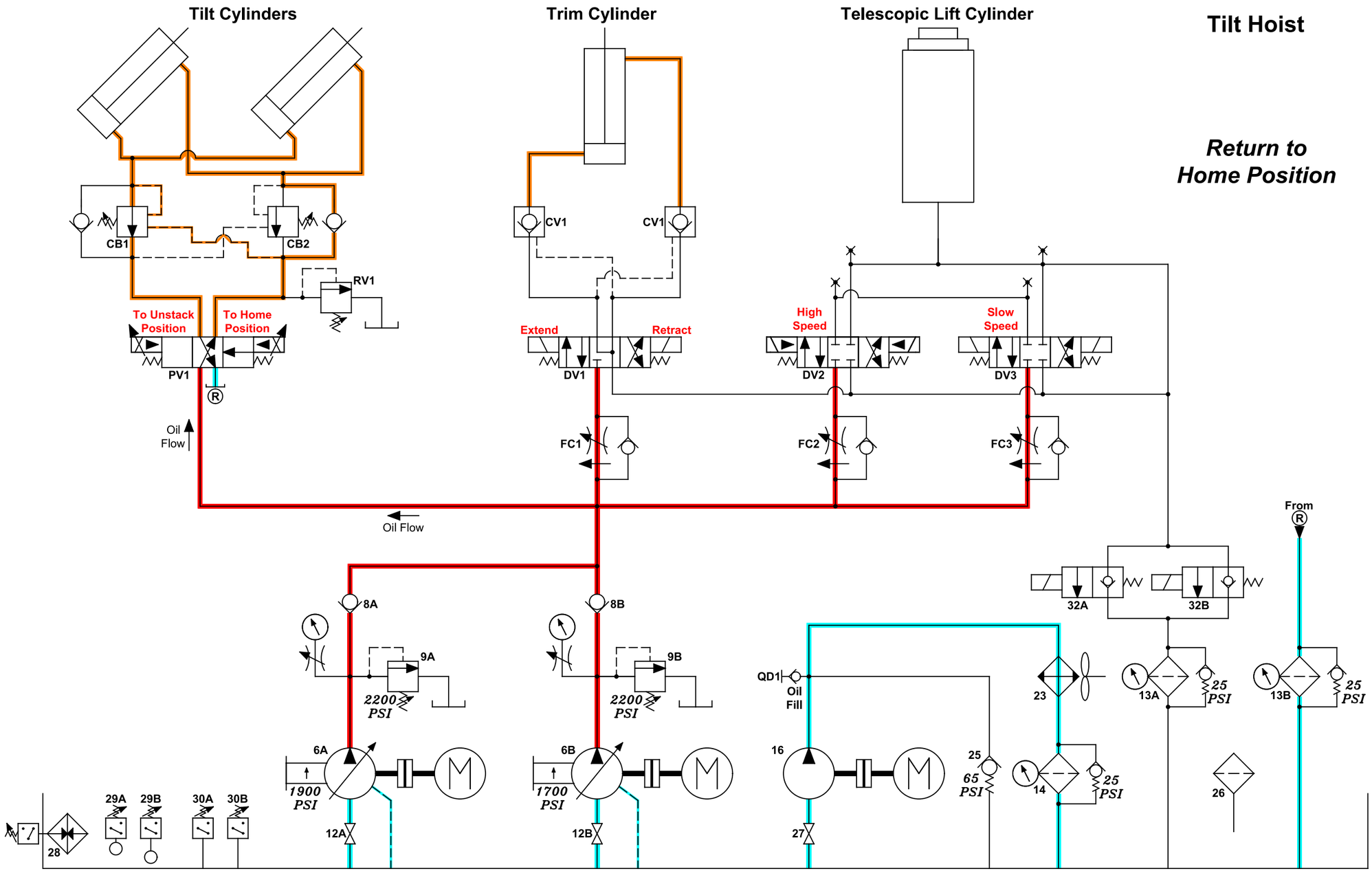
Down Fast



Tilt Hoist

Down Slow




Tilt Cylinders
Trim Cylinder
Telescopic Lift Cylinder
Tilt Hoist
Return to Home Position
CB1
CB2
RV1
To Unstack Position
To Home Position
PV1
R
Oil Flow
Oil Flow
CV1
CV1
Extend
Retract
DV1
FC1
High Speed
Slow Speed
DV2
DV3
FC2
FC3
From R
32A
32B
8A
8B
9A
9B
2200 PSI
2200 PSI
6A
6B
1900 PSI
1700 PSI
12A
12B
QD1
Oil Fill
16
27
23
13A
13B
25 PSI
25 PSI
25
65 PSI
14
25 PSI
26
28
29A
29B
30A
30B