

Table of Contents

Operating Information.....	2
Hydraulic Information Diagrams.....	7
Hydraulic and Electrical Installation.....	10
Parts List.....	11
Troubleshooting.....	15

M3551

Operating Information



General Information about Power Unit M3551 (Plow Partner)

Warranty Identification

For purposes of warranty consideration, recording the serial number of the power unit is necessary. This serial number is displayed on a reservoir of the power unit.

Maintenance

Under normal operating conditions, the M3551 should not require servicing during the plowing season, provided post season maintenance has been carried out.

It is recommended that after the every season the hydraulic fluid be changed. The replacement fluid recommended is **UNIVIS J13 (HVI 13)** hydraulic fluid. Automatic transmission fluid is not recommended for this system and may lead to aeration of the oil in very cold weather conditions. The oil level in the reservoir is to within ½" from the top surface (with lift cylinder collapsed).

When draining the hydraulic fluid, the hoses at the cylinders should be disconnected and drained. With the hose disconnected, the cylinders should be collapsed to displace the oil out of the cylinder.

Periodically, and during post season maintenance, make sure the electrical connections are tight and free of corrosion. The terminals may be covered with grease for additional protection from corrosion.

Electrical System

Frequently problems develop due to an undersized electrical charging and storage system. Generally, the heavier the usage, the heavier the system should be. For a moderately light duty, the battery should not be less than 70 ampere-hours and the alternator should charge at a rate of not less than 60 amperes. For heavy usage and in the case where a number of other devices are run off the battery simultaneously, heavier ratings are strongly recommended.

Electric Motor

The 18442 electric motor is a two pole electromagnetic motor, consisting primarily of an armature/commutator, two field coils, four brushes in a brush holder set, and a tubular steel body with cast end cap. Although the motor is grounded through the body, an additional grounding stud is provided on the motor body. The motor must be grounded to the vehicle body with a grounding strap from this stud.

The power unit with this motor is equipped with the 03 pump offering the most optimum performance.

The motor should be serviced periodically to insure good performance. Service as follows:

- a) Check brush set for wear and replace if necessary,
- b) Blow dirt and dust off motor housing and check for shorts, burnt wires or open circuits,
- c) Check bearings (bad bearing can cause a motor to make growling noise),
- d) Check for excessive “end play” of an armature and add thrust washers as required.

Hydraulic Pump

The hydraulic pump converts mechanical energy transmitted by the prime mover (in this case a 12 volt DC electric motor) into hydraulic energy. The hydraulic energy is due to flow (kinetic energy) and pressure (potential energy). The rate of energy output is expressed in horsepower.

At the inlet, as the gears unmesh, the volume in the cavity increases thereby causing fluid to enter. This fluid is then carried between the gears and the housing to the other side of the gears into the outlet cavity. At this point the gear teeth mesh. The outlet cavity volume decreases, causing fluid to flow into the system. Note that without a load, the pressure at the outlet port is nil.

The pressure at the outlet of the pump is due to external loads placed on the system. These loads can be transmitted through cylinders and linear actuators as well as hydraulic motors and rotary actuators. In practice, system components by virtue of orifice and line sizes, offer some resistance to the flow of fluid. This translates into pressure at the outlet of the pump.

Valve Information

Pressure Relief Valve

The pressure relief valve consists of a ball, a retaining spring and a seat. The ball is exposed to the pressure in the outlet line from the pump. This pressure acting on the exposed area of the ball, causes a force on the retaining spring. When the pressure is such that the force on the ball exceeds the force in the spring (due to a preset amount of precompression) the ball lifts off the seat and the fluid from the outlet of the pump is allowed to flow back to the reservoir. The “standard setting” for the M3551 is 2000 psi.

Solenoid Valves

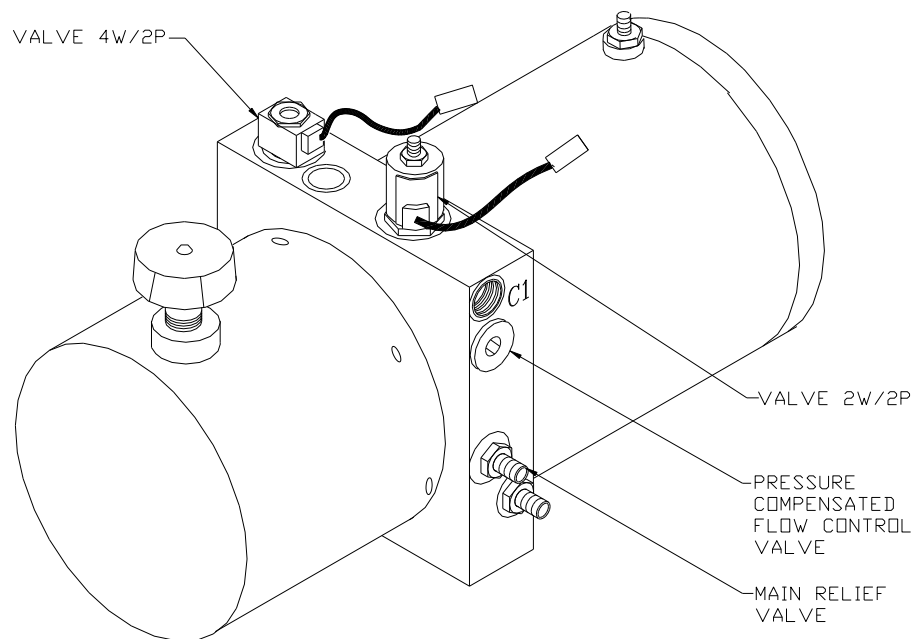
The M3551 circuit contains 2 solenoid valves. These are identified as 2 way/2position (2W/2P) and 4 way/ 2 position (4W/2P). Solenoid valve 2W/2P position is normally closed poppet (check) type valves. The 4 W/ 2P valve is valve of a spool type construction.

A basic solenoid valve consists of a valve cartridge and coil. The valve cartridge consists of an armature attached to a valve mechanism. This armature is controlled electrically by way of a coil. The cartridge screws into a modular valve manifold.

The coil consists of a certain length of wire wrapped around a spool and often surrounded by a metal can. When current is put through the coil, magnetic forces are set up causing the armature to be pulled further into the coil. The armature pulls a poppet or spool into its energized position. A coil spring is compressed in this position; hence when the current ceases and the magnetic field has collapsed, this spring pushes the armature back to its de-energized (normal) position.

Solenoid Valve 2W/2P

Valve 2W/2P is normally closed poppet valve. This valve allows oil to flow into the lifting cylinder but will not let oil out of the cylinder unless the coil is energized. See figure 1 and 2.



Solenoid Valve 4W/2P

Valve 4W/2P is four way two position spool valve. With the coil de-energized (and 2W/2P valve energized) flow from the pump lowers the plow. With 4W/2P coil energized the plow is lifted. See figure 1 and 2.

Pressure Compensated Flow Control

Pressure compensated flow control provide constant regulated flow in one direction (when plow is coming down) regardless of changes in load pressure. Flow in reverse direction (when plow comes up) is non-regulated free flow.

Control Switch

The M3551 control box has two push buttons and a float switch. One up button and one down button.

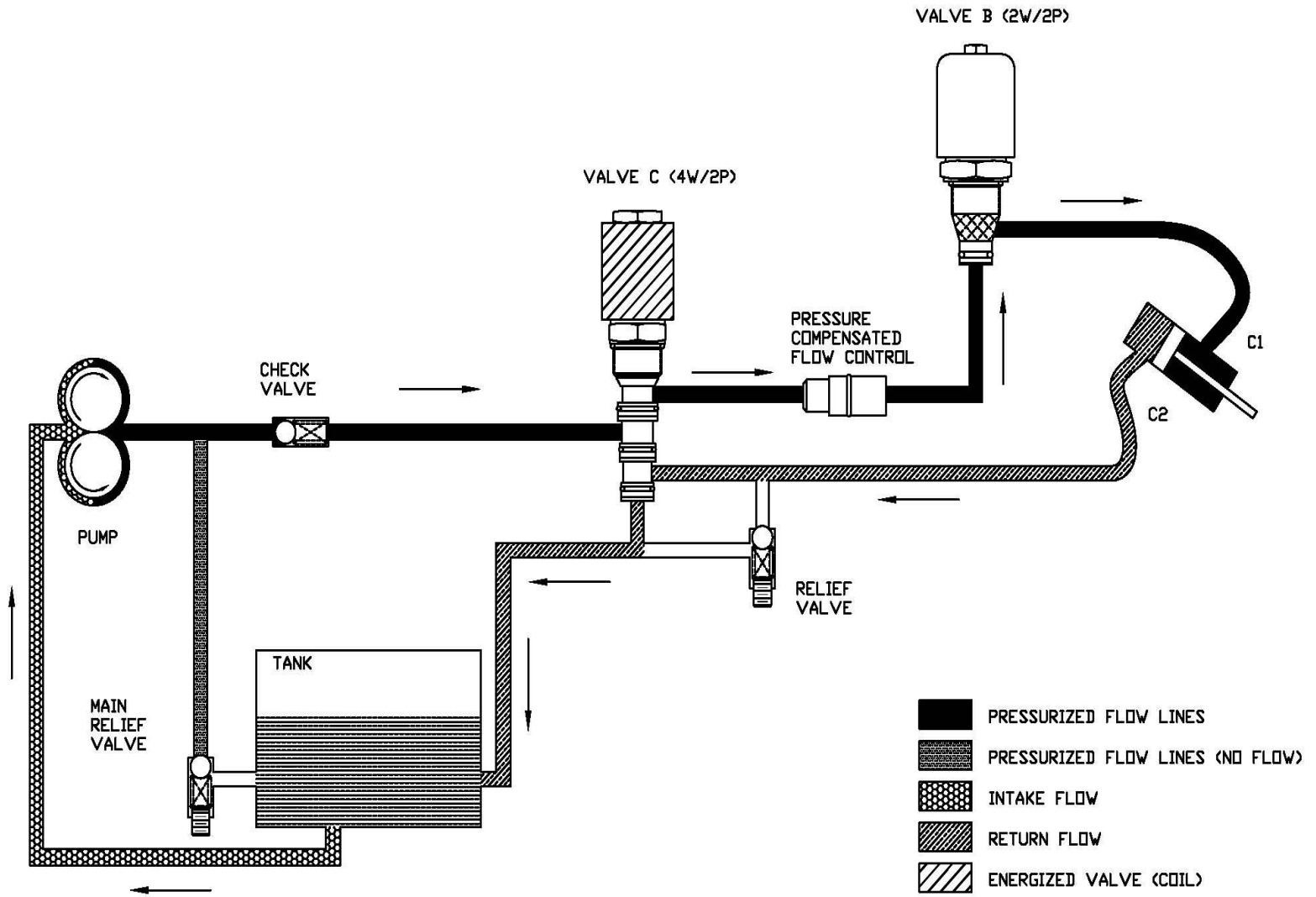
The up button starts the motor and shifts the 4W/2P valve to lift the plow. The down button starts the motor and shifts the 2W/2P valve to lower plow. If the float switch in float position, it shifts the 2W/2P valve to lower plow partner.

If float switch is switched in float position, a blade will drop to the floor. Float switch is used, to facilitate removal of a blade from a truck, or for plowing on uneven surfaces or dragging light snow. If using float switch does not clean a surface, turn off float switch and use down pressure button.

Warning:

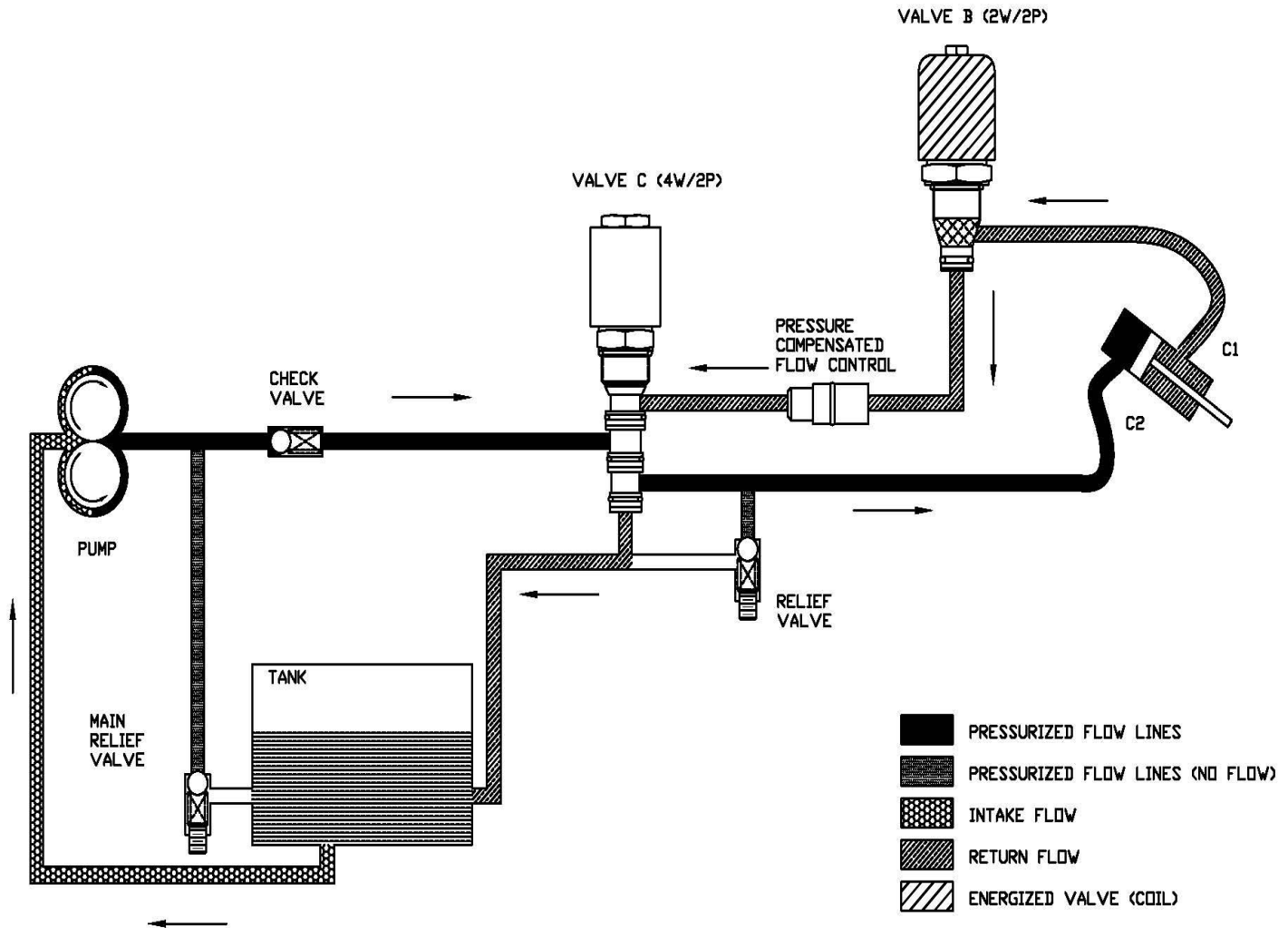
Do NOT use float switch when driving on the road. Do NOT leave a float switch in float position when a vehicle is turned off. A blade will not lift if a float switch is in float position.

- Do NOT use float switch when driving on the road. Do NOT leave a float switch in float position when a vehicle is turned off.



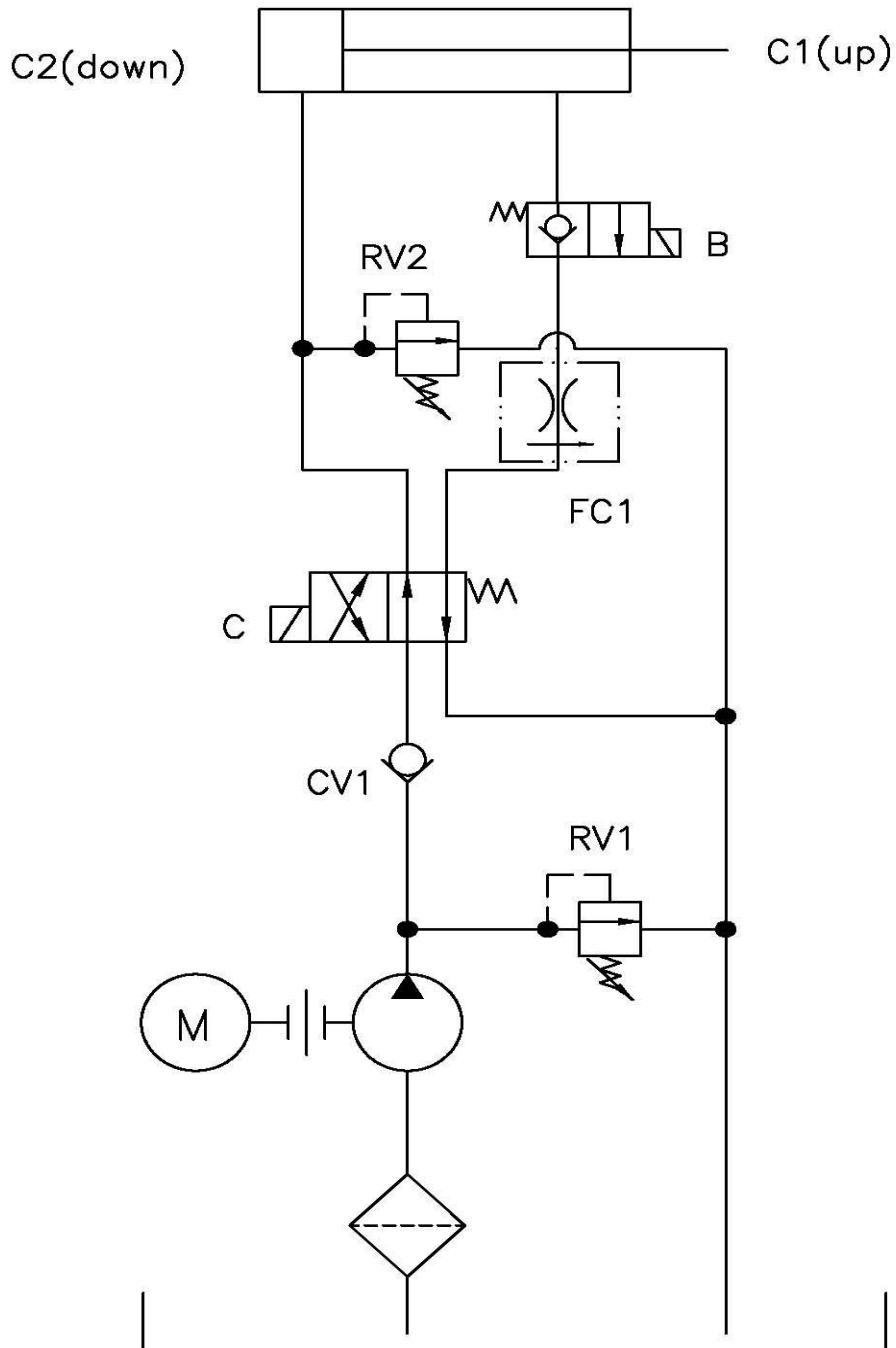
CYLINDER UP
M3551
FIGURE 2

M3551 R02



CYLINDER DOWN—M3551

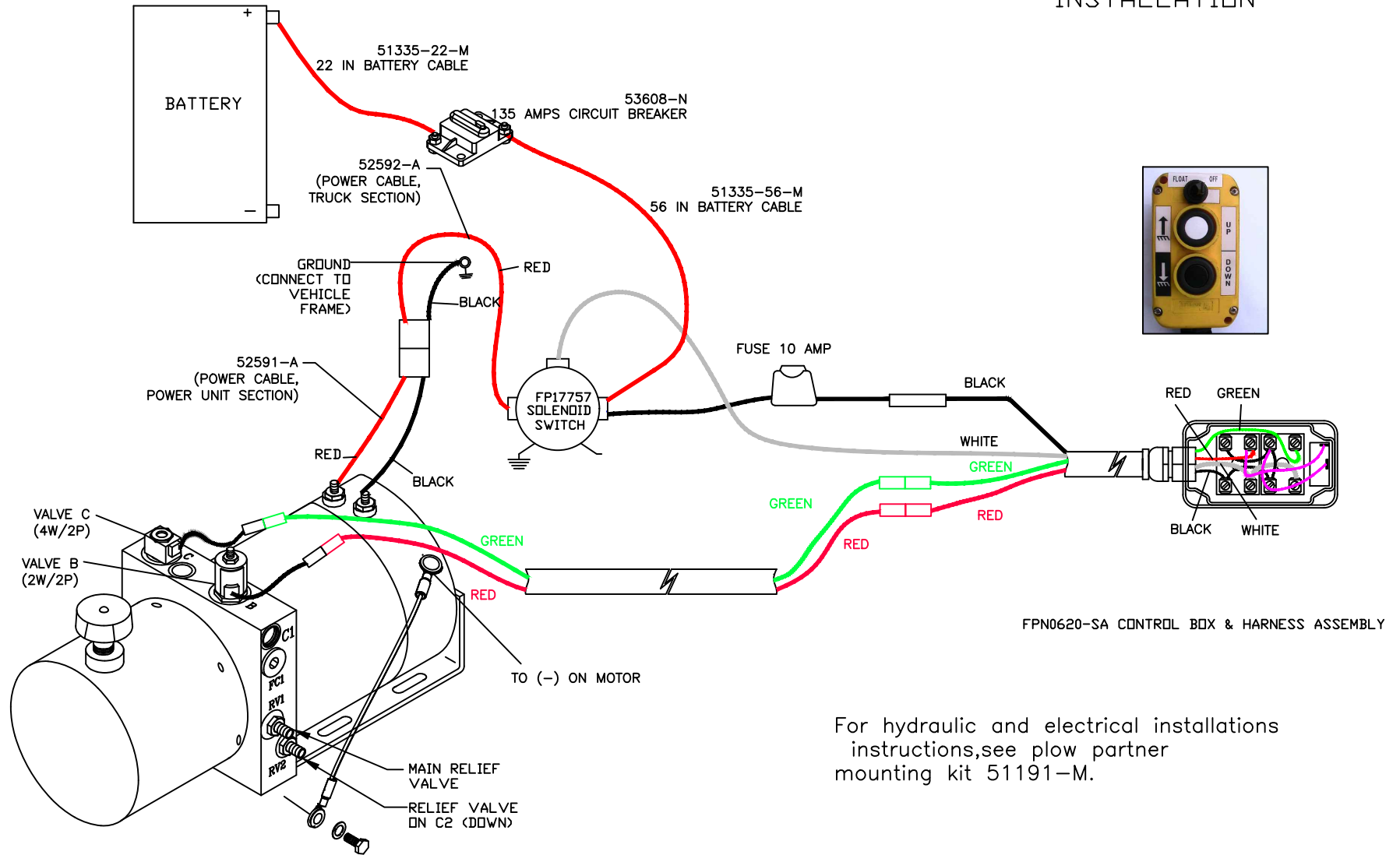
- IF DOWN BUTTON IS PRESSED MOTOR IS RUNNING
 - IF FLOAT SWITCH IS PRESSED MOTOR IS NOT RUNNING
- FIGURE 1



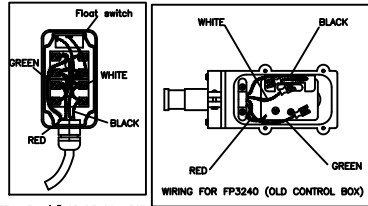
HYDRAULIC SCHEMATIC M3551

R02

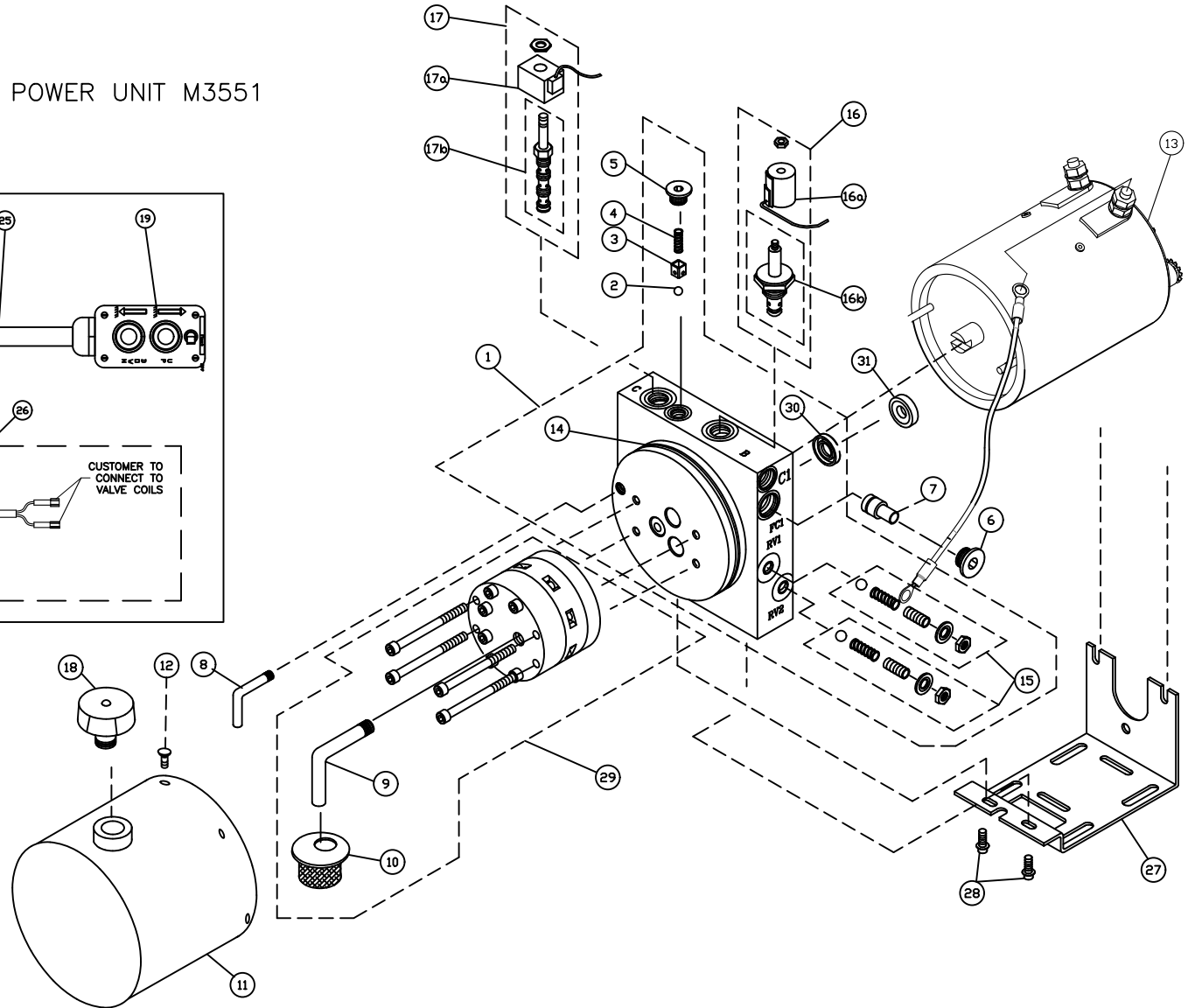
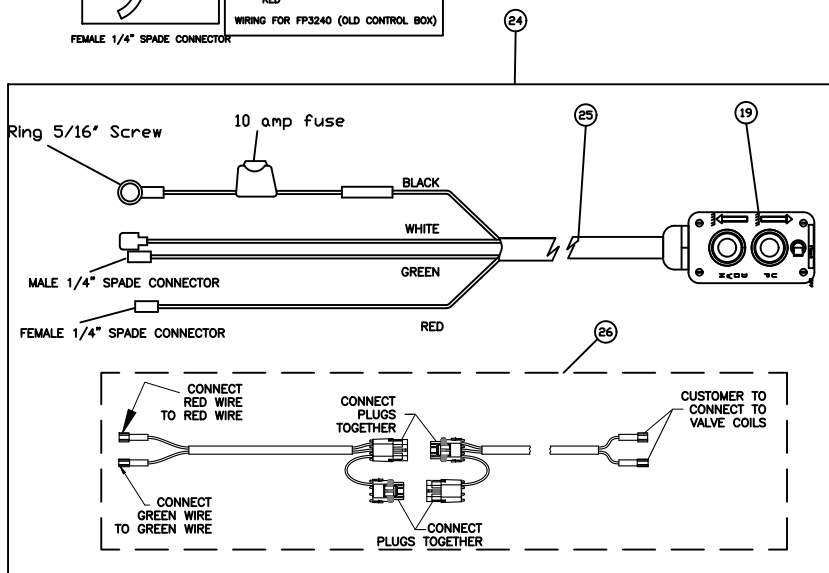
M3551 WIRING DIAGRAM INSTALLATION



For hydraulic and electrical installations
instructions, see plow partner
mounting kit 51191-M.



POWER UNIT M3551





53607-B



Plug view of 53607-B



FPN0919-SA



53607-01-B



Plug view of 53607-01-B

Ref #	Qty	Part #	Description
1	1	FP12379	Pump base assembly
1a	1	FP7985	Needle Bearing (Pump Shaft to Pump Base)
2	1	FP0126	Ball, 5/16
3	1	FP2680	Poppet
4	1	FP0130	Spring
5	1	FP3276	Plug, 9/16
6	1	FP3274	Plug, 3/4
7	1	FP1723-0.75	Flow control
8	1	FP13059	Return tube
9	1	FP13092	Suction tube, 90 degree elbow
10	1	FP13107	Filter screen
11	1	FP14045	Reservoir
12	6	FP7703	Screw, self-tapping, 10mm x 3/8
13	1	FP18442	Motor, 12VDC
14	1	FP2352	O-ring
15	2	FP7527	Relief valve kit
16	1	FP0490-D	Valve assembly, 2 way / 2 position #8
16a	1	FP10861-D	Coil
16b	1	FP10907-D	Cartridge
17	1	FP10833-D	Valve, 4W / 2P
17a	1	FP18835-D	Coil
17b	1	FP11111	Cartridge
18	1	FPN0571	Vent plug
19	1	FP7995	Control box, only
20	1	FP1694	Terminal, quick connect
21	1	FP1346	Terminal, ring, 5/16 screw
22	1	FP17757	Solenoid
23	1	FP3414	Terminal #10 stud
24	1	FPN0620-SA	Control box and harness assembly
25	1	FPN0919-SA	Control Box Harness
26	1	FPN0920-SA	Assembly consist of (53607-B & 53607-01-B)
27	1	FP2238	Pump mounting plate
28	2	FP7899	Self-tapping screw, 5/16
29	1	FP12171-250-SA	Modular pump assembly
30	1	FP2159	Pump shaft seal
31	1	FP2318	Bearing, motor to pump base

- FP10907-D was FP0307 *note: if Deltrol cartridge with 3/8 stems FP0307 is replaced with Deltrol cartridge with 1/2 stem FP10907-D, coil must also be replaced with FP10861-D
- FP10861-D was FP0496 *note: If coil FP0496 is replaced with FP10861-D, Deltrol cartridge with 3/8" stem must also be replaced with Deltrol 1/2 stem FP10907-D
- FP7249-D was FP7249
- FP0679-D was FP0679 *note: If Parker cartridge FP0679 is replaced with Deltrol cartridge FP0679-D, Parker coil must also be replaced w/ Deltrol coil FP18835-D
- FP18835-D replaces FP10977
- FP11111 replaces FPN0406 *note: if Parker cartridge FPN0406 is replaced with Deltrol Cartridge FP11111, Parker coil FPN0408 must also be replaced with Deltrol coil FP18835-D
- FP0490-D was FP0490
- FP10833-D was FPN0352
- FP18442 was FP8034
- FP17757 was FP7518

Troubleshooting flow chart for power unit M3551

- Motor does not operate.
- Plow partner does not raise
- Plow partner does go down
- Plow partner does not hold in down position.
- Plow partner leaks down in up position

Warning:

- Top of battery needs to be protected. If positive side of battery is accidentally grounded person could be burnt or wiring system can be damaged, or battery gasses could explode causing injuries.
- Disconnect cable from negative battery terminal before replacing the motor or solenoid.
- Always wear eye protection and protective clothing when working around hydraulic systems.
- Remove jewelry and objects that might conduct electricity while working on power units.
- Fluid under pressure can pierce the skin and enter the bloodstream causing death or serious injury.
- When adjusting the relief valve be sure to use a pressure gauge. Failure to accurately set the relief valve can cause failure resulting in damage to the equipment or cause bodily harm.

Specification:

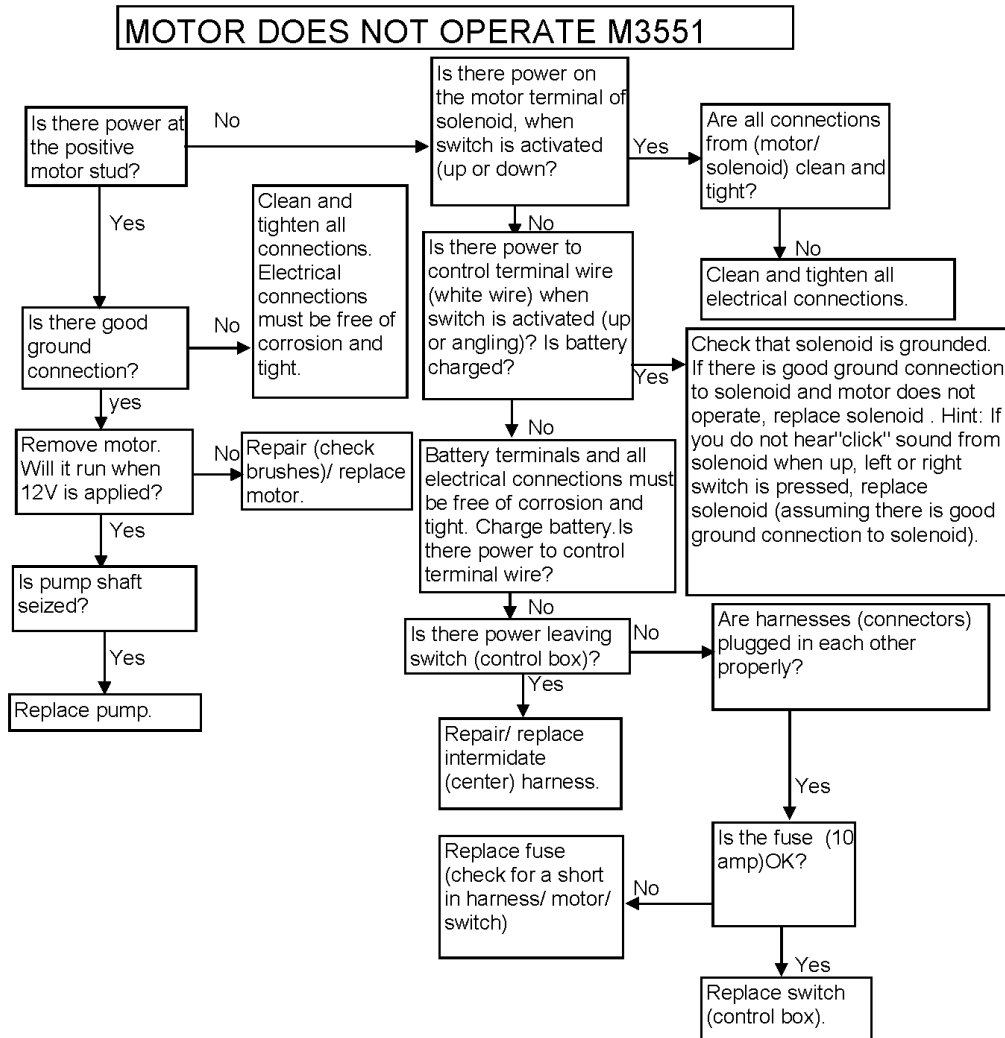
- Max Amp Draw 210 AMP (AMP draw of motor should be measured at maximum raise or maximum angle when motor is running at pressure setting at 2000 psi).
- Note: Do not operate motor continuously for more than 30 sec.
- Relief valve setting RV1 2000 psi (this is system relief valve and it is closer to the top), and RV2 2000 psi (this one is for down pressure and it is closer to bottom).

R01

Troubleshooting tips M3551:

1. Pump shaft can be turned freely (smoothly) using two fingers. If it can't be turned replace pump. Proper pump rotation is clockwise looking from the motor end.
2. Use a screwdriver to check magnetism of solenoid coils. Place screwdriver on the nut securing the coil and have the switch operated. Strong magnetic attraction should be felt.
3. When testing or making adjustments on the relief valve the system must be "dead headed" (cylinder at full stroke or in a position where cylinder movement is zero).
4. AMP draw of motor should be measured at maximum raise or maximum angle when motor is running at 2000 psi system pressure.
5. Use volt meter or test light to test for power in a harness or continuity in a switch. A test light is simply a light bulb which has one end connected by a wire to an alligator clip and the other end connected to a metal probe. It is used to check the electrical circuit when the battery is connected to the system. The alligator clip is grounded and the light glows when the probe comes in contact with a "live" electrical component.
6. Do not screw cartridge valves into cavity too fast; use a back and forth motion and have O-rings well lubricated.
7. Clean all parts thoroughly before assembly and lubricate with clean oil.
8. Do not use Teflon tape on hydraulic connections as it can easily jam the valves and plug the filters in the system, use pipe sealant. Never apply pipe sealant at the end of fitting, always 2- 3 threads back.
9. If valves are not stamped, C valve is at the back and B valve is at the front.
- 10 .To adjust relief valve:
 - a. Loosen jam nut counter-clockwise. b. Turn screw clockwise to increase pressure or turn screw counter-clockwise to decrease pressure. c. Tighten jam nut clockwise to 50in.lb. torque. d. Check system pressure after jam nut is tight. Readjust pressure if screw is moved during tightening of jam nut.

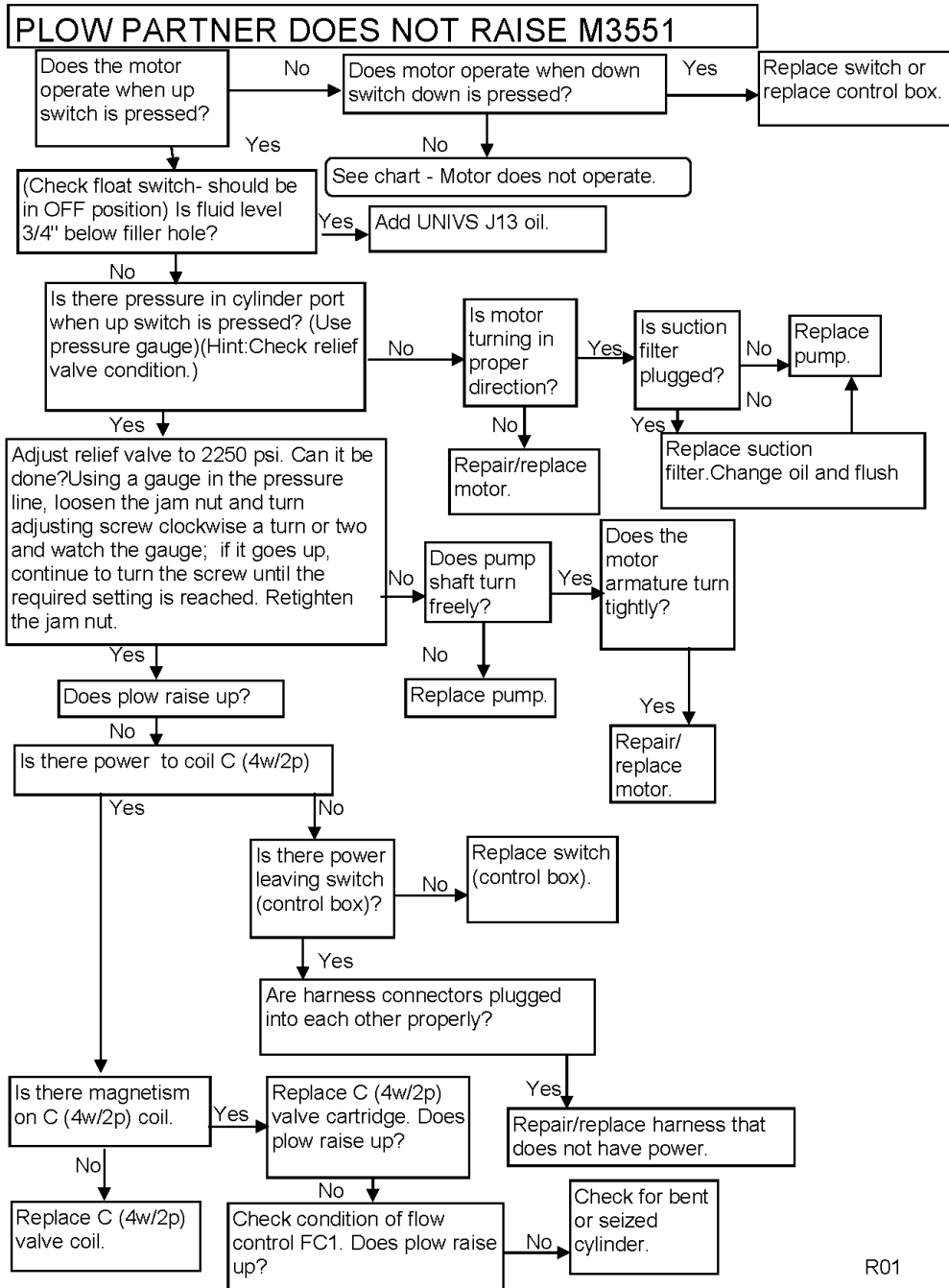
R01



MOTOR OPERATES CONTINUOUSLY M3551

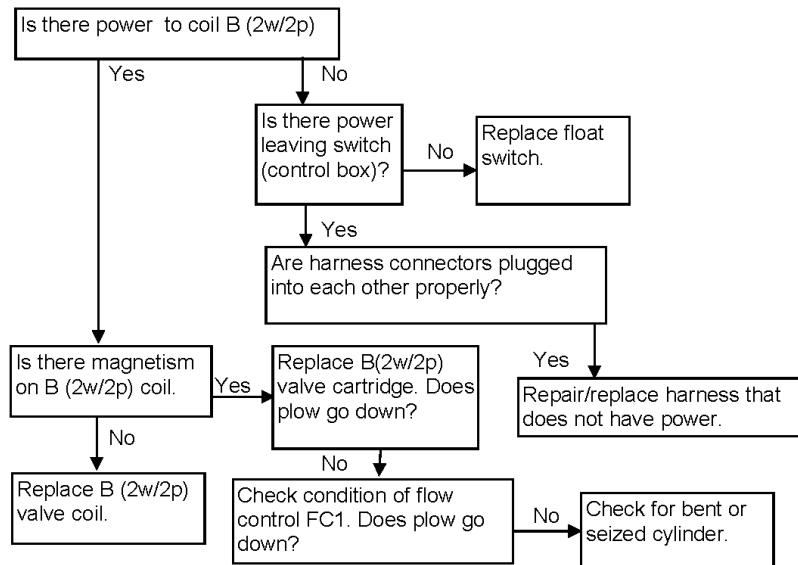
If motor operates continuously, change solenoid.

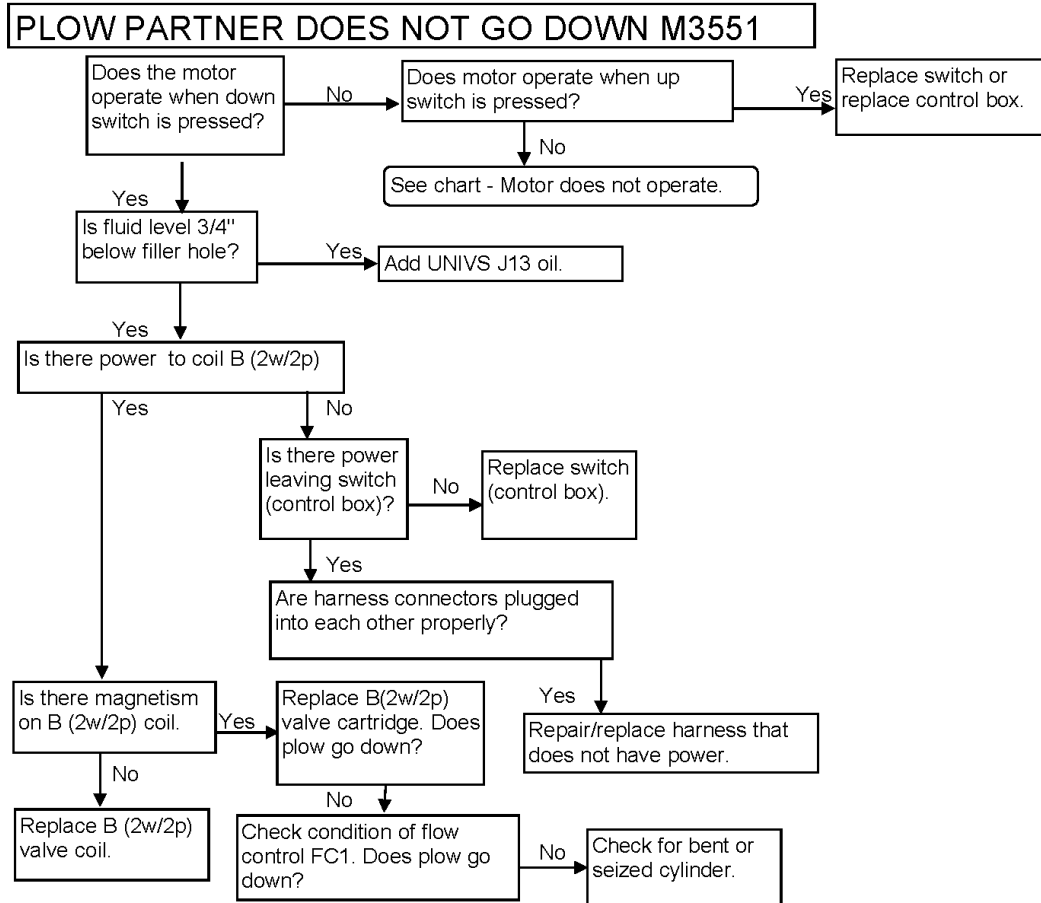
R01



R01

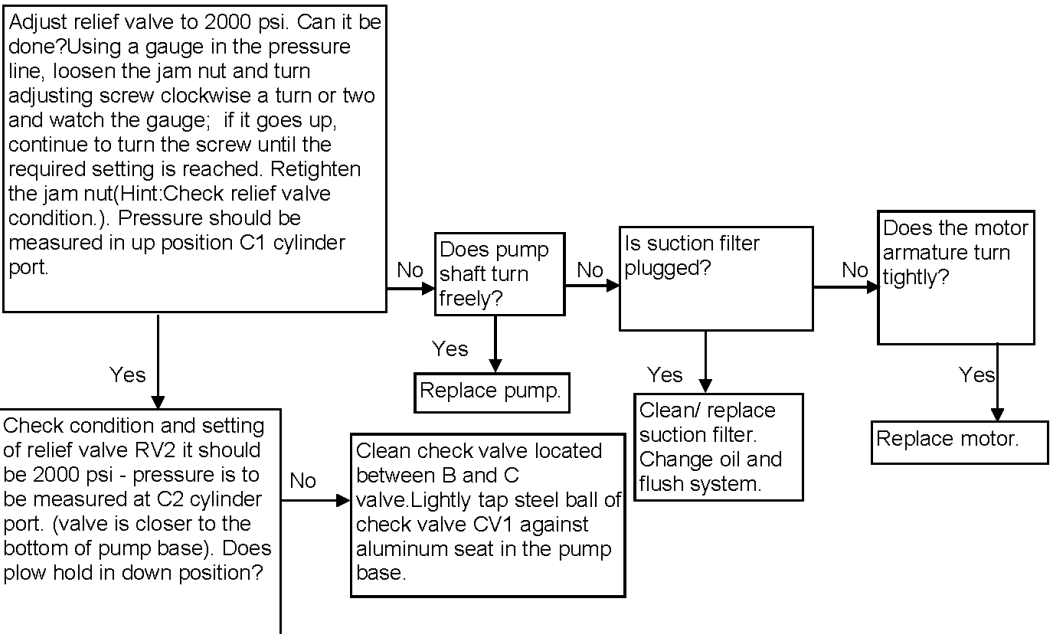
**PLOW PARTNER DOES NOT GO DOWN WHEN
FLOAT SWITCH IS IN FLOAT POSITION**



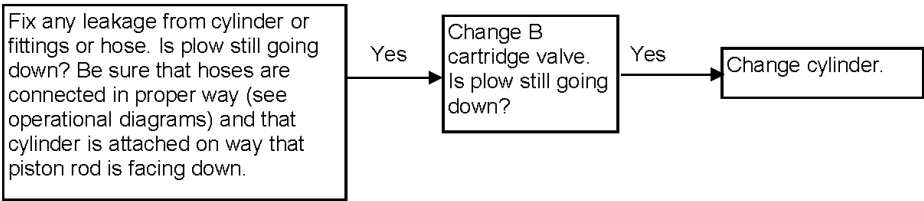


R01

PLOW PARTNER DOES NOT HOLD IN DOWN POSITION M3551



PLOW PARTNER LEAKS DOWN IN UP POSITION



R01