

Arctic Equipment Manufacturing Corporation
M3551 Hydraulic Power Unit

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M3551

Operating Information

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.

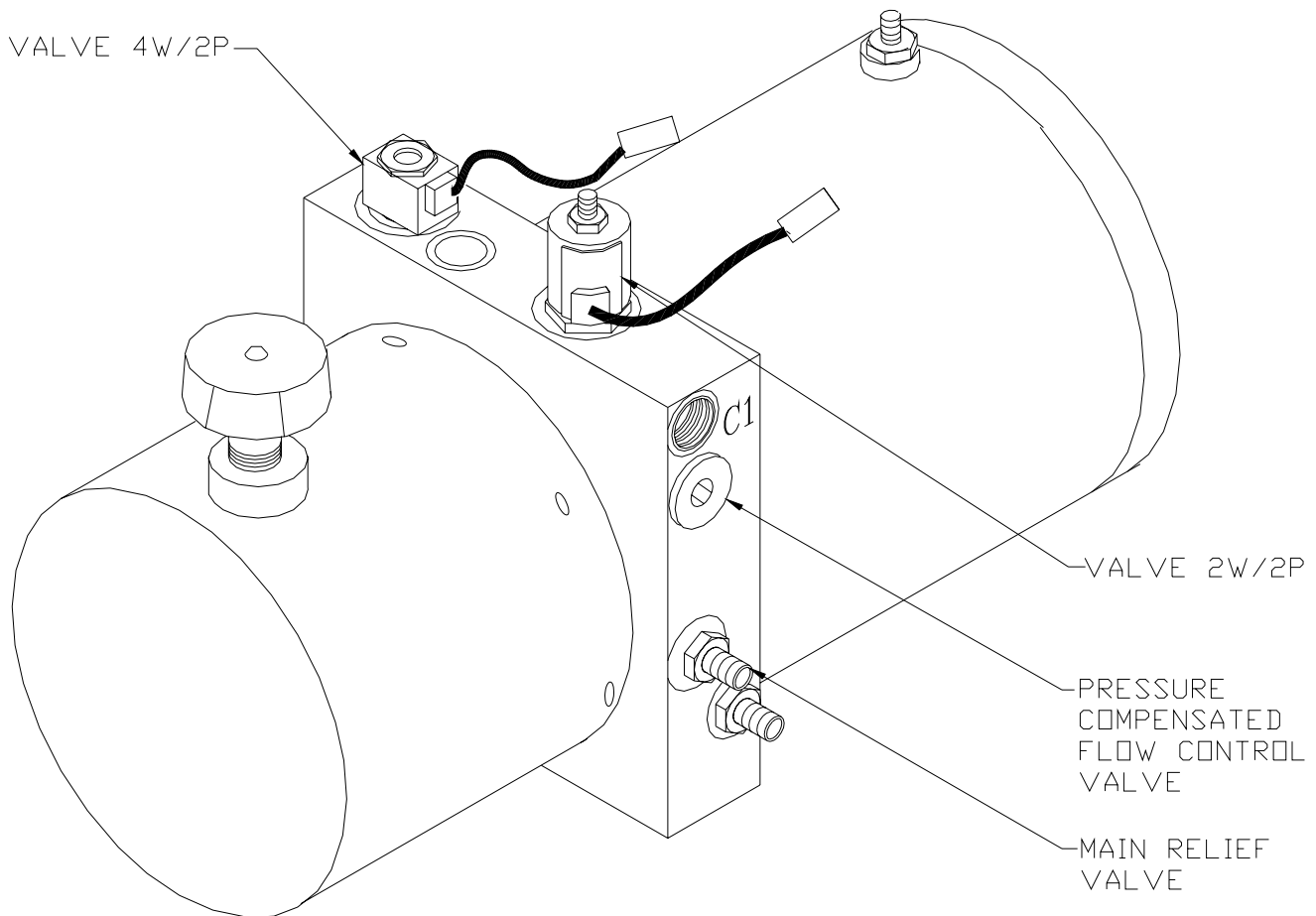
A basic solenoid valve consists of a valve cartridge and coil. The valve cartridge consists of an armature attached to a valve mechanism. This armature is controlled electrically by way of a coil. The cartridge screws into a modular valve manifold.

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.

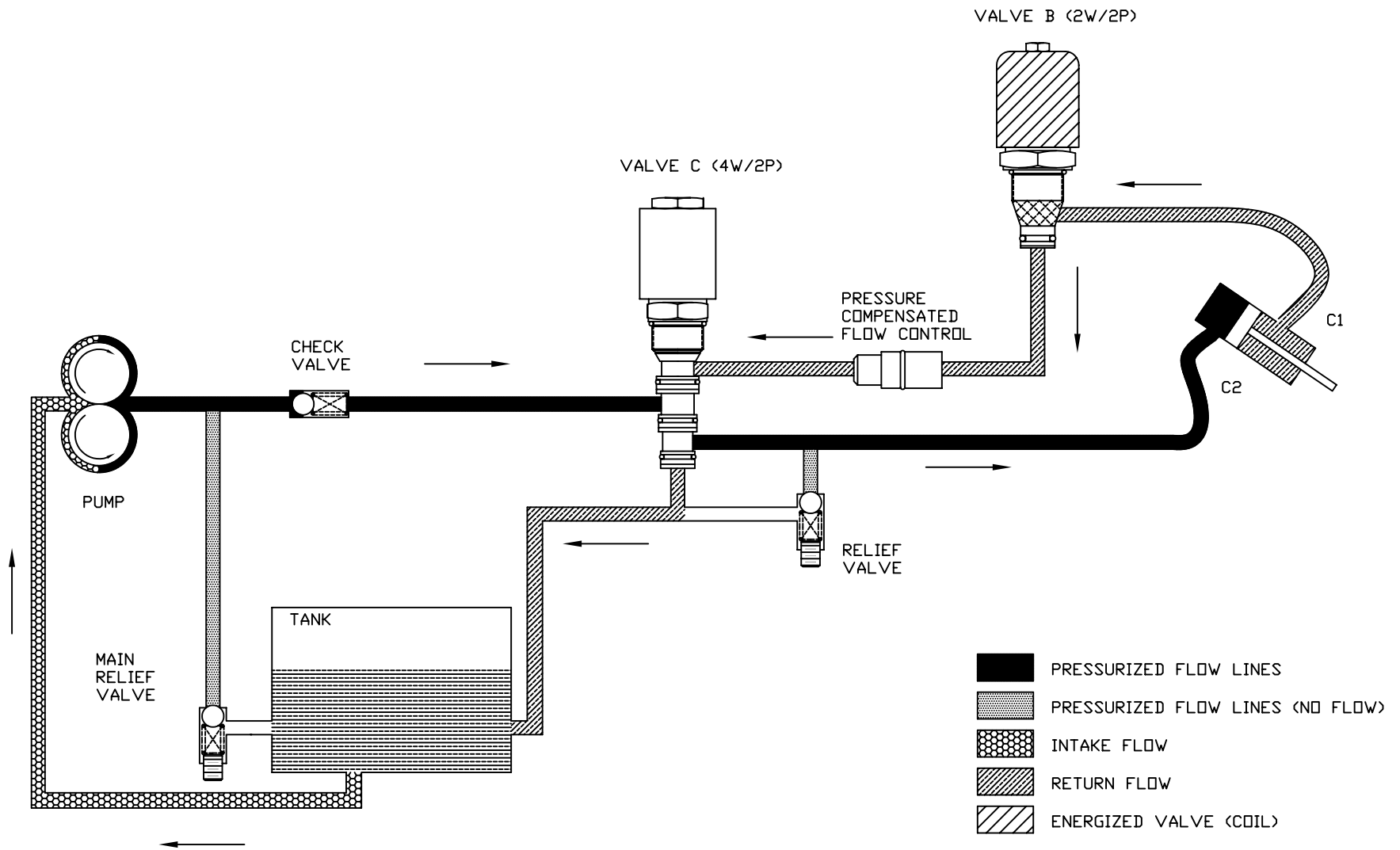
Pressure Compensated Flow Control

M3551 (Plow Partner Power Unit)

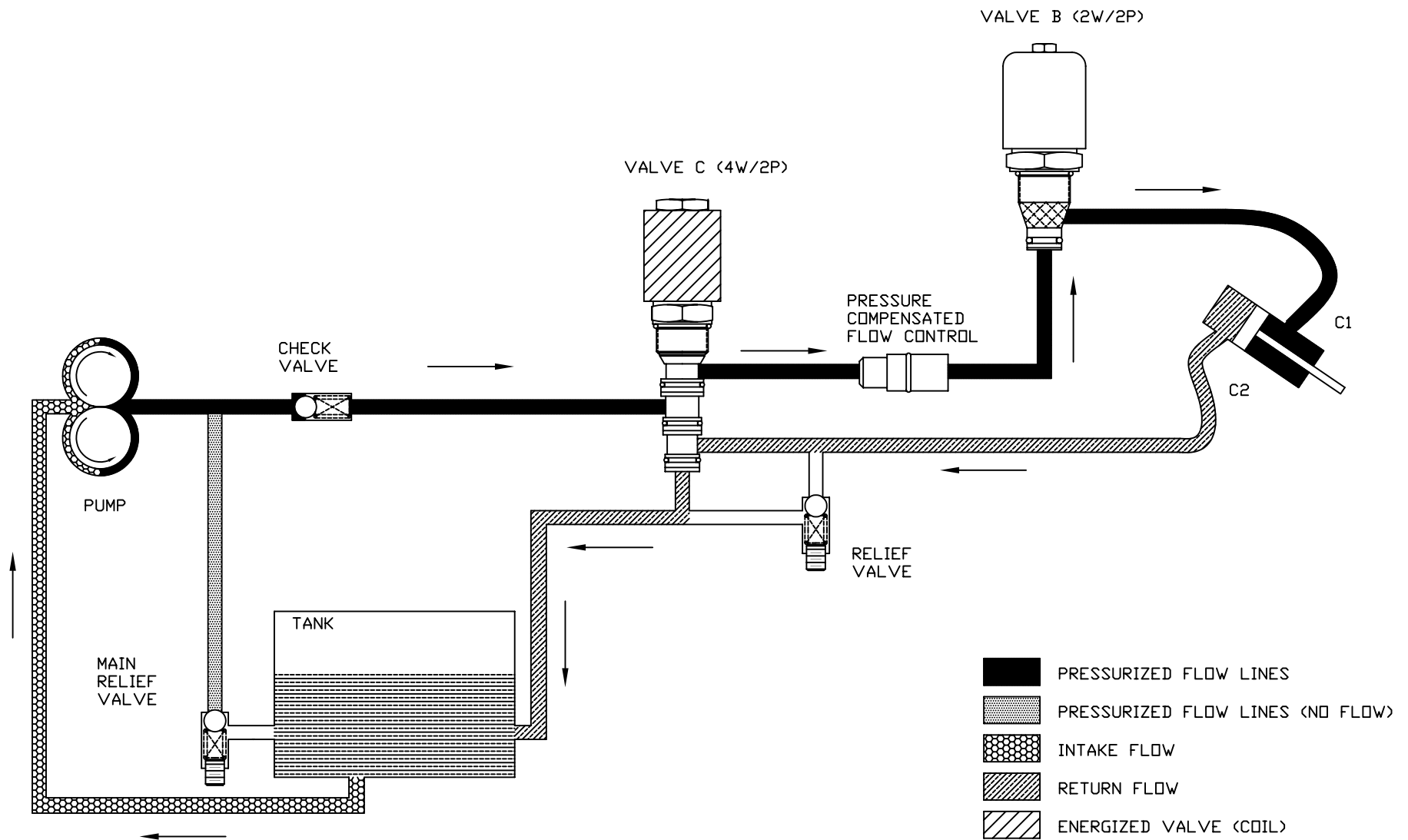
Pressure compensated flow control provide constant regulated flow in one direction (when plow is coming down) regardless of changes in load pressure. Flow in reverse direction (when plow comes up) is non-regulated free flow.

Control Switch

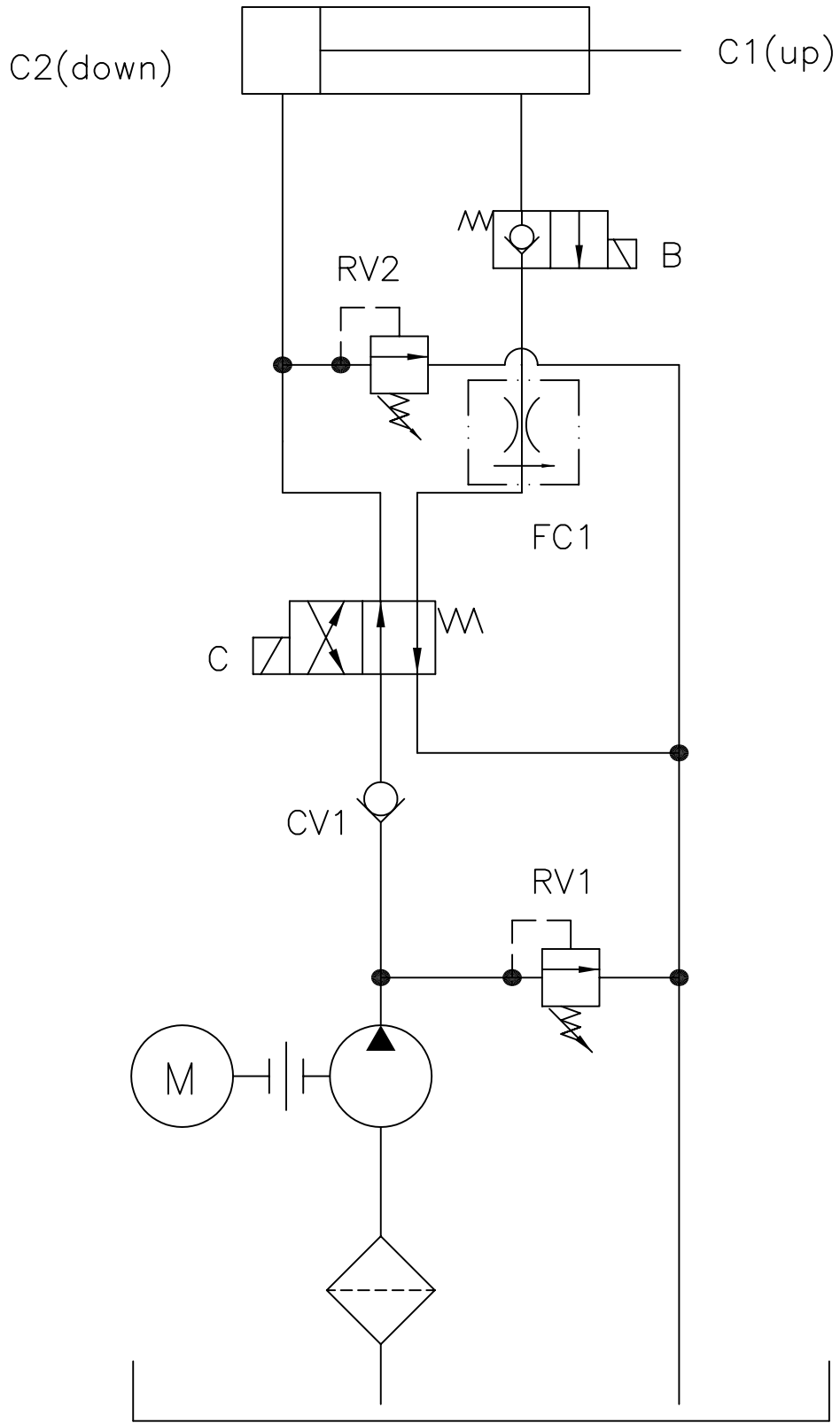
The M3551 control box has two push buttons. One up button and one down button. The up button starts the motor and shifts the 4W/2P valve to lift the plow. The down button starts the motor and shifts the 2W/2P valve to lower plow.



CYLINDER
DOWN - M3551
 FIGURE 1

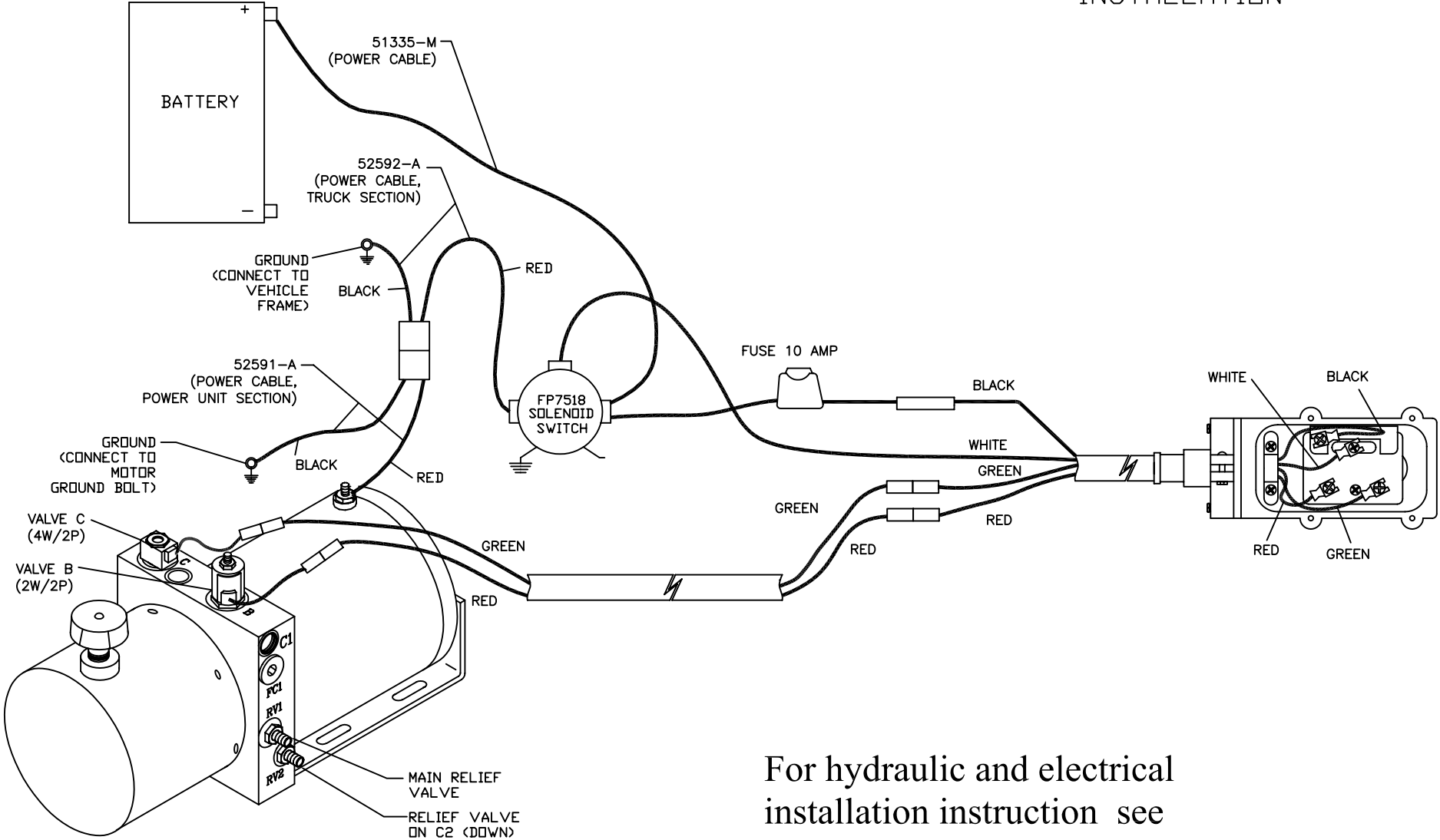


CYLINDER UP
M3551
 FIGURE 2



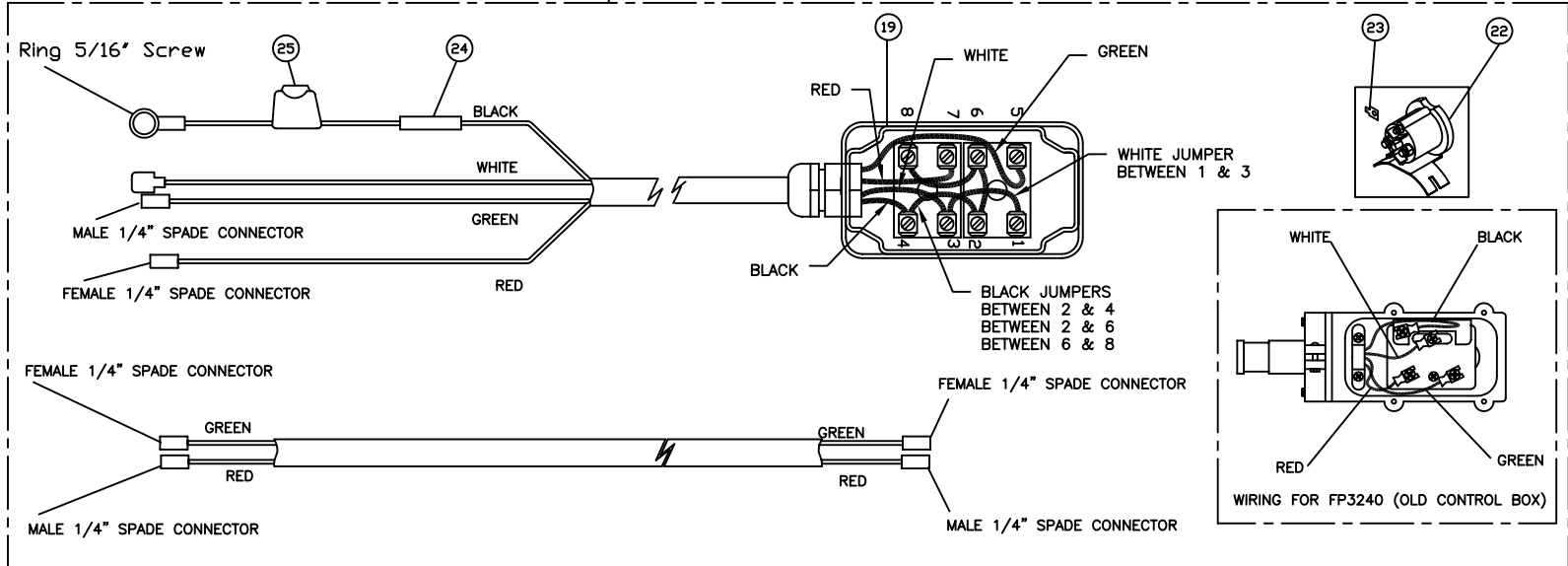
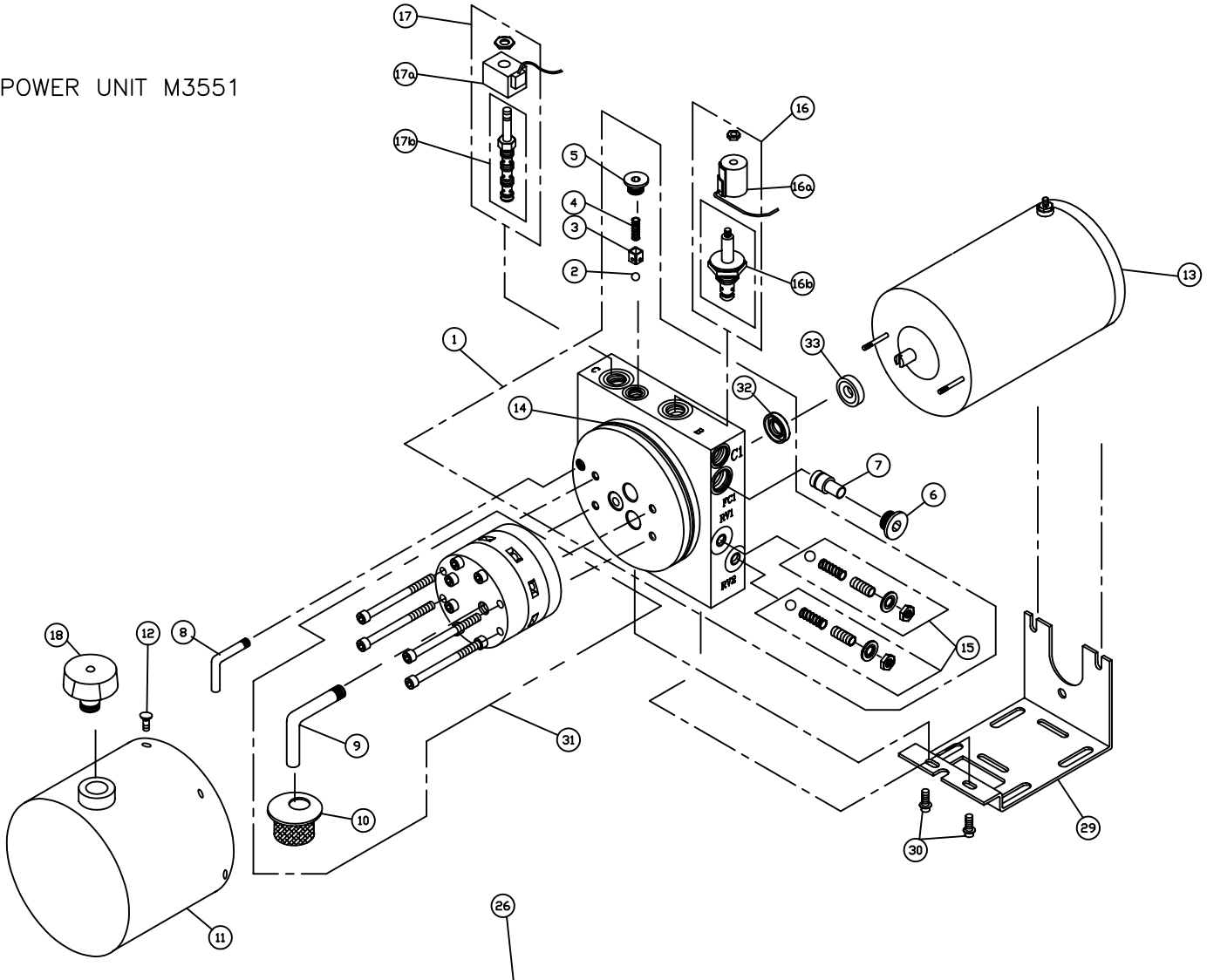
HYDRAULIC SCHEMATIC M3551

M3551 WIRING DIAGRAM INSTALLATION



For hydraulic and electrical installation instruction see plow partner mounting kit 51191-M.

POWER UNIT M3551



	Ref #	Quant.	Part #	Description
	1	1	FP12379	Pump base assembly
	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 deg elbow
	10	1	FP13107	Filter screen
	11	1	FP14045	Reservoir
	12	6	FP7703	Screw, self tapping, 10mm x 3/8
R02	13	1	FP18442	Motor, 12VDC
	14	1	FP2352	O-ring
	15	2	FP7527	Relief valve kit
R01	16	1	FP0490-D	Valve ass'y, 2 way / 2 position #8
R01	16a	1	FP10861-D	Coil
R01	16b	1	FP10907-D	Cartridge
R01	17	1	FP10833-D	Valve, 4W / 2P
R01	17a	1	FP18835-D	Coil
R01	17b	1	FP11111	Cartridge
	18	1	FPN0571	Vent plug
	19	1	FP3240	Control box
	20	1	FP1694	Terminal, quick connect
	21	1	FP1346	Terminal, ring, 5/16 screw
R03	22	1	FP17757	Solenoid
	23	1	FP3414	Terminal #10 stud
	24	1	FPN0451	Butt connector
	25	1	FPN0619	10 amp fuse
	26	1	FPN0620-SA	Control box and harness assembly
	27	3	FPN0622	Male connector
	28	3	FPN0623	Female connector
	29	1	FP2238	Pump mounting plate
	30	2	FP7899	Self tapping screw, 5/16
	31	1	FPK12171-250	Modular pump assembly
	32	1	FP2159	Pump shaft seal
	33	1	FP2318	Bearing, motor to pump base

- R01 FP0490-D was FP0490
-FP10861-D was FP0496

-FP10907-D was FP0307
-FP10833-D was FPN0352
-FP11111 was FPN0406
-FP18835-D was FPN0408

- R02 FP18442 was FP8034
- R03 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).

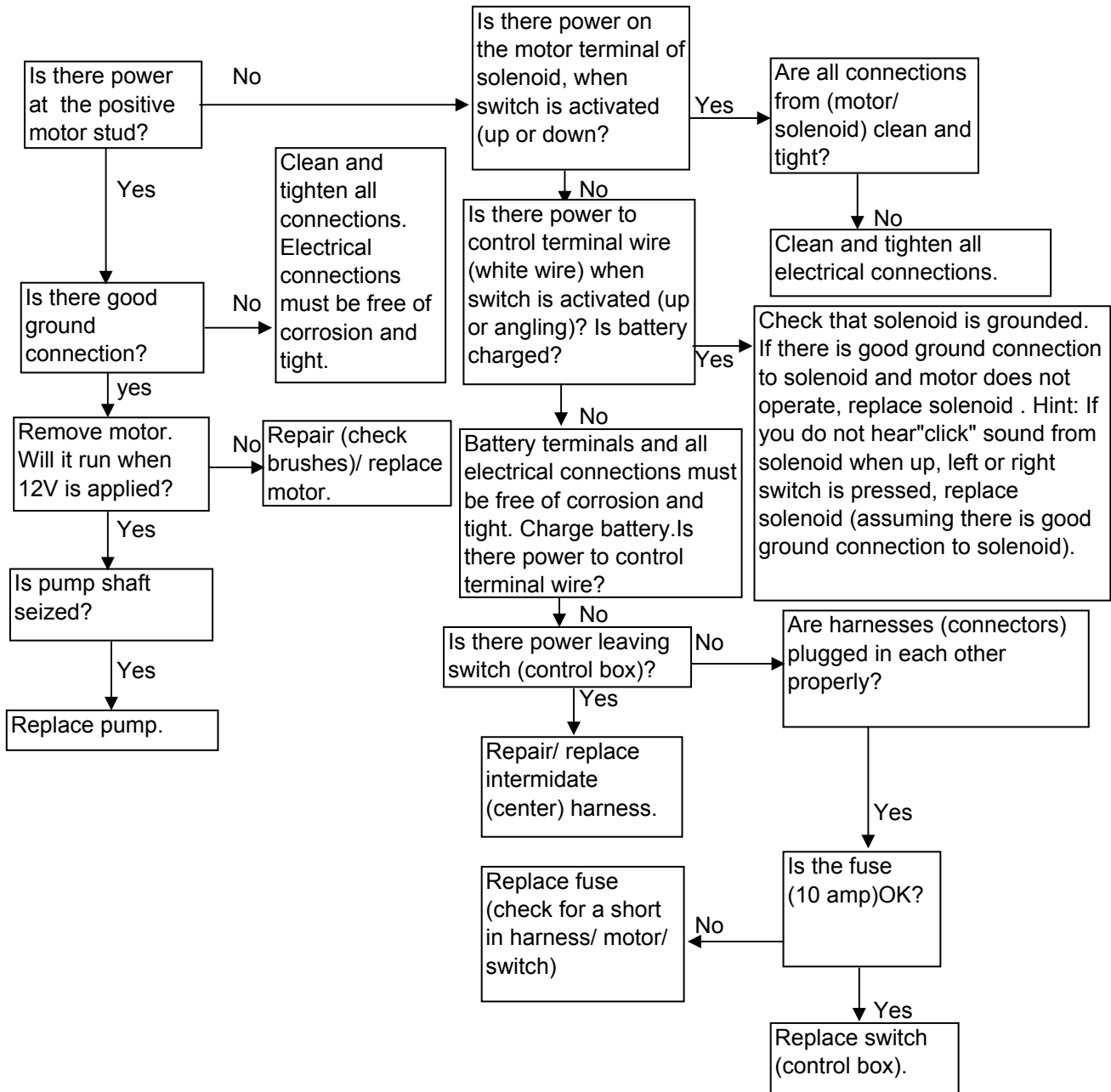
Note: Do not operate motor continuously for more than 30 sec.

-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).

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.

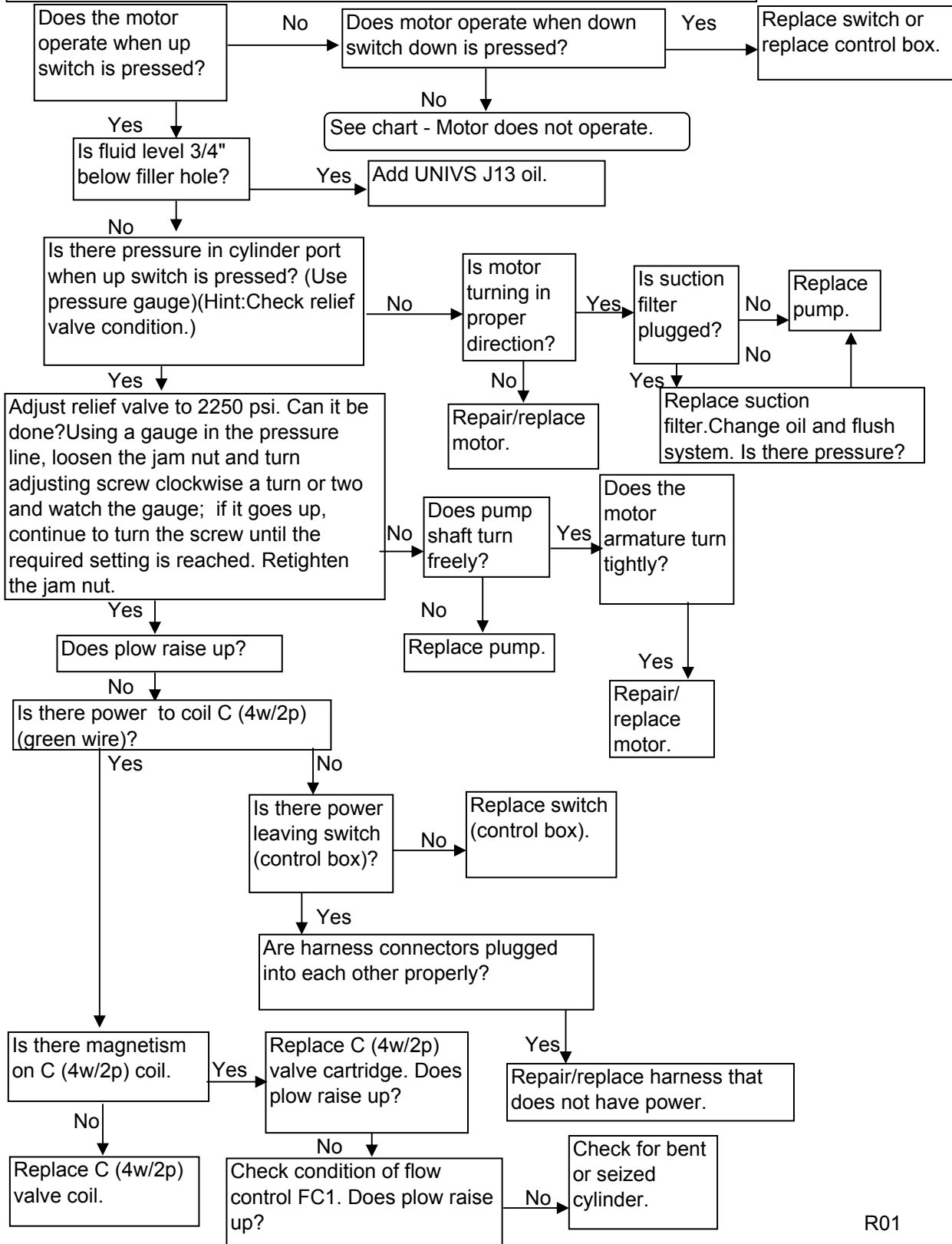
MOTOR DOES NOT OPERATE M3551



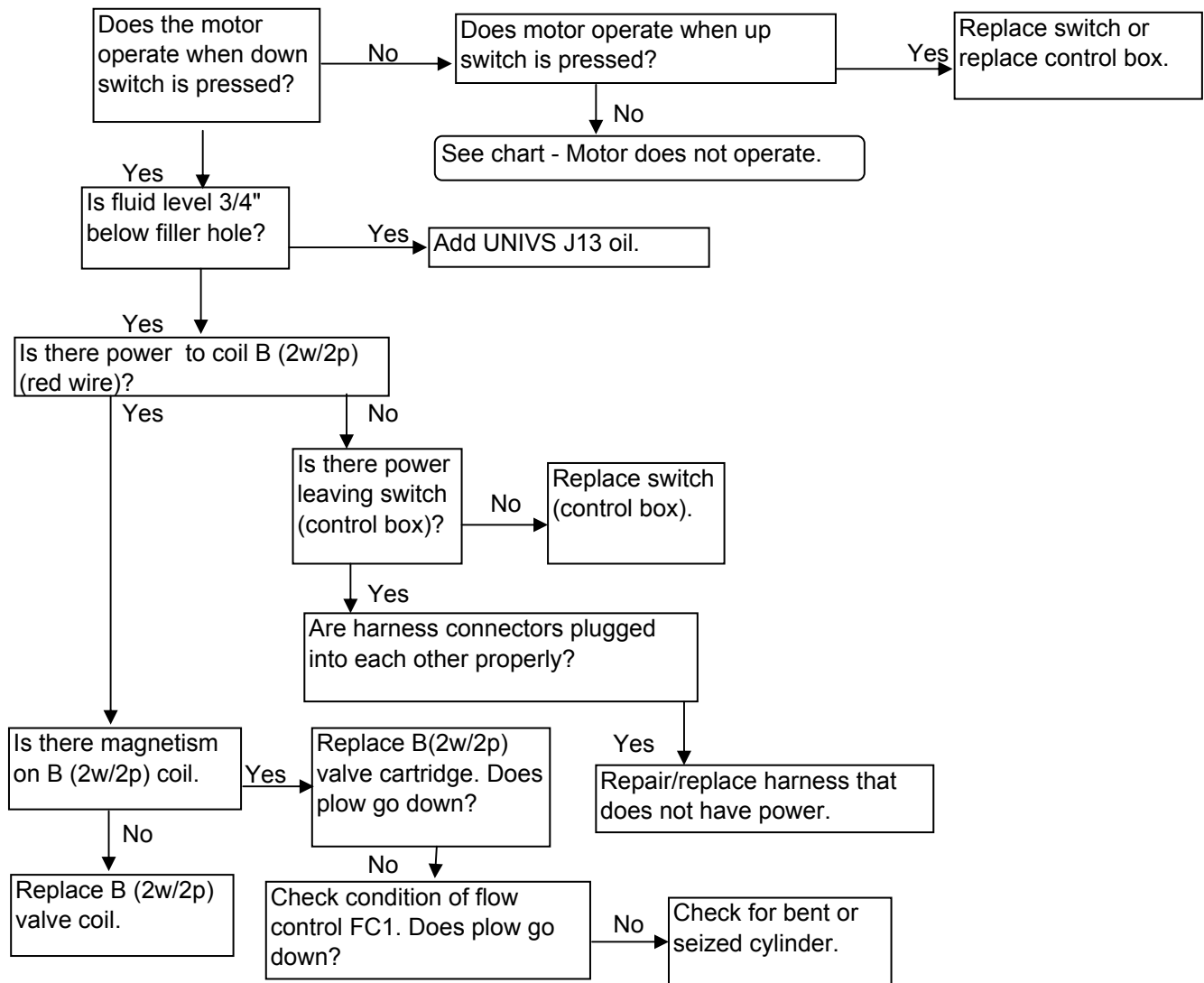
MOTOR OPERATES CONTINUOUSLY M3551

If motor operates continuously, change solenoid.

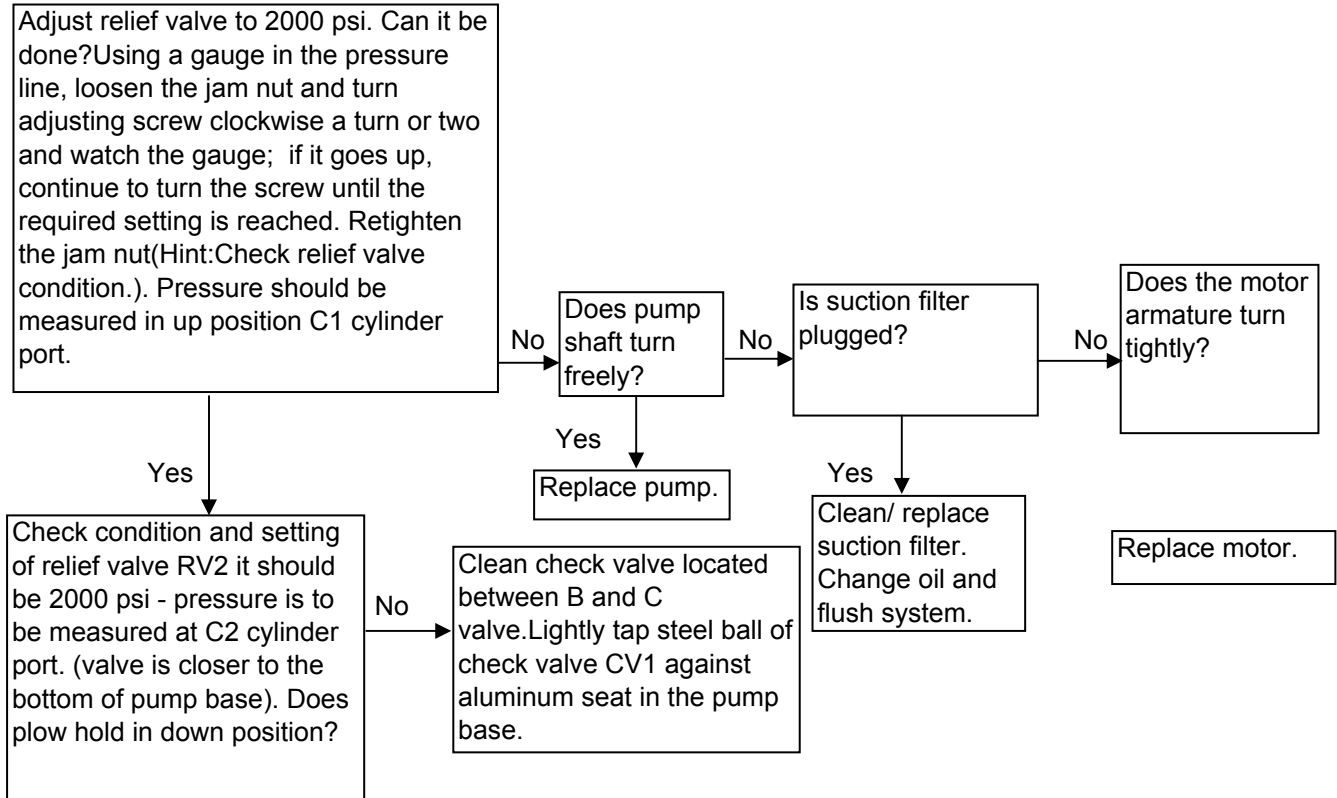
PLOW PARTNER DOES NOT RAISE M3551



PLOW PARTNER DOES NOT GO DOWN M3551



PLOW PARTNER DOES NOT HOLD IN DOWN POSITION M3551



PLOW PARTNER LEAKS DOWN IN UP POSITION

