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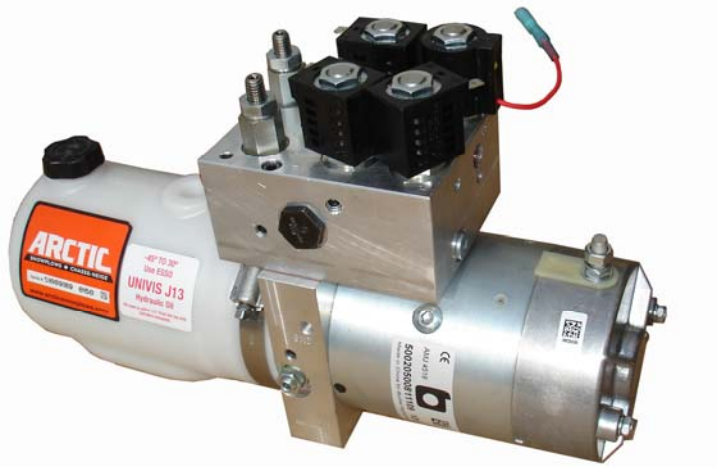
M3493-05
Operating Information



General Information about Power Unit M3493-05

Warranty Identification

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

Maintenance

Under normal operating conditions, the M3493-05 should not require servicing during the plowing season, provided post season maintenance has been carried out.
It is recommended that after every season the hydraulic fluid to be changed.(For the first 3 years after purchase a preventive maintenance schedule must be performed in order to extend your warranty- please see your dealer for details) The replacement fluid 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. Use of any fluid other than J13 will void warranty. The oil level in the reservoir is to be within ½" from the top surface (when lift cylinder is 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 must be covered with grease for additional protection from corrosion.
Sometimes, in order to **release pressure in angling cylinders** it is necessary to follow these instructions: when blade is angled to the right (curb side), angle blade to the left (driver side) and as blade is angling press release button, than let go of both.

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 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 8111-I electric motor is 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 endcap.

The power unit with this motor is equipped with the 05 pump. This combination of pump and motor offers optimum performance.

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 though 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 pre-set 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 relief valve setting" for the M3493-05 is 1350 psi.

Directional Valves

The M3493 circuit contains 4 directional valves identified as 'A', 'B', 'C' and 'D'. Valves 'A', 'C' and 'D' are 3 way, 2 position spool valves. Valve 'B' is a 2 way 2 position normally closed poppet valve.

A basic directional valve consists of a valve cartridge and a coil. Inside the cartridge valve, an armature is attached to the valve mechanism.
The coil consists of a wire wrapped around a spool. When power is applied to the coil (the coil is energized), the magnetic field created by coil pulls the armature into the coil. The armature shifts the valve mechanism into the energized position. When power is removed from the coil, a spring inside the valve cartridge pushes the armature and valve mechanism to the de-energized position.

Directional Valve 'B'

Valve 'B' is a 2 way 2 position normally closed poppet valve which is used for lowering the plow. In the de-energized position, valve B acts as a check valve allowing pump flow to the lift cylinder but preventing return flow from the lift cylinder to the reservoir. Energizing valve B opens the valve and allows flow from the lift cylinder to the reservoir thereby lowering the plow. See figure 2. Note: the lift cylinder is connected to C3.

Directional Valves 'A', 'C' & 'D'

Directional Valves 'A', 'C' and 'D' are 3 way, 2 position spool valves. Directional Valve 'C' operates the lift cylinder on C3 port (See Figure 1). Directional Valves 'A' and 'D' operate the left

and right angling cylinders. Valve 'A' operates the angling cylinder on the right side of vehicle on C2 port (See Figure 3). Valve 'D' operates the angling cylinder on the left side of vehicle on C1 port (See Figure 4).

In the de-energized position, the valves block flow from pump to the cylinder but allow return flow from the cylinder to the reservoir. In the energized position, flow from the pump to the cylinder is permitted but flow from the cylinder to the reservoir is not.

Note: When angling the plow, one cylinder is extending and the other is retracting therefore one cylinder is receiving oil from the pump and the other is returning oil to the reservoir. Valves 'A' and 'D' must work together.

Cross over relief valve

The cross over relief valves are provided to protect the valves and manifold from the pressure spikes created when the plow strikes an object. The cross over relief valves are similar in construction to a regular direct acting relief valve.

Cross over valves, when activated, bleed fluid from C1 to C2 or vice versa. In this manner both angling cylinders, the plow frame and the truck frame are offered some protection from the normal impact forces associated with plowing. Striking a fixed object while plowing at high speeds will damage the cylinders and perhaps the plow. The cross over relief valves are adjustable and are normally set at about 2500 psi.

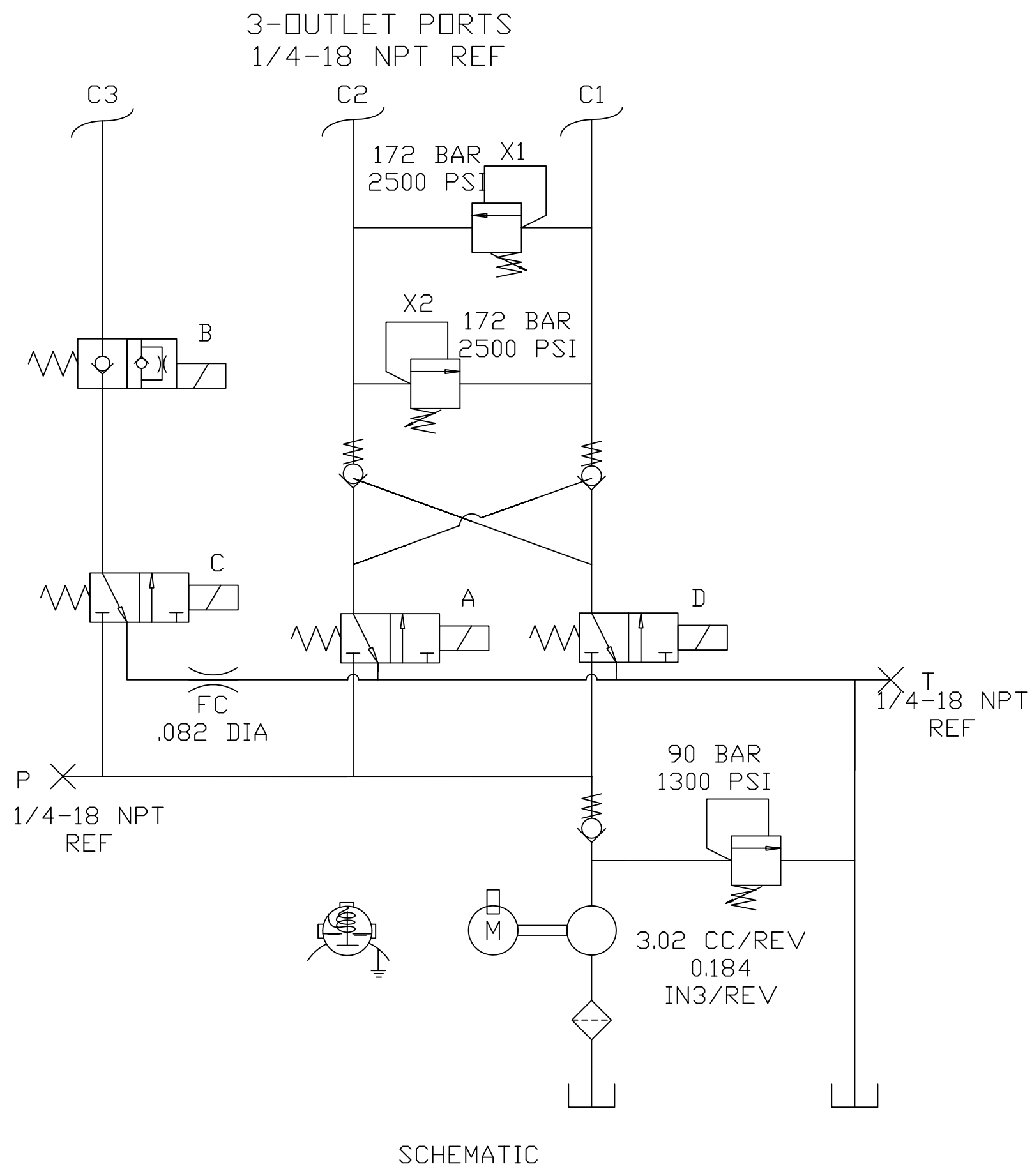
Pilot Operated (PO) Check Valve

A dual pilot operated check valve (PO Check Valve) is provided on ports C1 and C2 to hold the plow at the desired angle. Without the PO Check valves, leakage through directional valves 'A' and 'D' would allow the plow to drift.

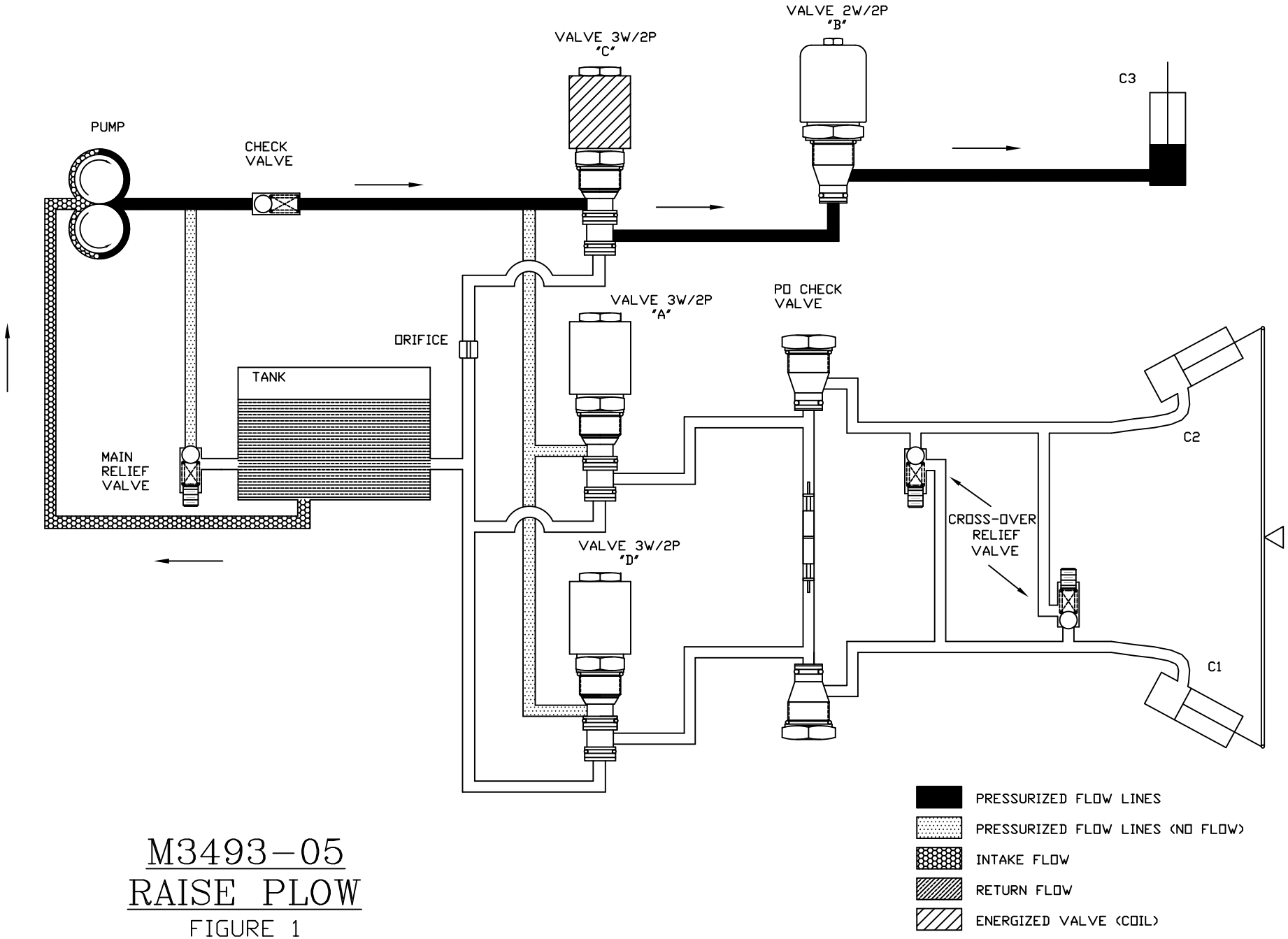
Without pilot pressure, a pilot operated check valve (PO check valve) allows flow in only one direction. In the free flow direction, oil flowing through the valve lifts the poppet of the seat. In the opposite direction, returning oil pushes the poppet against the seat thereby blocking flow. When pressure is applied to the pilot piston, the poppet is lifted off the seat and flow in both directions is permitted. When angling, pilot pressure is provided for the check valve returning oil to the reservoir. For example; when valve 'D' is energized pump flows oil to C1. Oil is allowed to return oil through the check valve to the reservoir because the pressure on C1 is acting on the pilot piston of the C2 PO Check Valve.

Controller

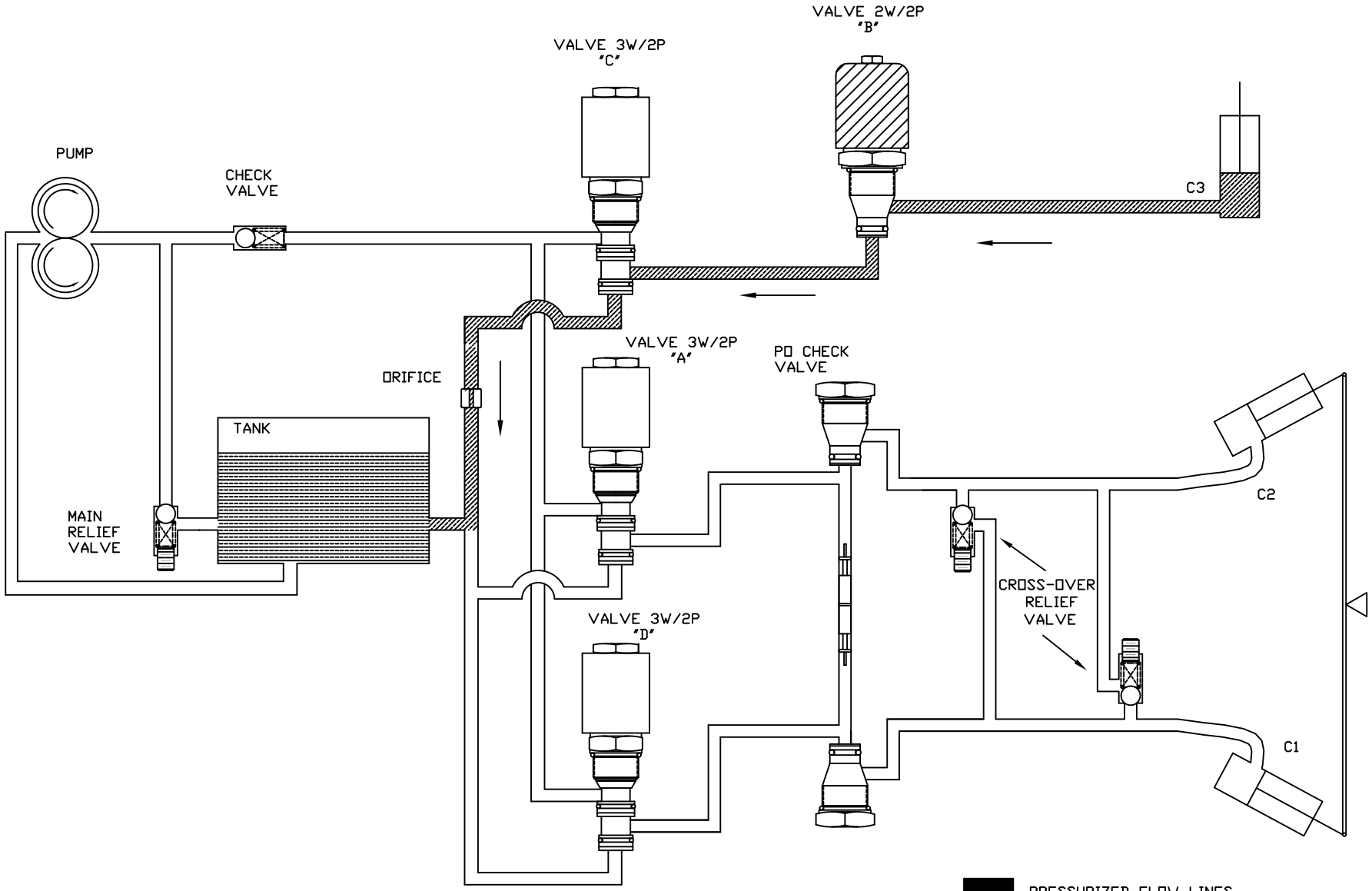
The M3493-05 uses four different control boxes: control box with rocker switches, touchpad control box, handheld controller and joystick control box. Each control box performs same functions: up, down, angle left and angle right.


3-OUTLET PORTS
1/4-18 NPT REF
C3
C2
C1
172 BAR X1
2500 PSI
X2
172 BAR
2500 PSI
B
C
A
D
FC
.082 DIA
T
1/4-18 NPT
REF
P
1/4-18 NPT
REF
90 BAR
1300 PSI
M
3.02 CC/REV
0.184
IN3/REV

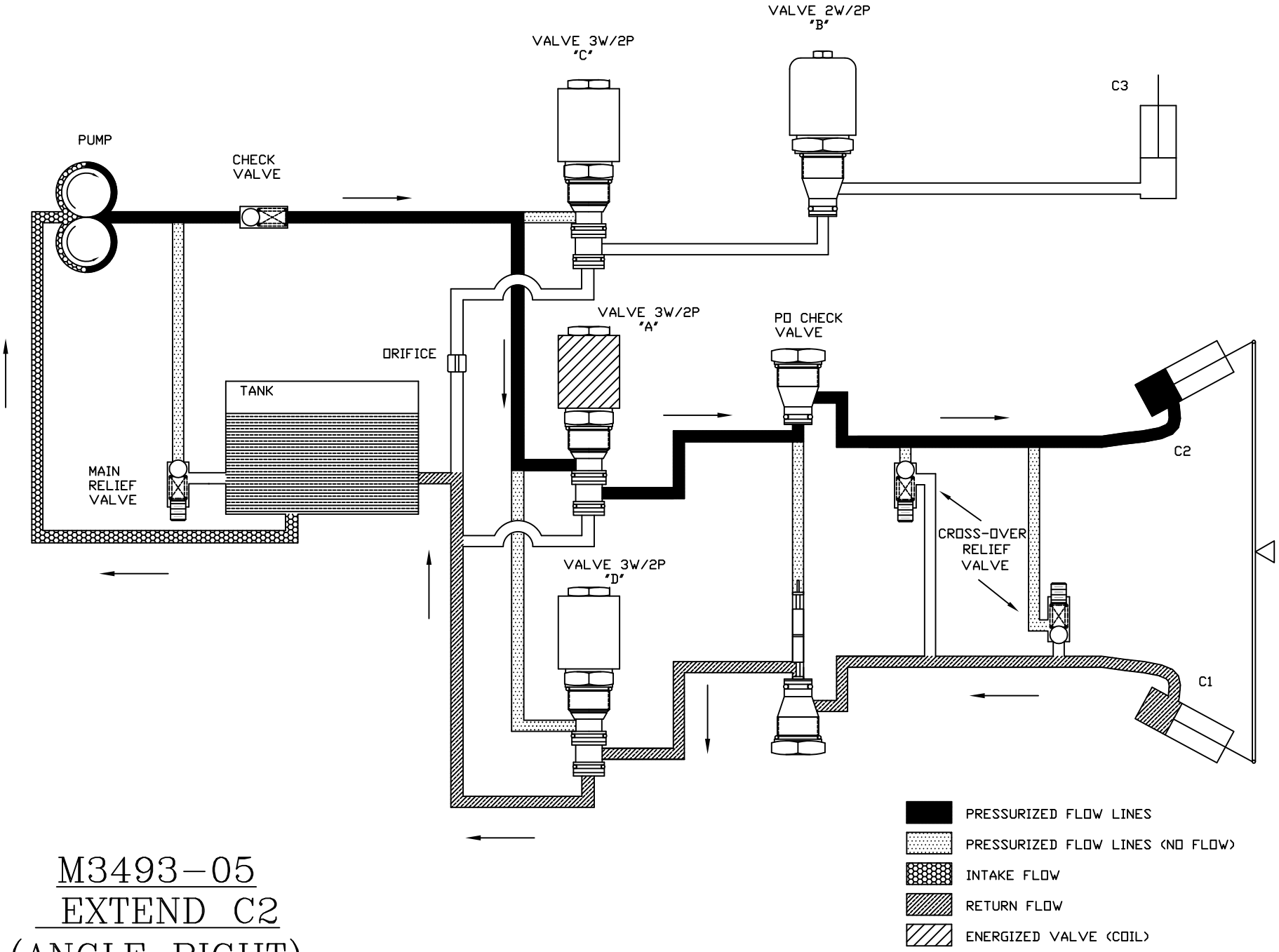
SCHEMATIC



M3493-05
RAISE PLOW
FIGURE 1

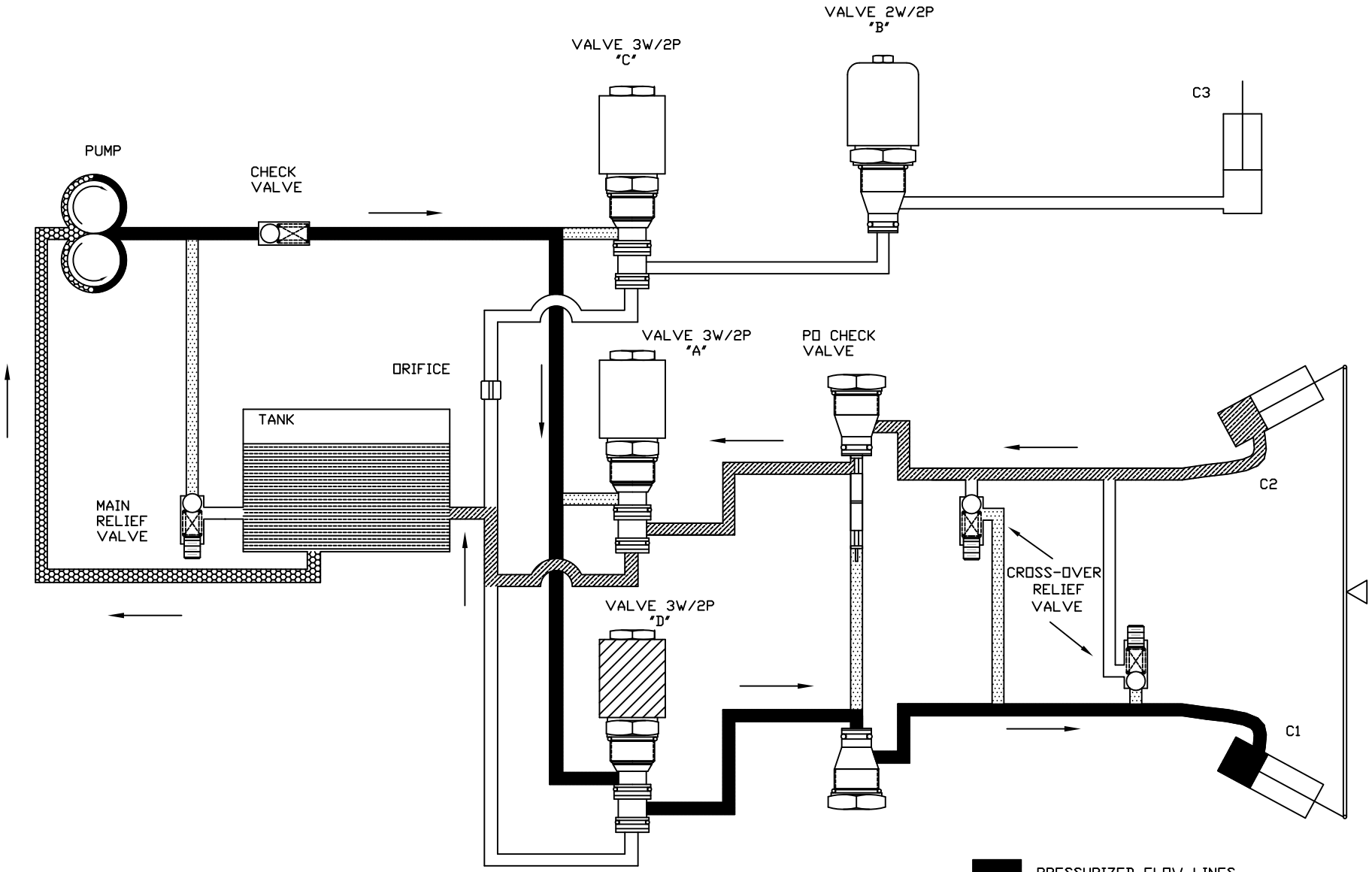


M3493-05
LOWER PLOW
FIGURE 2



M3493-05
EXTEND C2
(ANGLE RIGHT)

FIGURE 3

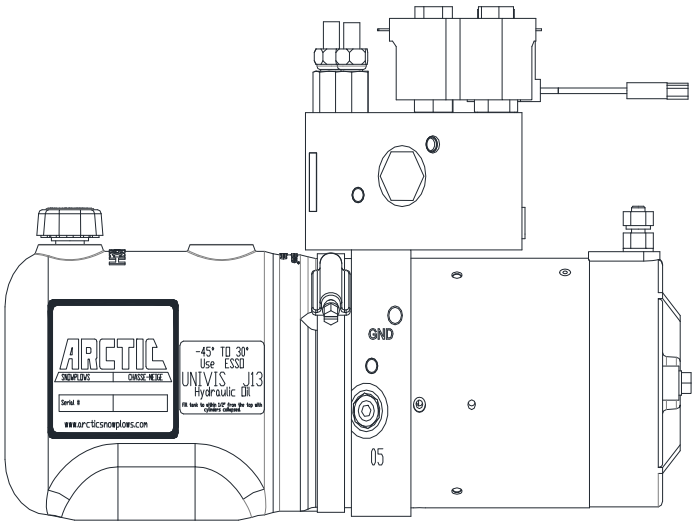


M3493-05
EXTEND C1
(ANGLE LEFT)

FIGURE 4

M3493-05 hydraulic installation instructions

(for electrical instructions see one piece harness 53617-M or multiplexing installation 53618-M)
(it requires light kit 800084 or 800085 or 800086)



M3493-05 installation instructions

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 starting installation.
- 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.
- Hydraulic hoses and electrical cables (harnesses) must be tied and routed safely to avoid any damage and pinching (away from hot places, sharp objects etc.)

Note: Do not use Teflon tape on hydraulic fittings as it can easily jam valves and plug the filters in the system. **Use of fluid other than J13 will void warranty. Apply dielectric grease to all connections to prevent corrosion.**

Read also One piece harness installation / Multiplexing installation instructions before proceed with the installation below.

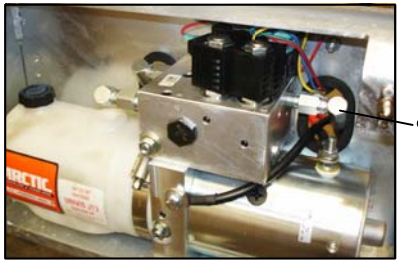
For electrical installation read:
one piece harness installation 53617-M** or **multiplexing installation 53618-M / 53618-02-M

Hydraulic Installation:

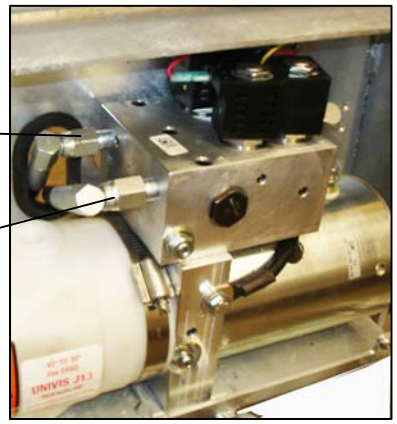
1. Install hoses and fittings as per diagrams and pictures below.

2. Remove vent cap and fill reservoir with UNIVIS J13 (HVI 13) hydraulic oil. Do not use automatic transmission fluid in this system as it may lead to aeration of the oil in very cold weather conditions. Use of fluid other than J13 will void warranty.

3. Manually angle one section of the blade to one side (Curb side (CS)) before activating the power unit. Tighten hose – the fitting on the Curb Side cylinder.
   The hose connection on the Driver Side cylinder must be loose (to let air out). Press the controller and angle the blade all the way to the Driver Side. Tighten hose – the fitting on the Driver Side cylinder. Fill up the reservoir, so that oil level is 1/2” from the top of the reservoir, and angle the blade to the curb side.
   Move, operate, the blade up and down, left and right and refill it up as necessary.

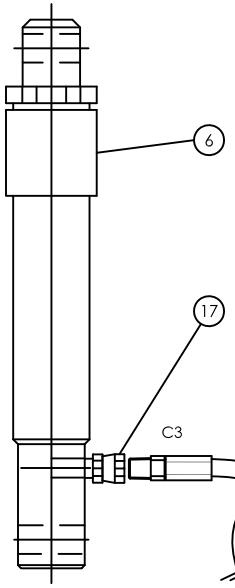


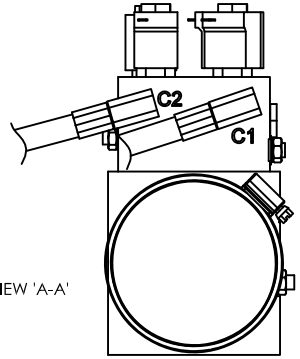
C3 - 29" HOSE



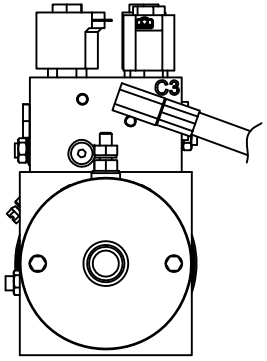
C2
DRIVER SIDE
ANGLE CYLINDER - 36" HOSE

C1
CURB (PASSENGER) SIDE
ANGLE CYLINDER -29" HOSE

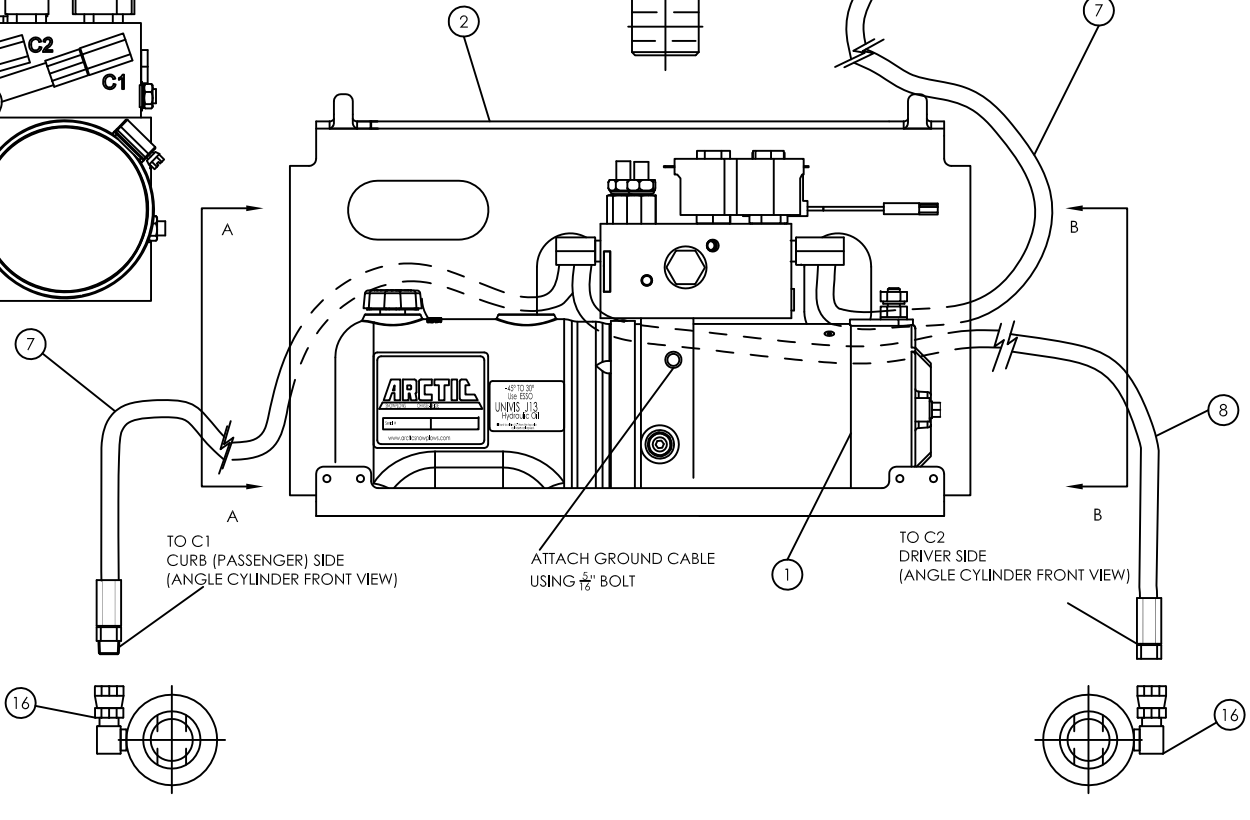




VIEW 'A-A'



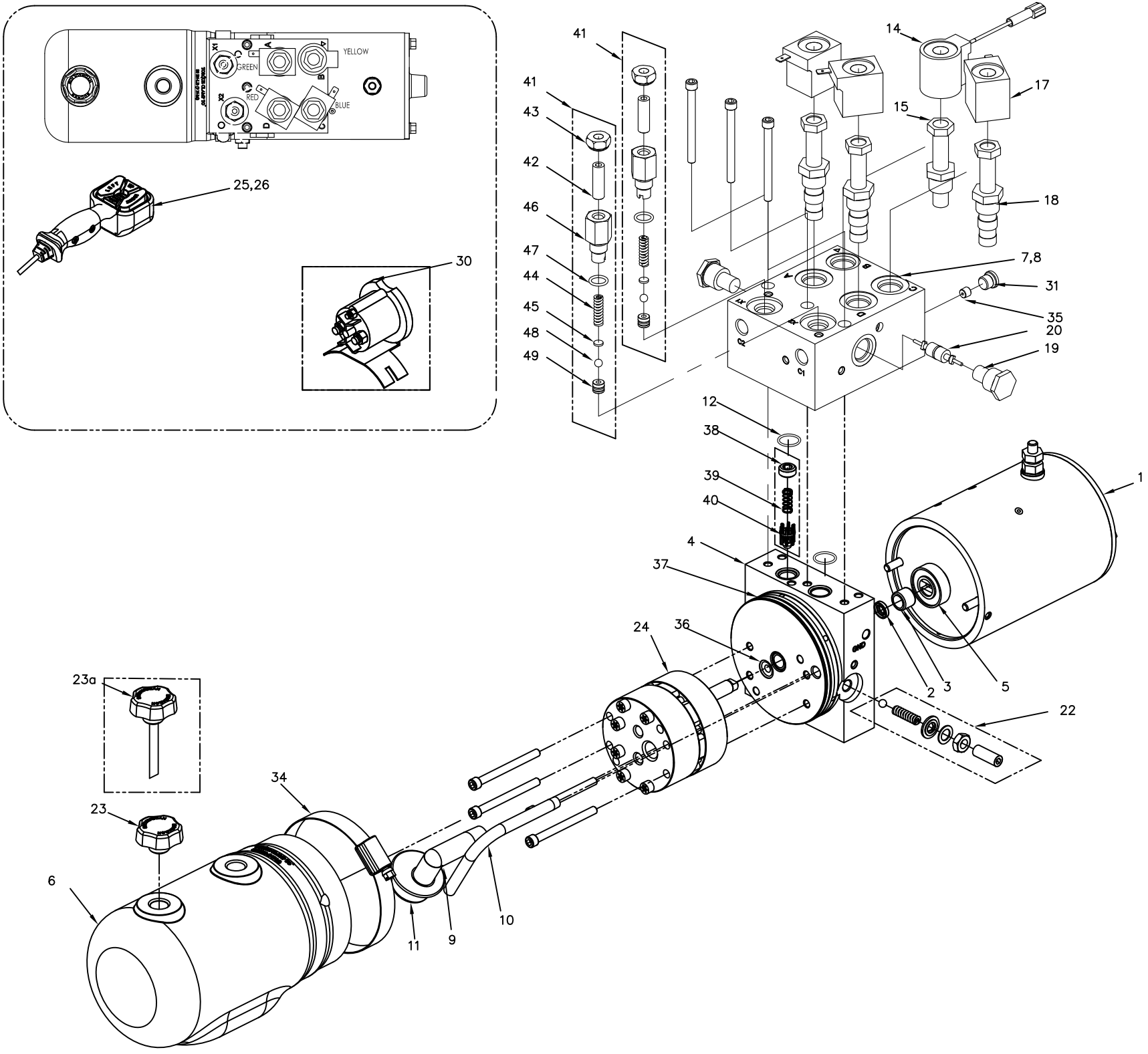
VIEW 'B-B'



Power Unit Kit 53623-M, M3493-05, Hi Boy Lift Frame (no harnesses)			
	Part#	Description	Quantity
1	M3493-05	M3493-05 Power Unit	1
2	52870-C-GA	Pump Plate	1
3	52429-C	Cover	1
4	53476-B	18" Cable Plug Assembly	1
5	53477-B	90" Ground Cable (Black)	1
6	CS200-06.00-NRS	1.1/2"X6" Lift Cylinder	1
7	51904-M	29" Hose Assembly	2
8	51905-M	36" Hose Assembly	1
9	53478-B	90" Power Cable (Red)	1
10	52431-M-BB	Bolt Bag	1
11	51335-56-M	Battery Cable, 56”	1
12	51335-22-M	Battery Cable, 22”	1
13	53608-N	Circuit Breaker, Fuse 135 AMP	1
Bolt bag 52431-M-BB			
	Part#	Description	Quantity
14	52436-N	Grommet 1/4" x 1.3/4x2.1/2	2
15	HH-00293-006	1/4-20x1 HHCS	1
16	HH-00790-002	90 Deg Swivel Elbow Fitting	2
17	HH-00794-003	1/4" Pipe To Pipe Fitting	1
18	HH-00340-017	5/16-18 Nyl. Ins.	4
19	HH-00341-004	3/8” Flatwasher	2
20	HH-00457-004	3/8” Lockwasher	2
21	HH-00294-001	¼”-20 Hex Nut	1
22	HH-00457-006	¼” Lockwasher	1
23	HH-00455-007	#8 x 3/4 screw	4
24	490056-01	Tube Dielectric Grease	1
25	HH-00293-049	3/8-16x1 HHCS	2
26	HH-00971-043	5/16-18x1 Carriage	4
27	53560-A	Dummy Plug (Power & Ground)	1
28	52427-N	Red Terminal Protector	1
29	52700-01-N	Grommet 1/8 x 3 x 3.625	1
30	HH-00293-028	5/16”-18 x 1 HHCS	1
31	HH-00457-007	5/16” Lockwasher	1
32	52700-02-N	Grommet 1/4 x 3 x 3.625	1

M3493-05
Parts list

M3493-05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23a
23
34
6
11
9
10
25,26
30
YELLOW
GREEN
RED
BLUE

M3493-05 Power Unit Parts List			
	Part #	**Description**	**Qty**
1	FP8111-I	Motor, 12 VDC	1
2	FP2159	Pump Shaft Seal	1
3	FP7985	Needle Bearing (Pump Shaft to Pump Base)	2
4	FP21115	Pump base assembly, M3493	1
5	FP2318	Bearing, Motor to Pump Base	1
6	FP6102	Reservoir, Plastic	1
7	FP21812	Manifold assembly	1
8	FP21811	Manifold only	1
9	FP1209	Suction tube	1
10	FP13058	Return tube	1
11	FP1134	Suction filter	1
12	FP0118	O-ring, 5/8 x ¾ x 1/16, -016	2
13	FP0490-D	Valve, #8 2W / 2P, valve assembly (14,15)	1
14	FP10861-D	Coil #8 2W / 2P,	1
15	FP10907-D	Valve, cartridge, 2W/2P	1
16	FP7249-D	Valve, #8, 3W / 2P, valve assembly (17,18)	3
17	FP18835-D	Coil, 12VDC, 3W/2P	1
18	FP0679-D	Valve cartridge, 3W / 2P	1
19	FP7217	Check Valve	2
20	FP7218	Piston	1
21	FP7526	Check valve kit	1
22	FP7527	Relief valve kit	1
23	FPN0571	Breather	1
23a	FPN0571-DIP	Breather c/w 2” dipstick	1
24	FPK12171-380-SA	Pump assembly kit	1
25	FPN0670	Harness valve section	1
26	53282-M	Handheld Controller	1
27	53282-1PC	Handheld Controller c/w harness	1
30	FP17757	Solenoid, switch	1
31	53220-N	Plug, SAE #4 (7/16”)	1
32	53282-N	Handheld controller	1
33	53185-N	Small joystick	1
34	FP7900	Clamp (torque up to 80inlb)	1
35	FP2361	Orifice 1/16”	1
36	FP0120	O-ring, 1/2 x 5/8 x 1/16, -014	1
37	FP2352	O-ring, 3 3/4 x 4 x 1/8, -240	1
38	FP7732	Screw, spring retainer 9/16” -18	1
39	FP0130	Spring	1
40	FP18391	Poppet	1
41	FP13023	Cross over relief valve assembly	2
42	FP7899	Screw	1
43	FP0386	Sealing nut	1
44	FP0147	Spring	1

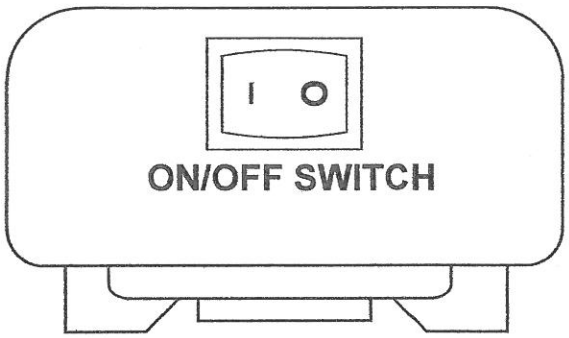
M3493-05 Power Unit Parts List			
	Part #	**Description**	**Qty**
45	FP1288	Plate	1
46	FP0379	Housing	1
47	FP0114	O-ring	1
48	FP0012	Ball	1
49	FP0378	Seat	1

ARCTIC
SNOWPLOWS ✦ CHASSE-NEIGE

HANDHELD CONTROL for STRAIGHT BLADE

1. Turn the ON/OFF switch on the control to the ON position. The control keypad will glow green, indicating the control is on.
   NOTE: The ON/OFF switch can be used as an emergency stop when required.

2. Press the DOWN button for 1.3 seconds to engage the FLOAT mode. The FLOAT indicator light, located in the center of the keypad (logo), will change from green to red. To cancel the FLOAT mode, momentarily press the UP button.
   FLOAT mode will automatically cancel after 17 minutes, and the FLOAT indicator light will turn back to green. To restart FLOAT mode, repeat step 2.



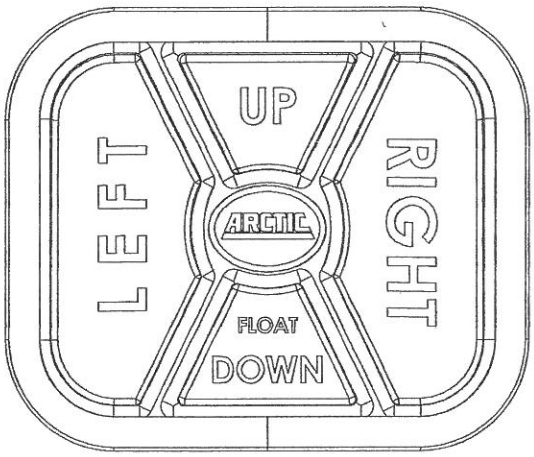
(LOCATED ON TOP OF HANDHELD CONTROL)

Blade Operation Time Outs

All control functions automatically time out (shut off) after a period of time. This helps reduce wear on the pump motor and prevent unnecessary battery drain.
All functions will time out after 8.0 seconds.

Automatic Shutdown

After being idle for approx. 22 minutes, the control will automatically turn off and the indicator light located at the center of the keypad (logo) will blink from red to green. To restart the control, turn the control OFF (ON/OFF switch) and then back ON.



KEYPAD

⚠ WARNING

TO PREVENT
ACCIDENTAL ACTIVATION
OF PLOW,TURN PLOW
OFF WHEN NOT IN USE

Troubleshooting Safety Information

Precautions

Whenever any maintenance is done on a snowplow, there are several precautions that need to be observed. Improper installation & operation could cause injury or damage. For your personal safety:

*Put the vehicle in park and remove the ignition key during installation or service.
*Wear tight fitting cloths and secure any item (jewelry, hair) that could get "snagged".
*Wear safety glasses at all times.
*Avoid touching hot surfaces (engine, hoses, radiator, exhaust ext.)
*Always have a fire extinguisher handy.

⚠ WARNING	Turn OFF the plow control and vehicle while preforming any inspection or repair & when attaching and detaching the plow.
⚠ WARNING	Always lower the blade when the vehicle is parked. If hydraulic pressure is lost, the blade would drop unexpectedly.
⚠ WARNING	Everyone should be 8 feet away from the blade during any operation of the plow.
⚠ WARNING	Whenever placing the vehicle on a hoist, always remove the blade first.
⚠ WARNING	Gasoline is highly flammable and the vapors can be explosive. Keep open flames away from gas tank & lines. Do Not smoke.
⚠ WARNING	Keep work area well ventilated. Exhaust fumes, even in low concentrations, can cause death.

Battery Precautions

Do Not allow sparks or flames near the battery. Always wear safety glasses and protect your face when when working around the battery.

⚠ WARNING	Disconnect the battery before removing or replacing any electrical components.

Hydraulic Precautions

Before use, always inspect the hydraulic components and hoses. Immediately replace any worn or damaged parts.

⚠ WARNING	Hydraulic fluid is under pressure and can cause a skin injection injury. If injured, seek medical attention immediately.

Note: If you suspect a hose leak, DO NOT use your hands to inspect the hose. Use a piece of wood and always wear safety glasses.

Fuse Precautions

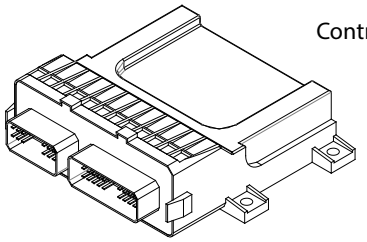
There are several fuses located on the plow's electrical system, as well as, fuses located on the vehicle. When replacing a defective fuse, always use the same type & amperage rating as the original fuse.

⚠ WARNING	Installing a fuse with a higher amperage rating can damage the electrical system and could start a fire.

⚠ HELPFUL TIP#1

TO AVOID CORROSION AND EXTEND THE LIFE OF THIS CONTROL MODULE, KEEP CONNECTORS WELL GREASED WITH DIELECTRIC GREASE.

Control & Module Electrical System Troubleshooting



Control Module Electrical System
P/N: 800080-MPX

ATTENTION:
Static-Sensitive Device Inside
Handle Only at Static-Safe Workstations
(No serviceable parts inside)
Opening will break internal seal, damage module and may void warranty

Basic Control Module Introduction

The Control Module acts as the brain of the electrical system by receiving information from the controller (over two wires, through a series of electrical pulses), translating that information and sending it to the plow. The Control Module (when the plow is attached) also takes in and sends out the information needed to switch power from your vehicles headlights to the plow's lights.
Because of the complexity of the Control Module, maintenance on the Control Module by a non-professional is NOT recommended.

Basic Troubleshooting

If an electrical problem exists, there are some basic maintenance issues that should be looked at first: (Note: The vehicle must be turned ON and the plow must be attached for the electrical system to work properly.)

⚠ WARNING Turn OFF the plow and the vehicle while preforming the following maintenance checks.

1. Check to make sure there are no cut or damaged wires throughout the plows electrical system.
2. Check all the connectors for corrosion. If corrosion exists, clean off the corrosion and apply dielectric grease to the terminals. Hint: Periodically apply dielectric grease to the terminals of all of the electrical connectors, if they need it or not.
3. Check to make sure all of the connections are secure and correctly installed. Also, check to make sure that all of the wires are properly seated in the connectors (have not pushed out).
4. Check for blown fuses on the vehicle and check for blown fuses on the plows electrical system.
5. Check to make sure the vehicles battery and charging system are in good working order. Make sure the battery connections are secure and clean.
6. For new installs, check to make sure the Positive (+) power wires are connected to the Positive (+) battery terminal and the Negative (-) wires are connected to the Negative (-) battery terminal.
WARNING: Reversing the battery wires may cause damage or injury.
6. Check the fluid level in the hydraulic reservoir. Make sure it is at the proper level, do not overfill.
Note: Use recommended fluid and do not mix different fluids, this could cause damage and performance problems.
7. Check to make sure there are no leaks from the hoses, fittings, rams or hydraulic unit.
8. **Check that the plows electrical system is properly grounded.** Hint: Improper grounding is the number one problem when it comes to snowplow electrical issues.
   *Make sure the grounds are in a proper location.
   *Make sure the grounds are clean and corrosion free (good contact). Hint: Sand away any paint or debris so that good contact can be made.

For more specific troubleshooting issues, see the chart on the next page.

⚠ HELPFUL TIP#2

In any electrical system, proper grounding is essential. If a system in not properly grounded, features of the system will "steal" a ground from wherever it can. Many times this will cause issues. When an issue arises, always check for proper grounding.

Troubleshooting Guide

If you have gone through the "Basic Troubleshooting" maintenance list and an issue still remains, locate the issue below and check for the proper solution.

Important Note: At times, for a variety of reasons, communication between the controller and the electrical module may be lost. Most of the time the electrical system will compensate and correct itself. If the system can not correct itself, it is possible for an issue to arise. Most of these issues can be corrected by recycling the controller (turning Off and then back ON). Or, by recycling the control module. To recycle the control module, the vehicles ignition must be shut OFF, then back ON.
Note: To recycle control module, controller must receive power from a "switched power source."
If after recycling the controller & module, the issue persists, locate the issue below and check for the proper solution.

⚠ CAUTION Some of the fixes are complicated. Unless you are experienced in electrical & hydraulic repair, take the plow to a professional.

Plow Control Issues

Issue	Cause	Fix
A. Control power light does not come on (glowing keypad).	1-Controller is not Plugged in.	1-Plug in controller.
	2-Vehicle ignition is not on.	2-Turn vehicles ignition on.
	3-Fuse (on vehicle side harness) to controller is blown.	3-Replace Fuse
	4-Fuse that powers controller, located in vehicles fuse box is blown.	4-Replace Fuse
	5-Defective control.	5-Replace control.
B. Control power light is on but snowplow does not respond at all.	1-Plow not plugged in at grille.	1-Plug in plow harness at grille.
	2-Damaged harness or cables.	2-Replace/Repair any damaged wires.
	3-No power to coils.	3-Check for voltage at coils & pump solenoid. See Voltage Check Procedure instructions below.
	4-Defective or improperly installed pump relay (solenoid). Float only works.	4-Replace or install properly.
	5-Damaged control or electrical module.	5-Install a properly working control. If corrected, return controller to be fixed. If not corrected, replace the electrical module.
C. Individual function does not respond (Up, Down, Left ext.)	1-Damaged harness or cables.	1-Replace/Repair any damaged wires.
	2-No power to non-responsive coil.	2-Check for voltage at non-responsive coil. See Voltage Check Procedure instructions below.
	3-Damaged control or electrical module.	3-Install a properly working control. If corrected, return controller to be fixed. If not corrected, replace the electrical module.

Plow Control Issues (continued)

Issue	Cause	Fix
D. Individual function working intermittently or slowly (Up, Down, Left ext.).	1-Hydraulic fluid low, leaking or a bad or dirty valve. 2-Short in wire harness. 3-Carbon build-up on circuit board (very rarely does this happen). 4-Bad ground 5-Vehicle battery weak or defective charging system	1-Add hydraulic fluid,fix leak or replace or clean valve. 2-Check harness, fix or replace. 3-Carefully disassemble the control. Lift up keypad and use alcohol wipe to clean board (where carbon pad touches). 4-Check grounds and fix. 5-Replace battery and check charging system.
E. Control power light is blinking or constantly Blue or Red.	1-Communication has been lost. 2-Control timed out (due to non-use) 3-If Red, control may be in Float. 4-Damaged control	1-Recycle the control (OFF, then ON) 2-Recycle the control (OFF, then ON) 3-Hit the Up button to escape Float. 4-Replace control
F. Pump relay (solenoid) runs all the time. Fix immediately.	1-Defective control. 2-Defective electrical module. 3-Defective pump relay.	1-Replace control. 2-Replace electrical module. 3-Replace pump relay.

⚠ WARNING Allowing the pump relay to run for an extended time may cause a fire and may cause damage or injury.

⚠ CAUTION If disassembling the control, do so at a static-safe workstation. Only handle the circuit board by the edges at all times.

Voltage Check Procedure

Use a "Multi-Meter" to check for proper voltage at the coils and pump solenoid.
1. Remove the wire to be tested from the coil or pump.
2. With the plow ON, but NO functions activated, a "detect signal" of around 5 volts should be present at each coil and the pump solenoid.
To test the voltage during activation it is recommended that a long wire (with a spade terminal) be plugged to to the wire to be tested. Then, the voltage reading can be taken from the end of this "extension" wire. This long wire should be long enough to allow all persons to be well away from the plow when it is activated.

⚠ WARNING Standing close to a snowplow at any time when a snowplow function is being activated can cause severe injury or death. Always stay clear during activation.

Once you are set up a safe distance from the plow. With the plow ON and the coil or pump wire to be tested activated, a reading of around 12 volts should be present.
If zero or weak voltage is present, the control module may be defective. Also, check for proper grounding and check the vehicles charging system. If correct voltage is present, check the coils/valves or pump solenoid.

Vehicle Headlight Issues

Because of the variety of vehicles (many with different style headlights) it can be very difficult to determine the cause of a headlight issue. For new installations it is important to first determine that the proper headlight harness is being used on your vehicle. Many headlights have the same bulbs (or connectors going to the bulbs), but they require different light harnesses to make them work properly. Use the headlight application guide, or consult with your dealer, to make sure you are installing the correct harness.

Note: Vehicle manufactures are constantly changing the headlights on new vehicles. It is possible that a proper lighting harness has yet to be designed for some of the newer headlight configurations. If the guide below does not solve your issue on a newer vehicle, please consult with your plow dealer.

For any headlight issue, it is important that you first check all the steps (most notably, make sure the lighting system is properly grounded) in the "Basic Troubleshooting" section of these instructions. Once you have gone through all the steps, below is a guide to more specific issues that may arise:

How the lighting system works

Before figuring out why the lighting system is not working correctly, you must first understand how the lighting system works. In order for the lights to switch from the vehicles headlights to the plow lights, several criteria must be met:

-Headlight switch on the vehicle must be turned ON.
-The plugs (X3) at the vehicles grille must be plugged to the plow harnesses plugs (X3).
-The control has to be turned ON. Note: Once lights have switched, control can be turned OFF without switching lights back to vehicle headlights.
-The lighting system must "read" that the plow light bulbs (at least two) are present and working.
-The lighting system must "read" that a number of coils (at least two) are present and working.
If this criteria is met, the lights should switch from the vehicles lights to the plow lights.

⚠ HINT By unplugging the two connectors (unscrew attaching bolts) attached to the control module, the vehicles lighting system should return to normal operation.

Issue	Cause	Fix
G. No lights on vehicle or plow.	1-Headlight switch on vehicle not turned ON.	1-Turn on headlight switch.
	2-Burned-out bulbs on vehicle.	2-Replace bad bulbs
	3-Defective fuses in vehicle.	3-Replace bad fuses.
H. Vehicle lights do not switch to plow lights.	1-Headlight switch on vehicle not turned ON.	1-Turn on headlight switch.
	2-Control is not turned on.	2-Turn the control on.
	3-Plugs at grille, not plugged in.	3-Plug in grille connectors.
	4-Burned-out bulbs on plow lights.	4-Replace bad bulbs.
	5-Defective fuses in vehicle.	5-Replace bad fuses.
	6-Coils not plugged in or working.	6-Plug or replace coils.
	7-Defective lighting relay.	7-Replace bad relay.
	8-Using wrong lighting harness.	8-Replace with correct harness.

Vehicle Headlight Issues (continued)

Issue	Cause	Fix
I. Plow lights work intermittently or shut off.	1-Short in wire harness (lighting or coils).	1-Inspect wire harness, fix or replace.
	2-Defective lighting relay.	2-Replace bad relay.
	3-System lost communication.	3-Recycle the control (Off, then On). Or, Recycle ignition (Off, then On).
	4-Debris or corrosion to connectors or ground.	4-Check and clean.
	5-Insufficient ground.	5-Provide proper grounding.
	6-Using wrong lighting harness.	6-Replace with correct harness.
J. No high beam or no low beam.	1-Defective headlight relay.	1-Replace bad relay.
	2-Harness or plug damaged.	2-Inspect and fix or replace.
	3-Using wrong lighting harness.	3-Replace with correct harness.
K. No turn or run lights or not working correctly.	1-Burned-out bulb.	1-Replace bad bulb.
	2-Harness or plug damage.	2-Inspect and fix or replace.
	3-(If tapping in under hood) Bad splice.	3-Inspect and fix.
	4-Bad ground.	4-Inspect and fix.
	5-Defective fuses in vehicle.	5-Replace bad fuses.
L. Lights work but are dim.	1-Vehicles battery is week or charging system is defective.	1-Replace battery and check charging system.
	2-Debris or corrosion to connectors or ground.	2-Check and clean.
	3-Insufficient ground.	3-Provide proper grounding.
	4-Vehicles electrical system is inadequate.	4-Check vehicles specifications and recommendations.
M. Headlight warning light on dash comes on (if applicable).	1-Burned-out bulb on vehicle or plow.	1-Replace bad bulb.
	2-Harness or plug damage.	2-Inspect and fix or replace.
	3-Lighting system lost communication.	3-Recycle control (OFF, then ON) - may have to turn ignition OFF to clear warning.
	4-Defective fuses in vehicle.	4-Replace bad fuse.
	5-Using wrong lighting harness.	5-Replace with correct harness.

Troubleshooting flow chart for power unit M3493-05

For Multiplexing issues go to Multiplexing Page.

Safety and warnings

Servicing the snowplow (hydraulic power system, hoses, hydraulic cylinders, controllers, wiring harnesses, lights, blade frame, blade moldboard, A-frame, quadrant, lift frame and vehicle undercarriage) without special tools and knowledge could result in personal injury. See an authorized Arctic dealer for service.

-Fluid under pressure can pierce the skin and enter the bloodstream resulting in serious injury or death.
-Eye protection and protective clothing must be worn when working on any portion of the snowplow.
-Remove any jewellery (rings, bracelets, watches, necklaces) that could conduct electricity while working with electrical system.
-Lifted blade should be securely propped or immobilized while working on it or any other suspended part so it cannot fall.
-Do not operate blade when anyone is within a 10 foot radius of it.
-Use of any fluid other than J13 will void warranty

Tips

-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.

-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.

-Measure pump pressure at an angle hose (at full angle) it has to be 1350 psi (assuming that cross over relief valve setting is 2500 psi, if X-over relief valve setting is less than relief valve setting pressure gage will read lowest reading). The most accurate reading of system pressure is reading pressure on lift cylinder. 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).

-AMP draw of motor should be measured at maximum raise or maximum angle when motor is running at 1350 psi.

-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.

-Do not screw cartridge valves into cavity too fast; use a back and forth motion and have O-rings well lubricated.

-Clean all parts thoroughly before assembly and lubricate with clean oil.

-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.

-X-over pressure could be set using hand (hydraulic) pump. Example: If you want to set the pressure at x-over X1 insert hand pump hose in the C1 port together with pressure gauge. Loosen the jam nut and turn adjusting screw clockwise a turn or two and watch the gauge; if it goes up, continue to turn the screw until the required setting is reached. Retighten the jam nut. To set X-over X2 repeat the same steps as setting X1.

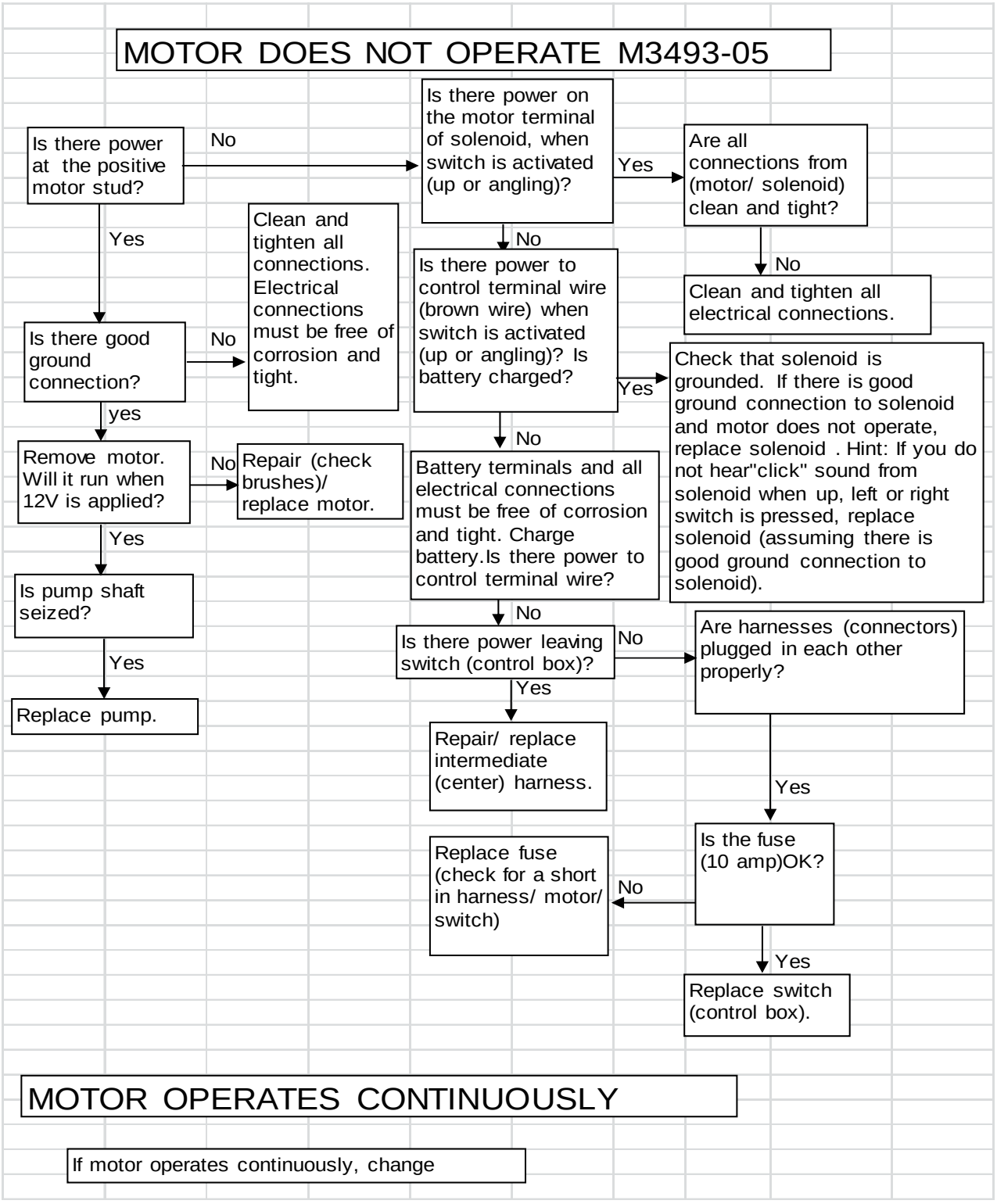
To adjust relief valve**:**
-Loosen jam nut counter-clockwise. Turn screw clockwise to increase pressure or turn screw counter-clockwise to decrease pressure. Tighten jam nut clockwise to 50in.lb. torque. Check system pressure after jam nut is tight. Readjust pressure if screw is moved during tightening of jam nut.

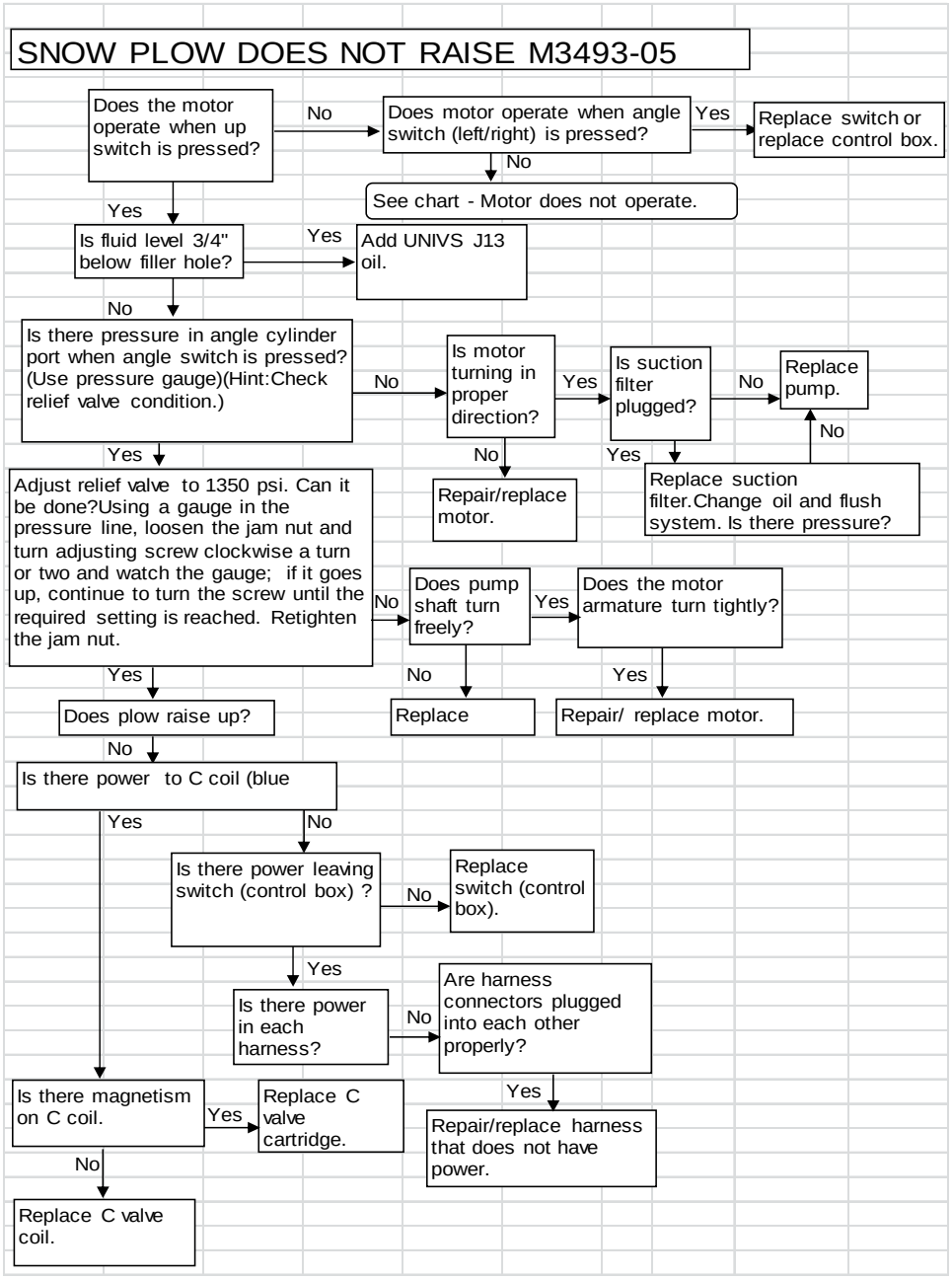
Specification:

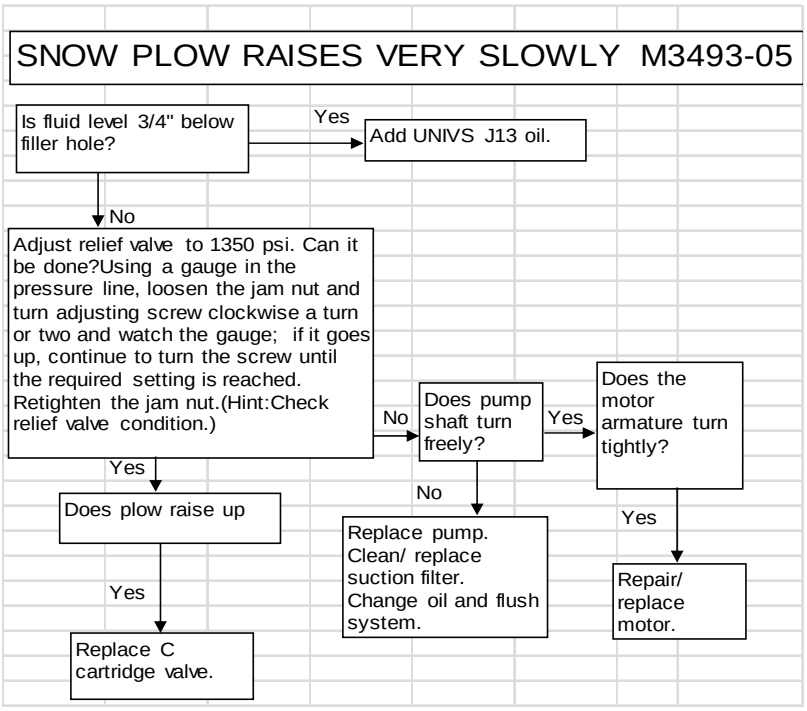
-Max Amp Draw 220 AMP (AMP draw of motor should be measured at maximum raise or maximum angle when motor is running at pressure setting at 1350 psi).
Note: Do not operate motor continuously for more than 30 sec.
-Relief valve setting 1350 psi.
-X-over relief valve setting 2500 psi.

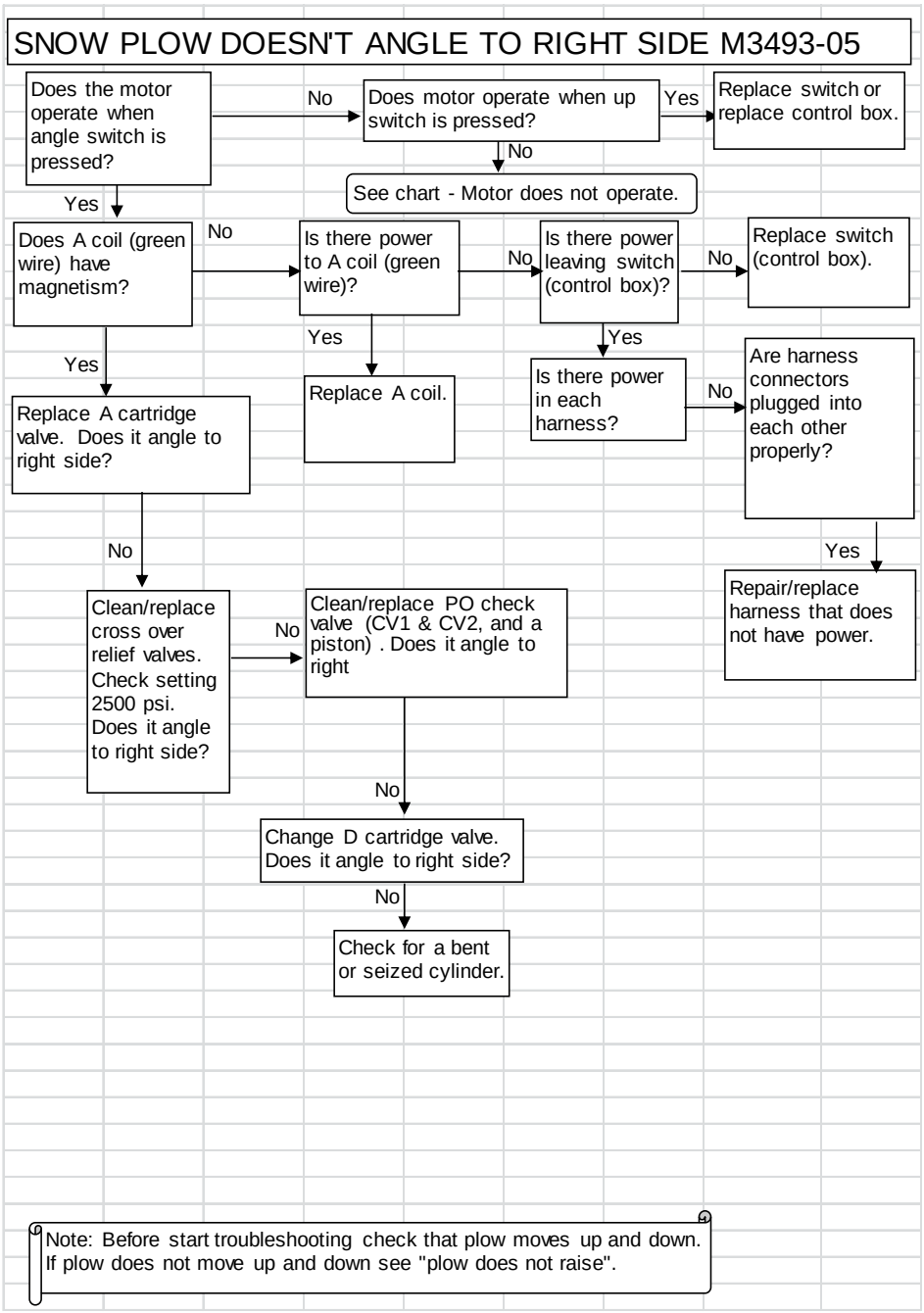
-Troubleshooting tips
- Motor does not operate.
- Motor operates continuously
- Snow plow does not raise.
- Snow plow raises up very slowly.
- Snow plow will not lower.
- Snow plow leaks down.
- Snow plow angles before going up when up switch is pressed.
- Snow plow when is fully angled going up when angle switch is pressed.
- Snow plow does not angle to right.
- Snow plow does not angle to left.

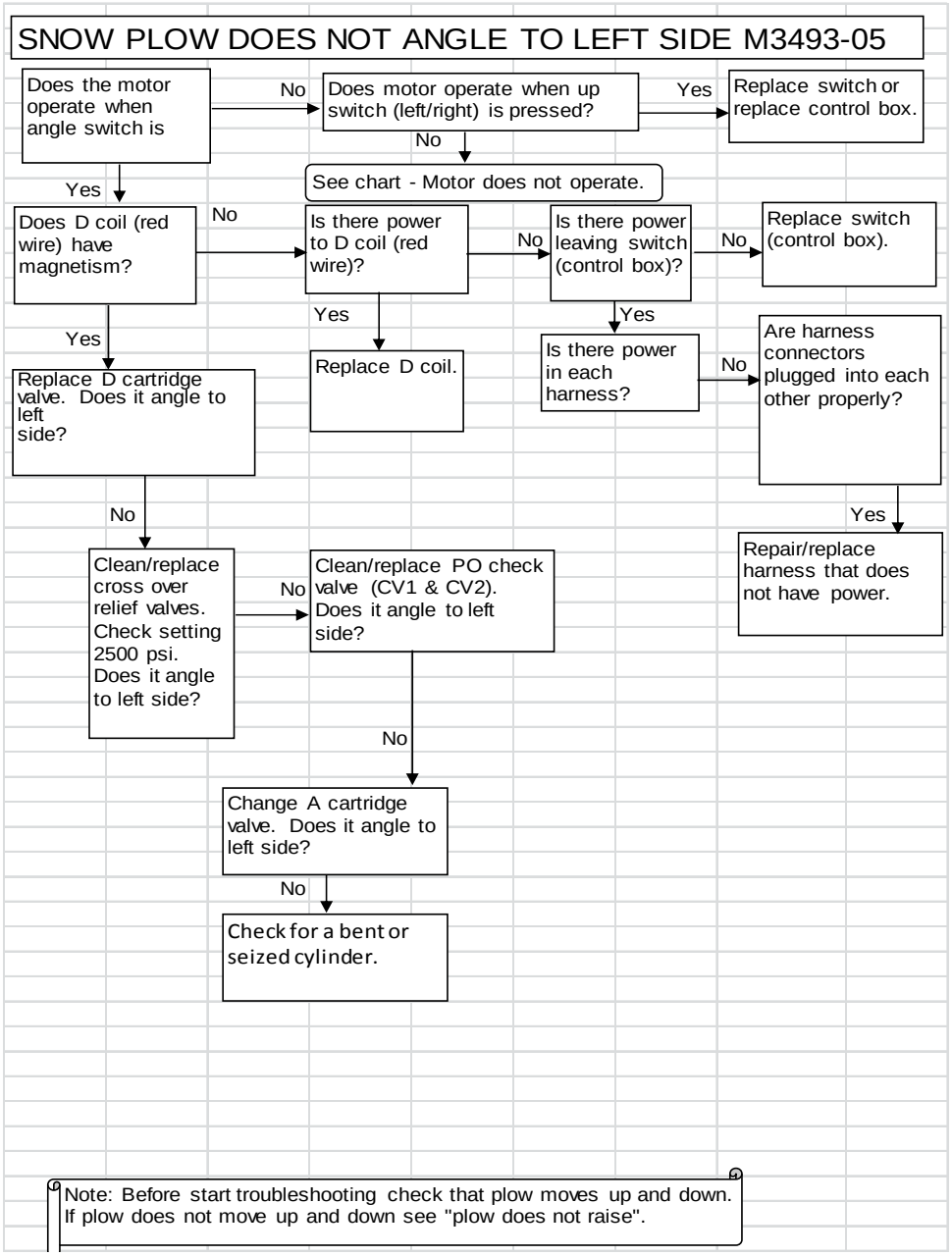
Note: Quick couplers are an optional item. If unit is not equipped with quick couplers, disregard troubleshooting steps involving them.


MOTOR DOES NOT OPERATE M3493-05
Is there power at the positive motor stud?
No
Yes
Clean and tighten all connections. Electrical connections must be free of corrosion and tight.
Is there good ground connection?
No
yes
Remove motor. Will it run when 12V is applied?
No
Repair (check brushes)/ replace motor.
Yes
Is pump shaft seized?
Yes
Replace pump.
Is there power on the motor terminal of solenoid, when switch is activated (up or angling)?
Yes
Are all connections from (motor/ solenoid) clean and tight?
No
Clean and tighten all electrical connections.
No
Is there power to control terminal wire (brown wire) when switch is activated (up or angling)? Is battery charged?
Yes
Check that solenoid is grounded. If there is good ground connection to solenoid and motor does not operate, replace solenoid . Hint: If you do not hear"click" sound from solenoid when up, left or right switch is pressed, replace solenoid (assuming there is good ground connection to solenoid).
No
Battery terminals and all electrical connections must be free of corrosion and tight. Charge battery.Is there power to control terminal wire?
No
Is there power leaving switch (control box)?
No
Are harnesses (connectors) plugged in each other properly?
Yes
Repair/ replace intermediate (center) harness.
Yes
Is the fuse (10 amp)OK?
No
Replace fuse (check for a short in harness/ motor/ switch)
Yes
Replace switch (control box).
MOTOR OPERATES CONTINUOUSLY
If motor operates continuously, change

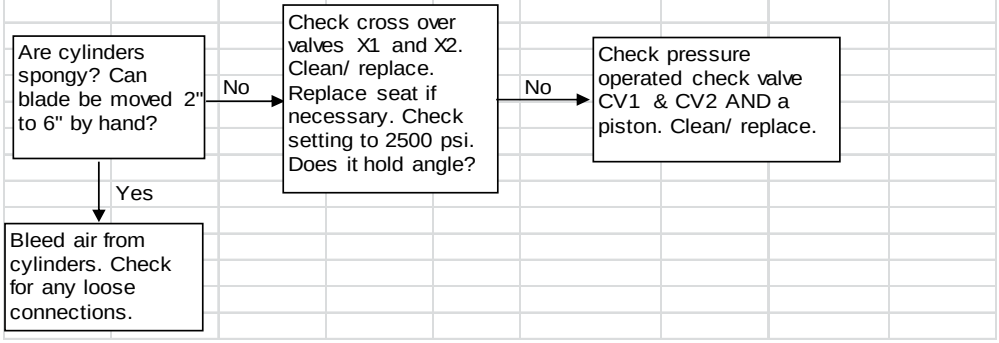

SNOW PLOW DOES NOT RAISE M3493-05
Does the motor operate when up switch is pressed?
No
Does motor operate when angle switch (left/right) is pressed?
Yes
Replace switch or replace control box.
No
See chart - Motor does not operate.
Yes
Is fluid level 3/4" below filler hole?
Yes
Add UNIVS J13 oil.
No
Is there pressure in angle cylinder port when angle switch is pressed? (Use pressure gauge)(Hint:Check relief valve condition.)
No
Is motor turning in proper direction?
Yes
Is suction filter plugged?
No
Replace pump.
No
Yes
Repair/replace motor.
Yes
Replace suction filter.Change oil and flush system. Is there pressure?
Adjust relief valve to 1350 psi. Can it be done?Using a gauge in the pressure line, loosen the jam nut and turn adjusting screw clockwise a turn or two and watch the gauge; if it goes up, continue to turn the screw until the required setting is reached. Retighten the jam nut.
No
Does pump shaft turn freely?
Yes
Does the motor armature turn tightly?
Yes
No
Yes
Does plow raise up?
Replace
Repair/ replace motor.
No
Is there power to C coil (blue
Yes
No
Is there power leaving switch (control box) ?
No
Replace switch (control box).
Yes
Is there power in each harness?
No
Are harness connectors plugged into each other properly?
Yes
Is there magnetism on C coil.
Yes
Replace C valve cartridge.
Repair/replace harness that does not have power.
No
Replace C valve coil.


SNOW PLOW RAISES VERY SLOWLY M3493-05
Is fluid level 3/4" below filler hole?
Yes
Add UNIVS J13 oil.
No
Adjust relief valve to 1350 psi. Can it be done?Using a gauge in the pressure line, loosen the jam nut and turn adjusting screw clockwise a turn or two and watch the gauge; if it goes up, continue to turn the screw until the required setting is reached. Retighten the jam nut.(Hint:Check relief valve condition.)
No
Does pump shaft turn freely?
Yes
Does the motor armature turn tightly?
Yes
Does plow raise up
No
Replace pump. Clean/ replace suction filter. Change oil and flush system.
Yes
Repair/ replace motor.
Yes
Replace C cartridge valve.

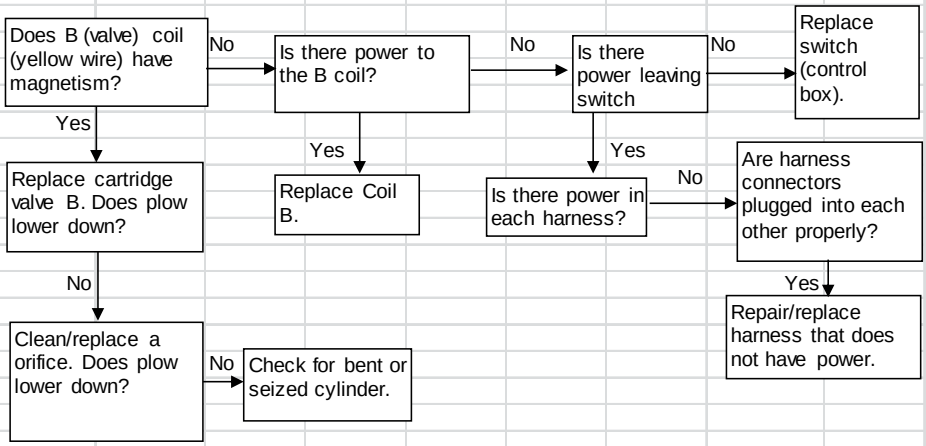

SNOW PLOW DOESN'T ANGLE TO RIGHT SIDE M3493-05
Does the motor operate when angle switch is pressed?
No
Does motor operate when up switch is pressed?
Yes
Replace switch or replace control box.
No
See chart - Motor does not operate.
Yes
Does A coil (green wire) have magnetism?
No
Is there power to A coil (green wire)?
No
Is there power leaving switch (control box)?
No
Replace switch (control box).
Yes
Yes
Yes
Replace A coil.
Is there power in each harness?
No
Are harness connectors plugged into each other properly?
Yes
Replace A cartridge valve. Does it angle to right side?
No
Yes
Repair/replace harness that does not have power.
Clean/replace cross over relief valves. Check setting 2500 psi. Does it angle to right side?
No
Clean/replace PO check valve (CV1 & CV2, and a piston) . Does it angle to right
No
Change D cartridge valve. Does it angle to right side?
No
Check for a bent or seized cylinder.
Note: Before start troubleshooting check that plow moves up and down. If plow does not move up and down see "plow does not raise".


SNOW PLOW DOES NOT ANGLE TO LEFT SIDE M3493-05
Does the motor operate when angle switch is
No
Does motor operate when up switch (left/right) is pressed?
Yes
Replace switch or replace control box.
No
See chart - Motor does not operate.
Yes
Does D coil (red wire) have magnetism?
No
Is there power to D coil (red wire)?
No
Is there power leaving switch (control box)?
No
Replace switch (control box).
Yes
Yes
Yes
Replace D cartridge valve. Does it angle to left side?
Replace D coil.
Is there power in each harness?
No
Are harness connectors plugged into each other properly?
No
Yes
Clean/replace cross over relief valves. Check setting 2500 psi. Does it angle to left side?
No
Clean/replace PO check valve (CV1 & CV2). Does it angle to left side?
Repair/replace harness that does not have power.
No
Change A cartridge valve. Does it angle to left side?
No
Check for a bent or seized cylinder.
Note: Before start troubleshooting check that plow moves up and down. If plow does not move up and down see "plow does not raise".

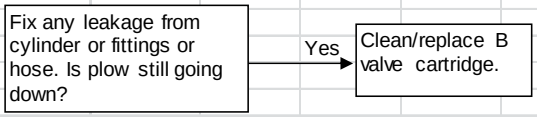
PLOW DOES NOT HOLD ANGLE M3493-05



SNOW PLOW WILL NOT LOWER M3493-05



SNOW PLOW LEAKS DOWN M3493-05



SNOW PLOW ANGLES BEFORE GOING UP WHEN UP SWITCH IS PRESSED M3493-05

If snow plow angles left before going up change D valve and if snow plow angles to right side change A valve.

SNOW PLOW WHEN FULLY ANGLED GOES UP (WHEN ANGLE SWITCH IS PRESSED) M3493-05

Change C Valve cartridge.