



MP² ADVANTAGE SYSTEMS

THE FUTURE OF SNOW & ICE CONTROL



OPERATIONS, SERVICE & PARTS MANUAL

SNOW & ICE PRODUCTS

PERFORMANCE

ECONOMY

CONVENIENCE

SAFETY

This manual contains the most up to date information available at the time of printing. In the event that revised information will become available after printing, new pages may be downloaded from munciepower.com

TABLE OF CONTENTS

INSTALLATION

Designated Hydraulic Ports . . . . .	.5
Electrical Installation . . . . .	.6
Joystick Installation . . . . .	.7
Initial Startup . . . . .	.8

OPERATIONS AND PROGRAMMING GUIDE

Programming Table of Contents	11
Cylinder Operations	12
Joystick and Spreader Operations.	13-14
Liquid Operations.	14
User Adjusted Settings	14 -19

ELECTRONICS GUIDE

Explanation of MP ² Advantage System Electronics	21
Electrical Block Diagram for the Primary and Secondary Modules	22
Electrical Block Diagram for the Control Panel and Joystick Connection.	23
Control Panel Error Indicators	24
MP ² Advantage System Joystick Parts Identification	25
MP ² Advantage System Electronic Components	26
Wiring Harness Diagrams and pinouts	27-31

MEDIUM SYSTEM

Explanation of Cartridge Valves and Hydraulic Specifications	34-38
Solenoid Shift Sequence.	39
HF49520-08 Plow and Dump Manifold (Revised)	
Cartridge Designations, Functions, and Part Numbers.	40
Hydraulic Schematics.	41
Work Ports	42
Adjusting the Counterbalance and Relief Valves	43
HF49519-08 Inlet and Spreader Manifold (Revised)	
Cartridge Designations, Functions, and Part Numbers.	44
Hydraulic Schematics.	45
Work Ports	46
Adjusting the Relief Valves	47

TANKS, ENCLOSURES, AND HARDWARE

Medium/Large Enclosure Dimensions With and Without Tank . . . . .	.48
Medium/Large Return Line Filter. . . . .	.49



TABLE OF CONTENTS

TROUBLESHOOTING

Joystick Fault . . . . .	.50
Hydraulic Faults . . . . .	.51-52
Control Panel—Arrowed Cylinder Button Faults. . . . .	.53
Control Panel—Spreader Control Faults. . . . .	.54
Control Panel—Error Indicators . . . . .	.55

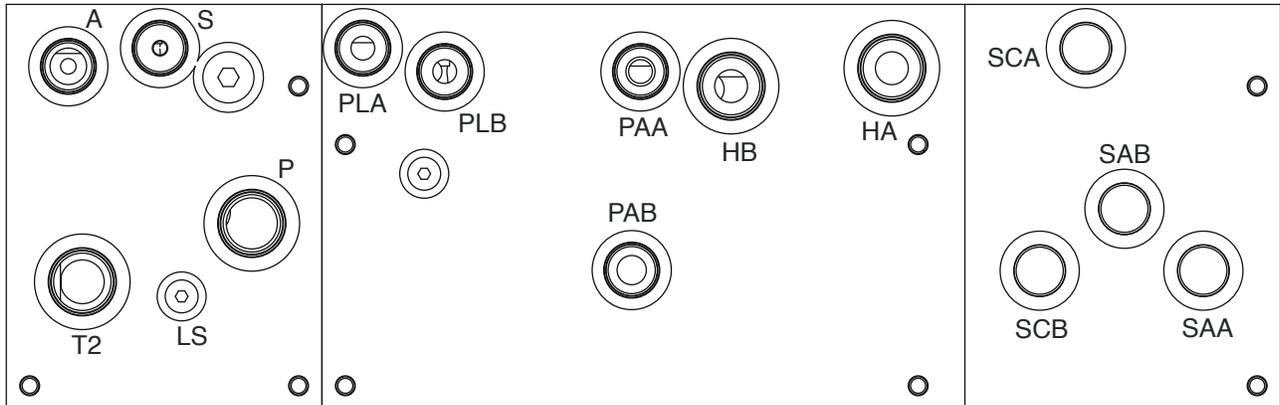


MP2 ADVANTAGE SYSTEM - INSTALLATION

HYDRAULIC PLUMBING INSTALLATION

REVISED MID-SIZE SYSTEM

Plumbing Installation: Connect the work hoses to their designated ports. Reference the table below for details.



HF49519-08

HF49520-08

HF35470-06

DESIGNATION	FUNCTION	SIZE (SAE)
P	PUMP INLET	12
LS	LOAD SENSE	4
A	AUGER	10
S	SPINNER	10
T2	TANK	12
PAA	PLOW LEFT	10
PAB	PLOW RIGHT	10
PLA	PLOW RAISE	10
PLB	PLOW LOWER	10
HA	HOIST RAISE	12
HB	HOIST LOWER	12
* SCA	SCRAPER LOWER	10
* SCB	SCRAPER RAISE	10
* SAA	SCRAPER LEFT	10
* SAB	SCRAPER RIGHT	10

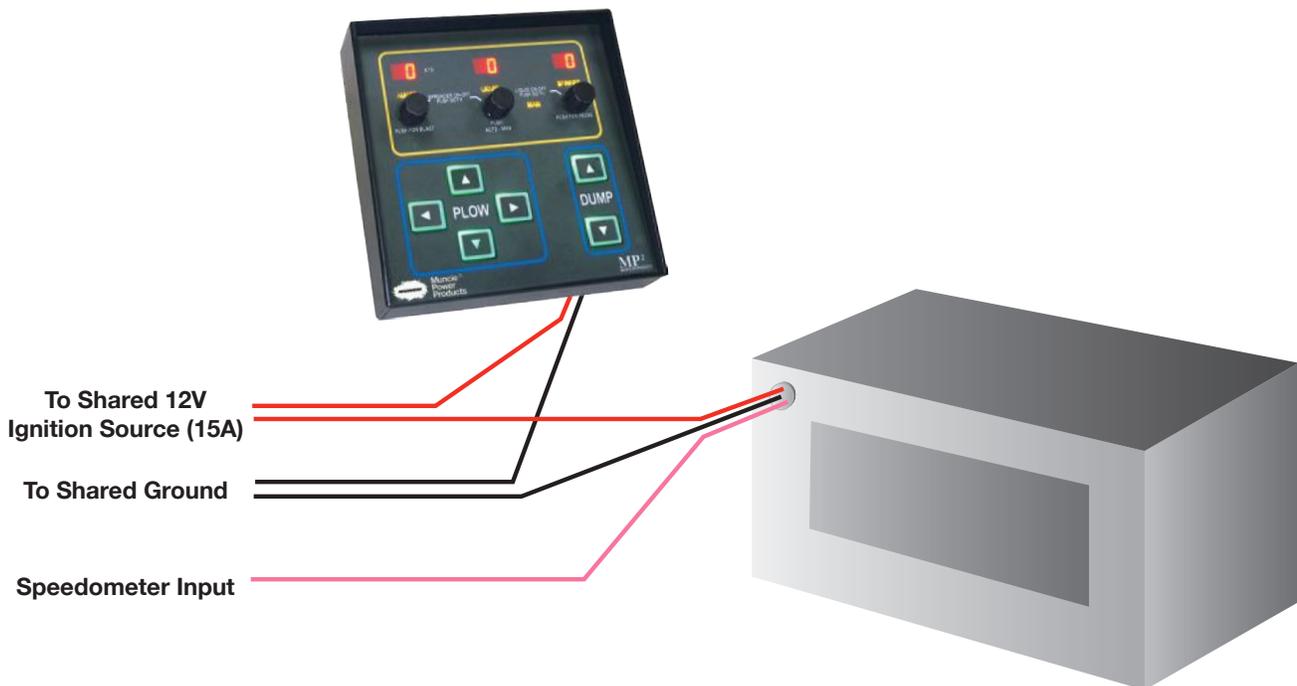
* Disregard scraper if not included with system.

ELECTRICAL HOOK-UP

Only power and ground need to be connected for the mp2 advantage to function. However, a speedometer input needs to be connected if using ground speed orientation (auto mode).

Power & Ground: It is recommended that the power and ground connections be shared by the control panel and valve control modules. Power should be from an ignition key source or a relay installed that powers from the ignition key.

Speedometer: A speedometer input is required for the AUTO mode operation of the spreader. This can typically be picked up at the TCM or ECU. Contact the truck manufacturer for further speedometer input details.



JOYSTICK INSTALLATION



- 1) Locate the control panel. Remove the two Allen screws to expose the 25 pin electrical port.



- 2) After the joystick has been mounted, locate the NXWH5 cable.



- 3) Plug the 25 pin connector of NXWH5 into the 25 pin connector port on the control panel.



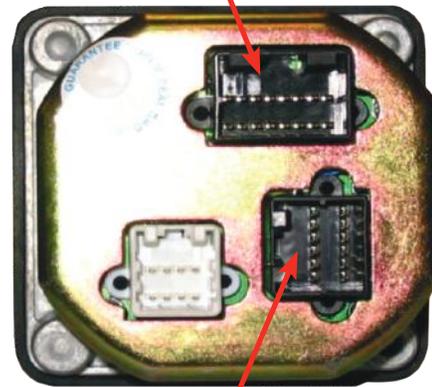
16-pin Amp Connector

12-pin Amp Connector

- 4) Plug the 16 pin connector and the 12 pin connector of NXWH5 into the bottom of the joystick.

BOTTOM OF JOYSTICK

Insert 16-pin Connector here.



Insert 12-pin Connector here.

INITIAL STARTUP

1. If the system is equipped with a Joystick, we recommend unplugging it at the Control Panel for the initial operation. This will allow “Fault Displays” to be more recognizable on the Control Panel.
2. Familiarize yourself with the Operation and Programming Guide before beginning.
 - a. Certain Program Menu settings must be correctly set for proper operation.
 - i. For example – the Pump Unloading feature must be set correctly for either a gear pump or piston pump.
 - ii. Cylinder operations – depend upon the PL dr (plow lift) PA dr (plow angle) and DH dr (dump hoist) settings being correct. If these settings are low (below 30) the cylinders may not function.
 - iii. Auger & Spinner – there are LO & HI settings for each of these functions which will impact the flow of these circuits.
3. All cylinder selections in the Program Menu should be set for Double Acting even though the cylinder might be Single Acting. This is required to generate pilot pressures to unlock load-holding cartridges in the Advantage System.

Small Advantage Systems: Main Relief is 3000 PSI – additionally this relief is used for the Dump and Plow raise functions. This relief is set high enough to accommodate high pressure scissor hoists. If you do not require the operating pressure to be this high, adjustment to a lower setting is recommended. Spreader Relief is 2000 PSI. The downside reliefs on double acting cylinders are 750 PSI.

Mid-size and Large Advantage Systems: Main Relief is 2200 PSI – this relief is used for the spreader valves, hoist valves, and Plow raise valves. Spreader Relief is 2000 PSI. The downside reliefs on double acting cylinders are 750 PSI.

For specific instructions on adjusting relief valve settings, see the hydraulic section for your system size.



MP2 ADVANTAGE SYSTEM - INSTALLATION



OPERATIONS AND PROGRAMMING GUIDE



TABLE OF CONTENTS

Cylinder On-Off Control				12
Disabling Cylinder Controls				12
Plow & Dump Touchpad Control				12
Plow Float				12
Joystick Control				13
Spreader Auto-Man, Blast & Pause				13
Granular Product Selection	PR	00	**	13
Automatic Spreading				13
Manual Spreading				14
Spinner Control				14
Pre-wet Control				14
Entering Adjustment Mode				14
Scrolling Through The Menu	CR	**	**	15
Auger Min and Max	AU	LO	**	15
	AU	HI	**	15
Spinner Min and Max	SP	LO	**	15
	SP	HI	**	15
Liquid Min and Max	LI	LO	**	15
	LI	HI	**	15
Speedometer Input Select	GS		**	16
Blast Timer and Level	BL	TO	**	16
	BL	HI	**	16
Speedometer MPH Matching	GS	CR	**	16
Weighed Dump Calibration	AU	RT	**	16
	LB	**	**	16
Spreader Calibration Reference	RC	**	**	16
Liquid Drive PWM Adjust	LF	**	**	17
Plow & Dump Cyl. SA/DA	PD	CY	**	17
	HD	CY	**	17
Plow Min and Max (Up & Down)	PL	LO	**	17
	PL	DR	**	17
Plow Angle Max (Left & Right)	PA	DR	**	17
Dump Min and Max	DH	LO	**	17
	DH	DR	**	17
Scraper Up-Down Max	SU	DR	**	17
Scraper Angle Max	SA	DR	**	18
Joystick Deadband Adjust	J4	DB	**	18
Backup Joystick Channels	J4	FB	**	18
	J4	LR	**	18
Product 2 & 3 Weight Ratios	PR	02	**	18
	PR	03	**	18
Pass Code Setting	PC	**	**	18
Auto Mode Take-off Timer	AO	TO	**	18-19
Pump Unloader Disable	UN	LD	**	19
Liquid Setting	L	30	**	19
Datalogging On/Off	dL	01	**	19
Encoder Direction	EC	r	**	19
Primary Module Software ID	3U	**	**	19
Control Panel Software ID	PU	**	**	19
Exit the Adjustment Menu	EX	IT		19



Cylinder Operations



On-Off Controls

- The Plow and Dump Keypad On-Off is controlled from the ignition on-off.
- The Spreader On-Off is controlled by simultaneously pushing the Auger and Liquid knobs together.
- The Liquid Pre-wet On-Off is controlled by simultaneously pushing the Liquid and Spinner knobs together.

Disabling Cylinder Controls

- You may turn-off the cylinder control pushbuttons or joystick control as follows.
- To disable the pushbuttons, press the plow up & down simultaneously and hold for 5 seconds. The keypad lighting will switch from green to red. The buttons will remain red but will not operate. Repeat holding the plow up & down to reinstate the controls.
- To disable the joystick hold the plow and scraper selection buttons simultaneously for 5 seconds. The Plow, Dump & Scraper labels on the panel will go off. The joystick is now dead. Repeat the sequence to reinstate joystick control.

Plow & Dump Operations

- Push an arrowed button to operate. Up arrows will raise. Down arrows will lower.
- The system will respond to the first button pushed if more than one is pressed at one time. However, a plow angle and a plow up or down button can be pressed concurrently.
- The backlighting on the arrowed buttons will change from green to red to indicate the action has been successfully communicated to the valves.
- Alternating green and red lights on the arrowed buttons indicates a fault with the attempted function. This could be a short or open circuit.
- Any operation of a plow function will generate a quick chirp when the arrowed button is pressed.
- Any operation of a dump function will generate a continuous tone when the arrowed button is pressed.

Plow Float Operations

- If the system has been hydraulically configured for Plow Float it will function as follows:
- Select Single-Acting on the Plow Cylinder Type in the user adjustment menu. (pg. 20)

- If the plow down control is depressed-released and momentarily depressed again within 5 seconds the float function will be enabled. The plow down arrowed button will turn red to indicate float mode. Activating plow raise automatically cancels it.
- The joystick operation is similar. Push the joystick to lower the plow-return to center- and push it forward again within a 5 second interval to activate the feature.

Joystick Operations

If your system is equipped with a joystick, it is designed to operate up to three pieces of equipment with full proportional speed control.

- Select between Plow, Dump or Scraper operation by momentarily pressing the appropriate button on the joystick head. The selection will be locked in and displayed on the control panel with a lighted label (Plow, Dump, Scraper)
- The dead-man switch trigger must be depressed before moving the joystick and held throughout the operation. If you release the trigger the operation will cease and you must return the joystick to center in order to re-initiate control.



Spreader Operations

Auto-Man, Blast & Pause

- Select Auto or Manual operation by pressing the Liquid control and holding for two seconds, and release to see the change.
- Blast operation will be initiated by pressing and releasing the Auger control knob. Blast will last a predetermined time and then normal spreader operation will resume.
- Pause operation of the spreader will be initiated by pressing and releasing the Spinner control knob. Press and release again to resume spreader operations.



Product Selection

- Up to 3 different granular material products can be selected for calibrated operation. These are designated Prod 1, 2 & 3 by the system.
- To change a Product selection, push and hold the Spinner knob before the Spreader function is turned-on, and slightly turn the knob either direction. The display shown will appear. While holding the Spinner knob down turn it either direction to the desired Product number and release.



Auto Spreading

- Push and hold the Liquid control for two seconds and release to switch from Man to Auto.

- The AUTO label will flash whenever the MPH is “0” or there is no speedometer connection. This also indicates the auger is not turning.
- Select an Auger output by turning the Auger control to increase or decrease the display from “00” to “99”.
- If the system has been weight calibrated then the number displayed times 10 indicates the “LBS PER MILE” to be spread in Auto. (Ex. Display 50 X10 = 500 Lbs./Mile)
- If the system has not been weight calibrated then adjust the Auger control setting while observing the spread pattern in your mirrors. With the Auto function, the pattern will vary at different speeds to produce a constant output per mile. (Lbs./Mile)

Manual Spreading

- Push and hold the Liquid control for two seconds and release to switch from Auto to Man.
- Adjust the Auger control for “00, 10, 20, 30, ... 90, 99” on the display. These are simply reference values and have no other meaning attached to them.
- Make an adjustment while observing the pattern in your mirrors. Your setting will result in a constant auger speed regardless of MPH.
- Use the PAUSE function to stop and start at intersections, etc.



Spinner Control

- Turn the Spinner control to adjust the display from “00, 10, 20, 30, ... 90, 99”.
- Observe your mirrors to find a suitable pattern width.
- The numbers are reference values only and have no other meaning.

Liquid Pre-Wet Operations

- The Liquid function is turned on/off by simultaneously depressing the Liquid and Spinner knobs.
- The Liquid function can only be turned on if the Spreader function is also on.
- The Liquid knob controls the output and is adjustable from 00, 10, 20, ... 70, 80, 90, 99.
- These numbers are simply reference values and have no other meaning.
- The Liquid output will run in proportion to vehicle speed when the Spreader function is operating in AUTO.
- When the Spreader function is operating in MAN mode the Liquid function will remain at a constant rate as selected regardless of MPH.

User Adjustments

Entering The Adjustment Mode

- With the spreader control off - press the Auger and Spinner knobs together and hold for two seconds.
- After the controller powers up in Calibration Adjustment mode (CA), enter your Pass Code using the Liquid and Spinner displays and knobs. Press the Spinner knob to enter the value. If the wrong value is entered the screen will go blank. Factory default Pass Code is 001.



Scrolling Through The Menu

- After entering the proper pass code the first line of the menu of adjustments will appear as shown.
- You may scroll through the menu items by turning the Auger control knob.
- There may be some adjustments that do not apply. For example you may not have a Pre-wet system or joystick control. Any adjustment that does not apply can simply be skipped.

Auger (Min) Lo and Auger (Max) Hi

- The hydraulic pump should be operating before this adjustment is made.

WARNING!
When these adjustments are made the Auger motor will operate!

- Auger LO sets the lowest speed available to the operator. It is important that it be high enough to cause the Auger or Conveyor to turn. Turn the Spinner knob to adjust the value and then press to enter.
- Auger HI sets the highest speed available to the operator. Turn the Spinner knob to adjust the value and then press to enter.



Spinner (Min) Lo and Spinner (Max) Hi

- The hydraulic pump should be operating before this adjustment is made.

WARNING!
When these adjustments are made the Spinner will operate!



- Spinner LO sets the lowest speed available to the operator. It is important to set it high enough to cause Spinner movement. Turn the Spinner knob to adjust the value and then press to enter.
- Spinner HI sets the highest speed available to the operator. Turn the Spinner knob to adjust the value and then press to enter.

Liquid (Min) Lo and Liquid (Max) Hi

WARNING!
When these adjustments are made the Liquid system will operate.

- Liquid LO sets the lowest output flow available to the operator. It should be set high enough to cause some flow. Turn the Spinner knob to adjust the value and then press to enter
- Liquid HI sets the highest output flow available to the operator. Turn the Spinner knob to adjust the value and then press to enter



Speedometer Input Type

- GS or Groundspeed is asking for the type of speedometer input.
- 0 = Trucks equipped with a manual transmission and includes most trucks equipped with an Allison automatic.
- 1 = Some International trucks
- Select the input number on the Spinner display and enter by pushing the Spinner knob.



Blast Timer and Level Settings

WARNING!
When adjusting Blast HI the Auger or Conveyor will operate.

- Blast (to) sets the Time-Out function on Blast operations. This can be set for 0-30 seconds of operation after the Blast button is released. Use the Spinner knob to select and push to enter the value.
- Blast HI sets the Auger or Conveyor speed for the Blast operation. This can be 0-99% of full capacity. Use the Spinner knob to select and push to enter the value.



Weighed Dump Calibration

- Fill the truck with material and weigh.
- Position the truck to discharge material. The hydraulic pump has to be operating and the engine speed should be at least 1500 RPM.
- Set the Auger (rt) rate on the Spinner display to a mid-level value (30-70) and press the Spinner knob to start the dump process. Allow the Auger to dump a large sample of material.
- Push the Spinner knob again to stop the dump process.
- Reweigh the truck and subtract from the first weight to determine the dumped pounds of material.
- Enter the dumped pounds using the Liquid and Spinner knobs and displays. Push the Spinner knob to enter the value.



Speedometer MPH Matching

- GS CA is the Groundspeed Calibration. It is used to synchronize the control system to the truck.
- Adjust the Spinner display to a target MPH. 20 to 30 MPH is sufficient.
- Drive the truck until the target speed is reached and hold steady.
- Push the Spinner knob while the truck is at the target speed.
- Check the results by slowing and reaccelerating. The Spinner display will blink and an audible tone will sound when the speed is matched or exceeded.



Calibrated Value

- This value is automatically calculated and displayed after completing the preceding "Weighed Dump" procedure.
- The number is a mathematical computation and only has meaning to the computer.
- You should write this number down and keep it for reference.
- If you should need to recheck the calibration of your system in the future this is your reference.
- If you should ever need to replace a control you can insert the number from the old into the new control on this line and avoid having to re-do a new "Weighed Dump" process.



Liquid Drive PWM Frequency

- This sets the drive frequency for the Liquid system to 50, 100, 150 or 200 Hz. This can vary according to whether the liquid system is operating an electric pump or hydraulic valve.
- Use 200 Hz for electric pumps.
- Most hydraulic valves will respond well to 100 Hz. Check with the hydraulic valve manufacturer's recommendations.



(up & down) operation when those keypads are pressed. Set a value on the Spinner display and push the Spinner knob to enter.



Plow and Dump Cylinder Type

- Single or double acting cylinder functions for the plow lift and dump lift cylinders can be selected. 0 = Double Acting & 1 = Single Acting.
- Please select 0 = Double Acting even for single acting cylinders. The manifold is equipped with load-locking devices that require pilot pressures for lowering all cylinders.
- The exception to this would be for optionally equipped systems with plow float operation.



Plow Angle (Max left & right) dr

- This setting allows for trimming the speed of the angle operation when the joystick is full left or right. It also determines the speed of the angle operation when the left and right arrowed pushbuttons are used on the keypad control.
- Adjust the value in the Spinner window with the Spinner knob and push the Spinner knob to install the setting into the system.



Dump (Min) Lo and Dump (Max) dr

- For Joystick users... the Dump LO and (dr) will set the low and high Dump flows for the travel of the Joystick. Set each on the Spinner display and push the Spinner knob to enter the values.
- For Keypad users... the Dump LO serves no function and can be ignored. The Dump (dr) "drive" will allow trimming the flow or speed of the Dump operation when those keypads are pressed. Set a value on the Spinner display and push the Spinner knob to enter.



Plow (Min) Lo and Plow (Max Up & Down) dr

- For Joystick users... the Plow LO and (dr) will set the low and high Plow (up & down) flows for the travel of the Joystick. Set each on the Spinner display and push the Spinner knob to enter the values.
- For Keypad users... the Plow LO serves no function and can be ignored. The Plow (dr) "drive" will allow trimming the flow or speed of the Plow



Scraper Up - Down (Max) dr

- The Scraper Up - Down (dr) will allow trimming the flow or speed of the Scraper (Up-Down) operation when the joystick is



OPERATION & PROGRAMMING GUIDE

actuated. Using the spinner knob, enter a value on the Spinner display and push the spinner knob to enter.

Scraper Angle (Max) dr

- The Scraper Angle (dr) will allow trimming the flow or speed of the Scraper (left - right) operation when the joystick is actuated. Using the spinner knob, enter a value on the Spinner display and push the spinner knob to enter.



Joystick Deadband

- This adjustment will determine the sensitivity of the Joystick as it is moved off center.
- Set the Spinner display for 0-5 to determine how many degrees from center the Joystick must be moved before operation begins.



Backup Joystick Channels

- The joystick has the unique feature of having two sets of output mechanisms.
- If the primary channel fails you have the recourse of switching to the backup channel to “repair” the joystick.
- If you lose operation on the raise-lower function “Fb” (forward-back) you can select “channel 1” to restore function. “Channel 0” is the factory default or primary.
- Use the Spinner knob and display to change channels. Push the spinner knob after the selection to lock it in.
- A backup channel is also assigned to the left-right function of the joystick. (See preceding instruction)



- You may select “channel 1” if you are experiencing a problem with the left-right joystick operation. “Channel 0” is the factory default and primary channel.
- Use the Spinner knob and display to change to “channel 1” and lock in the setting by depressing the Spinner knob.

Product 2 & 3 Weight Ratios

- The product used to perform the Weighed-dump calibration is Product 1 and is the reference product.
- The weight ratio of Product 2 and Product 3 as compared to Product 1 can be entered as a percentage 50-150% on the Spinner display and entered by pushing the Spinner knob.
- Example: If the weight of Product 2 is half of Product 1 enter 5 (50%). If Product 3 is 20% heavier than Product 1, enter 12 (120%).



Pass Code Setting

- You may change your Pass Code to anything between 0-9999. Do this by using the Liquid and Spinner knobs and displays to enter a number and then set it by pushing the Spinner knob.
- Be careful to remember and record your new Pass Code.



Auto Mode Take Off Timer

- The AUTO mode has a (to) take-off timer that will cause the Auger speed to operate at the Blast



OPERATION & PROGRAMMING GUIDE

level for however many seconds have been set on this feature whenever the truck starts from 0 MPH. Set the Spinner display for 0-9 seconds and push the Spinner knob to enter the value.

- This feature ensures good coverage for intersections and overcomes operator's objections to the appearance of no spreader output during initial take-off.

Pump Unloader Disable

- If you are using a variable displacement pump with your MP2 Advantage system you will need to disable the system's pump unloading function.
- Do this by using the Spinner knob and adjust the Spinner display to 1. Press the Spinner knob to store the selection.
- 0 = Unloader is enabled (Gear Pumps),
1 = Unloader is disabled (Variable Displacement Pumps).



Liquid Setting

- Set the display to 0 if the liquid output is driving a solenoid valve.
- Set the display to 1 if the liquid output is driving an electric motor.



Datalogging

- Set the display for 0 if a datalogging module is present.
- Set the display for 1 if a datalogging module is not present.



Encoder Rotation

- This adjustment will reverse the movement of the Encoder Knobs as they are rotated CW or CCW.
- Set the EC r display for 0 to disable reverse or to 1 to enable Encoder Reverse.
- Set 0 for panel versions 1.06 and newer.
- Set 1 for panel versions 1.05 and older.



Primary Module Software ID

- This display indicates the software revision identity for the Primary Module in the system.
- It is not user adjustable.



Control Panel Software ID

- This display indicates the software revision identity for the Control Panel in the system.
- It is not user adjustable.



Exit The Adjustment Menu

- The last line of the Adjustment menu is an Exit.
- Press the Spinner knob on this menu line to return to the normal operating mode.



ELECTRONICS GUIDE



Connections:

The only hard-wired connections of the system are to the truck's 12VDC power and ground circuits plus a connection to the truck speedometer system for groundspeed control of the spreader.

Swenson Chassis Network (SCN):

This is the technology that allows this system to communicate between its parts via a network that is established on the truck's 12VDC power and ground circuits. Any component of the system connected to power and ground can network with any other component similarly connected. The system uses digital information packets superimposed on the power connections to establish control. This is a reliable and mature technology that is also used in ABS braking systems for truck trailers.

Network Command Integrity

Data and control commands are sent from the MP2 Advantage Control Panel to the Primary Module approximately 4 times per second. When the Primary Module receives a command, it sends back a confirmation to the Control Panel. For example: When a cylinder control button is pressed on the Control Panel, the Primary Module will confirm the command by changing that button's backlight from green to red. If the Primary Module did not receive the command, the button would remain green. If the Primary Module detects an out of range electric current for that position, it will flash the Control panel button with alternating red and green backlighting and cause the panel to beep.

The commands are further protected from radio interference or creating radio interference by continually shifting the frequency of the data packets being sent. This means the system cannot be compromised by any single frequency nor will it produce a set frequency that causes interference.

Current Protection:

The system continually monitors the electric current of each individual circuit for under or over current conditions. Upon detection of an out-of-range electric current, the system will automatically interrupt power to the problem circuit. It will also automatically reset itself to allow another opportunity to operate if the condition was momentary.

Current Compensation:

The system incorporates electric current regulation on its outputs to valves to overcome deviations in valve performance and stability as a function of voltage fluctuations and heating effects on the impedance of solenoid coils.

Memory Storage:

The system employs non-volatile memory that allows for complete disconnection from power without losing program settings.

Program Updates:

The system components all have serial port connectivity and EEPROM memory that allows for the re-flashing of operational changes and/or improvements as they become available.

MP2 ADVANTAGE SYSTEM ELECTRONICS SPECIFICATIONS

Voltage Supply

10.5 – 16VDC

Operating Current

*1.5 Amps – Control Panel & Joystick
10 Amps – Primary & Secondary Modules*

Speedometer Input

*AC or DC pulses
5Hz – 5kHz range
Input sourcing or sinking*

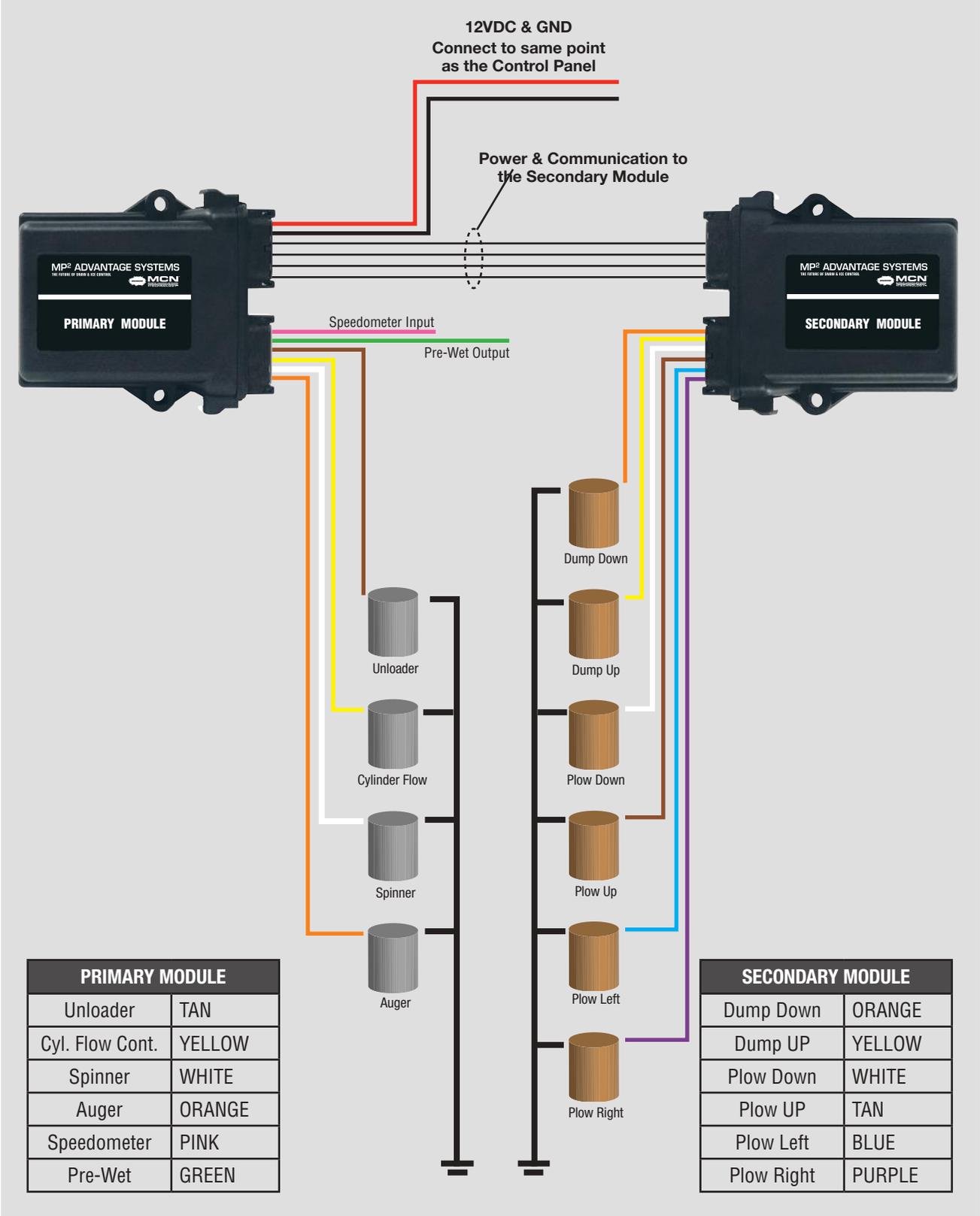
Valve Outputs

*Pulse – Width – Modulation
0-2.25 Amps proportional
Current compensated
Current protected*

Pre-Wet Output

*Pulse – Width – Modulation
0-8 Amps proportional
Current compensated
Current protected*

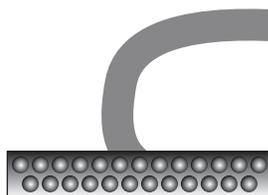
Electrical Block Diagram for Primary & Secondary Modules



Electrical Block Diagram for Control Panel & Joystick

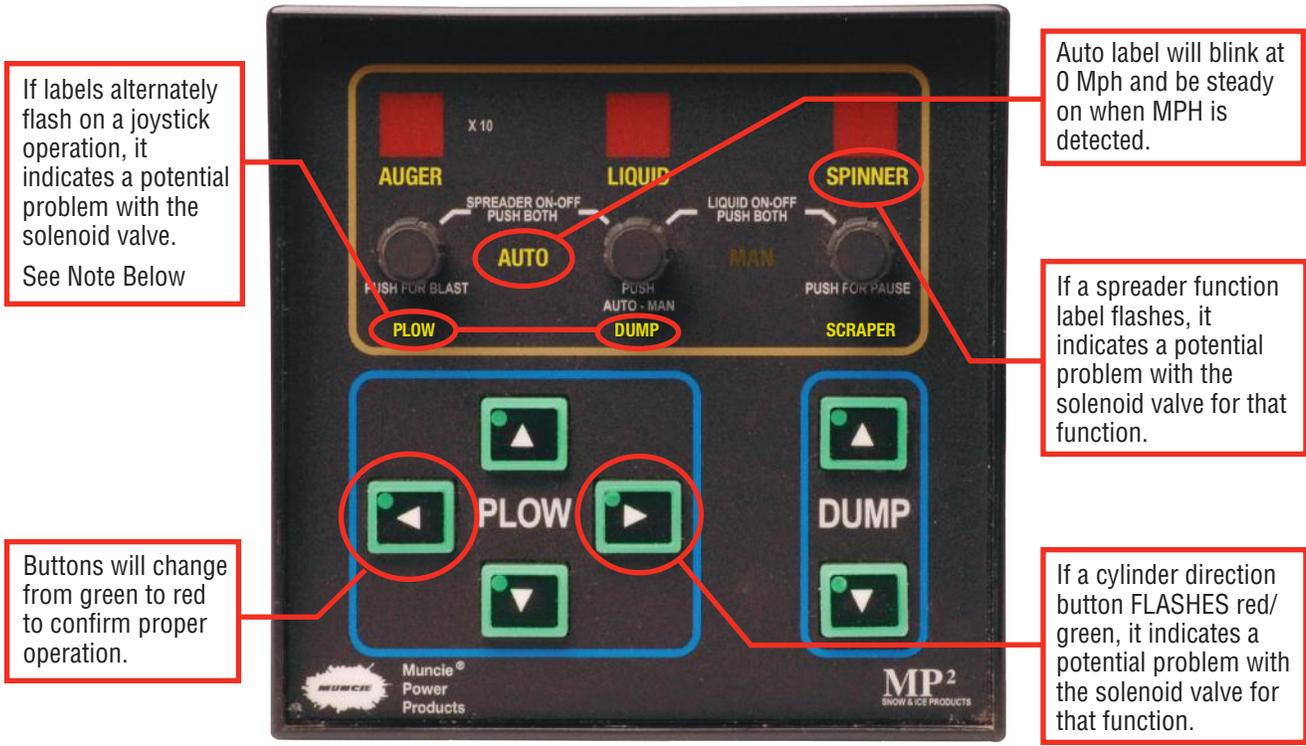


12VDC Power and Ground
Connect to the same Keyed ignition supply as Primary and Secondary modules.



DB25 Connector
Plugs to the back of the control panel.

Control Panel Error Indicators



DISPLAY	CAUSE
Cylinder buttons light red on power up and do not work.	Cylinder functions are turned off. Restore by pressing the Plow Raise & Lower button for 5 seconds
Cylinder buttons light green but do not turn red when pressed and no operations.	Primary Module is unplugged, lost power or ground has failed. Try recycling power to the system first.
All cylinder buttons flash red/green when any one function is depressed.	Potential open or short in the Unloader valve or Flow Divider valve.
A cylinder button flashes red/green but other button work okay.	Potential open or short in the solenoid valve for that function.
An Auger, Spinner or Liquid label flashes and the function fails to work.	Potential open or short in the solenoid valve for that function.
The Plow, Dump and/or Scraper labels alternately flash upon a joystick operation.	Potential open or short with a solenoid valve. Please see note below about this error.

NOTE: IF THE JOYSTICK OPERATION IS A PROBLEM, TURN POWER OFF AND UNPLUG THE JOYSTICK AT THE BACK OF THE PANEL. TURN POWER BACK ON AND DIAGNOSE THE PROBLEM USING ONLY THE BUTTONS.



MP2 Advantage System Joystick



The Dead-Man Switch must be depressed BEFORE moving the joystick from center and MUST be held throughout the operation. If released, the joystick must be returned to center to re-activate the Dead-Man switch.

The Selector buttons only need to be depressed MOMENTARILY to select Plow, Dump, etc. The selection will display on the Control Panel. Selections must occur when the joystick is centered.

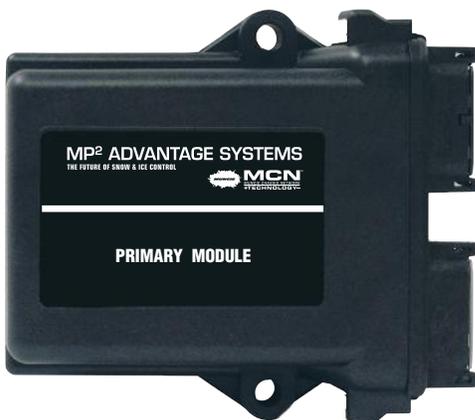
MP2 Advantage Electronic Components



**NX1AJ1XX1
JOYSTICK**



**NXCP1A
CONTROL PANEL**



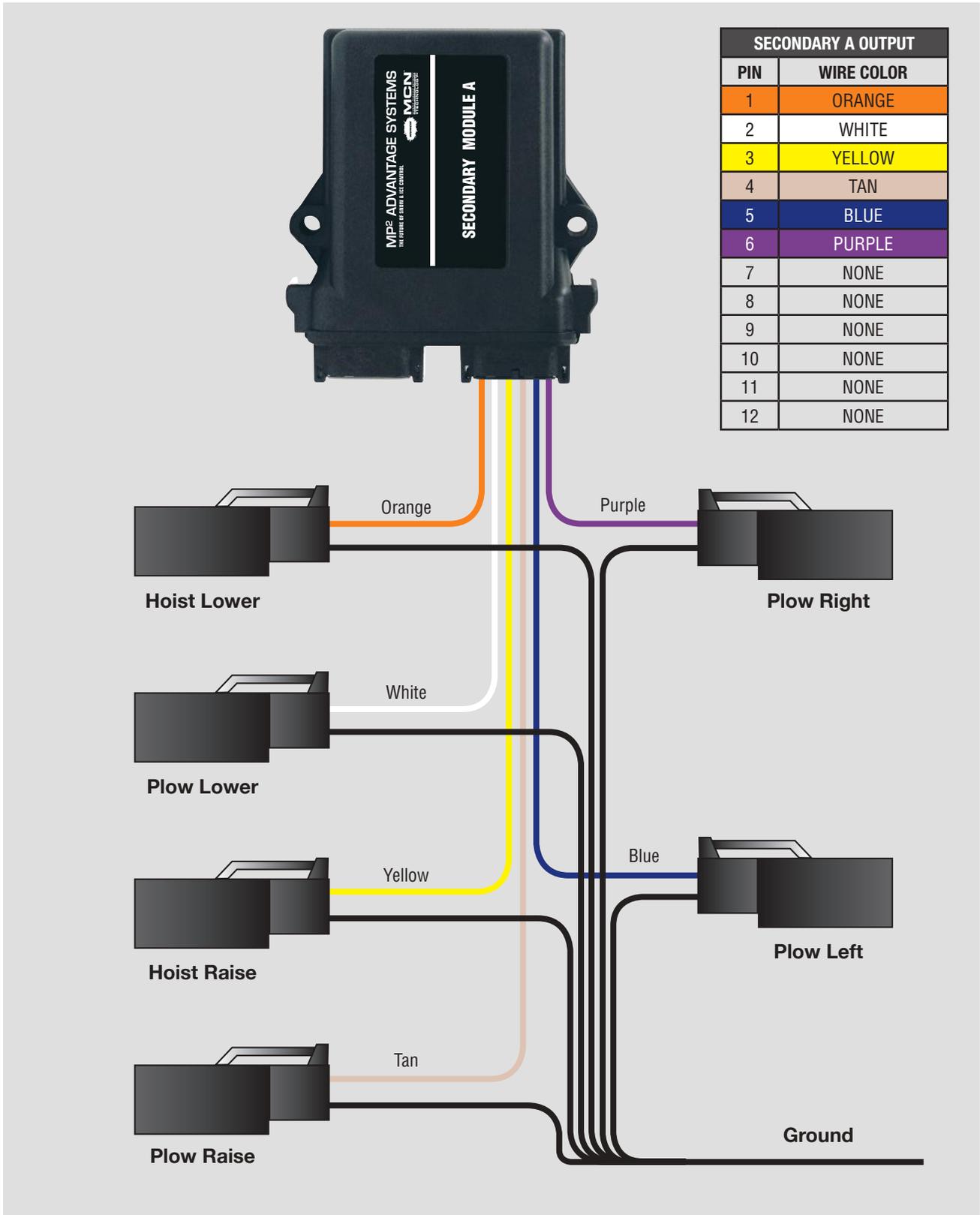
**NXMM1A
PRIMARY MODULE**



**NXSM1A
SECONDARY MODULE**

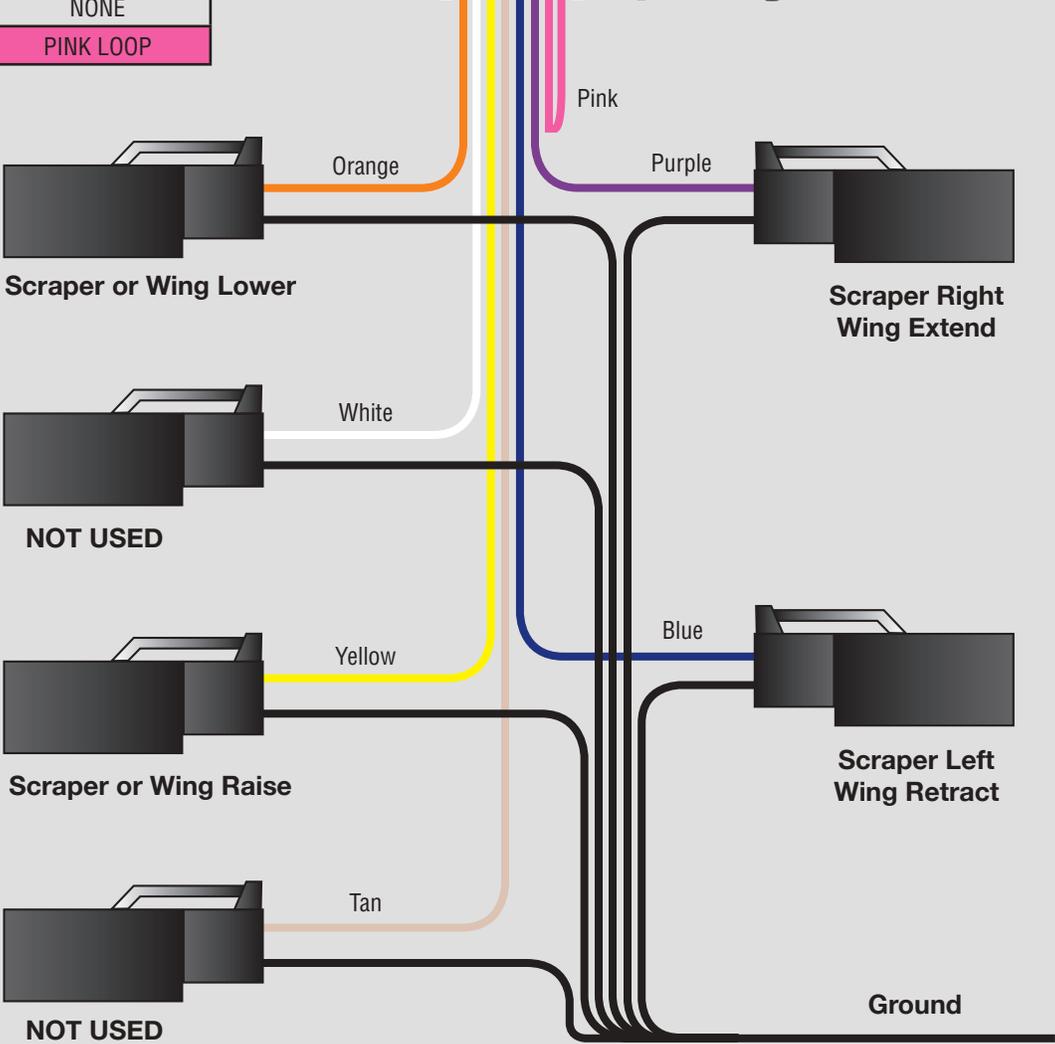


Secondary A Output Harness – NXWH4A

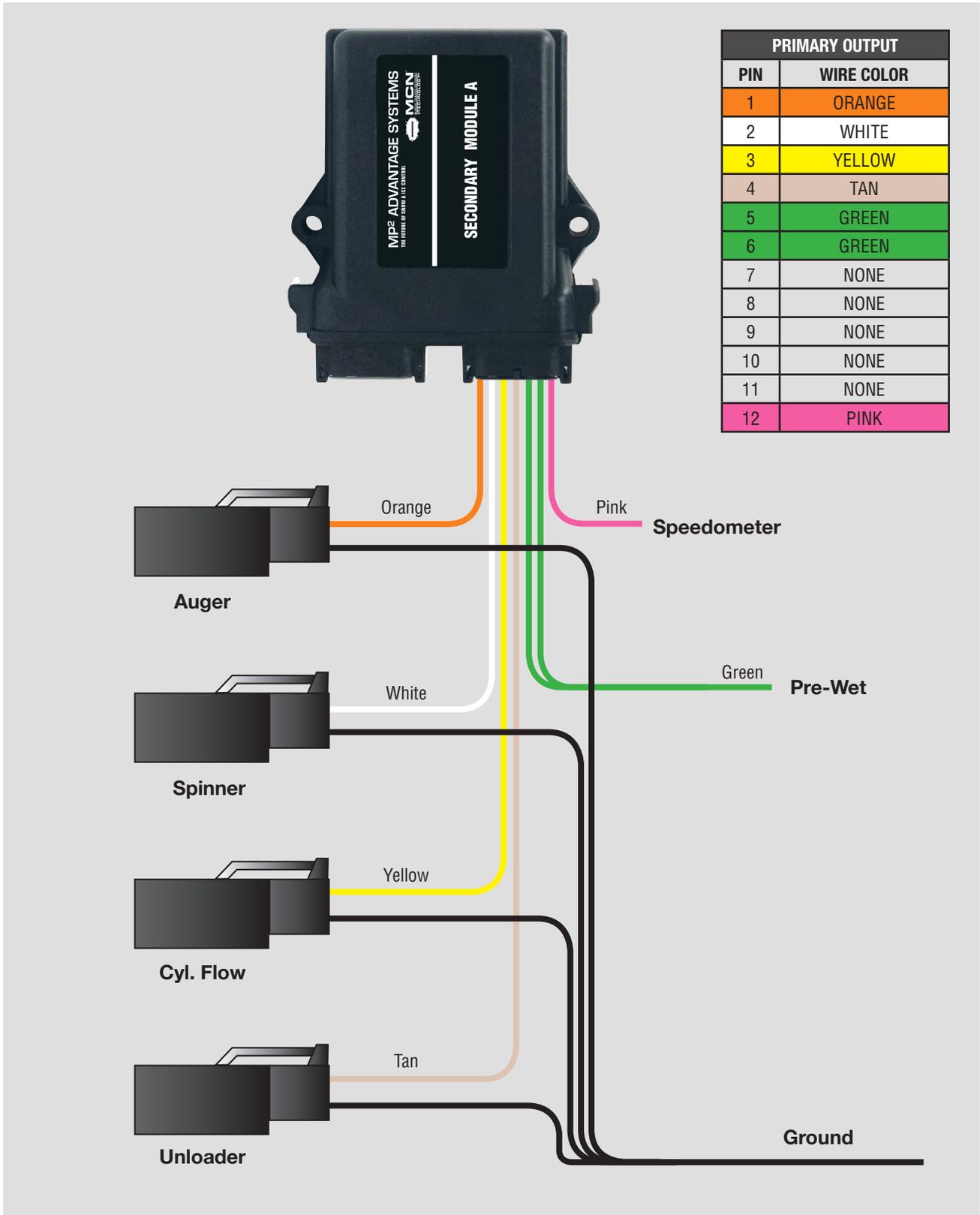


Secondary B Output Harness – NXWH6A

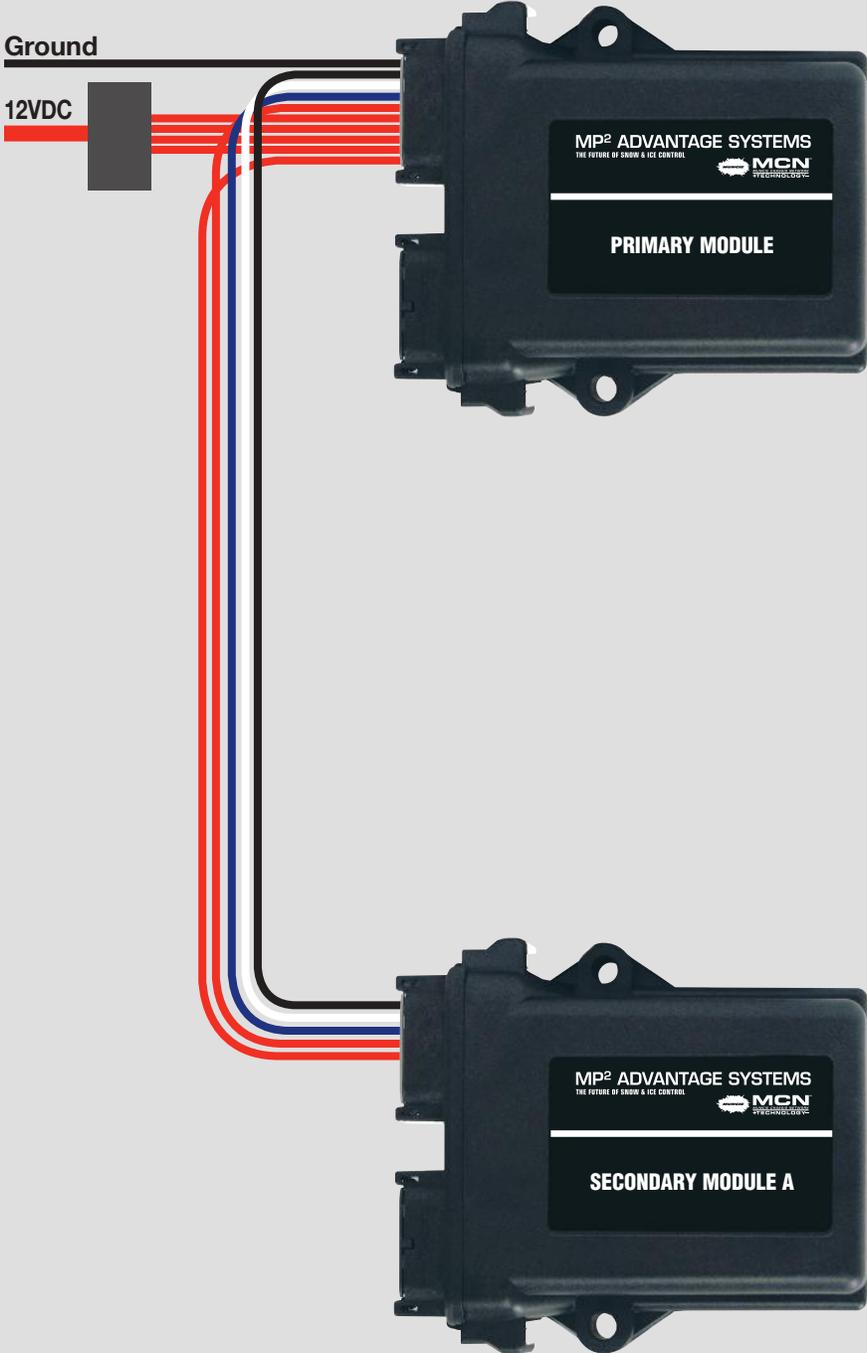
SECONDARY B OUTPUT	
PIN	WIRE COLOR
1	ORANGE
2	WHITE
3	YELLOW
4	TAN
5	BLUE
6	PURPLE
7	PINK LOOP
8	NONE
9	NONE
10	NONE
11	NONE
12	PINK LOOP



Primary Output Harness – NXWH3A



Primary/Secondary Power Harness – NXWH1A



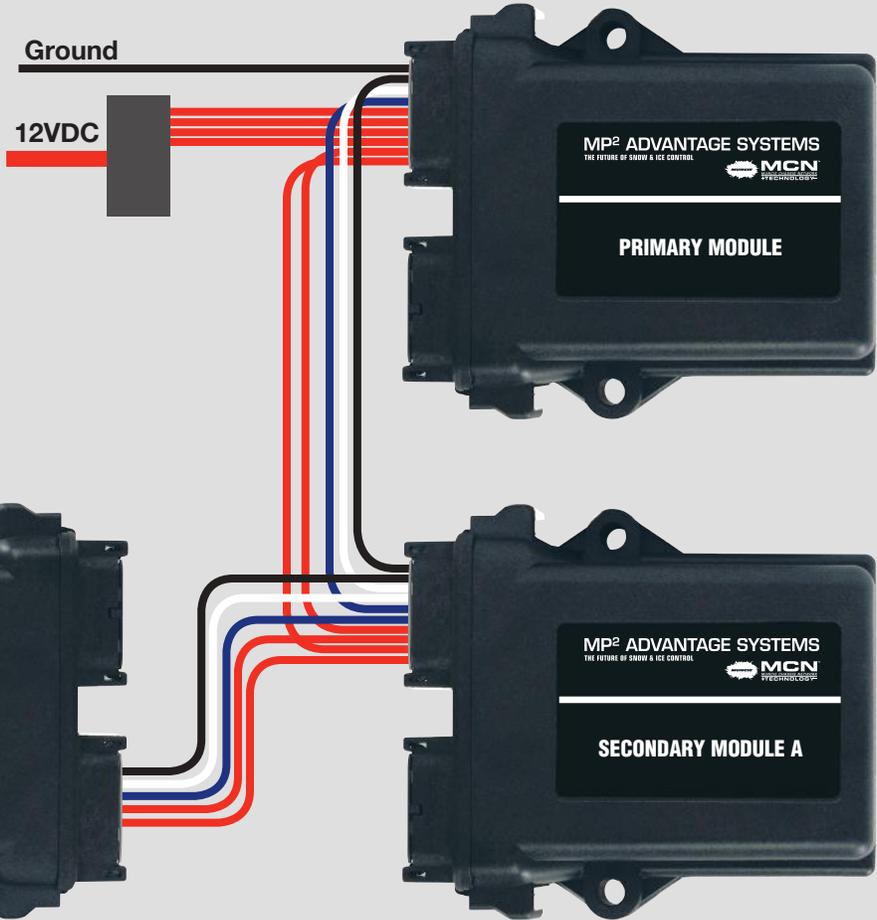
PRIMARY PIN LOCATIONS	
PIN	WIRE COLOR
1	BLACK
2	BLACK
3	NONE
4	WHITE
5	NONE
6	BLUE
7	RED
8	RED
9	RED
10	RED
11	RED
12	RED

SECONDARY A PIN LOCATIONS	
PIN	WIRE COLOR
1	BLACK
2	NONE
3	WHITE
4	NONE
5	BLUE
6	NONE
7	RED
8	NONE
9	RED
10	NONE
11	NONE
12	NONE



Primary/Secondaries (A&B) Power Harness – NXWH2A

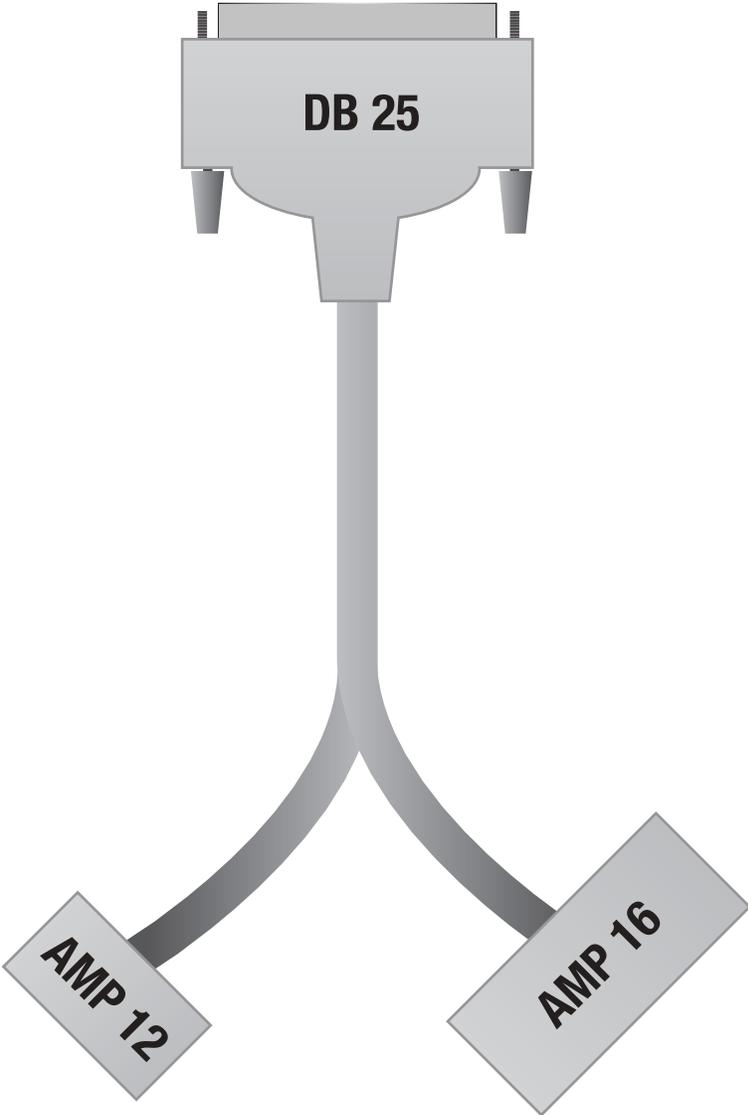
PRIMARY PIN LOCATIONS	
PIN	WIRE COLOR
1	BLACK
2	BLACK
3	NONE
4	WHITE
5	NONE
6	BLUE
7	RED
8	RED
9	RED
10	RED
11	RED
12	RED



SECONDARY B PIN LOCATIONS	
PIN	WIRE COLOR
1	BLACK
2	NONE
3	WHITE
4	NONE
5	BLUE
6	NONE
7	RED
8	NONE
9	RED
10	NONE
11	NONE
12	NONE

SECONDARY A PIN LOCATIONS	
PIN	WIRE COLOR
1	BLACK
2	BLACK
3	WHITE
4	WHITE
5	BLUE
6	BLUE
7	RED
8	RED
9	RED
10	RED
11	NONE
12	NONE

Joystick Cable – NXWH5A



DB25 PIN	AMP 12 PIN
PIN 10	PIN 1
PIN 19	PIN 2
PIN 11	PIN 3
PIN 7	PIN 4
PIN 13	PIN 5
PIN 24	PIN 6
PIN 25	PIN 7
PIN 12	PIN 8

DB25 PIN	AMP 16 PIN
PIN 14	PIN 2
PIN 15	PIN 3
PIN 16	PIN 8
PIN 9	PIN 8
PIN 17	PIN 11
PIN 18	PIN 12



MEDIUM MP2 ADVANTAGE SYSTEM



MEDIUM MP2 ADVANTAGE SYSTEM INLET/SPREADER MANIFOLD: HF35687-06

(Reference circuit schematic for HF35687-06)

Pump Gage Port (PGP) – Indicates the inlet pressure from the pump. This pressure will be approximately 300 PSI higher than the Load Sense Gage Port (LSGP). If the system is operating with a variable displacement pump this difference in pressure will be the boost pressure of the pump. The boost pressure should be a minimum of 300 PSI for proper operation of the MP2 Advantage System. When the system is unloading the pump (no functions operating) the PGP pressure will be approximately 20-80 PSI depending upon the flow of the pump. This gage port should be used to adjust RV1 (Main Relief) if required.

Load Sense Gage Port (LSGP) – Indicates the pressure of the load (cylinder or motor). If more than one function is operating concurrently, then the higher load pressure is seen.

There will only be a pressure at LSGP if a function is operating. The LSGP can be used to adjust all other pressure relief cartridges in the system. Remember, the PGP will display a pressure approximately 300 PSI higher.

EV1 – Pump bypass and pre-pressure compensation cartridge. EV1 is a normally closed-two position - two way – pilot cartridge. It can provide a very low pressure path for pump flow to escape to tank. This is its primary function when no functions are operating. The bypass pressure of the pump in this state will vary from about 20-60 PSI depending upon the pump flow. This pressure will show at PGP. The path to tank is opened by pump pressure being applied to the left side pilot of EV1 which forces it open. The right side pilot line of EV1 is

drained to tank through SV1 (Unloader Solenoid Valve) to allow this to happen.

SV1 – Unloader solenoid valve. SV1 is a normally open, two position – two way solenoid operated cartridge. When its solenoid is not energized it provides a drain path for the pilot pressure on the right side of EV1. This allows for pilot pressure on the left side of EV1 to push it open and expose a low pressure path for the pump flow to escape to tank.

SV1 will energize whenever any function of the MP2 Advantage System is operating. This closes the pilot drain on the right side of EV1 and that in-turn cause EV1 to begin shutting off the pump flow escape to tank. Pump flow is now forced to move toward motor and cylinder valves as required. If SV1 was energized or manually overridden (if equipped) without any other system valves functioning, the pressure at PGP would be approximately 300 PSI. LSGP would not have pressure.

CV1 – Boost pressure check valve. CV1 is a simple spring biased ball check cartridge. Its purpose is to raise the differential or boost pressure between PGP and LSGP by a margin of approximately 300 PSI. It comes into play when SV1 is energized. At that point the pilot pressure on the right side of EV1 can only drain through CV1. CV1's internal bias spring is set for 270 PSI. That means the pressure of EV1's pilots (both sides) must build to at least 270 PSI before the right side pilot can drain through CV1 and allow EV1 to begin to open. This boost pressure is required to allow flow to get through other cartridge valves in the system to operate functions.

MEDIUM MP2 ADVANTAGE SYSTEM

When CV1 has a load-sense pressure applied to its right side which is communicated from LS2 (Load Shuttle) this will add to the pressure required for EV1 to drain its right side pilot and open. For example, if the load-sense pressure for a cylinder or spreader motor is 1000 PSI, this will be added to the (270 PSI) spring bias pressure of CV1. Now EV1 cannot begin to open its path to tank until the pump pressure has achieved something slightly higher than 1270 PSI. PGP would display 1270 + PSI and LSGP would display 1000 PSI. In this way the system will always attempt to sustain a differential or boost pressure of approximately 300 PSI.

RV1 – Main system relief valve. RV1 is an adjustable relief cartridge that is used in conjunction with EV1 to limit the maximum pump pressure. RV1 is located in the pilot path on the right side of EV1. It is preset from the factory at 2200 PSI. This can be adjusted to a maximum of 3000 PSI. When RV1 opens it begins to drain the pilot on the right side of EV1 at whatever pressure RV1 has been set. The pressure of the pump and the left side of EV1 will build slightly higher and force EV1 to begin to open and provide a tank path for the pump.

ORF1 – Load sense drain orifice. ORF1 provides a controlled drain for the load-sense pilot line/EV1 control pilot. Its function is to ensure that pressure cannot be trapped in this pilot and result in EV1 not being able to fully open at low pressure when required.

PV4 – Spinner flow control valve. PV4 is a proportional solenoid flow control valve that also incorporates pressure compensation. In its unenergized state it provides a

blocked path between the pump flow and the spinner work port. When it is energized it provides an increasing orifice opening to flow as a result of increasing electric current to its solenoid coil. Its range of flow control is 0-6 gallons-per-minute. A second internal stage of PV4 provides pressure compensation of the flow control. This stage will react to changes of pump pressure conditions relative to the spinner load pressure demands. If the pressure difference goes too high the compensator stage will “squeeze down” to prevent extra flow from “shooting” through the proportional valve orifice setting. The basis of stable flow control requires this feature.

PV2 – Auger/Conveyor flow control valve. PV2 is a proportional solenoid flow control valve that also incorporates pressure compensation. In its non-energized state it provides a blocked path between the pump flow and the auger/conveyor work port. When it is energized it provides an increasing orifice opening to flow as a result of increasing electric current to its solenoid coil. Its range of flow control is 0-14 gallons-per-minute. A second internal stage of PV2 provides pressure compensation of the flow control. This stage will react to changes of pump pressure conditions relative to the auger/conveyor load pressure demands. If the pressure difference goes too high the compensator stage will “squeeze down” to prevent extra flow from “shooting” through the proportional valve orifice setting. The basis of stable flow control requires this feature.

RV5 – Spreader pressure relief valve. RV5 limits the pressure of the spreader motor circuits. It is located in the pilot load-sense

line of the spreader work ports so that when it opens it ultimately limits the pressure at CV1 and therefore EV1 which ultimately opens to dump pump flow to tank. RV5 is adjustable. Its pressure setting will be displayed at LSGP if a spreader motor load exceeds the relief setting or a blockage of a spreader work port occurs.

LS1 – Load shuttle cartridge. LS1 is similar to two check valves set back-to-back. Its purpose is to communicate the load pressure of the highest spreader motor pressure back to CV1 via LS2.

LS2 – Load shuttle cartridge. LS2 is similar to two check valves set back-to-back. Its purpose is to communicate the higher of two load pressures (spreader or cylinders) back to CV1.

CP1 – Cavity plug. CP1 blocks a flow path between the pump inlet port and a passage leading directly to PV2 & PV4, the spreader flow control valves. Normally, pump flow is routed to the plow & dump manifold of an MP2 Advantage System and through a priority flow divider valve in that manifold before being returned through a bypass (BY) port to provide flow to PV2 & PV4. Replacing CP1 with a standard SAE -12 plug will open this passage and allow direct connection of the pump flow to PV2 & PV4. This can be done when using an Inlet/ Spreader manifold alone without a Plow & Dump manifold attached.

MEDIUM MP2 ADVANTAGE SYSTEM INLET/SPREADER MANIFOLD: HF35461-06

(Reference circuit schematic for HF35461-06)

MANIFOLD INTERFACE (LEFT SIDE OF DRAWING) – This interface of connecting ports mates to the Inlet/Spreader manifold with o-ring seals as the two manifolds are assembled together as one. The port designations on the drawing is as follows: (R) is the tank return, (P) is the pressure, (BY) is the pressure feed to the spreader valves in the Inlet/Spreader manifold, (LS) is the load-sense connection from the plow and dump body valves back to the Inlet/ Spreader manifold.

MANIFOLD INTERFACE (RIGHT SIDE OF DRAWING) – This interface of connecting ports is typically plugged. If there is an optional wing or scraper manifold added to the system these ports connect those additional manifolds. The port designations on the drawing is as follows: (P2) is a continuation of the pressure passage, (R2) is a continuation of the return to tank, (D2) is a continuation of a pilot pressure drain, (D) is a connecting port for draining pilot pressure to the tank.

PV1 – Priority flow control valve. PV1 is a proportional solenoid flow control with two outputs. One provides priority flow to the cylinder operations. The other provides flow to the spreader valves via the (BY) bypass passage on the manifold interface to the Inlet/Spreader manifold. When PV1's solenoid is not energized all pump flow becomes available to the spreader. If a cylinder function is operated, PV1's solenoid becomes energized and some or all of the pump flow will be delivered to the cylinder function. PV1's solenoid is proportionally controlled by the degree of stroke on the joystick in the electronic control group. If a joystick is not being used and a cylinder

is operated by one of the keypads on the Control Panel, then PV1's solenoid will proportion flow to that cylinder according to the Program Menu Settings of the Control Panel. This could be anything from a fraction to full pump flow.

EH1-6 – Pilot pressure control valves. EH1-6 are solenoid operated pilot valves. Their purpose is to provide hydraulic pilot shifting force to move the PE1-3 valves that in-turn provide directional control of the plow and dump body cylinders. It requires (6) of the EH valves, two for each of the PE valves. When an EH valve is energized it completes a path from the pressure output of PV1 to the actuation end of one of the PE directional controls for a cylinder. Two EH valves are used for each PE valve. One actuates the PE to extend a cylinder and the other actuates the PE to retract the cylinder. The EH valves use very little to no flow since they are pilot controls. When the EH valves are not energized they drain any residual pressure from the actuation ends of the PE valves.

PE1-3 – Directional control valves. PE1-3 have a neutral position and two actuated positions. The actuated positions alternately switch the tank and pressure lines connected to the cylinders to provide extension in one case and retraction in the other. PE1 controls the Plow Lift, PE2 controls the Plow Swing and PE3 controls the Dump Hoist.

SUN1 – Counter-balance control. SUN1 is located in the extension side of the Plow Lift work line. It is a hybrid valve that places a check valve in parallel with a relief valve. The check valve direction allows for free-

flow to extend the cylinder but prevents flow from leaking out of the cylinder. The relief valve section of SUN1 has a pilot control connection to the opposite cylinder work port (rod-side). When the plow is being lowered, the pressure on the opposite side is used to open the relief valve section. This in-turn allows flow to drain from the piston-side of the cylinder to lower it. If the weight of the plow causes the lowering to runaway, then the pilot pressure on the SUN1 relief section will drop and the relief will begin to shutoff flow draining from the cylinder. This enables a counter-balance valve to help maintain cylinder control in the face of gravity conditions.

RV1 – Relief valve. RV1 provides relief pressure control for the rod-side of double acting cylinders. It is adjustable and is preset from the factory for 750 PSI.

CR1 – Cross-relief valve. CR1 provides cross-relief or cushion control for the plow angle cylinders. It is adjustable and is preset from the factory for 1500 PSI. Its function is to keep the angle cylinders from being damaged when the plow encounters an obstruction. If the pressure in an extended cylinder exceeds the setting of CR1 oil is allowed to cross-over to the opposite side of the opposing cylinder.

SUN2 - Counter-balance control. SUN2 is located in the extension side of the Dump Hoist work line. It is a hybrid valve that places a check valve in parallel with a relief valve. The check valve direction allows for free-flow to extend the cylinder but prevents flow from leaking out of the cylinder. The relief valve section of SUN2 has a pilot control connection to the opposite cylinder

MEDIUM MP2 ADVANTAGE SYSTEM

work port (rod-side). When the dump hoist is being lowered, the pressure on the opposite side is used to open the relief valve section. This in-turn allows flow to drain from the piston-side of the cylinder to lower it. If the weight of the dump body causes the lowering to runaway, then the pilot pressure on the SUN2 relief section will drop and the relief will begin to shutoff flow draining from the cylinder. This enables a counter-balance valve to help maintain cylinder control in the face of gravity conditions.

RV2 - Relief valve. RV2 provides relief pressure control for the rod-side of double acting cylinders. It is adjustable and is preset from the factory for 750 PSI.

CV1 – Pilot operated check valve. CV1 is positioned in the rod-side of a double acting cylinder to provide free-flow to the cylinder for retraction. It will block flow from exiting the rod-side of the cylinder unless CV1 pilot line is activated by the pressure of PE3 when raising the dump body. This is a safety measure to prevent accidental “ratcheting-up” of a dump body bouncing on the frame of a moving truck.

CV2 – Pilot operated check valve. CV2 is used to provide a second path for lowering dump body cylinders. It is designed to open when PE3 is shifted to cause lowering of the dump hoist. This allows the cylinder to drain oil through CV2 as well as PE3 to decrease lowering downtimes. The pilot of CV2 is controlled by PS1.

PS1 – Pressure sequence valve. PS1 connects system pressure to the pilot control of CV2 when shifted. This opens CV2 to provide a second high flow drain

path for lowering the dump hoist cylinder. PS1 is in-turn shifted by the pressure output of EH5 which is the solenoid pilot control for shifting PE3 to lower the dump body. PS1 has an adjustable sequence pressure and is factory preset at 125 PSI.

MEDIUM MP2 ADVANTAGE SYSTEM HYDRAULIC SPECIFICATIONS

Maximum Inlet Flow

40 GPM

Maximum System Pressure

3000 PSI

Unloaded Pressure Drop

40 PSI @ 35 GPM

Dump Hoist Flow (Proportional)

21 GPM Raise & Lower (100 PSID)

Plow Lift Flow (Proportional)

12 GPM Raise & Lower (150 PSID)

Plow Angle Flow (Proportional)

15 GPM Left & Right (150 PSID)

Auger Flow (Proportional)

14 GPM Pressure Compensated

Spinner Flow (Proportional)

6 GPM Pressure Compensated

Main Relief

Factory Setting 2200 PSI (Adjustable)

Hoist Down Relief (D.A. Cyls.)

Factory Setting 750 PSI (Adjustable)

Plow Down Relief (D.A. Cyls.)

Factory Setting 500 PSI (Adjustable)

Plow Angle

Crossover Relief Protection (Adjustable)

Spreader Relief

Factory Setting 2000 PSI (Adjustable)

SOLENOID SHIFT SEQUENCE

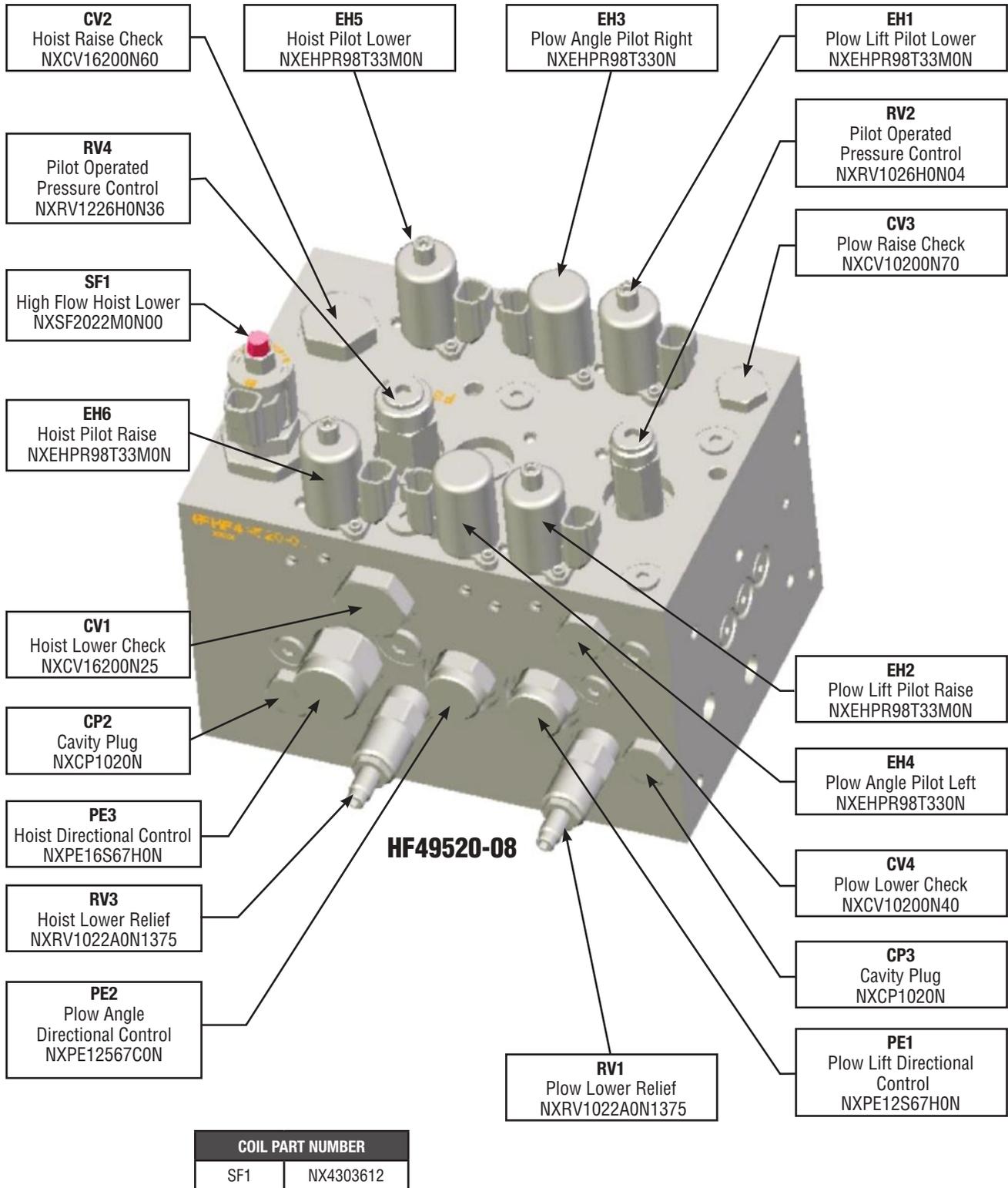
(Manifolds HF35687-06 & HF35461-06)

<u>FUNCTION</u>	<u>SOLENOIDS & VALVES</u>
Spreader	(SV1) Pump Unloader Pilot, (PV4) Spinner, (PV2) Auger
Plow Raise	(SV1) Pump Unloader Pilot, (PV1) Priority Flow Divider, (EH2) Proportional Pilot Control
Plow Lower	(SV1) Pump Unloader Pilot, (PV1) Priority Flow Divider, (EH1) Proportional Pilot Control
Plow Left	(SV1) Pump Unloader Pilot, (PV1) Priority Flow Divider, (EH4) Proportional Pilot Control
Plow Right	(SV1) Pump Unloader Pilot, (PV1) Priority Flow Divider, (EH3) Proportional Pilot Control
Dump Raise	(SV1) Pump Unloader Pilot, (PV1) Priority Flow Divider, (EH6) Proportional Pilot Control
Dump Lower	(SV1) Pump Unloader Pilot, (PV1) Priority Flow Divider, (EH5) Proportional Pilot Control
	<i>(Added manifold HF35470-06)</i>
Scraper Raise	(SV1) Pump Unloader Pilot, (PV1) Priority Flow Divider, (EH1) Proportional Pilot Control
Scraper Lower	(SV1) Pump Unloader Pilot, (PV1) Priority Flow Divider, (EH2) Proportional Pilot Control
Scraper Left	(SV1) Pump Unloader Pilot, (PV1) Priority Flow Divider, (EH3) Proportional Pilot Control
Scraper Right	(SV1) Pump Unloader Pilot, (PV1) Priority Flow Divider, (EH4) Proportional Pilot Control

MEDIUM MP2 ADVANTAGE SYSTEM

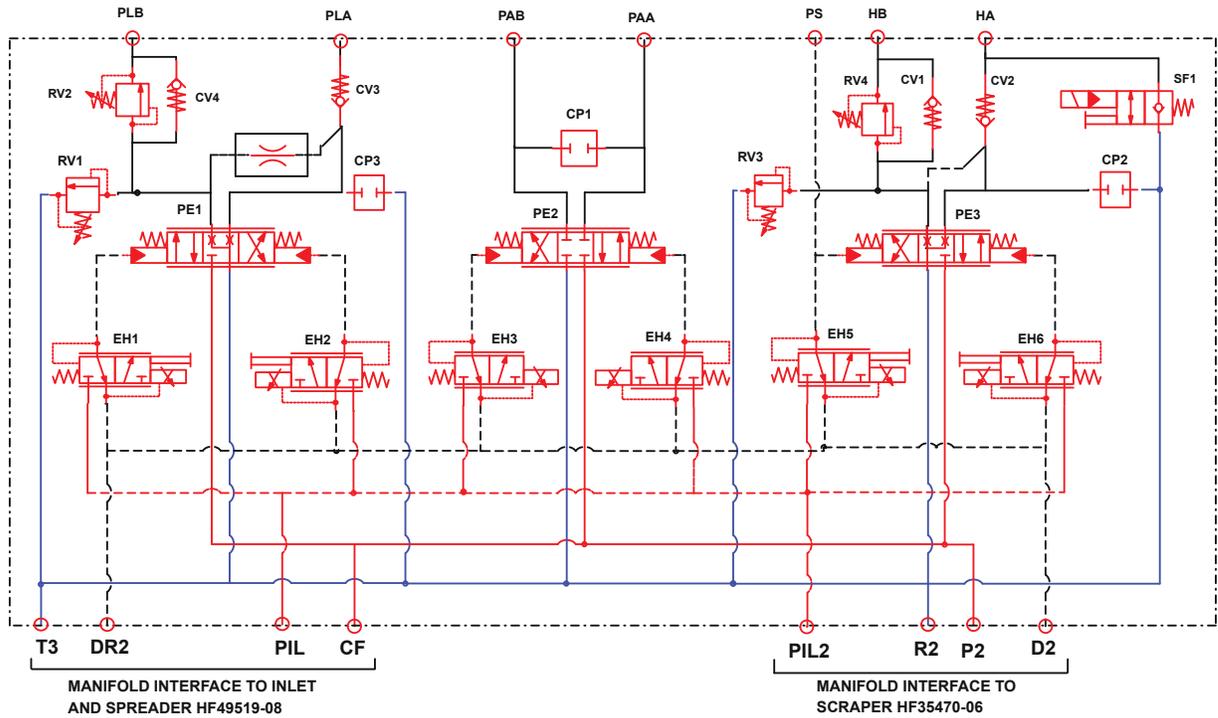
CARTRIDGE DESIGNATIONS, FUNCTIONS & PART NUMBERS

NEW MID-SIZE PLOW & DUMP MANIFOLD

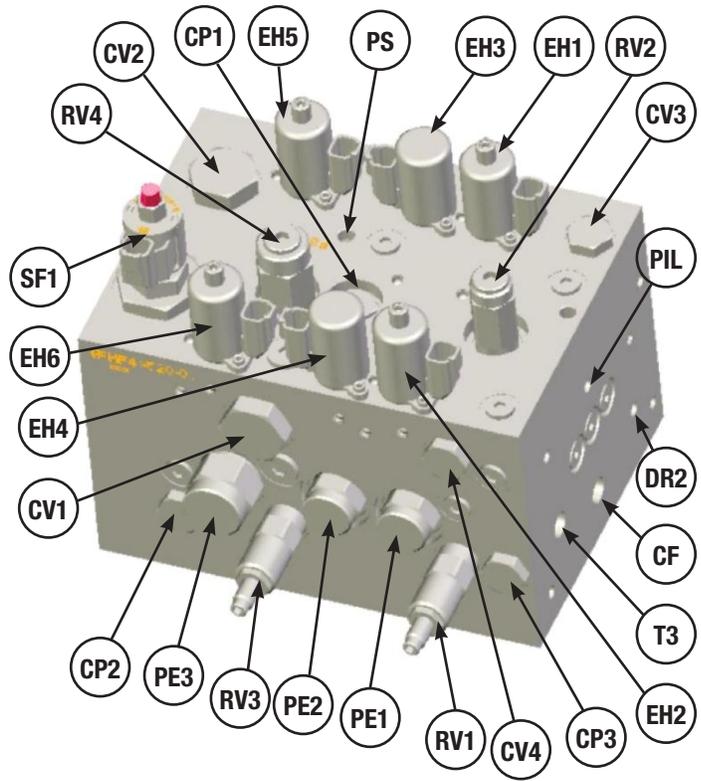
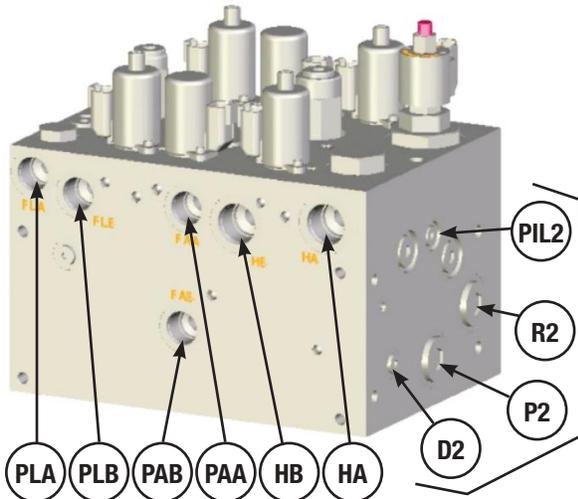


SCHEMATICS

NEW MID-SIZE PLOW & DUMP MANIFOLD



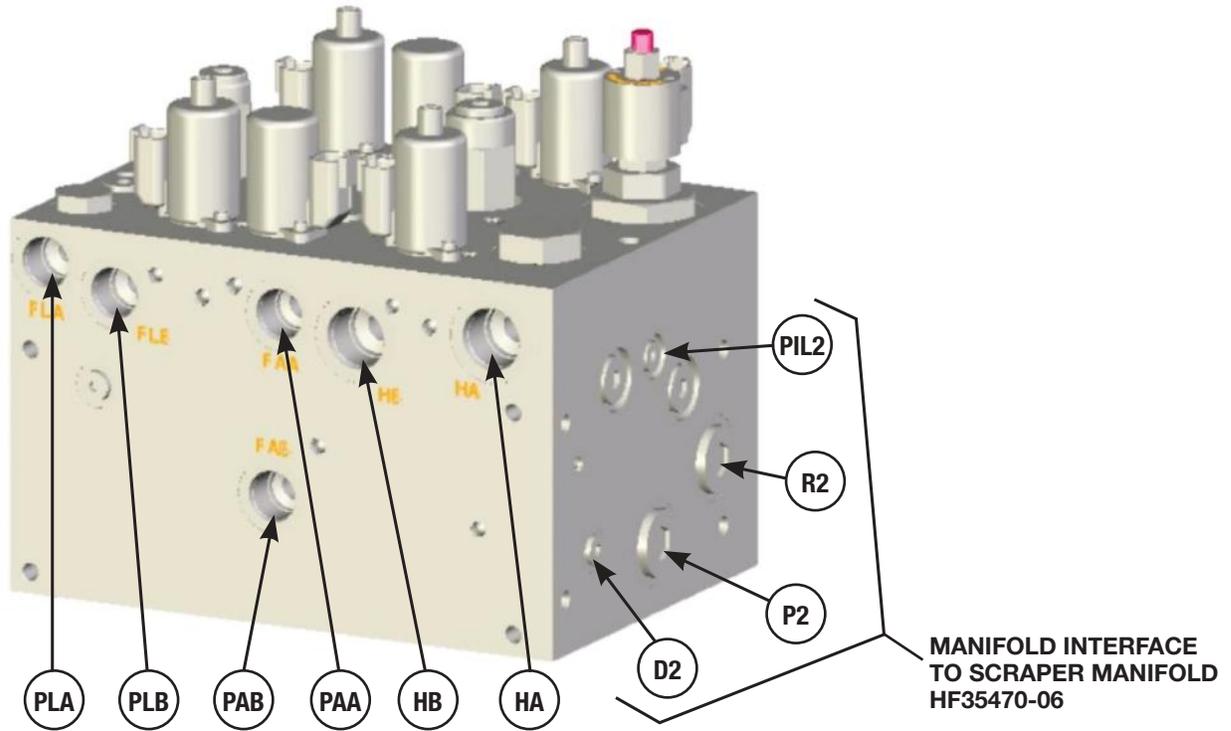
DESIGNATION	FUNCTION	DESIGNATION	FUNCTION
PLA	PLOW RAISE	DR2	DRAIN
PLB	PLOW LOWER	D2	DRAIN
PAA	PLOW LEFT	T3	TANK
PAB	PLOW RIGHT	CF	CYLINDER FLOW
HA	HOIST RAISE	PS	PSI SWITCH
HB	HOIST LOWER	PIL	PILOT
R2	RETURN	PIL2	PILOT
P2	PUMP		



MANIFOLD INTERFACE TO SCRAPER MANIFOLD - HF35470-06

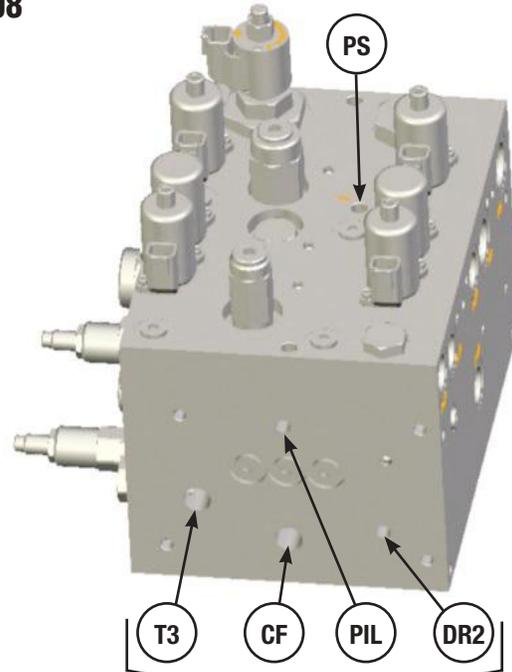
WORK PORTS

NEW MID-SIZE PLOW & DUMP MANIFOLD



HF49520-08

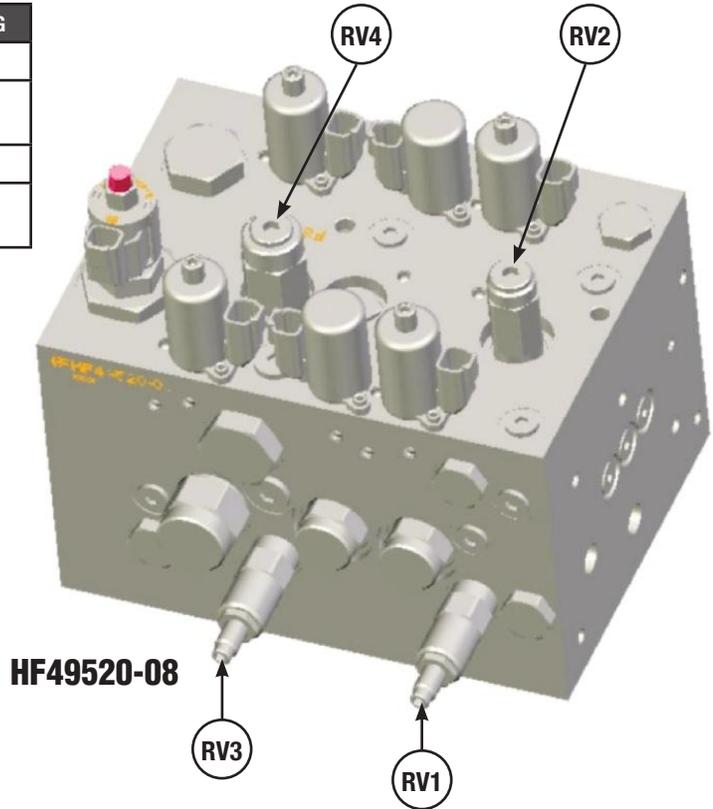
DESIGNATION	FUNCTION	SIZE (SAE)
PLA	PLOW RAISE	10
PLB	PLOW LOWER	10
PAA	PLOW LEFT	10
PAB	PLOW RIGHT	10
HA	HOIST RAISE	12
HB	HOIST LOWER	12
PIL	PILOT	4
R2	RETURN	12
P2	PUMP	12
DR2	DRAIN	
D2	DRAIN	4
T3	TANK	
CF	CYLINDER FLOW	
PS	PSI SWITCH	1/4" NPTF
PIL2	PILOT	



MANIFOLD INTERFACE
TO INLET & SPREADER
HF49519-08

RELIEF VALVES NEW MID-SIZE PLOW & DUMP MANIFOLD

DESIGNATION	FUNCTION	FACTORY SETTING
RV1	PLOW LOWER RELIEF	750 PSI
RV2	PLOW PILOT OPERATED PSI CONTROL	300 PSI
RV3	HOIST LOWER RELIEF	750 PSI
RV4	HOIST PILOT OPERATED PSI CONTROL	300 PSI



PLOW LOWER RELIEF

1. The tools required for adjusting the Plow Down relief cartridge include: $\frac{3}{4}$ " wrench and a $\frac{1}{4}$ " Allen drive.
2. Remove the lock-nut while holding the Allen screw stationary.
3. Start the truck and deadhead the plow cylinder down. Adjust the plow down relief while observing the gauge in the L.S. Port, which is located on the inlet and spreader manifold. **(CW increases P.S.I. / CCW decreases P.S.I.)**
4. Once the desired pressure has been established, hold the Allen screw stationary while tightening the lock-nut back on the cartridge.

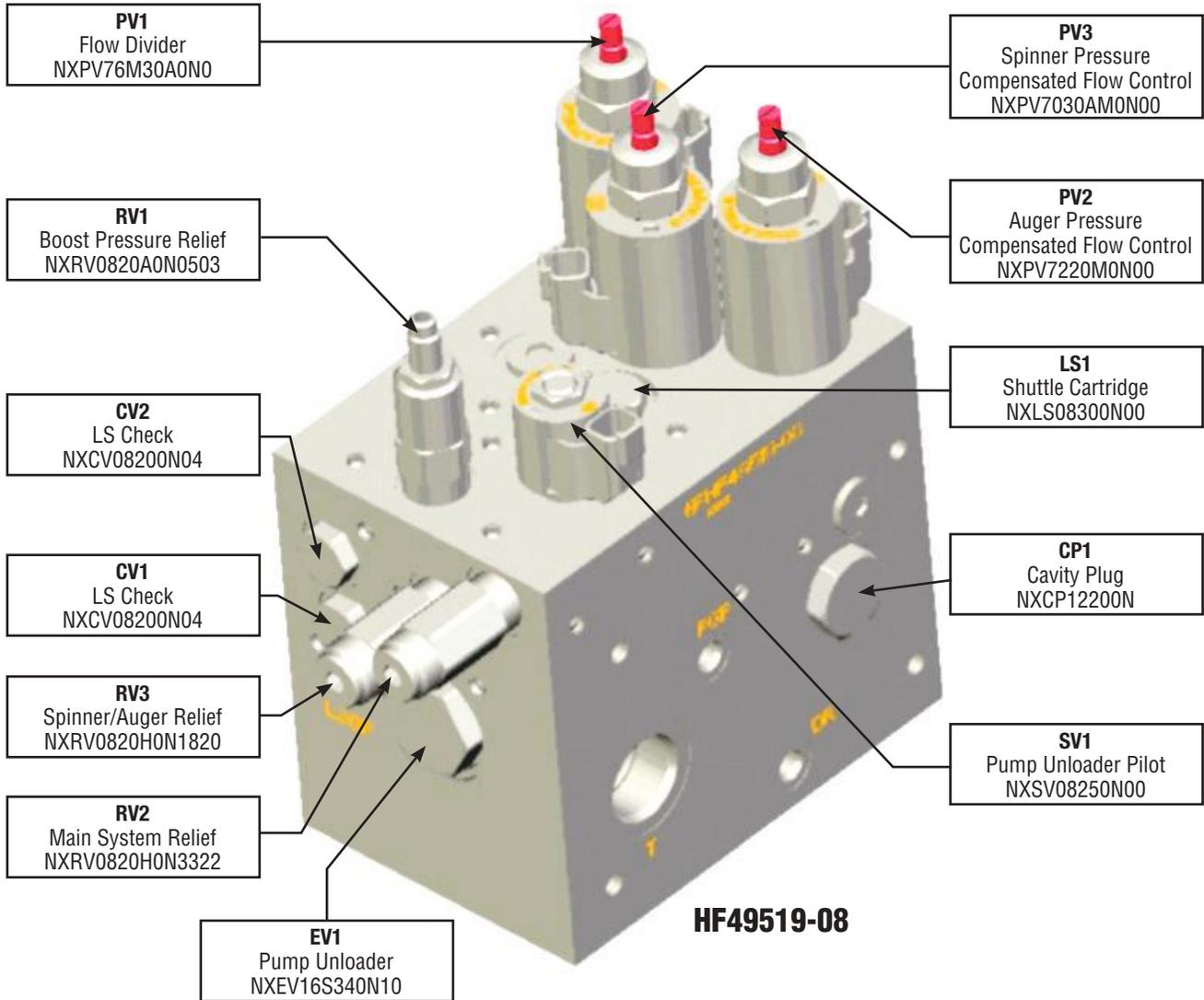
HOIST LOWER RELIEF

1. The tools required for adjusting the Hoist Down relief cartridge include: $\frac{3}{4}$ " wrench and a $\frac{1}{4}$ " Allen drive.
2. Remove the lock-nut while holding the Allen screw stationary
3. Start the truck and deadhead the hoist cylinder down. Adjust the relief while observing the gauge in the L.S. Port, which is located on the inlet and spreader manifold. **(CW increases P.S.I. / CCW decreases P.S.I.)**
4. Once the desired pressure has been established, hold the Allen screw stationary while tightening the lock-nut back on the cartridge.

RV2 AND RV4 ARE FACTORY SET- DO NOT ADJUST

CARTRIDGE DESIGNATIONS, FUNCTIONS & PART NUMBERS

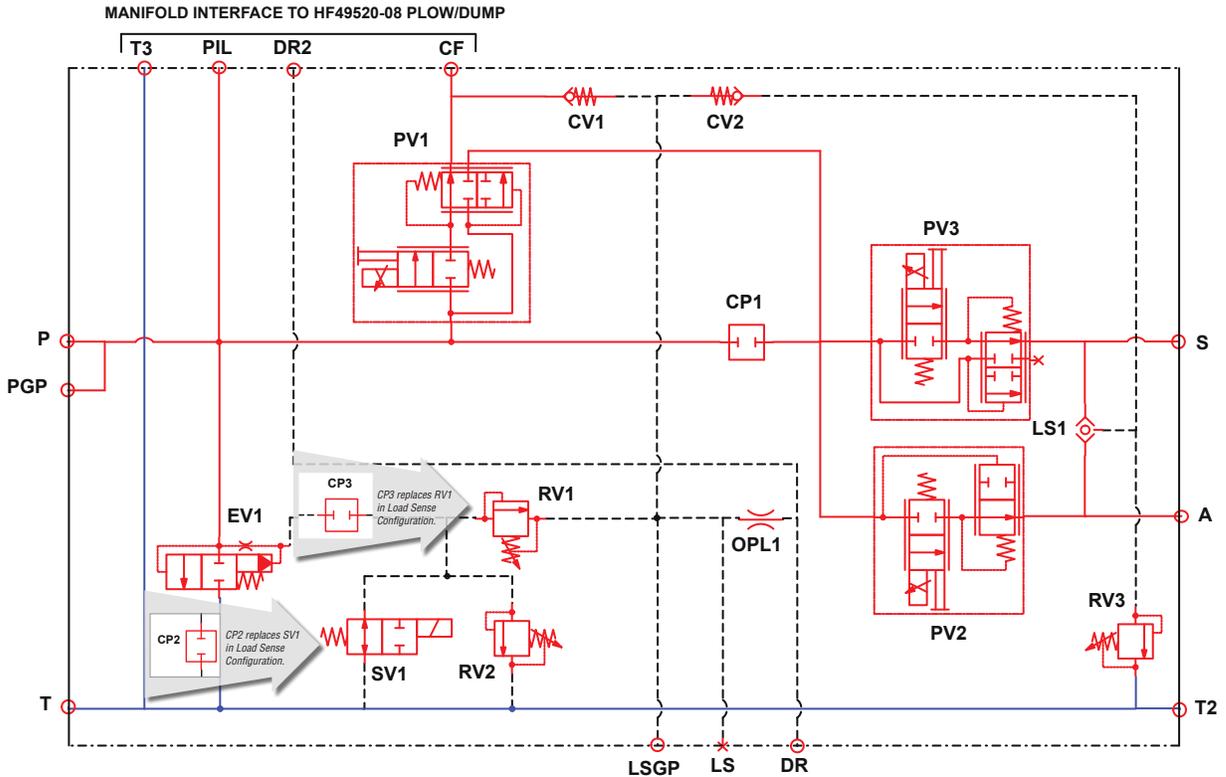
NEW MID-SIZE INLET AND SPREADER MANIFOLD



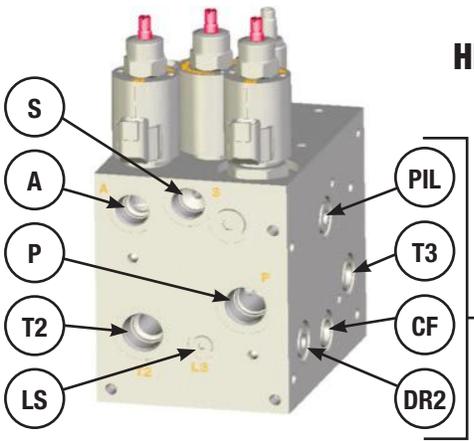
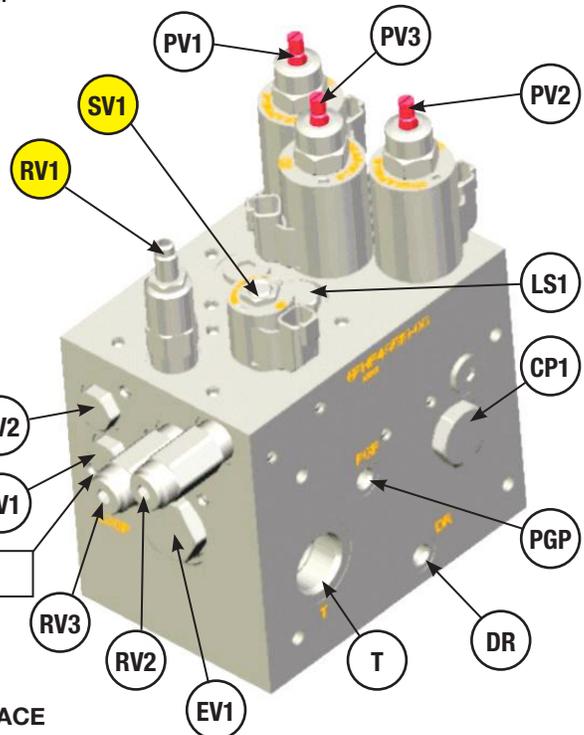
COIL PART NUMBER	
PV1	NX4303212
PV2	NX4303212
PV3	NX4303212
SV1	NX4303612



SCHEMATICS - INLET & SPREADER MANIFOLD OPEN-CENTER & LOAD SENSE



DESIGNATION	FUNCTION	DESIGNATION	FUNCTION
T	TANK	LSGP	LOAD SENSE GAUGE PORT
T2	TANK	A	AUGER
T3	TANK	S	SPINNER
P	PUMP	PIL	PILOT
P2	PUMP	CF	CYLINDER FLOW
PGP	PUMP GAUGE PORT	DR	DRAIN
LS	LOAD SENSE	DR2	DRAIN



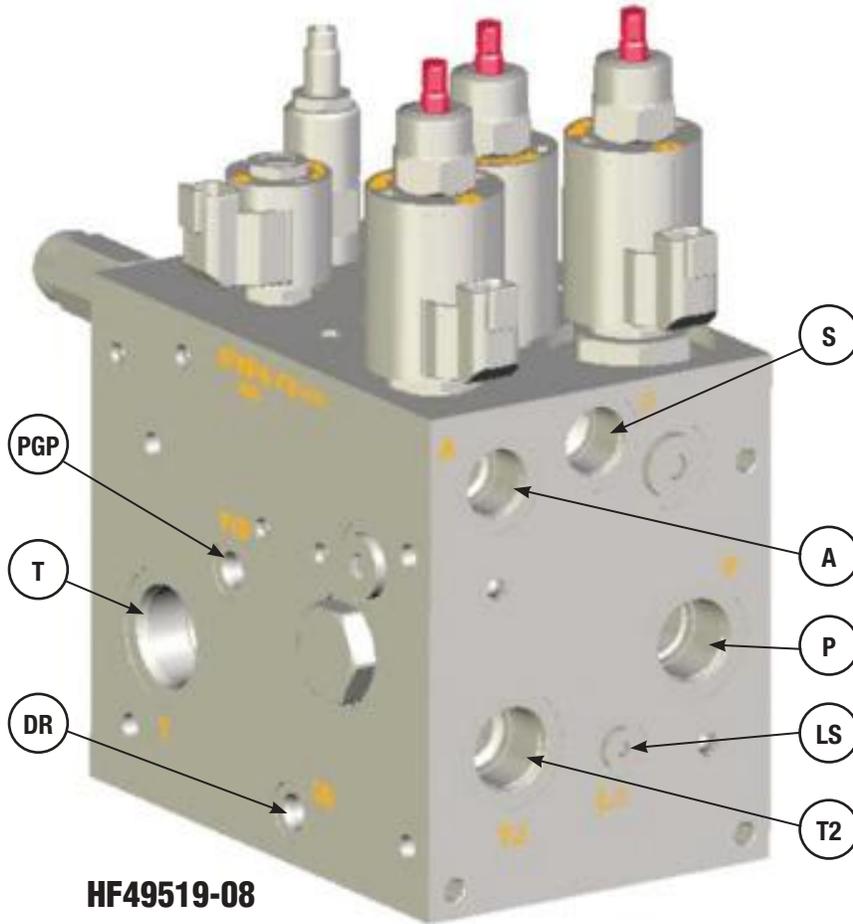
HF49519-08
MANIFOLD INTERFACE TO PLOW/DUMP MANIFOLD - HF49520-08

(SV1) replaced with cavity plug (CP2) in Load Sense Configuration. (RV1) replaced with cavity plug (CP3) in Load Sense Configuration.



WORK PORTS

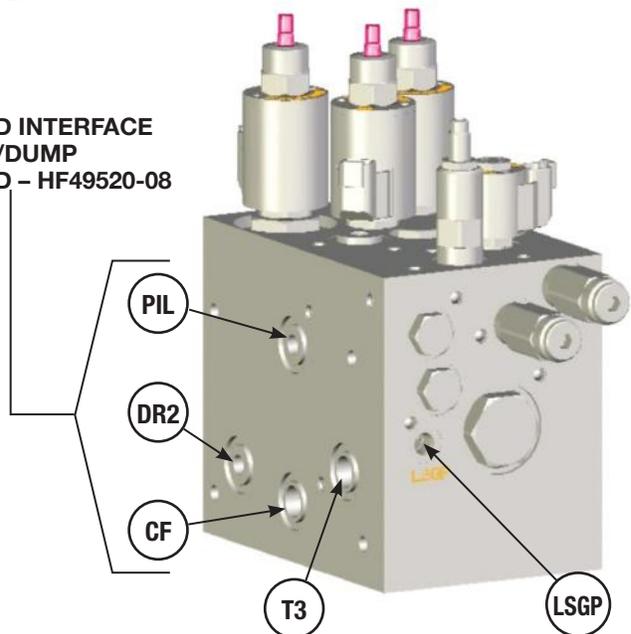
NEW MID-SIZE INLET & SPREADER MANIFOLD



HF49519-08

DESIGNATION	FUNCTION	SIZE (SAE)
P	PUMP	12
PGP	PUMP GAUGE PORT	04
LS	LOAD SENSE	04
LSGP	LOAD SENSE GAUGE PORT	04
A	AUGER	10
S	SPINNER	10
T	TANK	16
T2	TANK	12
T3	TANK	
PIL	PILOT	
DR	DRAIN	04
DR2	DRAIN	
CF	CYLINDER FLOW	

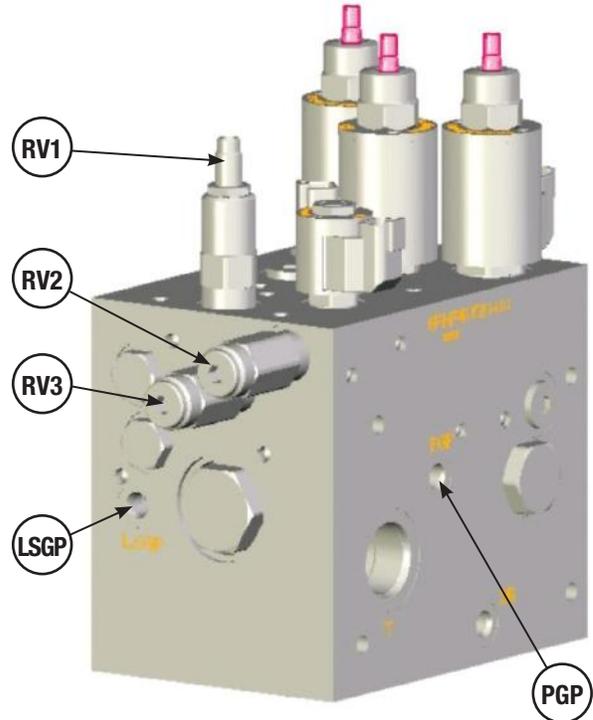
MANIFOLD INTERFACE TO PLOW/DUMP MANIFOLD - HF49520-08



RELIEF VALVES

NEW MID-SIZE INLET & SPREADER MANIFOLD

DESIGNATION	FUNCTION	FACTORY SETTING
RV1	BOOST RELIEF	300 PSI
RV2	MAIN RELIEF	2200 PSI
RV3	AUGER/SPINNER RELIEF	2000 PSI



HF49519-08

MAIN SYSTEM RELIEF

1. The tools required for adjusting the main relief cartridge include: 5/16" Allen drive and a 1/4" Allen drive.
2. With the truck off, insert a pressure gauge into the (PGP) port on the manifold.
3. Remove the cap of the Main System Relief Cartridge. Oil may seep out of this valve while the cap is removed and the system is operating.
4. Start the truck and deadhead either the hoist cylinder up or the plow cylinder up. Adjust the main system relief while observing the gauge in the (PGP) port. **(CW increases P.S.I. / CCW decreases P.S.I.)**
5. Once the desired pressure has been established, replace the cap on the pressure relief cartridge.

AUGER AND SPINNER RELIEF

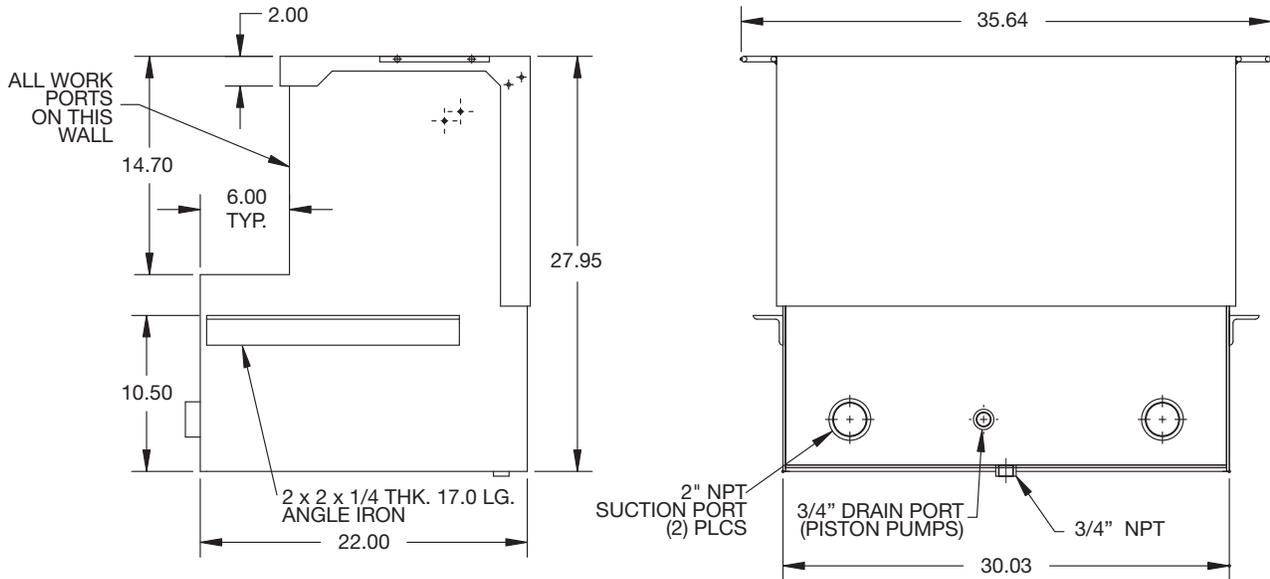
1. The tools required for adjusting the auger/spinner relief cartridge include: 5/16" Allen drive and a 1/4" Allen drive.
2. Remove the cap of the Auger / Spinner Relief Cartridge. Oil may seep out of this valve while the cap is removed and the system is operating.
3. Disconnect either the spinner or the auger flow supply. Flow should not reach either the spinner or auger motor.
4. With the controller turned on, adjust for flow to the deadheaded function. Adjust the auger/spinner relief while observing the gauge in the (LSGP) port. **(CW increases P.S.I. / CCW decreases P.S.I.) – DO NOT EXCEED THE MAIN RELIEF SETTING.**
5. Once the desired pressure has been established, replace the cap on the pressure relief cartridge.

BOOST PRESSURE RELIEF VALVE

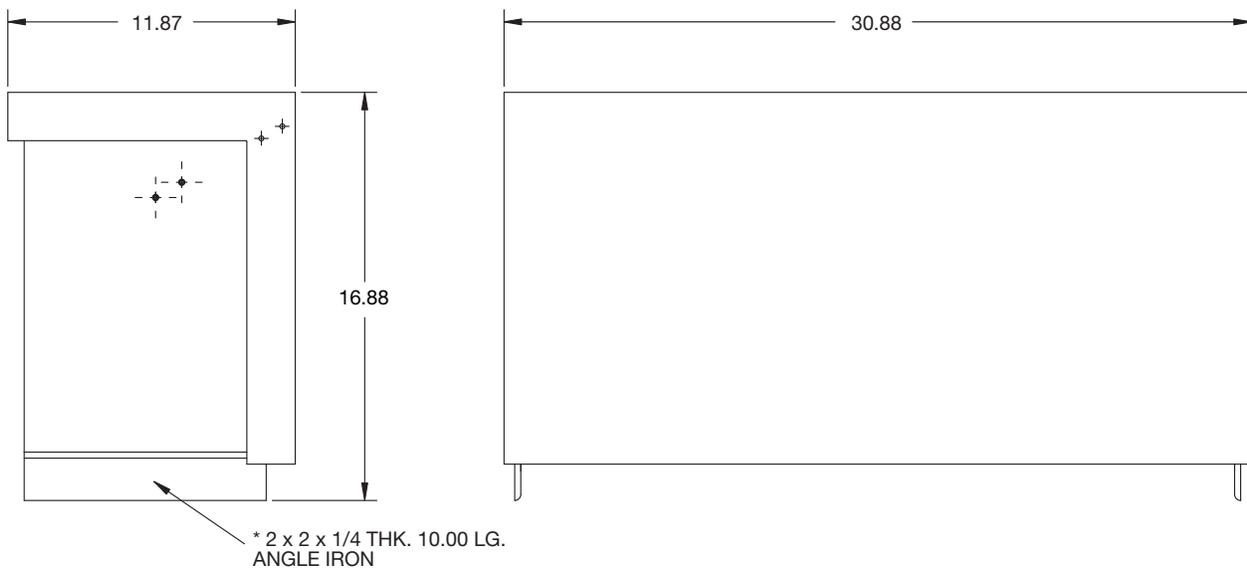
1. The tools required for adjusting the boost pressure relief include: 3/4" wrench and a 1/4" Allen Drive
2. Loosen the lock-nut while holding the Allen screw stationary.
3. With the truck off, insert a pressure gauge into the (PGP) port on the manifold.
4. With the controller turned on, deadhead the hoist cylinder down or the plow cylinder down.
5. While observing the two gauges, adjust the relief to the desired differential pressure between the two gauges. **It is recommended that the Pump Gauge should be 300 P.S.I. greater than the Load Sense Gauge.**
6. Once the desired pressure has been established, tighten the lock-nut back onto the cartridge while holding the allen screw stationary.

TANK AND MANIFOLD ENCLOSURES

LARGE AND MEDIUM ENCLOSURE FOR MANIFOLD AND TANK

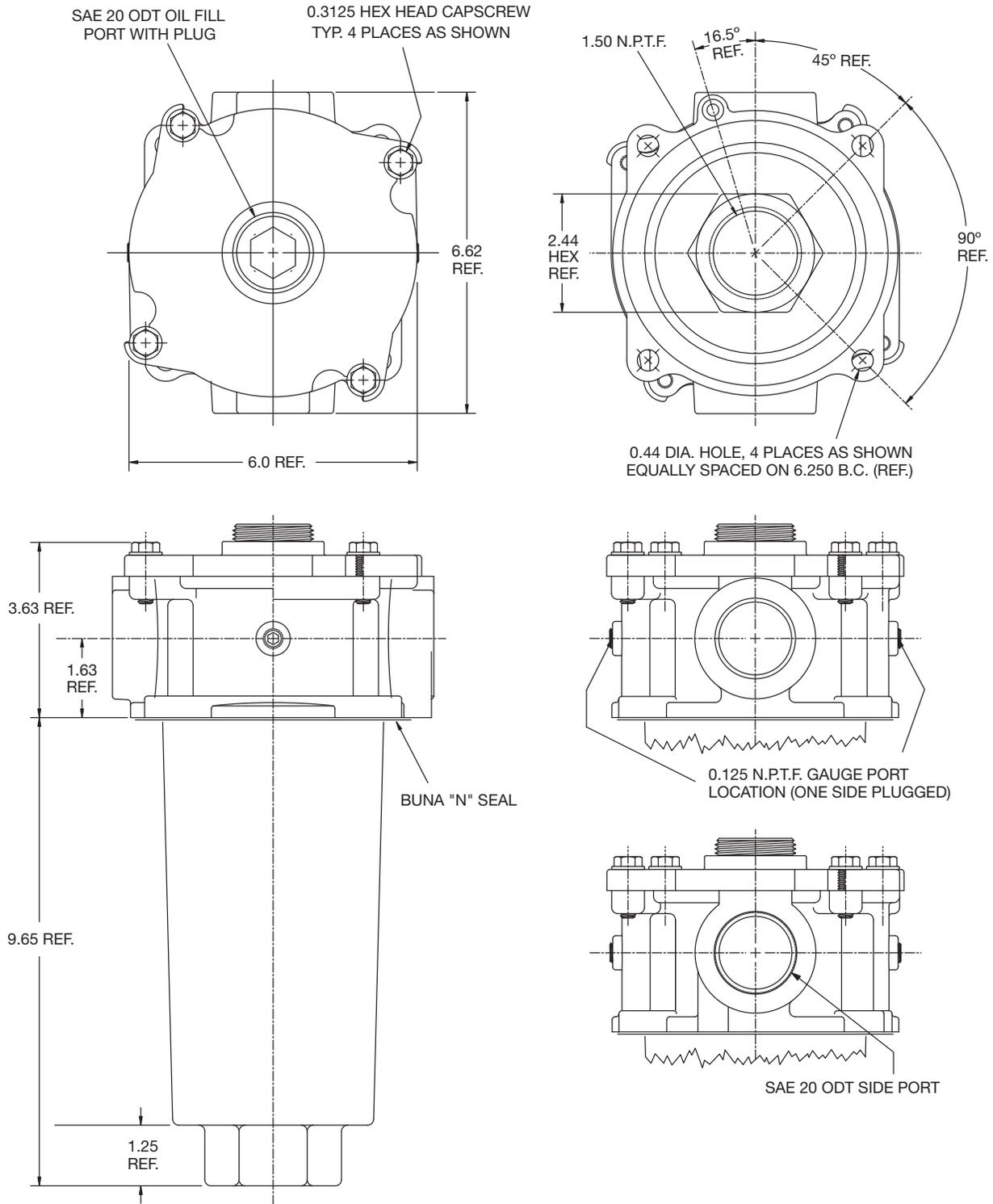


LARGE AND MEDIUM ENCLOSURE FOR MANIFOLD WITHOUT TANK



MEDIUM/LARGE RETURN LINE FILTER

PART NO.: TRLF503



- **FLOW CAPACITY:** 120 gpm (return) 35 gpm (suction)
- **PRESSURE:** 100 psi maximum operating.
- **WARNING:** 80 psi max. Without by-pass valve.
- **TEMPERATURE:** -65° to +250° F.
- **APPLICATION:** Petroleum based fluid only. Consult factory for synthetic fluids.

TROUBLESHOOTING JOYSTICK FAULTS

PROBLEM	CAUSE & SOLUTION
<p>During joystick operation the Control Panel labels for PLOW, DUMP, ETC. jump and/or flash.</p>	<p>This indicates a possible open or short circuit condition in a valve connection.</p> <ol style="list-style-type: none"> 1. Unplug the joystick from the Control Panel and operate the system using the Arrowed Buttons. The system error displays are easier to follow from this method of operation. 2. Follow the troubleshooting guideline for Arrowed Button Faults. (Page 88)
<p>Joystick operation seems intermittent or unpredictable.</p>	<p>Proper operation of the joystick requires that the “deadman” trigger switch be (1) depressed at neutral position and (2) held throughout the stroke of the handle. Releasing the “deadman” trigger after stroking the handle requires returning to neutral.</p>
<p>Cannot select Plow, Dump, etc.</p>	<p>Equipment selection on the joystick handle buttons can only be done with the joystick in neutral.</p>
<p>Joystick operation does not have good proportional speed control on the cylinders.</p>	<p>This is likely an adjustment issue in the Program Menu. There are (Lo) settings for the Plow lift and angle and another for the Dump. There also are (dr) settings for each. The (Lo) settings establish the cylinder speed when the joystick is just off center. The (dr) settings establish the cylinder speed when the joystick is at maximum deflection. Be sure the settings are not too close in value to each other (Lo) and (dr). Also be sure the (dr) settings are not too high (i.e. above 85). Flow to the cylinders is typically at maximum at 80. Higher numbers result in wasting joystick resolution.</p>



TRUBLESHOOTING

HYDRAULIC FAULTS

PROBLEM	CAUSE & SOLUTION
<p>NO HYDRAULIC OPERATIONS.</p>	<p>Test all functions. Observe the pressure gauge on the manifold.</p> <p>FOR GEAR PUMP OPERATIONS:</p> <ol style="list-style-type: none"> 1. Be sure the Unloader is enabled in the Program Menu. 2. The installed pressure gauge reads the load pressure. Install a second pressure gauge in the port stamped PGP. This reads the pump pressure. 3. If the Unloader is equipped with a manual override – engage it. The pump pressure should now be 250-300 PSI. If there is no override, attempt to operate a cylinder or spreader function. The pump pressure should be 250-300 PSI even if the cylinder or motor does not operate. 4. Replace the Unloader cartridge valve if there is no pressure in steps above. <p>FOR PISTON PUMP OPERATIONS:</p> <ol style="list-style-type: none"> 1. The installed pressure gauge reads the load pressure. Install a second pressure gauge in the port stamped PGP. This reads the pump pressure. 2. The pump pressure should be 250-300 PSI without operating anything. If not, check the pump’s control valve adjustment. 3. If the pump standby pressure is okay observe there is a load pressure on the other gauge when attempting an operation. 4. Make sure the (dr) setting for a Plow or Dump operation is not set too low (not below 30) in the Program Menu.
<p>PLOW WILL NOT LOWER.</p>	<p>Be sure the Program Menu setting for the plow cylinder type is set for double-acting. This is required even if the cylinder is single-acting because pressure is required to unlock the load-holding valves.</p> <p>If this is a Medium or Large size system it could be equipped with a counter-balance valve on the Plow circuit. Follow the directions elsewhere in this manual for proper adjustment. An improperly adjusted counter-balance valve will prevent the cylinder from draining.</p>
<p>PLOW LOWERING IS VERY SLOW.</p>	<p>If this is a Medium or Large size system it could be equipped with a counter-balance valve on the Plow circuit. Follow the directions elsewhere in this manual for proper adjustment. An improperly adjusted counter-balance valve will prevent the cylinder from draining.</p>



TROUBLESHOOTING

HYDRAULIC FAULTS

PROBLEM	CAUSE & SOLUTION
DUMP WILL NOT LOWER.	<p>Be sure the Program Menu setting for the dump cylinder type is set for double-acting. This is required even if the cylinder is single-acting because pressure is required to unlock the load-holding valves.</p> <p>If this is a Medium or Large size system it could be equipped with a counter-balance valve on the Dump circuit. Follow the directions elsewhere in this manual for proper adjustment. An improperly adjusted counter-balance valve will prevent the cylinder from draining.</p>
DUMP LOWERING IS VERY SLOW	<p>If this is a Medium or Large size system it could be equipped with a counter-balance valve on the Dump circuit. Follow the directions elsewhere in this manual for proper adjustment. An improperly adjusted counter-balance valve will prevent the cylinder from draining.</p>



TROUBLESHOOTING

CONTROL PANEL– ARROWED CYLINDER BUTTON FAULTS

PROBLEM	CAUSE & SOLUTION
<p>Arrowed cylinder buttons light red when the Control Panel powers up. No operation.</p>	<p>Depress the Plow Up & Down buttons simultaneously and hold for 5 seconds. The buttons will all turn green and operations will be restored. Repeat to turn operations off. See Operations and Programming Guide for this feature.</p>
<p>Arrowed cylinder buttons light green but do not turn red when depressed. No operation. Spreader will not turn on.</p>	<p>No “NETWORK” communication with the Primary Module.</p> <ol style="list-style-type: none"> 1. Recycle power to the system. 2. Check power/ground to the Primary Module. 3. Power & Ground for the Panel and Modules should be connected to same point. 4. Replace Primary Module and/or Control Panel.
<p>An arrowed cylinder button alternately flashes red and green when depressed. The Control Panel also beeps.</p>	<p>This indicates a possible open or short condition on the (EH) pilot solenoid for the function showing the fault display (see diagram page).</p> <ol style="list-style-type: none"> 1. A connector in the valve enclosure could be unplugged. 2. Try lowering the Program Menu (dr) setting for that function. Overdriving it can give an erroneous short. 3. Temporarily move the connection from the (EH) valve and connect to another. With the engine off try the cylinder button. Replace the (EH) valve if the problem disappeared. 4. Replace the Secondary Module.
<p>All arrowed cylinder buttons alternately flash red and green when any one button is depressed.</p>	<p>This indicates a possible open or short on the Unloader solenoid (SV1) or the Cylinder Flow Divider (PV1) (see diagram page).</p> <ol style="list-style-type: none"> 1. A connector in the valve enclosure could be unplugged. 2. If your system has (SV1) replaced with a cavity plug make sure the Program Menu setting for the Unloader function is disabled (see Operation and Programming Guide). 3. If your system has (SV1), temporarily disable it in the Program Menu and retry the Control Panel with the engine off. If the fault is gone replace the coil on (SV1) and re-enable the Unloader function in the Program Menu. 4. Replace the coil on (PV1). 5. Replace the Primary Module.
<p>The Plow Down button lights red and remains until Plow Raise is depressed.</p>	<p>Later model systems have a Plow Float provision in the controls. If the Plow Down operation is initiated twice within 5 seconds the Plow Down button will light red to indicate Plow Float. Raising the plow cancels it.</p>

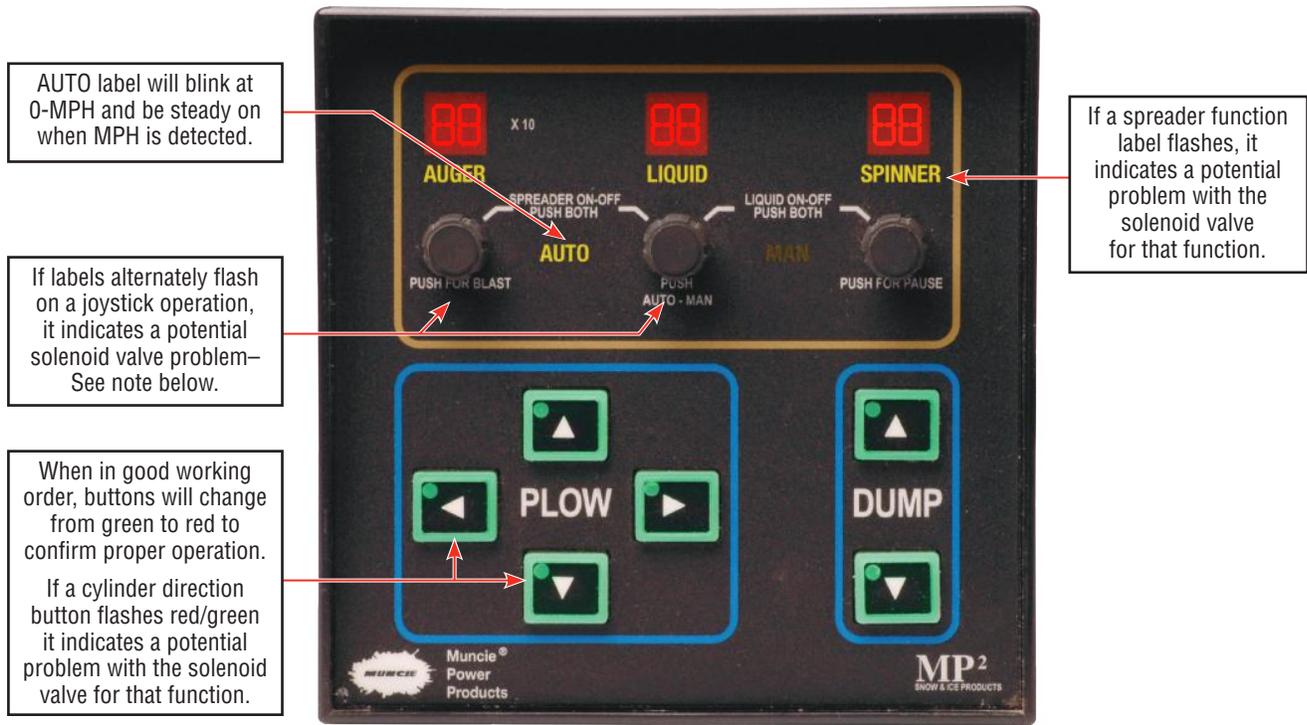
TROUBLESHOOTING

CONTROL PANEL – SPREADER CONTROL FAULTS

PROBLEM	CAUSE & SOLUTION
<p>AUTO Mode does not function.</p>	<p>The AUTO label will blink continuously if the truck is stopped or if there is no detected vehicle speed by the system.</p> <p>AUTO will not allow an Auger/Conveyor output when the AUTO label is blinking. The AUTO label will light steady when the system detects a speedometer signal.</p> <ol style="list-style-type: none"> 1. Check the speedometer connection to the system. 2. Check the speedometer input setting and the speedometer matching in the Control Panel Programming Menu.
<p>The AUGER and/or SPINNER label flashes and operation ceases.</p>	<p>This indicates a possible open or short condition at the solenoid valve for the Auger or Spinner function.</p> <ol style="list-style-type: none"> 1. A connector could be unplugged on the Auger and/or Spinner valve. 2. Try raising the Program Menu (Lo) setting for the Auger and/or Spinner. This is especially important if these values are below 15. A very low setting can mimic an “open” circuit fault. 3. Try lowering the Program Menu (Hi) setting for the Auger and/or Spinner. This is especially important if the values are above 85. A very high setting can mimic a “short” circuit fault. The valves are typically full open at a setting of 80. 4. Power and ground connections for the Control Panel and valve Modules should be checked for solid mechanical connection. Even a momentary interruption of power can cause the internal microprocessors to reset.
<p>The LIQUID label flashes and operation ceases.</p>	<p>This indicates a potential open or short circuit condition for the LIQUID Pre-wetting drive.</p> <ol style="list-style-type: none"> 1. A connector in the valve enclosure could be unplugged. 2. Try raising the Program Menu (Lo) setting for the Liquid. This is especially important if the value is below 15. A very low setting can mimic an “open” circuit fault. 3. Try lowering the Program Menu (Hi) setting for the Liquid. This is especially important if the value is higher than 85. A very high setting can mimic a “short” circuit fault. 4. Electric pumps are often equipped with integral pressure switches attached. These switches will open the electrical drive to the pump motor if the discharge pressure exceeds 40 PSI. When this occurs, the system will detect an “open” circuit fault.



TROUBLESHOOTING CONTROL PANEL ERROR INDICATORS



DISPLAY	CAUSE
Cylinder buttons light red on power up and do not work.	Cylinder functions are turned off. Restore by pressing the Plow Raise & Lower buttons for 5 seconds.
Cylinder buttons light green but do not turn red when pressed and no operations.	Primary Module is unplugged, lost power, or ground has failed. Try recycling power to the system first.
All cylinder buttons flash red and green when any one function is depressed.	Potential open or short in the Unloader Valve or Flow Divider Valve.
A cylinder button flashes red and green but other buttons work okay.	Potential open or short in the solenoid for that function.
An Auger, Spinner or Liquid label flashes and the function fails to work.	Potential open or short in the solenoid for that function.
The Plow, Dump and/or Scraper labels flash alternately upon a joystick operation.	Potential open or short in the solenoid valve.

NOTE: If the joystick operation is at issue, please unplug it the back of the panel and try the system using only the buttons. You will need to turn power off and back on to do this. The buttons make it easier to diagnose problems.



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