

## TROUBLESHOOTING

TROUBLESHOOTING .....	63
Troubleshooting Chart .....	64
Y-Strainer Cleaning .....	66
Inlet Strainer Cleaning .....	66
Swapping Components .....	67
Fuses .....	67
Nozzle Valves .....	68
Pressure Sensor Input Power Check .....	71
Pressure Sensor Signal Test .....	72
Commander Master Flow Module .....	73
N-Ject Flow Meter Module .....	73
Rate Controller Flow Meter Calibration .....	76
Field Check .....	77
Rate Controller .....	77
SERIAL SETUP AND DIAGNOSTICS .....	78
SCHEMATICS .....	79
3 - SECTION SHUTOFF ELECTRICAL SCHEMATICS .....	80
6 - SECTION SHUTOFF ELECTRICAL SCHEMATICS .....	82
9 - SECTION SHUTOFF ELECTRICAL SCHEMATICS .....	84
DUAL MANIFOLD 3 - SECTION (24 VALVE) .....	86
DUAL MANIFOLD 6 - SECTION (24 VALVE) .....	88
DUAL MANIFOLD 9 - SECTION (36 VALVE) .....	90
ELECTRICAL DIAGRAM (N-JECT 9 SECTION) .....	92
ELECTRICAL SCHEMATIC .....	93

## TROUBLESHOOTING

### CAUTION

Instructions are necessary before operating or servicing system. Read and understand the Instruction Manual. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.

### DANGER

Anhydrous Ammonia (NH<sub>3</sub>) is extremely hazardous and can cause death and/or personal injury. Review the safety requirements for handling and application of NH<sub>3</sub> with your NH<sub>3</sub> supplier.

### DANGER

Always bleed the N-Ject System completely before performing service or repairs. Use extreme caution when bleeding the N-Ject System to prevent inhalation of the NH<sub>3</sub> vapor or NH<sub>3</sub> contact with the skin or eyes. Always wear PPE when bleeding the system.

**NOTE:** Before performing any service or maintenance to the N-Ject system the N-Ject system must be drained and vented of all NH<sub>3</sub>.

See N-Ject System Venting And Draining on page 57.

### DANGER

Use extreme caution when bleeding the N-Ject system to prevent any ammonia vapor inhalation or any ammonia contact with the skin or eyes.

### DANGER

Even though the N-Ject manifold has been properly vented and drained there is always a chance that some ammonia remains. Always be alert for signs of ammonia when servicing the N-Ject system.

### DANGER



Anhydrous Ammonia (NH<sub>3</sub>) vapors can cause death. Do not breathe vapors. Wear appropriate respirator rated for NH<sub>3</sub>.

**TROUBLESHOOTING CONT.**

**Troubleshooting Chart**

Use the following troubleshooting chart to locate and correct problems which most often occur with the N-Ject System.

<b>PROBLEM</b>	<b>CAUSE</b>	<b>CORRECTION</b>	
Under application.	Plugged nozzle valves	Clean or replace nozzle valves	
	Plugged filter(s)	Clean or replace filter(s)	
	Filter(s) not installed correctly	Check all filters for correct installation	
	Plugged, kinked or collapsed hoses	Check all hoses and replace as needed	
	Product supply valve not fully open	Open supply valve fully	
	Outrunning system capability	Slow down	
		Run at optimum pressure (not too low, not too high)	
	Incorrect rate settings	Check and adjust rate settings	
	Incorrect calibration settings	Check and adjust settings	
	Faulty radar	Replace radar	
	Poor GPS satellite signal	Verify that the GPS is working correctly	
	Flowmeter cal # incorrect	Check flowmeter calibration	
	Faulty flowmeter	Repair or replace the flowmeter	
Servo valve not working correctly	Check servo valve and replace if needed		
Over application	Worn nozzle valves	Replace nozzle valves	
	Speed too slow	Increase speed	
	Incorrect rate settings	Check and adjust rate settings	
	Incorrect calibration settings	Check and adjust settings	
	Flowmeter cal # incorrect	Check flowmeter calibration	
	Faulty flowmeter	Repair or replace flowmeter	
Rate instability.	Low voltage to rate controller	Test voltage and repair as needed	
	Faulty flow meter	Check flow meter and replace if needed	
	Faulty speed sensor reading	Check radar and replace if needed	
	Collapsed suction hose	Replace suction hose	
	Inlet plugged	Check and clean inlet if needed	
	Incorrect valve calibration settings	Check and adjust settings (See the rate controller's manual)	
	Faulty rate controller.	Replace rate controller.	

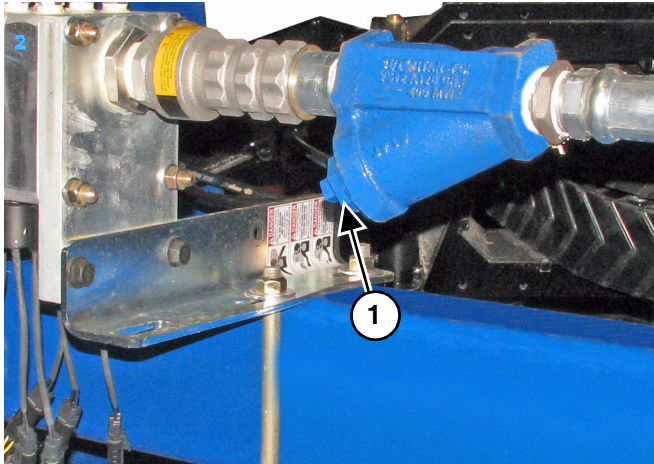
**TROUBLESHOOTING CONT.**

PROBLEM	CAUSE	CORRECTION
Pressure instability	Faulty rate controller	Replace rate controller
	Worn or sticky nozzle valves	Check and replace nozzle valves as needed
	Incorrect valve calibration settings	Check and adjust settings. (See the rate controller's manual)
	Faulty pressure sensor	Replace pressure sensor
N-Ject sections will not apply NH <sub>3</sub>	Blown fuse at battery	Check fuse at battery
	Blown fuses at electronic flow control module	Check fuses at electronic modules
	Faulty N-Ject Cab Control	Replace N-ject Cab Control
	Faulty rate controller	Repair or replace rate controller
N-Ject section will not apply NH <sub>3</sub>	Faulty or damaged harness	Repair or replace harness
	Faulty section switch	Replace switch
	Blown fuse at electronic flow control module	Check fuses at electronic modules
	Rate controller not activating section	Verify N-Ject section signal on manifold Repair or replace rate controller components
Single nozzle leaks when shutoff	Orifice is lodged with debris	Clean nozzle valve See Nozzle Valve Cleaning on page 69
	Orifice is worn	Replace valve body See Nozzle Valve Cleaning on page 69
	Plunger is lodged with debris	Clean nozzle valve See Nozzle Valve Cleaning on page 69
	Plunger is worn	Replace plunger See Plunger Inspection on page 69
	O-ring pinched or broken	Replace O-ring
Single nozzle valve operates erratically	Nozzle valve is faulty	Replace nozzle valve
Single nozzle valve will not shut off	Orifice is lodged with debris	Clean nozzle valve See Nozzle Valve Cleaning on page 69
	O-ring pinched or broken	Replace O-ring
	Plunger is lodged with debris	Clean nozzle valve See Nozzle Valve Cleaning on page 69
	Plunger is worn	Replace plunger. See Plunger Inspection on page 69

**TROUBLESHOOTING CONT.**

**Y-Strainer Cleaning**

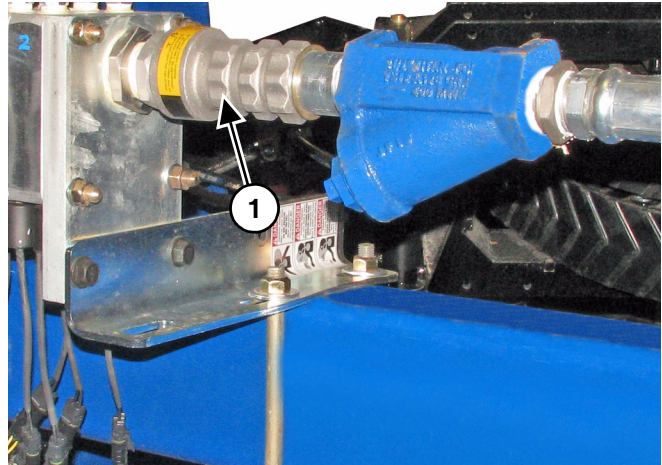
**Figure 37**



Remove the plug (Item 1) [Figure 37] remove the screen and magnet from the Y-strainer housing. Wash the screen with water to clean the debris from the screen. Replace the screen if damaged.

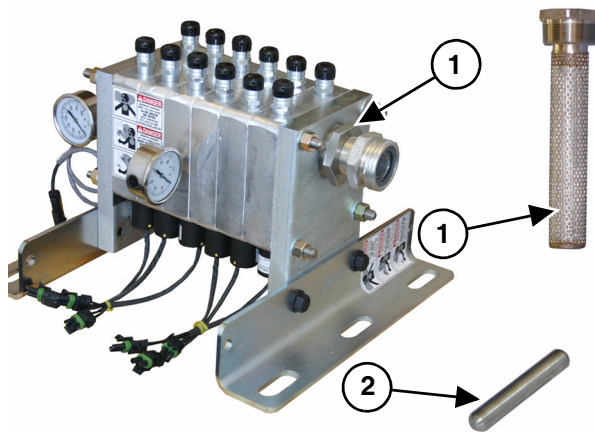
**Inlet Strainer Cleaning**

**Figure 38**



Disconnect the Y-strainer assembly from the N-Ject manifold (Item 1) [Figure 38].

**Figure 39**



Remove the strainer (Item 1) and magnet (Item 2) [Figure 39] from the N-Ject manifold. Wash the strainer with water to clean the debris from the screen. Replace the screen if damaged.

**TROUBLESHOOTING CONT.**

**Swapping Components**

N-Ject systems are comprised of a number of components. Some of these components are used in multiples. Components with multiple usage are:

- Nozzle Valves.
- Extension Harnesses.
- Electronic Control Modules.

When troubleshooting failed components, it can be helpful to swap the failed part with a working part at another location. If the problem follows the failed part to the new location, repair or replace the failed part.

If the problem does not follow the failed part, then the problem is likely elsewhere in the system and other troubleshooting means may be followed.

**NOTE: Use caution when swapping failed components as in rare cases the failed component may cause other components to fail at the new location.**

**Fuses**

FUSE LOCATION	RATING	TYPE	COLOR
Battery Power Harness	30 Amp	ATO/ATC	Green
Flow Control Module	10 Amp	BUSS	NA

Blown fuses are indicators of a short or overload condition. Therefore, never replace a fuse with a larger fuse. Larger fuses may result in costly component failures.

- The battery power harness fuse is located on the power harness at the tractors battery.
- The flow control module contains three 10 amp fuses for the N-Ject sections.

**NOTE: If the tractor is to be jump started or welded on, always remove the 30 amp fuse near the battery to protect the N-Ject system electronics.**

## TROUBLESHOOTING CONT.

### Nozzle Valves

Plugged nozzle valves can be classified into two categories:

- Plunger blockage.
- Plunger stuck.

Plunger blockage results when larger debris catches between the orifice and plunger seal. This is the smallest flow passage within the nozzle valve.

Stuck plungers result when smaller debris collects around the barrel of the plunger and binds the plunger in place.

Symptoms of a blocked or stuck plunger are:

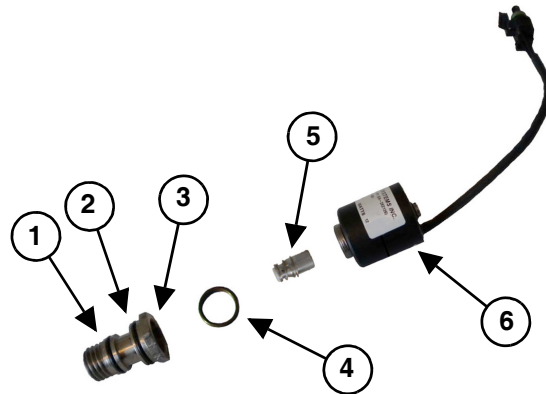
- Constant application.
- Leaking when the nozzle valve is shut off.

**NOTE: Pinched or split O-rings will also cause nozzles to leak when shutoff.**

**NOTE: Operating a plugged nozzle valve for extended periods of time may result in a nozzle valve coil failure. Clean any plugged nozzle valves immediately.**

**NOTE: If plugged nozzles are a frequent problem in a particular N-Ject section, inspect the N-Ject system filter screens for plugged or damaged screens. An 80 mesh screen is recommended to prevent nozzles from plugging. Check the mesh size of the strainers and replace strainers if they are too coarse.**

Figure 40



Nozzle component identification [Figure 40].

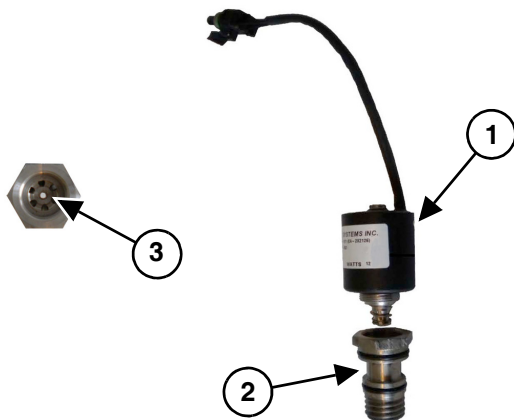
ITEM	DESCRIPTION
1	O-ring
2	O-ring
3	Valve Body
4	O-ring
5	Plunger
6	Coil

## TROUBLESHOOTING CONT.

### Nozzle Valves Cont.

#### Nozzle Valve Cleaning

Figure 41



Remove the coil (Item 1) by unscrewing the coil from the valve body (Item 2) [Figure 41].

Inspect the valve body (Item 2). Make sure the orifice (Item 3) [Figure 41] is not plugged with debris, worn or damaged. If orifice is worn or damaged replace valve body.

**NOTE: Remove debris from nozzle components by washing components with clean water.**

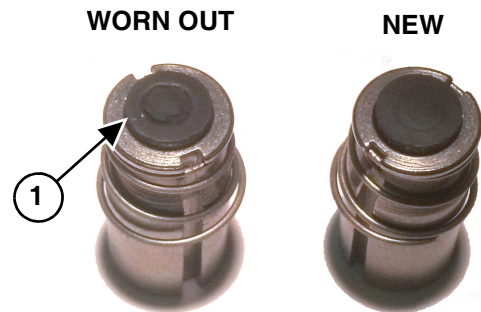
Figure 42



Remove the plunger (Item 1) [Figure 42] from the coil. Inspect the plunger for wear or damage.

#### Plunger Inspection

Figure 43



After extended use the soft plunger seal (Item 1) [Figure 43] will wear a groove where the seal impacts the hard orifice seat. Replace plunger if worn or damaged.

As the groove deepens the pressure capacity of the valve will decrease, until the pressure capacity interferes with the operating pressure of the N-Ject system.

The result is erratic pulsing, often described as “flickering”. The N-Ject system will operate normally at lower pressures until replacement parts can be acquired. High operating pressures and abrasive chemicals will accelerate the wear of the plunger seal material.

- Clean the connector terminals
- Replace coil



## TROUBLESHOOTING CONT.

### Nozzle Valves Cont.

#### Coil Failure

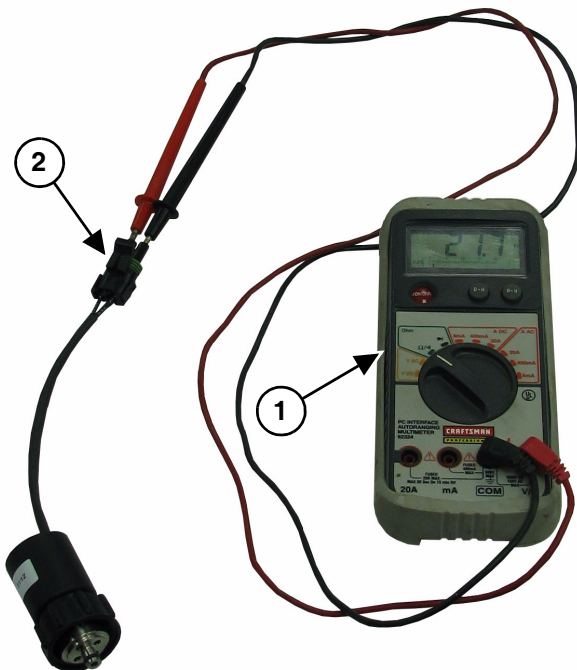
Coil failures are often the result of:

- Extended valve use with a plugged nozzle.
- Extended use in corrosive environments.

**NOTE: Capstan recommends washing the outside of the coils with clean water on a regular basis.**

Disconnect the nozzle valve from the harness (2-Pin Packard connector) located near the N-Ject manifold.

**Figure 44**



Use a voltmeter (Item 1) [Figure 44] to measure 21 to 23.5 ohms of resistance across pins A and B on the nozzle valve connector.

If proper resistance is not found:

- Clean the connector terminals.
- Replace the coil.

Coil failures are often the result of two factors:

1. Extended valve use with a plugged plunger.
2. Extended use in corrosive environments.

Capstan recommends cleaning any plugged nozzle valves immediately. Capstan also recommends rinsing the N-Ject manifold with clean water and washing the outside of the coils with clean water as often as practical.

If the N-Ject system is not operating properly:

- Check fuses.
- Perform system voltage checks.

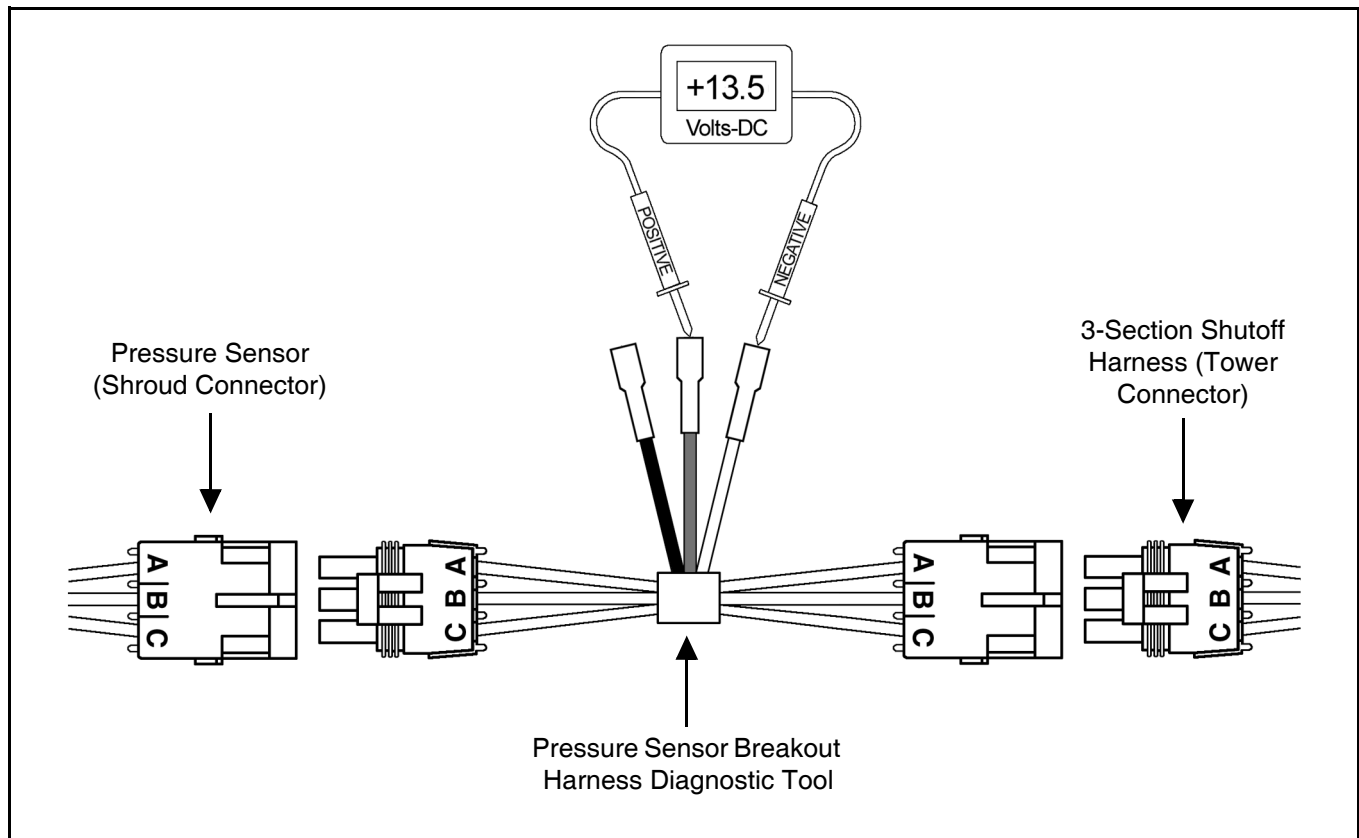
## TROUBLESHOOTING CONT.

### Pressure Sensor Input Power Check

**NOTE:** Perform the following tests on both the inlet and outlet pressure sensors.

Disconnect the pressure sensor 3-pin connector from the 3-section shutoff harness, and then insert the Capstan pressure sensor breakout harness diagnostic tool.

Figure 45



Use a voltmeter to observe that there is 13.5 vdc between the White and Red wire on the pressure sensor breakout harness with the engine running, or 12.0 vdc without the engine running [Figure 45].

Be sure the polarity is accurate by observing that there is positive voltage when the Red (positive) probe is connected to Red pressure sensor breakout harness wire and the Black (negative) probe is connected to White pressure sensor breakout harness wire.

If no voltage is present:

- Check the fuse located at the battery.
- Check the battery connections.
- Check the condition of the battery.
- Check the condition of the alternator.

## TROUBLESHOOTING CONT.

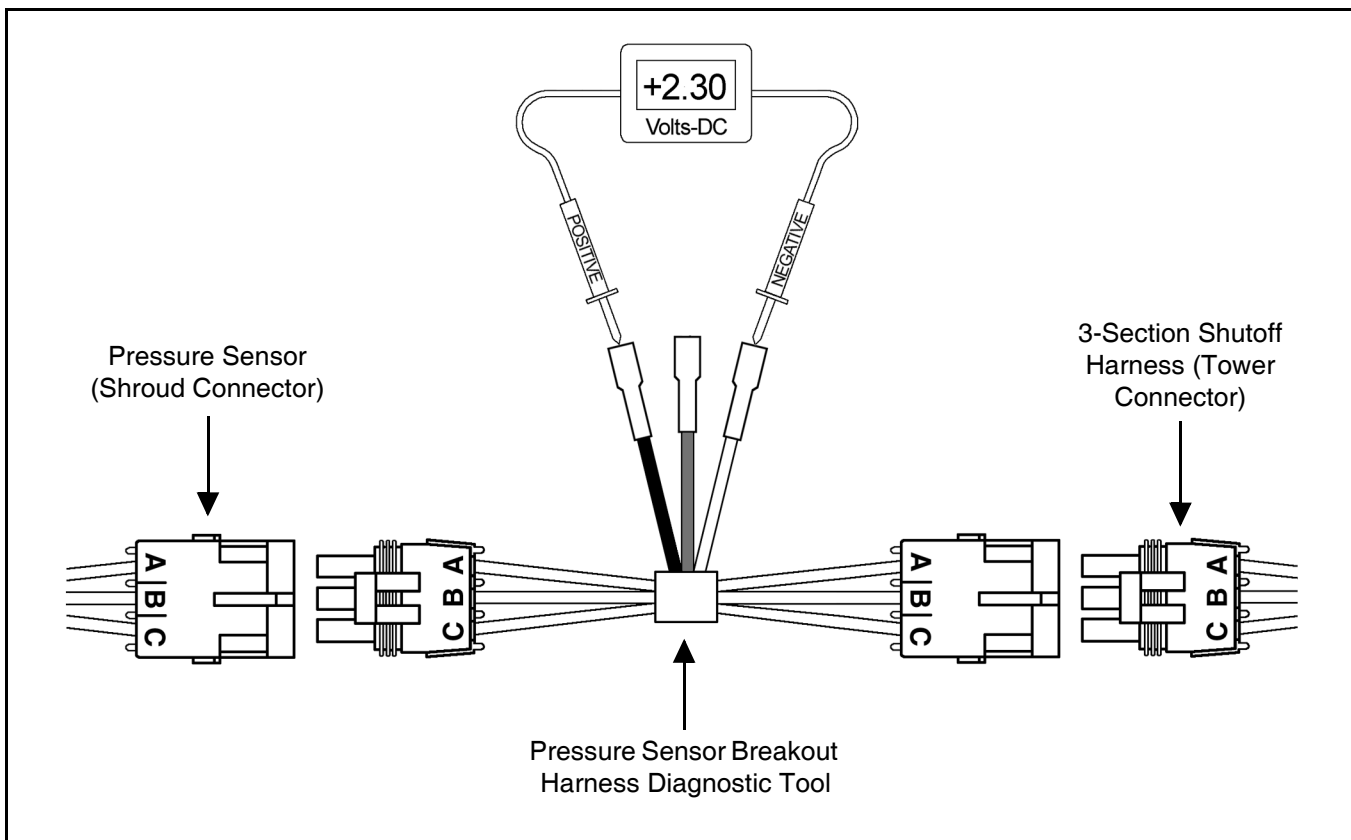
### Pressure Sensor Signal Test

**NOTE: Perform the following tests on both the inlet and outlet pressure sensors.**

Disconnect the pressure sensor 3-pin connector from the 3-section shutoff harness and then insert the pressure sensor breakout harness diagnostic tool.

With the engine running and the N-Ject system turned on, use the rate controller to establish 40 PSI on the pressure gauge.

**Figure 46**



Use a voltmeter to observe that there is 2.30 vdc between the Black and White wire on the pressure sensor breakout harness [Figure 46].

Using the rate controller, adjust the pressure. Increasing the pressure should result into a higher output signal on the voltmeter (up to 5.0 vds at 100 PSI). Decreasing the pressure should result in a lower output signal (down to 0.5 at 0 PSI).

If accurate voltage is not present:

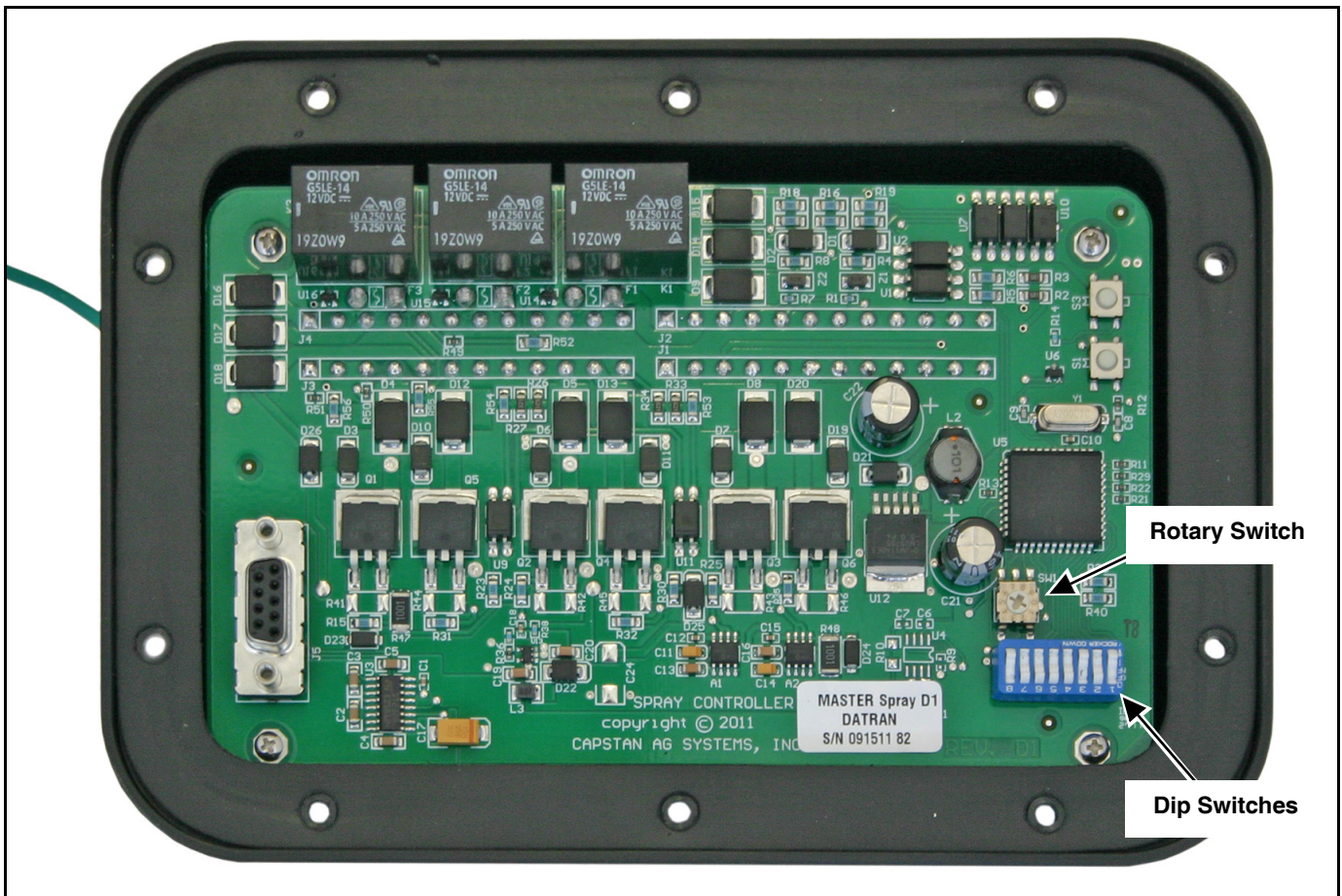
- Verify the accuracy of the pressure gauge.
- Check for power to the pressure sensor. See Pressure Sensor Input Power Check on page 71.
- Replace the pressure sensor.

**TROUBLESHOOTING CONT.**

**Commander Master Flow Module**

To access the master flow module circuit board [Figure 47], remove the enclosure cover and remove the cover from the master flow module.

**Figure 47**



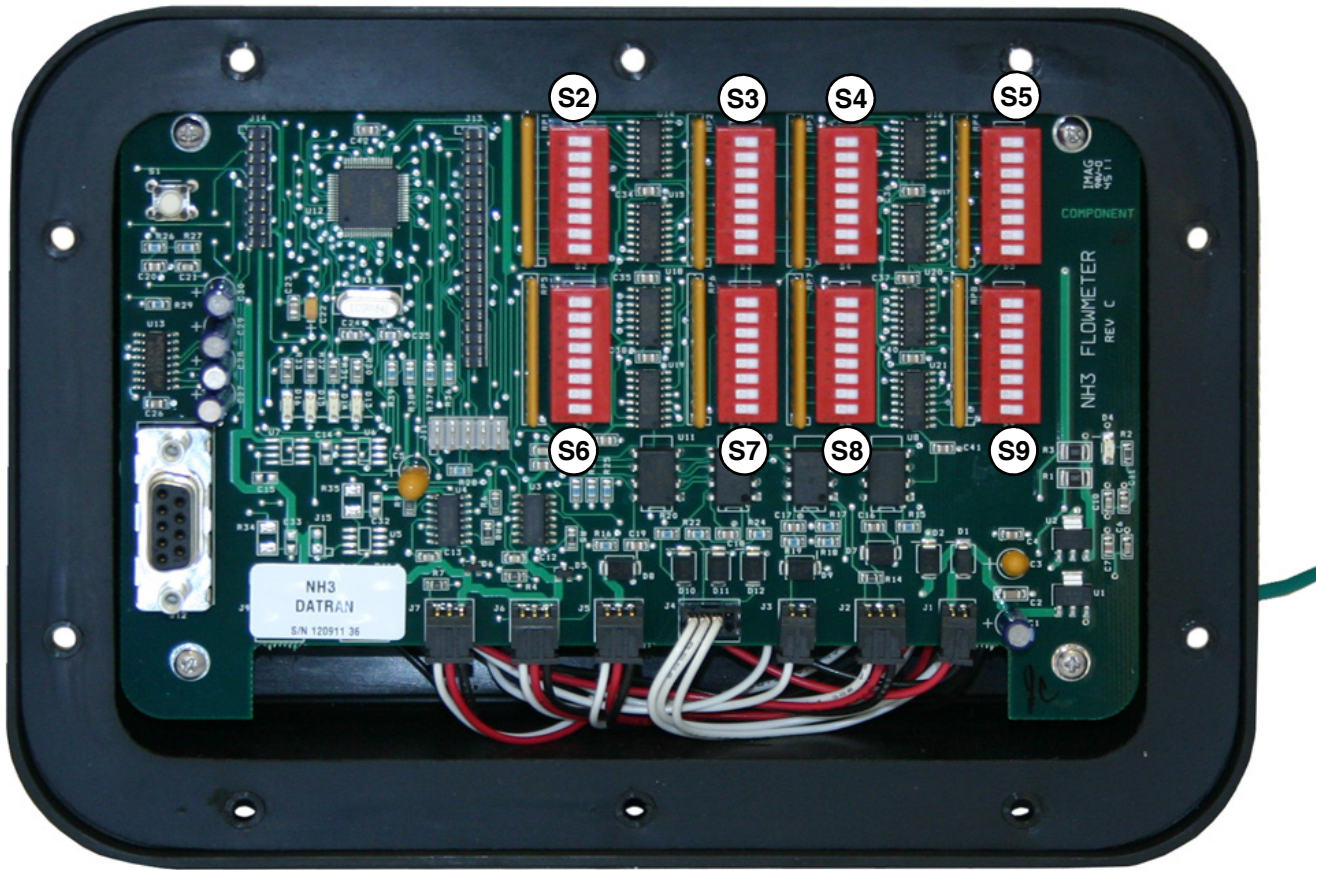
Dip Switch	1	2	3	4	5	6	7	8	
	Mode	Freq.	Min. DC	Display	Not Used	Not Used	Servo	Resistor	
ON	Master	3 Hz	10%	OFF			PWM	Enable	
OFF	Slave	10 Hz	0%	ON			Bipolar	Disable	
Rotary Switch - Response Time									
Position	0	1	2	3	4	5	6	7	
Response	1 sec	2 sec	3 sec	4 sec	6 sec	8 sec	10 sec	12 sec	
Default Settings	DS #1	DS #2	DS #3	DS #4	DS #5	DS #6	DS #7	DS #8	Rotary Switch
Master	ON	OFF	ON	OFF	OFF	OFF	OFF	ON	Position 3
Slave	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	Position 3
N-Ject	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	Position 4

**TROUBLESHOOTING CONT.**

**N-Ject Flow Meter Module**

To access the N-Ject flow meter module circuit board [Figure 48], remove the enclosure cover and remove the cover from the N-Ject flow meter module.

Figure 48



Eight banks of Dip switches are located on N-Ject flow meter module circuit board [Figure 48]. The Dip switch banks are labeled S2, S3, S4, S5, S6, S7, S8 and S9 on the circuit board.

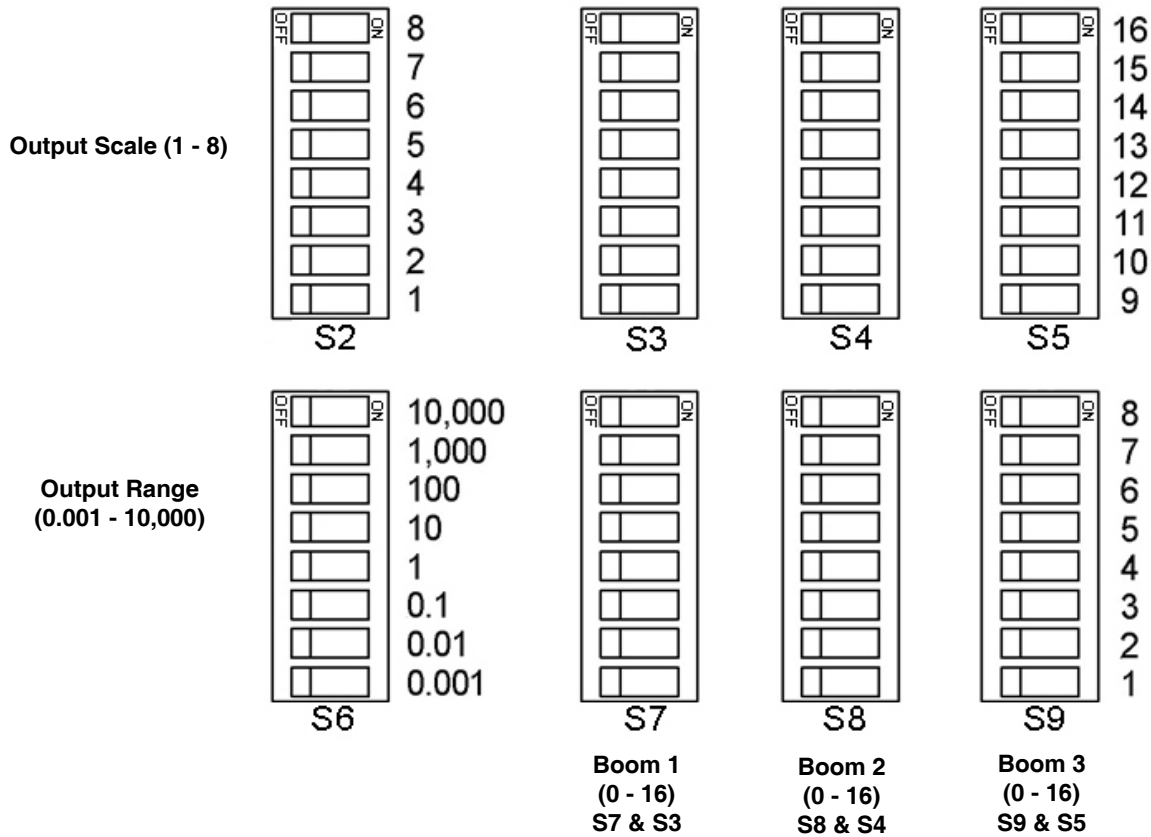
**TROUBLESHOOTING CONT.**

**N-Ject Flow Meter Module Cont.**

*N-Ject Section Configuration*

**NOTE:** The number of valves used on each boom section must be indicated by flipping one switch “ON” for each valve.

**Figure 49**



**Example:** Boom section one, if there are six valves used, turn on #1 thru #6 DIP switches on S7 [Figure 49].

**Example:** Boom section one, if there are twelve valves used, turn on #1 thru #8 DIP switches on S7 and turn on #9 thru #12 DIP switches on S3 [Figure 49].

**NOTE:** If using side dress application with 1/2 rate valves on the end rows. Flip two DIP switches on for each full rate valve, and flip one DIP switch on for each half rate valve. Then use half the multiplication value to make up for double flipped shutoff settings.

**TROUBLESHOOTING CONT.**

**Flow Meter Module Cont.**

*Output Multiplication*

Rate controllers require the flow meter signals to be within a range of frequencies. For example Raven controllers may not exceed 500 Hz. Use the following chart to determine the multiplication factor required.

**Figure 50**

			Flowmeter Output Frequency for the Following Parameters:							
			100 % PWM		1 knives			125 psi		
			Scale Multiplier							
			S2 #1	S2 #2	S2 #3	S2 #4	S2 #5	S2 #6	S2 #7	S2 #8
			1	2	3	4	5	6	7	8
Range Multiplier	S6 #1	0.001	1	1	2	2	3	3	4	4
	S6 #2	0.010	5	10	15	20	26	31	36	41
	S6 #3	0.100	51	102	154	205	256	307	358	410
	S6 #4	1.000	512	1024	1536	2048	2561	3073	3585	4097
	S6 #5	10.00	5121	10242	15363	20485	25606	30727	35848	40969
	S6 #6	100.0	51211	102423	153634	204846	256057	307269	358480	409691
	S6 #7	1000.0	512114	1024229	1536343	2048457	2560571	3072686	3584800	4096914
	S6 #8	10000.0	5121143	10242286	15363428	20484571	25605714	30726857	35848000	40969143

This chart is for one valve, so multiply the output value by the total number of section DIP switches turned on. For example, a 12 row toolbar with four valves on each section, multiply by 12.

For a Raven controller that cannot exceed 500 Hz, choose a output multiplier that will restrict the flow meter output to less than 500 Hz. For a 12 row toolbar divide 500 by 12, for an output frequency of 42. Since S2 #8 and S6 #2 give us an output frequency of 41, this is a good choice.

**Rate Controller Flow Meter Calibration**

The rate controller must be calibrated to convert the Flow Meter Modules output frequency into an actual flow value in #N of actual ammonia per minute. There are two simple ways of calibrating the rate controller.

Capstan has developed spreadsheets for popular rate controllers that will give a starting flow meter calibration number. One example of this spreadsheet is as follows:

**Figure 51**

Initial "Meter Cal" for Raven Controller with Ultra-Flow 5/32" Orifice Valve (125 psi Capacity)										
			Scale Multiplier							
			S2 #1	S2 #2	S2 #3	S2 #4	S2 #5	S2 #6	S2 #7	S2 #8
			1	2	3	4	5	6	7	8
Range Multiplier	S6 #1	0.001	32	63	95	127	159	190	222	254
	S6 #2	0.010	317	635	952	1269	1587	1904	2222	2539
	S6 #3	0.100	3174	6347	9521	12694	15868	19042	22215	25389
	S6 #4	1.000	31736	63472	95208	126945	158681	190417	222153	253889
	S6 #5	10.00	317361	634723	952084	1269446	1586807	1904169	2221530	2538892
	S6 #6	100.0	3173614	6347229	9520843	12694458	15868072	19041687	22215301	25388916
	S6 #7	1000.0	31736145	63472289	95208434	126944578	158680723	190416867	222153012	253889157
	S6 #8	10000.0	317361446	634722892	952084337	1269445783	1586807229	1904168675	2221530120	2538891566

In the previous example, S2 #8 and S6 #2 were selected for flow meter output multiplication. The above chart for a Raven controller with Capstan's 5/32" orifice nozzle valve gives a starting flow meter calibration number of 2539.

## TROUBLESHOOTING CONT.

### Field Check

**NOTE: It is very important to weigh the first tank of ammonia to be sure the calibration is correct.**

When using the numbers in the chart on page 76 [Figure 51], you will usually under apply by 10% to 20%. If the first tank is 15% too low, then adjust the calibration number as per the rate controller manufacturer's instructions.

**NOTE: Keep a close eye on tank weights as you work. Tank weight errors are an indication that something is wrong in the N-Ject system.**

### Rate Controller

See your rate controllers manual for troubleshooting the rate controller.



## SERIAL SETUP AND DIAGNOSTICS

Accessing information from the N-Ject flow meter module serial port is easily done using a computer with a terminal emulator program.

Information is accessed by selecting: Start => Accessories => Communications => **HyperTerminal**.

**Figure 52**



Connect the computer to the N-Ject flow meter module serial port (Item 1) [Figure 52] using a male to female DB9 cable.

**NOTE:** These cables are commonly found in computer supply stores and come in various lengths.

Set up the emulator and communication information as follows:

### SET-UP INFORMATION

Emulator Information		Communication Information	
Emulation:	ANSIW	Bits per Second:	19,200
Telnet Terminal ID:	VT100	Parity:	None
Backscroll Buffer Lines:	500	Stop Bits:	1
		Flow Control:	None

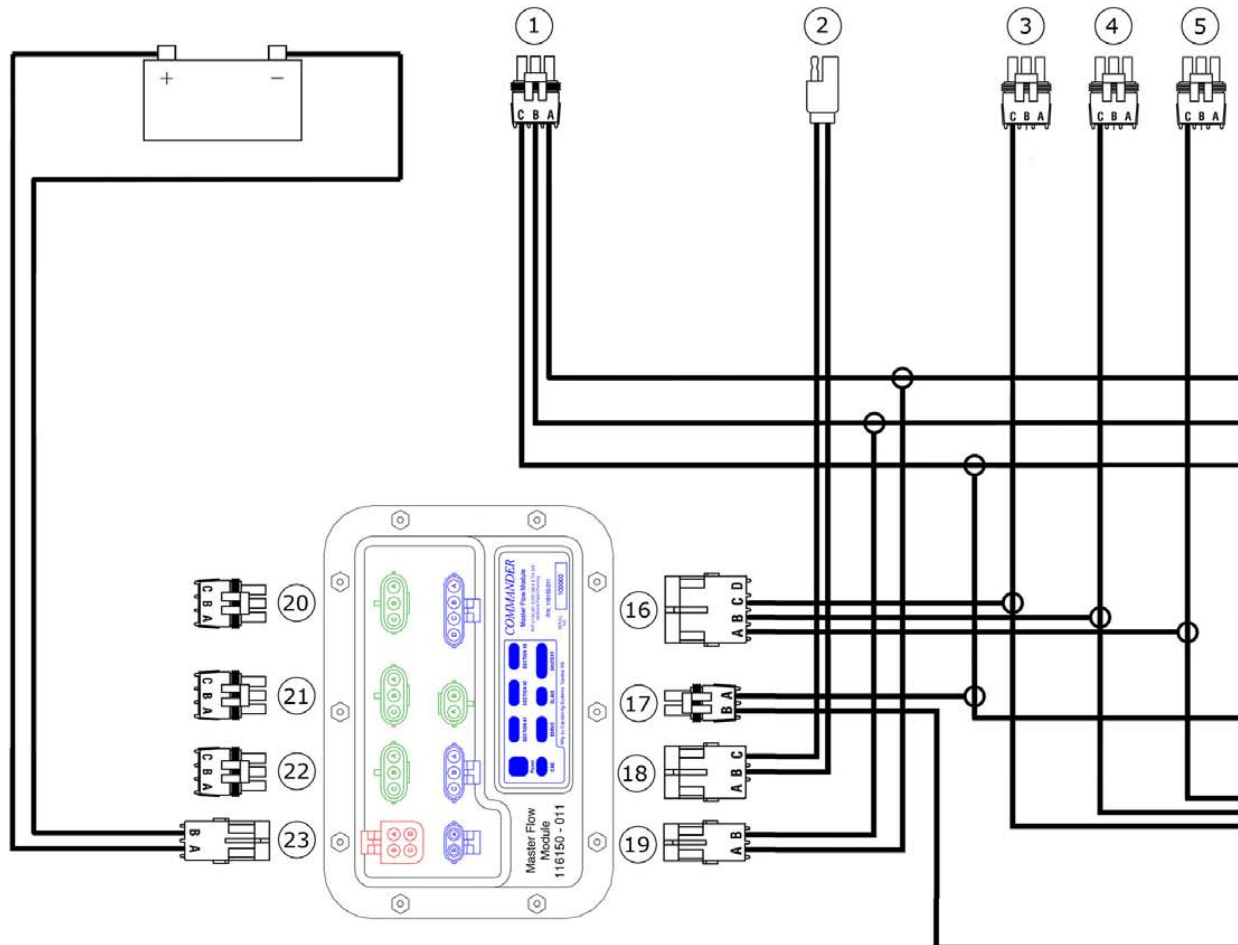
## SCHEMATICS

<b>3 - Section Shutoff Schematic .....</b>	<b>80</b>
<b>6 - Section Shutoff Schematic .....</b>	<b>82</b>
<b>9 - Section Shutoff Schematic .....</b>	<b>84</b>
<b>3 - Section Dual Manifold (24 Valve) .....</b>	<b>86</b>
<b>6 - Section Dual Manifold (24 Valve) .....</b>	<b>88</b>
<b>9 - Section Dual Manifold (36 Valve) .....</b>	<b>90</b>
<b>Electrical Diagram (N-Ject 9 section) .....</b>	<b>92</b>
<b>Electrical Schematic .....</b>	<b>93</b>

### 3 - SECTION SHUTOFF ELECTRICAL SCHEMATICS

N-Ject 3 Section Shutoff Schematic		Wiring Layout		
Connector Description	Connector ID	Pin ID	Wire Color	Description
Cab Box	1	A	Red	Switched Power
		B	Black	Ground
		C	Purple/White	Duty Cycle to LED
Servo	2	Pin	Brown	12V Decrease Servo
		Socket	Red	12V Increase Servo
Boom Section 1	3	A	Empty	
		B	Empty	
		C	Black	12V Boom 1 ON
Boom Section 2	4	A	Empty	
		B	Empty	
		C	Brown	12V Boom 2 ON
Boom Section 3	5	A	Empty	
		B	Empty	
		C	Blue	12V Boom 3 ON
Flowmeter	6	6 O'Clock	Gray	Signal
		2 O'Clock	Red/White	12V Power
		10 O'Clock	Orange	Ground
Boom Section 4	7	A	Empty	
		B	Empty	
		C	Black/White	12V Boom 4 ON
Boom Section 5	8	A	Empty	
		B	Empty	
		C	Brown/White	12V Boom 5 ON

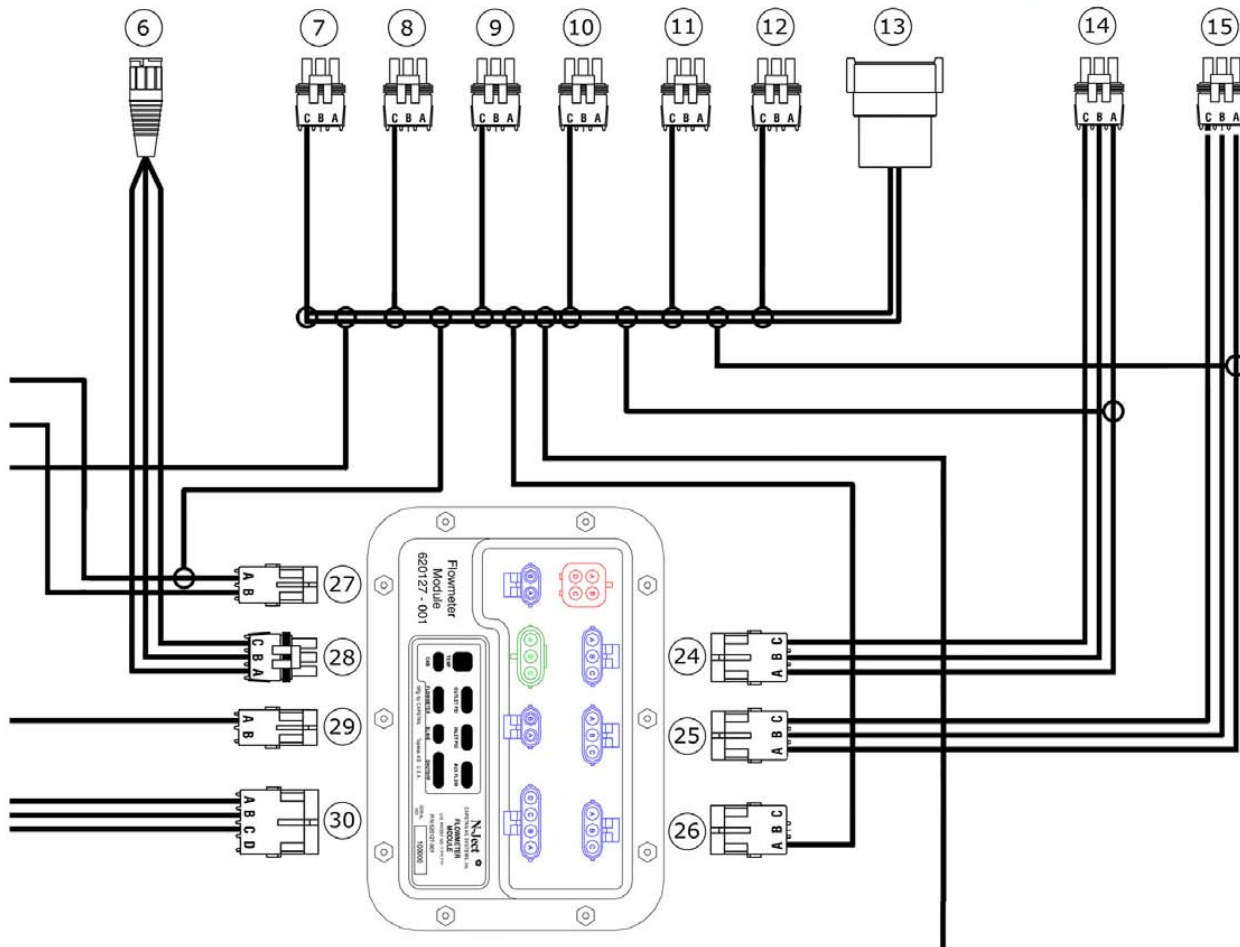
N-Ject 3 Section Shutoff Schematic		Wiring Layout		
Connector Description	Connector ID	Pin ID	Wire Color	Description
Boom Section 6	9	A	Empty	
		B	Empty	
		C	Blue/White	12V Boom 6 ON
Boom Section 7	10	A	Empty	
		B	Empty	
		C	Black/Brown	12V Boom 7 ON
Boom Section 8	11	A	Empty	
		B	Empty	
		C	Tan/Orange	12V Boom 8 ON
Boom Section 9	12	A	Empty	
		B	Empty	
		C	Blue/Orange	12V Boom 9 ON
6 Section Expansion Pack	13	1	Red	12V Switched
		2	Purple/White	Duty Cycle
		3	Purple	Duty Cycle
		4	Black/White	12V Boom 4 ON
		5	Brown/White	12V Boom 5 ON
		6	Blue/White	12V Boom 6 ON
		7	Black/Orange	12V Boom 7 ON
		8	Tan/Orange	12V Boom 8 ON
		9	Blue/Orange	12V Boom 9 ON
		10	White	Outlet PSI Signal
		11	White/Black	Inlet PSI Signal
		12	Orange/White	Aux Flow Signal



N-Ject 3 Section Shutoff Schematic		Wiring Layout		
Connector Description	Connector ID	Pin ID	Wire Color	Description
Flowmeter Outlet Pressure Sensor	14	A	White	Signal
		B	Red	Power
		C	Black	Ground
Flowmeter Inlet Pressure Sensor	15	A	White/Black	Signal
		B	Red	Power
		C	Black	Ground
Master Shutoff	16	A	Blue	12V Boom 3 ON
		B	Brown	12V Boom 2 ON
		C	Black	12V Boom 1 ON
		D	Empty	
Master Slave Out	17	A	Purple/White	Duty Cycle
		B	Purple	Duty Cycle
Master Servo	18	A	Empty	
		B	Red	12V Increase Servo
		C	Brown	12V Decrease Servo
Master Cab	19	A	Red	Switched Power
		B	Black	Ground
Master Section 3	20	A	Black	Power
		B	Green	Even Pulse
		C	White	Odd Pulse
Master Section 2	21	A	Black	Power
		B	Green	Even Pulse
		C	White	Odd Pulse

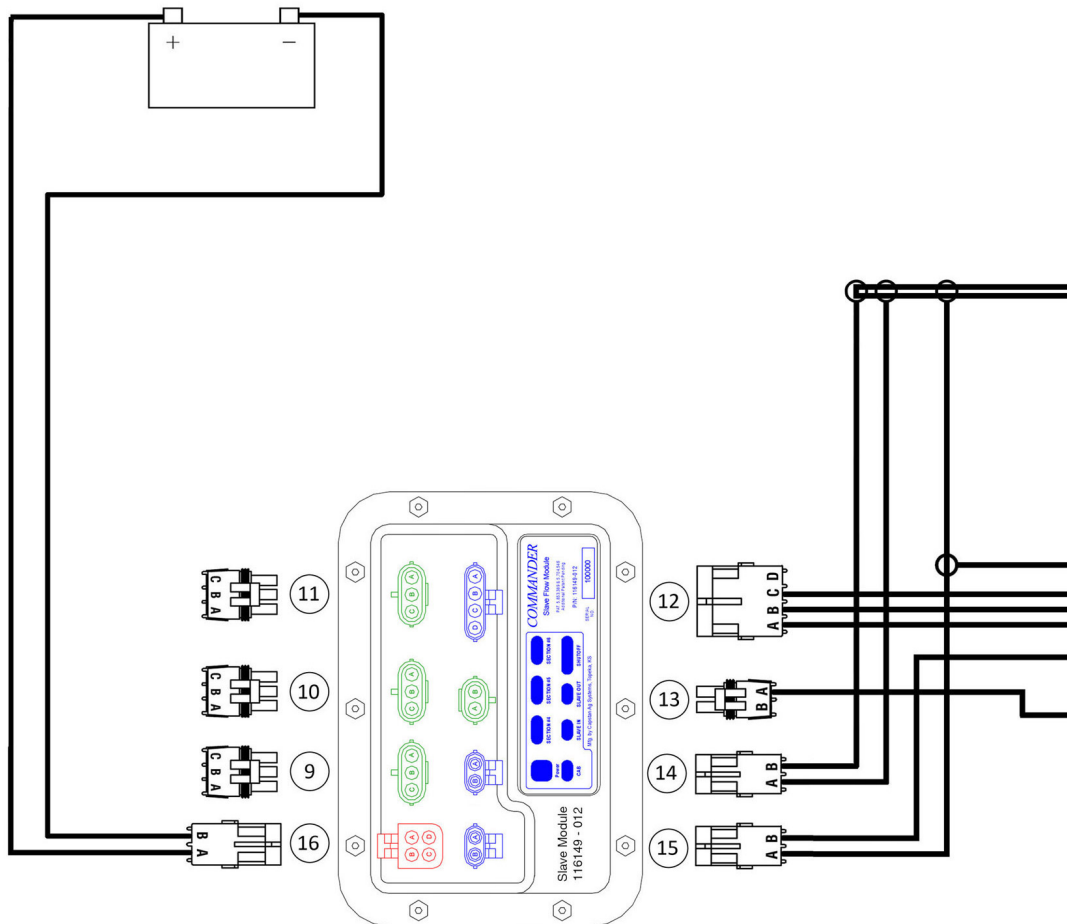
  

N-Ject 3 Section Shutoff Schematic		Wiring Layout		
Connector Description	Connector ID	Pin ID	Wire Color	Description
Master Section 1	22	A	Black	Power
		B	Green	Even Pulse
		C	White	Odd Pulse
Battery Power	23	A	Red	12V Battery
		B	Green	Ground Battery
		C	Black	Ground Battery
		D	White	12V Battery
Flowmeter Outlet PSI	24	A	White	Signal
		B	Red	12V
		C	Black	Ground
Flowmeter Inlet PSI	25	A	White/Black	Signal
		B	Red	12V
		C	Black	Ground
Flowmeter Aux	26	A	Orange/White	Signal
		B	Empty	
		C	Empty	
Flowmeter Cab Power	27	A	Red	Switched 12V
		B	Black	Ground
Flowmeter Flow	28	A	Gray	Signal
		B	Red/White	12V Power
		C	Orange	Ground
Flowmeter Slave In	29	A	Purple/White	Duty Cycle
		B	Empty	
Flowmeter Shutoff	30	A	Blue	12V Boom 3 ON
		B	Brown	12V Boom 2 ON
		C	Black	12V Boom 1 ON



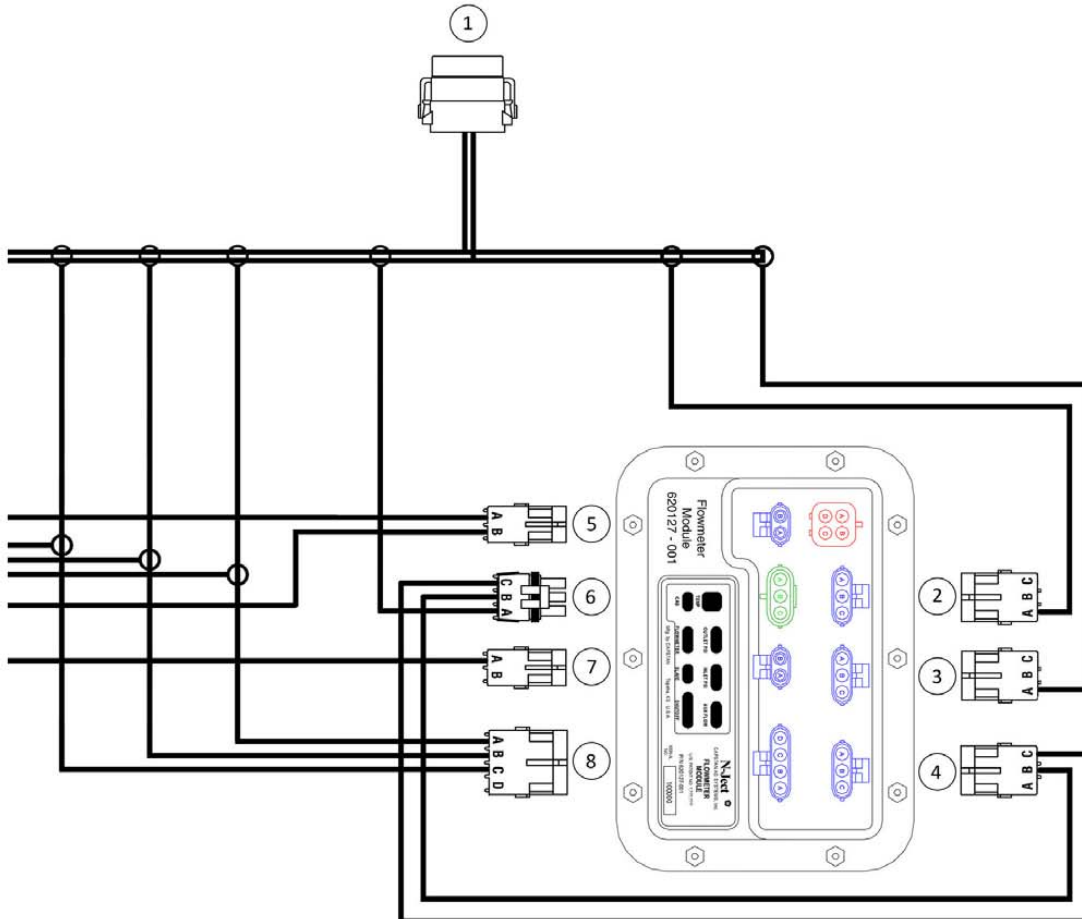
## 6 - SECTION SHUTOFF ELECTRICAL SCHEMATICS

N-Ject 6 Section Shutoff Schematic		Wiring Layout		
Connector Description	Connector ID	Pin ID	Wire Color	Description
6 Section Expansion Pack	1	1	Red	12V Switched
		2	Purple/White	Duty Cycle
		3	Purple	Duty Cycle
		4	Black/White	12V Boom 4 ON
		5	Brown/White	12V Boom 5 ON
		6	Blue/White	12V Boom 6 ON
		7	Black/Orange	12V Boom 7 ON
		8	Tan/Orange	12V Boom 8 ON
		9	Blue/Orange	12V Boom 9 ON
		10	White	Outlet PSI Signal
		11	White/Black	Inlet PSI Signal
		12	Orange/White	Aux Flow Signal



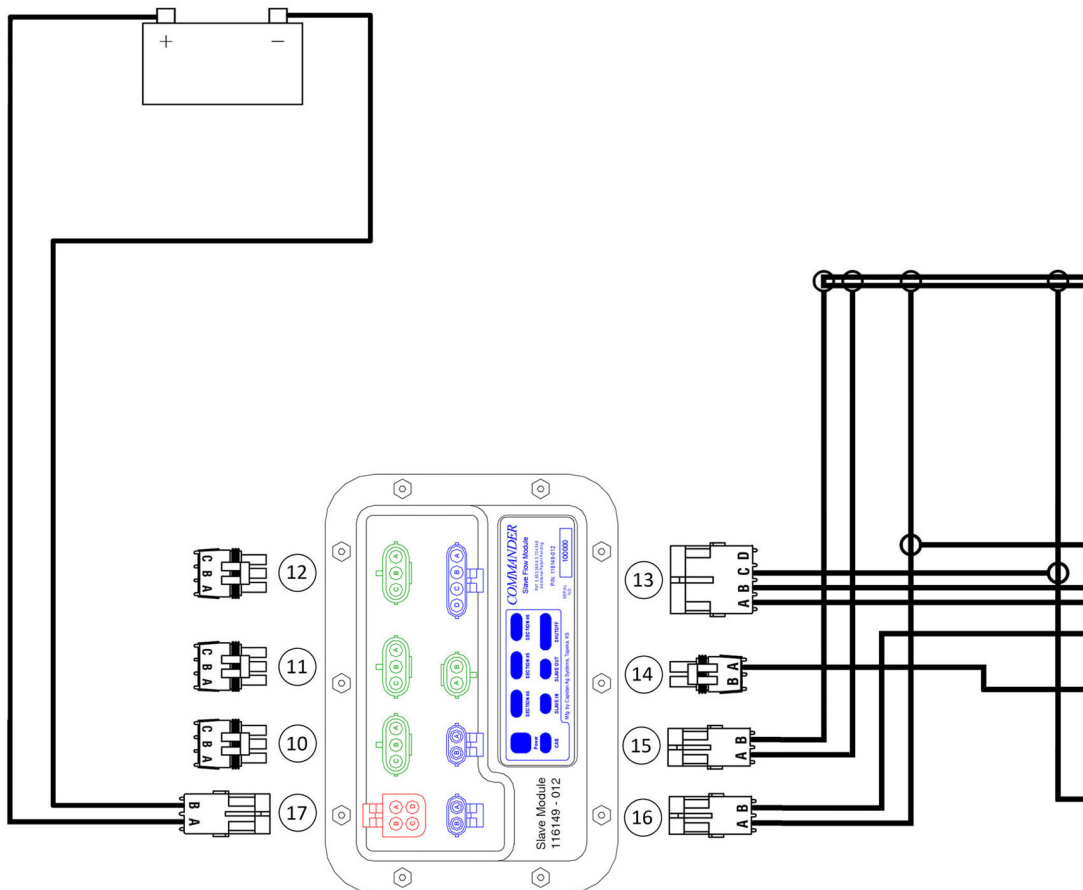
N-Ject 6 Section Shutoff Schematic		Wiring Layout		
Connector Description	Connector ID	Pin ID	Wire Color	Description
Flowmeter Outlet Pressure Sensor	2	A	White	Signal
		B	Red	Power
		C	Black	Ground
Flowmeter Inlet Pressure Sensor	3	A	White/Black	Signal
		B	Red	Power
		C	Black	Ground
Flowmeter Aux	4	A	Empty	
		B	Red	12V Power
		C	Black	Ground
Flowmeter Cab	5	A	Red	Switched 12V
		B	Black	Ground
Flowmeter Flow	6	A	Orange/White	Signal
		B	Red	12V Power
		C	Black	Ground
Flowmeter Slave In	7	A	Purple/White	Duty Cycle
		B	Empty	
Flowmeter Shutoff	8	A	Blue	12V Boom 3 ON
		B	Brown	12V Boom 2 ON
		C	Black	12V Boom 1 ON
		D	Empty	
Slave Section 4	9	A	Black	Power
		B	Green	Even Pulse
		C	White	Odd Pulse

N-Ject 6 Section Shutoff Schematic		Wiring Layout		
Connector Description	Connector ID	Pin ID	Wire Color	Description
Slave Section 5	10	A	Black	Power
		B	Green	Even Pulse
		C	White	Odd Pulse
Slave Section 6	11	A	Black	Power
		B	Green	Even Pulse
		C	White	Odd Pulse
Slave Shutoff	12	A	Black/Orange	12V Boom 7 ON
		B	Tan/Orange	12V Boom 7 ON
		C	Blue/Orange	12V Boom 7 ON
		D	Empty	
Slave Out	13	A	Violet/White	
		B	Empty	
Slave In	14	A	Violet/White	
		B	Violet	
Slave Cab	15	A	Red	Switched 12V
		B	Black	Ground
Slave Battery	16	A	Red	12V Power
		B	Black	Ground



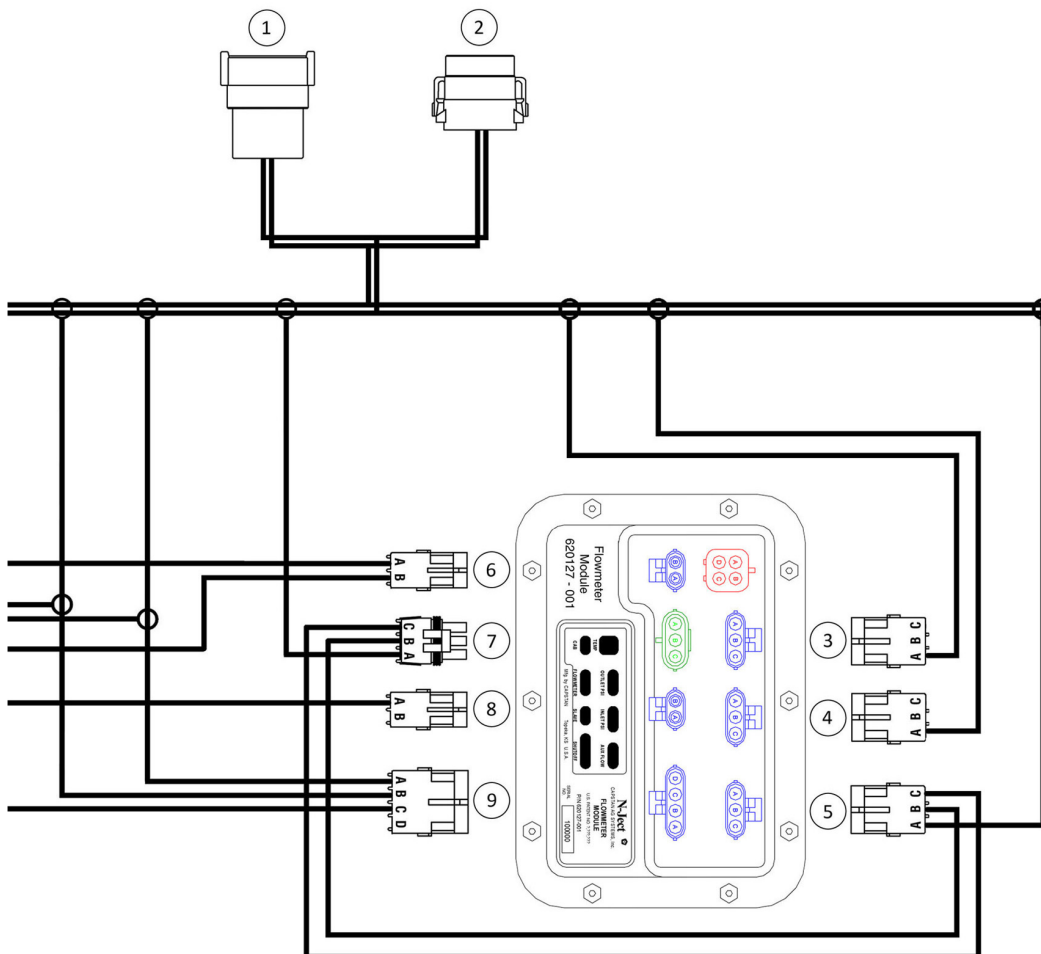
**9 - SECTION SHUTOFF ELECTRICAL SCHEMATICS**

N-Ject 9 Section Shutoff Schematic		Wiring Layout		
Connector Description	Connector ID	Pin ID	Wire Color	Description
6 Section Expansion Pack	1	1	Red	12V Switched
		2	Purple/White	Duty Cycle
		3	Purple	Duty Cycle
		4	Black/White	12V Boom 4 ON
		5	Brown/White	12V Boom 5 ON
		6	Blue/White	12V Boom 6 ON
		7	Black/Orange	12V Boom 7 ON
		8	Tan/Orange	12V Boom 8 ON
		9	Blue/Orange	12V Boom 9 ON
		10	White	Outlet PSI Signal
		11	White/Black	Inlet PSI Signal
		12	Orange/White	Aux Flow Signal
9 Section Expansion Pack	2	1	Red	12V Switched
		2	Purple/White	Duty Cycle
		3	Purple	Duty Cycle
		4	Black/White	12V Boom 4 ON
		5	Brown/White	12V Boom 5 ON
		6	Blue/White	12V Boom 6 ON
		7	Black/Orange	12V Boom 7 ON
		8	Tan/Orange	12V Boom 8 ON
		9	Blue/Orange	12V Boom 9 ON
		10	White	Outlet PSI Signal
		11	White/Black	Inlet PSI Signal
		12	Orange/White	Aux Flow Signal



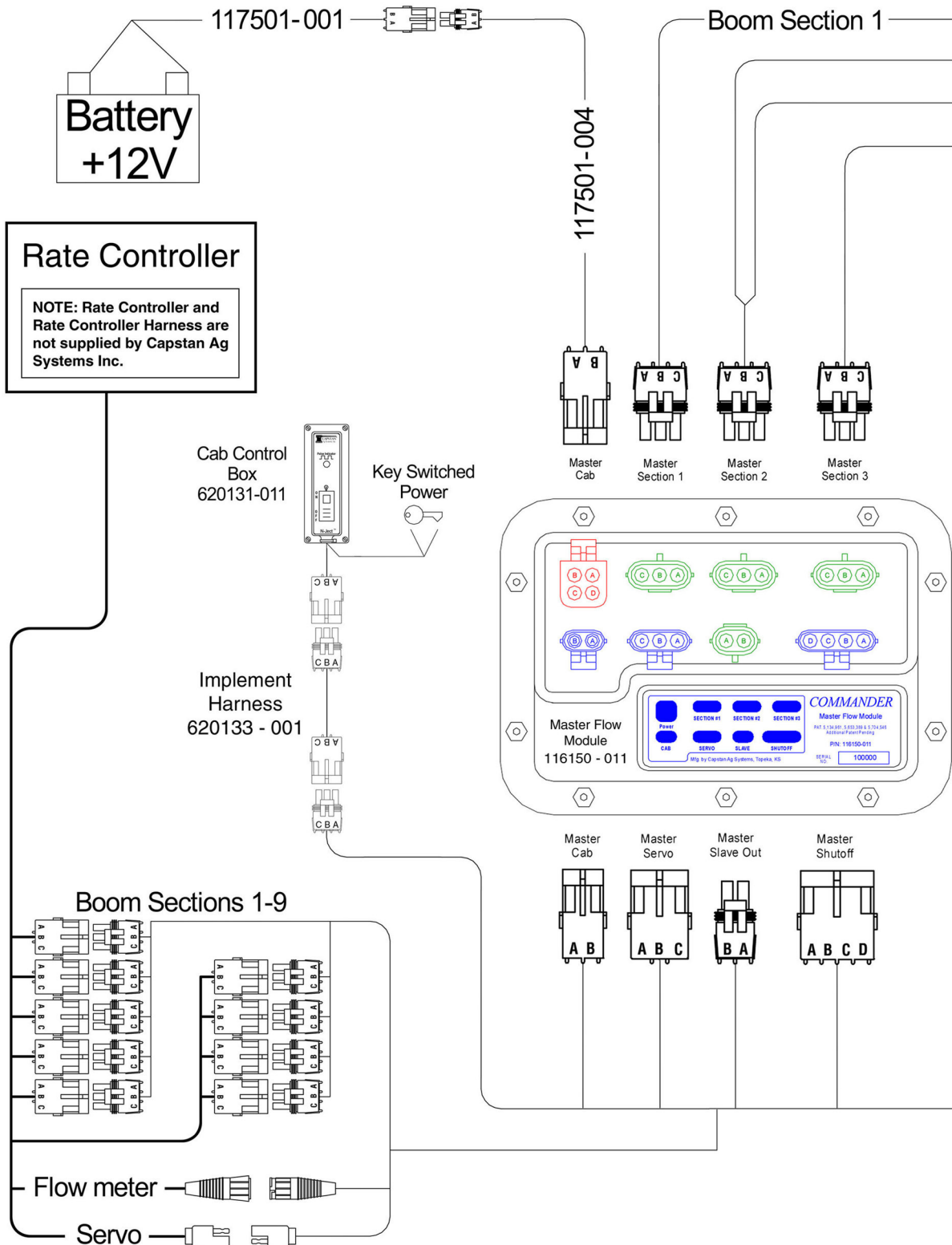
N-Ject 9 Section Shutoff Schematic		Wiring Layout		
Connector Description	Connector ID	Pin ID	Wire Color	Description
Flowmeter Outlet Pressure Sensor	3	A	White	Signal
		B	Red	Power
		C	Black	Ground
Flowmeter Inlet Pressure Sensor	4	A	White/Black	Signal
		B	Red	Power
		C	Black	Ground
Flowmeter Aux	5	A	Orange	Signal
		B	Red	12V Power
		C	Black	Ground
Flowmeter Cab	6	A	Red	Switched 12V
		B	Black	Ground
Flowmeter Flow	7	A	Orange/White	Signal
		B	Red	12V Power
		C	Black	Ground
Flowmeter Slave In	8	A	Purple/White	Duty Cycle
		B	Empty	
Flowmeter Shutoff	9	A	Blue	12V Boom 3 ON
		B	Brown	12V Boom 2 ON
		C	Black	12V Boom 1 ON
		D	Empty	
Slave Section 7	10	A	Black	Power
		B	Green	Even Pulse
		C	White	Odd Pulse

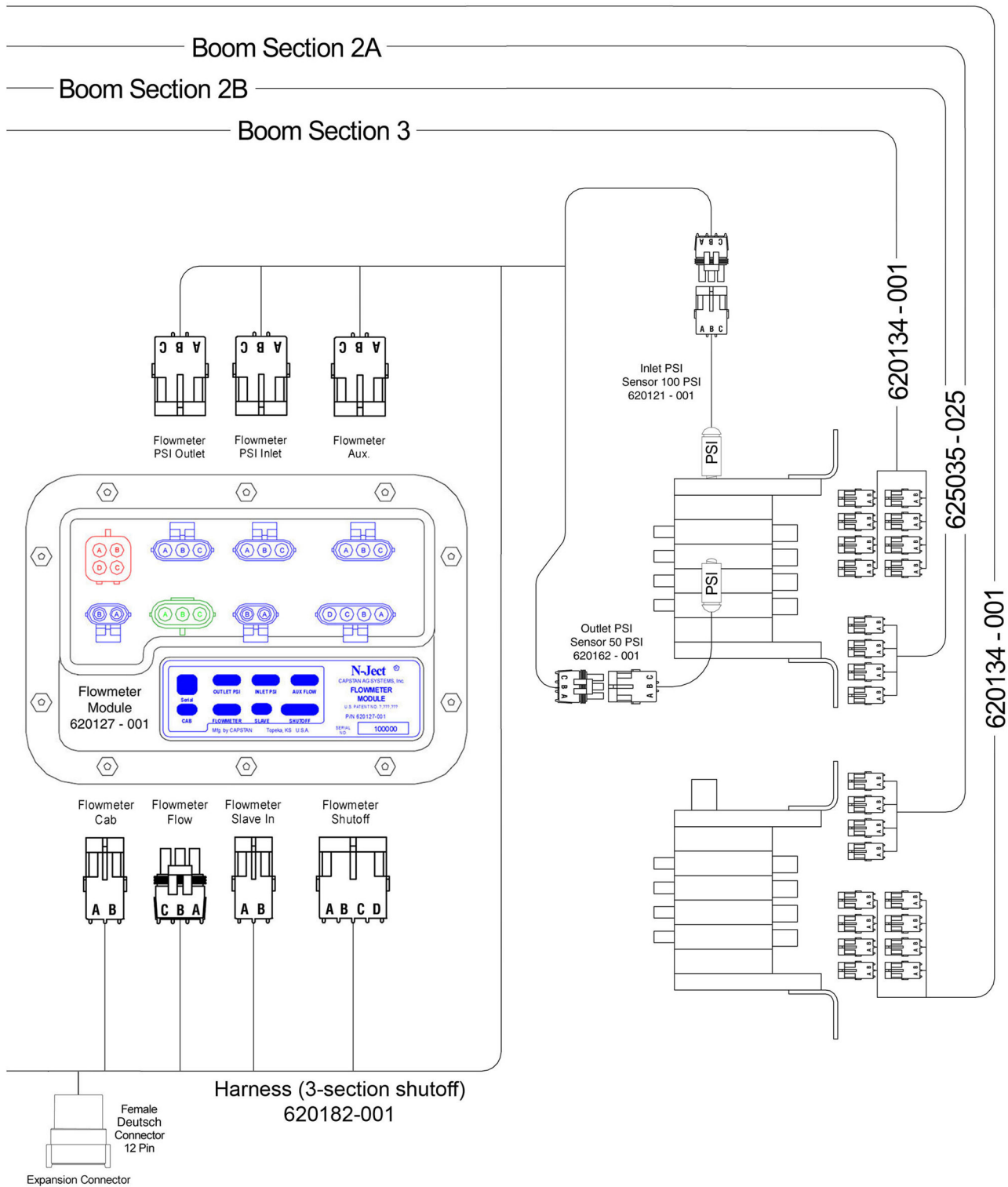
N-Ject 9 Section Shutoff Schematic		Wiring Layout		
Connector Description	Connector ID	Pin ID	Wire Color	Description
Slave Section 8	11	A	Black	Power
		B	Green	Even Pulse
		C	White	Odd Pulse
Slave Section 9	12	A	Black	Power
		B	Green	Even Pulse
		C	White	Odd Pulse
Slave Shutoff	13	A	Black/Orange	12V Boom 7 ON
		B	Tan/Orange	12V Boom 7 ON
		C	Blue/Orange	12V Boom 7 ON
		D	Empty	
Slave Out	14	A	Violet/White	
		B	Empty	
Slave In	15	A	Violet/White	
		B	Violet	
Slave Cab	16	A	Red	Switched 12V
		B	Black	Ground
Slave Battery	17	A	Red	12V Power
		B	Black	Ground



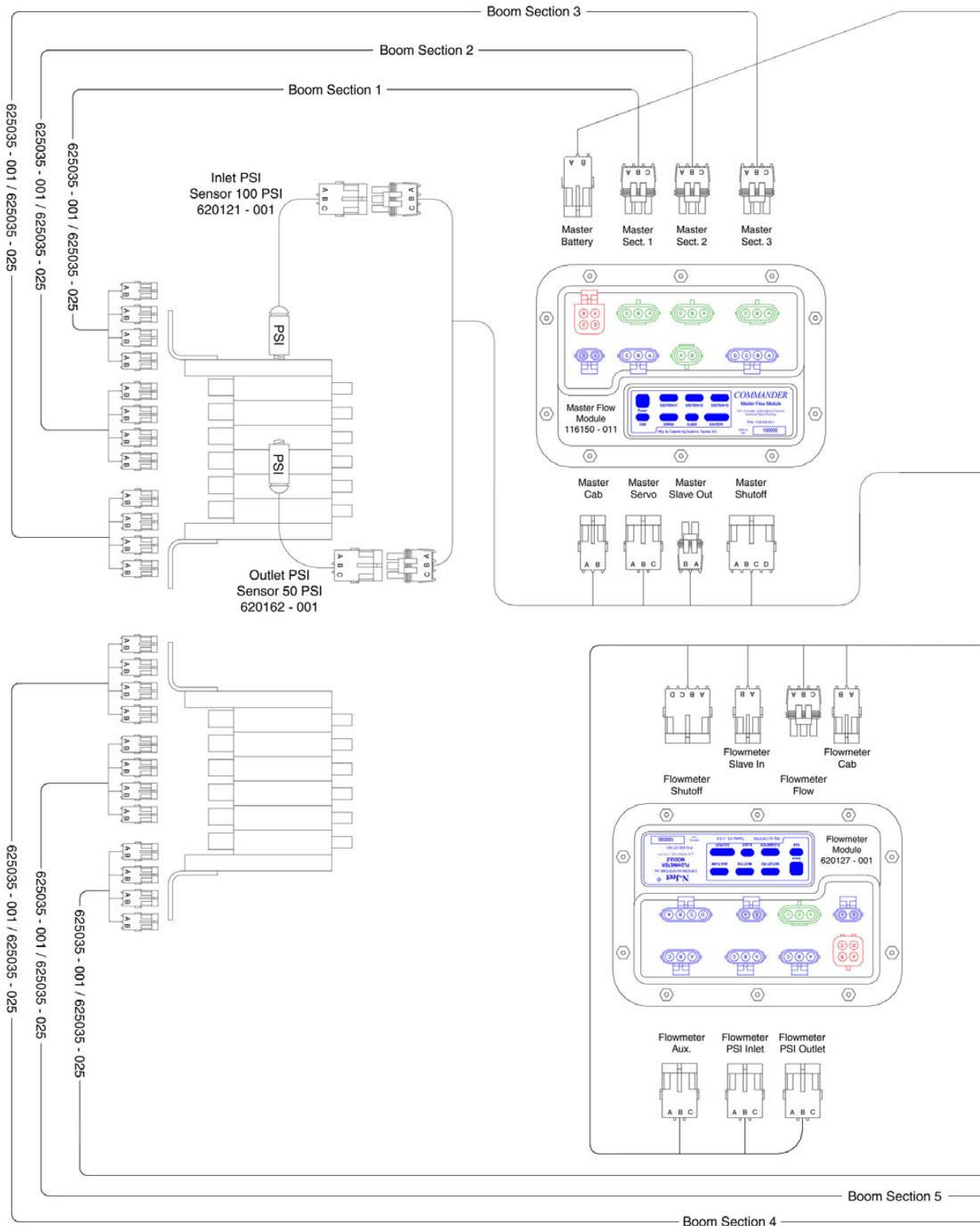


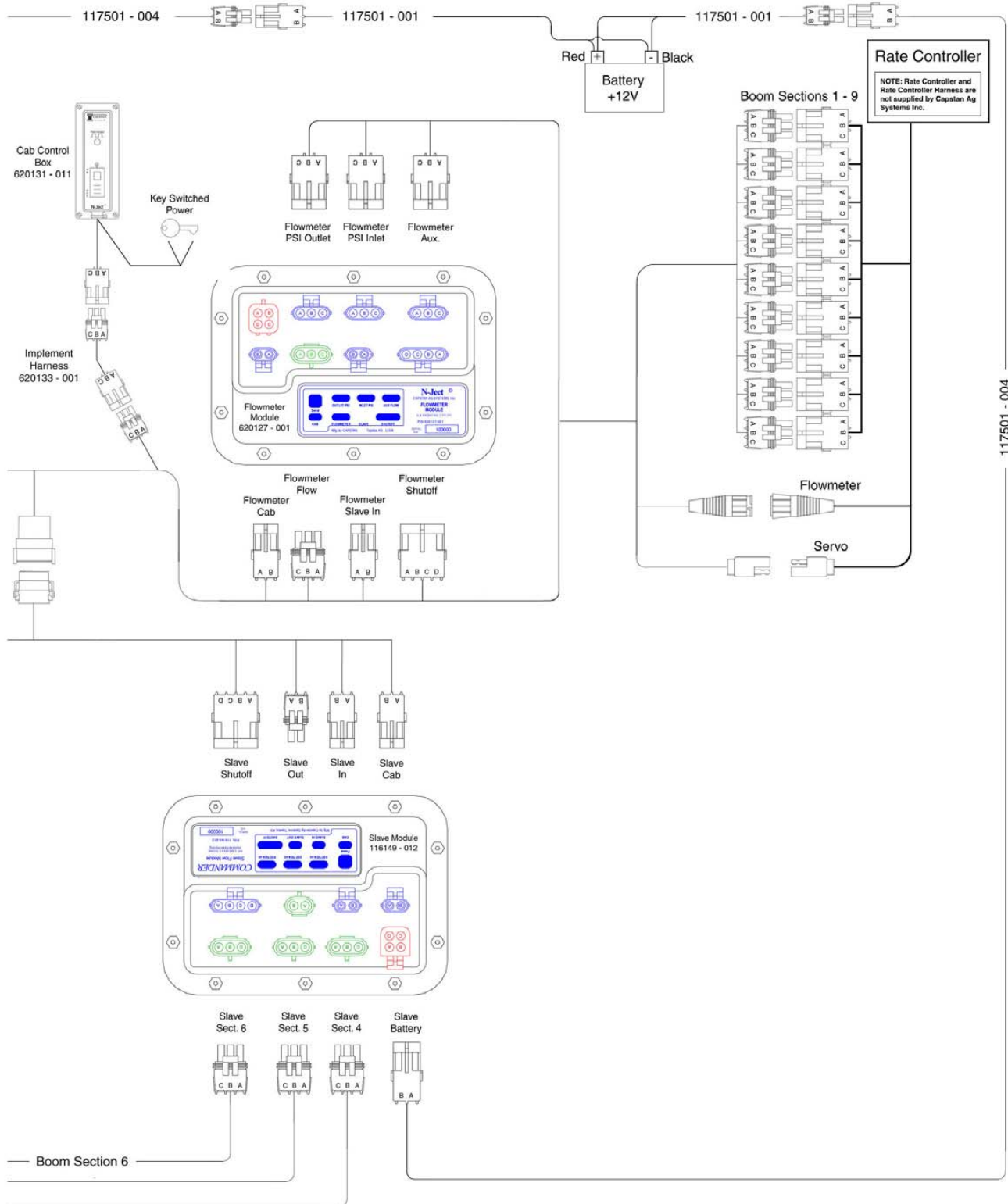
**DUAL MANIFOLD 3 - Section (24 Valve)**



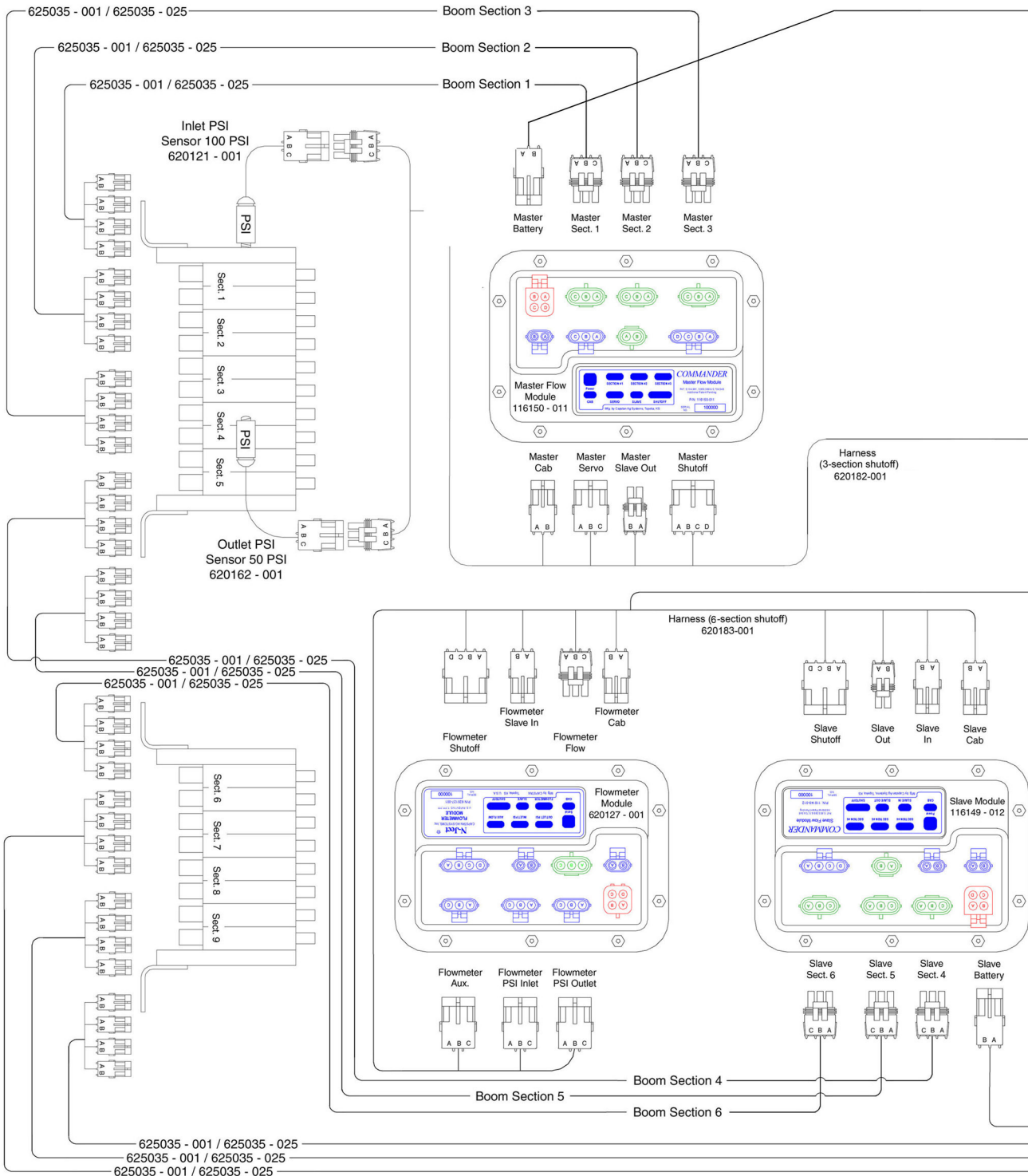


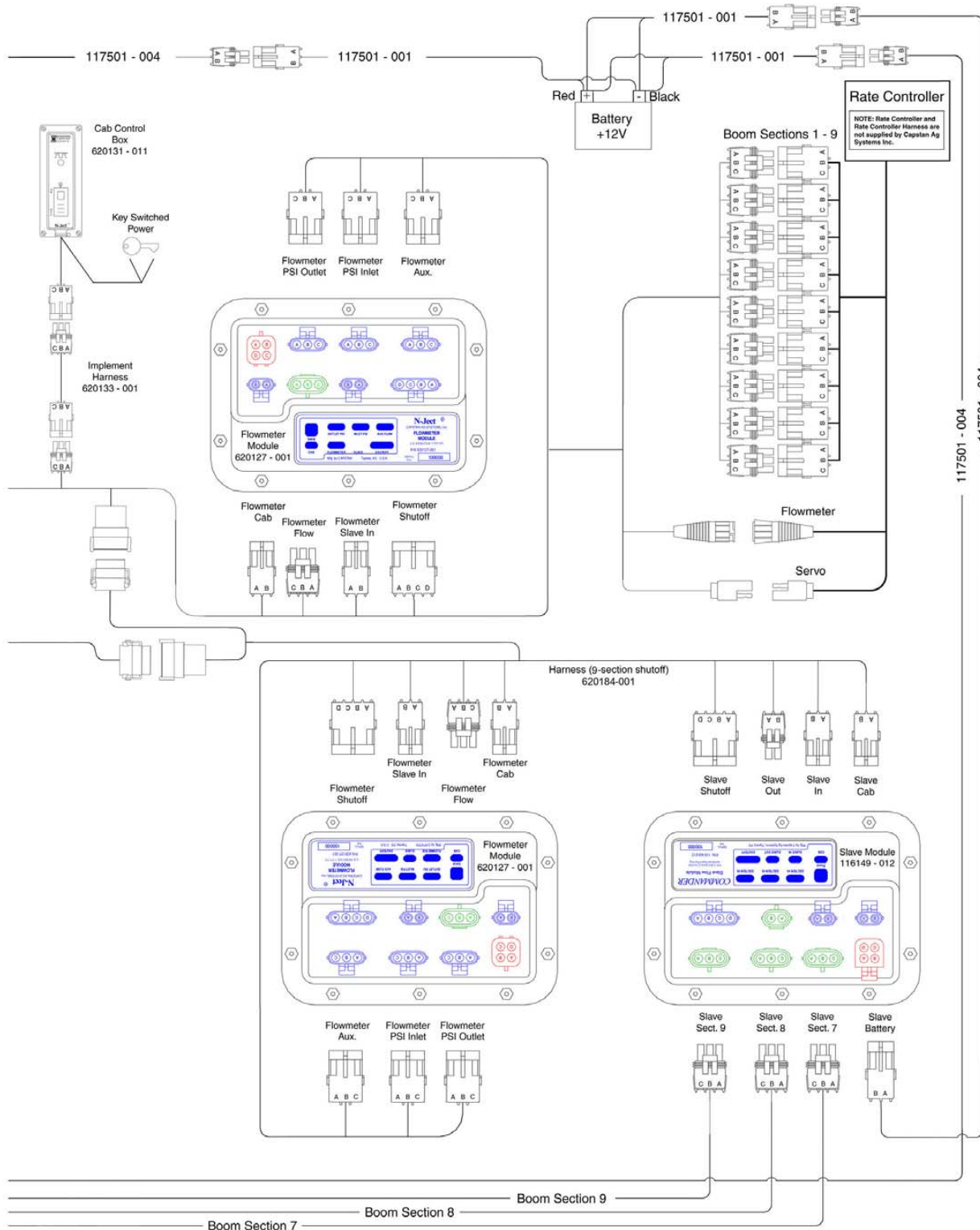
**DUAL MANIFOLD 6 - Section (24 Valve)**





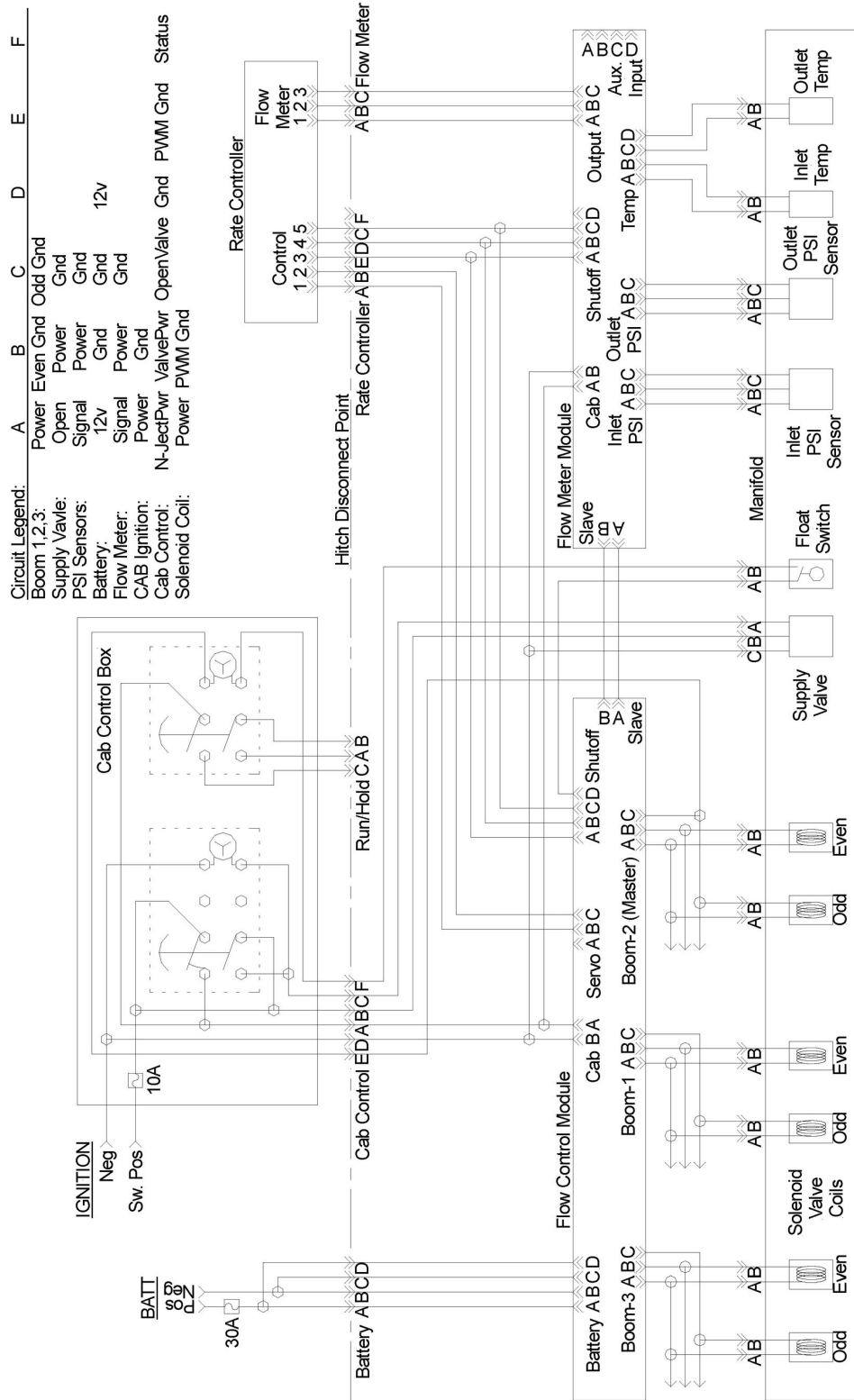
**DUAL MANIFOLD 9 - Section (36 Valve)**







**ELECTRICAL SCHEMATIC**



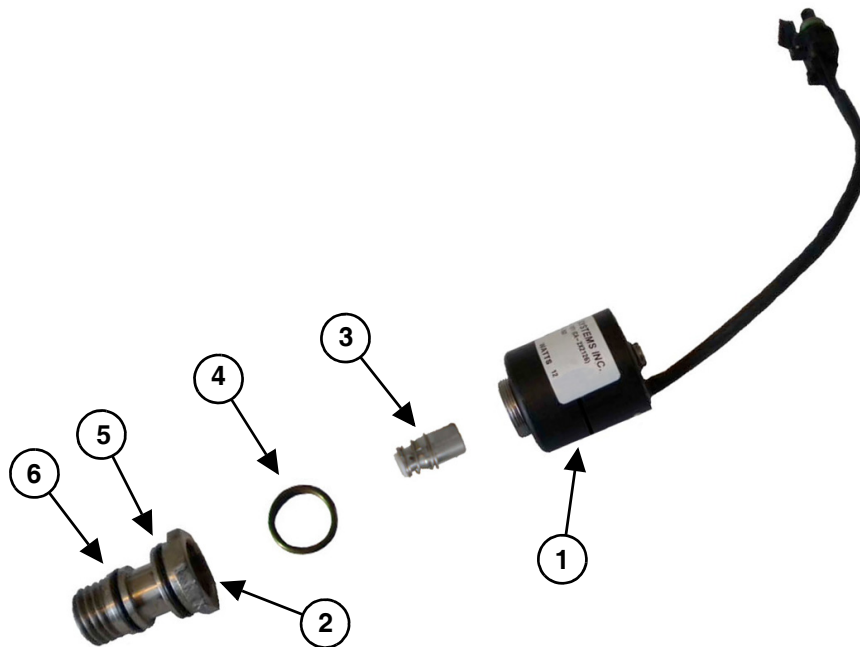


**PARTS LIST**

PARTS LIST .....99  
    Nozzle Valve Parts Identification .....99  
    N-Ject Parts Identification .....100  
    N-Ject Manifold Parts Identification .....102

**PARTS LIST**

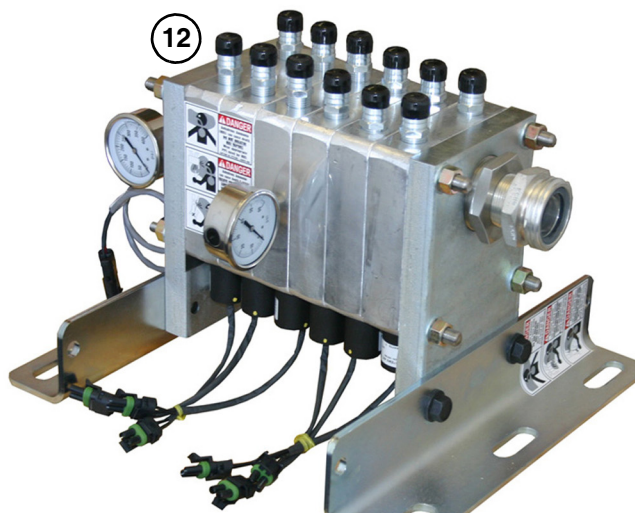
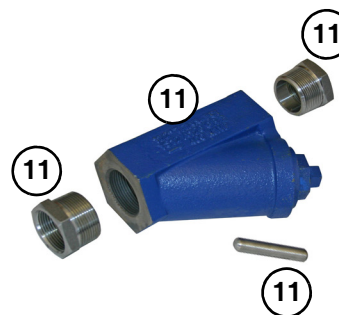
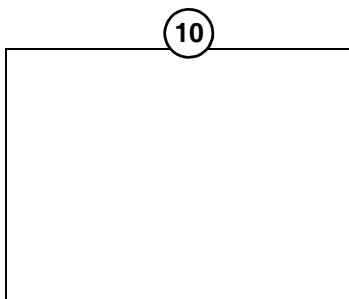
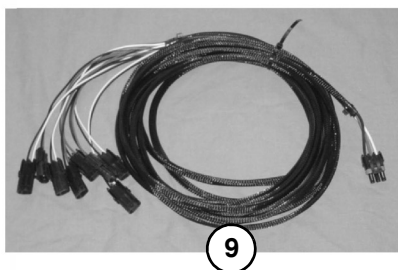
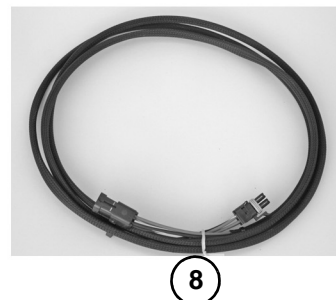
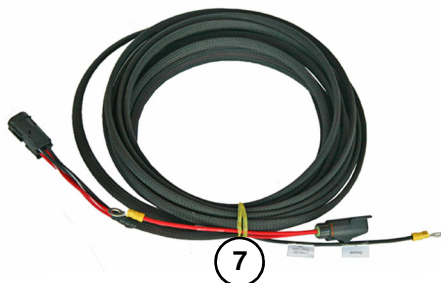
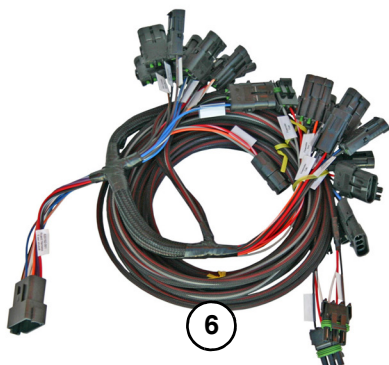
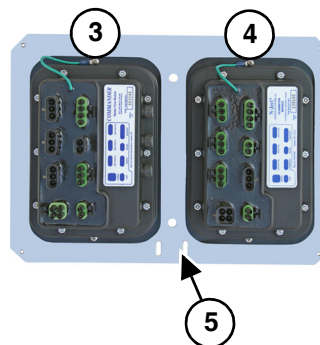
**Nozzle Valve Parts Identification**



ITEM NO.	PART NO.	DESCRIPTION	QTY.
1	625147-011	Coil Assembly 12 Watt	0-1
	116189-111	Coil Assembly 7 Watt	0-1
2	620108-001	Valve Body 5/32" Orifice	0-1
	620208-001	Valve Body 3/32" Orifice	0-1
3	716190-001	Plunger Assembly Teflon	1
4	621022-204	O-Ring 015	1
5	620116-011	O-Ring 017 x 2 mm	1
6	620115-001	O-Ring 019	1

**PARTS LIST CONT.**

**N-Ject Parts Identification**



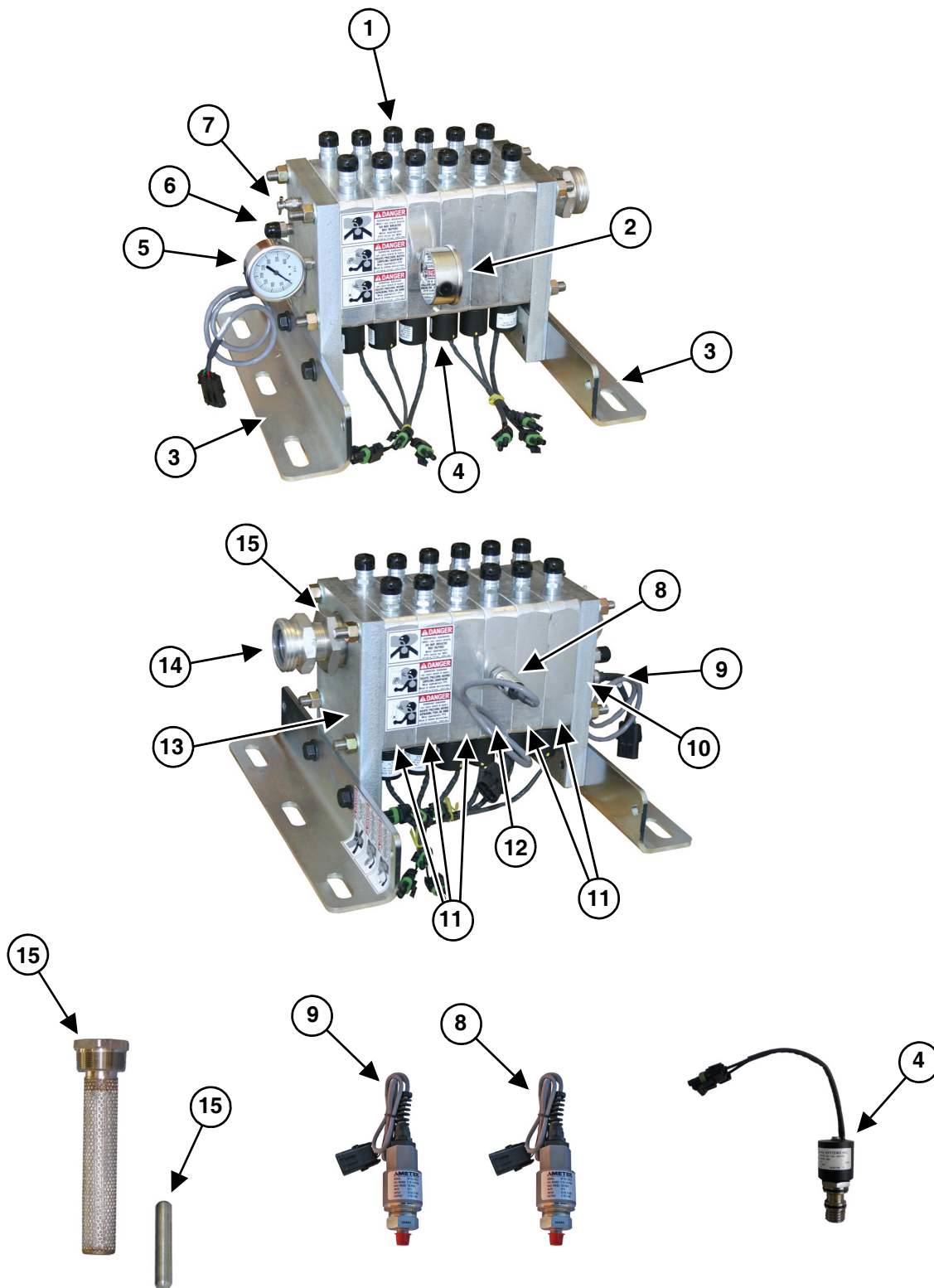
**PARTS LIST CONT.**

**N-Ject Parts Identification Cont.**

ITEM NO.	PART NO.	DESCRIPTION	QTY.
1	620131-011	N-Ject Cab Control	1
2	116400-001	Enclosure Assembly (2-Module)	1 - 3
3	116150-011	Module, Master Flow	1
4	620127-001	Module, Flow Meter	1 - 3
Not Shown	116149-012	Module, Slave	0 - 2
5	620135-001	Bracket Enclosure Mounting	1 - 3
6	620182-001	Harness (3-section shutoff)	1
Not Shown	620183-001	Harness (6-section shutoff)	0 - 1
Not Shown	620184-001	Harness (9-section shutoff)	0 - 1
7	117501-001	Harness Battery Power	1 - 3
8	117501-004	Harness Battery Extension	1 - 3
9	625032-001	Harness 8n x 10'	As Req.
	620134-001	Harness 8n x 25'	As Req.
	625038-001	Harness 4n x 10'	As Req.
	625038-025	Harness 4n x 25'	As Req.
	625035-001	Harness 4n + 4n x 10'	As Req.
	625035-025	Harness 4n + 4n x 25'	As Req.
10	620133-001	Harness Cab Control/Implement	1
11	620200-080	External Y-Strainer, 1.5", 80 mesh (w/magnet & bushings)	1
12	N/A	Manifold Assembly (See page 102)	1 - 2
Not Shown	116200-046	Plug 3-Pin Tower	As Req.
Not Shown	116200-045	Plug 2-Pin Tower	As Req.
Not Shown	116200-077	Plug 4-Pin (sq) Tower	As Req.
Not Shown	116200-048	Plug 3-Pin Shroud	As Req.
Not Shown	706530-356	Plug 12-Pin Deutsch (socket plug)	1
Not Shown	620185-001	Pressure Sensor Breakout Harness	1
Not Shown	620159-001	Pressure Sensor Calibration Jumper	1
Not Shown	620137-001	Bolt	As Req.
Not Shown	620138-001	Nut	As Req.
Not Shown	000000-000	N-Ject NH3 Product Manual	1
Not Shown	000000-000	N-Ject NH3 Quick Reference Guide	1

**PARTS LIST CONT.**

**N-Ject Manifold Parts Identification**



**PARTS LIST CONT.**

**N-Ject Manifold Parts Identification Cont.**

ITEM NO.	PART NO.	DESCRIPTION	QTY.
1	620117-002	Fitting, 1/2" HB X 1/2" MNPT Steel	As Req.
	620117-004	Fitting, 3/4" HB X 1/2" MNPT Steel	As Req.
2	620124-001	Pressure Gauge, 60 PSI (outlet)	1
3	620106-001	Bracket Manifold Mounting	2 - 4
4	621011-001	Nozzle Valve, Assembly, 12 Watt 5/32" (See 99)	As Req.
	621010-001	Nozzle Valve, Assembly, 12 Watt 3/32" (See 99)	As Req.
	621011-001	Nozzle Valve, Assembly, 7 Watt 5/32" (See 99)	As Req.
	621010-001	Nozzle Valve, Assembly, 7 Watt 3/32" (See 99)	As Req.
5	620125-001	Pressure Gauge, 400 PSI (inlet)	0 - 1
6	620122-001	Valve Relief	1
7	620123-001	Valve Bleed	1
8	620162-001	Pressure Sensor, 50 PSI (outlet)	1
9	620121-001	Pressure Sensor, 100 PSI (inlet)	1
	620120-001	Pressure Sensor, 250 PSI (inlet)	0 - 1
10	620100-001	Inlet Flange	1- 2
11	620103-001	Slice Dual Port	As Req.
12	620104-001	Slice Master	1 - 2
13	620101-001	End Flange	1 - 2
14	620136-001	Fitting, 2 1/4" x 1 1/4" MNPT	1
15	620118-001	Inlet Strainer, 100 Mesh 2" MNPT X 1 1/4" FNPT SS (W/Magnet)	1
Not Shown	620140-001	Slice Single Port	As Req.
Not Shown	620109-001	Rod Threaded	As Req.
Not Shown	620112-001	O-Ring	As Req.
Not Shown	620110-001	Nut	As Req.
Not Shown	620111-001	Washer	As Req.
Not Shown	620113-001	Bolt	As Req.
Not Shown	620114-001	Nut	As Req.
Not Shown	620126-001	Plug Valve	As Req.
Not Shown	620139-001	Slice Spacer	As Req.
Not Shown	620140-001	Slice Single Port	As Req.
Not Shown	620143-001	Plug 1/4" NPT	As Req.
Not Shown	620144-001	Plug 1/2" NPT	As Req.



# WARRANTY

## **WARRANTY**

WARRANTY POLICY .....	109
WARRANTY AND REPAIR EVALUATIONS .....	111



## WARRANTY POLICY

**Capstan Ag Systems, Inc., the Seller, warrants to the original Purchaser/User, its products to be free from defects in material and workmanship in normal use and service for a period of one year from the date of purchase.**

**The Purchaser, by acceptance of the Seller's product, assumes all risk and liability of the consequences of any use or misuse by Purchaser, its employees, or others.**

The Seller's obligation under this warranty shall be limited to the repairing or replacing (at the Seller's option), at no cost to the Purchaser, the product or part thereof which the Seller's inspection discloses to be defective, FOB point of manufacture, provided the Buyer; (i) Notify Seller of defect within thirty (30) days of failure; (ii) Returns the defective product to Seller, transportation prepaid; and (iii) Establishes that the product has been properly installed, maintained and operated in accordance with the Seller's instructions or instructions contained in its operations or maintenance manuals and within the limits of normal usage.

All replacement products, or parts thereof, furnished under this warranty, will be invoiced in the usual manner and adjustments will be made after the product, or part thereof, claimed to be defective has been returned to and inspected at the Seller's factory.

Replacement products, or parts thereof, furnished under this warranty shall be FOB Buyer's location, and the Seller shall not be responsible for installation costs. (For all international transactions, replacement products shall be furnished FOB Seller's factory and the Buyer shall be responsible for all customs and brokerage fees). The Buyer shall be liable for all freight, inspection, and handling costs if such product or such parts do not prove to be defective. In no event will any claim for labor or incidental or consequential damages be allowed for removing or replacing a defective product. No warranty is made as to any product or part which has been subject to misuse, abuse, accidents, alterations, improper or negligent use, in maintenance, storage, or transportation, and handling.

The liability of the Seller under this warranty, or for any loss or damage to the products whether the claim is based on contract or negligence, shall not in any case exceed the purchase price of the products and upon the expiration of the warranty period all such liability shall terminate. The foregoing shall constitute the exclusivity remedy of the Buyer, and the exclusive liability of the Seller.

The terms of this warranty do not in any way extend to any product which was not manufactured by the Seller or an affiliate of the Seller.

This warranty shall be void, and the Seller shall not be liable for any breach of warranty, if the product or parts shall have been repaired or altered by persons other than the Seller, unless it was expressly authorized by the Seller in writing.

The foregoing warranty is exclusive and is in lieu of all other warranties expressed or implied. All implied warranties of merchantability and fitness for a particular purpose are hereby disclaimed by the Seller and are excluded from this agreement. The Seller shall not be liable for any incidental or consequential damages resulting from any breach of warranty.

Limitation of Liability – The Buyer's exclusive remedy for breach of warranty shall be to repair or to replace defective products: Provided, the products are incapable of being repaired or replaced, the Buyer's exclusive remedy shall be money damages. Such damages shall not exceed the purchase price of the products.

Any claim for breach of the Seller's warranty must be in writing and addressed to the Seller. It must set forth the alleged defect in sufficient detail to permit its easy identification by the Seller. All breach of warranty claims must be made within thirty (30) days after expiration of the warranty period which is applicable to the defective product. The applicable time periods are set forth in the above warranty term. Any breach of warranty claim not timely made will not be honored by the Seller and will be of no force and effect.

### **WARRANTY POLICY CONT.**

On any claim of any kind, including negligence, the Seller's liability for any loss or damage arising out of, or from the design, manufacture, sale, delivery, resale, installation, technical direction of installation, inspection, repair, or operation of use of any products shall in no case (except as provided in the terms of the Patent Indemnity) exceed the purchase price allocable to the products.

In no event, whether as a result of breach of contract, warranty, or alleged negligence, shall the Seller be liable for incidental or consequential damages, including, but not limited to: personal injury, loss of profits or revenue, loss of use of equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities or services, downtime costs, environmental damage, crop losses, or claims of customers of the Buyers for such damages.

Patent Indemnity. The Seller retains for itself any and all property rights in and to all designs, inventions, and improvements pertaining to any products and to all patents, trademarks, copyrights and related industrial property rights arising out of work done in connection therewith. The Buyer expressly agrees that it will not assert any rights to property rights retained herein by the Seller.

### WARRANTY AND REPAIR EVALUATIONS

Any part or module that needs to be repaired or evaluated for warranty must be authorized before return. Contact the factory (785-232-4477) for a Return Materials Authorization (RMA #). This tracks the part coming into the factory for repair or replacement.

Before returning any component to the factory, clean the component as well as possible to remove any dirt or chemical residue. Components received at the factory that are not clean, will be returned and the warranty will be denied.

If warranty repair or evaluation is requested on a nozzle valve, the entire valve must be returned to the factory. The Warranty will not be offered on individual valve parts.

After receiving the RMA#, package the part. Include the RMA#, your name, address, phone number, customer name and description of the problem or failure. Then ship the package to:

**Capstan Ag Systems, Inc.**  
**Attn: Warranty & Repair**  
**4225 S.W. Kirklawn Ave.**  
**Topeka, KS 66609**

**Toll-free number: (855) 628-7722**  
**Topeka Office Phone: (785) 232-4477**  
**Topeka Office Fax: (785) 232-7799**  
**Hours: 8 a.m. - 4:30 p.m. CST**

**On-Line: [www.CapstanAg.com](http://www.CapstanAg.com)**  
**[Orders@CapstanAg.com](mailto:Orders@CapstanAg.com)**

Upon receipt of the part in question, the part will be evaluated for warranty, then repaired and returned.