N-Ject® NH3

Operator and Maintenance Manual

APPLICATION SYSTEMS
FOR PROFESSIONALS

www.capstanAG.com

CapstanAG

How Can We Help?
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CapstanAG

Thank you for your business!

At CapstanAG™, our goal is to redefine the way people do their chemical application. Our PWM control systems have been setting the bar for maximum productivity for more than 20 years. Our focus on performance, support, and education have dramatically changed the landscape of agricultural chemical application.

Capstan® Ag Systems, Inc. specializes in creating proprietary systems for the agricultural industry, primarily focusing on chemical and fertilizer applications. Our inventive process involves research, engineering, design, and lab and field testing.

Service Contact Information

If a problem occurs with the your system that cannot be corrected with the information in this manual, please contact your dealer for service and technical assistance. If further assistance is needed, contact CapstanAG™.

System Purchased: _____

Dealer:_____

Contact:_____

Phone:_____

Address:_____

City,State/Province,Zip:_____

Factory Service/Repairs

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E-mail: prodsupport@capstanag.com | Online: www.CapstanAG.com

CONTENTS

1.0 - SAFETY

1.1 - Signal Words

[Figure 1] - Signal words designate a degree or level of hazard seriousness.
DANGER indicates an imminent hazard which, if not avoided, will result in death or serious injury. This signal word is limited to the most extreme situations, typically for machine components that, for functional purposes, cannot be guarded.
WARNING indicates a potential hazard which, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices.
CAUTION indicates a potential hazard which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Figure 1

[Figure 2] - NOTE and IMPORTANT

NOTE: This is used for additional information that can help understand or operate the system.

IMPORTANT: This is used to draw attention to specific information that is necessary in the operation, setup, or service of the system.

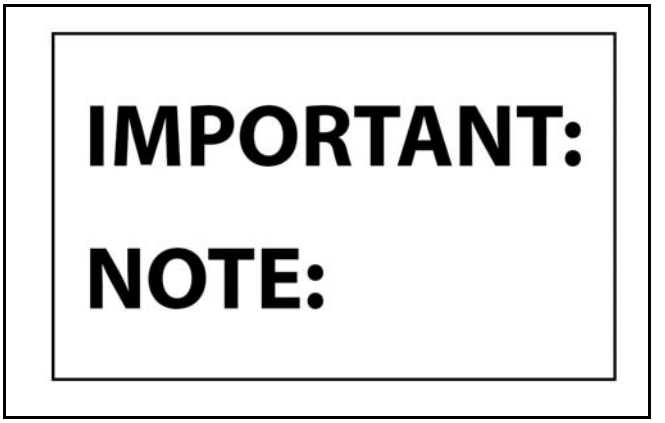

Figure 2

1.2 - Pressurized Fluid Lines

Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials. Pressurized lines can accidentally burst when too much heat is present.

1.3 - Personal Protective Equipment (PPE)

Wear close fitting clothing and the correct PPE for the job. See the manufacturer's manual or other information for correct PPE.

1.4 - Battery Safety

Use the procedure in the appropriate agricultural equipment manual for connecting, disconnecting, and jump-starting the machine's battery.

Keep sparks and flames away from the battery. Battery gas can explode and cause serious injury. Do not smoke in the battery charging area.

Remove jewelry, which might make electrical contact and create sparks.

1.5 - Chemical Safety

Chemicals used in agricultural applications can be harmful to your health and/or the environment if not used correctly. Always follow all label directions for effective, safe, and legal use of agricultural chemicals.

1.6 - Emergency Safety

Fire extinguishing systems must meet the applicable OSHA requirements and all users of portable/fixed fire suppression equipment must know the types, limitations, and proper uses of this equipment; including hazards involved with incipient stage firefighting.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.

Know where fire extinguishers and first aid kits are located and how to use them.

Inspect the fire extinguisher and service the fire extinguisher regularly.

Follow the recommendations on the instructions plate.

Very small fires can be put out (extinguished) with a fire extinguisher. Use an appropriate method to extinguish a fire (water for paper fires, and chemical extinguishers for electrical or chemical fires.

1.7 - Safety Signs

[Figure 3] - The HCS aligned its provisions with the United Nations' Globally Harmonized System (GHS) Classification and Labeling of Chemicals in 2012. This is an GHS safety label example for a chemical hazard.

These labels and safety messages warn all personnel about hazardous chemicals or potentially unsafe chemical conditions that may exist while working around agricultural application equipment.

CapstanAG® add-on application systems for OEM and retrofit agricultural application equipment (booms and toolbars) may contain HCS pictograms and GHS safety labels and safety signal word messages.

Figure 3

2.0 - INTRODUCTION

2.1 - This Manual

Make sure that all personnel have read this manual and thoroughly understand safe and correct operation and maintenance procedure. Failure to do so could result in personal injury or equipment damage.

This manual should be considered a permanent part of your system and should remain with the system when you sell it.

Right and left sides are determined by facing in the direction of forward travel of the machine the system is on.

The information, screen shots, and other illustrations were correct at the time of publication. Changes can occur without notice.

This manual contains important information on how to safely and correctly install, operate, and maintain CapstanAG™ equipment. These instructions will help keep personnel safe, reduce downtime, and increase the reliability and life of the equipment, its components, and related systems.

Review the safety information in the Original Equipment Manufacturer (OEM) agricultural equipment manual(s).

Follow the instructions (in this manual) for each step to make sure that work conditions in and around the OEM equipment are safe.

It is important for all individuals working with chemicals to understand the potential risks, necessary safety precautions, and proper response in the event of accidental contact.

- Review the OEM agricultural equipment manual(s) for chemical safety information.
- Review, understand and read procedures and use Safety Data Sheets (SDS) and the required Personal Protective Equipment (PPE) for hazardous chemicals.

Please keep this manual and all enclosed documentation in an accessible location known to all operators, installation, and maintenance personnel.

If you do not understand the CapstanAG™ equipment after reading this manual, please obtain the proper training before working with equipment to make sure of your own safety and well as your co-workers' safety.

Do not attempt to operate any equipment or system until you completely understand why, when, and how it operates. If you are uncertain after studying this manual, please contact CapstanAG™.

2.2 - System Identification

Write the system name, serial number, and other information down in the Service Contact Information on the inside cover of this manual. Your dealer will use these numbers when you order parts. File a copy of the identification numbers in a secure place off the machine.

If you are not the original owner of this machine, it is in your interest to contact your local CapstanAG™ dealer to inform them of this unit's serial number. This will help Capstan® Ag Systems, Inc. notify you of any issues or product improvements.

3.0 - INSTALLATION AND SETUP

IMPORTANT: Before installation make sure that all parts are included in the shipping boxes.Check the list of parts for your machine from the shipping materials.

⚠ CAUTION Before operation or service to the system, read and understand the machine's operator manual and the N-Ject® NH3 operator and maintenance manual. Chemical residue may be present on/in the OEM equipment. Make sure that the system is rinsed completely with clean water before installation or service. Use the correct personal protective equipment.

IMPORTANT: Do not attach the harnesses with cable ties until a dry test of the system is complete.

NOTE: Do a check of the general system layout at the back of this manual.

3.1 - Set the Flow Meter Module Settings (1.5 and 0.5 Rate Rows)

IMPORTANT: These settings needs to be checked when the N-Ject® system contains a mix of 5/32" and 3/32" valves.

1.5 and 0.5 Rate Rows are typically used for side-dress application when the side-dress implement does not match up to the planter.

When counting the number of valves per section, the valves that are 5/32" count as 1 valve, and the valves that are 3/32" valves count as 0.5 valves.

Example: A 17 Knife, 3-section N-Ject® with 2-0.5 rate valves will side-dress behind a 16 Row planter.

N-Ject® section 1 = 5-5/32" valves and 1-3/32" valve or 5.5 valves

N-Ject® section 2 = 5-5/32" valves and 0-3/32" valves or 5 valves

N-Ject® section 3 = 5-5/32" Valves and 1-3/32" valve or 5.5 valves

For dip switches: 1 dip switch = 1 valve. They do not account for a 0.5 rate valve.

To correctly enter the number of valves into the flow meter module, you must multiply by a factor that gives whole numbers. In this case 2 works. The module computes a frequency based on the number of valves as long as the ratio of the number of valves is the same, the module will compute the frequency correctly.

N-Ject® section 1 = 5.5 valves x 2 = 11

N-Ject® section 2 = 5 valves x 2 = 10

N-Ject® section 3 = 5.5 valves x 2 = 11

To set the flow meter module dip switches, see Master Flow Meter Module Setting on page 9.

When multiplying the dip switch settings, the flow meter calibration number is multiplied by the same factor.

If the flow meter calibration number is 317, then doubling the dip switches would mean that the flow meter calibration number would change to (317 x 2) 634.

3.3.1 - Altering The Preset N-Ject® System Configuration

Each N-Ject®system is shipped with a configuration sheet that contains a preset section control setup. The electronic modules are programmed at the factory according the configuration sheet.

NOTE: The following steps need to be performed **ONLY** if the implement configuration is altered from the configuration sheet that is shipped with the system.

3-Section System

1. Determine the number of sections
2. Set the master flow meter module settings

6-Section or 9-Section System

1. Determine the number of sections
2. Set the master flow meter module settings
3. Set the slave flow meter module settings

Determine the number of sections

The number of sections available will be limited to the kit that was ordered. You will either have a 3-section, 6-section, or 9-section kit. All of the sections available do not need to be used, however do not use more sections than the kit contains.

Determine the number of valves per section:

- For the typical tool bar, a single hose barb per valve assembly will be installed. This lets one valve assembly supply one row.
- For the typical seeder installation, a splitter with two hose barbs per valve assembly will be installed. This lets one valve assembly to supply two rows.
- A 12 watt coil on a valve assembly requires 1 amp to actuate. The maximum number of coils per section with a 12 watt coil is eight valves (9 amps).
- A 7 watt coil on a valve assembly requires 5/8 amp to actuate. The maximum number of coils per section with a 7 watt coil is 16 valves (8.75 amps).
- If there is a mixture of 7 watt and 12 watt coils, add the total amperage together. Do not exceed 9 amps per section. Typically a mixture of 7 watt and 12 watt coils are only used when a tool bar is used for side dress applications. This usually requires 1.5 or 0.5 rates on the end knives.

To determine which coils you have, reference the identification tag on the coil.

Now that the number of valves per section has been determined, please record the new configuration here.

NUMBER OF VALVES PER SECTION			
Section 1	_____ # Valves	Section 6	_____ # Valves
Section 2	_____ # Valves	Section 7	_____ # Valves
Section 3	_____ # Valves	Section 8	_____ # Valves
Section 4	_____ # Valves	Section 9	_____ # Valves
Section 5	_____ # Valves		

Set the Master Flow Meter Module Settings (3-Section System)

1. **[Figure 1] -** Locate the master flow meter module. The master flow meter module is the flow meter module in the electronic module enclosure that is connected to the 3-section shutoff harness.
2. Remove the two machine screws that attach the flow meter module to the electronic module enclosure mounting plate.
3. Remove the ten machine screws that secure the flow meter module backing plate to the flow meter module. Remove the backing plate and set aside.

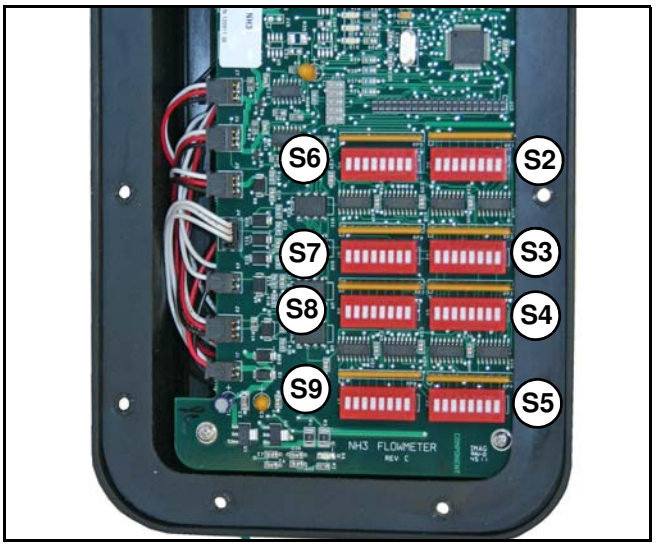

Figure 1

S9 and S5 program the number of valves on Boom 1.

S8 and S4 program the number of valves on Boom 2.

S7 and S3 program the number of valves on Boom 3.

Reference the number of valves recorded per section for your N-Ject® system on page 6.

One dip switch should be turned on for each valve in a section.

Example:

NUMBER OF VALVES PER SECTION		
Section 1	4	# Valves
Section 2	9	# Valves
Section 3	5	# Valves

1. S9 = 4 dip switches turned on and 5 turned off.
   S5 would have all the dip switches turned off.
2. S8 = 8 dip switches turned on.
   S4 = 1 dip switch turned on.
3. S7 = 5 dip switches turned on and 4 turned off.
   S3 would have all the dip switches turned off.

The flow meter module can now be assembled and connected to the electronic module enclosure mounting plate.

Set the Slave Flow Meter Module Settings (6 or 9-Section System)

Determine the number of sections (see Step 1)

Locate the slave flow meter module for sections 4-6 or 7-9. This is the flow meter module with the 6-section or 9-section shutoff harness attached.

Remove the two machine screws that attach the flow meter module to the mounting plate.

Remove the ten machine screws that attach the flow meter module backing plate to the flow meter module. Remove the backing plate and set aside.

S9 and S5 program the number of valves on Boom 4 or Boom 7.

S8 and S4 program the number of valves on Boom 5 or Boom 8.

S7 and S3 program the number of valves on Boom or Boom 9.

IMPORTANT: S6 and S2 generate the flow meter frequency multiplier. This should only be altered with the direction of a CapstanAG™ field representative or a qualified dealer.

Set the dip switches with same procedure as master flow module (See Step 2).

The slave flow meter module can now be assembled and attached to the electronic module enclosure mounting plate.

3.2 - Install the N-Ject® Manifold(s)

Mount the N-Ject® manifold(s) so that the valve assemblies are offset from the implement attachment location. This makes the valve assemblies easy to access for service and makes more room for installation of the boom section harnesses.

IMPORTANT: If mounting a single N-Ject® manifold, a central mounting location on the implement is ideal, this minimizes the length of hose needed for routing to each row.

When installing a dual N-Ject® manifold system, locate one N-Ject® manifold to the left of center and the other N-Ject® manifold to the right of center on the implement. Centering the N-Ject® manifolds on the rows, will minimize the length of hose needed for routing to each row.

The inlet flange should be located in a direction so that a nurse tank hose can be attached.

Use the mounting brackets and U-bolts (not supplied with kit) to install the manifold on the implement.

3.2.1 - Install N-Ject® Manifold/Implement Plumbing

[Figure 2] - Use a marker to label each N-Ject® manifold valve (1) to identify the implement row that connects to the manifold valve.

Attach hoses (2) to the top of the N-Ject® manifold and route to each row. On a typical implement one hose routes to one row. If a splitter is used, see Splitter Installation (Optional).

With a dual N-Ject® manifold system the numbering on the secondary manifold should start where the numbering ended on the primary manifold.

Install the hoses to the connections with hose clamps. Then install cable ties to keep the hoses in place.

IMPORTANT: The hoses must route from the N-Ject® manifold to the implement rows. Every other implement row must alternate, just like the nozzle valves, (white/green wire alternation).

When the implement is folded/unfolded, make sure that there is no interference that could pinch or damage the hoses.

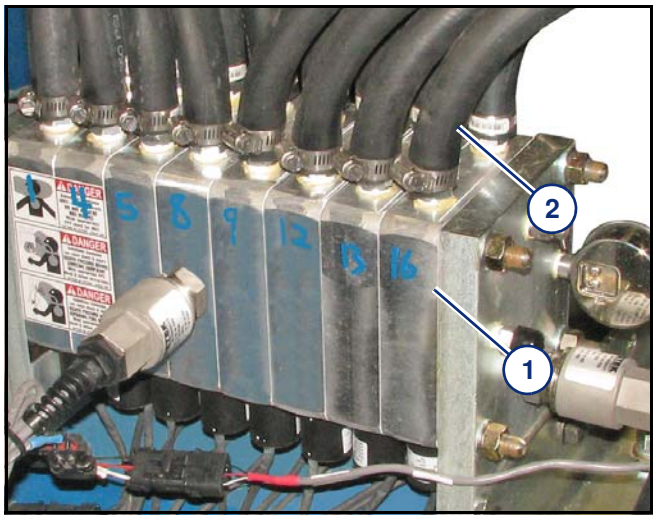

Figure 2

3.2.2 - Slitter Installation (Optional)

[Figure 3] - If desired, a splitter can be installed to connect two rows to one manifold port.

In this scenario, label the splitter by the row number rather than the N-Ject® manifold. Row location 1 would be referenced as 1A and 1B or as 1 and 2.

On a dual N-Ject® manifold system, the numbering on the secondary manifold should begin where the numbering ended on the primary manifold.

Example: If row 15 ends on the primary manifold, then row 16 would start on the secondary manifold.

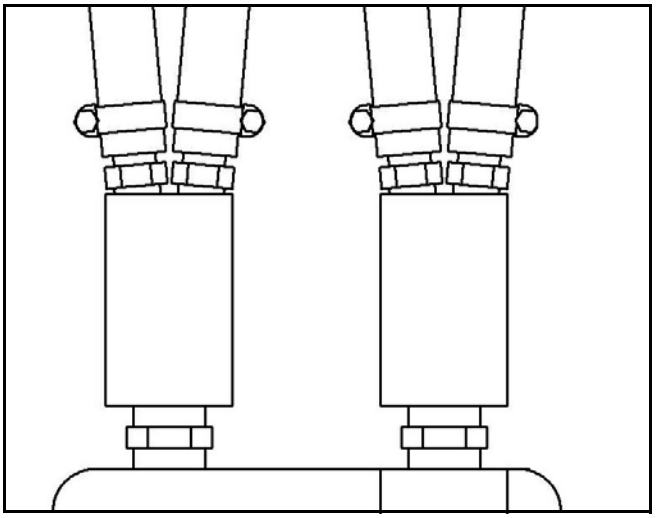

Figure 3

3.3 - Install the Electronic Module Enclosure

Installation of the Master Flow and Flow Meter Modules

[Figure 1] - Install the electronic module enclosure with U-bolts (not supplied in the kit), near the center-front of the implement.

Mount the electronic module enclosure in a location that is easily accessed. The opening of the electronic module enclosure should be directed away from the tires, which can throw debris.

CALL OUT	PART NO.	DESCRIPTION
1	116150-011	Master Flow Module
2	620127-001	Flow Meter Module
3		Electronic Module Enclosure Cover

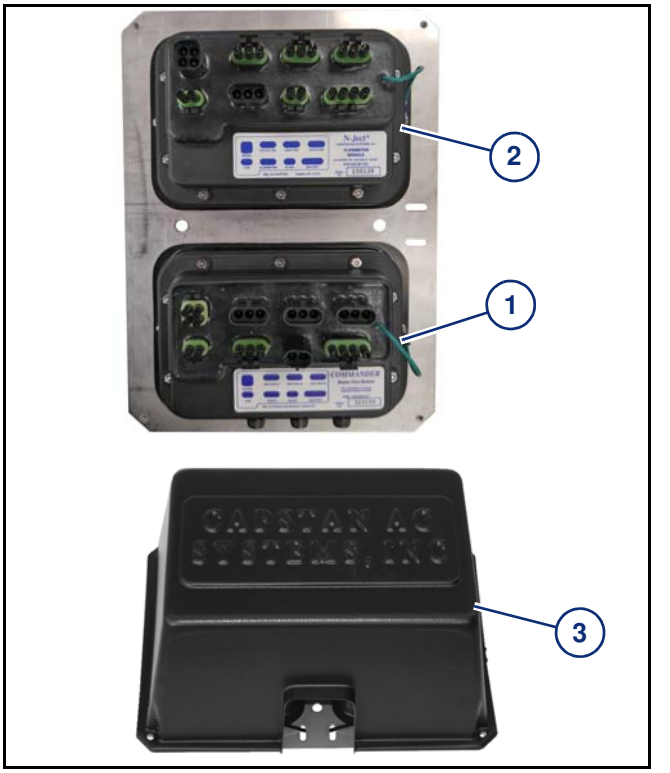

Figure 1

The master flow module receives commands from the rate controller and then pulses the solenoid valves to the correct rate.

The flow meter module receives signals from pressure sensors and then sends the flow measurement to the rate controller.

NOTE: The 3-section module harness is used with the master flow module and flow meter module. The 6 and 9-section kits will require additional electronic module enclosures to be installed. Mount additional electronic module enclosures within close proximity.

3.3.1 - Install Slave Flow and Flow Meter Modules

Necessary for additional sections

[Figure 2] - The slave flow module (1) and flow meter module (2) are contained in an electronic module enclosure located on the implement near the N-Ject® manifold.

PART NO.	DESCRIPTION
116149-012	Slave Flow Module
620127-001	Flow Meter Module

The slave flow module receives commands from the master flow module.

The slave flow module sends the flow signals to the master flow meter module.

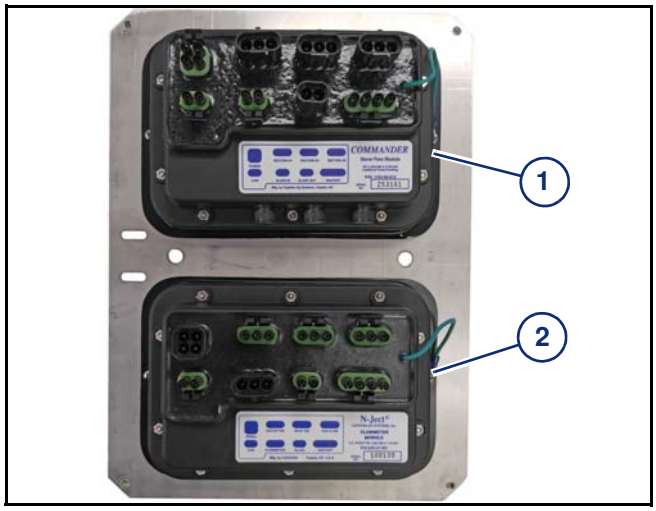

Figure 2

3.3.2 - Install the Module Harness

[Figure 3] - The module (3-section shutoff) harness connects to the master flow module, N-Ject® cab display, flow meter module, inlet pressure sensor, outlet pressure sensor, and rate controller.

PART NO.	DESCRIPTION
620202-003	N-Ject® Module (3-Section Shutoff) Harness

See page 55 for 3-section system wiring.

Figure 3

To expand the system to six sections, it is necessary to have a second electronic module enclosure that includes a slave flow module and a flow meter module.

To expand the system to nine sections, it is necessary to have a second and third electronic module enclosures that each include a slave flow module and a flow meter module.

PART NO.	DESCRIPTION
650306-001	N-Ject® 6-Section Expansion Kit
650309-001	N-Ject® 9-Section Expansion Kit

3.3.3 - Install the Additional Harness, if necessary

[Figure 4] - If it is necessary, the additional module harness connects to the slave flow module(s) and flow meter module(s).

See page 57 for 6-section system wiring and page 59 for 9-section system wiring.

CALL OUT	PART NO.	DESCRIPTION
1	620202-006	6-Section Shutoff Harness
2	620202-009	9-Section Shutoff Harness

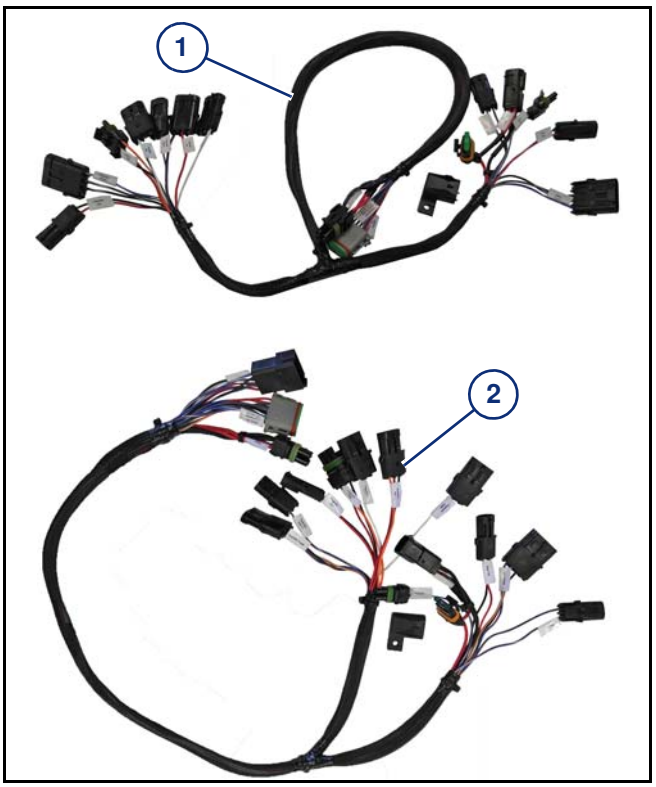

Figure 4

3.4 - Install the N-Ject® Section Harness

[Figure 4] - Route the N-Ject® section harness from the electronic module enclosure to the N-Ject® manifold. Connect the section 2-pin pigtail connectors to the appropriate nozzle valves on the manifold.

IMPORTANT: One section harness is required for each section.

PART NO.	DESCRIPTION
625038-001	Harness - 4 Valves x 10 ft
625038-025	Harness - 4 Valves x 25 ft
625032-001	Harness - 8 Valves x 10 ft
620134-001	Harness - 8 Valves x 25 ft
625035-001	Harness - 4 Valve + 4 Valve x 10 ft
625035-025	Harness - 4 Valve + 4 Valve x 25 ft

Figure 4

The 4-section harness is used to connect the nozzle valves in a section with 4 valves or fewer.

The 8-section harness is used to connect the nozzle valves in a section with 8 valves or fewer.

The 4 nozzle + 4-section harness is used to connect the nozzle valves in a section with 8 or fewer valves.

The 4 nozzle + 4-section harness also connects sections that are split between two manifolds.

IMPORTANT: When installing an N-Ject® section harness onto the nozzle valves, the boom sections harness pigtails (connectors) wires are color coated.

The boom section harness pigtail (connector) will have a white and black wire. The adjacent pigtail (connector) will have a green and black wire.

The N-Ject® section harness pigtail (connectors) must alternate along the nozzle valves, white/green wire alteration.

3.3.1 - Install the Extension Harness, if required

[Figure 5] - If it is necessary connect the extension harness to the N-Ject® section harness to the flow module(s).

NOTE: One section harness is required for each N-Ject® section.

PART NO.	DESCRIPTION
117501-002	Extension Harness - 3 Conductor x 10 ft
117501-003	Extension Harness - 3 Conductor x 25 ft

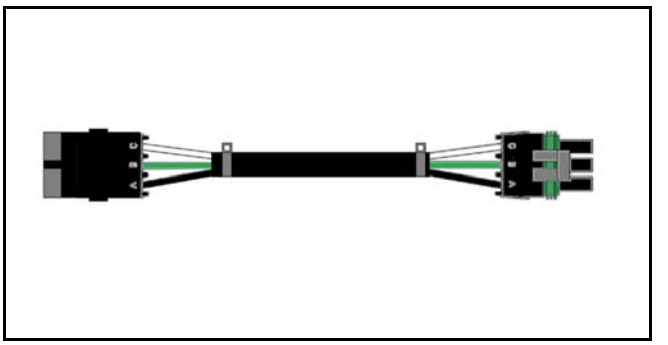

Figure 5

3.3.2 - Section 1, 2, and 3 N-Ject® Harness Installation

1. Locate the N-Ject® section harnesses that will be used for section 1, 2 and 3.
2. Attach the N-Ject® section harnesses into the master flow module connector labeled section 1, 2 and 3.
3. Route the N-Ject® section harness to the N-Ject® manifold containing the valves for section 1, 2, and 3.
4. Install the N-Ject® section harnesses onto the nozzle valves for section 1. Make sure that the N-Ject® section harness pigtail (connectors) wires alternate along the nozzle valves, white/green wire alternation.

NOTE: Only connect nozzle valves that will be controlled by section 1 into the section 1 N-Ject® section harness etc.

5. Repeat step 4 for N-Ject® section 2 and section 3 harnesses.
6. Install dust caps on all unused connectors.
7. Secure the N-Ject® section harness wiring with cable ties.

The N-Ject® manifold ships with pressure sensor's and gauges installed.

Use extreme caution when working on the N-Ject® system. System may be charged at full tank pressure. Always bleed the N-Ject® system before service or maintenance.

If the pressure gauges are not visible from the cab, fittings/hose barbs (rated for full tank pressure) can be installed on the master slice and end flange to move the pressure gauges to a visible location.

Never use hoses that are not rated for full tank pressure.

3.3.3 - Section 4, 5, and 6 N-Ject® Harness Installation

If required, to install the N-Ject® section harnesses for N-Ject® sections 4, 5, and 6, locate the correct slave flow module. The slave flow module will be attached to the 6-section N-Ject® section harness. Repeat the above procedures to install the N-Ject® section harnesses onto the N-Ject® manifold for sections 4, 5, and 6.

3.4.4 - Section 7, 8, and 9 N-Ject® Harness Installation

If required, to install the N-Ject® section harnesses for N-Ject® sections 7, 8, and 9, locate the appropriate slave flow module. The slave flow module will be attached to the 9-section N-Ject® section harness. Repeat the above procedures to install the N-Ject® section harnesses onto the N-Ject® manifold for sections 7, 8, and 9.

3.5 - Install the Pressure Sensor Harness

[Figure 6] - The 3-pin connectors for pressure sensor harness are labeled:

- Inlet (1)
- Outlet (2)

Make sure to connect to the correct pressure sensor.

PART NO.	DESCRIPTION
620202-004	Pressure Sensor Harness - 8 in

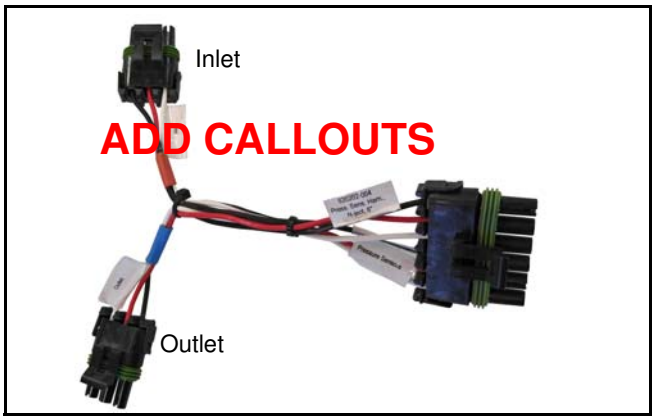

Figure 6

[Figure 7] - The pressure sensor harness connects to the pressure sensor extension harness and to the inlet and outlet pressure sensors on the N-Ject® manifold.

CALL OUT	PART NO.	DESCRIPTION
1	620120-250	Inlet Pressure Sensor - 250 PSI
2	620162-050	Outlet Pressure Sensor - 50 PSI

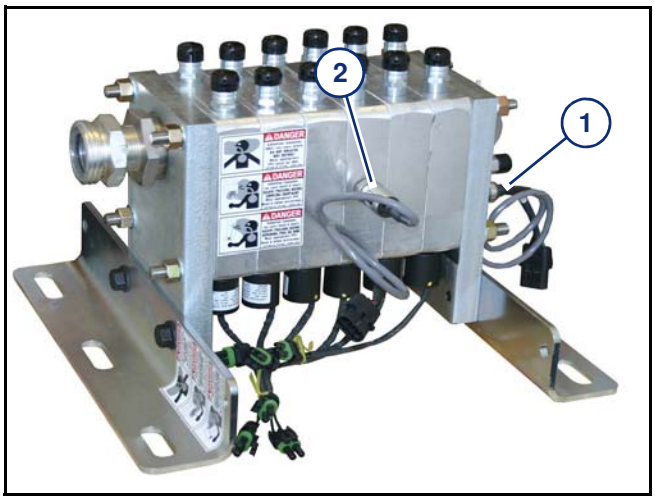

Figure 7

3.5.1 - Install the Pressure Sensor Extension Harness

[Figure 8] - The pressure sensor extension harness connects to the pressure sensor harness and to the 3-section module harness.

PART NO.	DESCRIPTION
620202-010	Pressure Sensor Extension Harness - 10 ft
620202-011	Pressure Sensor Extension Harness - 25 ft

- The 25 ft pressure sensor extension is shown.

Figure 8

3.6 - Install the Liquid Level Sensor (Optional)

[Figure 9] - Install the liquid level sensor onto the manifold.

PART NO.	DESCRIPTION
620127-008	Liquid Level Sensor

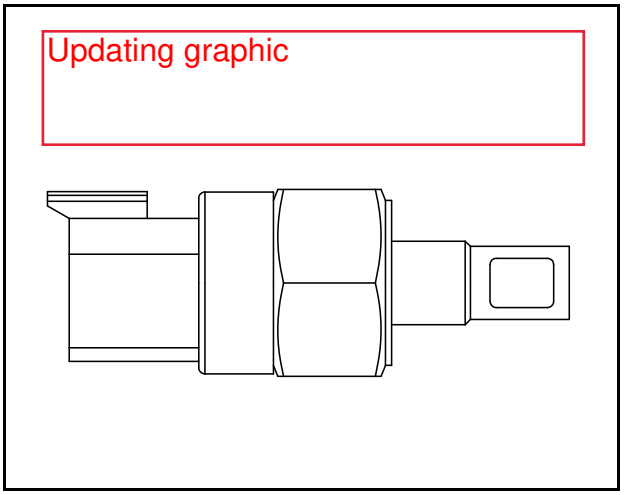

Figure 9

3.3.1 - Install the Liquid Level Sensor Harness

[Figure 10] -

PART NO.	DESCRIPTION
620202-022	Liquid Level Sensor Harness

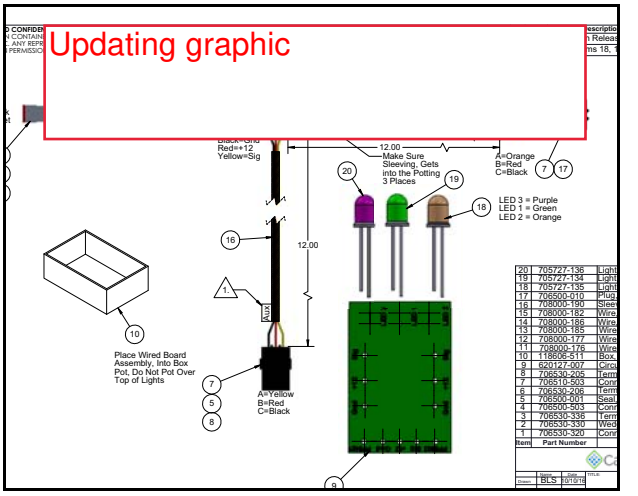

Figure 10

3.3.2 - Install the Extension Harness

[Figure 11] -

PART NO.	DESCRIPTION
620202-017	Extension Harness

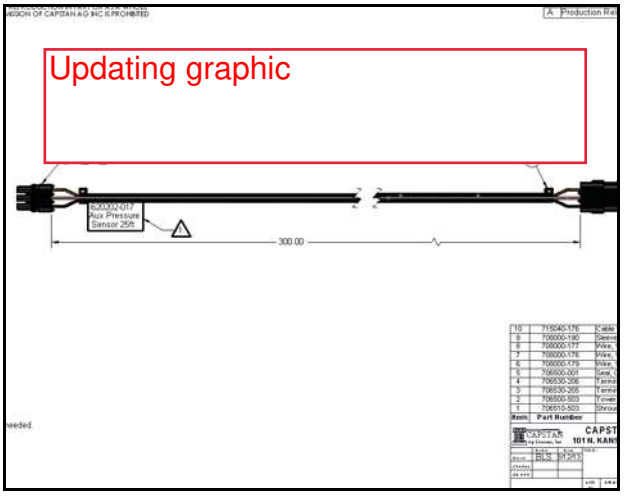

Figure 11

3.3.3 - Liquid Level Sensor Adapter for a Dual Manifold

[Figure 10] -

PART NO.	DESCRIPTION
620202-020	Liquid Level Sensor Adapter for a Dual Manifold

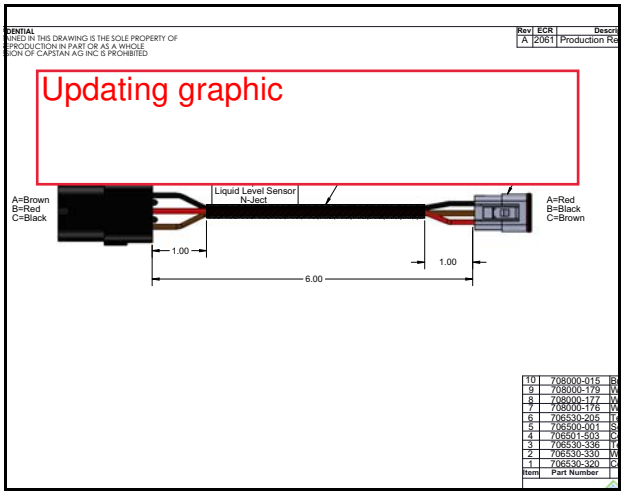

Figure 12

3.7 - Install the System Power Harness

The system power harness connects to the battery with the 60 A circuit breaker and to the 3-section module harness.

NOTE: Complete all N-Ject® component wiring and harness connections before installing the circuit breaker and battery connections. Make sure that all wiring is secured and clear from pinch point.

[Figure 5] - Connect the system power harness positive (+) red cable (1) to the circuit breaker (2).

From the battery positive (+) terminal, connect the positive (+) red cable (3) to the circuit breaker.

Connect the system power harness negative (-) black cable (4) to the battery ground terminal.

NOTE: If the machine is equipped, the system power harness negative (-) black cable must be wired to the main power disconnect.

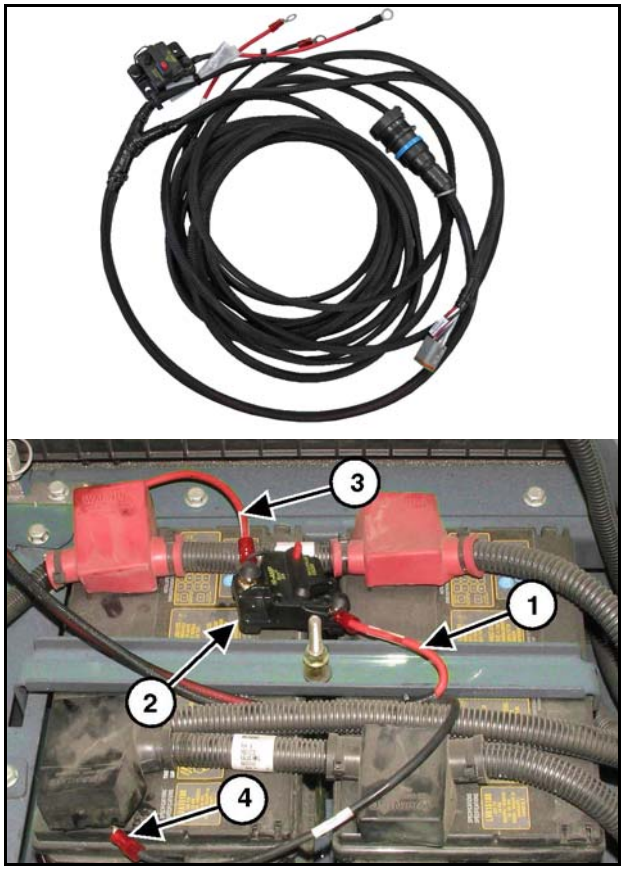

Figure 5

3.6.1 - Install the Power Harness Extension

[Figure 13] - Connect the power harness extension to the 3-section module harness and to the system power harness. Attach the harness to the frame with cable ties.

PART NO.	DESCRIPTION
620202-015	Power Harness Extension - 15ft
620202-002	Power Harness Extension - 30 ft
620202-005	Power Harness Extension - 50 ft

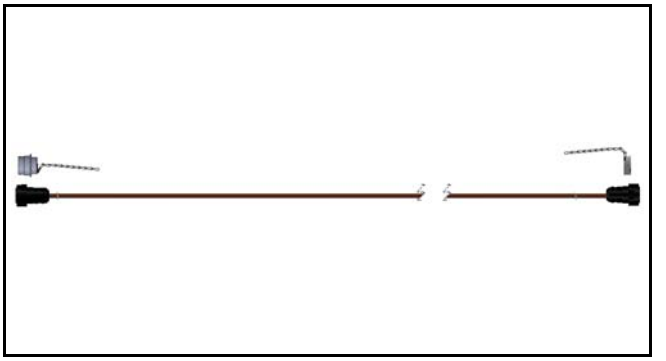

Figure 13

3.8 - Install the N-Ject® Cab Display

[Figure 14] - Mount the N-Ject® cab display in the cab of the machine with the supplied with kit. Make sure that the N-Ject® cab display is within view and reach of the operator.

CALL OUT	PART NO.	DESCRIPTION
1	620131-002	N-Ject® Cab Display
2	118603-111	RAM Mount Install Kit

Figure 14

3.7.1 - Install the N-Ject® Cab Display Connections

[Figure 6] - The connections on the back of the N-Ject® cab display include:

- Main connection (1)
- GPS connection (2)
- Diagnostic (AUX) connection (3)

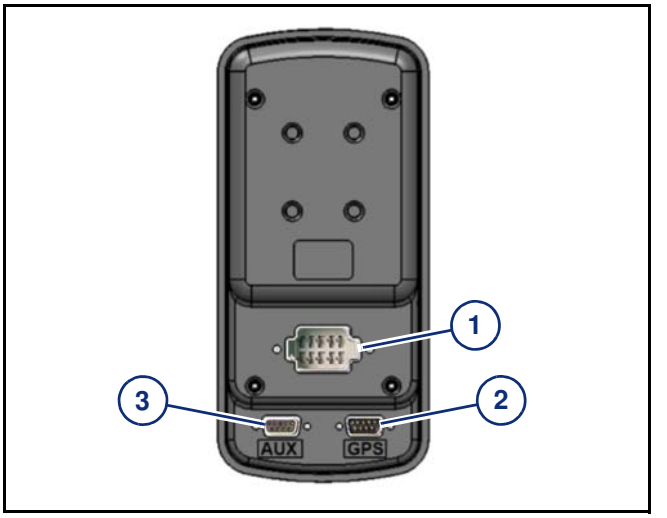

Figure 6

3.7.2 - Install the N-Ject® Cab Display Extension Harness

[Figure 15] - The N-Ject® cab display extension harness connects to the 3-section module harness and to the N-Ject® cab display main connection port.

PART NO.	DESCRIPTION
620202-007	Cab Display Extension Harness - 15 ft.

Figure 15

3.9 - Setup

3.3.1 - Specific Menu Items

Line 1 - Backlight

[Figure 1] - The backlight gives choices of the brightness of the LCD screen and light behind the keypad for low light conditions.

Range: 1 - 5 (Dimmest to Brightest)

When selections 1 or 2 are active (low ambient light conditions) the keypad buttons become back-lit.

Figure 7

Line 2 - Alarm Volume

[Figure 2] - The alarm volume menu let you change the volume level of the alarm.

To silence the alarm, select **Off**.

Range: 1 - 5 (Quiet to Loudest)

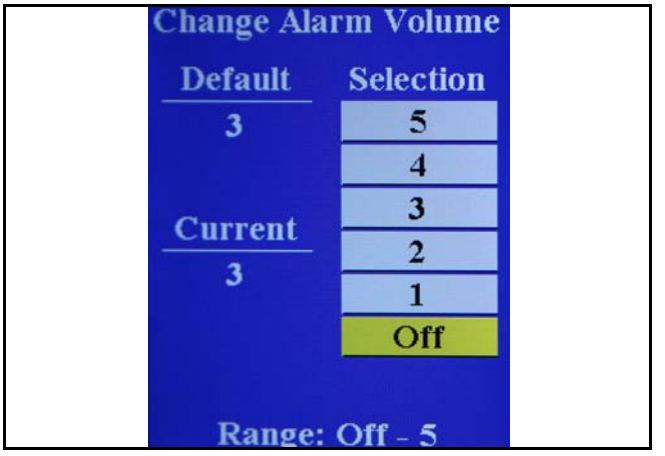

Figure 8

Line 3 - Auxiliary PSI Sensor

[Figure 3] - The auxiliary psi sensor menu lets you change the sensor settings between 250 psi or 50 psi.

Range: Inlet or Outlet

Waiting on decision about the liquid level sensor....standard or option...
Remove if liquid level sensor is standard...

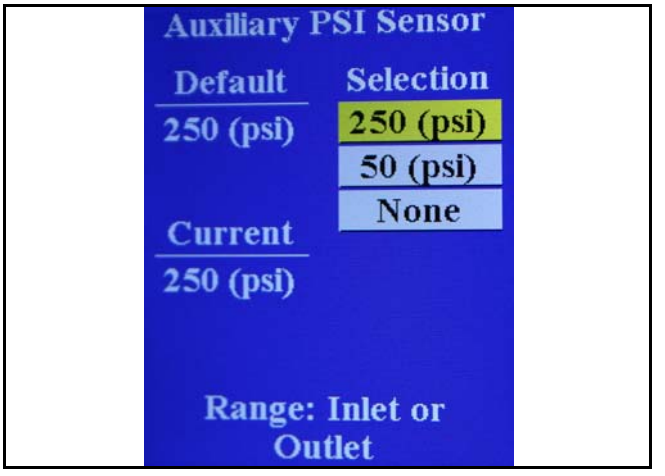

Figure 9

Line 4 - Float Switch

[Figure 10] -

The float switch menu let you change the setting for the inlet and outlet.

Range: Enabled or None

Waiting on dicision....
Float Switch will not be available.
It will change to the the following menu items:
Liquid Sensor 1 Enabled
Liquid Sensor 2 Enabled/Disabled
Liquid Sensor Sensitivity 5s

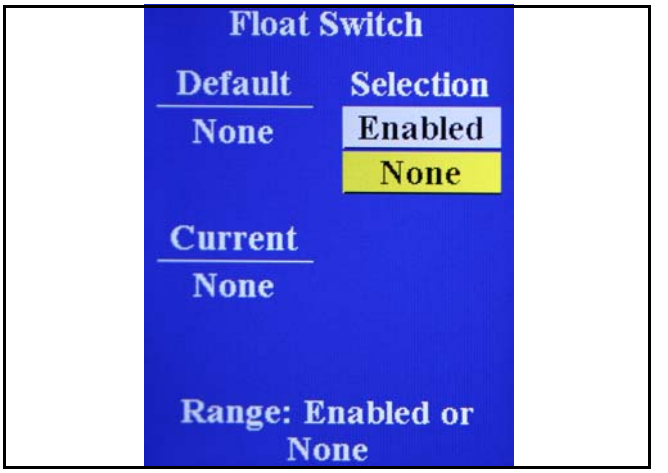

Figure 10

Line 5 - Diagnostics

[Figure 11] - The diagnostics menu shows the set parameters in the N-Ject® NH3 system that cannot be changed. These can be useful in troubleshooting and/or diagnostic purposes.

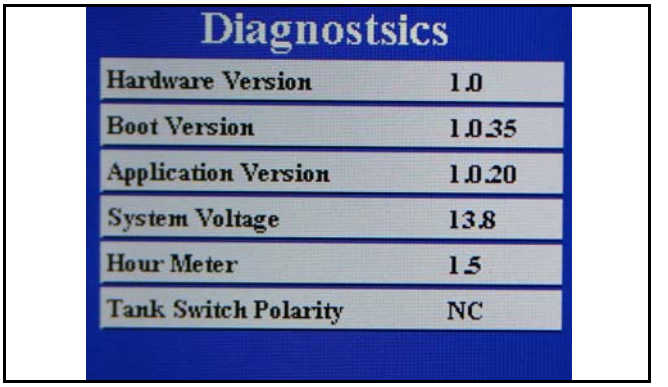

Figure 11

Line 6 - Exit Menu

[Figure 12] - Use this line to exit the main menu structure:

1. Use the increase/decrease buttons to highlight **6 Exit**
2. Press the menu button.

This is necessary since the Menu button doubles as enter and exit functions.

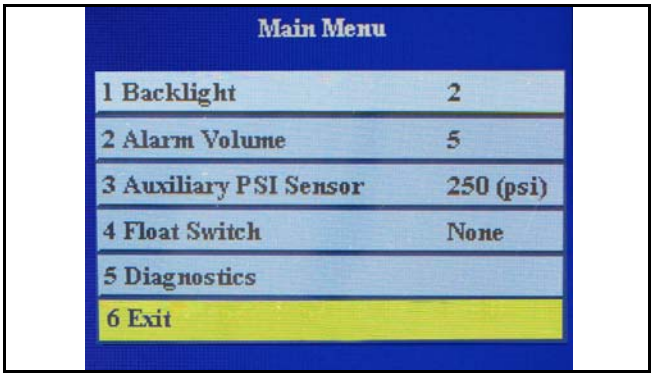

Figure 12

4.0 - OPERATION

4.1 - N-Ject® NH3 System

The rate controller uses the speed signal, the section widths, flow meter value rate, and servo signal to calculate the actual flow rate. Then the rate controller compares the actual flow rate to the target flow rate. Using the servo signal, the rate controller tells the N-Ject® to increase flow, decrease flow, or hold steady.

If the rate controller tells the N-Ject® to increase the flow, the duty cycle of the PWM signal is increased to the pulsing valves. The pulsing valves increase to pulsing at 3 hz or three times per second which provides more flow through the valve during each pulse.

If the rate controller tells the N-Ject® to decrease the flow, the duty cycle of the PWM is decreased to reduce the flow through the valve during each pulse cycle.

If the rate controller sends no signal, then the N-Ject® does not change the duty cycle and the flow remains constant.

4.2 - N-Ject® Cab Display

[Figure 16] - The N-Ject® cab display has four buttons to navigate and control the system. A screen on the N-Ject® cab display shows immediate information and gives access to the menu items.

Press the **POWER** button to turn on the N-Ject® cab display, the light behind the power button will illuminate.

Press the **MENU** button to go the main menu list.

The Menu button doubles as enter or exit through all the menu items.

Press the **INCREASE** or **DECREASE** buttons to move through the menu items. The selected menu item is highlighted.

Figure 16

[Figure 17] - The main menu screen has two pages and shows all of the menu items and current value of each.

Press the **MENU** button to go the selected information.

To exit the main menu:

1. Use the **INCREASE** or **DECREASE** button to highlight Exit.
2. Press the **MENU** button.

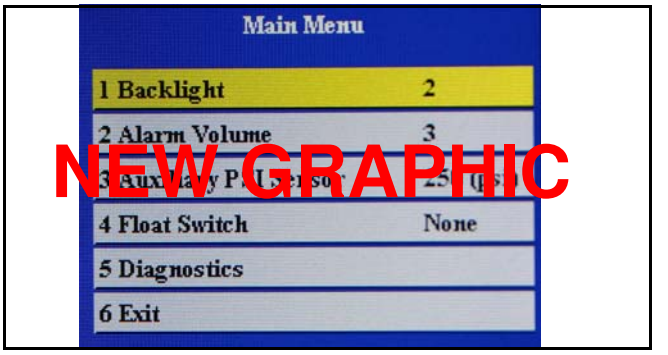

Figure 17

4.3 - Start a New Tank

1. Make sure that the N-Ject® cab display is off when connecting the first ammonia tank of the day.
2. Once the ammonia tank is connected and the machine/implement is moved to the field, turn on the tank manual shutoff valve.

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

3. With ammonia pressure showing on the inlet pressure gauge, and wearing proper protective equipment, open the bleed valve on the N-Ject® manifold(s) and bleed the air from the manifold and supply line.

The air has been removed when white ammonia vapor is released from the bleed valve.

Bleeding the air from the system is not required when switching tanks throughout the day as ammonia vapor usually remains within the manifold and displaces any incoming air.

4.4 - Apply NH3 with the N-Ject® System

IMPORTANT: Before applying ammonia, weigh the first tank of ammonia to make sure that the calibration is correct.

Start Up Procedure

1. Before starting the engine, always make sure that the N-Ject® cab display and rate controller are off.
2. Start the machine.
3. Make sure that the section switches and master switch are off.
4. Turn on the rate controller.
5. Make sure that rates and settings are correct on the rate controller.
6. Turn on the N-Ject® system.
7. Turn on the section switches and/or master switch to apply product.
8. Use the section and/or master switch on the rate controller to turn on/off the product, as desired.

Shut Down Procedure

1. Turn off all section switches.
2. Turn off the N-Ject® cab display and the rate controller.
3. Close the tank manual shutoff valve.
4. Shut off machine.

4.5 - Vent and Drain the N-Ject® System

IMPORTANT: This procedure must be done before any service or maintenance is performed on the N-Ject® system.

1. Close the tank manual shutoff valve.
2. Pull the application knifes through the soil.
3. Turn on the N-Ject® system and the section and master switches to apply ammonia.

- Pressure will be relieved through the knifes and into the soil. When pressure is no longer seen on the inlet pressure gauge, turn off the N-Ject® system.

4. Make sure that there is no pressure on the inlet pressure gauge.
5. Open the bleeder valve located on the inlet end plate on the N-Ject® manifold(s).

- Any pressure remaining in the N-Ject® system inlet hoses is released.

6. The machine/implement can be moved to a safe place for service.

4.6 - System Testing

Perform the these procedures to make sure that the nozzle valves are operating correctly.

4.3.1 - N-Ject® System Dry Test

1. Make sure that the machine engine off and key is on (in the auxiliary position).
2. Make sure that the N-Ject® cab display and rate controller are on.
3. Put the master switch in the on position.
4. Turn on section 1.

- Nozzle valves for section 1 should start clicking.

5. Turn off section 1.
6. Repeat steps 4 and 5 for each section to make sure that each section is operating correctly.
7. Turn on all of the N-Ject® section switches.
8. In **"MAN"** mode, cycle the INC/DEC switch on the rate controller in the INC position.

- The valves should lock open, (stop pulsing) after approximately three seconds.

9. When the valves lock open, make sure that there is a 100% duty cycle.
10. In **"MAN"** mode, cycle the INC/DEC switch on the rate controller in the DEC position.

- The valves should begin pulsing again. After about six seconds, the valves should lock closed (stop pulsing).

11. When the valves lock closed, verify that there is a 0% duty cycle.

If the valves lock open and lock closed, the N-Ject® system is operating correctly.

If the system does not respond correctly, check all wiring connections and refer to the troubleshooting section.

4.6.2 - N-Ject® Flow Meter Test

[Figure 18] - To flow test the N-Ject® system without ammonia, use the pressure faker, or pressurize the inlet pressure sensor with air to 60 psi. These options will simulate ammonia pressure.

Use one of these options to calibrate the N-Ject® system without ammonia

Figure 18

If using a pressure faker to calibrate the N-Ject® system:

1. Disconnect the inlet pressure sensor from the harness.
2. Connect the pressure faker into the harness, in place of the inlet pressure sensor.
3. With the rate controller and the N-Ject® cab display in the off position, start the machine.
4. Turn on the rate controller and put in **"MAN"** mode.
5. Set a target speed in the rate controller using the self test feature. Turn on the master boom switch.

- If the self test mode will not hold the speed, disconnect the radar.

6. Turn on the master switch and boom section switches.

- You should hear the valves pulsing.

7. Put the rate controller in **"AUTO"** mode (Rate 1 or Rate 2).

- The rate controller should adjust the duty cycle of the pulsing valves and lock in on the target rate.

8. Change the self test speed to make sure the system operates at lower speeds.
9. Test the rate changes to match planned variable rates.

- If the system has trouble hitting the high rates, slow down the speed. If the system has trouble hitting the low rates, speed up.

IMPORTANT: Be sure the rate controller is calibrated for N-Ject® section width.

10. When the N-Ject® system is turned back on, it will default to a 50% duty cycle and stay there until the rate controller is placed in automatic control mode.

PSI	MPH	DUTY CYCLE	VALVE TYPE	SPACING	LB/PER ACRE
60	5	50%	1/16 in.	30 in.	
60	5	50%	5/32 in.	30 in.	130
60	5	50%	3/32 in.	30 in.	80

11. Enter a test speed in the rate controller from the chart above that closely matches the target speed.

12. Turn the boom sections and all switches on, as if you were applying ammonia.

13. Adjust the meter calibration number until the application rate in the chart matches the rate displayed on the rate controller.

14. Remove the pressure faker and connect the inlet pressure sensor back into the implement harness or remove the air pressure from the inlet pressure sensor.

The N-Ject® system has been verified and is now ready for field operation.

5.0 - MAINTENANCE

5.1 -Service the N-Ject® NH3 System

⚠ CAUTION Before operation or service to the system, read and understand the machine's operator manual and the N-Ject® NH3 operator and maintenance manual.

IMPORTANT: Before performing any service or maintenance to the N-Ject® NH3 system the application system must be drained and vented of all NH3.

5.2 - Clean the N-Ject® System

Clean the implement and N-Ject® system after each use.

Avoid high pressure spray when cleaning the N-Ject® system components, valves and wiring connectors.

5.3 - Inspect the N-Ject® System

Inspect N-Ject® system hoses for cuts, nicks, or abrasions before each use. Replace any damaged hoses immediately.

Make sure that N-Ject® strainers are clean.

Make sure that all hoses and wiring are secure.

Check for loose hoses, mounting hardware, and other components. Tighten if necessary.

Check for damaged or missing decals. Replace if necessary.

5.4 - Storage of the N-Ject® System

Thoroughly clean the implement and N-Ject® system before long storage.

IMPORTANT: Use of N-Serve requires that the system is flushed with one or two tanks of NH3 without N-Serve at the end of the season before long storage.

5.5 - Jump Start/Charge

- If jump starting the machine, trip the 60 Amp circuit breaker to prevent damage to the N-Ject® control system.
- If charging the machine's batteries or welding on the machine, trip the 60 Amp circuit breaker or the machine's battery disconnect to prevent damage to the N-Ject® control system.

5.6 - Clean the Y-Strainer

IMPORTANT: Always bleed the N-Ject® system completely before performing any service or maintenance.

NOTE: Clean the strainers on a regular basis.

[Figure 19] - Remove the plug (1), the magnet (2), and the screen (3). Clean debris from the magnet and screen by washing with water.

Replace the screen if damaged.

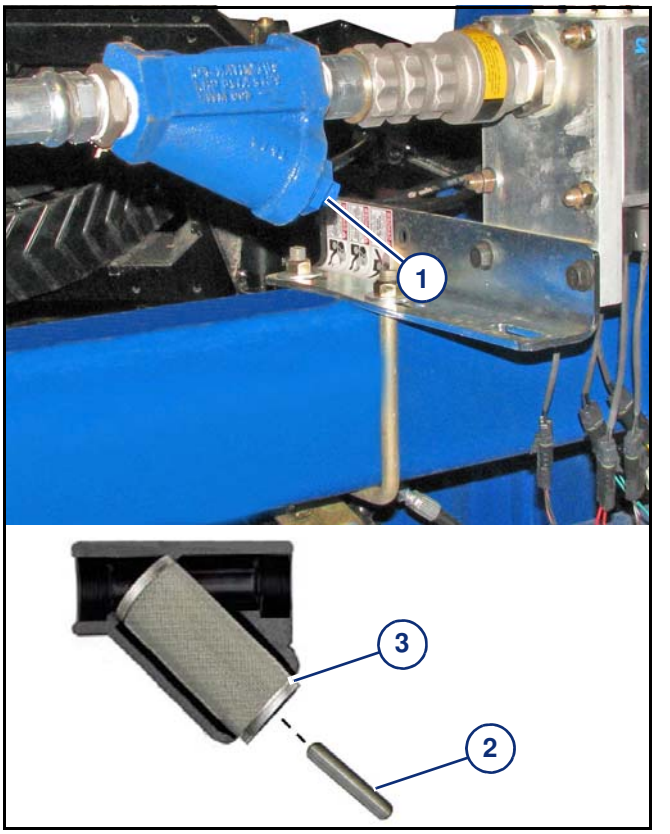

Figure 19

5.7 - Clean the Inlet Strainer

IMPORTANT: Always bleed the N-Ject® system completely before performing any service or maintenance.

NOTE: Clean the strainers on a regular basis.

[Figure 20] - Disconnect the inlet plumbing (1) from the N-Ject® manifold.

Remove the strainer (2) and magnet (3) from the N-Ject® manifold**.** Clean debris from the magnet and strainer by washing with water.

Replace the screen if damaged.

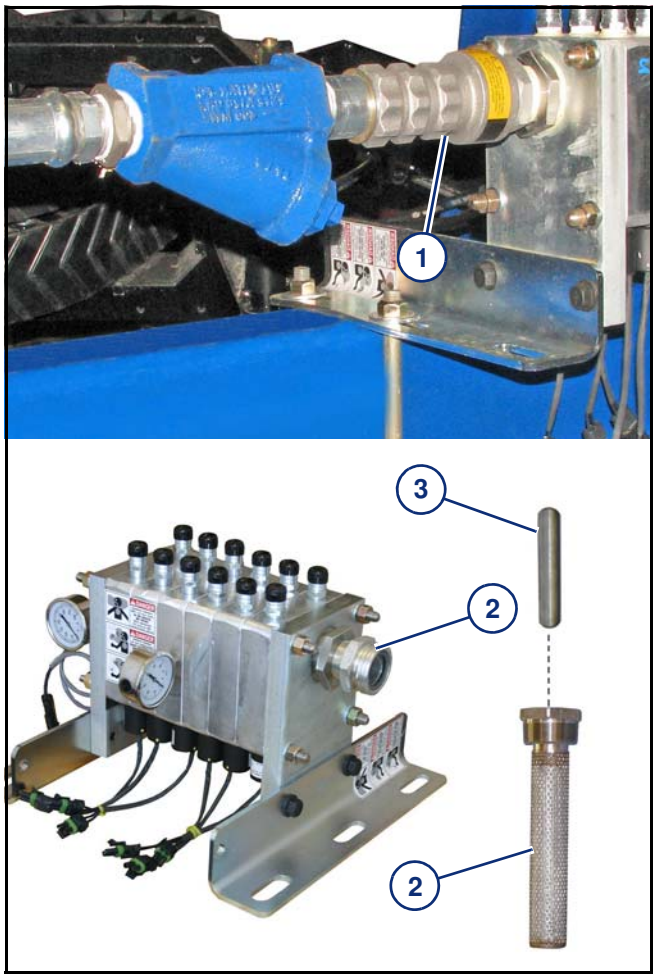

Figure 20

6.0 - TROUBLESHOOTING

⚠ CAUTION Before operation or service to the system, read and understand the machine's operator manual and the N-Ject® NH3 operator and maintenance manual.

6.1 - Recommended Guidelines

When servicing a N-Ject® System, CapstanAG™ recommends the following three step troubleshooting process:

1. Perform baseline service checks and verify the original N-Ject® setup values in this manual.
2. Identify individual performance problems. Evaluate possible causes and corrections for performance issues.
3. Troubleshoot individual components and replace if needed.

IMPORTANT: The primary service tool will be a simple multi-meter that can measure voltage and resistance (ohms).

6.2 - N-Ject® Baseline Evaluation Protocol

1. Verify voltage readings. See pages 40 to 46 for individual component testing.
2. Visually check all wire connections, harnesses, and connectors for loose, broken, or damaged wires.
3. Visually check all hoses for wear or damage.
4. Compare current settings with those recorded in this manual at setup.
5. Do a "like component swap" to see if the failure follows the component.
6. For the dry test, see System Testing on page 26.
7. Make sure that the strainer(s) are clean.
8. Repair or replace any damaged components.

IMPORTANT: Before performing any service or maintenance to the N-Ject® system the N-Ject® system must be drained and vented of all NH3.

9. See Vent and Drain the N-Ject® System on page 25.

6.3 - Troubleshooting Chart

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

PROBLEM	CAUSE	CORRECTION
Under application of product.	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.
	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.
	flow meter cal # incorrect.	Check flow meter calibration.
	Faulty module.	Replace module.
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.
	flow meter cal # incorrect.	Check flow meter calibration.
	Faulty flow meter module.	Repair or replace flow meter module.
Rate instability.	Faulty rate controller.	Replace rate controller.
	Faulty module.	Check module and replace if needed.
	Faulty speed sensor reading.	Check radar and replace if needed.
	Collapsed supply hose.	Replace supply hose.
	Strainer(s) plugged.	Check and clean strainer(s) if needed.
	Incorrect valve calibration settings.	Check and adjust settings (See the rate controller's manual).
	Faulty rate controller.	Replace rate controller.
	Low voltage to rate controller.	Test voltage and repair as needed.

PROBLEM	CAUSE	CORRECTION
Two or more sections will not apply NH3.	Tripped circuit breaker.	Reset circuit breaker.
	Blown fuses at master/slave module.	Check fuses at master/slave modules.
	Faulty N-Ject® Cab Display.	Replace N-Ject® Cab Display.
	Faulty rate controller.	Repair or replace rate controller.
One section will not apply NH3.	Faulty or damaged harness.	Repair or replace harness.
	Faulty section switch.	Replace switch.
	Blown fuse at master/slave module.	Check fuses at master/slave modules.
	Rate controller not activating section.	Verify section signal at master/slave module. Repair or replace rate controller components.
Single nozzle leaks when shutoff.	Orifice is lodged with debris.	Clean nozzle valve.
	O-ring pinched or broken.	Replace O-ring.
	Orifice is worn or damaged.	Replace valve body.
	Plunger is lodged with debris.	Clean nozzle valve.
	Plunger is worn or damaged.	Replace plunger.
	Plunger is worn.	Replace plunger.
Single nozzle valve operates erratically.	Nozzle valve is faulty.n	Service nozzle valve.
Liquid level sensor alarm sounds.	Tank is empty.	Fill the tank.
	Slow ground speed	Strainers are plugged, bad tank, or blockage in hose plumbing

6.4 - Interchange the Components

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

- Nozzle valves
- Boom and extension harnesses
- Electronic control modules

When troubleshooting failed components, it can be helpful to replace 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 interchanging failed components as in rare cases the failed component may cause other components to fail at the new location.

6.5 - Circuit Breaker

[Figure 13] - A circuit breaker is located near the battery or in the battery box. The 60 A circuit breaker has an automatic/manual trip button (1) and a manual reset lever (2).

A tripped circuit breaker is an indicator of a short or overload condition.

CIRCUIT BREAKER LOCATION	RATING	TYPE
Battery	60 A	Trip Reset

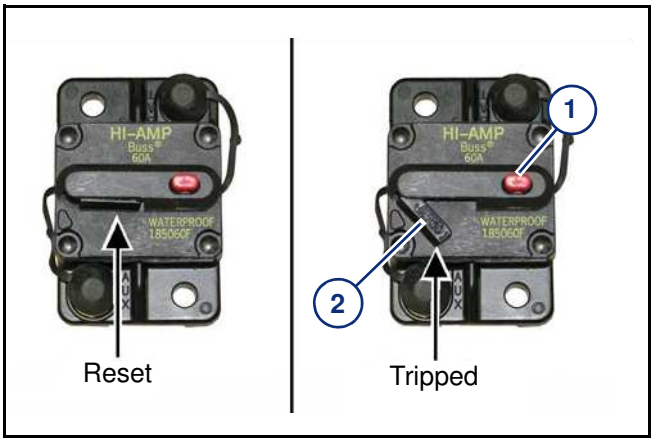

Figure 13

6.6 - Fuses

Blown fuses are indicators of a short or overload condition. Do not replace a blown fuse with a larger fuse. Larger fuses may result in component failures.

[Figure 21] - The master and slave flow module each contain three 10 amp fuses.

FUSE LOCATION	RATING	TYPE	COLOR
Master Flow Module	10 A	Buss	N/A
Slave Flow Module	10 A	Buss	N/A
Cab Power Harness	5 A	ATO/ATC	Tan
Module Harnesses - 3, 6, and 9-Section	30 A	ATO/ATC	Green

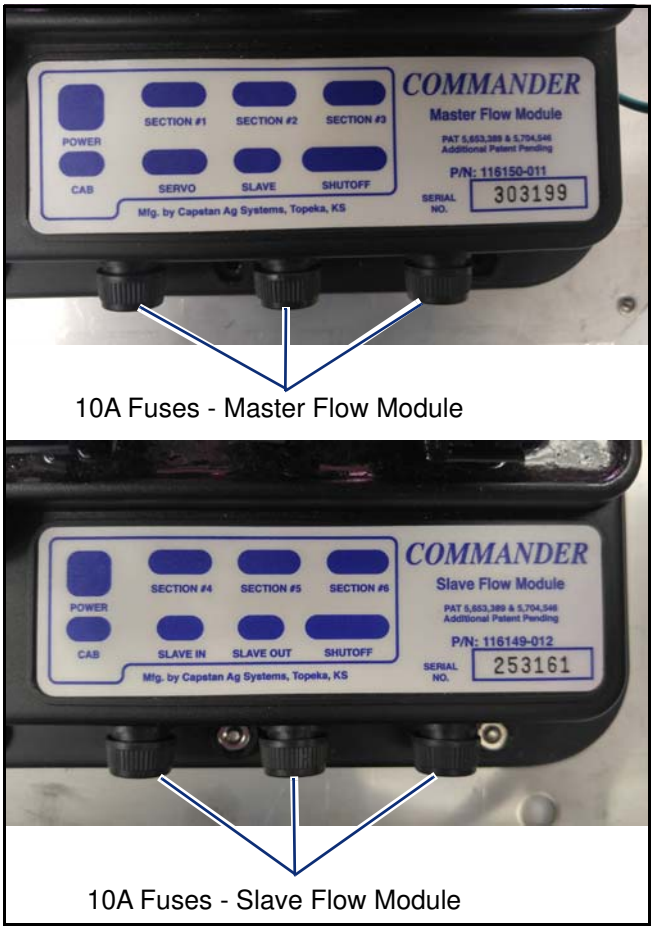

Figure 21

6.7 - Nozzle Valves

[Figure 22] - The nozzle valves are on the N-Ject® manifold(s).

Nozzle valve assemblies are offered with a 7 watt coil with either a 1/16 inch or 3/32 inch orifice or a 12 watt coil with a 5/32 inch orifice.

The 1/16 inch or 3/32 inch orifice for low flow applications or a 5/32 inch orifice for high flow applications.

TYPE	COLOR
-	Valve Assembly, 7 watt, 1/16 inch Orifice
621010-001	Valve Assembly, 7 watt, 3/32 inch Orifice
621011-001	Valve Assembly, 12 watt, 5/32 inch Orifice
620212-001	Valve Body, 1/16 inch Orifice
620208-001	Valve Body, 3/32 inch Orifice
620108-001	Valve Body, 5/32 inch Orifice

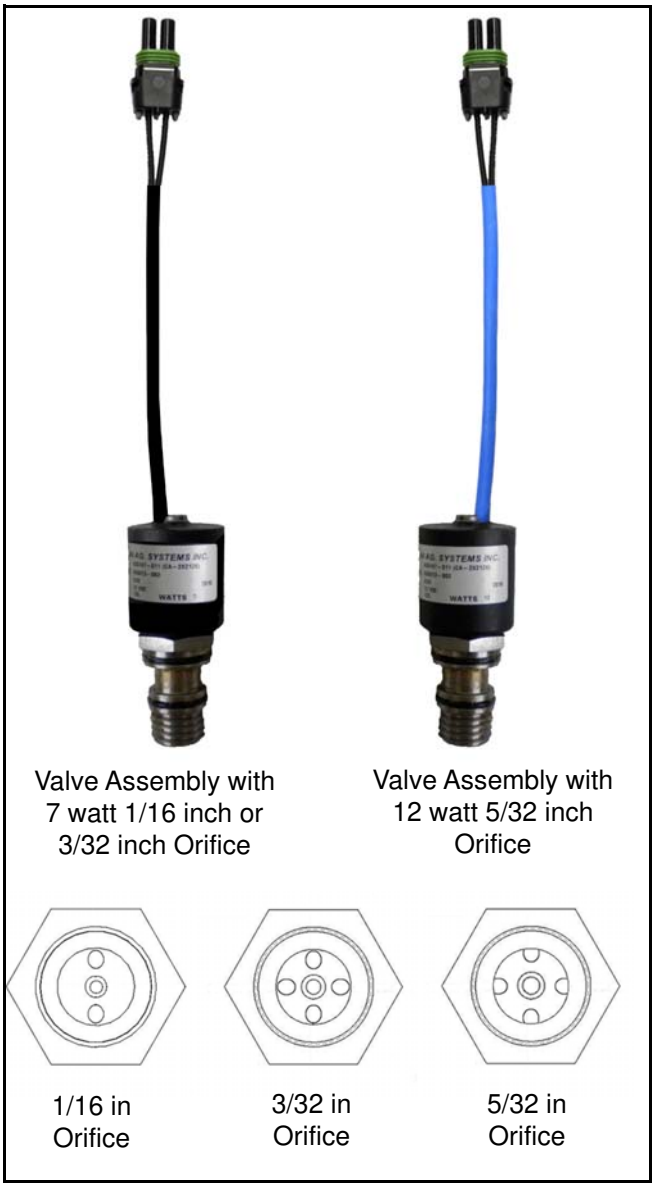

Figure 22

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 is shut off
- No application

NOTE: Pinched or split O-rings will also cause nozzles to drip 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: Before removal or installation of the nozzle valves, make sure that the pressure has been released from the N-Ject® system.

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 100 mesh screen is recommended to prevent nozzles from plugging. Check the mesh size of the strainers and replace strainers if they are too coarse.

6.7.1 - Clean the Nozzle Valve

1. Remove the nozzle valve assembly from the manifold.
2. **[Figure 24] -** Remove the coil (1) by rotating the coil counter clockwise from the valve body (2).
3. Remove the plunger (3) and O-ring (4) from the coil.
4. Remove debris from the plunger, O-rings, and valve body by washing with clean water.
5. Inspect the O-rings (5) and (6).
6. Inspect the valve body and make sure the orifice (7) is not plugged with debris, worn or damaged. If the orifice is worn or damaged, replace the valve body.
7. Inspect the plunger for wear or damage. Replace the plunger if it is worn or damaged.

CALL OUT	DESCRIPTION
1	Coil
2	Plunger
3	O-ring - Size-015
4	O-ring - Size-019
5	O-ring - Size-017
6	Valve Body

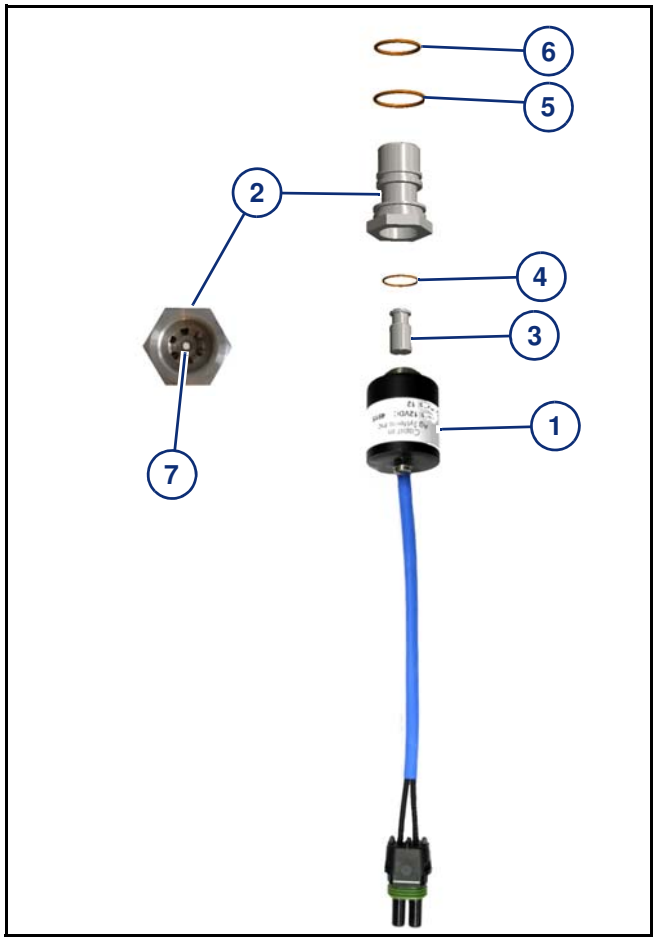

Figure 23

6.7.2 - Inspect the Plunger Seal

[Figure 24] - After extended use, the Teflon plunger seal will wear a groove (1) 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 installed. High operating pressures and abrasive chemicals will accelerate the wear of the plunger seal material.

- Clean the connector terminals
- Replace coil

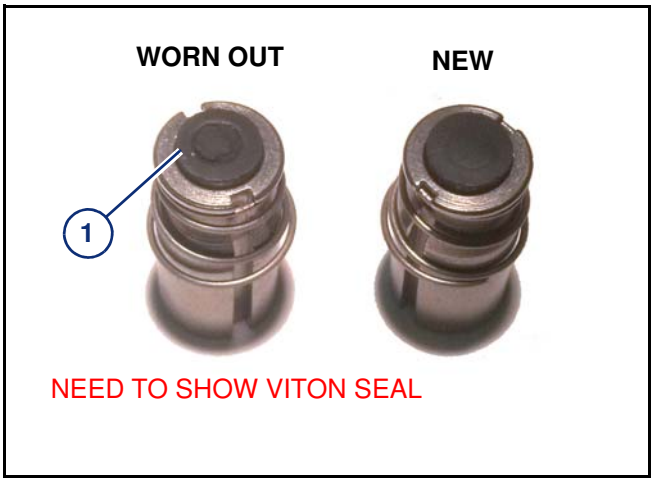

Figure 24

6.8 - Coil Test

Coil failures are often the result of two factors:

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

NOTE: CapstanAG™ recommends cleaning any plugged nozzle valves immediately.

[Figure 25] - - Use a voltmeter to measure the ohms of resistance across pins A and B on the nozzle valve connector.

- 7 watt coil resistance of 21 ohms to 23.5 ohms
- 12 watt coil resistance of 11 ohms to 13.5 ohms

If proper resistance is not found:

- Clean the connector terminals and retest
- Replace the coil

Figure 25

6.9 - Testing the Pressure Sensor Signal

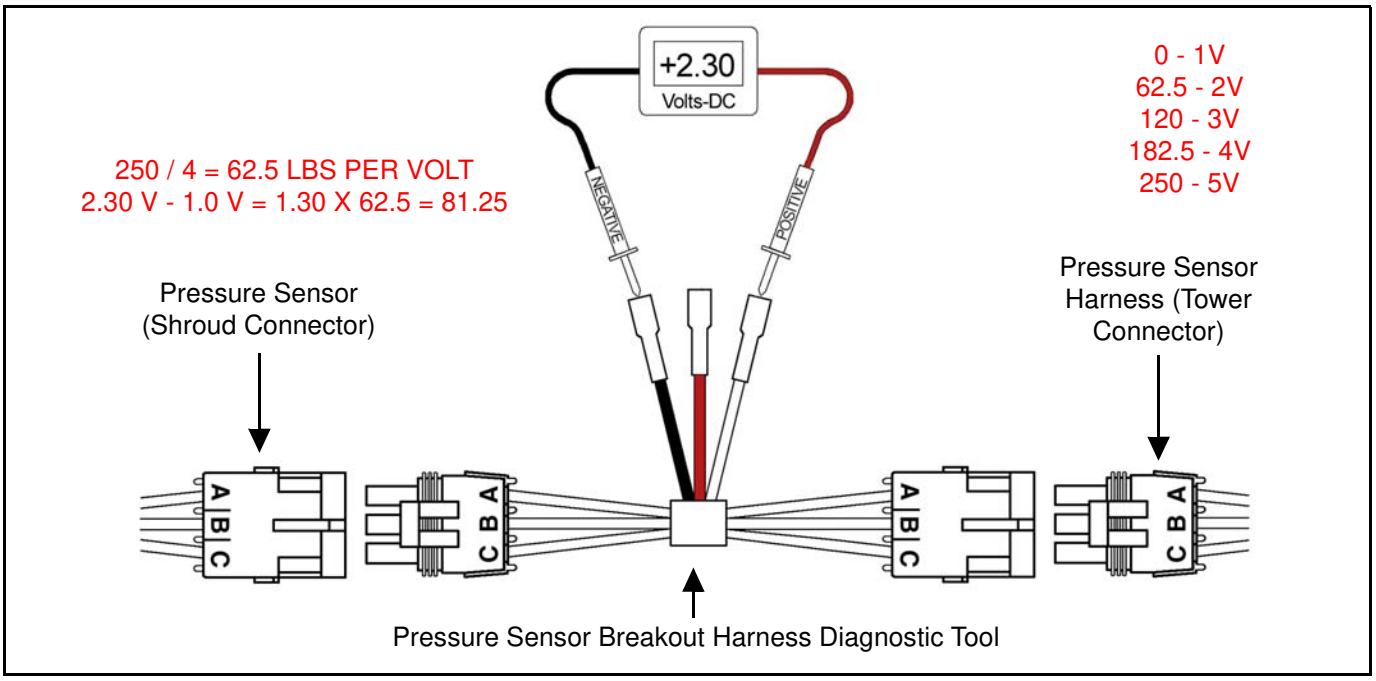

Figure 26

[Figure 26] - Disconnect the pressure sensor from the pressure sensor harness. Connect one end of the pressure sensor breakout harness diagnostic tool into the pressure sensor shroud connector. Connect the other end into the pressure sensor harness tower connector

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

Use a voltmeter to observe that there is 2.30 vdc between the black and white wire on the pressure sensor breakout harness.

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 250 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 Check the Power to the Pressure Sensor Input on page 42.
- Replace the pressure sensor.

6.3.1 - Check the Power to the Pressure Sensor Input

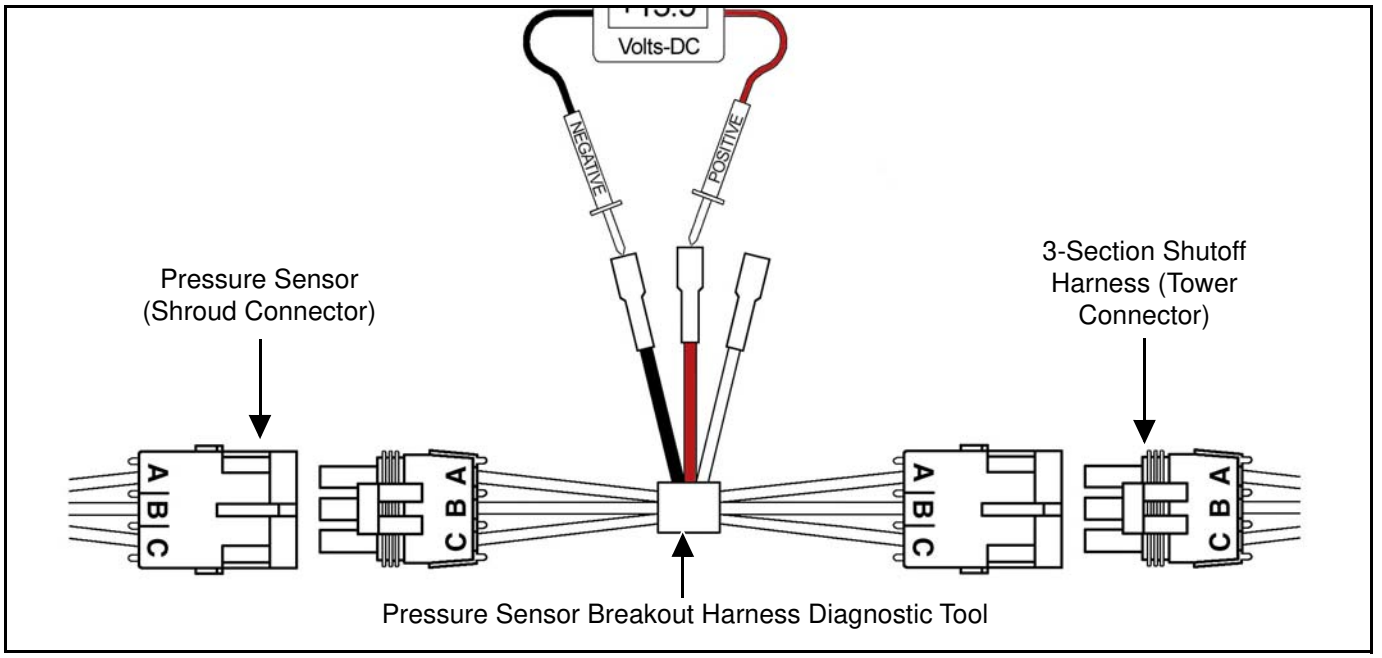

Figure 27

[Figure 27] - Disconnect the pressure sensor from the pressure sensor harness. Connect one end of the pressure sensor breakout harness diagnostic tool into the pressure sensor shroud connector. Connect the other end into the pressure sensor harness tower connector.

Use a voltmeter to observe that there is13.5 VDC between the Red and Black wire on the pressure sensor breakout harness with the engine running, or 12.0 VDC without the engine running.

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 Black 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.

6.10 - Commander Master Flow Module

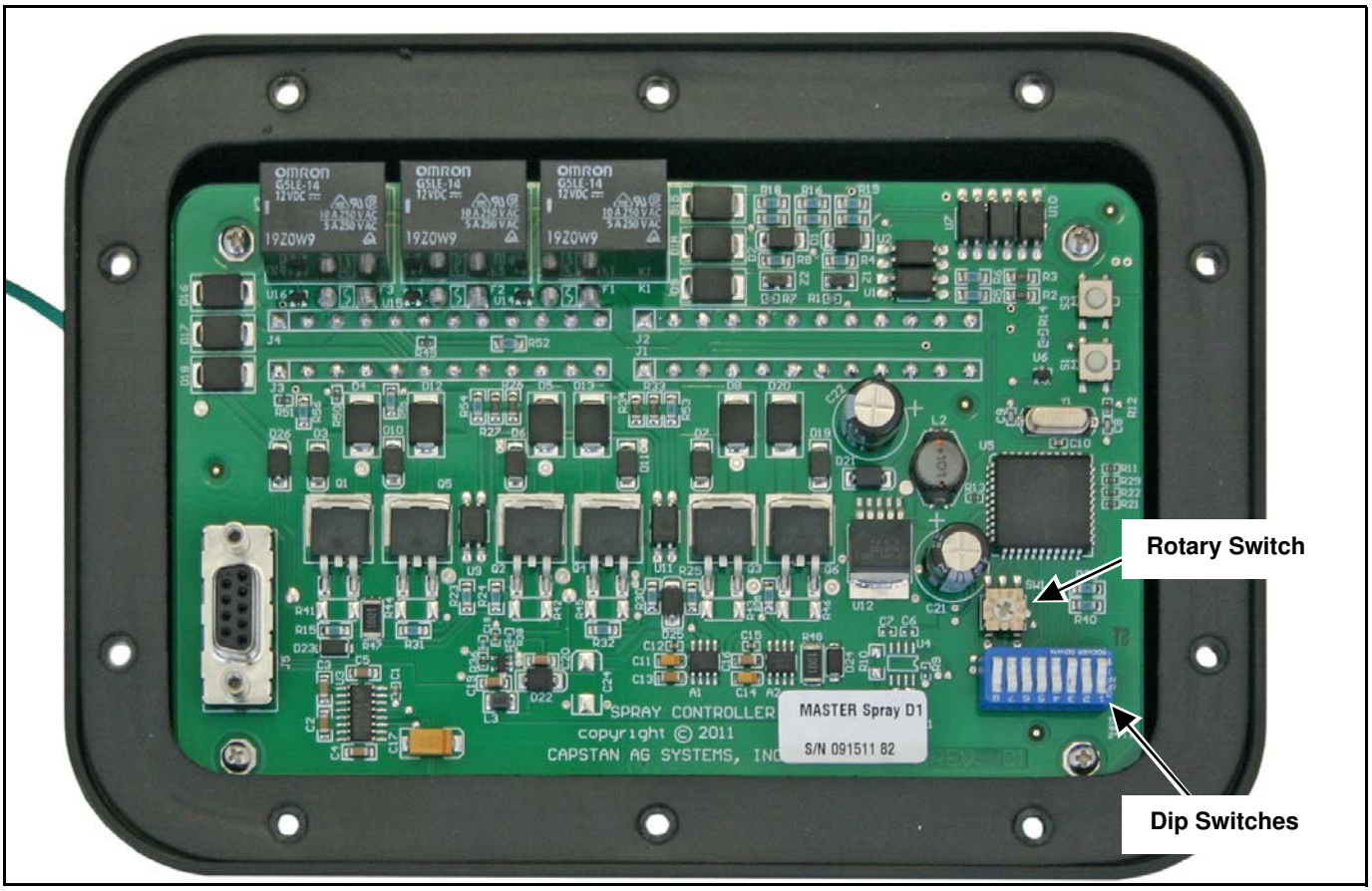

Figure 28

[Figure 28] - To access the master flow module circuit board, remove the enclosure cover and remove the cover from the master flow module.

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	ON	OFF	OFF	OFF	OFF	OFF	ON	Position 4

6.11 - Flow Meter Module

To access the flow meter module circuit board, remove the enclosure cover and remove the cover from the flow meter module.

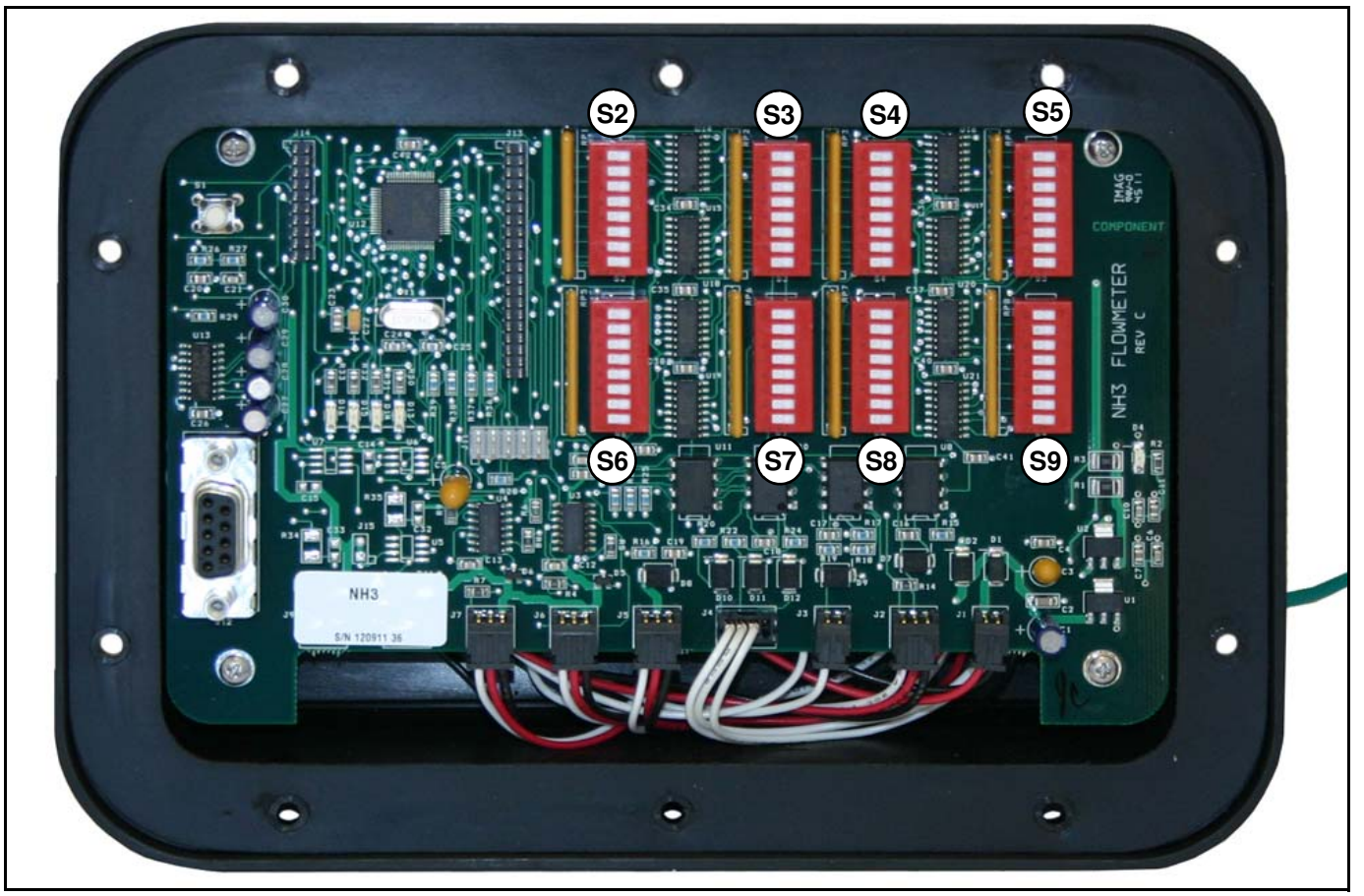

Figure 29

[Figure 29] - Eight banks of dip switches are located on N-Ject® flow meter module circuit board. The dip switch banks are labeled S2, S3, S4, S5, S6, S7, S8 and S9 on the circuit board.

6.3.1 - Flow Meter Module Section Configuration

The number of valves used on each boom section must be indicated by flipping one switch to the on position for each valve.

IMPORTANT: Default settings should only be altered with the direction of a CapstanAG™ field representative or a qualified dealer.

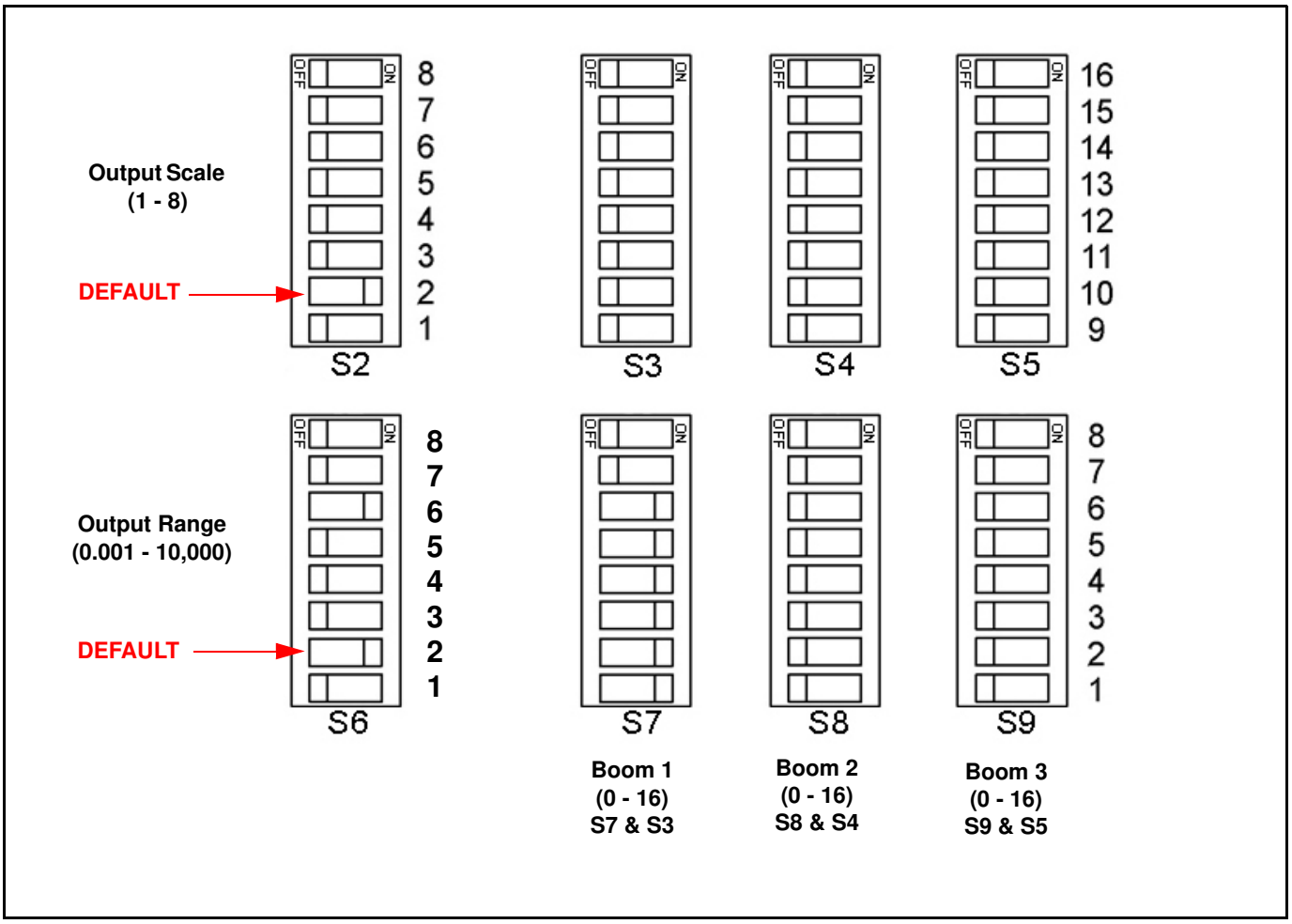

Figure 30

[Figure 30] - Example: Boom section one, if there are six valves used, turn on #1 through #6 DIP switches on S7.

Example: Boom section one, if there are twelve valves used, turn on #1 though #8 DIP switches on S7 and turn on #9 through #12 DIP switches on S3.

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.

6.12 - Serial Setup And Diagnostics

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

[Figure 31] - Connect the computer to the flow meter module serial port (1) using a male to female DB9 cable.

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

With Capstan® Diagnostics or an alternative terminal emulator program, access information by selecting: **Start > Accessories > Communications > Capstan Diagnostics**.

Set up the emulator and communication information as follows:

SET-UP INFORMATION		
Emulator Information		**Communication Information**
Emulation:	ANSIW	Baud Rate:
Telnet Terminal ID:	VT100	Parity:
Backscroll Buffer Lines:	500	Stop Bits:
		Flow Control:

Figure 31

6.13 - Liquid Level Sensor

[Figure 32] - The LED lights:

- Green - Power (12 V)
- Purple - Sensor 1
- Orange - Sensor 2

When the green LED illuminates, there is power to the system and liquid in the system.

If the purple or orange LED illuminates, the sensor is not seeing liquid.

To test the senor, remove from the implement, and put in water to test the operation of the sensor.

Use a breakour harness to check the voltage.

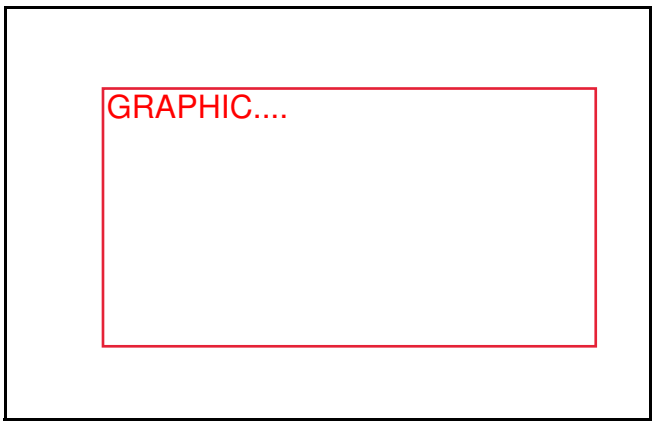

Figure 32

7.0 - WARRANTY

LIMITED WARRANTY

Rev Date: 7/15/2014

A. What does the Limited Warranty cover?

The ultimate purchaser/user (“you”), by acceptance of seller Capstan Ag Systems, Inc.’s, (“our,” “we,” or “us”) product, assume all risk and liability of the consequences of any use or misuse by you, your employees, or others.

All replacement components furnished under this warranty, but shipped before the failed component is returned for evaluation, will be invoiced in the usual manner and warranty adjustments will be made after the component claimed to be defective has been returned to and inspected and deemed defective by us at our factory.

Upon determining that a component has failed under warranty, the repaired component or replacement component, furnished under this warranty, will be shipped at our expense, to your location. We will credit you an amount equal to the incoming freight you paid. We shall not be responsible for installation costs. (You shall be responsible for all customs and brokerage fees for all international transactions.)

If the component does not prove to be defective, you shall be liable for all freight, inspection and handling costs. In no event will any claim for labor or incidental or consequential damages be allowed for removing or replacing a defective product. Warranty will be denied on any component which has been subject to misuse, abuse, accidents, or alterations, or to improper or negligent use, maintenance, storage or transportation and handling.

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

The terms of this warranty do not in any way extend to any product which was not manufactured by us or one of our affiliates.

While necessary maintenance or repairs on your Capstan Ag Systems, Inc. product can be performed by any company, we recommend that you use only authorized Capstan Ag Systems, Inc. dealers. Improper or incorrectly performed maintenance or repair voids this warranty.

The foregoing warranty is exclusive and is in lieu of all other warranties expressed or implied. We shall not be liable for any incidental or consequential damages resulting from any breach of warranty.

Your exclusive remedy for breach of warranty shall be repair or replacement of defective component(s): Provided, if the component(s) are incapable of being repaired or replaced, your exclusive remedy shall be credit issued, but such credit shall not exceed the purchase price of the components.

On any claim of any kind, including negligence, our liability for any loss or damage arising out of, or from the design, manufacture, sale, delivery, resale, installation, technical direction of installation, inspection, repair, operation of use of any products shall in no case exceed the purchase price allocable to the components.

In no event, whether as a result of breach of contract or warranty or alleged negligence, shall we 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 you for such damages.

B. What is the period of coverage?

We warrant to you, that our products are free from defects in material and workmanship in normal use and service for a period of one year from date of purchase.

C. How do you get service?

Our obligation under this warranty shall be limited to the repairing or replacing at our option, the component which our inspection discloses to be defective, free of charge, return freight paid by us, provided you: (i) Notify us of defect within thirty (30) days of failure; (ii) Return the defective component to us, freight prepaid; (iii) Complete the Owner Registration Form and returned it to us; and (iv) Establish that the product has been properly installed, maintained and operated in accordance with our instructions or instructions contained in our operations or maintenance manuals and within the limits of normal usage.

Any claim for breach of our warranty must be in writing addressed to us and must set forth the alleged defect in sufficient detail to permit its easy identification by us. 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. Any breach of warranty claim not timely made will not be honored by us and will be of no force and effect.Any component that needs to be repaired or evaluated for warranty has to be authorized before return. Contact the factory (785-232-4477) to get a Return Materials Authorization (RMA #). This helps to track 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 warranty denied.

After receiving your RMA #, package the part, making sure to include the RMA #, your name, customer's name, your address and phone number and description of problems or failure. Then ship to:

Capstan Ag Systems, Inc.
Attn: Warranty/Repair
4225 SW Kirklawn Ave.
Topeka, KS 66609

Phone: (785) 232-4477
Fax: (785) 232-7799
Hours: 8 a.m. - 4:30 pm CST

D. How does state law relate to this Limited Warranty?

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

8.0 - SCHEMATICS

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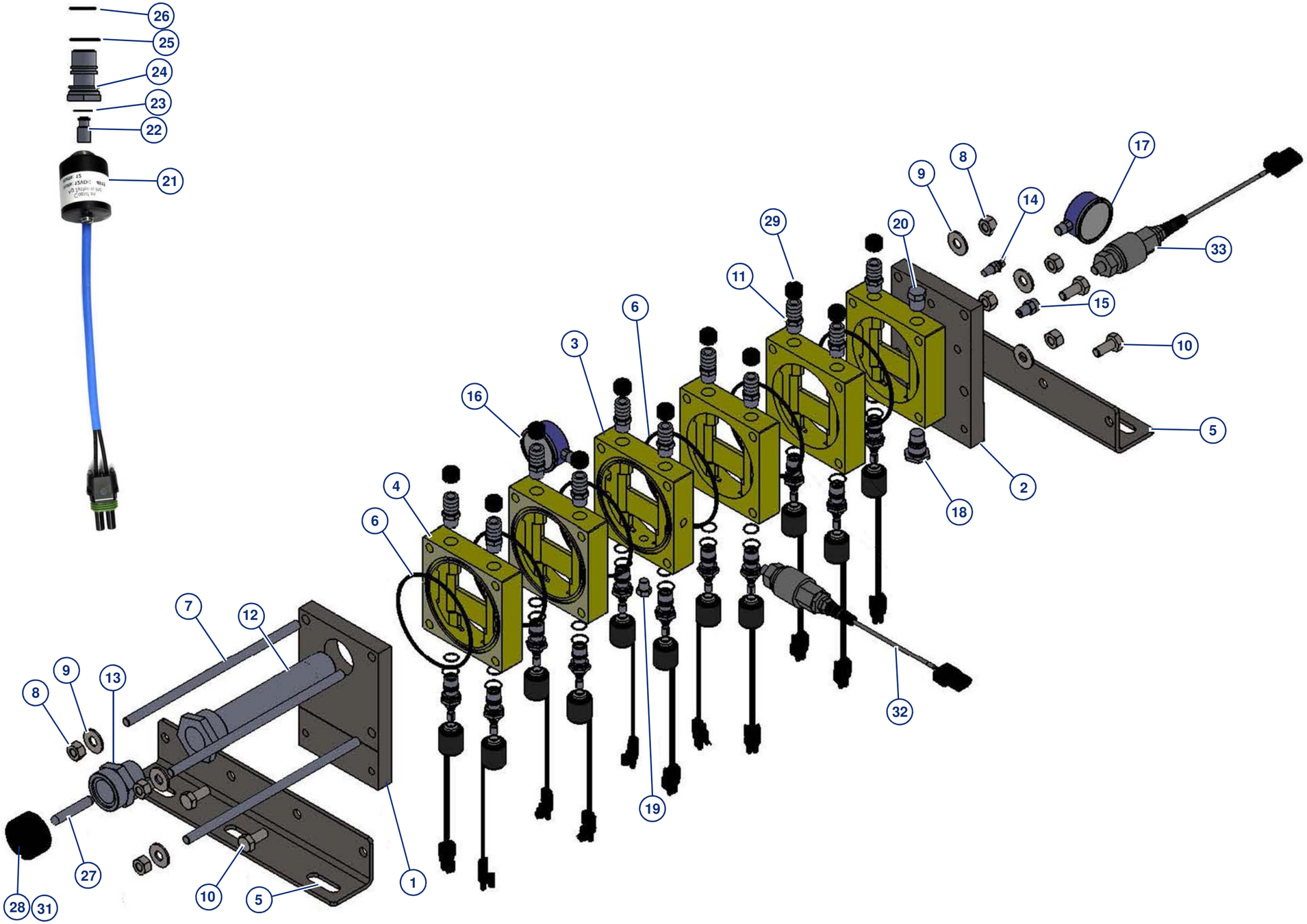
8.1 - N-Ject® NH3 Manifolds

NH3 MANIFOLD ASSEMBLY PARTS			915 MANIFOLD 650098-001	1015 MANIFOLD 650100-001	1113 MANIFOLD 650101-001	1213 MANIFOLD 650103-001	1515 MANIFOLD 650110-001	1615 MANIFOLD 650112-001	1715 MANIFOLD 650114-001	2013 MANIFOLD 650119-001
ITEM	PART NO.	DESCRIPTION	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.
1	620100-001	Inlet Flange	1	1	1	1	1	1	1	1
2	620101-001	End Flange	1	1	1	1	1	1	1	1
3	620104-002	Master Slice	1	1	1	1	1	1	1	1
4	620103-002	Dual Port Slice	5	5	5	5	5	5	5	5
5	620106-001	Mounting Bracket	2	2	2	2	2	2	2	2
6	620112-001	4 mm x 136 mm O-Ring - Buna-N	7	7	7	7	9	9	10	11
7	620109-004	1/2-20 x 13 in Threaded Rod	4	4	4	4	-	-	-	-
	620109-006	1/2-20 x 16 in Threaded Rod	-	-	-	-	4	4	-	-
	620109-007	1/2-20 x 17.5 in Threaded Rod	-	-	-	-	-	-	4	-
	620109-008	1/2-20 x19 in Threaded Rod	-	-	-	-	-	-	-	4
8	620110-001	1/2-20 Grade 8 Nut	8	8	8	8	8	8	8	8
9	620111-001	M12 Flat Washer	8	8	8	8	8	8	8	8
10	620186-001	1/2-13 x 1-1/4 in Grade 8 Bolt	4	4	4	4	4	4	4	4
11	620117-004	1/2 in HB x 3/4 in MNPT Fitting	9	10	11	12	15	16	17	20
12	620118-001	Strainer - 100-Mesh	1	1	1	1	1	1	1	1
13	620136-001	2-1/4 in ACME Fitting	1	1	1	1	1	1	1	1
14	620123-001	Bleeder Valve	1	1	1	1	1	1	1	1
15	620122-001	Relief Valve - 312 PSI	1	1	1	1	1	1	3	3
16	620124-001	Pressure Gauge - 60 PSI	1	1	1	1	1	1	1	1
17	620125-001	Pressure Gauge - 400 PSI	1	1	1	1	1	1	1	1
18	620126-001	Valve Plug with O-Ring	3	2	1	-	1	-	1	-
19	620143-001	1/4 in MNPT Plug	1	1	1	1	1	1	1	1
20	620144-001	1/2 in MNPT Plug	3	2	1	-	1	-	1	-
21	116189-111	Coil Assembly - 7 Watt	9	10	11	12	15	16	17	20
22	716190-001	Teflon Plunger Assembly	9	10	11	12	15	16	17	20
23	621022-204	O-Ring - 015 Buna	9	10	11	12	15	16	17	20
24	620208-001	Valve Body - 3/32 Orifice	9	10	11	12	15	16	17	20
25	620115-001	O-Ring - 019 Buna	9	10	11	12	15	16	17	20
26	620116-001	O-Ring - 017 Buna	9	10	11	12	15	16	17	20
27	620199-001	Strainer Magnet	1	1	1	1	1	1	1	1
28	706530-272	Vinyl End Cap	3	3	3	3	3	3	3	3
29	620178-001	1/2 in Vinyl Push On Cap	9	10	11	12	15	16	17	20
30	620154-001	Safety Decal (Not Shown)	3	3	3	3	3	3	3	3
31	715040-178	12 in Cable Tie	1	1	1	1	1	1	1	1
32	620162-050	Pressure Sensor - 50 PSI	1	1	1	1	1	1	1	1
33	620162-250	Pressure Sensor - 250 PSI	1	1	1	1	1	1	1	1

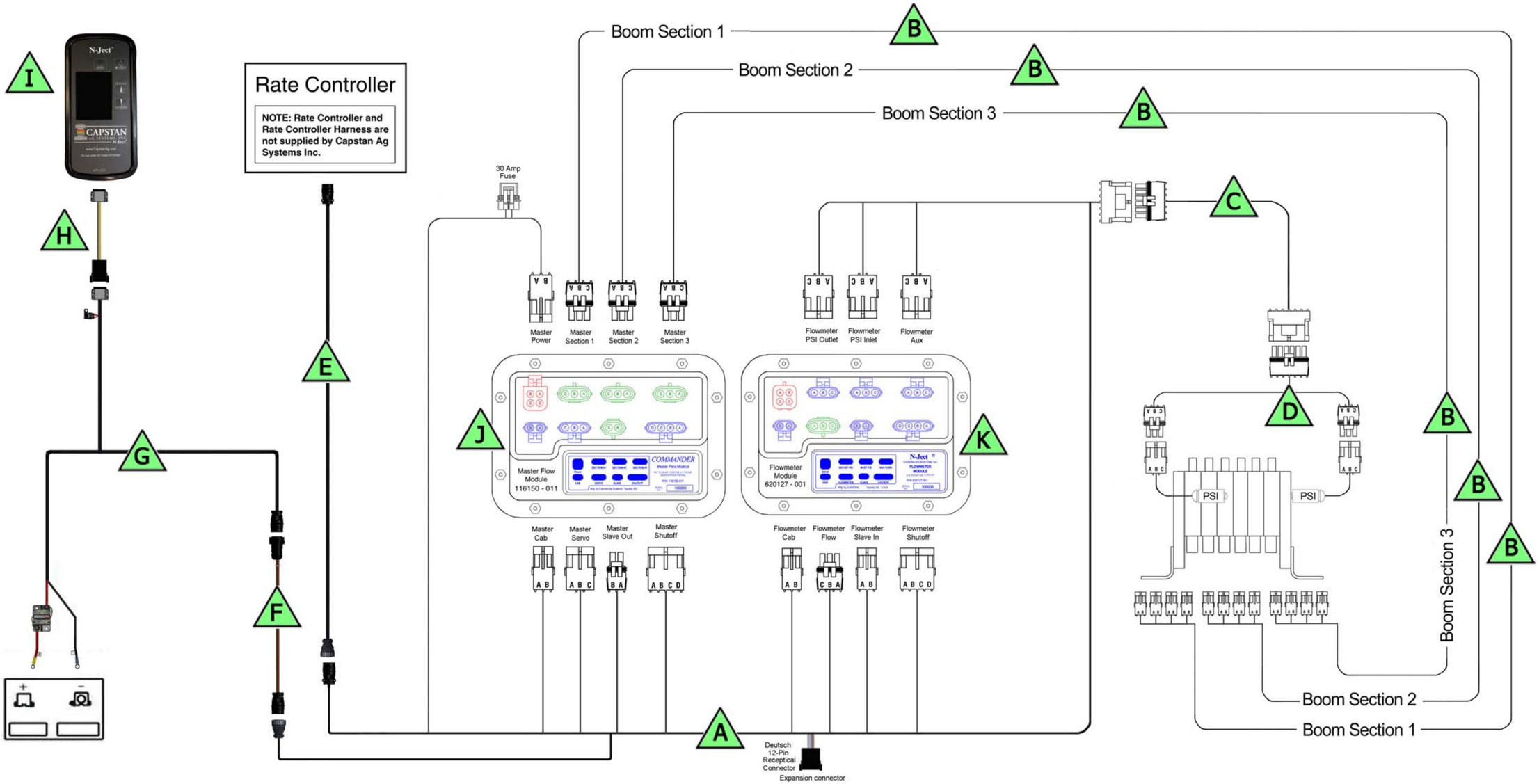
8.3.1 - Manifold Assembly N-Ject® 1113 - 650101-001



8.2 - N-Ject® NH3 System Diagrams

N-JECT® NH3 3-SECTION SHUTOFF			
Item	Description	Part No.	Qty.
A	3-Section Shutoff Harness	620202-003	1
B	4 Nozzle x 10 ft Harness	625038-001	As Reg.
	4 Nozzle x 25 ft Harness	625038-025	
	8 Nozzle x 10 ft Harness	625032-001	
	8 Nozzle x 25 ft Harness	620134-001	
	4 Nozzle + 4 Nozzle x 10 ft Harness	625035-001	
	4 Nozzle + 4 Nozzle x 25 ft Harness	625035-025	
C	Pressure Sensor Extension	620202-010	1
D	Pressure Sensor Harness	620202-004	1
E	Raven Adapter Harness	118640-050	As Reg.
	Ag Leader Adapter Harness	118640-051	
	Trimble Adapter Harness	118640-052	
	Seed Hawk Air Drill Adapter Harness	118640-053	
F	Extension Power Harness	620202-015	As Reg.
	Extension Power Harness	620202-002	
	Extension Power Harness	620202-005	
G	Power Harness	620202-001	
H	Extension Display Harness	620202-007	1
I	Cab Display	620131-002	1
J	Master Flow Module	116150-011	1
K	Flow Meter Module	620127-001	1

8.2.1 - N-Ject® NH3 3-Section System Wiring Layout

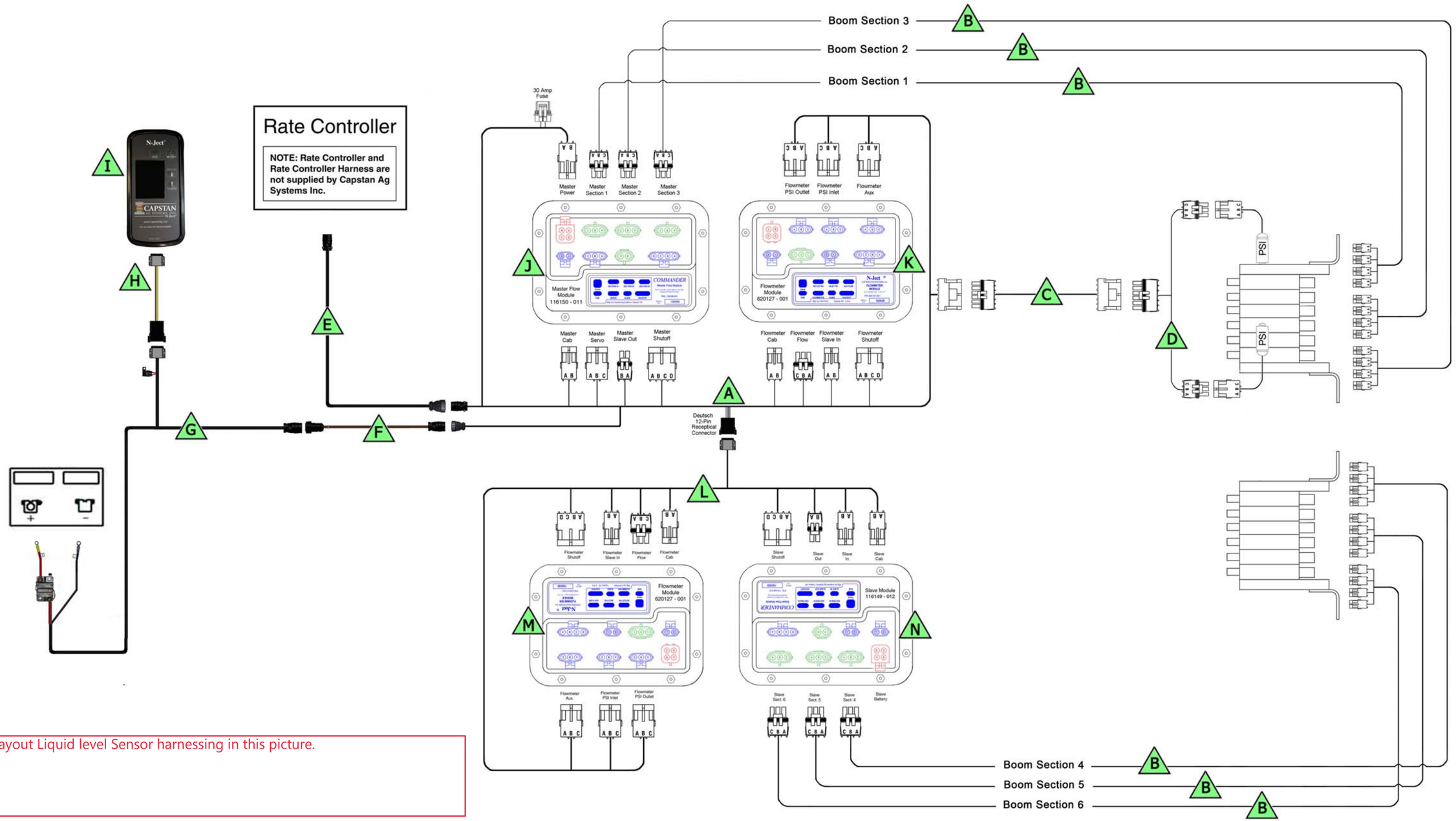


Need to layout Liquid level Sensor harnessing in this picture.

8.2.2 - N-Ject® NH3 6-Section System Wiring

N-JECT® NH3 6-SECTION SHUTOFF			
Item	Description	Part No.	Qty.
A	3-Section Shutoff Harness	620202-003	1
B	4 Nozzle x 10 ft Harness	625038-001	As Reg.
	4 Nozzle x 25 ft Harness	625038-025	
	8 Nozzle x 10 ft Harness	625032-001	
	8 Nozzle x 25 ft Harness	620134-001	
	4 Nozzle + 4 Nozzle x 10 ft Harness	625035-001	
	4 Nozzle + 4 Nozzle x 25 ft Harness	625035-025	
C	Extension, Pressure Sensor	620202-010	1
D	Pressure Sensor Harness	620202-004	1
E	Raven Adapter Harness	118640-050	As Reg.
	Ag Leader Adapter Harness	118640-051	
	Trimble Adapter Harness	118640-052	
	Seed Hawk Air Drill Adapter Harness	118640-053	
F	Extension Power Harness	620202-015	As Reg.
	Extension Power Harness	620202-002	
	Extension Power Harness	620202-005	
G	Power Harness	620202-001	1
H	Extension Display Harness	620202-007	1
I	Cab Display	620131-002	1
J	Master Flow Module	116150-011	1
K	Flow Meter Module	620127-001	2
L	6-Section Shutoff Harness	620202-006	1
M	Slave Module	116149-012	1

8.2.3 - N-Ject® NH3 6-Section System Wiring Layout

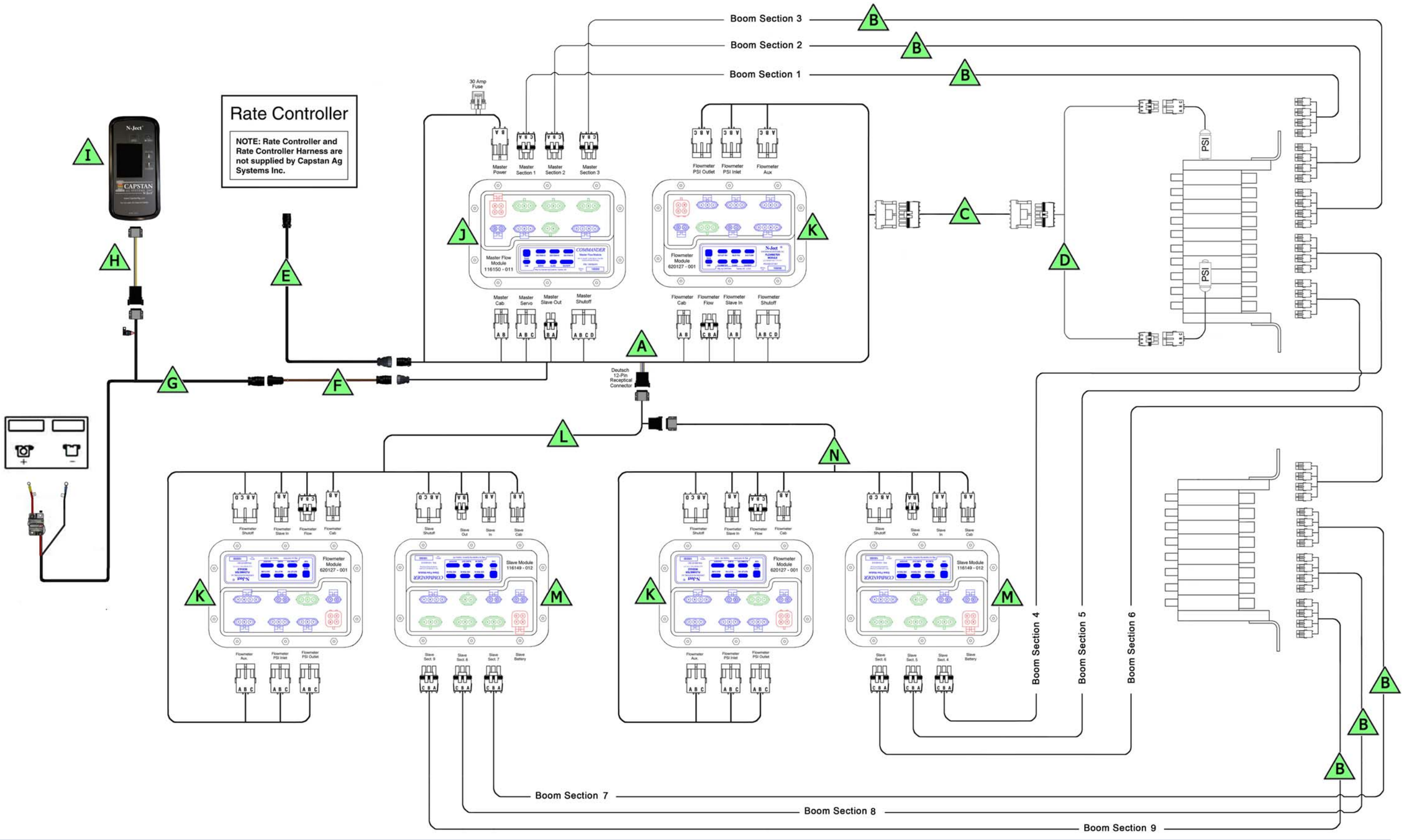


Need to layout Liquid level Sensor harnessing in this picture.

8.2.4 - N-Ject® NH3 9-Section System Wiring

N-JECT® NH3 6-SECTION SHUTOFF			
Item	Description	Part No.	Qty.
A	3-Section Shutoff Harness	620202-003	1
B	4 Nozzle x 10 ft Harness	625038-001	As Reg.
	4 Nozzle x 25 ft Harness	625038-025	
	8 Nozzle x 10 ft Harness	625032-001	
	8 Nozzle x 25 ft Harness	620134-001	
	4 Nozzle + 4 Nozzle x 10 ft Harness	625035-001	
	4 Nozzle + 4 Nozzle x 25 ft Harness	625035-025	
C	Pressure Sensor Extension	620202-010	1
D	Pressure Sensor Harness	620202-004	1
E	Raven Adapter Harness	118640-050	As Reg.
	Ag Leader Adapter Harness	118640-051	
	Trimble Adapter Harness	118640-052	
	Seed Hawk Air Drill Adapter Harness	118640-053	
F	Extension Power Harness	620202-015	As Reg.
	Extension Power Harness	620202-002	
	Extension Power Harness	620202-005	
G	Power Harness	620202-001	1
H	Extension Display Harness	620202-007	1
I	Cab Display	620131-002	1
J	Master Flow Module	116150-011	1
K	Flow Meter Module	620127-001	3
L	6-Section Shutoff Harness	620202-006	1
M	Slave Module	116149-012	2
N	9-Section Shutoff Harness	620202-009	1

8.2.5 - N-Ject® NH3 9-Section System Wiring Layout



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