



Application System

For systems using Dual Plus™ and
SafeGuard™ consoles

Operation



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MAIL and UPS:
Micro-Trak® Systems, Inc.
ATTN: Service Department
P.O. Box 99
111 East LeRay Avenue
Eagle Lake, MN 56024-0099

Table of Contents

About This Manual	6
Important Considerations	6
Water Quality	6
Applying Product In-Furrow.....	6
Freeze warning	6
Overview	7
Tank Assembly.....	7
Pump-Pak™ Assembly	8
Chemical Pump.....	8
Solution Pump.....	9
Flowmeter	9
Strainers.....	9
Electric Motor Drivers.....	9
Relay Module	10
Pressure Sensor	10
Air Compressor	10
3RIVE 3D™ Manifold Assembly	11
Row Delivery	12
Control Summary	13
Displays.....	13
Rotary Dial Positions.....	14
Switch Functions	15
Button Functions	15
Operation.....	16
Charge and Rinse Procedures.....	16
Preparing for Operation – Charging the System.....	16
End of Day – Rinsing the System	18
End of Season Storage/ Winterization	19
Cold Evening Procedure	19
Depressurizing the system.....	20
Automatic Operation	20
On-the-Go Rate Adjustments.....	20
Manual Operation.....	20
Periodic Maintenance.....	21
Chemical Pump Assembly	21
Metering Tube	21
Changing metering tube.....	21

Cleaning Flowmeter	23
Manifold Assembly	24
Liquid Inlet	24
Air Inlet	25
Section valves	25
Troubleshooting	26
Pumps Not Running	26
No Speed	26
Astro GPS speed sensor	26
No Flow	27
Testing channel 1 flowmeter sensor	27
Testing channel 2 flow sensor	28
3RIVE 3D™ Product Delivery	28
No foam – single rows	28
No foam – entire single section	28
No foam – entire planter	29
Complete Error Message List	30
Calibration	31
Verifying / changing calibration settings	31
Standard calibration settings	32
Determining channel 1 and 2 target rates	33
Channel 1 Target Rate	33
Channel 2 Target Rate	33
Entering Target rates into Controller	34
Special Calibration	35
Changing/viewing special calibration settings	35
Restoring Default Calibration Values	43
SafeGuard™ Blockage Monitor	44
Components	44
SafeGuard™ Console	44
SafeGuard™ Sensor	44
Implement Switch & Module	44
Normal Operation	44
Troubleshooting	45
Display freezes during startup	45
Console won't turn on	45
Sensors Not Detected	45
Sensor not detecting blockage	45
Sensor doesn't read GOOD	45

Open.....	45
Net.....	45
Error	45
Appendices	46
Appendix A – Default Settings	46
Appendix B – Wiring Diagrams	49
Console to Planter.....	49
Implement Harness	50
Junction Harness	51
Channel 1 Branch	52
Wiring Diagram – Channel 2 Branch	52
Section Harness.....	53
Appendix C – Fine Tuning Speed/Distance Calibration.....	54
Appendix D – Fine Tuning Flow Meter Calibration	55
Chemical Pump Flow Calibration	55
Solution Flowmeter Fine Tuning Calibration	56
Appendix D – Replacement Parts.....	58

ABOUT THIS MANUAL

This manual is tailored to the 3RIVE 3D™ application system. The full standard versions of the Dual Plus rate controller and SafeGuard blockage system are available online at

<http://www.micro-trak.com/resources/manuals>

IMPORTANT CONSIDERATIONS

WATER QUALITY

- Only CLEAN water should be used in water tank! No product mixing occurs in the tank.



Adding other chemicals to the clean water tank that are not approved by FMC may result in poor foam quality and degraded system operation.

The system warranty does not cover performance issues or equipment plugging/damage caused by adding chemicals to the clean water tank!

- Water should have a pH between 5.4-8.5 for best quality foam
- Hard water may produce poor quality foam.
- Rust – water should be free from rust particles. Extreme rust conditions may require additional filter maintenance or customer to find alternate water source.

APPLYING PRODUCT IN-FURROW



When testing system with active product follow all chemical handling rules and safety procedures!

- Expanded formulation can be affected by several factors, including water quality (pH, hardness, etc.), application rate of chemical and water, air pressure, air orifice disk size, and ¼ inch tubing length.
- Product being discharged should come out steadily from all rows. Product will break and tear when being tested with planter raised up and not moving.

FREEZE WARNING



The 3RIVE Application System uses water (which freezes at 32 degrees F) as a carrier component. The Capture 3RIVE component is safe to temperature of 27 degrees F. To avoid damage caused from freezing, the system should be parked indoors or the Cold Evening procedure should be implemented, if night time temps are expected to be below freezing.

OVERVIEW

The 3RIVE 3D™ application system is designed exclusively for use with 3RIVE 3D™ formulations on planters. The 3RIVE 3D™ Application System uses low water volumes to deliver crop protection products to the furrow. The system expands mixtures up to 50 times creating a three-dimensional continuous Zone of Protection delivered directly into the furrow.

The Dual Plus™ controller controls both water and chemical to accurately apply 3RIVE 3D™ formulations at the desired application rates. The water and formulation is mixed at the correct ratio and then flows to the section control manifold. The section manifold contains shutoff valves to control both liquid and air for each section. The mixed liquid then travels to the 3RIVE 3D™ manifolds where the product/water mixture and air are combined and the expanded formulation (foam) is created. The manifold has blockage sensors for each row. The foam flows through the blockage sensor to a row unit and out through a delivery nozzle located in furrow.

TANK ASSEMBLY

The tank assembly contains a 130 gallon water tank, 30 gallon product tank, Pump-Pak™, air compressor, control valves and all plumbing necessary for control and mixing of the water and chemical. It is mounted on the planter frame. The water and product remain separate until combined at the solution pump inlet.



Tank Assembly

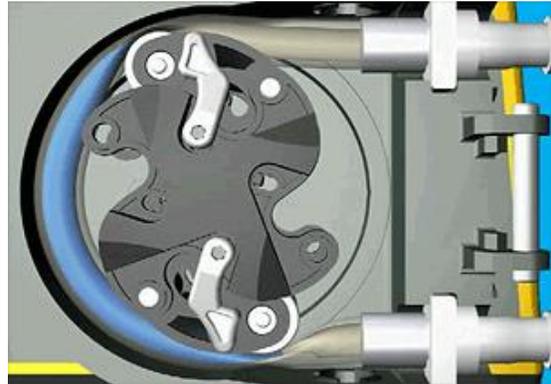
PUMP-PAK™ ASSEMBLY

The Pump-Pak™ is mounted on the tank assembly. It contains both water and chemical pumps, control valves and other devices necessary to precisely apply the product. It consists of:

- Chemical pump
- Solution pump
- Flowmeter
- Strainer
- Three-way valves for calibration/draining of tanks
- Electric motor drivers
- Relay module
- Pressure sensor
- Air compressor

CHEMICAL PUMP

The chemical pump is a precision peristaltic pump. A peristaltic pump is a type of positive displacement pump. The fluid is contained within a flexible tube fitted inside a circular pump casing. A rotor compresses the flexible tube. As the rotor turns, the part of the tube under compression is pinched closed thus forcing the fluid to be pumped to move through the tube. Additionally, as the tube opens to its natural state after the passing of the cam fluid flow is induced to the pump.



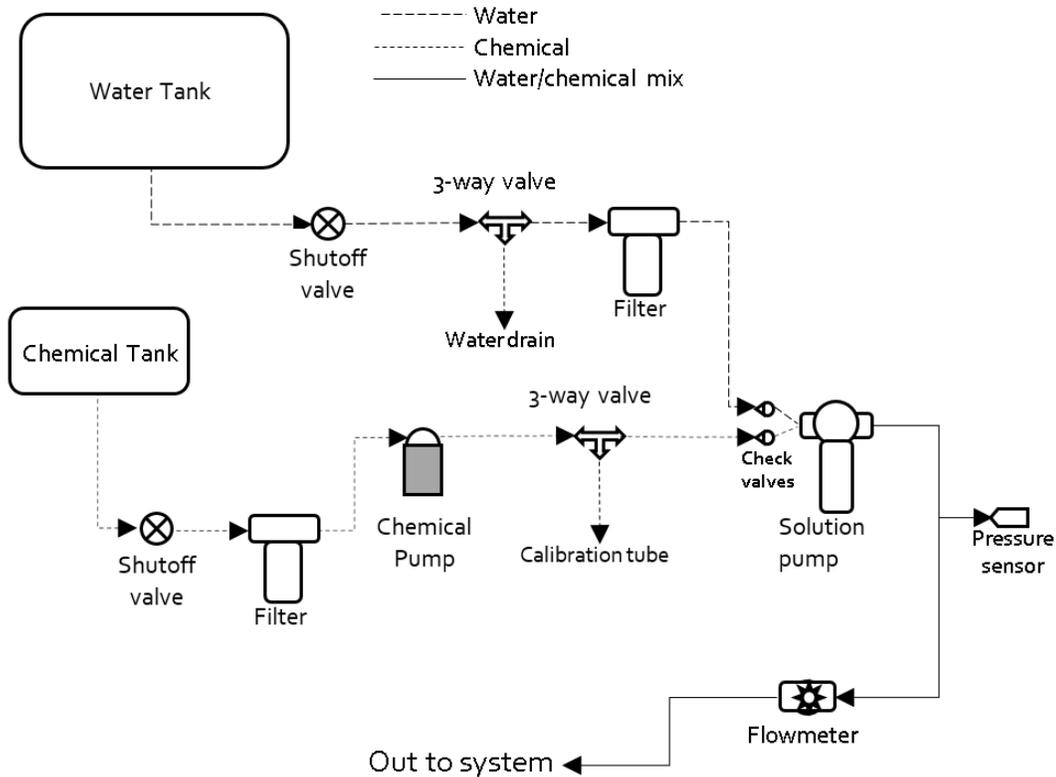
The chemical first passes from the tank through a shutoff valve, mesh filter, and a three-way valve to the pump tube inlet. The controller monitors the rpm of the pump to determine the ounces per minute of chemical flow. The output of the pump goes to the inlet of the solution pump. Here it is mixed with water.

Water flows from the tank through a shutoff valve, filter and a three-way valve to the solution pump inlet. Here it is mixed with the chemical.

Channel 2 controls the chemical pump to the rate of chemical. Channel 1 controls the solution pump to achieve the desired chemical + water total volume. This combined channel 1 volume is typically the desired chemical rate x 5, or 40 ounces per acre, whichever is greater.

The water/chemical solution is then pumped through a precision flowmeter out to the system manifolds. Pressure is monitored by the controller via a pressure sensor mounted on the output side of the solution pump.

The pump is controlled via a 12 VDC electric motor driver module.



Pump-Pak diagram™

SOLUTION PUMP

The solution pump is controlled via a 12 VDC electric motor driver module. Water and chemical are supplied to the input side of the pump. The pump is controlled to provide the combined chemical/water rate as set in channel 1. This rate is typically the desired chemical rate in ounces per acre x 5, or 40 ounces whichever is greater. The water and chemical is mixed in the pump and the solution is then pumped out to the manifold assemblies.

FLOWMETER

The flowmeter is a low-volume precision flowmeter. It measures the combined water/chemical solution after it exits the solution pump. From there the solution passes to the manifolds.

STRAINERS

The system uses two #50 mesh strainers to strain the chemical and water before entering the Pump-Pak™. The chemical strainer has a bottom drain to minimize spilling chemical when removing strainer bowl for cleaning.

ELECTRIC MOTOR DRIVERS

The pumps are powered by 10 amp electric motor drivers (EMD). There is one for each pump. The EMD has three connections; battery in, power out to motor, and control. The controller adjusts the RPM of each pump through these EMD modules. It has status and control input indicators. See troubleshooting section for more information

RELAY MODULE

The air compressor is turned on via a relay module. It has three connections; battery in, power out to compressor, and control. The controller turns the compressor on whenever a section is turned on. If all sections are off, the compressor is turned off. If a second compressor is used, another module will control it turning it on as needed. The relay module has a status indicator that lights when the relay module is on.

PRESSURE SENSOR

The pressure sensor located in the Pump-Pak™ monitors the pressure of the solution as it leaves the Pump-Pak™. This is displayed on the pressure position on the rotary dial with channel 1 selected.

AIR COMPRESSOR

The air compressor turned on whenever the system has at least one section turned on. If all sections are turned off, or the ground speed goes to 0 the compressor is shut off. The compressor is full on or off; there is no variable control of the output pressure. This is adjusted through the air regulator located on the planter. Air pressure is displayed on the pressure position on the rotary dial with channel 2 selected. The air compressor has a replaceable air filter element.

3RIVE 3D™ MANIFOLD ASSEMBLY

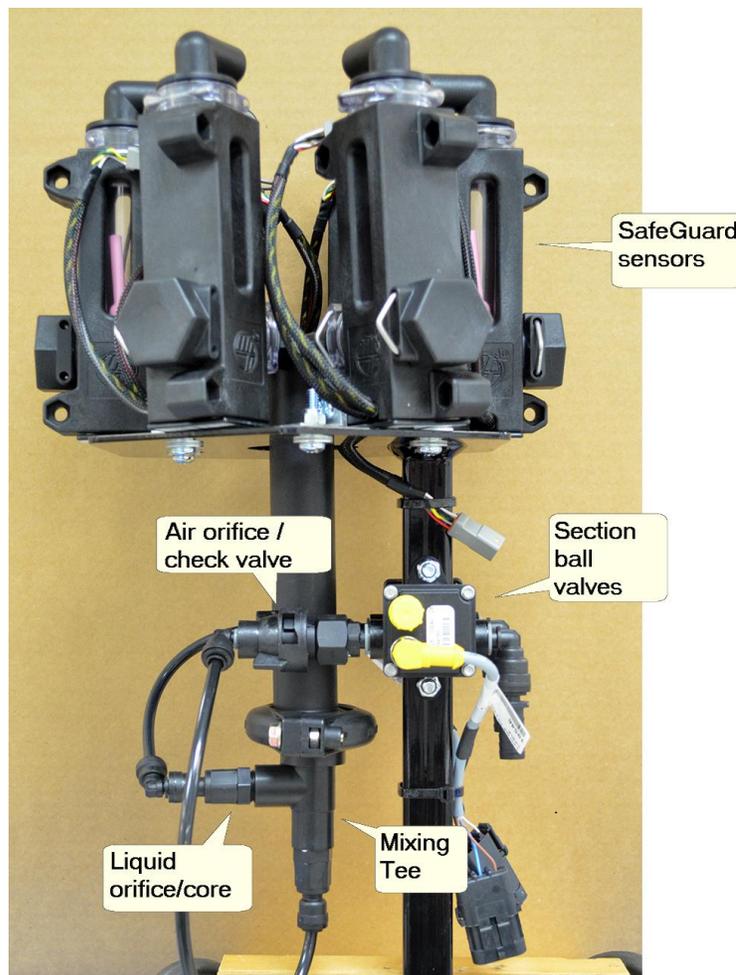
There is one 3RIVE 3D™ manifold assembly per section. The 3RIVE 3D™ manifold assembly generates the foam and distributes it across the individual rows.

It consists of:

- Steel mounting bracket
- SafeGuard™ blockage sensors
- Foam mixing tower
- Air shutoff valve
- Solution shutoff valve

Air enters the mixing tee at the bottom, and the water/product mix enters the side of the mixing tee. Foam is generated inside the tower and is distributed through the SafeGuard™ blockage sensors to the individual rows.

The manifold assembly consists of the bottom mixing tee and upper foam tower. The air is introduced at the bottom of the mixing tee. The chemical solution enters the mixing tee at the side and is sprayed into the airstream. It is easier to remove the mixing tee from the foam tower when cleaning the orifices.



ROW DELIVERY

Foam is delivered to the row via ¼" tubing travelling from the SafeGuard™ blockage sensor. A stainless steel tube is used at the row unit to ensure a uniform bead of foam is applied to each furrow. There is a valve on each row to provide immediate shutoff of foam delivery.



Row unit seed firmers

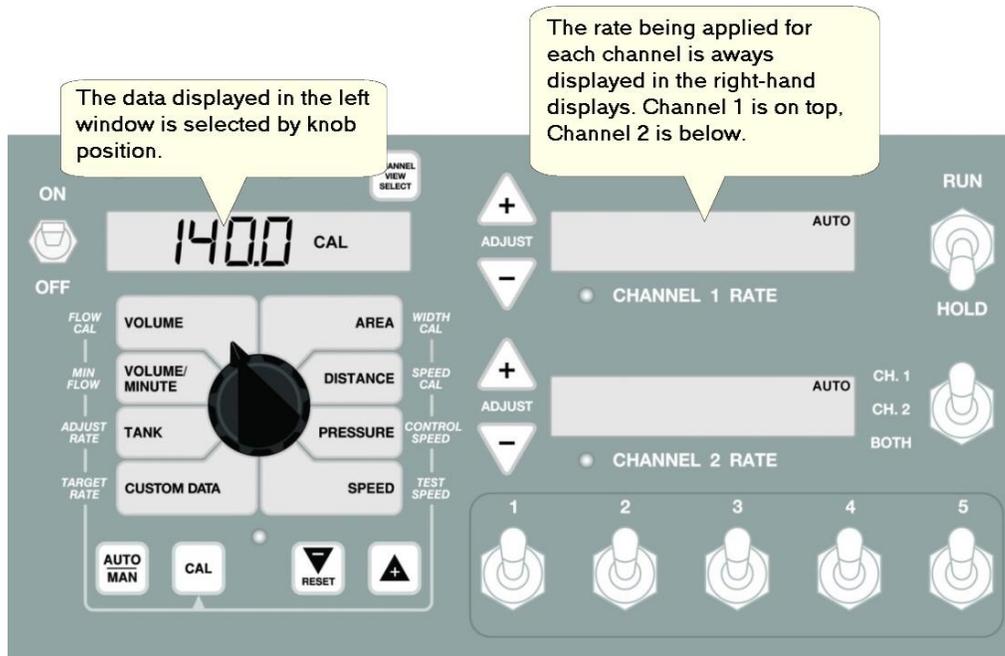


Foam delivery

CONTROL SUMMARY

The following is an overview of the 3RIVE 3D™Dual Plus™ control system. Detailed diagrams and information can be found in the Installation/Service manual. The 3RIVE 3D™ controller is a multi-section, dual channel controller. For 3RIVE 3D™ application the controller is used in Injection mode. Channel 2 (product) is injected into channel 1 (water). The water is needed to create the expanded foam product formulation. Function selection and display are on the left side of the console.

DISPLAYS



ROTARY DIAL POSITIONS

Information displayed in the left window corresponds to the knob position

VOLUME (1) (2) (3) – Displays the total volume of product applied in ounces. May be reset.

VOLUME/MINUTE – Displays the flow rate from the flowmeter in ounces per minute

TANK – Displays ounces of liquid remaining.

CUSTOM DATA – Selects data for display based on Special Cal setting – choices are:

Target Rate

Output Drive (STD or PWM)

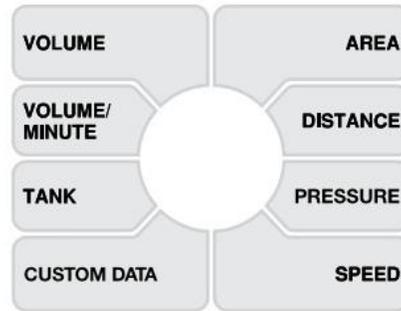
Variable Target Rate

Elapsed Hours

Area per Hour

Total Width

Section Status



AREA (1) (2) (3) – Displays the running total of area worked in acres. May be reset.

DISTANCE – Displays the running total of distance covered in feet. May be reset.

PRESSURE – Display the reading from the pressure sensor.

SPEED – Displays ground speed in miles per hour.

SWITCH FUNCTIONS

Switch Functions

<p>Console Power Switch</p> 	<p>ON</p> <p>OFF</p>	<p>Switches system between active and standby</p>	<p>RUN</p>  <p>HOLD</p>	<p>Section switches</p> <p>Up=On Down=Off</p>	<p>1</p> 	<p>2</p> 	<p>3</p> 	<p>4</p> 	<p>5</p> 	<p>Channel Select Switch</p> <p>CH. 1</p> <p>CH. 2</p> <p>BOTH</p>	
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BUTTON FUNCTIONS

Button Functions

<p>AUTO MAN</p> <p>AUTOMATIC/MANUAL</p> <p>Changes operation from automatic control to manual. (If Manual Control is enabled).</p>	<p>CAL</p> <p>CALIBRATION</p> <ul style="list-style-type: none"> Enters & exits calibration mode. Selects the Section # in 'Width Cal' position. Select the page # in "Special" Calibration. Toggles between SPEED CAL and Distance traveled while fine tuning the SPEED CAL factor or between FLOW CAL and Volume when fine tuning the Flow Cal factor. 	<p>RESET</p> <p>INCREASE/DECREASE</p> <ul style="list-style-type: none"> In Volume, Area, or Distance, the "+" button selects the counter set. RESET: When in Hold and not in CAL, clears the selected counter set when held for one second. When in CAL, the "+" button increases and the "-" button decreases the calibration value displayed.
<p>CHANNEL VIEW SELECT</p> <p>CHANNEL VIEW SELECT</p> <p>Chooses which channel data is visible in the data window above the rotary dial.</p>	<p>ADJUST</p> <p>RATE ADJUST</p> <p>Adjusts the application rate on the individual channels of the controller while in normal operation. The application rate can be adjusted in any position of the rotary dial. (In this manual referred to as Rate Adjust + and Rate Adjust -.)</p>	

OPERATION

CHARGE AND RINSE PROCEDURES

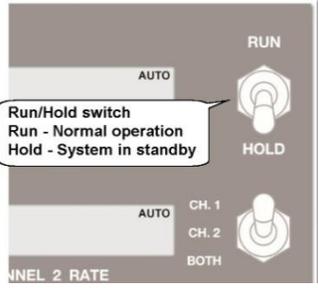
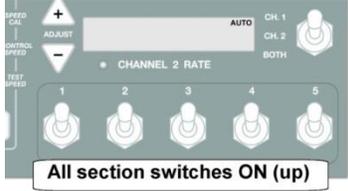
PREPARING FOR OPERATION – CHARGING THE SYSTEM

This procedure will get air out of the system, and fill all components with solution or foam making it ready for use. This charge routine will run until one of the following occurs:

- Charge cycle duration timer expires
- The + button is pressed to terminate the routine
- A NO FLOW error persists for greater than 15 seconds after initial flow is established

Placing the system in HOLD pauses the duration timer. The system runs only Channel 1 (water only) until steady water flow is detected before starting the Channel 2 chemical pump. This will prevent flooding the system with 100% chemical before the channel 1 side is primed and pumping.

1.	Make sure adequate formulation is in chemical tank, and fresh clean water is in water tank.
2.	Open valves on both chemical and water tank.
3.	Start tractor. This will prevent issues caused by low voltage.
4.	Lower planter into planting position. This will trip the whisker implement switch to put the system in RUN mode. Planter should be parked on level ground to ensure adequate purging.
5.	<p>Turn on the 3RIVE 3D™ control console. After a power up sequence it will display a “no speed” indication on the right side displays.</p> 
6.	Turn on the SafeGuard™ blockage monitor. After a power up sequence it will show ALL BLOCKED .

7.	Put system in HOLD .	 <p>Run/Hold switch Run - Normal operation Hold - System in standby</p> <p>INEL 2 RATE</p>
8.	Turn the knob to SPEED .	
9.	Press and hold the + button located below the knob for 5 seconds. The console will beep three times and display CHARGE in the left display window.	
10.	Turn all section switches ON .	 <p>All section switches ON (up)</p>
11.	Place the system in RUN mode. The air compressor will start and the pumps will begin running.	
12.	<p>After a few minutes foam will be seen building in the blockage monitor row units. Foam will <u>not</u> come out of each row unit equally until the system is fully charged with foam. The foam creates back pressure which evens out row-to-row distribution. Foam will typically begin flowing from the two middle sections first, and then foam will develop in the outer sections last.</p> <p>To conserve chemical you can turn individual sections off after all rows in a section are producing good quality foam.</p> <p>If you decide to turn off individual sections, turn all sections back on for a short time after the outer sections are producing quality foam so foam is being generated at each row before exiting the charge routine.</p> <p>In the CHARGE mode the system runs in AUTO mode at a simulated ground speed of 6 mph. This will fill the system with water & chemical solution mixed at the correct ratio based on your programmed rates. Those target rates are displayed on the right side channel displays.</p>	
13.	After a steady bead of foam is being generated at each row the blockage monitor should show ALL GOOD .	
14.	Switch system to HOLD . SafeGuard™ should show ALL BLOCKED after 2 – 4 seconds.	
15.	Press the + button to cancel the CHARGE routine and return to normal operation.	

END OF DAY – RINSING THE SYSTEM



It is recommended that the mixed solution of 3RIVE Product and water be rinsed from the system at the end of the day. This rinsing will help prevent plugging of orifices, strainers, and lines. This rinse routine will run until one of the following occurs:

- Rinse cycle duration timer expires
- The - button is pressed to terminate the routine
- A NO FLOW error is detected indicating water tank is empty.

NOTE: In rinse mode, with the section switches ON and the system in HOLD, the pumps are turned off but the sections remain ON which allows pressure to bleed off the system. When the system is placed in RUN the rinse mode continues with channel 1 pumping water through the system.

1.	Make sure water tank has adequate clean water, at least 3 gallons.
2.	Switch the Run/Hold switch to HOLD.
3.	Turn the knob to SPEED
4.	Press and hold the - button located below the knob for 5 seconds. The console will beep three times and riNSE will be displayed in the left window.
5.	Turn all section switches ON.
6.	Switch the Run/Hold switch to RUN. <ul style="list-style-type: none">• The air compressor will start• The Channel 1 solution pump will begin pumping water through the system. The Channel 1 pump will run at the MAX PWM setting during rinse mode. After a section is running clear you can turn it off to increase water flow to the remaining sections.
7.	Run the system in this configuration until each SafeGuard sensor chamber is free of foam and clear water is seen in each sensor chamber.
8.	Place the system in HOLD.
9.	Press the – button to exit the rinse mode
10.	The system is now rinsed of chemical from the solution pump to the row units.

END OF SEASON STORAGE/ WINTERIZATION



The 3RIVE Application System uses water as a carrier component, and the chemical contains ingredients that can cause clogging if allowed to settle out / dry within the system. The entire system **MUST BE THOROUGHLY RINSED AND WINTERIZED** prior to storage.

Perform a RINSE routine of at least 15 minutes duration prior to winterization to ensure the system is clean and free of any chemical residue.

Note: Even if the system is stored in a heated building, it is imperative that the chemical tank and strainer are cleaned, and a full clean water rinse routine is performed prior to storage. Failure to clean out all chemical residue will cause malfunctions due to sediment and residue.

1.	Drain the chemical tank and chemical strainer and rinse out residual chemical and debris with clean water making sure tank is empty when complete.  Dispose of all chemical and rinsate/waste water in the proper manner.
2.	Perform a RINSE routine with clean water of at least 15 minutes duration to ensure the system is clean and free of any chemical residue.
3.	Pour 1 gallon of RV antifreeze in the chemical tank and 3 gallons in the water tank.
4.	Run a CHARGE routine, followed by another RINSE routine. This will fill both chemical and water sides of the system with RV antifreeze. Run the RINSE routine until RV antifreeze is seen in the SafeGuard chambers and is running out of the row units.
5.	The system is now ready for storage.

COLD EVENING PROCEDURE



Important! The 3RIVE Application System uses water as a carrier component which freezes at 32 degrees F. The Capture 3RIVE component is safe to temperature of 27 degrees F. To avoid damage caused from freezing the system should be parked indoors or the procedure below should be implemented if night time temps are expected to be below freezing.

Follow procedure for **End of Day Rinsing** with the following changes. Prior to starting rinsing procedure:

Drain all water from clean water tank. Add 2 gallons of RV antifreeze to the clean water tank. Run RINSE routine until tank is empty (routine will stop when tank is empty). RV antifreeze should be seen in all SafeGuard sensor chambers.

NOTE: Windshield washer fluid with a suitable below freezing rating can be used in lieu of RV antifreeze.

DEPRESSURIZING THE SYSTEM

During maintenance or troubleshooting, it may be necessary to disconnect solution or air lines in the system. To depressurize the system:

1. Turn the knob to SPEED.
2. Place the system in HOLD.
3. Turn at least one section switch ON.
4. Press the – button to enter the RINSE mode.

In rinse mode, with the section switches ON and the system in HOLD section valves are turned on allowing pressure to bleed off the system.

AUTOMATIC OPERATION

This mode sets and maintains a steady application rate - unaffected by changes in speed or section switching.

1. Select a Channel using the Channel View Select button.
2. Press the AUTO/MAN button to select Automatic mode (“AUTO” icon will be displayed).
3. Switch on the desired number of boom sections.
4. Switch the RUN/HOLD switch to RUN.
5. Drive vehicle. (Speed signal will activate system.)
6. Use the Section switches, the RUN/HOLD switch or remote RUN/HOLD sensor to Start or Stop application at any time.

ON-THE-GO RATE ADJUSTMENTS

To adjust the application rate, press the Rate Adjust buttons. The increment of this change is set in the ADJUST RATE position in Calibration. For example, if the calibrated TARGET RATE = 20.0 GPA and ADJUST RATE = 1.0 GPA, pressing ADJUST RATE once will increase the target rate from 20.0 to 21.0. The display will momentarily show the new TARGET (21.0) for two seconds before it resumes showing the ACTUAL application rate. The “adjusted” target rate is maintained until console power is turned off or Calibration mode is entered.

MANUAL OPERATION

This mode sets and maintains a steady flow rate (ounces per minute) **not** affected by changes in vehicle speed. The overall application rate will vary depending on speed (slow vehicle speed = increased application rate, fast speed = lower application rate.) Manual mode is most useful for system set up, spot applications, etc.

- Select a Channel using the Channel View Select button.
- Press the AUTO/MAN button to select Manual mode (“MAN” icon will be displayed).
- Adjust the flow rate by using the Rate Adjust buttons located next to controller channel rate windows. The longer the buttons are held, the faster the valve will move to allow both rapid movement and fine adjustments.

Note: Manual control can be disabled by changing the MANUAL ENABLE setting in Special Calibrate.

PERIODIC MAINTENANCE

CHEMICAL PUMP ASSEMBLY

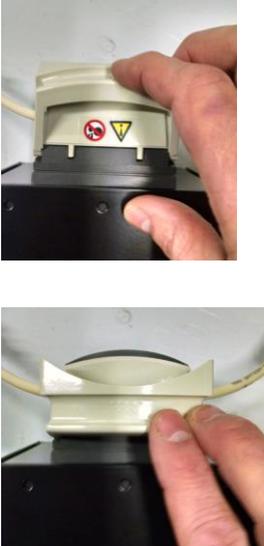
The metering tube should be changed before each season to ensure the highest level of accuracy. A worn tube will begin to under-apply as the tube walls become less resilient.

METERING TUBE

You will not have to change tubing size unless you're significantly changing your application rate from the initial setup. The chemical pump uses a metering tube for precise metering of the chemical. There are three tubes available. Selection is based on ounces per minute required by the system. Each tube size has its own calibration value that's entered into channel 2 flow cal. This calibration value represents pulses per ounce measurement.

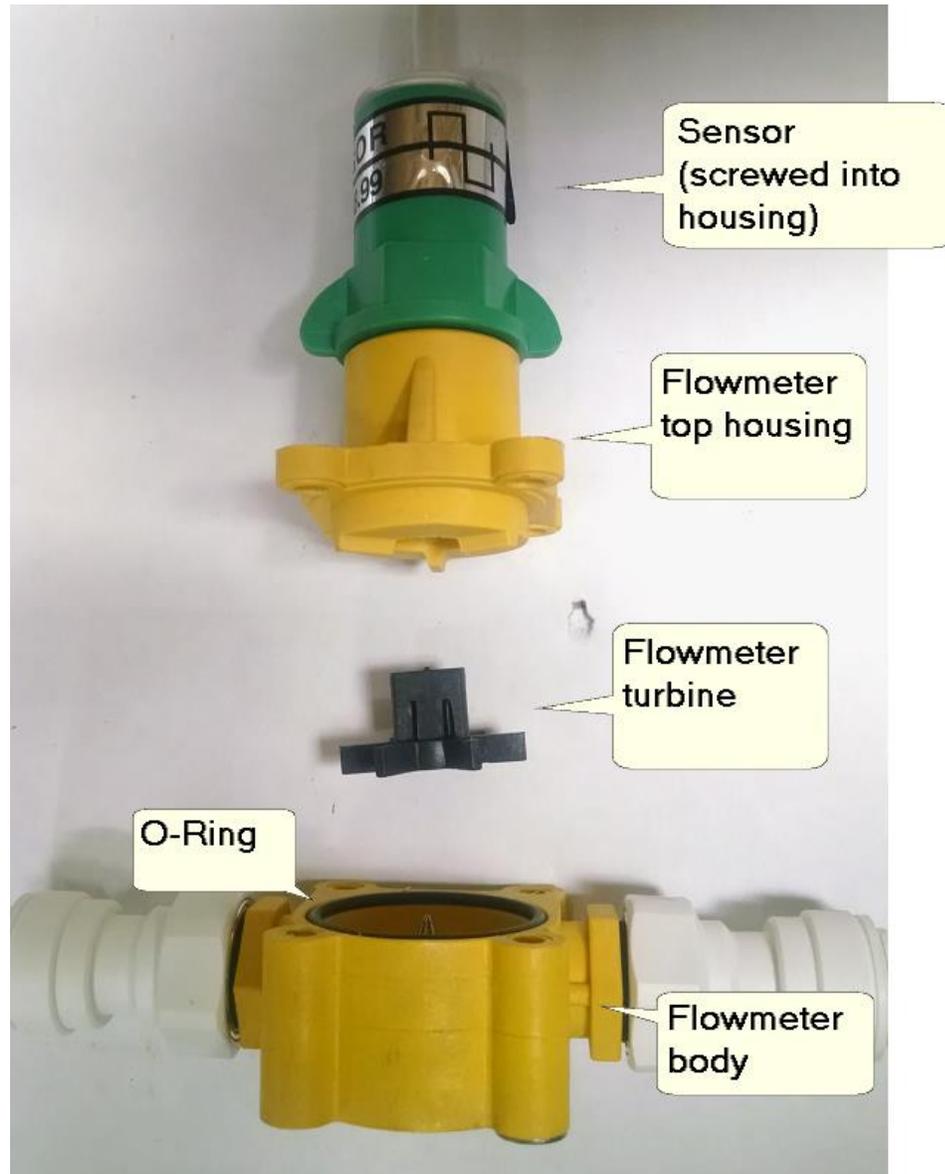
P/N	Description	Cal value
19893	3.2 METERING TUBE	2944
19894	2.4 METERING TUBE	5071
19385	1.6 METERING TUBE	10963

CHANGING METERING TUBE

1.	Disconnect the tube from the input and output tubes at the push-to-connect fittings.	 When working on system with active product follow all chemical handling rules and safety procedures! The solution released in this step contains active chemical. Dispose of released solution in an appropriate manner.
2.	Pull down on the front of the pump head to open the tubing jaws.	

3.	Lift up on tube to remove from pump jaws.	
4.	Lay the replacement tube into the jaws of the pump. The tube should be approximately centered on roller.	
5.	Gently close the jaws making sure the tube is centered in the V notch of the jaw cover.	

CLEANING FLOWMETER



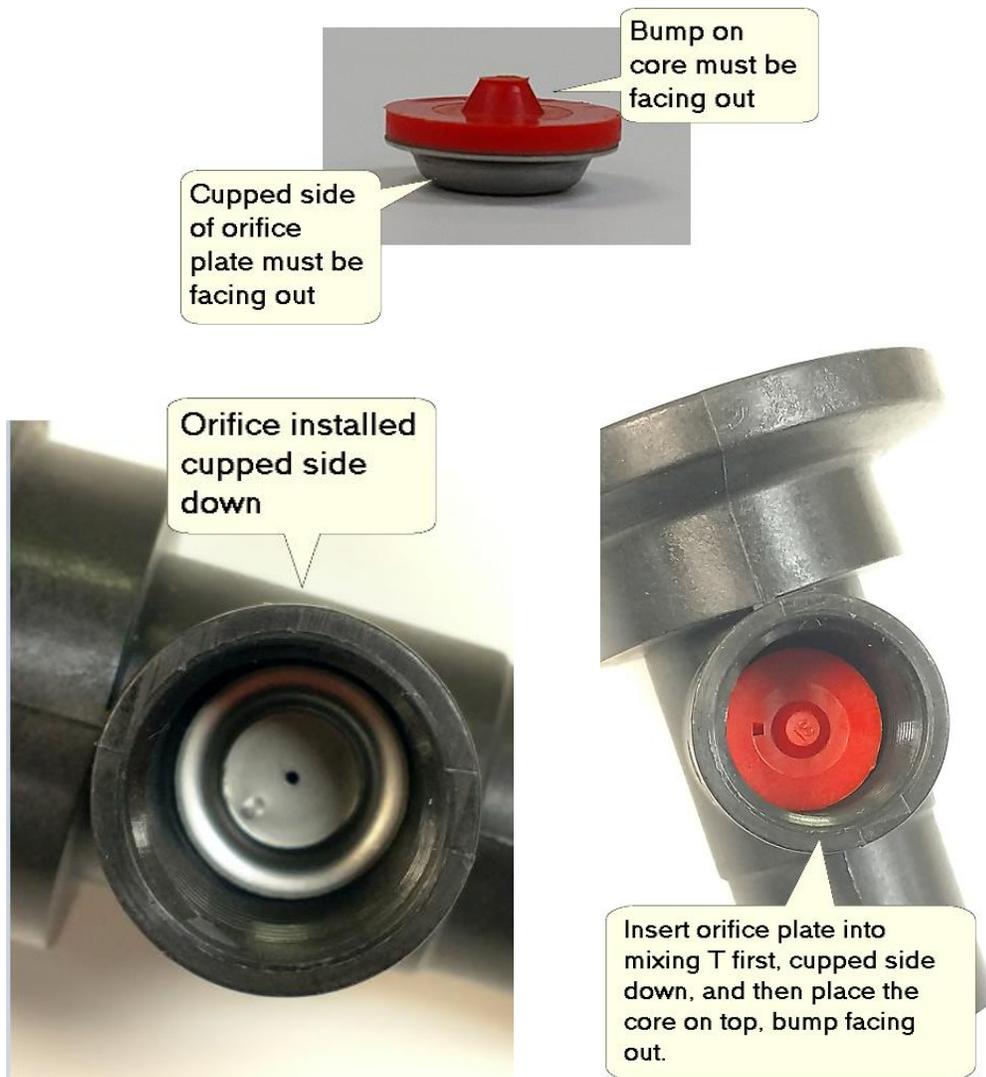
1. Remove four nuts, screws and washers holding the top housing on the flowmeter body.
2. Remove the top housing from the flowmeter body.
3. Remove the turbine.
4. Clean any dirt or debris from the turbine, Turbine support pin, and flowmeter housing.
5. Reinstall turbine on top of support pin.
6. Reinstall top housing making sure O-ring is correctly placed in groove on flowmeter body.
7. Reinstall four nuts, screws and washers.
8. The flow sensor should be screwed completely into the top housing, finger tight.

MANIFOLD ASSEMBLY

LIQUID INLET

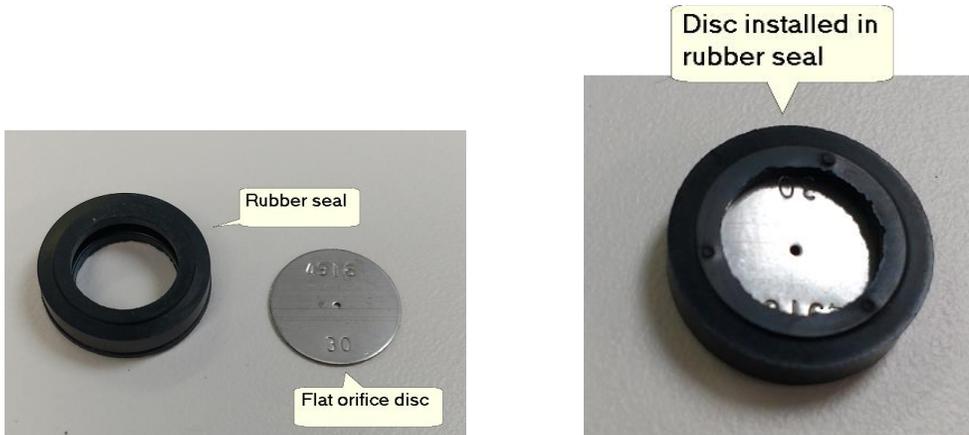
The water/chemical solution enters the manifold at the side of the mixing tee. The spray pattern of the liquid is controlled by a Tee Jet spray tip core and stainless steel orifice disc.

When cleaning, remove both the core and orifice plate and make sure they are free of chemical residue. Ensure the nylon core is not distorted and the holes in both the core and orifice plates are clear. Make sure they are oriented properly when reinstalling as shown below.



AIR INLET

The air enters the manifold at the bottom of the mixing tee. The volume and velocity of the air is controlled by a Tee Jet flat orifice plate. The orifice plate is installed in an EPDM rubber seal as shown below.



The air inlet also has a check valve which prevents liquid from filling the air line when the system is off. Put the disc with seal into the mixing tee first, with the check valve installed last.

Ensure the orifice plate hole is clear, and the check valve is free of sediment.

SECTION VALVES

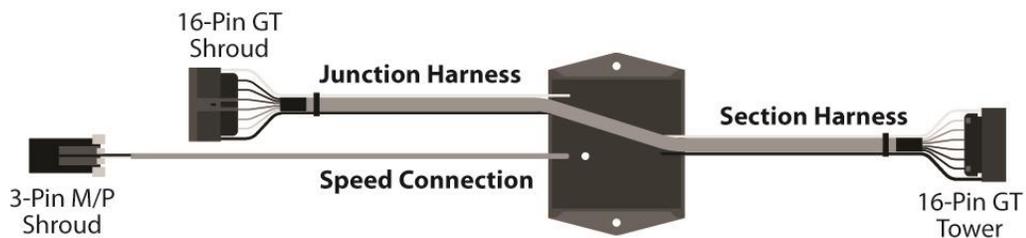
The manifold assembly uses 1/4" ball valves to turn the section on or off. These are three wire ball valves.

Pin A – constant 12 VDC – always present.

Pin B – ground

Pin C – switched 12 VDC – when present the valve opens. When removed the valve closes.

SECTION RELAY MODULE



This module controls the supply of electricity to the 3RIVE 3D system preventing battery drain when not in use. When vehicle voltage is present at the accessory power line at the Speed Connection, a relay turns on main power to the system - and vice versa.

A green LED on the potted enclosure will light when power is turned on.

Note: if the Speed input on the ISOmod harness is in use, install a "Y" cable - available from Micro-Trak, PN 18048.

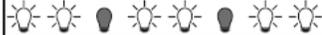
TROUBLESHOOTING

This troubleshooting guide covers common error messages that may be seen on the 3RIVE 3D™ system. The full troubleshooting data is located in the Installation/Service manual.

PUMPS NOT RUNNING

Check LEDs on Electric Motor Driver modules connected to the pump motors.

The status indicator is located in the center of the module.

LED STATUS INDICATOR CODES		
Light on steady		Unit is turned on and operating normally
Steady Flashing		Standby mode. Main power present, waiting for command from controller.
1 Flash/pause		Open circuit detected. Check motor connections for open.
2 Flashes/pause		Output short circuit detected. Check motor wiring.
3 Flashes/pause		Over-current condition. Check total load.
4 Flashes/pause		Input Power fault. Check input power wiring.
5 Flashes/pause		Input frequency out of range.
NOTE: Cycle power with the controller ON/OFF switch to clear a fault code		

Signal status LEDs are located in the corner of the module. One LED will be illuminated when there is a PWM control signal present. This LED will get brighter as the signal increases (running pump faster) and dimmer (slowing pump speed) as the control signal decreases.

If your module does not have center status LED, verify supply voltage at main power input connection to module.

NO SPEED



A NO SPEED message indicates there's no feedback from the speed sensor. This is normal when in auto mode, and the vehicle is not moving. If the vehicle is moving and there's a NO SPEED indication check the following:

ASTRO GPS SPEED SENSOR

The Astro GPS has a module near the connector. This module has two red indicators.

- Both indicators off
 - Verify there's 12 volts DC at the harness connection between pins C (ground) and B (power).
 - If power is present, replace GPS sensor
- One indicator on steady, the other is off
 - Replace GPS sensor
- One indicator on steady, the other is flashing

- GPS trying to acquire signal. Make sure GPS sensor has clear view of sky (i.e. not in building). If flashing does not stop after two minutes replace GPS sensor

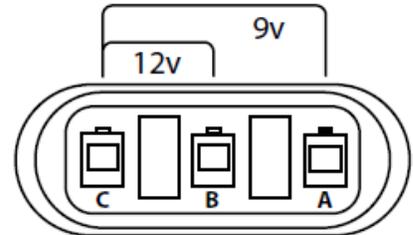
The Astro GPS sensor is repairable. Return to Micro-Trak for a repair evaluation.

Checking for possible harness or connectivity problem:

Pin A – Signal

Pin B – Power

Pin C – Ground



- Check for 9 volts DC between pins A and C. Pin A is the signal input to the console.
- Check for 12 volts DC between pins B and C. Pin B is the power to the sensor.
- Turn the knob to SPEED. Tapping between pins A and C simulates pulses coming from the sensor. You should get an erratic reading on the console if it is receiving these pulses.

If voltage and tap test are good, this usually indicates a bad sensor.

NO FLOW



A NO FLOW message indicates there's no flow reading from the flowmeter when liquid flow is expected.

TESTING CHANNEL 1 FLOWMETER SENSOR

Unscrew flow sensor from flowmeter body. With console turned on, place sensor flat against metal plate. A red LED should illuminate beneath the clear top cover.

Does the red LED turn on when placed against metal plate?

Yes – Move the sensor away from the metal plate. The LED should turn off.

If this checks good, proceed to pulse test.

Pulse test

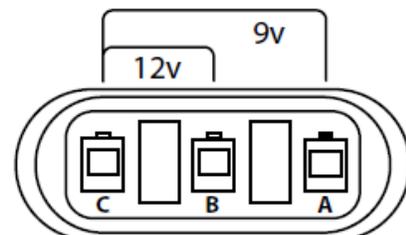
Place sensor flat against metal bracket. Red LED should turn on.

Move sensor away from plate. LED should turn off. Repeat this several times rapidly (simulating pulses from flowmeter). This should produce an erratic reading under channel 1 volume per minute display.

If this produces erratic reading on console, the sensor and cabling to the controller are good. Disassemble and clean flowmeter. If it does not, proceed with tap test as outlined below in *possible harness or connectivity problem* procedure.

Checking for possible harness or connectivity problem:

Pin A – Signal



Pin B – Power

Pin C – Ground

- Check for 9 volts DC between pins A and C. Pin A is the signal input to the console.
- Check for 12 volts DC between pins B and C. Pin B is the power to the sensor.
- Turn the knob to VOLUME/MINUTE. Tapping between pins A and C simulates pulses coming from the sensor. You should get an erratic reading on the console if it is receiving these pulses.

If voltage and tap test are good, this indicates a bad sensor.

TESTING CHANNEL 2 FLOW SENSOR

Channel 2 uses feedback from an internal encoder on the chemical pump. Perform connection and tap test as outlined above in *possible harness or connectivity problem* procedure. If tap test and voltages check ok, return pump assembly for repair.

3RIVE 3D™ PRODUCT DELIVERY



When testing system with active product follow all chemical handling rules and safety procedures! The solution released in this step contains active chemical. Dispose of released solution in an appropriate manner.

NO FOAM – SINGLE ROWS

Put the system in CHARGE mode. Cycle the system from HOLD to RUN.

Can you hear row shutoff valve operating?

Yes – Place the system in HOLD and remove liquid tube from output of row shutoff valve.

Place the system in RUN. Does liquid flow from row shutoff valve output?

Yes – check for plugged or kinked row unit tubing

No – Verify liquid is present at row valve input.

No – If 12 VDC is present on pins A & C at connector when the system is in RUN, replace valve. If 12 VDC is not present, troubleshoot wiring.

Pin A – constant 12 VDC (needed to close valve. Always present)

Pin B – ground

Pin C – switched 12 VDC (12 volts present opens valve)

NO FOAM – ENTIRE SINGLE SECTION

Is liquid bubbling up in the section manifold SafeGuard™ sensor tubes?

Yes – Is there air pressure present at the tube going into the section air shutoff valve?

Yes – Verify manifold air inlet screen and orifice are clean. Verify fittings on manifold are not leaking

No – Troubleshoot kinked or leaking air tube.

No – Verify operation of section liquid shutoff valve. Place the system in CHARGE mode, Cycle the system between HOLD and RUN mode. Can you hear the valve operating?

Yes – Place the system in HOLD. Remove liquid tube from output of section shutoff valve. Place the system in RUN. Does liquid flow from shutoff valve output?

Yes – Verify section manifold liquid inlet orifices are clean. Check for plugged or kinked tubing

No - Troubleshoot liquid supply line for kinks or leaks.

No – If 12 VDC is present on pins A & C at connector when the system is in RUN, replace valve. If 12 VDC is not present, troubleshoot wiring.

Pin A – constant 12 VDC (needed to close valve. Always present)

Pin B – ground

Pin C – switched 12 VDC (12 volts present opens valve)

NO FOAM – ENTIRE PLANTER

Is there liquid bubbling up in the section blockage sensor tubes?

Yes – Is there air pressure at the air regulator?

Yes – Verify section air shutoff valves are operating. If not, troubleshoot wiring.

No – Is the air compressor running?

Yes – Check for kinked or disconnected air line between compressor and air regulator manifold.

Verify air is being supplied by compressor.

Verify air compressor relief shutoff valve is not stuck on. This will vent compressor output to outside system.

No – Verify LED is lit on relay module indicating “ON” condition. Check for power at output of relay module. If green LED on relay module is lit and there’s no 12 VDC at output, check fuse at battery connection.

No – Verify tank shutoff valves are open. Verify both pumps are running. Check channel 1 pressure. If pressure is building very high (> 60 psi) check section liquid shutoff valves for proper operation.

COMPLETE ERROR MESSAGE LIST

bad ^{CAL}	Indicates a corrupt calibration value. Can only be cleared by entering Calibration or Special Calibration modes, checking and/or changing settings and exiting to save.
CLEAR	The message alerts the user that the currently selected counter will be cleared if the reset button is held for 2 seconds. Also serves as a reminder to use "+" button to select counters.
Error	Error message displayed if Open Loop is selected when Flow @ Max. PW = 0. Also shown in Open Loop and Override if Flow @ Max. PW < Flow @ Min. PW
FILL	Tank level is below 'Tank Alarm Setting'.
h i P S I	High Pressure warning message. The input pressure exceeds the specified High Pressure Limit.
Ho ld	Visible in channel rate window. Channel is ON and Run/Hold switch is set to Hold.
Lo P	Low Power. Check all power and ground connections.
Lo P S I	Low Pressure warning message. The input pressure is less than the specified Low Pressure Limit.
no FLO	(Alternating no/Flo) Flow Signal not detected. Check flowmeter and verify there is liquid flow and the tank is not empty. After 15 seconds, system will disable (Emergency Stop).
no P S I	In Pressure Control mode - no pressure detected at sensor. After 15 seconds, system will disable (Emergency Stop).
no S P E E D	(Alternating no/Speed) Speed Signal not detected - visible in RATE position.
OFF	Visible in channel rate window. Channel is OFF.
O P E n	In Pressure Control mode - no pressure sensor detected (circuit is "open").
P H o L d	Prescription Hold - GPS/Mapping controller is sending '0' rate command.
P U L S E	System configured for Pulse Width Modulation 12V drive mode. Message is shown during start-up screens.
r H o L d	Remote Run/Hold is connected and set to "Hold".
S P E C	Special Calibration Mode is active.
S t d	System configured for Standard 12V drive mode. Message is shown during start-up screens.
V CAL	The Live Calibration mode (PWM Only) is active.
3 W A Y	(3 WAY) The system is configured for three-way valves. Message is shown during start-up screens.
99999	Counters (DISTANCE or AREA or VOLUME) have reached their maximum. RESET to clear counters and resume counting.
- - - - -	Indicates an unused Special Calibrate or Live Calibrate position.
Indicator LED	Lit when console is in Calibration or Special Calibration mode.
Rate Warning LEDs	Channel Rate Warning LEDs flash when the Rate error is over 10%, Volume/Minute is below the Minimum, Tank level is at less than Tank Set Point, or Pressure readings are over/under set alarm limits.
Audible Alarm	Alarm will sound 3X if Alarm Enable is ON and the Tank Level is below minimum, Application Rate error rate is greater than 10%, or if Pressure is too low or too high for prescribed limits.

CALIBRATION

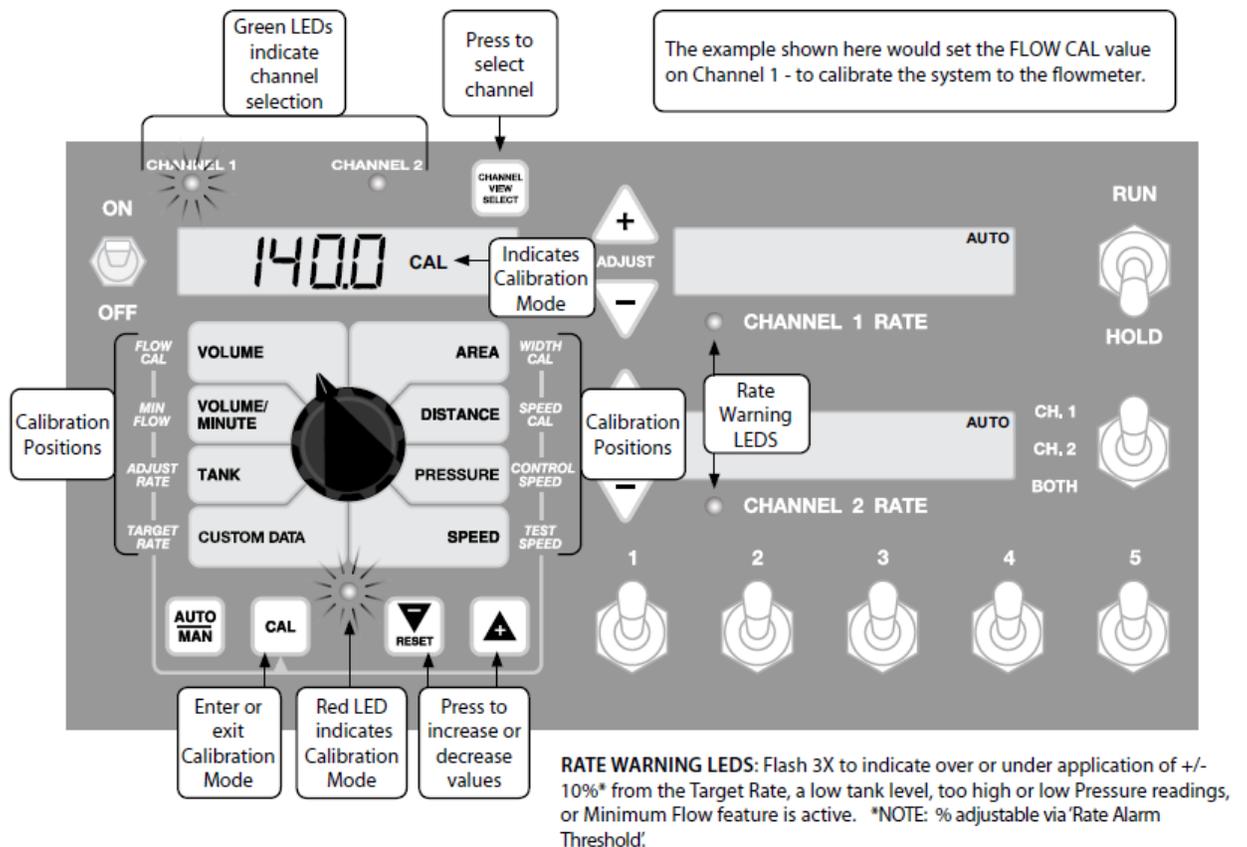
VERIFYING / CHANGING CALIBRATION SETTINGS

The controller is programmed for optimal performance with the 3RIVE 3D™ system from the factory. If it is necessary to verify or adjust settings under the advice of a technician follow these steps.

CALIBRATION STEPS:

1. Stop the vehicle, if moving.
2. Switch console to HOLD.
3. Press and hold the CAL button about 1 second until the 'CAL' icon appears on screen and Red LED light is on.
4. Select calibration position on rotary selector (see explanations of each position starting on page 20).
5. Select channel with Channel View Select. In Speed Cal and Test Speed positions, any changes apply to both channels and both channel LEDs will remain lit.
6. Adjust values using Increase/Decrease buttons.
7. To exit Calibration without saving changes - turn console OFF.
8. To save changes and exit Calibration - press and hold the CAL button for 1 second - 'CAL' icon on screen will turn off and red LED light will turn off.

NOTE: If console is locked, Calibration values can be viewed but not adjusted. Test Speed position is always active.



STANDARD CALIBRATION SETTINGS

Flow Cal

This position calibrates the system to the flowmeter factory setting. The flowmeter is calibrated with water at the factory and assigned a “Liquid Cal” number. Adjust to this number - printed on the plastic tag attached to the flowmeter. This number represents pulses per ounce of liquid. To fine tune the calibration value for the flowmeter, perform the procedure Appendix D – Fine Tuning Flow Meter Calibration.

Min Flow

This setting controls total minimum gallons per minute flow. The min. flow setting is adjusted dynamically, *proportional* to the number of active sections. Example: if min. flow is set to 2 GPM and half the sections are turned off, the flow will be 1 GPM.

Adjust Rate

Adjust the value for the desired amount of change to be used for making on-the-go rate adjustments. When operating in AUTO control, pressing Rate Adjust buttons will change the TARGET RATE by the amount entered for ADJUST RATE. This allows the operator to make incremental changes to the TARGET RATE. To disable this feature, simply enter a value of zero.

Target Rate

Adjust the value for the desired target application rate in ounces per acre (milliliters per hectare). This is the application rate that the console will lock onto when operating in AUTO.

Width Cal

Adjust the effective working width, in inches (meters) for each section. Channel 1 has 5 to 7 sections depending on model, Channel 2 has 1 section. With the 3RIVE 3D™ system Channel 2 uses Channel 1 widths. Enter a value of “0” (.000) for any unused sections. To adjust WIDTH CAL, quickly press and release the CAL key until the desired Section Number is on, then adjust the value.

Speed Cal

This calibrates the system to the speed sensor. This value represents pulses per inch (pulses per centimeter). To fine tune your existing calibration, or to determine a new calibration value perform the procedure Appendix C – Fine Tuning Speed/Distance Calibration Value.

Control Speed

This position adjusts valve response time to fine-tune the system. Example: increase Control Speed if the system is responding slowly to rate changes because of slow-moving valves. The range is -12 to 3. **NOTE: Exercise caution when increasing the valve response speed - the system may become unstable with higher control speed numbers entered.**

Test Speed

TEST SPEED is not a CALIBRATION setting. It internally simulates a speed signal to test the system without the vehicle moving. It allows you to test a spraying application with water to make certain that all of the equipment is operating properly while remaining stationary. Test speed is cancelled by exiting CAL. Test speed will not accumulate Distance/Area measurements and can be used if the console is locked.

DETERMINING CHANNEL 1 AND 2 TARGET RATES

3RIVE 3D™ is applied in ounces per acre. The product is injected into water which is necessary to facilitate the generation of foam.

- Channel 1 controls the ounces of water per acre being used as the carrier. Channel 1 supplements the chemical to bring the total combined flow rate to the value calculated below..
- Channel 2 controls the ounces of chemical being applied per acre.
- Minimum combined volume of chemical and water is 40 ounces per acre.
- It is recommended that the ratio of WATER to 3RIVE product be maintained at 4 to 1 whenever possible.

Determining Channel 1 Rate: 3RIVE 3D™ Rate x 5 or 40 ounces per acre **whichever is greater**.

Examples

1. # 1: If 3RIVE 3D™ Product rate is 4-8 ounces per acre Channel 1 Rate (total volume) should be 40 ounces per acre.
2. # 2: If 3RIVE 3D™ Product rate is 10 ounces per acre Channel 1 Rate should be 50 ounces per acre.
3. # 3: If 3RIVE 3D™ Product rate is 12 ounces per acre Channel 1 Rate should be 60 ounces per acre.
4. # 4: If 3RIVE 3D™ Product rate is 16 ounces per acre Channel 1 Rate should be 80 ounces per acre.

CHANNEL 1 TARGET RATE

Channel 1 measures the combined water/chemical solution prior to it being turned into foam. It injects water into the chemical stream to bring the total volume up to the desired level.

3RIVE 3D™ target (oz. per acre) _____ X 5 = _____ Channel 1 Target Rate (40 minimum setting)

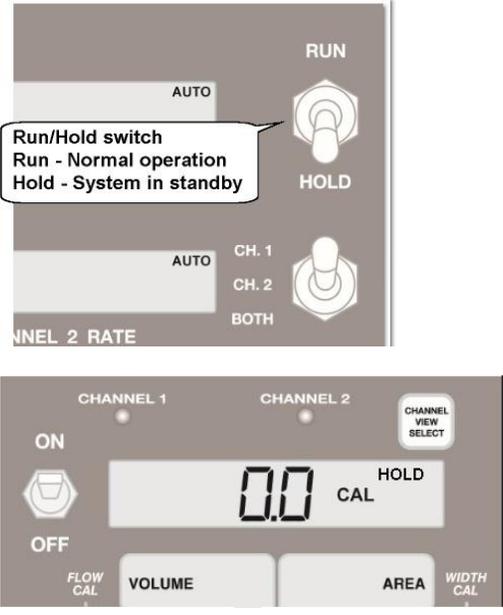
CHANNEL 2 TARGET RATE

Channel Target Rate = _____ 3RIVE 3D™ ounces per acre

These rates can be adjusted to improve foam protection band delivery. Increasing the water rate can help make up for poor foam quality due to hard water, but **NEVER** exceed water to 3RIVE 3D™ ratio of 10 to 1.

Example: If satisfactory foam delivery is not achievable with CH2 rate of 4 ounces per acre and a CH1 Rate of 44 ounces per acre higher quality water or an increase in 3RIVE 3D™ product will be needed.

ENTERING TARGET RATES INTO CONTROLLER

<p>1. Place the console in HOLD The left display will display CAL and HOLD.</p>	
<p>2. Press the CHANNEL VIEW SELECT button to select the desired controller channel as shown by the channel 1 and channel 2 indicators.</p>	
<p>3. Rotate the knob to the lower left TARGET RATE position.</p>	
<p>4. Enter your desired rate, in ounces per acre using the + or – buttons located below the knob / left display area. Press the CHANNEL VIEW SELECT button to switch between channel 1 and 2.</p> <p>Channel 2 chemical – desired ounces per acre of chemical</p> <p>Channel 1 water – ounces per acre of chemical X 5, or 40 whichever is greater.</p>	
<p>5. Press and hold the CAL button until the CAL indicator on the left screen goes out. Your settings are now saved and you are back to normal operating mode.</p>	

SPECIAL CALIBRATION

Special Calibration mode accesses important system parameters and settings. It is important to remember to select the appropriate channel you wish to adjust - some parameters affect both channels.

The UNITS position must be set before changing any other Calibration or Special Calibration settings.

These settings enable or disable other setting options to adjust applicable parameters:

- **UNITS:** determines which unit of measurement is used. For 3RIVE 3D™ use gallons/acre.
- **MATERIAL:** choice of H₂O or NH₃. For 3RIVE 3D™ select H₂O.
- **OUTPUT TYPE** - PWM or STD: defines electronic drive signal for the control valve. For 3RIVE 3D™ select PWM.
- **MULTIFUNCTION A or B:** defines MULTIFUNCTION output configurations

Special Calibration settings are accessed by selecting the row position with the main rotary knob and then pressing the CAL button to access Pages. Numbers displayed on the screen indicate which Page is active. Pressing the AUTO/MAN button once displays an abbreviated parameter title. Pressing and holding the AUTO/MAN button for 3 seconds enables Supervisor Lockout.



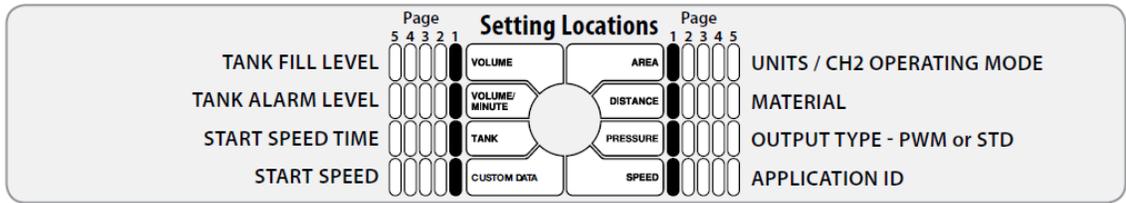
Note: Changing UNITS loads default calibration values and resets all counters to 0.

CHANGING/VIEWING SPECIAL CALIBRATION SETTINGS

1. Turn ON console while pressing the CAL button - screen will display “SPEC”, then ‘CAL’ and number 1 (Page 1).
2. Select the Channel to be calibrated. (Some Special Calibration parameters affect both channels - see description.)
3. Select a Special Calibration position using rotary knob. (See explanations of settings starting below)
4. Adjust Page 1 value or press the CAL button to access Pages 2-5.
5. Adjust value using Increase/Decrease buttons.
6. To exit Special Calibration without saving changes - turn console OFF.
7. To save changes and exit Special Calibration - press and hold the CAL button for 1 second - ‘CAL’ icon on screen will turn off and red LED light will turn off.

NOTE: Supervisor Lockout - Press and hold Auto/Man button 3 seconds to enter Supervisor Lockout control - use Increase/Decrease buttons to enable/disable this feature. Once locked, Special Calibration values can be viewed but not adjusted. Press CAL button to exit.

Special Calibration Settings - Page 1



Tank Fill Level

Location: PAGE 1 - VOLUME

Description: Adjust this setting to the known capacity of the tank. This value will be automatically entered when in Tank position by pressing the Increase (+) button. This can be set to OFF (0) up to 65535. Parameter units: ounces

Tank Alarm Level

Location: PAGE 1 - VOLUME/MINUTE

Description: Enables and adjusts value for Tank Alarm - set value to notify operator when level is reached. This can be set to OFF (0) or between 1 - 65535. Parameter units: ounces

Start Speed Time

Location: PAGE 1 - TANK

Description: Enables "Quick Start - Speed" function and defines the duration of the simulated speed - up to 6 seconds. Setting to 0 (Off) will disable the function.

Start Speed

Location: PAGE 1 - CUSTOM DATA

Description: Enables "Quick Start - Speed" function and defines the intended simulated speed in MPH (km/H). Setting to 0 (Off) will disable the function.

Units

Location: PAGE 1 - AREA

Description: Defines unit of measurement – 3RIVE 3D™ uses English. Changing UNITS setting also loads system default settings and clears all counters. (This affects both channels.)

To restore default calibration values and clear all counters (Tank, Volume, Area and Distance):

1. Change the UNITS value.
2. Turn the rotary knob to a different calibration page.
3. Turn the rotary knob back to UNITS.
4. Reset UNITS value to original choice.

Operating Mode

Location: PAGE 1 - AREA

Description: Chooses operating mode. For 3RIVE 3D™ this must be set to **Injection**.

Material

Location: PAGE 1 - DISTANCE

Description: Chooses material for application- Must be set to H2O for 3RIVE 3D.

Output Type

Location: PAGE 1 - PRESSURE

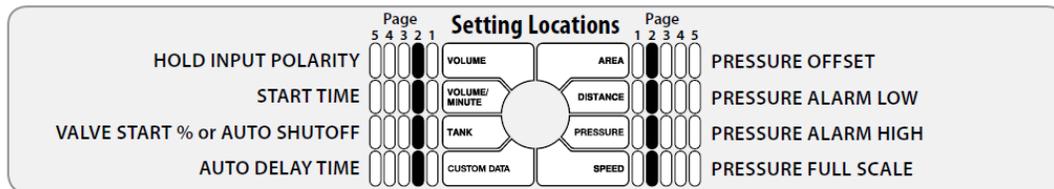
Description: Choose PULSE for use with 3RIVE 3D™ system.

Application ID

Location: PAGE 1 - SPEED

Description: Enter an ID number to identify the console if desired. (This number could also represent an application or a vehicle.) If you connect the console to another device via serial port, the APPLICATION ID is included with the Totals Data List and Equipment List information. (Micro-Trak® protocol only)

Special Calibration Settings - Page 2



Hold Input Polarity

Location: PAGE 2 - VOLUME

Description: On Remote Run/Hold connection – allows user to reverse the circuit function. The default setting is CLOSED - meaning that 3RIVE 3D™ Dual Plus will be in HOLD when the circuit is closed. (Affects both channels. Both channels must be the same setting.)

Start Time

Location: PAGE 2 - VOLUME/MINUTE

Description: Enables “Quick Start - Valve” function and defines the duration of the “Quick Start”. Setting to 0 (Off) will disable the function.

Valve Start Percentage

Applies to PWM mode only. Set to 10% for the 3RIVE 3D™ system.

Location: PAGE 2 - TANK

Description: Enables “Quick Start - Valve” function and defines the percentage of the PWM duty cycle during the “Quick Start - Valve” feature.

Auto Delay Time

Location: PAGE 2 - CUSTOM DATA

Set to 1 second for the 3RIVE 3D™ system.

Description: Enables and adjusts value for Auto Delay feature. When transitioning from HOLD to RUN, it provides time for motorized valves to operate and allows the flow to stabilize before AUTO control begins. This can be set to OFF (0) or between 1 - 4 seconds. **NOTE:** If a “Quick Start” feature is enabled, then AUTO DELAY TIME should be set to 0.

Pressure Offset

Location: PAGE 2 – AREA

Set to 0 for the 3RIVE 3D™ system.

Description: This adjusts the system accurately read a pressure sensor.

Note: Leave at 0 when using optional Micro-Trak pressure sensor(s) P/N 18757-18758, they are “gauge” type sensors and self-adjust for ambient atmospheric pressure. To adjust system to calculate pressure readings when using an “Absolute” style pressure sensor, input Absolute Atmospheric Pressure in PSI (bar) for your location.

Pressure Alarm Low

Location: PAGE 2 - DISTANCE

Description: Enables and adjusts value for Pressure Alarm - set value to notify operator when low level is reached. This can be set to OFF (0) or up to 50% of FULL SCALE setting. Parameter units: English = PSI.

Pressure Alarm High

Location: PAGE 2 - PRESSURE

Description: Enables and adjusts value for Pressure Alarm - set value to notify operator when high level is reached. This can be set to OFF (0) or up to 100% of FULL SCALE setting. Parameter units: English = PSI.

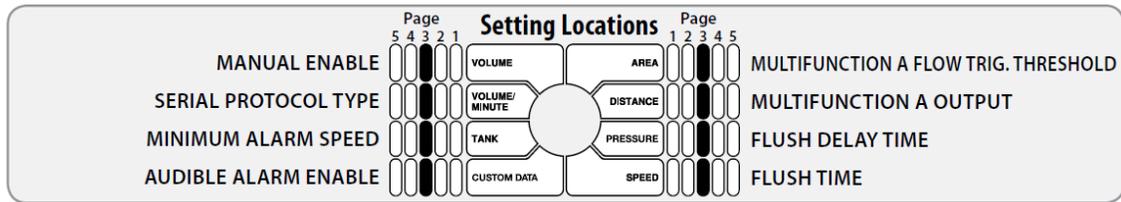
Pressure Full Scale

Location: PAGE 2 – SPEED

Set to 100 for the 3RIVE 3D™ system.

Description: Displays and adjusts FULL SCALE (maximum) value for Pressure Sensor. Default setting is 150 PSI for Micro-Trak Pressure Sensor P/N 18757. Adjust it to 300 PSI for Micro-Trak P/N 18758. This measurement is always rated in PSI.

Special Calibration Settings - Page 3



Manual Enable

Location: PAGE 3 - VOLUME

Description: Enables (ON) or disables (OFF) Manual Control mode. Disabling this function means the console will only run in AUTO mode and the AUTO/MAN switch will be inactive.

Serial Protocol Type

Location: PAGE 3 - VOLUME/MINUTE

Description: Chooses serial protocol used for communicating VRA information through the serial port. Choices are Micro-Trak or Raven (model 660) Default is Micro-Trak protocol. (This affects both channels.)

Minimum Alarm Speed

Location: PAGE 3 - TANK

Description: Enables and adjusts a minimum speed threshold for the audible alarm - this prevents unneeded warnings while stopping and starting. This can be set to OFF (0) or from 0.1 to 99.9 mph (km/h). Affected alarms are Application Rate Error and Minimum Flow. (Affects both channels.)

Audible Alarm Enable

Location: PAGE 3 - CUSTOM DATA

Description: Enables (ON) or disables (OFF) Audible Alarm function - allows user to operate system without hearing any system warnings. Flush cycle completion alert is not affected by this setting.

Multifunction A Flow Trigger Threshold

Location: PAGE 3 - AREA

Description: When Multifunction A output is set to Fixed Flow Trigger (F-FLO) or Proportional Flow Trigger (P-FLO), this adjusts the threshold value for activating the voltage output.

F-FLO: Threshold value turns on power to Multifunction A output based on the fixed total flow rate, regardless of active width.

P-FLO: Threshold value turns on power to Multifunction A output based on flow rate, proportional to active width. Example: If the threshold is set to 10GPM while running only 2 out of 5 sections, the trigger will be on at 4GPM - (2/5 X 10). (Note: System must be in Inj. Mode to choose P-Flo on Chan 2.)

Multifunction A Output

Location: PAGE 3 - DISTANCE

Description: Selects mode of 12VDC power sent to Multifunction Output A connection on branch harness.

1. **OFF** = Always off
2. **ON** = Always on
3. **RELIEF VALVE** = On in Hold
4. **MASTER** = On in Run and at least 1 section on (Note: there is a 1/2 second delay switching from HOLD to RUN)
5. **FLUSH** = Enables Flush cycle to purge chemicals from lines when switching from Run to Hold - see below
6. **F-FLO** = Fixed Flow Trigger - see above
7. **P-FLO** = Proportional Flow Trigger- see above

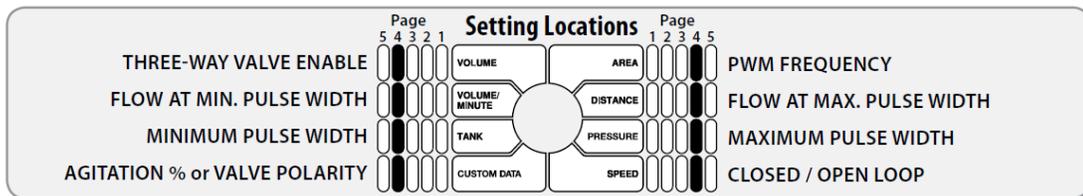
Flush Delay Time

Not used with 3RIVE 3D.

Flush Time

Not used with 3RIVE 3D.

Special Calibration Settings - Page 4



Three-way Valve Enable

Not used with 3RIVE 3D.

Flow at Minimum Pulse Width-PWM only

Not used with 3RIVE 3D.

Minimum Pulse Width

Location: PAGE 4 - TANK

Description: In PWM Output, this adjusts value for Minimum Pulse Width. This setting can be useful to maintain hydraulic motor minimum rpms or to ensure nozzle minimum flows are maintained. This can be set from 0 to 100%.

Agitation Percentage

Not used with 3RIVE 3D.

PWM Frequency

Location: PAGE 4 - AREA

Description: In PWM Output, this adjusts value for PWM Frequency. This can be set from 50 to 500Hz. Consult your PWM device information for optimal frequency. Default frequency is 200Hz.

Flow at Maximum Pulse Width

Not used with 3RIVE 3D.

Maximum Pulse Width

Location: PAGE 4 – PRESSURE

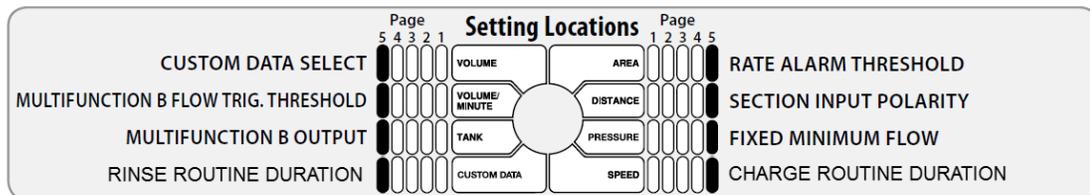
Set to 100% for the 3RIVE 3D™ system.

Description: In PWM Output, this adjusts value for Maximum Pulse Width. This can be set from 0 to 100%. (This value must be larger than the Minimum Pulse Width.)

Closed/Open Loop

Not used with 3RIVE 3D. System default set to Closed Loop.

Special Calibration Settings - Page 5



Custom Data Select

Location: PAGE 5 - VOLUME

Description: Choose the information displayed in the data window.

Choose from:

Rate - Calibrated Target Rate

Output Drive - STD or PWM **VRA** - VRA target rate, connection status etc.

Hours - Number of elapsed hours on console

APH - Area per hour

Width - Total of calibrated width

Section - Shows which sections are active

Multifunction B Trigger Threshold

Location: PAGE 5 - VOLUME/MINUTE

Description: When Multifunction B output is set to Fixed Flow Trigger (F-FLO) or Proportional Flow Trigger

(P-FLO), this adjusts the threshold value for activating the voltage output.

F-FLO: Threshold value turns on power to Multifunction B output based on the fixed total flow rate, regardless of active width.

P-FLO: Threshold value turns on power to Multifunction B output based on flow rate, proportional to active width. Example: If the threshold is set to 10GPM while running only 2 out of 5 sections, the trigger would engage at 4GPM - $(2/5 \times 10)$. (Note: System must be in Inj. Mode to choose P-Flo on Chan 2.)

Multifunction B Output

Location: PAGE 5 - TANK

Description: Selects mode of 12VDC power sent to Multifunction Output B connection on branch harness.

1. **OFF** = Always off
2. **ON** = Always on
3. **RELIEF VALVE** = On in Hold
4. **MASTER** = On in Run and at least 1 section on (Note: there is a 1/2 second delay switching from HOLD to RUN)
5. **F-FLO** = Fixed Flow Trigger - see above
6. **P-FLO** = Proportional Flow Trigger - see above

Rate Alarm Threshold

Location: PAGE 5 - AREA

Description: Adjusts threshold value for the Rate Alarm - can be set from 10% - 30%. This value is the percentage of difference between the actual rate of application and the target rate.

Section Input Polarity

Set to 12V for 3RIVE 3D.

Location: PAGE 5 - DISTANCE

Description: This setting allows the user to reverse the polarity of section inputs. This may be useful when connecting a separate device to the 3RIVE 3D™ Dual Plus system for automatic section control. Default is 12v. (Affects both channels.)

Fixed Minimum Flow

Location: PAGE 5 - PRESSURE

Description: Sets an absolute minimum flow for the system. This ensures that the flow rate is never less than the lowest range of the flowmeter – preventing the flowmeter from stalling.

Maximum Rinse Timer

This sets the maximum duration for the Rinse routine. This can be set from 0-99 minutes.

Maximum Charge Timer

This sets the maximum duration for the Charge routine. This can be set from 0-99 minutes.

RESTORING DEFAULT CALIBRATION VALUES

Location: PAGE 1 - AREA

This is performed at the UNITS setting.

To restore default calibration values and clear all counters (Tank, Volume, Area and Distance):

1. Change the UNITS value.
2. Turn the rotary knob to a different calibration setting.
3. Turn the rotary knob back to UNITS.
4. Reset UNITS value to original choice.

SAFEGUARD™ BLOCKAGE MONITOR

SafeGuard™ is an electronic blockage monitor that will help you operate more cost-effectively by providing the information you need to maintain proper application rates of liquid chemicals. SafeGuard™ has been designed for easy installation and operation.

COMPONENTS

SAFEGUARD™ CONSOLE

This is the main unit of the SafeGuard™™ system. It continually scans for a blocked indication.

SAFEGUARD™ SENSOR

The sensor assembly is a liquid flow chamber surrounded by a blockage detection shroud. The bottom openings of the sensor assembly accommodate a variety of plugs (male) and caps (female). The chamber contains a detection cartridge which rises with flow, and drops when flow is interrupted.

IMPLEMENT SWITCH & MODULE

SafeGuard™ can accept an optional Implement Switch and Module. This option silences the audible alarm on the SafeGuard™ when the implement is not in use. The Module provides the interface between an implement switch and SafeGuard™ wiring and can be placed at any point in the chained sensor connections.

NORMAL OPERATION

When the console is turned on it searches for sensors and implement switch modules installed on the data line. During the power up sequence the console displays the number of sensors found, for example: **S 48** indicates 48 sensors were detected during power up. If the number of detected sensors has changed since the last power-up sequence, the console will pause, display the new sensor count, and beep to alert the operator.

Operator must acknowledge the new sensor count by pressing either volume button to continue the power-up sequence.

Devices are numbered sequentially based on their position on the data line starting with # 1 being closest to the console end of the cable.

Sensors and implement switch modules are numbered separately so the first implement switch module on the data line is always module # 1.

The console continually monitors the sensors for a blocked indication. When a blockage is detected the console immediately alerts you by flashing the red warning LED, sounding an audible alarm, and displaying the number of the sensor that is blocked. This alert will remain until the blockage is cleared. With the implement switch activated the display should show that all runs are blocked, and HOLD is displayed (audible alarm muted). This serves as confirmation that the system is working properly.

TROUBLESHOOTING

DISPLAY FREEZES DURING STARTUP

When the console is turned on it searches for sensors and implement switch modules installed on the data line. During the power up sequence the console displays the number of sensors found, for example: S 48 indicates 48 sensors were detected during power up. If the number of detected sensors has changed since the last power-up sequence, the console will pause, display the new sensor count, and beep to alert the operator. **Operator must acknowledge the new sensor count by pressing either volume button to continue the power-up sequence.**

CONSOLE WON'T TURN ON

Is there power on the console power cable? Pin A is +12 VDC, Pin B is ground.

5. **NO** Troubleshoot for possible blown fuse, broken wiring or bad connections on power cable. Verify there's power at cable connection point.
6. **YES** Disconnect data cable and try to turn on the console. If it turns on with data cable disconnected troubleshoot damaged cable or sensor assembly. If it does not turn on with data cable disconnected, replace console.

SENSORS NOT DETECTED

7. **Several sensors in a row missing** - Check connection between last good sensor and first bad sensor. Bypass first bad sensor in string with extension cable or adjacent sensor leads.
8. **Single sensors not detected** - Isolate or verify bad sensor by bypassing suspect sensor with extension cable or sensor leads. Cycle power on console to re-scan for sensors.

SENSOR NOT DETECTING BLOCKAGE

If the cartridge is at the bottom of the sensor assembly and the sensor does not indicate BLOCKED, verify cartridge is in the sensor tube with tail on top/ball on bottom. If this is correct, replace sensor.

SENSOR DOESN'T READ GOOD

Remove cartridge from sensor chamber. If sensor doesn't read good with cartridge removed, replace sensor.

OPEN

No sensors detected during power up sequence. Check connection and cables between console and first sensor.

NET

Displayed when operating and communication with all sensors is lost

ERROR

Sensor was present at power-up, and is now not talking to the console. The sensor number will be displayed. If an H is displayed the error is originating from an implement switch module. The number of the module will be displayed.

APPENDICES

APPENDIX A – DEFAULT SETTINGS

NOTE: These settings are based on requirements for a 24-row planter

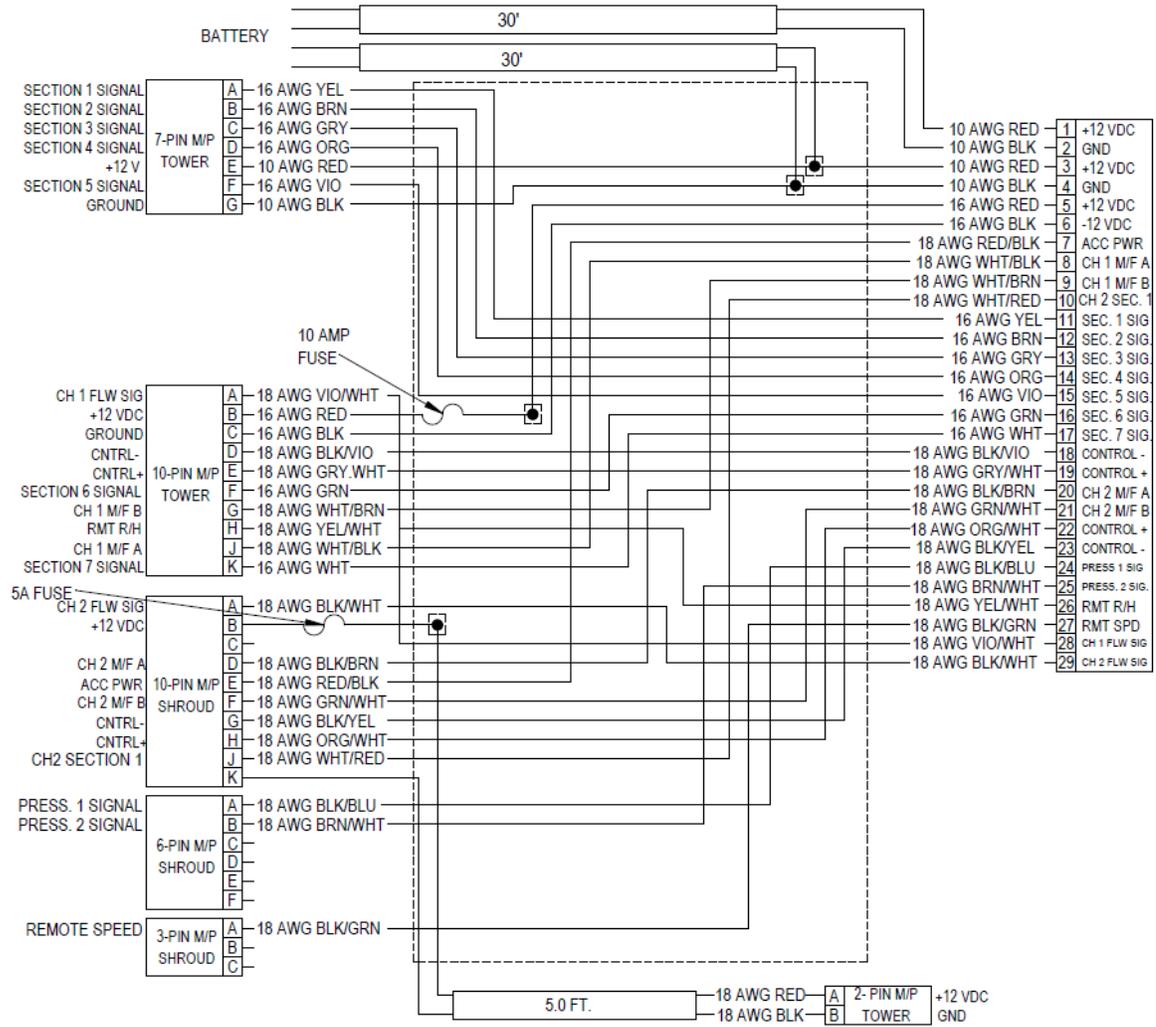
Calibration Factor	Channel 1			Channel 2		
	English	Turf	Metric	English	Turf	Metric
Flow Cal (Edges/Ounce)	52.0	52.0	52.0	5071	5071	5071
Min Flow	0.0 (Off)	0.0 (Off)	0.0 (Off)	0.0 (Off)	0.0 (Off)	0.0 (Off)
Target Rate	40.0 Ounces/Acre	0.93 Oz/1000 Ft ²	3.00 liters/ha	8.00 Ounces/Acre	0.20 Oz/1000 Ft ²	0.60 liters/ha
Adjust Rate	1.00 Ounces/Acre	0.05 Oz/1000 Ft ²	0.10 liters/ha	1.00 Ounces/Acre	0.02 Oz/1000 Ft ²	0.10 liters/ha
Section 1 Width	180 in	180 in	4.600 m	720 in	180 in	18.400m
Section 2 Width	180 in	0	4.600 m			
Section 3 Width	180 in	0	4.600 m			
Section 4 Width	180 in	0	4.600 m			
Section 5 Width	0	0	0			
Section 6 Width	0	0	0			
Section 7 Width	0	0	0			
Tank Alarm Level	Off	Off	Off	Off	Off	Off
Tank Fill Level	Off	Off	Off	Off	Off	Off
Control Response	-1	-1	-1	-1	-1	-1
PWM Frequency	100 Hz	100 Hz	100 Hz	100 Hz	100 Hz	100 Hz
Minimum PW	10%	10%	10%	15%	15%	15%
Flow @ MIN PW	.00	.00	.00	.00	.00	.00
Maximum PW	100%	100%	100%	100%	100%	100%
Flow @ MAX PW	.00	.00	.00	.00	.00	.00
Flowmeter Scale	1	1	1	1	1	1

Start Speed	0 mph(Off)	0 mph(Off)	0 km/h(Off)	0 mph(Off)	0 mph(Off)	0 km/h(Off)
Start Speed Time	0 s	0 s	0 s	0 s	0 s	0 s
Start Up Time	0 (Off)					
Valve Start %	10	10	10	10	10	10
Flush Delay Time	3 s	3 s	3 s	3 s	3 s	3 s
Flush Time	5 s	5 s	5 s	5 s	5 s	5 s
Multi Function-A	Off in Hold					
Multi Function-B	F-FLO	F-FLO	F-FLO	Off in Hold	Off in Hold	Off in Hold
Trig Threshold-A	15.0 OPM	0.35 OPM	1.20 l/m	15.0 OPM	0.35 OPM	1.20 l/m
Trig Threshold B	15.0 OPM	0.35 OPM	1.20 l/m	15.0 OPM	0.35 OPM	1.20 l/m
Rate Alarm Threshold	10%	10%	10%	15%	15%	15%
Agitate %	0 (Off)					
Auto Delay Time	1 sec					
Pressure Alarm Lo	0 psi (Off)	0 psi (Off)	0 bar (Off)	0 psi (Off)	0 psi (Off)	0 bar (Off)
Pressure Alarm Hi	0 psi (Off)					
Min Pressure	10.0 psi	10.0 psi	1.00 bar	10.0 psi	10.0 psi	1.00 bar
Pressure Offset	0 psi	0 psi	0.0 bar	0 psi	0 psi	0.0 bar
Pressure Full Span PSI	100	100	100	100	100	100
Fixed Min Flow	10.0	10.0	10.0	2.0	2.0	2.0
Custom Data	Duty Cycle					
Material (H ₂ O / NH ₃)	H ₂ O					
Valve Polarity	Bypass	Bypass	Bypass	Bypass	Bypass	Bypass
Auto Shut-Off	Off	Off	Off	Off	Off	Off
Drive Type (Std / PWM)	PWM	PWM	PWM	PWM	PWM	PWM
FTW Mode	Off	Off	Off	Off	Off	Off
VRA Protocol	MicroTrak	MicroTrak	MicroTrak	MicroTrak	MicroTrak	MicroTrak
Closed / Open Loop	Closed Loop	Closed Loop	Closed Loop	Closed Loop	Closed Loop	Closed Loop

Manual Control Enable	On	On	On	On	On	On
Audible Alarm Enable	On	On	On	On	On	On
Mode Flags	Hold, Manual	Hold, Manual	Hold, Manual	Hold, Manual	Hold, Manual	Hold, Manual
Channel Select (1 / 2)	1	1	1	1	1	1
Units (C1 selected)	00 (Eng)	10 (Turf)	01 (Metric)			
Ch 2 Mode (C2 selected)				Inj	Inj	Inj
Speed Cal	0.189 (in/edge)	0.189 (in/edge)	0.48 (cm/edge)	← Global Cal factors apply to both Channels		
Rem Hold Input Polarity	Closed	Closed	Closed			
Minimum Alarm Speed	0 mph	0 mph	0 kph			
Section Input Polarity	12v	12v	12v			
Application ID	1	1	1			
Console Lock	Unlocked	Unlocked	Unlocked			

APPENDIX B – WIRING DIAGRAMS

CONSOLE TO PLANTER



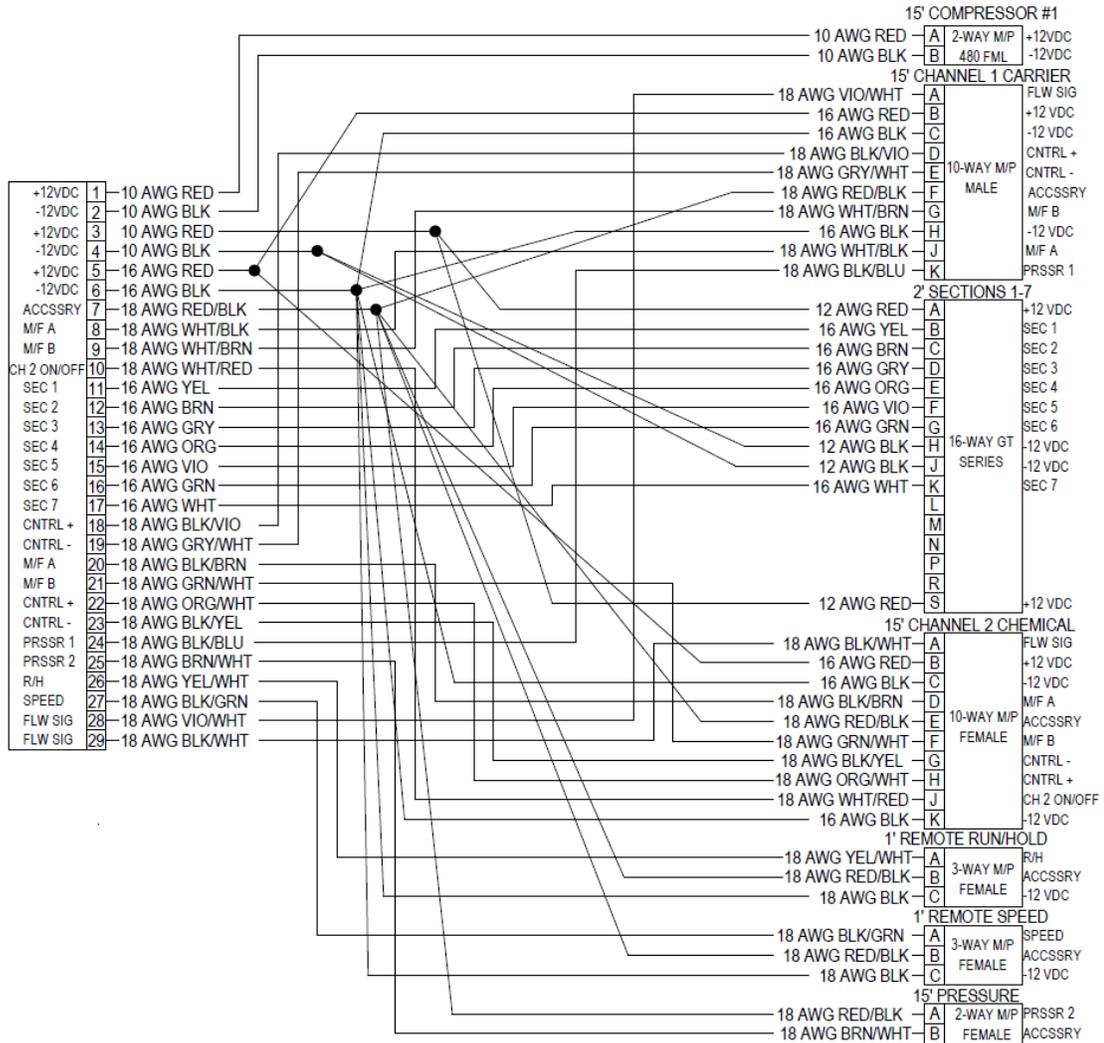
IMPLEMENT HARNESS

(Extension between hitch and junction harness)

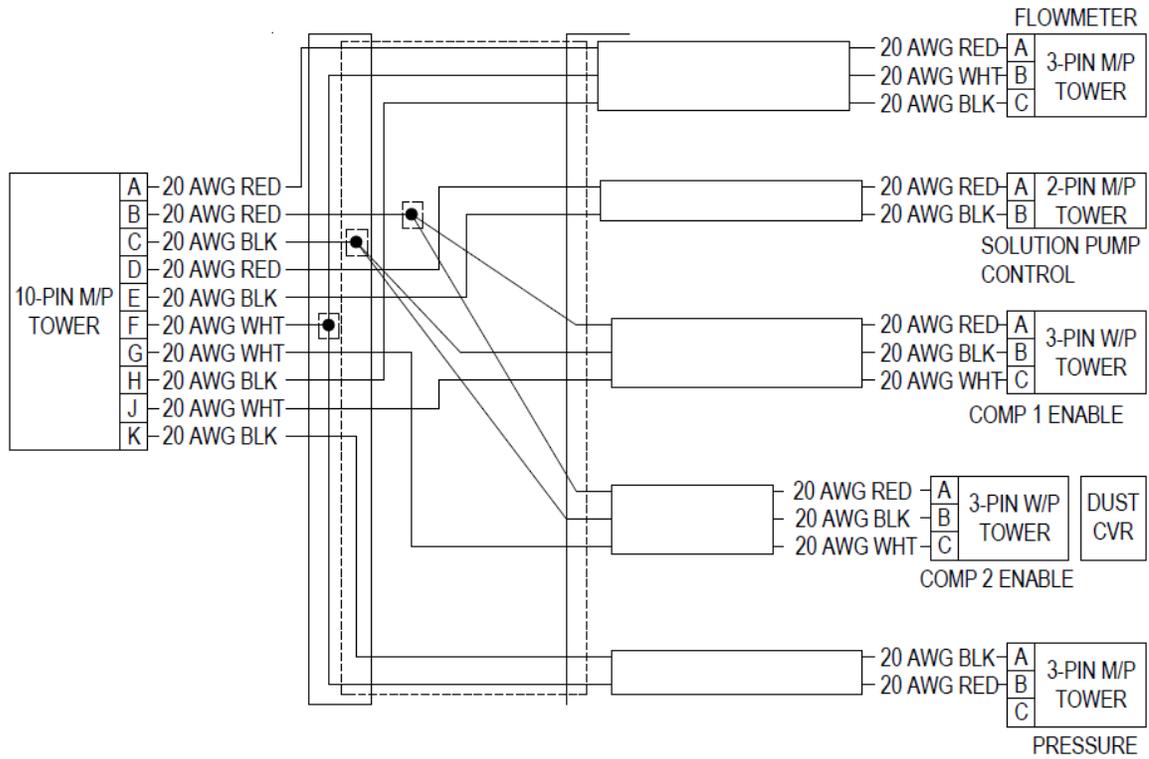
DEUTSCH HDP26-24-29PE	1	10 AWG RED (14096) +12VDC 30AMPS A	1
	2	10 AWG BLK (14095) -12VDC 30AMPS A	2
	3	10 AWG RED (14096) +12VDC 30AMPS B	3
	4	10 AWG BLK (14095) -12VDC 30AMPS B	4
	5	16 AWG RED (18364) +12VDC 10AMPS C	5
	6	16 AWG BLK (18362) -12VDC 10AMPS C	6
	7	18 AWG RED/BLK (18395) ACCESSORY POWER	7
	8	18 AWG WHT/BLK (18396) MULTIFUNCTION A CHANNEL 1	8
	9	18 AWG WHT/BRN (18397) MULTIFUNCTION B CHANNEL 1	9
	10	18 AWG WHT/RED (18398) CHANNEL 2 ON/OFF	10
	11	16 AWG YEL (18365) SECTION 1	11
	12	16 AWG BRN (18363) SECTION 2	12
	13	16 AWG GRY (18368) SECTION 3	13
	14	16 AWG ORG (11787) SECTION 4	14
	15	16 AWG VIO (18367) SECTION 5	15
	16	16 AWG GRN (18366) SECTION 6	16
	17	16 AWG WHT (18369) SECTION 7	17
	18	18 AWG BLK/VIO (18411) CONTROL+ CHANNEL 1	18
	19	18 AWG GRY/WHT (18433) CONTROL- CHANNEL 1	19
	20	18 AWG BLK/BRN (18405) MULTIFUNCTION A CHANNEL 2	20
	21	18 AWG GRN/WHT (18430) MULTIFUNCTION B CHANNEL 2	21
	22	18 AWG ORG/WHT (18428) CONTROL+ CHANNEL 2	22
	23	18 AWG BLK/YEL (18408) CONTROL- CHANNEL 2	23
	24	18 AWG BLK/BLU (18410) PRESSURE CHANNEL 1	24
	25	18 AWG BRN/WHT (18426) PRESSURE CHANNEL 2	25
	26	18 AWG YEL/WHT (18429) REMOTE RUN/HOLD	26
	27	18 AWG BLK/GRN (18409) REMOTE SPEED	27
	28	18 AWG VIO/WHT (18432) FLOW SIGNAL CHANNEL 1	28
	29	18 AWG BLK/WHT (18412) FLOW SIGNAL CHANNEL 2	29

DEUTSCH HDP24-24-29SE

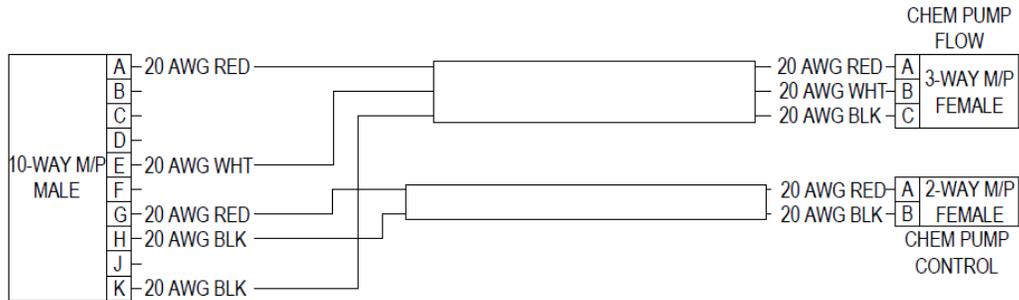
JUNCTION HARNESS



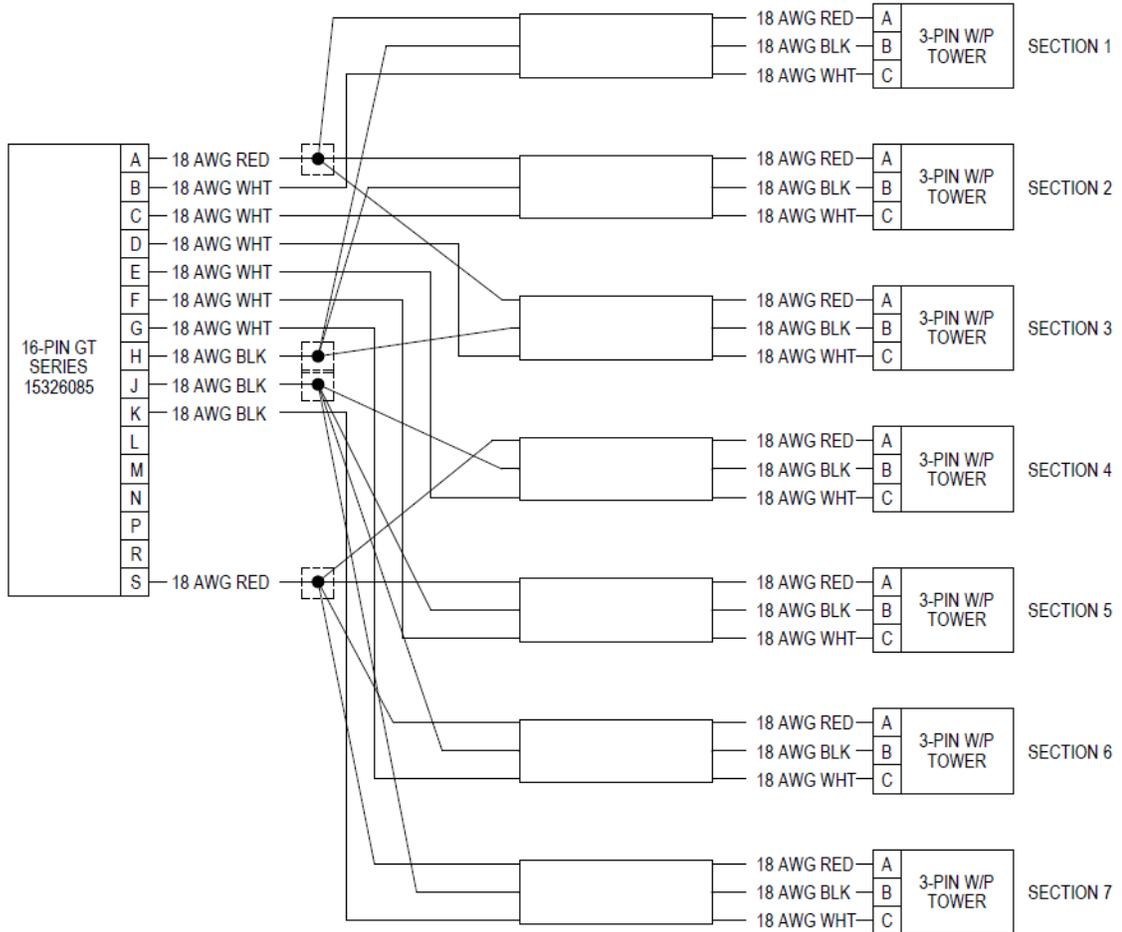
CHANNEL 1 BRANCH



WIRING DIAGRAM – CHANNEL 2 BRANCH



SECTION HARNESS



Valve Connections

Pin A – constant 12 volts DC

Pin B – ground

Pin C – switched 12 volts DC

APPENDIX C – FINE TUNING SPEED/DISTANCE CALIBRATION

Accurately measure a distance of 1000 feet (300 meters). Clearly mark the beginning and end points with flags or something highly visible to the operator.

PROCEDURE

1. With the console turned ON, place the Run/Hold switch in the HOLD position. (The HOLD icon will be displayed).
2. Turn the rotary dial to the DISTANCE position. Reset the distance counter by pressing and holding "RESET" until the display returns to 0. (CLEAR will be displayed when reset is pressed). Make sure pump is off. Turn on the section switches.
3. You are now ready to drive the measured course. Pick a location on the vehicle to use as a marker for starting and stopping the distance counting function (door handle, mirror, step, etc.). You should begin driving the course well ahead of the starting flag and drive past the ending flag, using the Run/Hold switch to start and stop the counting function. It is not recommended to start from a dead stop at the starting flag and stop at the ending flag.
4. Place the Run/Hold switch in RUN when the marker on the vehicle passes the starting flag to activate the distance counting function. The console display numbers will increase, adding to the distance total as you drive.
5. Drive the pre-measured course and place the Run/Hold switch in HOLD when the marker on the vehicle passes the ending flag, to stop the distance counting function. The console display should display "HOLD".
9. With the rotary dial still at DISTANCE (SPEED CAL), press and hold the CAL button for one second. Once the console is in "CAL," the speed calibration value will be displayed. Momentarily press the CAL button and the word "CAL" will begin to flash and the distance travelled will be displayed. *See figure 28 below.*
10. When the display shows distance ("CAL" is flashing), verify whether the number displayed is the exact distance you drove (+/- 1 - 2 %). If not, press the **Increase** or **Decrease** button to adjust the figure to match the distance driven.
11. When the number shown on the display matches (as closely as possible) the actual distance driven, you have arrived at the correct calibration value. If you cannot adjust the displayed distance to exactly match the actual distance driven, adjust the figure as close as possible to the actual distance. You may check the calibration number by momentarily pressing the CAL button. The word "CAL" will stop flashing and the SPEED CAL number will appear. Exit "CAL" by pressing the CAL button for one second.
12. The speed sensor is now calibrated. To verify proper calibration, repeat the procedure a second time. Write down the new speed calibration number and keep it in a safe place. If the calibration values are ever accidentally changed, you can simply reenter this number.

APPENDIX D – FINE TUNING FLOW METER CALIBRATION

CHEMICAL PUMP FLOW CALIBRATION



When working on system with active product follow all chemical handling rules and safety procedures!

This procedure involves running the chemical pump and collecting the chemical in a graduated container. The console is reading out in ounces, so a beaker marked in ounces is preferable. If the product is collected in a gallon container remember to multiple gallons collected by 128 to get the ounces collected. I.E. 1 quart collected = 32 ounces on display

1. Remove the front cover from the Pump-Pak.
2. Place the calibration tube into a graduated container to collect the chemical. As long as a clean container is used the chemical collected can be put back into the chemical tank when test is complete.
13. Note: the system will also pump water out of the row units, but all chemical is diverted to the catch container.
3. Move the three-way valve to the calibrate position.
4. Turn on the console.
5. Place the console run/hold switch into the HOLD position.
6. Press and hold the CAL button until CAL is displayed on left screen. Release button.
7. Turn knob to SPEED.
8. Using the + button, adjust the test speed to the speed you plan on planting.
9. Place the controller select switch to BOTH.
10. Press the CHANNEL VIEW SELECT to select CHANNEL 2.
11. Turn the knob to VOLUME.
12. Press and hold the “- RESET” button until the volume counter resets to 0.0.
13. Place the run/hold switch in the RUN position.
14. The system will begin to pump chemical into the graduated container. Water and air will also be coming out of row units.
15. After collecting a measureable sample of chemical (a minimum of 32 ounces, or 1 quart, is recommended) compare the amount collected with the volume counter for channel 2. If the two measurements vary by more than 3 % perform the following:
 - a. Place the run/hold switch to HOLD
 - b. Press and hold the CAL button until the CAL indicator is displayed on screen.
 - c. With the knob turned to volume, the flow calibration value is displayed.
 - d. Press the CAL button once, and the display will now show the volume counter.
 - e. Press the + or – button as needed to make the channel 2 volume match the actual amount collected.
 - f. Press the CAL button once, and your new calibration value is displayed.

- g. Press and hold the CAL button until the CAL indicator goes out on the display. Your new cal value is now saved.

SOLUTION FLOWMETER FINE TUNING CALIBRATION



When working on system with active product follow all chemical handling rules and safety procedures!

This procedure involves running the solution pump and collecting the liquid in a graduated container. The console is reading out in ounces, so a beaker marked in ounces is preferable. If the product is collected in a gallon container remember to multiple gallons collected by 128 to get the ounces collected. I.E. 1 quart collected = 32 ounces on display

1. Remove the front cover from the Pump-Pak.
2. Disconnect a liquid supply line from one section. Run that tube into a graduated container to collect the liquid.
3. Turn on the console.
4. Place the console run/hold switch into the HOLD position.
5. Turn off all sections with the exception of the section you disconnected the supply line from in step 2.
6. Press and hold the CAL button until CAL is displayed on left screen. Release button.
7. Turn knob to SPEED.
8. Using the + button, adjust the test speed to the speed you plan on planting.
9. Place the controller select switch to CH. 1.
10. Press the CHANNEL VIEW SELECT to select CHANNEL 1.
11. Turn the knob to VOLUME.
12. Press and hold the “- RESET” button until the volume counter resets to 0.0.
13. Place the run/hold switch in the RUN position.
14. The system will begin to pump liquid into the graduated container.



Chemical will be present in the liquid.

15. After collecting a measureable sample of liquid (a minimum of 1 gallon is recommended) compare the amount collected with the volume counter for channel 1. If the two measurements vary by more than 3 % perform the following:
 - a. Place the run/hold switch to HOLD
 - b. Press and hold the CAL button until the CAL indicator is displayed on screen.
 - c. With the knob turned to volume, the flow calibration value is displayed.
 - d. Press the CAL button once, and the display will now show the volume counter.
 - e. Press the + or – button as needed to make the channel 1 volume match the actual amount collected, in ounces.
 - f. Press the CAL button once, and your new calibration value is displayed.
 - g. Press and hold the CAL button until the CAL indicator goes out on the display. Your new cal value is now saved.

APPENDIX D – REPLACEMENT PARTS

In The Cab On the Tractor Parts

- 13774 Dual Console Mount Kit
- 18805 3RIVE 3D™ Dual Console (5 section)
- 19362 3RIVE 3D™ Dual Console (7 section)
- 19174 15' 29Pin 3RIVE 3D™ Tractor Harness
- 19175 25' 29Pin 3RIVE 3D™ Tractor Harness
- 19289 3RIVE 3D™ Dual Manual (Net Price only)
- 50340 3RIVE 3D™ Installation Manual (Net price only)
- 50394 Cab Card (Net price only)
- 13181 SafeGuard Console Mount Kit
- 19360 3RIVE 3D™ SafeGuard Console
- 18982 3RIVE 3D™ SafeGuard Power Cable
- 18526 6Pin 5' M/P to JWPF Adapter Cable
- 19361 3RIVE 3D™ SafeGuard Manual (Net price only)

On The Planter Parts

- 19226 15' 29Pin 3RIVE 3D™ Dual Junction Harness
- 19020 3RIVE 3D™ ISOMOD Module
- 19298 3RIVE 3D™ ISOMOD Junction Harness
- 01840 SafeGuard Implement Switch Kit
- 18531 Implement Switch Module
- 18541 Whisker Switch w/Bracket & Mag Mount
- 19162 1/2" x 50 Mesh Water Strainer (Red)
- 19238 1/2" PolyPro Water/Chem Tank Valve
- 19144 3/4" PolyPro Water Rinse Valve
- 19234 3/4" 50 Mesh Chem Strainer
- 19108 Air Regulator Mount Bracket
- 19129 100 PSI Pressure Sensor
- 19131 Air Pressure Regulator
- 19163 60 PSI Pressure Gauge
- 19286 2' Pressure Sensor Adapter cable
- 19429 UBolt, 3/8" x 7" x 7" x 7"
- 12522 1/2" MPT x 1/2" Barb Tee PP Black
- 12526 1/2" FPT x 1/2" FPT Tee PP Black
- 12527 1/2" MPT x 1/2" MPT Nipple Black
- 13947 1/2" MPT x 1/2" Barb PP Black

PumpPak Related Parts

18104 10Amp PWM EMD Module
19110 1/4" 3Way Solenoid Valve
19285 PumpPak Channel 1 Branch Cable
19287 PumpPak Channel 2 Branch Cable
19356 PumpPak Power Branch Cable
19359 Gear Motor Interface Cable
22034 Crouzet Chemical Gear Motor
22035 Watson Marlow Pumphead
19363 Remco Water Pump
19425 Flowmeter Sensor Cable 6"
22032 FM250 P Flowmeter
19371 1/2" Side Load Banjo Valve
19383 3.2 Metering Tube
19384 2.4 Metering Tube
19385 1.6 Metering Tube
19611 Single Relay Control Module
18837 Air Compressor w/Adapter
19126 Air Compressor Air Filter 1/4"
19164 1/4" S.S Street Elbow
19151 1/2" Braided Vinyl Hose
19153 3/8" Braided Vinyl Hose
19576 DZUS 1/4 Turn Fastener Stud
19577 DZUS 1/4 Turn Receptacle
19442 1/2" Quick Coupler Panel Mount
19443 3/4" Quick Coupler Insert
19373 Tubing 1/4" ID x 3/8" OD Blue
19374 Tubing 1/4" ID x 3/8" OD White
19375 Tubing 1/4" ID x 3/8" OD Black
19477 Tubing 1/4" ID x 3/8" OD Green
19548 3/8" Stem x 1/2" Barb Black
19596 1/4" MPT x 3/8" PTC Black
19597 1/4" MPT x 3/8" PTC Swivel 90° Black
19148 3/8" Stem x 3/8" PTC Black
19202 3/8" Stem x 3/8" Barb Black

- 19251 1/4" FPT x 3/8" PTC Black
- 19557 1/2" x 1/2" x 1/2" Barb Tee Black
- 19560 1/2" MPT x 3/8" PTC Black
- 19561 3/8" PTC x 3/8" MPT Tee Black
- 19170 Big Air 30 Amp Power Fuse Holder Kit
- 19295 Big Air 30' 2pin M/P 480 Power Cable

Chemical & Water Tank Related Parts

- 19144 3/4" FP 4Bolt PolyPro Valve
- 19162 1/2" x 50 Mesh Red Strainer
- 19234 3/4" 50 Mesh Micro Strainer
- 19238 1/2" FP Union PolyPro Valve
- 12527 1/2" MPT x 1/2" MPT Nipple Black
- 19165 3/4" MPT x 3/4" MPT Nipple Black
- 19185 3/4" FPT x 3/4" FPT Tee PP Black
- 19186 3/4" MPT x 1/2" MPT Nipple Black
- 19242 3/4" MPT x 3/4" Barb PP Black
- 19560 1/2" MPT x 3/8" PTC Black
- 19233 3/4" MPT x 3/4" Barb 90⁰ PP Black
- 19594 3/4" Rubber Spiral Hose
- 10509 3/4" MPT x 1/2" Barb PP Black
- 19148 3/8" Stem x 3/8" PTC 90⁰ Black
- 19441 3/4" MPT x 1/2" FPT Bushing
- 12526 1/2" FPT x 1/2" PFT Tee PP Black
- 12527 1/2" MPT x 1/2" MPT Nipple Black
- 13947 1/2" MPT x 1/2" Barb PP Black

Section Tower Related Parts

- 18500 6pin 20' JWPF Extension Cable
- 18510 SafeGuard Sensor UClip, S.S
- 18514 SafeGuard Sensor Retainer Clip
- 18627 Plug Fitting 3/8" John Guest 90⁰
- 18687 Pink Cartridge (Net price only)
- 18822 3RIVE 3D™ Foam Blockage Sensor
- 19083 Mixing Tee Fitting
- 19119 Mixing Tee 1" Gasket
- 19120 Mixing Tee Clamp
- 19148 3/8" Stem x 3/8" PTC 90⁰ Black

19151 1/2" Braided Vinyl Hose
19153 3/8" Braided Vinyl Hose
19192 Foam Manifold Assembly
19202 3/8" Stem x 3/8" Barb Black
19219 UBolt, 3/8" x 7" x 9"
19194 Liquid Core Disc
19244 Liquid Disc D1
19246 Liquid Disc D2
19247 Liquid Disc D4
19195 Air Disc 1 #30
19248 Air Disc 2 #35
19249 Air Disc 3 #40
19250 Nipple, 11/16" x 1/4" PP
19375 Tubing 1/4" ID x 3/8" OD Black
19409 3/8" Stem x 1/4" PTC
19410 1/4" Tubing
19512 4Row Splitter Cable
19513 6Row Splitter Cable
19541 Coiling Bracket
19542 1/4" Zip Valve
19544 Row Valve Bracket
19545 Section Tower Bracket
19546 3pin W/P to 4pin M12 cable
19599 M12 Dust Cover
19547 1/4" Stem x 1/4" PTC 90⁰ Black
19548 3/8" Stem x 1/2" Barb Black
19549 1/4" FPT x 1/4" PTC
19550 1/4" PTC Straight Quick Cap Black
19551 1/4" FPT Quick Body Black
19552 EPDM Rubber Seal
19553 1/4" MPT x 3/8" Stem Black

InFurrow Delivery Related Parts

19121 S.S Foam Tube Straight
19122 S.S Foam Tube Bent
19497 3/8" PTC x 1/4" PTC Union Black

Proudly manufactured in the U.S.A. by:



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