

FLOWTRAK™ II

Application Monitor



REFERENCE MANUAL



MICRO-TRAK®
SYSTEMS, INC.

FLOWTRAK™ II

Application Monitor **REFERENCE MANUAL**

FlowTrak II is an electronic monitoring system that can help you achieve maximum yields and operate more cost-effectively by providing the information you need to maintain proper application rates of liquid chemicals and fertilizer. FlowTrak II has been designed for easy installation and operation. However, since each installation will vary depending on your equipment, please take time to familiarize yourself with this manual and the actual components before beginning. Following the procedures described in this manual will ensure proper performance and help avoid problems or questions once you are in the field.

This manual is written for the FlowTrak II, which may be used for English, Metric or Turf measurement. Please read the manual carefully and follow the instructions as they apply to your usage.

If you do encounter a problem that cannot be corrected by reviewing this manual, consult your dealer or distributor, or contact a Micro-Trak technician for assistance.

Toll Free in U.S. or Canada: 800-328-9613
Phone: 507-257-3600 • Fax: 507-257-3001
www.micro-trak.com • trakmail@micro-trak.com



MICRO-TRAK®
SYSTEMS, INC.

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Micro-Trak® Warranty

Micro-Trak (herein "Seller") warrants to the original purchaser (herein "Buyer") that, if any product or part of the product (herein "part") proves to be defective in material or workmanship, upon inspection and examination by Seller, within one (1) year from the original date-of-purchase, and is returned to Seller with dated proof-of-purchase, transportation prepaid, within thirty (30) days after such defect is discovered, Seller will, at their option and sole discretion, either repair or replace said part, except that the warranty for expendable parts, including but not limited to, light bulbs and batteries shall be thirty (30) days from the original date-of-purchase. Said warranty is valid only when the part has been installed, operated and maintained in strict accordance with the procedures outlined in the manual. Any damage or failure to said part resulting from abuse, misuse, neglect, accidental or improper installation or maintenance, unauthorized modification, use with other products or attributable to acts of God, as determined solely by the Seller, will invalidate the warranty. Said part will not be considered defective if it substantially fulfills the performance specification. Buyer shall be responsible for all maintenance services, if any, all in strict accordance with the procedures outlined in the manual. The warranty does not include labor, installation, replacement parts or repairs, delivery of replacement parts or repairs or time and travel. Said warranty is non-transferable.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY, FITNESS FOR PURPOSE AND OF ANY OTHER TYPE, WHETHER EXPRESS OR IMPLIED. The Seller's liability, whether in contract, in tort, under any warranty, in negligence or otherwise, shall not exceed the return of the amount of the purchase price paid by the Buyer, and under no circumstance shall the Seller be liable for special, indirect or consequential damages. Seller neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with said part. No action, regardless of form, arising out of the transactions under this agreement may be brought by the Buyer more than one (1) year after the cause of action has occurred.

Seller agrees to extend the term of the foregoing warranty period should the Buyer return completed warranty registration information, with dated proof-of-purchase, to the Seller within one (1) year from the original date-of-purchase. All conditions and limitations of said foregoing warranty, except the term of said foregoing warranty, shall apply. Said term shall be extended to a total of three (3) years from the original date-of purchase on display consoles and network communication modules, as defined by Seller, and said term shall be extended to a total of two (2) years from the original date-of-purchase on all other parts, except that the warranty for expendable parts, including but not limited to, light bulbs and batteries shall be thirty (30) days from the original date-of-purchase, and except that the warranty for parts manufactured by someone other than the Seller, including but not limited to, shutoff and control valves, DGPS receivers, memory cards and drives, mapping software, flowmeters and pressure sensors shall be one (1) year from the original date-of-purchase.

Buyer accepts these terms and warranty limitations unless the product is returned to Seller, via proper distribution channels and approved return authorization, with dated proof-of-purchase, transportation prepaid, within fifteen (15) days from the date-of-purchase for refund of the purchase price.

Units under warranty should be sent prepaid, with dated proof-of-purchase, within 30 days of discovering defect, to the address below:

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

EXTENDED WARRANTY OPTION

It's simple! Just complete the enclosed registration card(s) for this product and mail it in and we'll extend your warranty for up to three years*, at no additional charge.

MAIL IN YOUR REGISTRATION CARD(S) TODAY!

Registration Card information is for internal use only.

* Some limitations apply. See warranty statement for details.

At Micro-Trak Systems, we believe a product that delivers quality and performance at a low cost is what is needed to help today's operator and the operator of the future compete in the world market.

It is our goal to provide operators with a line of electronic equipment that will help build and maintain an efficient and profitable operation that can be passed on to future generations.

We thank you for your purchase and hope that we can be of service to you in the future.

Micro-Trak Systems, Inc.

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Introduction to the FlowTrak II

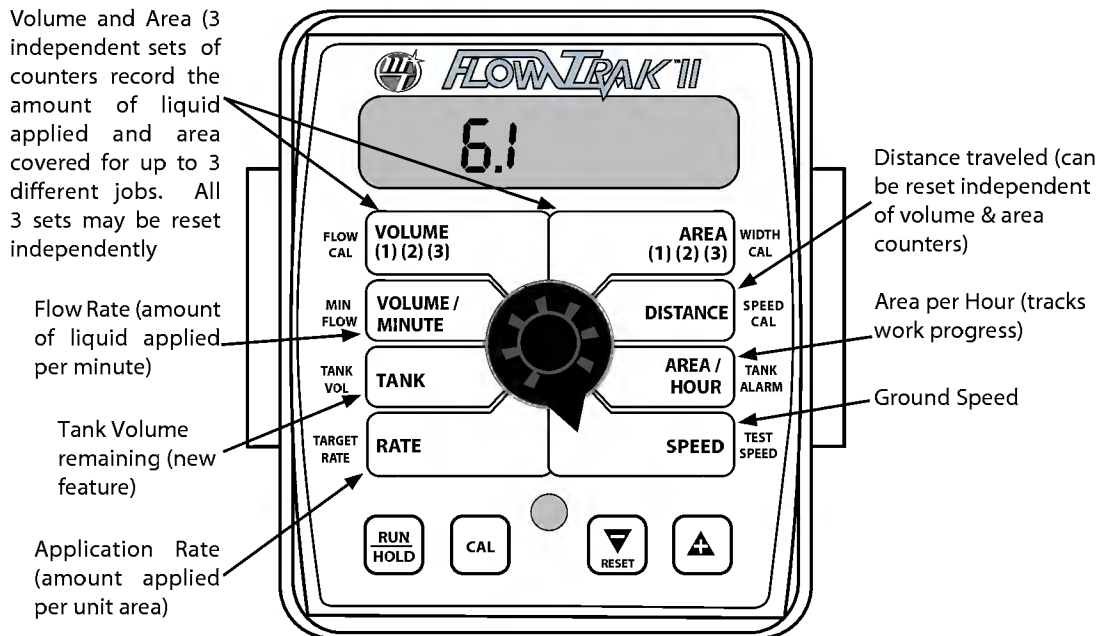
The FlowTrak II sprayer Monitor, like the original FlowTrak, provides a complete picture of critical spraying functions and is easy to install and operate. The system monitors and displays:

NEW FEATURES in the FlowTrak II include additional Volume and Area counters and a new "Tank" feature.

The console can also be programmed to operate either as a sprayer monitor, or as a batch counter for filling tanks:

SPRAYER MONITOR MODE: When used in typical spraying operations, the "Control output" should be programmed to the "HOLD" mode; the Control output can turn an external valve or pump ON/OFF in response to the status of the Run/Hold button or the optional remote Run/Hold sensor, and the Tank counter will show the amount remaining in the tank. When operating in this mode, the Tank alarm feature can also be used; it will flash "FILL" on the display when the tank reaches a (settable) low level. See the calibration and operation sections for details.

BATCH MODE: When used in a batching operation or at a depot where tanks would be filled, the "Control output" can be programmed in the "FILL" mode. In this mode the Control output will control a valve or pump used to fill the tank, turning the valve or pump OFF when the amount reaches a (settable) level. In this mode, the TANK display will show the amount that has been pumped into the tank and the tank alarm is inoperative. This mode requires a fill flowmeter and possibly a relay adapter if high current levels are required.



Component Parts and Assembly Hardware

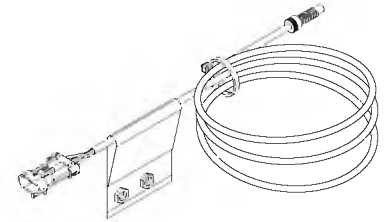
Before beginning installation, check the carton contents for the following items:



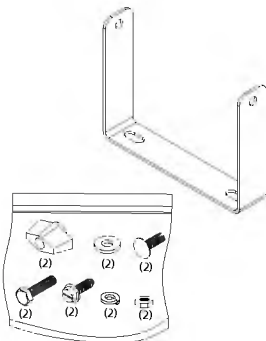
FlowTrak II Console
P/N 17186



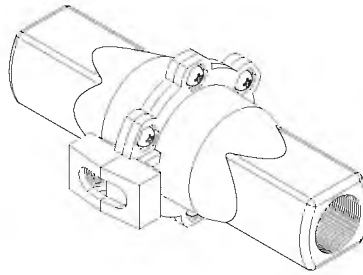
Owner's Manual
P/N 17193



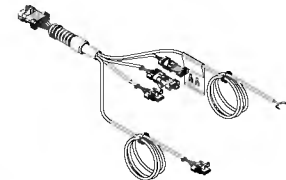
5' Hall-effect Flow Sensor Cable
with threaded sensor
P/N 13096



Console Mount Kit
P/N 13181

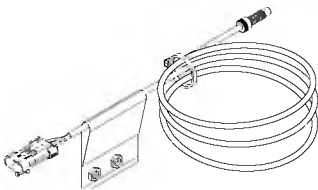


FM750 GFN Flowmeter
(P/N 11501)



Power/Speed/Flow/RH/Opt
Harness P/N 17194

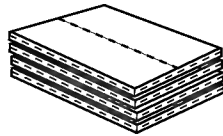
Speed Sensor Kit P/N 01531 (1) Including items A-F, below:



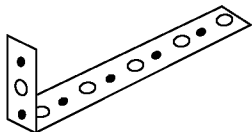
A. 5' Hall-effect Speed/Flow
Sensor Cable P/N 13096



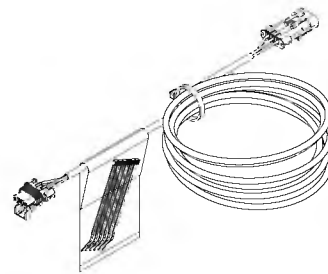
B. 14" Nylon cable ties (10)
P/N 12910



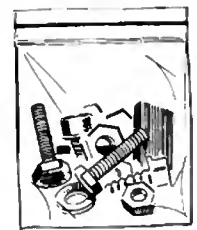
E. Magnets (6) P/N 12069
(2 in hardware bag)



D. Speed sensor
mounting bracket
P/N 10013



C. 15' 3-Pin Extension Cable
M/P 150 P/N 13207

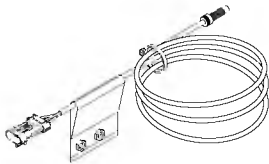


F. Hardware Bag
P/N 13251


Component Parts and Assembly Hardware (cont)

Optional Equipment

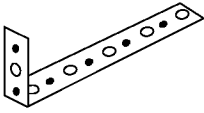
RPM Sensor Kit P/N 01535
Including items below:



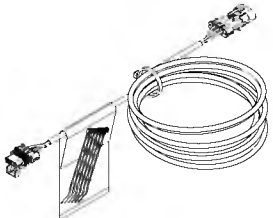
5' Run/Hold Sensor Cable
P/N 13226




Hardware Bag
P/N 13251



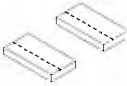
Speed Sensor
Mounting Bracket
P/N 10013



10' Extension Cable
M/P 150 P/N 13206

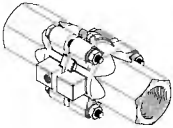


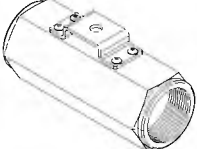
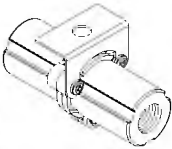
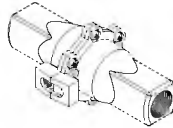
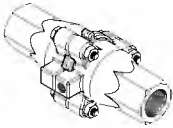


14" Nylon cable ties (2)
P/N 10045



Magnets - 6
(2 in hardware bag)
P/N 10012

Flowmeter Kits Available

						
FM1000SS Flowmeter P/N 13187 <u>Kit P/N 01505</u>	FM270 Flowmeter P/N 14286 <u>Kit P/N 01515</u>	FM10-100 Flowmeter P/N 14829 <u>Kit P/N 01514</u>	FM1500SS Flowmeter P/N 12274 <u>Kit P/N 01506</u>	FM500 Flowmeter P/N 13269 <u>Kit P/N 01500</u>	FM750GFN Flowmeter P/N 11501 <u>Kit P/N 01501</u>	FM750SS Flowmeter P/N 10131 <u>Kit P/N 01504</u>

Speed Sensors

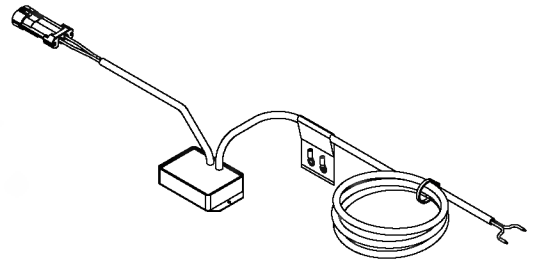


Astro GPS Speed Sensor
P/N 01425



Vansco Radar Speed Sensor
P/N 01527

Relay Kit

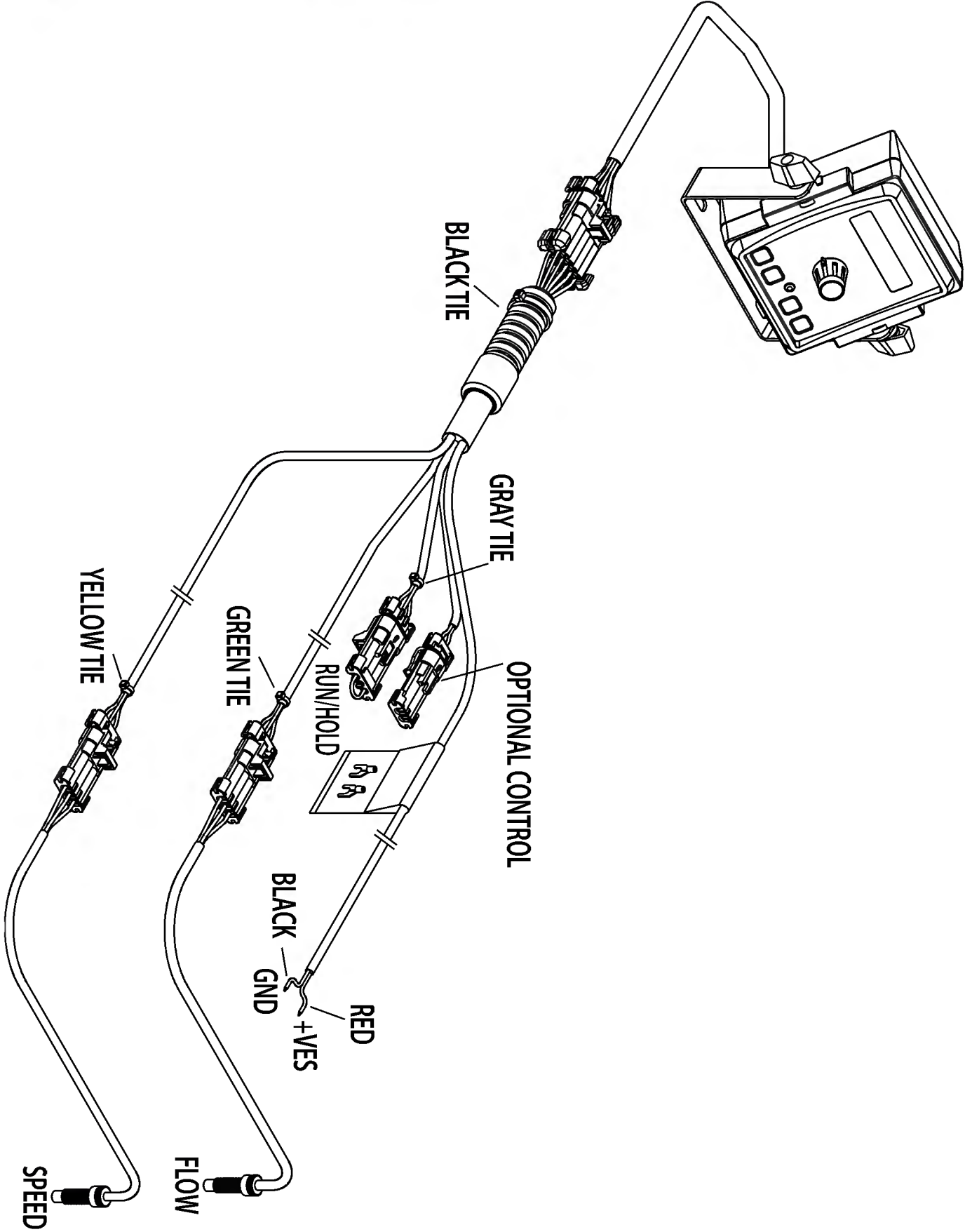


Relay Kit
P/N 17200

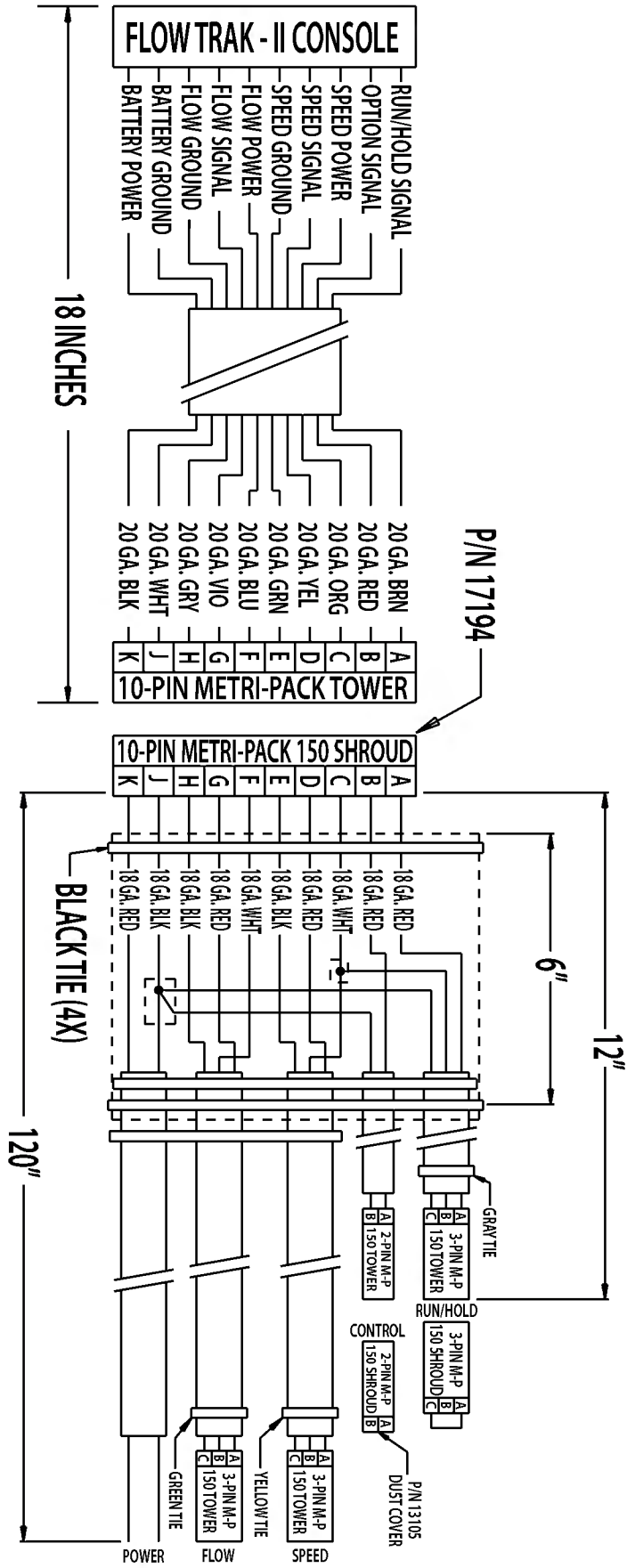
Optional 2-Pin, 3-Pin and 10-Pin Metri-Pack 150 extension cables:

<u>Part No.</u>	<u>M/P 2-Pin</u>	<u>Part No.</u>	<u>M/P 3-Pin</u>	<u>Part No.</u>	<u>M/P 5/5 10-Pin</u>
13200	5-foot	13205	5-Foot	14363	5-Foot
13201	10-foot	13206	10-Foot	14316	10-Foot
13202	15-foot	13207	15-Foot	14317	15-Foot
13203	20-foot	13208	20-Foot	14364	20-Foot
13204	25-foot	13209	25-Foot	14365	25-Foot

FlowTrak II System Overview



FlowTrak II Wiring Overview



Installation

Mounting the Display Console

Select a mounting location which seems most workable, and that best fits your needs. It should be convenient to reach and highly visible to the operator. **DO NOT INSTALL IN A POSITION THAT OBSTRUCTS THE VIEW OF THE ROAD OR WORK AREA.** Whenever possible, avoid locations that expose the console to direct sunlight, high temperature, strong chemicals or rain.

Place the mounting bracket in selected location, mark holes, drill 1/4" (7mm) holes and mount bracket with bolts, lockwashers and nuts provided. (Use self-tapping screws if not practical to use bolts.) See *Illustration 1*.

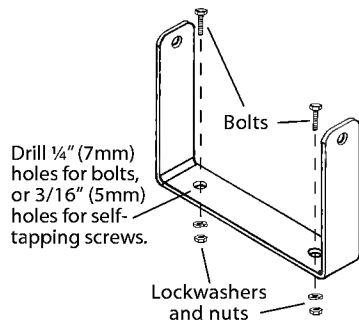


Illustration 1

Put rubber washers on carriage bolts and put the bolts through the bracket holes from the inside out. Loosely attach the mount knobs onto the bolts. Place console over carriage bolt heads and tighten knobs to secure the console. See *Illustration 2*.

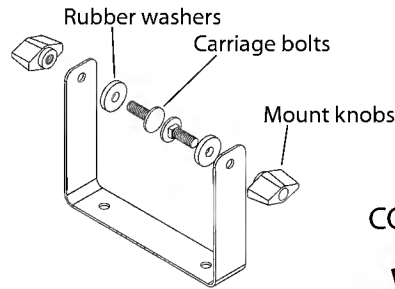
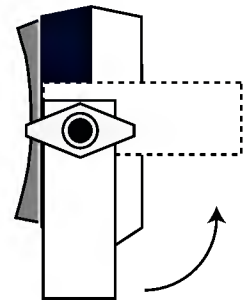


Illustration 2

CONSOLE END VIEW



Console easily adjusts for side or dashboard mounting.

Electrical Installation

This section explains how to connect your FlowTrak II to a 12-volt power source.

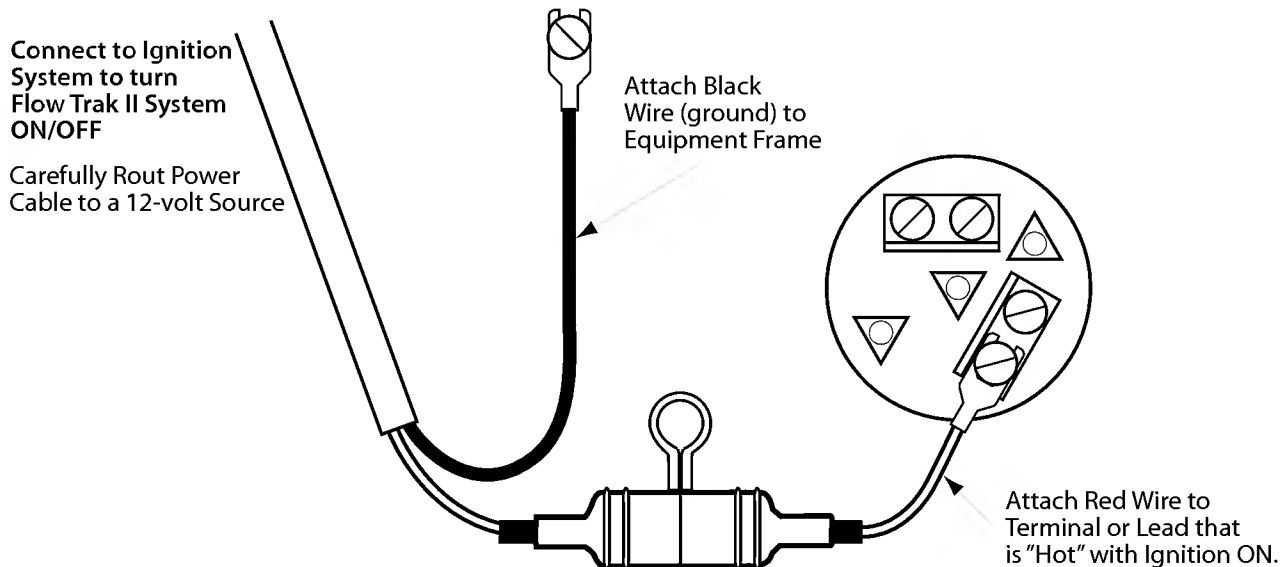
NOTE: The FlowTrak II must be connected to a 12-volt DC negative ground electrical system.

Route the power cable of the FlowTrak II harness from the console to the switched source, plug the connector into the mating plug for the console and connect the red wire to the switched power source as shown in *Illustration 3* (terminal

or wire). Connect the black wire to a screw or bolt on the equipment frame. Use your test light to locate a terminal or wire connected to your ignition switch which is "hot" when the ignition is turned on and "dead" when the ignition is off.

Your FlowTrak II is equipped with a non-volatile memory which does not require a constant supply of power to retain daily totals or calibration values. This type of memory conserves battery power and will not discharge the vehicle's battery when equipment is not in use.

Illustration 3



4-Amp In-Line Fuse (NOT PROVIDED) Required for Unprotected Circuits.

Installation (cont)

Speed Sensor Installation

Please Note: If you have purchased an Astro GPS Speed Sensor or a Vansco radar speed sensor, disregard the following section on magnetic speed sensors and install the speed sensor as described in the instructions included with the unit. You may need an adapter cable to connect to some radars, see Appendix C.

Locations where the sensor may be installed:

1. Non-driven wheel on tractor, vehicle or implement. This is less susceptible to errors resulting from wheel slip.
2. Tractor, vehicle or planter drive shaft. This type of mounting is recommended for trucks, four-wheel drive tractors or other equipment that has poor or no access to a non-driven wheel.

Locate the following parts:

- Speed sensor cable (Green body)
- Magnets
- Mounting "L" bracket
- Cable ties

Magnets

Please read the following information about magnet spacing and polarity.

The number of magnets that must be used depends on the size of your tire and where you mount the sensor. On tractor or implement wheels the general rule of thumb is one magnet for each wheel bolt (minimum of two, and *always* an even number). For drive shafts or small wheels (ATV's), two magnets are usually adequate.

Some installations may require that more than two magnets be installed. To determine the number of magnets required, measure the distance traveled of one revolution of the sensor equipped wheel in inches (centimeters).

See the following tables to find the minimum number of magnets required (always an even number)

English or Turf (inches)

Wheel Circumference	40	80	120	160	200
Number of Magnets	2	4	6	8	10

Metric (cm)

Wheel Circumference	100	200	300	400	500
Number of Magnets	2	4	6	8 <td>10</td>	10

NOTE: Magnets may be attached mechanically or adhered with epoxy or other high quality adhesive. When using adhesive, thoroughly clean the area of dirt and oil.

The magnets provided by Micro-Trak are marked with a punched dashed line on the SOUTH pole side of the magnet. See *Illustration 4*.

Always use an even number of magnets, and always alternate the polarities of the magnets as you go around the wheel hub or drive shaft.

To install, mount the first magnet with the SOUTH pole side (dashed line) facing toward the hub or shaft. Mount the second magnet with the NORTH pole side facing toward the hub or shaft. See *Illustration 5*.

For proper operation, the magnets must be evenly spaced around the wheel or drive shaft. The magnets must be at least 1" apart. See *Illustration 6*.

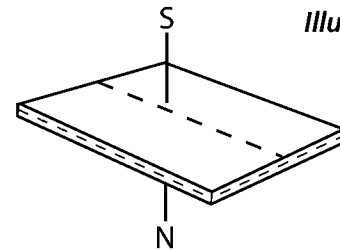
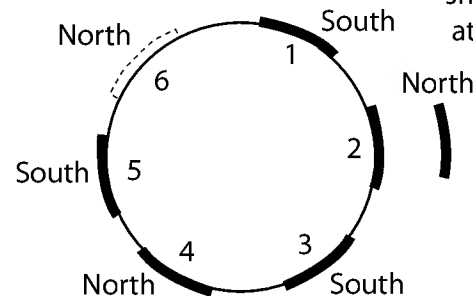


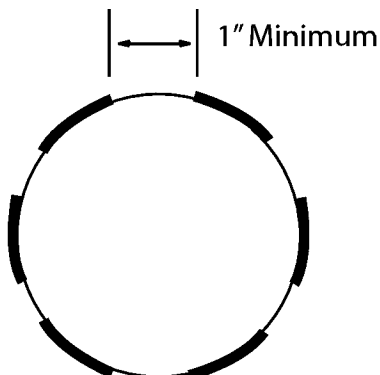
Illustration 4

Illustration 5



Test magnet should alternately attract and repel.

Illustration 6



Installation (cont)

Attaching the Speed Sensor

The magnets are attached to a wheel hub or drive shaft and the speed sensor is mounted directly over the magnet. When the wheel or drive shaft begins turning, a speed impulse is sent to the FlowTrak II console every time a magnet passes by the tip of the speed sensor. For the speed sensor to operate properly, the spacing between the magnets and the tip of the sensor must always remain constant. Before permanently mounting any parts, be sure that the location you have selected will meet the requirements shown in *Illustration 7*.

NOTE: Observe magnet polarities (see previous section).

Connecting the Speed Sensor Cable

The speed sensor cable has a GREEN sensor body and mates with the 3-pin connector which is marked with a YELLOW cable tie. The speed sensor and the flow sensor are identical, but must be connected to the proper harness connector. The speed sensor always connects to the 3-pin M/P connector with the YELLOW tie and flow sensor always connects to the 3-pin M/P connector with the GREEN tie. See *FlowTrak II Wiring Diagram on page 8*.

The optional Run/hold sensor also uses the same type of connector as the speed and flow sensors. However, the Run/hold sensor has a GRAY tie near the 3-pin connector, the sensor body is BLACK, and it always connects to the main harness lead with the GRAY tie. See *FlowTrak II Wiring Diagram on page 8*.

Speed Sensor Options

In addition to the standard Hall-effect magnetic speed sensor, the FlowTrak II may be interfaced with a variety of other speed sensing equipment. Several options are listed below.

Astro GPS Speed Sensor

The Astro is an easy-to-install economical alternate to radar speed sensors. The Astro is available with either a 1 HZ or 5 HZ GPS receiver. The sensor converts GPS signals to a pulsed speed signal, providing an accurate speed input even in conditions where radar does not perform well.

Vansco™ Radar Speed Sensor

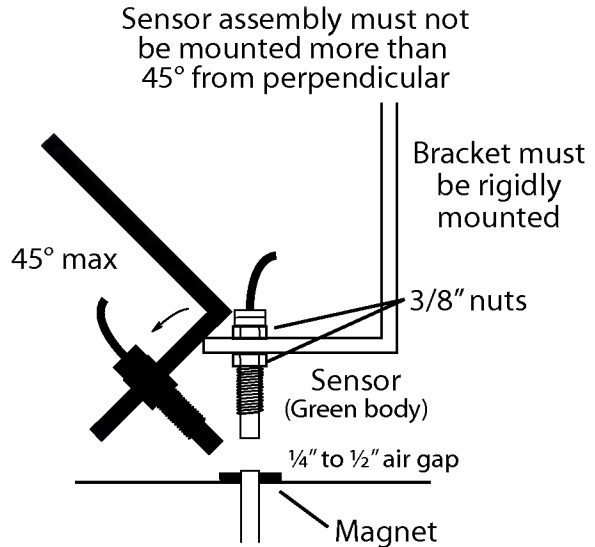
The Vansco radar speed sensor uses a microwave (radar) signal to deliver a reliable, accurate speed signal for electronic equipment. It features state-of-the-art electronic design/manufacturing, rugged aluminum housing and complete testing and certification.

Radar Interface

The FlowTrak II may also be interfaced with most popular radar ground speed sensors. An adapter cable is required for proper interface.

SEE APPENDIX C FOR LIST OF ADAPTER CABLES FOR RADAR.

Illustration 7



SENSOR IDENTIFICATION CHART

SENSOR	SENSOR BODY COLOR	MAIN HARNESS TIE COLOR
Speed	Green	Yellow
Flow	Green	Green
Run/Hold	Black	Gray

Astro 5 GPS Speed Sensor



Vansco Radar Speed Sensor



GPS Speed Sensor Interface

The FlowTrak II may also be used with most other GPS speed sensors that output a pulsed signal, such as SkyTrak or Dickey-John GPS speed sensors. An adapter cable may be required.

Contact a Micro-Trak dealer/distributor for details on any of these products, or call Micro-Trak Systems, Inc. at 1-800-328-9613.

Installation (cont)

Mounting and Plumbing Flowmeter

The Flowmeter must be installed in the main boom line after any strainers or return lines. Securely mount flowmeter (hardware not supplied) in a vertical position in an area away from intense vibration. **DO NOT** install flowmeter closer than 12" to servo valve or boom shut-off valves. The flowmeter is a bidirectional meter (exception: Polmac's 1 1/2"-3"). Liquid can flow in either direction, but **up** is preferred, especially at rates below 5 GPM (19 lpm). Make connections using appropriate fittings without the use of reducers, elbows or sharp bends for a minimum of six inches (15 cm) either side of meter. See *Illustration 8*. Save plastic plugs to protect flowmeter during storage. (The flowmeter may need periodic cleaning, so it should be easy to remove.)

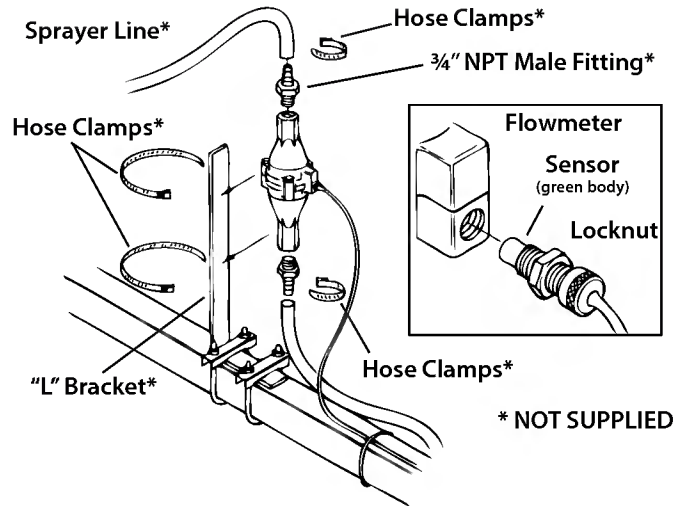


Illustration 8

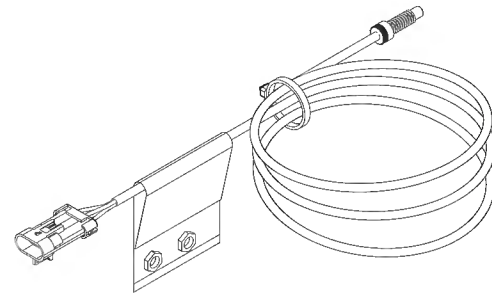
Installing Flow Sensor Cable

With the flowmeter in place, install the flow sensor cable.

The flow sensor cable has a GREEN sensor body and mates with the 3-pin connector on the main harness marked with a GREEN cable tie. Screw sensor all the way into hole of flowmeter. Tighten 3/8" jam nut to secure sensor in place.

Uncoil flow sensor cable and carefully route it to meet the main harness flow connector marked with GREEN tie. Align connectors and press firmly together until locking tab clicks into place. Secure cable with ties provided. See *Illustration 9* and *FlowTrak II Wiring Diagram* on page 8.

Note: Sensors with GREEN bodies can be used for either SPEED or FLOW but not for RUN/HOLD.



5' Hall-effect Flow Sensor Cable with threaded sensor and male connector (P/N 13096)

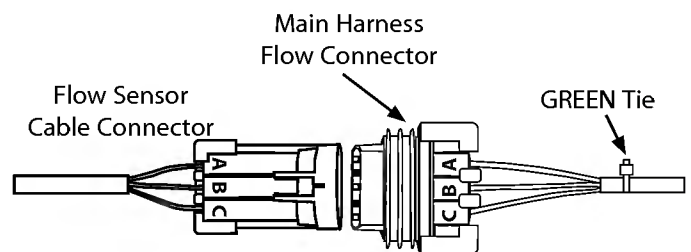


Illustration 9

Connect flow sensor cable to green-tie console cable.

Installation (cont)

Remote Run/Hold (Requires Kit # 01535)

The run/hold sensor cable has a BLACK body and mates with the main harness cable having a GRAY cable tie near the 3-pin M/P connector. Make certain that you install the correct sensor cable and connect it to the correct connector on the main harness.

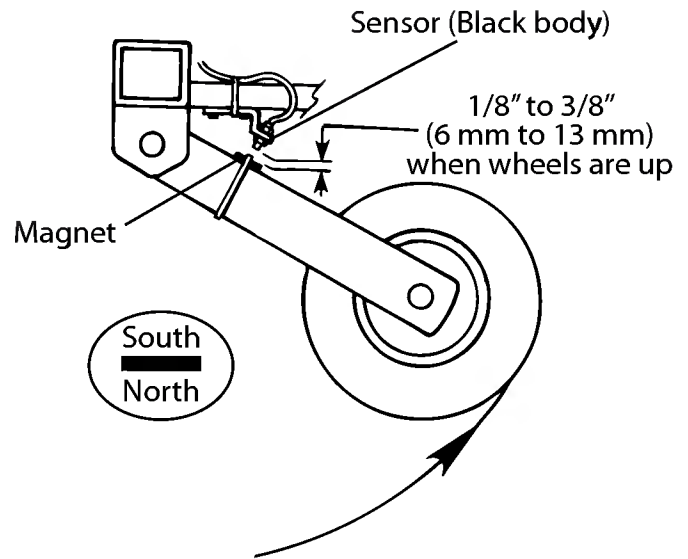
IMPORTANT:

If not using Run/Hold cable for remote use, make certain a dust cover with jumper is installed.

- The basic idea is to attach a magnet to a lever or some part of the equipment that moves when the implement is raised and lowered. The Hall-effect Run/Hold sensor is sensitive only to the south pole of the magnet. Install the magnet with the dashed line facing the sensor. When the magnet is away from the sensor, the console will be in HOLD and the area and distance counting functions will be disabled. NOTE: The run/hold kit includes a 5' sensor cable and 10' extension. You may require additional extension cables which are available in 5 ft. (1.5 m), 10 ft. (3 m), 15 ft. (4.5 m), 20 ft. (6 m) and 25 ft. (7.6 m) lengths.
- You may also use a toggle or other type switch. Simply cut the black jumper wire in the dust cover and splice on an appropriate length of wire to reach your switch. Do not connect to a switch with power.

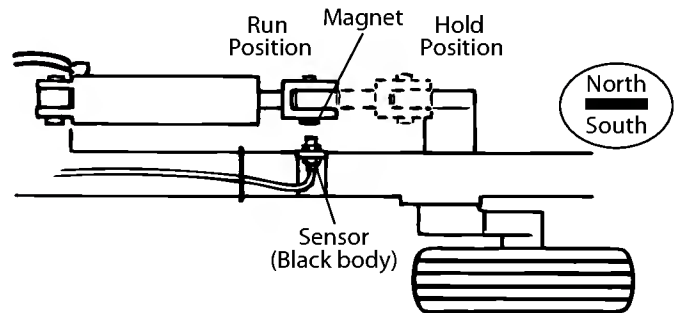
When switch is closed, console is in RUN. When the switch is open, the console is in HOLD.

Lift Wheel Mounting

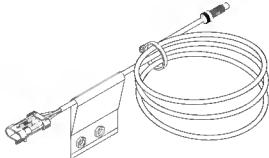


Hydraulic Cylinder Mounting


Remote Run sensor on hydraulic cylinder. Magnet and sensor are in line when equipment is lowered and operating.



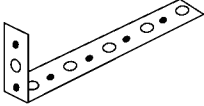
RPM Sensor Kit P/N 01535
Including items below:



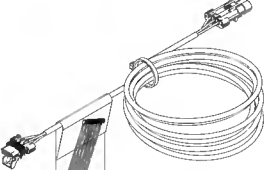
5' Run/Hold Sensor Cable
P/N 13226




Hardware Bag
P/N 13251



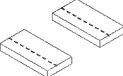
Speed Sensor
Mounting Bracket
P/N 10013



10' Extension Cable
M/P 150 P/N 13206



14" Nylon cable ties (2)
P/N 10045

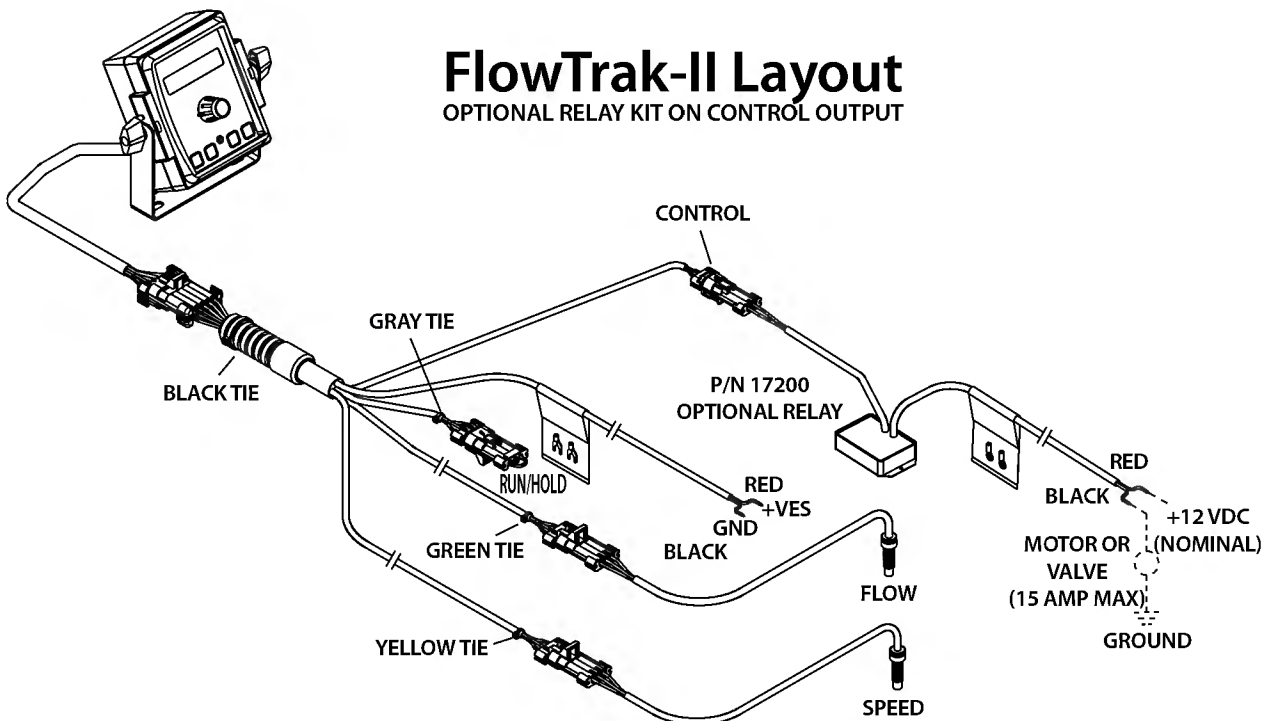
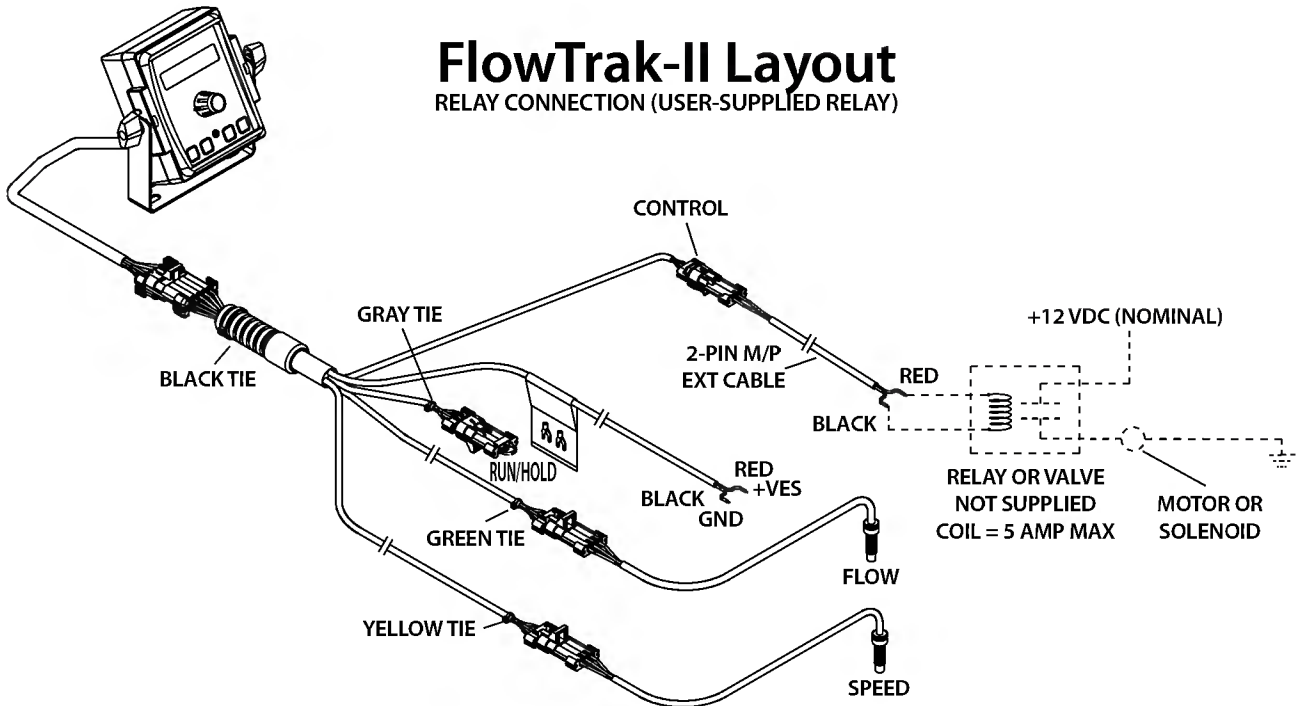


Magnets - 6
(2 in hardware bag)
P/N 10012

Installation (cont)

Connecting the Control Output

The "Control" output will drive a load of up to .5 ampere maximum. For higher currents, either order a Relay Kit, P/N 17200 (15 amp maximum output) or purchase a suitable relay (maximum .5 amp coil current) and connect to the CONTROL output as shown in the *Illustrations below*.



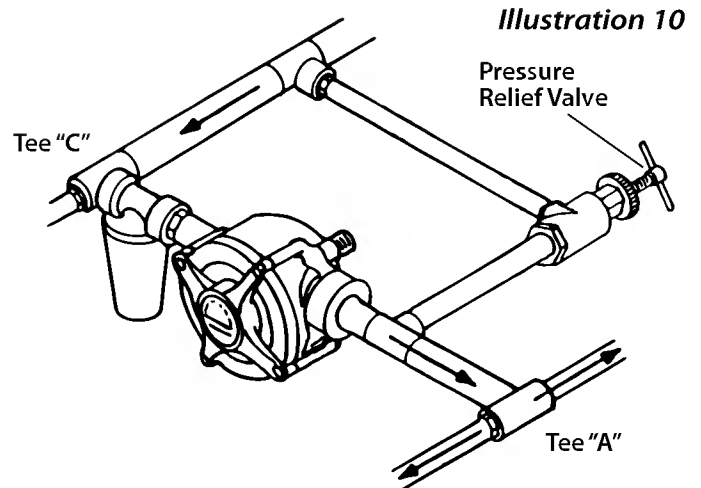
Installation (cont)

Manual Pressure Relief Valve

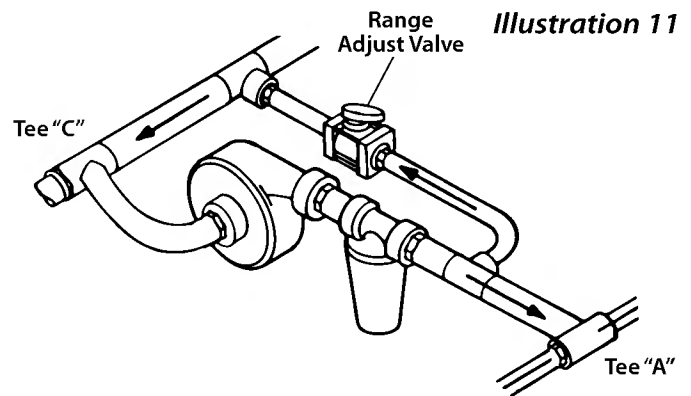
If you have a positive displacement pump or a centrifugal pump capable of generating excessive pressure, you must install a pressure relief valve and adjust it to a safe maximum pressure. If a positive displacement pump is operated without a pressure relief valve, damage may result to pump or other plumbing component. See *Illustration 10*.

Range Adjust Valve

With oversized pumps, it may be necessary to install a range adjust valve. The range adjust valve will reduce the pump's output to the rest of the system. See *Illustration 11*.



Positive Displacement Pumps



Oversized Pumps

Care and Maintenance of your FlowTrak II

CONSOLE

Store the console in a cool dry location if it will not be used for an extended period of time, such as during the off-season. As with any electronic equipment, use care in cleaning so that water or other liquids do not enter the case. Thoroughly flush flowmeter with clean water, install plastic shipping plugs and keep from freezing.

PRECAUTIONS

- The input pressure on the glass-filled nylon flowmeter FM750 GFN should not exceed 100 PSI (689 kpa).
- Do not expose the flowmeter to liquid temperatures exceeding 130 degrees F (55 degrees C).
- Some chemicals may damage the turbine material. If you are in doubt, contact the chemical manufacturer.

FlowTrak II Console Functions

The FlowTrak II features a large, easy-to-read liquid crystal display, easy-to-use rotary dial and lighted panel for night use.

VOLUME (1) (2) (3): Displays total gallons (liters) or lbs. (kg) of NH₃ applied. May be reset. (Note: VOLUME and AREA counters work in pairs, if VOLUME counter 1 is reset, it also resets AREA counter 1.)

AREA (1) (2) (3): Keeps a running count of the total acres (hectares) (thousands of square feet) worked. May be reset. (Note: VOLUME and AREA counters work in pairs, if AREA counter 1 is reset, it also resets VOLUME counter 1.)

VOLUME/MINUTE: Displays total gallons (liters) of liquid applied per minute, or lbs. (kg) NH₃ per minute.

DISTANCE: Displays distance traveled in feet (meters). May be reset.

TANK: In normal operation, displays gallons (liters) of liquid remaining or lbs. (kg) of NH₃ remaining. Can also be used as a Fill flow counter for batching operations, *see Special Calibration and Operation sections.*

AREA/HOUR: Displays current work rate in acres per hour (hectares per hour) (thousands of square feet per hour).

RATE: Displays application rate GPA(LPH), or lbs. N/acre (kg of N/hectare).

SPEED: Displays ground speed in miles per hour (kilometers per hour).



WARNING LIGHT: Indicates over or under application of 10% of the Target Rate, or below min flow or tank set point. Also lit when in CAL.

Calibration Positions

FLOW CAL: Used in calibration mode to enter the calibration value assigned to your flowmeter (*See Flowmeter Tag*)

MIN FLOW: Used in the calibration mode to enter the minimum flow rate (GPM/LPM) of the spray boom.
Caution: See page 23 for detailed instructions.

TANK VOL: Used to calibrate the tank volume in gallons (liters), lbs (kgs) NH₃.

TARGET RATE: Used in calibration mode to enter the target application rate (GPA/LPH) or lbs/acre (kg/hectare) N.

Calibration Positions


WIDTH CAL: Used in calibration mode to enter the working width of your sprayer booms or other equipment.

SPEED CAL: Used in calibration mode to enter the speed calibration number in inches (cm) per pulse.


TANK ALARM: Used to calibrate the tank alarm set point in gallons (liters), lbs (kgs) NH₃

TEST SPEED: Used in calibration mode to enter a test speed in miles per hour (kilometers per hour).


Key Functions:



RUN/HOLD: Key which changes between run and hold modes of operation.




CAL: This key is used to enter & exit the calibration mode.



PROGRAM KEYS: Used to increment and decrement the different calibration values.

- RESET when not in CAL, clears the selected counter when held for two seconds while in hold.
- When in CAL, the "+" key increases and the "-" decreases the value displayed.



Calibration

English or Metric?

The FlowTrak II is capable of displaying information in American English or standard Metric or Turf measurement units. The FlowTrak II is shipped from the factory programmed for English. **Note that the following procedures will also load factory default calibration values.** To simply change units without loading defaults, see the "Special Calibration" section.

METRIC

- To activate the Metric mode, turn power OFF and place the rotary switch at "AREA." Hold down both the "CAL" and "-" keys and turn power ON. See *Illustration 12*. The console will display LOAd for two seconds. Once LOAd is displayed, release the two keys. To "lock-in" Metric mode you must enter and exit calibration. You must be in HOLD to enter Cal. Press and hold the CAL key until "CAL" icon appears on the display. The console is now in calibration and Metric mode is selected. Exit CAL by pressing and holding the "CAL" key until CAL disappears from the display (approximately 1 second). **NOTE: you must exit CAL to lock in Metric units.**

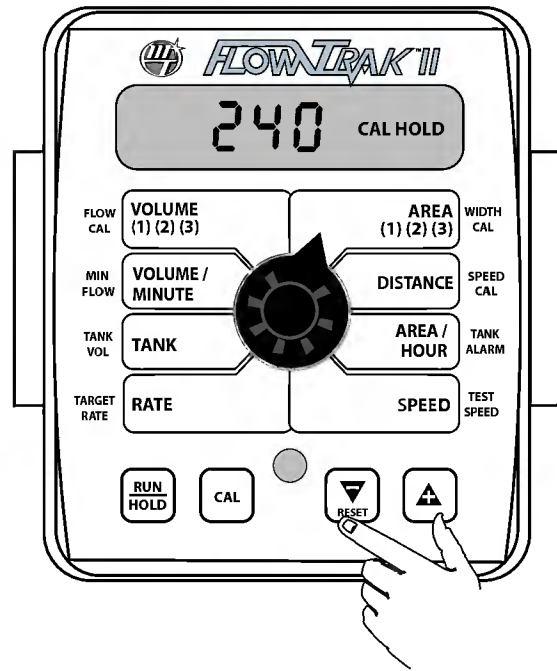
ENGLISH

- To activate the English mode, turn power OFF and place the rotary switch in the VOLUME position. Hold down both the "CAL" and "-" keys and turn power ON. The console will display LOAd. Once LOAd is displayed, release the two keys. To "lock-in" English mode you must enter and exit calibration. You must be in HOLD to enter Cal. Press and hold the CAL key until "CAL" lights on the display. The console is now in calibration and English mode is selected. Exit CAL by pressing and holding the "CAL" key until CAL disappears from the display (approximately 1 second). **NOTE: you must exit CAL to lock in English units.**

IN ALL CALIBRATION OPERATIONS:

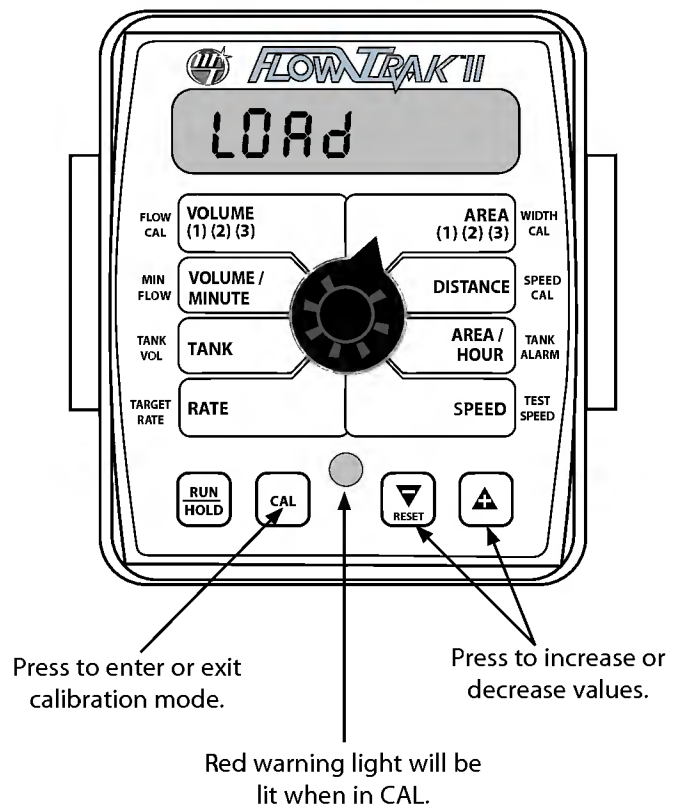
- Put system in "HOLD".
- Press and hold the "CAL" key for 1 second to select the calibration mode. The console display will display the "CAL" icon, the currently selected calibration value, and the red warning light will turn on.
- Turn the rotary dial to the desired "CAL" position. Then use the "+" or "-" key to adjust the displayed value up or down as needed. Adjust ALL necessary values. See *Illustration 13*.
- Hold the "CAL" key again for 1 second to exit calibration. "CAL" will disappear from the display. **NOTE: You must exit CAL to save changes.**

Illustration 12



NOTE: In metric, the width will have a decimal point, in English there is no decimal point. Also, changing from English to Metric mode may change or alter any previously entered calibration values. After switching measurement modes, confirm that all calibration values are correct.

Illustration 13



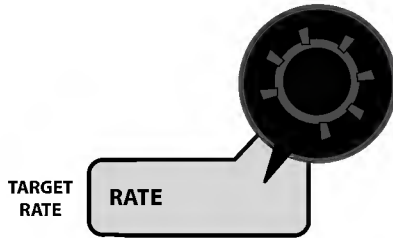
Calibration (cont)

Entering Calibration Values

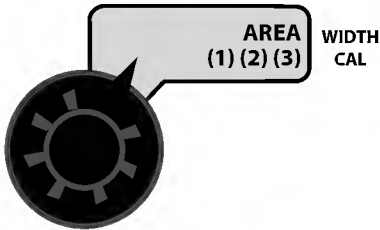
TANK VOL: If using the Tank feature, this setting can be used to enter the volume of the tank in gallons (liters, lbs. NH3). Use the “+” and “-” buttons to choose OFF or any value from 1-65,535. Then when the tank is filled, the tank counter can be reset to full by simply turning the rotary switch to the TANK position and pressing the “+” button. Depending on the “UNITS” setting, the TANK SIZE units will be either gallons or liters. If “material” is set to NH3, the Tank Size will be in lbs. or kg. Anhydrous Ammonia (NH3). **Note: the TANK VOLUME remaining feature does not work if the system is programmed in the (Tank) FILL mode. See page 30 for setup and operation details for the Tank FILL mode.**



TARGET RATE: Enter the value for the desired target application rate in gallons per acre (liters per hectare) or lbs. of N per acre (kgs of N per hectare). During operation, the warning light will flash if the actual application rate is +/- 10% from the calibrated target rate.



WIDTH: Enter the effective working width of the entire boom, in inches (meters). Your “working” width per boom section will be the number of nozzles on the boom section times the nozzle spacing in inches (mm). For example, if you have 7 nozzles spaced at 20 inches, the working width of the boom section is 140 inches.



SPEED CAL: This position is used to calibrate the speed sensor for accurate speed and distance measurement. When this position is selected, the display will show THE SPEED CAL value.



TANK ALARM SET POINT: Enter the tank alarm set point in gallons (liters) or lbs. (kgs) NH3. Use the “+” and “-” buttons to set the level where the Warning LED starts flashing and the word “FILL” flashes on the display. Range is OFF or 1-65,535. When the tank value drops below the set point, the alarms will



notify the user that the tank level is low. **Note: this feature is inoperative if the system is set up in the (Tank) FILL mode. See Special Calibration (pages 25-26) and Tank fill Operation (page 30) for setup and operation details for the Tank FILL mode.**

Calibration (cont)

Speed Cal for Radar or GPS Speed Sensors

See the following table for SPEED CAL numbers to enter for various radar models or GPS speed sensors. To fine tune the SPEED CAL number, see page 22.

Radar or GPS Speed Sensor Calibration

Radars	English Cal # in.	Metric Cal # in.	Hz/MPH
Vansco	.150	.38	58.90
Raven	.148	.38	59.80
Magnavox	.154	.39	57.40
Dickey-john (NOTE: Dickey-john radars may be factory calibrated for any of these four settings).	.149	.38	58.94
	.199	.51	44.21
	.319	.81	27.64
	.518	1.32	17.034
GPS Speed			
Astro II & 5	.189	.48	46.56
SkyTrak	.910	2.31	9.82
SkyTrak	1.50	.38	58.94
Dickey-john	.210	.53	42.00
John Deere (In-cab speed signal)	.197	.50	44.70

Factory-Loaded Calibration Values

Calibration Factor	Measurements Affected	Default Values	
		English	Metric
TARGET RATE	Application Rate in Auto	10.0 Gallons/Acre	100.0 liters/hectare
TANK VOL	Tank alarm or Control Output	Off	Off
WIDTH CAL	Area, Application Rate	720 inches	18.00 meters
SPEED CAL	Distance, Area, Application Rate, Area/Hour	1.750 inches	4.44 centimeters
MINIMUM FLOW	Application Rate, Alarm	0.0 Gallons/Minute	0.0 liters/minute
FLOW CALIBRATION	Flow/Application Rates, Volume	145.0 pulses/gal	145 pulses/gallon
TANK ALARM	Tank Alarm	Off	Off

Calibration (cont)

Determining the SPEED CAL (Skip this section if using radar or GPS speed sensor)

For the console to calculate the correct speed and measure distance accurately, the circumference of the sensor-equipped wheel must be entered. Determine the circumference of the sensor-mounted wheel to the nearest tenth of an inch (tenth of a centimeter) with the following method:

METHOD: Mark the tire with a piece of chalk and measure the distance traveled on the ground for one complete revolution. See *Illustration 14*. For improved accuracy, it is recommended that you perform this function in field conditions, measure several revolutions, and take the average.

Divide the measured revolution by the number of magnets installed to get your starting SPEED CAL calibration value. Once calibration of the system is complete, this number should be fine-tuned for optimum accuracy.

For fine-tuning the SPEED CAL value, see page 22.

Drive Shaft Speed Sensor Calibration

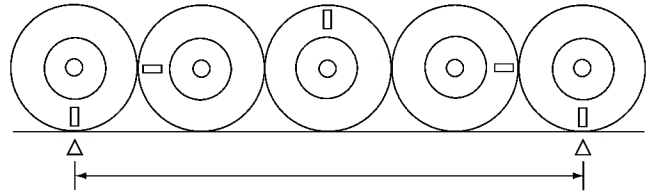
NOTE: If you have mounted the magnetic speed sensor on a wheel, skip this step and go on to Fine Tuning Speed/Distance Calibration Values.

Because of the difference in wheel-to-drive shaft ratios, it is difficult to determine a calibration value for installation on a drive shaft by measuring a wheel. You must start with an estimated calibration value and then fine-tune the calibration.

Any number between 10 and 15 (255 mm to 380 mm) is a good starting value.

NOTE: For fine-tuning the SPEED CAL value, see next section.

Illustration 14



To determine SPEED CAL, measure the distance of one complete wheel revolution and divide by the number of magnets installed.

Calibration (cont)

Fine Tuning Speed/Distance Calibration Value

PREPARATION:

In order to achieve accurate measurements, each step in this fine tuning procedure should be performed as precisely as possible.

1. Once the system is fully installed and calibrated, select a straight tract of ground that is similar to your actual field conditions and as level as possible.
2. Measure a distance of 1000 feet (500 meters). Clearly mark the beginning and end points with flags or something highly visible to the operator.

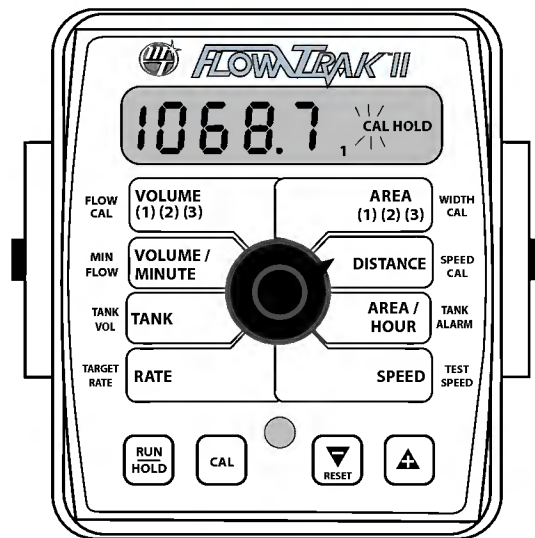
NOTE: Using a course with a different ground surface, such as a hard surface road, will result in different readings than actual field conditions.

PROCEDURE

1. With the console turned ON, use the Run/Hold button to select HOLD mode. The HOLD icon will be displayed. Turn the rotary dial to the "DISTANCE" position. Be sure the display shows 0. If not, reset the distance counter by pressing and holding "RESET" until the display returns to 0 (approximately one second). The word CLEAR will be displayed when reset is pressed.
2. 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 button 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.
3. Use the Run/Hold button to select RUN mode 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. Drive the pre-measured course and use the Run/Hold button to select HOLD mode, when the marker on the vehicle passes the ending flag, to stop the distance counting function. The console display should read "HOLD". See *Illustration to the right*. Stop the vehicle in a level and safe area and continue with this procedure.
4. With the rotary dial still at DISTANCE (SPEED CAL), press and hold the "CAL" key for one second. Once the console is in "CAL," CAL and the speed calibration value will be displayed. Momentarily press CAL and the word CAL will begin to flash and the distance traveled will be displayed. See *Illustration*.

5. When the display shows distance ("CAL" is flashing), verify whether the number displayed is the exact distance you drove (within +/- 1 - 2 %). If not, press the "+" or "-" key to adjust the figure to match the distance you actually drove. If the display reads too high, use the "-" key to lower the displayed value. If the display reads too low, use the "+" key to raise the displayed value.
6. 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 CAL. The word CAL and the SPEED CAL number will appear. Exit "CAL" by pressing "CAL" for one second.

NOTE: 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 re-enter this number.



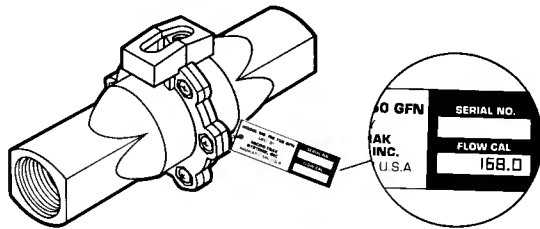
Calibration (cont)

Fine Tuning Speed/Distance Calibration Value (cont)

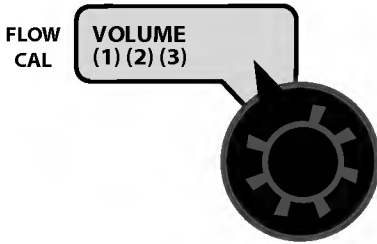
FLOW CAL: This position is used to calibrate the flowmeter for accurate liquid measurement.

Every flowmeter is calibrated with water at the factory and assigned a "FLOW CAL" value to make it operate properly with the FlowTrak II console. This number is stamped on the metal tag attached to the flowmeter. See *Illustration 15*. This is a starting point only. If your spray solution has a specific gravity or viscosity that is different than water, flowmeter calibration should be done for the specific solution (please refer to Fine-Tuning Flowmeter Calibration on page 24.)

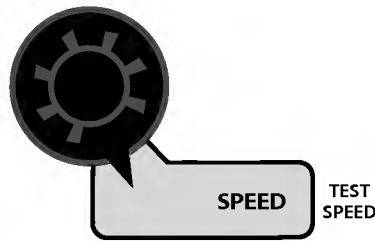
Illustration 15



MIN FLOW: The purpose of this calibration value is to warn the operator when applying below the recommended minimum rate for the nozzles. The *minimum* flow rate in gallons per minute (liters per minute) based on the nozzles being used, for the entire boom on the sprayer. **DO NOT enter the actual flow of your spray application.** For example: If the minimum flow rate for the nozzle you are using is .22 GPM at their minimum recommended pressure and your boom has 20 nozzles, enter 4.4 as the MIN FLOW value (.22 x 20 = 4.4). This value should be checked/ changed for each different nozzle that you use.



TEST SPEED: Test speed is a built-in ground speed simulator that is used in performing pre-field checks. When a typical operating speed is entered, the FlowTrak II will respond as if you were actually driving that speed. It allows you to simulate your monitoring application, while remaining stationary, to make certain that all of the equipment is operating properly and that your monitor can actually perform the intended application. Test speed is cancelled by exiting CAL. Test speed will not accumulate Distance or Area measurements.



ENTER TARGET APPLICATION TEST SPEED INTO CONSOLE

Put console in Hold, and press and hold the CAL button for 1 sec. to enter calibration. Turn rotary switch to TEST SPEED position. Use the "+" or "-" button to enter target application speed. Do not exit calibration mode.

Put console in RUN and turn rotary switch to RATE position. The console should begin monitoring at the simulated test speed.

TEST SPEED will automatically cancel when you exit the CAL mode or when power to the console is turned OFF.

EXITING CALIBRATION Upon completion of the calibration process, exit calibration by pressing and holding the CAL button until the RED warning light turns off (approximately three seconds). Basic calibration is now complete. **BEFORE** beginning application, confirm that the system is set up to do the job that you want it to. Please refer to Pre-Field System Checkout to confirm calibration settings, nozzle selection and overall system performance. **NOTE: You must exit CAL to save any changes.**



Calibration (cont)

Fine Tuning Flowmeter Calibration Value

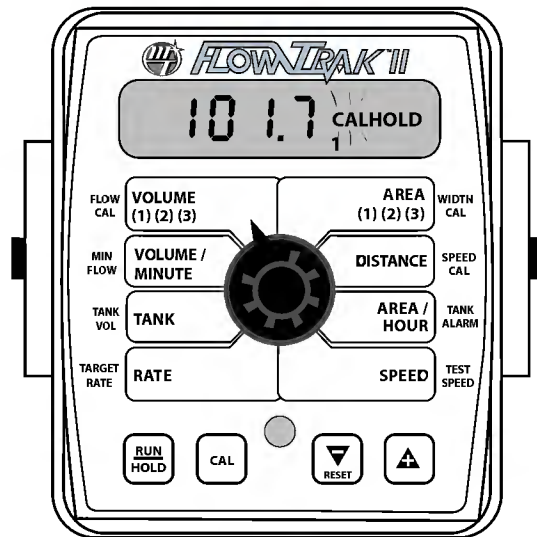
This procedure is used to verify and fine-tune the flowmeter calibration. Every flowmeter is calibrated with water at the factory and stamped with a calibration value. Enter that value as a starting point and use this procedure to fine-tune that value for your specific installation and spraying application. This procedure should be repeated each time a new solution is being applied (differing solutions will have different specific gravities and different flow characteristics) or when the flowmeter installation has been altered.

PROCEDURE:

1. Put enough water in the sprayer tank to perform this test. (Preferably 100 gallons or more. The larger the volume of water used, the more accurate will be the calibration.)
2. Start sprayer pump and turn on booms. Run enough water to purge all air from lines. Turn off booms but leave pump running.
3. Turn console rotary selector to the VOLUME position. Select the counter (1-3) that you want to use. Press and hold the RESET button until the display reads 0 (about 2 seconds).
4. Turn on all booms, and run a known amount of water (preferably 100 gallons or more). *
5. Turn off all booms. Compare the console's VOLUME reading with the known amount of water run. See *Illustration*. If the two amounts are within one or two percent, no fine tuning is required. If the two amounts are more than two or three percent different, continue with the next step.
6. With the console still in the VOLUME position and in HOLD, enter calibration (boom switches OFF, hold the CAL button until red warning light comes on; about one second). The display will show the flowmeter calibration value and the CAL icon.
7. Momentarily press the CAL button. The CAL icon will begin to flash and the total volume will be displayed.

8. When the TOTAL VOLUME value is displayed, use the "+" or "-" button to adjust the value to match the amount of water run.
9. Momentarily press the CAL button. The word CAL and the flowmeter calibration number will be displayed. You will notice that the flowmeter calibration value has changed. Write down the new flowmeter calibration value. This is your "fine tuned" calibration value, keep it for future reference.
10. Exit calibration by holding the "CAL" button until the red warning light goes out (about one second).

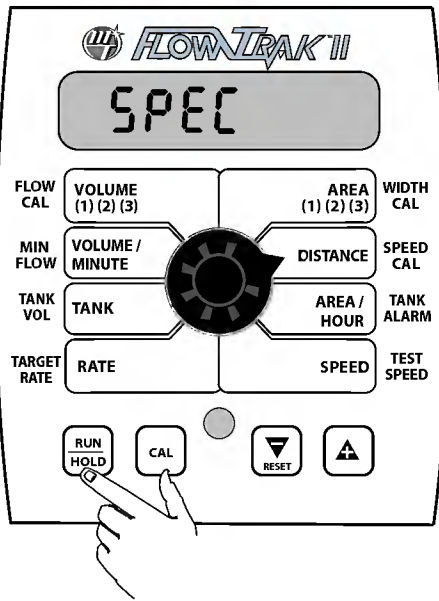
* The most accurate method to measure the volume of water run is to place a container under EVERY nozzle and add together the amount from each nozzle. This assures that 100 percent of the water is collected and that all nozzles are spraying equally. It is important to perform this procedure at a flow rate similar to that which will be used in the field. It is also possible to disconnect the main boom line and run it to a large measuring container but a valve must be installed and properly adjusted to simulate actual field conditions.



“Special” Calibration

The “Special” calibration mode is used to set up system parameters that rarely need to be changed or adjusted. To enter Special Cal, put the system in HOLD, turn the console OFF, press and hold both the RUN/HOLD button and CAL button while turning console ON. The console will display SPEC for 2 seconds to show that the console is in the Special Calibration mode. Release the RUN/HOLD and CAL buttons. The CAL icon and Warn LED will turn on. The desired Special Calibration parameter(s) can then be accessed with the rotary switch per the illustration below. To exit Special Calibration, press and hold the CAL button for 2 seconds. The console will store any changes and revert to normal operation.

NOTE: you must exit Special Calibration to save changes.



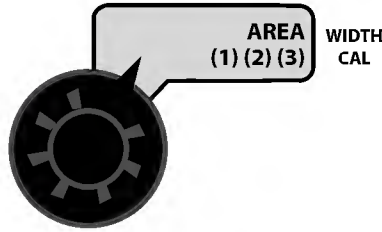
Special Cal

Units

Material

HOLD/FILL

Units: Choose the system of units desired. Turf units are the same as English units except Area is in thousands of square feet. Use the “+” and “-” buttons to choose between EnG (American English Units), MEt (Metric) and TurF (Turf units).



Material: Use “+” and “-” buttons to select between liquid (H₂O displayed) or anhydrous ammonia (NH₃ displayed). If in NH₃ mode, rates will be displayed in pounds (kg) actual N and totals will be displayed in pounds (kg) anhydrous ammonia (NH₃).



HOLD/FILL: “HOLD” selects normal sprayer monitor mode, “FILL” selects batch mode for filling tanks at a depot. The selection of HOLD or FILL mode affects both the way the control output operates and the way the counters operate. Use “+” and “-” buttons to select between HOLD and FILL modes. In



HOLD mode, the Control Output can be used to open or close a valve based on the RUN/HOLD status. If the system is in RUN, the Control Output turns ON, if in HOLD, it will turn OFF. If set in the HOLD mode, the TANK display will show the amount remaining in the tank and the TANK ALARM will work as described on pages 19 & 27. In FILL mode, the optional Control Output energizes when the console is changed from HOLD to RUN mode and remains energized until total flow equal to TANK VOL is reached, then it is de-energized. This may be used to fill the tanks at a depot or batching operation. It is not recommended to use the FILL mode at all if operating the system in typical sprayer monitor applications.

To exit Special Calibration, press and hold the CAL button for 2 seconds. The console will store any changes and revert to normal operation.

NOTE: you must exit Special Calibration to save changes.

The following table describes the special cal parameters and shows the factory settings. More detailed descriptions follow the table.

Parameter	Description	Factory Setting
Units	System of units: EnG (English) / mEt (Metric) /TurF (Turf)	EnG (English)
Material	Choose Liquid (H ₂ O or Anhydrous (NH ₃))	H ₂ O
Control Mode	“HOLD” - Selects Sprayer Monitor Mode “FILL” - Selects Batch Counter Mode for Filling Tanks	HOLD

Operation

Operation in the SPRAYER MONITOR Mode

HOLD selected for Control Mode

(See page 30 to operate the system in the Batch (TANK FILL) mode.)

FlowTrak II can be operated either as a sprayer monitor or as a batch counter for filling tanks. (See *Special Calibration Section*.)

Make sure your system is properly calibrated before beginning to monitor your application.

The FlowTrak II system features an easy to use rotary dial. Simply turn the knob to the desired function. The console gives a continuous display of the function until another one is chosen.

CONSOLE POWER/SYSTEM ON/OFF: The system can be turned ON and OFF by the ignition switch. When the console is turned on, it will display the number of hours of operation for 2 seconds, then it will display the software version along with the "v" icon for 2 seconds before it begins normal operation.

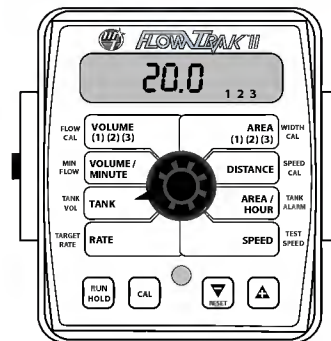
DISPLAY: During normal operation, the console will display information selected by the rotary switch position. Typically the rotary switch will be set on RATE, and the console will display the Application Rate in units of gallons per acre (liters per hectare). See *DATA DESCRIPTION for additional information about data displayed*.

RUN/HOLD BUTTON: The RUN/HOLD is the master button for turning all monitoring on and off. This function can be done either manually with the RUN/HOLD button, or automatically, using the optional RUN/HOLD sensor kit.

"+" AND "-" BUTTONS: During normal operation, when the rotary dial is set to Volume 1, 2, or 3 or Area 1, 2, or 3, the "+" button will select the counter pair to be cleared, and the "-" button will clear the selected counter pair. See *page 28*.

WARNING DEVICE: The console is equipped with a RED warning light. The light will automatically turn on and flash when the actual application is plus or minus 10 percent of the calibrated target rate, or if the TANK alarm feature is activated and the tank is below the set point (display will also flash "FILL" message). If the light stays on, refer to the troubleshooting section of this manual. The RED warning light will also be illuminated when calibration mode is active on the console.

ROTARY SWITCH: During normal operation, you can view any one of eight monitored functions by turning the rotary switch to the appropriate position. The functions that are active during normal operation are the WHITE boxes. Calibration positions are identified by the WHITE labeling on each side of the rotary selector (Please refer to *Calibration section for details*).



Turn rotary dial to display desired readout.

DATA DESCRIPTION

VOLUME (1) (2) (3): Displays the total gallons (liters) applied since the active counter was last reset to zero. When the FlowTrak II is used in conjunction with NH₃, the console display will read total pounds (kg) of NH₃ applied since the counter was last reset. To select a pair of AREA and VOLUME counters, use the "+" button to select set 1, 2 or 3, indicated by the small numbers in the lower right on the display. **DO NOT** use the "-" button to select counters because the button will clear them. (See *Resetting System Counters on page 28*.) This active pair of counters may be reset to zero independent of other system counters.

VOLUME/MINUTE: Displays the actual gallons (liters) per minute being applied. When the FlowTrak II is used in conjunction with NH₃, the console display will read total pounds (kg) of NH₃ per minute being applied.

TANK: Displays amount remaining in the tank. When the tank is refilled, and the tank volume has been entered in Special Cal, the TANK amount can be reset to a full tank by simply pressing the "+" button for 1 second while the rotary switch is in the TANK position. The amount in the tank can be decreased by using the "-" button.

RATE: Displays the actual number of gallons per acre (liters per hectare) being applied. When the FlowTrak II is used in conjunction with NH₃, and NH₃ has been selected in "Special Calibration", the console display will read pounds (kg) of actual "N" per acre (hectare) being applied.

AREA (1) (2) (3): Displays the acres (hectares) covered since the counter was last reset to zero. The area counters do not accumulate area when the console is in HOLD or if all booms are turned OFF. To select a pair of AREA and VOLUME counters, use the "+" button to select set 1, 2 or 3, indicated by the small numbers in the lower right on the display. **Do NOT** use the "-" button to select counters because the button will clear them. (See *Resetting System Counters on page 28*.) The selected pair of counters may be reset to zero independent of other system counters.

DISTANCE: Displays the feet (meters) driven since the counter was last reset to zero. This counter does not accumulate when the console is in HOLD. This counter may be reset to zero independent of other system counters.

AREA/HOUR: Displays acres per hour (hectare per hour) (thousands of square feet per hour) being covered.

SPEED: Displays the ground speed in miles (kilometers) per hour.

Operation

Operation in the BATCH (Tank Fill) Mode

To operate in the Tank FILL mode, select the FILL control mode, *see Special Calibration*.

Make sure your system is properly calibrated before beginning to monitor your application.

CONSOLE POWER/SYSTEM ON/OFF: The system can be turned ON and OFF by the ignition switch. When the console is turned on, it will display the number of hours of operation for 2 seconds, then it will display the software version along with the "v" icon for 2 seconds before it begins normal operation.

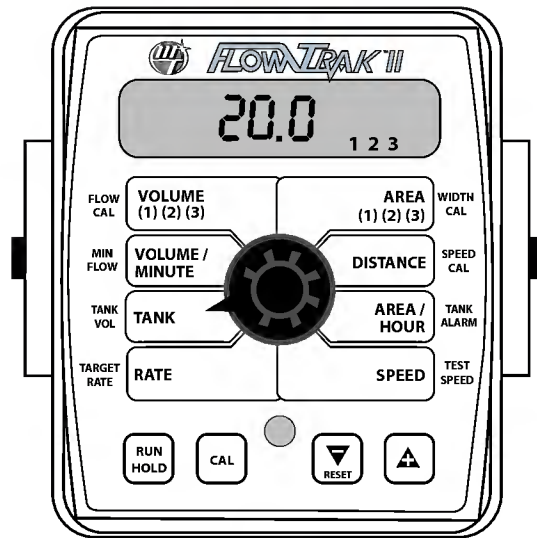
DISPLAY: During Tank FILL operations, the console will display either the tank level as it is filled (TANK position), or the flow rate (VOLUME/MINUTE) as selected by the rotary switch position. Typically the rotary switch will be set on TANK, *as shown in illustration to the right*.

RUN/HOLD BUTTON: The RUN/HOLD is used to turn the FILL operation on and off. Select RUN to start the FILL operation, select HOLD to stop or pause the operation. A TANK VOLUME must be entered or the Control Output will not turn on. When the amount pumped into the tank reaches the calibrated TANK VOLUME, the Control Output automatically shuts off. The display will show FULL and the HOLD icon. If the RUN/HOLD button is pressed, the display and TANK counter will be cleared and a new FILL process will start (Control Output turns on).

"+" AND "-" BUTTONS: During Tank FILL operations, the "+" and "-" buttons can be used to adjust the TANK VOLUME when the system is in HOLD. This is useful in case the tank is not completely empty when starting a new FILL process. The user can enter the "leftover" amount before starting the FILL process so when the system stops the FILL process, it will not overflow the tank by the amount leftover.

WARNING DEVICE: The red warning light is disabled in the Tank FILL mode.

ROTARY SWITCH: In the Tank FILL mode, the only active selections on the rotary dial are the TANK and VOLUME/MINUTE positions.



Turn rotary dial to display desired readout.

DATA DESCRIPTION:

VOLUME (1) (2) (3): Not active in Tank FILL mode.

VOLUME/MINUTE: Displays the actual gallons (liters) per minute being pumped into the tank.

TANK: Displays amount pumped into the tank. When the amount pumped equals the Calibrated TANK Volume, the Control Output will shut off.

RATE: Disabled in Tank FILL mode.

AREA (1) (2) (3): Disabled in Tank FILL mode.

DISTANCE: Disabled in Tank FILL mode.

AREA/HOUR: Disabled in Tank FILL mode.

SPEED: Disabled in Tank FILL mode.

Resetting System Counters

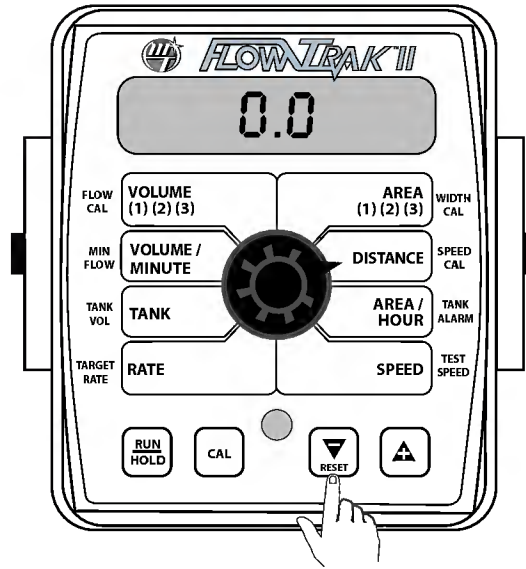
Not applicable to the Batch (Tank FILL) mode

The AREA, DISTANCE and VOLUME counters maintain a running count during operation regardless of the position of the rotary switch. When any of these counters reach their maximum capacity, or when you want to start a new count, the value may be reset to zero by performing the following routine. Counters may be reset independently of each other.

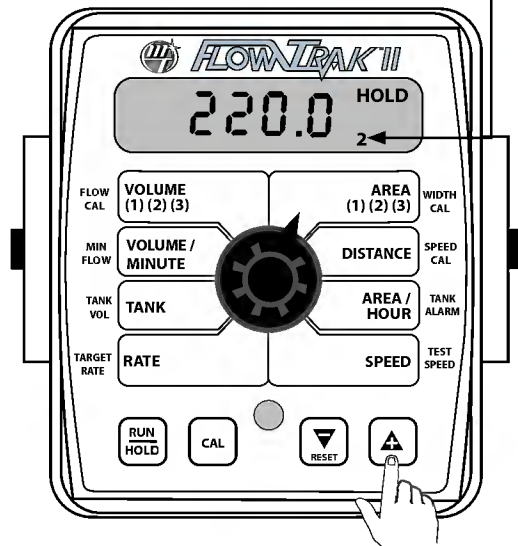
1. Put the system in HOLD.
2. Turn the rotary switch to the counter to be reset.
3. To reset distance turn the rotary switch to DISTANCE and simply press and hold the RESET button until the display reads zero. The display will show the word "CLEAR" during this process, and will show 0.0 when reset to zero is complete.
4. To reset the volume and area counters; there are three independent AREA counters, paired with three VOLUME counters. The active pair of counters is indicated by the small numbers in the lower right area of the display (1,2, or 3) when the rotary switch is in the AREA or VOLUME position. Select the pair of counters you want to use by pressing the "+" button. The small number will increment each time the "+" button is pressed (from 1 to 3, then rolls back to 1). **DO NOT** attempt to select the counter number by using the "-" button, because that will clear the active pair of counters if held for 2 seconds. If the "-" button is accidentally pressed, the console will display "CLEAR" to alert the user that the counters will be cleared. If the user continues to hold the "-" button for 2 seconds "CLEAR" will disappear and be replaced by 0.0, indicating that the selected pair of counters has been cleared.

To SELECT A PAIR OF AREA AND VOLUME COUNTERS:

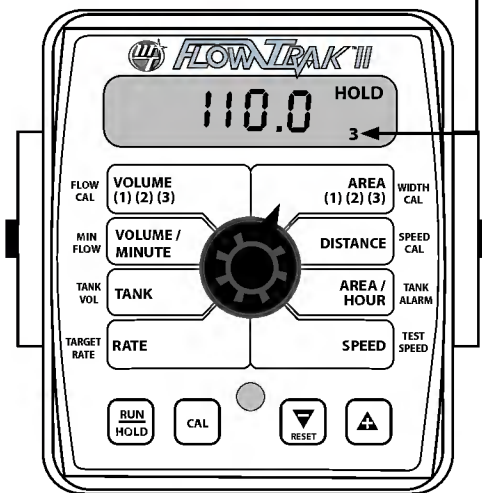
Verify that the desired counter pair is selected, or use the "+" button to select.



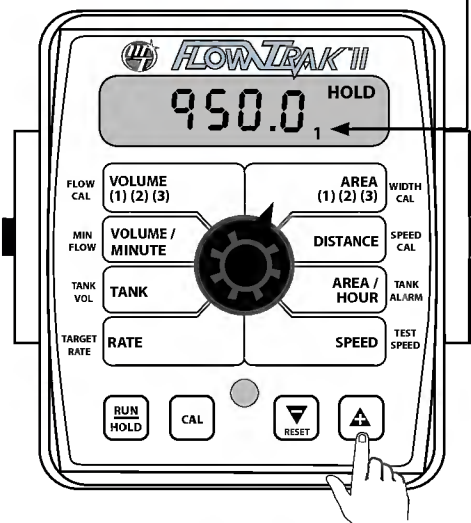
Display indicates counter pair #2 is selected



Display indicates counter pair #3 is selected



Display indicates counter pair #1 is selected



Resetting System Counters

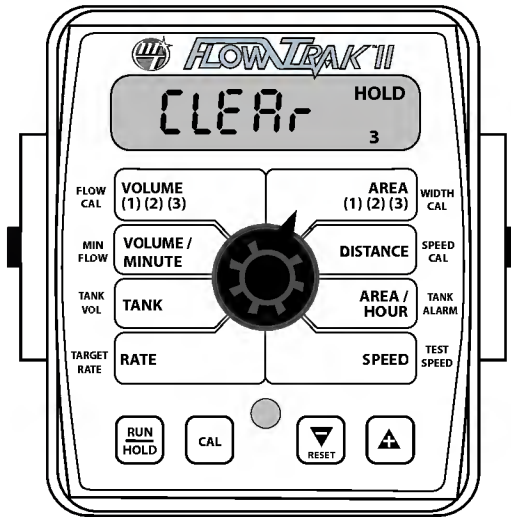
To clear counters

When the desired counter number is displayed, press the "-" (RESET) button and "CLEAR" will be displayed.

NOTE: holding the "-" (RESET) button for 2 seconds will clear both the #3 AREA counter and the #3 VOLUME counter whether the rotary switch is in the AREA or the VOLUME position.

If the "-" button is released before 2 seconds have elapsed, the counters will not be cleared and the "CLEAR" message will be replaced with the previous total.

After the "-" (RESET) button has been held for 3 seconds, the "CLEAR" message will be replaced by 0.0, indicating that counter pair #3 has been cleared.



Troubleshooting

Messages / Warnings

bad CAL

This message appears when an error occurs while verifying calibration values during the power-up. Enter calibration and verify that the calibration values have not changed and exit calibration. Cycling power will not clear the bad CAL message. The message can only be cleared by entering and exiting calibration mode.

Lo P

Low Power. Check all power and ground connections.

LoAd

Has loaded Default Cal factors (appears when default calibration factors are loaded by holding CAL and “-” buttons while turning the console on).

no SPEED

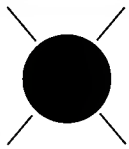
Will flash in display if rotary switch is in RATE position and there is no Speed signal regardless of all other conditions. Check speed sensor and connections per Troubleshooting section.

no FLo

Will flash in display if rotary switch is in RATE position and should have flow (In Run, some booms on, speed greater than 0) but no flow is detected. Check flowmeter and flow harness connections per Troubleshooting section.

FILL

Rotary switch in any position, FILL will flash if tank level is equal to or less than tank set point. Fill tank and reset TANK counter by setting the rotary switch at the TANK position and pressing the “+” button for one second. Check to make sure TANK set point is properly calibrated.



Warn LED flashes when the Rate error is over 10% or Volume/Minute is below the Minimum, or Tank is less than Tank Set Point. It is on steady when in CAL mode or SPECIAL CAL mode or Test Speed.

SPEC

Special Calibration mode is active. Appears when entering Special Calibration mode (hold RUN/HOLD and CAL buttons while turning console on).

v

On startup, the “V” is displayed next to the software version #. (Console hours displayed first.)

CLEAR

The message alerts the user that the currently selected counter will be cleared if held for 2 seconds. Also serves as a reminder to use “+” button to select counters.

OFL

Counters (DISTANCE or AREA or VOLUME) have exceeded their maximum. RESET (see pages 27-28) to clear counters and resume counting.

FULL

Turns on (in Tank FILL mode) when the amount pumped into the tank is equal to the calibrated TANK Volume. Press Run/Hold button momentarily to clear and start a new FILL operation.

Troubleshooting (cont)

General

All FlowTrak II consoles and flowmeters are tested prior to packaging, so unless there has been damage in shipment you can be confident that everything will be operational when you receive it.

However, if you do encounter a problem that appears to be related to equipment failure, **PLEASE DO NOT OPEN THE CONSOLE**. Your system is protected by a warranty, and Micro-Trak will gladly correct any defect.

Problems can be the result of mistakes in installation or operation. Before returning any parts for service, carefully check your installation and review the operating instructions. For easy-to-follow guidelines, refer to the troubleshooting section which follows.

CONSOLE APPEARS DEAD

Using your test light, check for 12 volts at the power source. Also check for damaged power cable or reversed terminals. (Console requires 12 volts for proper operation).

SPEED IS ALWAYS ZERO OR ERRATIC

Check for properly calibrated speed cal number.

Review speed sensor installation. Check for proper mounting, alignment and spacing of speed sensor in relationship to magnet assembly. Make sure magnet polarities are alternated. Also check cable for breaks or incomplete connection. *For more suggestions on solutions to speed problems, see Hall-effect sensors and console inputs on pages 34-35.*

DISTANCE COUNT IS INACCURATE

Speed cal number was incorrectly calculated or entered. Review calibration, re-adjust and test.

AREA COUNT IS INACCURATE

Working width or wheel circumference was measured incorrectly, or speed cal number was calculated or entered incorrectly. Go back through the original procedures, make changes, and test for acre (hectare) count again. Verify accuracy with formula:

$$\text{Acres} = \text{Distance} \times \text{Width in feet} / 43560$$

$$\text{Hectares} = \text{Distance} \times \text{Width in meters} / 10,000$$

$$\text{Thousands of square feet} = \text{Distance} \times \text{Width in feet} / 1000$$

NO READOUT OF GALLONS (LITERS), OR GALLONS (LITERS) PER MINUTE

Check to see that the sprayer pump and equipment are operating properly. If liquid is moving through the line, check the flow sensor to be sure it is screwed all the way into the flowmeter.

Check to see that a **FLOW CAL** number has been entered. Also check cable for breaks or incomplete connection.

If the flowmeter is new or has not been used for a long period of time, the turbine may be sticky. Flushing the system out with water should make the turbine spin freely.

Flow rate may be too low to register a reading, or foreign material may be lodged in the flowmeter.

Total liquid used is inaccurate

This may result from an incorrectly-entered "FLOW CAL" value. Check the number stamped on the flowmeter tag, and be sure this is entered in the console's "FLOW CAL" position. If the meter has been used for some time, wear may have changed the Flow Cal value. *See Fine-Tuning Flowmeter Calibration on page 24.*

Check the mounting position of the flowmeter. With lower flow rates, the meter should be mounted vertically. Also check to see that the flow sensor is screwed all the way into the flowmeter.

Other causes may be inaccurate sprayer tank markings, a flow rate too low to register, or foreign material lodged in the flowmeter.

CONSOLE IS ERRATIC IN OPERATION

If you have a two-way radio, it may be mounted too close to the console. Keep all FlowTrak II cables away from the radio, its antenna and power cable.

Ignition wires may be causing the console to malfunction. Keep FlowTrak II cables away from ignition wires, or install ignition suppressor.

Reroute all cable away from electric solenoids, air conditioning clutches and similar equipment.

DISPLAYED MEASUREMENTS DO NOT MAKE SENSE

The console may be in the incorrect measurement mode (English or metric). *See page 18 for instructions.*

DISPLAY READS "OFL"

DISTANCE, AREA, and VOLUME counters read OFL when they have exceeded their maximum count. Reset to zero to resume counting.

Troubleshooting (cont)

Checking Individual Components

CONSOLE

The only way to field test a console is to connect it to a harness on a vehicle with a known working console or install it on an E-POP (Electronic Point of Purchase) display stand.

HARNESS

The harness can be checked using an ohmmeter or continuity tester. The main wiring diagram shows the pin out of all connectors. See page 8.

ELECTRICAL INTERFERENCE

Erratic operation of the system may be the result of electrical interference from ignition wires or inductive loads (electrical clutch, fan, solenoid, etc.). Always try to route wires as far away from suspect areas as possible. If problems occur, you may need to relocate the console and/or wiring harness, or install a noise suppressor.

POWER

Check power source with the MT-101 or a test light. If there is no power, trace cable toward battery looking for breaks. Also check any fuses or circuit breakers that supply power to the console.

ACCESSORY POWER

The speed, flow and run/hold cables all have an accessory power wire. Check for 12 volts between B (usually white) and C (usually black) of these connectors. If power is not present, make sure the accessory power wire is not open or shorted to ground or to another wire. If this wire has a problem, the console may exhibit erratic behavior or not function at all.

RUN/HOLD HALL-EFFECT SENSOR

Caution: Improper connection or voltage could damage the Hall-Effect sensor. The Hall-effect sensor works similar to a reed switch, but requires power in order to function. This particular type of Hall-effect sensor "closes" when near the south pole of a magnet and is otherwise "open".

Ground pin C (black) and connect clean 12 volts to pin B (white) of the Hall-effect sensor cable. Connect the positive lead (red) of an ohmmeter or continuity tester to pin A (red) and the negative lead (black) of the ohmmeter or continuity tester to pin C (black) of the Hall-effect sensor cable.

Holding the tip of the sensor up to the south pole (face with dotted line) of a magnet should result in a very low resistance (around 300 ohms). Taking the sensor away from the magnet should result in a very high resistance (infinite).

RUN/HOLD JUMPER DUST COVER

To test for proper continuity on the jumper wire, connect the ohmmeter to the pins of the dust cover with the jumper wire. There should be continuity — near zero ohms.

MAGNETIC HALL-EFFECT SPEED AND FLOW

SENSORS

Caution: Improper connection or voltage could damage the Hall-effect sensor. The Hall-effect sensor works similar to a reed switch, but requires power in order to function. Also, this particular type of Hall-effect sensor requires alternating magnetic polarities in order to switch. This means that the north pole of a magnet will "open" the Hall effect and the south pole of a magnet will "close" the Hall effect.

Ground pin C (black) and connect clean 12 volts to pin B (white) of the Hall-effect sensor cable. Connect the positive lead (red) of an ohmmeter or continuity tester to pin A (red) and the negative lead (black) of the ohmmeter or continuity tester to pin C of the Hall-effect sensor cable.

Holding the tip of the sensor up to the north pole of a magnet should result in a very high resistance (infinite), while holding the tip of the sensor up to the south pole of a magnet should result in a very low resistance (around 300 ohms).

VANSCO RADAR SPEED SENSOR

Carefully check your installation and operating instructions. The following are tips for troubleshooting;

1. Disconnect the radar adapter cable from the console harness.
2. Check for 12 VDC between pins B and C of the main harness connector (yellow tie). If not present, console or harness may be defective.
3. Using a jumper wire (paper clip bent into a "U"), rapidly short together positions A and C of the main harness speed connector (yellow tie) several times. The console should respond with some reading. If not, the console or harness may be defective.
4. Reconnect the radar adapter cable to the main harness speed connection (yellow tie).
5. Disconnect the radar from the radar adapter cable.
6. Check for 12 VDC between pins 1 and 3 of the radar adapter connector. If it is not present but was present in step 2, the radar adapter cable may be defective.
7. Using a jumper wire (paper clip bent into a "U"), rapidly short together positions 2 and 3 of the radar connector (round 4-pin) several times. The console should respond with some speed reading. If not but had a reading in step 3, the radar adapter cable may be defective.
8. If the system passes all above tests, the radar may be defective.

Troubleshooting (cont)

Console Inputs

If there is no response from any of the following tests, refer to the main wiring diagram to locate the next connector in line toward the console and repeat the test at that connector. If there is a response at that connector, the problem may be in the cable between the two connectors (or the connectors themselves).

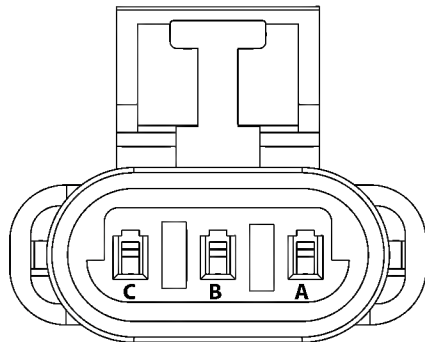
SPEED INPUT

Turn rotary switch to speed position and disconnect the speed sensor (yellow tie) from the main harness. Check for 12 volts between pins B (white) and C (black) of the main harness speed cable (yellow tie). Using a clip lead or other jumper wire (such as a paper clip bent in a "U"), several times rapidly short together pins A (red) and C (black) of the 3-pin connector (See *Illustration 17*). The console should respond with some speed reading.

FLOW INPUT

Turn rotary switch to VOLUME/MINUTE and disconnect the flow sensor (green tie) from the main harness. Check for 12 volts between pins B (white) and C (black) of the main harness flow cable (green tie). Using a clip lead or other jumper wire (paper clip bent in a "U"), several times rapidly short together pins A (red) and C (black) of the 3-pin connector. The console should respond with some flow rate reading.

Illustration 17



Three-Pin Connector

REMOTE RUN/HOLD INPUT

Disconnect the remote run/hold sensor (or jumper cover) from the main harness.

Check for 12 volts between pins B (green) and C (violet) of the main harness remote run/hold cable (grey tie). Placing a clip lead or other jumper wire (such as a paper clip bent in a "U") between pins A (blue) and C (violet) of the main harness run/hold connector (grey tie) should turn off the "HOLD" icon on the console display. Removing the jumper should turn on the "HOLD" icon on the console display.

FLOWMETER

Shaking the Flowmeter end to end should produce a "rattling" sound (shaft end play). Blowing in the meter from either end should spin the turbine freely. If the turbine spins freely but the meter will not register flow with a known working sensor, the turbine may be defective. See *Flowmeter Assembly and cleaning on page 43 for details*.

PLUMBING

Proper plumbing is a very important factor in obtaining optimal performance from your FlowTrak II system. The chart on the next page will help you determine what area of the plumbing may be causing your problem. At this point, it is assumed that your plumbing basically matches that of the system diagram and that the flowmeter is installed correctly and is functioning properly. In addition, make certain that you have selected and installed the correct spray tips for the application, speed and spray rate that you intend to maintain. Don't forget the obvious such as leaky fittings and hoses, pinched hoses and plugged or worn nozzles. If you need more detail than the chart provides, please refer to *Plumbing Guidelines on pages 36-38*.

Plumbing Troubleshooting Chart

SYMPTOM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Loses pressure	<ul style="list-style-type: none"> • Pump Air-lock 	<ul style="list-style-type: none"> • Clean strainer • Larger hoses
Little or no pressure adjustment	<ul style="list-style-type: none"> • Too much restriction in servo loop 	<ul style="list-style-type: none"> • Larger hoses and fittings • No sharp bends
Pressure won't go high enough	<ul style="list-style-type: none"> • Pump starved or too small • Too much agitation • Throttle, range adjust or pressure relief valves 	<ul style="list-style-type: none"> • Larger hoses • Reduce agitation • Adjust
Pressure, Speed and Spray Rate don't check out according to charts	<ul style="list-style-type: none"> • Inaccurate pressure reading • Dirty or worn tips 	<ul style="list-style-type: none"> • Use a different gauge and check each boom. • Clean or place
Pressure fluctuates greatly	<ul style="list-style-type: none"> • Sagging or kinked hoses • Throttle valve too far closed • Pump starved or too small 	<ul style="list-style-type: none"> • Support or replace hoses • Adjust throttle and range valves • Larger hoses • Larger pump • Clean strainer

Plumbing Guidelines

GENERAL

In order for your sprayer to function properly, it must be correctly plumbed. This section will explain the purpose of each component, list some problems it can cause and recommend some possible solutions to those problems.

A word about pressure drops: All hose, valves and fittings (especially elbows) cause undesirable pressure losses. Keep hoses as large as practical. Don't use longer hoses than necessary. Avoid bends whenever possible. Use as few fittings as possible. Use full port valves or the next larger size valve. Long hoses should be supported to avoid sagging and kinking. Many spray tip manufacturers have charts showing pressure drop for various fittings and hose sizes.

Now let's break the system into four sections and cover each one separately. The four sections are the pump inlet line, the agitation line, the flowmeter (boom) line, the servo line and the pump itself.

PUMP INLET

The hose connecting the tank to the pump should be at least as large as the pump inlet port. In most cases 1 1/4" is a good size. The valve in this line is for complete tank shut-off only and should always be fully open during operation. If this hose is too small or the valve is partially closed, you may not be able to reach your high end goals and pump damage could occur.

AGITATION

The size of the agitation line is dependent upon the amount of agitation required which is determined by the size of the tank and the type of chemical being used. In most cases a 1" hose is large enough.

FLOWMETER

The line feeding the flowmeter and the boom shut-off valves should be at least as large as the flowmeter. The size of lines going from the shut-off valves to each boom section depends on the flow rate of each boom.

PUMP

The pump must have enough capacity to satisfy the agitation, servo and flowmeter sections of the plumbing. The following example will take you through the steps involved.

EXAMPLE: Let's say our example sprayer has a 300-gallon tank with a Spraying Systems 6290 SC-8 Jet Agitator. The agitator uses 10.2 GPM at 40 PSI. The sprayer has a 40' boom with a total of 12 tips. We plan to put on a 25 GPA at 5 MPH and in some areas of the fields we may want to increase our rate to 30 GPA and in other areas decrease to 15 GPA. After checking the tip charts we find that a TK-5 Floodjet has a range of 14.9 to 30 GPA at 5 MPH. According to the charts, to get 30 GPA at 5 MPH with a TK-5, the pressure must be 40 PSI. At 40 PSI a TK-5 will spray 1.0 GPM. So, 12 tips at 1.0 GPM each is a total of 12 GPM.

NOW LET'S ADD EVERYTHING TOGETHER.

Agitation	10.2
Spray tips	12.0
Servo	<u>5.0</u>
	27.2 Total GPM

The above addition shows that the system needs 27.2 GPM at 40 PSI. If we add a 10% margin ($27.2 \times 1 = 2.72$ and $27.2 + 2.72 = 29.92$), we have about 30 GPM. To be sure we have enough volume, the pump should be able to deliver 30 GPM or more at 40 PSI.

VALVE PURPOSE AND ADJUSTMENTS

TANK SHUT-OFF VALVE

The tank shut-off valve is for convenience only. It allows you to work on the plumbing without draining the tank. It should always be fully open during operation.

AGITATION SHUT-OFF VALVE

The agitation shut-off valve is mostly for convenience. It allows you to work on the plumbing without draining the tank. It should normally be fully open during operation.

PRESSURE RELIEF VALVE

The pressure relief valve is used to avoid excessive pressure when the booms are turned off. Start with the handle screwed mostly out. Slowly bring pump up to operating RPM (make sure pressure does not go too high). Now slowly screw handle in until maximum desired pressure is reached. Lock handle in place with locking nut or collar.

RANGE ADJUST VALVE

The range adjust valve is required when the pump is much larger than necessary. When the range valve is opened, some of the liquid will be bypassed around the pump to avoid "overloading" the rest of the system. The setting of the range adjust valve is determined by the throttle valve. Start with the range valve fully closed. If the throttle valve needs to be more than two thirds closed, open the Range valve slightly.

THROTTLE VALVE

The throttle valve limits your high end to maximize servo performance. Start with throttle valve fully open.

EXAMPLE: With the throttle fully open, you may be able to get 50 GPA at 5 MPH when you only want 25 GPA. Therefore, close the throttle until your high end has dropped from 50 GPA to about 30 GPA.

A needle valve is Spraying Systems Type 12690 or 12795. A ball valve may be used but is more difficult to adjust and keep adjusted. Do not install a pressure regulator or relief as a throttle valve.

If the throttle valve is closed too much, PSI may fluctuate greatly.

Appendices

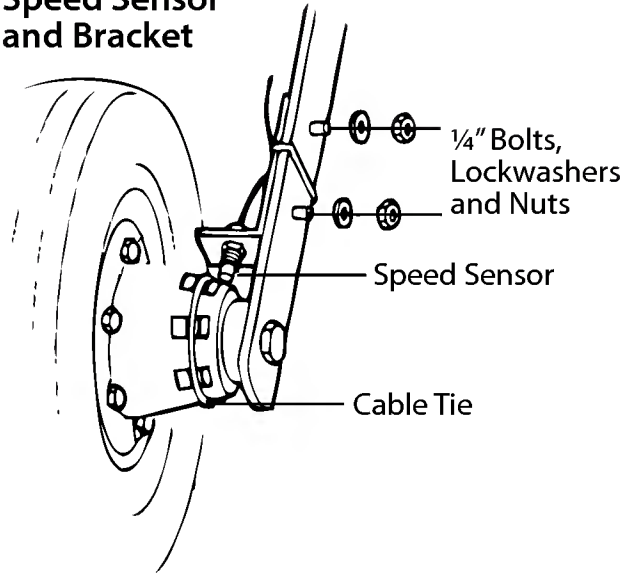
Appendix A

Optional Speed Sensor Mounting Installation

Implement Wheels

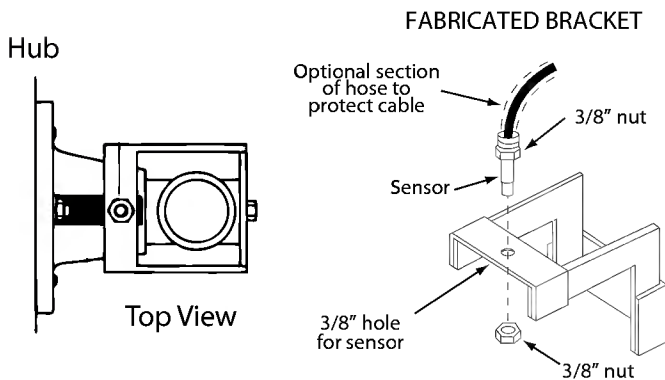
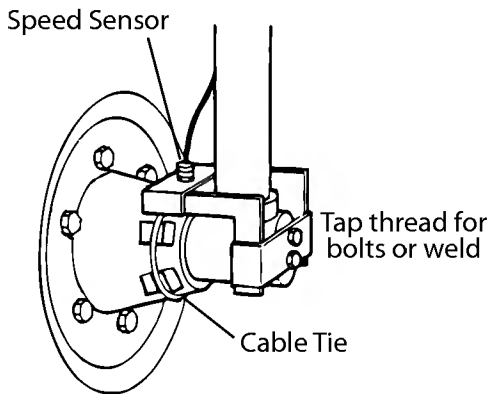
1. Secure magnets mechanically or with epoxy.
2. Rigidly mount sensor mounting bracket to the wheel assembly. Cut or bend "L" bracket as required for proper positioning of sensor.
3. Install sensor, adjust to correct spacing (1/4" to 1/2" or 6 to 13 mm is recommended), and secure with 3/8" locking nuts. *See Illustration at right.*

Speed Sensor and Bracket



Front Tractor Wheel

1. Magnets may also be secured with a cable tie and an adhesive such as epoxy.
2. Mount the speed sensor bracket to a part of the wheel assembly that does not change position to the hub when the wheels are turned. If the "L" bracket provided cannot be bent and mounted to properly position the sensor, make a bracket similar to the one shown at right.
3. Install sensor, adjust to correct spacing (1/4" to 1/2" or 6 to 13 mm is recommended), and secure with 3/8" locking nuts. *See Illustration below.*

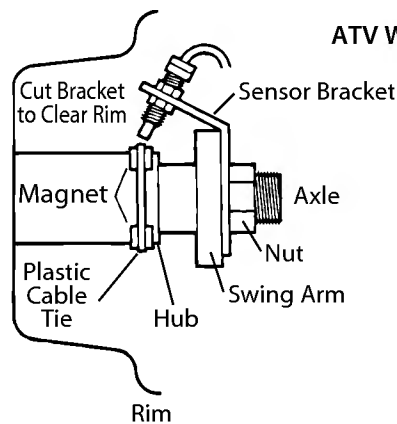


ATV Wheels

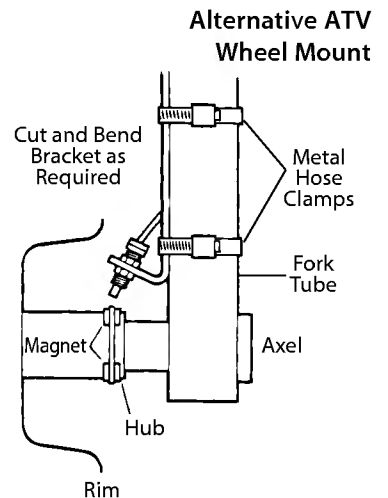
Two mounting examples are illustrated.

1. Using one cable tie (ribbed side toward magnets), secure two magnets to the wheel hub so they are exactly opposite each other. Alternate the magnets' polarities.
2. Cut and bend sensor mounting bracket as needed and rigidly mount.
3. Insert sensor, adjust spacing (1/4" to 1/2" or 6 to 13 mm) and secure with 3/8" locking nuts.

CAUTION: Make sure valve stem cannot make contact with sensor or bracket.



ATV Wheel Mount



Alternative ATV Wheel Mount

Appendix A (cont)

Optional Speed Sensor Mounting on Drive Shaft

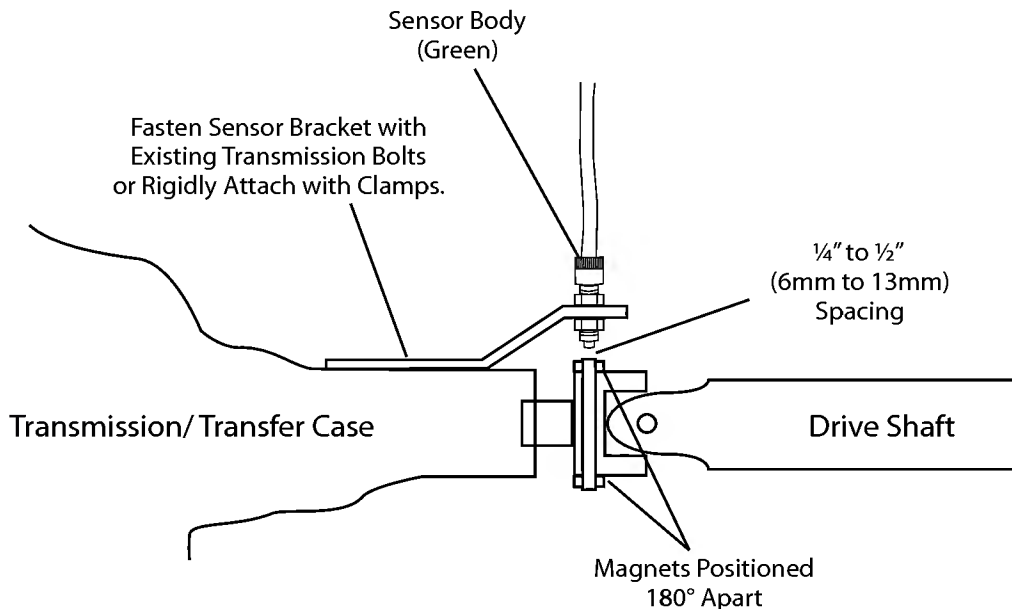
NOTE: This is an optional method generally used on pickups or custom vehicles. It may also be necessary on any other vehicles where access to the wheels is limited. *This installation requires a fine tuning procedure, see pages 19-20.*

Determine the best location for the magnets on drive shaft according to which is the most practical spot to attach sensor mounting bracket. This position should be no more than 12" (.30 meters) behind the front U-joint. For best results, mount "L" bracket to transmission and mount magnets on drive shaft as close to transmission as possible. This will ensure proper alignment if drive train shifts under heavy loading.

Two magnets are required for proper Hall-effect speed sensor operation. Position them exactly opposite each other (180 degrees apart). The polarity (north and south poles) detected by the Hall-effect speed sensor must alternate as the shaft is turned. The magnets provided by Micro-Trak are marked with a dashed line on the SOUTH pole side of the magnet.

- Attach magnets onto drive shaft, one NORTH pole side out and the other SOUTH (dashed) pole side out, by wrapping cable tie around shaft and magnets. Position each magnet so that its longest dimension moves in the direction of rotation. Pull cable tie tight and trim off excess. An adjustable, non-magnetic (stainless steel) band clamp may also be substituted.
- Attach sensor bracket to vehicle transmission. *See Illustration below.* Use either the short or long end of the bracket as a base.
- Turn one locking nut onto threaded sensor and insert sensor into large hole selected on mounting bracket. Turn on remaining locking nut. Set sensor to proper distance from magnets (1/4" to 1/2", or 6mm to 13mm). When distance is set, tighten nuts to lock sensor in place.
- Secure sensor cable to frame with cable ties. Place first tie as close to sensor assembly as possible.

See SPEED CAL on page 18.



Appendix B

Flowmeter Assembly

IMPORTANT: Opening the flowmeter will void the Flowmeter Calibration value assigned to your unit. However, you may need to take the flowmeter apart for periodic cleaning or to remove an obstruction.

If you can shake the flowmeter from end-to-end to produce a “rattling” sound (shaft-end play), or if you can blow into the meter from either end and cause the turbine to spin freely, your flowmeter does not need cleaning. If you cannot hear the “rattling” sound or get the turbine to spin freely, your flowmeter needs to be cleaned. See *Illustrations below for reassembly instructions.*

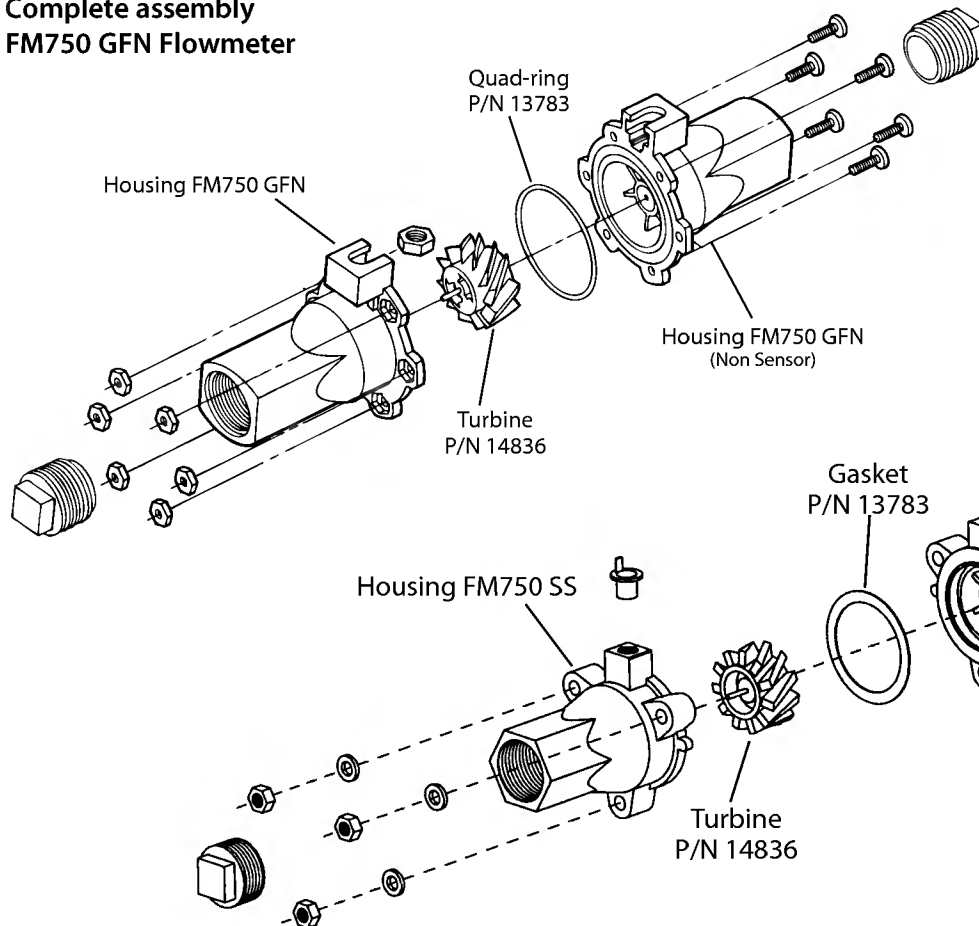
OPENING THE FLOWMETER

Cut the calibration tag retaining wire. Remove the screws and disassemble the flowmeter. Do not attempt to remove the sleeve bearings from the flowmeter housing.

Use warm water and if necessary, a mild detergent and a soft bristle brush to clean all parts. Do not use solvents or diesel fuel to clean the flowmeter. A magnet works well for removing fine metallic particles from the turbine.

Inspect all parts. Check for excessive bearing or shaft wear. The shaft will wear shorter until the turbine drags on the housing. When the shaft is worn to the point of drag, the turbine must be replaced.

Complete assembly FM750 GFN Flowmeter



On a flat surface, place each housing half on end. Set and spin the turbine in each half. It should spin freely. If it does not spin freely, remove the turbine, wipe the shaft and try again. If it still does not spin freely, the shaft or bearings may have excessive wear. (Service may be necessary.)

ASSEMBLING THE FLOWMETER

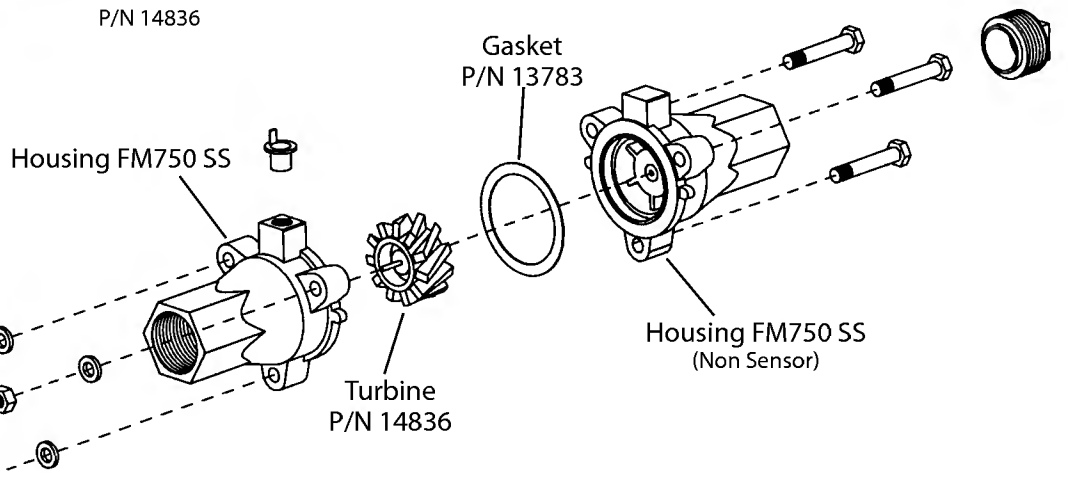
Stainless steel meters use a Teflon gasket. Sealants are normally not required. Plastic meters use an o-ring (Quad-ring). Apply a small amount of silicon grease for lubrication. Gaskets and o-rings may be reused several times but eventually may need replacement.

Place the turbine in the non-sensor housing. Position gasket / o-ring; carefully place sensor housing over turbine. Drop all screws into holes. Hold nuts (and lock washers on stainless meters) in place and finger-tighten screws. Ensure proper placement of gasket / o-ring and evenly tighten all screws. Attach tag.

After assembly, shaking flowmeter end-to-end should produce a “rattling” sound (shaft end play). Blowing into the meter from either end should cause the turbine to spin freely. If the turbine only spins from one direction, install the flowmeter so that the liquid flows in that direction (service may be required).

For maximum accuracy the flowmeter should be mounted in a vertical position. Recalibration is required before field operation.

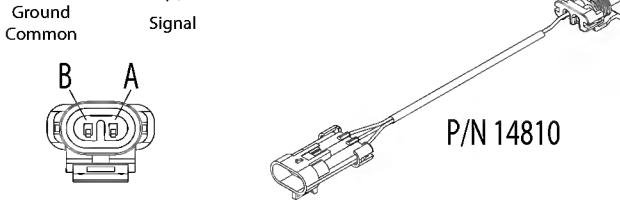
Complete assembly FM750 SS Flowmeter



Appendix C

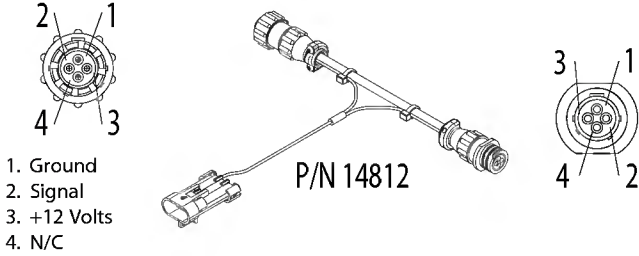
Radar "Y" Adapter Cables

In-Cab John Deere Metri-Pack Connector
8000/9000 Series



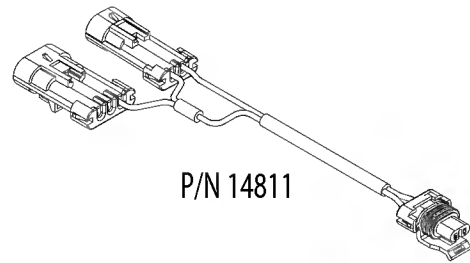
RADAR	CONNECTOR	SIGNAL PIN
DICKEY-john	Amp	2
DICKEY-john	Cannon	3
DICKEY-john	Deutsch	3
DICKEY-john	Ford	2
DICKEY-john	Packard	B
In-Cab JD (8000 & 9000's)	Metri-Pack	A
Magnavox & Phillips	Packard	C
Raven	Conxall	3
Vansco	Amp	2

DICKEY-john Radar Amp Connector

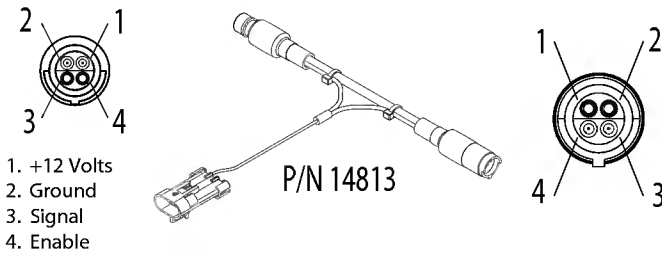


1. Ground
2. Signal
3. +12 Volts
4. N/C

In-Cab John Deere "Y" Connector

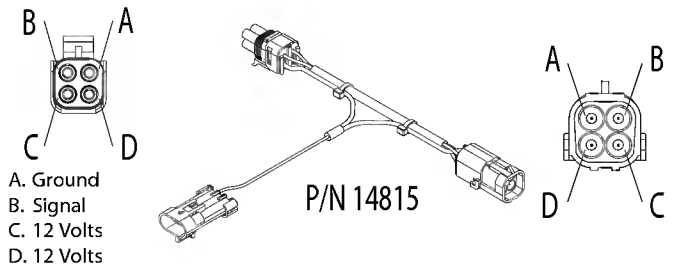


DICKEY-john Radar Cannon Connector



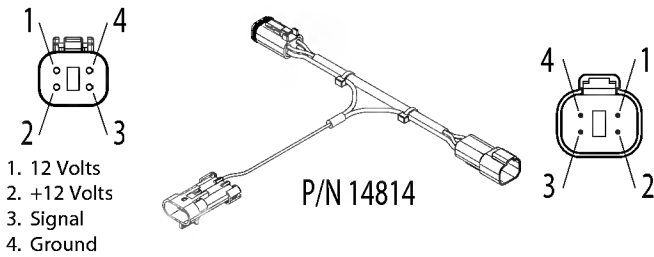
1. +12 Volts
2. Ground
3. Signal
4. Enable

DICKEY-john Radar Packard Connector



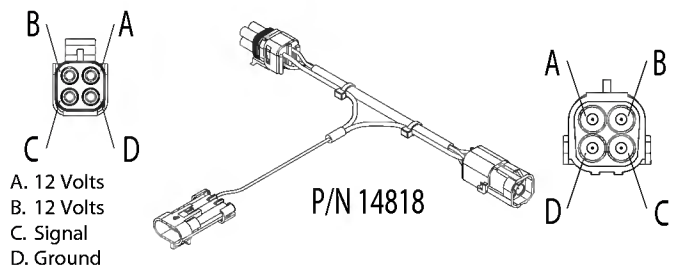
- A. Ground
- B. Signal
- C. 12 Volts
- D. 12 Volts

DICKEY-john Radar Deutsch Connector



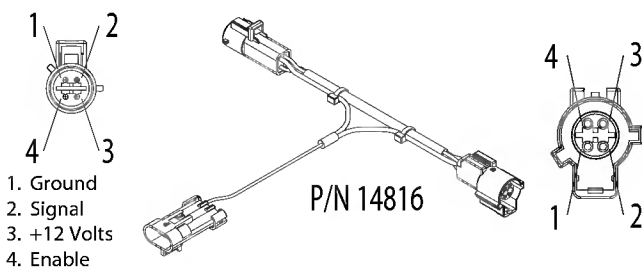
1. 12 Volts
2. +12 Volts
3. Signal
4. Ground

Magnavox & Phillips Radar Packard Connector



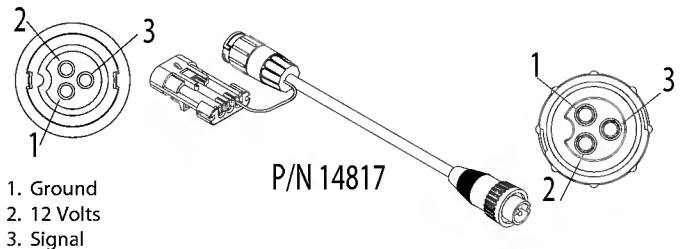
- A. 12 Volts
- B. 12 Volts
- C. Signal
- D. Ground

DICKEY-john Radar Ford Connector



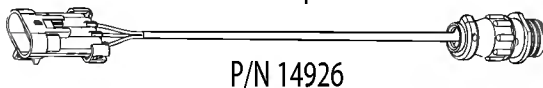
1. Ground
2. Signal
3. +12 Volts
4. Enable

Raven Radar Conxall Connector



1. Ground
2. 12 Volts
3. Signal

Vansco Radar Amp Connector



P/N 14926

Appendix D

Conversion Chart

English to Metric		
When You Know	Multiple By	To Find
LINEAR MEASUREMENT		
inches	25.4	millimeters
feet	0.305	meters
yards	0.914	meters
miles	1.61	kilometers
LAND MEASUREMENT		
square inches	645.16	square millimeters
square feet	0.093	square meters
square yards	0.836	square meters
acres	.405	hectares
square miles	2.59	square kilometers
LIQUID MEASUREMENT		
fluid ounces	29.57	milliliters
pint	0.473	liters
quart	0.946	liters
gallons	3.785	liters
VOLUME		
cubic feet	0.028	cubic meters
cubic yards	0.765	cubic meters
DRY MEASUREMENT		
quart	1.101	liters
peck	8.810	liters
bushel	35.239	liters
FUEL CONSUMPTION		
10 miles per gallon = 4.25 kilometers per liter		

Metric to English		
When You Know	Multiple By	To Find
LINEAR MEASUREMENT		
millimeters	.039	inches
meters	3.28	feet
meters	1.09	yards
kilometers	.62	miles
LAND MEASUREMENT		
square millimeters	0.00155	square inches
square meters	10.764	square feet
square meters	1.195	square yards
hectares	2.47	acres
square kilometers	0.386	square miles
LIQUID MEASUREMENT		
milliliters	0.034	fluid ounces
liters	0.529	pint
liters	0.264	quart
liters	2.64	gallons
VOLUME		
cubic meters	35.314	cubic feet
cubic meters	1.307	cubic yards
DRY MEASUREMENT		
liters	1.101	quart
liters	8.810	peck
liters	35.239	bushels
FUEL CONSUMPTION		
10 kilometers per liter = 23.5 miles per gallon		

Conversion Abbreviations

Symbols	Symbols	Symbols
in. = inches	pt. = pint	km = kilometers
ft. = feet	qt. = quart	mm ² = square millimeters
yd. = yards	gal. = gallon	m ² = square meters
mi. = miles	ft ³ = cubic feet	ha = hectares
in ² = square inches	yd ³ = cubic yards	km ² square kilometers
ft ² = square feet	pk. = peck	ml = milliliters
yd ² = square yards	bu. = bushel	l = liters
mi ² = square miles	mm = milliliters	dal = dekaliters (10 liters)
fl oz. = fluid ounces	m = meters	m ³ = cubic meters

Appendix E

Replacement Parts List

The following replacement parts are available from your dealer or distributor.

Micro-Trak Systems, Inc.
 P.O. Box 99, 111 East LeRay Avenue
 Eagle Lake, MN 56024-0099

When ordering parts, please list the model number of your console, and the description and part number of each part that you want to order.

PART NUMBER	DESCRIPTION
12069	Magnet kit (6 magnets per kit)
10013	Speed sensor mount bracket
12910	14" Black plastic cable ties (bag of 10)
13181	Console mount kit *
12888	Console mount knob
12889	Console mount washer
13096	5-foot Hall-effect Speed/Flow Sensor Cable with threaded sensor, nut and female connector
13226	5-foot remote run/hold sensor cable
01531	Speed sensor kit
01535	Remote run/hold sensor kit
11501	FM750 GFN Flowmeter
10131	FN750 SS Flowmeter
17194	Power, speed, flow, run/hold option harness
10899	FM750N Flowmeter - NH3 ONLY
14348	FM1500N Flowmeter - NH3/Liquifier
17200	Optional Relay Kit

Optional 2-Pin, 3-Pin and 10-Pin Metri-Pack 150 extension cables:

PART NO.	M/P 2-PIN	PART NO.	M/P 3-PIN	PART NO.	M/P 5/5 10-PIN
13200	5-foot	13205	5-Foot	14363	5-Foot
13201	10-foot	13206	10-Foot	14316	10-Foot
13202	15-foot	13207	15-Foot	14317	15-Foot
13203	20-foot	13208	20-Foot	14364	20-Foot
13204	25-foot	13209	25-Foot	14365	25-Foot

* The Console Mount Kit is available only as a kit, some parts are not available in individual components.
 Parts and design specifications subject to change without notice.

MANUFACTURED IN U.S.A. BY:



111 East LeRay Ave • Box 99 • Eagle Lake, MN 56024-0099

Toll-Free: 800-328-9613

507-257-3600 • Fax 507-257-3001

www.micro-trak.com • trakmail@micro-trak.com

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