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IAS Advance AutoStart™ Installation and Operation Manual

04-10-13

IAS Advanced AutoStart™ Installation Manual

I) IAS Advanced AutoStart™ (AAS) Mounting and Wiring Instructions

(Disconnect all electrical power and follow all safety warning of all equipment you are working on)

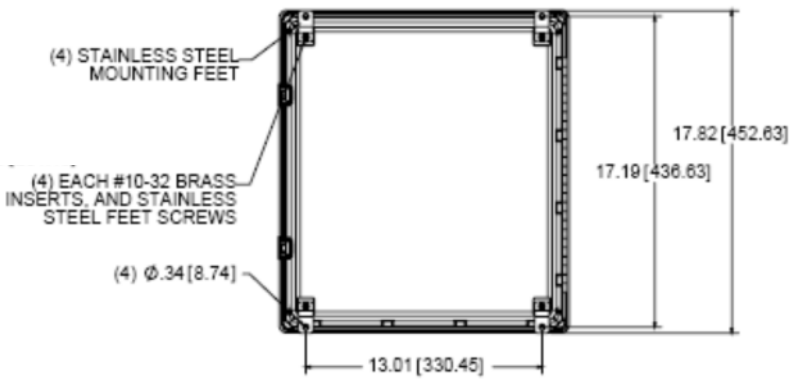
Please note, solid wire should not be used, all wiring cables should be stranded. Shielded cables should be used for all sensor cables if not supplied (18awg with a braided shield is recommended). The shield should be grounded on the sensor end only as close to the sensor as possible, if a ground source at the sensor end is not available, you can ground it at the termination end. Be careful not to create ground loops and use a single point ground.

All power cables should be connected directly from the battery posts and large gauge wire should be used (12 awg is recommended). Special care should be used with "spark ignition engines" contact us with noise suppression suggestions.

A) AAS Enclosure Mounting: The IAS AAS is designed to be wall mounted in a properly vented pump house protecting the enclosure from weather and sun. It should be mounted as far away from the engine as possible, isolating the AAS from the engine heat, but allowing easy access. The pump engine exhaust needs to be vented outside the pump house at an elevation preventing it from re-entering. The engine/pump assembly needs to be properly mounted to a support pad designed to distribute the vibration isolating the AAS mounting wall.

The AAS has four stainless steel mounting feet at each corner of the enclosure. It is recommended to use all four mounting locations and attach them to a ½" thick piece of plywood minimum. The plywood should be of sufficient size to span the pump house wall studs as needed to place the AAS as far away from the engine heat and possible emergency water relief valves as possible.

IAS ASS Mounting Dimensions:



B) AAS Enclosure Layout: See Additional Document 4 for the AAS Enclosure Bottom Hole Layout Diagram.

C) Cell Modem Antenna: The cell modem which communicates the system data back to our IAS secure website requires an antenna. The 3' "Wilson"cell modem antenna with 12' cable should be mounted outside of the pump house preferably at the peak of the building. You will need to attached

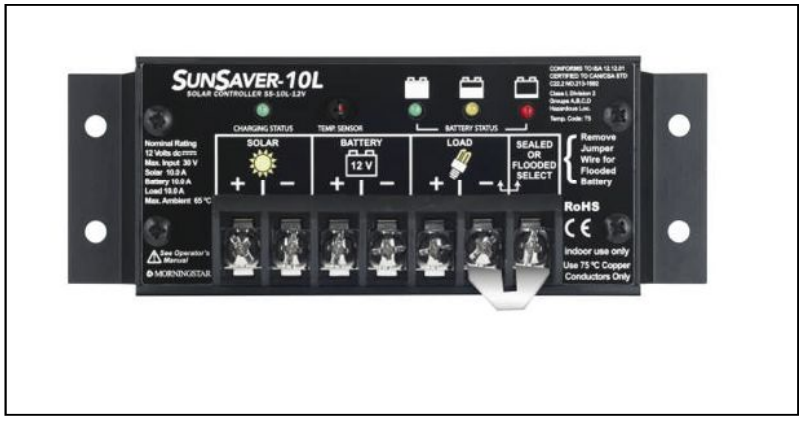
the four screw in ground plane extensions and feed the integral cable through a hole created through the pump house wall. Mount and secure the antenna cable to prevent chaffing. Make sure to pre-measure and leave enough cable length to reach the AAS enclosure. Securely install the supplied angle antenna mounting bracket to the outside wall or secure trim of the pump house and attach the antenna to the bracket using the supplied weather proof hardware.

D) Radio Antenna: The radio antenna is needed to create the local network to communicate the measured field sensor values to our system. The radio system requires line-of-sight between the AAS master radio with each of the field radio's. It is recommended to locate the 5" or 15" radio antenna as high as possible on the outside of the pump house if possible. Use the supplied nylon mounting bracket and run the 10' or 20' supplied antenna cable back to the AAS enclosure and connect it to the PCB radio installed inside the enclosure running the cable up through the preferred cable gland located on the bottom of the enclosure. If your system uses a pump house wall mounted master radio, connect the antenna to this radio.

E) Engine Harness: See Additional Document 5 for the 25 conductor AAS Engine Harness Wiring Diagram. This provides the description required to properly attach each of the engine sensors and discharge water pressure transmitter to the IAS AAS via the supplied custom quick disconnect weather proof wiring harness.

F) Solar Panel: The 55-60 Watt (approximately: 34" x 22") aluminum framed solar panel needs to be mounted in a shade-less location facing due south using the heavy duty (27" x 3.25" channel) bracket, supplied. It should be angled between 32 – 42 degrees, using the included stainless steel hardware with instructions. It is typical to mount the solar panel to the roof of the pump house depending on its orientation. You can also use the bracket to mount the solar panel to a 2" pipe post (by others).

Wire the positive (+) and negative (-) wire leads from the solar panel (wire by others) up through the gable glands as shown and connect to the proper posts as labeled on the solar panel/battery charge controller located inside the ASS enclosure.

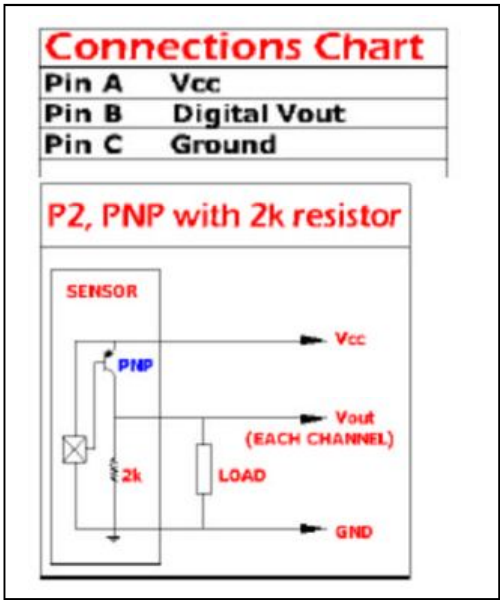


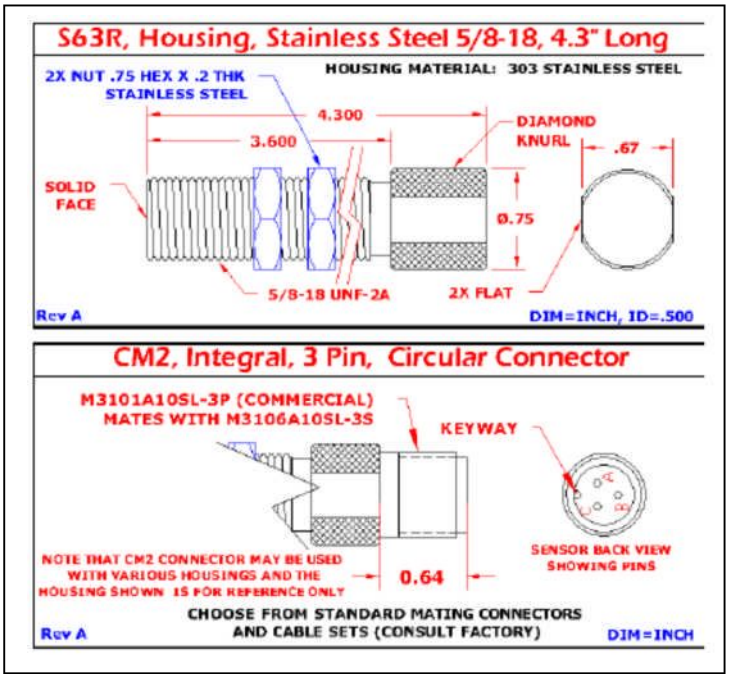
- This charge controller is for Lead-Acid batteries only, the battery voltage must be greater than 6 volts before connecting
- The Status green LED indicator shows charging status in the daytime, off at night and blinks red when there is a solar input fault or solid red.
- Leave the jumper in for sealed batteries as supplied.
- Battery status green or yellow LED's provides approximation of the batteries state of charge, and red flashing or solid when a load fault condition exists. Call IAS service department

Warning: Shock hazard. The solar PV panel can produce open-circuit voltages when in daylight. If the panel is not completely covered preventing light from reaching it, it is live.

G) AAS Engine Sensors.

1) 3-Pin Engine Speed Sensor and specific 3 conductor wiring cable with weather tight quick disconnect.





a) Speed Sensor Trouble Shooting:

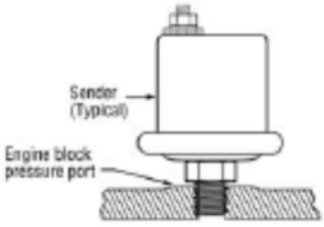
1) Trace wiring and inspect the wiring for critter damage.
2) Confirm the electrical connection is correct.
3) Confirm the wire shield is grounded.
4) Make sure the cable is not run near spark plug/ignition wiring.
5) Confirm the flywheel gearing is made from a magnetic material.
6) Pull the sensor to inspect the sensor end and thoroughly clean (all metal shaving have to be removed).
7) Confirm the speed sensor is positioned above the flywheel correctly. (with the engine off-most sensors should be screwed down to contact The flywheel and back off between 1/4 to 1/2 a turn. If you are too far Away the pickup signal strength will be too weak, see specific manufactures IOM for detailed positioning instructions)
8) Confirm the number of flywheel teeth and this value is entered correctly in the Murphy 467 EMS control unit (S8-SPD CAL)
9) Confirm what the raw frequency is in HZ coming from the speed sensor (Any "M" parameter).

2) Murphy Engine Coolant Temperature Sensor with ½" or 5/8"-18 UNF mounting connection. It is a two wire ungrounded electric temperature sensor wired to the temperature sensor leads in the engine harness as shown on Document 4.
(300F maximum temperature rating.)

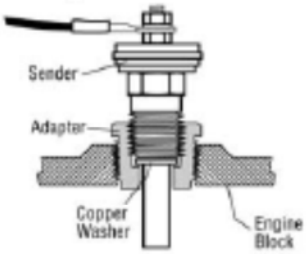
3) Murphy Engine Oil Pressure Sensor with one wire to ground sender.

CAUTION: Do not use sender body to tighten.
If sealant tape or pipe dope is used on the pressure sender, be sure that the tape or dope does not plug the sender's orifice.

Pressure Sender

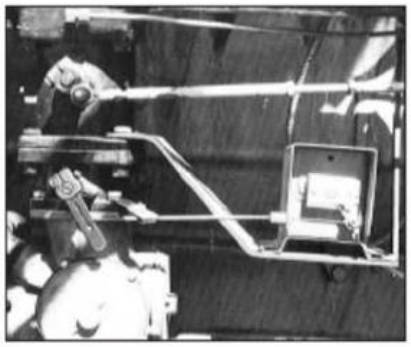


Temperature Sender



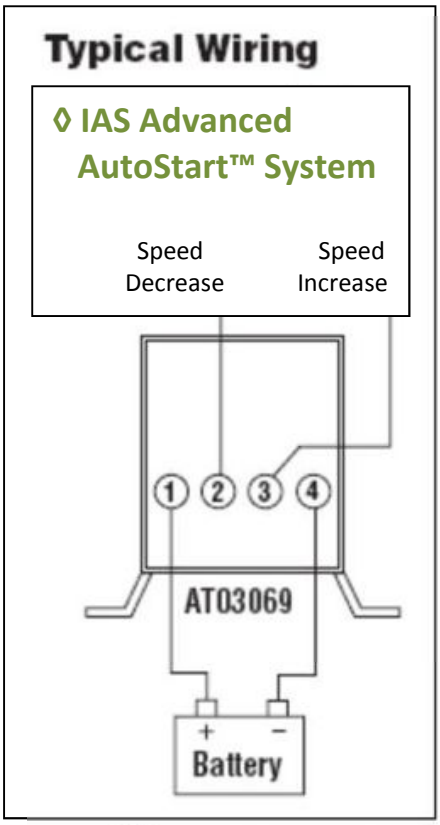
CAUTION: Extreme caution must be used in handling or working on or around the fuel tank. It must be worked on only in a WELL VENTILATED area. Keep all flame and hot materials away from it. Do not smoke while working on or around the tank. Avoid sliding or dragging the tank, or other actions which may cause a spark.

H) Murphy Throttle Actuator: Includes 4' throttle cable (installation by others).



Trouble Shooting the Actuator

- With the engine and 467 turned off so it can't start accidentally use a spare/loose wire to touch terminal "2" to "ground". You should see the lever move CCW and make sure it travels its full arc to disconnect itself from the internal limit switches.
-Perform the same test with wire touching Terminal "3" to ground and you should see the lever move "CW", hold it until it makes its complete arc.
- If it doesn't move in both directions completely, replace the actuator.



- Automatically adjusts engine speed to meet demands of discharge water pressure
- Speed changes are made slowly and smoothly.
- Saves fuel, engine wear, horsepower and labor.
- Perfect for warm-up and cool-down as programmed in the IAS 467 controller.
- 11-28VDC (negative ground)
- 25 inch pound torque rating
- Adjustable lever arm linkage for maximum flexibility
- 11-20 second travel time depending on voltage and force
- Mechanical support brackets (by others)

I) Discharge Water Pressure Transmitter: Murphy PXT (pre-09/12) & PXT-K [0-100 psi range]

PXT and PXT-K Series Pressure Transmitter Cabling Identification

The PXT Series Pressure Transmitters have been changed. Previous pressure transmitters in this series were identified as ***PXT Pressure Transmitters***. The newest version is the ***PXT-K Series Pressure Transmitters***. Identification of electrical cable color is NOT interchangeable between the two series of pressure transmitters.

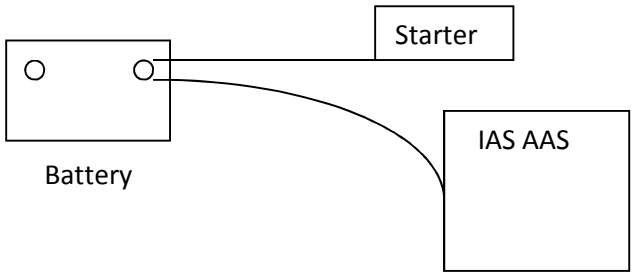
This document contains information to assist you in identifying the pressure transmitter unit you have and the correct electrical cable colors to avoid wiring mistakes.

PXT SERIES	PXT-K SERIES
	

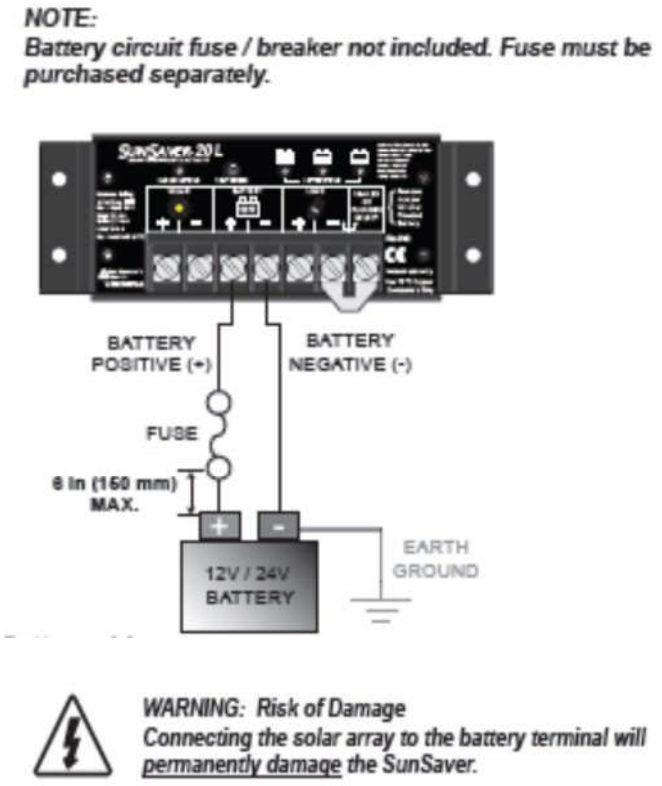
Cable Color	Connection	Cable Color	Connection
RED	POWER	RED	POWER
BLUE	SIGNAL	BLUE	N/A
BLACK	CASE GROUND	BLACK	SIGNAL
ORANGE, YELLOW, WHITE	N/A	ORANGE, YELLOW, WHITE	N/A
Installation Instructions	00-02-0475	Installation Manual	00-02-0840
Installation Diagram	05-08-0754	Installation Diagram	05-08-0763

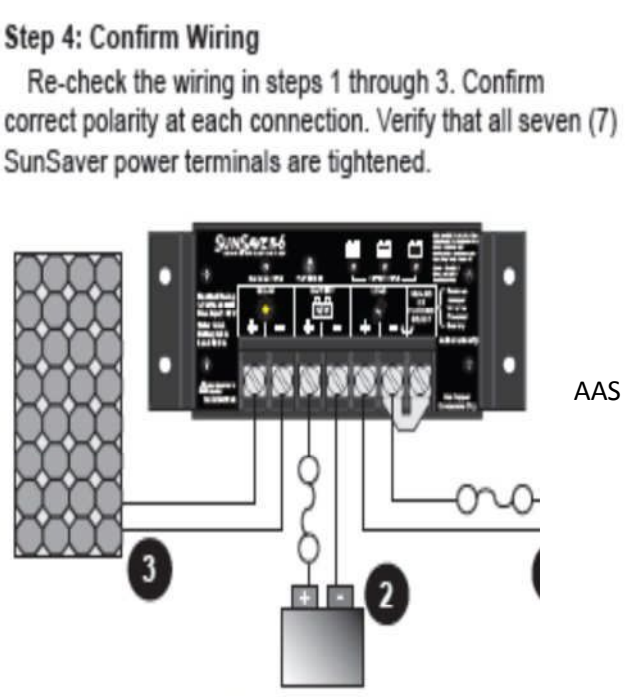
J) AAS Main Power Connection: The main power connection to the IAS AAS should be made last after you have checked all other wiring connections and confirmed the integral fast acting 5 amp glass fuse and 30 amp main fuse are both intact and installed.

It is recommended to break the noise-coupling path from alternators, and power droops during starting by connecting power directly from the battery posts. Use large gauge wire (12 awg recommended) when connecting to the charge controller.



You need to connect the 12 gauge wire from the battery posts directly to the IAS AAS charge controller positive and negative terminals as shown on the following page. See document 6 for the detail AAS wiring diagram.





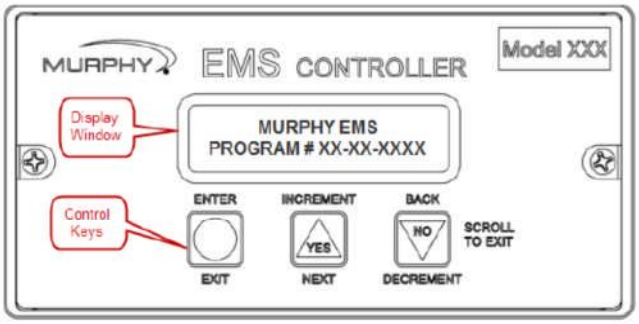
AAS

Figure 7. System Wiring Review.

II) IAS AAS 467 Programmable Controller (For detailed Operation Instructions see 467 IOM)

A) IAS 467 Controller Default Set Up Parameters and how to use the touch pad are shown in document 5 in the appendix of this manual. Please note, the default parameters shown are of the standard firmware version available at the time of printing. Please confirm the firmware version of your IAS 467 by looking at the main screen of the display and comparing it to version shown in Document 7. If you need a version to match what your IAS 467 is running please call the service department with your firmware version number and they can send it to you.

Please note, you most likely have modified the set up parameters to meet your application and if you have sent us your IAS 467 in to be upgraded you would have received a set up parameters report showing the custom/specific parameters that have been reentered back into the updated firmware. Also note, some old parameters don't apply to the new firmware parameter fields.



- The **"ENTER / EXIT"** button is used to confirm a set point, enter and leave a display and acknowledge alarms.
- The **"YES (INCREMENT)"** button is used to scroll up the display, to select messages and to increase values.
- The **"NO (DECREMENT)"** button is used to scroll down the display, to select messages and to decrease values. (Don't worry you can always go back and change it back!)

1) Each season and when you receive an IAS 467 from the service department, the first item to confirm is the time and date. To update the time and date you need to locate the correct fields in the "S" parameter section you can find in the "IAS 467 Default Set Up Parameters" (Document 5 in the appendix) by locating the "hours", "minutes" and "date". Once you locate the correct "S" Parameter field you press enter and then use the arrow keys to increase or decrease the value and press enter to preliminarily store the value(s). It is critical that after you make your changes and exit the "S" parameters you power cycle the IAS 467 by turning it on and off, either by using an external fuse holder near the battery (by others) or disconnecting the 25 pin cable connected on the center back of the IAS 467 inside the IAS AAS.

2) In the "IAS 467 Default Set Up Parameters" (Document 5 in the appendix) you are required to review all default and set values to confirm they are correct for your application. Due to the flexibility of our design it is possible to place an IAS 467 controller into any AAS and the settings may not be appropriate for the engine/pump it is placed into. With all new and updated IAS 467's they are

labeled with the pump/bog name as given to us. It is always in your best interest to confirm all data before you start up any of the systems.

C) Basic operation: Confirming the Gateway/Master radio wired to the IAS 467 Controller is reading the correct information from the field radio's and sensors you can scroll through the main display/dashboard by pressing the arrow keys. (Note, it moves one line at a time)

Dashboard

Main Two Line Display:
- -Firmware Version: (ie: IAS110712)
- -IAS Phone: 800-549-4551
- -Today's Date
- -Time (Military)
- -System/Engine Run Hours
- -Battery/System Voltage
- -*Current Engine RPM
- -Current Discharge Pressure
- -**Current "Crop" Temperature
- -Current Engine Oil Pressure
- -Current Engine Coolant Temperature
- -Selector Status (Auto/Hand)
- -"ST" – State *(not ready, panel ready, start dly, prime, crank on, crank off, recrank dly, warmup, at load, stop dly, cooldown, and shutdown)*
- -Current Soil Moisture if installed (lowest reading if multiple)

- It is good to verify the correct battery voltage
- -*It will show an rpm with the system off due to the sensor resolution and where it is positioned over the teeth of the flywheel. Electric driven pumps will display 0.
- -**You are looking for the field temperature reading from the field radio. This is very important and confirms your local radio network is working properly. Please note, if you are utilizing more than one field radio the IAS 467 Controller will display the lowest temperature reading which will be very similar to the value displayed as "Crop Temperature" on the IAS secure website for this pump/bog.

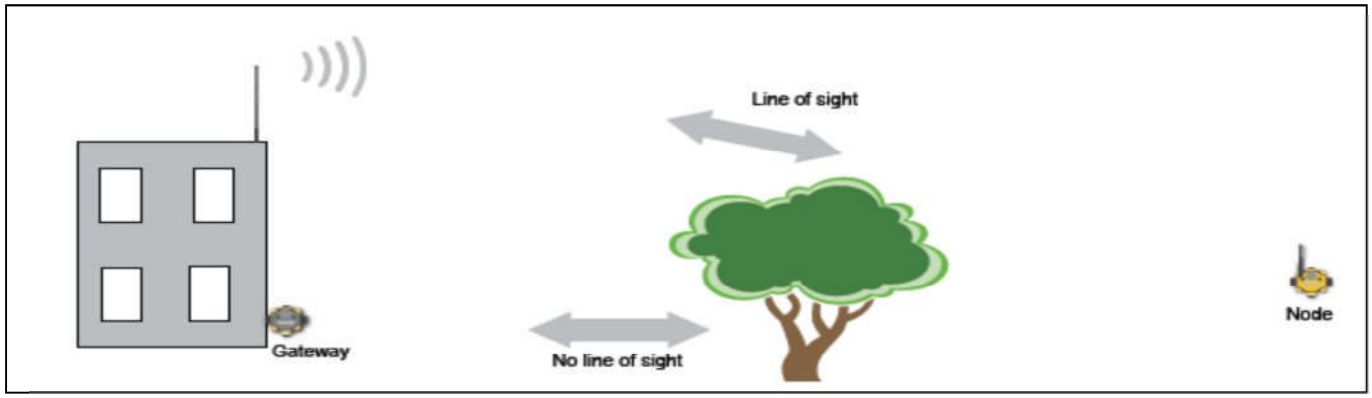
III) IAS AAS Communication/Master and Field Radio Guide

The IAS AAS solution requires the use of at least one local radio network comprised of a Master radio bound to up to eight (8) Field radios with measuring sensors. Typically temperature and/or soil moisture sensors are wired to the Field radios. End of Line (EOL) water pressure along with multiple other sensors can be connected to field sensors as well, contact your local iRep or the factory technical sales office to discuss your needs.

All new systems are designed and supplied with the new Banner more versatile Multi-Hop series of radios with Flex-Power. These radios minimize the loss of communication signals while being capable of operating from dual power sources. These features allow us to mount all field radios in our IAS solar charged bird house (SPBH). The SPBH improves the performance of the field radios minimizing the low power issues that have been experienced in the past in harsh weather conditions. The SPBH also provides additional weather and UV protection for the radios, substantially extending the life cycle of the field radio.

We will continue to support the Non-Multi-Hop radios as long as we can and recommend all field radios capable of Flex-Power be retro-fitted into a Solar Charged Bird Houses. The Multi-Hop and Non-Multi-Hop radios cannot be used in the same local network and have specific Master/Gateway radios. If you have any questions regarding what type of radios you have and what their capabilities are, please contact your local iRep or the Factory Technical Sales Office.

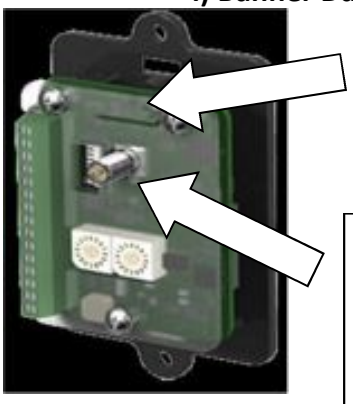
Please note, all radio networks use electronic technologies that require line-of-sight alignment between the field radio, the repeater if used, and the gateway/data/master radio. To insure the radio signals are transmitted most efficiently we recommend all field radios should be located a minimum of 6' above the ground. This will minimize radio wave absorption by plant material and surface moisture/thermal gradients.



A) Banner Data/Gateway/Master and Field Radios

1) Newest Banner Multi-Hop Radios supplied on all new systems.

i) Banner Data Radio/Master "PCB" Radio located inside the AAS enclosure.



Push button for binding to field radio's.

Antenna cable connection, which is passed through the enclosure bottom cable gland out to the remote mounted radio antenna.

- Model DX80LDR9M-HB1-17420

- This is the master radio that needs to be linked/bound (see binding instructions) to the field radios which communicate the measured sensor data to the programmable IAS 467 controller.

ii) *Optional* Gateway/Master Radio located outside the AAS enclosure.

Push button 2 for binding to field radio's.

Antenna cable connection, which is passed through the enclosure bottom cable gland out to the remote mounted radio antenna.

- Model DX80DR9M-H-11431
- This is the master radio that needs to be linked/bound (see binding instructions) to the field radios which communicate the measured sensor data to the programmable IAS 467 controller.
- This can be mounted inside the AAS enclosure or outside depending on the area protection.

iii) Field Radio located up to 3 miles (line of sight) from Data/Master Radio with measuring sensors hardwired (Temperature, Soil Moisture, End of Line Pressure, as stnd). It is recommended the all Field Radios are mounted 6' of the ground minimum to help insure minimal loss of the radio connection.

Push button 2 for binding to field radios.

- Model DX80DR9M-H1E-19478
- This is the field radio that powers the loop powered sensors and needs to be linked/bound (see binding instructions) to the data/gateway/master radio.
- The field radios need to be mounted 6' off the ground minimum and positioned to maintain line-of-sight to the data/gateway/master radio at all times.
- It is recommended to locate the field radio in a secondary weather proof enclosure such as our IAS Solar Powered Bird House.

2) Banner Non-Multi-Hop Radios

i) Banner Gateway/Data /Master Radio (RR1000) Radio located inside or outside the AAS enclosure.

Push button 2 for binding to field radios.

- Model DX80G9M2S-P
- This is the master radio that needs to be linked/bound (see binding instructions) to the field radios which communicate the measured sensor data to the programmable IAS 467 controller.
- This can be mounted inside the AAS enclosure or outside depending on the area protection.

ii) Banner Field Radio located up to 2 miles (line of sight) from Gateway/Master Radio with measuring sensors hardwired (Temperature, Soil Moisture, wired temperature)

Push button 2 for binding to field radios.

- Model DX80
- This is the field radio that powers the loop powered sensors and needs to be linked/bound (see binding instructions) to the data/gateway/master radio.
- The field radios need to be mounted 6’ off the ground minimum and positioned to maintain line-of-sight to the data/gateway/master radio at all times.
- It is recommended to locate the field radio in a secondary weather proof enclosure such as our IAS Solar Powered Bird House.

Please note, many of your small body field radios have been updated to “long body” radios to improve performance and the exact radio model should be written on the label affixed to the internal black plastic electronics cover.

3) Radio Binding Process

We are assuming the radios have been previously configured for the application with proper jumper and DIP switch settings. The rotary switch pair on the front/top of the radio should be set to 0/1 for Multi-Hop radios and 0/0 for Non-MultiHop radios. Refer to your IAS Banner set up sheet supplied with your order. Radios will not communicate until they are bound and it ensures the radios only exchange data within their designed wireless network. Due to the IAS AAS system being an integral part of your farm management plan, it is recommended that the field radio specific high power batteries be replaced annually before each growing season which can be ordered through your IAS iRep.

i) MultiHop ***(DX80DR)*** ***and Non-MultiHop*** ***(DX80[G of N])*** *radio binding procedure:*

Power up the Data/Gateway/Master (RR1000) radio, wait a minute for it to power up and finish an operational cycle. Place it in binding mode by pressing the right button on the front/top of the radio above the #2 LED 3 times in succession. Look for "binding" on the display and LED 1 (left) and LED 2 (right) should alternately flash red while in binding mode. It will stay in binding mode until you take it out of binding mode.

Place a new IAS high power battery into the field radio(s) [FR] [TR1000] (make sure the radios in a particular network are either all MulitHop or Non-MultiHop) and make sure the temperature element is wired per the temperature element wiring instructions. Try to keep at least 10 feet between all radios in the network. With the field radios with push buttons, place the FR in binding mode by pressing the right button above the #2 LED 3 times in succession. You will see "binding" if the radio has a display and the two LED's will flash alternately red.

When bound it will display "bound" and both red LED's flash simultaneously four times. The FR will take itself out of binding mode and will display "run" and cycle normally.

Now you must take the data/gateway/master radio out of binding mode by pressing the right button two (2) times in succession and it will stop flashing and it will display run.

ii) Non-MultiHop Radios ***<u>without</u>*** ***Push Buttons*** *Binding Procedure:*

Begin the binding process with the data/gateway/master radio as explained above. With the battery powered field radio without pushbuttons, remove/unscrew the circular plastic window, inspect the O-ring and replace if broken or cracked. You will need a small screw driver to turn both rotary

switches to “F”/”F” and it will go into binding mode, and the LED lights will follow the same sequence when bound.

Now you must take the data/gateway/master radio out of binding mode by pressing the right button two (2) times in succession and it will stop flashing and it will display run.

MultiHop Verify Communications via the visual LED indicator

LED 1	LED 2	Status
Green ON, then Green flashing		Slave/repeater: entering RUN mode
Green flashing		Master: in RUN mode Slave/repeater: synchronized to the parent radio
Red solid		Slave/repeater: detected parent radio and searching for other parents within range
Red flashing		Slave/repeater: searching for a parent radio
	Yellow solid	Slave/repeater: selects a suitable parent Master: power applied
	Yellow flashing	Slave/repeater: serial data packets transmitting between radio and its parent Master: serial data packets transmitting between master and its children
	Red solid	Slave/repeater: synchronizing to selected parent radio
	Red flashing	

Non-MultiHop (Gateway=Master, Node = Field Radio) Verify Communications via the visual LED indicator

	Gateway		Node	
Status	LED 1	LED 2	LED 1	LED 2
Power ON or RF Link OK	Green ON		Green flash (1 per sec)	
System Error	Red flash	Red flash	Red flash	Red flash
RF Link Error				Red flash (1 per 3 sec)
Modbus Communication Active		Yellow flash		
Modbus Communication Error		Red flash		

4) Radio Trouble Shooting

i) MultiHop (DX80DR-): Read the number that follows the DADR designation on the Data/Gateway/Master radio and it should match all bound field radio number that follows the PADR.

Scroll the IAS 467 display using the arrow keys until the temperature field is shown. The value shown will be the measured value from the field radios temperature element. Note, the value shown will be the coldest temperature of all the networked field radios with temperature elements if you have more than one radio with temperature sensors.

ii) Non-MultiHop (DX80N9-): Read the number that follows the DADR designation on the Data/Gateway/Master radio and it should match all bound field radio number that follows the PADR.

Remove the circular plastic screw on cover to expose the two rotary switches of the Data/Gateway/Master radio. Turn the right rotary dial to match the field radio (node) you would like to display (ie: 0/1 will read the radio with its rotary switches set at 0/1). The master radio will show the node you "dialed" in (ie: Nod 1) and then sequence through the read positions. The temperature reading of most field radios will be displayed after either I/O 6 or I/0 5. The temperature will be displayed in degrees C if you have not factory updated, or degrees F if you have updated the radios. This verifies the network connection and that the temperature measurement is being made.

Scroll the IAS 467 display using the arrow keys until the temperature field is shown. The value shown will be the measured value from the field radios temperature element. Note, the value shown will be the coldest temperature of all the networked field radios with temperature elements if you have more than one radio with temperature sensors.

5) IAS Solar Powered Bird House (SPBH)

The IAS SPBH extends the life of the field radio with FlexPower by allowing the radio to be powered from two batteries. The enclosure provides a secondary weather resistant enclosure protecting the field radio from the weather, sun and sprinkler activity. It also provides some security by hiding the radio from vandals.

[Additional Information Pending]

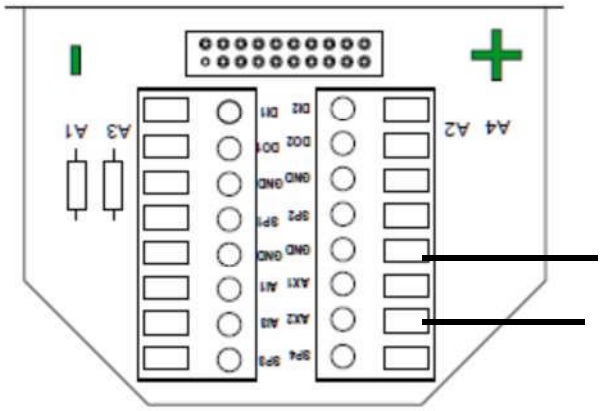
IV) IAS Field Radio Mounted Sensors

A) IAS Temperature Element

New systems are supplied with a high precision temperature element with a 1/8" diameter stainless steel sensing tip. The older systems were supplied with a larger 7/32" diameter stainless steel sensing tip. The table below shows the wiring differences between the new and old sensors and the connection terminals that should be used for the MultiHop and Non-MultiHop Field Radios.

Radio Type	Radio Terminal Label /Description	Old Temperature Probe Wire Color	New Temperature Probe Wire Color
MultiHop	AX2 / Signal	White	Red
	GND / Ground	Black	White
Non-MultiHop	TH1 / Signal	White	Red
	GND / Ground	Black	White

Typical MultiHop



B) IAS Soil Moisture Sensor (Tensiometer)

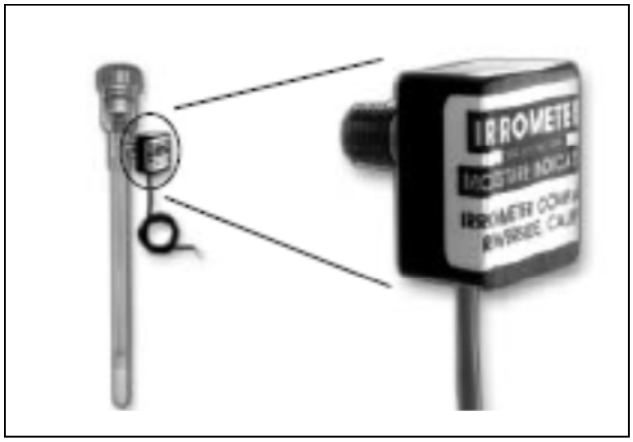


Figure 3 Soil Moisture Sensor (Tension)

Tensiometer Specifications:

- Butyrate Body, 1/2" diameter ceramic tip, neoprene stopper, ABS weatherproof transmitter enclosure
- 6" sensor standard (other depths available up to 60" dictated by irrigation method and root depth)
- Replaceable threaded White Ceramic tip with O-ring seal
- Factory calibrated, no field calibration required
- Integral refillable reservoir sufficient for several irrigation cycles
- 4-20mA 12-24VDC loop powered transducer
- Calibrated Range 0 – 93 kPa (Centibars)
- 32°- 150°F operating temperature range
- Includes IAS @lert™ Family "Smart Cable" with RJ11 quick connect jack total length 20' (up to 100' cable lengths available)

Description:

Our *Soil Moisture Sensor* directly measures the soil water tension (or matric potential) in "Centibars" indicating the physical forces at work which have to be overcome for the plant to move water into its root system. The soil water tension is the energy (vacuum) applied to the soil by the plant as it draws in water for nutrition. The Tensiometer acts as a dummy root, allowing the soil moisture to interact with the instrument through the porous ceramic tip. Soil water tension outside of the instrument tries to remove the water from it, which creates a measurable tension inside the column. This tension is read with either a mechanical gauge or a transducer attached to the instrument. While this is the most accurate and proven method available, there is some maintenance required periodically to keep them full of water, and they must be removed from the field during the winter months to avoid freezing.

Use the following readings as a general guideline:

- **0-10 Centibars** = Saturated soil
- **10-30 Centibars** = Soil is adequately wet (except coarse sands, which are beginning to lose water)
- **30-60 Centibars** = Usual range for irrigation (most soils)
- **60-100 Centibars** = Usual range for irrigation in heavy clay
- **100-200 Centibars** = Soil is becoming dangerously dry for maximum production. Proceed with caution!

	Morning tension	Midday tension	Water table level
	--------cbars--------		in. below
Too wet	0 to 2	0 to 2	0 to 6
Adequate	>2 to 5	>2 to 10	>6 to 18
Too dry	>5 to 80	>10 to 80	>18

Table 1. Critical levels of tension for irrigation scheduling on cranberry beds

"A tensiometer reading in the 2 to 6 cbar range should be expected as long as the water table is between 8-18 inches" The chart above shows possible adequate ranges which may vary with your bog/marsh design and soil types.

[per the UMass Cranberry Chart Book 2011]

“Perhaps the most important soil moisture reading is the difference between today's reading and that of 3 – 5 days ago. That is to say, how quickly is the reading going up? A slow increase means the soil is drying out slowly. But a big jump means the soil is losing water very rapidly. By analyzing such trends in the readings, you will determine WHEN to irrigate. A graph of readings over time makes it easier to see the trends, thereby making interpretation simpler. Your own situation may be unique because of differences in crop, soils and climate. You can use the logged data shown on the website to generate a report with a graph that you can use to interpret historical information which will allow you to more accurately irrigate your crop.”

Location/Operation:

The sensor location is dependent on many factors: how you will be using the measured data, soil type, the heterogeneity within the soil, drainage, the type, coverage and orientation of your sprinkler system, the geometry of your growing area, the bog/marsh dyke configuration, capillary rise/water table level, bed contour, etc. As with the placement of the temperature sensors needing to be at the coldest part of the bog/marsh to provide the earliest warning for frost protection you want to locate the soil moisture sensor where it will give you a repeatable indication of soil moisture you can use to control the irrigation system to prevent plant stress. See the following guide:

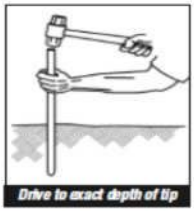
> **“Monitor soil moisture in the appropriate area of the bed.** “Perhaps the most important soil moisture reading is the difference between today's reading and that of 3 – 5 days ago. That is to say, how quickly is the reading going up? A slow increase means the soil is drying out slowly. But a big jump means the soil is losing water very rapidly. By analyzing such trends in the readings, you will determine WHEN to irrigate. A graph of readings over time makes it easier to see the trends, thereby making interpretation simpler. Your own situation may be unique because of differences in crop, soils and climate. You can use the logged data shown on the website to generate a report with a graph that you can use to interpret historical information which will allow you to more accurately irrigate your crop.”

Installation/Care:

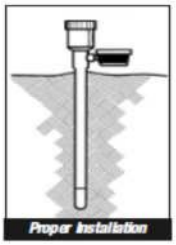

Soaking Tips

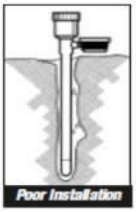
Step 1 – Preparation — Take the plastic wrappers off the tips and fill IRROMETERS with clean water. ***Do not handle the ceramic tip.*** Leave the instrument cap OFF and place the tip of the IRROMETER in clean water overnight (use clean non-rusting glass jar, plastic bucket or basin). Water in the instrument will drain through the tip and this operation may be repeated as often as time permits. After soaking and you are ready to install, protect the tip from air drying with wet paper towels or the plastic tip bag while transporting to the installation site.


Pushing on cap


Drive to exact depth of tip

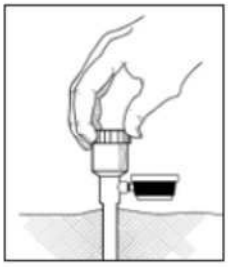
Step 2 – Installation — Drive a hole in the ground with an IRROMETER Installing Tool or with a standard piece of 1/2 in. pipe. Standard 1/2 in. pipe will make a hole for an exact fit. ***Install in the root zone of the crop.*** Insert IRROMETERs in the hole, leaving at least 1 in. of space between the bottom of the gauge and ground surface. Be sure instrument is “seated” firmly in the bottom of the hole.


Proper Installation


Poor Installation


Air removal


Breaking the air lock




Release valve

Step 3 – Servicing — Fill all IRROMETERs with a diluted solution of IRROMETER fluid (1 scant capful of concentrate to 1 gallon of water). Fill the IRROMETERs to the circle on the reservoir. Tap top of the IRROMETER with the palm of your hand to relieve any air lock. Take the vacuum pump and extract air from the instruments by pulling a vacuum of 80–85 cb (kPa) as registered on the gauge. Leave pump on the instrument for 10–15 seconds to allow air to rise and then release vacuum gently. Refill if necessary and replace cap until stopper comes in contact with bottom of the reservoir, then continue ***tightening for 1/4 turn only.*** Repeat pumping as above each time, after reading, for three or four times to improve sensitivity.

Wiring:

Radio Type	Radio Terminal Label /Description	Irrometer Soil Moisture Probe
MultiHop	AI1 / Signal	Black
	SP3 / Signal	Red
Non-MultiHop	AI1 / Signal	Black
	SP1 / Signal	Red

C) End of Line (EOL) Pressure Transmitter

[Information Pending]