

Accurate

TECHNOLOGY INC.

Linear Digital Measuring Systems

ProRF™
Encoder
Transmitter &
Receiver



User Manual

WARRANTY

Accurate Technology, Inc. warrants the ProScale Systems against defective parts and workmanship for 1 year commencing from the date of original purchase. Upon notification of a defect, Accurate Technology, Inc., shall have the option to repair or replace any defective part. Such services shall be the customer's sole and exclusive remedy. Expenses incidental to repair, maintenance, or replacement under warranty, including those for labor and material, shall be borne by Accurate Technology, Inc. (Including freight or transportation charges during the first 30 days).

Except as expressly provided in this warranty, Accurate Technology, Inc. does not make any warranties with respect to the product, either expressed or implied, including implied warranties of merchantability or fitness for a particular purpose, except as expressly provided in this agreement.

Accurate Technology, Inc. shall not be liable for any special, incidental, or consequential damages or for loss, damage or expense directly or indirectly arising from the customer's use of or inability to use the equipment either separately or in combination with other equipment, or for personal injury or loss or destruction of other property, or from any other cause.

To request repair work, (either warranty qualified parts or not) contact Accurate Technology, Inc. directly by phone, fax, or e-mail. A [Returned Merchandise Authorization](#) (RMA) number is required before returning a product for repair.

FCC NOTICE

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the Receiver.
- Connect the equipment to an outlet on a circuit different from that to which the Receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

Operation with non-approved equipment is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of the manufacturer could void the user's authority to operate this equipment.

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FCC Identification

Contains FCC ID: OUR-XBEE

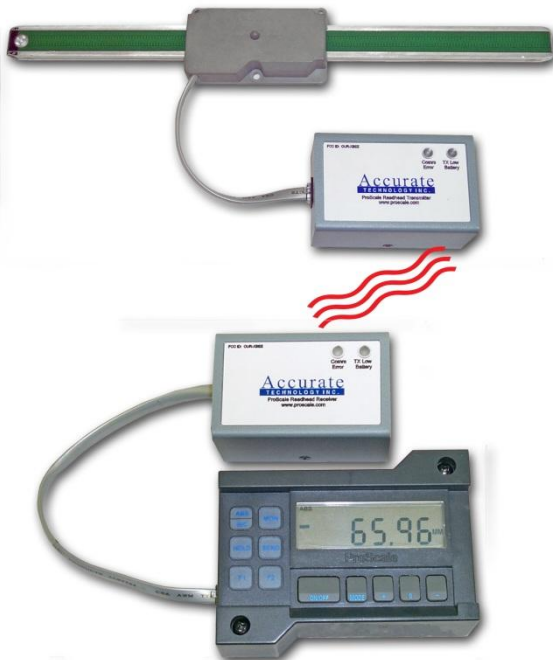
The enclosed device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

- (i) This device may not cause harmful interference and
- (ii) This device must accept any interference received, including interference that may cause undesired operation.

What This Manual Contains

This manual includes Set-up and Operation information for:
[ProRF Encoder Transmitter / Receiver.](#)

The ProRF Encoder Transmitter/Receiver pair is designed to operate with ProScale Encoders and Readouts that are placed at distances greater than 30 foot apart or that cannot be physically connected by a standard Encoder cable.



Introduction

These units are designed to be used as a wire replacement system between a ProScale™ Digital Readout (DRO) and Encoder.

Typical applications for the RF system include situations where it would be difficult and/or expensive to route cabling between the DRO and the encoder. Examples include:

- Encoder cable lengths over 30 feet.
- Installations where the encoder and DRO are located in separate rooms and/or buildings.
- Applications involving excessive motion of the encoder cabling.
- Applications that would require the encoder cable being installed in the same conduit/wire way with high voltage cables over long distances (greater than 20 feet).

The RF system is easy to install and requires minimum maintenance. It is backwards compatible with all previously manufactured ProScale measurement systems..

The system utilizes RF transceivers with the ability to provide two way communications. This helps to guarantee the reliable transfer of position information and provides remote annunciation of transmitter low battery conditions and encoder status.

The RF system incorporates IEEE standard 802.15.4 radio modules operating at 2.4GHz which yield reliable data communications with worldwide acceptance. Typical operating range is from 50 to 100 feet (15 to 30 meters) depending on environmental conditions.

Receiver power is derived from a 6 to 18 volt DC power supply and the transmitter is powered from one or two 3 volt lithium (123) battery OR external 9 VDC power supply. Average battery life is from 3 to 9 months depending on usage.

NOTE: This RF system is designed for intermittent data transmission of position information. Transmitter battery life is directly proportional to the amount of data transmissions generated. Do not use this RF system in applications where the ProScale linear measuring system is being used in continuous operation.

Specifications

Encoder Transmitter

- Enclosure: 2.94" L x 1.85" W x 1.4" H (75mm x 47mm x 36mm).
- Power: One or two 3 volt lithium battery, EL123 or equivalent OR 9 volt DC power supply.
- Current Consumption: 140uA standby, 45mA active.
- Input: ProScale incremental, absolute or high speed encoder.
- Indicators: Communications Error LED, Low Battery LED.
- Average Battery Life: 3 to 9 months depending on service.
- RF power output: 1 mW (0 dBm).
- Frequency: 2.4 GHz ISM band using spread spectrum technology.
- Typical RF range: 50 to 100 feet (15 to 30 meters) depending on environmental conditions.

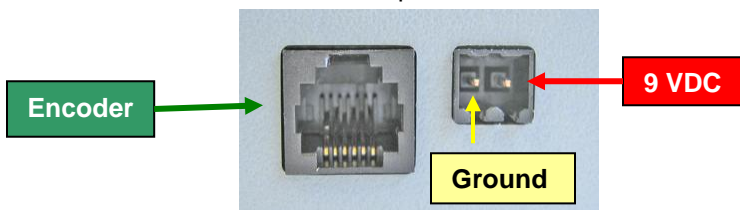
Readout Receiver

- Enclosure: 2.94" L x 1.85" W x 1.4" H (75mm x 47mm x 36mm).
- Power: 6 to 24 volts DC from a regulated and filtered power supply (100-240VAC in – 15VDC out power supply included).
- Current Consumption: 55 mA.
- Output: DRO interface supporting Mitutoyo Digimatic SPC format.
- Indicators: Message Received LED, Transmitter Low Battery.
- RF sensitivity: -92 dBm.
- Frequency: 2.4 GHz ISM band using spread spectrum technology.

NOTE: The actual range of the RF system is dependent on many environmental factors. Please read through this manual BEFORE completing the installation. If you are unsure of the range capabilities of the system for your application, do not permanently mount the transmitter and receiver prior to operational testing. This will allow easier relocation of either unit in the event that the desired range is unattainable from the desired mounting locations.

Transmitter Connection

Connect the Encoder cable to the transmitter. If you are using battery operation, connections are now complete.



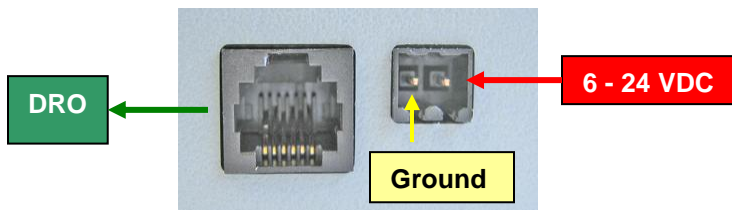
An optional 9 volt DC power supply can be used instead of battery power if desired. To use an external power supply, connect the power supply to the supplied un-pluggable terminal strip, observing polarity. **The terminals are identified by +9V and GND on the transmitter top cover label.** The shunt on jumper JP1 must be set to EXT.

NOTE: The terminal strip plug is rotated 180 degrees when it is inserted into the receiver. Be sure to verify the correct polarity PRIOR to applying power.

Receiver Connections

Connect the two position power plug to a power supply providing 6 to 24 VDC. . If using the provided plug-in power adapter, the wire with the white stripe or trace is positive. Minimum current requirement is 100mA. **The terminals are identified by +24V and GND on the receiver top cover label.**

NOTE: The terminal strip plug is rotated 180 degrees when it is inserted into the receiver. Be sure to verify the correct polarity PRIOR to applying power.



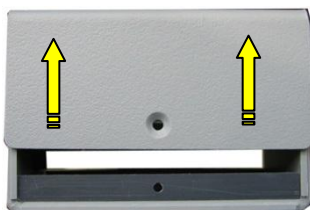
-
1. Turn on (or plug in) the power supply. Both LED indicators on the receiver will illuminate for 1 second to indicate proper operation.
 2. Connect the supplied modular cable between the DRO and the Receiver.

At this point, the DRO will display “no Enc”. This message may continue to be displayed until the receiver and transmitter have been configured and the encoder position is initially changed.

Channel Configuration

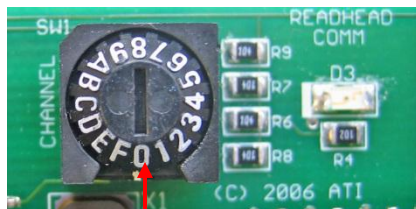
Prior to operation, the user can optionally set the RF communications channel to a value other than the factory default (0). **Unless there are other ProScale Wireless Encoder systems in operation in the area, the factory default channel setting should be used.**

To access the channel selectors remove the enclosure screws located on each side of the case from the Transmitter and the Receiver. Slide off the top covers vertically from the bottom covers to expose the circuit boards and selector switches.



To change the operating RF channel, use a small flat blade screwdriver and rotate the channel selector until the desired channel number is indicated on the switch.

When changing the RF channel number, BOTH receiver and transmitter must be set to the same operating channel.



MUST BE SET TO THE SAME VALUE

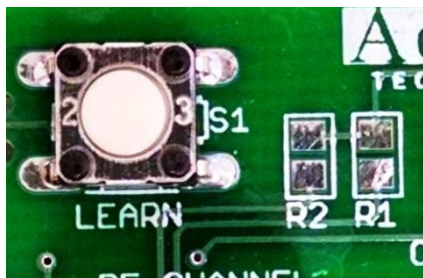
Associating the Transmitter and the Receiver (Learning)

NOTE: If you ordered this product as a complete system (not as individual Receiver or Transmitter), the following procedure has been completed for you at the factory and does not need to be repeated - unless the new components are to be used with other Receivers or Transmitters.

On the receiver, open the jumper on JP2 by lifting it off the pins.
(JP2 is located next to the text: "OPEN FOR LEARN".)



Momentarily press S1 on the transmitter circuit board labeled **LEARN**.



If the association is successful, LED D3 COMM will illuminate briefly on the receiver. The position of the encoder can now be changed and the DRO will reflect the position update.

Reinstall the jumper across both pins of JP2 on the receiver. This prevents another encoder transmitter from being accidentally associated.

Testing

After transmitter and receiver have been successfully associated, the position of the Encoder will be shown on the DRO attached to the receiver.

If a reliable RF communications link exists, the COMM ERROR LED (LED1) **should not** illuminate on the *transmitter*



but the MESSAGE LED (D3) **should pulsate** on the *receiver* whenever the encoder position is changed.

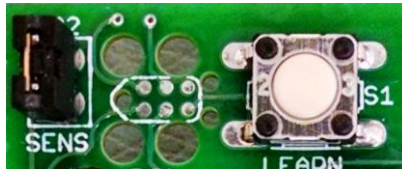


If the COMM ERROR LED (LED1) on the *transmitter* pulsates, it indicates that one or more RF data messages are not being sent successfully to the receiver. If this occurs more than once for every 50 messages, the location of the transmitter and/or receiver may need to be changed.

Encoder Sensitivity

The transmitter is programmable for the amount of initial change in position detected by the encoder before RF transmission occurs. This “window of motion” allows for small amounts of motion, such as from machine vibration, to be detected without frequently sending RF signals to the receiver. This helps to increase transmitter battery life and minimizes RF communications.

Jumper JP2 on the transmitter, by default, is closed. In this mode, the amount of position change detected from the last “resting” position must be at least $\pm .0015$ ” (.04mm). If JP2 is open (no jumper installed) the amount of position change detected must be at least $\pm .009$ ” (.23mm).



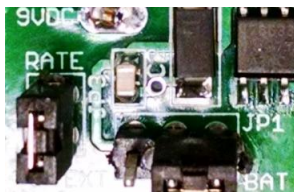
Once a position change greater than the programmed threshold has occurred, all detectable motion changes will cause RF messages to be sent. After the encoder stops detecting position changes for .75, the transmitter then again engages the “window of motion” tolerance.

If your application contains large amounts of vibration during normal operation, consider using the larger motion tolerance to extend battery life. Otherwise, the default jumper setting (closed) should be adequate.

Transmission Rate

Once the system has started to transmit, messages are sent at the update rate of the encoder for the duration of motion. For standard Absolute and Inductive Incremental encoders, the rate is about 10 times per second. For High Speed Absolute encoders, the rate is about 20 times per second.

In situations where extended battery life is preferred over the update rate of the readout, the user can open JP3, RATE jumper. This reduces the transmission rate to half of the normal rate and increases the battery life by approximately 2x.

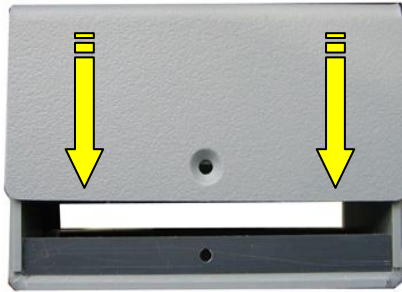


Completing the Configuration

This product is supplied with Industrial strength Double Faced Tape to facilitate easy installation/placement of the Transmitter and Receiver units. If a more permanent installation is desired, proceed to

Section 3: Installation.

Otherwise the covers can be reinstalled. Be sure to orient the covers in the same direction as they were removed and slide the top cover down over the bottom cover until it is firmly in place. Install the two screws, one on each side of the housing.



Your system is now ready for use.

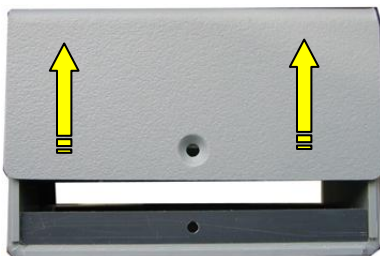
This product is supplied with Industrial strength Double Faced Tape to facilitate easy installation/placement of the Transmitter and Receiver units. If a more permanent installation is desired follow the instructions in this section.

WARNING: Be sure to touch an electrically grounded object prior to disassembly of system components to dissipate any static electric charge.

NOTE: These instructions pertain only to the installation of the Wireless Encoder Receiver/Transmitter system. It assumes that the ProScale Measuring System or other devices used with this product are already installed. See the ProScale/Other manuals for installation of those respective products.

Receiver Installation

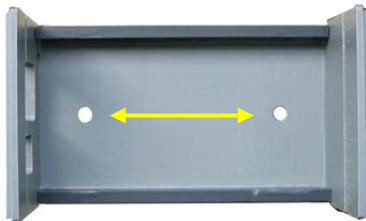
If the Receiver cover had not been removed prior to this step, remove the two enclosure screws, one located on each side of the case. Slide off the top cover vertically from the bottom cover to expose the circuit board. Unplug the 2 position power input terminal strip plug from the receiver module and set it aside.



Gently push outward on the rear panel of the bottom enclosure, opposite the modular connector, lifting the rear edge of the circuit board up and out. Set the circuit board aside on a non-conductive surface.



Two mounting holes are located in the base of the bottom enclosure that accept #6 (or M3) machine screws. Secure the bottom enclosure to a flat vertical mounting surface. The mounting location chosen should be as elevated as possible to provide the greatest RF signal range. The actual mounting location will typically be limited by the length of the cable that connects the Receiver to the Digital Readout.

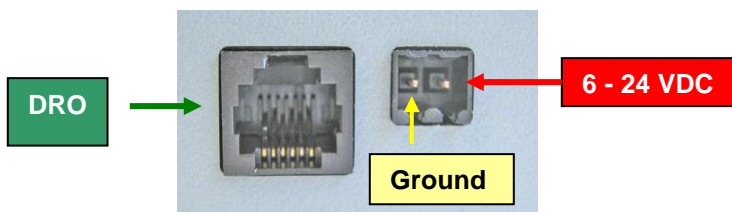


Re-install the receiver board into the bottom enclosure by inserting the modular connector end in first. Note the slot in both the front and back of the housing to accept the circuit board. Gently push outward on the back of the enclosure while fitting the circuit board into the slots. Be sure the modular and power connectors are protruding completely through the enclosure wall. Leave the top cover off of the receiver until configuration is complete.



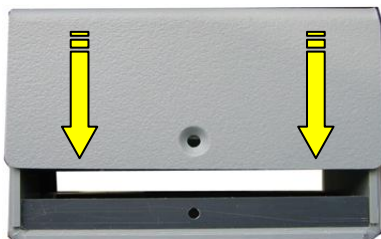
Connect the two-position power plug to a power supply providing 6 to 24 VDC. . If using the provided plug-in power adapter, the wire with the white stripe or trace is positive. Minimum current requirement is 100 mA. **The terminals are identified by +24V and GND on the receiver top cover label.**

NOTE: The terminal strip plug is rotated 180 degrees when it is inserted into the receiver. Be sure to verify the correct polarity PRIOR to applying power.



Turn on (or plug in) the power supply. Both LED indicators will illuminate for 1 second to indicate proper operation. Connect the provided modular cable between the Digital Readout and the receiver.

After all testing has been completed, the top cover can be reinstalled. Be sure to orient the cover in the same direction as it was removed and slide the top cover down over the bottom cover until it is firmly in place. Install the two screws, one on each side of the housing.

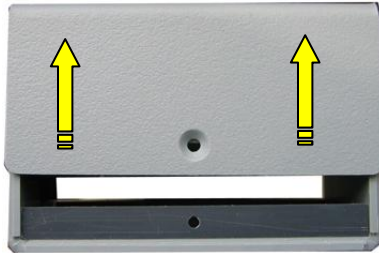


Transmitter Installation

WARNING: Be sure to touch an electrically grounded object prior to disassembly of system components to dissipate any static electric charge.

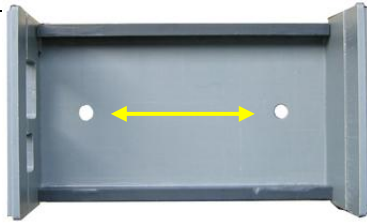
NOTE: These instructions pertain only to the installation of the Wireless Encoder Receiver/Transmitter system. It assumes that the ProScale Measuring System or other devices used with this product are already installed. See the ProScale/Other manuals for installation of those respective products.

If the Transmitter cover had not been removed prior to this step, remove the two enclosure screws, one located on each side of the case. Slide off the top cover vertically from the bottom cover to expose the circuit board. Unplug the cable from the Encoder.



Gently push outward on the rear panel of the bottom enclosure, opposite the modular connector, lifting the rear edge of the circuit board up and out. Set the circuit board aside on a non-conductive surface.

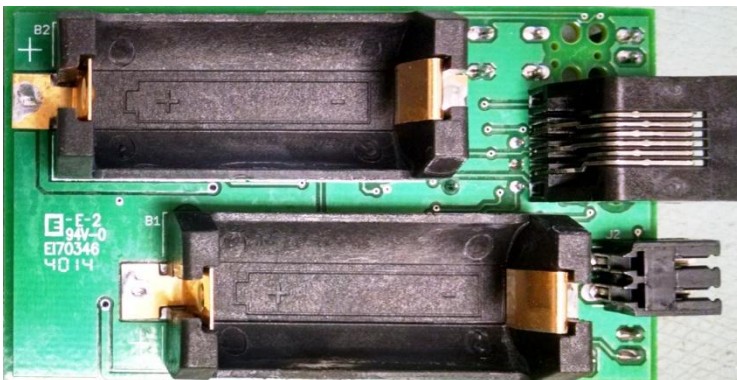




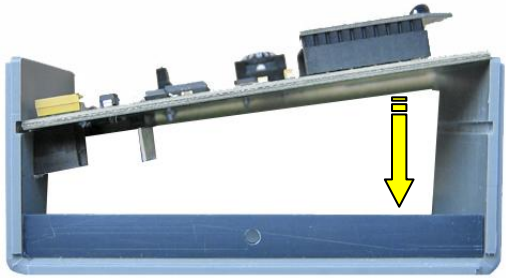
Two mounting holes are located in the base of the bottom enclosure that accepts #6 (or M3) machine screws. Secure the bottom enclosure to a flat mounting surface. The mounting location should be as elevated as possible to maximize RF signal range. This will typically be limited by encoder cable length.

Due to regulations governing the transport of Lithium batteries your system **MAY or MAY NOT** have the batteries already installed. If the batteries are not installed, perform the following:

Remove the battery retaining rings on the transmitter circuit board by gently lifting one end of the locking ring from the base of the battery holder. Insert the lithium batteries into the holder observing the correct polarity. A '+' and '-' symbol are molded into the plastic holder. Improper battery installation will result in no transmitter operation and excessive current drain from the battery. When properly installed, the two LED indicators will momentarily illuminate for 1 second. Re-install the battery retainer rings by sliding it over each battery and make sure the ends latch to the battery holder.

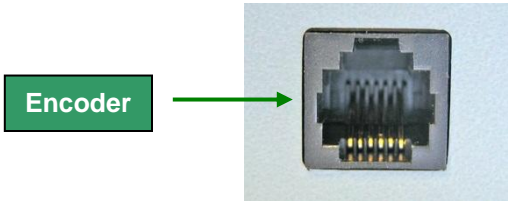


Re-install the transmitter board into the bottom enclosure by inserting the modular connector end in first. Note the slot in both the front and back of the housing to accept the circuit board. Gently push outward on the back of the enclosure while fitting the circuit board into the slots. Be sure the modular connector protrudes completely through the enclosure wall. Leave the top cover off of the transmitter until configuration is complete.

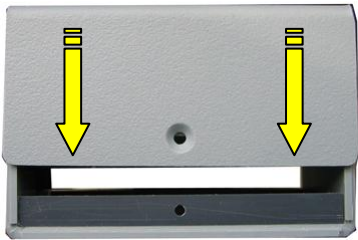


(Shown without battery for clarity)

Connect the Readhead Encoder cable to the transmitter. Installation is now complete.



After all testing has been completed, the top cover can be installed. Be sure to orient the cover in the same direction as it was removed and slide the top cover down over the bottom cover until it is firmly in place. Install the two screws, one on each side of the housing.

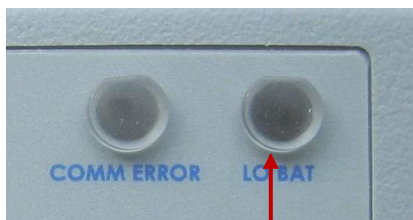


The operation of the wireless encoder system is designed to be transparent to the user. The ProScale system will operate just as it normally would if the encoder cable were plugged directly into the DRO.

Battery Replacement

The transmitter monitors the status of the battery voltage whenever a transmission occurs. When the battery starts to deplete to a low level of operation, the transmitter will flash its LO BAT LED. In addition, a message is sent to the receiver causing its TX LO BAT LED to flash. The user should replace the transmitter batteries as soon as possible. EL123 (or equivalent) 3-volt lithium batteries can be found at most hardware or department stores.

Transmitter

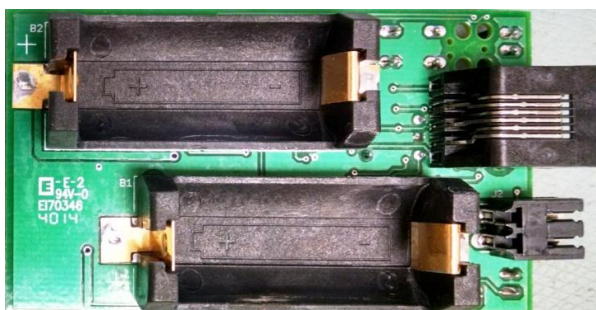


Receiver



LOW BATTERY

Remove the battery retaining rings on the transmitter circuit board by gently lifting one end of the locking ring from the base of the battery holder. Insert the lithium batteries into the holder observing the correct polarity. A '+' and '-' symbol are molded into the plastic holder. Improper battery installation will result in no transmitter operation and excessive current drain from the batteries. When properly installed, the two LED indicators will momentarily illuminate for 1 second. Re-install the battery retainer rings by sliding it over each battery and make sure the ends latch to the battery holder.



Thank you for choosing a ProScale Product,

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