Accurate
TECHNOLOGY INC.
Linear Digital Measuring Systems

ProRF™

Receiver

TRANSMITTER ID

Accurate Technology Inc.

LEARN

POS MSG

LOW BAT

SUPERVISORY

User Manual

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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.

Table of Contents

SECTION 1   GENERAL INFORMATION

What This Manual Contains

This manual includes Set-up and Operation information for:
ProRF Universal Receiver

The ProRF Universal Receiver is designed to operate with:

ProRF SPC Transmitter   ProRF Encoder Transmitter

This manual DOES NOT include Set-up and Operation information for either of the Transmitters pictured above.

For Set-Up and Operation information of ProRF Transmitters refer to:
http://www.proscale.com/Manuals.htm

Introduction

The ProRF Receiver was designed to be used in conjunction with [ProScale® measuring systems](#) and a wireless [ProRF SPC Transmitter](#) or [ProRF Encoder Transmitter](#).

The purpose of this system is to provide a **two-way** wireless communication channel between any ProScale [Digital Readout](#) with a 10 pin SPC output and a computer or other device having an RS232 or USB communication port..

The Receiver provides RS-232 or USB serial data in standard ASCII text format and may be configured for various output formats. In addition, the Receiver will support standard baud rates from 2400 to 57600 bits per second.

ProRF Receiver features

- 2.4 GHz radio transceiver providing two-way RF communications using the industry standard 802.15.4 communications protocol.

- 2 digit LED readout for transmitter identification.

- Six output formats to support various data collection requirements.

- Programmable data field delimiter character.

- Programmable line terminator.

- Record start sentinel character enable/disable.

- Character echo enable/disable.

- Baud rate selection.

- Fifteen selectable RF channels for interference free operation

- Typical signal range: 50' to 100' depending on the environment.

- Receiver configuration is stored in non-volatile memory. .

NOTE: This Receiver is only compatible with ProRF SPC and ProRF Encoder Transmitters. It CANNOT be used with older ProScale Digital Readouts with built-in antenna.

Specifications

Size: 3.4 x 5.5 x 1.5 inches (W x L x H)

Power: RS232: 5-15 VDC
                     USB: none

Input: RF Data from ProRF Encoder Transmitter
                     RF Data from ProRF SPC Transmitter.

Output: RS232 or USB

# of Inputs: 8

# of RF Channels: 15

Range: 50' to 100' depending on the environment

Communication: 2-way

Frequency: 2.4 GHz (802.15.4)

Terminology

This section provides a brief description of terms used within this manual.

ASCII Text – Standard English text that is used in conjunction with computers. This can include upper and lower case letters, numbers and punctuation.

Field – A field is an individual data element such as position, units or other information.

Delimiter – A character that is used to separate individual fields from one another, such as a space or tab.

Entry Record – A group of fields separated by delimiter characters that together form an entry in a computer file.

Terminator – A special character(s) that is used to terminate an entry record.

Record Start Marker – A special character that can be used to indicate the start of a record being received. In this case, the marker is an asterisk (*).

Transmitter Index (axis) – A number from 1 to 8 that is used during Receiver configuration to identify a particular system Transmitter.

DRO – Refers to a ProScale Digital Readout.

Association/Learning – Associates one or more Transmitters with the ProRF Receiver to allow position messages to be received.

SECTION 2   SET-UP

The ProRF Receiver can be connected to a PC using **either** the DB-9 serial port **or** the USB interface. The DB-9 connector and the USB connector CANNOT be used simultaneously.
Two jumpers must be set inside the Receiver to select either the USB or RS232 DB-9 operation. The default setting is USB operation. See below.
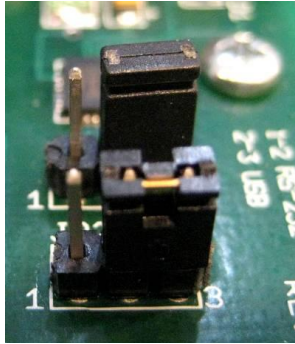
*RS232 **OR** USB operation Jumper location.*

USB Installation:

1. Install the USB drivers provided with your receiver.

2. Connect the ProRF Receiver to the PC using the supplied USB cable. The Receiver will momentarily display the first two digits of the baud rate.
    If it is the first time connecting the Receiver to the PC, the operating system should automatically install the appropriate drivers.

ProRF Receiver shown with USB cable connection

Note: When connecting the ProRF Receiver to the PC via a USB cable, the Receiver is powered from the PC. No additional power is required.

RS232 Installation:

1. Connect a 5-15 VDC power supply (NOT provided) to the rear of the Receiver. The two 7-segment displays will momentarily display the first two digits of the baud rate.

2. Connect the male (pin) end of a DB-9 serial cable (NOT provided) to the ProRF Receiver. Connect the female (socket) end to the PC serial port.

3. Set the Receiver in a location that is centrally located to receive signals from your ProScale display(s). Do not place the Receiver next to large metal objects such as a filing cabinet as this may reduce the receiving range.

SECTION 3   CONFIGURATION

After the Receiver has been connected to the computer it is ready to be configured for operation.
This is accomplished using a terminal emulation program such as HyperTerminal™.
SEE: Configuration using Hyper Terminal

NOTE: Although a terminal emulation program such as HyperTerminal™ can be used to configure the Receiver and view measurement data as it is received, this type of program is not normally used for actual data collection.

In most cases, the user provides a program to read the data from the Receiver. Another option is to use a keyboard wedge program that redirects the serial port/USB data from the Receiver and places it directly into an application such as Microsoft® Excel™. Accurate Technology offers two third party applications that provide this capability.
See:http://www.proscale.com/products/interfaces/wired_converters.htm

Default Settings

The default *port settings* of the Receiver are:
- 9600 baud

- 8 data bits

- No parity

- 1 stop bit.

- Flow Control: None

Although the Receiver can be configured for different baud rates, the other communications parameters are fixed and cannot be altered.

The default *operational mode* for the Receiver is:
- Output mode 0: (Position value only. No units. No transmitter ID.)

- Terminator: Carriage return + Line feed.

- Echo Mode: On.

- Delimiter: Tab.

- Record Start Marker Mode: Off.

In many cases, these settings will be adequate for most operations.

Transmitter Compatibility

The ProRF Receiver is designed to operate with either the ProRF SPC Transmitter or the ProRF Wireless Encoder Transmitter.

The ProRF SPC Transmitter is used to transmit measurement data from any ProScale Digital Readout (DRO) that is equipped with an SPC data port. This transmitter sends measurement data whenever the SEND key is depressed on the DRO.

The ProRF Wireless Encoder Transmitter is used to transmit measurement data from a ProScale Encoder directly to a PC via the ProRF Receiver. In this instance, there is no Readout in the system. Instead, the Receiver performs as a "virtual" Readout.

The ProRF Receiver can support up to a total of 8 transmitters in any combination of SPC or Wireless Encoder Transmitter versions.

Transmitter Association (Learning)

Each ProRF Transmitter is assigned a unique 64-bit ID that identifies each Transmitter. For proper communication to occur between the Transmitter and Receiver, each Transmitter in the system must be *associated* or "*learned*" by the Receiver.

The association process is a one time operation where the Receiver is placed into a special mode which listens for new Transmitters to be acquired. To learn a particular Transmitter, the user activates a "learn" pushbutton on the desired Transmitter. The Transmitter sends its unique 64-bit ID which the Receiver then stores in its permanent memory. Following this operation, the Receiver will accept messages from any learned Transmitter and reject messages from unknown Transmitters.

If you have just purchased this Receiver as a system, i.e. with an SPC or Wireless Encoder Transmitter, the Receiver and Transmitter(s) have already been associated at the factory during final testing. If you have purchased this Receiver separately, you will need to associate any Transmitters that you already have, or aquire, with the Receiver. The Transmitter association procedure is detailed in Association/Transmitter Learning.

Configuration using HyperTerminal

If the factory default configuration for the ProRF Receiver is to be changed, the user must use a terminal emulation program such as HyperTerminal™ to complete the configuration. HyperTerminal is typically included with many of the Microsoft® Windows™ operating systems. You can also download HyperTerminal at http://www.hilgraeve.com/htpe/download.html.

To start HyperTerminal and configure it to communicate with the ProRF Receiver, do the following:

1. Start the HyperTerminal program.

2. If this is the first time executing the program, the application may ask you for a telephone area code. Enter an area code and click OK. You may have to click OK again to accept the Location setup dialog box if one appears.

3. If HyperTerminal has been run previously but not configured to communicate with the ProRF Receiver, a dialog box will appear titled *Connection Description*. In the Name field, enter ProRF and click OK.

4. A second dialog box will appear titled *Connect To*. In the field *Connect Using:*, select a COM port that will be used to connect to the ProRF Receiver. If the computer has a dedicated serial port it will typically be either COM1 or COM2. If you have installed a USB to Serial adapter or are using the USB port on the Receiver*, one or more COM ports (typically COM5 or above) may be shown in the list. The actual COM port assignment is completed by Windows based on the computer's hardware. As such, COM port assignments will vary from PC to PC. After a COM port has been selected, press the OK button

5. A new dialog will appear entitled *COMx Properties* where x is the COM port number. Set the properties to match the values shown below.

   - Bits per Second: 9600

   - Data Bits: 8

   - Parity: None

   - Stop Bits: 1

   - Flow Control: None

Click OK when complete. The dialog box will close.

A blank window will now be displayed. In the lower left hand corner of the bottom frame, the message "Connected" should be displayed with a timer

running. In addition, you should see either Auto Connect or 9600 8-N-1 displayed next to the Connected message.

6. To verify the connection, type the letter "**v**" followed by the <ENTER>. If a valid connection to the Receiver exists, you should see the letter v displayed on the screen followed by the message *ProRF Receiver V2.00.* If you do not see either the letter v when you type v or the version message, a valid communications connection to the Receiver does not exist. You may need to change the COM port selection in the Properties dialog box. This can be accessed by either using the menu File/Properties or the far right tool bar button. Note: You need to disconnect prior to changing properties. Click on the Disconnect tool bar button (fourth from left) to disconnect first prior to changing properties.

7. If you have received the firmware version message: *ProRF Receiver V2.00* when you typed v followed by the ENTER key, you have successfully connected to the ProRF Receiver. You may proceed to the next section to review the configuration commands.

Command Format

The ProRF Receiver uses a standard format for all configuration commands.

- A single command letter.
  Lower case letters allow the user to *view* the parameter without modification.
  Upper case letters allow the user to *change* the parameter configuration.

- For some commands, a Transmitter index number is required after the command letter to identify the appropriate associated Transmitter.

- One or more characters are used when modifying configuration parameters. They have no effect when parameters are viewed (lower case command letters).

The format for a command to <u>read</u> a Receiver parameter is:

> **c**<ENTER> or **c x**<ENTER>
>
>> Where **c** is the lowercase command letter and **x** is the transmitter index number 1 to 8. Note that global commands do not need a transmitter index.

The format for a command to <u>write</u> a parameter to the Receiver is:

> **C p**<ENTER> or **C x p**<ENTER>
>
>> Where **C** is the uppercase command letter, **x** is the transmitter index number 1 to 8 and **p** is the parameter value. Note that global commands do not need a transmitter index.

Command Details

Version Command (V or v)

This command is used to identify the current firmware of the ProRF Receiver.

Read Syntax: **V**<ENTER> or **v**<ENTER>

Response: "*ProRF receiver V2.xx*" where xx indicates the minor revision number.

Parameters: None.

Output Mode Command (O or o)

This command sets or reads the position measurement output format. By setting this command appropriately, the user can tailor the format of the position data sent to the PC.

Read Syntax: **o**<ENTER> Reads the current output format setting

Read Response: "*Output mode = p"* where p is the current output mode setting.

Write Syntax: **O p**<ENTER> where p is a parameter number from 0 to 5. This sets a new output format based on the value of p.

Write Response: "*Output mode now set to p*" where p is the new parameter setting.

Parameter p:
>   0 = Position only.
>   1 = Position + delimiter + units
>   2 = Position + delimiter + transmitter index (1 to 8)
>   3 = Position + delimiter + units + delimiter + transmitter index.
>   4 = Position + delimiter + units + delimiter + transmitter index + delimiter + signal strength (1 to 7).
>   5 = Binary Mode, for Tiger Stop Integration

Example: **O 3**<ENTER> will set output mode to 3.

Default Setting = 0

See Output Mode settings.

Delimiting Character (D or d)

This command sets or reads the delimiter character that is to be used to separate fields in a measurement record. Any ASCII character can be used between ASCII 0 and ASCII 127 although <tab> and <space> are typical selections

Read Syntax: **d**<ENTER> reads the current delimiter character.

Read Response: "*Delimiter = p*" where p is the current delimiting character.

Write Syntax: **D p**<ENTER> where p is the character to use as the delimiter. p could the <TAB> key or the <SPACE> key or other character.

Write Response: *"Delimiter is now set to p"* where p is the new delimiting character.

Example: **D <TAB>**<ENTER> sets the delimiter to a tab character.

Default Setting: Tab.

Echo Control (E or e)

This command controls if typed characters are echoed back from the Receiver to the PC while setting commands. This would normally be desired if the user is utilizing HyperTerminal to configure the Receiver. If echo mode is turned off, the user will not see anything that is being typed.

Read Syntax: **e**<ENTER> reads the current echo mode.

Read Response: "*Echo mode is (on or off)",* depending on the current echo mode.

Write Syntax: **E p**<ENTER> where p is the enable/disable parameter.

Write Response: "*Echo mode now set to (on or off)",* depending on the parameter value used.

Parameter: 0 = No echo, 1 = Echo.

Example: **E 0**<ENTER> turns the echo mode to off.

Default Setting: On.

Record Start Marker (M or m)

Controls whether the sentinel character (*) precedes each measurement record sent to the PC. This is typically used to assist in parsing the record data by a computer program.

Read Syntax: **m**<ENTER> reads the current marker mode.

Read Response: *"Marker mode = (on or off)",* depending on the current mode.

Write Syntax: **M p**<ENTER> where p is the enable/disable parameter.

Write Response: "*Marker mode is now set to (on or off)*", depending on the parameter value used.

Parameter: 0 = No start marker (*). 1 = Use (*) start marker.

Example: **M 0**<ENTER> turns the record start marker off.

Default Setting: Off.

Record Terminator (T or t)

Controls how a measurement record text string is terminated when sent to the PC. It determines if a carriage return or other character is sent.

Read Syntax: **t**<ENTER> reads the current terminator mode.

Read Response: "*Terminator = p*", where p could equal CR/LF, CR, LF/CR, CR/CR, ;, or *.

Write Syntax: **T p**<ENTER> where p is a valid parameter number.

Write Response: "*Terminator now set to p",* where p could equal CR/LF, CR, LF/CR, CR/CR, ;, or *.

Parameter:
> 0 = Carriage Return (CR) then Line Feed (LF)
> 1 = CR only
> 2 = LF then CR.
> 3 = CR then CR
> 4 = ; (semicolon, no CR or LF)
> 5 = * (asterisk, no CR or LF)

Example: **T 1**<ENTER> sets terminator to CR only.

Default Setting = 0 (CR/LF)

Baud Rate (B or b)

Sets the Receiver's communication baud rate used to transmit and receive data. The baud rate of the Receiver and PC/Host must match for proper operation. **Note: When the Receiver is initially powered up, the two digit LED display will show the first two digits of the current baud rate setting.**

Read Syntax: **b**<ENTER> reads the current baud rate setting.

Read Response: "*Baud rate is p*", where p could be 1200, 2400, 9600, 19200, 38400 or 57600.

Write Syntax: **B p**<ENTER> where p is a valid baud rate setting.

Write Response: "*Baud rate will be set to p*", where p could be 1200, 2400, 9600, 19200, 38400 or 57600.

Parameter:
    1200 = 1200 baud
    2400 = 2400 baud
    9600 = 9600 baud
    19200 = 19200 baud
    38400 = 38400 baud
    57600 = 57600 baud

Example: **B 19200**<ENTER> sets the new baud rate to 19200

Default Setting: 9600.

Note: Immediately after changing the Receiver to a different baud rate, the PC must also be changed to match the new baud rate or no further communications with the Receiver will be possible.

Association/Transmitter Learning (A or a)

Transmitter(s) must be associated or learned by the Receiver before they will be recognized to receive data.

Read Syntax: **a**<ENTER> displays the current association enable status.

Read Response: "*Associate Transmitters (Learning) is p*", where p is "enabled" or "disabled" depending on the current status.

Write Syntax: **A p**<ENTER> enables or disables association based on the value of p.

Write Response: "*Associate Transmitters (Learning) is p*", where p is "enabled" or "disabled" depending on the new status.

Parameter: 0 = Disable, 1 = Enable

Example: **A 1**<ENTER> turns ON transmitter association.

Default Setting: Disabled on power-up and automatically disabled after 10 minutes of being active.

To associate one or more Transmitters with the Receiver, complete the following:

1. Connect to the ProRF Receiver using HyperTerminal™ or other terminal emulation program as described previously.
2. Enable transmitter association by issuing the command **A 1**<ENTER>. The Receiver will indicate that learning is enabled.
3. If learning an SPC Transmitter, insert a bent paperclip into the hole on the face of the transmitter labeled PGM, depressing the small button underneath. The MSG SENT LED should momentarily light on the transmitter and the Receiver will send the following message to the PC: "Transmitter learned. Use L for list". The association is complete.
4. If learning an Wireless Encoder Transmitter, remove the top housing cover from the transmitter. Locate and momentarily depress the small LEARN pushbutton. The MSG ERROR LED will momentarily light and the Receiver will send the following message to the PC: "Transmitter learned. Use L for list". The association is complete.

To disable transmitter association, send the command **A 0**<ENTER> from the PC. The Receiver will indicate that transmitter association is now disabled.

RF Channel Selection (F or f)

Reads or changes the current RF channel used by the radio system. Note: If the ProRF Receiver channel is reconfigured, the RF channel for all associated Transmitters must also be changed to match the Receiver's new channel setting.

Read Syntax: **f**<ENTER> reads the currently set RF channel.

Read Response: "*RF channel selection is p*" where p is the current channel number.

Write Syntax: **F** p<ENTER>, where p is the new channel value 0 to 15.

Write Response: "*New RF channel being set to p*" where p is new channel number.

Parameters: 0 to 15 relating to the available channel selections.

Example: **F 5**<ENTER> sets the Receiver to channel 5.

Default Setting: Channel 0.

Note: Unless there are other ProRF systems in the immediate area that could interfere with the radio communications, it is not recommended to change from the Default RF channel of 0.

List Learned Transmitters (L or l)

Generates a listing of currently learned Transmitters in the Receiver's memory. It displays the transmitter index (1 to 8) and the type of transmitter for each.

Read Syntax: **L**<ENTER> or **I**<ENTER>

Read Response: A listing of eight lines displaying "*Axis x type*" where x is the transmitter index (1 to 8) and type is either "SPC Type" or "Wireless Encoder Type 1". If an axis is not programmed, the listing for that index will be "*Axis x unprogrammed*" where x is the transmitter index (1 to 8).

Invalidate (unlearn) a Transmitter (I)

Use this command to delete an associated Transmitter from the Receiver's active list of transmitters. It is recommended to use the **L** command first to verify the list of transmitters currently in memory.

Write Syntax: **I p**<ENTER> where p is the selected axis 1 to 8.

Write Response: "*Axis x is now invalid (unlearned)"* where x is the axis 1 to 8 selected.

Example: **I 3**<ENTER> deletes axis 3 from the Receiver's memory.

Report Last Position (R or r)

Lists the last position reported by the Transmitter. If no position has been reported since the Receiver was powered up, an error message will be provided.

Read Syntax: **R x**<ENTER> or **r x**<ENTER> where x is the axis number 1 to 8.

Read Response: Position data will be provided based on current Output Mode. If an axis has not reported in since the Receiver powered up, the Receiver will display "*Axis not reported yet*".

Measurement Units Reported (U or u)

This command sets the Receiver for type of measurement units to report. The selections are millimeters, inches or DRO defined. The selection of millimeters or inches forces all measurements to be reported in the defined units. If DRO defined is selected, measurements will report as follows:

- If the Transmitter is an SPC type, the reported units will be based on the current units selection of the ProScale DRO.
- If the transmitter is a Wireless Encoder type, the reported units will be in millimeters.

Read Syntax: **u x**<ENTER> where x is the transmitter index (1 to 8).

Read Response: "*Axis x reports position*" followed by "*in millimeters*" if parameter was 0, "*in inches*" if parameter was 1 or "*by DRO defined*" if parameter was 2. x is the transmitter index 1 to 8.

Write Syntax: **U x p**<ENTER> where x is the transmitter index (1 to 8) and p is the parameter setting.

Write Response: "*Axis x reports position*" followed by "*in millimeters*" if parameter was 0, "*in inches*" if parameter was 1 or "*by DRO defined*" if parameter was 2. x is the transmitter index 1 to 8.

Parameter: 0 = always mm, 1 = always inches, 2 = DRO defined.

Example: **U 1 2**<ENTER> sets transmitter 1 to report measurements defined by the DRO (assumes an SPC transmitter).

Default Setting: 1: always inches.

Set Position (P)

Applies to Wireless Encoder Transmitters only
Sets the current measurement position in the Receiver's virtual DRO for a particular transmitter index 1 to 8. This is the equivalent to using the + and – keys on a ProScale DRO to set its current position.

Write Syntax: **P x f**<ENTER> where x is the transmitter index (1 to 8) and f is a floating point (decimal) number representing the current position of the virtual DRO.

Write Response: "*Axis x position set to f*" followed by "*inches*" if set to report in inches or "mm" if set to report in millimeters. x is the transmitter index 1 to 8 and f is the floating point position value.

Example: **P 1 3.45**<ENTER> sets the virtual DRO for transmitter 1 to a current position of 3.45 (inches or mm depending on the current units).

Default Setting: No datum or offset applied. Virtual DRO will display the literal position of the encoder.

Scale Direction (S or s)

Applies to Wireless Encoder Transmitters only
This command allows the user to change the direction of an encoder attached to a Wireless Encoder Transmitter. For example, if an encoder is mounted horizontally, this command can configure encoder movement to the right as increasing positive. Or, it can configure encoder movement to the right as increasing in the negative direction (more negative).

Read Syntax: **s x**<ENTER> reads the current direction setting where x is the transmitter index (1 to 8).

Read Response: "*Scale direction for axis x is* " followed by "*0*" or "*1*" where x is the transmitter index.

Write Syntax: **S x p**<ENTER> sets a new direction where x is the transmitter index (1 to 8) and p is the allowable values of 0 or 1.

Write Response: "*Scale direction for axis x is* " followed by "*0*" or "*1*" where x is the transmitter index.

Example: **S 3 0**<ENTER> sets the current direction at 0 for transmitter 3.

Note: Parameter values 0 and 1 are relative depending on the mounting orientation of the encoder.

Default Setting: 0

Long Scale Usage (G or g)

Applies to Wireless Encoder Transmitters only
When utilizing long (over 17 inch/433 mm) Model 150, 150G, 250, or 250G ABS scales, this feature should be turned on for proper processing of measurement data.

Read Syntax: **g x**<ENTER> reads the current configuration for long ABS scale operation where x is the transmitter index.

Read Response: "*Long scale operation for axis x is* " followed by "*enabled*" or "*disabled*". x is the transmitter index.

Write Syntax: **G x p**<ENTER> enables/disables long ABS scale usage where x represents the transmitter index (1 to 8) and p represents the allowable parameters of 0 or 1.

Write Response: "*Long scale operation for axis x is* " followed by "*enabled*" or "*disabled*". x is the transmitter index.

Parameter: 0 = Disabled. 1 = Enabled.

Example: **G 2 1**<ENTER> enables long scale operation on transmitter 2.

Default Setting: Disabled.

Modify Segment Count (C)

Applies to Wireless Encoder Transmitters only

Long ABS scales are constructed of two or more 433 mm scale panels laid end to end. Each 433 mm panel is referred to as a segment. As the encoder traverses from one segment to the next, the virtual DRO in the Receiver adds 433 mm to the overall position which yields an accumulated position over the total length of the scale. In some instances, it is possible for this accumulated total to become corrupted. If this occurs, the reported position will be in error by one or more multiples of 433 mm (~ 17 inches). The user can correct this problem by adding or subtracting segment multiples in the virtual DRO. This is done by the Modify Segment Count command. If the reported position is less than the actual position by one or more segment multiples, the user can add segment multiples to bring the system back into calibration. The inverse is true if the system is reporting a position one or more multiples greater than the actual position. In this case, subtracting segments will bring the system into calibration. The advantage of modifying the segment count versus using the Set Position (P) command is that the system can quickly be recalibrated without going to a known datum point. This command only works if the virtual DRO is in error by one or more segment periods.

Write Syntax: **C x +**<ENTER> or **C x** -<ENTER> increments or decrements the virtual DRO's segment count by one segment period. x is the transmitter index.

Write Response: "*Axis x segment count has been* " followed by "*incremented*" or "*decremented*". x is the transmitter index.

Parameter: Use "+" to add one segment period to the count. Use "-" to subtract one period from the count.

Example: **C 1 +**<ENTER> increments the segment count by one period for transmitter 1.

Note: If the reported position has more that one period of error, issue this command multiple times.

Remote Command (N or n)

Applies to Wireless Encoder Transmitters only

Currently, there are several parameters that are specific to a Wireless Encoder Transmitter that can be reconfigured or read *remotely* from the ProRF Receiver. These parameters are:

- Periodic transmitter check-in time.
- Position detection tolerance.

In certain cases, it may be useful to modify these parameters of the Wireless Encoder Transmitter for custom applications. The ProRF Receiver allows these parameters to be read or reconfigured but the user should have a brief understanding of how this process occurs.

Periodic transmitter check-in time – Wireless Encoder Transmitters periodically transmit their current position even when no motion is being detected by the connected encoder. This provides the ProRF Receiver with a verified position even when hours or days go by without any detected changes in position. It also serves as a supervisory signal to inform the Receiver that the Transmitter is still within radio range and operational. The default check-in time is 30 minutes.

Position detection tolerance – When no significant motion is being detected by the attached encoder, a "window of motion tolerance" exists that prevents excessive radio transmissions from occurring due to machine vibration. This feature helps to extend the battery life of the Transmitter. Initial motion must be detected that exceeds this "window tolerance" before radio transmissions occur. Once the threshold is exceeded, any change in position is reported by the Transmitter. The default value for this "window tolerance" is +/- .003 inches (.08 mm).

The Wireless Encoder Transmitter is not in constant radio contact with the Receiver in order to maximize battery life, but the Transmitter does send a periodic check-in signal as detailed previously. When this occurs, the ProRF Receiver sends back a message indicating if the user is either requesting a parameter value or if the user is requesting to reconfigure a parameter. Since the check-in message occurs only at a periodic rate, Remote Commands (N or n) must be queued (saved in the order received) in the Receiver's memory and wait for the Transmitter to check in. As a result, there will be a time lag between the time a Remote Command (N or n) is entered into the Receiver and the response received from the Transmitter.

Read Syntax: **n x p**<ENTER> queues a parameter read command for Transmitter x. p is the parameter ID (check-in time or position tolerance).

Read Response: "*Remote command queued*" if the command was accepted by the Receiver or "*Remote command queue full*" if there is not enough room in the Receiver's memory for the command. A maximum of 4 remote commands can be queued at any one time.

Write Syntax: **N x p v**<ENTER> queues a parameter write command for Transmitter x. p is the parameter ID (check-in time or position tolerance) and v is the new value for the parameter.

Write Response: "*Remote command queued*" if the command was accepted by the Receiver or "*Remote command queue full*" if there is not enough room in the Receiver's memory for the command. A maximum of 4 remote commands can be queued at any one time.

Parameters:
- Parameter p can take the value of either 0 or 1.
  0 = Position detection tolerance
  1 = Check-in time.

- Parameter v is the value to be written to parameter p.
  1 to 255 = Position detection tolerance values
        Values are in .01mm increments.
  2 to 60 = Check-in time values. Values are in minutes.

Example: **N 3 0 10**<ENTER> sets transmitter 3 position detection tolerance to 10 units of .01 mm each (.1 mm or ~.004 inches).

Wireless Encoder Transmitter Default Settings :
Position detection tolerance = 8 (~.003 inches),
Check-in time = 30 minutes.

Response from Encoder Transmitter: After the Encoder Transmitter has received the remote command queued in the ProRF Receiver and a response has been sent back, the Receiver will send one of several messages to the PC.

For position detection tolerance:
- For read: "*Position detect tolerance for unit x is v mm*" where x is the transmitter index (1 to 8) and v is the tolerance in millimeters.
- For write:
  "*Position detect tolerance update for unit x was successful*" OR
  "*Position detect tolerance update for unit x FAILED*"

For check-in time:
- For read: "*Check-in time for unit x is v minutes*" where x is the transmitter index (1 to 8) and v is the time in minutes.

- For write:
  "*Check-in time update for unit x was successful*" OR
  "*Check-in time update for unit x FAILED*"

Note: The transmitter default check-in time is 30 minutes. This means that it could take up to 30 minutes after a remote command has been queued by the Receiver for a response to be received from the transmitter.

Setting the check-in time to a lower value (more frequent) will result in decreased transmitter battery life.

Help Request (H or h)

This command provides a list of available commands with an abbreviated description for each.

Read Syntax: **H**<ENTER> or **h**<ENTER>.

Command Summaries

The following is a summary of command letters and their meanings:

ProRF Receiver

V – Firmware version ID. No parameters.

O – Output mode. Formats the record text for the desired measurement data content. See **Output Modes** on page 30 for more information. **The default is mode 0**; position data only.

D – Configures the delimiting character that is used to separate fields within a record. **The default is a tab**.

E – Enables or disables the character echo when typing in data from the terminal program. **The default is ON**.

M – Record Start Marker. Enables or disables the use of the new record start (sentinel) character, which is an *. When enabled, each new record transmitted starts with an asterisk *. **The default is OFF.**

T – Record Terminator. Each record can be terminated with either a carriage return or carriage return and line feed. **The default is carriage return and line feed (CR/LF)**

B – Baud Rate. Sets the baud rate used to communicate with the Receiver. **The default is 9600 bits per second**.

A – Association Enable. Turns on or off the feature that allows new transmitters to be "learned" by the Receiver. The default value is off (0). When enabled with a parameter of 1, the Association feature remains active for 10 minutes and then is automatically disabled. The user may use the command with parameter 0 to manually disable learning.

H – Help request. Provides a list of user commands, listed here, with a brief description of each.

F – RF Channel. Sets the operating frequency channel used by the radio system for communication. **The default channel is 0.**

L – List Learned Transmitters. Generates a listing of currently learned Transmitters, displaying their transmitter index 1 to 8 and the type of Transmitter, (SPC or Wireless Encoder.)

ProRF SPC Transmitters

The following commands relate to individual Transmitters and must use a Transmitter index number from 1 to 8.

I – Invalidate Transmitter. Used to "unlearn" a Transmitter from memory and ignore all future message transmissions.

R – Report Last Position. Whenever a Transmitter reports a position message to the Receiver, the Receiver echos the position to the PC and maintains the position data in RAM memory. The PC can then query the Receiver for the last known position that the Transmitter reported. Note that this command is not valid after Receiver power up until a position message has been received by a Transmitter.

U – Measurement Units Reported. Sets the type of units reported by the Transmitter.
Parameter 0 = measurements reported in millimeters.
Parameter 1 = measurements reported in inches.
Parameter 2 = measurement units defined by DRO.

Wireless Encoder Transmitters

The following commands relate ONLY to Wireless Encoder Transmitters and must use a transmitter index number 1 to 8.

P – Set Position. Sets the current reported position of the virtual DRO for the indicated Transmitter. This is equivalent to setting a position datum on a ProScale DRO using the + and – buttons.

S – Scale Direction. Sets the direction of reported position. The parameter is either 0 or 1.

G – Use Long ABS Scales. If long ABS scales (> 17 inches, 430 mm) are to be used with the Wireless Encoder transmitter, set this parameter to 1. Otherwise, set to 0. Default setting is disabled.

C – Modify Segment Count. Used in conjunction with long ABS scales to modify the accumulated period count of an ABS position. Valid parameters are "+" or "-".

N – Remote Command. Allows the user to remotely program various parameters of a Wireless Encoder Transmitter.

Output Modes

There are six output modes available on the ProRF Receiver. The first five are ASCII text formats and the sixth mode transmits binary data.

Mode	Description
0	Position only
1	Position with units type (MM or IN)
2	Position with transmitter ID
3	Position with units and transmitter ID
4	Position with units, transmitter ID and signal strength
5	Binary Mode

In the case of output mode 0, an ASCII position is provided followed by the programmed terminator; carriage return or carriage return and line feed (CR or CR/LF). In the other text modes, each field is separated by the programmed delimiting character (<TAB> by default). The entire line or record is then followed by the programmed terminating character.

The following are examples of output modes 0 through 3:

Output mode 0
Position Only<terminator>

Example (using <space> delimiter, measurement in inches):

5.637

Output mode 1
Position<delimiter>and Units<terminator>

Example (using <space> delimiter, measurement in millimeters):

28.35 MM

Output mode 2
Position<delimiter>Transmitter ID<terminator>

Example (using <space> delimiter, Transmitter # 3, measurement in Inches):

5.637 3

Output mode 3

Position<delimiter>Units<delimiter> Transmitter ID<terminator>

Example (using <space> delimiter, Transmitter #3, measurement in):

5.637 IN 3

Output mode 4

Position<delimiter>Units<delimiter>Transmitter ID<delimiter>signal strength<terminator>

Example (using <space> delimiter, Transmitter #3, measurement in inches with a relative strength of 5):

5.637 IN 3 5

Signal strength is represented by a value from 1 to 7 where 1 is a very weak signal and 7 is a very strong signal. This can be used for verifying the quality of signal reception from a particular Transmitter location.

Output mode 5

This output mode is intended to be used for applications that were designed around, and with, the earlier ProRF (Version 1) radio interface system.

The binary message packet reports a combination position/status message. This message packet is described below in an outline format.

Measurement Sample:

Receiver's Address [255] (Base)	Sender's Address [1 –254]	Command Header ['A']	RSSI Value ['1' – '7'] 1 = low signal 7 = high signal	Message Packet ID [0 – 255]	Number of Data Bytes [13]
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6

Module Type [1]	Module Status [0 – 0xFF]	Encoder Status [0 – 0xFF]	Data Capture Latch [0 – 0xFF]	Units of Operation [0] = mm. [1] = in.	ASCII Position Data ['0' – '9' '.' '-']
Byte 7	Byte 8	Byte 9	Byte 10	Byte 11	Bytes 12 - 19

Note: In this mode, bytes 7 through 10 are fixed at 1, 0, 1, and 1 respectively.

Example:

Position packet message: position = 8.537 inches, sent from Transmitter ID 1, with a signal strength of 5, with message 34.

| Byte Number	Value	Description
1	255	Destination address (Receiver)
2	1	Display address ID
3	'A'	Position command character ASCII A
4	'5'	Signal strength ASCII 5
5	34	Message ID
6	13	Number of data bytes to follow
7	1	Always 1
8	0	Always 0
9	1	Always 1
10	1	Always 1
11	1	1 = inches, 0 = mm
12	' '	space if positive, '-' if negative
13	' '	hundreds digit
14	' '	tens digit
15	'8'	ones digit
16	'.'	decimal point
17	'5'	tenths digit
18	'3'	hundredths digit
19	'7'	thousandths digit

Deleting a previous measurement record

Applies to SPC Transmitters only

The ProScale Digital Display (DRO) has the capability of transmitting
a "delete previous measurement" signal by pressing the F2 key on the DRO.
This causes the text "DEL" to be displayed instead of a position. This can be
used to indicate the previously recorded entry in a file needs to be removed.

Defaulting to Factory Values

In the event that the user wishes to restore the Receiver to factory values,
complete the following:

1. Remove the four screws from the bottom of the Receiver and
    remove the top cover.

2. Press and hold the small pushbutton on the circuit board labeled
    DEFAULT for 3 seconds.

3. All of the LEDs will momentarily flash and the unit will display the
    first 2 digits of the current baud rate.

4. Replace the top cover and re-install the four bottom screws.
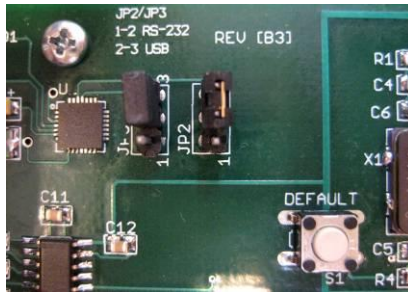
Location of Button to Default Transmitter to factory settings.

Receiver Display and LED Functions

Baud Rate: On power-up, Receiver will display first two digits of Baud Rate.
Transmitter ID #: When data is received, transmitter ID is displayed.

LEARN: This LED illuminates when a Transmitter has successfully been "associated" with the Receiver.

POS MSG: This LED illuminates when a new position data message has been received.

LOW BAT: This LED illuminates when an associated Transmitter's battery voltage is low.

SUPERVISORY: This LED illuminates when an Encoder Transmitter fails to "check-in".

Thank you for choosing a ProScale Product,

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