DIGITAL CONTROL INCORPORATED

DigiTrak® F5

Directional Drilling Locating System

User Guide

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3-XXXX-00-P

Trademarks

Patents

The DigiTrak® F5™ Locating System is covered by one or more of the following U.S. Patents: 6,653,837; 6,693,429; 6,756,784; 6,768,307; 6,838,882; 6,924,645; 7,061,244; 7,080,698; 7,154,273; 7,159,672; 7,167,005; 7,176,690; 7,304,479; 7,309,990; 7,345,486. Sale of a DigiTrak® F5 receiver does not convey a license under any patents covering the DigiTrak® transmitter or underground drill housing. Other patents pending.

Limited Warranty

All products manufactured and sold by Digital Control Incorporated (DCI) are subject to the terms of a Limited Warranty. A copy of the Limited Warranty is included with your DigiTrak® F2® Locating System; it can also be obtained by contacting DCI Customer Service, 800-288-3610 or 425-251-0559, or by connecting to DCI's website, **www.digitrak.com**.

Important Notice

All statements, technical information, and recommendations related to the products of DCI are based on information believed to be reliable, but the accuracy or completeness thereof is not warranted. Before utilizing any DCI product, the user should determine the suitability of the product for its intended use. All statements herein refer to DCI products as delivered by DCI and do not apply to any user customizations not authorized by DCI nor to any third-party products. Nothing herein shall constitute any warranty by DCI nor will anything herein be deemed to modify the terms of DCI's existing Limited Warranty applicable to all DCI products.

FCC Compliance Statement

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions : (1) this equipment may not cause harmful interference, and (2) this equipment must accept any interference received, including interference that may cause undesired operation. DCI is responsible for FCC compliance in the United States: Digital Control Incorporated, 19625 62nd Ave. S., Suite B-103, Kent, WA 98032; phone 425-251-0059 or 800-288-3610.

Changes or modifications to the DCI equipment not expressly approved and carried out by DCI will void the user's Limited Warranty and the FCC authorization to operate the equipment.

Battery Disposal 

This symbol on equipment indicates that the equipment must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of such equipment by handing it over to a designated collection point for the recycling of batteries or electrical and electronic equipment. If the equipment contains a banned substance, the label will show the pollutant (Cd = Cadmium; Hg = Mercury; Pb = Lead) near this symbol. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service, or the shop where you purchased the equipment.

Safety Precautions

- Read this manual. If you have any questions about the operation of this or any DigiTrak equipment, contact Digital Control Incorporated's Customer Service Department at anytime day or night. See "Digital Control Inc. Contact Information:" on the title page of this guide.
- All operators must review and understand the safe and proper operation of drilling and locating equipment before using the DigiTrak F5 Locating System for directional drilling operations.

	Serious injury and death can result if underground drilling equipment makes contact with an underground utility such as a high-voltage electrical cable or a natural gas line.

∇	Substantial property damage and liability can result if underground drilling equipment makes contact with an underground utility such as a telephone, fiber-optic, water, or sewer line.

	Work slowdowns and cost overruns can occur if drilling operators do not use the drilling or locating equipment correctly to obtain proper performance

	The DigiTrak F2 equipment is not explosion-proof and should never be used near flammable or explosive substances.

- The DigiTrak F5 Horizontal Directional Drilling Locating System cannot be used to locate utilities.

- The battery charger provided with the DigiTrak F2 system is designed with adequate safeguards to protect you from shock and other hazards when used as specified within this document. If you use the battery charger in a manner not specified by this document, the protection provided may be impaired. Do not attempt to disassemble the battery charger. It contains no user-serviceable parts. The battery charger is not to be installed into caravans, recreational vehicles, or similar vehicles

- Remove the batteries from all components of the system during shipping and prolonged storage.

- Interference can cause inaccuracies in the measurement of depth and loss of the transmitter's pitch, roll, or heading. You should always perform an electrical interference check prior to drilling.

    - Sources of interference include but are not limited to traffic signal loops, invisible dog fences, cable TV, power lines, fiber-trace lines, metal structures, cathodic protection, telephone lines, cell phones, transmission towers, conductive earth, salt water, rebar, radio frequencies, and other unknown sources of interference.

    - Interference with the operation of the remote display may also occur from other sources operating nearby on the same frequency, such as car rental agencies using their remote check-in modules, other directional drilling locating equipment, etc.

    - Background noise must be minimal and signal strength must be at least 150 points above the background noise during all locating operations.

- Continued exposure to heat, due to frictional heating of the transmitter in the drill head from drilling in sand, gravel, or rock without sufficient fluid flow around the transmitter, can cause inaccurate information to be displayed and may permanently damage the transmitter. For more information see the *Transmitter* section of this manual.

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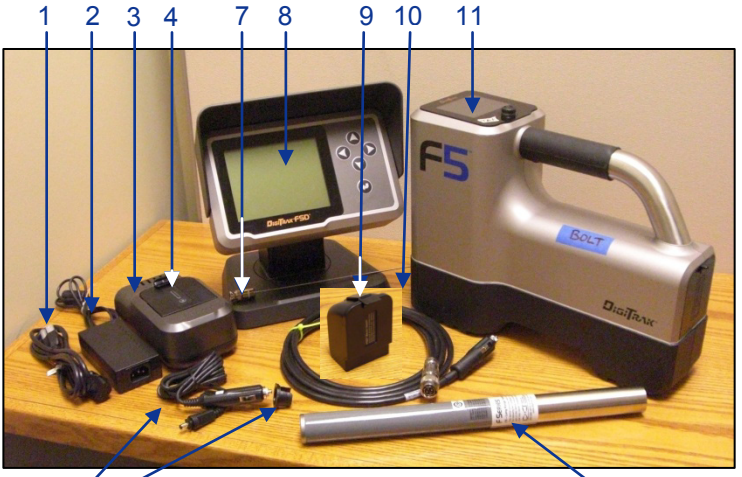
System Components



DigiTrak F5 Locating System

1 – AC Power Cord for Battery Charger

2 – AC Adapter for Battery Charger (AC source 100-240V, 50-60 Hz, 1.5 A max)

3 – DigiTrak F Series Battery Charger (FBC)

4 – DigiTrak F Series Battery Pack (FBP)

5 – DC Power Cord for FBC (DC source 12V, 5 A max)

6 – DC Power Cord Plug Adapter (Use when the DC plug does not fit snugly in the power port)

7 – Remote Display's Telemetry Antenna (Install before use)

8 – DigiTrak F Series Remote Display (FSD)

9 – Brace Insert (Provides structural integrity for the FSD remote when a battery pack is not installed)

10 – Remote Display's DC Power Cable (MFDC)

11 – DigiTrak F5 Receiver (F5R)

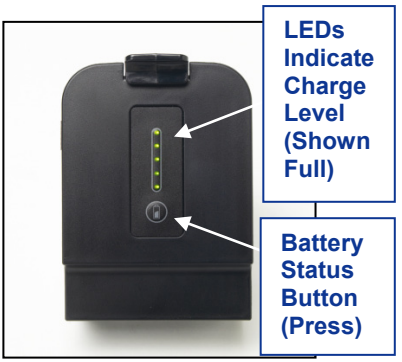
12 – DigiTrak F Series Transmitter (See the DigiTrak F5 Series Transmitter Models Specifications Sheets for a full list of the F5 transmitter options)

Getting Started

Battery Pack and Charger

Checking Battery Status

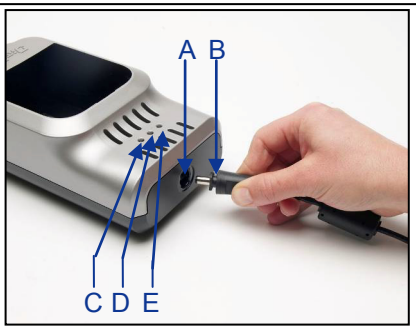
Press the battery status button. Each of the 5 LEDs represents 20% of the battery charge. The battery charge status can be checked even if it is installed in a unit. A fully charged FBP will power an F5 receiver for approximately 10 hours or an FSD remote for approximately 14 hours before recharging is necessary.



F Series Battery Pack (FBP)

Charging a Battery Pack

Only use F Series battery packs with the F Series battery charger. Power must be supplied to the battery charger, as indicated by the flashing orange LED (D) on the battery charger, before charging a battery.



Inserting Plug into Power Port

A – Power Port
B – Plug from system item (2) or (5)
C – Green LED
D – Orange LED
E – Red LED

To supply power to the battery charger, install either the AC Adapter (2) or DC Power Cord (5) by inserting the appropriate plug (B) into the battery charger power port (A).

If using AC power, connect the AC power cord (1) to the AC

adapter and then plug the cord into an AC power receptacle (wall outlet). If using the DC power cord, plug it directly into the DC power source. Once powered, the orange LED (D) on the battery charger will begin to flash.

To begin charging, install the battery pack in the orientation shown below.

DCI F Series Battery Charger with F Series Battery Pack

The battery pack is properly installed when the red LED (E) on the battery charger illuminates indicating active charging. The battery is done charging when the green LED (C) illuminates. Press the battery status button on the battery pack to check the charge.

Removing Battery Pack or Brace Insert

To remove the battery pack or brace insert from the FSD remote, F5 receiver, or F-Series Battery Charger, push the tab towards the face of the battery pack/brace insert and pull it away from the unit as shown in the figure "Removing Battery Pack or Brace Insert". When the battery pack/brace insert is released, grasp it firmly to lift it out of the unit.

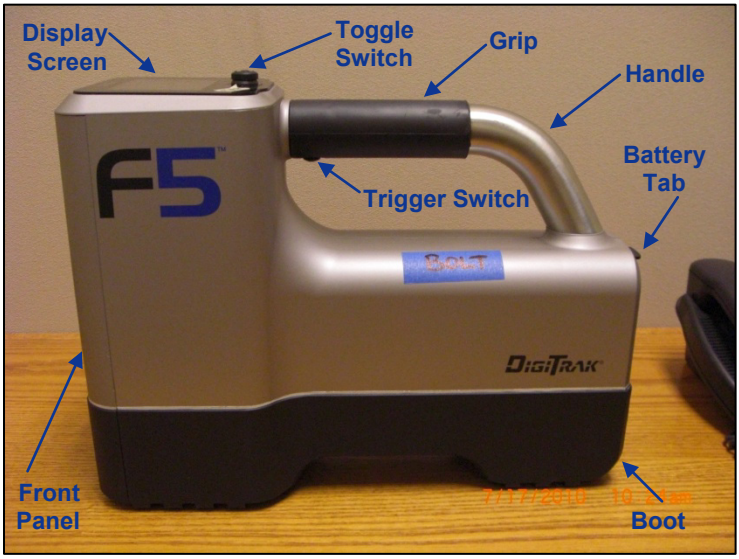
Removing Battery Pack or Brace Insert

Storing a Battery Pack

If you plan to store the battery packs for any period of time, please follow the guidelines listed below.

- Do not store the battery pack at temperatures greater than 113°F (45°C).
- Do not store the battery pack in a fully discharged state.
- Do not store the battery pack in the battery charger.
- If the battery pack is going to be stored for an extended period of time, precharge the battery so at least two LEDs illuminate on the battery pack when the battery status button is pressed.

Receiver



F5 Receiver – Side View

Power On

1. Install a charged battery pack as shown ensuring the tab is securely latched once the battery is installed.
2. Pull in and hold the trigger switch for at least one full second to turn on the receiver.
3. A warning screen will then appear. Pull and release (click) the trigger switch to indicate that you have read and understand this manual.

Inserting Battery Pack

4. The automatic self test results display. The startup screen then appears displaying DCI contact information and the receiver version information.

5. If all items of the self-test pass, the startup screen will display as shown below.

F5 Start Up Screen

If an item of the self test fails, the failure will show in place of the Model Name and a warning symbol will appear in place of the Regional Designation Number. Contact DCI at one of the phone numbers shown on the start up screen for support.

6. Click the trigger to open the Main Menu. See the Navigating Menus section for more information.

Automatic Shutdown

The F5 receiver will shut down if no trigger action and no transmitter signal are detected for 15 minutes.

Toggle & Trigger Switches

The F5 receiver has two types of switches for operating the system – a toggle (thumb switch) located on the top of the unit and a trigger located under the handle.

Toggle Switch – Used to access and navigate menus. It moves in four directions – left, right, up and down. Each movement of the switch has a corresponding action on the display. See the Navigating Menus section.

Trigger Switch – Used to turn on the unit, adjust the screen contrast, select menu options, and to change the screen view for depth readings. See the Navigating Menus and Locating sections for more information.

Adjusting Screen Contrast

Hold the trigger in with the receiver held vertical. Release the trigger when the screen contrast is adjusted.

Audible Tones

The F5 receiver gives audible tones to signal power on/off, menu changes, and the pass/fail status of actions, as summarized below. The receiver also emits tones with transmitter temperature increases as defined in the transmitter discussion later in this section.

Power On – One short beep followed by a long beep.

Power Off – Four long beeps.

Confirmation Signal – Four short beeps to confirm menu selection has been successfully executed.

Failure Signal – Two long beeps to indicate a problem with the menu item selected. A failure screen will appear and display until the trigger is clicked.

Transmitters

DCI manufactures several different styles of transmitters for use with the F5 system. The most common style, FX, is shown below and is available in a range of transmitting frequencies.

Long-Range FX Transmitter

The FX transmitter is 15” (38.1 cm) long and 1.25 in. (3.175 cm) in diameter and must fit snugly in the housing. It may be necessary to wrap the transmitter with tape or O-rings to prevent it from rattling in the housing.

The index slot in the front end of the transmitter fits onto the anti-roll pin (key) in the housing for proper alignment of the transmitter in the housing.

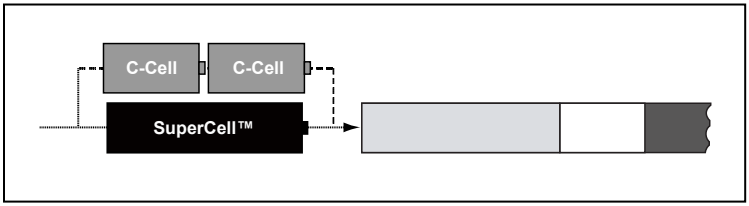
The Extended-Long Range, FXL, is the second most popular transmitter style in the F-Series transmitter line and is the same as FX shown above but is 19” (48.3 cm) long with an extended transmitting range.

For an up to date list of all of the transmitter styles available for use with the F5 system including transmitting frequencies, ranges, battery and housing requirements see the DigiTrak F-Series Transmitter Models specification sheets included with your system and available on DCI’s website, www.digitrak.com.

Getting Started

Power On

1. Remove the battery cap from the transmitter.
2. Insert battery or batteries positive terminal first as shown.



Install Transmitter Batteries Positive Terminal First

3. Replace the battery cap.

Use the F5 receiver to verify data from the transmitter. All readings should be stable unless the transmitter or receiver is moved. If there is a problem, verify the regional designation number on the transmitter matches that displayed on the receiver's startup screen or call DCI for support.

Sleep Mode (Automatic Shutdown)

The transmitter is programmed to stop broadcasting and go into a battery conserving sleep mode after 15 minutes of no rotation. To wake the transmitter, rotate the drill stem.

Transmitter Battery Status 

When using alkaline batteries, the battery status symbol, shown above, indicates the battery life remaining.

NOTE: The SuperCell battery will appear to be full until just before it dies. You must track the hours of use for the SuperCell battery.

Transmitter Temperature

The transmitter temperature is displayed on the F5 receiver and FSD remote next to the thermometer icon. The receiver and remote will emit warning tones with every 4°C temperature increase as defined in the following table.

Temperature	Warning Tones
61–97°F (16–32°C)	Double-beep sequence (beep-beep)
104–111°F (36–44°C)	Two double-beep sequences. **NOTE**: Action is required to cool the transmitter.
118–133°F (48–56°C)	Three double-beep sequences **NOTE**: Cooling is critical.
Above 140°F (60°C)	Three double-beep sequences every 5 seconds on the remote display, and every 20 seconds on the receiver. **NOTE**: Irreversible damage is eminent.
Above 183°F (84°C)	Transmitter shuts down.
180°F (82°C)	FS or FC transmitter overheat indicator (temp dot) turns black.
220°F (104°C)	All other F Series Transmitters overheat indicator (temp dot) turns black. **FACT** ✓

Remote Display

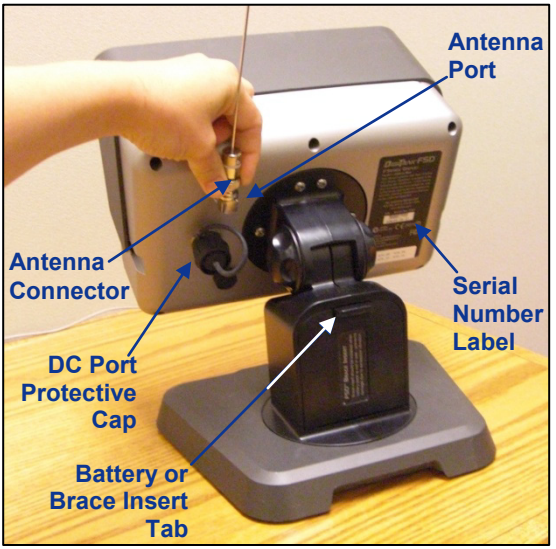
DigiTrak F Series Display (FSD)

Power Options

The FSD remote can be powered with an F Series Battery Pack or through a 14.4 V DC source using the DC power cable (10). When the DC power cord is used, the "brace insert" must be installed in place of the battery pack for structural integrity. If both a battery pack and DC cable source are installed, the FSD remote will draw power from the battery pack until its voltage is below that of the DC source.

Battery Pack

See the figure below for the correct orientation of battery pack and brace insert in the FSD remote.



Antenna Installation

The battery pack/brace insert is secure when the tab is latched and a slight pull on it does not dislodge the battery.

DC Power Cable

To install the DC power cable, remove the protective cap from the DC power port on the back of the FSD remote. The DC power port is keyed to mate with the DC power cable. Push the keyed end of the DC power cable into the DC power port and rotate it clockwise to secure the cable in place. Install the other end of the DC power cable into the DC power source.

Installing Antenna

The antenna must be installed onto the remote display prior to drilling in order to receive telemetry data. To install the antenna, align its connector with the antenna port on the FSD remote, push in and rotate the antenna connector clockwise until it locks into place. See the figure above.

Getting Started

Power On

Press the execute button  for a half second or more to turn on the FSD remote. You will hear a tone and the main display screen will appear.

If a transmitter and receiver are powered on, the locating data should display. If no locating data displays, verify the receiver is displaying locating data and that the receiver and remote are set to the same telemetry channel. *See Navigating Menus* for more information on setting the telemetry channels.

Adjusting Screen Contrast

With the FSD remote powered on, hold in the execute button while pushing the right arrow (to lighten the display) or the left arrow (to darken the display). Each push of the right or left arrow will change the contrast incrementally.

Adjusting Viewing Angle

The FSD remote allows you to adjust the viewing angle through a range of 180° left/right, 90° up/down, and 270° about the display's center.

Up/Down – Loosen and squeeze together the two knobs on the back of the remote display. Then adjust the screen as desired and tighten the knobs. If the knobs are loose, the display will hold its vertical position only until the knobs are squeezed together or the display is vibrated. Thus, DCI recommends tightening the knobs before drilling.

Left/Right – With the FSD remote's magnetic base secure, grasp the top portion of the display and rotate it about the base to the desired orientation.

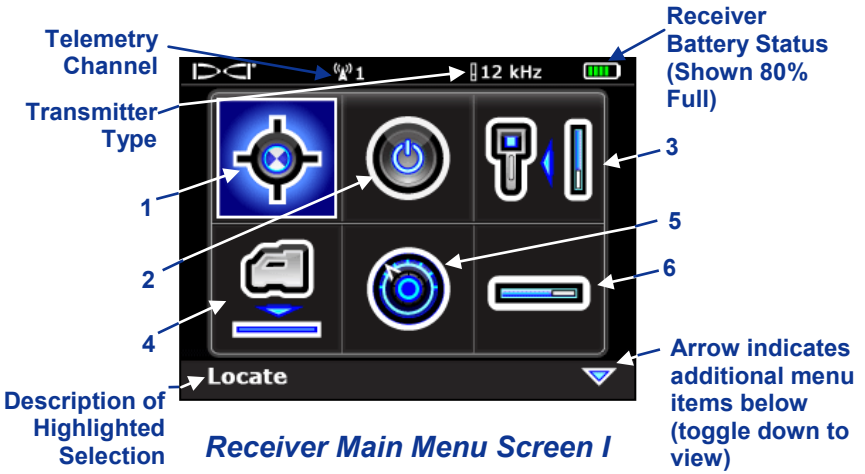
Center – With the FSD remote's magnetic base secure, grasp the top portion of the display and rotate it about the center of the screen to the desired orientation.

Navigating Menus

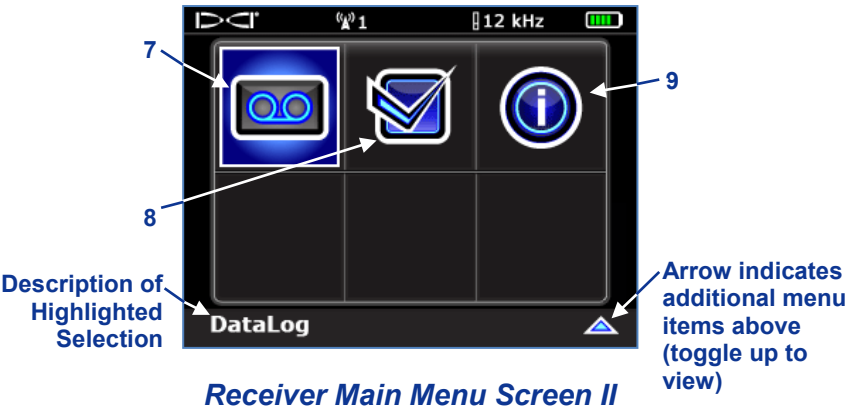
Receiver Main Menu

To access the receiver main menu, click the trigger from the start up screen or from the locate mode screen, toggle down (push toggle switch toward the handle). The toggle switch is then used to highlight different menu options and the trigger switch is used to select menu items.

The main menu is shown below followed by a description of each numbered menu option.



Receiver Main Menu Screen I



Receiver Main Menu Screen II

1 – Locate Mode (Shown Highlighted for selection. Opens the locating screen. See the “Standard Display Screens” section.)

2 – Power Off (Powers off the receiver.)

3 – Calibration Menu (Opens the Calibration menu. See “Calibration Menus” later in this section.)

4 – Height Above Ground (HAG) Menu (Opens Height Above Ground Menu (HAG) for setting the height the receiver will be held above ground during depth readings. See HAG Menu later in this section.)

5 – Settings Menu (Opens the settings menu where you can set the depth units, pitch units, time and calendar, telemetry channel, and roll offset. See “Settings Menu” later in this section.)

6 – Transmitter Selection Menu (Opens the Frequency Selection menu where you can select the frequency and type of transmitter you are using.) MORE INFO?

7 – DataLog Menu (Shown highlighted for selection. Opens the DataLog Menu, see the “DigiTrak F5 DataLog Manual” for more information.)

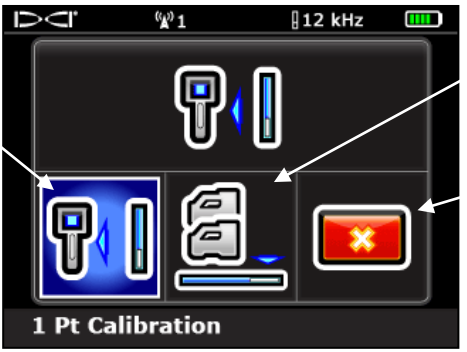
8 – Pre-Drill Checklist (Opens the Pre-Drill Checklist menu where you can verify the receiver’s internal level is functioning properly and perform the self-test for diagnostic purposes. Contact the Digital Control Customer Service department if you have questions about using this menu item.)

9 – System Info (Opens the system info screen where you can see the software versions and configuration of the unit.)

Calibration Menu 

The calibration menu shows two calibration options, 1 Pt Calibration (one point calibration) and 2 Pt Calibration (two point calibration).

When the calibration option has been selected in the main menu, the following screen will appear.



1 Point Calibration (Shown Highlighted)

2 Point Calibration

Exit (Cancels Calibration)

Receiver Calibration Menu

To select the 1 Point Calibration option from this screen, click the trigger. See “Calibrating the Receiver to the Transmitter” and “1 Pt Calibration” below for more information.

To select the 2 Point Calibration option, toggle right to highlight the 2 Pt Calibration option and click the trigger. See “Calibrating the Receiver to the Transmitter” and “2 Pt Calibration” below for more information.

To cancel the calibration, toggle right until the Exit option is highlighted then click the trigger. You will be returned to the main menu with no change to the calibration.

Calibrating the Receiver to the Transmitter

A tape measure is required for both calibration methods.

The 1 Pt Calibration is the preferred calibration method and is used to calibrate the receiver to the transmitter when the transmitter is above the ground. When using this method, the receiver and transmitter should be parallel and level with each other.

The 2 Pt Calibration is for calibrating the receiver to the transmitter when the transmitter is below ground. When using this method the transmitter must be below ground, approximately level, and have been properly located. See the *Locating* section for information on locating the transmitter.

Do not calibrate if:

- You are within 10 ft (3 m) of metal structures, such as steel pipe, chain-link fence, metal siding, construction equipment, automobiles, etc.
- The receiver is over rebar or underground utilities.
- The receiver is in the vicinity of excessive electrical interference.

> **Note:** Electrical interference is determined by observing the signal strength with the transmitter turned on and then with the transmitter turned off. If the difference between these numbers is less than 150, the electrical interference is excessive.

- The transmitter is not turned on.
- The transmitter is not installed in the housing.
- The signal strength from the transmitter is less than 300 points or greater than 950 points.

After a calibration option is selected from the calibration menu, the following screen will appear while the receiver verifies that the signal strength is acceptable for calibration.

1Pt Calibration (Above Ground)

Before Calibration:

Ensure that the transmitter is in its housing, parallel to, and level with the receiver at the appropriate distance, 10 ft (or 3 m), and that the receiver is displaying stable transmitter data.

To Calibrate:

Select the 1 Pt Calibration option from the calibration menu, the receiver will detect the signal from the transmitter and the following screen will display.

Accept 1 Pt Calibration (Shown Highlighted)

Exit (Cancels Calibration)

Perform 1 Pt Calibration Screen

The screen shows the correct setup of the receiver and transmitter for calibration. Verify the setup and click the trigger to begin the calibration or toggle right and select the exit option to be returned to the main menu.

After selecting the checkmark, the screen will show that the receiver is calibrating. Do not move the receiver while it is calibrating. Four short tones and a check mark on the screen indicate a successful calibration.

After a successful calibration, take a depth measurement without moving the transmitter or receiver. The depth should be 10 ft ± 5 in. (or 3 m ± 15 cm).

2 Pt Calibration (Below Ground)

Before Calibration:

A. The receiver must be level and positioned directly above an approximately level transmitter. See the locating section for instructions on aligning the receiver directly above the transmitter.
B. Verify the signal strength at both calibration points (on the ground and raised 3 ft or 1 m) is between 300 and 950 points. If the signal strength is too high at the first calibration point, lift the receiver until the signal is within an acceptable range. The second point for calibration will then be taken 3 ft (or 1 m) directly above the first point. If the signal is too low at this point, you will have to pull back to calibrate.
C. Verify that roll and pitch values are being displayed on the receiver and that a steady signal is being received from the transmitter.

To Calibrate:

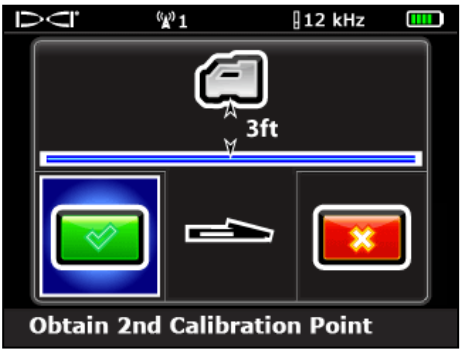
Select the 2 Pt Calibration option from the calibration menu. The following screen will display.

2 Point Calibration, 1st Point

1. Click the trigger to obtain the first calibration point or toggle right and select the exit option to be returned to the main menu.

After selecting the checkmark, the screen will show that the receiver is calibrating. Do not move the receiver while it is calibrating.

The second point calibration screen will then appear.



2 Point Calibration, 2nd Point

2. Lift the receiver 3 ft (or 1m) directly up and click the trigger to initiate calibration of the second point or toggle right and select the exit option to be returned to the main menu with no change to the calibration.
3. After selecting the checkmark, the screen will show that the receiver is calibrating. Do not move the receiver while it is calibrating. Four short tones and a check mark on the screen indicate a successful calibration.

After a successful calibration, take a depth measurement at each calibration point. The difference should be 3 ft ± 2 in. (or 1 m ± 5 cm). Repeat these measurements several times as you continue drilling to verify that the depth remains valid as the pitch of the transmitter changes.

Calibration Results

If the calibration is successful, a checkmark will appear on the screen and you will hear the confirmation signal of four short beeps. The screen will then return to the main menu with the locate option highlighted for selection.

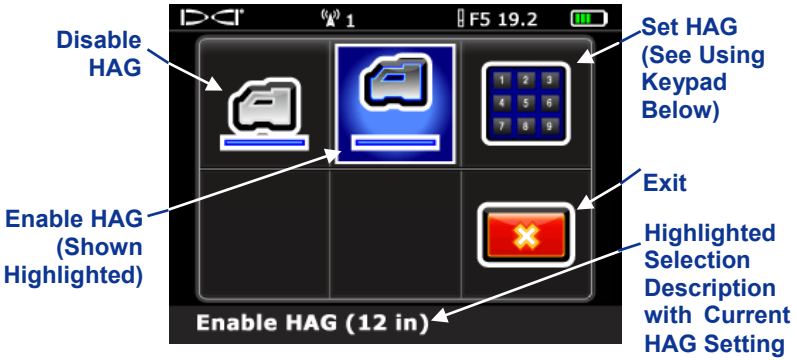
If the calibration fails, you will hear two long tones and the calibration failed screen will appear.

Calibration Failed Screen

You may click the trigger to try the calibration again or toggle right and select exit to be returned to the main menu. Verify the setup and try again or contact DCI for support.

Height-Above-Ground (HAG) Menu

The HAG menu shows three Height Above Ground options (Disable, Enable, and Set).



Height Above Ground (HAG) Menu

Selecting the enable HAG option will turn on the Height Above Ground function to the value shown at the bottom of the screen (the default value or the last value set).

Selecting the set HAG option will open the keypad for setting an HAG value. See “Using the Keypad” at the end of this section for more information.

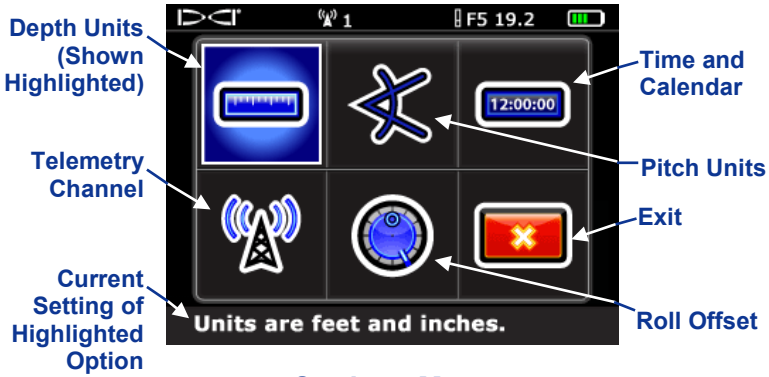
When the HAG has been turned on (set or enabled), depth readings must be taken with the receiver held at the height above ground specified.

Selecting the disable HAG option will turn off the HAG function. Depth readings must be taken with the receiver on the ground.

The HAG is turned off whenever the receiver is turned off, depth units are changed, or *Target Steering* is used.

Settings Menu

The settings menu has six options shown below.



Settings Menu

Use the toggle switch to highlight an option, and then pull the trigger to select it. The function for each item is discussed below.

Depth Units Menu

The options that appear in the depth units menu are:

xx” (Sets units to inches)

x.xx’ (Sets units to feet)

x’xx” (Sets units to feet/inches)

x.xx m (Sets units to meters)

Exit (Exits the menu with no change to the setting)

Select the depth units option you wish to use. The confirmation signal will sound and you will be returned to the settings menu with the exit option highlighted.

Pitch Units Menu

The options that appear in the pitch units menu are:

x% (Sets pitch units to percent)

xº (Sets pitch units to degrees)

Exit (Exits the menu with no change to the setting)

Select the pitch units you wish to use. The confirmation signal will sound and you will be returned to the settings menu with the exit option highlighted.

Time and Calendar Setting

After selecting the "Set Time and Calendar" option from the settings menu, the following screen will display.

Date and Time Keypad (Clock Active)

Setting the Time

The time function runs on a 24 hour clock. To set the time, ensure that the clock is the active function on the keypad as shown above, then select the desired value one digit at a time left to right and select the return button. For example to set the clock to 14:39 (2:39 pm), toggle to highlight the "1" then pull the trigger to select it, then highlight the "4" and pull the

trigger, then highlight the “3” and pull the trigger, then highlight the “9” and pull the trigger. Confirm the time reads as desired and then highlight the return button and pull the trigger. The confirmation tone will sound as the screen returns to the settings menu.

Setting the Date 

To set the date, open the Time and Calendar setting menu and select the calendar icon on the Date and Time Keypad. The calendar should then show active as indicated by the change to the display window and the yellow color of the icon.

Date and Time Keypad (Calendar Active)

Enter the date one digit at a time (month, then day, then last two digits of the year) left to right and then select return. For example to set the date to January 2nd 2011, toggle over to highlight the “0” and pull the trigger, then highlight the “1” and pull the trigger, then highlight the “0” and pull the trigger, then highlight the “2” and pull the trigger. Then highlight the “1” and pull the trigger, pull the trigger once again with the “1” highlighted. Confirm the date reads as desired, “01/02/11,” then highlight the return button and pull the trigger. The confirmation tone will sound as the screen returns to the settings menu.

Telemetry Channel Menu

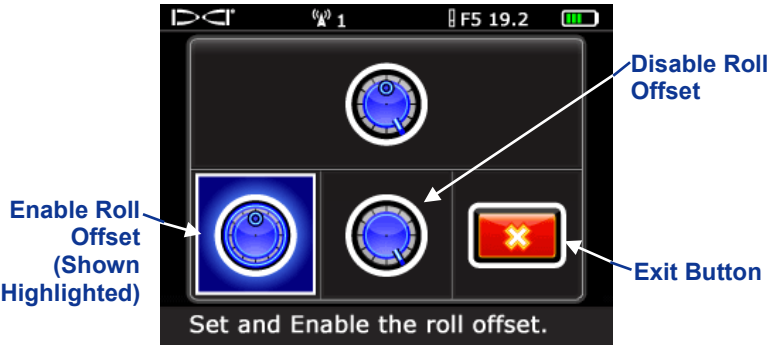
The telemetry channel menu has five telemetry setting options (1, 2, 3, 4, 0) and an exit button. Selecting the exit button will return the screen to the settings menu with no change to the telemetry channel setting. Selecting “0” will turn off the telemetry function. For communication to occur between the receiver and remote display, both devices must be set to the same telemetry channel.

To set the telemetry channel on the receiver, use the toggle switch to highlight the desired telemetry channel and pull the trigger. The confirmation tone will sound as the screen returns to the settings menu.

Roll Offset Menu

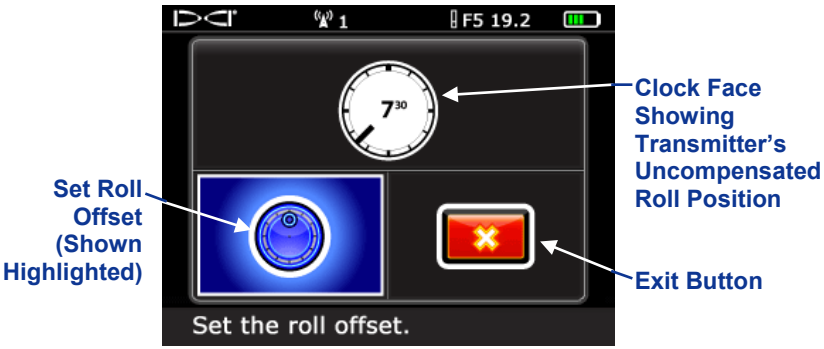
Roll offset is needed when the 12 o’clock position of the transmitter cannot be indexed to that of the drill head.

When the roll offset option is selected from the settings menu, the following screen will appear.



Roll Offset Menu

To electronically compensate the transmitter to match the drill head’s 12’clock position, select the Set and Enable Roll Offset option from the Roll Offset menu. A screen such as the following will display.



Enable Roll Offset Menu

With the set roll offset option highlighted (as shown), ensure that the transmitter is on (showing a roll value on the screen), the transmitter is in its housing, and that the drill head is at its 12 o'clock position, and then pull the trigger to set the roll offset. The confirmation tone will sound as the screen returns to the settings menu. The value that displays for roll on the locate mode screens will be the compensated value.

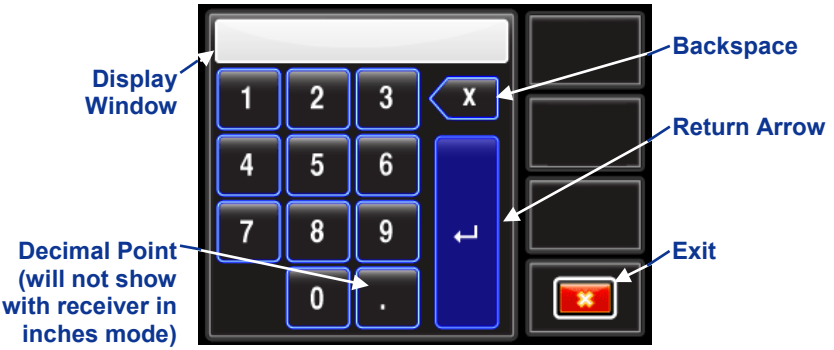
To turn off the roll offset function, select the "Disable Roll Offset" option from the roll offset menu. The confirmation tone will sound as the screen returns to the settings menu. The value that displays for roll on the locate mode screens will be that of the transmitter.

Using the Keypad

The keypad shows anytime the keypad icon is selected. It is used for setting a height above ground for the HAG function and setting a target depth for the *Target Steering* function. The keypad screen will appear slightly differently depending on which units are active.

Inches and Decimal Distance Keypad

The decimal keypad will appear when the receiver units are set to meters (x.xx m) or feet (x.xx'). The inches keypad appears when the receiver units are set to inches (xx"). The inches keypad is the same as the decimal keypad shown below except the decimal option will not show.



Decimal Keypad

Use the toggle switch to highlight the number or decimal you wish to select and then pull the trigger to select it. Enter each number left to right and select the backspace option to delete the last digit selected. When the value in the display window matches the value you wish to program, highlight and select the "return" arrow to lock in the value and turn on the function.

Feet and Inches Keypad

The feet and inches Keypad appears when the receiver units are set to feet/inches (x'xx") and the keypad function is selected in the set HAG or Target Depth Menu.

Feet Setting (Shown Active)

Feet/Inches Keypad

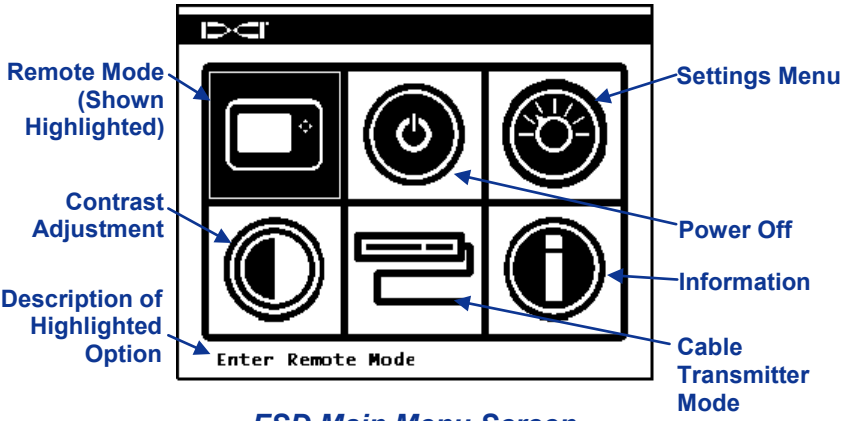
When the feet setting is active as shown in the image above, numbers entered on the keypad will be for the foot value. To activate the keypad for inputting inch values, use the toggle switch to highlight the inches setting option, 

, and pull the trigger to select it. The “ft” option will inactivate (change from yellow to black) and the “in” option will show active.

For the foot and inches setting, use the toggle switch to highlight the number you wish to select and then pull the trigger to select it. Enter each number left to right and select the backspace option to delete the last digit selected. When the value in the display window matches the value you wish to program, highlight and select the “return” arrow to lock in the value and turn on the function.

Remote Display Menu

Push the down arrow with the remote display powered on to access the main menu.



FSD Main Menu Screen

Use the arrow buttons to highlight an option, and press the execute button to select that option. The table below lists the main menu options and the result of selecting each item.

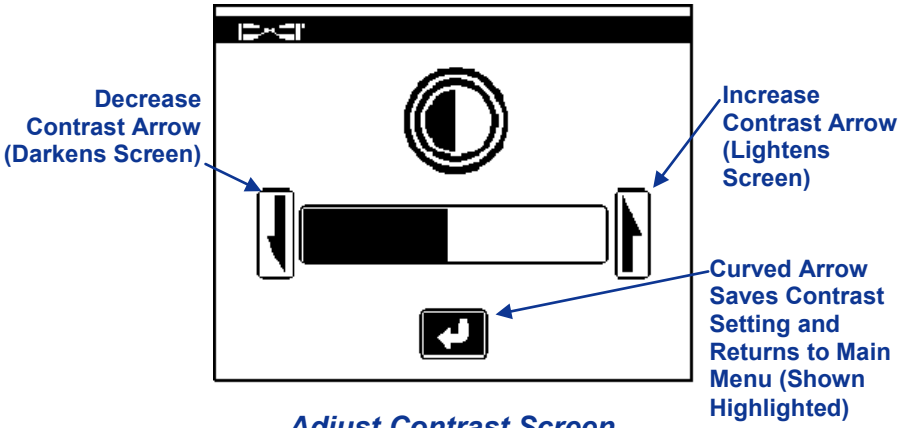
FSD Main Menu Options

.	**Remote Mode** – Puts the FSD unit into remote radio mode. It will then display information from the receiver.
	Power Off – Turns off the unit.
	Settings Menu – Opens the settings menu. See “Settings Menu” below.
	Contrast Adjustment – Allows you to adjust the screen contrast from the menu. See below for instructions.
	Cable Transmitter Mode – Puts the FSD remote in cable mode for reading cable transmitters. Requires a multi-function cable box. See the DigiTrak MFCB Multi-Function

	Cable Box Operator's Manual
	**Information** – Displays system information such as the software version, serial number, and current settings.

Contrast Adjustment Option

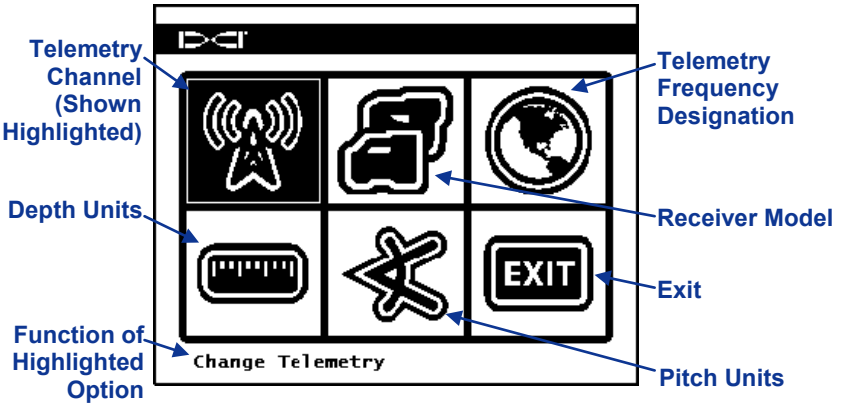
When this contrast adjustment option is selected from the main menu, the following screen will appear.



Adjust Contrast Screen

Use the left or right arrow button on the remote to highlight the desired action. Adjust the contrast by pressing the remote's execute button. Each time the execute button is pressed, the contrast will change incrementally.

Settings Menu



FSD Settings Menu Screen

The table below shows the menu options as they appear on the display with descriptions of their uses. Any changes that are made to the settings will be saved when the FSD unit is turned off. DCI recommends that you program the FSD settings to match the settings on your receiver.

FSD Settings Menu Options

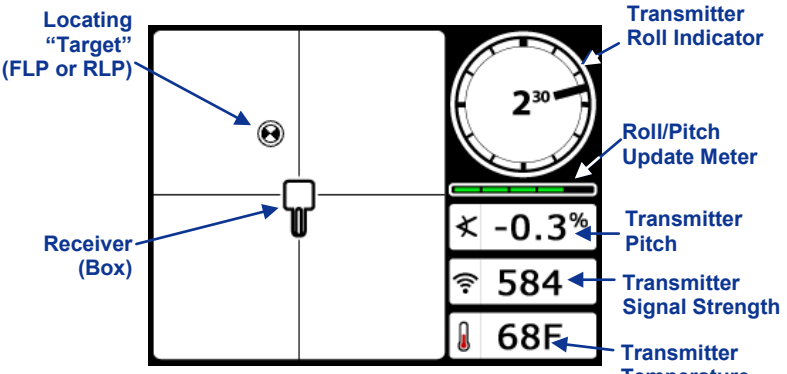
	**Telemetry Channel** – Opens telemetry channel options: 1, 2, 3, and 4. The remote and the receiver must be set to the same channel.
	**Receiver Model** – Allows you to program the FSD unit to work with an F5, F2, SE, Eclipse, or MK Series receiver. If a receiver other than the F5 is to be used, see the *MFD/FSD Operator's Manual*.
	**Telemetry Frequency Designation** – Opens the telemetry region options. If you must change this setting, call DCI to determine which setting is required in your area and to verify it matches the receiver frequency.
	**Depth Units** – Allows you to select distance units as either English or metric. When English units are selected, the temperature will display in degrees Fahrenheit (°F). When metric units are selected,

	the temperature will display in degrees Celsius (°C).
	**Pitch Units** – Allows you to select pitch angle units. The options are percent (%) or degree (°).
	**Exit** – Exits the settings menu and returns to the main menu screen. After a setting is changed, the exit option is automatically highlighted for selection.

Standard Display Screens

The receiver and remote each have three standard display screens: the Main Display Screen, Depth Display Screen and Predicted Depth Display Screen. All are described below.

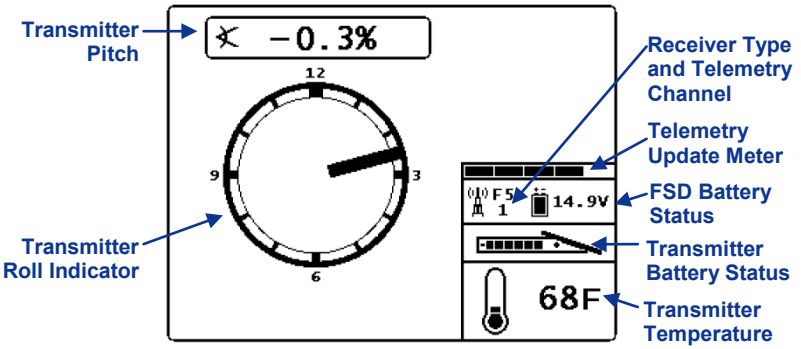
Main Display Screens



Receiver Main Locate Screen

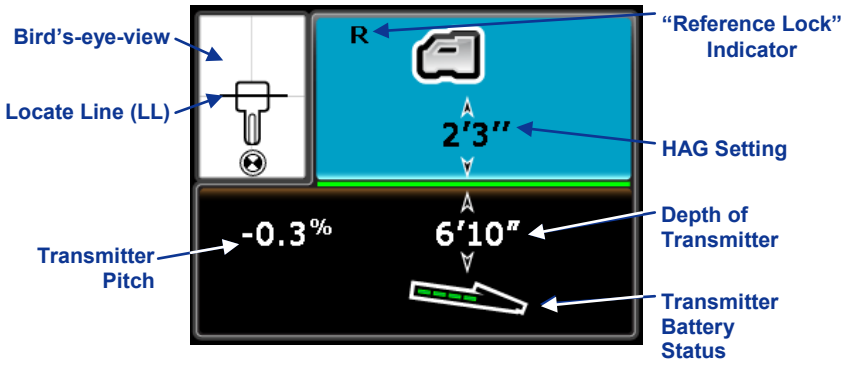
When roll offset is set, the clock on the receiver display will show as show to the right. The remote display clock will show "RO" next to the clock.

Roll Offset Clock



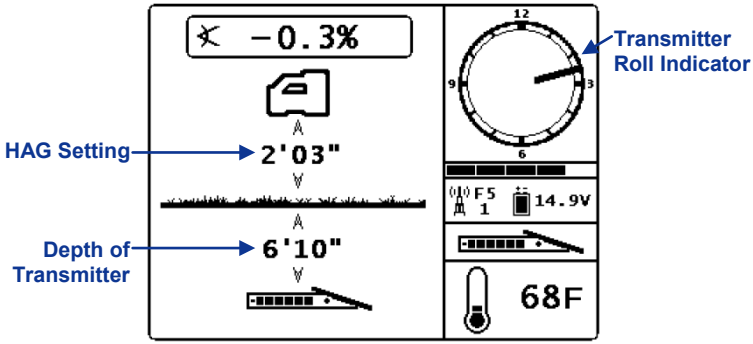
Remote Main Display Screen

Depth Display Screens



Receiver Depth Screen at LL

When the HAG setting is disabled, the receiver is show on the ground. The receiver must be placed on the ground for depth readings.

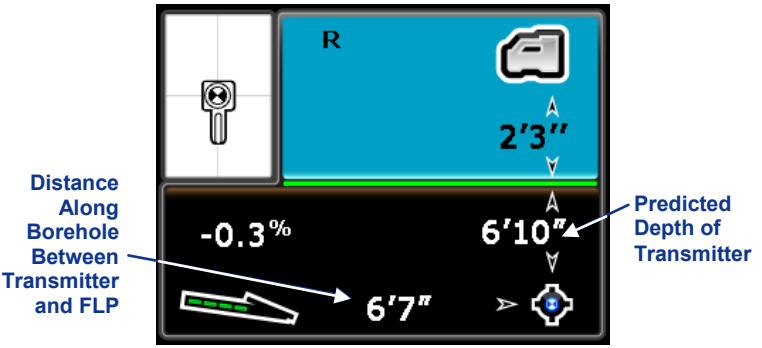


Remote Depth Display Screen

Depth data will continue to display on the remote display screen for 10 seconds after the trigger is released on the receiver.

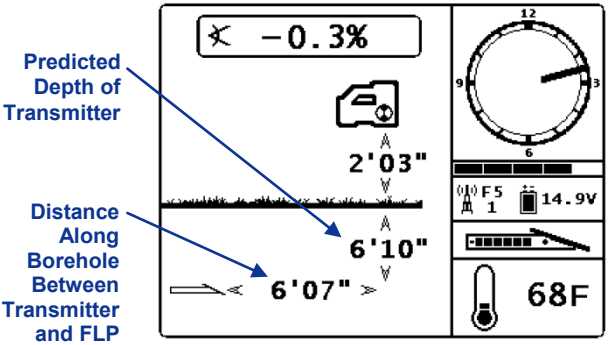
Predicted Depth Display Screens

Predicted depth is the depth the transmitter is calculated to be at when it reaches the front locate point (FLP) if it continues on its current trajectory.



Receiver Predicted Depth Screen

All other screen symbols have the same meaning as previously described.



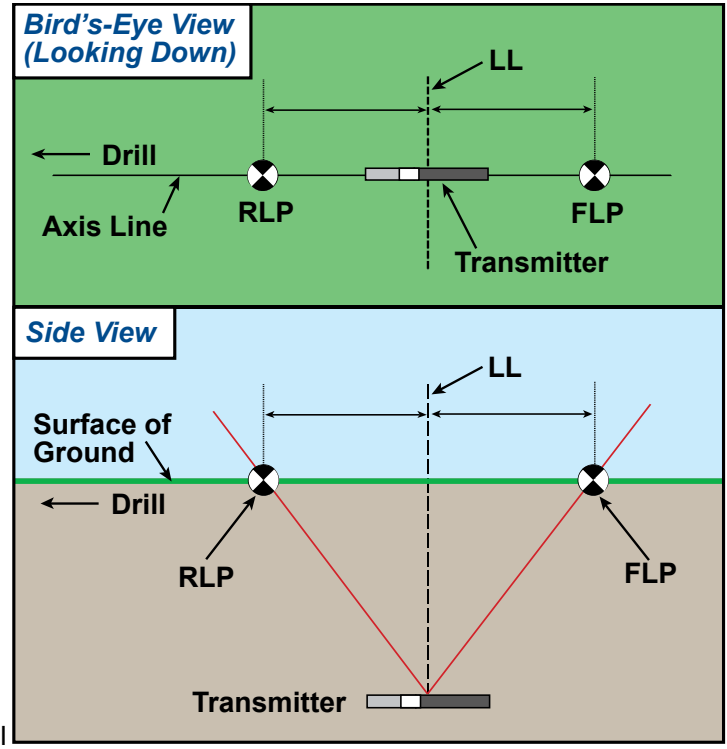
Remote Predicted Depth Screen

These screens are discussed further in the locating section.

Locating

The F5 receiver aides in locating the transmitter by detecting three specific places in the transmitter's magnetic field: the front and rear locate points (FLP and RLP) and the locate line (LL).

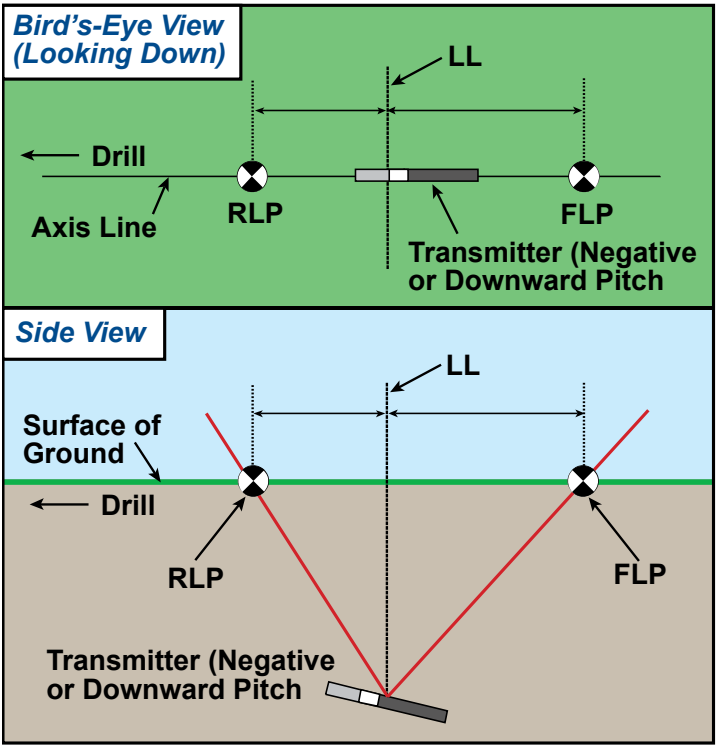
The most accurate tracking requires the use of all three locations to determine the position, heading, and depth of the transmitter. Aligning the FLP and RLP reveals the heading and left/right position of the transmitter. The LL determines the central position and depth of the transmitter.



Geometry of FLP, RLP, and LL from Top (Bird's-Eye) and Side Views

Note how the RLP and FLP are equal distances from the LL when the transmitter is level.

NOTE: If the transmitter pitch exceeds ±30% (or ±17°) and/or the transmitter depth exceeds 15 ft (4.5 m), see *Appendix B* for more detailed transmitter location information.



Effect of Pitch on FLP, RLP, and LL Relationship

Note how the RLP and FLP are at different distances from the LL when the transmitter is at a negative pitch (compare with figure on previous page in which the transmitter is level).

It is possible to calculate depth (for comparison to the receiver's depth reading) using the distance between the locate points and the pitch of the transmitter. For additional information, see *Appendix C*: *Calculating Depth Based on Distance Between FLP and RLP.*

Standard Locating Procedure

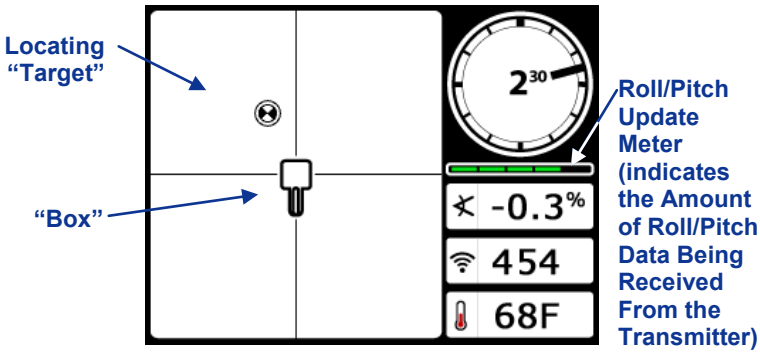
For accurate transmitter locating and tracking, it is important to accurately find and mark the locate points and the locate line.

The standard locating procedure requires you first find and mark the FLP. Then find and mark the RLP. Then connect the FLP and RLP with a line. Depth readings are taken where this line crosses with the LL.

Finding and Marking Locate Points

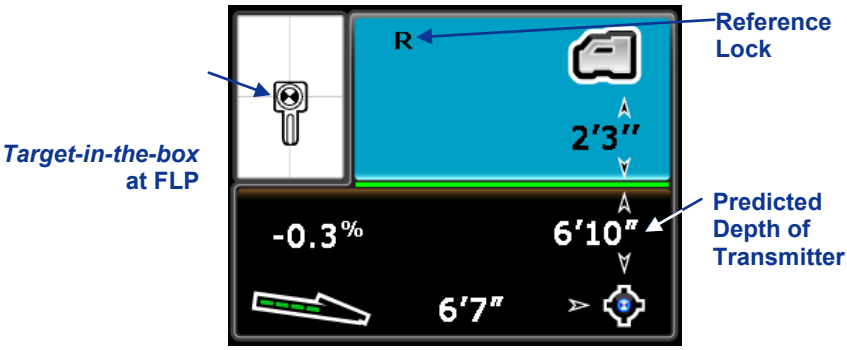
To find the FLP:

1. Stand facing the drill or last transmitter location at a distance of approximately one rod length in front of the transmitter. The deeper the transmitter is the further out in front of the transmitter you will need to stand.
2. Observe the position of the locating target on the receiver's locate mode screen.

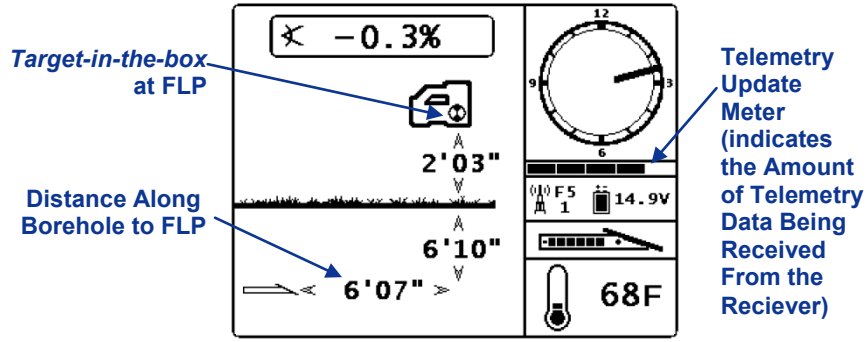


Receiver Locate Mode Screen

3. Walk in the direction that aligns the locating target inside the box. Forward and to the left in this example.
4. Once the locating target is centered in the box, pull and hold the trigger. The predicted depth screens will display and the receiver will obtain a "reference lock" on the transmitter's signal. Obtaining a reference lock is necessary before the LL can display over the transmitter.



Receiver Predicted Depth Screen (HAG on)

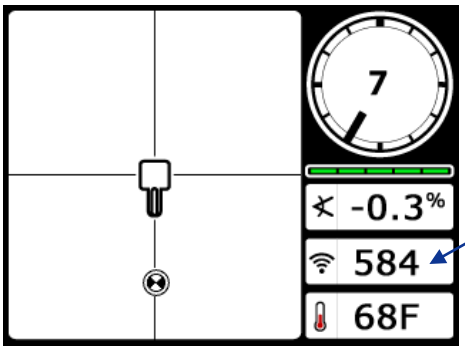


Remote Predicted Depth Screen (HAG on)

5. Mark the location of the FLP by standing with the receiver held level and the target in the box (the trigger may be held in or released). Project a vertical plumb line through the **center** of the display to the ground. Mark that location on the ground.

To find the RLP:

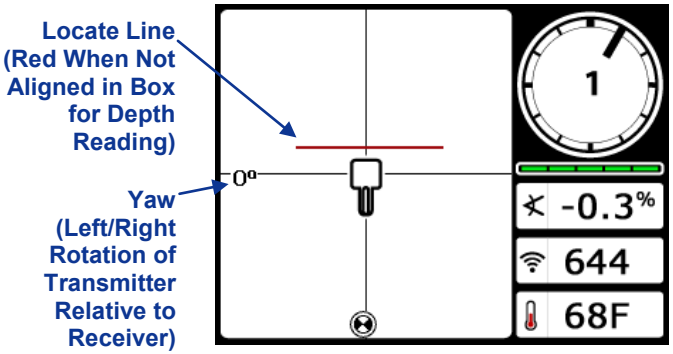
1. Walk in the direction of the drill head keeping the locating target on the vertical cross hair. Observe that the signal strength of the transmitter is increasing.



Receiver Locate Mode Screen (Passing LP)

If the signal strength decreases, you may have just found the RLP. Position yourself further away from and facing the drill or last known transmitter location to locate the FLP.

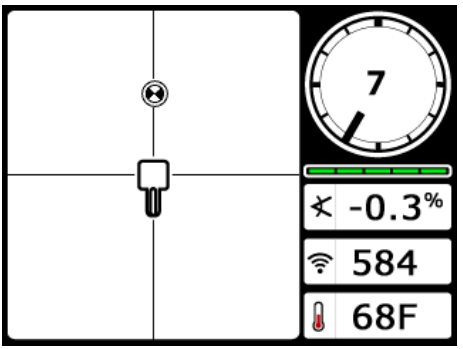
2. As you approach the location of the transmitter, the LL will appear and the locating target will flip to the top of the screen in the direction of the rear locate point.



Receiver Locate Mode Screen (Approaching LL)

Do not rely on the alignment of the target on the vertical cross hair to give the left/right position of the transmitter. You must find the RLP to be certain you are directly over the transmitter.

3. As you pass the locate line, the ball will flip from the bottom of the screen to the top of the screen. The ball now represents the approximate location of the RLP.
4. As you approach the RLP, keep the target aligned with the vertical cross hair.



Receiver Locate Mode Screen (Approaching LP)

5. Position the locating target in the box. To verify the signal is balanced through the receiver's antennae, rotate the receiver about the center of the display, keeping the receiver level, and observe that the target stays centered in the box. Contact DCI if there is a problem.
6. With the locating target in the box, mark the location directly below the center of the receiver's display as the RLP.

You may hold the trigger in to obtain a reference lock but the predicted depth value displayed will not be valid as you are behind the transmitter.

Finding and Marking the Locate Line and Transmitter Location

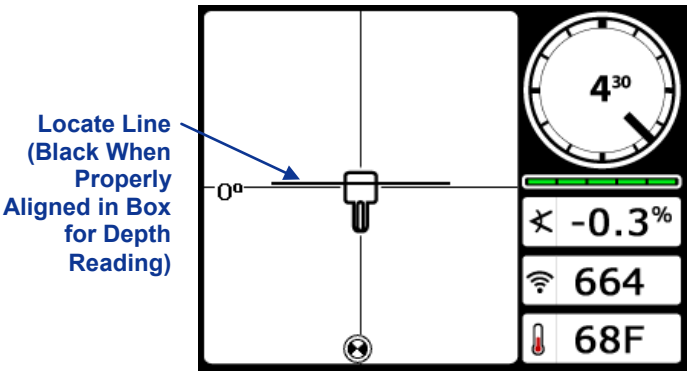
It is acceptable to mark the locate line when it is first found between the FLP and RLP. However, it is necessary to project a straight line between the FLP and RLP and find where the LL crosses this line to determine the left/right position directly over the transmitter.

Following from finding the Locate Points above:

1. Turn around and walk back toward the FLP keeping the locating target aligned with the vertical cross hair.
2. When the locate line appears, position yourself on the line that connects the FLP with the RLP.

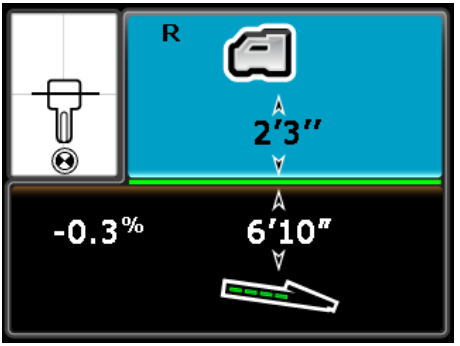
NOTE: If the locate line does not appear, move the receiver in a forward/aft direction over where you think the transmitter is located. You will see the locating target jump from the bottom of the screen to the top (or vice versa). Then hold the trigger in; this should re-reference the receiver to the transmitter's signal and bring up the locate line.

3. Holding the receiver level, align it so that the LL is in the box and the tick mark on the front of the receiver aligns with the line connecting the FLP and RLP. You are now directly over the transmitter.

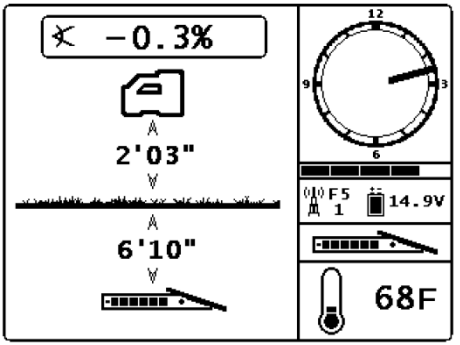


Receiver Locate Mode Screen (At LL)

4. Mark the location of the locate line side to side directly below the center of the receiver's display.
5. Mark the left/right position of the transmitter by aligning the FLP and RLP. This is the transmitter's heading.
6. Hold the trigger in at this location to take a depth reading. The depth screens will appear on the receiver and remote display.



Receiver Depth Mode Screen



Remote Display Depth Mode Screen

Continue by a positioning yourself on the bore path one rod length ahead of the last found FLP and repeat the procedure.

Tracking on the Fly

If you are running at 0% (0°) pitch over level ground, the predicted depth will be the actual depth. In this case, all locating can be done at the FLP even while the tool is moving.

Use this procedure once the transmitter location has been found and its heading has been determined to be online.

1. Start by positioning yourself on the bore path, one rod length ahead of the FLP.

2. As the tool advances, the FLP should travel along the receiver's vertical crosshairs indicating that the tool is still online.
3. Once the FLP is in the box, hold the trigger in and confirm that the predicted depth reading is as expected.
4. Continue by again positioning yourself one rod length ahead of the FLP and repeat the method.

Off-Track Locating

Use this procedure when it is not possible to walk above the transmitter due to a surface obstruction or interference.

For effective Off-Track locating, the pitch of the transmitter must match the pitch of the terrain. Ideally, pitch will be 0% (0º) on flat ground.

The technique uses the perpendicular relationship of the locate line to the transmitter. You must find and mark at least two points, preferably three, that are on the locate line, and out of the area of obstruction to track.

The procedure:

1. Stop drilling before the transmitter enters the area of the obstruction or pull back to where you can walk over the transmitter.
2. Find and align the FLP and RLP to determine the transmitter's heading.
3. Position the receiver with the locate line in the box.
4. Walk to the side of the transmitter while keeping the locate line in the box. Pull and release the trigger to re-reference the signal if the LL disappears.
5. Once you are able to walk forward without obstruction, move the receiver in a fore/aft direction and observe where the ball flips from the bottom of the screen to the top of the screen (or vice versa) and the locate line is aligned in the box. Mark this location on the ground.
6. Pull the trigger in for a depth reading. The depth reading will actually be the slant distance to the transmitter. Make note of this value and your distance from the bore

path. This information will be used to determine if the transmitter has maintained its heading or moved toward or away from the intended bore path.

Rather than track depth readings, you may choose to track signal strength, in this case make note of the signal strength at the location you mark.

7. Walk further to the side of the obstruction with the locate line in the box.
8. Again move the receiver in a fore/aft direction to find where the ball flips. Mark this location on the ground and take a depth reading making note of the value (and/or signal strength) and the distance from the bore path.
9. Once more walk further to the side of the obstruction with the locate line in the box. Move the receiver in a fore/aft direction to find where the ball flips. Mark this location on the ground and take a depth reading making note of the value (and/or signal strength) and the distance from the bore path.
10. Connect the three points to make a line. This line should perpendicular (at a 90° angle) to the transmitter's heading. If there is a problem, contact DCI.
11. Drill forward, tracking the locate line while walking parallel to the bore path and maintaining the noted distance from the bore path.
12. Keep the trigger held in as you walk forward to verify the slant distance to the transmitter is maintained. If you are tracking using signal strength, leave the trigger out and observe that the signal strength is maintained.
13. Periodically stop drilling and find the three points at the noted distances parallel to the bore path to verify heading is maintained.
14. If the depth reading increases or the signal strength decreases, the tool is moving away from you and needs to be steered back on track. If the depth reading decreases or the signal strength increases, the tool has moved toward you and needs to be steered back on track.
15. Use the transmitter's pitch to steer the transmitter up or down if required.

The Target Steering *Function*

The *Target Steering* function is useful when it is not possible to walk above or to the side of the transmitter such as in the case of road and river crossings. Unlike the Off-Track locating method, the Target Steering function allows for pitch changes and steering making it useful for a variety of drilling situations.

The function requires the F5 receiver be placed out ahead of the transmitter (on the other side of the obstruction) to be used as a steering target. See “Positioning the Receiver as a Target and Setting a Target Depth” below.

Because of the shape of the signal, in situations with significant pitch changes, such as during the launch/exit ends, or when the receiver is placed a significant distance ahead of the transmitter (about 30 ft or 10 m) the up/down steering information on the remote display may not be accurate. In these situations, only the left/right steering information and transmitter pitch should be considered accurate.

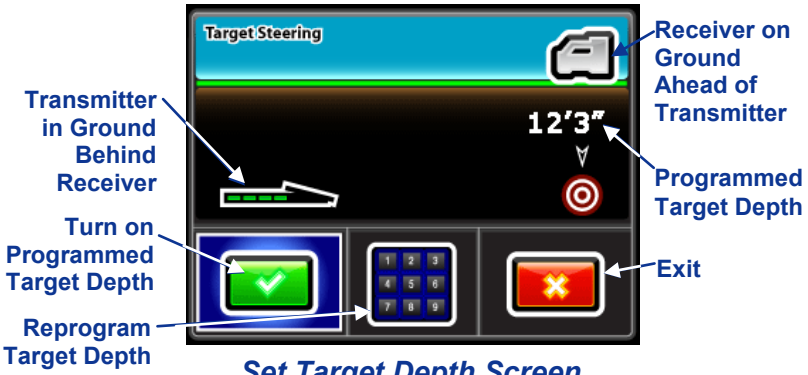
Positioning the Receiver as a Target and Setting a Target Depth

To activate the receiver as a target, a target depth must be set on the receiver. The target depth is the depth you want the drill head to be at when it reaches the location below the receiver.

Be sure that the bend radius of both the drill stem and the product you will install allows for the steering required to reach your target depth. Also, if the receiver is to be placed above ground level, you must add that distance to the target depth.

Turn On Target Steering:

1. Toggle up (push toggle switch toward display) to access the Target Depth menu. The following screen displays.



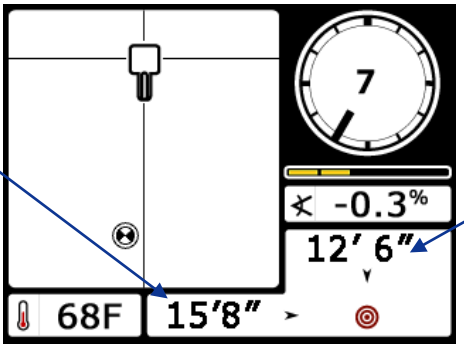
Set Target Depth Screen

The Target Depth menu shows the correct orientation of the receiver and transmitter for using *Target Steering* when the transmitter is within range. To position the receiver as a target, place the receiver ahead of the transmitter's front locate point while still within range of the transmitter (transmitter on screen) and the battery end of the receiver facing the drill rig or last locate point.

2. If the depth value on the display matches your target depth, pull the trigger to select the checkmark.

Otherwise, toggle right to highlight the keypad and pull the trigger. Enter the target depth using the keypad. See "Using the Keypad" in the *Navigating Menus* section.

3. After a target depth is selected, the confirmation tone will sound and you will be returned to the locate screen with *Target Steering* activated. The following screen will display.



Receiver Screen with Target Depth Programmed

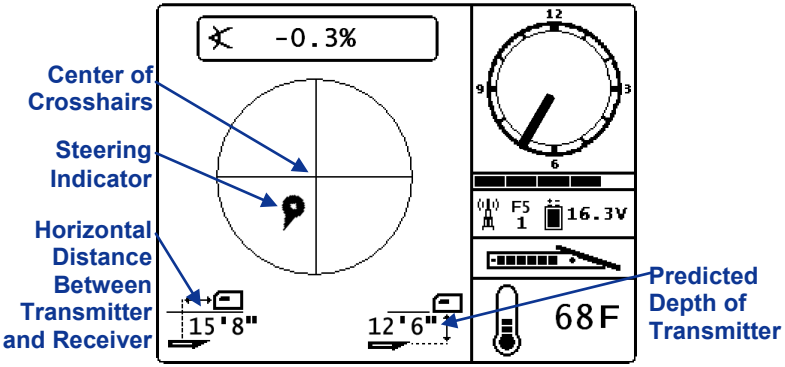
The predicted depth of the transmitter that displays is the depth that the transmitter will be at when it reaches the location beneath the receiver if it continues on its current path. In this case, the predicted depth of the transmitter is deeper than the target depth; steering is needed. See Steering to the Target below.

Turn Off Target Steering:

To turn off Target Steering, toggle down from the *Target Steering* locate mode screen and the screen will return to the standard locate screen.

Steering to the Target

The *Target Steering* screen will display on the remote when a target depth has been programmed in the receiver.



Target Steering on Remote Display

The steering indicator in this case shows that the drill head is to the left and too low for the intended path. A steering command of approximately 1 o'clock would bring the drill head toward the target. The transmitter is online to reaching the target, when the steering indicator is centered on the crosshairs. Note that, for quick interpretation, the pointed end of the steering indicator corresponds to the clock position of the drill head.

Appendix A: System Specifications and Maintenance Requirements

The power requirements, environmental requirements, and equipment maintenance requirements for the DigiTrak F2 Locating System are listed below.

Power Requirements

Device (Model Number)	Operational Voltage	Operational Current
DigiTrak F5 Receiver (F5R)	14.4 V ⎓ (nominal)	350 mA max
DigiTrak F Series Display (FSD)	14.4 V ⎓ (nominal)	220 mA max
DigiTrak F Series Battery Charger (FBC)	Input: 12 V ⎓ (nominal) Output: 16.8 V ⎓ (nominal)	Input: 5 A max Output: 1.8 A max
DCI Lithium-Ion Battery Pack (FBP)	14.4 V ⎓	4.4 Ah max, 65 Wh
DCI F Series Transmitters (FX, FXL)	2–3.6 V ⎓	0.75 A max

Appendix A

Environmental Requirements

Device	Altitude	Relative Humidity	Operating Temperature
DigiTrak F5 Receiver	<16,404 ft (<5000 m)	<90%	-4° to 140°F (-20° to 60°C)
DigiTrak F Series Display	<16,404 ft (<5000 m)	<90%	-4° to 140°F (-20° to 60°C)
DigiTrak F5 Transmitters	<16,404 ft (<5000 m)	<100%	-4° to 220°F (-20° to 104°C)
DigiTrak F Series Battery Charger	<13,123 ft (<4000 m)	<99% for 0-10°C <95% for 10-35°C	32° to 95°F (0° to 35°C)
DCI Lithium-Ion Battery Pack	<13,123 ft (<4000 m)	<99% for <10°C <95% for 10-35°C <75% for 35-60°C	-4° to 140°F (-20° to 60°C)

General Transmitter Care Instructions

- Periodically clean the spring and threads inside the battery compartment as well as the spring and threads of the battery cap to ensure a proper power connection with the batteries. An emery cloth or wire brush can be used to remove any oxidation that has built up. Be careful not to damage the battery cap O-ring; remove it while cleaning if necessary. After cleaning, use a conductive lubricant on the battery cap threads to keep the battery cap from binding in the battery compartment and maintain ground connection.

- Before use, inspect the battery cap O-ring for damage that may allow water to enter the battery compartment. Replace the 2-022 Buna-N70 type O-ring if the one installed becomes damaged.

- Placing tape around the fiberglass tube of the transmitter, if space allows, will keep the fiberglass protected from most corrosive environmental wear.

- Send in the Product Registration Card for the 90-day limited warranty.

Appendix A