DigiTrak® F5®

Directional Drilling Locating System

Operator's Manual

Supplement A:

Range® Mode

MOST

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Tél. : 01 69 33 17 39

DCI®

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XRange® patent pending.

Required Software

Only F5 receivers with software version 3.04 or higher[1] can communicate with a transmitter in XRange mode; to find your software version, from the Main menu select System Info and look for "F5 SW ver". To upgrade your receiver, please contact DCI Customer Service.

XRange capability on a transmitter is identified by an ⚡®R engraved on the battery tube.

Warning

⚠️ **Warning** All audio signals on the F5 receiver are disabled while it is in XRange mode. Visually monitor transmitter temperature values regularly.

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[1] XR is available in v3.01 in China.

Table of Contents

Introduction

This document is intended as a supplement to the F5® Operator's Manual, which should be reviewed in its entirety before using the equipment or techniques described herein.

To ensure you fully understand how XRange mode works, please read this entire document before using XRange.

XRange® (XR®) mode is a new locating feature in select F5 locators and transmitters that increases data range, providing roll/pitch data where high levels of interference or excessive depth might otherwise prevent the completion of a bore. XRange mode is always available, any time throughout the bore, to help finish the job. Switch to XRange mode when conditions prevent the transmitter from providing reliable roll/pitch data in its normal mode.

XRange mode provides two methods to help finish a bore. Locating with a transmitter in XRange mode using the **Real-time** method is nearly identical to locating with a transmitter in normal mode, with some small trade-offs (see XRange vs. Normal Mode on page 6). The XRange **Max** method can help lock in fluctuating XRange roll/pitch values, but may only be used when the drill head is stationary.

Warning Fluid pressure data from a Fluid Pressure Transmitter (FPT) is not supported while the transmitter is in XRange mode.

Enable XRange

To drill with XRange, first enable XRange mode on the transmitter (described below), then Enable XRange on the F5 Receiver (next section, page 3).

Enable XRange on the Transmitter

A new XRange transmitter powers on the first time in normal mode, but will remember its last used mode. Toggle the transmitter to XRange mode using one of the following two methods.

Use these same steps later to toggle XRange mode off.

Above Ground (Pre-Bore) Tilt Method

Use this method before drilling begins, when you want the transmitter to be in XRange mode at the start of the bore.

Monitor transmitter roll on the receiver or remote display during this sequence.

Clock position (CP) must begin and remain at 12 o'clock during this sequence.

-65 degrees

1. Start with the transmitter powered on, level, and at rest for at least five seconds.
2. Angle the transmitter down at approximately -65 degrees for 10–18 seconds.
3. Return the transmitter to level (0±8°) for 10–18 seconds.

Below Ground (Mid-Bore) RRS4 Method[1]

Use this Repeating Roll Sequence to place the transmitter in XRange mode while drilling in a section of the bore that requires additional data range.

Begin with the transmitter at any clock position and at rest for at least 40 seconds.

1. Complete one full clockwise rotation (±1 position) within 0.5–30 seconds, then wait 10–20 seconds.
2. Repeat step 1 three more times, for a total of *four* rotations (RRS4).
3. After the fourth rotation, leave the drill string at rest for a total of 60 seconds, after which the transmitter changes between XRange and Normal mode.

If any rotation is not completed within 10–20 seconds, or if any rotation continues for more than one full revolution, the transmitter mode change is cancelled.

If the receiver was displaying data while the transmitter was still in normal mode, that data should now disappear if the transmitter is in XR mode. If it does not, the transmitter mode was not successfully changed.

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[1] Repeating Roll Sequence is available on select FPT transmitters s/n 30070000 and above.

> **Note** Performing the above sequence with only three rotations will change the transmitter frequency, not switch to or from XRange mode (see Changing the Transmitter Frequency Mid-Bore on page 7.

Enable XRange on the F5 Receiver

From the Locate screen, hold the toggle right to open the Transmitter Shortcut menu. Select appropriate transmitter frequency, select the **XRange** (XR) check box, then select **Locate Mode** to return to the Locate screen.
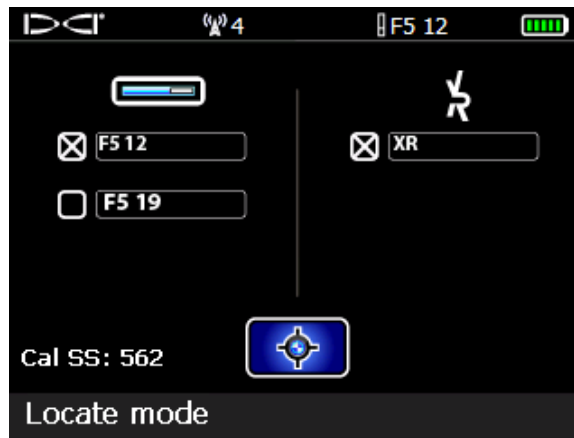
Transmitter Shortcut Menu Showing 19/12 kHz Transmitter

Use this same menu later to toggle XRange mode off.

An "XR" displays at the top right of the roll indicator to indicate the F5 receiver is now in XRange mode.
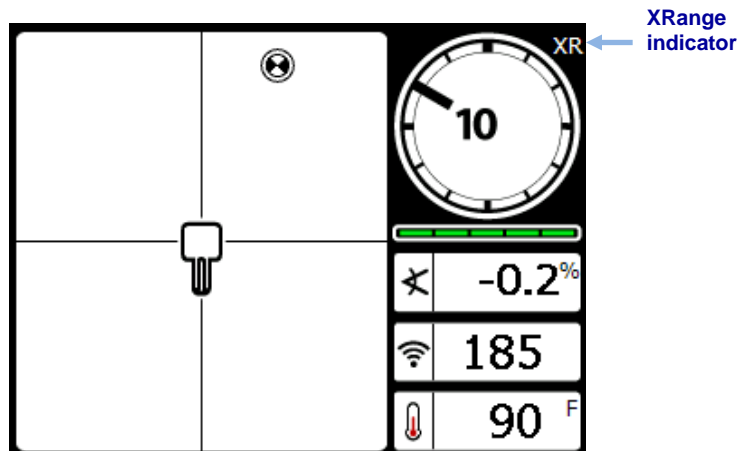
XRange Real-Time Locate Screen

Transmitter data fields such as roll and pitch may initially be blank; after the receiver reconnects to the transmitter in XRange mode, transmitter data will again display on the Locate screen.

If no data appears, ensure:

- the F5 receiver is actually in XRange mode (described at the beginning of this section)
- the F5 receiver is set to the same frequency as the transmitter
- the transmitter is powered on
- the transmitter has not gone into sleep mode due to 15 minutes of inactivity

When the receiver is in XRange mode, holding the trigger at any time starts the XRange Max method of reading data. XRange Max requires the drill head to remain stationary when taking readings.

Note   Selecting a new transmitter from the Transmitters option on the receiver's main menu, or re-selecting the same transmitter, will turn the receiver's XRange mode off.

Locating with XRange Real-Time

Locate with **XRange Real-time** when high levels of interference or excessive depth are causing loss of roll/pitch data. Locating with a transmitter in XRange mode using the Real-time method is nearly identical to locating with a transmitter in normal mode. For the basics of locating, refer to your F5 receiver's operator's manual.

Due to the adjusted rate and resolution of data as described in the table on page 6, transmitter data in XRange mode will update less frequently on the F5 receiver and remote display than when in normal mode.

In most cases of switching to XRange mode after losing data in normal mode, data reappears within seconds.

A Note on Data Readings

As when drilling with a transmitter in normal mode, data that appears quickly and remains steady can be considered to be more reliable than data that is fluctuating or flickering on and off. Never rely on data readings that change frequently in what appears to be a random manner, which indicates interference is hindering the transmission of data from the transmitter.

Sometimes data may change briefly to a random value before quickly returning to normal. A roll or pitch value may briefly change even when the drill isn't turning. These brief and occasional spikes or drops in an otherwise consistent history of values are also the effects of sporadic interference.

Locating with XRange Max

	Note	Before using the XRange Max method, try obtaining data using the XRange Real-time method as described in the previous section.

	Warning	The drill head must be stationary when taking readings using XRange Max. If the drill head is moving, data readings will not be accurate.

	Warning	Due to the nature of the extreme depth and/or high-interference environment where use of XRange Max will typically occur, the risk of obtaining unreliable data is increased. Never rely on data that does not display quickly and remain stable. XRange Max is never a substitute for prudent operator judgment.

The purpose of **XRange Max** is to stabilize erratic roll/pitch data when drilling at the very limit of the ability of XRange Real-time due to extreme depth or interference, which will vary by job site. *XRange Max cannot stabilize data if none existed while using the XRange Real-time method.*

Using XRange Max

With the F5 receiver and transmitter both in XRange mode and the drill head stationary, hold the trigger in at the Locate screen to take a depth reading.

While taking a depth reading, the receiver also takes multiple data readings to determine transmitter roll/pitch values. The number of readings is tracked by the XRange Max reading counter. Greater interference or deeper bores will require a higher number of readings before roll/pitch data displays, or may prevent data from displaying altogether.

When the roll/pitch data display is steady, and before the reading counter reaches 99 and restarts, note the data and release the trigger.
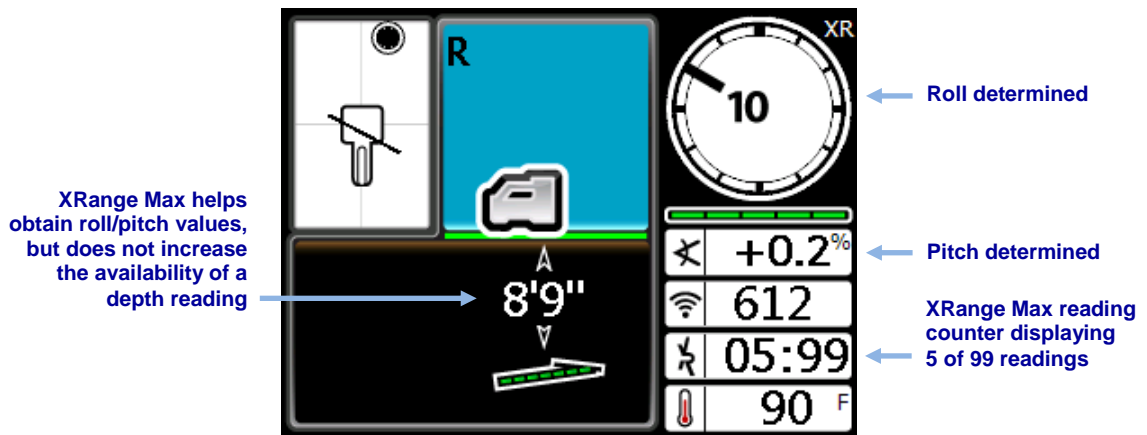
XRange Max Locate Screen

Limitations

DCI recommends obtaining a minimum of *three* consecutive XRange Max readings at the same location. Do not rely on XRange Max data unless:

- each of the roll and pitch values appear and stabilize within 10 counts (seconds)

- the three roll values are identical and the three pitch values are identical

If the roll or pitch values vary, the data is beyond the limits of XRange Max.

When roll or pitch values take longer to appear steady, it indicates interference is hindering the signal from the transmitter. Values that take longer to appear may be considered less reliable than values that appear sooner.

At a count of 99 seconds, XRange Max deletes all current readings, resets the counter, and starts taking new readings; this is the same as releasing and holding the trigger to start a new XRange Max reading. Holding the trigger beyond a count of 99 does not increase the reliability of the current reading.

XRange vs. Normal Mode

Compared to a transmitter's normal mode, XRange regulates transmitter data rate and resolution to maximize range and reliability of data transfer, as shown in the following table.

Data	Transmitter Mode	
	Normal	**XRange**
Roll positions	24	12
Pitch resolution	0.1%	0.2% at 0–3% 0.5% at 3–9% 1.0% at 9–45%
Pitch range	±45° (±100%)	±24.2° (±45%)
Temperature resolution	7° F (4° C)	4 ranges; see table
Battery life icon segments	7	4
Audible tones	Yes	No
FPT pressure data	Yes	No

Data Comparisons

As noted in the previous table, temperature readings in a transmitter's normal mode display in increments of 7° F (4° C), but in XRange the temperature displays as the *maximum* value of the range it resides in.

For example, a transmitter operating at 79° F (26° C), in the Good range shown below, will display on the receiver as 90° F (32° C), the maximum value of that range. A transmitter operating at 120° F (49° C), in the Serious range, will display on the receiver as 133° F (56° C).

Category	Range	Temperature Displayed
Good	-4 to 90° F -20 to 32° C	90° F 32° C
Fair	91 to 111° F 33 to 44° C	111° F 44° C
Serious	112 to 133° F 45 to 56° C	133° F 56° C
Critical	134 to 176° F 57 to 80+° C	176° F 80° C

XRange Temperature Values

Warning All audio signals on the F5 receiver are disabled while it is in XRange mode. Visually monitor transmitter temperature regularly.

Changing the Transmitter Frequency Mid-Bore

Below Ground RRS3 Method[1]

Using the other frequency of a dual-frequency transmitter may provide better data results while drilling in a section of the bore with a high level of interference. Use this new Repeating Roll Sequence to change the frequency of a transmitter between 19.2 and 12.0 kHz mid-bore.

Begin with the transmitter at any clock position (CP) and at rest for at least 40 seconds.

1. Complete one full clockwise rotation (±1 CP) within 0.5–30 seconds, then wait 10–20 seconds.

2. Repeat step 1 two more times, for a total of three rotations (RRS3).

3. After the third rotation, leave the drill string at rest for a total of 60 seconds, after which the transmitter changes frequencies.

Select the new transmitter frequency on the receiver as described in the F5 Operator's Manual.

If any rotation is not completed within the prescribed time, or if any rotation continues for more than one full revolution, the transmitter frequency change is cancelled.

The transmitter frequency can still be changed using the previous 10-2-7 roll method as described in the F5 Operator's Manual.

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[1] Repeating Roll Sequence is available on select transmitters s/n 30070000 and above.

> **Note** Performing the preceding sequence with four rotations instead of three will enable XRange mode on the transmitter, but it will remain in the same frequency (see).

Transmitter Specifications

Frequency .... 19.2 or 12.0 kHz
Pitch resolution, standard/XR .... ±0.1/0.2% at level
Roll data, standard/XR .... 24/12-position clock
Temperature resolution, standard/XR .... 7° F / 4 ranges
Diameter .... 1.25 in.
Fluid pressure range, standard only .... 0–250 psi
Fluid pressure resolution, 0–75 psi (0–517 kPa) .... 1 psi
    75–250 psi (517–1725 kPa) .... 5 psi

15 in. Transmitter - F5Dpx 19/12

Depth range .... 65 ft.
Standard roll/pitch data range .... 65 ft.
XRange data/Max data range .... 105/120 ft.
Battery life, awake/asleep
    2 C-cell alkaline .... 20/200 hrs
    1 SuperCell™ .... 70/400 hrs
    2 SAFT LSH14 .... 40/400 hrs

19 in. Transmitter - F5DLpx 19/12

Depth range .... 100 ft.
Standard roll/pitch data range .... 100 ft.
XRange data/Max data range .... 170/200 ft.
Battery life, awake/asleep[1]
    1 SuperCell .... 40/400 hrs
    2 SAFT LSH14 .... 30/400 hrs

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[1] Alkaline batteries are not recommended due to higher transmitter power requirements.

End of Supplement