

DigiTRAK[®] LWD[™] 3.04

**and the DataLog Feature
for Falcon F5[®]
with Optional iGPS**

Operator's Manual

403-3310-00-B, printed on 5/4/2017

© 2016–2017 by Digital Control Incorporated. All rights reserved.

Trademarks

The DCI[®] logo, DataLog[®], DigiTrak[®], DigiTrak Falcon logo, and F5[®] are U.S. registered trademarks.

Patents

U.S. and foreign patents apply to the product covered by this manual. For details, please visit www.DigiTrak.com/patents.

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 at the end of this manual; it can also be obtained at www.DigiTrak.com.

Important Notice

All statements, technical information, and recommendations related to DCI products are based on information believed to be reliable. However, DCI does not warrant or guarantee the accuracy or completeness of such information. Before using 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 for use with horizontal directional drilling in the ordinary course, and do not apply to any user customizations, third-party products, or any usage of the DCI product outside of the ordinary course. Nothing herein shall constitute a warranty by DCI nor will anything herein be deemed to modify the terms of DCI's existing Limited Warranty applicable to all DCI products. DCI may update or correct the information in this manual from time to time. You may find the most recent version of this manual on DCI's website, www.DigiTrak.com. Under **Service & Support**, click **Documentation** and select from the **Manuals** drop-down menu.

Compliance Statement

This equipment complies with Part 15 of the Rules of the FCC and with Industry Canada license-exempt RSS standards and with Australia Class License 2000 for LIPD (low interference potential devices). 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 B103, Kent WA 98032; phone 425.251.0559 or 800.288.3610 (US/CA).

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

CE Requirements



DigiTrak receivers are classified as Class 2 radio equipment per the R&TTE Directive and may not be legal to operate or require a user license to operate in some countries. The list of restrictions and the required declarations of conformity are available on DCI's website at www.DigiTrak.com. Under **Service & Support**, click **Documentation** and select from the **CE Documents** drop-down menu.

Contact Us

United States
DCI Headquarters

19625 62nd Ave S, Suite B103
Kent, Washington 98032, USA
1.425.251.0559 / 1.800.288.3610
1.425.251.0702 fax
dci@digital-control.com

Australia

2/9 Frinton Street
Southport QLD 4215
61.7.5531.4283
61.7.5531.2617 fax
dci.australia@digital-control.com

China

368 Xingle Road
Huacao Town
Minhang District
Shanghai 201107, P.R.C.
86.21.6432.5186
86.21.6432.5187 传真)
dci.china@digital-control.com

Europe

Brueckenstraße 2
97828 Marktheidenfeld
Deutschland
49.9391.810.6100
49.9391.810.6109 Fax
dci.europe@digital-control.com

India

DTJ 203, DLF Tower B
Jasola District Center
New Delhi 110025
91.11.4507.0444
91.11.4507.0440 fax
dci.india@digital-control.com

Russia

Молодогвардейская ул., д.4
стр. 1, офис 5
Москва, Российская Федерация 121467
7.499.281.8177
7.499.281.8166 факс
dci.russia@digital-control.com

Dear Customer,

Thank you for choosing a DigiTrak guidance system. We are proud of the equipment we have been designing and building in Washington State since 1990. We believe in providing a unique, high-quality product and standing behind it with world-class customer service and training.

Please take the time to read this entire manual, especially the section on safety. Please also register your equipment online at access.DigiTrak.com. Or, fill in the product registration card provided with this equipment and either fax it to us at 253-395-2800 or mail it to DCI headquarters.

Product registration entitles you to free telephone support (in the USA and Canada), notification of product updates, and helps us provide you with future product upgrade information.

Our Customer Service department is available 24 hours a day, 7 days a week in the U.S. to help with problems or questions. International contact information is available in this document and on our website.

As the horizontal directional drilling industry grows, we're keeping our eye on the future to develop equipment that makes your job faster, easier, and safer. Visit us online any time to see what we're up to.

We welcome your questions, comments, and ideas.

Digital Control Incorporated
Kent, Washington
2017

Watch our DigiTrak Training Videos at www.youtube.com/dcikent

Table of Contents

Important Safety Instructions	1
Compatibility	1
Falcon F5 DataLog	2
Introduction	2
How It All Works	2
DigiTrak DataLog Management (DDM)	3
Setting Time and Calendar	3
System Components	4
Receiver	4
Transmitter	4
LWD Software	4
Bluetooth USB Radio	5
Typical LWD Report	5
Using DataLog on Falcon F5	7
Enable DataLog	7
Receiver DataLog Menu	8
Create a New Job	8
Resolving Missing Data	12
Recording Partial Rods	12
Flags and Pins	13
Offset and Deviation	15
Closing or Pausing a Job	16
Appending to an Existing Job	17
Viewing and Pulling Back (Deleting) Rods from the Receiver	18
Measuring and Documenting the Last Rod	19
Adding a Drill DataLog Survey Point	20
Deleting a DataLog Job	21
Log-While-Drilling 3.04	22
Installing Bluetooth Drivers and LWD Software	22
Uploading Falcon F5 Data to a Computer	22
Add Falcon F5 Receiver to LWD Bluetooth Device List	22
Uploading DataLog or White Line from a Receiver	23
Uploading Recommendations	24
Opening Files	25
The LWD 3.04 Screen	26
Site Information	26
Job Information	27
Accounting for Entry Pit Depth	28
Data Table	28
Editing Data Points	31
Drill Profile and Drill Pressure Charts	33
Editing and Annotating Charts	35
Define Chart Properties	35
Add Annotations	36

Edit Flags and Pins	37
Viewing GNSS Data on Google Earth	38
Removing White Lines	39
Saving, Printing, and Sending Your LWD Job	39
Saving Project Files	39
Printing and Previewing Project Files	39
Sending Project Files	40
File Location	40
Appendix A: Receiver DataLog Icons	41
Appendix B: Menus	43
File Menu	43
Edit Menu	43
View Menu	44
Window Menu	44
Help Menu	44
Appendix C: Sample Printed Output	45
Customer Data	45
Drill and Pressure Graphs	46
Data Table	47
Flags and Pins	48
Fluid Pressure Table	50

STANDARD WARRANTY

Important Safety Instructions

Always operate your DigiTrak locating system properly to obtain accurate depth, pitch, roll, and locate points. If you have any questions about the operation of the system, please contact DCI Customer Service for assistance.

This manual is a companion to your Falcon F5[®] guidance system operator's manual, which contains a more thorough list of warnings regarding the potential for serious injury and death, work slowdowns, property damage, and other hazards and warnings regarding the operation of horizontal drilling equipment. Please read and understand your system operator's manual completely before operating the equipment described in this manual.



Data that is logged, displayed, stored, and used by the Falcon F5 receiver and LWD 3.04 software is not guaranteed to be accurate or complete. Human review and judgment is required. The accuracy and completeness of data generated by HDD guidance systems may be affected by active or passive interference and other environmental conditions, failure to calibrate or use the device properly, or a variety of other factors. DCI does not warrant or guarantee, and disclaims liability for, the accuracy and completeness of any data generated by any external source, including (without limitation) GNSS data and data received from a drill rig.

Compatibility

LWD 3.04 can open most jobs saved in prior versions of LWD. LWD 3.04 files (extension **lwd**), however, are not backwards-compatible with LWD 2.12, which uses files with the **dl5** extension. Additionally, iGPS data will not display in LWD 3.02. An older file that is opened and saved in LWD 3.04 becomes an **lwd** file that can no longer be opened in older versions of LWD. Contact DCI Customer Service for information on upgrading 2.12 or 3.02 software to version 3.04.

LWD 3.04 is not compatible with legacy F5 TensiTrak files, TensiTrak fluid pressure files, or files generated by an Eclipse or Mark Series receiver. To view these legacy files, continue using LWD 2.12.

Falcon F5 DataLog

The DataLog[®] feature on your receiver lets you capture and store the rod-by-rod data of your pilot bore. When used with our mobile phone app LWD Mobile, using DataLog while drilling lets you view a real-time plot of your bore in progress right on your phone, as well as geo-tag the entry and exit. If you use the DigiTrak Aurora remote display, its LWD Live app also lets you view the drill profile in real-time as each rod is completed, whether DataLog is enabled on the receiver or not.

In addition to the rod data DataLog has always captured, with Falcon F5 we've added features like left/right offset and deviation, which let you record with even greater detail precisely where your pilot bore is in relation to surrounding landmarks. Increasingly, this data is also required by the client to ensure drilling parameters were met. When you import your DataLog job into our Log-While-Drilling (LWD) 3.0 software for your PC, you can edit, annotate, and create the precise report you or your client requires.

Introduction

The DataLog feature can measure and record the following types of data:

- Rod number
- Depth
- Pitch
- Offset
- Deviation from running line
- Flags and pins
- Elevation change (surface topography)
- Fluid pressure (requires a fluid pressure transmitter)

The terms and techniques used in this manual are considered basic to the DigiTrak Falcon F5 locating system. You must read and understand your system operator's manual and familiarize yourself with the various DataLog menus on your receiver before using the system. If you have questions, please call DCI Customer Service for assistance.

How It All Works

Turning your HDD job into a concise LWD graph consists of the following steps, which are covered in detail later in this document.

Before uploading a DataLog from your receiver for the first time, you will need to [install LWD 3.04](#) on your PC, along with the Bluetooth radio (mini Falcon) drivers, and enter the receiver serial number and Bluetooth ID.

1. [Enable DataLog](#) on your receiver (it ships from our headquarters ON by default).
2. [Create](#) a new job, set optional [offset and deviation](#), and start recording.
3. Log full or [partial rods](#), [remove rods](#) (pullback), or insert [flags or pins](#) before [pausing or closing](#) the job.

4. Select the job to [upload](#) from your receiver, then either:
 - Upload it from within LWD 3.04 and annotate or edit the job data as required, or
 - Upload to your smart device using LWD Mobile to display all drilling data and even the drill profile in a read-only format right on your device.
5. If you uploaded to your smart device, you need a subscription to transfer the job to your DigiTrak Cloud account (optional). Once there, it can be accessed and edited in LWD 3.04 from any computer with internet access.

To link your receiver to a cloud account and manage subscriptions, go to www.MyDigiTrak.com.

Download the free LWD Mobile app for your smart device from the Apple Store or Google Play and read the user guide located at the Falcon F5 operator manuals [website](#). Refer to our Aurora page online for more information on the LWD Live app.

DigiTrak DataLog Management (DDM)

DataLog and Log-While-Drilling are parts of DCI's complete data management process. For more information, visit us online.

On the [Documentation](#) page of our website (Service & Support > Documentation), under Manuals, select Falcon F5 from the drop-down menu and scroll down to the section on related User Guides for information on:

Cloud Manager	Store and manage your DataLogs and Log-While-Drilling (LWD) files from all your receivers in one convenient place.
iGPS	Add GNSS latitude/longitude coordinates to every data point with this optional Falcon F5 add-on module.
LWD Live	Watch your bore plotted in real time on your Aurora® touchscreen display. Import a Vermeer BoreAssist file.
LWD Mobile	Use your smart phone to upload a Falcon F5 DataLog to your subscription cloud account for instant viewing and analysis company-wide.

Setting Time and Calendar

The correct time and date must be set on your receiver before logging data. The option to set the time and calendar is available on the **Settings** option on the Main menu. For additional help on setting the time and date for your receiver, consult your operator's manual.

System Components

The DigiTrak DataLog system has four main components:

Falcon F5 Receiver (FF5)	A receiver (locator) with DataLog menus used to display and record transmitter data.
Falcon Transmitter	A battery-powered device located in the drill head with sensors that continuously measure and transmit information about the below-ground drill head. This information is displayed on the FF5 receiver.
LWD 3.04 Software	The computer application used for downloading and working with Falcon F5 DataLog drill data from a receiver
Bluetooth USB Radio	A USB device required for the computer to communicate with the Falcon F5 receiver. Look for the miniature Falcon F5 in your system case.

Receiver

The receiver tracks the position and depth of the transmitter. With DataLog enabled, it also records drill data such as depth, pitch, and rod number. The Falcon F5 receiver can record and store 50 jobs (runs) before some or all jobs must be deleted to make memory available for new jobs. Each DataLog job can have hundreds of data points.

Transmitter

The Falcon F5 receiver will only work with a Falcon transmitter. The advanced technology used in the Falcon system makes the receiver incompatible with classic DigiTrak transmitters.

Standard drill data provided by a transmitter includes depth and pitch. A Falcon F5 transmitter also provides fluid pressure readings.

LWD Software

The Log-While-Drilling (LWD™) software is provided on a USB flash drive that also contains this operator's manual, the system operator's manual, sample drill data, and Bluetooth drivers.



LWD 3.04 USB Flash Drive

The software requires a computer with the following minimum specifications:

- Microsoft Windows operating systems currently supported by Microsoft Corporation
- USB port
- pointing device (mouse)
- printer (optional)

Bluetooth USB Radio

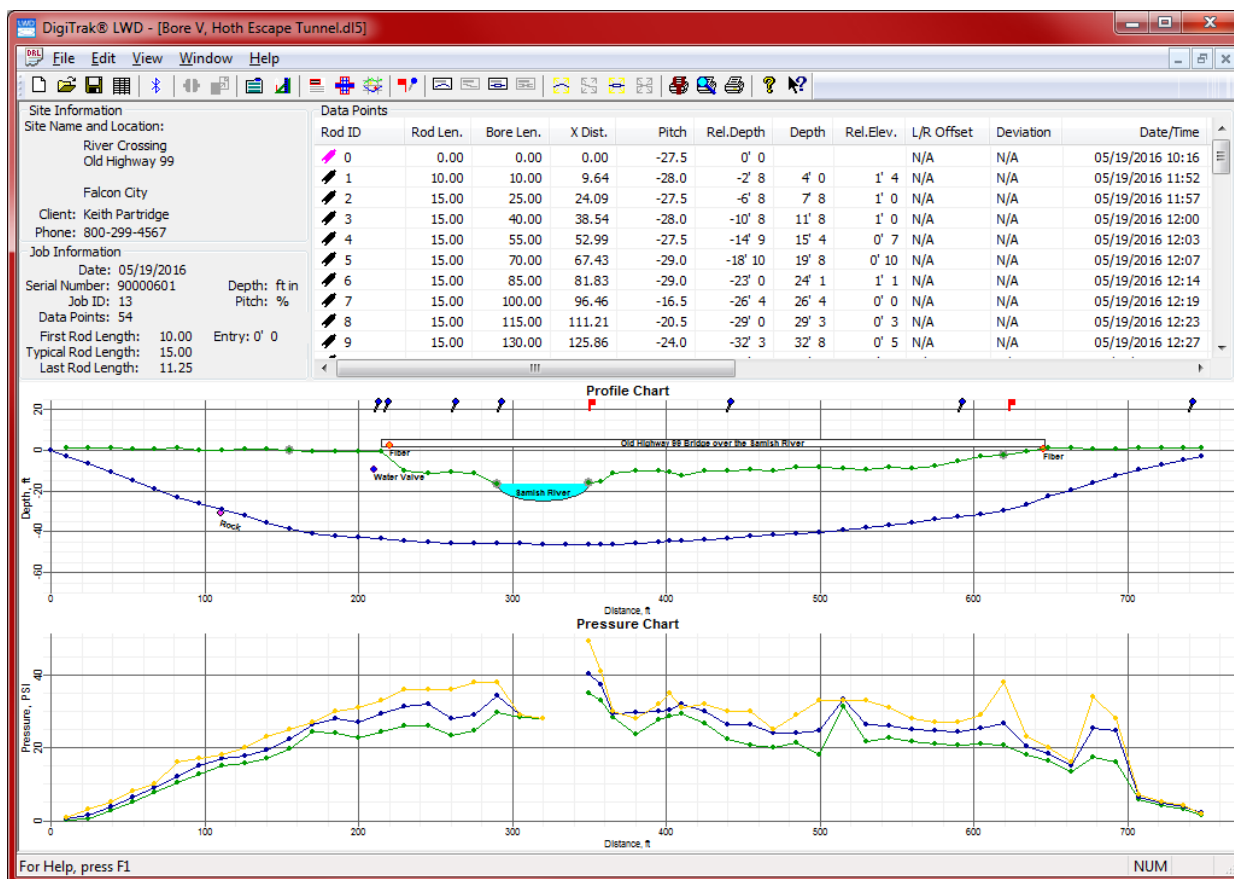
The Bluetooth USB radio plugs into your computer to allow the receiver to upload data. Drivers for the Bluetooth adapter are provided on the LWD flash drive and must be loaded before use; see [Log-While-Drilling 3.04](#) on page 22.



Bluetooth USB Radio

Typical LWD Report

The as-built report you view in the Log-While-Drilling program shows the drill data you recorded on your Falcon F5 receiver. All reports include standard transmitter data like rod number, depth, and pitch. This screen is discussed in detail in [Opening Files](#) on page 25.



DataLog with Fluid Pressure in LWD 3.04

Custom options while drilling with the Falcon F5 receiver:

- Deviation from running line
- Offset of borepath from a running line or parallel landmark such as a guard rail, curb, or fence
- Pins to mark geographical points adjacent to the bore path
- Flags to mark utility crossings
- Exit elevation

Custom options after downloading to computer:


- Add utilities by color code, type, and depth
- Add features like roads, water, and power poles using annotations
- Add, delete, or modify rods and rod lengths
- Scale the chart for more realistic view
- Add a survey point to show the elevation difference between the entry and exit elevations
- Scale the chart to hide pressure data

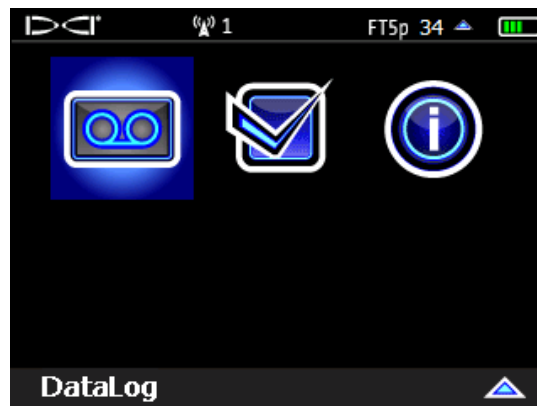
Using DataLog on Falcon F5

To record pilot bore drill data, the receiver must be receiving data from a properly paired and calibrated transmitter, as described in your receiver operator's manual.



Enable DataLog

The DataLog feature must be enabled before you can start recording or append to drilling data.

From the Main menu, toggle down to the second page and select **DataLog** .



Falcon F5 Receiver Main Menu, Second Screen

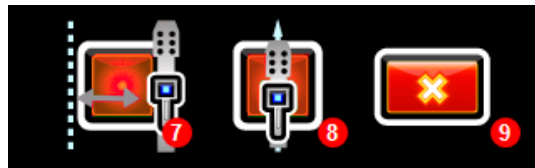
In the subsequent [DataLog menu](#) (next section), if the DataLog icon is red  (disabled), select it so it turns green  (enabled). If the icon is already green, DataLog is already enabled.

Receiver DataLog Menu

Use the **DataLog** menu to enable or disable DataLog, set up a job, delete jobs, and perform other DataLog tasks.



Second page



1. Set up job
2. Upload
3. Delete
4. Enable/disable
5. Survey point
6. View jobs
7. Enable/disable left/right offset from borepath
8. Enable/disable deviation from intended borepath
9. Exit

DataLog Menus

[Left/Right Offset](#) and [Deviation](#) icons are located below the Enable/Disable icon . Select either icon to turn each feature on (green) or off (red, shown above). Offset and Deviation are discussed on page 15.


Create a New Job

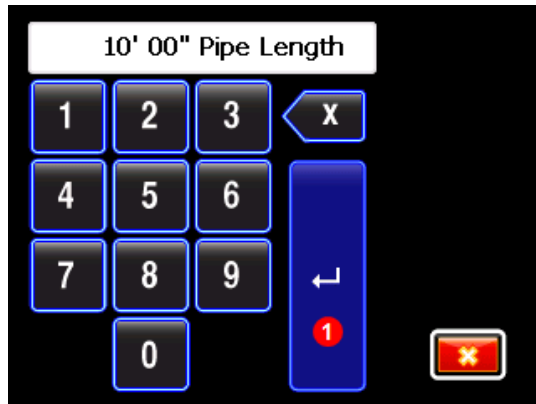
1. At the **Locate** screen, hold the trigger and toggle right to display the **Drill DataLog Start Recording** menu (this is the same as selecting **Set up job** from the receiver **DataLog** menu).
2. Select **Create a New Job** .



1. Create a new job

DataLog Recording Menu


- Enter the drill rod (pipe) length to be used for this bore on the keypad, then select **Enter**  to set it as the drill rod length.

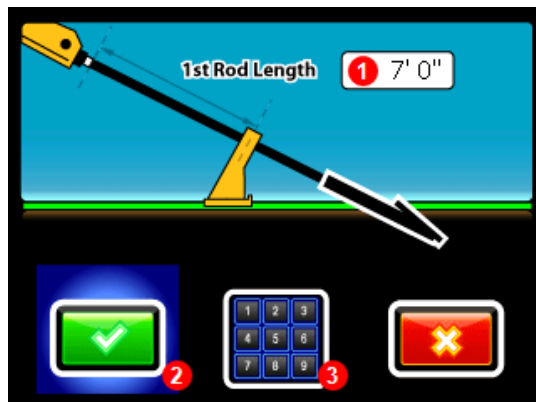


1. Enter

Keypad for Entering Pipe Length

The default rod length is 10 ft. The receiver remembers your last rod length.

- The 1st rod length input screen appears with a default value. This length is automatically calculated as 70% of your pipe length. If this is correct for your bore, select  to set this value and skip to the next step.



- First rod length
- Set first rod length to default value
- Select keypad to enter a different value

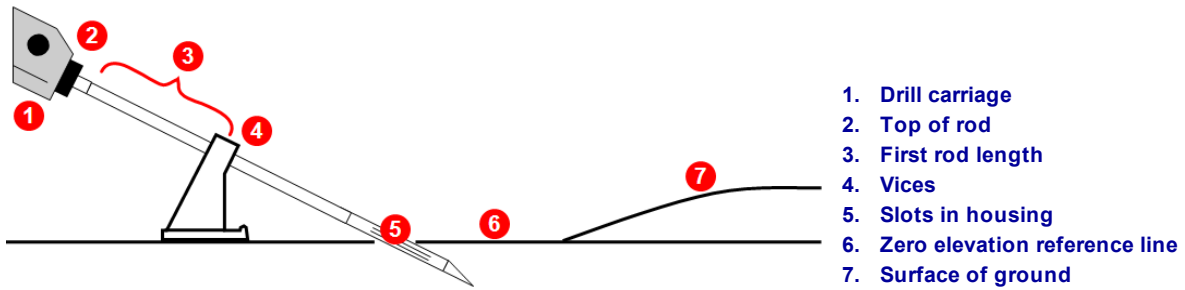
First Rod Length Input Screen





If the drill head cannot be positioned so the slots are half above and half below the ground due to tooling configuration (as shown in the preceding and following illustrations), you can still illustrate this later in LWD on your uploaded bore data by opening **Job Information** (under the **Edit** menu) and entering a value in the **Rel. Elev. (Relative Elevation) At Entry** box. For example, if the housing slots are 4 feet below ground, enter a value of -4.

To calculate a different 1st rod length value, measure from the vices to the top of the rod when the drill head is positioned for the first data point. For this measurement, the housing slots should be half above and half below the ground (or a plane parallel to the ground if drilling into a pit). The elevation at the first data point is the Zero Reference elevation, and is generally at the surface of the ground.

Select the keypad, enter the desired value, and select **Enter** .



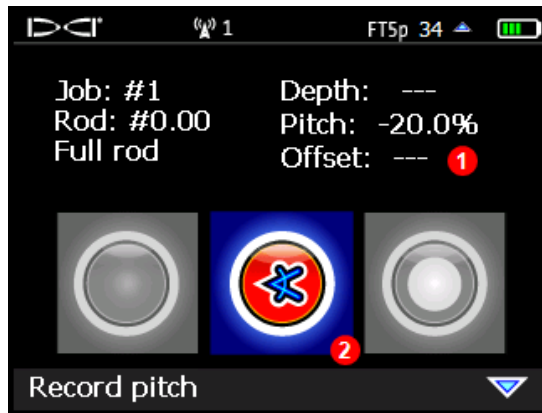
Measuring the 1st Rod Length

- When recording the first data point (rod 0), the only available option will be **Record Pitch Only** . With the receiver positioned within range of the transmitter (it does not have to be at the locate line or front locate point), select  to record the data point.




iGPS Note

It is best to record Rod 0 above the transmitter at the entry (#5 above). Record all iGPS data points with the Falcon F5 above the Locate Line (LL) to ensure proper GNSS records.



- The --- indicates offset is disabled
- Record pitch only

Drill DataLog Recording Options (Pitch Only)

- If [Deviation](#) is on (see page 15), select the arrows to enter the horizontal distance the located drill head is from the intended path (default is the last deviation entered), then select  to save and return to the **Locate** screen.
- Advance the drill head to the end of the first rod and position the receiver over the locate line (LL) or the front locate point (FLP). Hold the trigger to take a depth reading and set a reference point.

**iGPS Note**

GNSS data will be most accurate when data is recorded with the receiver over the locate line. Recording rod data at the FLP will store the GNSS data, but it will be hidden on the LWD report. This is because the GNSS data at the FLP is not above the locate line, but depths at the FLP are back-calculated to reflect depth above the drill head. After transferring the DataLog to LWD on a computer, you will have the option to unhide GNSS data at the FLP.

8. Hold the trigger and toggle right once to view Recording Options, which now has all options enabled.¹

**Drill DataLog Recording Options**




When this screen appears, data from the transmitter and iGPS is locked in and you may move the receiver. This data remains visible until you record this data or select **Exit**. Before recording, verify the rod number, depth, pitch, and offset are correct. If not, toggle down, select **Exit** (not shown above), and repeat this step.

**iGPS Note**

If no green icons (or LED lights on the iGPS module) are solid green, exit and obtain a better GNSS signal. Try staying in position longer or positioning your body on a different side of the receiver.

¹ This step can be done from the standard Locate screen or the Target Steering™ screen. It is not necessary to toggle out of the Target Steering screen for these DataLog functions.

8. Select one of the following to record the second data point (rod 1):

- **Record depth/pitch**  to log depth, pitch, and (with the optional iGPS module) GNSS information.
- **Record pitch only**  to log only the pitch because you are unable to position the receiver at the LL or FLP. This is also useful when drilling under rebar, which can lead to incorrect depth and topography values in the graph.
- **Record a blank rod**  if you have no data because you cannot position the receiver within range of the transmitter. This is especially useful for highway and water crossings.

9. **Optional:** if deviation is turned on (see page 15), enter the left or right deviation or a blank, after which the receiver returns to the **Locate** screen.

10. Continue drilling, using the trigger/toggle right sequence to record data points and deviation at the end of each drilled rod.

Resolving Missing Data

If the locator cannot be positioned above the drill head (LL) or at the FLP while toggling right to record a rod, the **Record Depth and Pitch** option will be unavailable and only pitch can be recorded. On the LWD graph on your computer, a pitch-only reading will produce a gap in topology where depth is missing but will keep the graphing accurate for the bottom bore profile.



iGPS Note


GPS is not recorded for pitch-only and blank recordings.

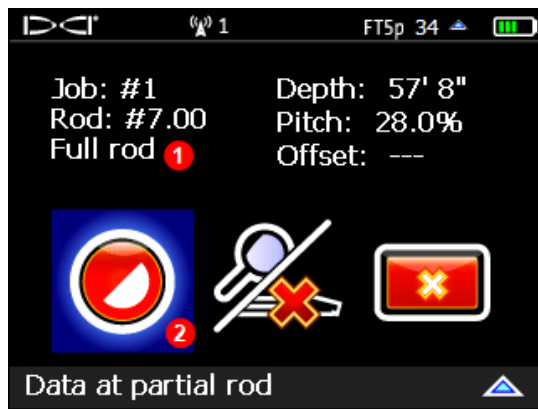
LWD will suggest an estimated depth based on surrounding topology, which you can accept or override with your own value in LWD. After uploading the data, right-click that rod in the data table, select Edit, and clear the "Depth is Hidden/Unknown" check box. For rods recorded as Blank, depth and missing pitch can be calculated by the LWD software or you can manually enter the proper pitch if known. See [Editing Data Points](#) on page 31.

Recording Partial Rods

The DigiTrak Log-While-Drilling (LWD) program requires data points to be recorded at equally spaced intervals, such as at the end of each drill rod. However, when drilling with long drill rods and/or making significant pitch changes, you may want to record data at partial pipe length intervals to more accurately depict the bore profile and changes in topography. The LWD function can accommodate quarter, half, three-quarter, and full pipe lengths. Partial rods may only be recorded after rod 1 (second data point) has been recorded.

To record a partial or pitch-only rod:

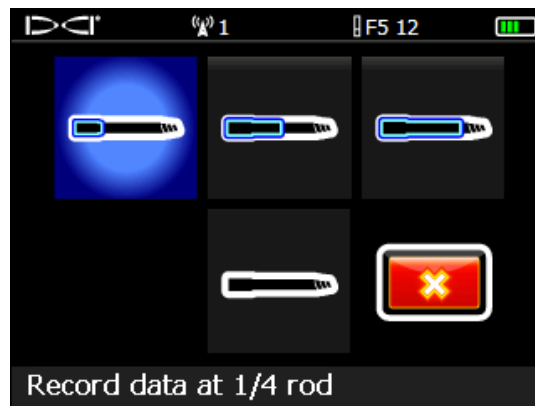
1. Position the receiver at the FLP, or over the LL, or within range of the transmitter for pitch only.
2. At the **Locate** screen, hold the trigger and toggle right once to view the recording menu.
3. Toggle down and select **Data at partial rod**  on the second page.



1. Rod length (full, 1/4, 1/2, 3/4, or finish depending on whether a full or partial rod is selected)
2. Data at partial rod

DataLog Recording Menu

4. Select a partial rod length.



DataLog Partial Rod Screen

The display returns to the first recording options screen with the partial rod value ($\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, or finish rod) appearing in place of "Full Rod" (see image in step 3).

5. Select the option to record the data point with depth and pitch (record pitch-only or blank only if you are unable to position the receiver at the LL or FLP). Record Deviation if applicable. The receiver returns to the **Locate** screen.
6. Record another data point at the partial rod length or end of the rod.

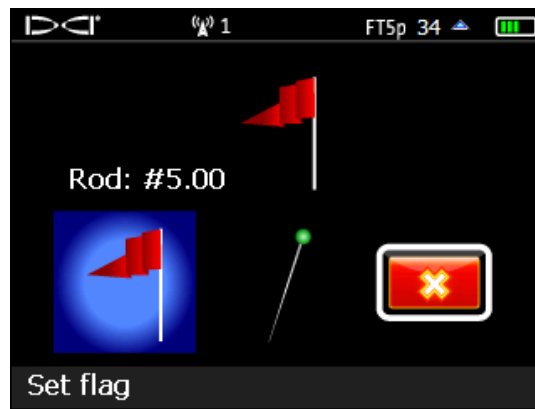
The "Finish Rod" option appears if a partial rod was previously recorded.

Flags and Pins

Set a Flag or Pin to include landmark or utilities information with your drilling data (see [diagram](#) on page 16). Flags and pins appear along the top of the LWD graph. View the drawing at the end of this section for a visual on the use of flags and pins.



Toggle right briefly at the Locate screen to set a flag or pin. Do not hold the trigger in for this function. A "hold toggle right" is the shortcut to change transmitter frequency bands.



DataLog Flag/Pin Menu


Flags are numbered sequentially starting at #1 and are tied to a specific rod number. Pins are also tied to a specific rod, but you enter your own custom pin number. Both flags and pins must be entered before the current rod is completed.

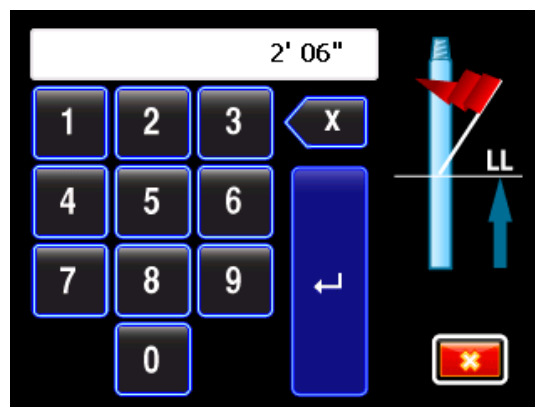
Lateral position of pins and flags are based on where the current LWD rod number started, based on the locate line, not the FLP. Even if a partial of that rod has been recorded, the flag/pin will be positioned from the start of that rod.

Starting with rod 1, each rod in a LWD file shows the X distance (see [diagram](#) on page 20), which is calculated as from the entry to the end of each rod.

On the printed report for flags and pins, each will receive an X Distance so it can be compared to depth readings on the report.


Flags

Set a **Flag**  when crossing an item of interest along the bore path, like a sidewalk, marked utility line, or river bank. The receiver internally assigns a sequential flag number starting at 1. Enter the approximate distance along the current rod; this number will always be less than one rod length, otherwise it would be assigned at the *next* rod. The receiver will calculate the total horizontal distance of the flag based on the total number of rods already logged. Handwritten details are required so they can be entered in LWD after download.



Flag Set Screen

Pins

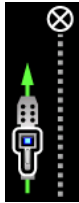
Set a **Pin**  to mark the location of a land feature to the left or right of the bore, such as a fire hydrant or power pole, that can help locate the bore path later. Setting a pin requires three pieces of data that are entered using the onscreen keypad:



1. An identifying number. Pick a number, any number. Create your own custom codes, such as 11.xx for fire hydrants, 22.xx for light posts, 33.xx for traffic light poles, and so on.



2. The approximate distance along the current rod.






3. How far the drill head is to the left or right of the feature.

Offset and Deviation

Both Offset and Deviation (see diagram below) are off (red) when you enable DataLog. To turn either feature on, simply select the icon so it turns green. Offset and deviation values are listed in the data table but not depicted on the graph.


Offset



On the **DataLog** menu, **Offset**  lets you specify a horizontal distance you intend to maintain from a feature beside and parallel to the intended bore path, such as curb, guardrail, or surveyed path. A "right" offset means the intended bore path is to the right of the feature. Think of this as a "running waypoint" that is recorded as long as the offset is in effect. Using the onscreen keypad, enter a value, select the **Left**  or **Right**  arrow, and then **Enter**.



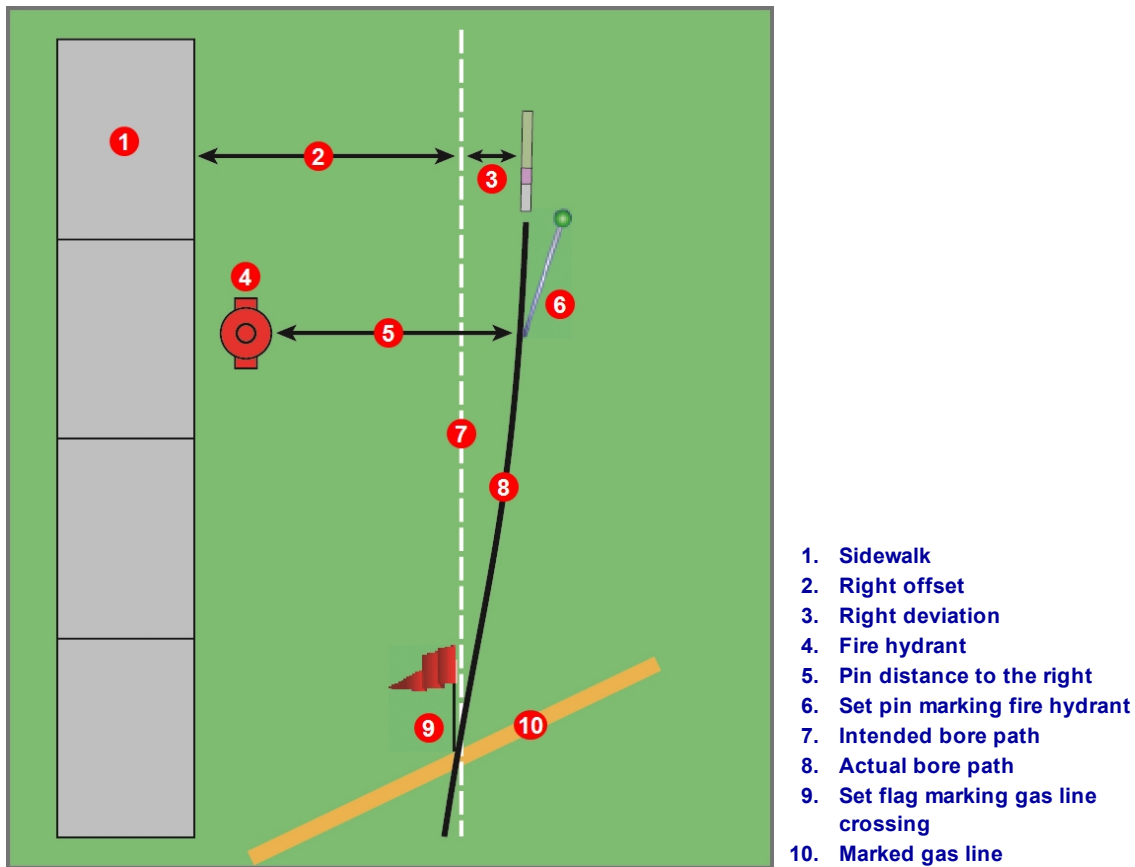
Offset can be turned on or off and adjusted to different distances at any rod number. For example, a curb offset may start at rod 7 at a distance of 10 feet left and end on rod 27. A new offset of a road edge may start at rod 50 at 5 feet right and last to the end of the bore.

Deviation

Also on the **DataLog** menu, **Deviation**  lets you mark how far the drill head is deviating from the intended bore path. A "right" deviation means the drill head is to the right of the intended bore path. Do not enter a deviation based solely on the distance of a front locate point to the left or right of the bore path.

Each time you log a rod at the Locate screen (hold trigger, toggle right), this feature lets you also record your current deviation. For example, if you locate the drill head slightly to the right of the intended bore path, you can enter this distance as a **right** deviation. Using the onscreen keypad, enter a value, select the **Left**  or **Right**  arrow, and then **Enter**.

Deviation also has a **Blank** option for those rods where locates are questionable or not available.




Left/Right Offset, Deviation, Flags, and Pins

Closing or Pausing a Job


Keep a handwritten log of the depth, description, rod number, and/or distance from the entry for each item and add this information to the drill data later in the LWD software on your computer.

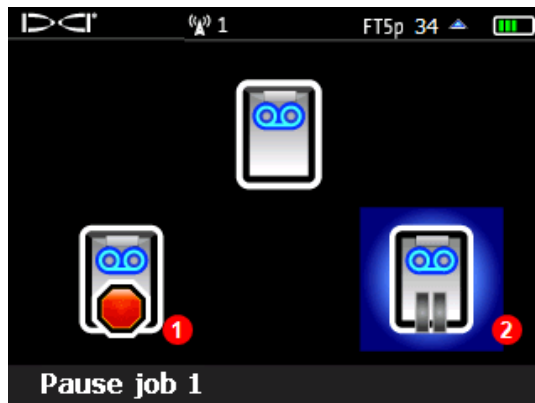
DataLog jobs must be closed before they can be uploaded. Close a job after recording the last data point.

You can also pause a job so it remains open while you navigate menu options. All jobs close automatically when the receiver powers off.

1. At the **Locate** screen, toggle down to open the DataLog Close/Pause Recording menu.
2. Select **Close Job**  to close the job. The job can now be uploaded to a computer (see [Uploading Falcon F5 Data to a Computer](#) on page 22) or added to later (see [Appending to an Existing Job](#) on page 17). An open job must be closed before a new one can be opened.

- OR -

Select **Pause Job**  to keep the job open. When you return to the Locate screen, your next data point will record on the same job.



1. Close job
2. Pause job


DataLog Close/Pause Recording Menu



An FF5 receiver can store a total of 50 DataLog jobs. The receiver displays a warning at 45 saved jobs. Trying to save more than 50 jobs will return you to the Start Recording menu where you can append to a job or exit.

Appending to an Existing Job

Use **Append** in the Start Recording menu to add data to a DataLog job that has been closed or paused.

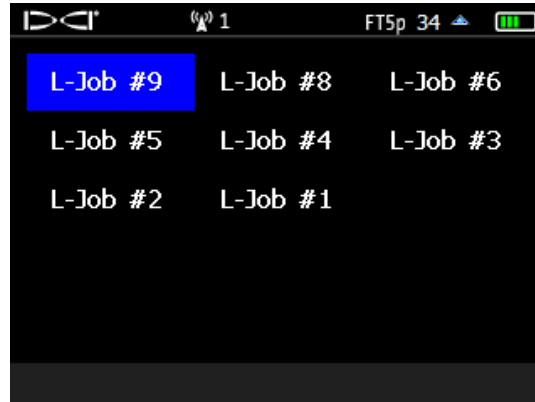
1. At the **Locate** screen, hold the trigger and toggle right once to view Recording Options.
2. Select **Append** .



1. Appending to an existing job

DataLog Recording Menu

3. Select the job number to append to. The locator proceeds to the Locate screen.




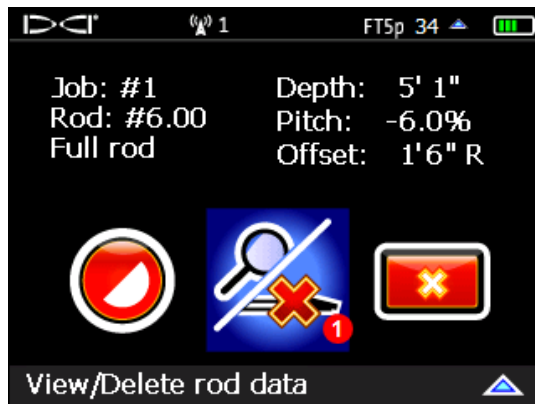
Sample DataLog Jobs Lists

4. Continue recording rods or partial rods as described earlier in this section. The appropriate next rod in sequence will be retrieved.

Viewing and Pulling Back (Deleting) Rods from the Receiver


Viewing data from previous rods is useful when a pullback and redirect of the bore path is required.

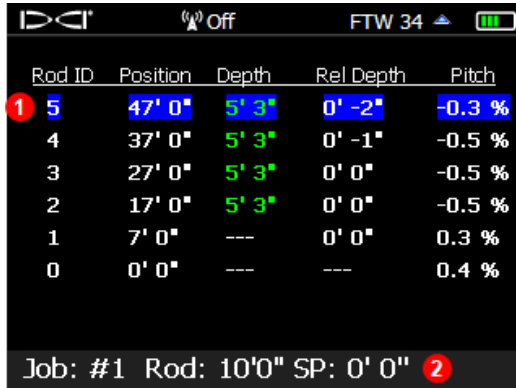
1. At the **Locate** screen, hold the trigger and toggle right once to view Recording Options.
2. Toggle down and select **View/Delete rod data** .



1. View/delete rod data (pull back a rod)

DataLog Recording Options Menu

3. In the View Rod Data List, the most recent rod (the only one that can be deleted) is highlighted in the top row.
 - To return to the Locate screen without deleting this rod (data point), simply toggle left or right.
 - To pull back the rod (delete it), click to select it, then select  to confirm.



Rod ID	Position	Depth	Rel Depth	Pitch
5	47' 0"	5' 3"	0' -2"	-0.3 %
4	37' 0"	5' 3"	0' -1"	-0.5 %
3	27' 0"	5' 3"	0' 0"	-0.5 %
2	17' 0"	5' 3"	0' 0"	-0.5 %
1	7' 0"	---	0' 0"	0.3 %
0	0' 0"	---	---	0.4 %

Job: #1 Rod: 10'0" SP: 0' 0" 2

1. Data for most recent rod
2. Survey point (appears blank unless value is entered under Survey Point menu option)

DataLog Rod List




Relative depth will be blank and remain so if more than two rods in a row do not have pitch.

For additional information on survey points, see [Adding a Drill DataLog Survey Point](#) on page 20.

Depths in green were recorded at the LL; depths in white were recorded at a locate point (LP).

Relative depth (**Rel Depth**) is a calculation of how deep the drill head is below the drill rig elevation, or "zero elevation reference line" (see diagram in next section). It is based on rod length and accumulated average pitch per rod. Relative depth can be negative or positive. Recording a rod without pitch (blank rod) will result in a blank relative depth value.


A blank (---) relative depth occurs when blank or pitch-only recording options are used.

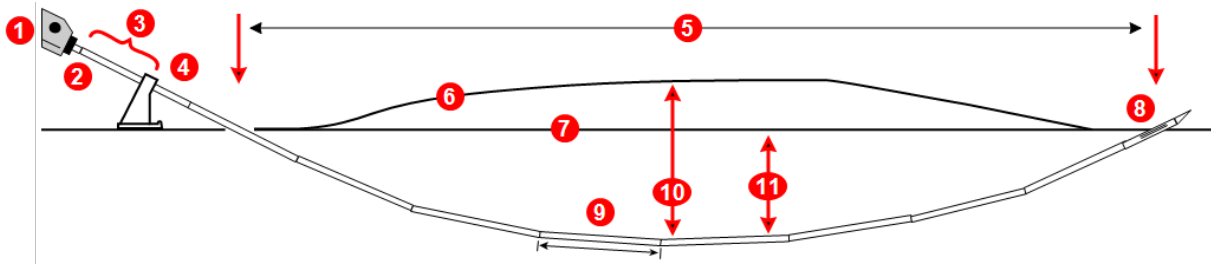
4. Click  to delete the last rod data point, or **Exit**  to cancel and return to the Locate screen.
5. Continue these steps for each rod you need to delete, selecting the most recent data point from the list shown in step 3 and then  to delete. When you are finished deleting rods, toggle left or right in the View Rod Data List to return to the Locate screen. Ensure that the number of rods deleted matches the number of rods pulled back.

Measuring and Documenting the Last Rod

When the drill head exits the ground or reaches the desired end position in the pit, measure and document the length of the last rod. This will be the pipe length minus the length of drill rod left on the carriage. For example, if the pipe length is 10 feet and 6 feet remain from the vice to the top of the rod, the last rod measurement will be $10 - 6 = 4$ feet.

The last rod measurement can be entered manually later in the LWD software after the job is uploaded. Or, enter it now by recording the approximate length as a partial. For example:

1. At the **Locate** screen, hold the trigger and toggle right once to view Recording Options.
2. Toggle down and select **Record a Partial Rod** .



Last Rod Measurement



- | | |
|--|----------------------------------|
| 1. Drill | 7. Zero elevation reference line |
| 2. Top of rod | 8. Drill head at exit (last rod) |
| 3. 6 feet rod length left on carriage | 9. Pipe length 10 feet |
| 4. Vices | 10. Depth |
| 5. X distance (from Rod 0 to last rod) | 11. Relative depth (Rel. depth) |
| 6. Ground surface (topography) | |

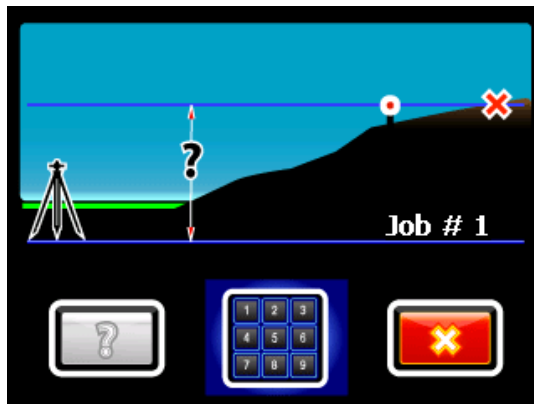
If the last rod length is 4 feet, record a half rod (5 feet), which is approximately the same. This eliminates having to enter the value manually later in LWD.

Adding a Drill DataLog Survey Point

Use an optional survey point to note a difference in elevation between the entry and exit of the bore, which provides a more accurate graph of the bore and terrain in the LWD software.

From the **Main** menu, select **Drill DataLog**, then **Add survey point**. The survey point can also be entered later in the Log-While-Drilling software after data upload (see [Survey Point Elevation Change](#) on page 28).

- In the **DataLog** menu , select **Add survey point** .
- From the list of existing drill jobs displayed, select the job to add the survey point to.
- Select the keypad icon.




- Set survey point back to unknown (see [relative depth](#) on page 19)
- Select keypad to enter known elevation difference

Survey Point Menu

- Use the onscreen keypad to enter the surveyed value for the difference in elevation between the entry and exit of the bore.







This keypad includes a “+/-” button, since the elevation difference can be positive or negative. The keypad assumes the value will be positive, meaning the exit has a higher elevation than the entry. Use the +/- button to change as needed.

5. Select **Enter**  to set the displayed value as the survey point value. The screen returns to the DataLog menu.



A survey point can be added to the job later in the Log-While-Drilling software (see link above). Setting a survey point of 0 feet will make the exit point the same elevation as the entry point. If the survey point is not entered, it defaults to "---", (blank), not 0 feet.

Deleting a DataLog Job

1. In the DataLog menu , scroll down and select **Delete DataLog job** .
2. Select the button to delete one  or all jobs .
3. If deleting one job, select from the list of available DataLog jobs.
4. At the confirmation screen, select **Confirm**  to delete or **Exit**  to cancel.

A job deleted from the receiver cannot be recovered. Ensure you have uploaded jobs you want to save to a computer before deleting them from the receiver.

Log-While-Drilling 3.04

Installing Bluetooth Drivers and LWD Software



Before removing an earlier version of LWD, read the section on [Compatibility](#) on page 1 for more information.

Minimum system requirements for use of LWD software on a computer can be found under [LWD Software](#) on page 4.

The default location for the LWD program files is c:\Program Files (x86)\DCI\DigiTrak LWD 3.04. The default location for sample and DataLog jobs is My Documents\DCI. You can change both of these default locations during installation or whenever you save an uploaded job.

1. Close any open applications.
2. Insert the LWD 3.04 flash drive into a USB port and view the contents of the drive.
3. Open the readme file and follow the detailed instructions.
4. Open the LWD Kit folder and double-click **Drivers for LWD** to install drivers.
5. Plug the Bluetooth USB radio into a USB port on your computer. If the computer is connected to the internet, drivers may install automatically. If they don't, open the Bluetooth Driver folder on the flash drive and double-click the *.exe file to install drivers (if you don't see file extensions like .exe, double-click the file of type *Application*).
6. Open the DigiTrak LWD Software folder and double-click on the **setup** file (setup.exe) to install the LWD software.

After the LWD 3.04 software have been installed, a shortcut icon appears on your desktop.




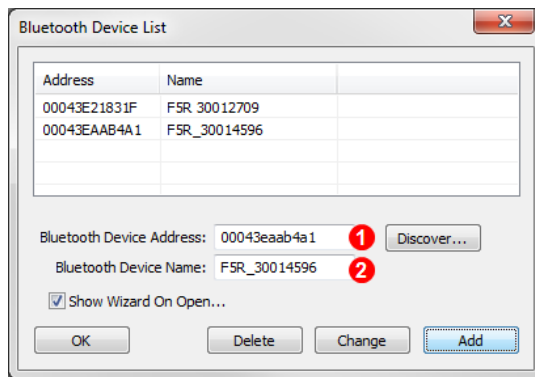
Uploading Falcon F5 Data to a Computer

Uploading DataLog jobs from the Falcon F5 receiver to your computer involves adding the Falcon F5 receiver's ID number and Bluetooth address to the LWD software's Bluetooth device list and then uploading the files to the computer over the Bluetooth connection.

Add Falcon F5 Receiver to LWD Bluetooth Device List

A Falcon F5 receiver must be added to the Bluetooth device list in the LWD software prior to first use.

1. Power on your computer and insert the Bluetooth USB adapter into a USB port.
2. Power on the Falcon F5 receiver and select **System Information** from the Main menu.
3. The Falcon F5 serial number (ID) is on page one and the Bluetooth (BT) address is on page 2. Keep this screen open or write these numbers down.
4. Open LWD 3.04 by double-clicking the icon on your desktop.
5. Click **Bluetooth**  (menus **View > Bluetooth Device List**) to open the Bluetooth Device List dialog box.



1. **Bluetooth Device Address**
2. **Bluetooth Device Name**

Bluetooth Device List Dialog Box

6. Enter your **Bluetooth Device Address** in the specified field.
7. In the **Bluetooth Device Name** field, enter your receiver ID number or name as desired. This is important if you own multiple receivers.
8. Click **Add**.
9. Click **OK**. The device appears in the Bluetooth device list.

You are now ready to upload job data.




Uploading DataLog or White Line from a Receiver



iGPS Note


Because a White Line job is typically associated with a specific DataLog job, upload a DataLog job first so you can open it and then import associated White Lines.


If the bore has not been drilled yet, you can import a White Line into a blank (new) LWD job. But do not delete it from the receiver, because later after the bore DataLog has been uploaded, the White Line can only be added to the job by importing it directly from the receiver.

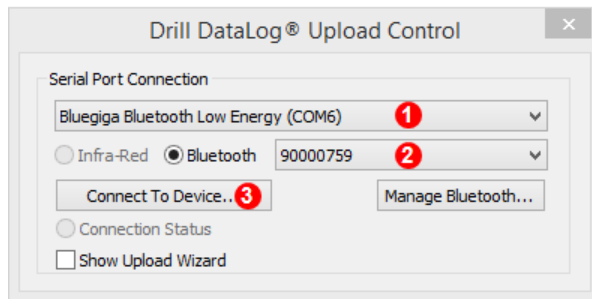
1. From the main menu, open the **DataLog**  or **White Lining**  menu. This process must be repeated separately for each of these items.
2. Select **Upload** .
3. Select the job to upload. "Waiting for PC connection..." appears at the bottom of the screen.



If data isn't communicated within two minutes, the receiver returns to the DataLog menu. Data must be communicated to the computer within 15 minutes or the receiver will power off due to inactivity.

4. In LWD, click **New**  (menus **File > New**).
5. Select DataLog or White Line:

- For a DataLog, click **Upload Data**  (menus **File > Upload Control**).
- For a White Line, click **Manage GPS White Lines**  (menus **Edit > GPS White Lines**), then **Import**.




1. **Connection**
2. **Receiver name**
3. **Connect to Device**

Upload Control Dialog Box, DataLog or White Line

6. In the Upload Control dialog box, select **Bluegiga Bluetooth Low Energy**.
7. Select your receiver's name from the Bluetooth drop-down list.
8. Click **Connect to Device** to begin uploading. An icon on the receiver screen shows that data is uploading; a large data file may take up to a minute to transfer.



Low-energy Bluetooth requires that the transmitting device (Falcon F5) and the receiving device (Bluetooth USB radio) be located within 2 feet of each other.

9. After file transfer:
 - After a DataLog has been transferred, the DataLog Job Information dialog box appears. You may enter the requested details now or later.
 - After a White Line has been transferred, it is listed in the **GPS White Lines**  dialog.
10. Click **OK**.

The new job data displays in the information fields and chart areas in the LWD application window.

If you created a new LWD job just for importing one or more White Lines, this is a good time to save it, even though it appears blank. Or, export the KML file, which saves it for viewing later in Google Earth, and discard the LWD job.



White Lines are only visible when the job is exported to [KML format](#) (see page 38) and viewed in Google Earth. White lines are not visible in LWD.

Uploading Recommendations

DCI recommends that once you are viewing your data in LWD, Save-As the file with a naming convention, such as a "-orig" or similar suffix. Leave this file as your unedited original. Immediately Save-As the file again with your common naming convention, without the "-orig" suffix, and use this as your working file. This ensures that no matter how many changes you make to the file in LWD, you will still have an original backup to refer to.

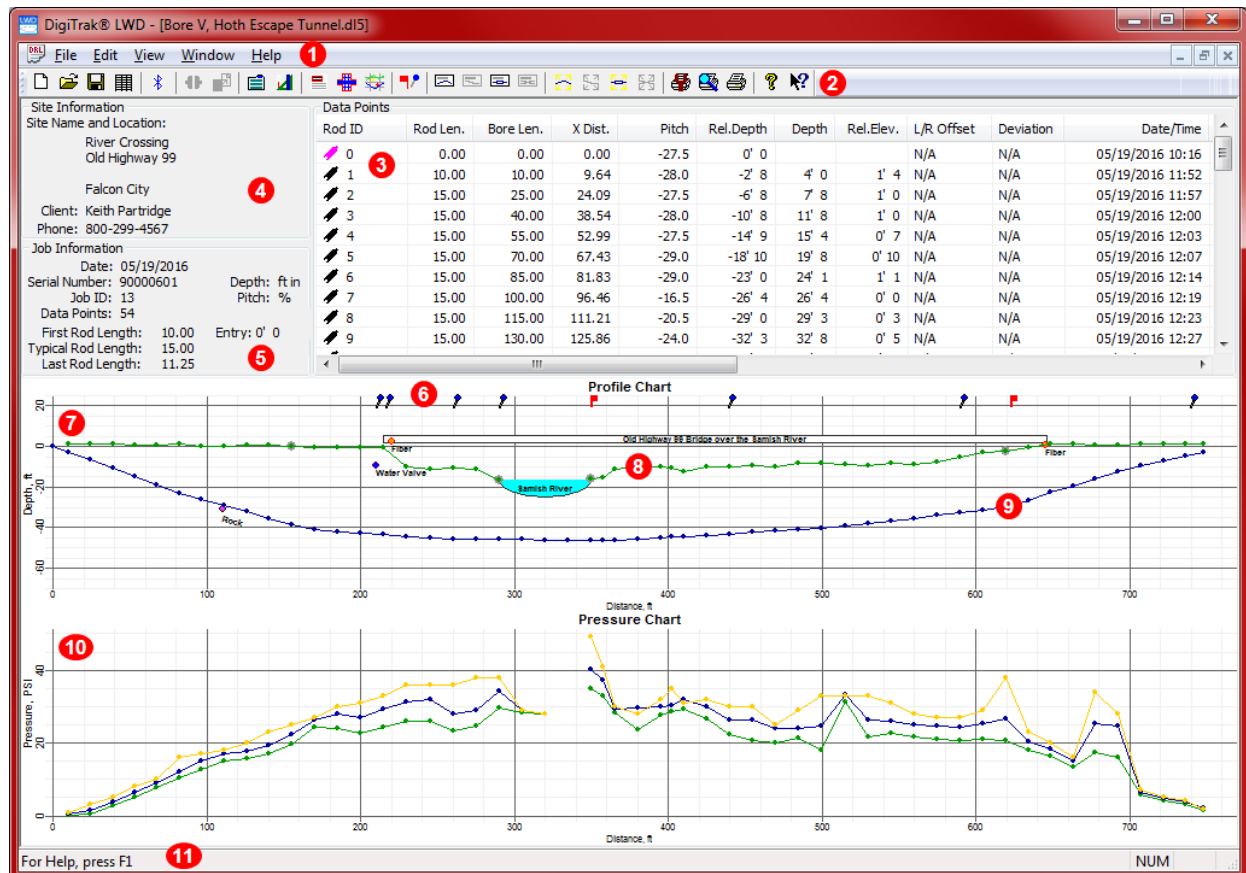
If you recorded a data point using the pitch-only or blank rod option, these data points will appear to be missing in the graph. The LWD software will make assumptions to fill in the missing data or you can choose to manually enter your own data (see [Editing Data Points](#) on page 31).

Opening Files

Start the Log-While-Drilling (LWD™) 3.04 program by double-clicking the LWD icon on the desktop.




A new LWD table will be blank; an LWD file with data will look like this:





DataLog with Fluid Pressure in LWD 3.04

- | | | |
|---------------------|------------------------|--------------------------|
| 1. Menu bar | 5. Job information | 9. Pitch profile |
| 2. Toolbar | 6. Flags and Pins | 10. Drill Pressure Chart |
| 3. Data table | 7. Drill Profile Chart | 11. Status Bar |
| 4. Site information | 8. Topology | |

To upload a job from your receiver, see [Uploading Falcon F5 Data to a Computer](#) on page 22.


Click **Open**  (menu **File > Open**) to open an existing DataLog file. You can also open a DataLog file directly from Windows Explorer by double-clicking a **lwd** or older **dl5** DataLog file. See [Compatibility](#) on page 1 for more information.

Detailed information on using and editing the data fields are provided in the **Help**  files. Or, click the **Tooltip Helper** , then click on a screen element for help with that function.

Many of the LWD menu commands are similar to those used in other Windows programs, and some have associated icons on the toolbar. Hover the cursor over any icon in LWD for a tooltip describing its function. Icons or menu items that are grayed out do not pertain to the current DataLog file. See [Appendix B](#) on page 43 for a complete list of menu options and their corresponding menu bar buttons.

The LWD 3.04 Screen

Site Information

Click **Site Information** , or in the menus select **Edit > Site Information**, or double-click in the Site Information area shown below to edit this information.

Site Information Dialog Box

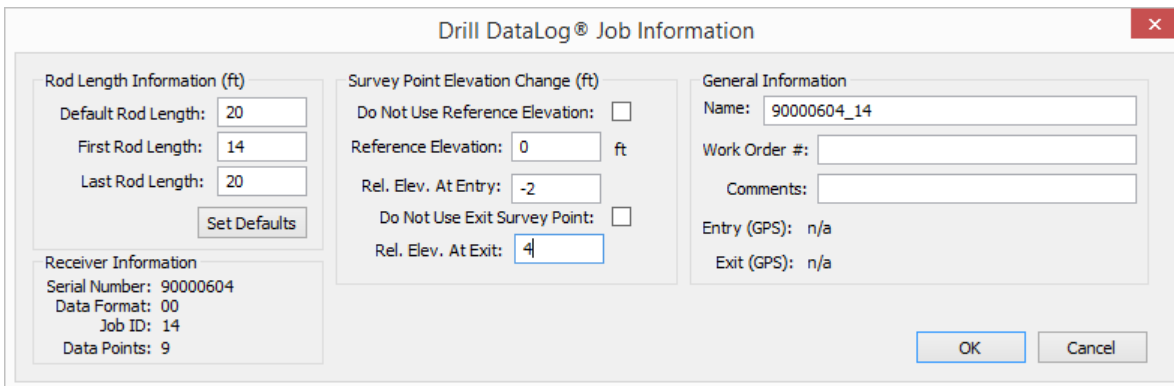
All the address and contact information for the job, client, and contractor are listed on the printed report; see [Saving, Printing, and Sending Your LWD Job](#) on page 39 for more information. Phone numbers are excluded from printed reports.



Site information remains from job to job to reduce the need for reentering identical data. If this information doesn't save from job to job, particularly for versions after Windows XP®, try this: exit LWD, right-click the desktop LWD icon, select **Properties**, select the **Compatibility** tab, check the box for "Run this program as an administrator", and click **OK**.

Job Information

Click **Job Information** , or in the menus select **Edit > Job Information**, or double-click in the Job Information area to edit this information.



Job Information Dialog Box

The Job Information section displays statistical information about the job. Some fields may not be edited.

Rod Length Information

Default Rod Length	The rod length data is included in uploads, but can be changed here if it was entered incorrectly on the receiver.
First Rod Length	This is the rod length for the first data point (rod 0), which is usually a partial rod. This value is determined by measuring the amount of drill rod left on the carriage from the vice to the top of the rod when rod 0 is recorded. See step 4 on page 8.
Last Rod Length	This is the rod length for the last data point, which is usually a partial rod. This value is determined by measuring the length of the drill rod left on the carriage from the vice to the top of the rod and then subtracting this distance from the rod length. For example, if the length of rod left on the carriage is 6 feet, and your rod length is 10 feet, the last rod will measure 4 feet (10 – 6 feet). See Measuring and Documenting the Last Rod on page 19.

Receiver Information

Serial Number	The Serial Number Serial number (ID) of the receiver.
Date Format	This corresponds to the first uploaded data point.
Job ID	The number assigned to the job in the receiver.
Data Points	The number of data points collected (includes manually inserted data).

Survey Point Elevation Change

Do Not Use Reference Elevation	Normally, leave this box checked. Clear this box to enter a reference elevation in the field below it.
Reference Elevation	This is the true elevation of the X axis above sea level. This value is not used in calculations; it is only noted on the Job Information report and the title of the chart.
Relative Elevation at Entry	The vertical distance from the zero elevation reference line to the drill head when it cannot be positioned at the zero elevation line.
Do Not Use Exit Survey Point	Selected by default, this box causes the exit elevation to be calculated based on the pitch, rod, and depth data only.
Relative Elevation at Exit	The positive or negative difference between the entry and exit elevations. Enter a negative value if the exit is lower than the launch; do not use a + symbol for a positive value. This information can be captured on the receiver by setting a Survey Point (see page 20).

General Information

Name	Enter an optional job name.
Work Order #	Enter an optional job work order number.
Comments	Enter optional job comments.
Entry (GPS)	The GNSS coordinates of the entry (comes from LWD Mobile).
Exit (GPS)	The GNSS coordinates of the exit (comes from LWD Mobile).

Accounting for Entry Pit Depth

If the drill head starts in an entry pit, enter the depth of the drill head in the pit in the **Rel. Elev. At Entry** field of the Job Information screen.

Data Table

The data points table displays all data points in the job in sequential order, along with their associated data. Depth and pitch units display in the job information box. Within this table you can insert, edit, delete, hide, or remove individual data points.

Rod ID	Rod Len.	Bore Len.	X Dist.	Pitch	Rel.Depth	Depth	Rel.Elev.	L/R Offset	Deviation	Date/Time	Type	RawDepth	RawDist	Avg. Pres.	High Pres.	Max Pres.	Latitud
0	0.00	0.00	0.00	-27.5	0' 0				N/A	05/19/2016 10:16	PO	0' 0	0.00	N/A	N/A	N/A	N/A
1	10.00	10.00	9.64	-28.0	-2' 8	4' 0	1' 4	N/A	N/A	05/19/2016 11:52	FLP	5' 1	5.21	0	1	1	N/A
2	15.00	25.00	24.09	-27.5	-6' 8	7' 8	1' 0	N/A	N/A	05/19/2016 11:57	FLP	9' 8	8.68	1	2	3	N/A
3	15.00	40.00	38.54	-28.0	-10' 8	11' 8	1' 0	N/A	N/A	05/19/2016 12:00	FLP	14' 10	12.50	3	4	5	N/A
4	15.00	55.00	52.99	-27.5	-14' 9	15' 4	0' 7	N/A	N/A	05/19/2016 12:03	FLP	19' 3	15.86	5	6	8	N/A
5	15.00	70.00	67.43	-29.0	-18' 10	19' 8	0' 10	N/A	N/A	05/19/2016 12:07	LL	20' 6	3.73	8	9	10	N/A
6	15.00	85.00	81.83	-29.0	-23' 0	24' 1	1' 1	N/A	N/A	05/19/2016 12:14	LL	25' 1	4.57	10	12	16	N/A
7	15.00	100.00	96.46	-16.5	-26' 4	26' 4	0' 0	N/A	N/A	05/19/2016 12:19	LL	26' 8	2.88	13	15	17	N/A
8	15.00	115.00	111.21	-20.5	-29' 0	29' 3	0' 3	N/A	N/A	05/19/2016 12:23	FLP	34' 6	25.83	15	17	18	N/A
9	15.00	130.00	125.86	-24.0	-32' 3	32' 8	0' 5	N/A	N/A	05/19/2016 12:27	FLP	39' 10	29.93	16	18	20	N/A

Data Table

This [diagram](#) on page 20 shows where each of these data measurements occur on a bore path.

Rod ID	<p>Rod number and status of the data point. A colored flag is displayed to indicate the status of the data:</p> <ul style="list-style-type: none">• Red Flag: Pitch missing; enter pitch for the bore path to be calculated correctly.• Magenta Flag: Depth missing; highlights pitch-only data points for the operator. Open the Edit Data Point dialog box and click OK to restore this flag to either blue or green depending on the data entered by the operator for depth.• Blue Flag: Data point has been edited• Gray Flag: Data has been hidden or removed• Green Flag: Overwritten data• Black Flag: Original data
Rod Len.	(Rod Length) The length of the rod.
Bore Len.	(Bore Length) The length of the bore (sum of all the previous rod lengths plus the current rod length).
X Dist.	(X Distance) The horizontal distance from the entry.
Pitch	The pitch value recorded at the specified data point.
Rel. Depth	(Relative Depth) The depth of the drill head below the zero elevation line.
Depth	The distance from the drill head to the terrain surface. This can be measured, entered manually by the user, or interpolated by the LWD software based on inserted or missing data.
Rel. Elev.	(Relative Elevation) The positive or negative difference from the Zero Elevation Line.
L/R Offset	(Left/Right Offset) The horizontal distance maintained left (L) or right (R) from a feature beside the bore path, such as a curb, guardrail, or surveyed path.
Deviation	How far the drill head deviated from the intended bore path.
Date/Time	The date and time the specified data point was recorded. This information will not appear on the printed report. The date/time must be set correctly on the receiver for this information to be accurate.

Type	<p>Information regarding the type of data recorded at the data point:</p> <ul style="list-style-type: none"> • BL: Blank (no pitch, depth, or GNSS data) • PO: Pitch Only (no GNSS data) • LL: Locate Line • FLP: Front Locate Point GNSS data is automatically hidden; right-click to unhide. GNSS X Distance (see page 20) will be positioned beyond the drill head. • IN: Inserted data point. Pitch and depth defaults are interpolated from adjacent data and not displayed by default. This data can be modified if required by overwriting the default values listed. The new data point is listed alphabetically (such as, the first point manually inserted after rod number 2 is listed as 2-A, the second as 2-B, etc.).
RawDepth	The depth reading on the receiver at the FLP (projected depth) or LL (depth). Raw means "without any corrections applied".
RawDist	An amount of correction. Added to X Distance, this value yields where the LL or FLP is in relationship to the drill head plot for the rod. The horizontal distance from where a data point was taken to a point directly above the transmitter. Raw means "without any corrections applied".
Avg. Pres.	(Average Pressure) See Drill Pressure Data Points on page 34.
High Pres.	(High Pressure) See Drill Pressure Data Points on page 34.
Max Pres.	(Maximum Pressure) See Drill Pressure Data Points on page 34.
Latitude	The latitude reading provided by the optional iGPS module.
Longitude	The longitude reading provided by the optional iGPS module.
GNSS X Dist.	(GNSS X Distance) (see page 20) X Distance plus RawDist.
Comment	Any comments on individual data points can be added to show in this column (see Edit Rod/Data Point below).



iGPS Note

With the iGPS module, lat/long is included for data points taken at the locate line (LL). Lat/long will be blank for data points taken at the FLP or recorded as pitch-only or blank. Lat/long data that is blank due to being recorded at the FLP can be unhidden by right-clicking the data row and selecting **Unhide GNSS**. In the same way, right-click a row to hide lat/long data if desired.

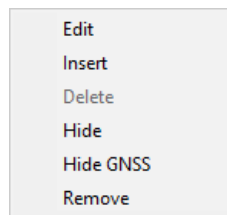
Without the iGPS module, latitude and longitude (lat/long) data will always be "n/a".

Symbols in the data points list identify different types of data:

o	data overwritten manually
e	rod length edited
i	data interpolated
f	data filled in; data missing in original upload
h	data hidden
x	pitch data missing

Editing Data Points

Right-click a data point in the table to open a pop-up menu with the options to Edit, Insert, Delete, Hide/Unhide, Hide/Unhide GNSS, and Remove.



Data Point Table Shortcut Menu

Edit Rod/Data Point

Right-click the data point and select **Edit**, or simply double-click a data point in the list or on the chart. Edit the data or add comments as required. Click **OK** to save changes, or **Cancel**.

1. Rod length in same units as depth measurement
2. Box is automatically checked if blank rod is recorded or inserted
3. Box is automatically checked if blank or pitch-only rod is inserted

Edit Data Point Dialog Box

If a blank data point exists, the **Pitch is Missing/Unknown** check box is selected by default. If you don't enter the correct pitch value and uncheck the box, there will be a gap in the pitch profile line on the chart. The missing data point will be emphasized on the chart. See [Resolving Missing Data](#) on page 12.

If a new rod is inserted or a blank or pitch-only data point is recorded, the **Depth is Hidden/Unknown** check box is selected by default. If you don't enter the depth value and uncheck the box, there will be a gap in the topology line on the chart and the missing point will not be shown.

To restore original recorded data, click the **Restore Default** button next to the data to be restored.

Insert Rod/Data Point

Right-click the data point prior to where the new data point is to be inserted and select **Insert**. A new data point appears in the data list and on the chart.

The new data point will be numbered the same as the one prior to it with a letter appended. For example, the first point manually inserted after rod 2 will be listed as 2-A, the second as 2-B, and so on. The values listed for pitch and depth are interpolated from adjacent data, and depth is hidden by default. The rod type will be listed as IN for inserted data. You may change data values as needed. To restore original interpolated data values, click **Restore Default** under the corresponding data field.

Delete Inserted Rod/Data Point

Right-click the data row to be deleted and select **Delete**. The data point is removed from the data points list and from the chart.

Original data cannot be deleted. If a rod is unintentionally recorded twice, select **Remove** to remove that data point.

Hide

When this option is selected, the data point still appears in the data list but it is hidden on the chart. The data is still included in the calculations. A check mark is placed next to the option on the pop-up menu and is visible the next time this rod is edited.

Remove

Select this option to remove the data point from the list, chart, and calculations. Use this option on original data that was unintentionally recorded twice.

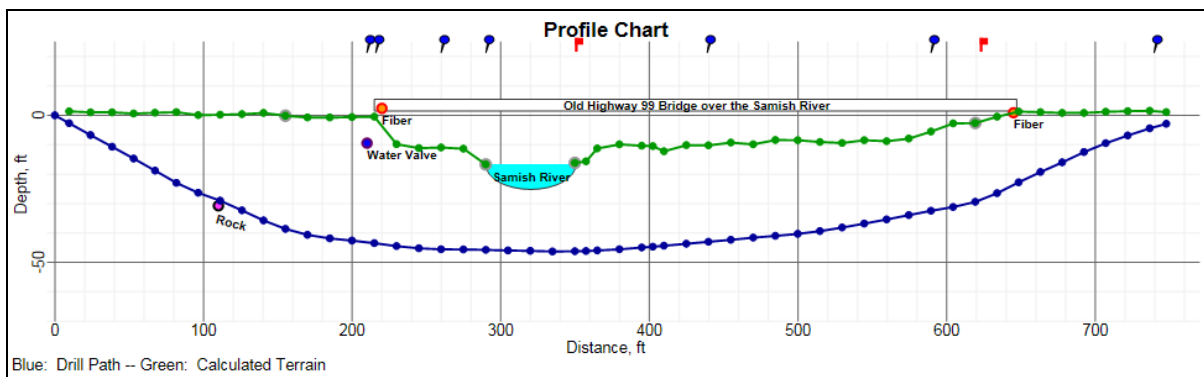
Drill Profile and Drill Pressure Charts

The **Drill Profile** chart graphically displays the data contained in the table. Hidden or removed profile data points will not display in the chart area. The profile chart will show points if they are hidden, but not if they are removed. Data resides in its own **Drill Pressure** chart at the bottom of the LWD window, separate from drill profile data but with each data point rod-aligned to correlate with the drill profile.

Hover the cursor over any graphical data point, flag, or pin to display details. Double-click data points or a row in the data table to view and/or edit the data. Click anywhere in the chart to make the table show data for that portion of the chart.

Data Points	Data points that have not been hidden or deleted.
Values	The value of the points contained in the chart area.
Cursor Coordinates	Place the cursor anywhere on the chart area to see the value of the coordinates at that point. Place the cursor on a data point to display data values recorded at that point.
Zoom In/Out	Hold the Ctrl key and drag the pointer through an area to zoom in. To return to normal scaling, Ctrl+click anywhere in the chart area.
Flags and Pins	Located along the top of the chart.

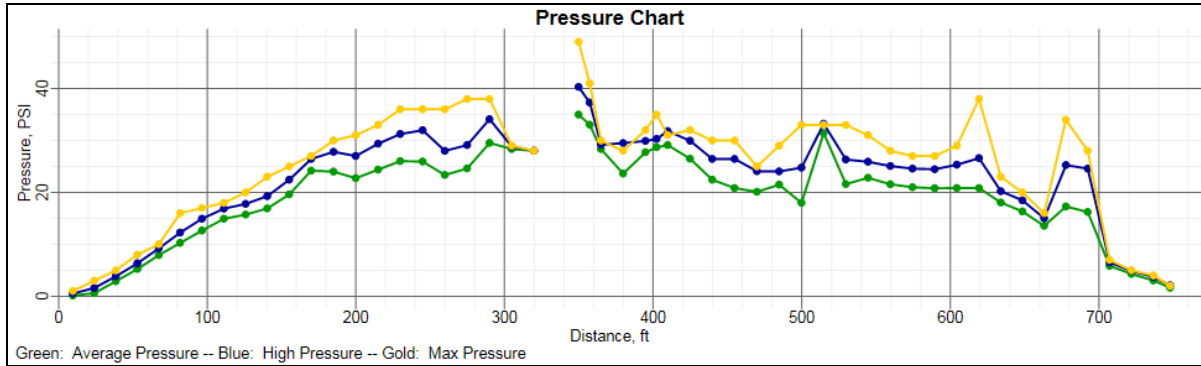
Drill Profile Data Points



Drill Profile Chart

Green	The calculated topographical profile of the bore. These points can only be edited for depth, after which they will also be highlighted.
Blue	The calculated bore based on rod length and pitch readings.
Highlighted	Points with a green circle behind them indicate rods have been deleted during the data collection process.

Drill Pressure Data Points



Drill Pressure Chart

Max Pres.	The maximum pressure recorded during the job up to when this data point was recorded, including deleted rods.
High Pres.	The high pressure recorded during the job up to when this data point was recorded, including deleted rods. This is the average plus one standard deviation—this includes 84% of the pressure readings (assuming a normal distribution). Statistically, there will have been occasional spikes above this pressure.
Avg. Pres.	The average pressure recorded during the job up to when this data point was recorded, including deleted rods.


Drill pressure data is collected at the rate of approximately one sample every four seconds. Drilling slowly will result in more data points per rod. The number of data points collected per rod is shown on the printed report data table under the **Num Samples** column (see sample printed drill fluid data table in [Appendix C](#) on page 50).

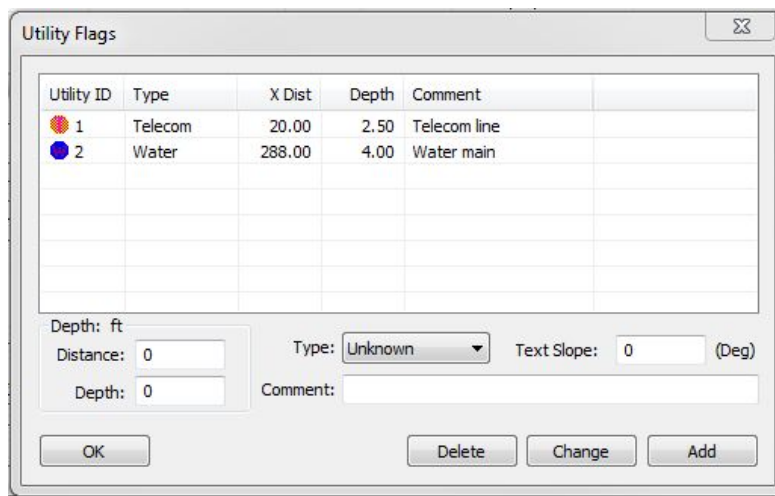
LWD provides seamless interaction between the drill profile and drill pressure charts and the tabular data. Hover over a data point to display detailed information collected at that point. Click a data point on the drill profile chart to display its corresponding row in the data points table; this makes it especially easy to align a data point on a chart for jobs that exceed 50 rods. Gaps in the charted data points will appear when data is missing or removed (but not when hidden). Sometimes hiding a data point on the chart helps show other elements, such as a utility flag. A data point hidden on the profile chart will still display in the data points list.

Each chart has its own coloring scheme for the displaying of data points.

Drill pressure data cannot be deleted. If an overpressure event was recorded during a rod that was subsequently deleted, it will be merged into the data of the next recorded rod. The data from that entire rod can be removed.

Utility Flags

Use utility flags to show the location and type of utilities on the chart and printed report. To add or edit utility flags, click **Edit Utility Flags**  (menus **Edit > Utility Flags**) to open the Utility Flags dialog box. Or, position the cursor at the desire location on the graph and Shift+click.



Utility Flags Dialog Box



Type	Select from the drop-down list. The flag will appear on the chart as a circle using APWA (American Public Works Association) recommended colors.
X Dist (Distance)	The horizontal length on the surface of the ground from the entry to the utility.
Depth	The vertical length from the surface to the utility.
Comment	The default caption is the type of utility; enter a comment to create a new caption.
Text Slope	The angle of the caption text on the chart.

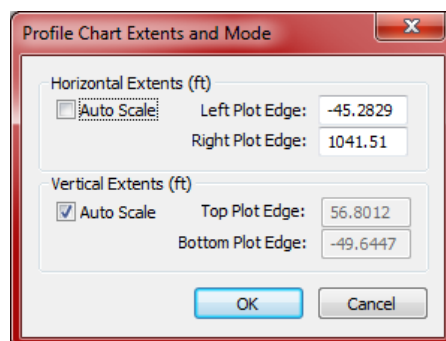
Editing and Annotating Charts

Charts can be edited and annotated in a number of ways.

Define Chart Properties

Under the **Edit** menu, use one of the **Properties** commands to change chart edges and scale. Or, click

Profile  or **Pressure**  chart in the toolbar. It is advisable to set both Profile and Pressure charts to the same horizontal edges so their data lines up with each other. To hide a graph, set all edges to zero.





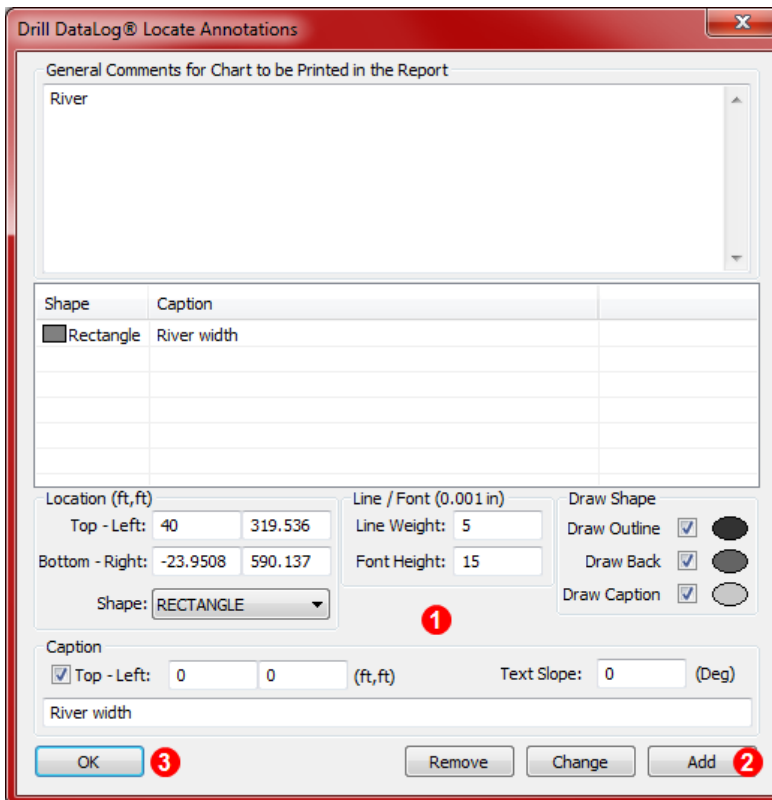
Profile Chart Properties Dialog Box

Add Annotations

Use **Annotations** to define shapes and captions to appear on charts to describe job site conditions and other points of interest.

To draw shapes directly on the chart, position the cursor at the desired location on the graph, hold the Shift key, and drag the mouse. When you finish, the Annotations dialog box includes the location coordinates of the box.

Alternatively, click **Profile**  or **Pressure**  chart in the toolbar (both also in the **Edit** menu) to open the Annotations dialog box first and enter location coordinates manually.



1. Define box boundaries and other properties in this section
2. Click to add
3. Click to save and exit

Annotations Dialog Box


Double-click an existing annotation to change its properties (captions cannot be edited in this manner, only objects).

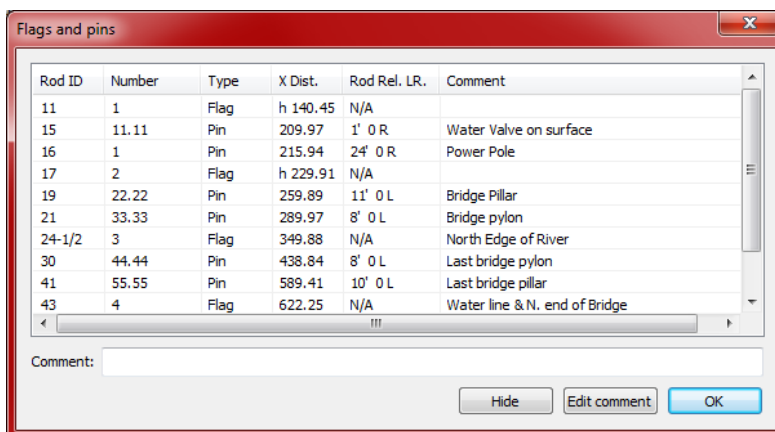
Select a **Shape** to add from the drop-down box. Adjust the **Line Weight** and **Font Height** as needed. Use the check boxes and double-click the ellipses in the **Draw Shape** section to set shape properties and colors.

Select the **Draw Caption** check box to activate the Caption section. A caption does not require a shape. Captions appear centered in the shape by default. To change the location or orientation of caption, use the **Top - Left** and **Text Slope** fields.

Click **Add** to add the annotation to the list, then **OK** to save and exit.

Edit Flags and Pins

To edit, hide, or comment on flags and pins, select **Edit > Flags and Pins**, or click .



Flags and Pins Dialog Box

To add or edit a flag or pin comment, select a pin or flag, enter or edit text in the **Comment** field, then click **Edit comment** to save it.

To hide a flag or pin from a printed report, select it and click **Hide**. the X Dist. value is now preceded by **h**. To show a hidden flag or pin, select it and click **Show**.

To close this window, click **OK**.

Rod ID	The rod number
Number	The number of the flag or pin
Type	Flag or pin
X Dist.	The horizontal distance along the bore from the entry (see diagram on page 20).
Rod Rel. LR	The distance the rod is left or right of the feature marked with a pin. Not applicable to flags.
Comment	User-entered comment

Viewing GNSS Data on Google Earth

When you open your DataLog in LWD 3.04, you have the option of viewing the bore as a Google Earth map overlay. To view your bore on Google Earth, do the following:

1. Install Google Earth on your computer. Go to <https://www.google.com/earth/>.
2. In LWD 3.04, open the desired job.
Optional: If you haven't yet added an existing White Line to the bore, see [Uploading DataLog or White Line from a Receiver](#) on page 23 to do so, then save the job.
3. Select **File > Export to KML...**
4. Use the suggested file name or create your own, select your desired destination folder, and click **Save**. This creates a separate KML file containing GNSS rod-by-rod data and all White Lines imported into this job.
5. Locate the **kml** file on your computer and double-click to open in Google Earth.

The Google Earth interface has several options for moving around the map, changing views, and editing viewing preferences. Please refer to the Google Earth application Help for details.

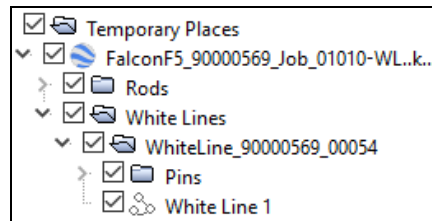
The following table lists some common functions.

To	Do this
Move the map	Drag the map
Rotate the map	Ctrl+mouse wheel
Zoom in/out	Use the onscreen + and - buttons on the right of the screen, or the slider between them
Print the map	Click the Print icon
Save the map	Click the Save icon
Use street-level view	Drag the orange person icon above the zoom control to a point on the map; to exit, click the "Exit Street View" button at the top right of the screen
Change direction in street view	Drag the map
Move in street view	Click the map near the left or right edge

Google Earth provides minimal editing abilities that allow you to remove or hide a latitude/longitude point, but hiding or showing the GNSS point in LWD 3.04 prior to saving the KML file may produce better results.

Removing White Lines


To view the bore in Google Earth without White Lines or other elements, expand the Places menu at the left of the Google Earth screen:



Select or clear boxes as desired to show or hide different elements on the map.

Saving, Printing, and Sending Your LWD Job

Saving Project Files

To save your project, click **Save**  (menu **File > Save**). If the file has already been saved, it will re-save under its current file name and location. If the file has not yet been saved, name the file and select the save location in the **Save As** dialog box, then click **Save**.

The default file name for DataLog drill data in LWD 3.04 is *DrillData#.lwd*, where # represents a number that starts at 1 and advances automatically as files are saved. Data exported in KML format contains only GNSS data for viewing in Google Earth and has a **kml** extension instead of **lwd**.

To save an open file with a different file name or location, select **File > Save As**. Change the file name and location as desired, then click **Save**.

To export a comma-separated value (*.csv) Unicode text file for use in a spreadsheet, click **Export**


Spreadsheet  (menu **File > Export Spreadsheet**).

DCI recommends saving a copy of each job as a backup as soon as you open it. See [Uploading Falcon F5 Data to a Computer](#) on page 22.

Printing and Previewing Project Files

To print job data, click **Print**  (menu **File > Print**). DCI recommends selecting **Landscape** orientation using the **Properties** button.

To preview pages before printing, click **Print Preview**  (menu **File > Print Preview**). On the preview window, click **Print** to reach the print dialog box or **Close** to return to the file. If the printed scale appears awkward, see [Editing and Annotating Charts](#) on page 35 for how to change chart edges and scale.

To edit printing properties such as the printer, paper size, and paper orientation, click **Print Setup**  (menu **File > Print Setup**).

Page one of the print job contains job information such as location, client, and contractor information, along with the statistical data about the job and job comments. Page two contains profile and plan view charts. Page three and beyond list topography survey data and drill data. Deleted data points will not display.

Sending Project Files




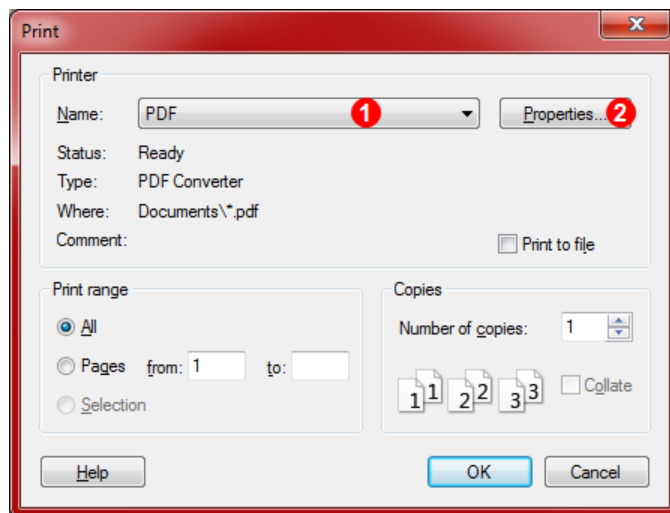
Your LWD 3.04 project file can be opened by anyone who also has the DigiTrak LWD 3.04 software. LWD 3.04 can also open jobs saved in prior versions of LWD. See [Compatibility](#) on page 1 for more information.

To send a report to a customer who does not have the LWD software, install a PDF print driver, then print to this “printer” to create an electronic report viewable on any PDF reader.

As an alternative to PDF, Microsoft Windows systems include a “Microsoft XPS Document Writer” in the list of available printers. Your customer will require Microsoft Internet Explorer to read this encapsulated postscript (XPS) format without an XPS reader. Please refer to <http://www.microsoft.com> for additional information on using this format.

Once you have your preferred PDF writer installed (or if you are using the XPS writer):

1. Click **Print**  (menus **File > Print**).
2. Use the **Name** drop-down list to select your PDF writer or Microsoft XPS Document Writer.



1. **Select printer/writer**
2. **Select landscape orientation here**

Profile Chart Properties Dialog Box














3. Click **Properties**, select landscape orientation (recommended), and click **OK** to save the orientation and close the **Properties** dialog box.
4. Click **OK** to print (generate) the file.
5. Choose the folder where you want to save the file and enter a **File Name**.
6. Click **Save**.








Depending on your print settings, you may automatically see the generated PDF file, or you may need to find and open it to see it. Most users will find it convenient to send the PDF file to their customer as an attachment to an email.

File Location

The default location for sample and DataLog jobs is /My Documents/DCI.

Appendix A: Receiver DataLog Icons









Symbol	Description
	Add Survey Point – Records a surveyed value for the difference in elevation (reference elevation) between the start and end of the bore. This value will help provide a more accurate profile graph in the LWD software. <i>Page 20</i>
	Append to an Existing Job – Continues adding data to an existing DataLog job. Select the job number from the list. <i>Page 17</i>
	Close Job – Saves and closes a DataLog job. A job can be viewed, appended to, and uploaded until it is deleted from the job list. <i>Page 16</i>
	Confirm Delete – Appears after a request to delete jobs to confirm the deletion. Select to confirm deletion or select Exit to cancel deletion. <i>Page 21</i>
	Create a New Job – Starts a new DataLog job. You will be prompted to set up the job with rod lengths. <i>Page 8</i>
	Delete All Jobs – Deletes all jobs stored in the receiver. <i>Page 21</i>
	Delete Job – Deletes the selected DataLog job(s) from the receiver. Also used in the Delete Job menu to select one job to delete. <i>Page 21</i>
	Enable / Disable DataLog – When “Enabled, click to disable” shows, the icon is green, the DataLog function is enabled, and you can access DataLog menu options at the Locate screen. When “Disabled, click to enable” shows, the icon is red, the DataLog function is disabled, and no logging will occur. <i>Page 7</i>
	Pause Job – Opens the receiver’s Main menu but keeps the job open with no data recording. Data continues recording on the current job number when you re-enter the Locate screen without powering the receiver down. <i>Page 16</i>
	Record a Blank Rod – Logs a data point with no pitch or depth information; use when the receiver cannot be positioned within range of the transmitter. <i>Page 12</i>
	Record a Partial Rod – Logs a data point after finishing a partial rod. Recommended when using long drill rods during significant pitch changes or to accurately plot small changes in topography. <i>Page 12</i>
	Record Depth/Pitch – Logs the depth and pitch information at a front locate point (FLP) or locate line (LL) data point. This option is unavailable at the first rod data point and when pitch or depth information is not available. The green lights indicate GNSS signal quality when the iGPS module is installed. <i>Page 12</i>
	Record Depth/Pitch with iGPS Module Installed – Same function as above, but the green lights indicate GNSS signal quality when the iGPS module is installed. These lights match the three solid rightmost lights on the iGPS module. <i>Page 12</i>

Symbol	Description
	Record Pitch Only – Logs only the pitch information at a data point; use when the receiver cannot be positioned over the FLP or LL. This option will be unavailable if pitch information is not available, in which case you must record a blank rod. <i>Page 12</i>
	Set a Flag – Set a flag when crossing an item of interest along the bore path, like a sidewalk, marked utility line, or river bank. <i>Page 14</i>
	Set a Pin – Set to mark the location of a land feature to the left or right of the bore, such as a fire hydrant or power pole, that can help locate the bore path later. <i>Page 15</i>
	Set Up Job – Sets up a new job or appends data to an existing job. Only accessible when DataLog is enabled. If no Drill DataLog job has been started, this option can also be accessed from the Locate screen by holding the trigger and toggling right. <i>Page 8</i>
	Upload Job – Uploads DataLog jobs to a computer with DigiTrak LWD software installed. The receiver can store a maximum of 50 DataLog jobs. <i>Page 22</i>
	View DataLog – Displays data for a specific job. <i>Page 18</i>
	View/Delete Rod Data – Shows all logged data points; lets you delete the last logged data point. <i>Page 18</i>




Appendix B: Menus








Many of the LWD 3.04 menu commands are similar to those used in other Windows programs, and some have associated icons on the toolbar. Point the cursor at any icon in LWD for a tooltip describing its function. Icons or menu items that are grayed out do not pertain to the current DataLog file. Page numbers below refer to the first page the command is mentioned in this manual.

File Menu


Symbol	Icon	Description
New		Create a new job (drill data, pressure-tension, or steering). Once a selection is made, a new blank job screen appears. <i>Page 23</i>
Open		Open an existing job. <i>Page 25</i>
Close	–	Close the current job.
Save		Save an open job. If the job has not yet been named/saved, this opens the same dialog box as Save As. <i>Page 39</i>
Save As	–	Save the current job to a specified file name and folder. <i>Page 39</i>
Print Setup		Select options such as a printer, paper size and orientation. These options are usually also available on a Windows Print dialog box under a button called Properties. <i>Page 39</i>
Print Preview		Display the job onscreen as it will appear printed. <i>Page 39</i>
Print		Print the job. <i>Page 39</i>
Export Spreadsheet		Export a comma-separated value (*.csv) text file for use in spreadsheet software. <i>Page 39</i>
Export to KML	–	Export the job to the KML format for viewing in Google Earth. <i>Page 38</i>
Upload Control		Link to a DigiTrak receiver to upload files. <i>Page 22</i>
File 1, 2...	–	Open a recently opened file.
Exit	–	Exit DigiTrak LWD 3.0.

Edit Menu

Symbol	Icon	Description
Site Information		Enter and edit the location, contact information, and comments that display in the Site Information box in the upper left corner of the program. Shortcut: double-click the site information box. <i>Page 26</i>
Display Units		Select the depth, pitch, temperature, and pressure units displayed on the LWD charts. The depth unit setting in the receiver will determine the units displayed. <i>Page 25</i>
Job Information		View and edit job details including rod length, survey point information for drill data files, and information about the product being installed for pressure-tension files. This dialog box displays immediately after uploading a DataLog file. Shortcut: double-click the Job Information box. <i>Page 27</i>

Symbol	Icon	Description
Utility Flags		Add, change, or delete flags and data regarding utilities. <i>Page 34</i>
Flags and Pins		Edit, hide, or comment on flags and pins. <i>Page 37</i>
GPS White Lines		Import or delete White Lines. <i>Page 23</i>
Profile Chart Annotations		Make comments and insert drawings to appear on the profile chart. Shortcut: Shift+drag a box on the chart. <i>Page 35</i>
Pressure Chart Annotations		Make comments and insert drawings to appear on the pressure chart. Shortcut: Shift+drag a box on the chart. <i>Page 35</i>
Profile Chart Properties		Adjust the scaling of the profile chart. <i>Page 35</i>
Pressure Chart Properties		Adjust the scaling of the pressure chart. <i>Page 35</i>


View Menu

Symbol	Icon	Description
Toolbar	–	Show or hide the toolbar.
Status Bar	–	Show or hide the status bar.
Bluetooth Device List		Show a list of registered Bluetooth devices. <i>Page 22</i>

Window Menu

Symbol	Icon	Description
New Window	–	Open the current file in a new window.
Cascade	–	Arrange windows in an overlapped fashion.
Tile	–	Arrange windows in non-overlapped tiles.
Arrange Icons	–	Arrange icons of minimized windows.
Window 1, 2...	–	Go to specified window.

Help Menu

Symbol	Icon	Description
Help Topics		An index of Help topics. <i>Page 25</i>
About DigiTrak LWD	–	Displays the version number of the DigiTrak LWD software.

Appendix C: Sample Printed Output

Customer Data



DataLog® Drill Report

Job Information

Job Location:
Name: River Crossing
Contact:
Phone:
Address: Old Highway 99
City: Falcon City

Client Information:
Partridge oil and Gas
Keith Partridge
3456 Peacock Lane
Rain Forest

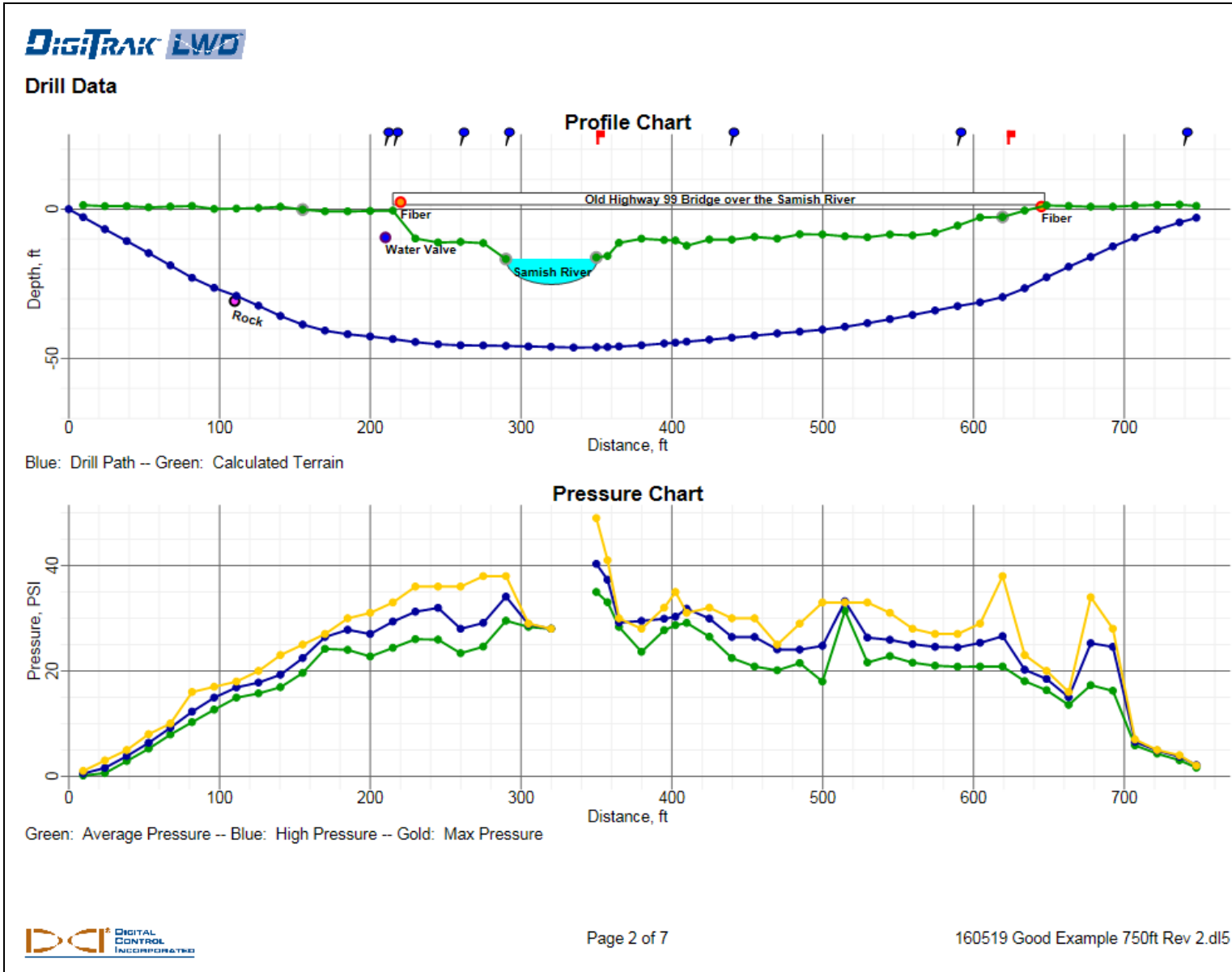
Contractor Information:
Sea Falcons Construction
Craig Allen
19625 62nd Av So
Kent

Receiver/Job Information

54 data points collected on unit Serial Number: 90000601 in Job 13 on 05/19/2016. Flags and Pins listed below (if applicable).
All units in charts and tables are Distance in ft, Depth in ft in, Pitch in %, and Pressure in PSI.
Reference Elevation is not measured.
Entry Point Relative Depth 0' 0". Chart and Table zero are the Reference Elevation.
Exit Terrain not surveyed.
First Rod Length is 10.00
Typical Rod Length is 15.00
Last Rod Length is 11.25
Total number of rods 50
Job Comments

Pilot bore was completed on 5/18/16, drilling North to South on West side of Highway 99.

Drill and Pressure Graphs



Data Table



Utility Marker List

Util ID	Type	Distance	Depth	Comment
1	Water	210.00	9' 0	Water Valve
2	Unknown	110.00	31' 0	Rock
3	Fiber	220.00	-6' 0	
4	Fiber	645.00	0' 0	

Profile Annotations List

Type	Distance	Depth	Width	Height	Caption
Basin	289.79	-16' 8	367.31	8' 7	Samish River
Rectangle	214.93	5' 5	641.73	4' 0	Old Highway 99 Bridge over the Samish River

Drill Data Points

FLP(Front Locate) - LL(Locate Line) - PO(Pitch Only) - BL(No Data) - o(override) - f(filled in) - i[*](interpolated)

Rod ID	Type	Rod Len.	Bore Len.	X Dist.	Pitch	Rel.Depth	Depth	Rel.Elev.	L/R Offset	Deviation
0	PO	0.00	0.00	0.00	-27.5	0' 0		0' 0	N/A	N/A
1	FLP	10.00	10.00	9.64	-28.0	-2' 8	4' 0	1' 4	N/A	N/A
2	FLP	15.00	25.00	24.09	-27.5	-6' 8	7' 8	1' 0	N/A	N/A
3	FLP	15.00	40.00	38.54	-28.0	-10' 8	11' 8	1' 0	N/A	N/A
4	FLP	15.00	55.00	52.99	-27.5	-14' 9	15' 4	0' 7	N/A	N/A
5	LL	15.00	70.00	67.43	-29.0	-18' 10	19' 8	0' 10	N/A	N/A
6	LL	15.00	85.00	81.83	-29.0	-23' 0	24' 1	1' 1	N/A	N/A
7	LL	15.00	100.00	96.46	-16.5	-26' 4	26' 4	0' 0	N/A	N/A
8	FLP	15.00	115.00	111.21	-20.5	-29' 0	29' 3	0' 3	N/A	N/A
9	FLP	15.00	130.00	125.86	-24.0	-32' 3	32' 8	0' 5	N/A	N/A
10	LL	15.00	145.00	140.45	-23.5	-35' 9	36' 7	0' 10	N/A	N/A
11	FLP	15.00	160.00	155.17	-15.5	-38' 7	38' 6	0' -1	N/A	N/A
Lost R/Pat FLP due to interference										
12	FLP	15.00	175.00	170.04	-11.5	-40' 7	39' 11	0' -9	N/A	N/A
13	FLP	15.00	190.00	184.99	-5.2	-41' 10	41' 2	0' -9	N/A	N/A
14	LL	15.00	205.00	199.97	-4.8	-42' 7	42' 0	0' -7	N/A	N/A
15	LL	15.00	220.00	214.94	-6.8	-43' 6	43' 0	0' -5	N/A	N/A
16	FLP	15.00	235.00	229.91	-6.6	-44' 6	34' 8	-9' 10	N/A	N/A
17	FLP	15.00	250.00	244.89	-3.2	-45' 2	34' 1	-11' 2	N/A	N/A
18	LL	15.00	265.00	259.89	-1.0	-45' 6	34' 7	-10' 11	N/A	N/A
19	LL	15.00	280.00	274.89	-0.3	-45' 7	34' 4	-11' 4	N/A	N/A
20	LL	15.00	295.00	289.89	-1.2	-45' 9	34' 0	-16' 9	N/A	N/A
South Edge of the Samish River										
21	PO	15.00	310.00	304.89	-1.2	-45' 11		-16' 8	N/A	N/A
22	PO	15.00	325.00	319.89	-1.2	-46' 1		-16' 7	N/A	N/A
23	PO	15.00	340.00	334.88	-0.8	-46' 3		-16' 5	N/A	N/A
No PSI data moving across the bridge as drill continued										



Flags and Pins



FLP(Front Locate) - LL(Locate Line) - PO(Pitch Only) - BL(No Data) - o(override) - f(filled in) - i[*](interpolated)

Rod ID	Type	Bore Len.	X Dist.	Pitch	Rel.Depth	Depth	Rel.Elev.	L/R Offset	Deviation	Latitude	Longitude	GNSS Time
24	LL	355.00	349.88	1.0	-46' 3	o 30' 1	-16' 2	N/A	N/A	N/A	N/A	NotSaved
North Edge of the Samish River												
24-1/2	LL	362.50	357.38	2.1	-46' 1	30' 6	-15' 8	N/A	N/A	N/A	N/A	NotSaved
25	LL	370.00	364.88	2.3	-46' 0	34' 8	-11' 3	N/A	N/A	N/A	N/A	NotSaved
26	FLP	385.00	379.88	3.6	-45' 6	35' 8	-9' 11	N/A	N/A	N/A	N/A	NotSaved
27	FLP	400.00	394.86	4.0	-44' 11	34' 8	-10' 4	N/A	N/A	N/A	N/A	NotSaved
27-1/2	FLP	407.50	402.36	4.0	-44' 8	34' 2	-10' 6	N/A	N/A	N/A	N/A	NotSaved
28	FLP	415.00	409.85	4.6	-44' 4	32' 1	-12' 3	N/A	N/A	N/A	N/A	NotSaved
29	FLP	430.00	424.84	4.0	-43' 8	33' 7	-10' 2	N/A	N/A	N/A	N/A	NotSaved
30	FLP	445.00	439.82	5.0	-43' 0	32' 10	-10' 2	N/A	N/A	N/A	N/A	NotSaved
31	FLP	460.00	454.81	4.6	-42' 3	33' 0	-9' 3	N/A	N/A	N/A	N/A	NotSaved
32	LL	475.00	469.79	5.2	-41' 7	31' 9	-9' 10	N/A	N/A	N/A	N/A	NotSaved
33	FLP	490.00	484.78	2.6	-41' 0	32' 7	-8' 5	N/A	N/A	N/A	N/A	NotSaved
34	LL	505.00	499.76	6.0	-40' 4	31' 11	-8' 5	N/A	N/A	N/A	N/A	NotSaved
35	LL	520.00	514.73	7.0	-39' 4	30' 3	-9' 1	N/A	N/A	N/A	N/A	NotSaved
36	FLP	535.00	529.69	8.6	-38' 2	28' 9	-9' 5	N/A	N/A	N/A	N/A	NotSaved
37	FLP	550.00	544.62	9.5	-36' 10	28' 4	-8' 6	N/A	N/A	N/A	N/A	NotSaved
38	FLP	565.00	559.56	9.5	-35' 5	26' 7	-8' 10	N/A	N/A	N/A	N/A	NotSaved
39	FLP	580.00	574.48	10.5	-33' 11	26' 0	-7' 11	N/A	N/A	N/A	N/A	NotSaved
40	FLP	595.00	589.41	9.0	-32' 6	26' 11	-5' 6	N/A	N/A	N/A	N/A	NotSaved
41	FLP	610.00	604.36	8.2	-31' 2	28' 5	-2' 9	N/A	N/A	N/A	N/A	NotSaved
42	LL	625.00	619.25	15.5	-29' 5	o 26' 10	-2' 7	N/A	N/A	N/A	N/A	NotSaved
Rock forced the pitch up naturally												
43	LL	640.00	633.96	24.5	-26' 6	26' 0	0' -5	N/A	N/A	N/A	N/A	NotSaved
44	LL	655.00	648.49	27.0	-22' 9	24' 0	1' 3	N/A	N/A	N/A	N/A	NotSaved
45	LL	670.00	663.08	21.0	-19' 3	20' 4	1' 1	N/A	N/A	N/A	N/A	NotSaved
46	LL	685.00	677.71	24.0	-15' 11	16' 9	0' 10	N/A	N/A	N/A	N/A	NotSaved
47	FLP	700.00	692.30	23.5	-12' 6	13' 4	0' 10	N/A	N/A	N/A	N/A	NotSaved
48	FLP	715.00	706.99	18.0	-9' 5	10' 8	1' 3	N/A	N/A	N/A	N/A	NotSaved
49	FLP	730.00	721.76	17.5	-6' 10	8' 3	1' 5	N/A	N/A	N/A	N/A	NotSaved
50	LL	745.00	736.56	15.0	-4' 5	5' 11	1' 6	N/A	N/A	N/A	N/A	NotSaved
50-3/4	LL	756.25	747.71	13.0	-2' 10	3' 11	1' 1	N/A	N/A	N/A	N/A	NotSaved

Flags and Pins

Type	Rod ID	User Num.	X Dist.	Rod Rel. LR.
Flag	11	1	h 140.45	N/A
Pin	15	11.11	209.97	1' 0 R
Comment: Water Valve on surface				
Pin	16	1	215.94	24' 0 R
Comment: Power Pole				
Flag	17	2	h 229.91	N/A

Data from an iGPS module would appear in the **Latitude**, **Longitude**, **GNSS Time**, and **GNSS X Distance** columns.

Flags and Pins (continued)

Type	Rod ID	User Num.	X Dist.	Rod Rel. LR.
Pin	21	33.33	289.97	8' 0 L
Comment: Bridge pylon				
Flag	24-1/2	3	349.88	N/A
Comment: North Edge of River				
Pin	30	44.44	438.84	8' 0 L
Comment: Last bridge pylon				
Pin	41	55.55	589.41	10' 0 L
Comment: Last bridge pillar				
Flag	43	4	622.25	N/A
Comment: Water line & N. end of Bridge				
Pin	50-3/4	4568.08	739.56	21' 0 R
Comment: Power Pole				

Note the comments added to the Pin at Rod 41.

Fluid Pressure Table

This report will only generate if fluid pressure data is available.



Pressure Data

Pressure Legend...

Rod ID	X Dist.	Num Samples	Avg. Pres.	High Pres.	Max Pres.	Comment
0	0.00	0	N/A	N/A	N/A	
1	9.64	172	0	1	1	
2	24.09	66	1	2	3	
3	38.54	47	3	4	5	
4	52.99	43	5	6	8	
5	67.43	53	8	9	10	
6	81.83	107	10	12	16	
7	96.46	69	13	15	17	
8	111.21	71	15	17	18	
9	125.86	55	16	18	20	
10	140.45	71	17	19	23	
11	155.17	51	20	22	25	Lost R/Pat FLP due to interference
12	170.04	20	24	26	27	
13	184.99	13	24	28	30	
14	199.97	35	23	27	31	
15	214.94	31	24	29	33	
16	229.91	51	26	31	36	
17	244.89	45	26	32	36	
18	259.89	114	23	28	36	
19	274.89	77	25	29	38	
20	289.89	24	30	34	38	South Edge of the Samish River
21	304.89	20	28	29	29	
22	319.89	2	28	28	28	
23	334.88	0	N/A	N/A	N/A	No PSI data moving across the bridge as drill continued
24	349.88	70	35	40	49	North Edge of the Samish River
24-1/2	357.38	20	33	37	41	
25	364.88	18	28	29	30	
26	379.88	24	24	29	28	
27	394.86	28	28	30	32	
27-1/2	402.36	22	29	30	35	
28	409.85	8	29	32	31	
29	424.84	55	26	30	32	
30	439.82	42	22	26	30	
31	454.81	29	21	26	30	
32	469.79	36	20	24	25	
33	484.78	27	21	24	29	
34	499.76	70	18	25	33	
35	514.73	7	31	33	33	
36	529.69	158	22	26	33	
37	544.62	78	23	26	31	
38	559.56	36	22	25	28	
39	574.48	39	21	25	27	

DCI Standard Warranty

DCI warrants that it will either repair or replace any product that fails to operate in conformity to DCI’s published specifications at the time of shipment due to a defect in materials or workmanship during the warranty period for that product, subject to the terms set forth below.

Category	Warranty Period
Falcon Transmitters (19" and 15")	Three years from date of purchase or first 500 hours of use, whichever occurs first.
All Other Transmitters	Ninety days from date of purchase
Receivers, Remote Displays, Battery Chargers and Rechargeable Batteries	One year from date of purchase
Software*	One year from date of purchase
Other Accessories	Ninety days from date of purchase
Service/Repair	Ninety days from date of repair

* For software products, in lieu of the warranty set forth above, DCI warrants that it will either update any defective software to bring it into material compliance with DCI’s specifications for such software, or refund the purchase price paid for the software.

Terms

- The 3-yr/500-hr warranty period for a Falcon transmitter is conditioned on registration of the purchase with DCI within 90 days of the date of purchase. *If the customer fails to register the purchase during this time frame, the warranty period for the transmitter will instead be ninety days from date of purchase.*
- Warranty coverage for a warranty **replacement** transmitter shall tie back to the original transmitter(s) submitted for warranty coverage. For example, if a Falcon transmitter is owned for one year and used for 250 hours, the warranty coverage for the replacement will be an additional two years or an additional 250 hours of use, whichever comes first.
- “Hours of use” for purposes of the Falcon transmitter warranty means active run-time hours, as measured internally by Falcon transmitters.
- In the event of a valid warranty submission, the choice of remedy (for example, to repair or replace a defective product or, in the case of defective software, to update or refund), shall be at DCI’s sole discretion. DCI reserves the right to use remanufactured replacement parts for repairs.
- The above warranties only apply to new products purchased directly from DCI or from a DCI-authorized dealer.
- The ultimate determination of whether a product qualifies for warranty replacement shall be at DCI’s sole discretion.

Exclusions

- Transmitters that have exceeded the maximum temperature, as indicated by the system.
- Defect or damage caused by misuse, abuse, improper installation, improper storage or transport, neglect, accident, fire, flood, use of incorrect fuses, contact with high voltages or injurious substances, use of system components not manufactured or supplied by DCI, failure to follow the operator’s manual, use other than that for which the product was intended or other events beyond the control of DCI.
- Any transmitter used with an improper housing, or damage caused to a transmitter from improper installation into or retrieval from a housing.
- Damage during shipment to DCI.

Any modification, opening up, repair or attempted repair of a product, or any tampering or removal of any serial number, label or other identification of the product, will void the warranty.

DCI does not warrant or guarantee the accuracy or completeness of data generated by HDD guidance/locating systems. The accuracy or completeness of such data may be impacted by a variety of factors, including (without limitation) active or passive interference and other environmental conditions, failure to calibrate or use the device properly and other factors. DCI also does not warrant or guarantee, and disclaims liability for, the accuracy and completeness of any data generated by any external source that may be displayed on a DCI device, including (without limitation) data received from a drill rig.

DCI may make changes in design and improvements to products from time to time. DCI shall have no obligation to upgrade any previously manufactured DCI product to include any such changes.

THE FOREGOING IS THE SOLE WARRANTY FOR DCI PRODUCTS (OTHER THAN THE 5-YR/750-HR EXTENDED WARRANTY FOR FALCON 15/19" TRANSMITTERS). DCI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IMPLIED WARRANTY OF NON-INFRINGEMENT, AND ANY IMPLIED WARRANTY ARISING FROM COURSE OF PERFORMANCE, COURSE OF DEALING, OR USAGE OF TRADE, ALL OF WHICH ARE HEREBY DISCLAIMED.

In no event shall DCI or anyone else involved in the creation, production, sale or delivery of the DCI product ("partners") be liable for any damages arising out of the use or inability to use the DCI product, including but not limited to indirect, special, incidental, or consequential damages, or for any cover, loss of information, profit, revenue or use, based upon any claim for breach of warranty, breach of contract, negligence, strict liability, or any other legal theory, even if DCI has been advised of the possibility of such damages. In no event shall DCI or its partners' liability exceed the purchase price for the product.

This warranty is not assignable or transferable. This warranty is the entire agreement between DCI and purchaser, and may not be expanded or amended in any way other than in writing by DCI.

Product demonstrations

DCI personnel may be present at a job site to demonstrate basic usage, features, and benefits of DCI products. DCI personnel are present only to demonstrate a DCI product. DCI does NOT provide locating services or other consulting or contracting services. DCI does not assume any duty to train the user or any other person, and does not assume responsibility or liability for the locating or other work performed at a job site at which DCI personnel or equipment are or have been present.