Schlumberger

Extreme Engineering
XDirect Software User Manual

104861896-01

Version	Date	Description	Prepared By	Reviewed By
00	15Feb2024	Initial Release	Lucas Rader	Sunny Ho Dan Klimuk
01	27Mar2024	Fixed Version Date	Sunny Ho	

Contents

1 Overview

This document details the use of XDirect software with Extreme Engineering surface equipment and downhole tools. XDirect is an integrated software suite to perform all the pre-run, downhole run, and post run operations.

1.1 XDirect Components

This manual will cover the following components of XDirect:

- Software retrieval and installation
- Pre-run tool setup
- Downhole run with XPTR, Laversab, XM4 or UDX
- Survey Calculations
- Standard Data Types and WITS IDs
- Well Logging
- Post run process

1.2 Acronyms

BOP – Blow-Out Prevention System
DD – Directional Driller
EDT – Equivalent Drilling Time
FAC – Field Acceptance Criteria
FFT – Fast Fourier Transform
GUI – Graphical User Interface
HDGM – High-Definition Geomagnetic Model
MWD – Measurement While Drilling
NC – Noise Canceling
PIB – Pressure Interface Board
PPM – Pulse Position Modulation
QPSK – Quad Phase Shift Key
REF – Reference
RES – Resolution
RM – Recorded Memory
ROP – Rate of Penetration
ROPA – Rate of Penetration on Average
RT – Real Time
RMS – Root Mean Square
RTC – Real Time Clock
SSC – Surface Survey Calculations
SNR – Signal to Noise Ratio
UDX – Uplink Downlink Xceiver
XDS – Extreme Downhole System
XM4 – Multi-Channel XEM or Four-Stake XEM
XPTR – XPulse Telemetry Receiver
XRT – Extreme Remote Terminal
XTR – Extreme Telemetry Receiver

1.3 Terminology

"**XDirect**" – Software suite containing launcher and all its applications including tool setup, web client, well logging, survey report, flash Upload etc.

"**Real Time Data**" – Surface data obtained when the tool is downhole. (Abbreviated as RT data)

"**Recorded Mode Data**" – Data downloaded from the flash memory of the tool. (Abbreviated as RM data)

"**Job**" – A job relates to services provided to client, which may not have any specific relation to a unique well or run. Tools may be rented to a client on a single job that will be used across many wells.

"**Job File**" – Job file or database is a data repository unit for XDirect. At a single instance of time only one job file is active in XDirect. A job file in XDirect is supposed to contain all data for a single well which need to be processed together for reports. A single job file has one run active at a time and all data received and decoded is associated with that run.

"**Well**" – unique name of the well for which data is being collected. There may be multiple runs on a well.

"**Run**" – The time between programming a tool with XDirect and downloading the flash data. This should be confined to a single trip in/trip out at a rig, on a single well. There can be multiple runs for a single well. Each run in XDirect has a set of associated tools.

"**Relog**" – Data acquired when user enables Relog operation from UI.

1.4 Related Documents

- XPulse Field Operations Manual (InTouch ID #6640709)
- XEM Field Operations Manual (InTouch ID #6411234)
- XM4 Best Practices Manual (GeMS #101731649, InTouch ID #6639604)
- XDirect Known Issues (InTouch ID #7312468)

2 System Requirements & Supported Telemetry Receivers

2.1 System Requirements

Required	
Operating System	Windows 7 or newer (32-bit or 64-bit) **NOTE:** Windows XP is not supported with XDirect.
Processor	• 1 gigahertz (GHz) or faster 32-bit (x86) or 64-bit (x64) processor • Dual core CPU or greater
RAM	4 GB RAM
Hard Disk	4 GB Available disk space (includes logging raw data)
Display	1024 x 768 or higher resolution
USB	2x USB 2.0 ports available (or via USB Hub)
Optional	
Serial Ports	RS-422 (required for RS-422 connection to XM4 or UDX)
Networking	Internet connection (Required for remote support)

2.2 Telemetry Receiver Support

Setup	Receiver Type
EM setup	XM4 Multi-Channel Surface Receiver or X-EM Telemetry Receiver Or UDX Multi-Channel Surface Receiver
Pulse setup	XPTR – XPulse Telemetry Receiver or Laversab with integrated Pressure interface board (PIB)
TelePacer setup	Laversab with integrated Pressure interface board (PIB)

3 Software Installation

3.1 Software Download

XDirect software suite requires two separate software packages to be installed on the machine.

- XDirect Installer
- Google Chrome Browser

Latest version of XDirect 6.0 can be obtained from XDirect Software reference page on the Schlumberger InTouch website (InTouch ID #8047274) The page includes all the necessary software and drivers for installation. XDirect 6.0 will install XDirect and the Extreme Surface Receiver. The installation package can also be obtained by contacting the Extreme Command Center.

Google Chrome browser needs to be downloaded from the internet and installed separately.
https://www.google.com/chrome/browser/desktop/#

XDirect has only been validated with Google Chrome. Other browsers are not currently supported.

Note that XDirect does not support spaces in Windows Login Username.

3.2 Licensing

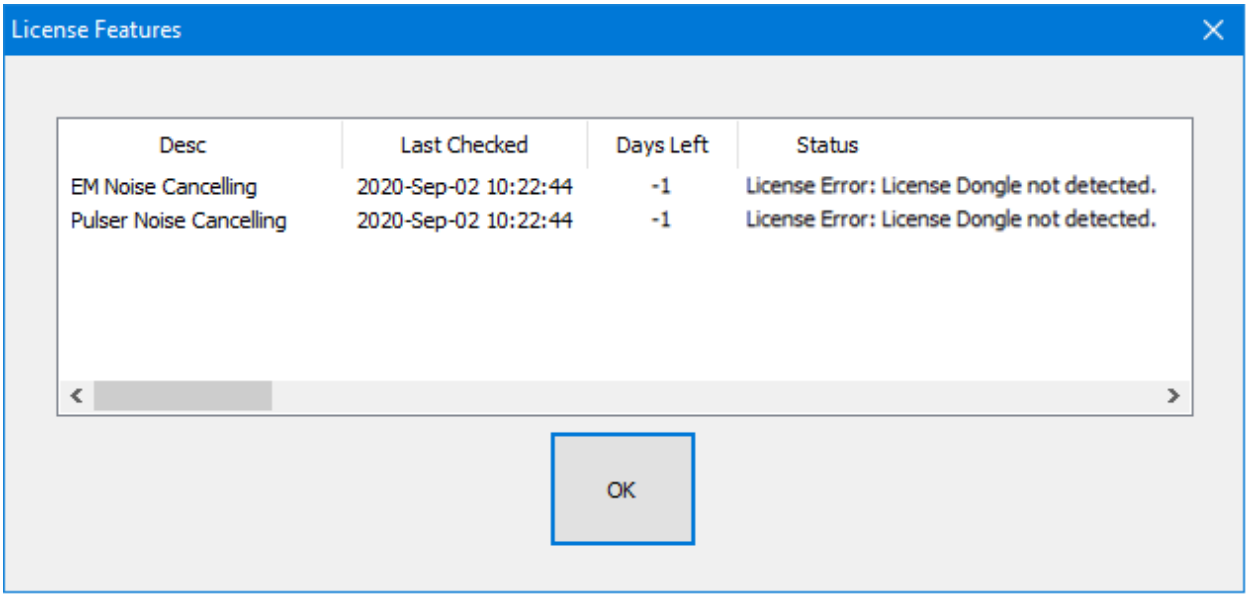
XDirect requires a licensed USB dongle to enable premium features in the Extreme Receiver and XDirect. The standard features for both software suites will function properly with or without the dongle.

3.2.1 Receiver

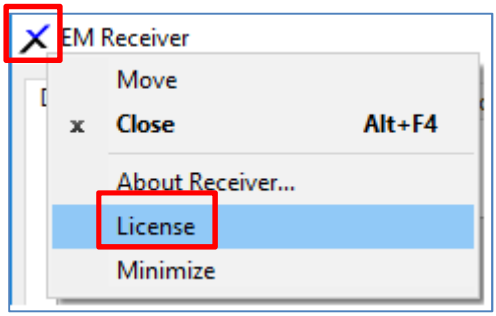
Currently there are two premium features available in the Receiver.

a. EM Noise Cancellation for XM4
b. Pulse Noise Cancelling

The following Pop Up will occur when the Receiver is started and will inform the user if any of the features are not available.



This information is available at any time by right clicking the Extreme Logo in the top left corner and choosing License.



3.2.2 XDirect

XDirect has a premium feature that can be enabled with a license dongle:

1. **Well Logging** – Allows creation of PDF well logs, CSV and LAS data files including recorded mode data after tool flash upload

If this is not enabled, the user will see a Licensing Alert popup when XDirect is started with details on the disabled function.

If Well Logging is disabled, the shortcut on the Launcher will be greyed out.

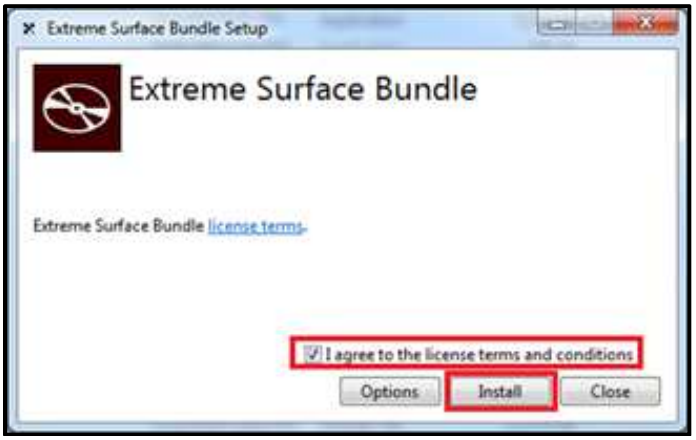
3.3 Installation to Computer

The installation pack will install both XDirect and the Surface Receiver software.

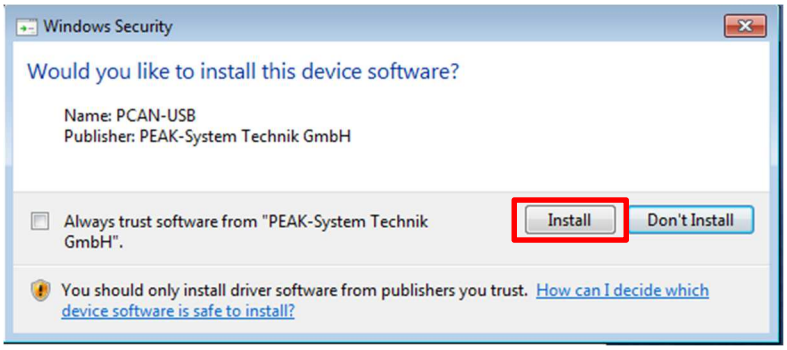
3.3.1 XDirect

To install XDirect, double-click the XDirect32.exe file.

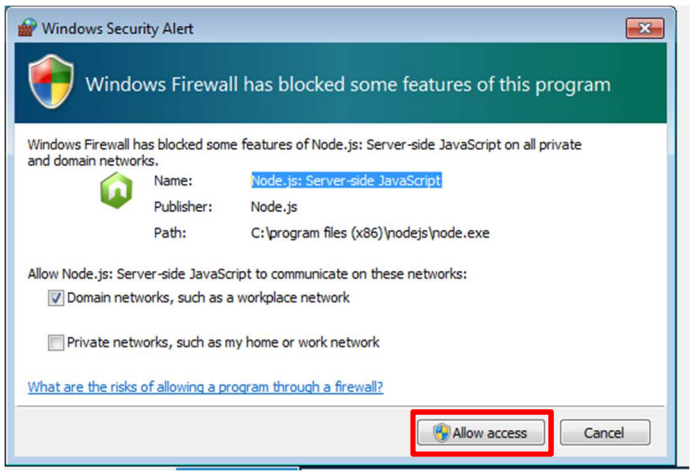
Carefully read the license terms, then check the box on the first screen to agree to the terms. Then click Install.



If this is the first time XDirect is installed on the computer, or if the computer has been recently re-imaged, the PCAN, SLBdrivers, and XM4drivers installers may appear. Click Install.



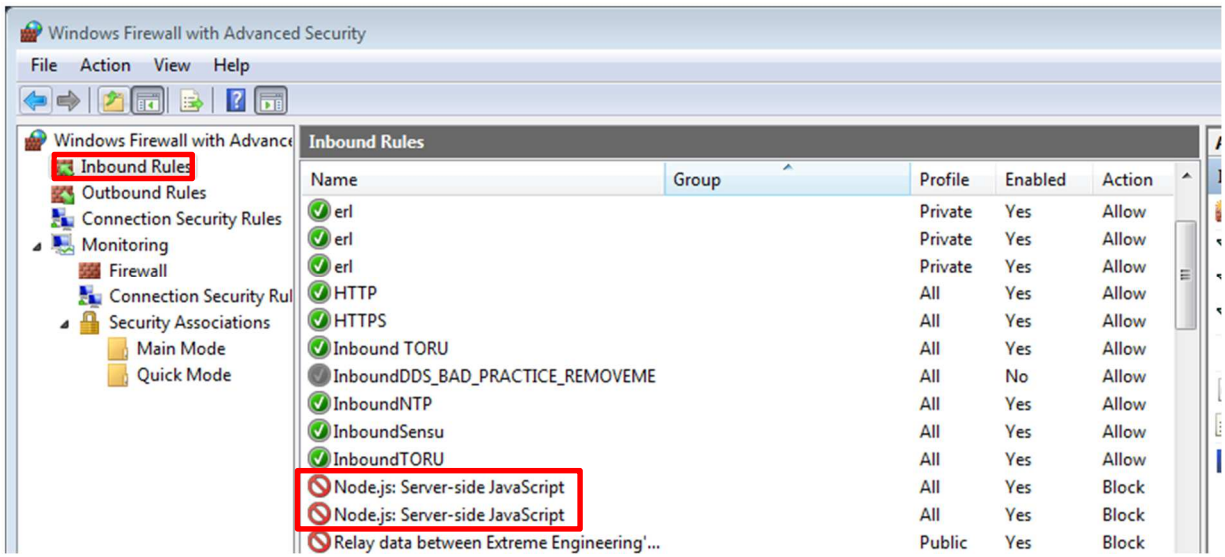
After installation is complete, user may be prompted to allow Windows Firewall access. Click Allow access for both Domain networks and Private networks. This is required to set up Remote View and Control later.



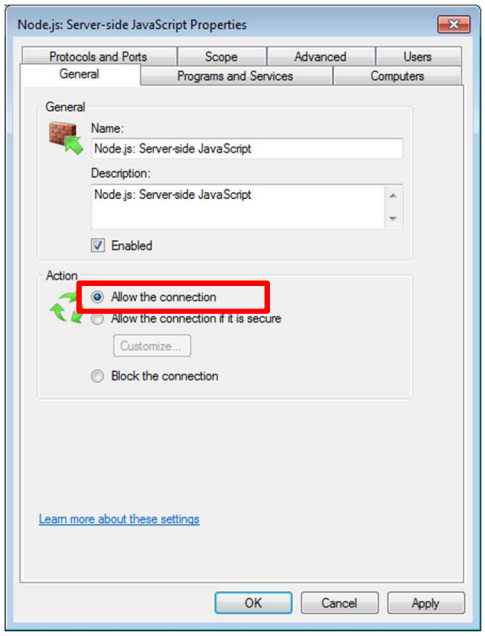
Some Windows PCs may not show the Allow access button here. If it is not there, the settings must be manually adjusted in Windows Firewall with Advanced Security.

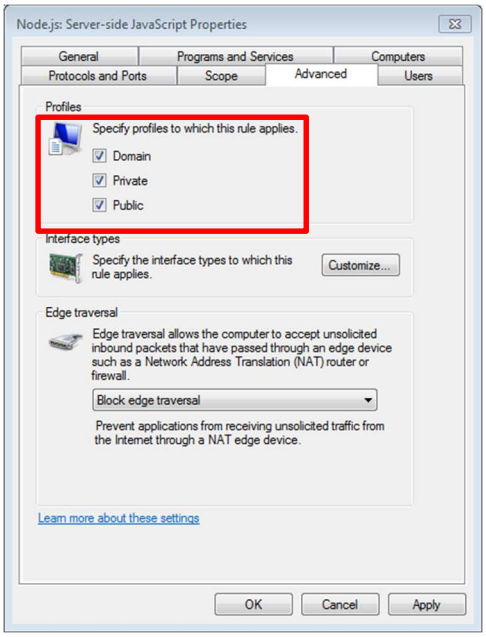
Navigate to **C:\Windows\System32** then Right Click on WF.msc and run as administrator.

Click on **Inbound Rules** on the left-hand side to open the window. Double click on **Node.js: Server-side JavaScript**.



Click on the Allow the Connection button under the General Tab and verify that Domain, Private and Public are checked under the Advanced tab.





Click Apply and OK. Verify that the icon on the left turns green. Repeat for the other Node.js listing.

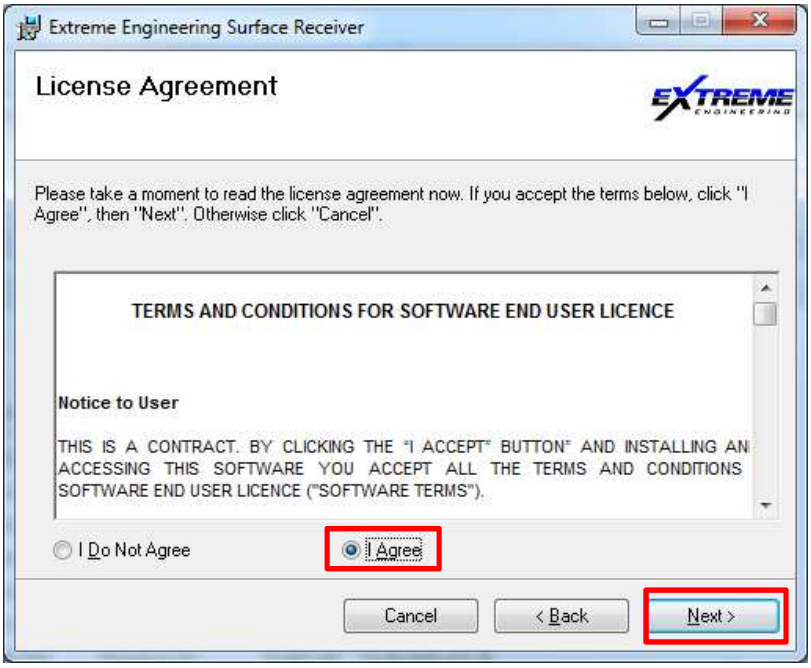
Note: If Node.js ("Node.js: Server-side…") and X-Server ("Relay data between Extreme…") do not appear in this menu, they must be manually added. Refer to the XDirect FAQ at InTouch 7142818 for instructions or contact Extreme Command Center for documentation.

3.3.2 Extreme Surface Receiver

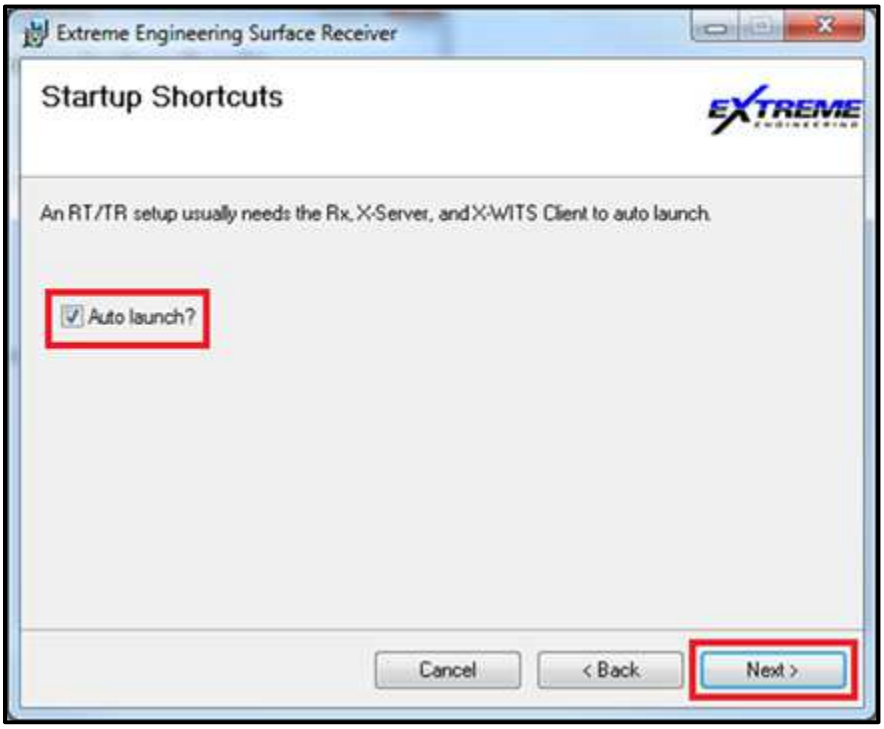
During the XDirect installation process, the Receiver will also be installed. The current version installed is **13.27.77** or higher. Older versions may have older GUI.

Follow the prompts on screens to continue installing the software. Click Next on the Setup Wizard.

Read the license agreement carefully, and click I Agree and Next on the License Agreement

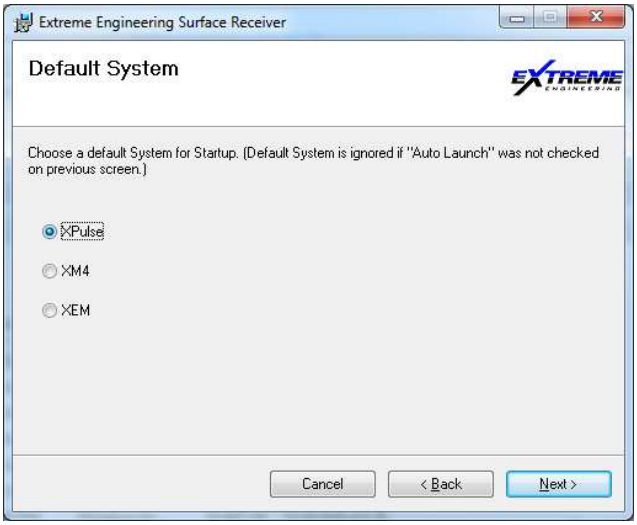


From the Startup Shortcuts window check the “Auto launch?” checkbox. Then click Next.

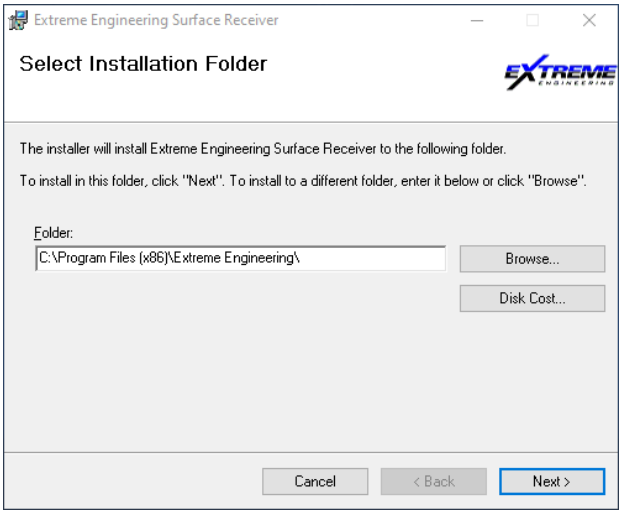


From the Default System window, select one of the three default systems options (XPulse, XM4, or XEM). This determines which Receiver will be automatically started when the computer is rebooted and configures the default WITS ports. Then click Next.

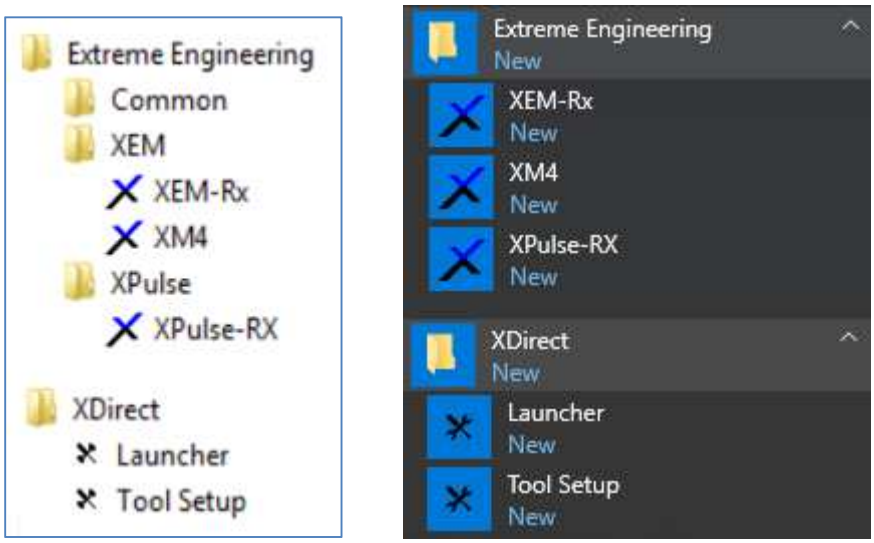
NOTE: When the "XM4" option is selected, the default "WITS" port selected in XWITSClient will be set to "XM4Rx".



Select the Installation Folder. It is not recommended to change this folder as it can affect program functionality.



Continue to follow the prompts on screens to continue installing the software. Once the installation is complete, XDirect and RX applications will be available from the start menu under "All Programs".



Windows 7 vs. Windows 10 start menus.

Note: Desktop shortcuts and Startup may need to be edited after installation, but the Start Menu will have all the necessary applications listed.

3.4 Driver Installation

All drivers should be automatically installed by XDirect. If there are any issues the drivers are available in a separate .ZIP file by request.

4 WITS Connection Options

The following table is an overview of the required connections from a Pason system to Extreme Engineering:

Pason	Extreme Engineering	Required Cable
Rig WITS	XPTR (22PULS0014) through “WITS” port	RS232 WITS Cable (22CABL0054)
Rig WITS	XM4/XTR/UDX Receiver (101523550) through “RS-232” or “RS-485” port	RT-WITS Cable (22CABL0054) or Pason WITS Cable (92WITS0003)
Rig WITS	Laversab (101981659) and Laversab Pigtail Connection with USB and Serial Port (101981662)	Null Modem Cable
Rig WITS	ToughBook (103272429) or Azonix (04AZNX0001) through USB	Null Modem Cable and USB to Serial Adapter

Once XDirect is installed, connect the computer to the WITS port on the Receiver chosen for the setup.

4.1 XTR and XPTR WITS Connections

There are no changes to the XTR and XPTR WITS connections from previous software releases. To use the WITS port built into the Receiver, select “WITS PORT” from the port selection drop-down menu in the X-WITSClient application.

4.2 Laversab WITS Connections

4.2.1 Laversab Built-in Serial Port

A Laversab computer has a built in RS-232 serial port which is accessible through a pigtail cable that exposes a DB9 connector. This connection is functionally identical to the DB9 connector on a 20ft RT-WITS RS232 Cable (22CABL0054), which is used with the XPTR (22PULS0014).

A Laversab 2850 computer includes a pigtail connection cable from the circular connector on the computer to a standard DB9 serial cable connection. This can be used to connect directly to a Pason Comm box or Pason workstation, or any other WITS receiver using a serial null modem cable.

By default, the Laversab external DB9 serial port is accessed as "COM2", which is the available on the pigtail cable. "COM1" is used inside the Laversab to connect to the pressure interference board (PIB.)

The Laversab also has a built in RS422 connection available on a 10 Pin connector on the Pigtail. This is defaulted to COM7 or COM9 but can be identified in Device Manager by the name Silicon Labs Dual CP210x USB to UART Bridge Enhanced COM Port.

4.2.2 USB to Serial WITS Adapter

An external USB to serial adapter and a serial cable can be used to connect any Windows PC to a WITS device. Select the correct serial port number in XWITS client for the adapter you want to use.

4.3 XM4/UDX WITS Connection Options

4.3.1 XM4/UDX WITS Port

Connect a 20ft RT-WITS RS232 Cable (22CABL0054) or PASON WITS Cable (92WITS0001) to the ports labeled "RS-232" or "RS-485" on the XM4. Both ports cannot be used at the same time. The user will need to configure which port was connected from the XM4 Surface Receiver Software detailed in "Surface Box Window".

4.3.2 USB to Serial WITS Adapter

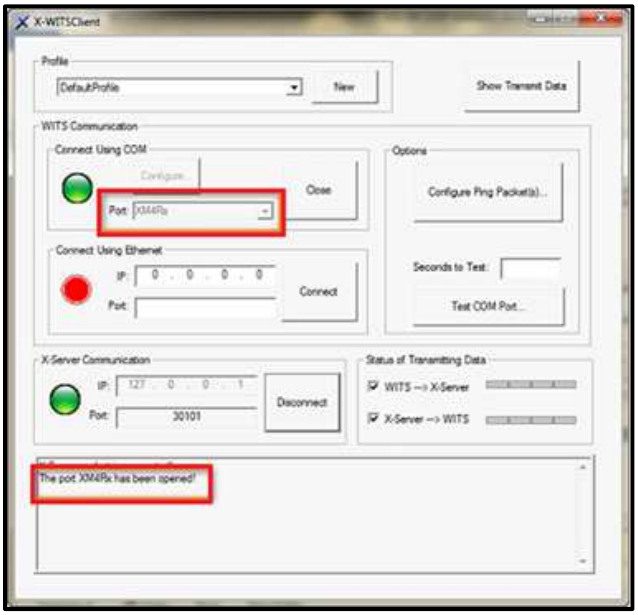
If you are using a computer that does not have an integrated serial port (including a Modified Azonix Barracuda Remote Terminal Revision B), you can use an external USB to serial adapter and a serial cable to connect to a WITS device.

4.4 X-WITS Client

Select the appropriate serial port number in the XWitsClient application. This selection is made in the “Connect Using COM” section of the X-WITSClient window.

If you are using the port on the XM4 or UDX, select the port named “XM4Rx”. When the “XM4Rx” port is selected, this will reroute ping and test packets to ***X-Server -- XM4 Rx -- XM4 Box*** that would normally go out the Serial/WITS Port directly from X-WITSClient. After the initial selection, subsequent startups of WITSClient will automatically select “XM4Rx” as the port.

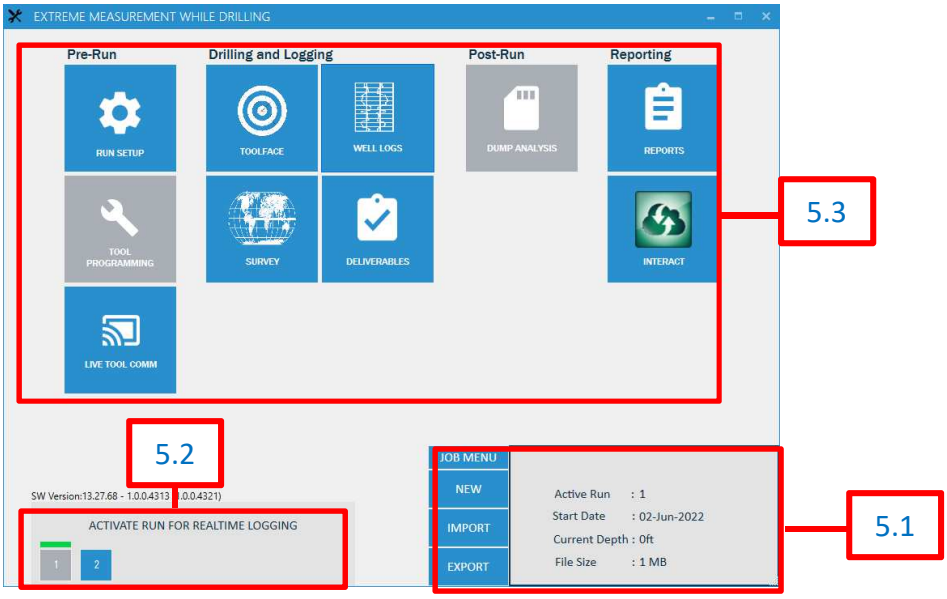
In addition, if the “XM4” option was selected in the installation then XWITSClient will automatically start with this port selected.



5 Launcher Window

The Launcher window is the XDirect hub for the pre-run, run, and post run sections. This window is available from the desktop ***Start menu -- All Programs -- XDirect -- Launcher.***

Anytime XDirect launcher window is opened, it is working on a single job file. XDirect automatically opens the most recent job file. All data for a single well (which needs to be processed together for logs and reports) should be stored in a single job file. At a single instance of time, only one run is active in the job file. All incoming/received data is associated to the active run in the job file.



5.1 Job File Section

This section gives a summary of active job file. The summary contains well name and job number as title. There are three buttons in this section.

- New Button: Starts a new job file and database. This action automatically saves the active job file in c:\ExtremeEngineering\XDirect\SavedJobs\ directory as a zip file.
- Import Button: Import a saved job file and make it as active. This action automatically saves the active job file in c:\ExtremeEngineering\XDirect\SavedJobs\ directory as a zip file.
- Export Button: Saves a copy of the current job file and database to the specified location

5.2 Run Activation Section

This section gives a summary of the current active run and any other runs that have not been activated yet. This allows the user to bank test tools for future runs before downloading tool flash for the current run.

- The active run is indicated by a grey box with a green rectangle above it. If Well Logging is enabled, data is only logged for active runs. Once a new run is activated, previous runs cannot be reactivated.
- New runs that have not been activated are indicated by a blue color. They can be activated by clicking on the button.
- Previous runs will not show up on this page

5.3 Apps Section

5.3.1 Pre-Run

- Run Setup Button: Starts XDirect pre-run workflow.
- Tool Programming Button: Opens programming workflow.
- Live Tool Comm Button: Opens tool string diagnostic page.

5.3.2 Drilling & Logging

- Toolface Button: Opens Toolface Web Client application in default browser.
- Well Logs Button: If Enabled, Opens Well Logs Web Client application in default browser. If not enabled, button is not present.
- Survey Button: Opens Survey Web Client application in default browser.
- Deliverables Button: Opens Client Deliverables Web Client application in default browser.

5.3.3 Post Run

- Dump Analysis Button: Starts XDirect Post Run workflow.

5.3.4 Reporting

- Reports Button: Opens direct link to Pre-Run Report, Post run Report and XM4 Signal Analysis Report.
- InterAct Button: Start process to connect to InterAct server.

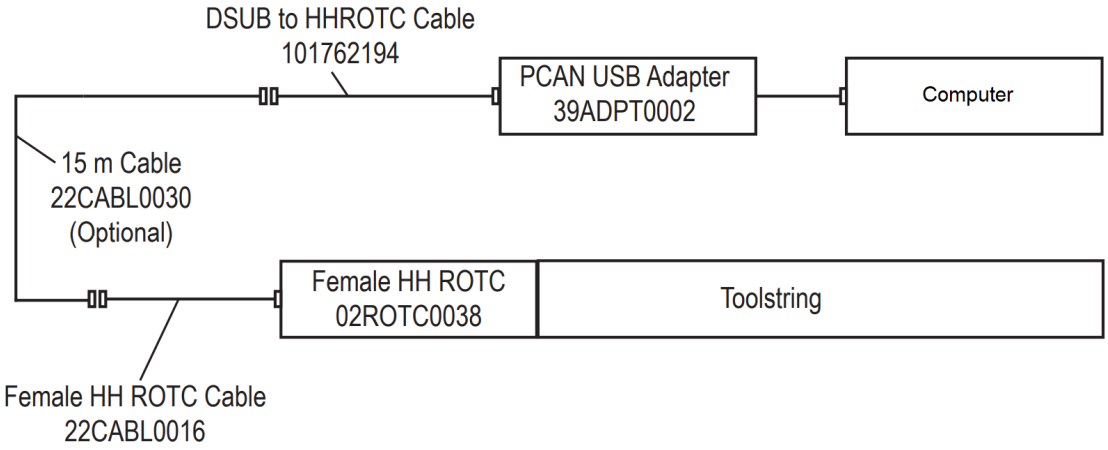
6 Pre-Run Process

Once the WITS setup is complete, the tool string can be connected to the computer and pre-run process should be started in XDirect. Each run in XDirect has a set of associated tools and data.

6.1 XBolt, XEM or XPulse Tool string Connection

XDirect requires a CAN interface connection to the tool string. This can be provided by one of the following hardware options:

1) XM4 Telemetry Receiver (101523550)
2) XTR Telemetry Receiver (22XEM0001)
3) XPTR Telemetry Receiver (22PULS0014)
4) UDX Telemetry Receiver (103134061)
5) USB PCAN Adapter (39ADPT0002) and DSUB to HHROTC XBUS Cable (101762194) - *See diagram below*:



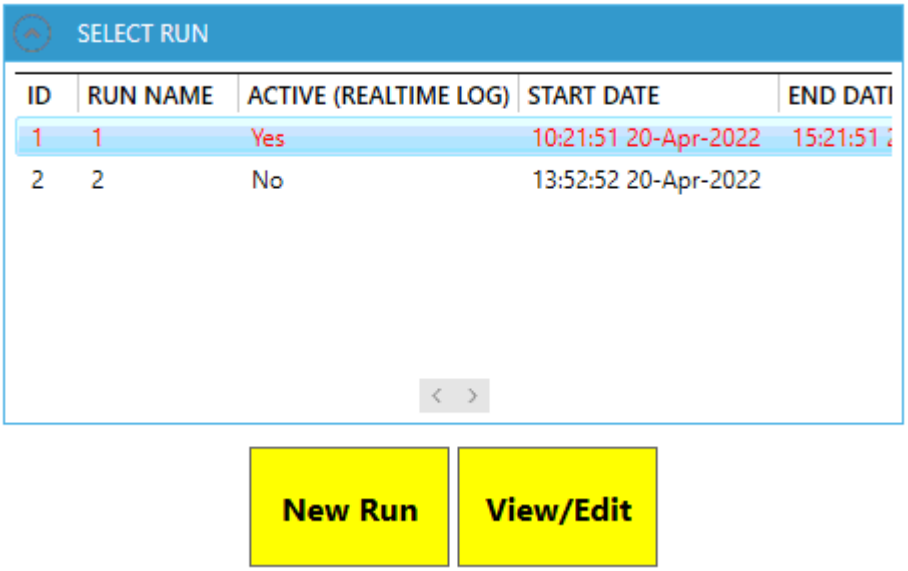
NOTE: Refer to the **XEM Operations Manual** (InTouch ID #6411234) or **XPulse Operations Manual** (InTouch ID #6640709) for detailed instructions on how to connect the tool string.

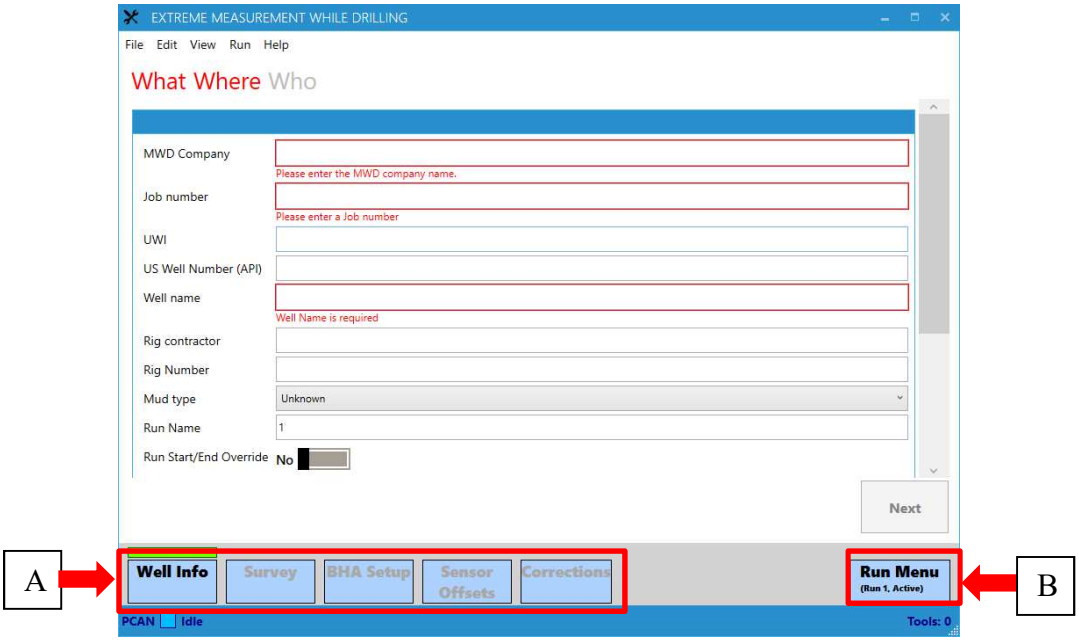
6.2 XDirect Run Setup

From the Launcher window click the Run Setup button to open the XDirect run setup.

This will bring up the Run Menu window to select existing runs or create a new run. The Run ID, Run Name, and indication of which run is currently active will be listed here. Any data that is logged will be stored in the run listed in Red and listed as “Yes” under Active (Realtime Log).

Tools can be bank tested for future runs if needed by creating a new run and going to View/Edit. Make sure that the correct run is selected to ensure the data is stored properly.





A. Main Tasks (bottom menu) – This menu shows the major steps of the currently active workflow (prerun or postrun). The current screen will have a green highlight above the button. All available screens will be in bold. Buttons will change color based on status.

- Blue: Task not completed
- Green: Task completed successfully
- Yellow: Task completed with warnings
- Orange: Task failed

B. Run Menu – Show the run that is associated with the data shown on screen and if it is active. Clicking the button will bring up the Run Menu and allow the user to change runs or create new runs.

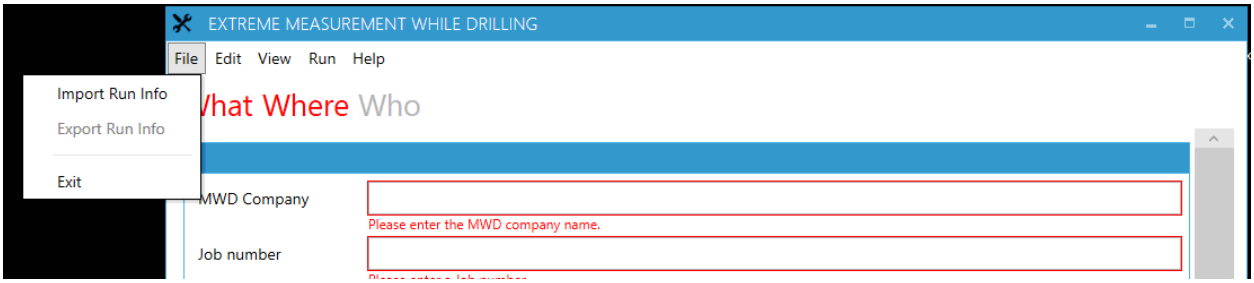
1) Use the labels at the top of the page to access each section of the individual Main Task buttons.

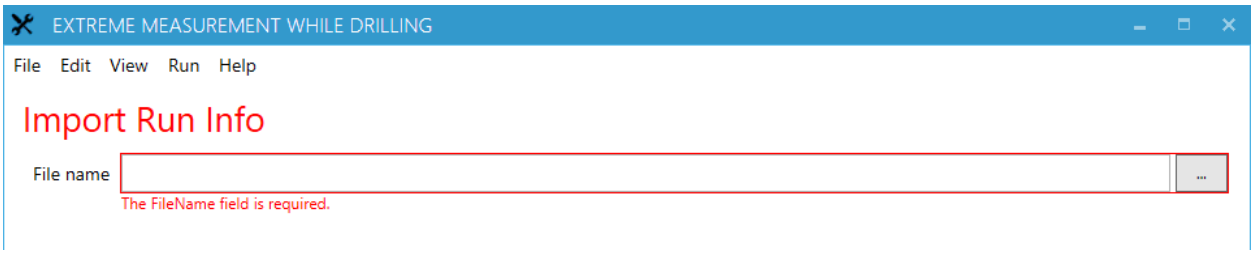
2) Any boxes in red including the MWD Company name, Job number and Well name fields on the What page, Magnetic information, County/Municipality and State/Province fields on the Where page must be completed before proceeding to other sections of XDirect. Other fields can be filled out as needed depending on the requirements of the job.

3) Unit selections (Imperial/Metric and Gauss/nT) are made on the first page in Unit set.

4) Once all the necessary information has been entered in each section, click the Next button.

All run information can be exported to a .csv file using the File - Export Run Info option. This file is used to import all data to the run information section using the File - Import run Info option.





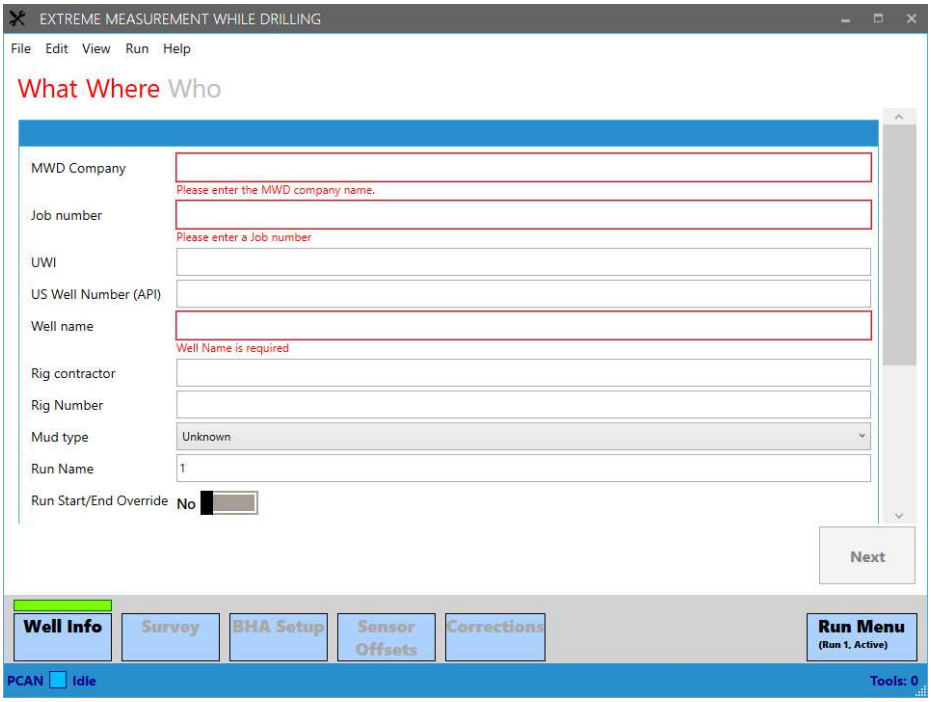
6.2.1 Well Info Setup

The Well Info Main Task contains three sections to capture general information about the rig and to setup the well. Information includes survey tie in and magnetic information and rig crew contact information. Well Info information will automatically carry over to any new run created. The information will be displayed in the pre-run, post run, well log and survey report headers.

6.2.1.1 What Section

This section contains information about the rig.

Unit sets can be selected here and depth and date ranges can be adjusted on this page. MWD Company and Job number and Well Name must be completed in this section.



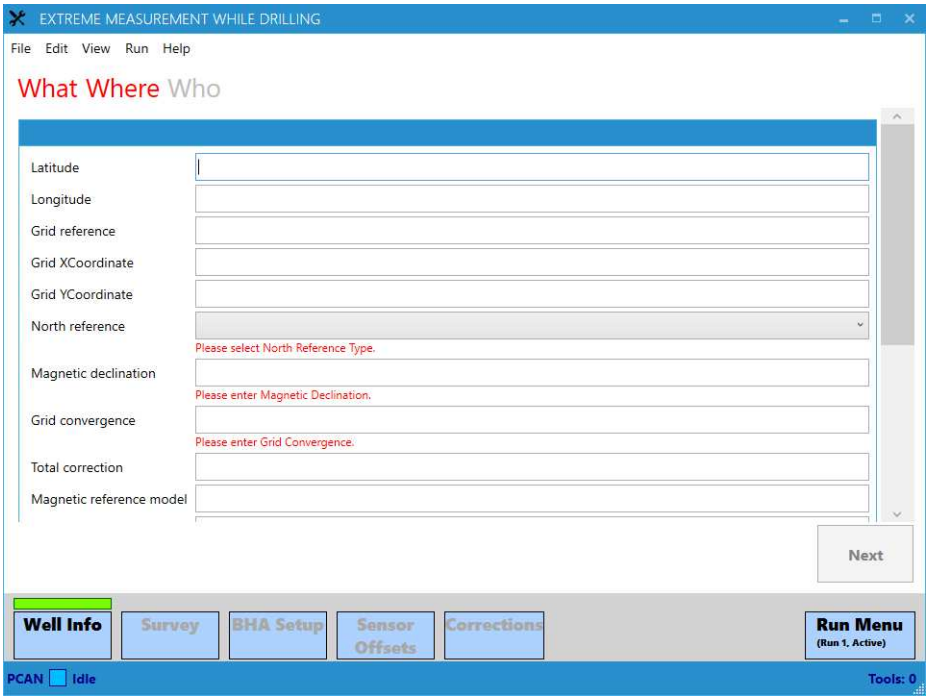
6.2.1.2 Where Section

This section details the location of the rig:

When a location is entered, a popup map will appear. Use this map to verify the location data entered matches the location of the rig. Verify that the values are correct.

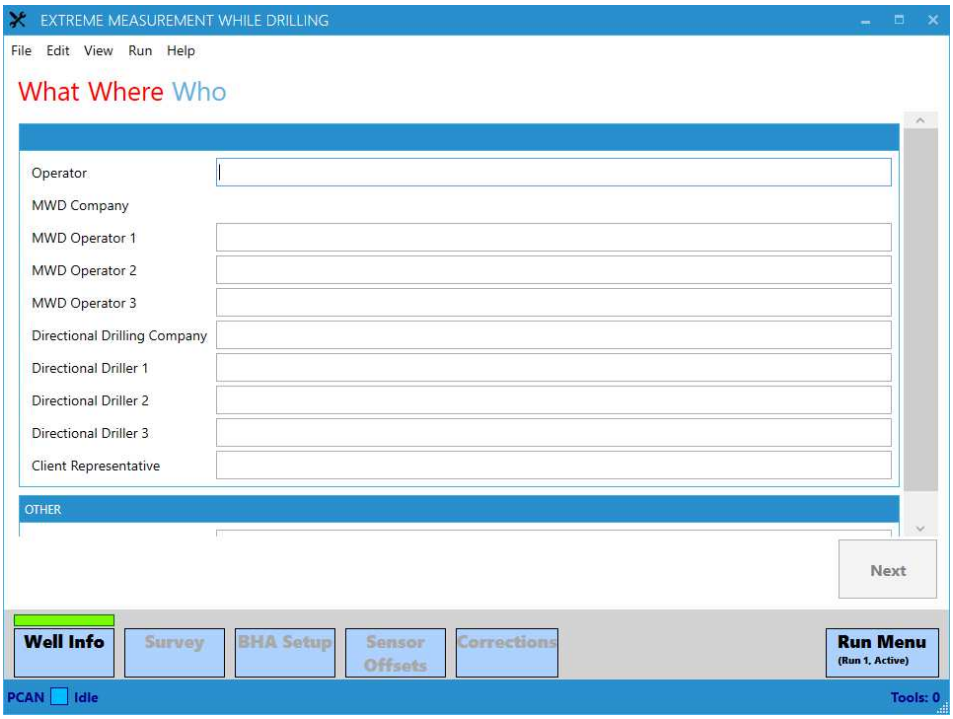
The map will display automatically the first-time coordinates are entered; it can be displayed any time by clicking ***View -- Show Map***. You can hide the map by clicking the down arrow icon. The map will only have valid data if the computer has access to the internet.

Magnetic declination information and County/State information must be completed in this section.



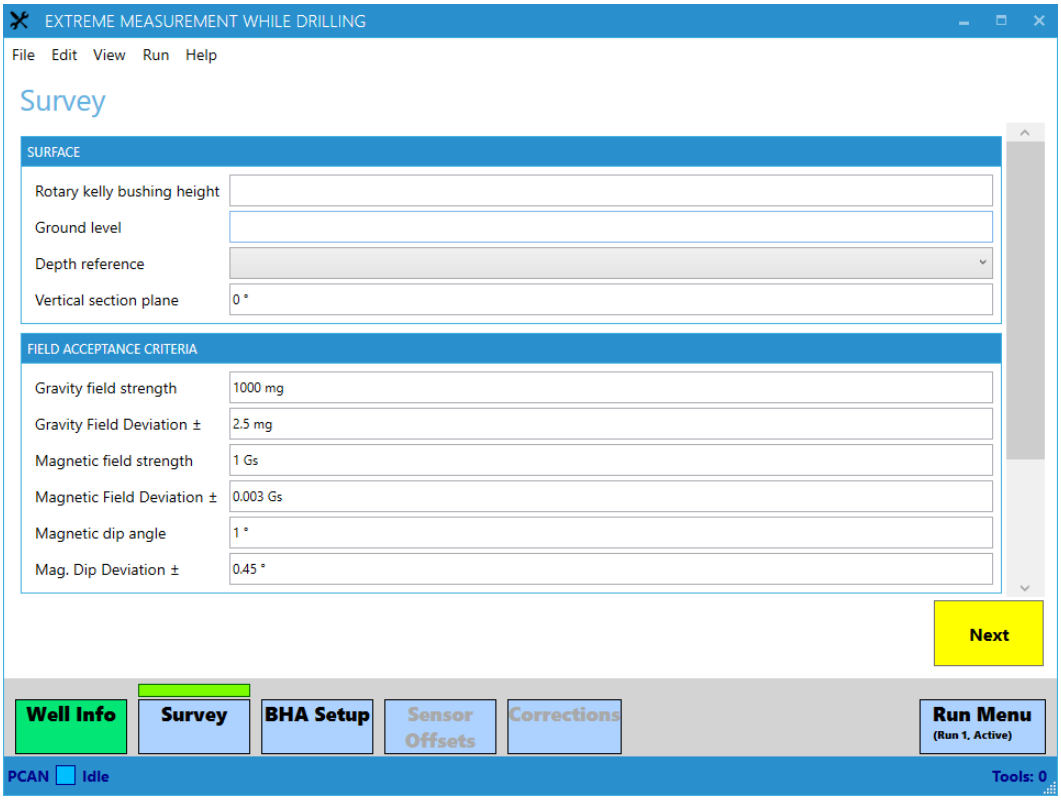
6.2.1.3 Who Section

This section contains contact information for the rig crew.



6.2.2 Survey Setup

Detailed location information and Field Acceptance Criteria for survey processing is located on this page. Survey Tie In information for each run is also entered here. All information will be carried over to any new run created.

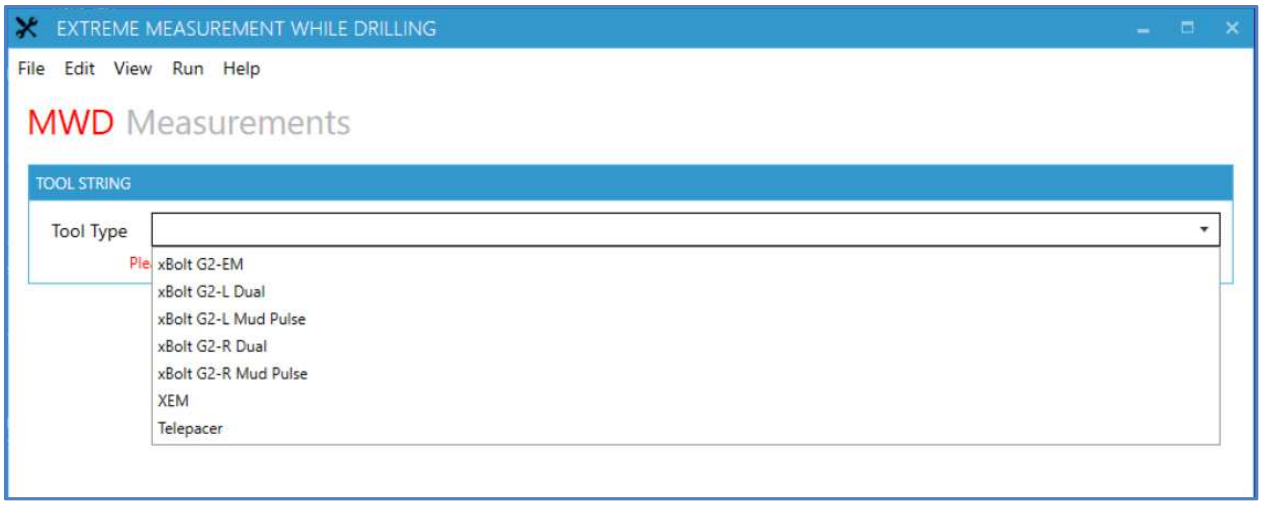


6.2.3 BHA Setup

Information on tool string composition and BHA details can be entered on this page. XDirect will provide user with all Tool Length Calculator values here.

6.2.3.1 MWD Section

Tool string type, size and composition can be entered here. Tool string type will be selected from the drop-down menu at the top of the page. Telepacer calculations are currently not supported.



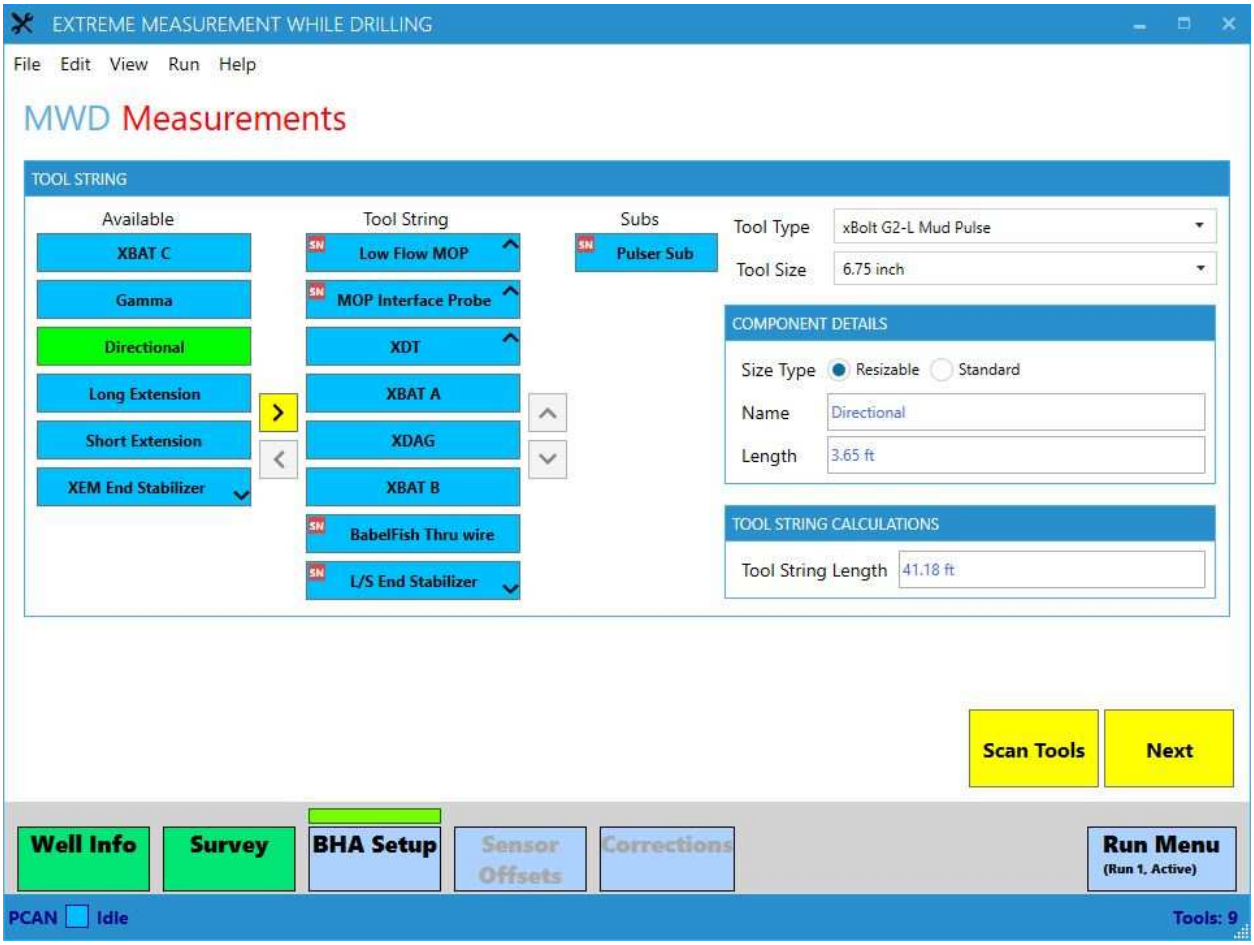
Tool string type, size and composition can be entered here. Tool string type and size will be selected from the drop-down menu at the top of the page. Note that Telepacer calculations are currently not supported.

Critical components will automatically be added to the Tool String list based on string type and available components will be listed in the Available section. The Available section list will be adjusted as the user selects components to prevent incompatible nodes.

Available components can be selected by clicking on them. The component will turn green to indicate it has been selected and the Name and Length will be shown on the right side under Component Details.

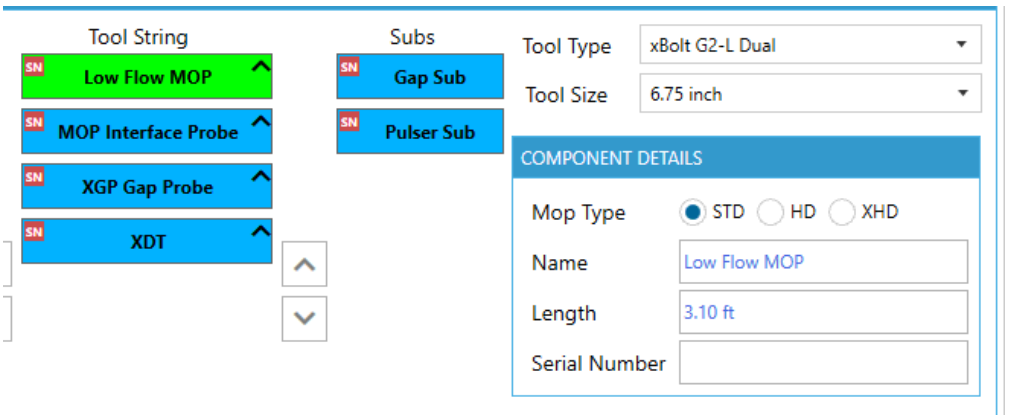
The component can be moved to the tool string by double clicking the component or by clicking the right arrow button.

The Scan Tools function at the bottom of the screen can be used to automatically add supported components that are connected to the system. This will also automatically add any supported serial numbers.

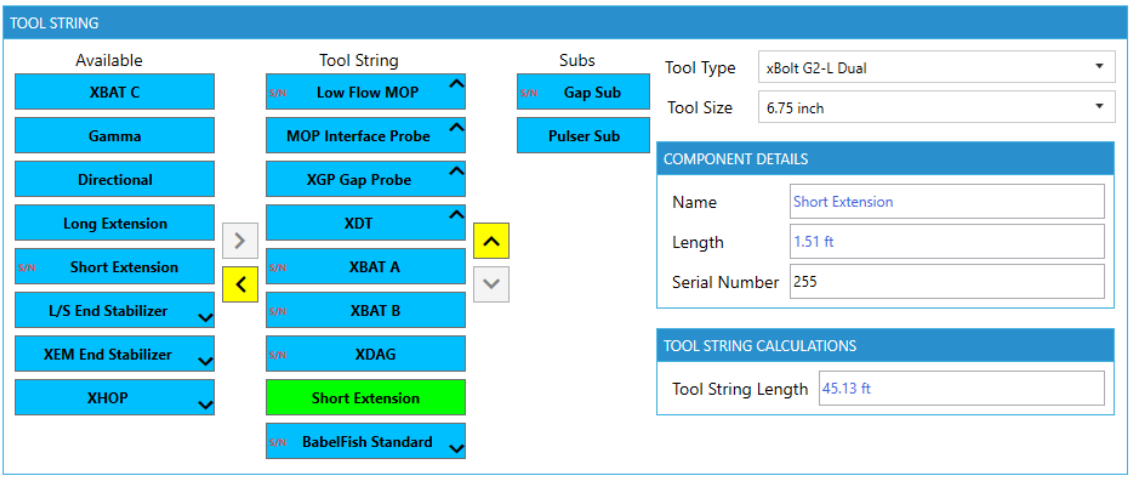


Once a component is added to the Tool String it can be moved up or down by selecting the component and clicking the arrows. Note that critical items will be locked in place and cannot be moved.

When a tool string item is selected the Name, Length and Serial Number will be shown on the right side under Component Details. Some items may have additional options in Component Details. Ex: Low Flow MOP has options STD, HD and XHD as seen below.



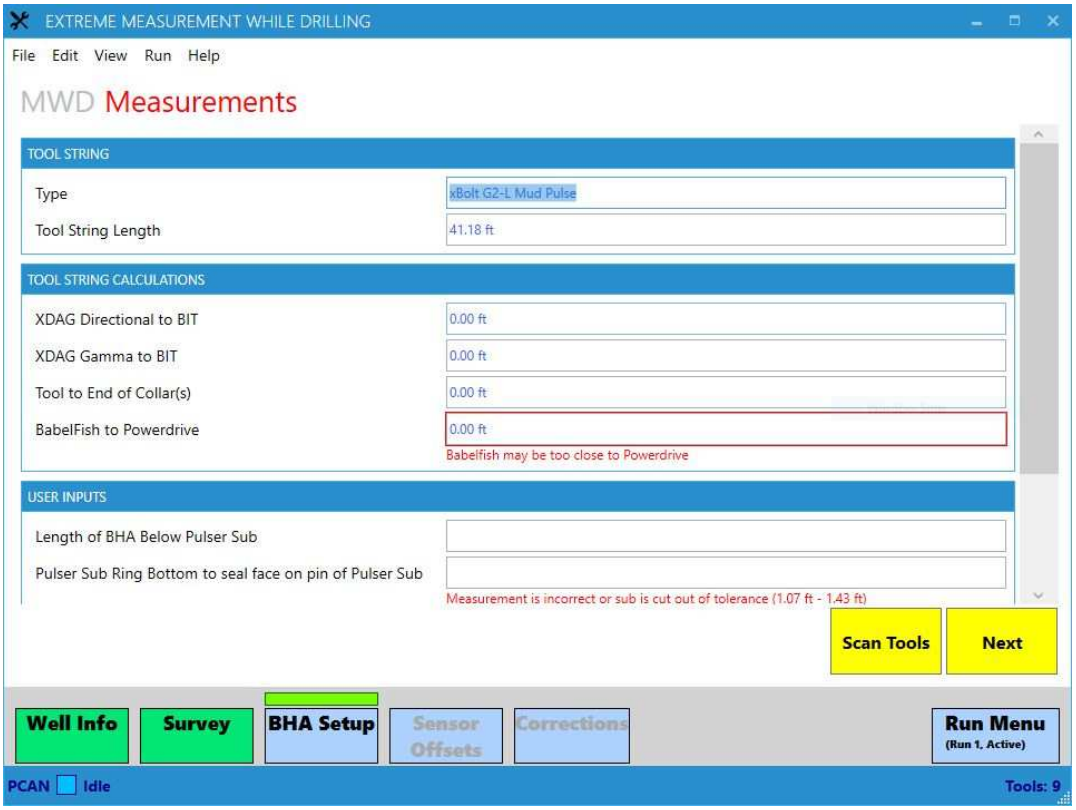
Items without a serial number will show S/N in red on the left side. If no Serial Number has been detected or if an incorrect serial number was populated a new serial number can be entered. Note this serial number will be added to the PreRun Report but it will not overwrite the Serial Number stored in the tool.



6.2.3.2 Measurements Section

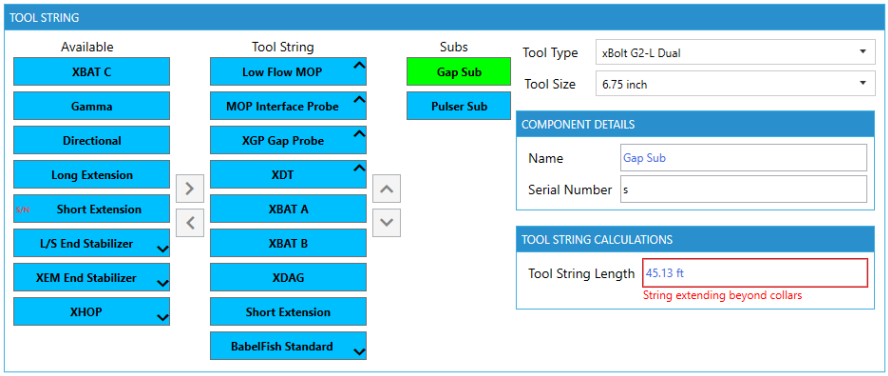
Once the tool string has been designated the Measurements Section can be used to enter lengths to calculate values for directional to bit or gamma to bit. This section will also alert the user if the tool is extending beyond the collars and provide measurements for XHOP and Babelfish distance to Powerdrive if available.

All values are entered in the USER INPUTS table. Calculations will not be made until all values are entered.



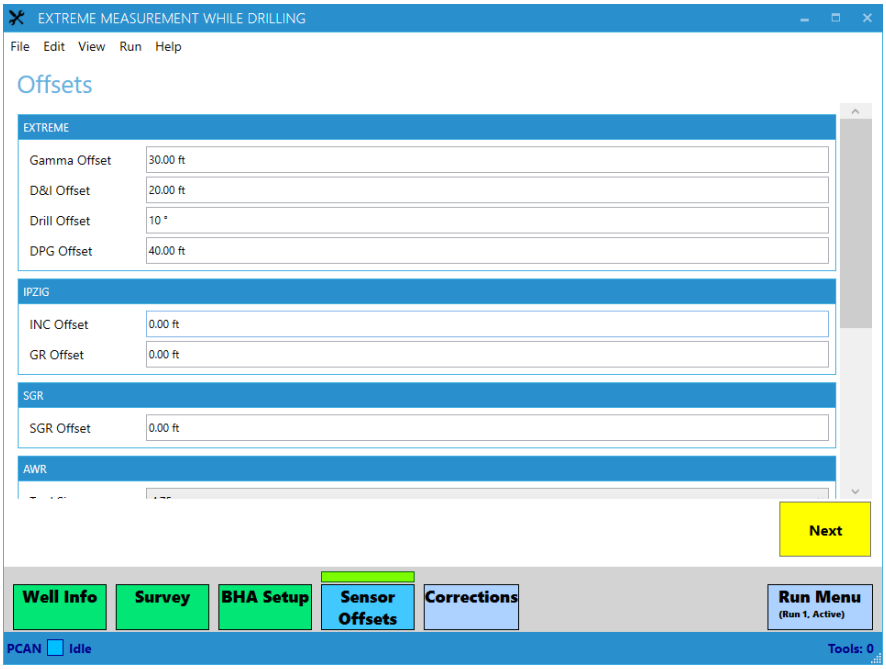
If the tool is extending outside of the collar or if the tool is making contact to the Powerdrive internals a warning will be displayed and the Measurements tab on top will turn red.

Once these values are calculated the String Extending Beyond Collars warning will also be visible on the MWD tab.



6.2.4 Sensor Offsets

Enter the values in this section used to calculate the depth and angle offsets for all sensors.



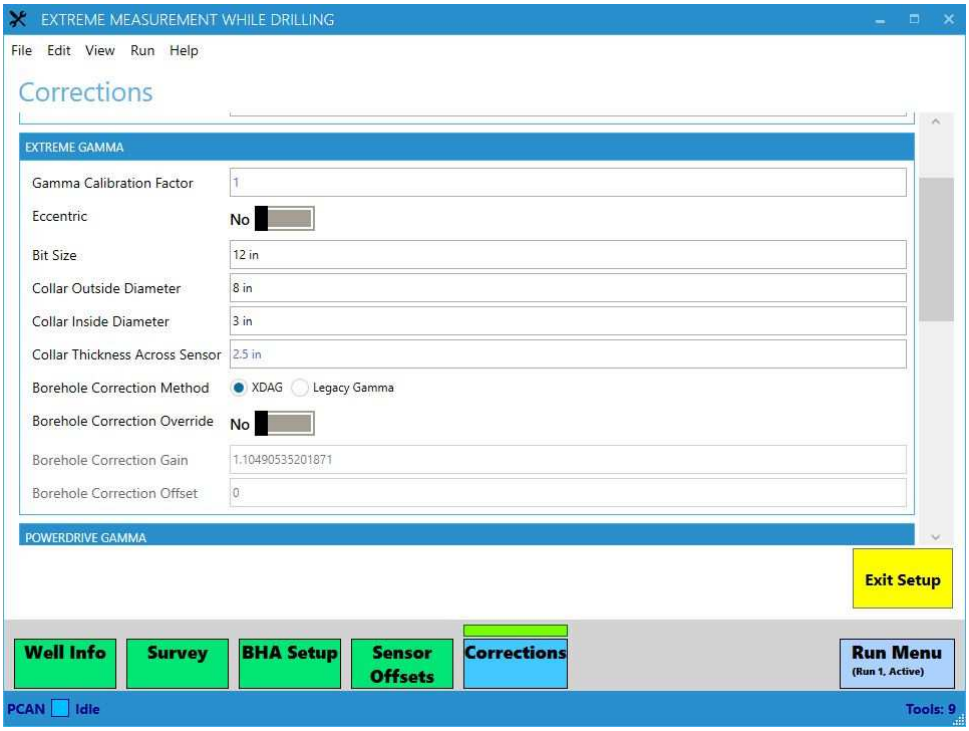
6.2.5 Corrections

Enter the values in this section used to calculate the Gamma correction factor for Extreme tools. The values entered here will be shown in the pre-run report and are applied to the real-time and recorded mode data.

The BHA parameters and mud properties entered in this section are used to calculate the Gamma correction factor/offset for Extreme gamma logs.

This correction factor can be overridden by setting the Borehole Correction Override to Yes. All entries in the MUD and EXTREME GAMMA sections must be filled out for the Borehole Correction Gain to be calculated.

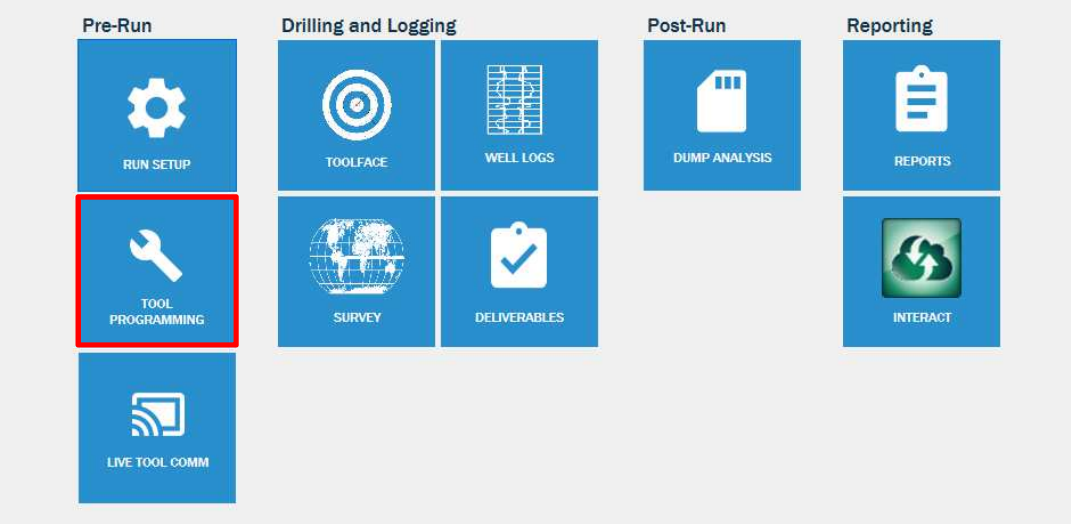
Gamma correction factors for tools other than Extreme Gamma can also be entered in this section.



Finish the Run Setup by clicking Exit Setup

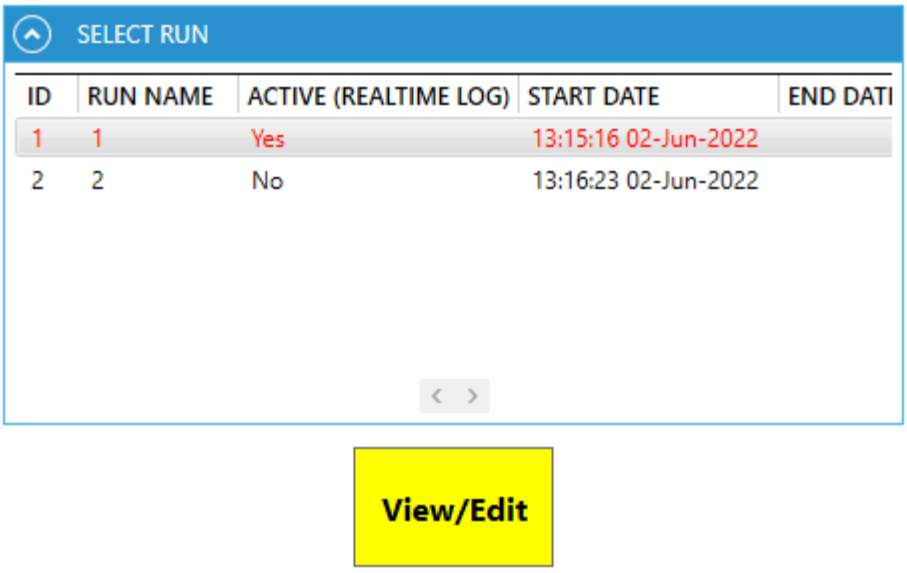
6.3 XDirect Tool Programming

From the Launcher window click the Tool Programming button to open the XDirect tool setup.



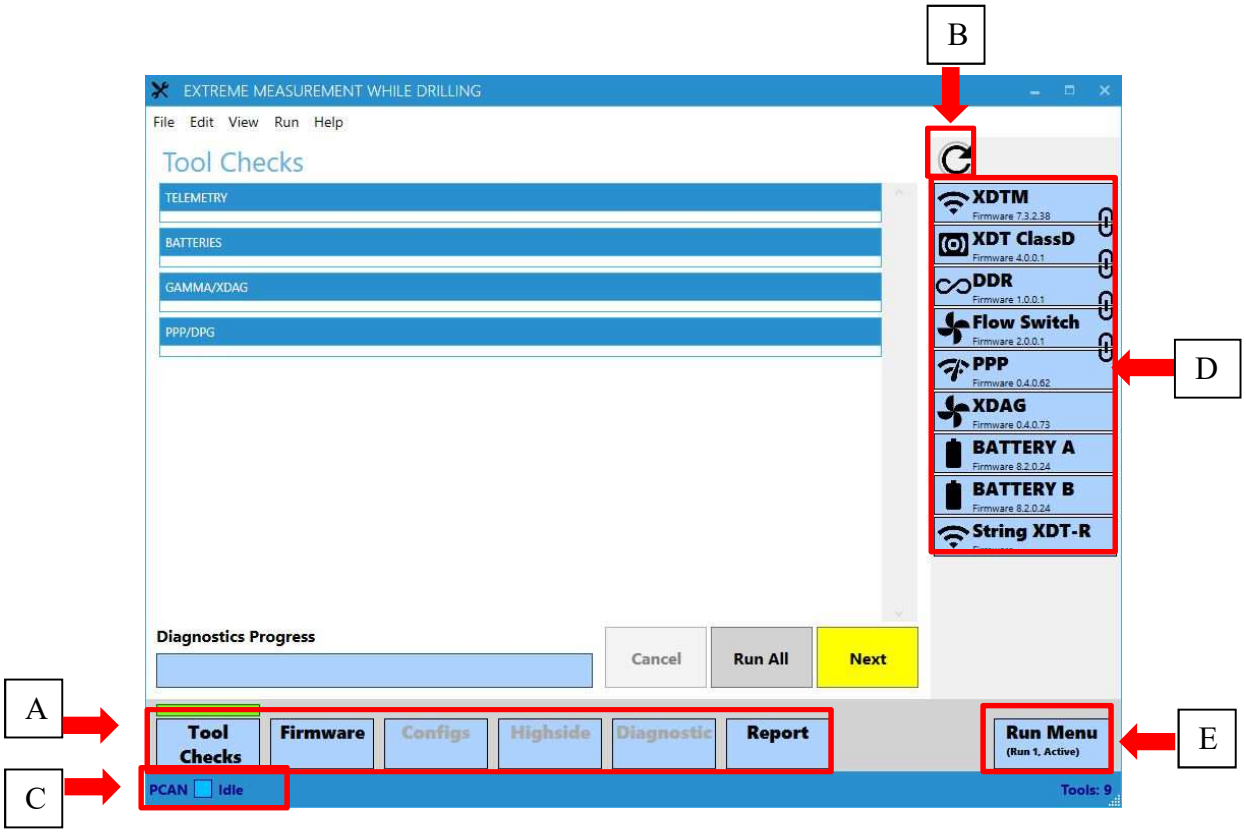
This will bring up the window to select which run the tool will be used on. The Run ID, Run Name and indication of which run is currently active will be listed here. Any data that is logged will be stored in the run listed in Red and listed as "Yes" under Active (Realtime Log.)

Tools can be bank tested for future runs if needed by creating a new run in Run Setup first and then accessing the run in Tool Programming. Make sure that the correct run is selected for the Bank Test to ensure the data is stored properly. New runs cannot be created in Tool Programming.



When toolsetup application is started and run is selected, XDirect will automatically try to connect to the tool string via PCAN bus and start the tool detection process provided that PCAN adapter is available to XDirect.

NO OTHER EXTREME SURFACE SOFTWARE SHOULD BE RUNNING WHILE PROGRAMMING THE TOOLS IN XDIRECT.



A. Main Tasks (bottom menu) – This menu shows the major steps of the currently active workflow (prerun or postrun). The current screen will have a green highlight above the button. All available screens will be in bold. Buttons will change color based on status.

- Blue: Task not completed
- Green: Task completed successfully
- Yellow: Task completed with warnings
- Orange: Task failed

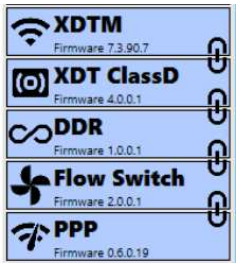
B. Refresh Tools (top right) – This button is enabled once XDirect detects PCAN adapter is connected and available to XDirect. User can click the refresh button to force XDirect to scan for the tools.

C. PCAN status and status message (bottom left) – This shows the status of PCAN adapter.

- Green: PCAN is active and is in use by XDirect.
- Blue: PCAN is not being used by XDirect.
- Yellow: XDirect has deferred PCAN in favor of another Extreme application (XConnect, XBootloader, XM4 Receiver, XEM Receiver, XPulse Receiver). XDirect will identify the application.

- Red: PCAN is not recognized

D. Tools in current Run (right menu - click the icon box to expand) – Right panel lists the currently detected tools in the run. The tool icon is color coded to reflect the status of the tool. Tools with multiple nodes will be connected by a link icon.

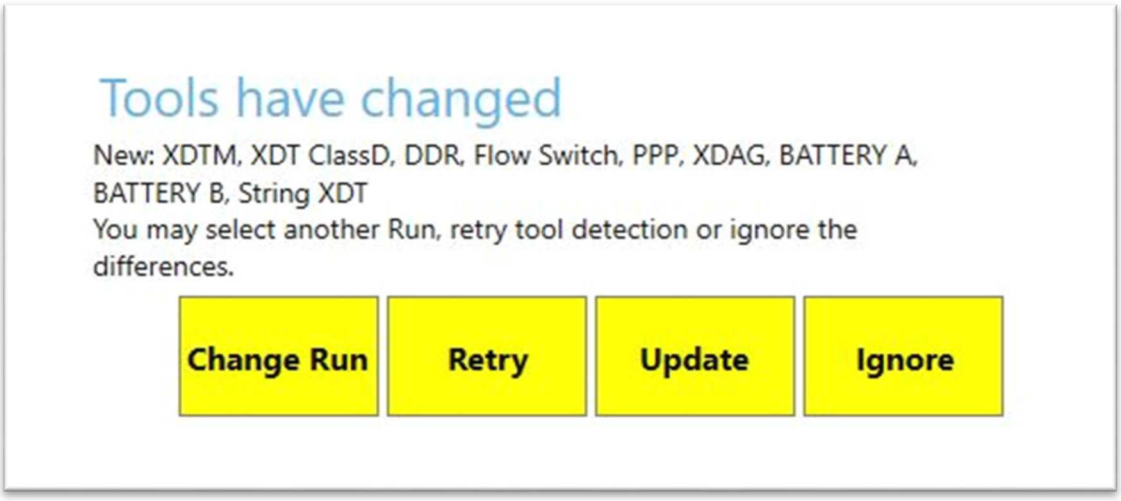


- White: probe not detected
- Blue: probe detected; diagnostics not yet run
- Green: probe diagnostics all passed
- Yellow: one or more of the probe diagnostics produced warnings
- Orange: one or more of the probe diagnostics produced failures
- Red: lost communication with node while running diagnostics

E. Run Menu – Show the run that is associated with the data shown on screen and if it is active. Clicking the button will bring up the Run Menu and allow the user to change runs.

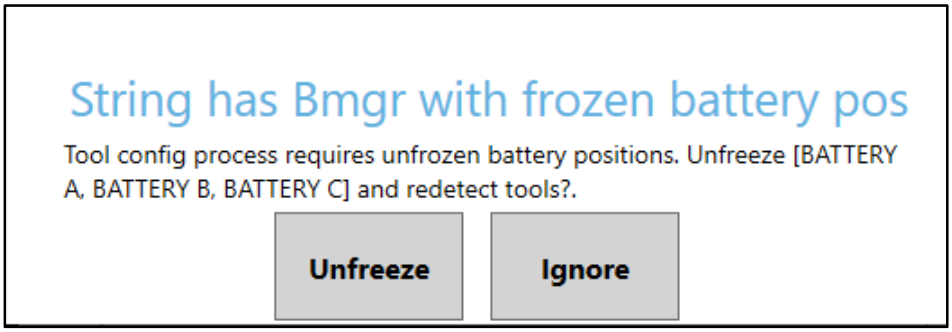
Tool Detection - Each run in XDirect has a set of associated tools. Any time XDirect detects a change in the tools for the active run it will prompt the user that tools have changed. There are four options to choose from currently.

- Change run – updates current selected run
- Retry – rereads tool string data
- Update – updates the selected run with the currently detected tool string data
- Ignore – ignores current tool string data and uses saved tool string data



XBolt Gap Probe Status – If a XBolt tool is detected, user will be prompted here to set the presence of the gap probe. This setting will only occur on the initial tool update. If this needs to be changed the Refresh Tools button on the top right can be used.

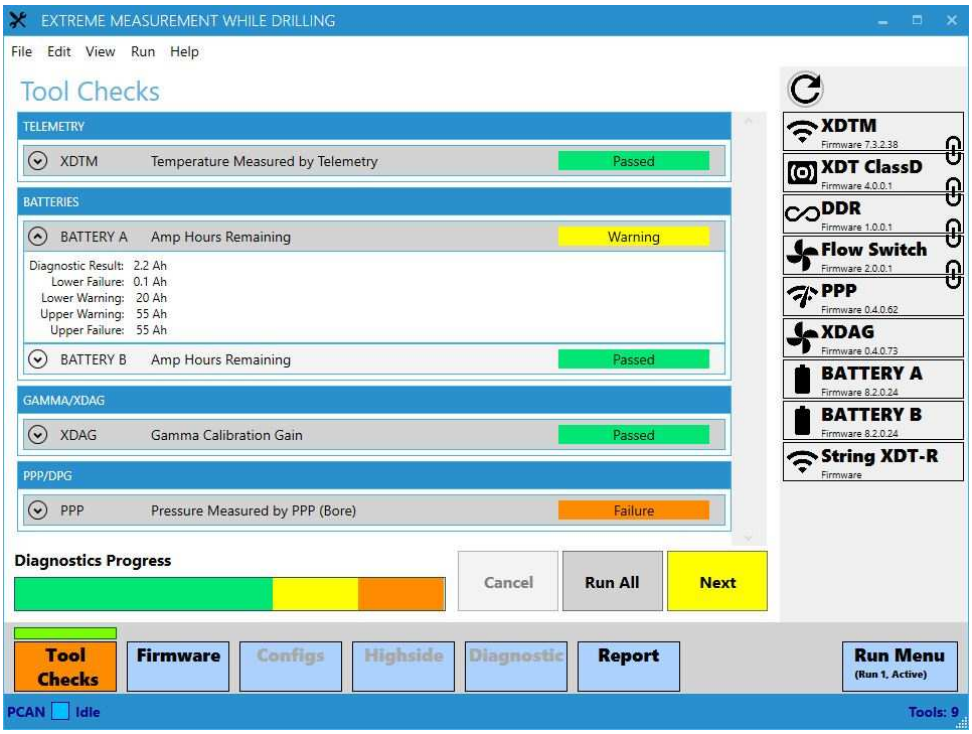
Battery Manager Position Freeze – New Battery Manager firmware has a new function that locks the position of the battery in the string to prevent certain downhole issues. If any of the batteries has this function, the user will be prompted. If this is the initial programming sequence, user should click Unfreeze so the batteries can auto detect their proper location in the string.



6.4 Tool Checks Page

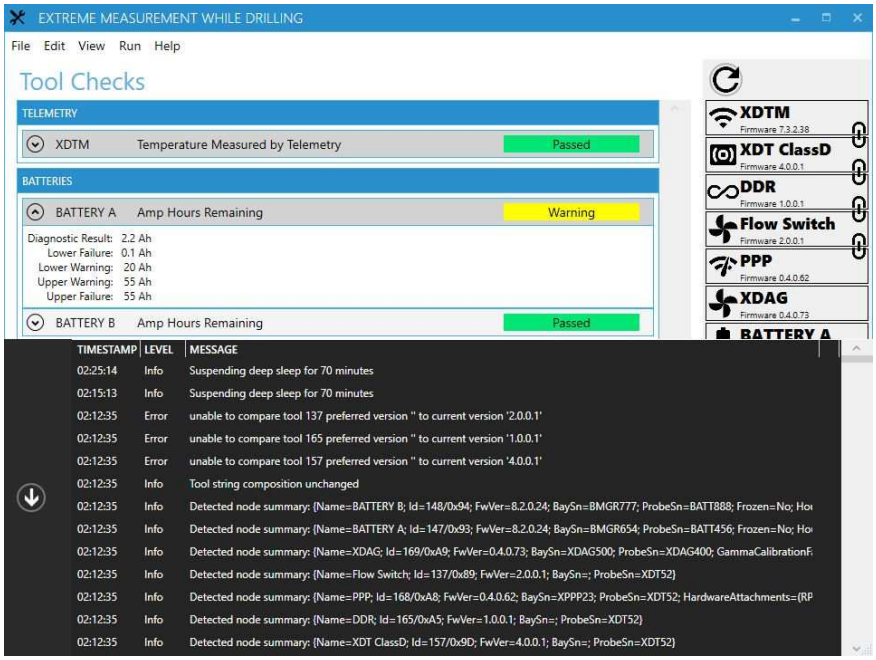
The tool checks page is displayed once the tool string is detected through the CAN connection. A small set of critical diagnostics are available to run before programming is started. The diagnostics are based on the string type and probes attached.

Tool checks can be run by pressing the Run All button. After they are run details can be seen by clicking the down arrow to expand the window.



6.5 View Log

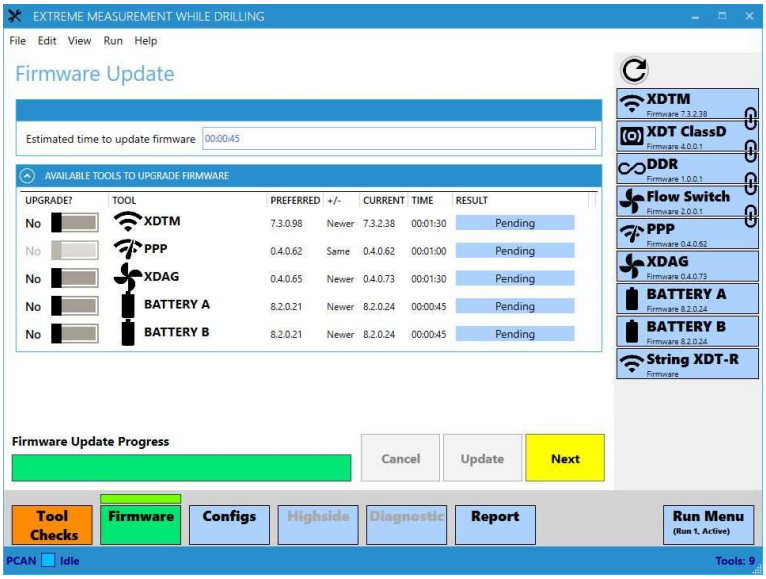
While setting up tools for a run, at any point user can access XDirect logs from ***View -- Show Logs*** menu to get information about the currently active process.

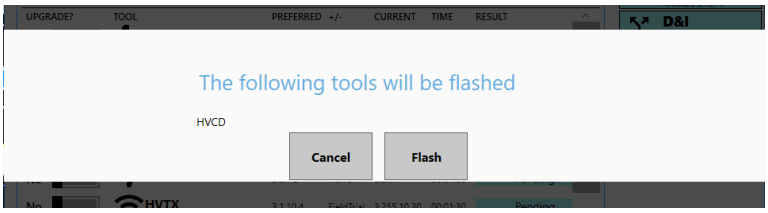

EXTREME MEASUREMENT WHILE DRILLING
File Edit View Run Help
Tool Checks
TELEMETRY
XDTM Temperature Measured by Telemetry Passed
BATTERIES
BATTERY A Amp Hours Remaining Warning
Diagnostic Result: 2.2 Ah
Lower Failure: 0.1 Ah
Lower Warning: 20 Ah
Upper Warning: 55 Ah
Upper Failure: 55 Ah
BATTERY B Amp Hours Remaining Passed
XDTM Firmware 7.3.2.38
XDT ClassD Firmware 4.0.0.1
DDR Firmware 1.0.0.1
Flow Switch Firmware 2.0.0.1
PPP Firmware 0.4.0.62
XDAG Firmware 0.4.0.73
BATTERY A
TIMESTAMP LEVEL MESSAGE
02:25:14 Info Suspending deep sleep for 70 minutes
02:15:13 Info Suspending deep sleep for 70 minutes
02:12:35 Error unable to compare tool 137 preferred version '' to current version '2.0.0.1'
02:12:35 Error unable to compare tool 165 preferred version '' to current version '1.0.0.1'
02:12:35 Error unable to compare tool 157 preferred version '' to current version '4.0.0.1'
02:12:35 Info Tool string composition unchanged
02:12:35 Info Detected node summary: {Name=BATTERY B; Id=148/0x94; FwVer=8.2.0.24; BaySn=BMGR777; ProbeSn=BATT888; Frozen=No; Ho
02:12:35 Info Detected node summary: {Name=BATTERY A; Id=147/0x93; FwVer=8.2.0.24; BaySn=BMGR654; ProbeSn=BATT456; Frozen=No; Ho
02:12:35 Info Detected node summary: {Name=XDAG; Id=169/0xA9; FwVer=0.4.0.73; BaySn=XDAG500; ProbeSn=XDAG400; GammaCalibrationF
02:12:35 Info Detected node summary: {Name=Flow Switch; Id=137/0x89; FwVer=2.0.0.1; BaySn=; ProbeSn=XDT52}
02:12:35 Info Detected node summary: {Name=PPP; Id=168/0xA8; FwVer=0.4.0.62; BaySn=XPPP23; ProbeSn=XDT52; HardwareAttachments={RP
02:12:35 Info Detected node summary: {Name=DDR; Id=165/0xA5; FwVer=1.0.0.1; BaySn=; ProbeSn=XDT52}
02:12:35 Info Detected node summary: {Name=XDT ClassD; Id=157/0x9D; FwVer=4.0.0.1; BaySn=; ProbeSn=XDT52}

6.6 Firmware Update Page

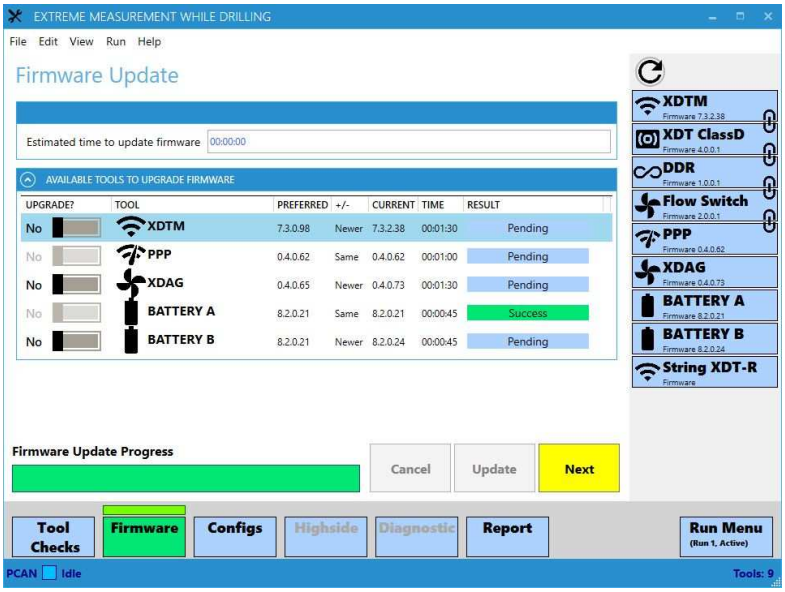
The Firmware page will update each probe's firmware to the latest released version. The slider next to each node can be used to turn off automatic firmware updates for any or all the connected probes. The estimated time to update each firmware set is listed in the table.

Make sure the desired sliders are set to Yes and click the Update button to begin the update process. A confirmation pop up will come up to confirm the firmware update. Click Flash to update or Cancel to exit.





Once all the selected probes have the latest firmware version loaded, the firmware button in the lower menu will turn green if the process is successful and the user can click Next to move to the Configs section.

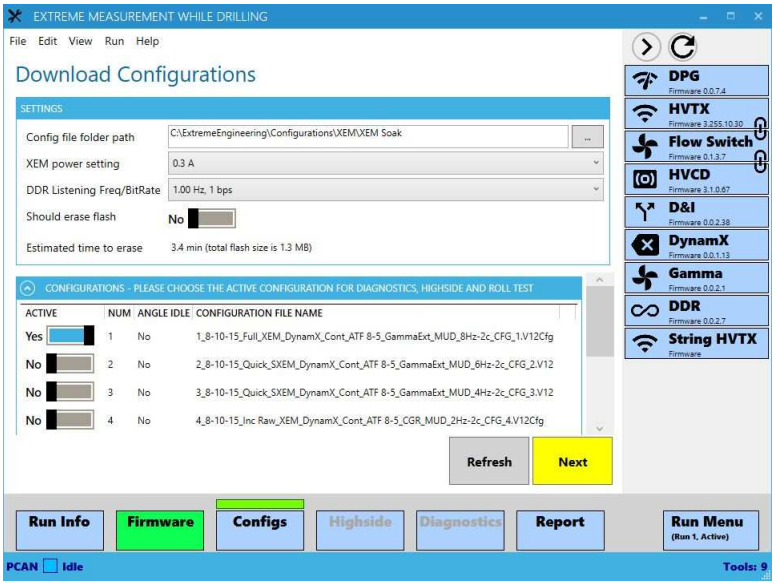


6.7 Download Configurations Page

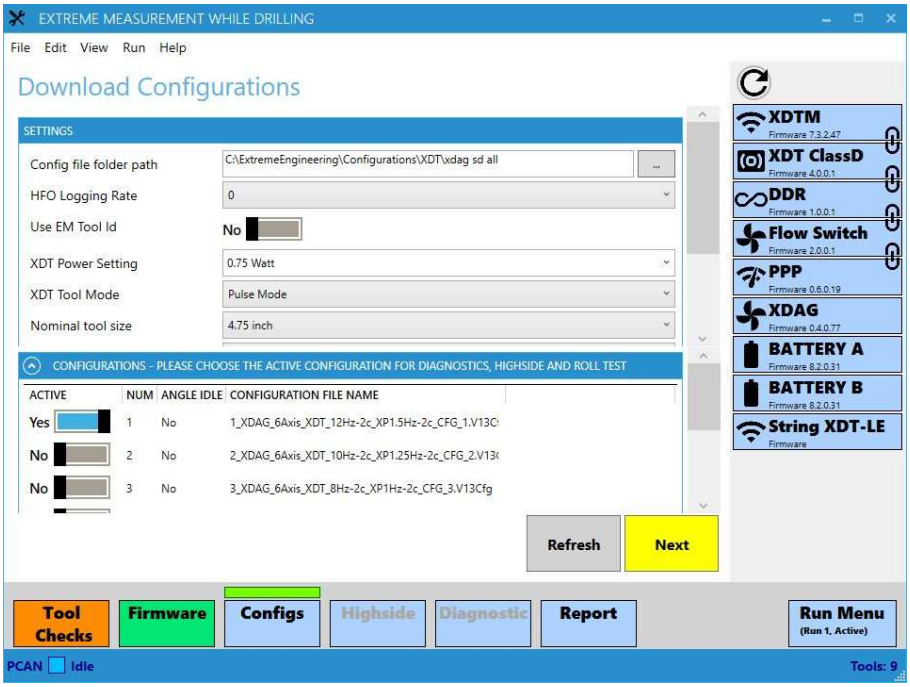
The Configurations page allows up to eight configuration files to be loaded on the tool and for the active configuration to be set by moving the Activeslider to Yes.

XDirect will automatically look for configurations in the default folder depending on the type of tool connected. It can also be loaded from subfolders using the … button.

For XEM tools, the power setting levels and DDR listening frequency/bitrate are set here.



For XDT tools, the XDT power setting, XDT Tool Mode, Tool Size, and DDR listening frequency/bitrate will be set here. If XDAG is being used, the HFO Settings, Crossover Angle and Tool Size will also be set. HFO Settings 0-17 are available. 0 is the default setting with the lowest recording rate and should be used unless otherwise advised. Details on all settings are available in Appendix A.

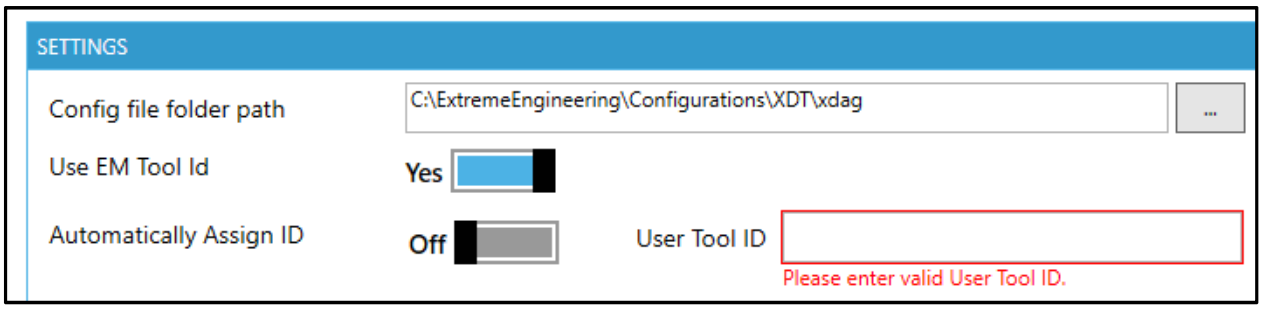


If XDTM firmware supports it, EM Tool ID settings will be set here as well. EM Tool ID allows the surface software and downhole hardware to filter downlink messages based on programming. This prevents downhole tools from receiving downlinks from different surface systems in the area.

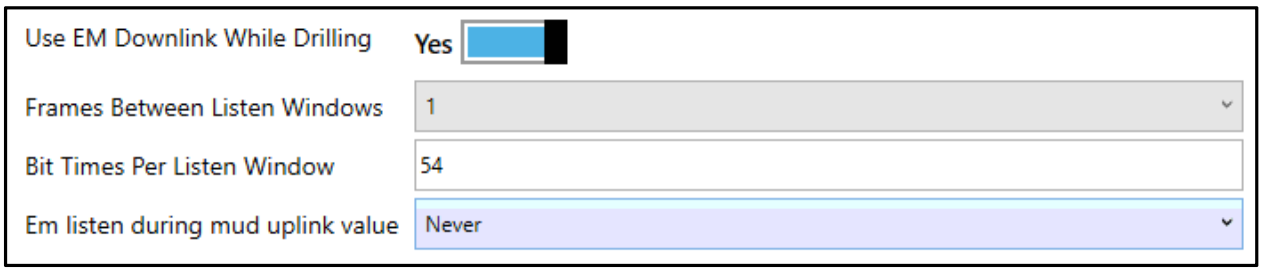
EM Tool ID can be set automatically based on the serial number of the XDT or the user can override this value. The valid range for EM Tool ID is 1-253.

User can choose not to apply this setting if they do not have compatible hardware or software. EM Tool ID value is shown in the PreRun Report and can be viewed and edited in Live Tool Com. Once applied it can only be turned off by redownloading configurations.

If HFO is supported by the XDAG firmware the user can choose the desired setting from the drop-down menu.



EM Downlink While Drilling settings can also be set here if firmware supports it.



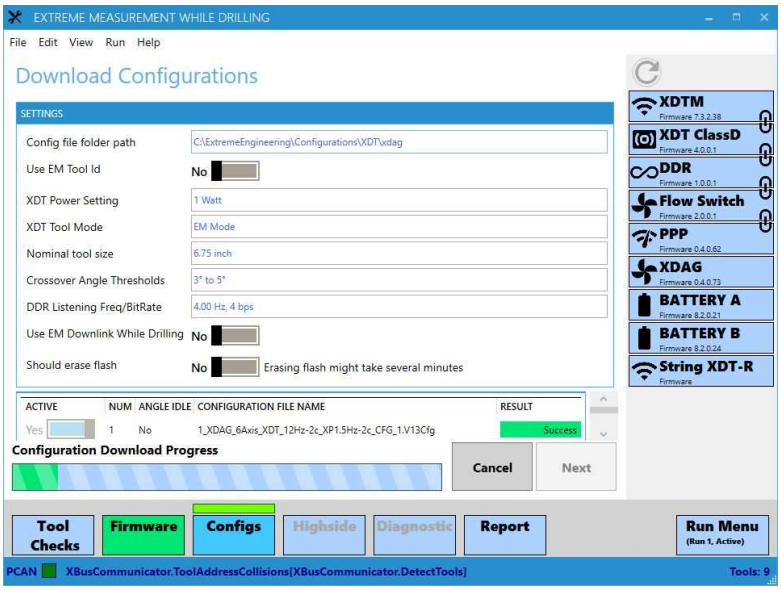
Set the "Should erase flash" slider to "Yes" to clear the flash of each node before downloading the configuration files. Note that the Estimated time to erase value is incorrect and will be much shorter than shown.

WARNING: Ensure you have saved all necessary flash data before proceeding with this step.

Once the required configurations are displayed, select which one you would like to be active and click Next to begin the download. After downloading the configuration files, XDirect will automatically perform additional steps to prepare the tool for use:

- Setting the tool's RTC to match the clock on the PC.
- Setting the active configuration as selected in the previous step.
- Setting the starting power level (XEM/XDT only).
- Setting the reversal flags for XDT string.
- Setting EM Tool ID if implemented.
- Setting Downlink While Drilling settings if implemented.

Once the download is complete a result message will be displayed for each Configuration file. If no problems were encountered during the configuration download process, XDirect will automatically continue to the Highside Wizard.



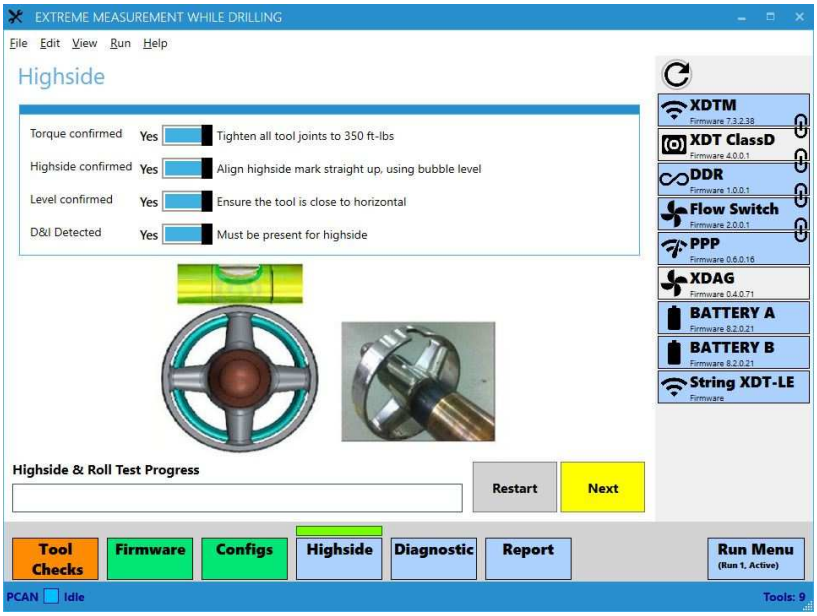
NOTE: If XDirect encountered problems while downloading configurations, the individual configuration file results will indicate where the problem occurred.

6.8 Highside Page

The Highside page programs the internal toolface offset of the directional probe. This section must be completed for any jobs requiring toolface signals to be transmitted. Follow the on-screen instructions and refer to the Operations Reference Manuals to complete this process.

6.8.1 Pre-Highside Checks

From the Highside window, move each slider to "Yes" to confirm that all the pre-highside checks have been performed. Then click Next.

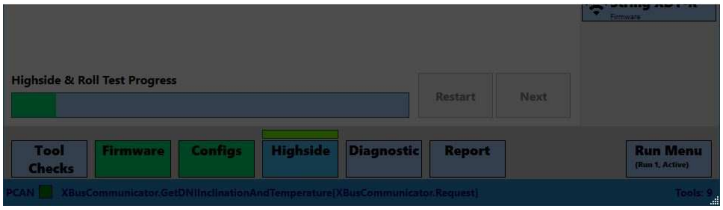


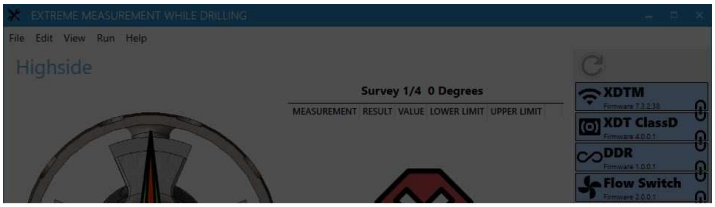
6.8.2 Measuring Internal Toolface Offset

During this step XDirect will request measurements from the directional probe to calculate and program the internal toolface offset. The fields in this section will automatically be populated as information is collected from the probe.

The inclination should be approximately 90 degrees as the tool string should be close to horizontal during the highside and roll check process.

XDirect will automatically move to the next section after the offset is measured.





6.8.3 Roll Test

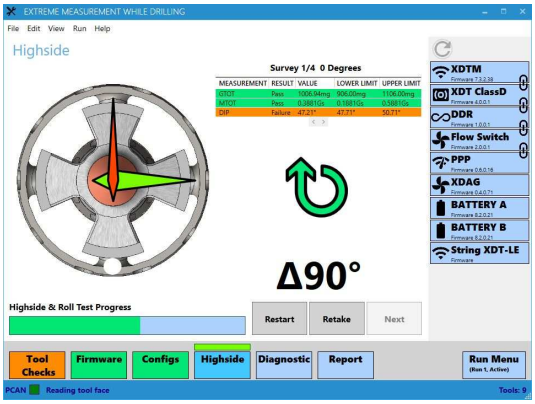
During the roll test process XDirect will prompt for the tool to be manually rotated to all four quadrants, approximately 90°, 180° and 270°. XDirect will provide live feedback indicating the target (**green line**) and the measured toolface (**red line**).

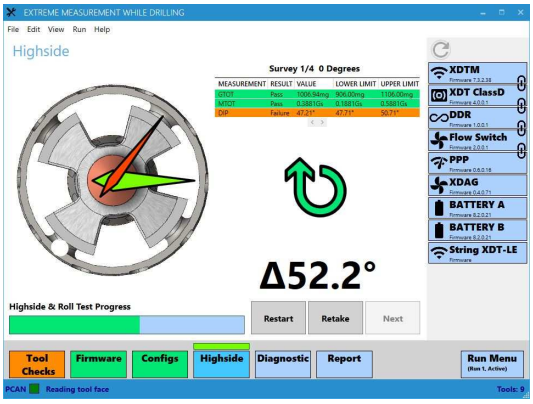
Manually roll the tool horizontally until the measured toolface is within 4° of the target. Once XDirect detects that the tool is within the target zone and is no longer moving, it will acquire a survey. The survey results will be shown with final acceptance criteria (FAC) and the display will

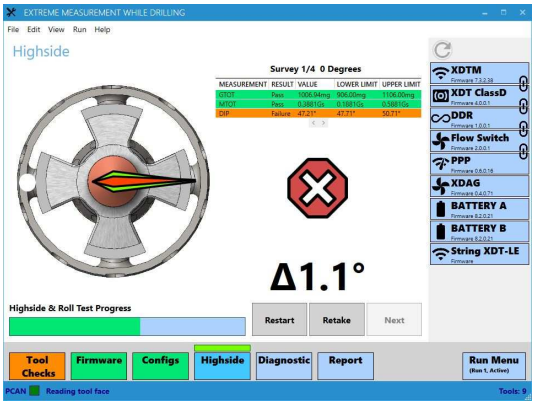
be updated to show the next target toolface. If a measurement is out of FAC the value in the table will show up orange. If it is within FAC it will be green.

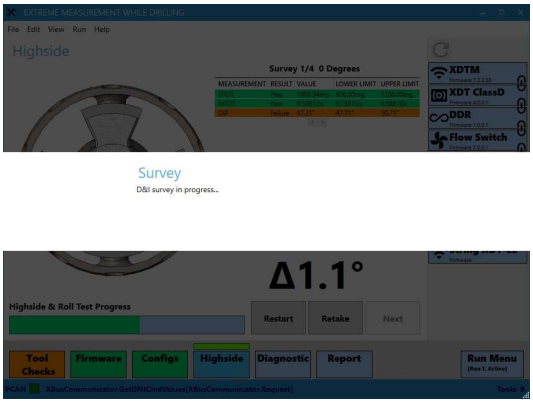
If user needs to retake survey use the Retake Button. If the survey is good roll to the next survey station.

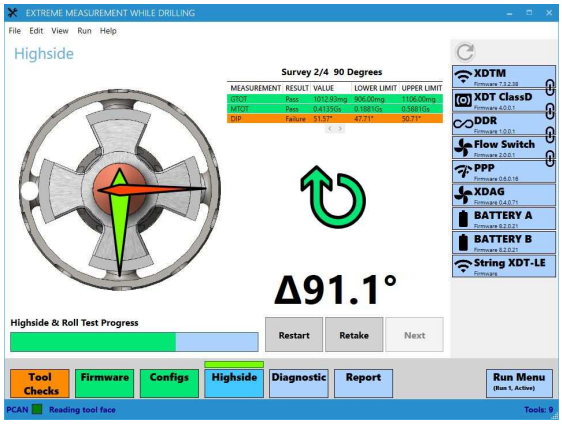
Repeat the manual rotation for 180° and 270°.

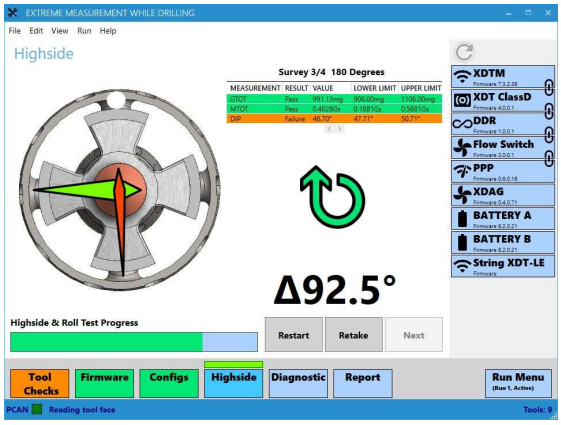


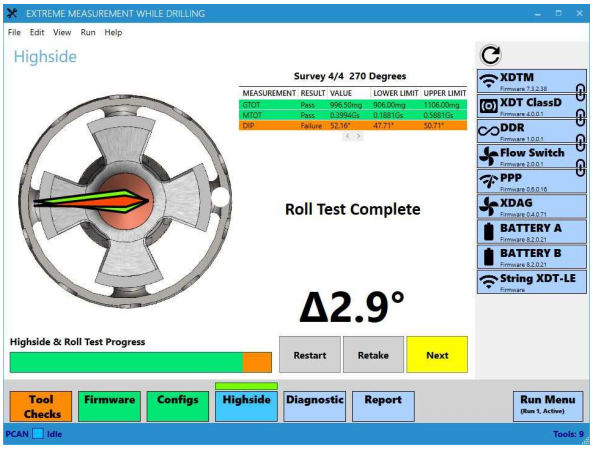










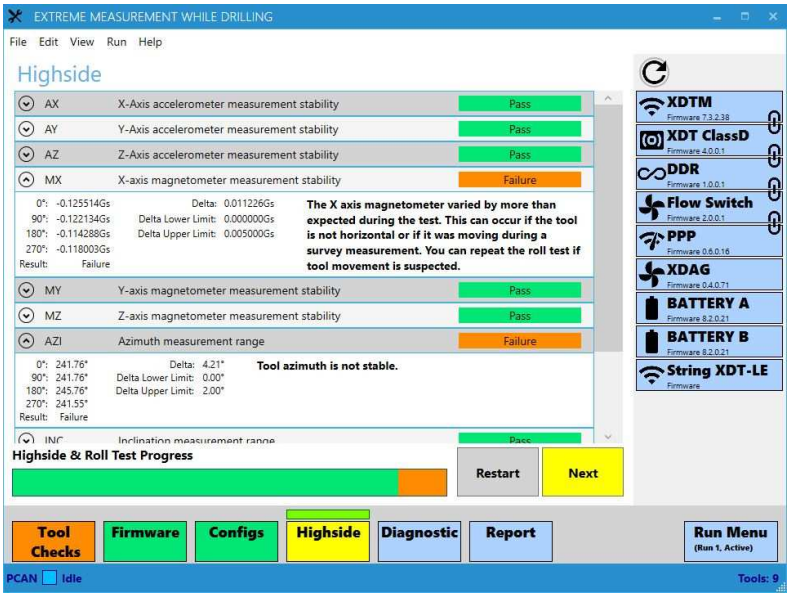


After taking the final survey at 270 degrees, click Next.

6.8.4 Roll Test Results

Once the roll check process is complete the test results are shown in a summary table. The measurements taken during the test are evaluated to ensure they are within the expected ranges.

Any values outside these ranges will be highlighted and should be checked before proceeding. Details for each measurement can be seen by clicking the down arrow on the left to expand the window. If it is necessary, repeat the highside and roll test process.



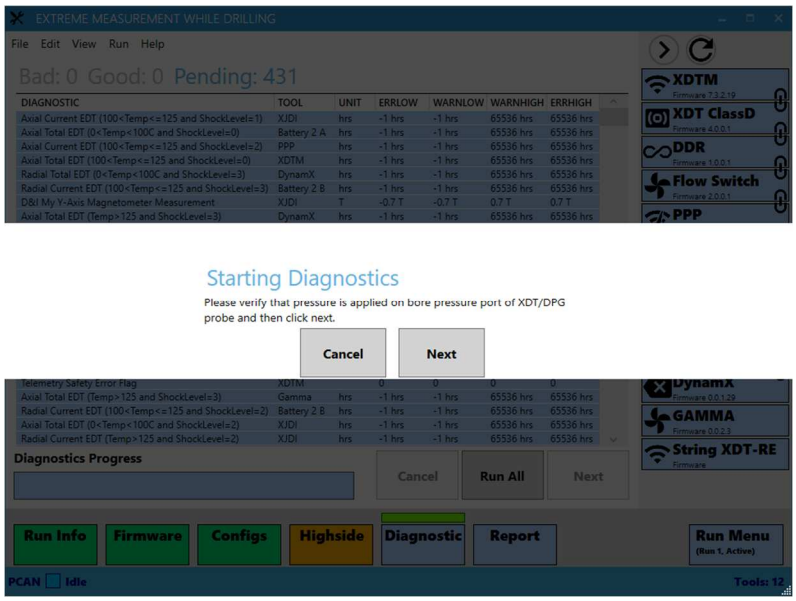
Click Next to continue to Diagnostics.

6.9 Diagnostics Page

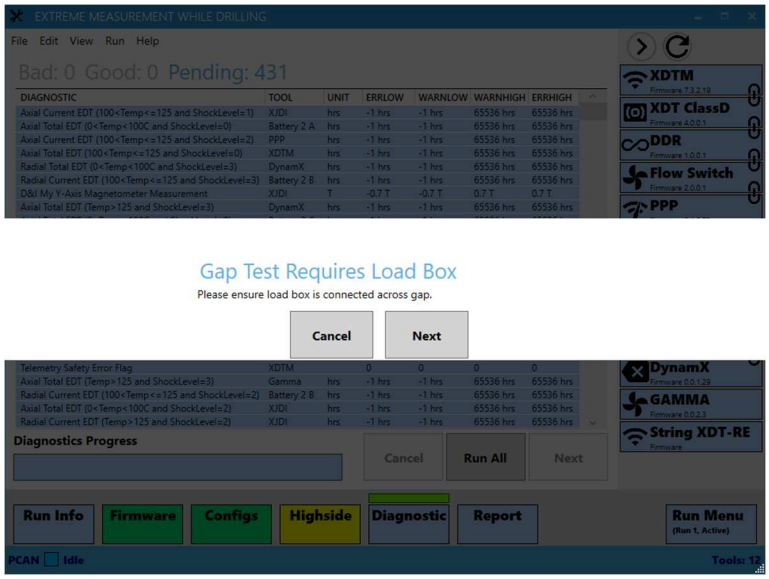
6.9.1 Basic Functions

Click the Run All button to run the automated tests of the connected probes to ensure that they are ready for downhole use. The tests performed, as well as the time required, will vary depending on the type and number of probes connected.

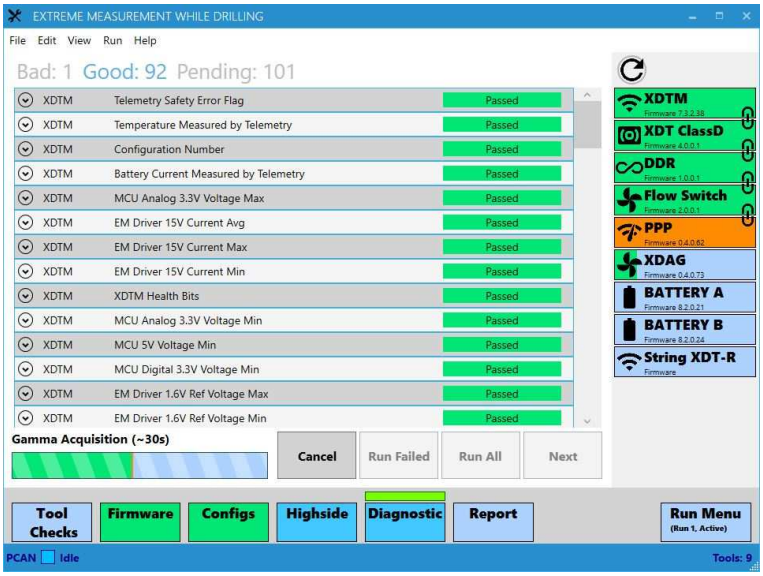
If using XDT or XEM, user will be prompted to apply pressure.



If using XEM or XDT with a gap, user will be prompted to hook up a load box across the gap.



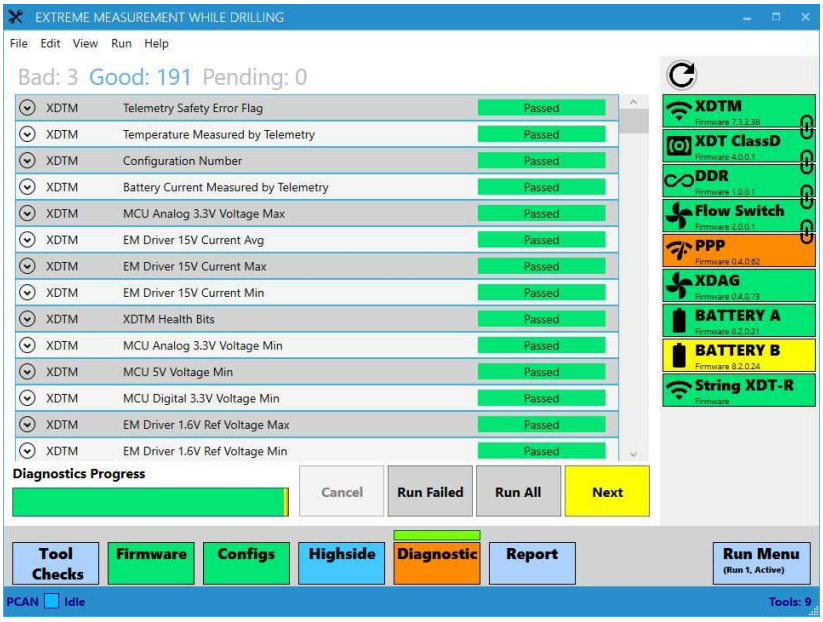
As the tests run, the probe buttons will indicate the progress and status of the test by changing color. Green indicates that all tests for the probe completed successfully, while yellow and orange indicate warnings and failures that should be reviewed before proceeding.



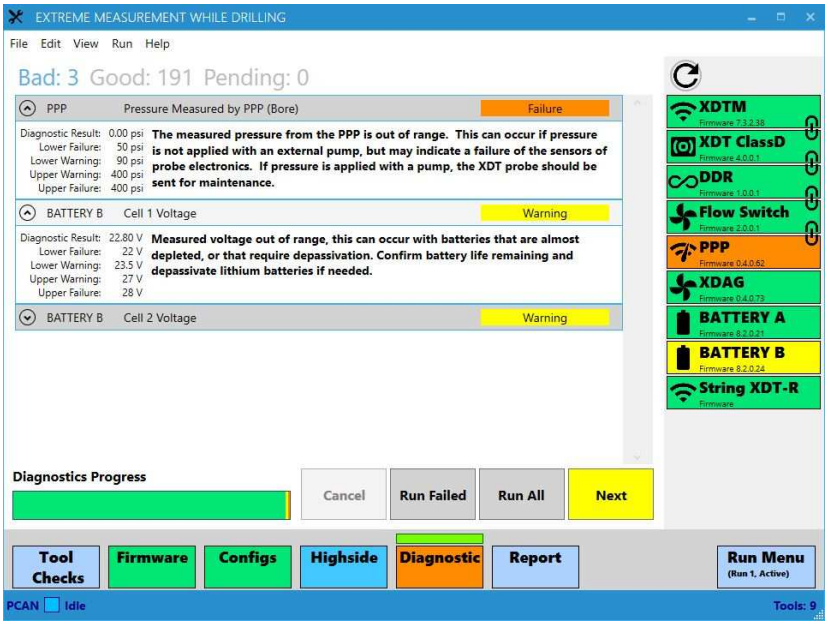
6.9.2 Warnings and Failures

Warnings and failures are grouped together and displayed under the “Bad” heading. The number next to the heading is the number of warnings and failures that have occurred. Review additional details for each of the warnings and failures by clicking the arrow on the left of the test result line. Click the Next button to move to the report.

If any diagnostics fail, user has the option to either run all diagnostics again, or they can just rerun the failed diagnostics.



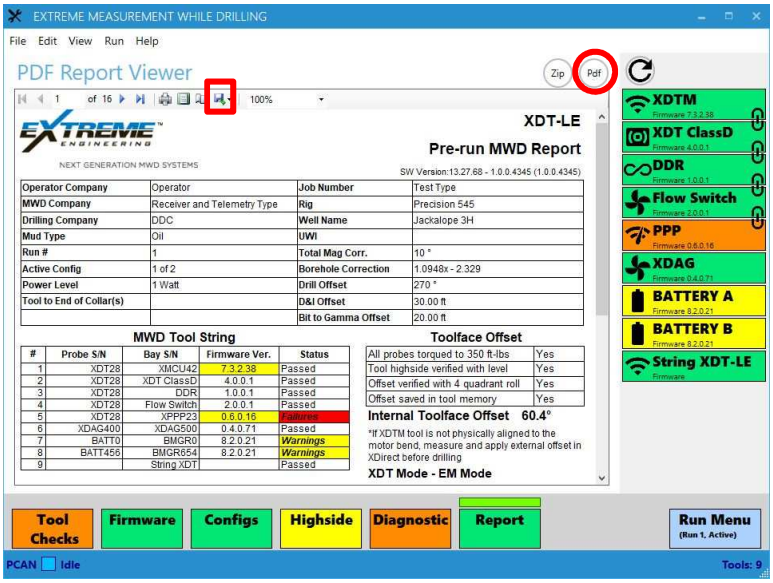
Warnings and failures can be seen by clicking on the Bad link on the top of the page. Details can be seen by clicking the down arrow next to each diagnostic.



6.10 Pre-Run Report

A report will be available from the "Report" page. The report includes information gathered from every step of the pre-run process. The user can scroll through the report using the arrow keys on the top of the page. The report can be saved using the Pdf button at the top-right corner or the Disk Icon. Save the report for required pre-run records.

The generated report includes a sign-off section on page one, with room for the MWD company, DD, and Company Representatives to sign (if they are required by the client). For best results when printing, select the PDF report and use a PDF application to print it. This report will be automatically saved in the **C:\ExtremEengineering\Xdirect\Reports\WellName** folder.



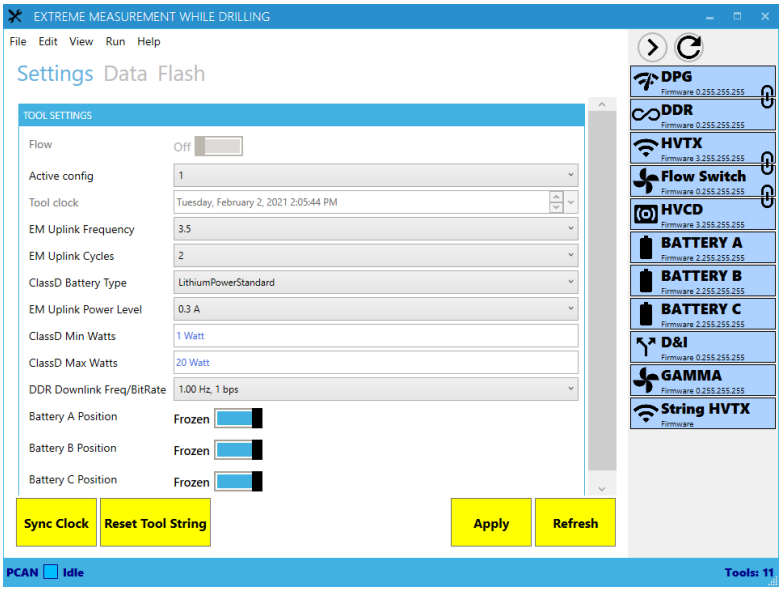
6.11 Live Tool Comm

Detailed tool information and settings are available in the Live Tool Comm section. While the tool is plugged in, XDirect allows the user to sync the clock, simulate flow and rotation, change configurations, and monitor selected values in real time for all tool types using the Settings Tab. If the battery firmware supports it and the setting is enabled, the Battery Freeze function can be enabled and disabled here.

Sync Clock, Reset Tool String and Flow and Rotation settings are applied automatically (as soon as the slider is moved or the button is clicked.) All other settings require the user to click Apply

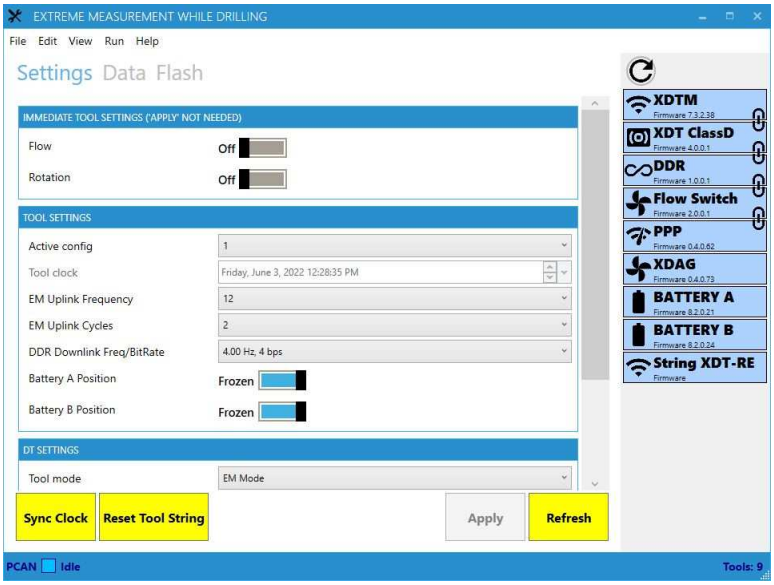
6.11.1 HVTX Settings

The user can set Frequency and Cycle of Uplink along with the Power Level and DDR downlink frequency and bitrate. If the firmware supports it, Class D Battery Type can be set, and the minimum and maximum power output will be shown based on the Battery Type.

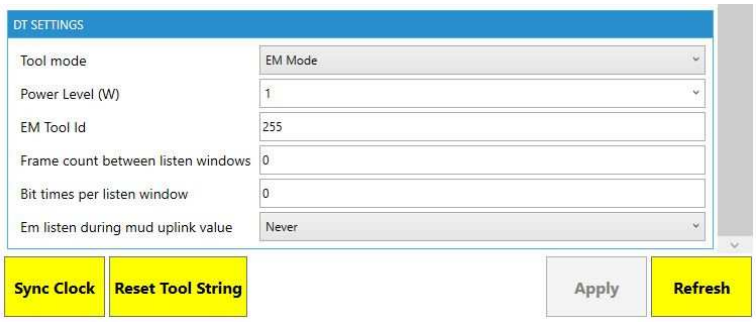


6.11.2 XDT Settings

User can set frequency and cycle of EM Uplink, EM Power Level, DDR downlink frequency and bitrate and Tool Mode (EM, Pulse, Hybrid and Trip Out.)



If supported by firmware, EM Tool ID Tool values and Downlink While Drilling settings can be accessed here by scrolling down.

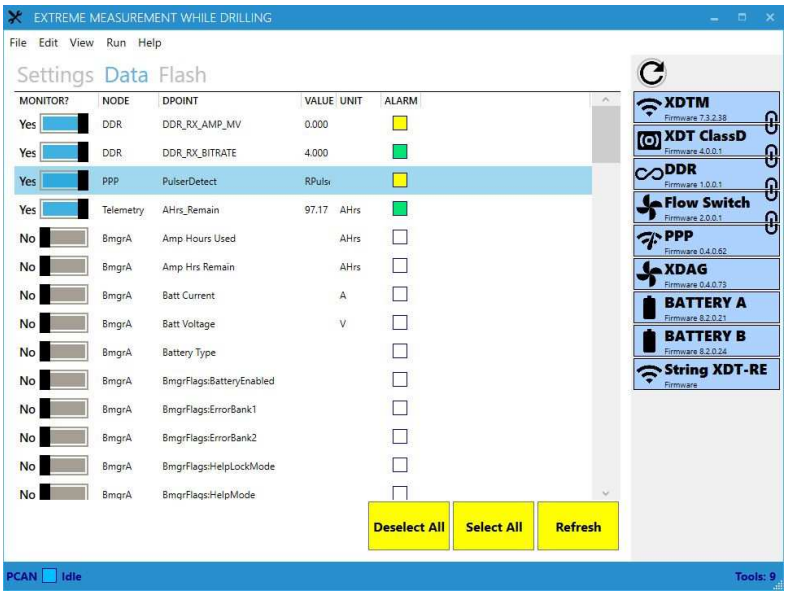


6.11.3 Data Tab

The Data Tab allows the user to monitor selected datapoints in real time by moving the corresponding slider to Yes and clicking Refresh.

User can choose from the default list containing datapoints from all nodes or if a node is clicked only the dpoints from that node will appear. Clicking the node again will show the complete tool string.

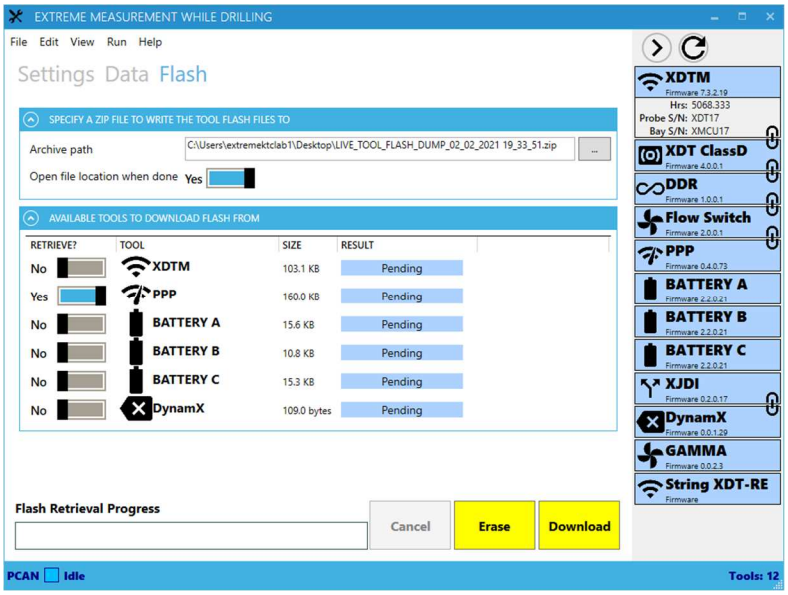
If a datapoint is selected and refreshed on a single node page it will also appear at the top of full list of datapoints.



6.11.4 Flash Tab

The flash tab allows the flash from a single node to be erased or downloaded. Note that if this function is used, the data will not be saved in the database.

Only one node can be active at a time.



7 XEM, XM4 and XPulse Surface Receiver Software Common Features

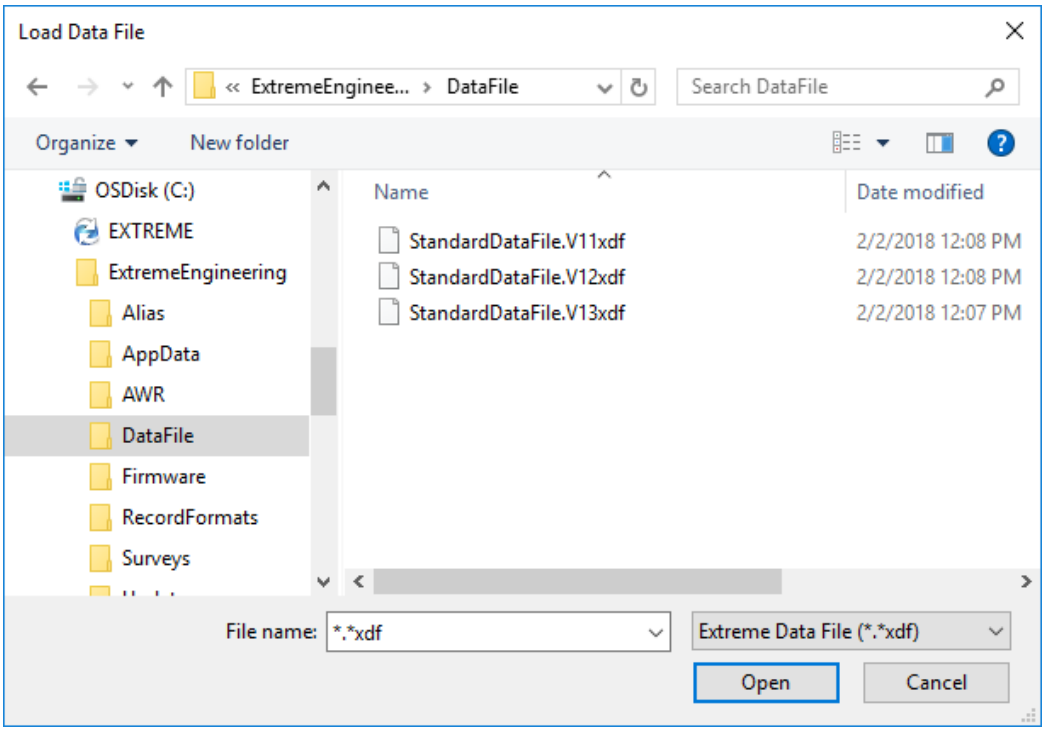
Once the tool string has passed the pre-run section it can be sent downhole.

Run the Receiver application based on the system type you are using (XM4 or XPulse).

This section will detail the common properties between both types of receiver software.

7.1 Loading Data File

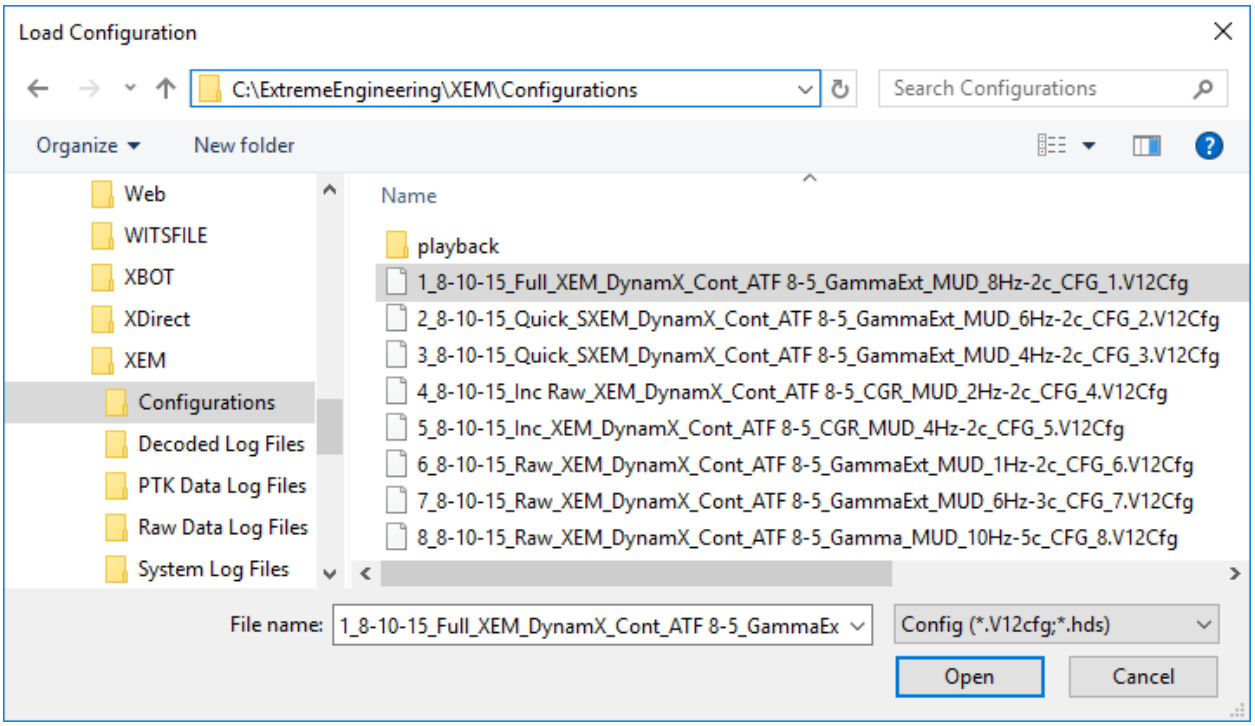
The surface Receiver, regardless of which version being utilized, will look for a Data file in the C:\ExtremeEngineering\DatFile\ folder. V11, V12, or V13 Data files can be loaded, and must match with the configuration files included in the next section.



7.2 Loading Configuration Files

When you double-click the XM4, XEM RX or XPulse Surface Rx icon, the corresponding application will look for a configuration file matching the version of the datafile selected. The receivers can open configurations and datafiles from V11 to XDirect (V12 and V13) for the supported modes.

The last character preceding the file extension represents the corresponding configuration number (example: default-12Hz-3c-1.V12cfg corresponds to the configuration number 1).

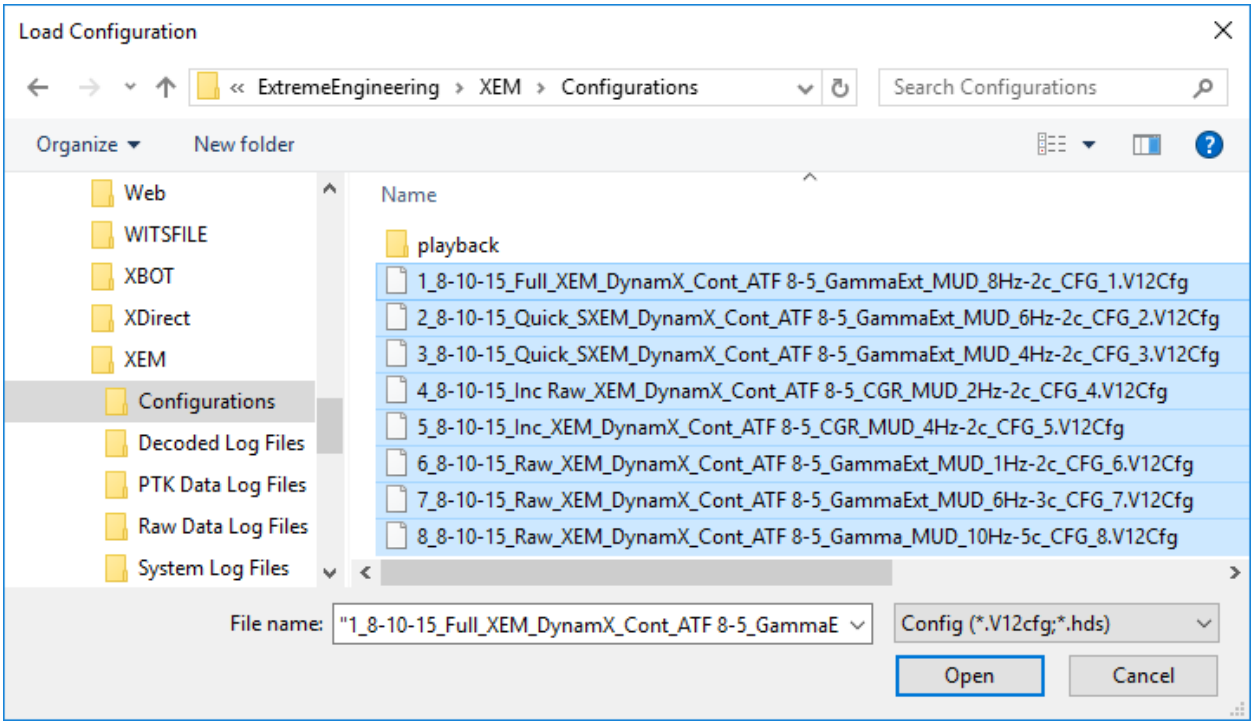


7.2.1 Multiple Configuration Files

Up to eight configuration files can be loaded at once using multiple selections in the "Load Configuration" open dialogue box. Each configuration file must have a unique configuration number from 1 to 8.

When more than one configuration files are loaded:

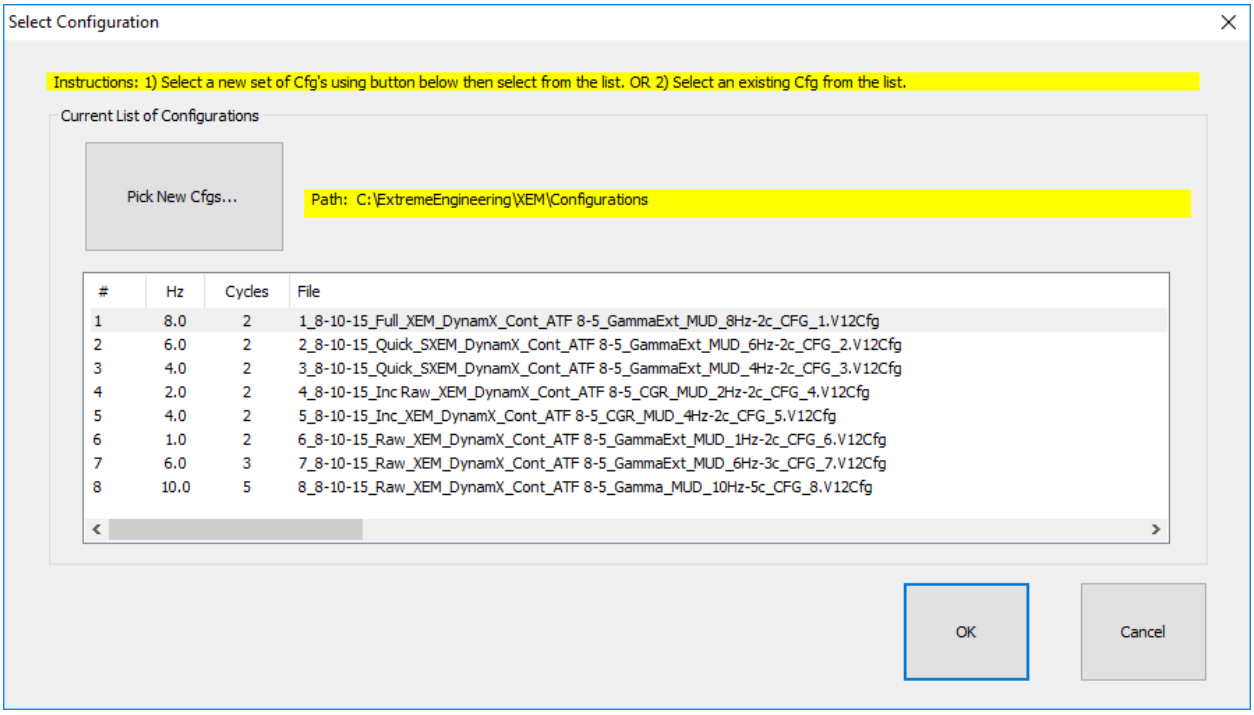
- The configuration file having the lowest configuration number will be used first.
- The other configuration files are automatically loaded when a configuration change is detected after a downlink (see the "Automatic Load of Configuration Files" section).



7.2.2 Changing Configurations Manually

From the Troubleshooting window (opened through the Troubleshooting button from the "Data" tab) click the Cfg file button. If multiple configurations are loaded a window will appear displaying a summary of the configuration properties.

From this list, select the configuration you want to activate and click OK. If the desired configuration is not in the list, click Pick New Cfgs… to load up to eight new files.


Select Configuration
Instructions: 1) Select a new set of Cfg's using button below then select from the list. OR 2) Select an existing Cfg from the list.
Current List of Configurations
Pick New Cfgs...
Path: C:\ExtremeEngineering\XEM\Configurations
Hz Cycles File
1 8.0 2 1_8-10-15_Full_XEM_DynamX_Cont_ATF 8-5_GammaExt_MUD_8Hz-2c_CFG_1.V12Cfg
2 6.0 2 2_8-10-15_Quick_SXEM_DynamX_Cont_ATF 8-5_GammaExt_MUD_6Hz-2c_CFG_2.V12Cfg
3 4.0 2 3_8-10-15_Quick_SXEM_DynamX_Cont_ATF 8-5_GammaExt_MUD_4Hz-2c_CFG_3.V12Cfg
4 2.0 2 4_8-10-15_Inc Raw_XEM_DynamX_Cont_ATF 8-5_CGR_MUD_2Hz-2c_CFG_4.V12Cfg
5 4.0 2 5_8-10-15_Inc_XEM_DynamX_Cont_ATF 8-5_CGR_MUD_4Hz-2c_CFG_5.V12Cfg
6 1.0 2 6_8-10-15_Raw_XEM_DynamX_Cont_ATF 8-5_GammaExt_MUD_1Hz-2c_CFG_6.V12Cfg
7 6.0 3 7_8-10-15_Raw_XEM_DynamX_Cont_ATF 8-5_GammaExt_MUD_6Hz-3c_CFG_7.V12Cfg
8 10.0 5 8_8-10-15_Raw_XEM_DynamX_Cont_ATF 8-5_Gamma_MUD_10Hz-5c_CFG_8.V12Cfg
OK
Cancel

7.3 Data Tab Features

The following features are under the "Data" tab of the Surface Receiver software.

7.3.1 Live Signal Trace

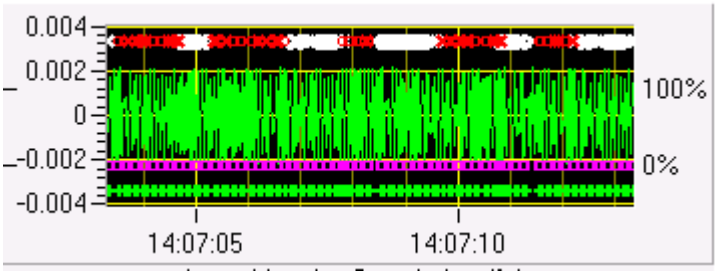
The live signal trace area for EM and XPulse in the bottom-right corner of the Receiver window displays filtered signals for XM4/XEM and filtered and raw signals for XPulse. There are some other overriding plots as well:

1) Magenta Solid – Currently Decoding Filtered Signal: Shows the signal from currently Decoding Channel for XM4.
2) Cyan Solid – Currently Decoding Filtered Signal: Shows the signal from currently Decoding Channel for XPulse and XEM.

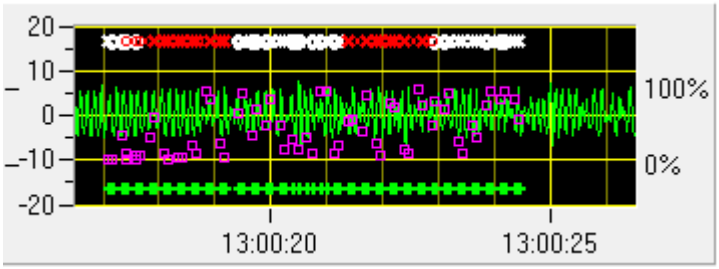
   The following data is only available for QPSK Configurations

3) Green Solid – Currently converted sine wave from decoded signal for XPulse
4) Empty Pink Square – Symbol Confidence: Is only plotted when the signal is being decoded. It shows the percentage measure of reliability of decoded data.
5) White ‘x’ – Even Signal’s bit 1: Is only plotted when the signal is being decoded. It shows that the current decoded bit for the symbol is 1.
6) White ‘o’ – Even Signal’s bit 0: Is only plotted when the signal is being decoded. It shows that the current decoded bit for the symbol is 0.
7) Red ‘x’ – Odd Signal’s bit 1: Is only plotted when the signal is being decoded. It shows that the current decoded bit for the symbol is 1.
8) Red ‘o’ – Odd Signal’s bit 0: Is only plotted when the signal is being decoded. It shows that the current decoded bit for the symbol is 0.
9) Bold Green ‘+’ – Good Signal: Is only plotted when the signal is being decoded. It shows that the current decoded signal is decoded correctly.
10) Bold Red ‘+’ – Bad Signal: Is only plotted when the signal is being decoded. It shows that the current signal was decoded but error was detected, and error correction cannot be applied.
11) Bold Cyan ‘+’ – Corrected Signal: Is only plotted when the signal is being decoded. It shows that the current signal was decoded but had errors and error correction was used to correct the error.

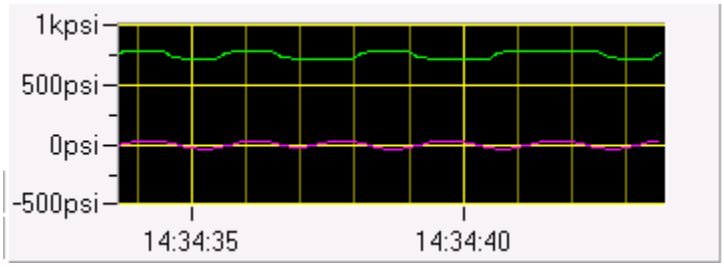
XM4



XEM/XTR

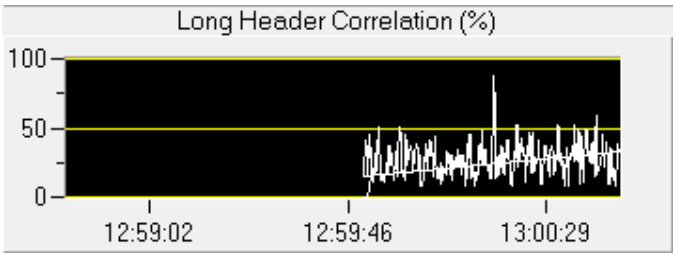


XPulse/XDSL



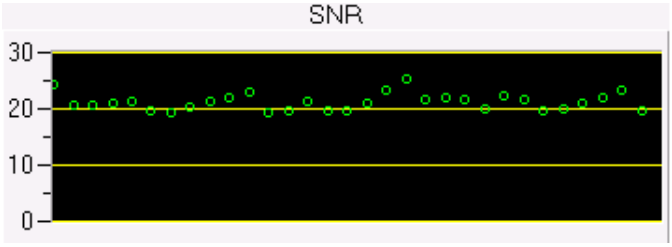
7.3.2 Long Header Correlation

Indicates the long header decoding confidence. There should be a spike that goes near 100% for good detection.



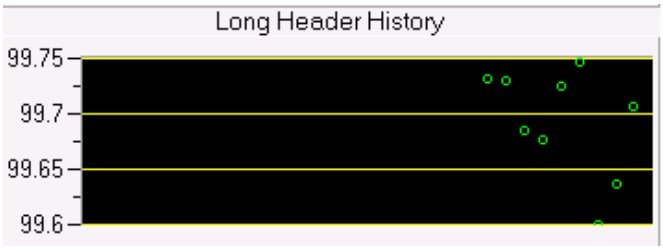
7.3.3 SNR

Shows the recent history of signal to noise ratio.



7.3.4 Long Header History

Shows the recent history of long header correlation percentages.



7.3.5 Decode Success

Shows the recent history of good and bad decodes.

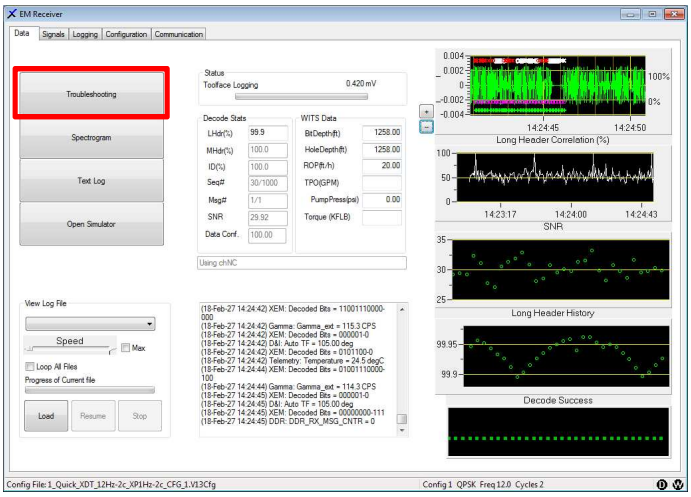
Green box : Good decode

Red Cross : Bad decode

Blue X : Corrected decode

7.3.6 Troubleshooting

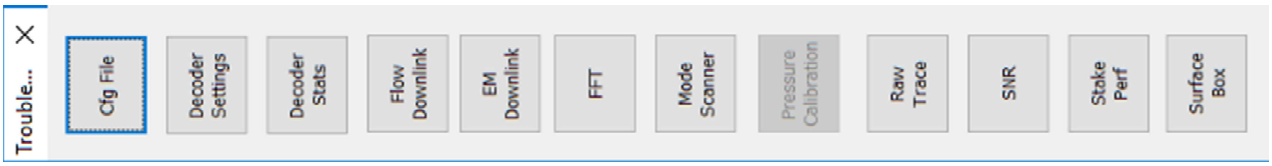
Several troubleshooting functions are in a centralized menu accessible from the Troubleshooting button on the “Data” tab.



The Troubleshooting window always appears on the left-side of the screen after closing and pressing the button again. The items are listed in alphabetical order. In general, all the buttons will be enabled. However, the Surface Boxbutton will not be accessible if the no Receiver was detected at startup.

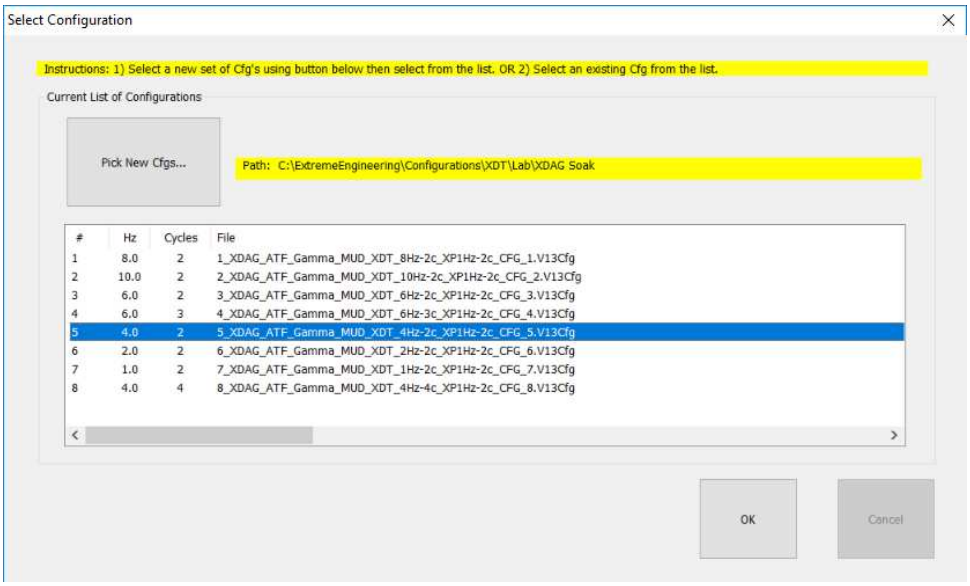
Some options are limited to specific receivers.

- Decoder Settings can have different settings depending on receiver. The specific receiver options will be covered in the that receiver section.
- Mode Scanner is not currently supported.
- Pressure Calibration is only available for XPulse RX
- Stake Perf is only available for XM4 RX
- Surface Box can have different settings depending on receiver. The specific receiver options will be covered in that receiver section.


Trouble...
Cfg File
Decoder Settings
Decoder Stats
Flow Downlink
EM Downlink
FFT
Mode Scanner
Pressure Calibration
Raw Trace
SNR
Stake Perf
Surface Box

7.3.6.1 Cfg File

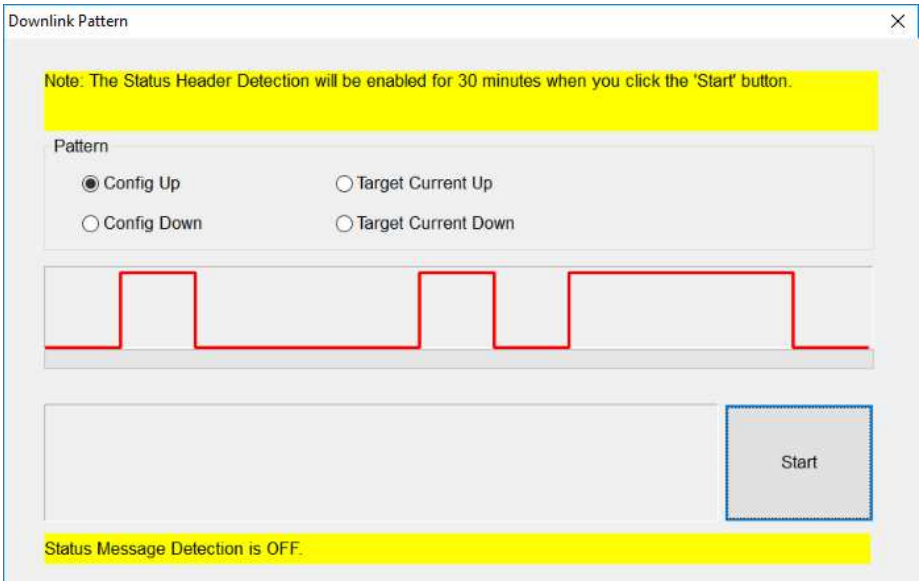
The active configuration file being used by the receiver can be changed using the Cfg File button by selecting the row with desired configuration and clicking OK.



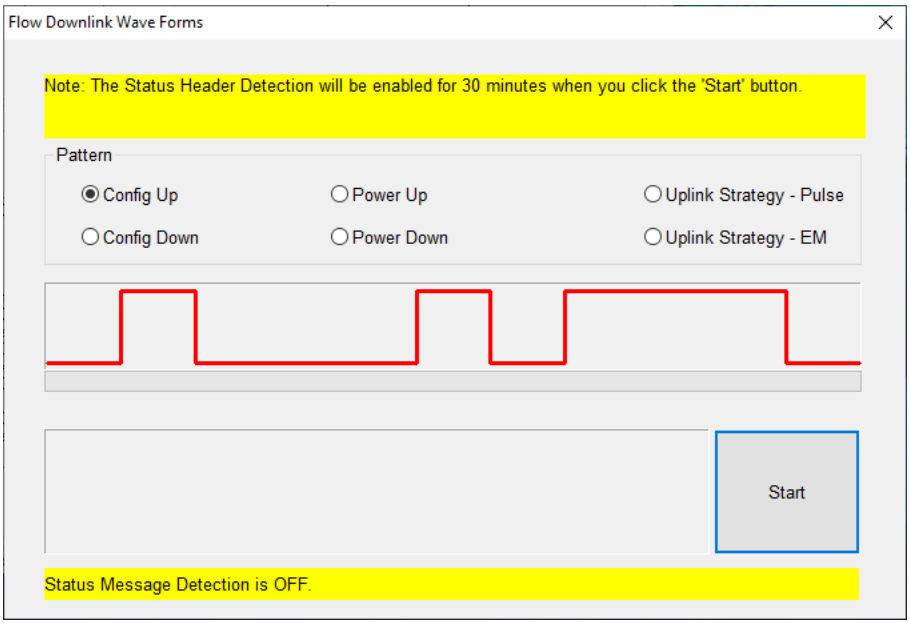
New configurations can be choosing by using the Pick New Cfgs.. button. If new configurations are loaded, the Datafile must match the previous configuration package.

7.3.6.2 Flow Downlink Timer

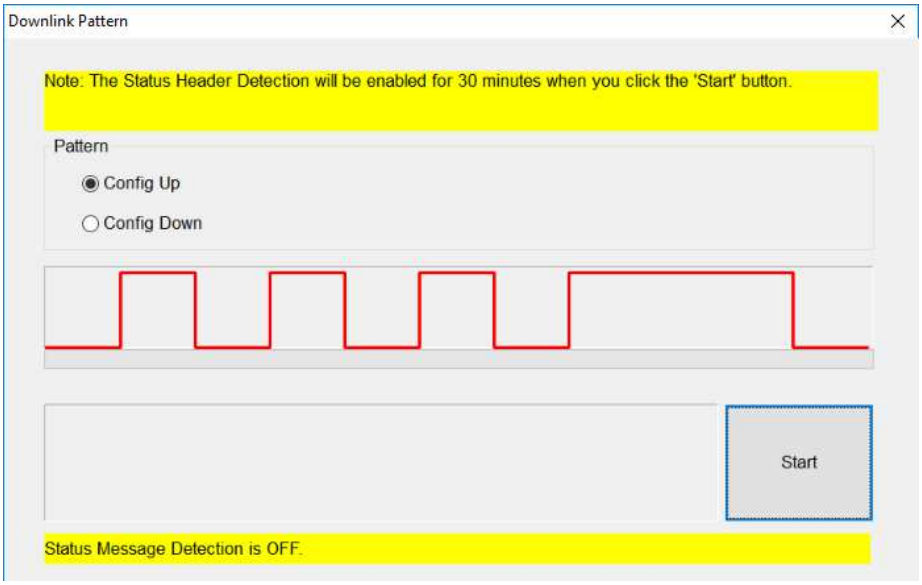
The downlink timer can be accessed from the Troubleshooting window (Flow Downlinkbutton). Select the desired downlink from the options listed along the top of the window and click Start when ready.



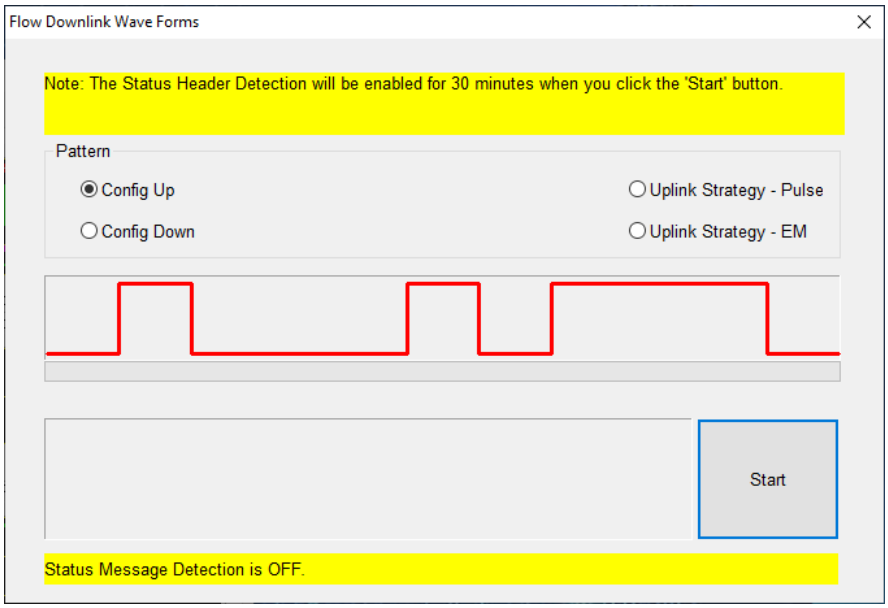
Downlink Pattern Window (XEM/XM4) - Four Options using HVTX



Downlink Pattern Window (XEM/XM4 with XDT) - Six Options using XBolt



Downlink Pattern Window (XPulse) - Two Options



Downlink Pattern Window (XPulse) - Four Options using XBolt

7.3.6.2.1 Status Message Detection

The Status header detection is automatically enabled when the downlink timer is used. When this feature is enabled it is indicated on the Downlink Pattern window.

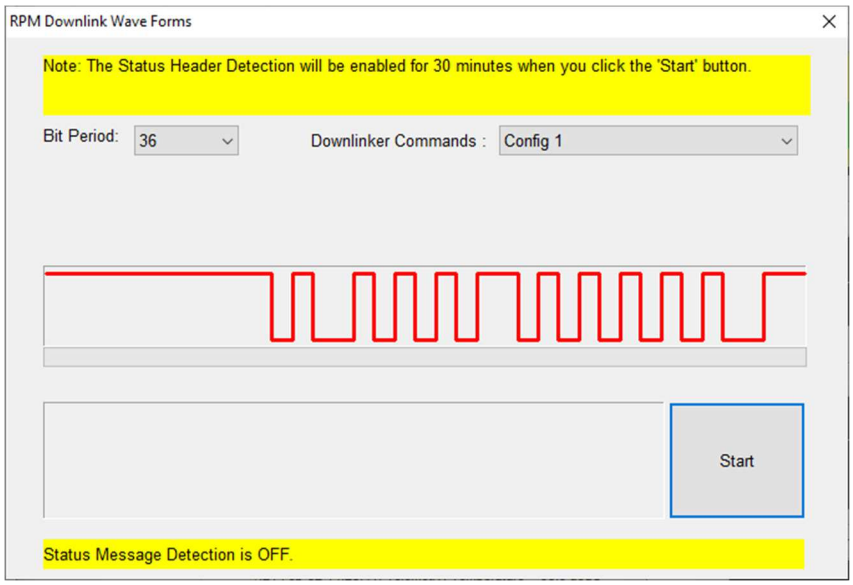
7.3.6.2.2 Automatic Load of Configuration Files

When the Status Message Detection is 'ON', the XDirect Receiver can detect any configuration change notifications transmitted by the tools. If a configuration change is detected, the XDirect Receiver searches the configuration files loaded during the application startup (see "Loading Configuration Files").

If the corresponding configuration file is found it is automatically loaded. Otherwise, a popup window appears and the configuration file needs to be loaded manually using the Cfg Filebutton (see "Changing Configurations Manually").

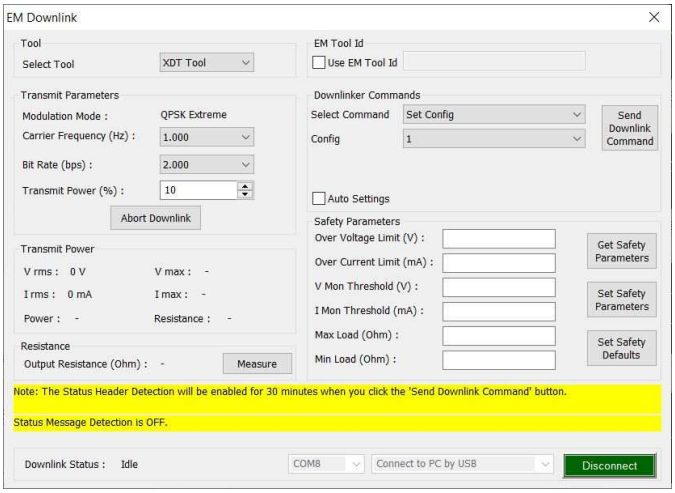
7.3.6.3 RPM Downlink

The downlink timer can be accessed from the Troubleshooting window (RPM Downlink button). Select the desired downlink from the options listed along the top of the window and click Start when ready. Note this is currently only supported for XBolt.



7.3.6.4 EM Downlink

Em Downlink functionality is integrated into the RX programs and is accessed from the Troubleshooting menu on the Data Tab in the receiver. Click the EM Downlink button to open the downlinker.



7.3.6.4.1 Communication

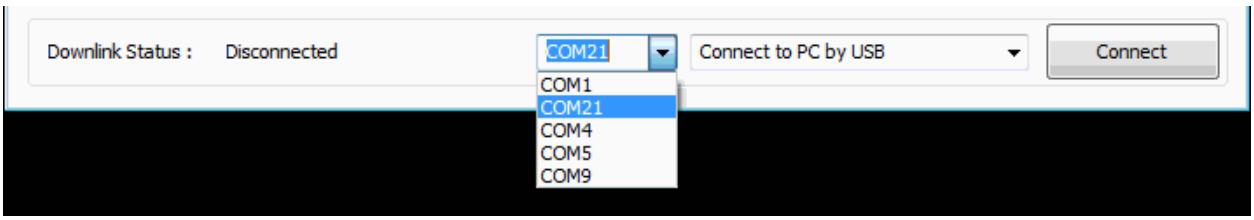
The EM Downlinker can be connected to the decoding computer directly through USB or if using a Laversab decoding computer by using a daisy chain RS485 communication through an XM4. If using a UDX the downlinker is integrated into the receiver box. Once the UDX uplink receiver is functioning the downlinker will be available.

The program requires the user to select the correct connection type and if using USB, the correct COM Port for communication.

7.3.6.4.2 XM4 USB

The USB COM Port can be found by going to Device Manager and finding the COM port assigned to the Extreme Downlinker. The device name should be either Extreme XEM Downlinker or USB Serial Device. If neither of these is shown, make sure the downlinker is powered up, unplug the USB, and plug the USB back in.

Once the COM port is known, select Connect to PC by USB in the drop-down menu at the bottom and select the proper COM port in the corresponding drop-down menu. If the COM Port is not listed, restart XM4/XEM RX and try again.

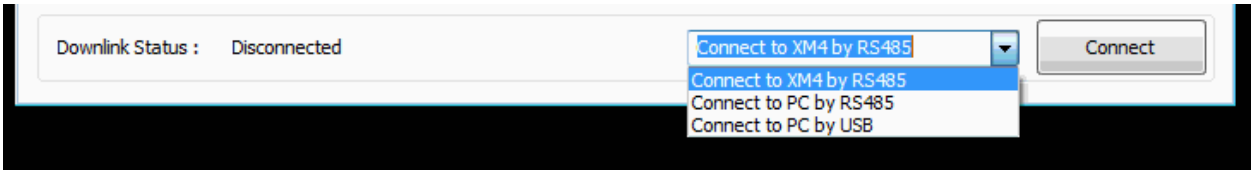


Press the CONNECT button on the bottom right corner to establish communication between the surface computer with the downlinker box. Once connection is established the button should change to DISCONNECT, the Downlink Status will change to Idle, and all the action buttons will become available.

7.3.6.4.3 XM4 RS485

RS485 can be used only when using a Laversab computer and XM4 updated to firmware version 2.2.

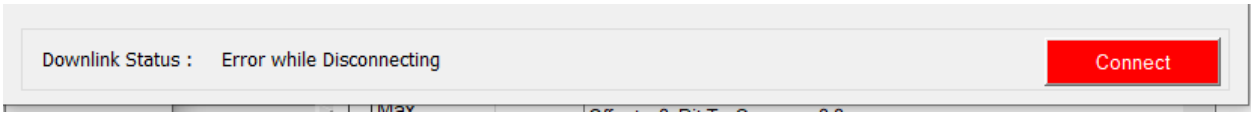
Verify that XM4 RX is connected to the Laversab via RS485 and is communicating with the XM4 properly. Select Connect to XM4 by RS485 in the drop-down menu at the bottom and press Connect.



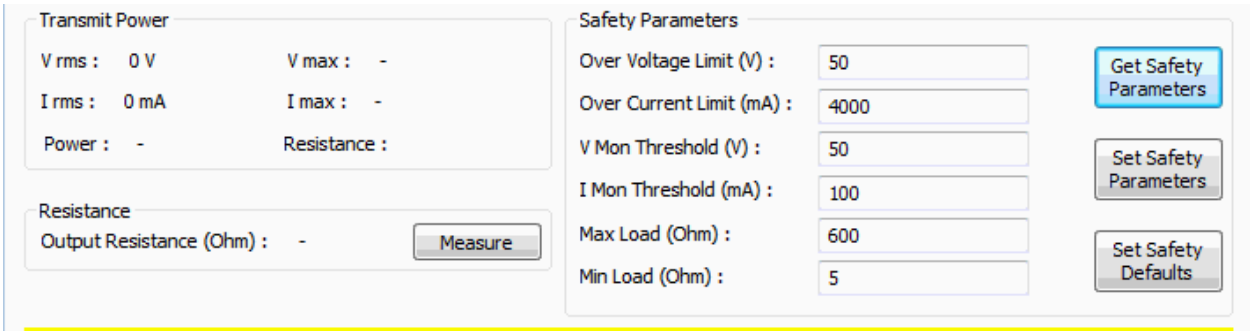
Once connection is established the button should change to DISCONNECT, the Downlink Status will change to Idle, and all the action buttons will become available.

7.3.6.4.4 UDX

If using a UDX receiver no additional physical connections are required. Click Connect in the EM Downlink window to enable the downlink function. Selection of connection type is not required. *Note that the XM4 RX trace will stop scrolling once the Downlinker is enabled.



7.3.6.4.5 Safety Configuration



Select the Get Safety Parameters Button to read the current Safety Parameters from the Downlinker.

Select the Set Safety Defaults button on the right to set the downlinker to default values. This will set the Over Voltage Limit to 50V and Over Current Limits to 4A. For larger Transmit Power level, you will have to set the Over Voltage Limit and Over current to above the desired power. The maximum values for these safety parameters are 150V and 4500mA.

Voltage and Current monitor thresholds are for Engineering purposes. Please do not change.

The Max and Min Load limits in Ohms sets the resistance range that the EM Downlinker will transmit. If the box measures resistance that is out of the range, the safety feature will prevent the box to transmit.

The Measure Button can be used to test the current resistance of the Downlinker setup. During Bank Test using the Black Box, this value should be around 200 – 400 Ohm.

7.3.6.4.6 Tool Type

XBolt (XDT) and XEM tools are both supported by EM Downlink. The proper tool should be chosen so that the available downlink commands are filtered properly.

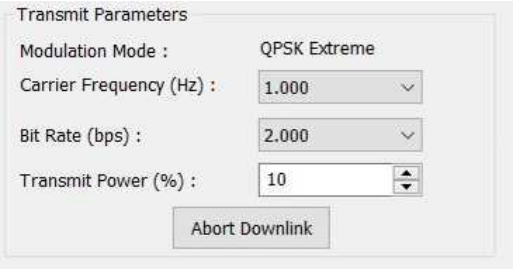
7.3.6.4.7 Transmit Parameters

There are three transmit parameters for downlinking.

1. Carrier Frequency – Reference Frequency for the Encoding Mode
2. Bit Rate – Data rate

3. Transmit Power – Percent of 300 Maximum Peak to Peak Voltage (Electrode Resistance will impact the output power). The Over Voltage Limit must be set to a value above the Transmit Power voltage.

Once these parameters are set, the utility is ready to send a downlink command.



ABORT DOWNLINK button can be used anytime to stop the transmit signal from the Surface Downlinker Box at any time.

If any alarm is triggered, the downlink will stop and the Abort Downlink button will change to Reset Alarm button. You must use the Reset Alarm button and decrease the Transmit Power or increase the safety limits before sending the next downlink command

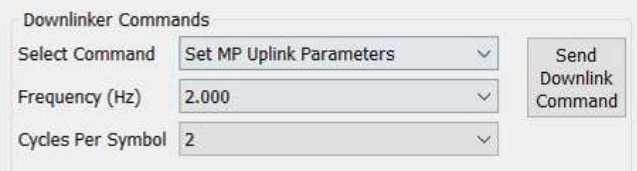
7.3.6.4.8 EM Tool ID

XBolt (XDT) tools may support the use of EM Tool ID to filter accepted downlinks. XEM does not support this feature. To enable EM Tool ID click the box to add a check and manually enter the desired value in the box.

7.3.6.4.9 Downlink Commands

The downlink command type is selected with the drop-down menu next to Select Command. Depending on what type of command is chosen, the user may get one or two additional drop down menus below to designate options.

Note that all commands may not be supported by older tool firmware. Please confirm compatibility.



Command Types

Set Config – This is available for both tool types. The user can select any of the configurations loaded in the tool from 1-8 and change the tool directly to that configuration.

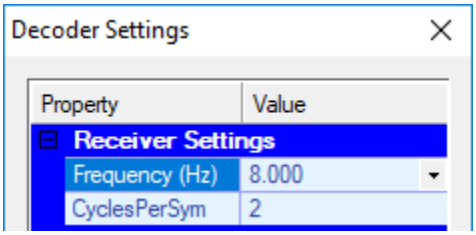
Set Current (XEM) – This sets the tool's target current. There are a total of 12 values starting from 0.1 Amps to 5 amps.

Set Power (XDT) – This sets the tool's target wattage. There are several values starting at 0.25 Watt going to 20 Watt.

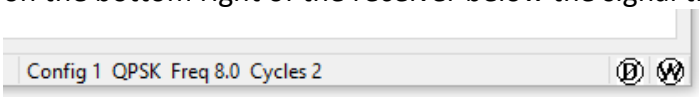
Set Uplink Parameters – This is available for both tool types (EM and MP.) This command changes the Frequency and Cycles Per Symbol of the current configuration

This will override the Frequency and Cycles Per Symbol of the active configuration in the tool.

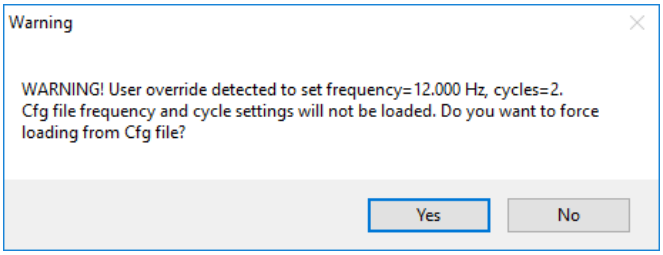
NOTE: When Set Modulation is used, the user will need to manually change the Frequency and Cycles Per Symbol in XM4, XEM or XPulseReceiver to match through the Troubleshooting button - Decoder Settings - Receiver Settings, selecting the values and clicking Set.



After successful Receiver adjustment the new Frequency and Cycles Per Symbol will be shown on the bottom right of the receiver below the signal trace.



After overriding the Frequency and Cycles Per Symbol, a warning will appear anytime another config is loaded or if the Receiver is restarted. The user can keep the override settings or reload the config settings. Select Yes to reload the settings from the configuration or No to keep the override settings.



Set XDT Mode – This sets the tool's transmission type.

- EM Mode – Tool sends all data to surface through EM transmission
- Pulse Mode - Tool sends all data to surface through Mud Pulse transmission
- MP with EM Survey – Tool sends all Toolface and Rotating frames to surface through Mud Pulse transmission and sends Surveys through EM transmission
- MP with EM & MP Survey - Tool sends all Toolface and Rotating frames to surface through Mud Pulse transmission and sends Surveys through EM transmission and then sends Surveys through Pulse transmission once pumps are turned on
- Trip Out Silent – Tool will not transmit any data in this mode. Tool can only be taken out of this mode with EM downlink or by connecting to tool directly. Flow downlink is disabled in this mode.

Set Downlink Parameters (XDT) – This sets the listening frequency and Bit Rate for the downhole tool to accept downlinks.

Set PowerDrive Relay (XDT) – This sends a message to the tool to make it send a pulse message to PowerDrive when the pumps are brought up.

xBolt-S FlowOff to PowerOff Delay (XDT) – This sets the rotor spin behavior for xBolt-S pulser.

Set Power Cycle Tooltring (XDT) – This sends a message to tool that will result in a hard power reset for the string by cycling battery power.

Request New Survey (XDT) – Retrieves and transmits new survey without a flow cycle.

XDAG Rotation Source (XDT) – Can be used to switch rotation source to directional package instead of rotation sensor in case of sensor failure.

Set EM Tool ID (XDT) – If XBolt was programmed with EM Tool ID active, command can be used to change the current value between 1 and 9. This command will not work properly if XBolt was not programmed initially with EM Tool ID.

The Downlink Status will let the user know that the downlinker is “Idle” or “Downlinking”. If an alarm occurs, it will also indicate which alarm was set (Over Voltage or Over Current.)

7.3.6.4.10 Downlink Power Monitor and Resistance

During the downlink, the EM Downlinker/UDX will measure six parameters. The V max and I max will update real-time. The rest will be displayed once the downlink is complete.

1. V rms – RMS Downlink Signal Voltage in Volts
2. I rms – RMS Downlink Signal Current in Amps
3. Power – RMS Downlink Signal Power in Watts
4. Resistance – Measured Resistance in Ohms
5. V max – Realtime Maximum Voltage in Volts
6. I max – Realtime Maximum Current in Amps

Downlink resistance can be measured here using the Measure button to send a short test signal. Physical setup may be adjusted based on this value.

7.3.6.4.11 Workflow

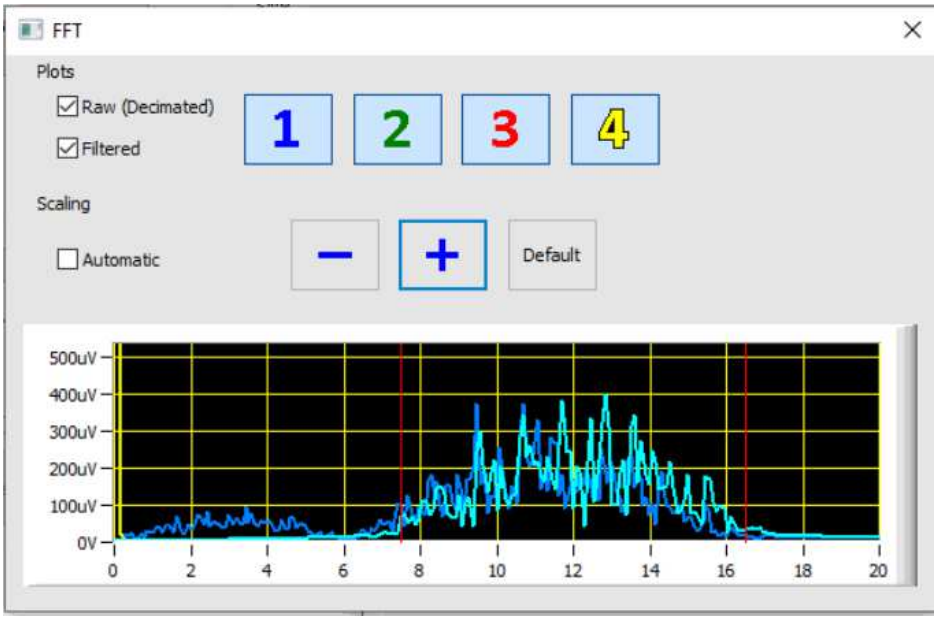
In EM Mode, DDR starts to receive downlink commands at the end of survey transmission. It will continue to listen until it senses another flow on event. Multiple downlinks can be performed during any listening period. If using XDT in Pulse Mode, the tool will receive downlink commands any time the tool is not transmitting.

A status message will be uplinked if a Configuration downlink is successful for XEM and XDT. XEM also sends a status message if frequency/cycles per symbol are changed.

Please note that no other downlinks will generate a status message.

7.3.6.5 Live FFT

The real-time FFT can be accessed by clicking the FFT button in the Troubleshooting window.



7.3.6.5.1 Channel Colors

Ch1 Raw	
Ch1 Filtered	
Ch2 Raw	
Ch2 Filtered	
Ch3 Raw	
Ch3 Filtered	
Ch4 Raw	
Ch4 Filtered	

7.3.6.5.2

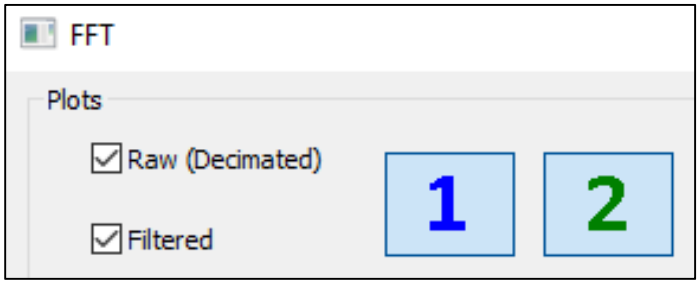
7.3.6.5.2 Display/Hide Channels

Channels can be displayed or hidden by tapping the buttons labeled 1–4 .

In the example below, channel 1 is displayed (light blue color) while channel 2 is not (grey color). Active channels will appear as a pressed button. This is only available for XM4.

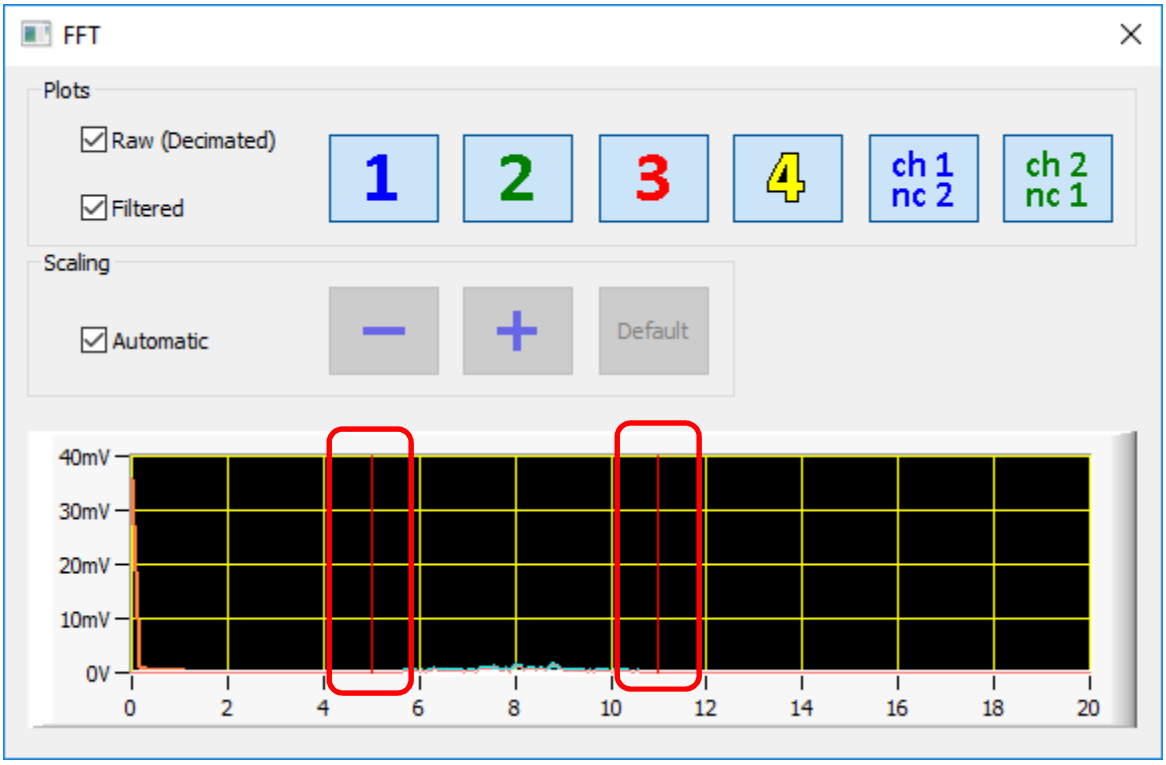
7.3.6.5.3 Display Raw or Filtered Trace

The raw signal or filtered signal can be displayed using the checkboxes in the Plots area of the FFT window.



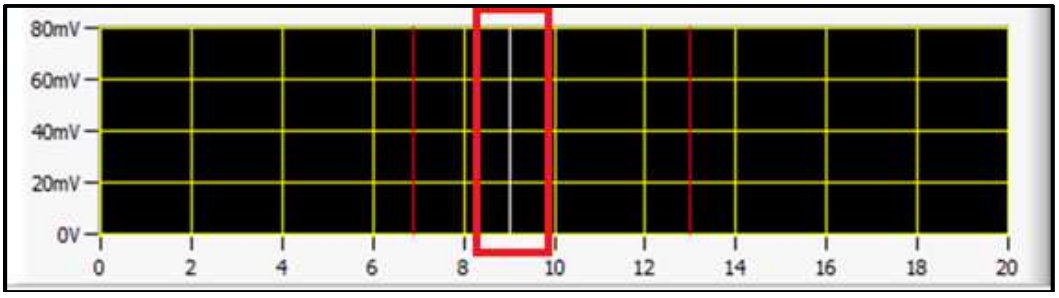
7.3.6.5.4 Band Pass Filter Limit Indicators

The limits of the band pass filter are indicated with vertical red lines on the FFT. Filtered traces will be near 0V outside of the bounds of the filter. Raw traces are not affected by the band pass or notch filters.



7.3.6.5.5 Notch Filter Frequency Indicator

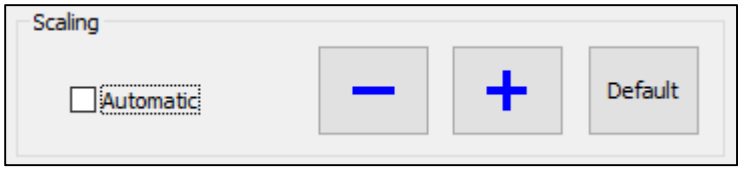
If a notch filter is active, a vertical white line will appear at the notch frequency.



7.3.6.5.6 Automatic or Manual Scaling

By default, the FFT display is scaled automatically. The scale adjusts based on the signal amplitude.

The vertical axis can be manually scaled by using the – and + buttons on the FFT window. After using the manual scaling, the automatic scaling can be used with the “Automatic” checkbox.



7.3.6.5.7 Default

Press the Default button (or use the “D” key on the keyboard) to use the default view of 0 to 2.5 Volts and 0 to 20 Hz.

7.3.6.6 Raw Sample Traces

Controls and color coding are the same as the FFT window.

7.3.6.6.1 Channel Colors

Refer to the FFT color code figure in "Channel Colors".

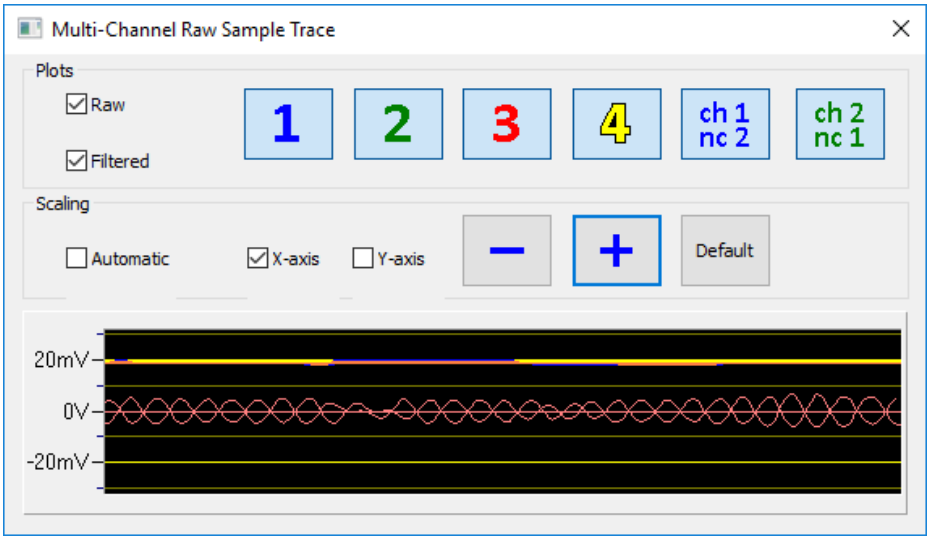
7.3.6.6.2 Display/Hide Channels

Channels 1 through 4 can be displayed or hidden by clicking inside the window, followed by pressing the “1” through “4” keys on the keyboard to toggle the display of those channels.

7.3.6.6.3 Adjust Voltage and Time Scales

The voltage and time scales can be adjusted by clicking inside the window, followed by pressing the "+" or "–" keys on the keyboard.

NOTE: "+" requires the "Shift" key on most keyboards.



7.3.6.6.4 Default Scale

Click the Default button or press the "D" key on the keyboard to use the default view of **-1 to 1 Volt**.

7.3.6.7 Signal-to-Noise Ratio

Channel SNR plots can be accessed by the SNR button of the Troubleshooting window.

- For an XM4 Receiver, SNR window shows four signal to noise ratio plots corresponding to input channels and a fifth plot for the noise cancelled channel.
- For an XEM and XPulse Receiver, there is single SNR plot corresponding to the input channel.

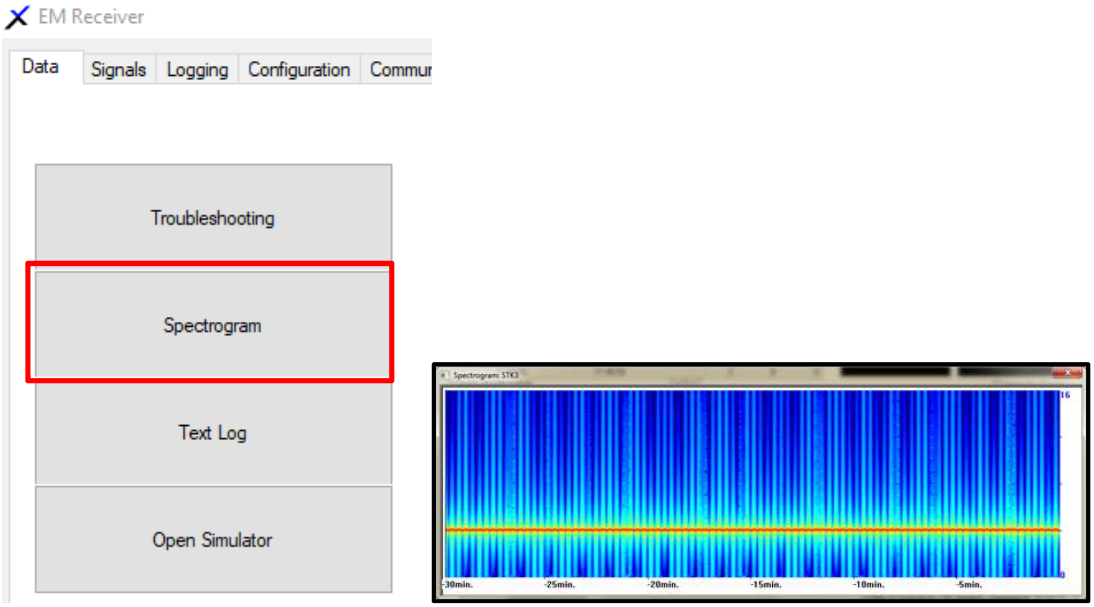
SNR plots are only updated when the decoder is decoding symbols and give useful information about the quality of data being decoded. High SNR mean good decode quality whereas low SNR corresponds to poor decode quality.

- For an XM4 Receiver, SNR plot gives a comparative view of channels decode performances.
- For QPSK modulated signals, SNR value greater than 10dB is essentially decoded error free by the decoder.

7.3.7 Spectrogram

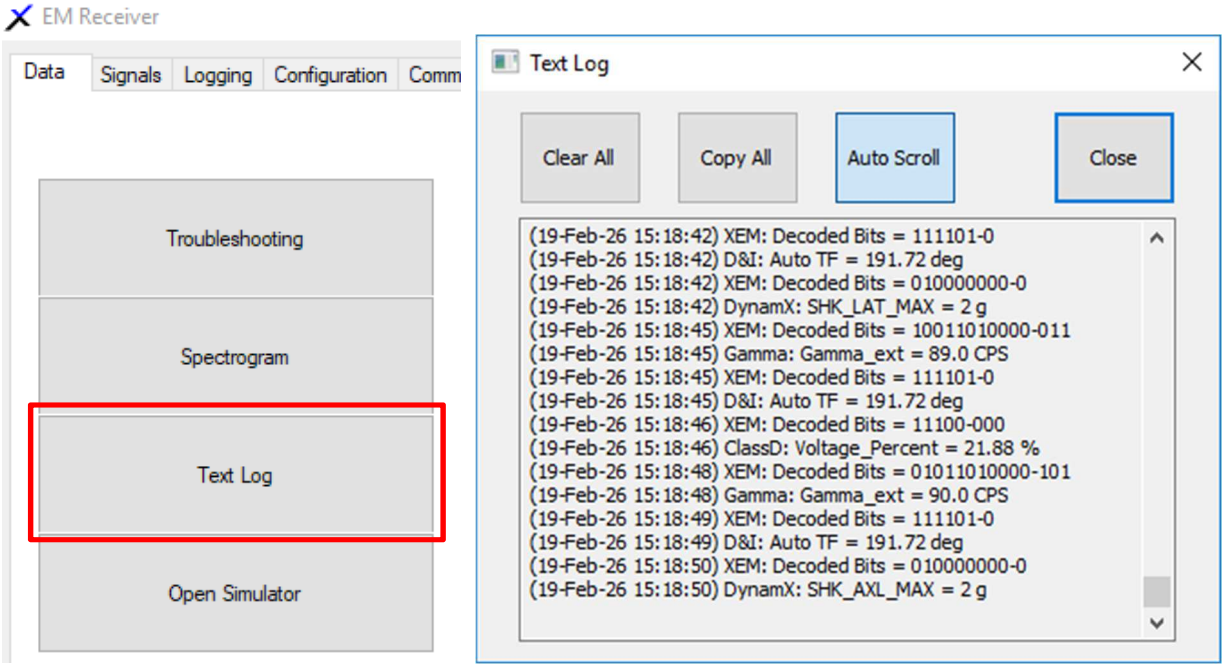
Clicking the Spectrogram button from the Data Tab will launch one window for each input channel, depending on the Receiver hardware being used. The frequency goes up to 16 Hz on the y-axis time in minutes passed along the x-axis.

Refer to the **XM4 Best Practices Manual** (InTouch ID #6639604) on how to use the spectrogram information.



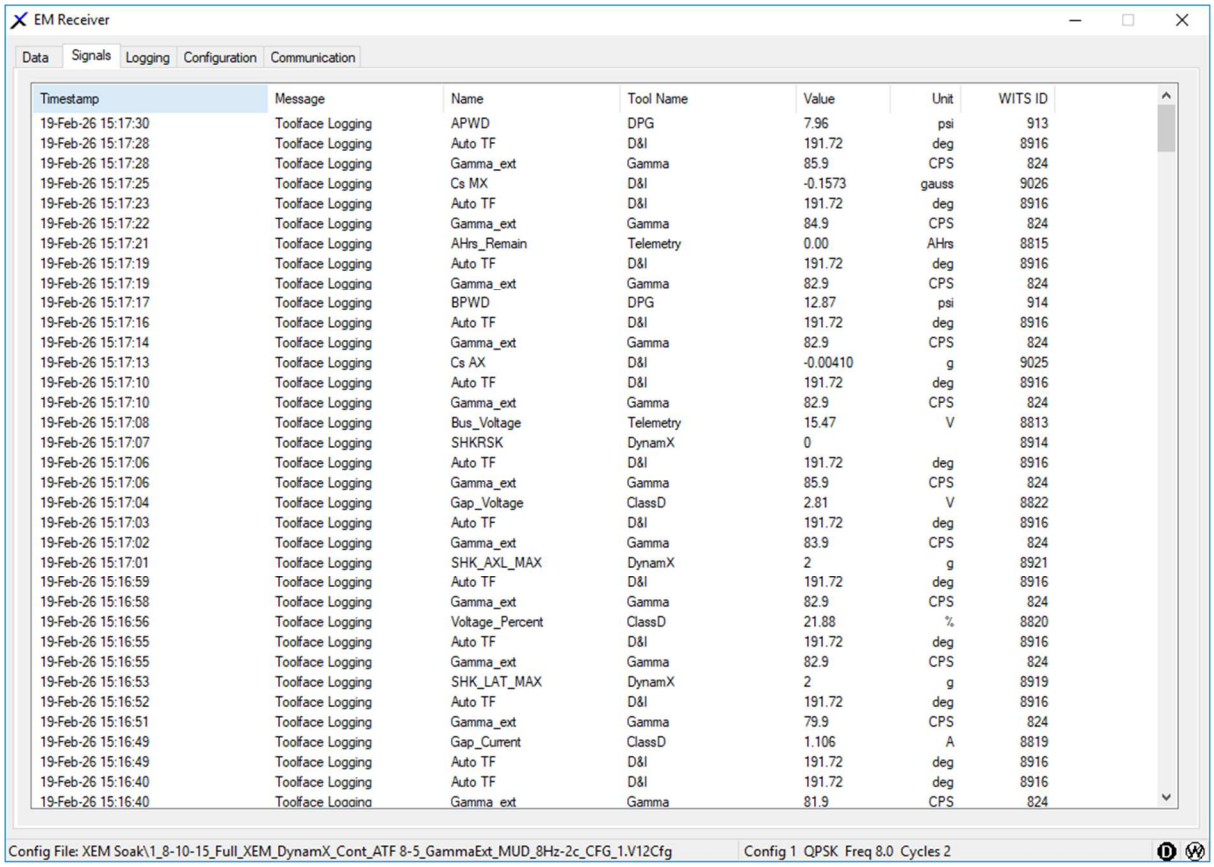
7.3.8 Text Log

The Text Log function shows the user the live decoded signals with information including time stamp, data point name, decoding quality, binary value and actual value.



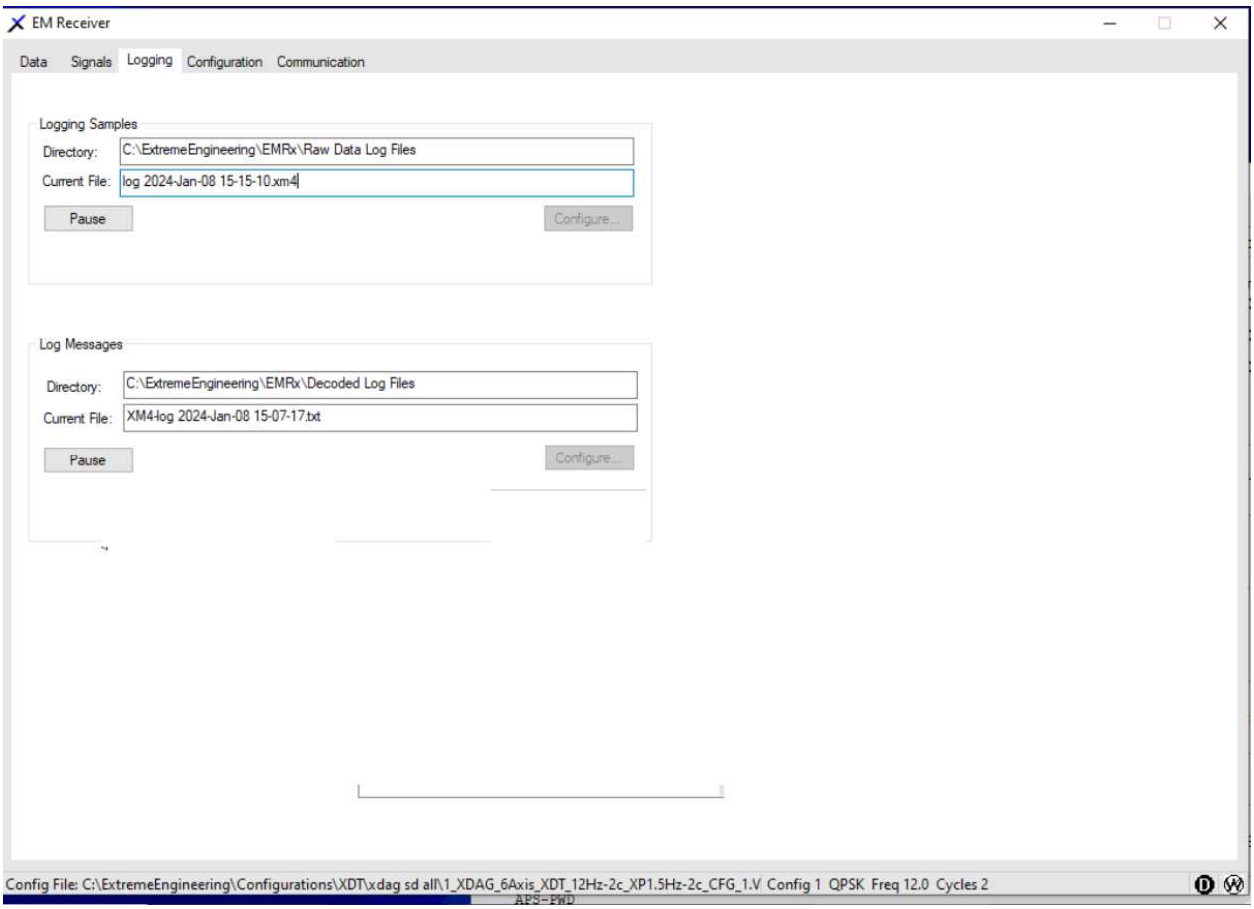
7.4 Signals Tab

The Signals Tab shows the user the live decoded values with information including Timestamp, Message (Survey, Toolface or Rotating), Datapoint Name, Tool Name, Value, Units and WITS ID.



7.5 Logging Tab

Controls where decoded and raw logs are saved.


EM Receiver
Data
Signals
Logging
Configuration
Communication
Logging Samples
Directory:
C:\ExtremeEngineering\EMRx\Raw Data Log Files
Current File:
log 2024-Jan-08 15-15-10.xm4
Pause
Configure...
Log Messages
Directory:
C:\ExtremeEngineering\EMRx\Decoded Log Files
Current File:
XM4-log 2024-Jan-08 15-07-17.txt
Pause
Configure...
Config File: C:\ExtremeEngineering\Configurations\XDT\xdag sd all\1_XDAG_6Axis_XDT_12Hz-2c_XP1.5Hz-2c_CFG_1.V Config 1 QPSK Freq 12.0 Cycles 2

7.6 Configuration Tab

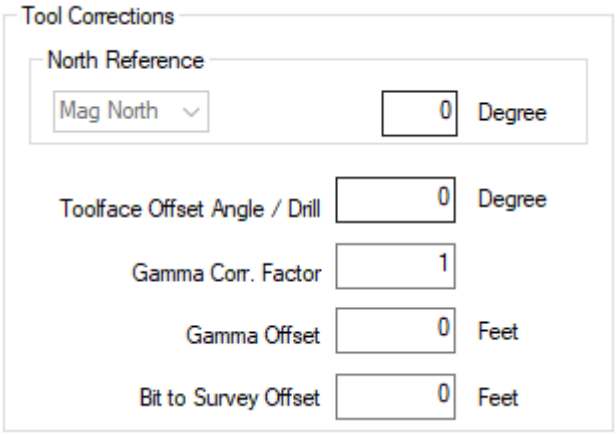
7.6.1 Survey Pop-up Window Setting

If the Survey Listing box is checked, a window will pop up when a survey is decoded and show all survey values.

7.6.2 Tool Corrections

Tool corrections including magnetic reference, toolface offset, gamma correction, gamma offset and bit to survey offset are shown here.

These values will be populated from the entries made in XDirect and cannot be edited in RX. They are updated each time a new header is decoded.

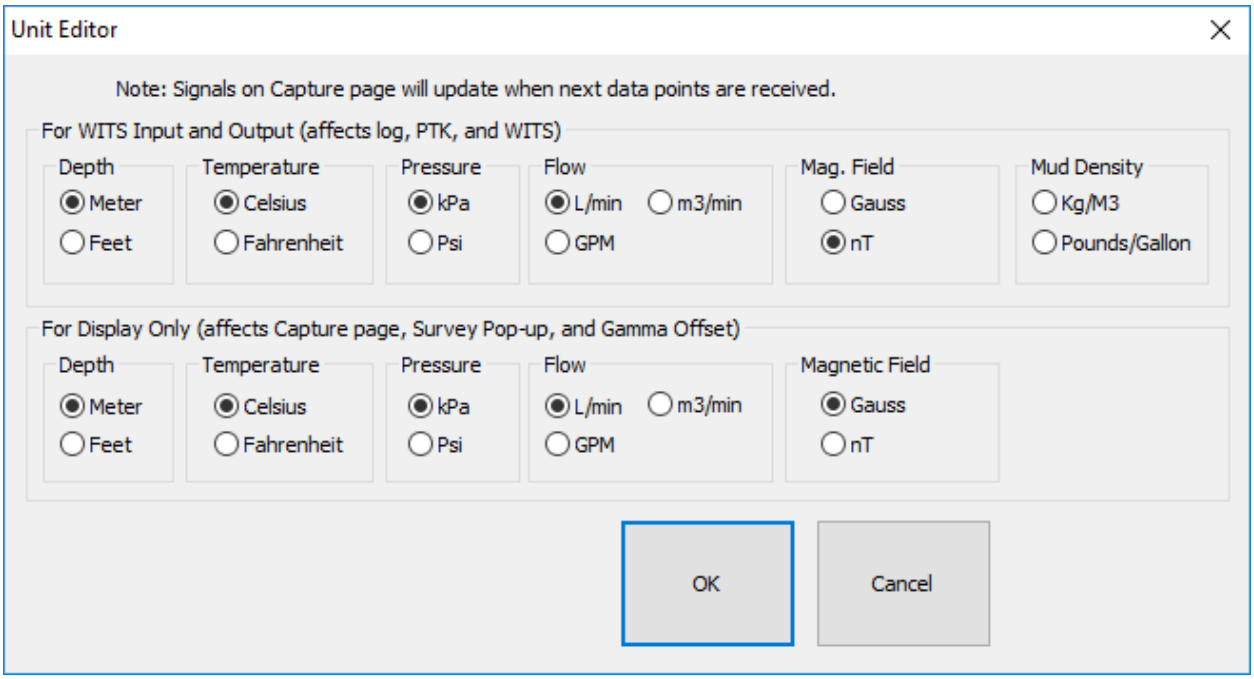


7.6.3 Qualifiers

Qualifier settings are not used in this release.

7.6.4 Unit Editor

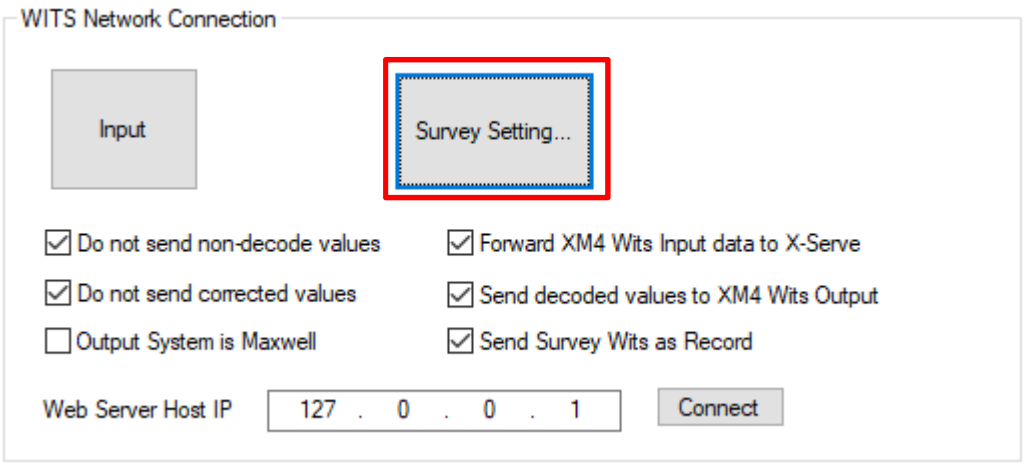
The Unit Editor allows the user to individually control the units for each measurement. There are two selections available in the Unit Editor. The top section controls WITS units and the bottom section controls Display units. Each can be adjusted individually. XDirect will take these settings into account and convert the values to the appropriate unit settings in XDirect. **The display settings will only affect the RX Program and will not carry over to XDirect. WITS settings will control the WITS output values.**



7.7 Communication Tab and WITS Settings

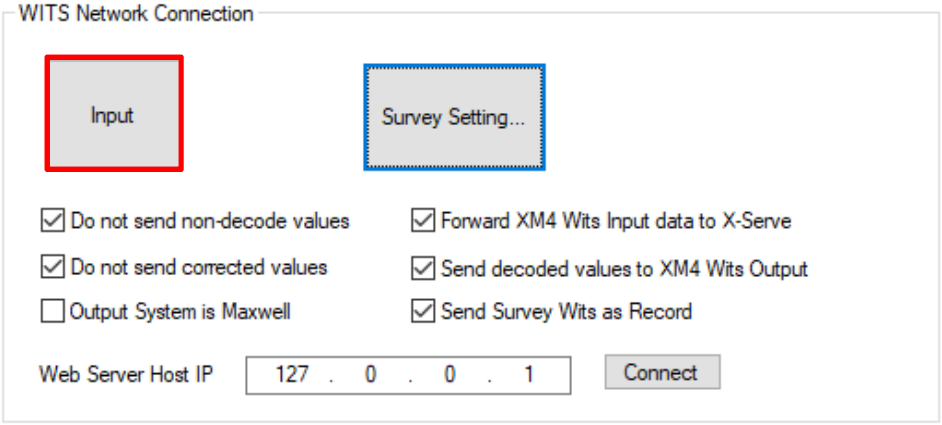
7.7.1 Survey Settings

Survey settings are not used in this release.



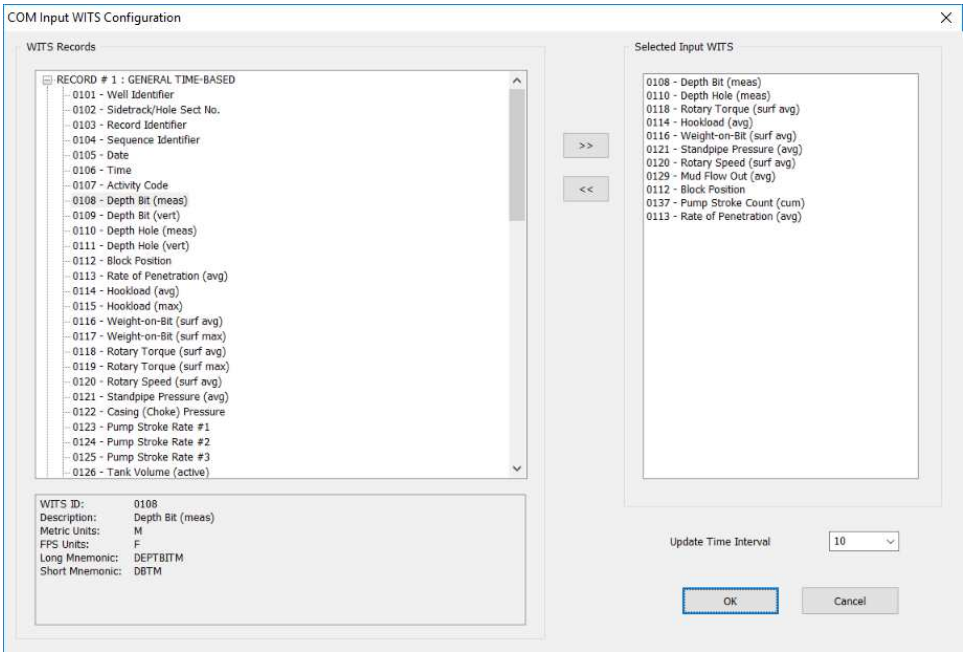
7.7.2 WITS Input

User can control which WITS Values they want to receive from the WITS Input line by clicking on the Input button.



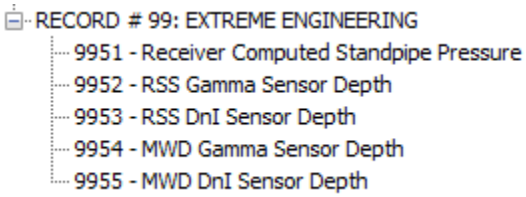
A list of all available WITS Records will be shown on the left. User can select which ones they want to receive and move them to the Selected Input WITS column on the right.

Update Time Interval can also be adjusted. The standard time used is 10 Second Interval.



7.7.2.1 Receiver Calculated Datapoints

Five new receiver calculated datapoints have been added to Record #99. If these are moved to the Selected Input WITS table, they will be available to view in XDirect.



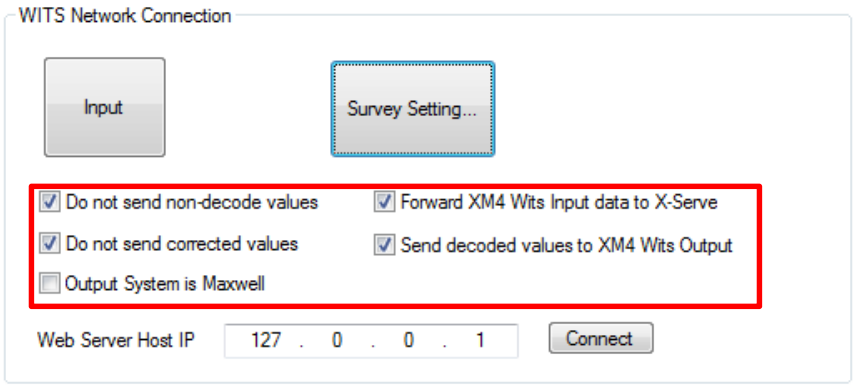
7.7.3 General WITS Output/Input Settings

There are five options to customize WITS transmission.

1. Do not send non-decode values – RX will not send bad decodes out over WITS
2. Do not send corrected values – RX will not send corrected decodes out over WITS
3. Output System is Maxwell – Edits WITS out values for selected datapoints to be compatible with HSPM/Maxwell systems

The following options are only available with XM4 and UDX Receiver. These are only applicable if there is a WITS stream connected to the XM4 receiver box. These are usually only used when running XDirect in parallel with another logging system to help prevent data duplication.

4. Forward XM4 WITS Input data to X-Server – Controls flow of incoming WITS data from external source connected through XM4 WITS serial cable
    - Disable this setting if you do not want to receive rig data into X-Server from the WITS port on XM4.
    - This will prevent the Extreme system from forwarding rig data to a third-party system.
    - Used if the third-party system is already receiving rig data directly.
5. Send decoded values to XM4 WITS Output – Controls flow of outgoing decoded WITS data from Receiver through XM4 WITS serial cable
    - Disable this setting if you do not want decoded values from the Extreme system to be transmitted directly to the rig through the WITS Port on XM4.
    - This will prevent the Extreme system from forwarding decoded values into the rig data system.
    - Used if the third-party system is already sending decoded values to the rig data system.



7.8 WITS IDs

Data Name	WITS ID	Hardcoded or Controlled by Database
Survey Depth	0708	Cannot be changed
Inclination	0713	Cannot be changed
Azimuth	0715	Cannot be changed
Mag Dip Angle	9014	Controlled by Datafile
Magnetic TF	8916	Controlled by Datafile
Gravity TF	8917	Controlled by Datafile
G Total	9017	Controlled by Datafile
M Total	9016	Controlled by Datafile
AX (D&I)	9022	Controlled by Datafile
AY (D&I)	9023	Controlled by Datafile
AZ (D&I)	9024	Controlled by Datafile
MX (D&I)	9019	Controlled by Datafile
MY (D&I)	9020	Controlled by Datafile
MZ (D&I)	9021	Controlled by Datafile

8 XM4 Receiver Setup Features

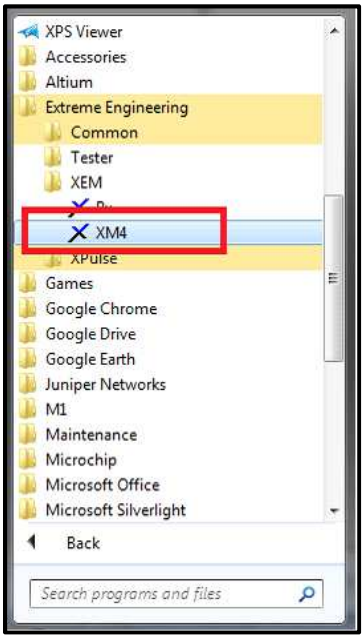
This section will detail using XDirect with the XM4 Receiver.

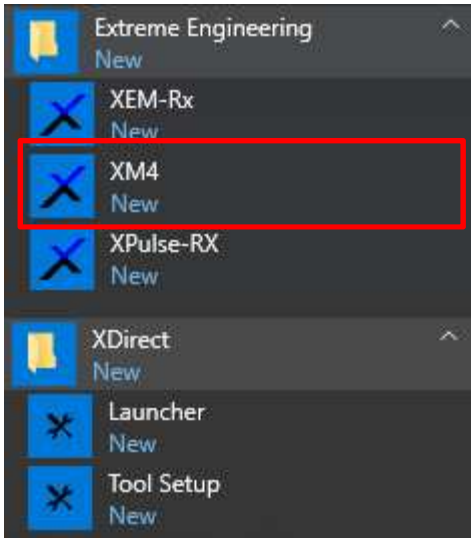
8.1 Starting XM4 Rx

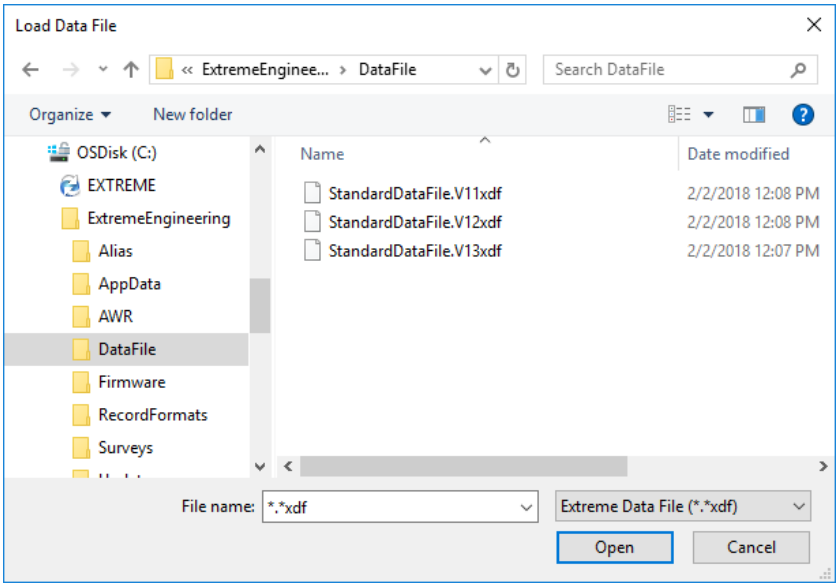
If the “Auto Launch” checkbox was selected during the software installation, XM4 Rx will start about 10 seconds after the computer finishes booting up.

To manually start the XM4 Software Rx, select ***Windows Start -- All Programs -- Extreme Engineering -- XEM -- XM4***

Select a Data file and Configuration file as with previous Surface Software versions.





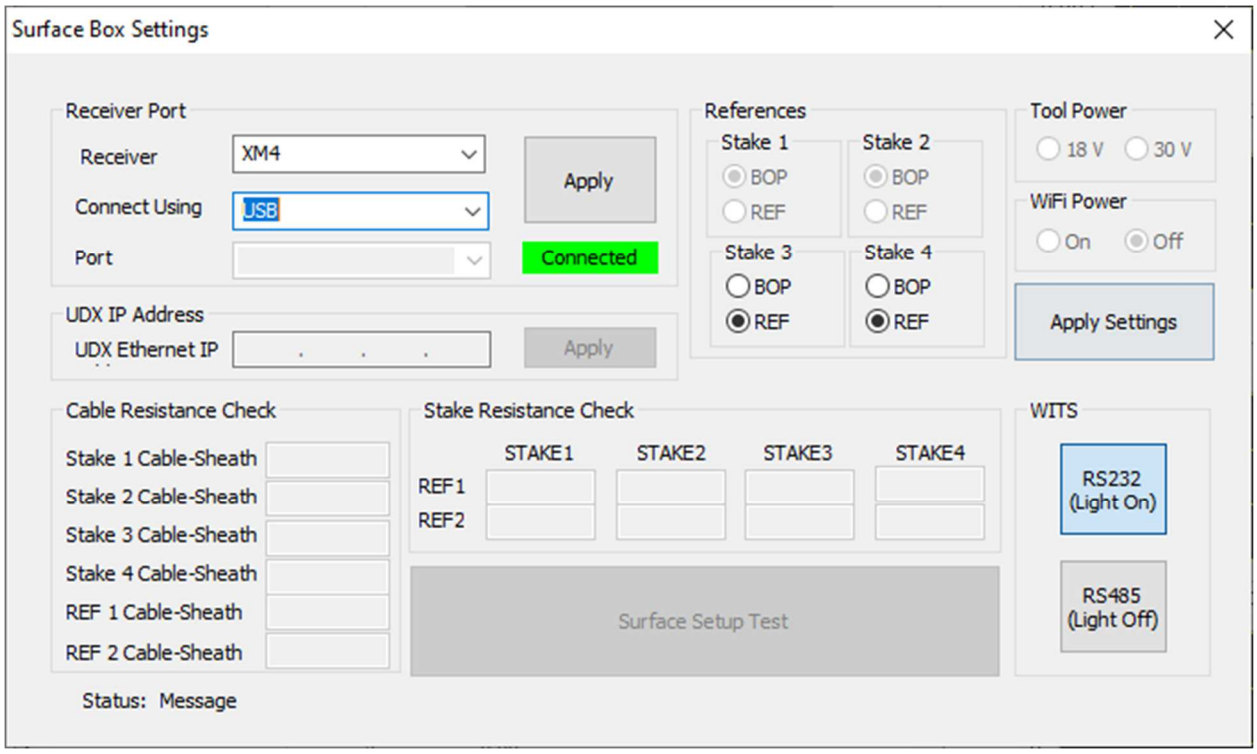


8.1.1 Load New Configuration File for XM4

A new configuration file can be loaded at any time using the Cfg File button in the Troubleshooting window.

8.2 Surface Box Window

Use the Surface Box window (accessible from the Troubleshooting menu) to configure the XM4 or UDX Surface Box options. The user must click Apply Settings to apply any selected changes. If a change to the Receiver Port is made the receiver must be restarted to apply the change.



8.2.1 BOP and REF Options

The “BOP and REF options” menu allows the user to select how the “BOP” and “REF” are connected inside the XM4 Receiver. It is possible for XM4 and UDX to measure the voltage at STK3 and STK4 compared with “BOP” or “REF”.

This option can be changed while troubleshooting signal issues, allowing the user to quickly change to an off-BOP stake to reduce the effect of electrical noise from the rig. Refer to the **XM4 Best Practices Manual** (InTouch ID #6639604) for more details.

8.2.2 Receiver Port

XM4 or UDX can be connected to the receiver via USB on the decoding computer that is connected to the PC-USB input on the XM4, or it can use a RS422 Serial connection from the decoding PC connected to the PC Serial 10 Pin input.

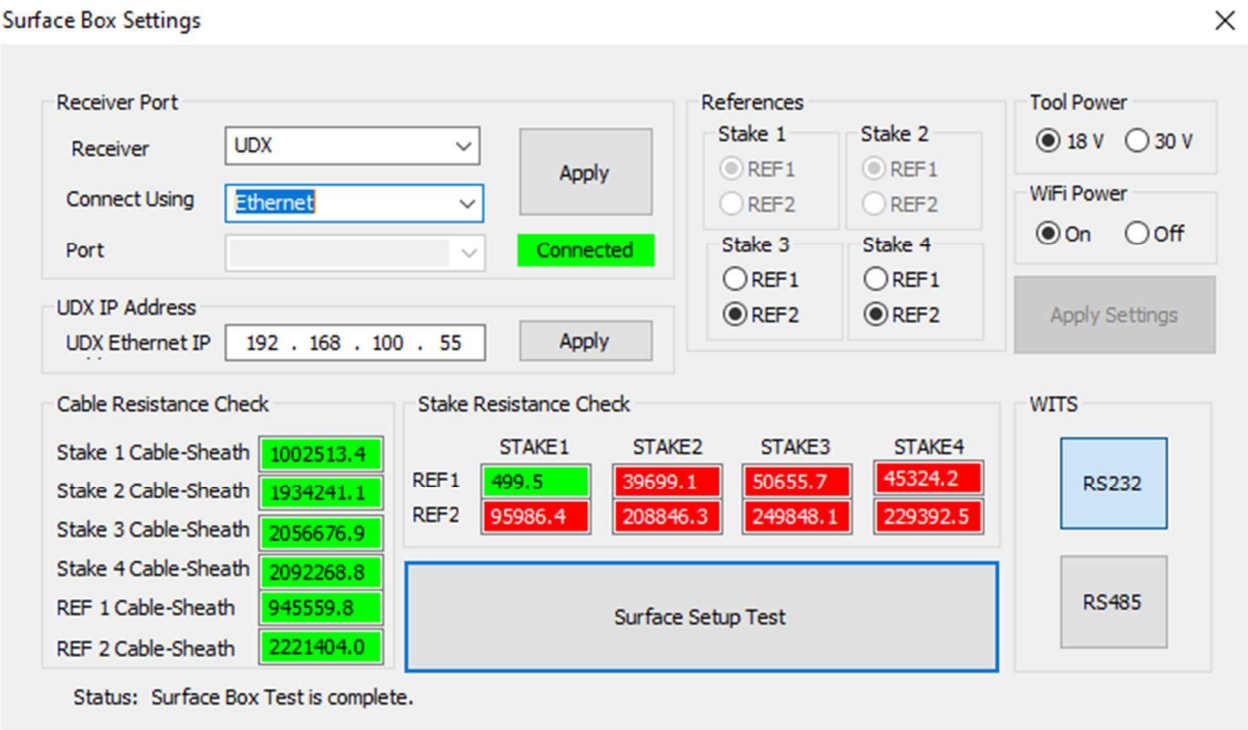
The Receiver Port setting should be set to USB if using USB. If RS422 is being used, the RS422 COM Port shown on the decoding computer needs to be identified and set in the drop-down menu.

8.2.3 Resistance Check

If a UDX is being used there are two resistance checks available to help troubleshoot.

The resistance checks can be started by clicking the Surface Setup Test button. This will send a low voltage signal through the system to determine if there are any issues with the cables or the stake connections.

If there are any issues measured the item will be colored red. If the Cable Resistance Check fails the test, the cable may have damage to the outside of the cable and may need replacement. If the Stake Resistance Check fails, the stake connection may be improper and should be checked.



8.2.4 Tool Power

If using a UDX Receiver there is an option to power the tool with 18 V or 30 V. **30 V should only be used with XBolt tools.**

8.2.5 WITS

If RS-232 is selected on the XM4 Receiver the LED is on. Otherwise, that LED is off and RS-485 is selected.

Generally, RS-232 is used to connect to a Pason COMM box or directly to another workstation using a null modem cable. RS-485 is used to connect directly to a Pason junction box. Use RS-232 for cable lengths of less than 50 feet. Otherwise use RS-485 for a maximum length of 4,000 feet.

Specification	RS-232	RS-485
Max Cable Length	50 ft.	4,000 ft.

8.3 XM4 Decoder Settings

The Undo and Set buttons are initially disabled. Once a change has been made, the buttons become enabled.

8.3.1 Applying Changes

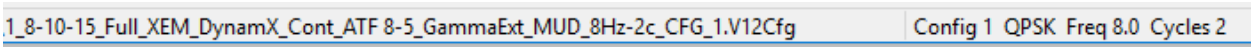
- Changes made in the Decoder Settings panel will not take effect until the Set button is clicked.
- Clicking Undo will revert any changes made before clicking Set.
- Clicking Default will return all settings controlled by this panel to their default values based on the configuration file that is loaded. There is no need to click Set after clicking Default.

8.3.2 Receiver Settings

8.3.2.1 Frequency and CyclesPerSym

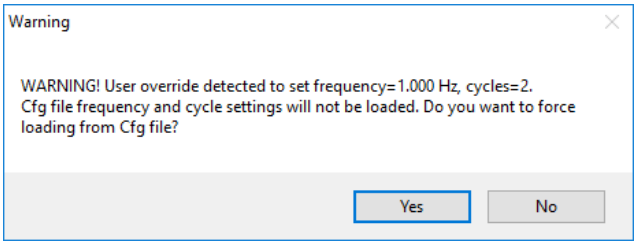
These settings allow the user to change the expected frequency and cycles per symbol that is being transmitted by the downhole tool without changing the configuration. These settings should only be changed if the Extreme EM Downlinker has been used to alter these settings on the downhole tool.

The newly set frequency and bitrate will be updated at the bottom right of the receiver window. Note you can see that the frequency and cycles on the right-hand side are different from the config settings on the left.



8.3.2.2 Warning Messages

If the frequency and/or bitrate has been changed manually and the user later changes the configuration, a warning message will appear.



Choose Yes if you want to load the frequency and bitrate that is assigned to the configuration that is being loaded. Choose No to keep the existing custom frequency and bitrate.

This warning will also appear if a custom value has been entered and XM4 RX is restarted.

8.3.3 Header Correlation Threshold

8.3.3.1 Not Decoding

This parameter defines the correlation threshold when decoder is not decoding any data and waiting for header to come in. This parameter needs to be lowered if there is too much noise and no header is being detected. This will make decoder start decoding but the performance may be decreased.

8.3.3.2 Decoding

This parameter defines the correlation threshold to start a new frame when the current frame has not been received completely. This happens when the tool starts transmitting a new frame before the completion of previous frame.

This parameter needs to be lowered if there are false triggers before the current message/frame is completed. This threshold should be at least equal to the “Not Decoding” threshold.

8.3.4 Header Confidence Ratio Threshold

Header confidence ratio is the amplitude ratio of header to the pre-header quiet interval (noise). Decrease this threshold value if headers are being missed even though correlation plot shows good header correlation.

8.3.5 Enable/Disable Correction

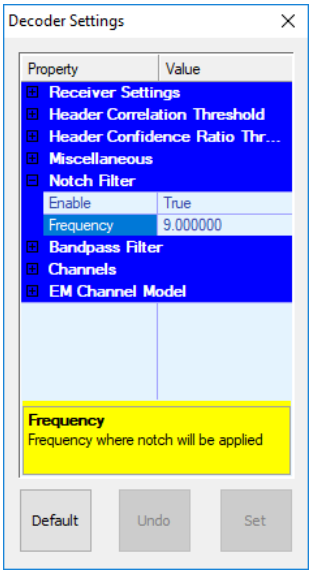
If this setting is “True”, the decoder will attempt to correct values that are decoded based on the error correction applied to the signal of the signal. Corrected signals will appear as blue values on the Capture pages' grid.

8.3.6 Set Notch Filter

If there is tone noise present within the signal bandwidth, and the noise is steady at a specific frequency as observed on the FFT, a notch filter can be set at that frequency to filter the noise and improve decoding.

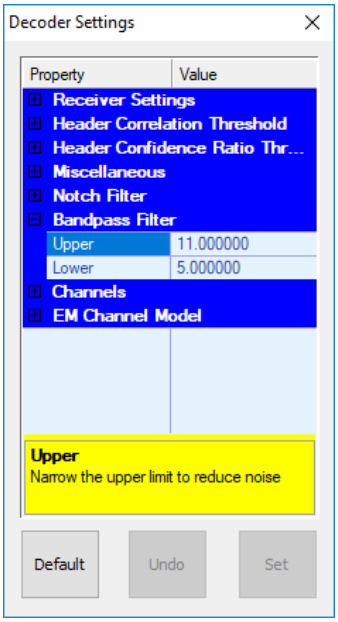
To set a notch filter, first set “Enable” to “True”, enter the desired notch frequency, and then click Set.

Note that Notch Filter cannot be used with Noise Cancellation decoder.



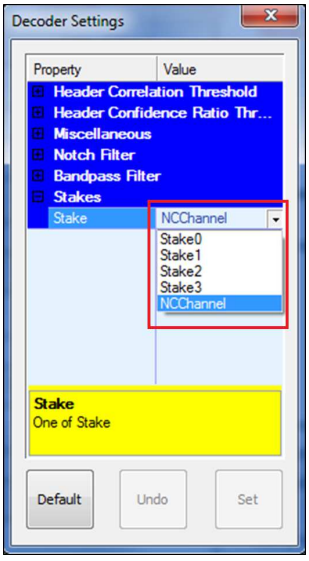
8.3.7 Set Band Pass Filter

If there is noise present near the edges of the signal band, the band pass filter limits can be narrowed. To modify the band pass filter, enter new “upper” and “lower” limits and click Set.



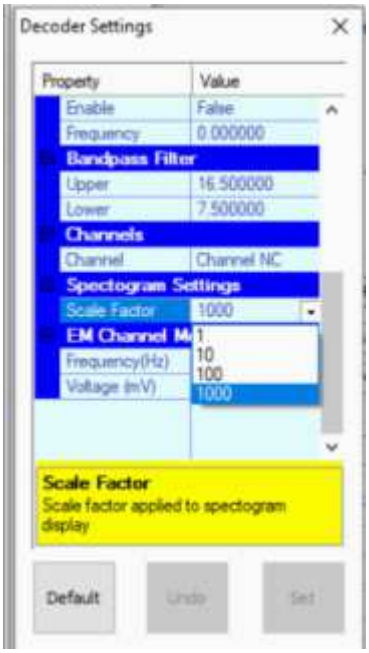
8.3.8 Enable/Disable Channels

The list of stakes has been replaced with a drop down. By default, channel “NCChannel” is used.



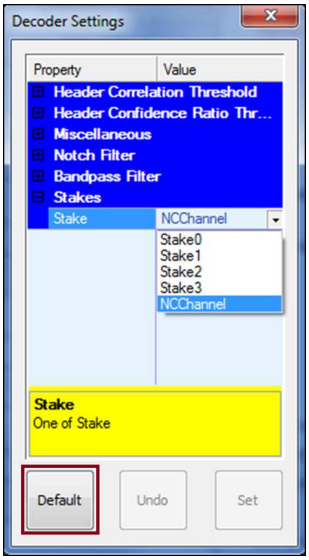
8.3.9 Spectrogram Settings

This allows the user to select the gain for the spectrogram plots. 1000 is the default gain.



8.3.10 Default Button

Clicking the Default button will enable "NCChannel", disable the rest of the channels, and set all the other values to their default based on the configuration file loaded.

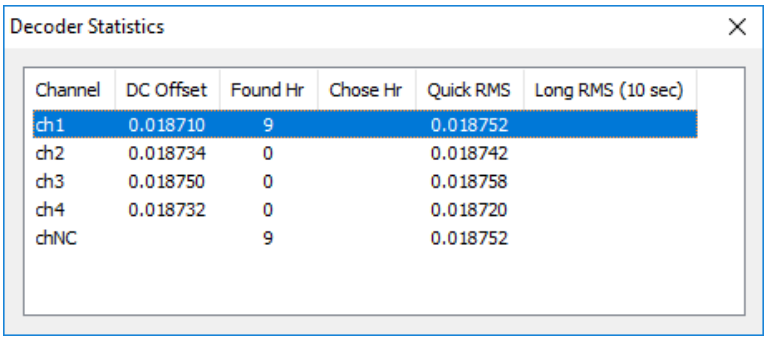


8.3.11 EM Channel Model

This function has been disabled.

8.4 XM4 Decoder Statistics

The Decoder Statistics window displays several points of data about each channel. The channel with the most “Chose Hr” will be highlighted in blue.



DC Offset: The DC voltage measured on the stake compared to the selected reference (BOP or REF).

> **NOTE #1:** Approximately 0.020V DC offset is intrinsic to the XM4 Board. Any additional offset is measured from the stakes.
>
> **NOTE #2:** The XM4 Receiver has a configurable hardware DC blocking filter which will cause any real DC offset present on the stakes to be filtered before it is measured here.

Found Hr: The number of headers detected on each channel. The count is reset to 0 when a new configuration file is loaded.

Chose Hr: The number of headers selected from each channel. This is an indication of the relative signal quality on each channel. For example, more chosen headers on channel 1 than channel 2 indicate that the signal quality on channel 1 is better.

Quick RMS: The RMS voltage on the channel averaged over a short period.

Long RMS: The RMS voltage on the channel averaged over a 10 second period.

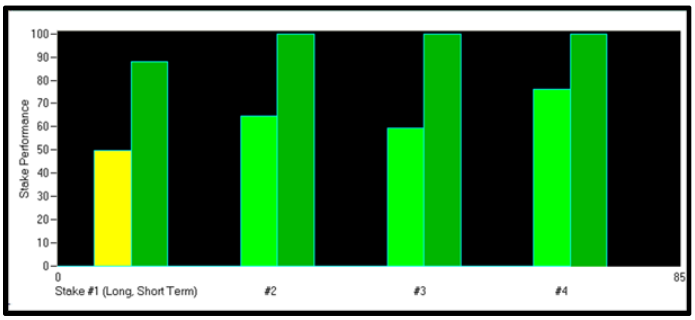
8.5 XM4 Stake Performance

The Stake Performance graph indicates how well a stake is picking up and decoding downhole transmission. There are two bar graphs per stake: the left bar is Long Term and indicates the last 30 minutes of accumulated performance values, whereas the right bar is Short-Term indicating the last 5 minutes of accumulated performance.

The color shade for the Long Term is brighter than the Short Terms. Performance is on a zero to 100 percentage scale with 100 being the best.

On the horizontal axis, the four stakes are shown. Ignore the “0” and “85” as these are just the range on which the percentage bars are shown.

Color	**Red**	**Yellow**	**Green**
Threshold	0 to 35	36 to 55	56 to 100
Meaning	Bad	Marginal	Good



8.6 EM Mode Scanner

This function has been disabled.

8.7 XM4 Supported Modes

The supported modes for the XM4 EM QPSK Decoder are listed in the table below.

Carrier Frequency	Bit Rate	Cycles Per Symbol
0.5	0.5, 1	2, 1
1	0.5, 1,2	4, 2, 1
1.5	1, 1.5	3, 2
2	0.5, 1, 2, 4	8, 4, 2, 1
2.5	1.25, 2.5	4, 2
3	0.5, 1, 1.5, 2, 3, 6	12, 6, 4, 3, 2, 1
3.5	1.75, 3.5	4, 2
4	0.5, 1, 2, 4, 8	16, 8, 4, 2, 1
4.5	1.5, 2.25	6, 4
5	0.5, 1, 1.25, 2, 2.5, 5, 10	20, 10, 8, 5, 4, 2, 1
5.5	1.375, 2.75	8, 4
6	0.5, 1, 2, 4, 6, 12	24, 12, 6, 3, 2, 1
6.5	1.625, 3.25	8, 4
7	0.5, 1, 2, 3.5	27, 14, 7, 4
7.5	1.875, 2.5	8, 6
8	0.5, 1, 2, 4, 8, 16	32, 16, 8, 4, 2, 1
9	0.5, 1, 2, 2.25	36, 18, 9, 8
10	1, 2, 4, 10, 20	40, 20, 10, 2, 1
10.5	1.75, 2.625	12, 8
11	0.5, 1, 2, 2.75	44, 22, 11, 8
11.5	1.4375, 2.875	16, 8
12	0.5, 1, 2, 4,6, 8, 12, 24	48, 24, 12, 6, 4, 3, 2, 1
14	1, 2, 4	28, 14, 7
16	1, 2, 4, 8, 16	32, 16, 8, 4, 2
18	1, 2, 4, 12	36, 18, 9, 3
20	1, 2, 4	40, 20, 10
24	2, 4	24, 12
32	2, 4	32, 16

8.8 XM4 Log File Recording and Playback

8.8.1 Log File Recording

Log files with the extension ".xm4" are automatically created in
C:\ExtremeEngineering\XEM\Raw Data Log Files

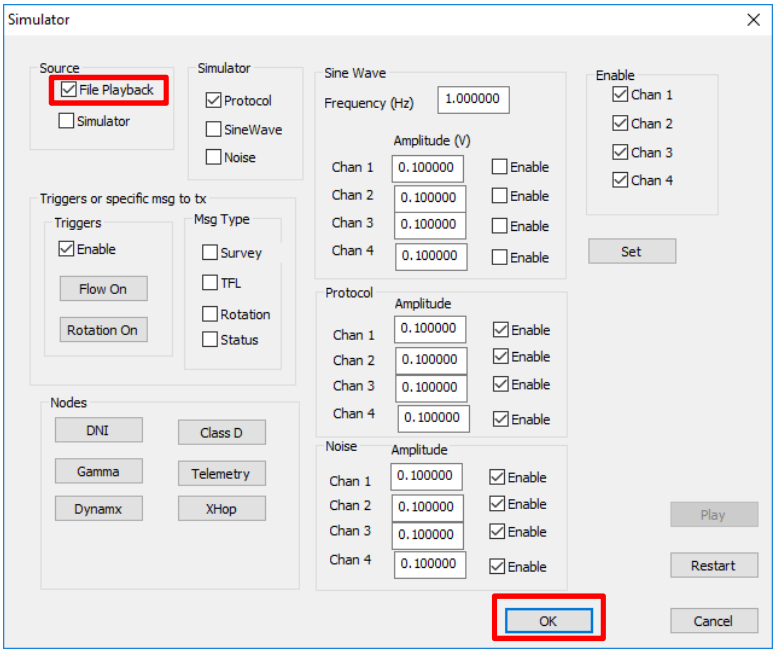
Log file storage takes about 1.126 MB/4 minutes (or 405 MB per day). Due to limited drive space, the number of log files allowed is 2,000, translating approximately to 5 days of software run time. Any files exceeding this threshold will be purged, starting from the earliest time-stamped files where the timestamp is based on the file name.

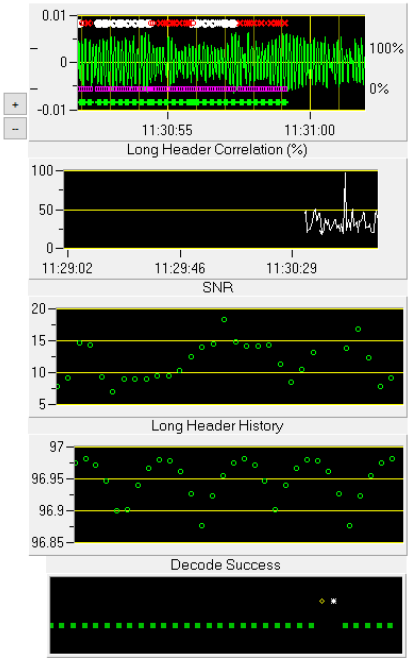
NOTE: Any log data required for archiving should be manually copied from this location to a different folder or an external hard drive before the system automatically removes the files.

8.8.2 Log File Playback

From the "Data" page, click the Open Simulator button and check the "File Playback" checkbox in the upper left-hand corner. Then click OK to close the window.

Load the .xm4 files. Then files will replay as in previous versions.





8.9 XM4 Noise Cancellation

This is a Premium feature that must be enabled using a dongle.

A noise cancellation feature is integrated with the use of an XM4 Receiver. Refer to the **XM4 Best Practices Manual** (InTouch ID #6639604) for full details.

9 XEM Setup Features

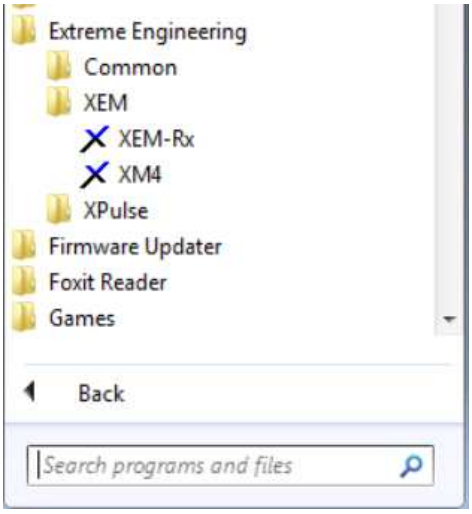
This section will detail using XDirect with XTR.

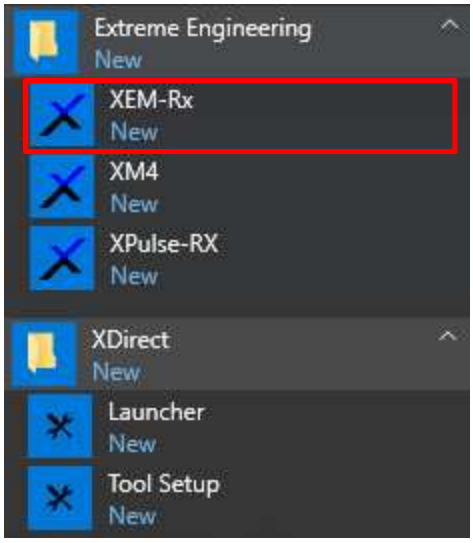
9.1 Starting XEM RX

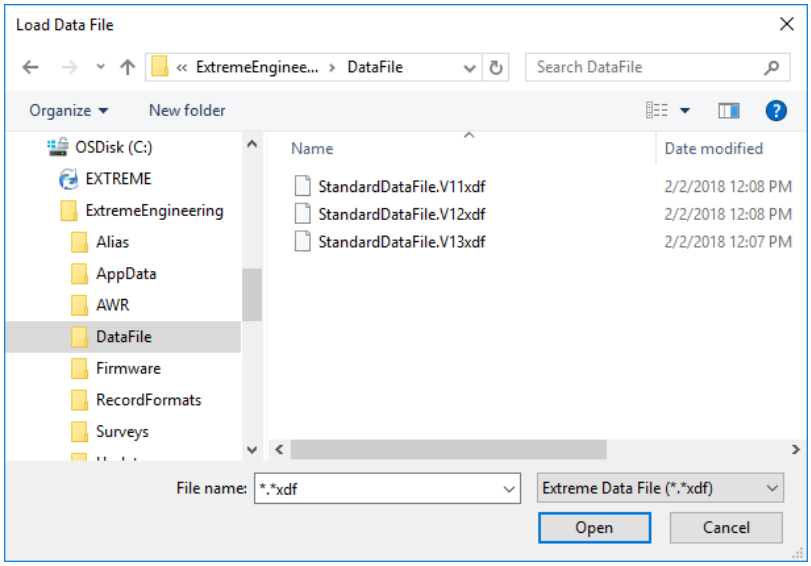
If the “Auto Launch” checkbox was selected during the software installation, XEM Rx will start about 10 seconds after the computer finishes booting up.

To manually start the XEM Software Rx, select ***Windows Start -- All Programs -- Extreme Engineering -- XEM -- XEM-Rx***

Select a Data file and Configuration file as with previous Surface Software versions.

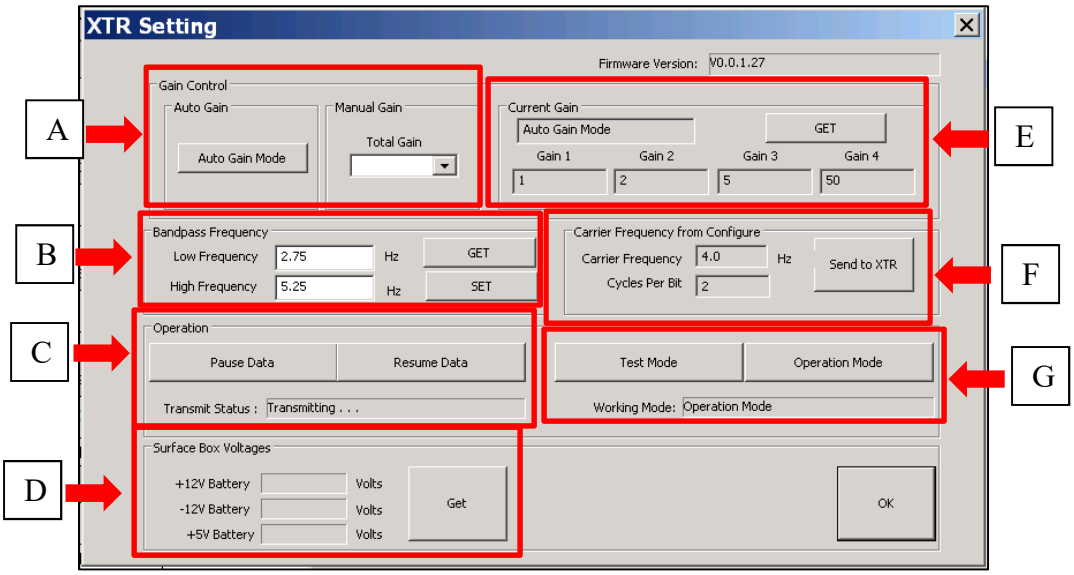






9.2 Surface Box Settings

These settings are now under the Troubleshooting button from the "Data" tab. This button will open the window shown below:



A. Gain Control
Auto Gain Mode is the default setting. This is the recommended setting to avoid damage from oversaturation. The user can override this by manually choosing the total gain by using the drop-down menu.

B. Bandpass Frequency
Shows the current bandpass frequency settings. If there is noise present near the edges of the signal band, the band pass filter limits can be narrowed. To modify the band pass filter, enter new "Low" and "High" limits and click SET.

C. Operation Mode
Transmit Status should always say Transmitting… If Status shows Transmitting is Paused, click Resume Data. If Status shows Transmitting is Paused, no signal will be visible or decode.

D. Surface Box Voltages
Click Get to obtain Surface Box Voltages. Voltages should be near listed values.

E. Current Gain
Shows if box is in Auto or Manual gain mode. Total gain is the product of Gain 1-4.

F. Carrier Frequency
Shows frequency and cycles of current configuration.

G. Mode Selection

Allows user to power nodes without a battery. Click Test Mode to supply power from XTR. Tool Power light on XTR will illuminate. XEM RX must be in Operation Mode to decode properly while downhole.

9.3 Decoder Settings

The Undo and Set buttons are initially disabled. Once a change has been made, the buttons become enabled.

9.3.1 Applying Changes

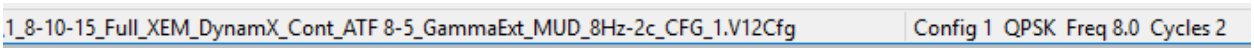
- Changes made in the Decoder Settings panel will not take effect until the Set button is clicked.
- Clicking Undo will revert any changes made before clicking Set.
- Clicking Default will return all settings controlled by this panel to their default values based on the configuration file that is loaded. There is no need to click Set after clicking Default.

9.3.2 Receiver Settings

9.3.2.1 Frequency and CyclesPerSym

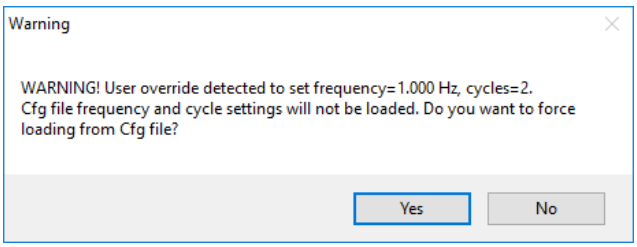
These settings allow the user to change the expected frequency and cycles per symbol that is being transmitted by the downhole tool without changing the configuration. These settings should only be changed if the Extreme EM Downlinker has been used to alter these settings on the downhole tool.

The newly set frequency and bitrate will be updated at the bottom right of the receiver window. Note you can see that the frequency and cycles on the right-hand side are different from the config settings on the left.



9.3.2.2 Warning Messages

If the frequency and/or bitrate has been changed manually and the user later changes the configuration, a warning message will appear.



9.3.3 Header Correlation Threshold

9.3.3.1 Not Decoding

This parameter defines the correlation threshold when decoder is not decoding any data and waiting for header to come in. This parameter needs to be lowered if there is too much noise and no header is being detected. This will make decoder start decoding but the performance will be poor.

9.3.3.2 Decoding

This parameter defines the correlation threshold to start a new frame when the current frame has not been received completely. This happens when the tool starts transmitting a new frame before the completion of previous frame.

This parameter needs to be lowered if there are false triggers before the current message/frame is completed. This threshold should be at least equal to the “Not Decoding” threshold.

9.3.4 Header Confidence Ration Threshold

Header confidence ratio is the amplitude ratio of header to the pre-header quiet interval (noise). Decrease this threshold value if headers are being missed even though correlation plot shows good header correlation.

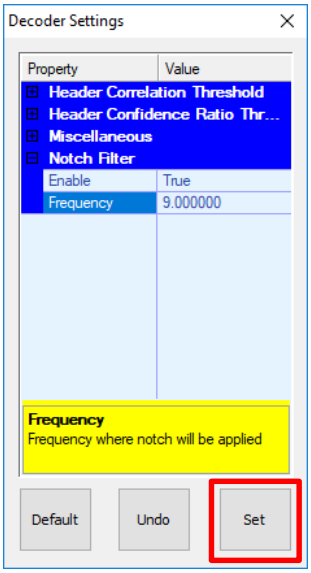
9.3.5 Enable/Disable Correction

If this setting is “True”, the decoder will attempt to correct values that are decoded based on the error correction applied to the signal of the signal. Corrected signals will appear as blue values on the Capture pages' grid.

9.3.6 Set Notch Filter

If there is tone noise present within the signal bandwidth, and the noise is steady at a specific frequency as observed on the FFT, a notch filter can be set at that frequency to filter the noise and improve decoding.

To set a notch filter, first set “Enable” to “True”, enter the desired notch frequency, and then click Set.

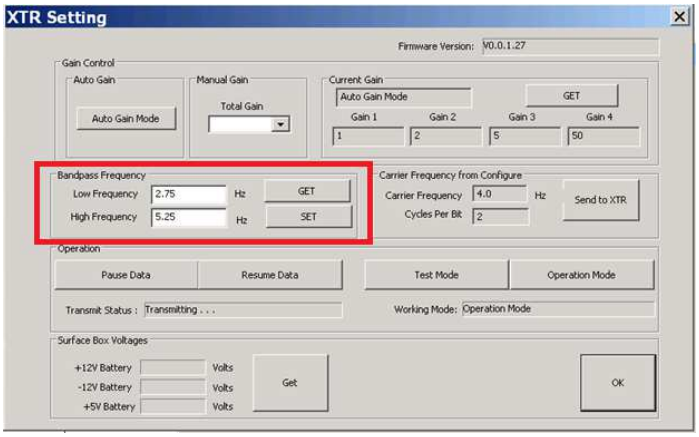


9.3.7 Default Button

Clicking the Default button will set all the values to their default based on the configuration file loaded.

9.3.8 Set Bandpass Filter

If there is noise present near the edges of the signal band, the band pass filter limits can be narrowed. To modify the band bass filter, open the Surface Box interface, enter new upper and lower limits and click set.



10 XPTR or Laversab Setup Features

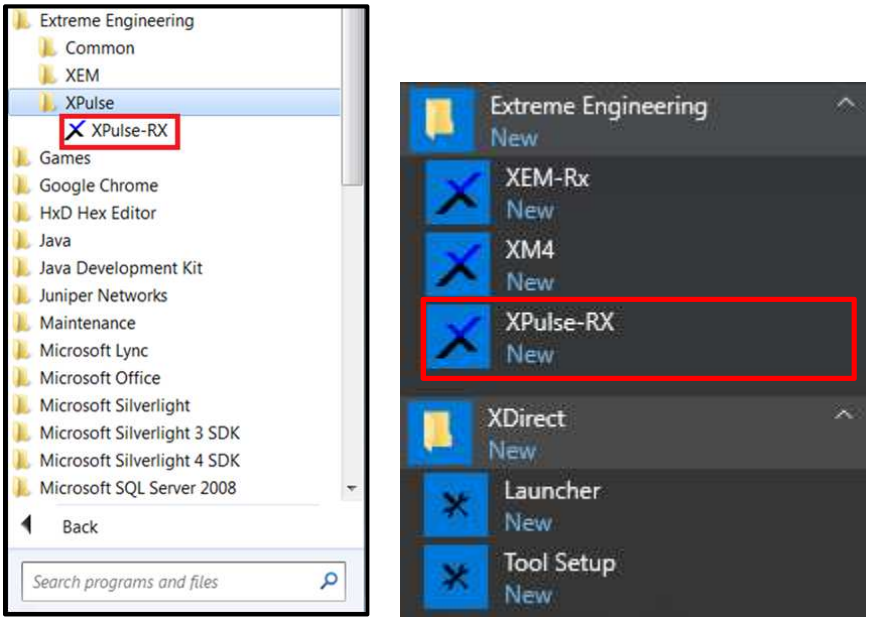
This section will detail using XDirect with an XPTR or Laversab setup.

10.1 Starting Pulser Rx

On reboot, Pulser Software Rx will start after about 10 seconds if you selected Pulser as a default system and setting auto launch.

To manually start the Pulser Software Rx, select ***Windows Start -- All Programs -- Extreme Engineering -- XPulser -- XPulser-RX***

Select a data file and configuration file as with previous Surface Software versions.



10.1.1 QPSK Pulser Overview

The XPulse Receiver supports the QPSK modulation. The QPSK modulation is intended to provide better decoding performance in deeper wells and reduce the effects of drilling and pump noise by increasing the frequency of the signal from the tool.

10.1.2 QPSK Supported Mode

The supported modes for XDirect XPulse QPSK Decoder are listed in the table below:

Carrier Freq. (Hz)	Bit Rate (bps)	Cycles Per Symbol
0.5	0.25, 0.5, 1	4, 2, 1
0.625	0.25, 0.42, 0.625, 1.25	5, 3, 2, 1
0.75	0.25, 0.5, 0.75, 1.5	6, 3, 2, 1
1.0	1	2
1.25	1.25	2
1.5	1.5	2
1.75	1.75	2
2	2	2

- **Note that legacy Xpulse only supports frequencies up to 0.75 Hz.**

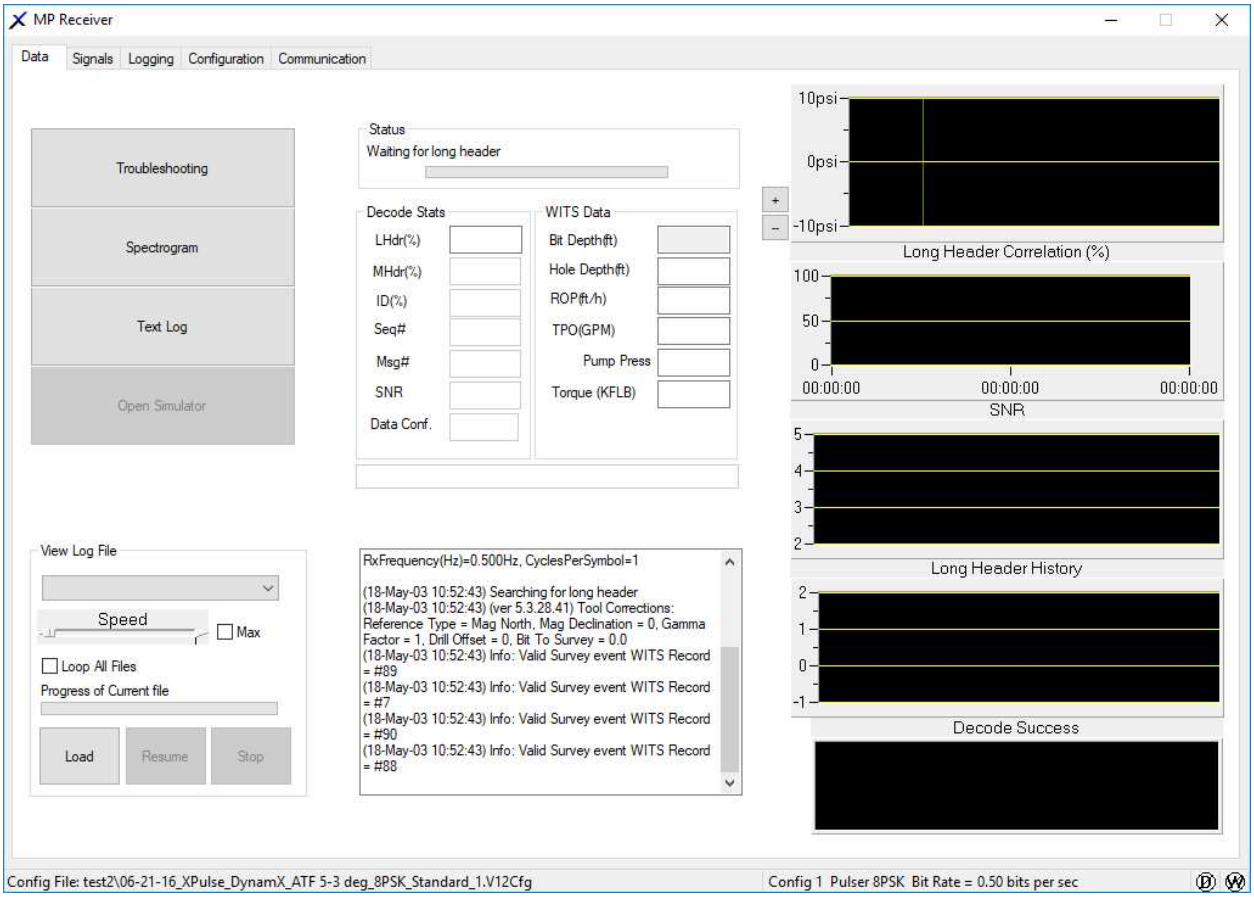
10.1.3 8PSK/PPM Decoder

The XPulse Receiver can load 8PSK (from Version 11 and previous) and QPSK configurations.

10.2 XPulse Data Tab

When running 8PSK/PPM configurations on an XPulse Receiver, the Data tab can be used to monitor the signal trace, Long Header Correlation, SNR, Long Header History, and Decode Success.

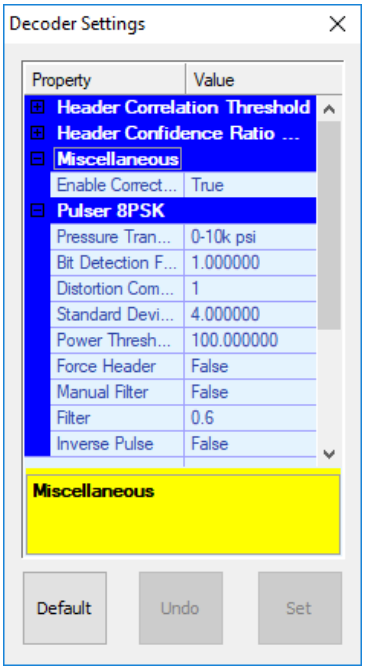
The Data tab is used for confirming data that may not be visible in XDirect.



10.3 XPulse Decoder Settings

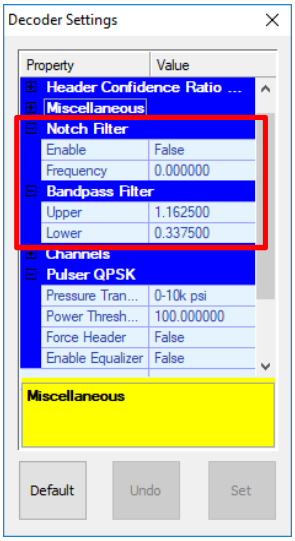
Decoder settings are accessed from the Troubleshooting button on the “Data” tab. The settings that are available will depend on the type of configuration file loaded and will be different for 8PSK/PPM configurations and QPSK configurations.

10.3.1 8PSK / PPM Configurations



10.3.2 XPulse Decoder Settings

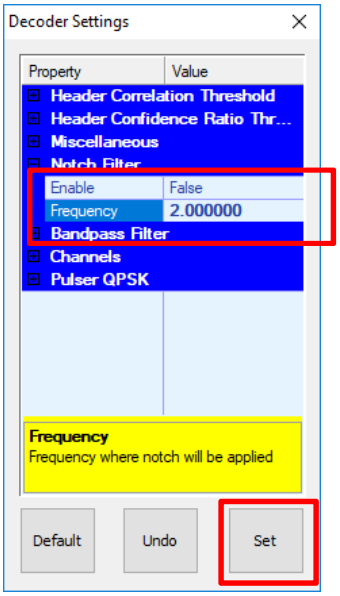
The Decode setting will change if you load a QPSK configuration file. When running QPSK files, band pass and notch filters are available.



10.3.2.1 Set Band Pass Filter

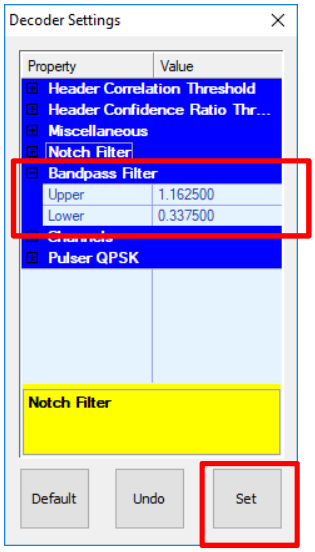
If there is tone noise present within the signal bandwidth, and the noise is steady at a specific frequency as observed on the FFT, a notch filter can be set at that frequency to filter the noise and improve decoding.

To set a notch filter, first set “Enable” to “True”, enter the desired notch frequency, and then click Set.



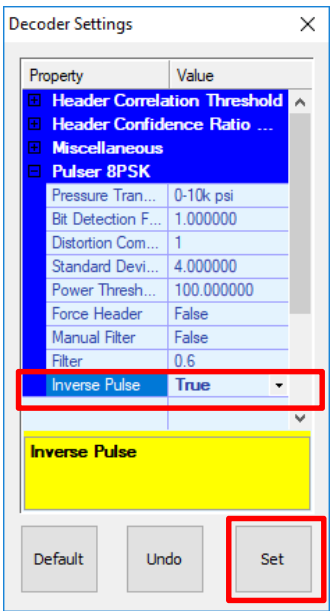
10.3.2.2 Modify Band Pass Filter

If there is noise present near the edges of the signal band, the band pass filter limits can be narrowed. To modify the band pass filter, enter new “upper” and “lower” limits and then click Set.



10.3.3 Inverse Pulse

The Inverse Pulse option can be used when troubleshooting suspected problems with the downhole tool, causing pulses where there should be no pulses, and vice versa, in the decoding frame. Set the “Inverse Pulse” option to “True”. Inverse Pulse is only available for PPM configurations.

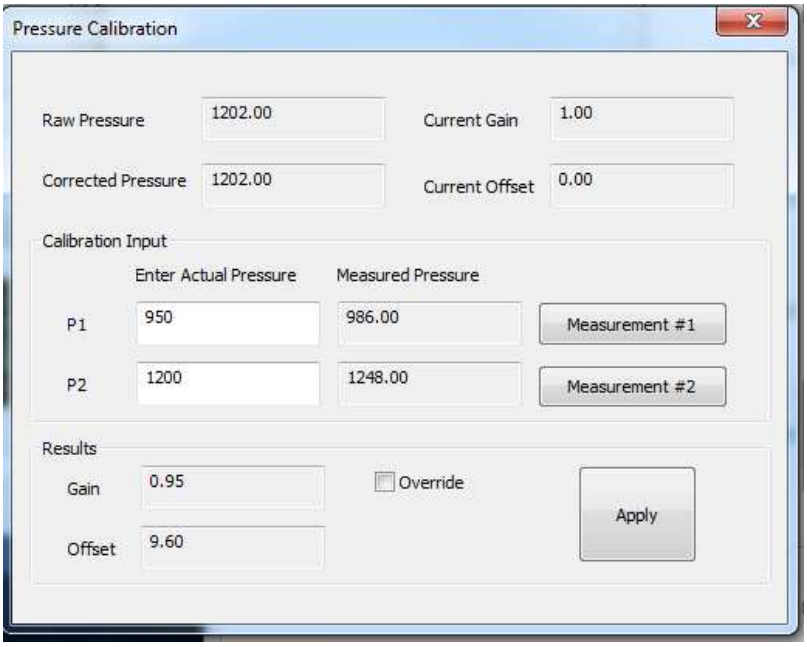


10.3.4 Pressure Calibration

When using a Viatran transducer with Laversab, the measured pressure may have to be calibrated for improved decoding performance. Calibration requires two measurements to be taken over 100 psi apart.

The setting is in the Troubleshooting Menu.

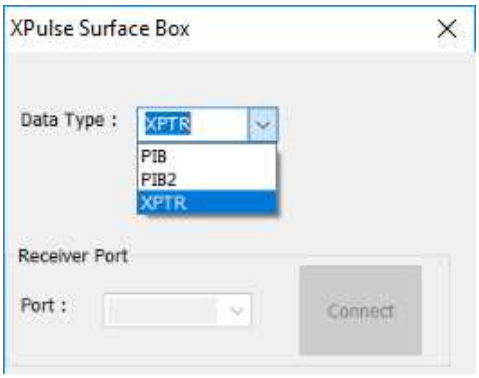
1. Open Pressure Calibration
2. Set rig to a certain pressure reading in Raw Pressure
3. Record actual Rig Value for Pressure in P1 and
4. Click Measurement #1
5. Have rig increase the pressure over 100 psi
6. Enter the pressure in P2
7. Click Measurement #2
8. The Gain and Offset Values will show under Results
9. If you want to accept these values, click Apply
10. If you want to revert to standard values,
    click Override and enter Gain of 1 Offset of 0


Pressure Calibration
Raw Pressure
1202.00
Current Gain
1.00
Corrected Pressure
1202.00
Current Offset
0.00
Calibration Input
Enter Actual Pressure
Measured Pressure
P1
950
986.00
Measurement #1
P2
1200
1248.00
Measurement #2
Results
Gain
0.95
Override
Apply
Offset
9.60

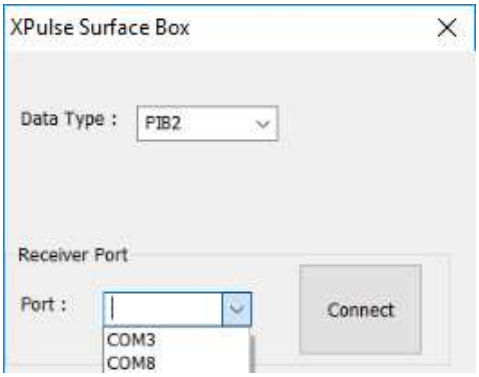
10.4 XPulse Surface Box

There are three types of XPulse decoding hardware. If user does not see XPulse trace scrolling, they should check the Surface Box settings under the Troubleshooting menu.

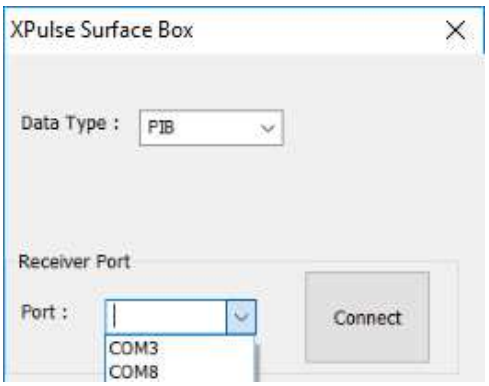
- XPTR: Choose Data Type XPTR from dropdown menu and click connect



- Laversab: Choose Data type PIB2 from dropdown menu and choose Port COM1 and click connect



- PIB in Box: Choose PIB from dropdown menu and corresponding COM port shown in device manager.



11 Surface Survey Calculations

Calculations for GTotal, MTotal, Dip Angle, Inclination, and Azimuth can be calculated on surface when the Survey frame contains only the raw axes: Ax, Ay, Az, Mx, My, and Mz. In addition to a Raw Axes Survey, the Rx will also distinguish between Quick, Full, and Inc-Only surveys.

The table below illustrates the definitions of each type of Survey. If a Configuration file does not have one of these Survey definitions, it is undefined.

Survey Type	Definition
Raw	Ax, Ay, Az, Mx, My, and Mz
Quick	Inc, Azm, GTotal, MTotal, and Dip Angle
Full	Ax, Ay, Az, Mx, My, Mz, Inc, Azm, GTotal, MTotal, and Dip Angle
Inc-Only	Inc, GTotal
Undefined	The Survey frame contains duplicates or missing words that constitute one of the above definitions.

11.1 Using SSC

SSC is automatic when the configuration contains raw axes in the Survey frame. The calculated words will appear in the output and in the GUI as though they were added in the configuration and transmitted by the downhole tool.

11.2 CSV Output

Contents of the Survey All and Accept CSV files consist of a header row at the top. Data will be displayed in the following rows:

#	Column Name	Description
1	Num	Sequential number of the Survey that starts from "1"
2	Time	Time that the Survey event occurred. For EM, this is the configuration time (usually 30 seconds) after the pumps are shut off. For Mud Pulse, the time is based on when the Decoder's pressure threshold triggers a flow off event. The format of time follows PTK's format of: HH:MM:SS DD-MMM-YYYY
3	Survey MD	Measured Depth
4	INC	Inclination that was computed by SSC or transmitted
5	AZM	Azimuth that was computed by SSC or transmitted
6	Course Length	Difference between the Survey MD that occurred beforehand and the current Survey's MD
7	Bit Depth	Bit Depth = Survey MD + Bit to Survey Offset
8	Bit to Survey Offset	The distance between the drill bit and the directional sensor
9	MTotal	Magnetic Total that was computed by SSC or transmitted
10	GTotal	Gravimetric Total that was computed by SSC or transmitted
11	Dip	Magnetic Dip Angle that was computed by SSC or transmitted
12	Ax	Raw axial accelerometer
13	Ay	Raw y-lateral accelerometer
14	Az	Raw z-lateral accelerometer
15	Mx	Raw axial magnetometer
16	My	Raw y-lateral magnetometer
17	Mz	Raw z-lateral magnetometer
18	Survey Type	Quick = 0, Raw = 1, Full – 2, Inc-Only = 3, and Not defined = -1
19	FAC Pass	Pass = 1 and Fail = 0
20	Inclination pass only	True = 1 and False = 0
21	Standard FAC used	Used = 1 and Not Used = 0
22	FAC value of MTotal	The reference value specified in the Qualifiers Window
23	FAC value of GTotal	The reference value specified in the Qualifiers Window
24	FAC value of Dip	The reference value specified in the Qualifiers Window
25	Accepted flag	Accepted = 1 and Rejected = 0. Only the Survey All CSV has this column

12 Drilling and Logging

XDirect contains a Well Logging system. In this system you can capture the history of the real-time and recorded data, including WITS.

The following features are available with the logging system:

- Loading and saving logging templates
- Adding and formatting tracks
- Adding, formatting, and removing curves
- Stick to now
- Depth and time-based plots display
- Relogging and Hole Depth Reset
- Autogenerated Curves
- LAS import
- Graphical and ASCII Exports

Note that XDirect will store the info being logged into the currently active run.

12.1 Prerequisites

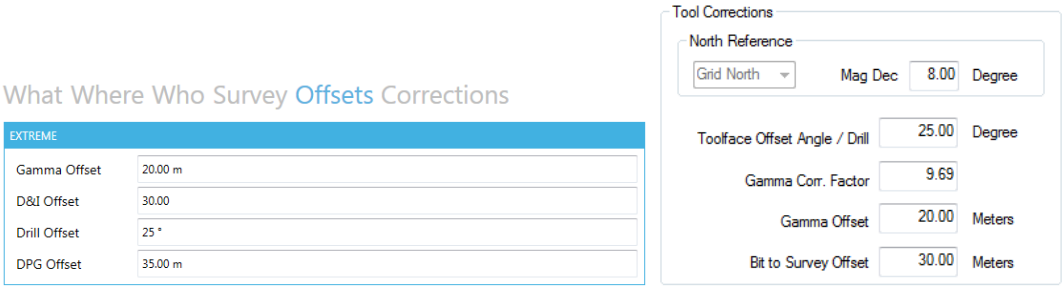
- X-WITS, X-Server and Surface Receiver applications are running before opening the Web Client application.
- XDirect build GR 312 and Receiver build 12.24.67 or newer must be installed.
- Current bit depth on WITS ID is "0821".
- Verify WITS data is being received from EDR.

12.2 Bit to Sensor Offsets

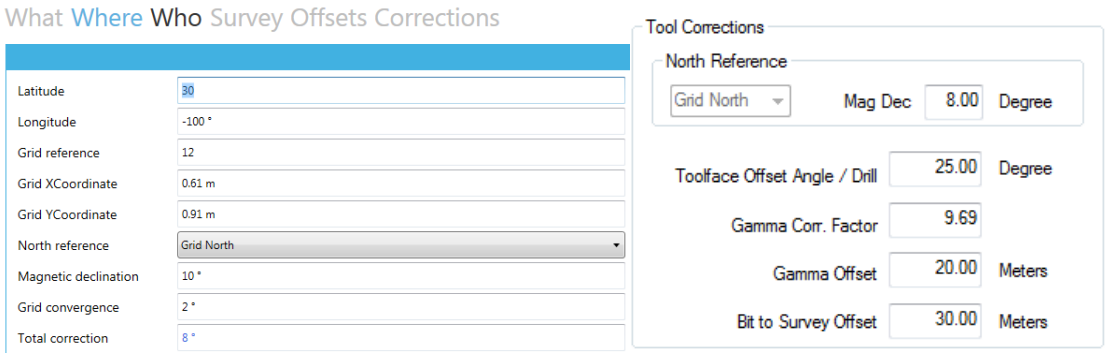
Ensure that the “bit depth” field is updating on the Receiver "Data" tab before proceeding.

If XDirect application is installed on the machine, receiver application will read the bit-to-D&I sensor and bit-to-gamma sensor values entered in XDirect and will update every time a header is decoded.

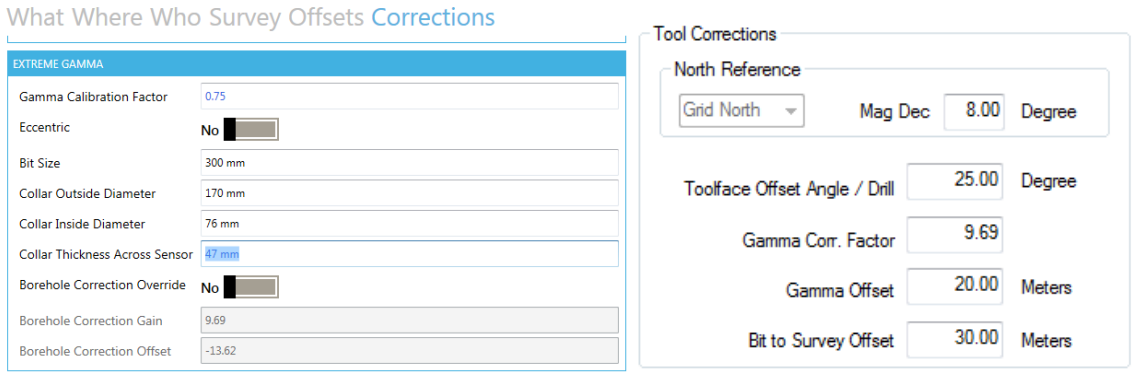
Verify that the XDirect tool run setup (left) and "Configuration" tab (right) must have identical information for Bit to Survey, Bit to Gamma and Drill offset.



Verify that the XDirect tool run setup (left) and "Configuration" tab (right) must have identical information for North Reference and Magnetic Declination.



Verify that the XDirect tool run setup (left) and “Configuration” tab (right) must have identical information for Gamma Borehole Correction Factor.



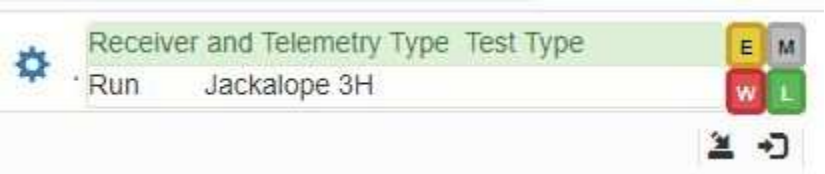
12.3 XDirect and Receiver Terminology

Note the difference in terminology between the applications and ensure the correct values are entered in both:

XDirect	Receiver
D&I Offset	Bit to Survey Offset
Drill Offset	Toolface Offset Angle / Drill
Gamma Offset	Gamma Offset
Borehole Correction Gain	Gamma Correction Factor

12.4 Status Indicators

All viewing pages in Google Chrome now provide a quick status reference to indicate the connection status between XDirect, Decoding Receivers, WITS Input and Logging Status. The status indicators are located on the top right of the page.



Receiver Types

- E = EM Receiver
- M = Mudpulse Receiver

Receiver States

- Green – decoding and connected
- Yellow – connected waiting for sync
- Grey – no data expected
- Red – not connected/communicating

W – WITS

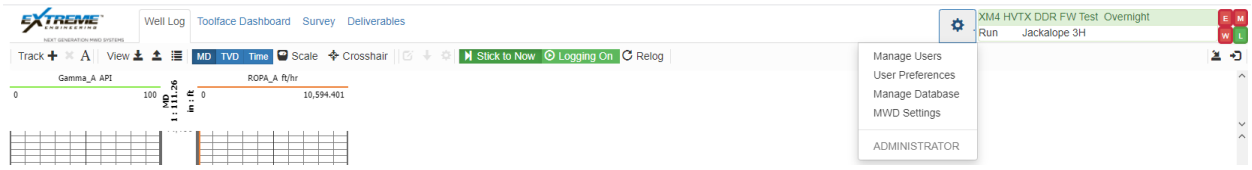
- Red – no data received for some time
- Green - good

L – Logging

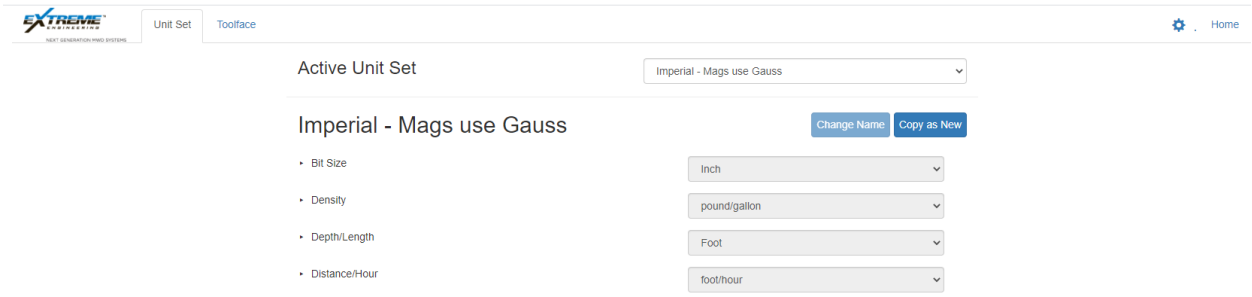
- Red – logging off
- Green – logging on

12.5 Unit Preferences

Unit preferences can be adjusted from any tab by clicking the Administrator button and selecting User Preferences.



Once this is done, there are four generic unit sets available which can be selected in the drop-down menu at the top of the page.



Custom sets can be created by clicking Copy as New and entering in a New Name then clicking Copy. After this is done each unit can be edited individually. Each user can create their own sets of units that can be seen and used by other users but cannot be edited.

12.6 Network Connection Options

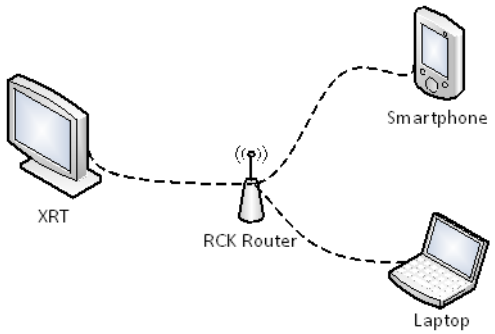
The well logging features can be accessed on the computer running XDirect, or on a remote computer with a web browser.

12.6.1 Local Computer Access

The well log can be viewed using a web browser (Chrome is preferred) running on the local computer. Using the browser running on the same computer running XDirect, enter the URL *http://localhost:3000* or click the Well Log button from the launcher page.

12.6.2 Remote Computer Access

To access the toolface dashboard features from a remote computer, the computer used as a viewer must be on the same network as the computer running XDirect. The diagram below represents a common configuration:



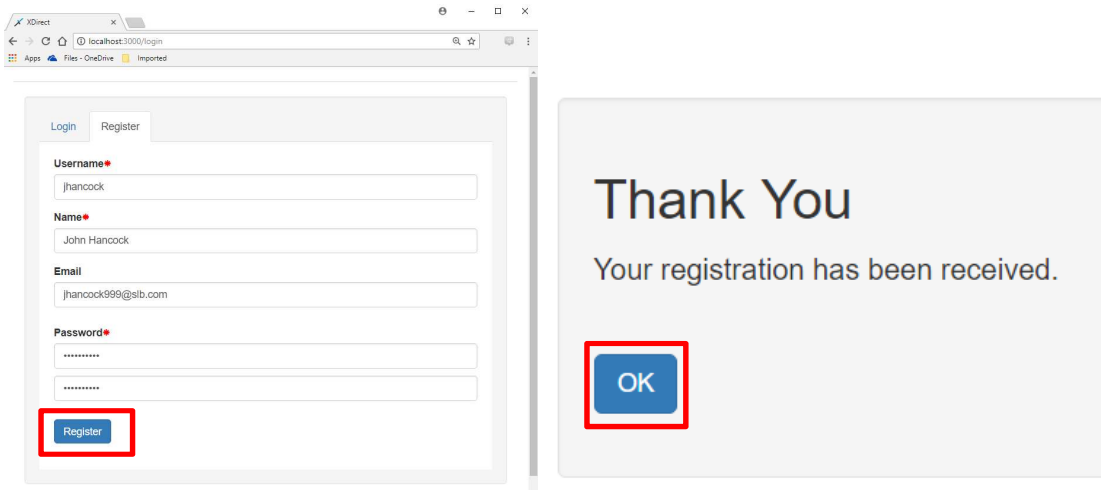
The XRT runs XDirect, which also acts as a web server for any other devices within the local network.

The other devices (smartphone, laptop etc.) can connect to the XRT using a web browser and connecting to: *http://255.255.255.255:3000* – replace 255.255.255.255 with the IP address of the XRT. This is typically in the 192.168.x.x range but will depend on the local network configuration.

The IP address of the XRT can be checked by opening a command prompt window and typing **ipconfig**.

12.7 Remote Connection Account Login

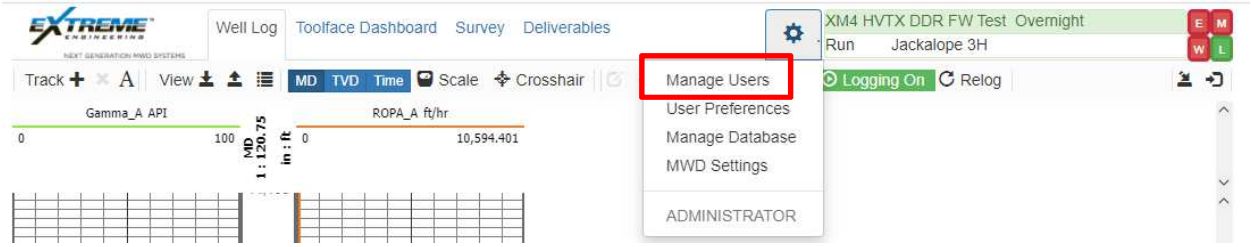
When connecting from a remote computer, you will be prompted to enter a username and password. The first time this feature is used, click the “Register” tab and enter a username, name and password. Then click Register. Then a "Thank You" message will be displayed.



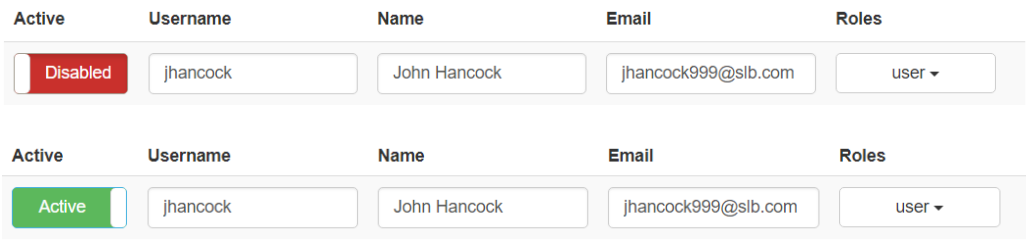
Click OK to go back to the login screen.

For security reasons, the newly registered user account must be activated on the computer running XDirect before it can be used to login. Using the browser running on the same computer running XDirect, enter the URL *http://localhost:3000* or click the Well Log button from the launcher page.

. Then click the Settings Icon and Manage Users.

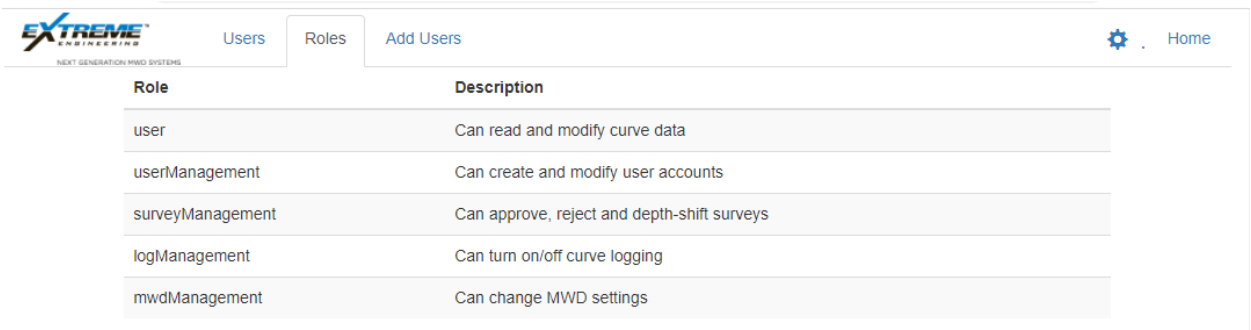


In the “Manage Users” screen, set the slider next to the new account to “Active”. The username and password can then be used to login from the remote device.

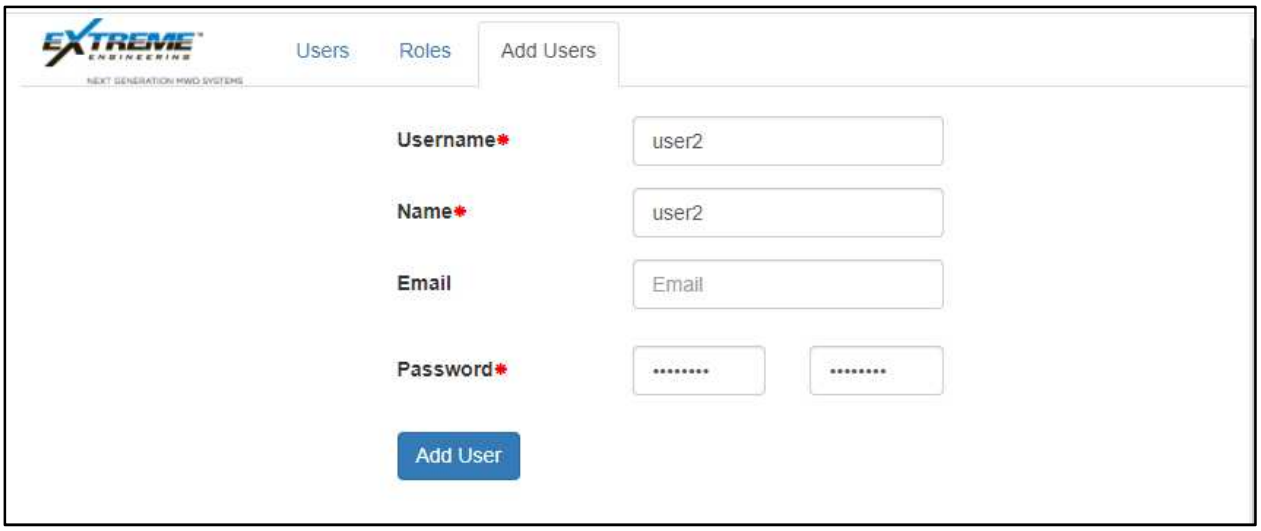


There are three levels of access available.

- User: Allows user to view data
- User management: Allows user to create and modify user accounts
- Survey Management: Allows user to approve, reject, and edit surveys
- Log Management: Allows user to edit well logs
- MWD Management: Can change MWD Settings

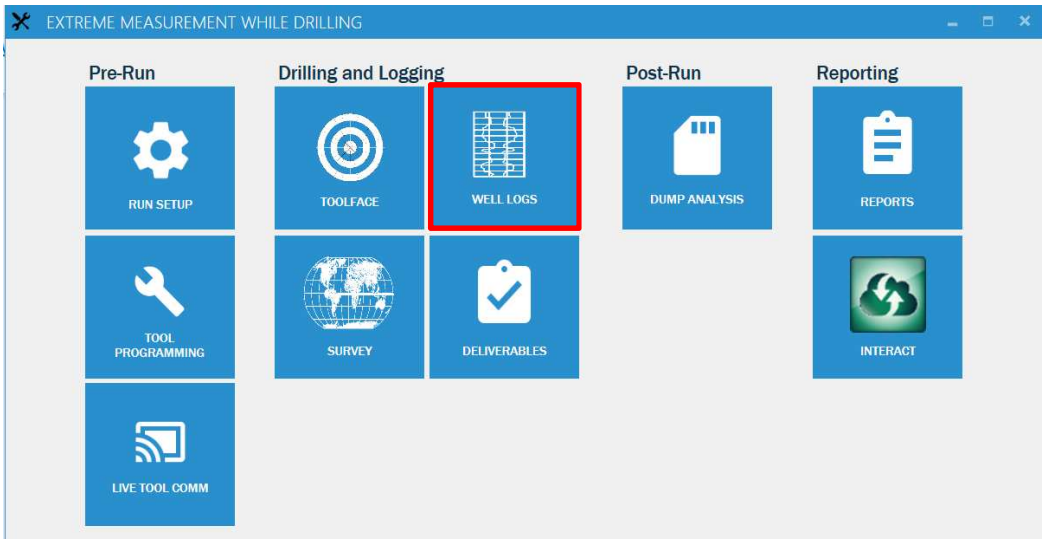


A remote user can also be created from the computer running XDirect using the Add User function

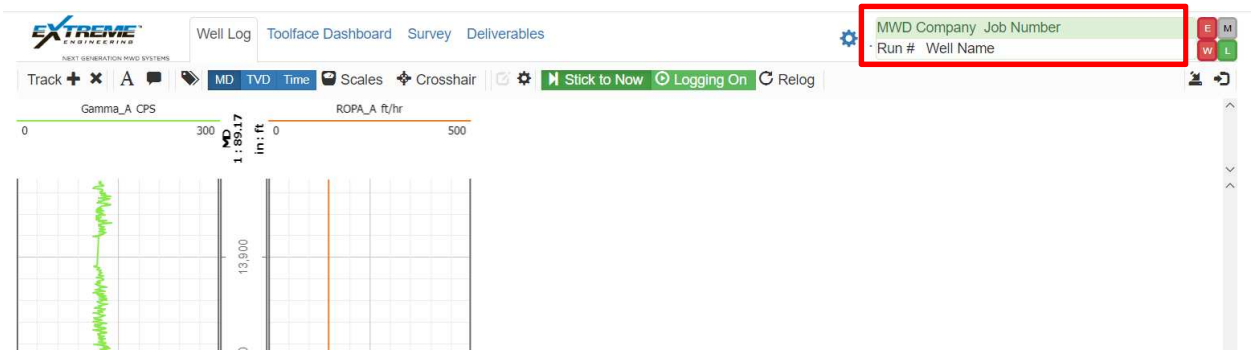

Users
Roles
Add Users
Username*
user2
Name*
user2
Email
Email
Password*
Add User

12.8 Well Log Interface

The main Well Log interface can be accessed by clicking the Well Logs shortcut on the launcher page or by accessing it directly from Google Chrome by navigating to localhost:3000



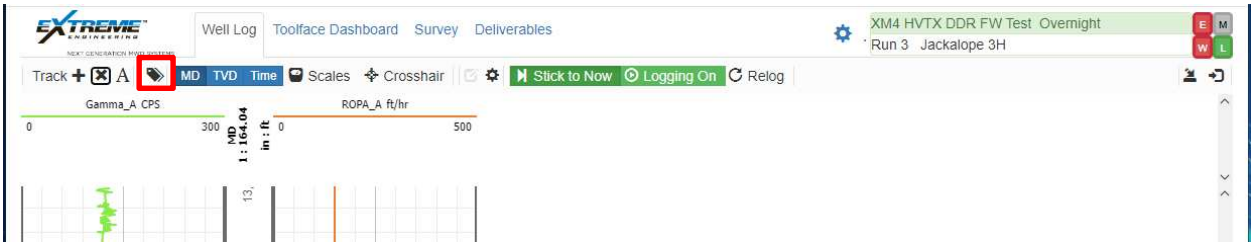
Job information entered in the Run Setup section will be shown on the top right of the page.



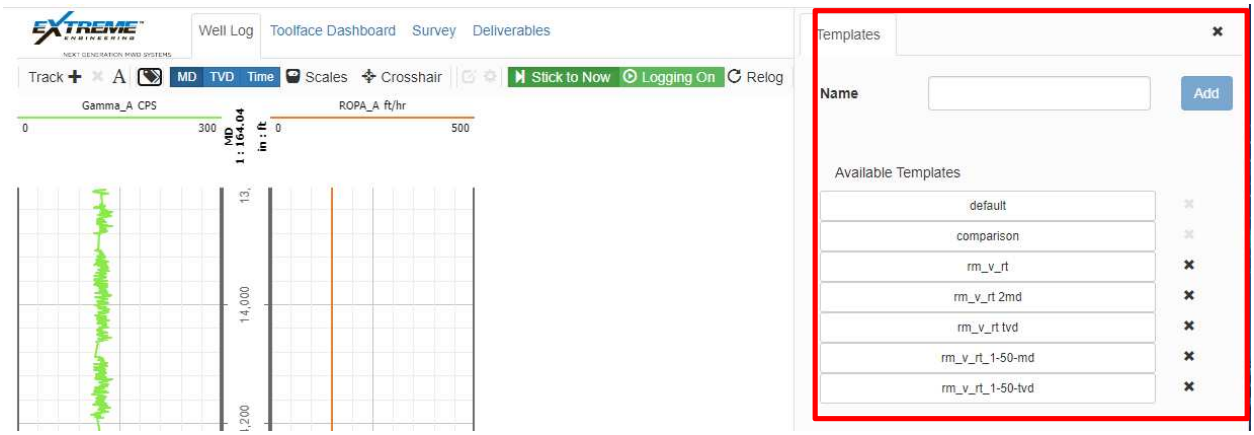
12.9 Loading and Saving Templates

12.9.1 Template Table

Well log templates can be accessed using the Template Table.



Clicking the table button will bring up a list of currently saved templates on the right side.



New templates can be created by entering a Name and clicking the Add button.

Individual templates can be deleted by clicking the X to the right of the template name.

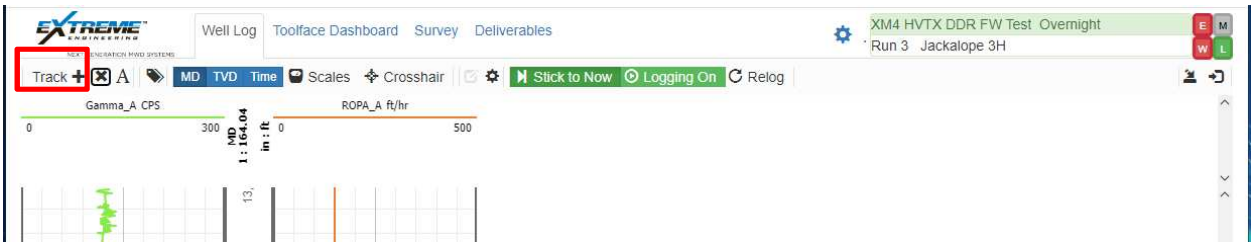
Existing templates can be loaded by clicking on the template name.

12.10 Tracks

The logging tracks are displayed as horizontal and vertical lines (grid) of the Well Log interface.

12.10.1 Adding Tracks

Click the Add Track button to add a choice of four tracks. Delete tracks by clicking them and then clicking the [x] icon.

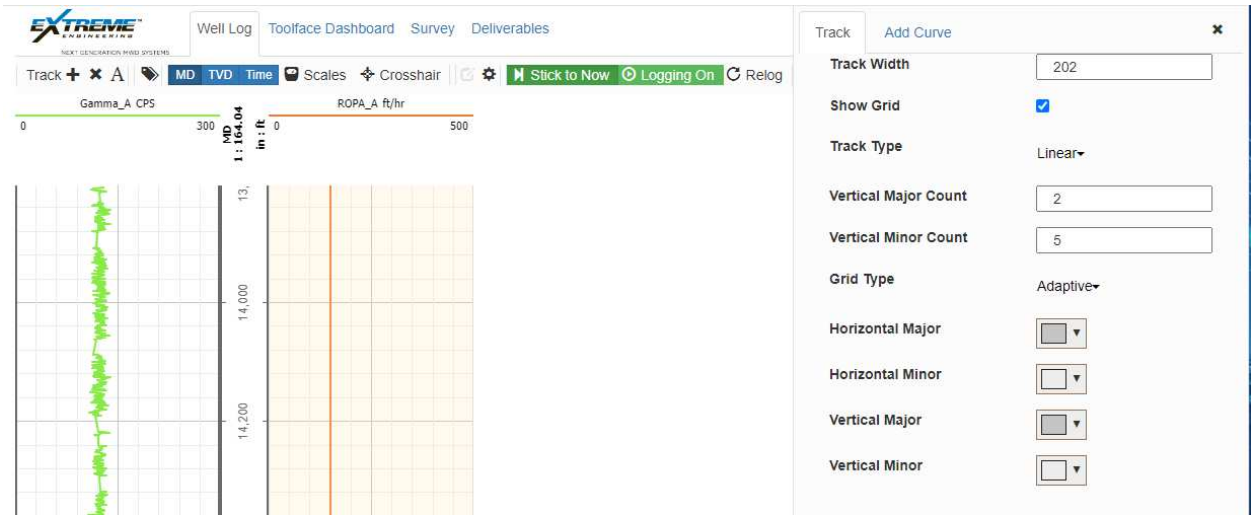


Track Types

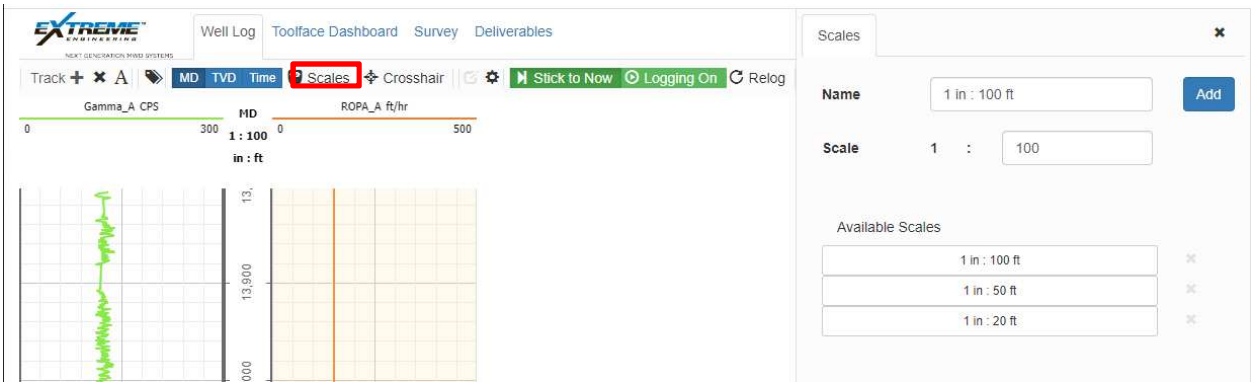
- Index Track - Grid showing what units are being used to display the data (depth or time).
- Linear Track - Grid which displays the logging curve.
- Logarithmic Track - Scaling on the X-axis.
- Text Track - Displays an annotation created by the user.

12.10.2 Formatting Tracks

Double-click a (non-index) track to bring up its Properties menu. You can change the selected track's properties such as the type, width, and color.

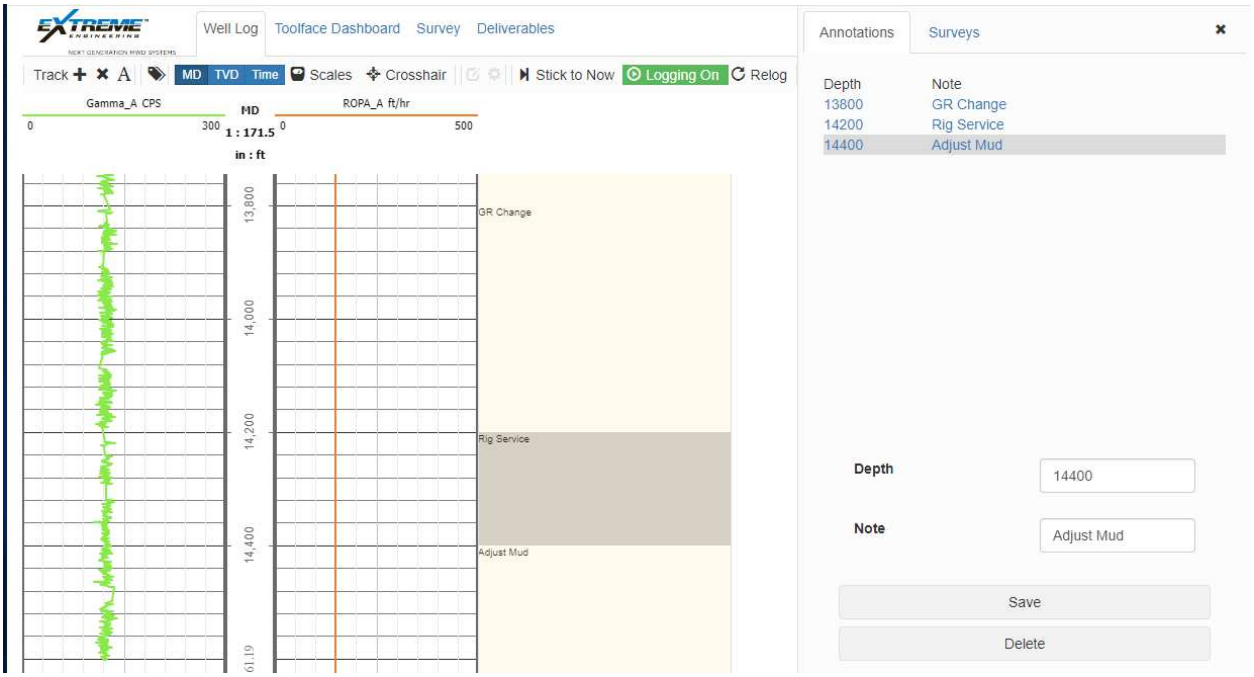


Scales can be selected by clicking the scale button. The scale menu will appear. User can create custom scales if needed.



12.10.3 Adding Annotations

From the "Add Track" menu select "Text" to create a Text track. Then select the A icon from the main menu.

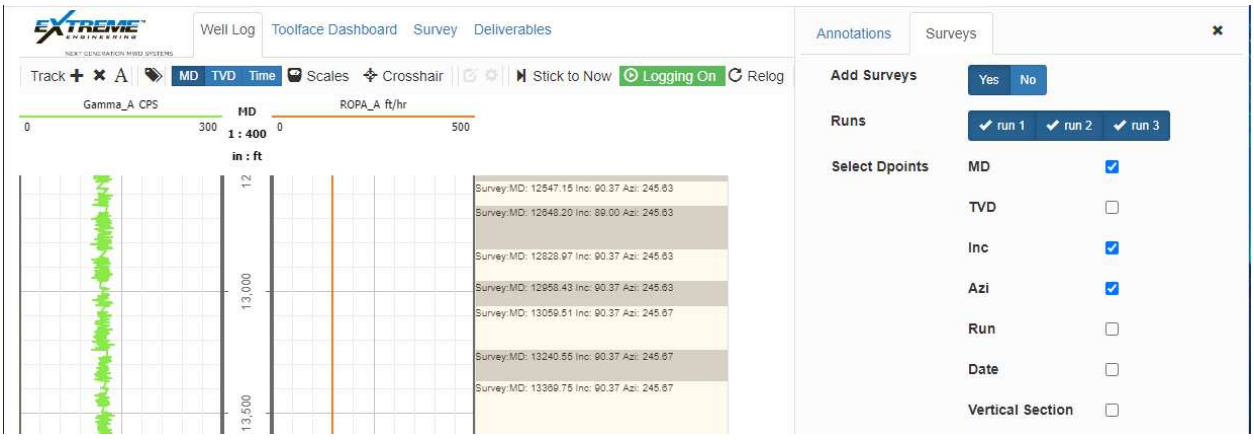


The Annotations menu will appear. Enter the depth on where you want the annotation to appear. Next, enter an annotation in the "Note" field. Then click Save.

The annotation will then be displayed on the well log.

A list of all annotations will populate with the corresponding depth. The annotations can be selected by clicking on them and the current depth and texts settings will be displayed. The annotation can then be edited or deleted.

Accepted surveys can also be added to the annotation track using the Survey tab. The user can filter surveys by run and choose which survey data to display on the track.



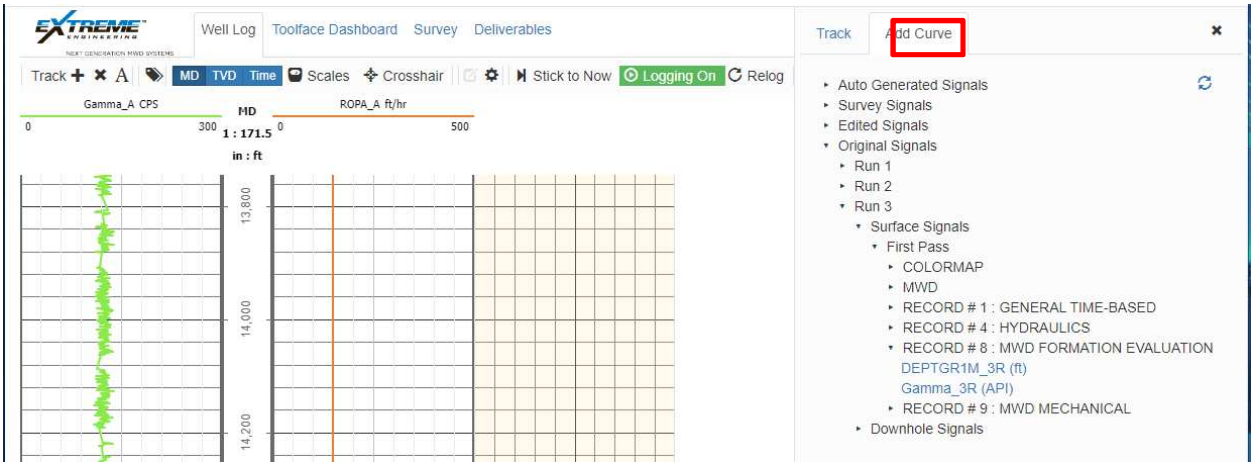
12.11 Curves

Curves can be added to the Well Log interface.

12.11.1 Adding/Deleting Curves

Double-click a track to select it.

Select the "Add Curve" tab. The user can then select a curve from the list which appears on the right panel.



Note that curve values with the following icon to the left do not currently contain any data but can be used to create templates.

If there is a data point missing that is currently decoding, click the refresh button to update the list.

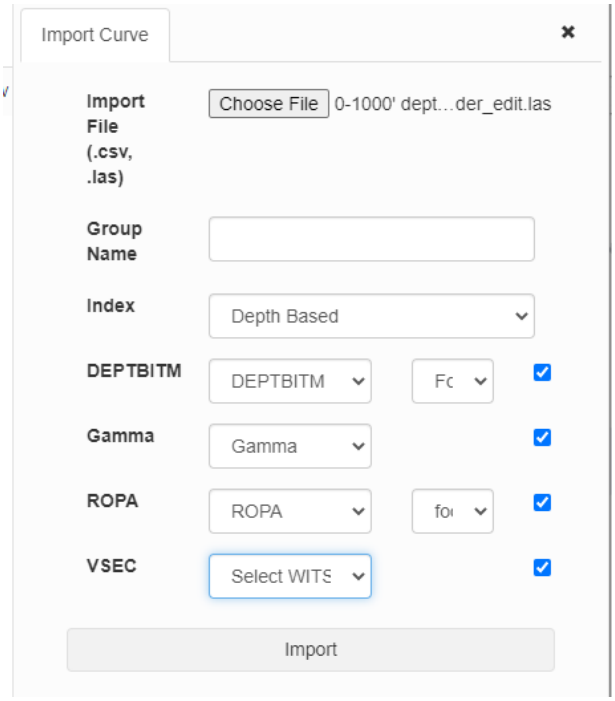
To Delete a Curve, click the Curve Header and then click the X in the Toolbar.

12.11.2 Importing Curves

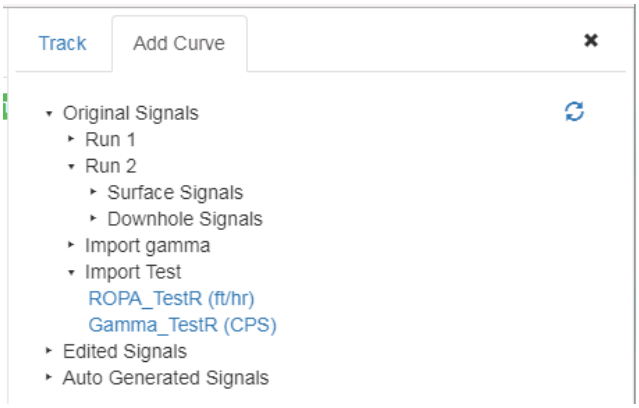
XDirect allows depth curves to be imported using an LAS or CSV file. Imported LAS files will be treated as separate runs and will be listed in the run menu under the Group Name that is used. There will not be a choice for Surface or Downhole for Imported Runs. The default setting is Surface.

Clicking the Import LAS shortcut will bring up the available options. Once a file is selected the user can manually select the units and WITS ID for selected datapoints.

- DEPTBITM must be assigned to the depth from the file to import values.
- A Group Name must be specified.
- Only values with the box checked next to the datapoint name will be imported.
- Units can be selected when applicable



The Imported curve will then show up in the Add Curve menu as a new run using the Group Name.



12.11.3 Curve Types

User has access to following different curve types for the same signal.

- Original
- Edited
- Autogenerated
- Color Maps

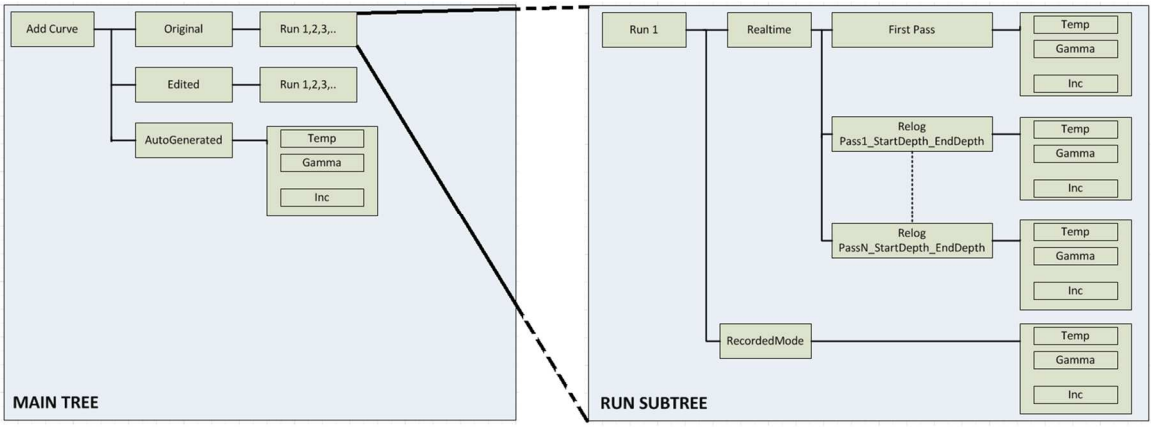
Original Curve: This curve contains the original signal data without any modification.

Edited Curve: These curves can be edited by the user (peak removal, depth shift, apply factor)

Autogenerated Curves: These curves are automatically generated by the system. Autogenerated curves combine data across multiple runs, relog sessions and real-time/recorded mode data.

Color Maps: These curves are available for azimuthal gamma ray data.

Signals in the curve list are organized in the following hierarchical chart:



12.11.4 Curve Naming Convention

Each signal in the curve list has different associated parameters. e.g. RunNumber, RealTime/RecordedMode, Original/Edited/Autogenerated. The naming convention reflects these properties in the curve name.

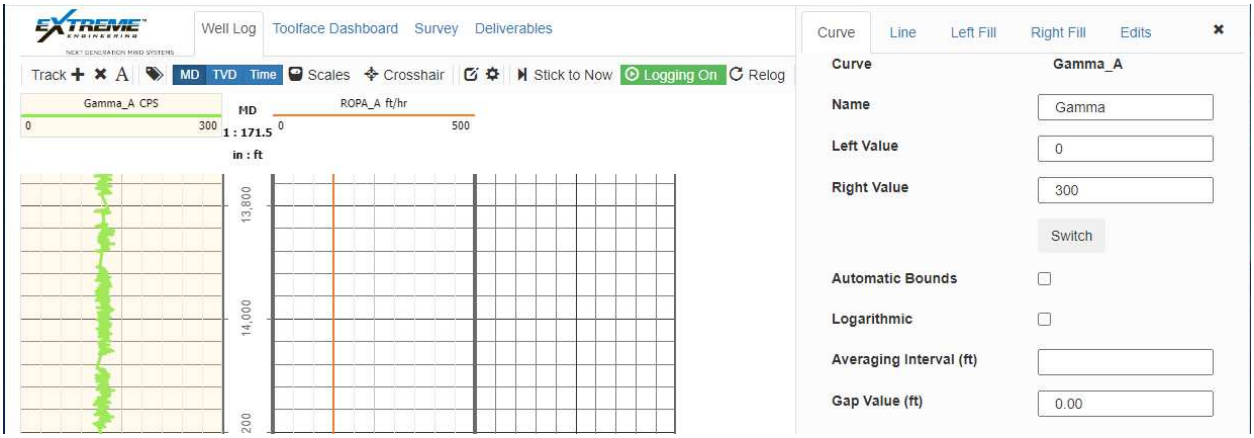
Signals in curve list have an associated postfix reflecting the type/properties of the curve. POSTFIX – Can have any of the following characters:

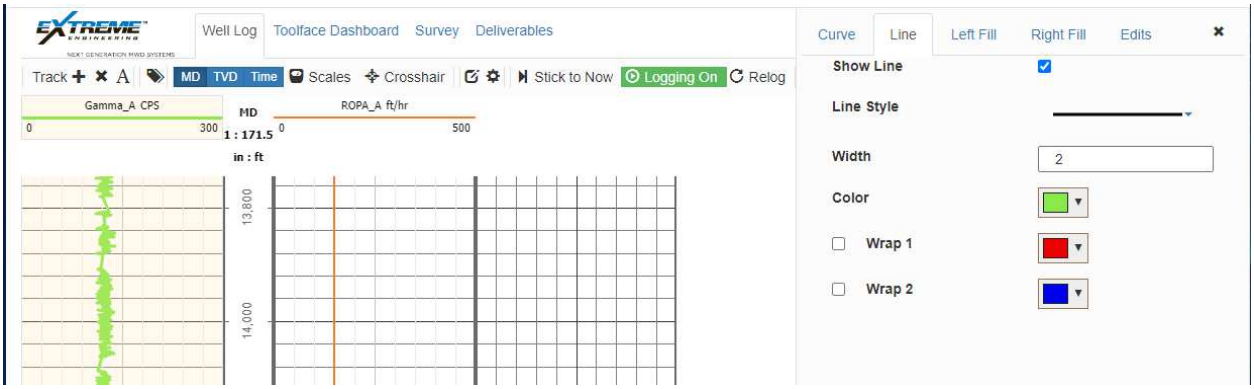
M ,R, E, A, #, and _#

- # can be any integer (1, 2, 3 …) representing the run number.
- Append ‘R’ or ‘M’ for realtime/memory data
- Append ‘E’ for edited
- Append ‘A’ for autogenerated curves
- _# can be any integer _1, _2, _3 .. representing the relog

12.11.5 Formatting Curves

Double-click a curve header on screen to bring up the curve's Properties menu. Then update the curve's properties such as changing the name, color, scale and curve wrapping. Curve smoothing is set with the Averaging Interval box.



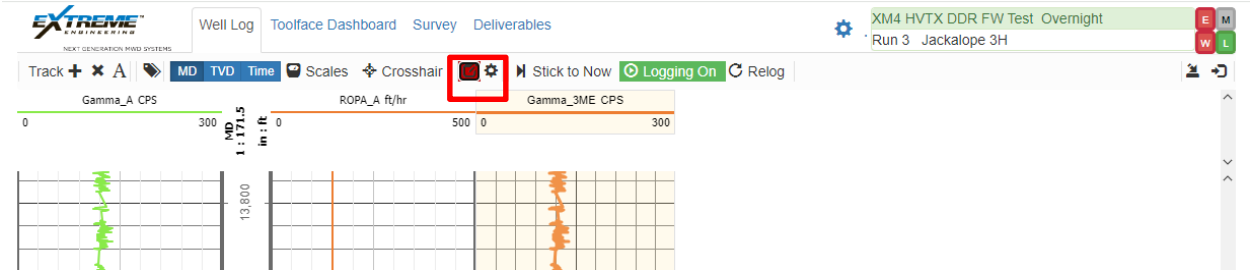


12.11.6 Editing Curves

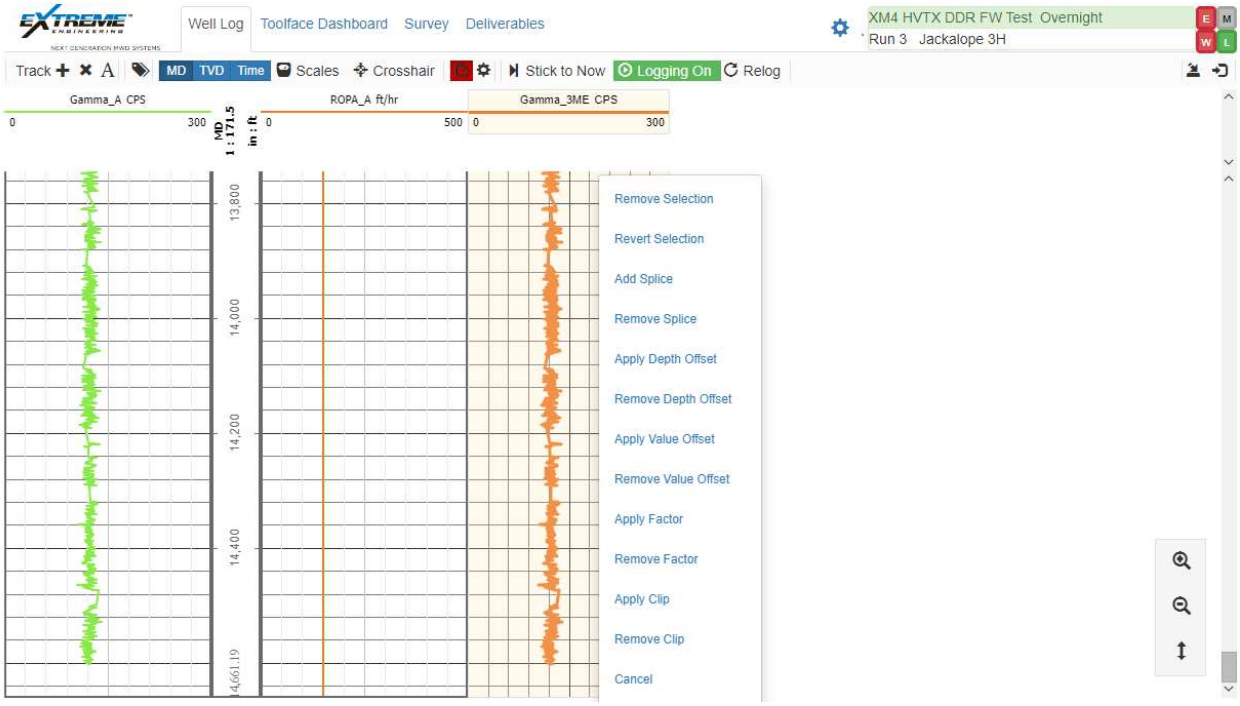
XDirect allows several edits to be made to the curves. Depth Shift is only available to the 'Edited Curve' and cannot be applied to Auto or Original curves. Edited curve values will transfer over to corresponding Auto Curves depending on the hierarchy. All other edits can also be applied to the Auto Curve.

- Remove Selection - Allows user to remove datapoints.
- Revert Selection – Adds removed selection back.
- Add/Remove Splice – Allows user to combine curves.
- Apply/Remove Depth Offset– Allows user to shift a section of a curve's depth.
- Apply/Remove Value Offset – Allows user to apply a value offset to a curve.
- Apply/Remove Factor – Allows user to apply a scale factor to a section of a curve.
- Apply/Remove Clip – Allows user to remove sections of the curve. Any values above or below the selected range will be removed for the depth selected. Useful for spike removal.

To use the edit functions, select an Editable Curve by clicking on it and the click the Edit Button.



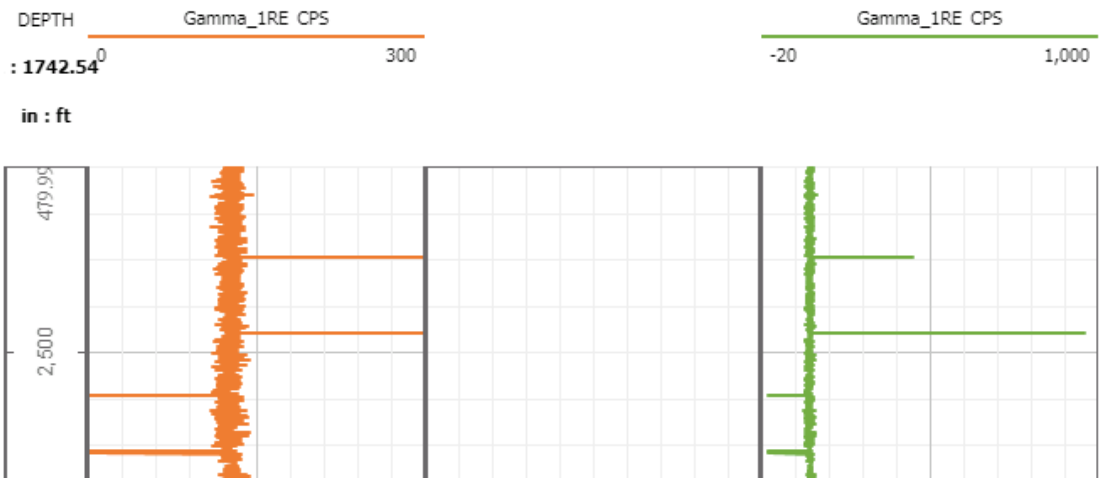
Click and drag to select the section of the curve you would like to edit. This will bring up the menu of available options.



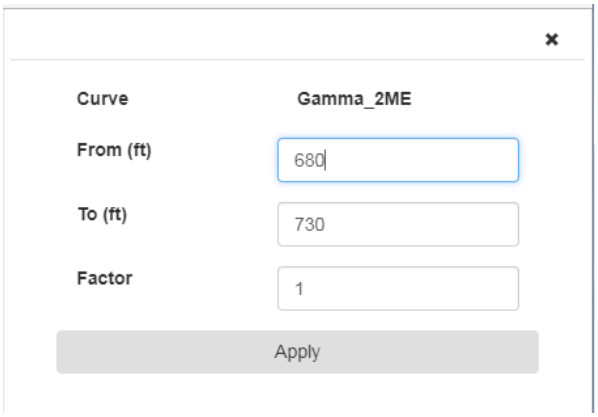
To use the "Remove Selection" function, the point must be visible in the log. If a spike extends outside of the viewable area, the scale will need to be adjusted to edit.

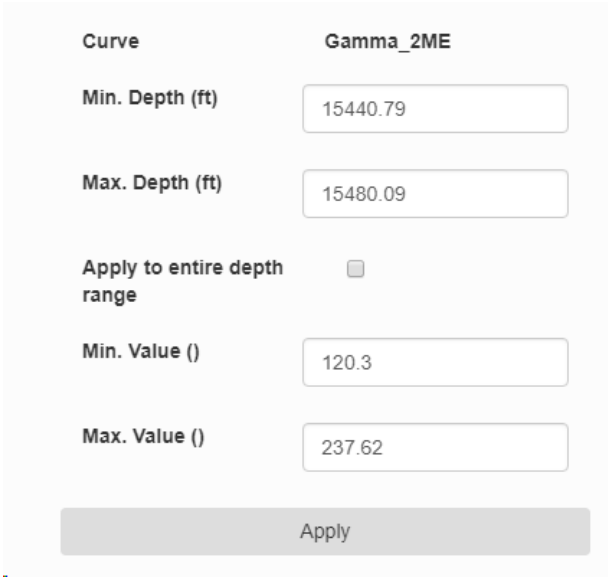
Spikes Outside Area – Cannot Remove

Spikes Visible – Can Remove



Applying an edit will show the selected depth range but will also allow you to override that choice and chose the exact depth range.

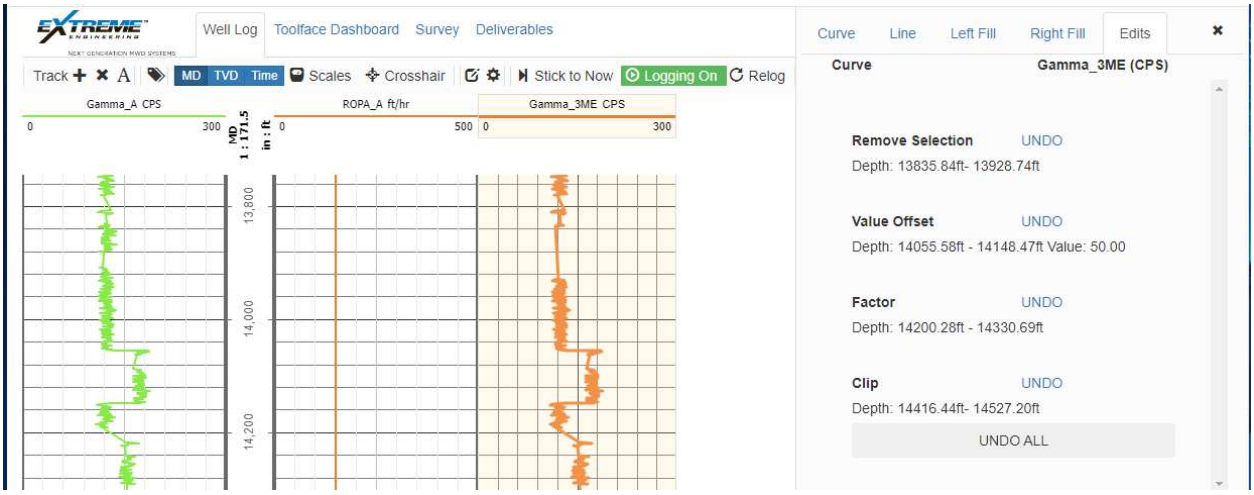




Changes to the curve can be removed by selecting the same area and using the following functions.

- Revert Selection
- Remove Offset
- Remove Factor
- Remove Clip
- Remove Splice

All changes to the curve can be viewed by double clicking on the curve to bring up Curve Properties and click on the Edits tab. Edits can be removed individually by clicking the Blue UNDO text next to the edit, or all edits to the curve can be removed by using the UNDO ALL function.



12.11.7 Splicing Curves

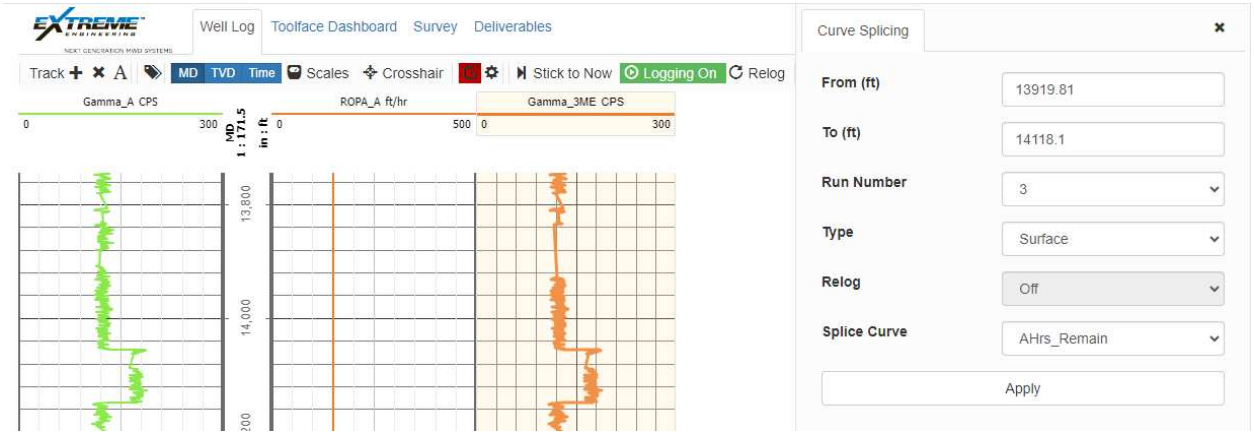
Any section of AutoGenerated or Edited Curve can be spliced from any of the available curves.

First click the curve to select it. Then click the [Edit Curve] icon from the menu so that the icon is highlighted. Draw a box around the area you want to insert data and select Add Splice from the popup menu. This will open “Curve Splicing” panel where user can select any curve, depth range, type and run (or group name for imported curves). The current depth range will be equal to the box that was drawn.

If Relog data is desired, choose the Run Number associated with the Relog, Set Relog to On and choose the Relog number.

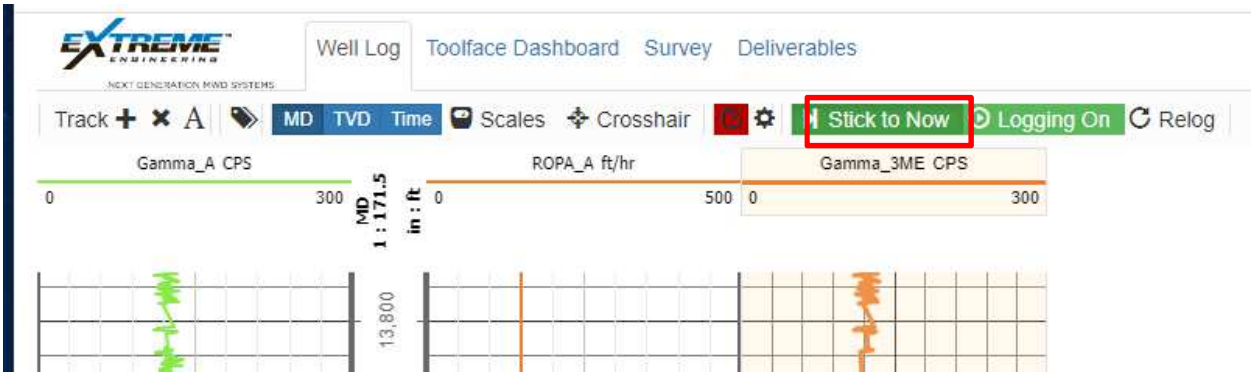
Click APPLY to splice new curve to selected curve.

User can undo the splice by selecting the spliced section of curve, clicking “Edit” and then selecting “Remove Splice” from the curve popup menu. The “Edit” button will stay red when active. The splice can also be removed in the Curve Properties menu.



12.12 Stick to Now

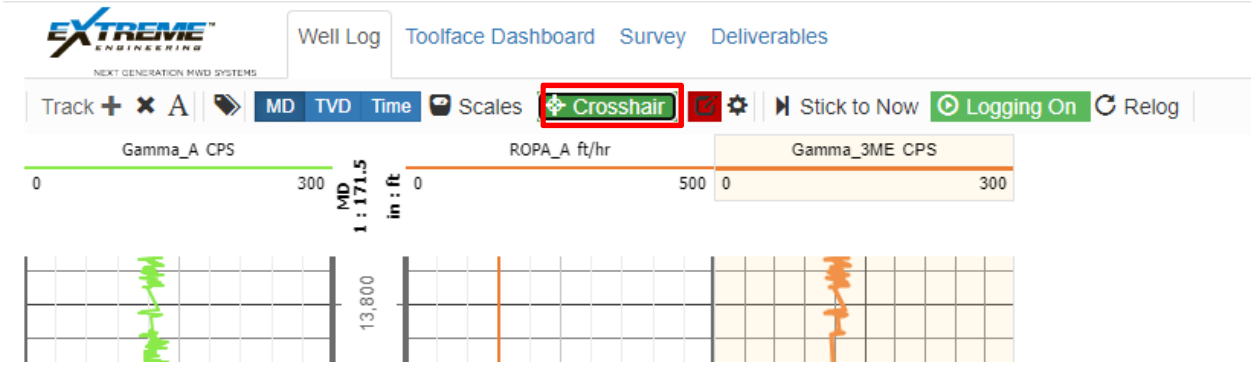
Click the Stick to Now button to force the Well Log interface to always focus on the bottom of the page, displaying real-time viewing of data. Deselect the button to stop the function. The button will turn Green when it is active.



12.13 Crosshair

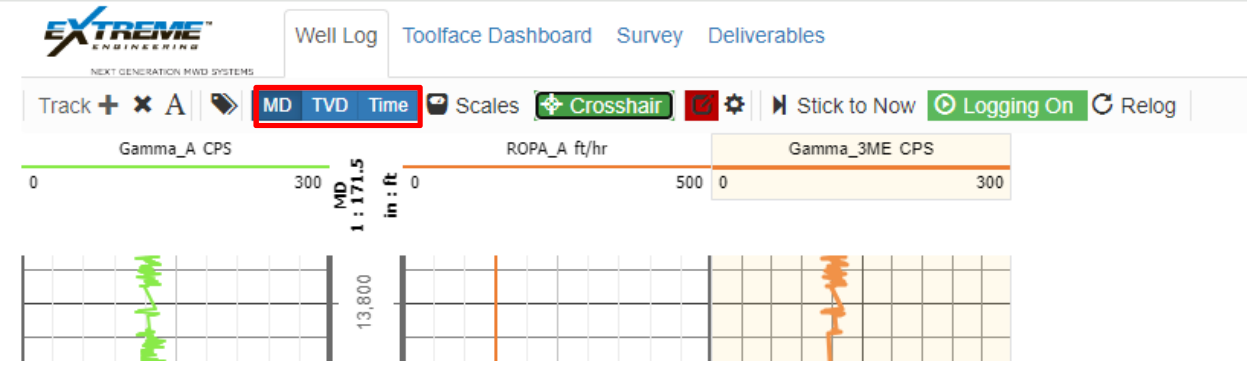
Activating the Crosshair function will display a value at any point on a curve in the header.

Click the Crosshair button to display of a horizontal line that moves with your mouse cursor. The button will turn Green when it is active. Deselect the Crosshair button to deactivate the function.



12.14 Depth and Time-Based Plots

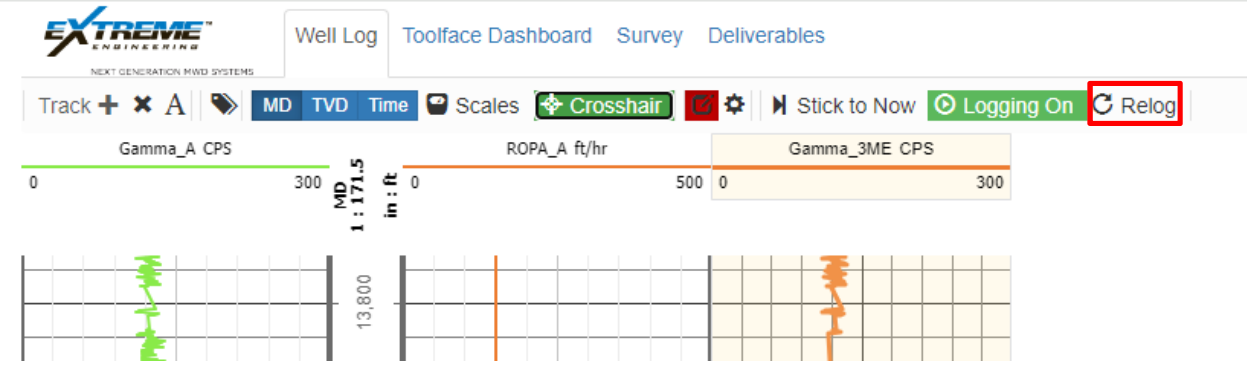
Clicking the Switch MD/TVD/Time button will toggle the plot data on the index track from either measured d depth, true vertical depth or time. The active item will be shown in dark blue.



12.15 Relogging

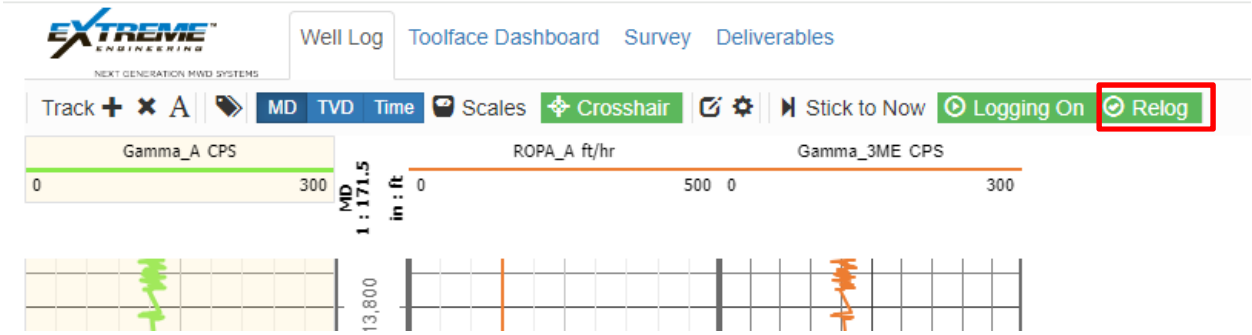
XDirect allows the user to relog a section of well log data using the Relog function.

To activate the Relog function, click the Relog button on the Well log tab.



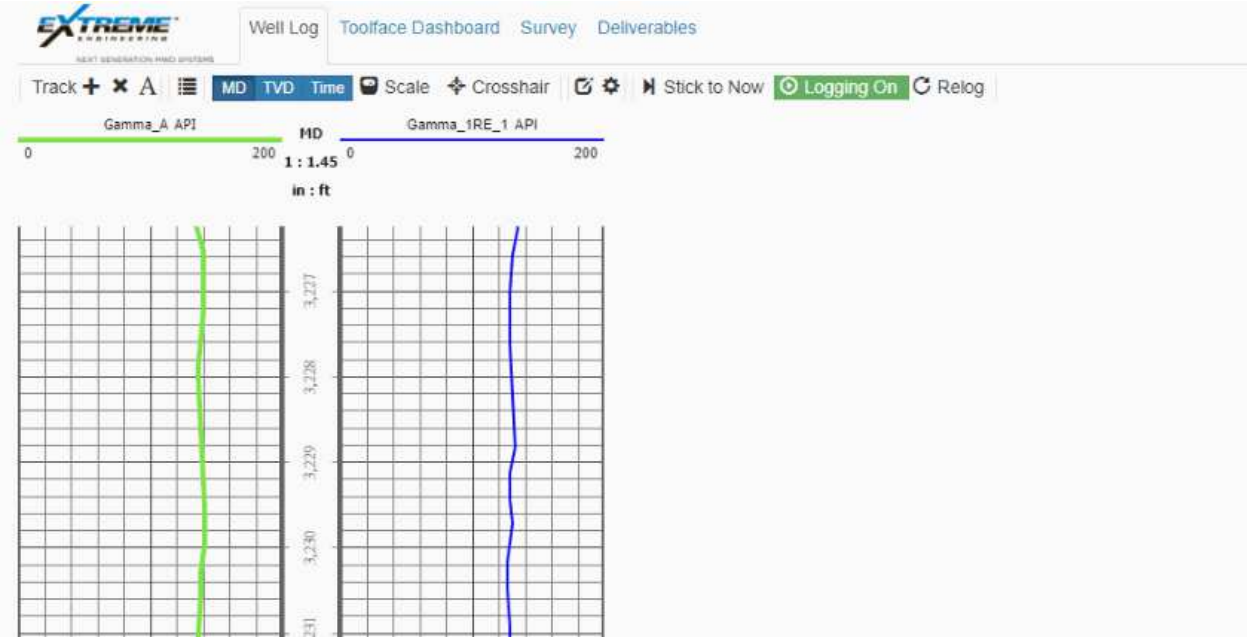
A confirmation will pop up to confirm the relog function. Click Relog On to start the Relog.

The relog button will turn green.



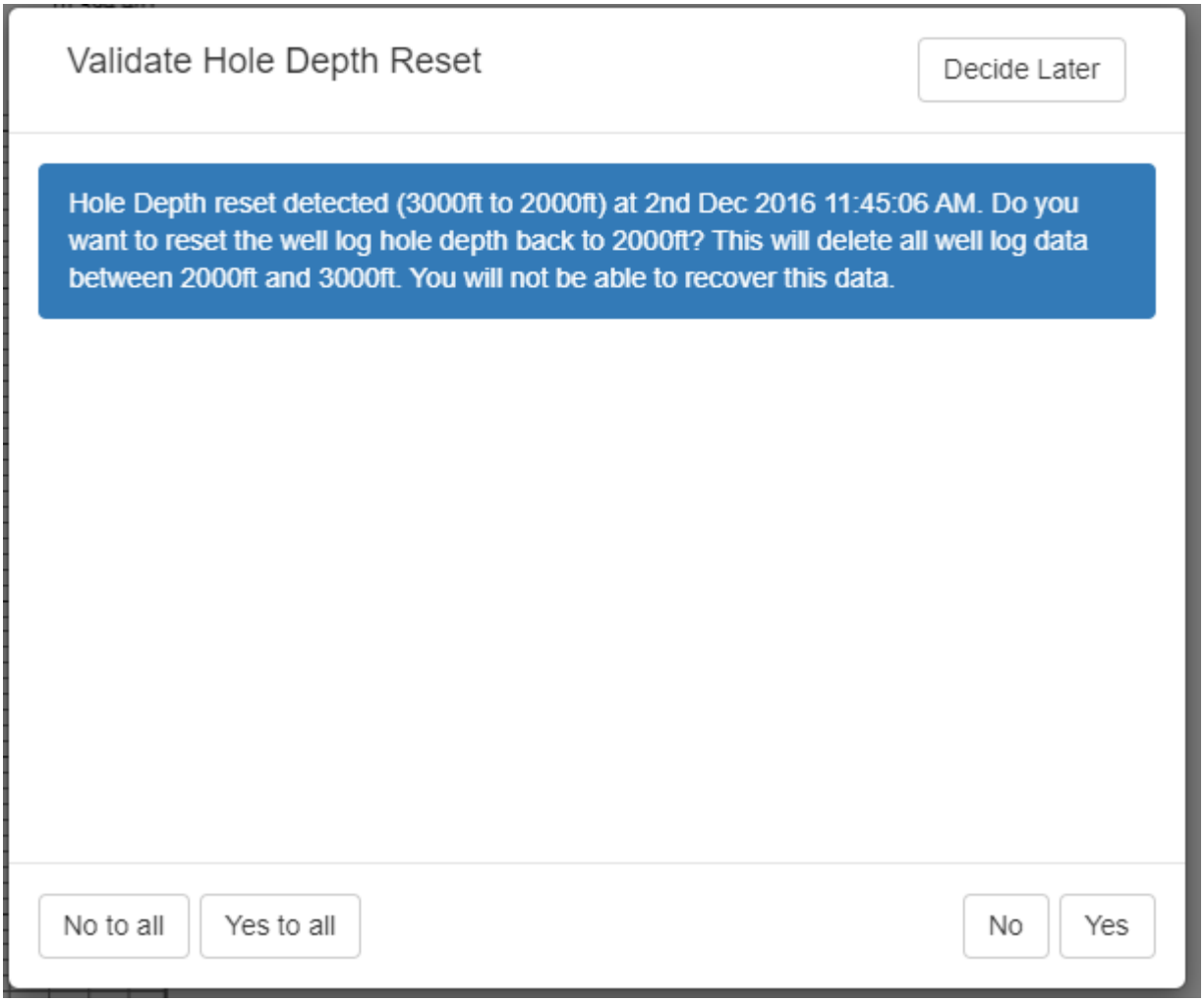
Relog data will be shown in the curve selection menu under the surface section of the active run. Each Relog will receive an identification number.

Relog data will automatically replace existing data and will update the related Auto Curve. The original surface data will still be available using the First Pass data under surface signals. Relog data can be removed using the edit curve function. Note that Relog data only applies to Surface data. Once there is Recorded Mode data, the relog data will not merge into that curve.



12.16 Hole Depth Reset

If XDirect notices a backwards jump in hole depth, an alert will be shown to the user.

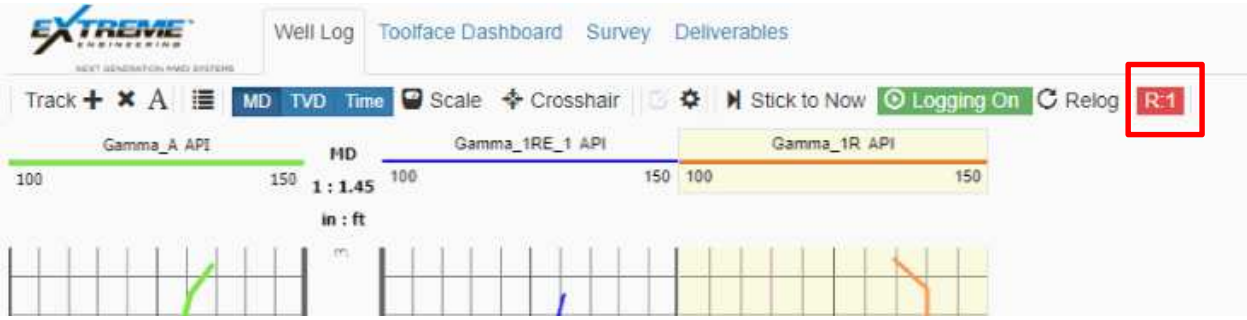


In this case the rig accidentally set the hole depth to 3,000 ft. When they corrected the depth to 2,000 ft XDirect alerted the user.

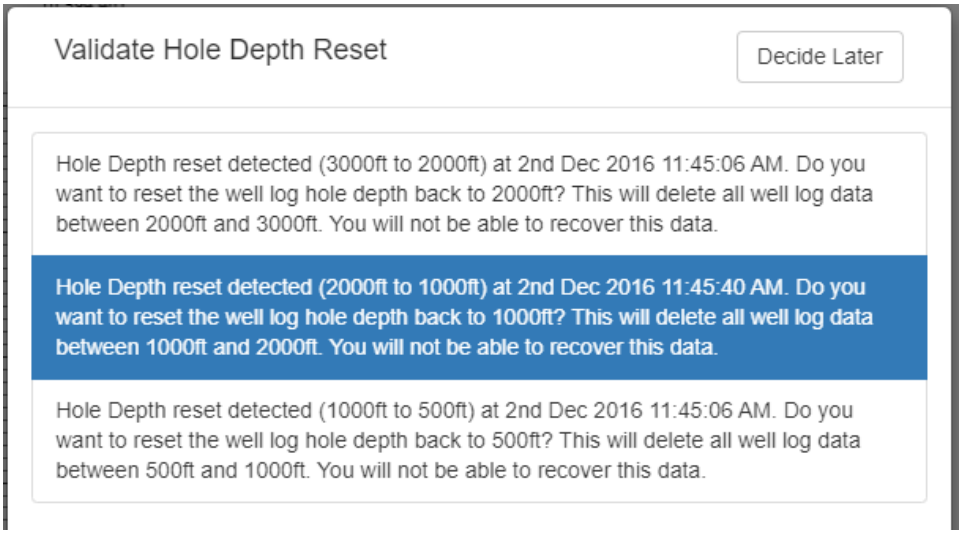
Available options for the function:

- No: Well Log Max depth will stay the same. No new data will log until bit depth passes the max hole depth.
- Yes: Well Log max depth will be changed to the new lower value. Note any data between the two values will be deleted and will not be able to be recovered.
- Decide Later: XDirect will keep the original max hole depth. The hole depth reset option will be saved and a reset icon will be shown in the Task Bar as R:1 in red. The menu can be accessed later by clicking on the R:1 icon. If user does not immediately accept or

reject the hole depth reset, logging data will be buffered and handled appropriately once user validates the reset.



If multiple resets happen, they will be grouped in the menu. They can be individually accepted or rejected, or all listed resets can be accepted or rejected.



12.17 Toolface Dashboard

The Toolface Dashboard displays real-time information such as the rosebud, depth data, and surface data. The five grid items on the left cannot be removed.

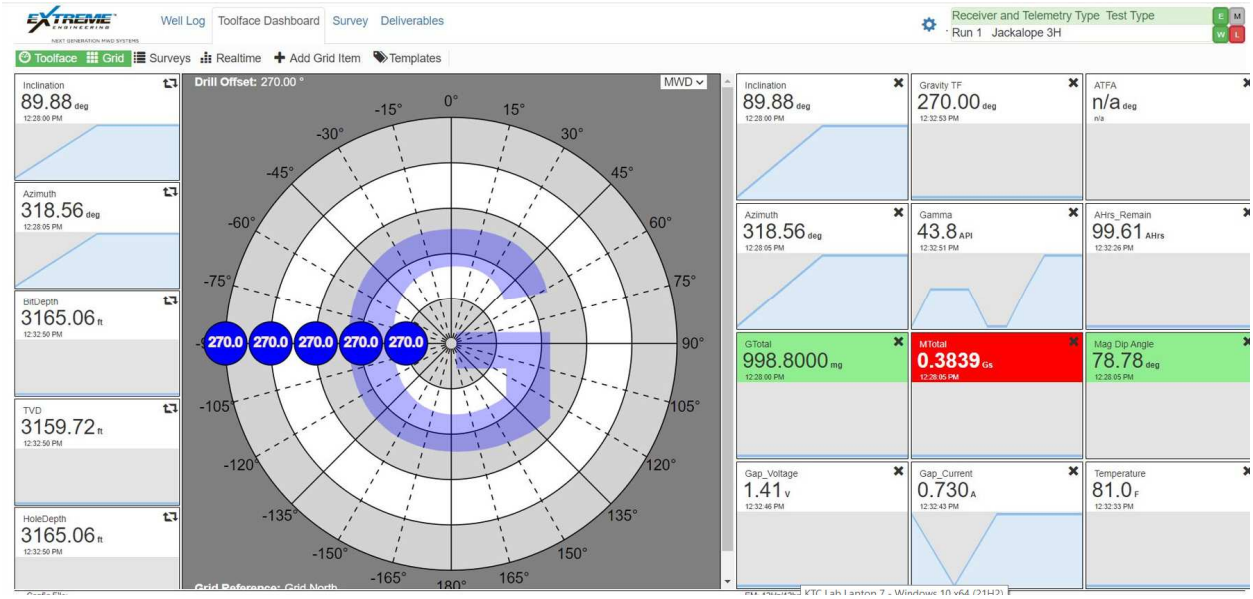
12.17.1 Controlling Visible Items on Dashboard

You can add items to the display by clicking the Add Grid Item button. Those items can then be moved around the display by clicking and dragging.

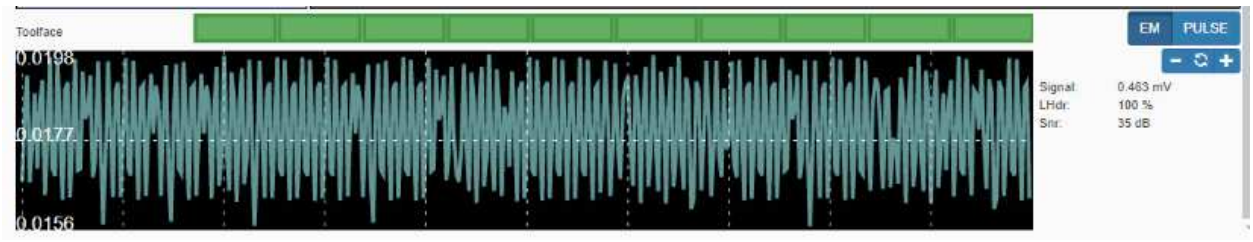
The toolface can be removed or added by clicking Toolface on the top.

The toolface cards on the right can be added by clicking Grid and removed by clicking the X on the top right of the card.

The toolface cards on the left can be changed by clicking the icon on the top right of the card.



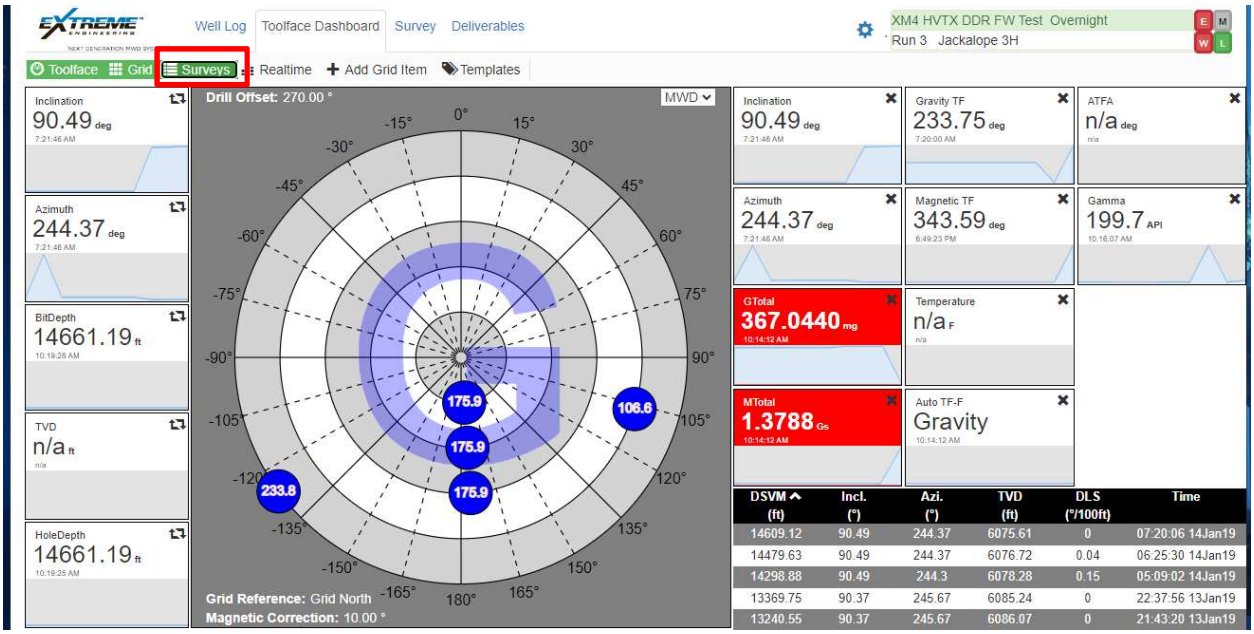
Realtime EM or Pulse signal data can be shown by clicking the Realtime button



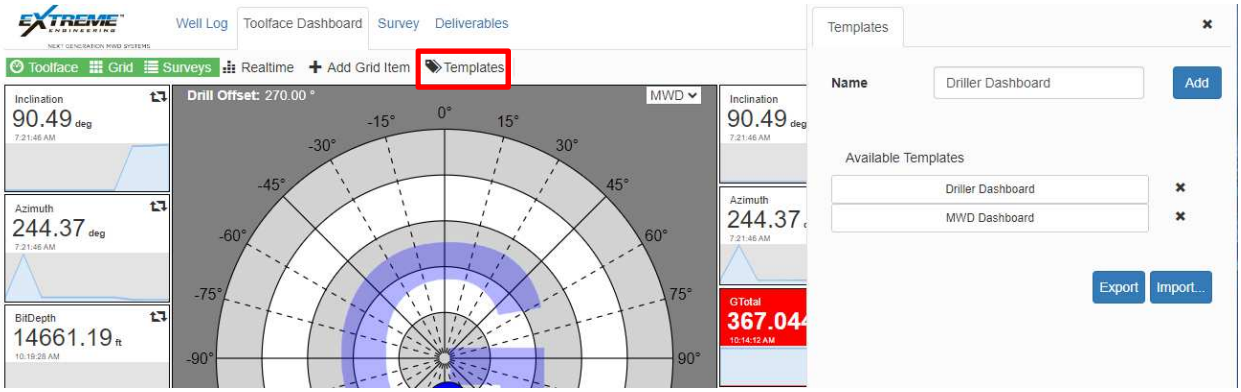
A red item indicates that the corresponding value is out of FAC / out of tolerance. You can view the FAC values by double clicking the box. The FAC values are entered into XDirect – Run Setup

– Survey section. You can also adjust the curve sample size for any box by double clicking and adjusting the value. This controls the amount of time shown for the moving graph.

The last four surveys taken can be viewed by clicking the Surveys button



Templates for Survey Dashboard are available



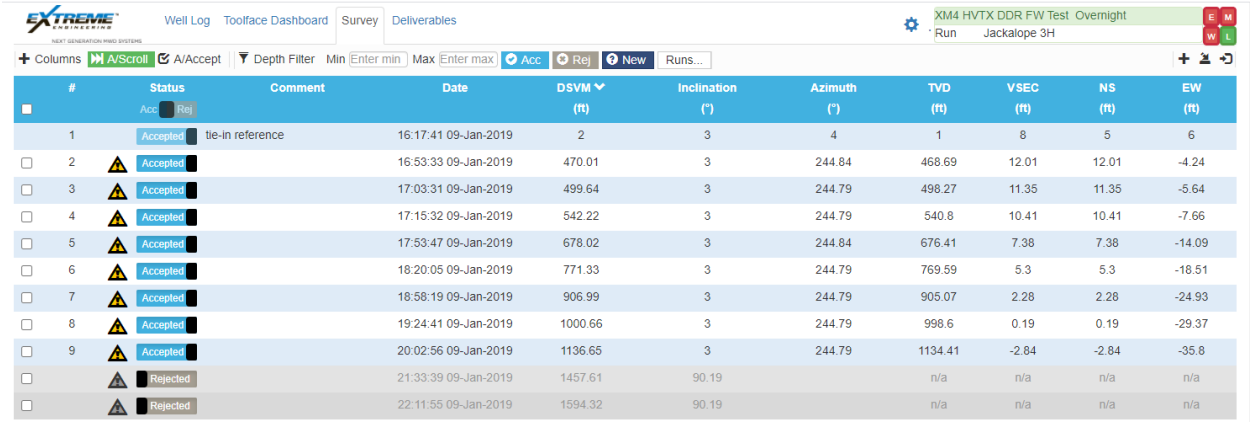
12.18 Survey Tab

The Survey Tab displays all surveys that have been taken during the job. The user can adjust the view of the Survey Tab to show or hide Accepted, Rejected and New surveys, set a depth filter, and sort by date.

12.18.1 Accepting/Rejecting Surveys

When a survey is taken it will populate in the survey list as New and the slider will be in the middle. The user can accept or reject the survey by clicking the slider. These can be adjusted at any time. Once a survey is accepted, the corresponding values (TVD, VSEC, etc.) to the right of the survey will populate.

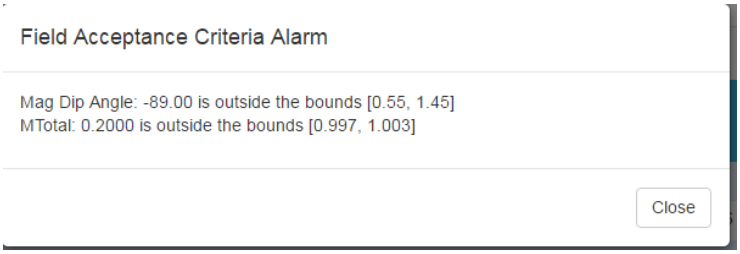
Surveys can be set to Auto Accept by clicking the A/Accept button.



#	Status	Comment	Date	DSVM (ft)	Inclination (°)	Azimuth (°)	TVD (ft)	VSEC (ft)	NS (ft)	EW (ft)
1	Accepted	tie-in reference	16:17:41 09-Jan-2019	2	3	4	1	8	5	6
2	Accepted		16:53:33 09-Jan-2019	470.01	3	244.84	468.69	12.01	12.01	-4.24
3	Accepted		17:03:31 09-Jan-2019	499.64	3	244.79	498.27	11.35	11.35	-5.64
4	Accepted		17:15:32 09-Jan-2019	542.22	3	244.79	540.8	10.41	10.41	-7.66
5	Accepted		17:53:47 09-Jan-2019	678.02	3	244.84	676.41	7.38	7.38	-14.09
6	Accepted		18:20:05 09-Jan-2019	771.33	3	244.79	769.59	5.3	5.3	-18.51
7	Accepted		18:58:19 09-Jan-2019	906.99	3	244.79	905.07	2.28	2.28	-24.93
8	Accepted		19:24:41 09-Jan-2019	1000.66	3	244.79	998.6	0.19	0.19	-29.37
9	Accepted		20:02:56 09-Jan-2019	1136.65	3	244.79	1134.41	-2.84	-2.84	-35.8
	Rejected		21:33:39 09-Jan-2019	1457.61	90.19		n/a	n/a	n/a	n/a
	Rejected		22:11:55 09-Jan-2019	1594.32	90.19		n/a	n/a	n/a	n/a

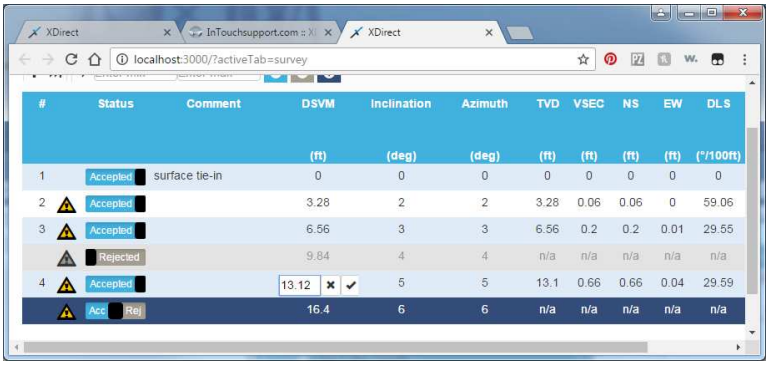
12.18.2 FAC Values

The Yellow Sign with exclamation mark indicates that the survey is out of FAC. Details on which value is out of FAC can be obtained by clicking on the sign. FAC is taken from Tool Run Info.



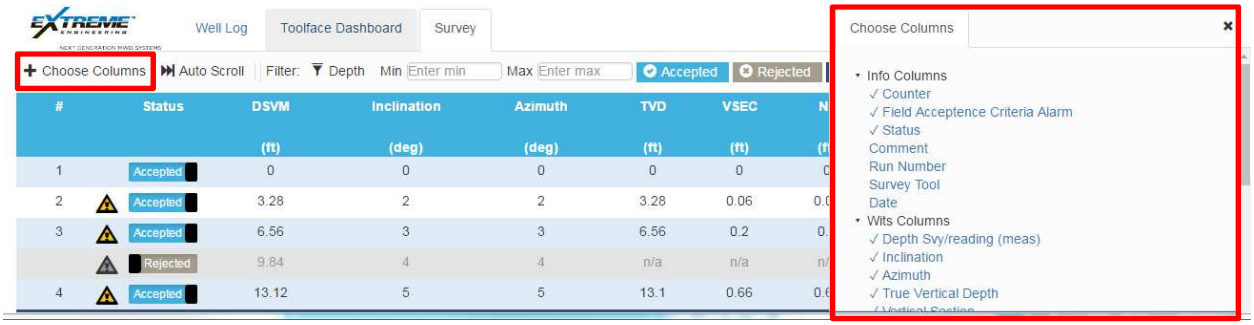
12.18.3 Editing Values

Depth (DVSM), Inc and Azm columns can be edited if the user has permission. These are edited by clicking on the number, changing the number, and clicking the check mark.

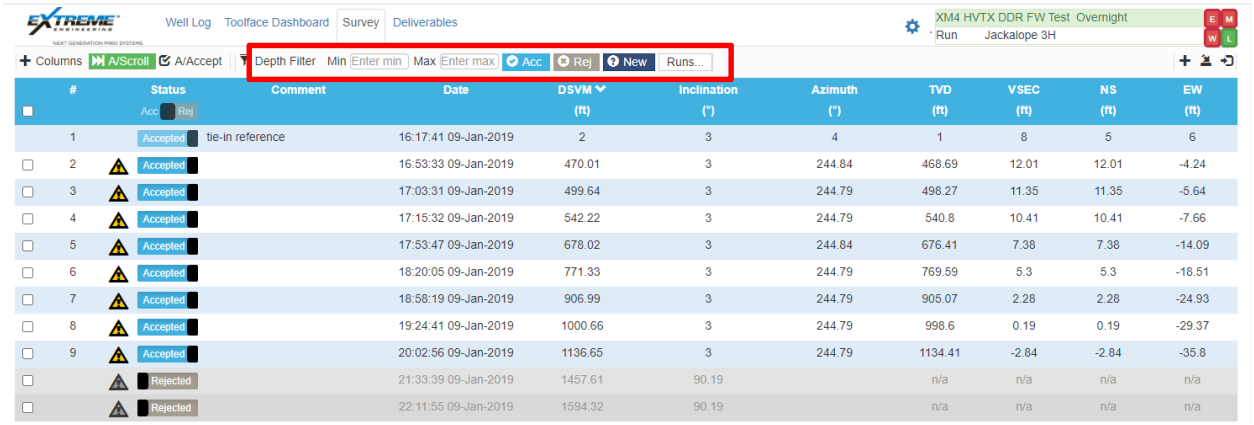


14.15.4 Editing View

The columns in the survey report can be edited by clicking the Choose Columns button on the top of the page and selecting the info desired on the far-right hand side.



The user can also control what surveys are visible by using the Filter Selections and selecting the Accepted/Rejected/New/Runs buttons on the top of the page or by entering a Min and Max depth and selecting the Depth filter.



If auto scroll is selected the survey list will automatically scroll to the latest survey once the screen is full.

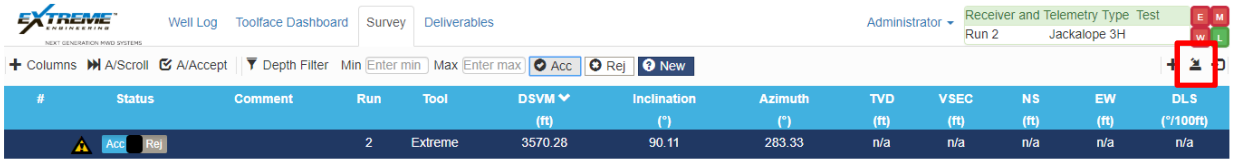
Surveys can be sorted by date or depth by clicking on the Date or DVSM header.

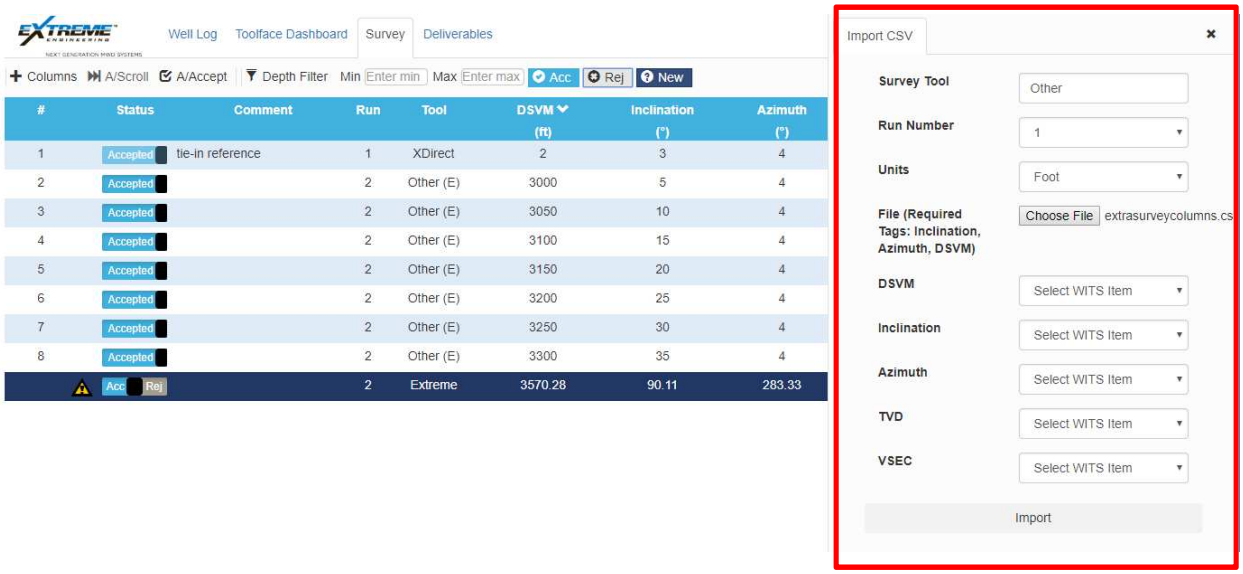
12.18.4 Importing Surveys

Surveys may be imported from a .CSV file by using the shortcut on the upper right-hand side. The format must include a header with the values Inclination, Azimuth, DVSM (Measured Depth.)

Run number and Tool Type may be entered along with Units of Measurement. Tool Type will be shown in the SurveyTool Column. General surveys are labeled with Tool Name Extreme.

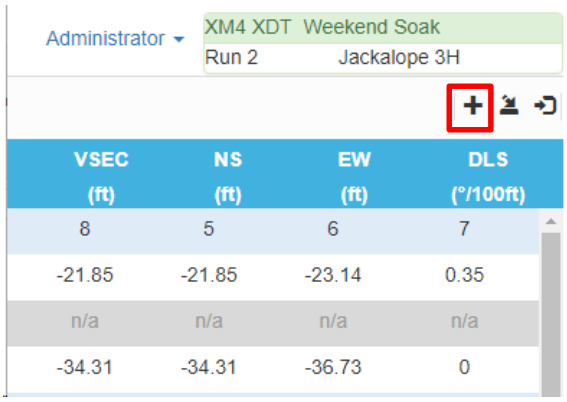
User will be required to assign proper WITS name to imported values by column. If any data is not desired to import, do not assign a WITS Item to it.

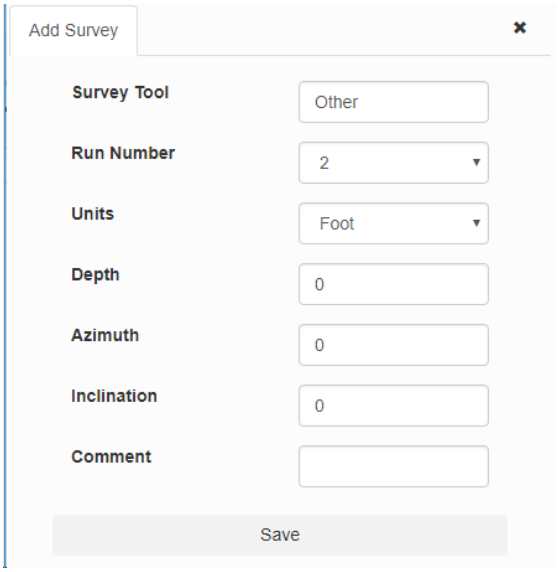




12.18.5 Adding Surveys

Surveys may be manually added by clicking the plus sign.





Post Run Process

Once the tool run is complete, the post run workflow for verifying and generating client deliverables can begin.

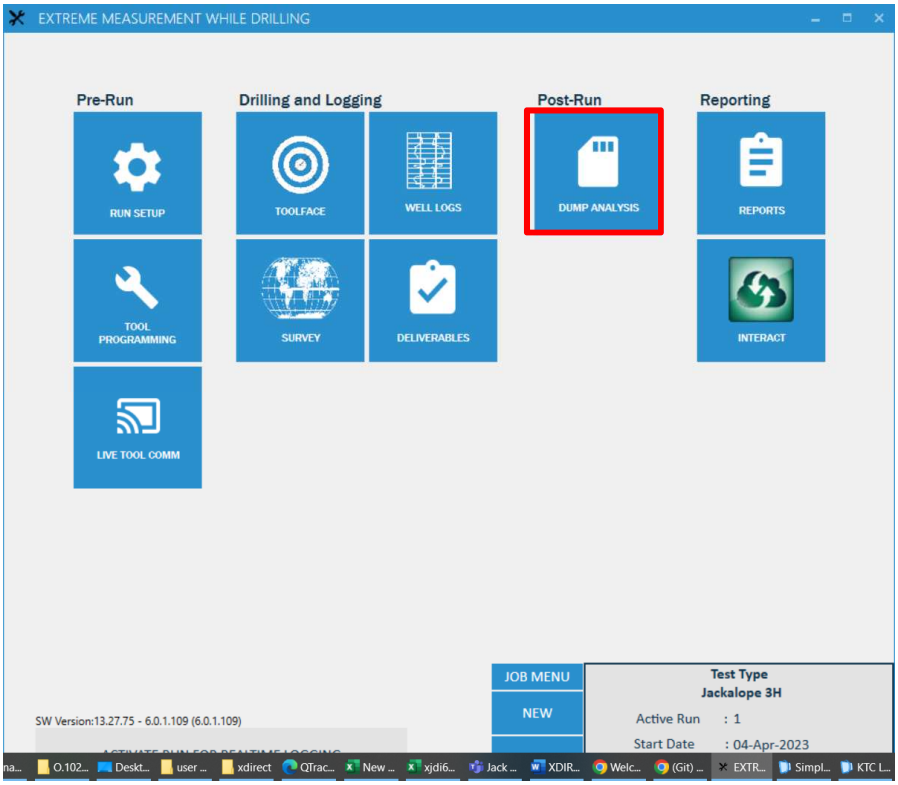
This section will detail how the post run and well logging data reports are verified, exported, and saved.

13.1 Post Run Prerequisites

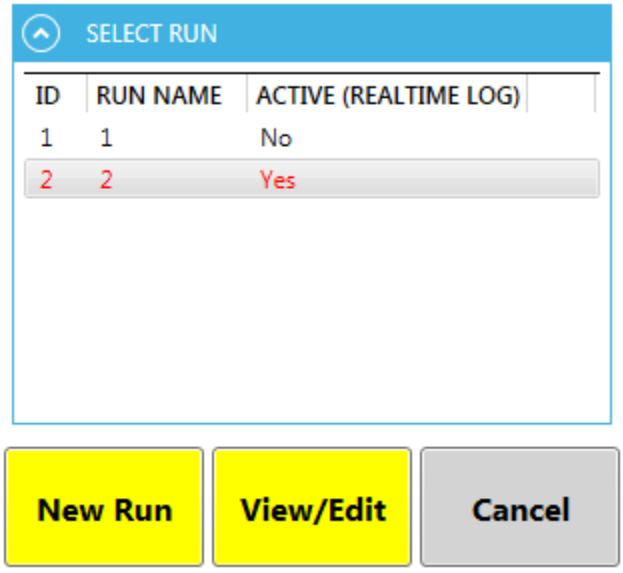
Ensure that the following has been done before starting the post run process:

- XDirect was used for the tool setup (pre-run).
- XDirect was running with receiver for the entire duration of job.
- The WITS connection was maintained throughout the job and includes the depth.
- Verify the time of the computer being used to download flash matches the time of the computer used to program the tool.

Once all the prerequisites are met, from the Launcher window click the Dump Analysis button. **Verify that no other Extreme programs are running before opening this section.**

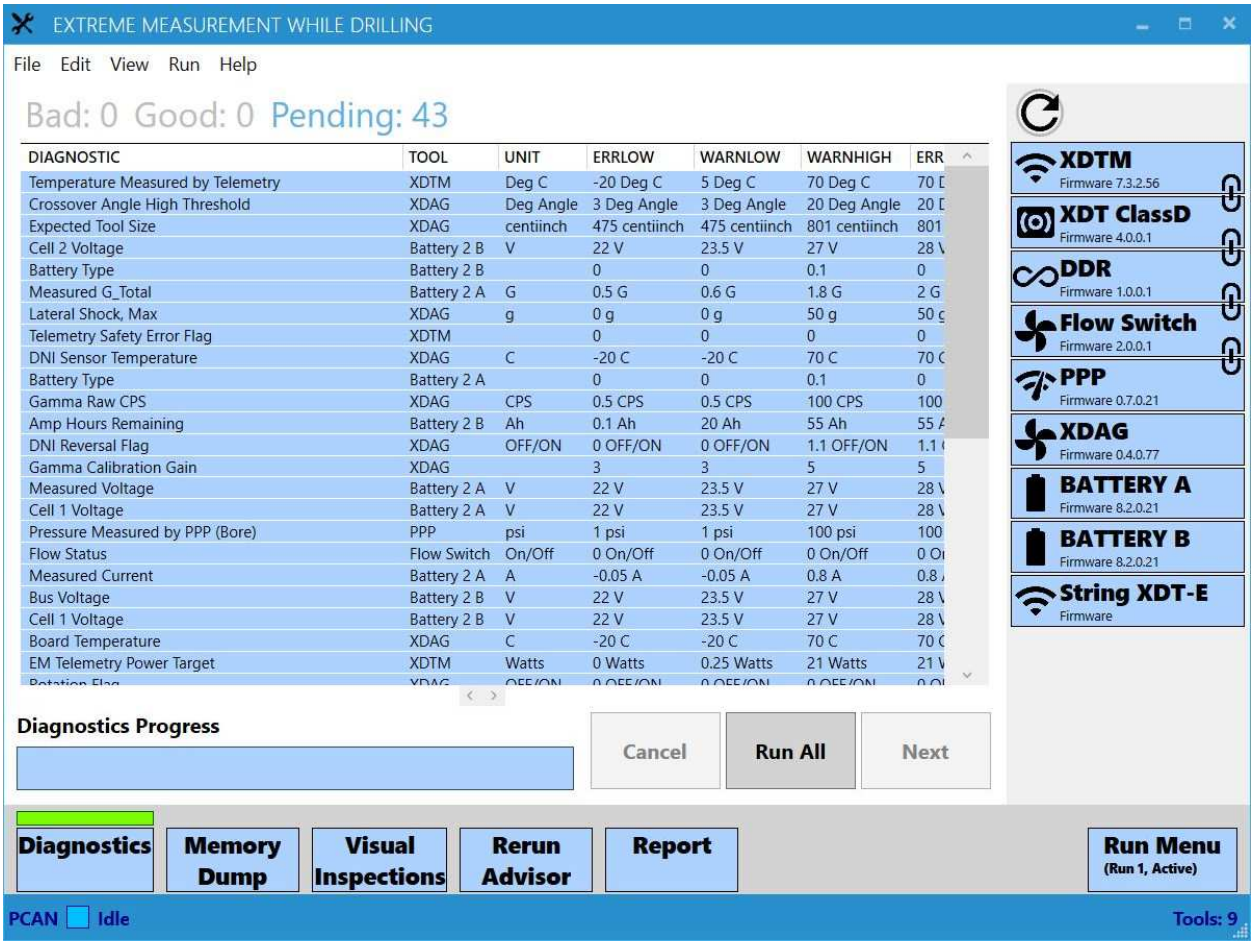


This will bring up the run selection menu. Select the run associated with the tool data and click View/Edit.



XDirect will read tool info when run is selected. If any change is found in tool string composition the user will be alerted.

13.2 Diagnostics Page



The Diagnostics page runs automated tests of the connected probes to provide post run information. The tests performed, as well as the time required, will vary depending on the type and number of probes connected. These tests are the same that are run in the Pre-Run setup.

As the tests run, the probe buttons will indicate the progress and status of the test by changing color. Green indicates that all tests for the probe completed successfully, while yellow and orange indicate warnings and failures that should be reviewed before proceeding.

Click Run All to begin the diagnostics tests.

If the string attached is HVTX or XBolt EM, the user will be reminded to attach a load box across the gap.

Once the diagnostics are complete the detailed results will be shown.

Results will be color coded by node and test:

Green: Pass

Yellow: Warning

Orange: Fail

Red: No Communication

NOTE: Warnings and failures should be addressed before the tools are put downhole, but they should not prevent continuing with the rest of the post run process.

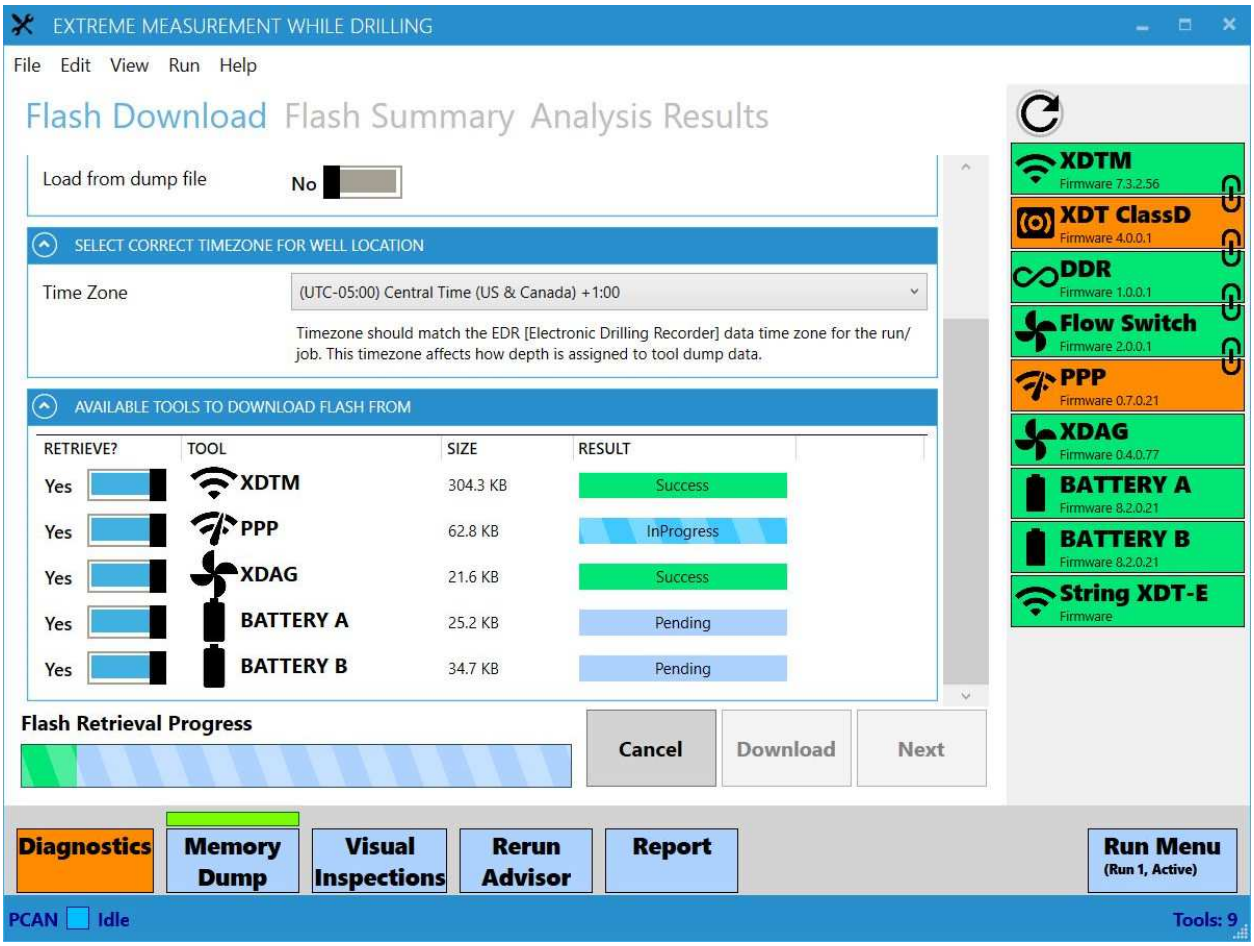
click Next to continue to the Logs page.

13.3 Memory Dump Page

The Memory Dump page is where XDirect collects data from the tool string after the run.

13.3.1 Flash Download

The Flash Download section will display the tools which have available flash data to retrieve.



13.3.1.1 Prerequisites

- The "Archive path" field is where the upload bin and csv files will be stored after the flash download is finished. You can change the default path if needed.
- Move the slider to either "Yes" or "No" if you want to see the file location popup in the file explorer after the flash download is complete.

13.3.1.2 Flash Download From Memory

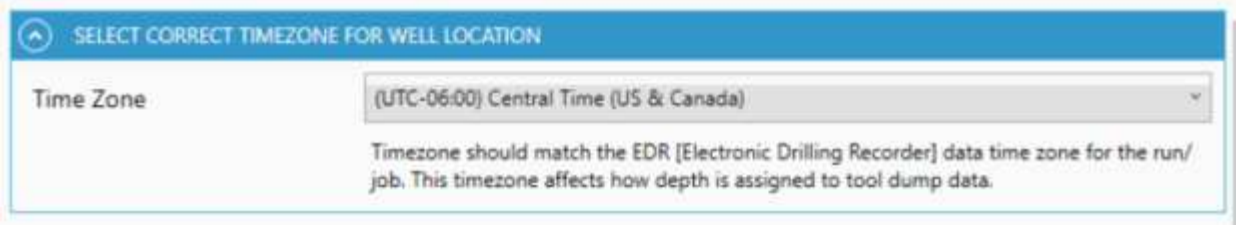
The Flash Download section will download the flash for the selected nodes and add the Recorded Mode data to the database as well as create a .ZIP file with all flash files. The location and name for the Zip file can be edited in the archive path at the top of the page.

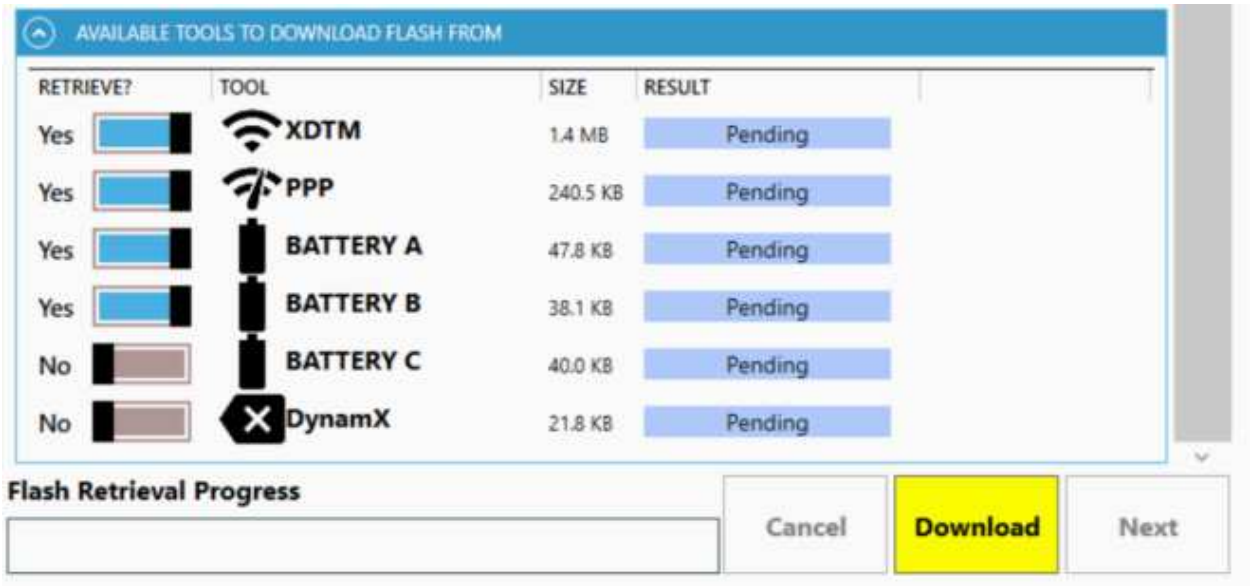
The Time Zone that the tool was programmed with needs to be selected to map the data to the proper depths.

The Retrieve? slider next to each node can be used to select any or all the connected probes that support flash download.

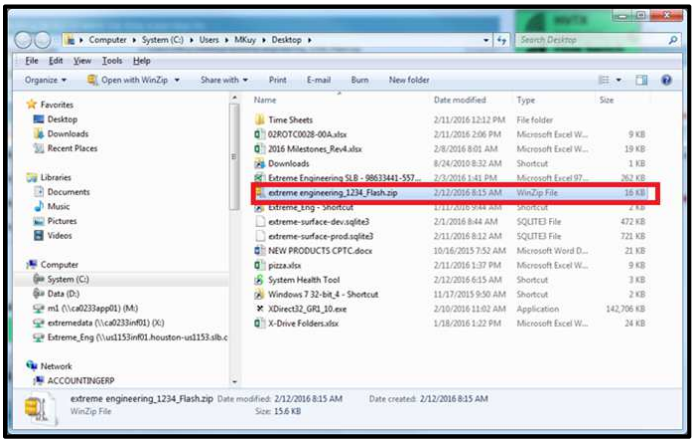
Click the Download button to begin the process after. If the Download button is not active, refresh the tool string with the button on the top right. If PCAN status in bottom is green (Active), verify no other Extreme programs are running. If Download is still not active, restart XDirect and load the page again.

Once all the selected probes have been downloaded, the user can click Next to move to the Diagnostics section.



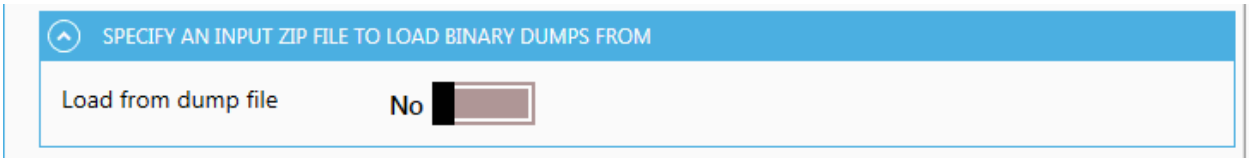


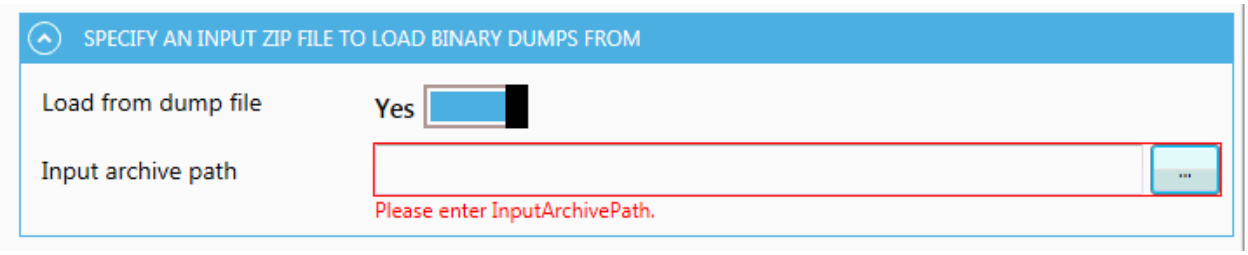
Once the flash downloads are complete the location of the zipped flash download will appear on screen.



13.3.2 Flash Download From Files

The user can also import recorded mode data from the tool flash files by using the Load from dump file selection. The .bin dump files must be compressed into a .zip file to be imported.



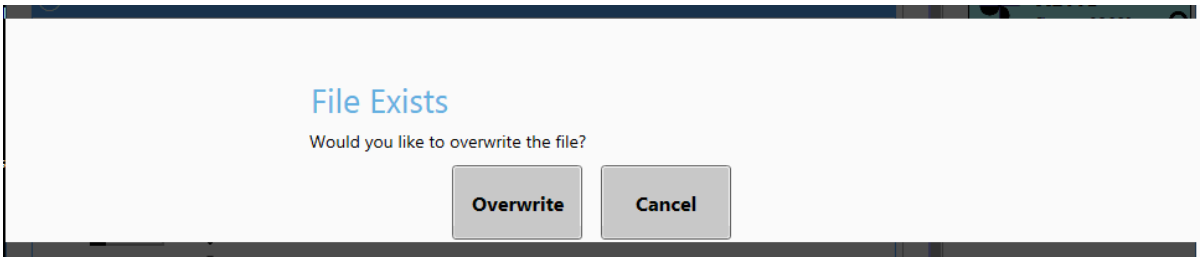


Move the slider to YES and select a ZIP file containing the corresponding flash .BIN files from the tool.

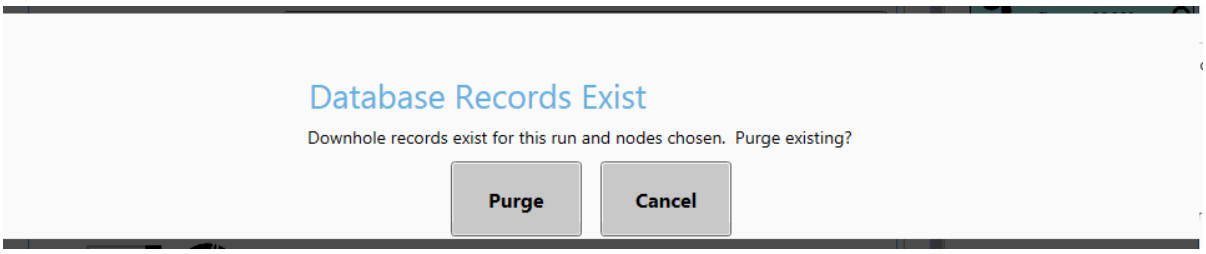
After this is done, select the tools desired to import by moving the sliders for each node to YES.

13.3.3 Replacing Data

If the file name and location for the flash download already exists, the user will be prompted if they want to overwrite the file. This does not affect the data contained in the database.



If the database already has existing memory data and the user downloads flash again, the user will be prompted if they want to Purge the data. This will replace the existing data with the new data.

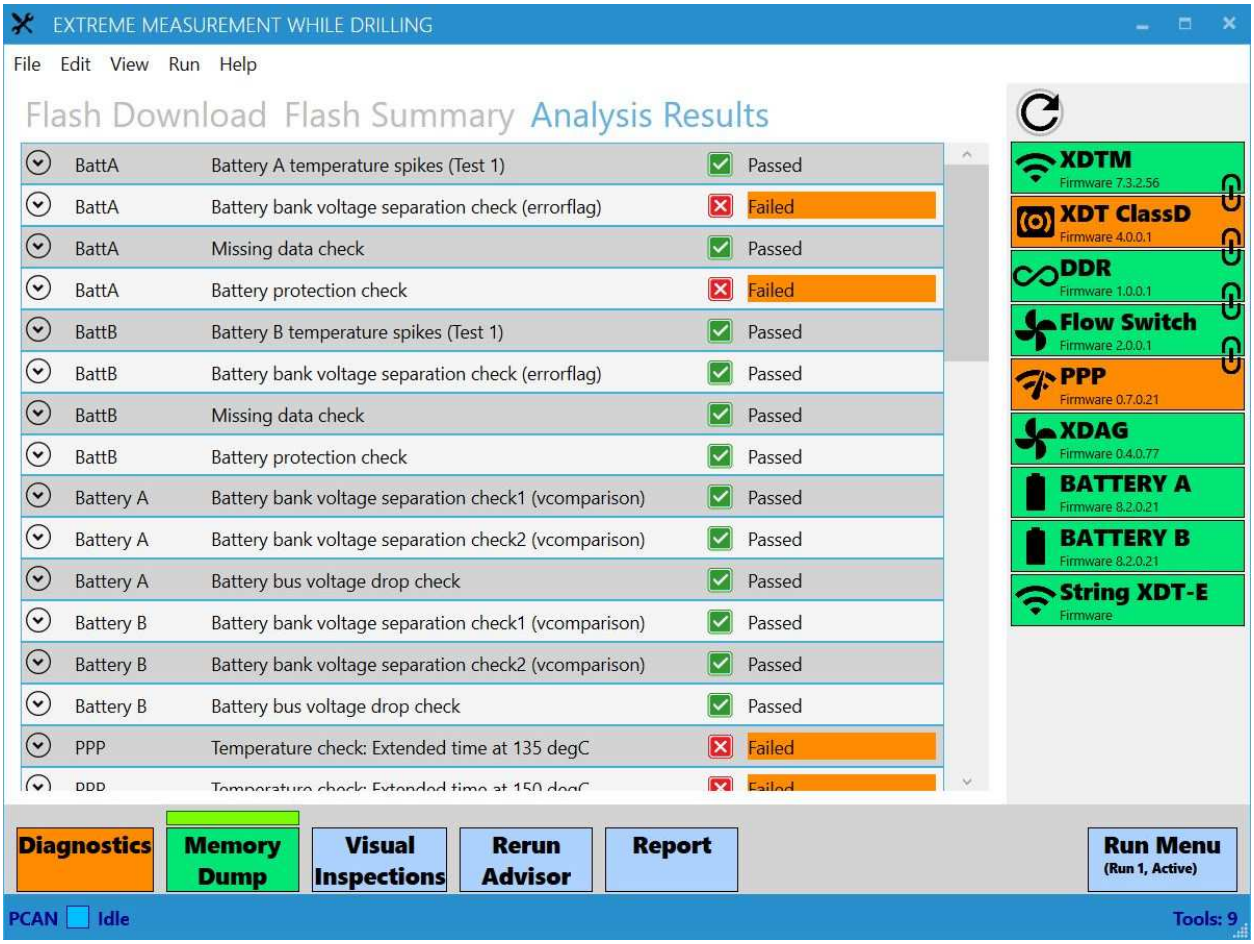


13.3.4 Flash Summary

Flash Summary is not currently supported.

13.3.5 Analysis Results

After flash is downloaded, XDirect will analyses the memory to check for out of spec environmental factors including temperature and shock and vibration as well as CAN errors and resets. For XBolt tools there are additional downhole checks based on various tool parameters.

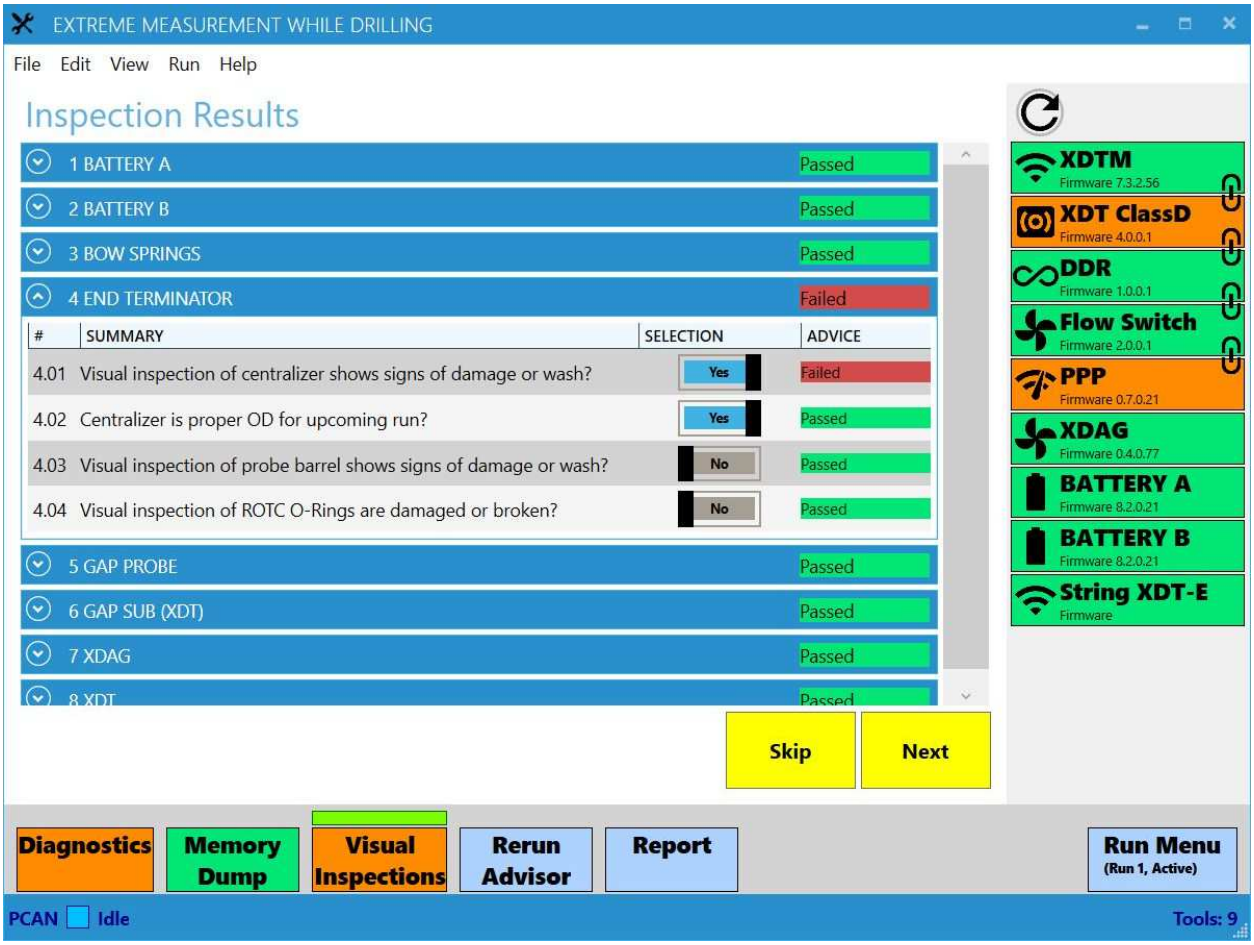


13.4 Visual Inspections

A series of questions regarding visual inspection of the tool string will be shown based on the composition of the attached tool string.

Pass/Fail/Incomplete settings can be changed by clicking the sliders.

Click Next once all questions are completed.



13.5 Rerun Advisor

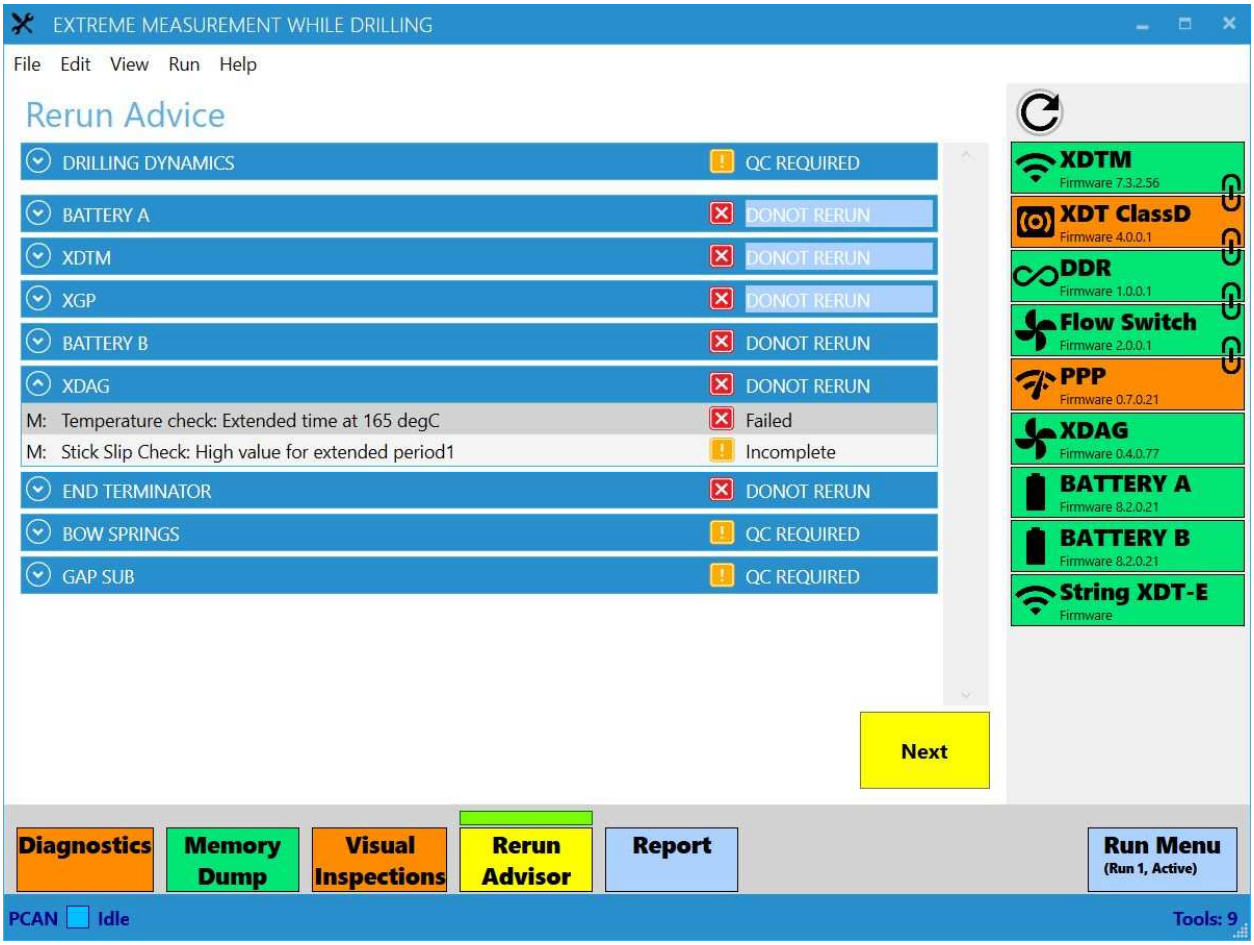
All well log analysis, real time diagnostics, and visual inspection information is combined in the Rerun advisor. This will give the status of each physical piece of the tool string.

- Rerun OK – Good to rerun.
- QC Required – some issues seen in post run process. Please contact Command / OSC for clearance to rerun the tool.
- Service Required – Tag the tool with the Service Level presented and return to maintenance.
- Error – unable to process test

If any item has a failure information about the failure will be shown in the details by clicking the arrow next to the tool name.

The source of the failure will also be indicated by a letter in front of the details.

- D: Diagnostics
- M: Memory Analysis
- V: Visual Inspection

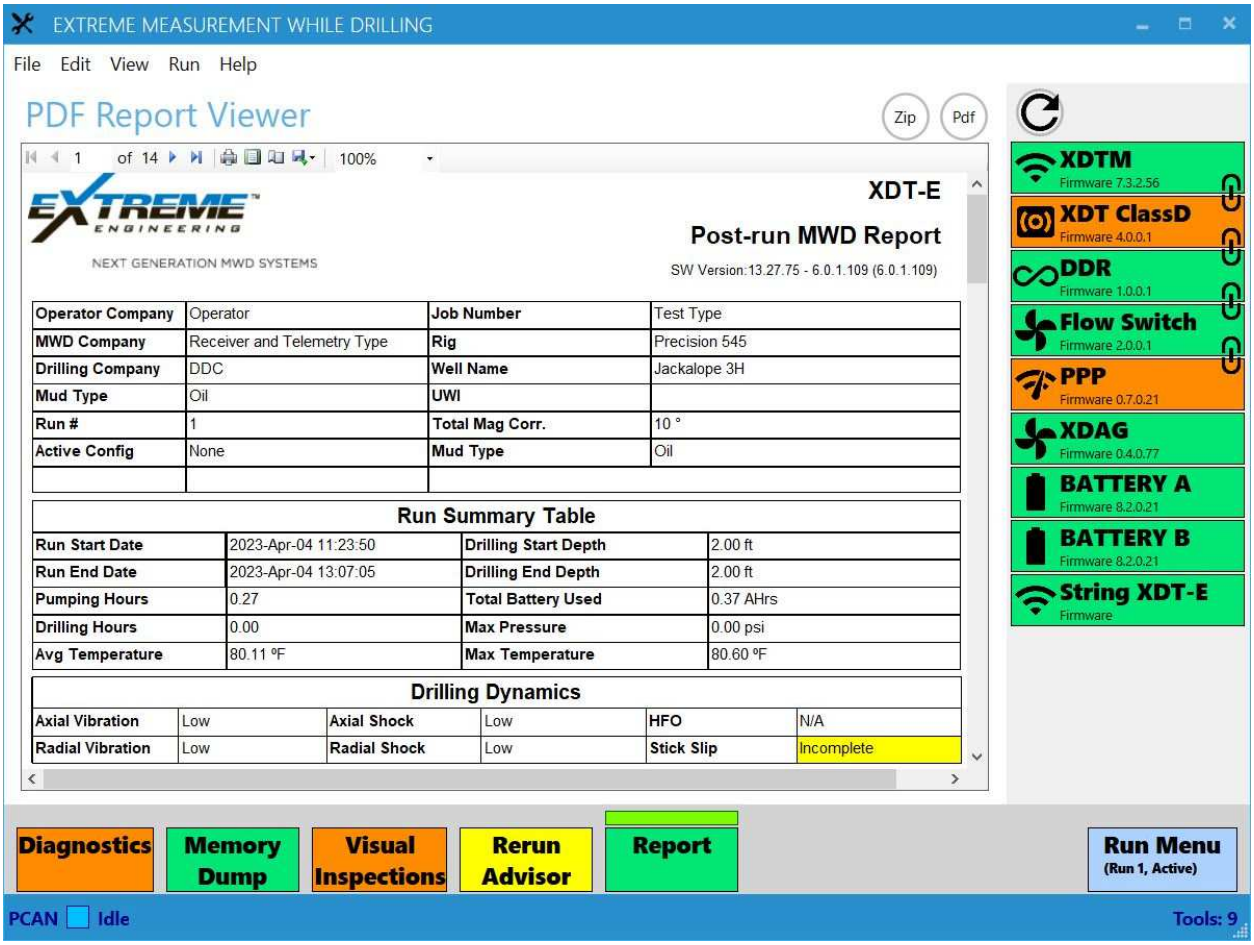


Click Next to move to the Post Run Report.

13.6 Post Run Report

A report will be available from the “Report” page. The report includes information gathered from the diagnostics stage along with general tool and run information including EDT. The user can scroll through the report using the arrow keys on the top of the page. The report can be saved using the Pdf button at the top-right corner. Save the report for required post run records.

For best results when printing, select the PDF report and use a PDF application to print it. This report will be automatically saved in the C:\ExtremEengineering\Xdirect\Reports folder.


EXTREME MEASUREMENT WHILE DRILLING
File Edit View Run Help
PDF Report Viewer
Zip
Pdf
1 of 14 100%
EXTREME ENGINEERING
NEXT GENERATION MWD SYSTEMS
XDT-E
Post-run MWD Report
SW Version:13.27.75 - 6.0.1.109 (6.0.1.109)
Operator Company | Operator | Job Number | Test Type
MWD Company | Receiver and Telemetry Type | Rig | Precision 545
Drilling Company | DDC | Well Name | Jackalope 3H
Mud Type | Oil | UWI |
Run # | 1 | Total Mag Corr. | 10 °
Active Config | None | Mud Type | Oil
Run Summary Table
Run Start Date | 2023-Apr-04 11:23:50 | Drilling Start Depth | 2.00 ft
Run End Date | 2023-Apr-04 13:07:05 | Drilling End Depth | 2.00 ft
Pumping Hours | 0.27 | Total Battery Used | 0.37 AHrs
Drilling Hours | 0.00 | Max Pressure | 0.00 psi
Avg Temperature | 80.11 °F | Max Temperature | 80.60 °F
Drilling Dynamics
Axial Vibration | Low | Axial Shock | Low | HFO | N/A
Radial Vibration | Low | Radial Shock | Low | Stick Slip | Incomplete
XDTM Firmware 7.3.2.56
XDT ClassD Firmware 4.0.0.1
DDR Firmware 1.0.0.1
Flow Switch Firmware 2.0.0.1
PPP Firmware 0.7.0.21
XDAG Firmware 0.4.0.77
BATTERY A Firmware 8.2.0.21
BATTERY B Firmware 8.2.0.21
String XDT-E Firmware
Diagnostics
Memory Dump
Visual Inspections
Rerun Advisor
Report
Run Menu (Run 1, Active)
PCAN Idle
Tools: 9

13.7 Generating Well Logs for Clients

XDirect can convert the recorded well logs from the downhole run into a PDF which can then be given to the clients as part of the MWD service. These logs can be organized by measured depth, true vertical depth. Or time.

The auto generated curves in the well logs are based on the data recorded in the downhole memory (wherever available) instead of the data recorded on the surface due to two reasons:

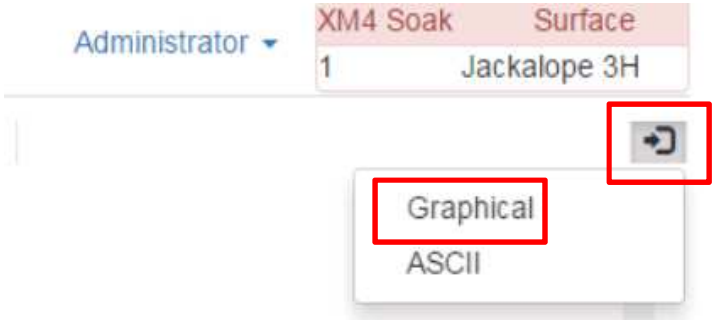
1) Downhole logs are stored more often than surface logs, as more data is collected per foot/meter drilled.
2) Decoded values can have errors that occur due to signal problems.

The export will be based on what is visible on the Well Log tab including tracks, curves and scale selected.

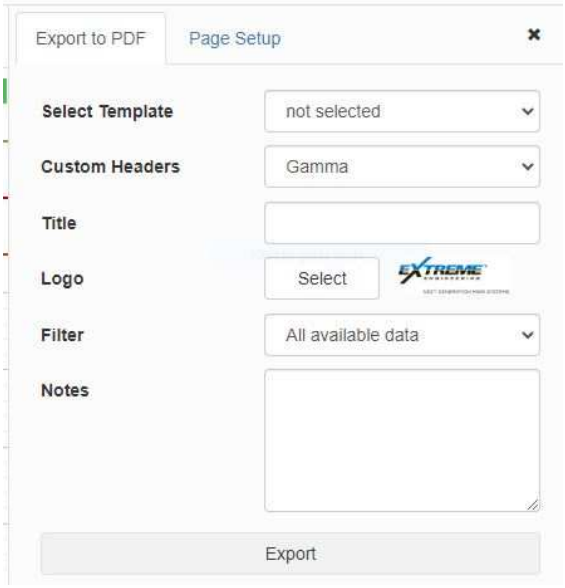
13.7.1 Exporting Well Log as a PDF

Once the well logs have been verified the user can export the log summary to a PDF format.

First click the [Export] icon on the right side of the screen and select Graphical.

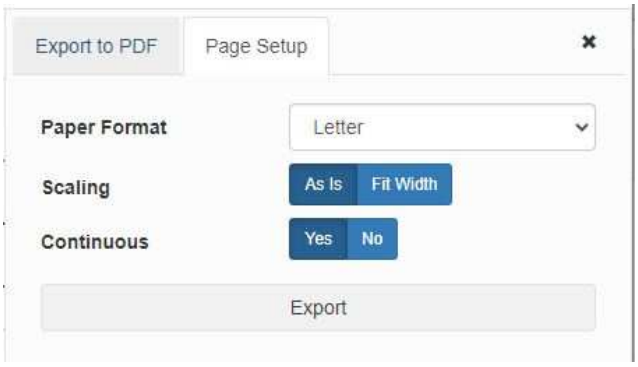


From the “Export to PDF” tab adjust the properties as needed.



For Gamma logs select “Gamma Header” from the “Custom Headers” drop down.

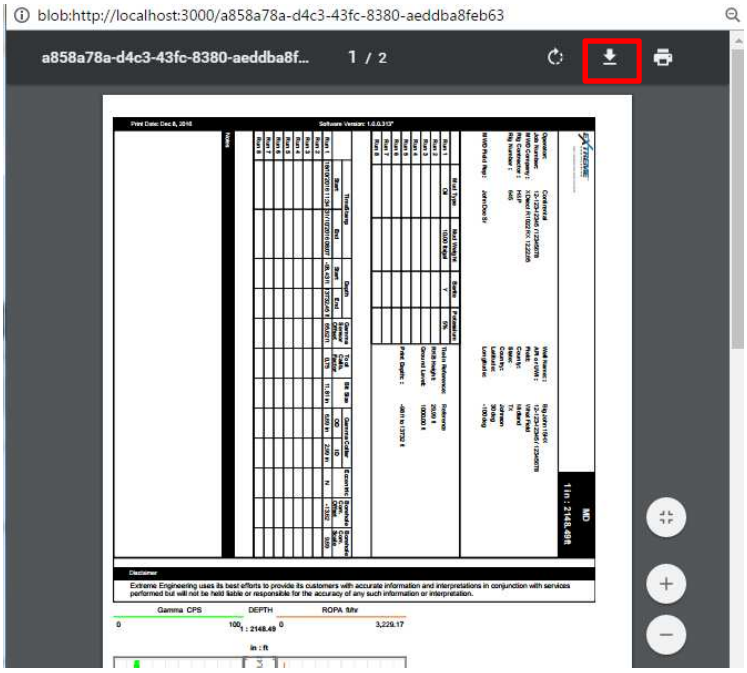
From the “Page Setup” tab adjust the settings of how the PDF will look.



- "Paper Format" – Set to size of page that will be printed
- "Scaling" – As Is prints to size shown on the screen. If the width of the log extends past the width of the page selected, choose Fit to Width
- "Continuous" – Yes removes margins for the top and bottom of each page of the well logs.

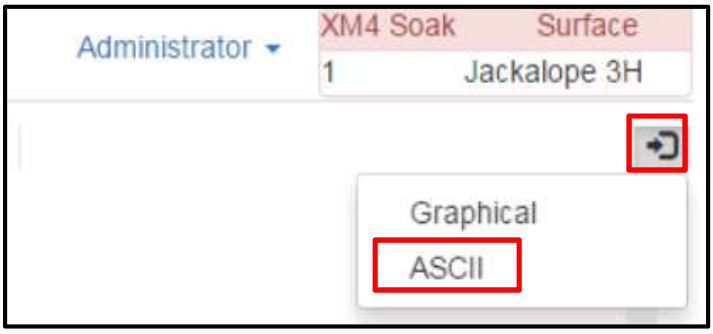
Click Export. The PDF will then appear on screen. The PDF can be downloaded by clicking the download button.

You can change the header information through XDirect's Launcher Tool Setup Interface.



13.8 Generating LAS and CSV Files for Client

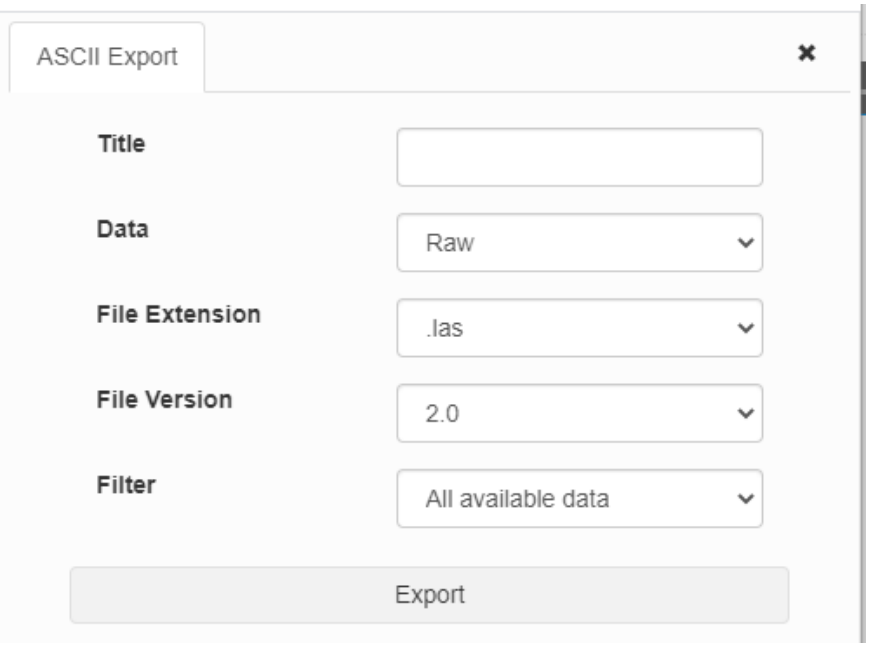
To generate a LAS or CSV file, first navigate to the Well Log tab and click the [Export] icon on the right side of the screen and select ASCII.



XDirect allows you to choose between LAS or CSV. These can be produced in a Raw format with the data only showing up when it was recorded or interpolated by required step. User can plot all data or provide a specific range.

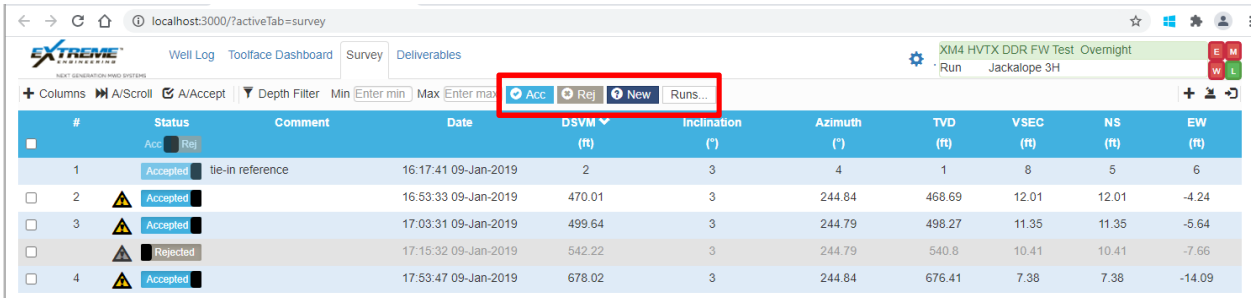
Note: It is recommended to use the Deliverables Tab for ASCII export as it allows more control

over the files.

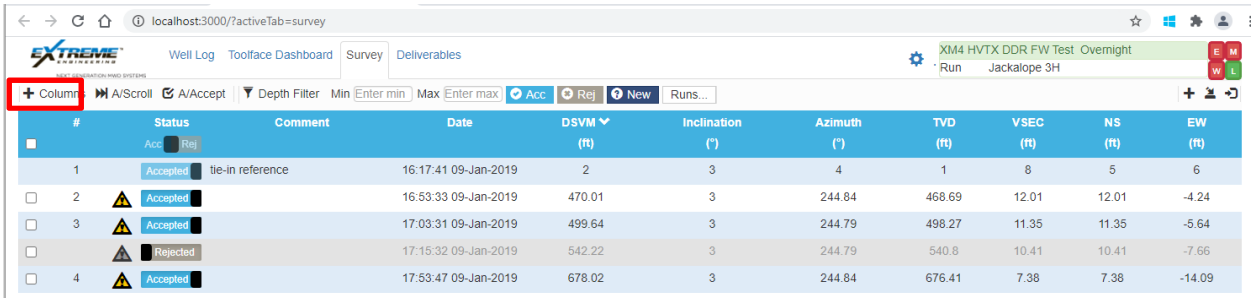


13.9 Generating Survey Files for Client

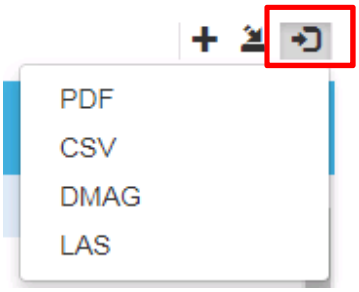
To generate a Survey File, navigate to the Survey Tab in the web browser. Verify that the surveys have been assigned correctly (Accepted or Rejected as needed.) The user can choose which surveys to display and export by clicking on the Accepted / Rejected / New / Runs tabs at the top of the page. Only the visible surveys in the list will be exported.



All columns visible on the screen will be exported. These can be adjusted by selecting the Choose Columns button.

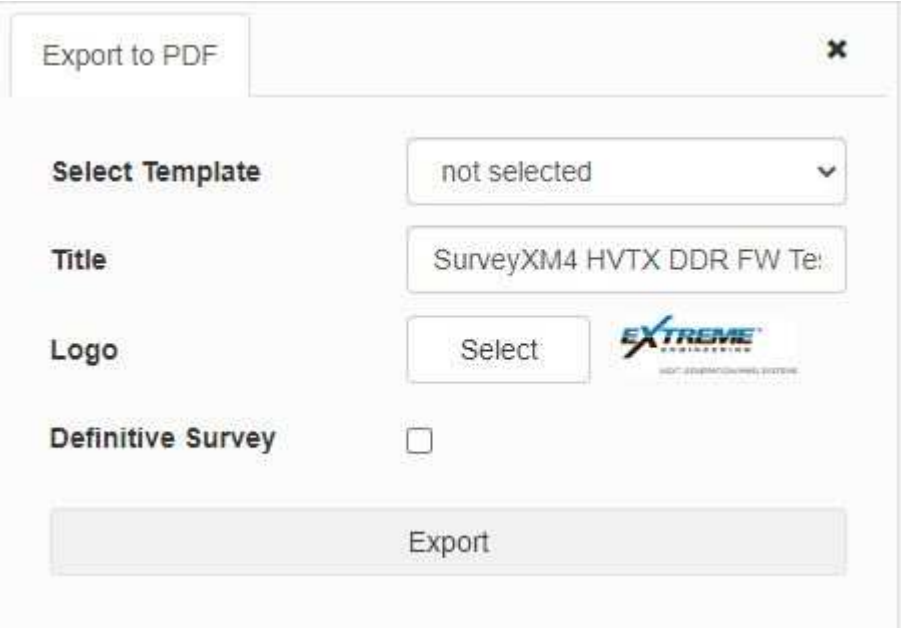


Once the surveys are assigned properly, click the export button. There are four options to choose from.



- PDF: Survey report in PDF format
- CSV: Survey report in CSV format
- DMAG: Custom survey output formatted for DMAG utility
- LAS: Survey report in standard LAS format – not affected by columns visible

PDF, CSV and LAS exports allow the title to be edited. PDF export allows the use of a standard Extreme logo, or a custom logo can be selected as well as detailed page setup settings.

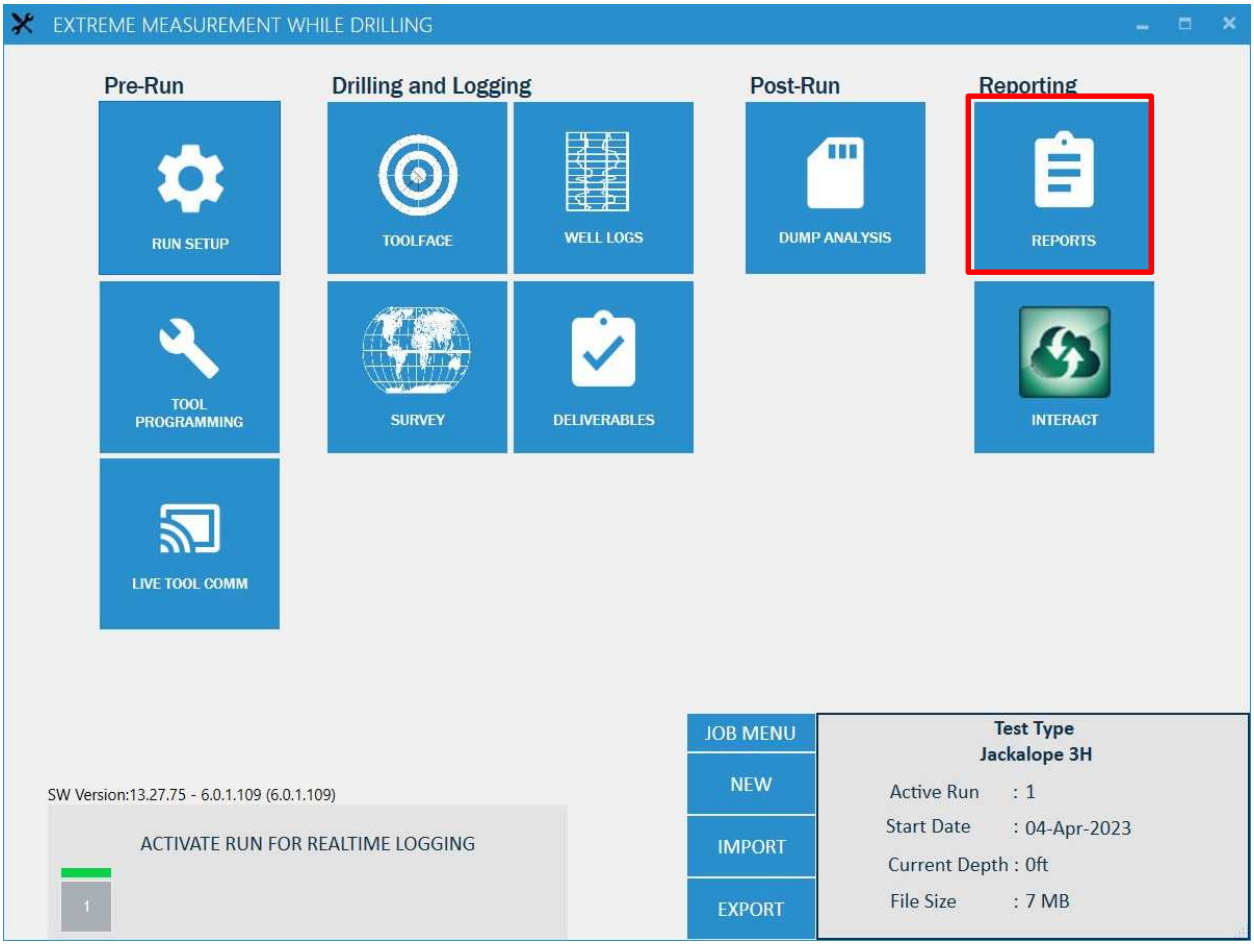


Click Export. The PDF will then appear on screen. The PDF can be downloaded by clicking the download button.

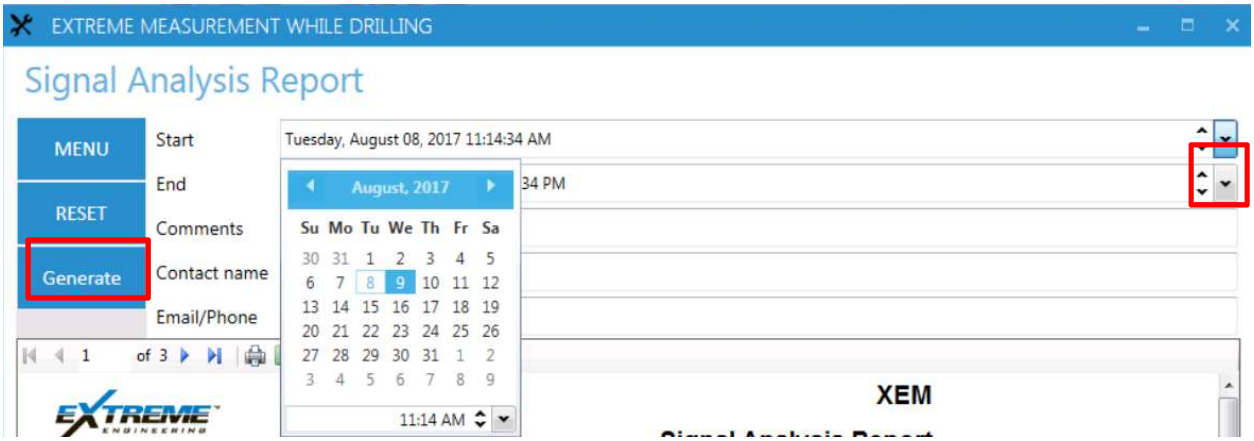
14 Reporting

14.1 Signal Analysis

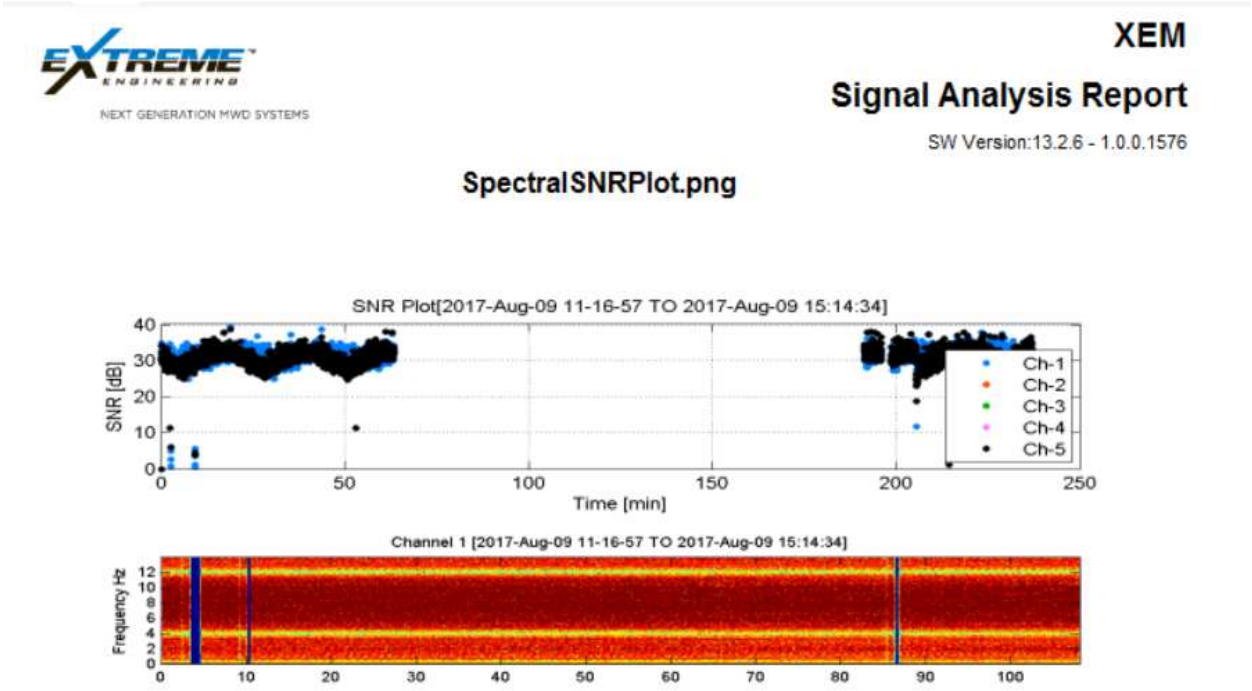
XDirect can generate real time Signal Analysis reports when using XM4 by referencing the Real Time PTK and Raw Signal files along with data from XM4 RX.



Select the Start and End date for the signal by using the drop-down menu and click Generate

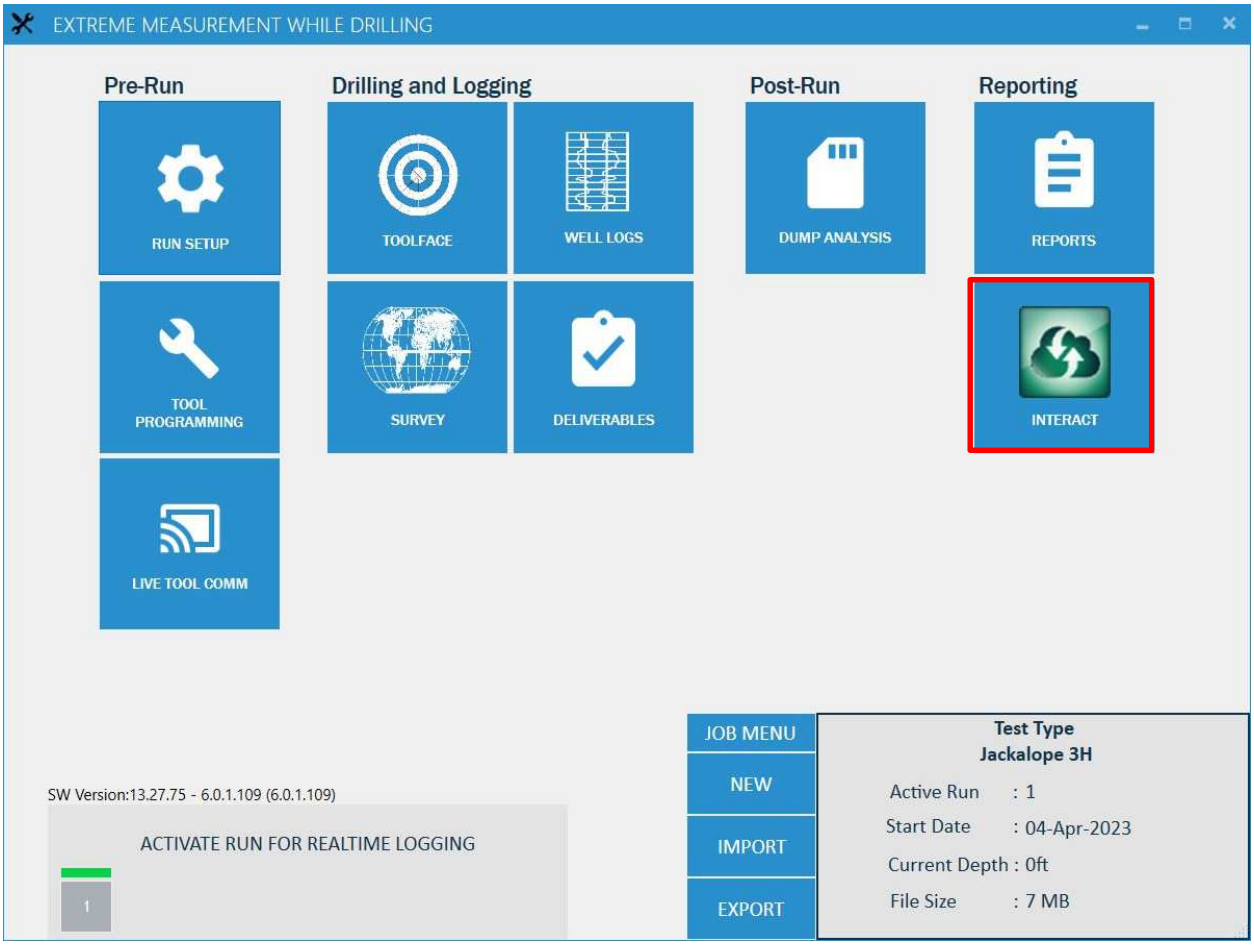

EXTREME MEASUREMENT WHILE DRILLING
Signal Analysis Report
MENU
RESET
Generate
Start
End
Comments
Contact name
Email/Phone
Tuesday, August 08, 2017 11:14:34 AM
34 PM
August, 2017
Su Mo Tu We Th Fr Sa
30 31 1 2 3 4 5
6 7 8 9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30 31 1 2
3 4 5 6 7 8 9
11:14 AM
1 of 3
XEM

A multipage report including SNR and spectral plots for each channel will be created.



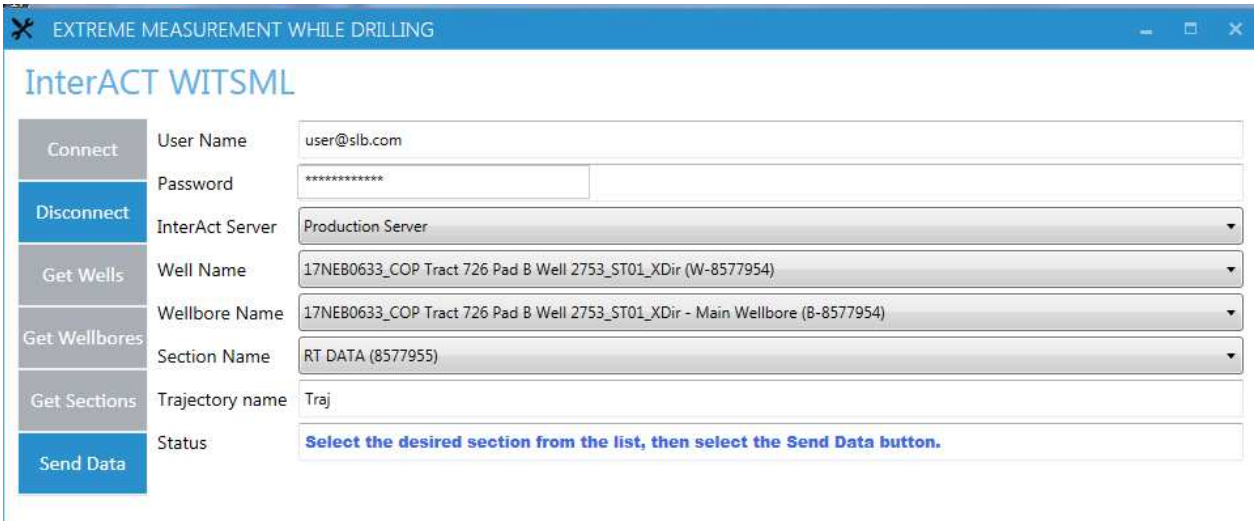
14.2 InterAct

XDirect supports connection to WITSML store like InterAct for live reporting of drilling data.

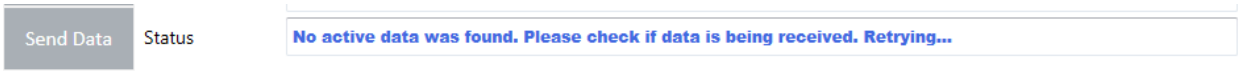


Enter username and password – click Connect. Select production server and click Get Wells.

Select well name from drop down menu and click Get Wellbores. Then click Get Sections. Select Section from drop down menu and click Send Data.



If successful, Status will show InterAct Connected. Data must be streaming to InterAct to maintain connection. XDirect will continue to try and connect to the InterAct server if data stops.



15 Deliverables

15.1 Introduction

The Deliverables tab allows the user to control and configure all deliverable items for the job. Existing templates can be utilized, or new templates can be created and saved for easy re-use. Below is a basic outline of all items in the Deliverables tab.

15.2 WellLog PDF

Generates a PDF formatted Well Log.

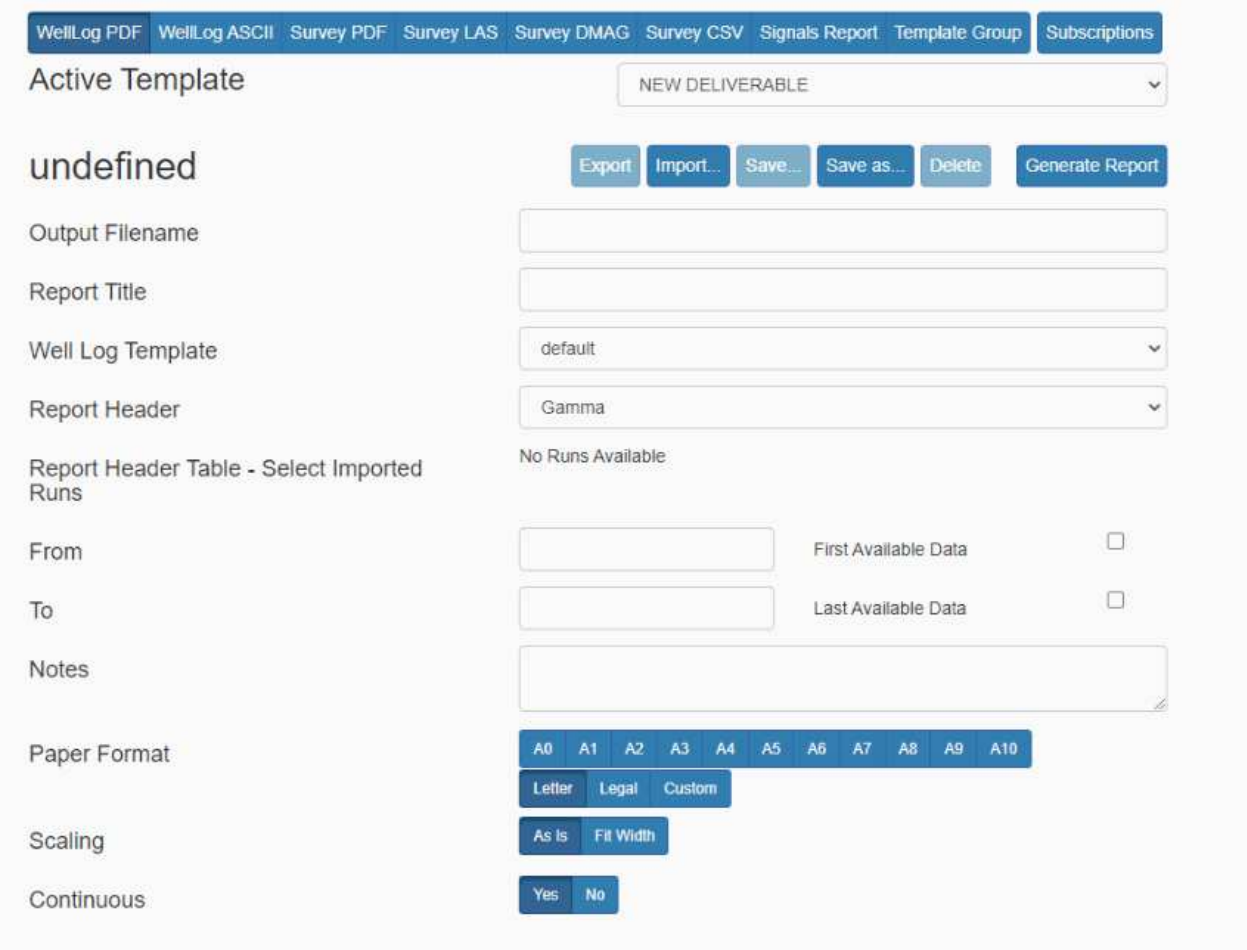
Active Template – the user can select from a list of templates or create their own.

Export, Import, Save, Add, Delete. These buttons are all used for creating, saving, and sharing templates.

Generate Report – When ready, the user can generate the expected report from the template, based on the data from the job.

Template Settings:

- Output Filename – user can specify the filename of the file to export.
- Report Title – user can input a custom title for the report
- Well Log Template – Default, Comparison, etc. These are created in the Well Log tab. All well log settings will be applied.
- Report Header – Standard or Gamma
- From/To – user can select a specific log interval or select the First/Last Available Data.
- Paper Format – designates size of page for pdf
- Scaling – As Is keeps formatting on screen. If logs do not fit on selected page size, choose Fit to Width
- Continuous – Yes removes the top and bottom margins from the well logs



15.3 WellLog ASCII

Generates an ASCII formatted Well Log.

Active Template – the user can select from a list of templates or create their own.

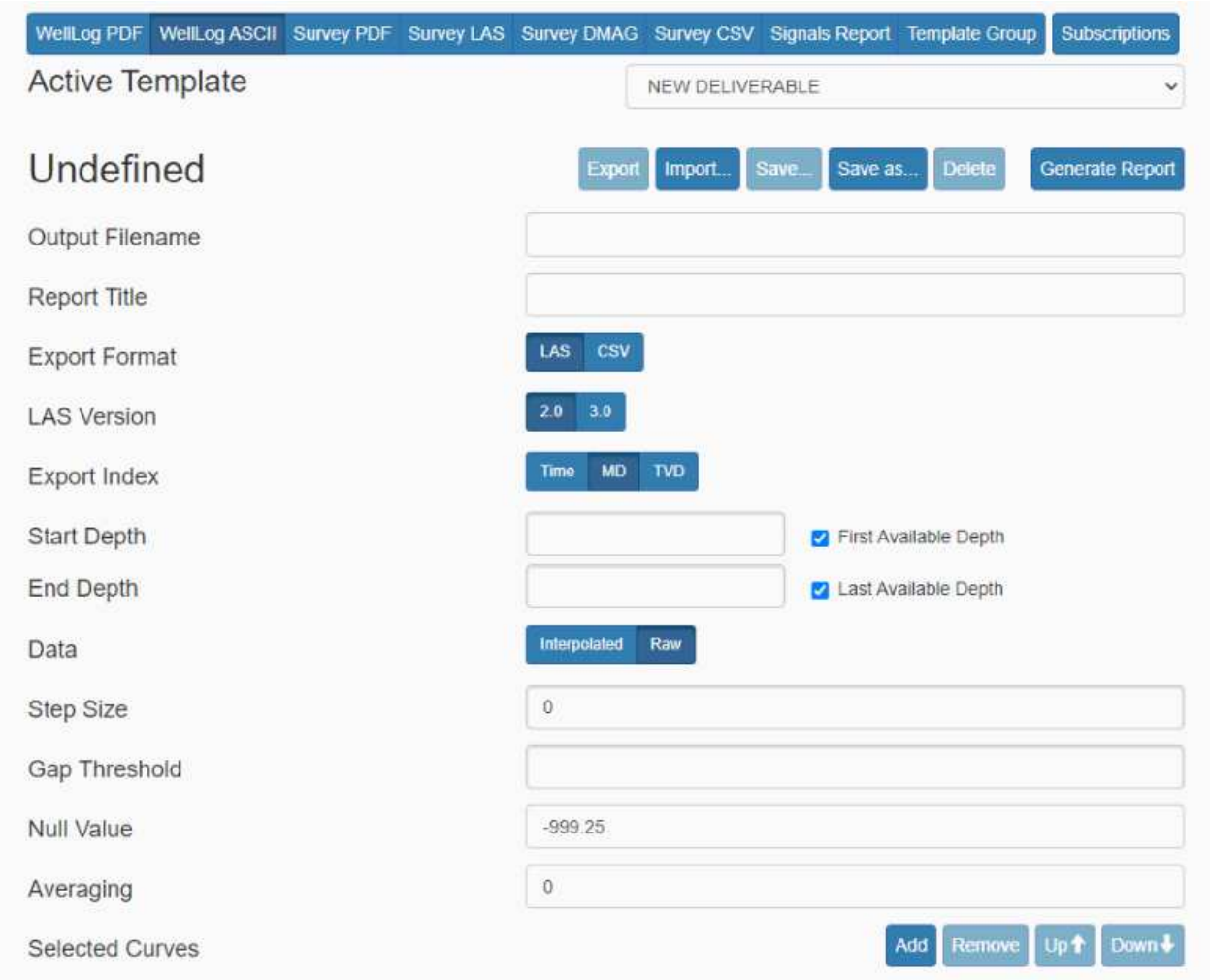
Export, Import, Save, Add, Delete. These buttons are all used for creating, saving, and sharing templates.

Generate Report – When ready, the user can generate the expected report from the template, based on the data from the job.

Template Settings:

- Output Filename – user can specify the filename of the file to export
- Report Title – user can input a custom title for the report
- Export Format – user can select LAS or CSV
- LAS Version – specifies V2.0 or V3.0 of LAS

- Export Index – user can select Time, Measured Depth (MD), or True Vertical Depth (TVD)
- Start/End Time/Depth – based on the Export Index, user can select a range
- Data – user can select Interpolated or Raw data
- Step Size – user can select step size if Interpolated data is chosen
- Null Value – user can input a null value for the data
- Averaging – user can average the results for smoother display
- Selected Curves – user can Add/Remove from a pre-defined set of curves that are populated by the data from the job. Selected Curves can also be rearranged.



15.4 Survey PDF

Generates a PDF survey report.

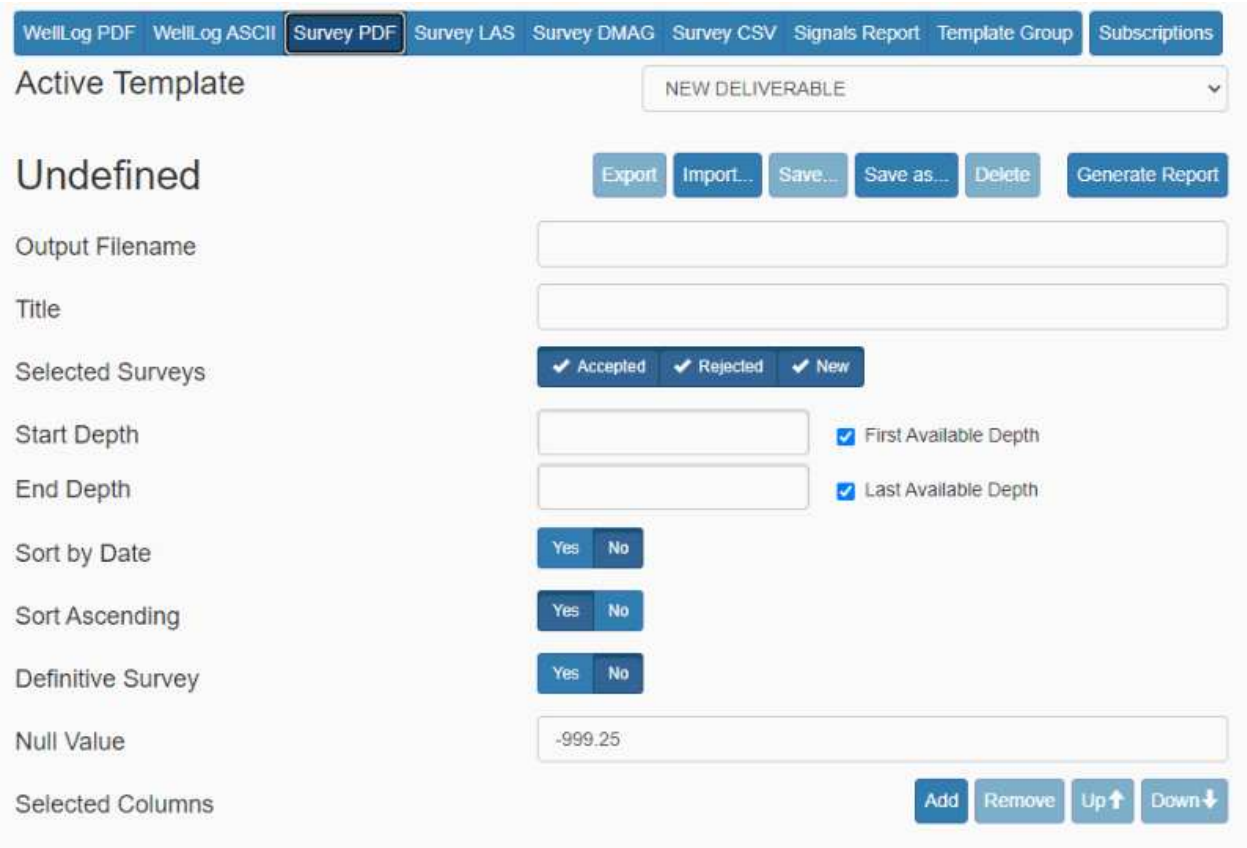
Active Template – the user can select from a list of templates or create their own.

Export, Import, Save, Add, Delete. These buttons are all used for creating, saving, and sharing templates.

Generate Report – When ready, the user can generate the expected report from the template, based on the data from the job.

Template Settings:

- Output Filename – user can specify the filename of the file to export
- Report Title – user can input a custom title for the report
- Definitive Survey – this checkbox can be enabled or disabled
- Selected Surveys – user can specify Accepted, Rejected, and/or New surveys
- Start/End Depth – user can select a range or choose first and last available depths
- Sort Date – Allows user to sort by date instead of depth
- Sort Ascending – Allows user to sort ascending (Yes) or descending (No)
- Definitive Survey – Adds notation that report is final
- Null Value – Allows user to specify notation used for null
- Selected Columns – user can Add/Remove from a pre-defined set of columns populated by data from the job. Columns can also be rearranged.


WellLog PDF
WellLog ASCII
Survey PDF
Survey LAS
Survey DMAG
Survey CSV
Signals Report
Template Group
Subscriptions
Active Template
NEW DELIVERABLE
Undefined
Export
Import...
Save...
Save as...
Delete
Generate Report
Output Filename
Title
Selected Surveys
Accepted
Rejected
New
Start Depth
First Available Depth
End Depth
Last Available Depth
Sort by Date
Yes
No
Sort Ascending
Yes
No
Definitive Survey
Yes
No
Null Value
-999.25
Selected Columns
Add
Remove
Up
Down

15.5 Survey LAS

Generates an LAS survey report.

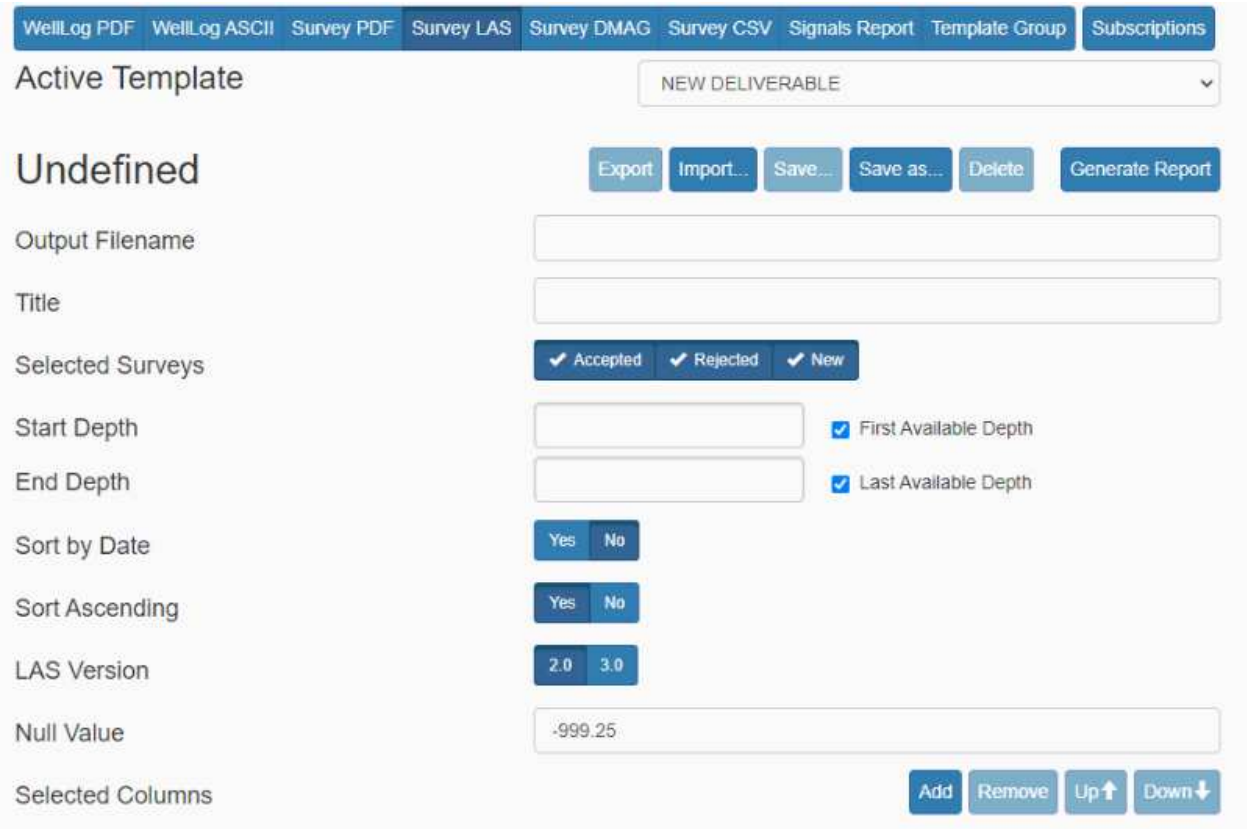
Active Template – the user can select from a list of templates or create their own.

Export, Import, Save, Add, Delete. These buttons are all used for creating, saving, and sharing templates.

Generate Report – When ready, the user can generate the expected report from the template, based on the data from the job.

Template Settings:

- Output Filename – user can specify the filename of the file to export
- Report Title – user can input a custom title for the report
- Selected Surveys – user can specify Accepted, Rejected, and/or New surveys
- Start/End Depth – user can select a range or choose first and last available depths
- Selected Columns – user can Add/Remove from a pre-defined set of columns populated by data from the job. Columns can also be rearranged.
- Output Filename – user can specify the filename of the file to export
- Report Title – user can input a custom title for the report
- Definitive Survey – this checkbox can be enabled or disabled
- Selected Surveys – user can specify Accepted, Rejected, and/or New surveys
- Start/End Depth – user can select a range or choose first and last available depths
- Sort Date – Allows user to sort by date instead of depth
- Sort Ascending – Allows user to sort ascending (Yes) or descending (No)
- LAS Version – Specifies V2.0 or V3.0 of LAS
- Null Value – Allows user to specify notation used for null
- Selected Columns – user can Add/Remove from a pre-defined set of columns populated by data from the job. Columns can also be rearranged.



15.6 Survey DMAG

Generates a DMAG survey report.

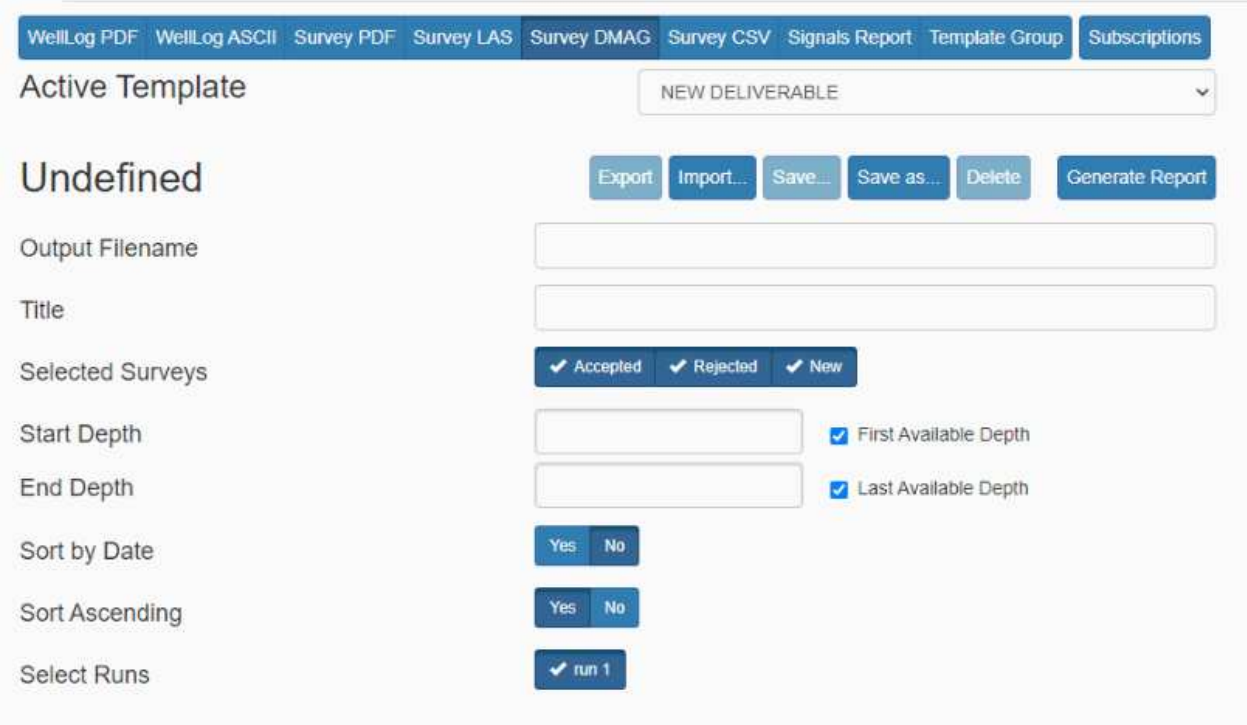
Active Template – the user can select from a list of templates or create their own.

Export, Import, Save, Add, Delete. These buttons are all used for creating, saving, and sharing templates.

Generate Report – When ready, the user can generate the expected report from the template, based on the data from the job.

Template Settings:

- Output Filename – user can specify the filename of the file to export
- Report Title – user can input a custom title for the report
- Selected Surveys – user can specify Accepted, Rejected, and/or New surveys
- Select Runs – user can select which runs to get data from
- Start/End Depth – user can select a range or choose first and last available depths
- Sort Date – Allows user to sort by date instead of depth
- Sort Ascending – Allows user to sort ascending (Yes) or descending (No)


WellLog PDF
WellLog ASCII
Survey PDF
Survey LAS
Survey DMAG
Survey CSV
Signals Report
Template Group
Subscriptions
Active Template
NEW DELIVERABLE
Undefined
Export
Import...
Save...
Save as...
Delete
Generate Report
Output Filename
Title
Selected Surveys
Accepted
Rejected
New
Start Depth
First Available Depth
End Depth
Last Available Depth
Sort by Date
Yes
No
Sort Ascending
Yes
No
Select Runs
run 1

15.7 Survey CSV

Generates a CSV survey report.

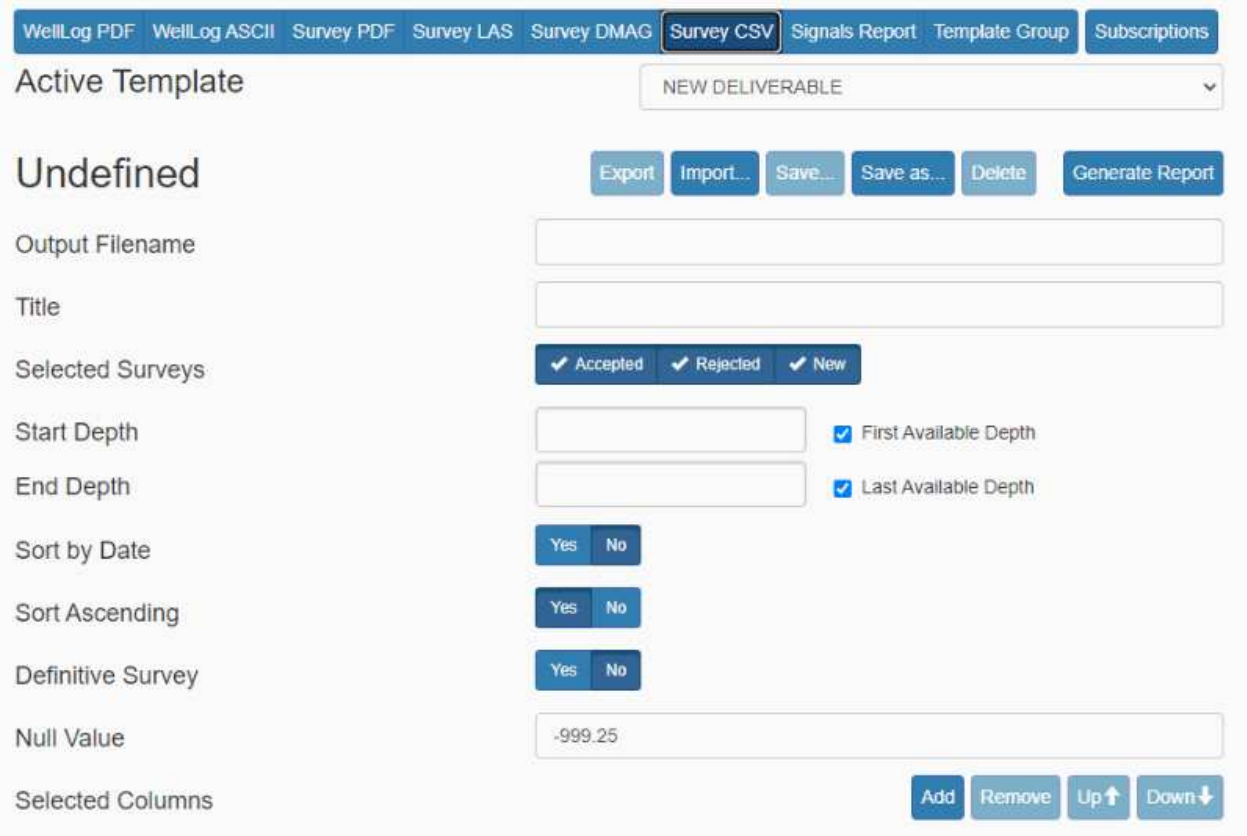
Active Template – the user can select from a list of templates or create their own.

Export, Import, Save, Add, Delete. These buttons are all used for creating, saving, and sharing templates.

Generate Report – When ready, the user can generate the expected report from the template, based on the data from the job.

Template Settings:

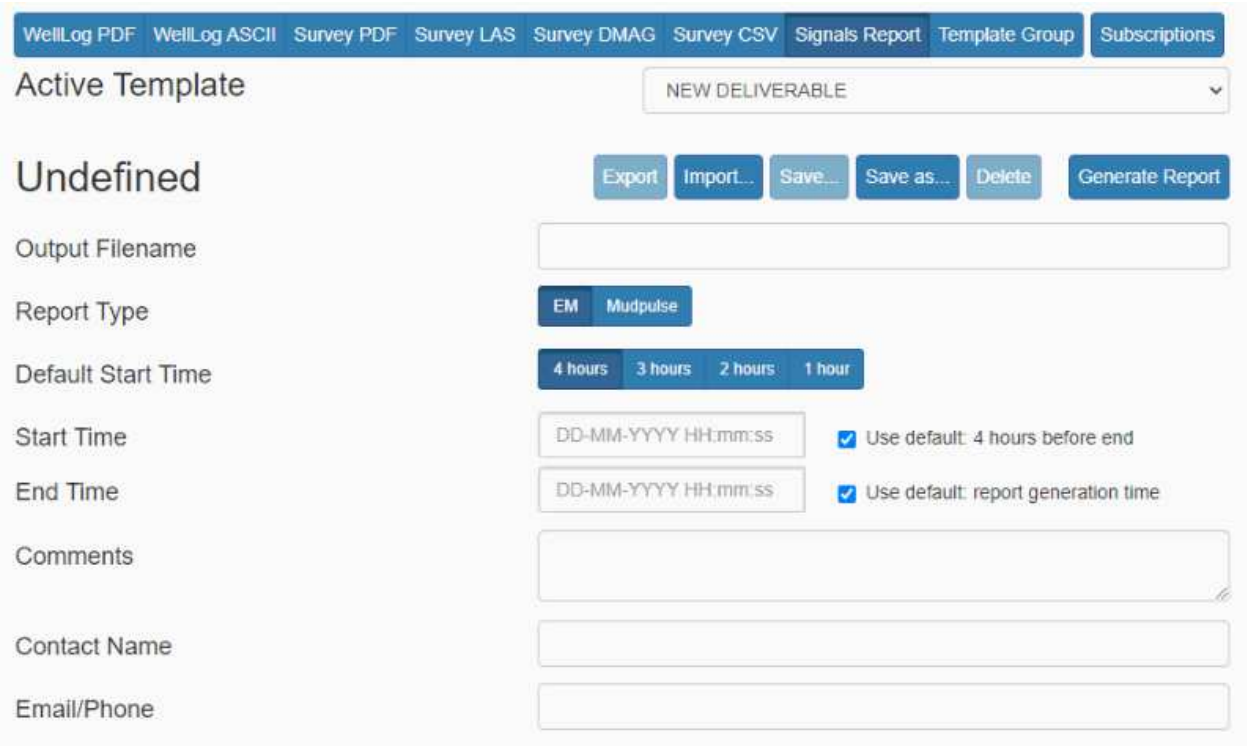
- Output Filename – user can specify the filename of the file to export
- Report Title – user can input a custom title for the report
- Definitive Survey – this checkbox can be enabled or disabled
- Selected Surveys – user can specify Accepted, Rejected, and/or New surveys
- Start/End Depth – user can select a range or choose first and last available depths
- Sort Date – Allows user to sort by date instead of depth
- Sort Ascending – Allows user to sort ascending (Yes) or descending (No)
- Definitive Survey – Adds notation that report is final
- Null Value – Allows user to specify notation used for null
- Selected Columns – user can Add/Remove from a pre-defined set of columns populated by data from the job. Columns can also be rearranged.



15.8 Signals Report

Generates a Signal Analysis Report for EM or Mudpulse.

- Output Filename – user can specify the filename of the file to export
- Report Type – designates EM or Mudpulse
- Default Start Time – User can specify how many hours of data the report will show. The report will end at the time it is generated and start the number of hours selected
- Start/End Time – User can specify any start and stop time from the entire job.
- Comments
- Contact Name
- Email/Phone



15.9 Template Group

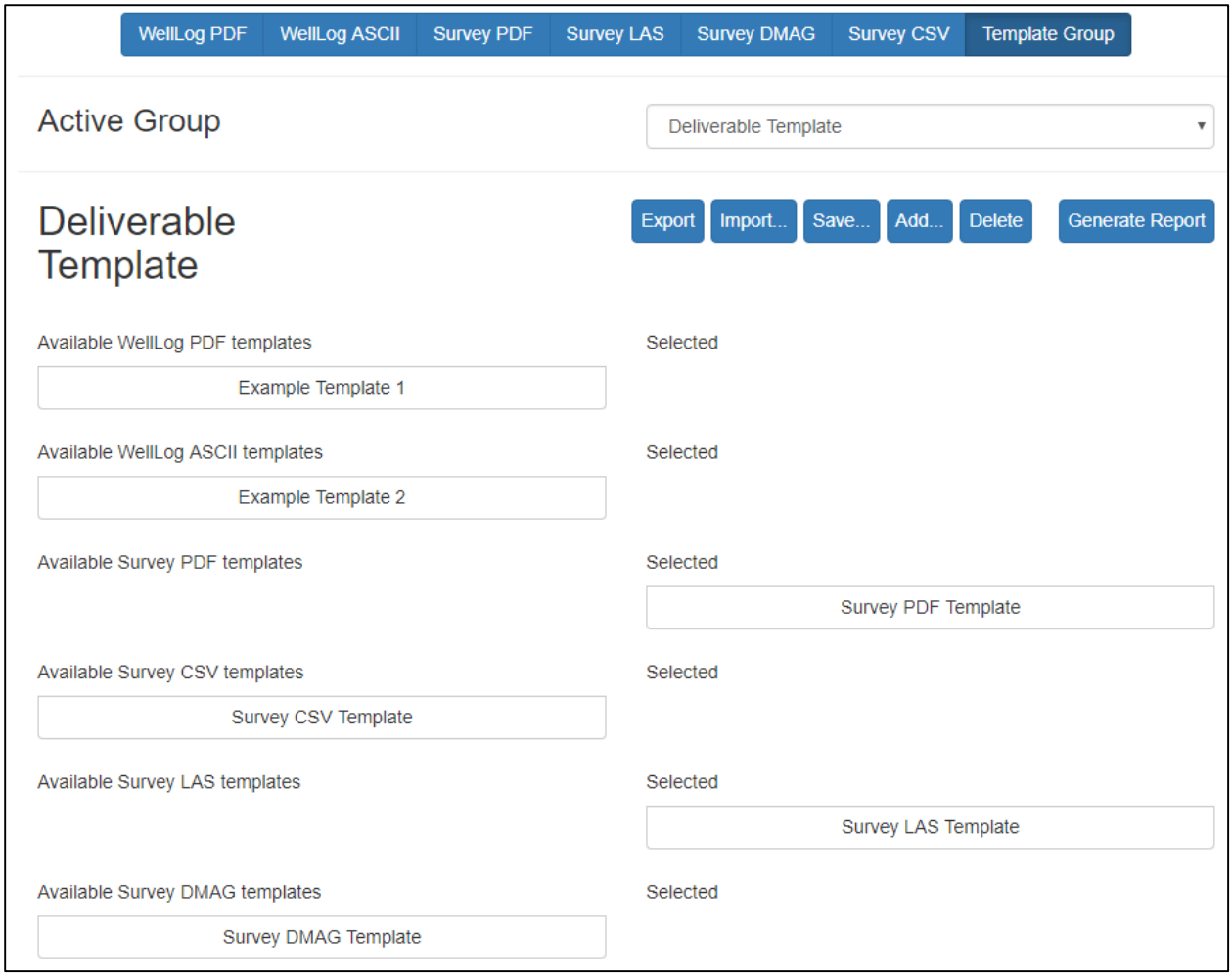
Generates a report using selected user-defined templates.

Active Group – the user can select from a list of groups of templates or create their own.

Export, Import, Save, Add, Delete. These buttons are all used for creating, saving, and sharing template groups.

Generate Report – When ready, the user can generate the expected report from the template group, based on the data from the job.

To move templates from the Available column to the Selected column, click on the template name, and it will move to the selected column. To de-select, or move it back to the available column, merely click on the template name again.



15.10 Subscriptions

The subscription function has been disabled in Version 6 due to loss of support from third party providers.

16 Appendix A

16.1 XDAG HFO Setting Details

	Lateral	Axial Filtered	Total
Index	Interval (Seconds)	Interval (Seconds)	M bytes per day
0	9000	7200	0
1	240	60	23
2	60	20	80
3	60	60	60
4	120	20	56
5	120	30	45
6	120	40	40
7	120	240	27
8	240	20	43
9	240	30	33
10	24	40	28
11	480	60	16
12	480	120	11
13	960	60	13
14	960	120	8
15	960	240	6
16	1200	300	5
17	1200	30	23