xBolt

Pre-Run Preparations

EXTREME™

Objectives

- Learn how to assemble all xBolt tool string
- Know how to strap xBolt equipment for run
- Setup surface software for job
- Understand how to program and test tools
- Finalize equipment setup to pick up for run

xBolt Pre-Run Preparations

Probe Assembly Order

Probe Assembly Order – R Dual Telemetry – Extreme Probes

7 Main Components

- R-Fishing Head (XET)
- Battery Probe(s) (DOBA)
- D&I Probe (SOCD)
- Gamma Probe (XGM)
- Dual Telemetry Probe (XDT)
- Gap Probe (XGP)
- xBolt-R Pulser (XPR)

Uphole

Downhole

- Sub Components
  - Bowsprings
  - Field Resizable Centralizers
  - Connector Housing

*__Build tool from Pulser on__

**__DOBA, SOCD and XGM may be placed in any order above XDT__

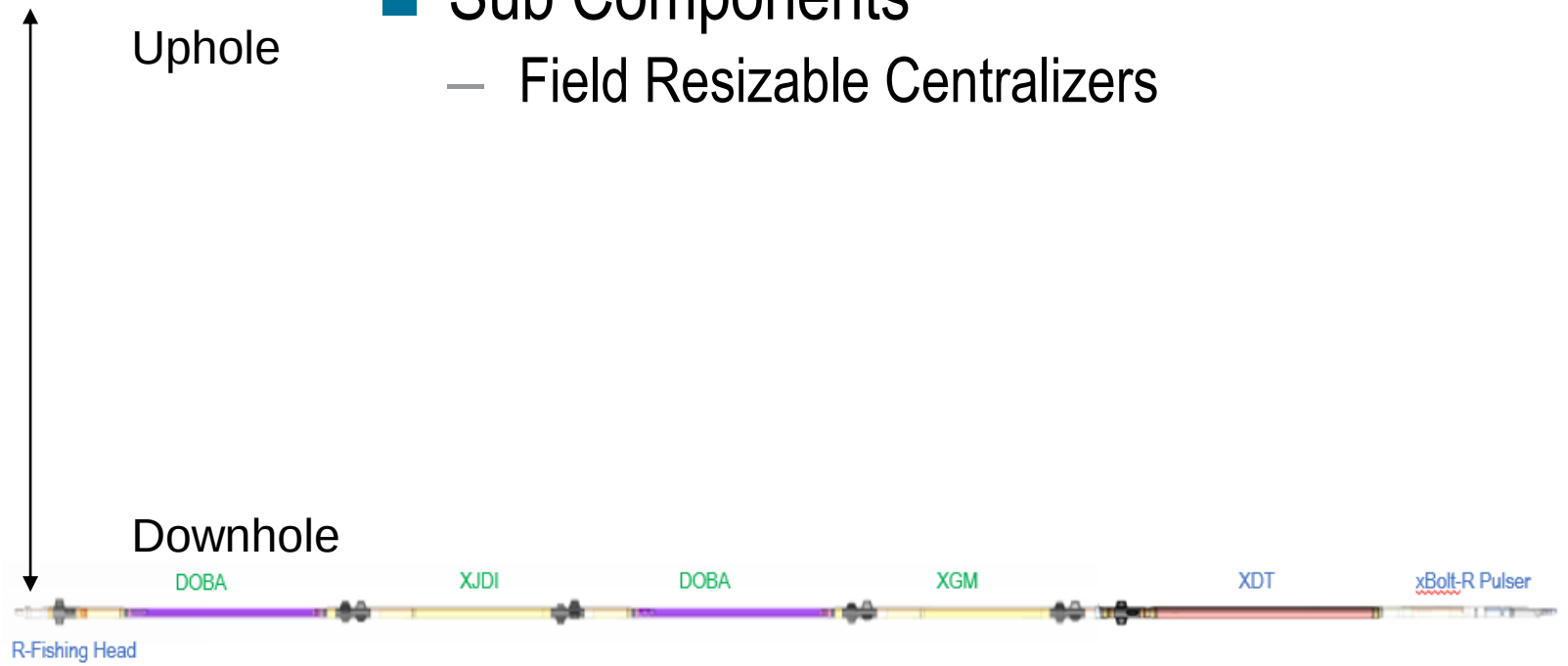
Never connect battery probes to XDT prior to assembly of XGP and Pulser to XDT.

Probe Assembly Order – R Mud Pulse Only – Extreme Probes

6 Main Components

- R-Fishing Head (XET)
- Battery Probe(s) (DOBA)
- D&I Probe (SOCD)
- Gamma Probe (XGM)
- Dual Telemetry Probe (XDT)
- xBolt-R Pulser (XPR)

- Sub Components
  - Field Resizable Centralizers



<u>*Build tool from XPR upward</u>

<u>DOBA, SOCD and XGM may be placed in any order above XDT</u>**

Never connect battery probes to XDT prior to assembly of Pulser to XDT.

Probe Assembly Order – L Dual Telemetry – Extreme Probes

8 Main Components

- L-Pulser (MOP)
- MOP Interface Probe (XIPL)
- Gap Probe (XGP)
- Dual Telemetry Probe (XDT)
- D&I Probe (SOCD)
- Battery Probe(s) (DOBA)
- Gamma Probe (XGM)
- Extreme End Stabilizer (ENDS)

*__Build tool from MOP downward__

**__DOBA, SOCD and XGM may be placed in any order below XDT__

Uphole

Downhole

- Sub Components
  - Bowsprings
  - Field Resizable Centralizers

Never connect battery probes to XDT prior to assembly of XGP and MOP to XDT.

Probe Assembly Order – L Mud Pulse Only – Extreme Probes

7 Main Components

- L-Pulser (MOP)
- MOP Interface Probe (XIPL)
- Dual Telemetry Probe (XDT)
- D&I Probe (SOCD)
- Battery Probe(s) (DOBA)
- Gamma Probe (XGM)
- Extreme End Stabilizer (ENDS)

*__Build tool from MOP downward__

**__DOBA, SOCD and XGM may be placed in any order below XDT__

Uphole

Downhole

- Sub Components
  - Field Resizable Centralizers

Never connect battery probes to XDT prior to assembly of MOP to XDT.

Probe Assembly Order – EM Only – Extreme Probes

6 Main Components

- Gap Probe (XGP)
- Dual Telemetry Probe (XDT)
- Battery Probe(s) (DOBA)
- D&I Probe (SOCD)
- Gamma Probe (XGM)
- Extreme End Stabilizer (ENDS)

Uphole

Downhole

- Sub Components
  - EM Fishing Head
  - Bowsprings
  - Field Resizable Centralizers

*__Build tool from XGP downward__

**__DOBA, SOCD and XGM may be placed in any order below XDT__

Never connect battery probes to XDT prior to assembly of XGP to XDT.

Probe Assembly Order – R Dual Telemetry – xBolt Probes

6 Main Components

- R-Fishing Head (XET)
- Azi Gamma/D&I Probe (XDAG)
- Battery Probe(s) (XBAT)
- Dual Telemetry Probe (XDT)
- Gap Probe (XGP)
- xBolt-R Pulser (XPR)

Uphole

Downhole

- Sub Components
  - Bowsprings
  - Field Resizable Centralizers
  - Connector Housing

*__Build tool from XPR upward__

**__XBAT and XDAG can be in any order above XDT__

Never connect battery probes to XDT prior to assembly of XGP and Pulser to XDT.

Probe Assembly Order – R Mud Pulse Only – xBolt Probes

5 Main Components

- R-Fishing Head (XET)
- Azi Gamma/D&I Probe (XDAG)
- Battery Probe(s) (XBAT)
- Dual Telemetry Probe (XDT)
- xBolt-R Pulser (XPR)

*__Build tool from XPR upward__

**__XBAT and XDAG can be in any order above XDT__

Uphole

Downhole

- Sub Components
  - Field Resizable Centralizers

Never connect battery probes to XDT prior to assembly of Pulser to XDT.

Probe Assembly Order – L Dual Telemetry– xBolt Probes

7 Main Components

- L-Pulser (MOP)
- MOP Interface Probe (XIPL)
- Gap Probe (XGP)
- Dual Telemetry Probe (XDT)
- Battery Probe(s) (XBAT)
- Azi Gamma/D&I Probe (XDAG)
- End Terminator (XETL)

Uphole

Downhole

- Sub Components
  - Bowsprings
  - Field Resizable Centralizers

*__Build tool from MOP Downward__

**__XBAT and XDAG can be in any order below XDT__

Never connect battery probes to XDT prior to assembly of XGP and MOP to XDT.

Probe Assembly Order – L Mud Pulse Only – xBolt Probes

6 Main Components

- L-Pulser (MOP)
- MOP Interface Probe (XIPL)
- Dual Telemetry Probe (XDT)
- Battery Probe(s) (XBAT)
- Azi Gamma/D&I Probe (XDAG)
- End Terminator (XETL)

*__**Build tool from MOP Downward**__

__XBAT and XDAG can be in any order below XDT**__

Uphole

Downhole

- Sub Components
  - Field Resizable Centralizers

Never connect battery probes to XDT prior to assembly of MOP to XDT.

Probe Assembly Order – EM Only – Extreme Probes

5 Main Components

- Gap Probe (XGP)
- Dual Telemetry Probe (XDT)
- Battery Probe(s) (XBAT)
- Azi Gamma/D&I Probe (XDAG)
- End Terminator (XETL)

***<u>Build tool from XGP downward</u>**

****<u>XBAT and XDAG can be in any order below XDT</u>**

Uphole

Downhole

- Sub Components
  - EM Fishing Head
  - Bowsprings
  - Field Resizable Centralizers

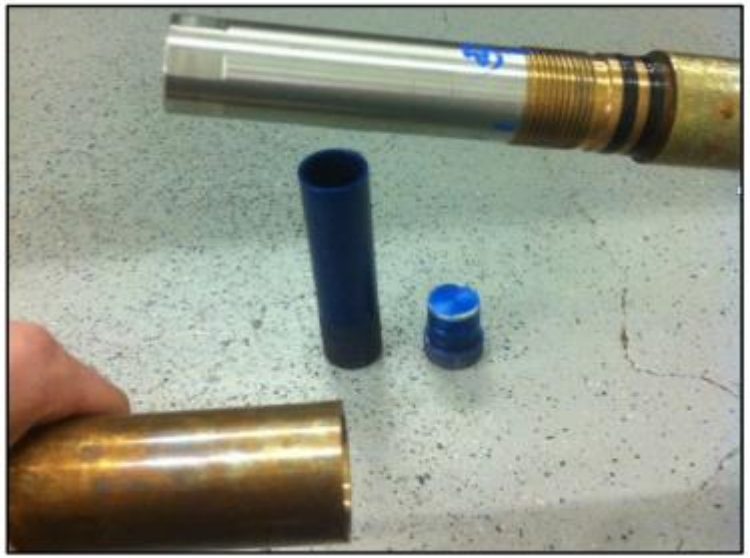
Never connect battery probes to XDT prior to assembly of XGP to XDT.

xBolt Tool Pre-Run Preparations

Building the Tool

Building the Tool – Pre-Assembly Checks

- Verify centralizers are sized for BHA and can drift all IDs in BHA where tool is housed
  - 2 11/16” – 475 BHA
  - 3 ¼” – 675 BHA
  - 3 1/2” – 800 BHA
- Inspect each connector for damage, clean with contact cleaner if necessary
- Inspect O-Rings for damage, apply DC111 to O-Rings
- Verify all three sizes of torque wrenches are available in kit: 1.75”, 1.875”, 2.00”
- Verify bow spring is installed is proper size and placement for tool string and BHA



Building the Tool – Golden Rule Assembly

Never connect battery probes to XDT prior to assembly of XGP and Pulser to XDT. Failure to do so could lead to current spike through XDT which will damage electronics.

Building the Tool – Assembly HSE

- Always wear steel toed boots, hard hat, safety glass, FR clothing and metatarsal gloves during assembly
- Use proper SIPP during all assembly operations
- LF MOP, XDAG and XBAT exceed 50lbs, use two man lift if unable to carry probe
- Never jump on barrel wrenches

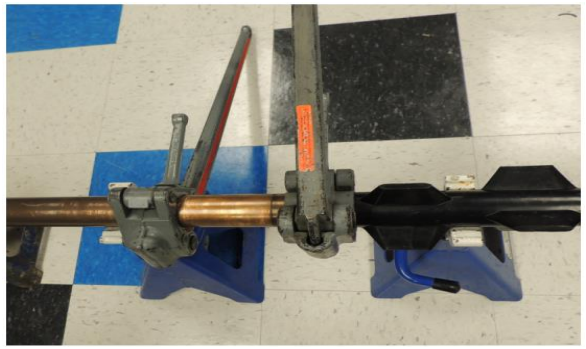
Building the Tool – Assembly Steps

- Step 1: Lay out tool string on jack stands in order
- Step 2: Begin assembling string from pulser downwards (upwards for xBolt-R), assemble all connections by hand before torqueing with barrel wrenches
- Step 3: Mark each connection with paint pen prior to torqueing
- Step 4: Communicate with tool string prior to applying torque and verify all nodes are present
- Step 5*: Begin torqueing string to 350 ft/lbs with barrel wrenches in same order as string was assembled. Be sure to verify torque on all field replaceable centralizers.
- Step 6: Verify all paint pen marks show torque applied

DO NOT TORQUE ACROSS XEM PROBES CENTRALIZERS.

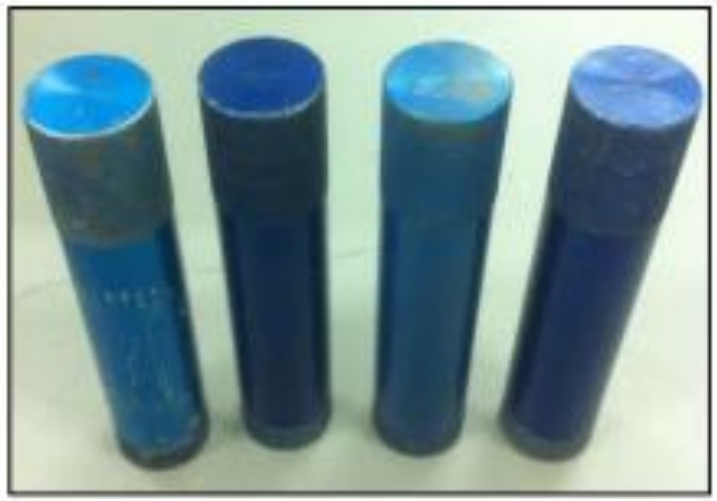
Building the Tool – Barrel Wrench Size Guidelines

- 2.00” Barrel wrench used for:
  - XDT
  - XDAG
  - XGP
- 1.875” Barrel wrench used for:
  - Field Resizable Centralizers
  - XETL
  - XBAT
- 1.75” Barrel wrench used for:
  - All XEM Probes
  - EM Fishing Head
  - R-Fishing Head



Building the Tool – Post Assembly Cleanup

- Once the tool string is assembled, collect the dust caps and store them in kit to prevent debris entering dust caps
- Return barrel wrenches and excess jack stands to kit box to prevent rusting



xBolt Tool Pre-Run Preparations

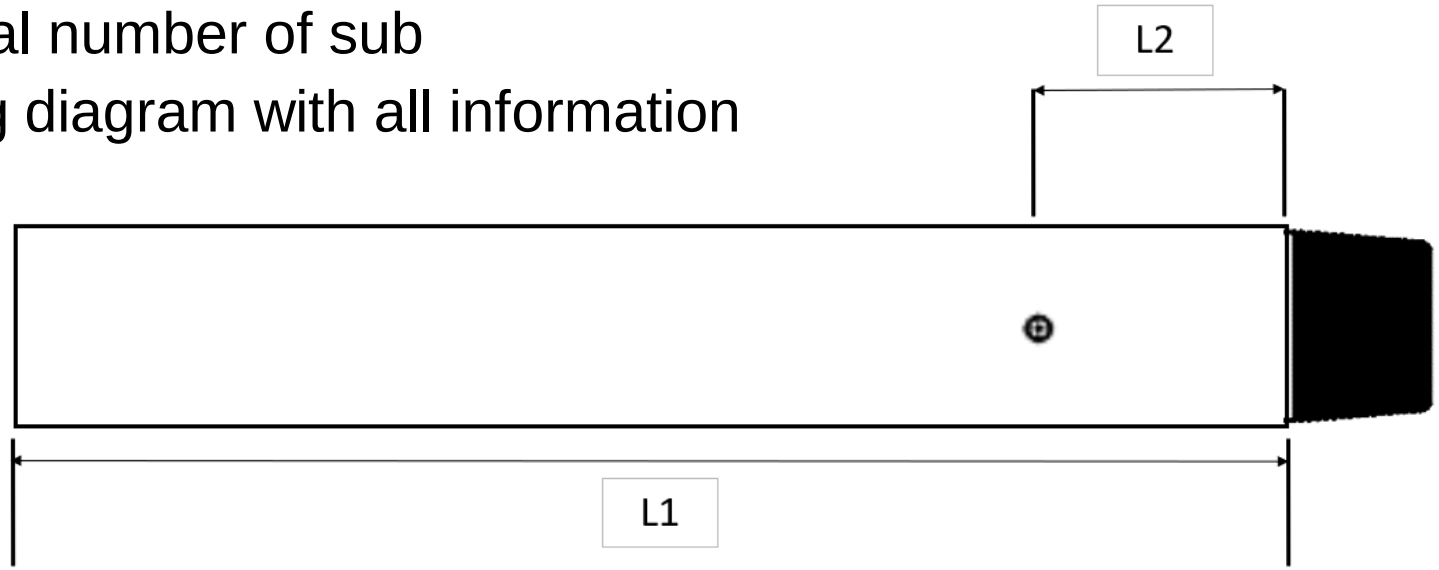
Strapping MWD Iron

Strapping MWD Iron – Strapping HSE

- Always wear steel toed boots, hard hat, safety glass, FR clothing and metatarsal gloves during strapping
- In low light condition, bring flashlight to identify hazards
- Never stick your hand inside a sub or collar before looking inside of it
- Never stand between two collars on a rack

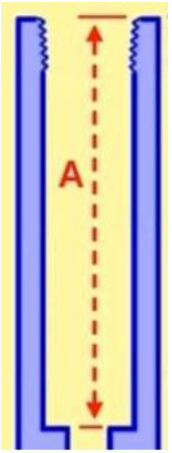
Strapping MWD Iron – Strapping Muleshoe Sub – xBolt-R

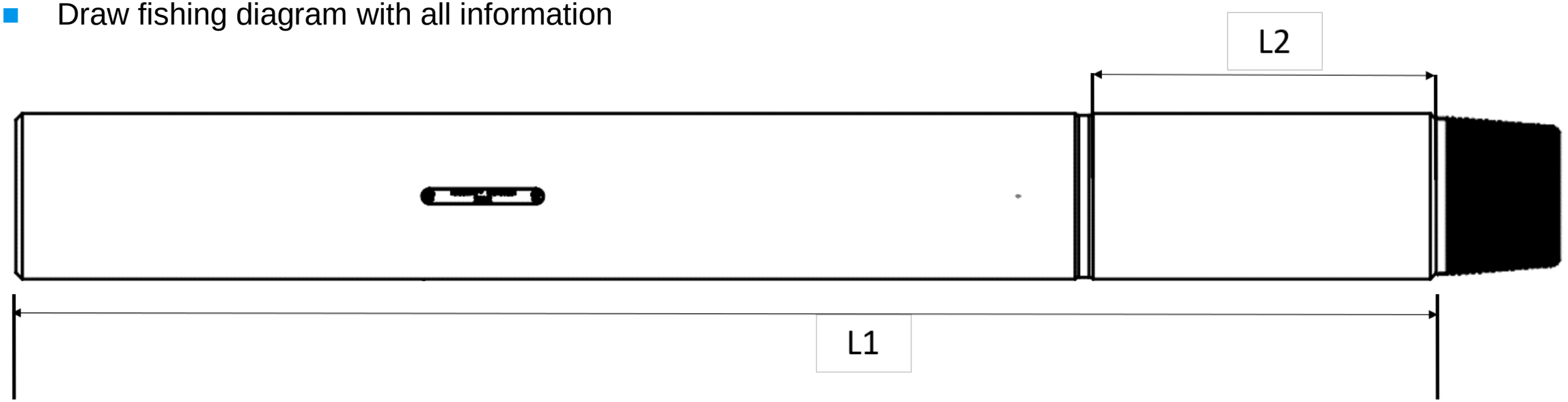
- Measure overall length of muleshoe sub from box seal face to pin seal face (L1)
- Measure distance from center of set screw hole to pin seal face (L2)
- Measure OD of sub near top of sub
- Measure ID of sub
- Record serial number of sub
- Draw fishing diagram with all information



Strapping MWD Iron – Strapping Pulser Sub – xBolt-L

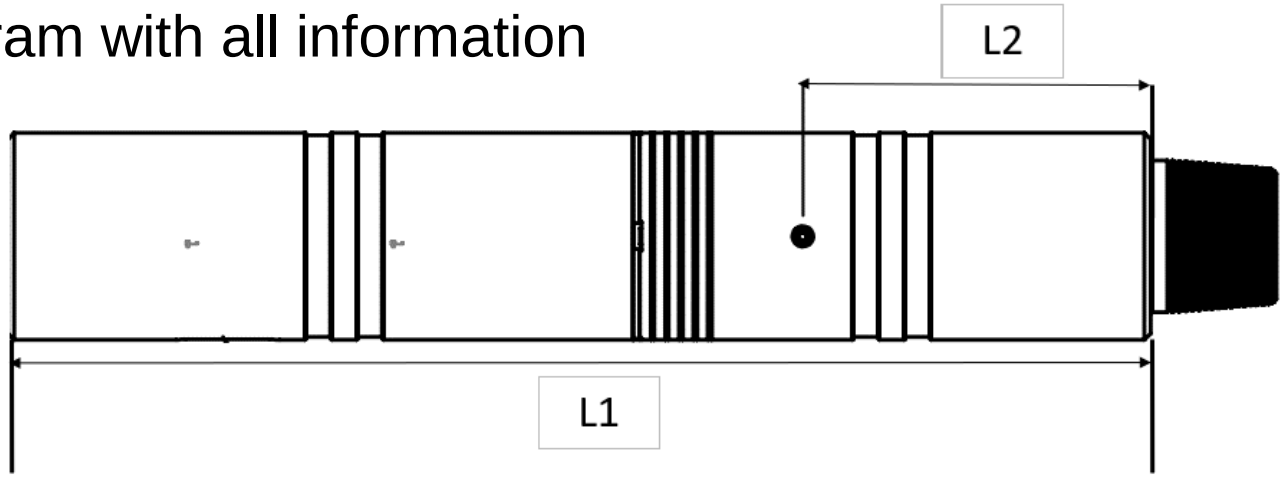
- Measure overall length of pulser sub from box seal face to pin seal face (L1)
- Measure distance from bottom of recess to pin seal face (L2)
- Measure sub internal bore depth (A)
- Measure OD of sub near top of sub
- Measure ID of sub
- Record serial number of sub
- Draw fishing diagram with all information





Strapping MWD Iron – Strapping Gap Sub – xBolt DT or EM

- Measure overall length of gap sub from box seal face to pin seal face (L1)
- Measure distance from center of set ground plug hole to pin seal face (L2)
- Measure OD of sub near top of sub and below gap
- Measure ID of sub
- Record serial number of sub
- Draw fishing diagram with all information

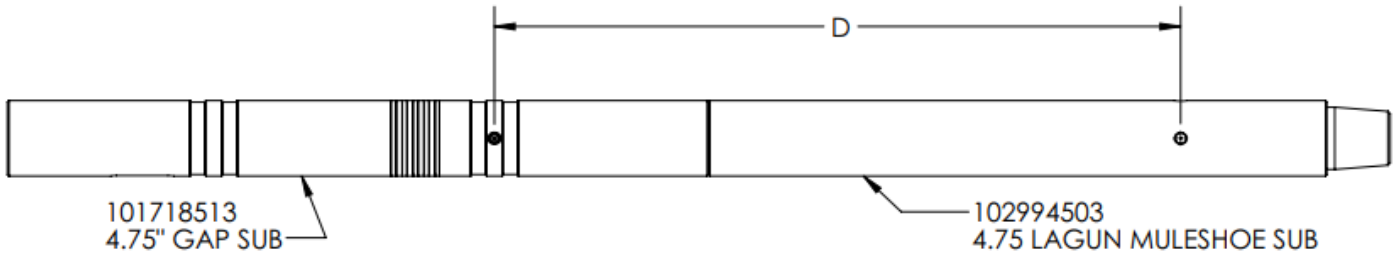


Strapping MWD Iron – Strapping NMDCs, NMFCs and NMPCs

- Measure overall length of collar(s) from box seal face to pin seal face
- Measure OD near top of collar(s)
- Measure ID of collar(s)
- Record serial number of collar(s)
- If using flex collars or ponies, strap distance to all upsets and record OD of each section
- Once offsets have been calculated for the run, measure OD of approximate area gamma sensor will sit
- Draw fishing diagram with all information

Strapping MWD Iron – Dual Telemetry Checks – MS Sub and Gap Sub

- Physical gap in gap probe (plastic sleeve) must sit within physical gap of gap sub for EM functionality
- Verify distance (D) between set screw port in muleshoe sub to gap sub ground plug ports falls within allowable range
- Refer to ITC # 7351465



	NEW	RECUT MIN
A	39.00	31.9
B	29.78	27.68
C	9.22	4.22
D	43.28	36.18
O.D	4.75	4.70

475 Tool

	NEW	RECUT MIN
A	40.0	31.25
B	30.41	27.66
C	9.59	3.59
D	43.29	37.79
O.D.	6.50	6.45

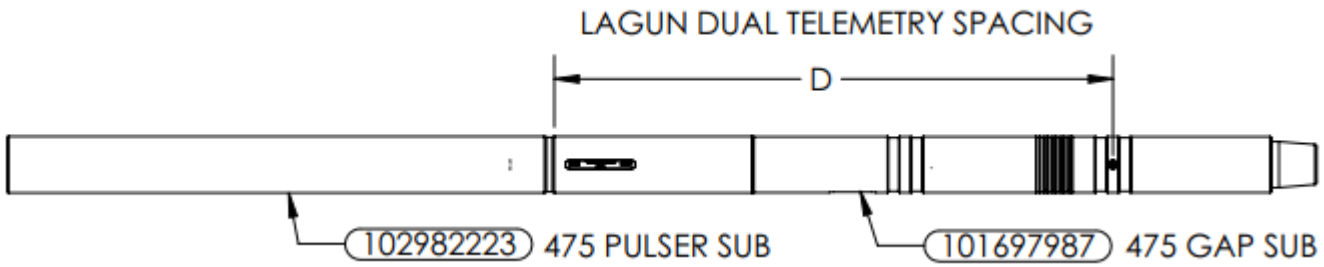
675 Tool

	NEW	RECUT MIN
A	39.00	31.75
B	31.41	28.66
C	7.59	3.09
D	44.86	42.11
O.D.	8.00	7.95

800 Tool

Strapping MWD Iron – Dual Telemetry Checks – Pulser Sub and Gap Sub

- Physical gap in gap probe (plastic sleeve) must sit within physical gap of gap sub for EM functionality
- Verify distance (D) between bottom of recess to gap sub ground plug ports falls within allowable range
- Refer to ITC # 7290551



	NEW	RECUT- MIN
A	63.6	52.6
B	45.8	38.8
C	16.9	12.9
D	47.7	39.7
O.D.	4.80	4.70

475 Tool

	NEW	RECUT- MIN
A	70.1	59.1
B	52.2	45.2
C	17.1	13.1
D	47.7	39.7
O.D. 5-1/2 FH	7.00	6.70
O.D. 4-1/2 IF	7.00	6.45

675 Tool

	NEW	RECUT- MIN
A	70.0	59.0
B	52.2	45.2
C	16.9	12.9
D	47.7	39.7
O.D.	8.125	7.050

800 Tool

xBolt Tool Pre-Run Preparations

Tool Length Calculation

Tool Length Calculation – Tool Length Calculator

- Obtain final BHA from DD and verify iron measurements match MWD strap
- Using measurements obtained from strap, fill out collar lengths and reference point measurements in calculator
- Select appropriate probes and verify they are in order on calculator compared to tool assembly
- Note down offsets in calculator, verify position of gamma sensor in BHA and corresponding OD/ID
- Verify D&I package is not near any wear bands or stabilizer blades as they could be magnetized
- Tool length calculator is located in ITC #7288212

Inputs:	ft	m
Length of BHA Below Pulser Sub	45	13.72
Bottom of Pulser Sub Ring to Pin of Pulser Sub	1.42	0.43
MWD Collar(s) Length	34.74	10.59
Gap Sub Length	3.68	1.12
Measured Distance from Shoulder (Box) of PowerDrive to Internals	2.79	0.85

Select probe from the drop down menu

Mud Pulse/Dual Telemetry(MOP Always Goes First)		
Mini-MOP	2.60	0.79
L Extender Probe	2.44	0.74
XGP	2.43	0.74
XDT	5.51	1.68
XBAT	8.97	2.73
XDAG	6.21	1.89
L/S End Terminator	0.21	0.06
None	0.00	0.00
None	0.00	0.00
None	0.00	0.00
None	0.00	0.00
None	0.00	0.00
None	0.00	0.00
None	0.00	0.00

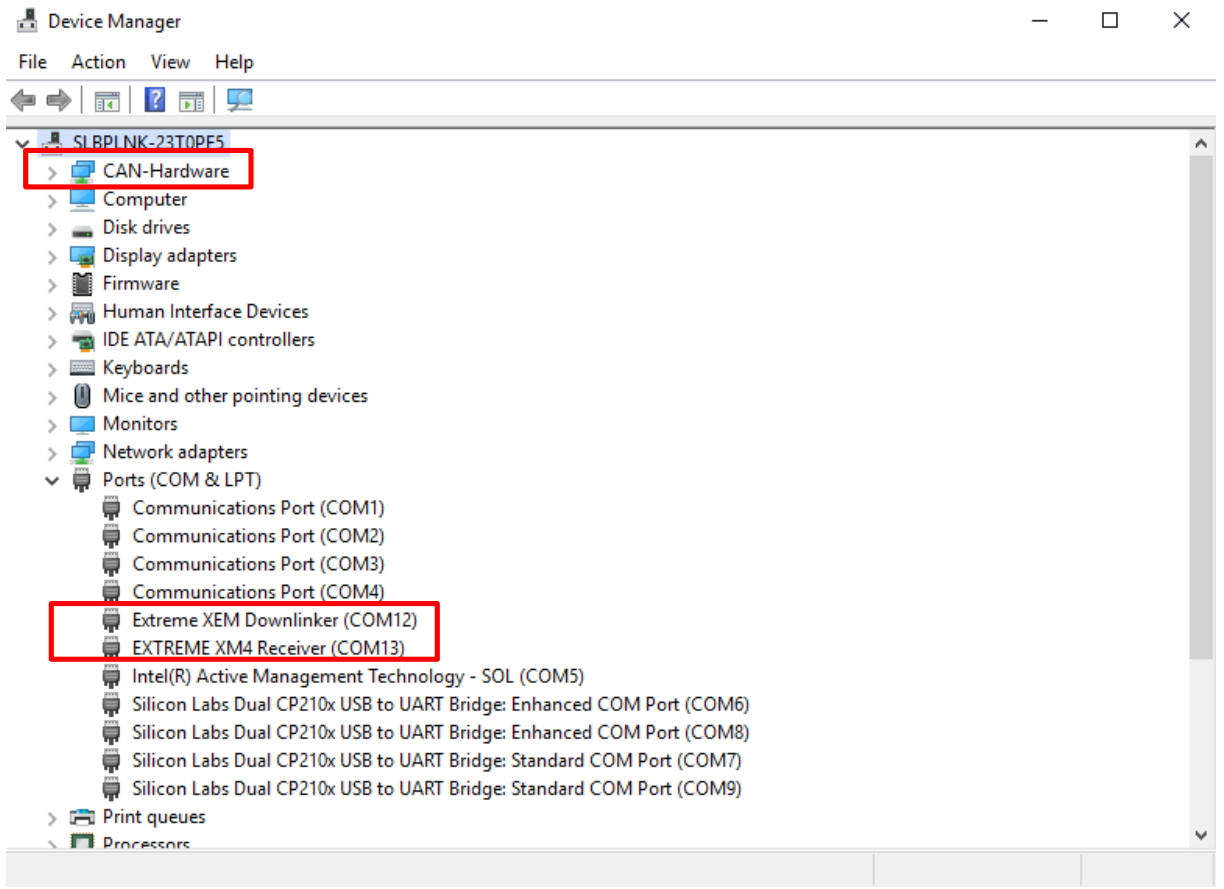
XEM D&I to Bit	0.00	0.00
XEM Gamma to Bit	0.00	0.00
XDAG D&I to Bit	26.73	8.15
XDAG Gamma to Bit	23.09	7.04
Tool to Collar Bottom	14.42	4.40
XHOP - POWERDRIVE DISTANCE	0.00	0.00
BABELFISH - POWERDRIVE DISTANCE	0.00	0.00

xBolt Tool Pre-Run Preparations

XDirect Software Setup

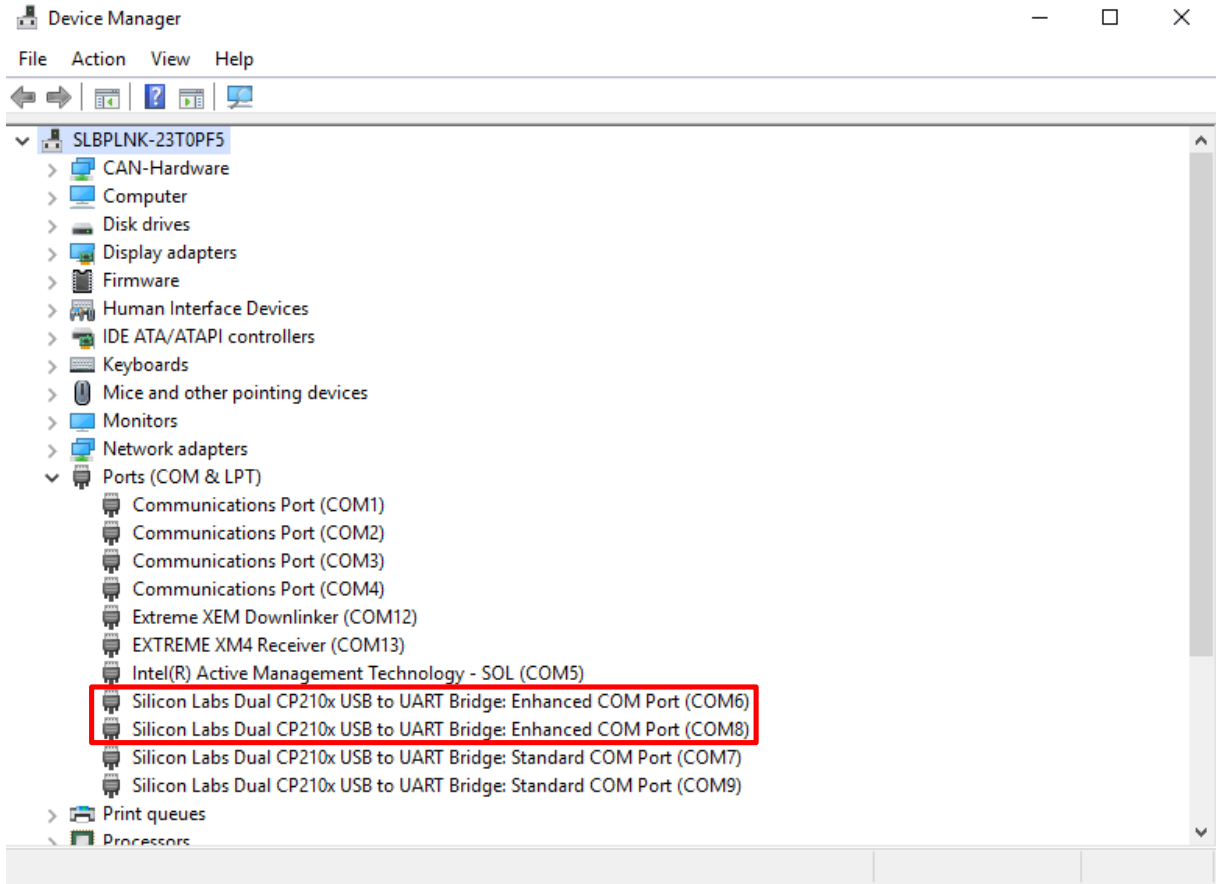
Software Setup – Verifying XM4 Connections to Computer

- Open “Device Manager” to verify all necessary connections are showing if using USB connections
  - CAN-Hardware
    - Needed for tool programming
  - Extreme XEM Downlinker
    - Needed for surface and downhole EM downlinks
  - EXTREME XM4 Receiver
- Note down COM Ports
  - In this example, COM12 for Downlinker, COM13 for XM4



Software Setup – Verifying XM4 Connections to Computer

- If using Isolator connection for XM4/Downlinker, one of the “Enhanced” COM Ports will be used for connection
- Downlinker connection will be going through XM4 and can be selected in downlinker application

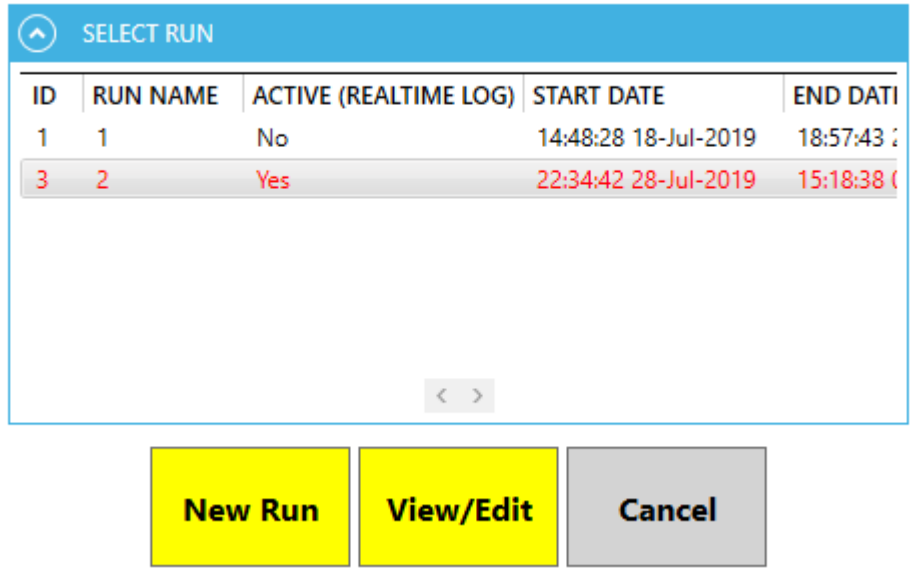


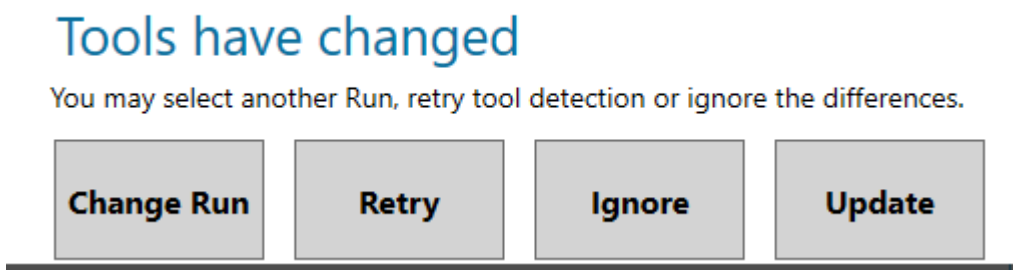
Software Setup – xDirect Job Setup

- Open “Launcher” to go to landing page
- Select “Tool Setup” icon to begin job setup

Software Setup – xDirect Job Setup

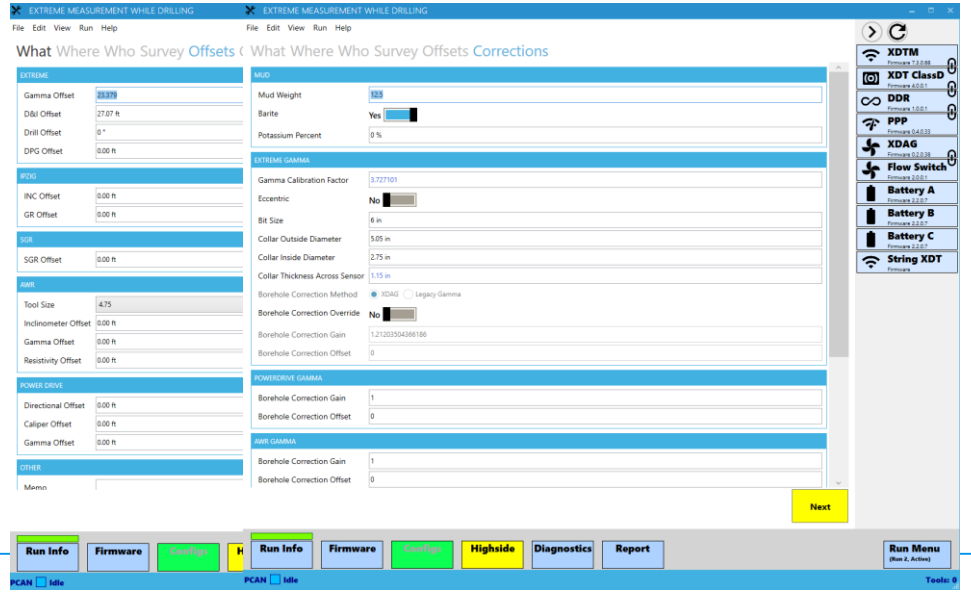
- Select “New Run” or select desired run and click “View/Edit”
- If plugged into correct tool for run selected, click “Update” when prompted.
- If not plugged into a tool or plugged into tool for different run, click “Ignore”

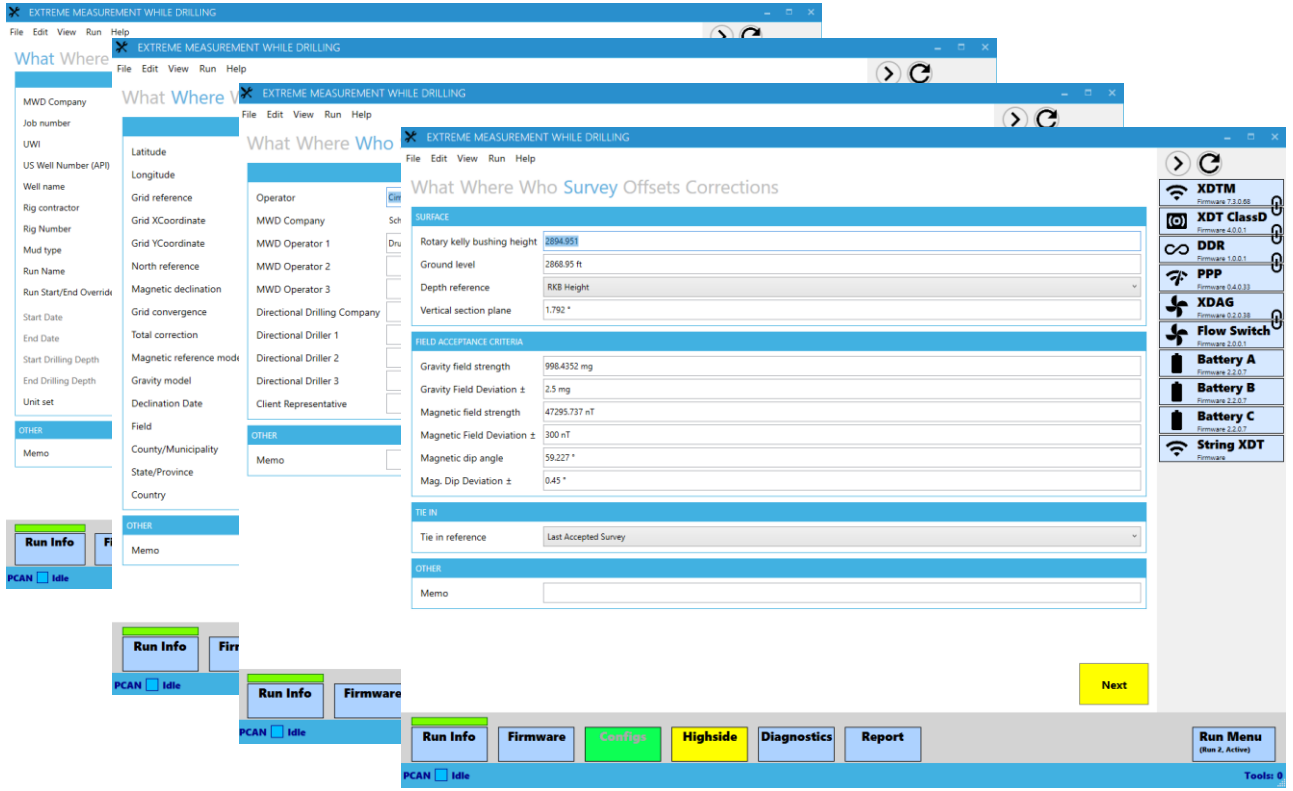




Software Setup – XDirect Job Setup

- Go through each tab and fill out all relative information related to job
- FAC criteria will be used in programming for high side



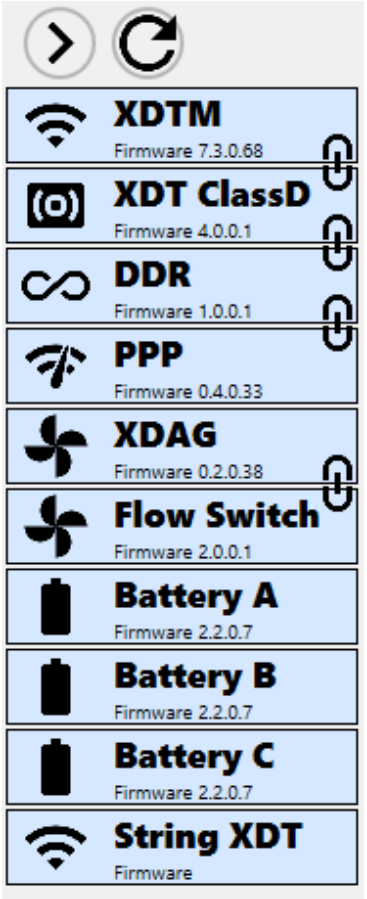


xBolt Tool Pre-Run Preparations

Tool Programming

Tool Programming – Tool Communication

- Verify all nodes appear on right hand side of screen for tool string
- If no nodes showing, click refresh button to request node identification
- If XDT Bank Test is open, communication to tool won't work in XDirect

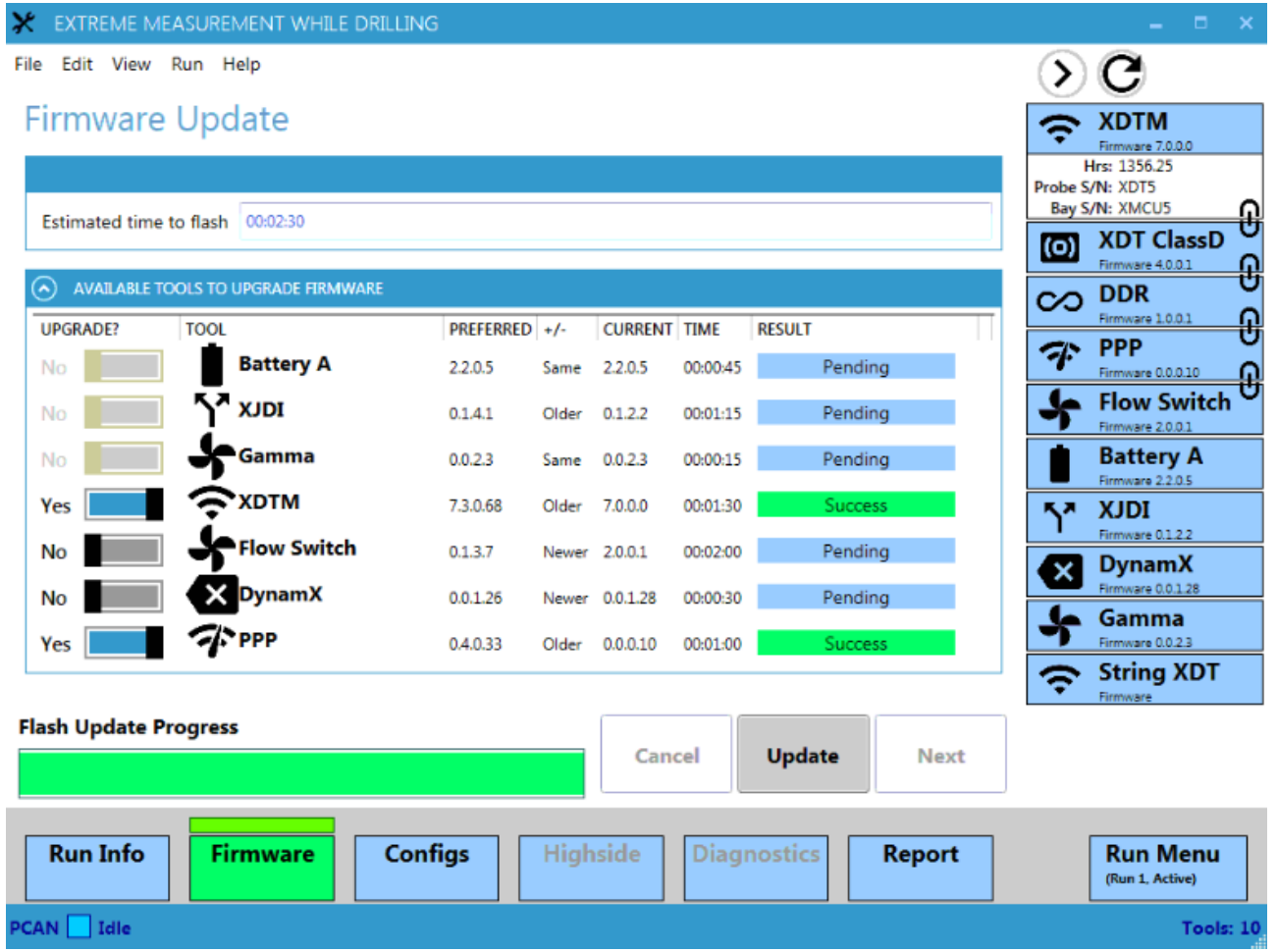


Tool Nodes

- XDT (String XDT)
  - XDTM
  - XDT Class D
  - DDR
  - PPP
  - Flow Switch
- XDAG
- Battery(s)
  - Battery A (Nearest battery to XDT)
  - Battery B (Second battery from XDT
  - Battery C (Third battery from XDT)
- SOCD
  - D&I
  - DynamX
- Gamma

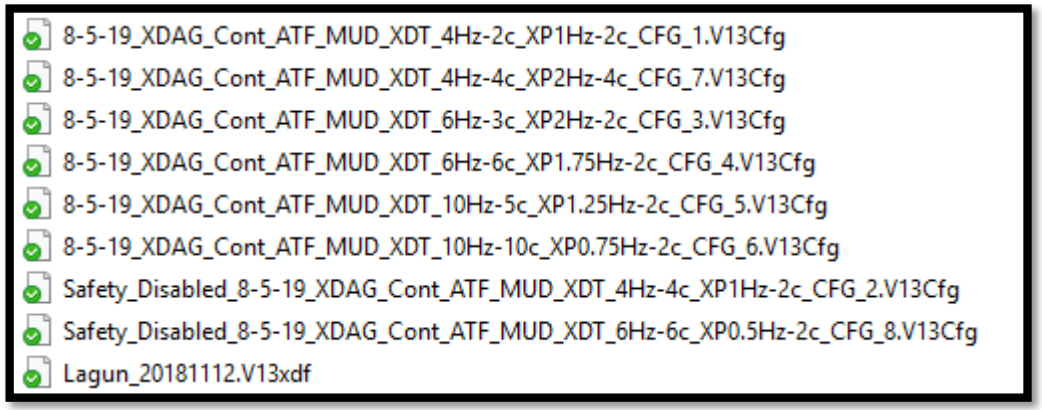
Tool Programming – Firmware Update

- Verify firmware up to date on tool string
- Firmware may be upgraded from this page
- Latest firmware may be found on ITC# 7299778



Tool Programming – Configuration Files

- Configuration files (configs) are similar to DTCs (PF) or Frames (D&M)
- Contains data frame list for survey, toolface logging, rotating and status frames
- Config files may be obtained through OSC and should only be updated through InTouch ticket
- Associated with datafile which controls WITS IDs, data point ranges and limits. Data file must match configs
- Save the Data File in the Data File folder on programing computer and decoding computer
  - \\C:\ExtremeEngineering\DataFile
- Save the Configurations in the Configuration folder on programing computer and decoding computer
  - \\C:\ExtremeEngineering\XDT\Configurations
  - \\C:\ExtremeEngineering\XEM\Configurations
  - \\C:\ExtremeEngineering\XPulse\Configurations



Tool Programming – Configuration Naming Convention

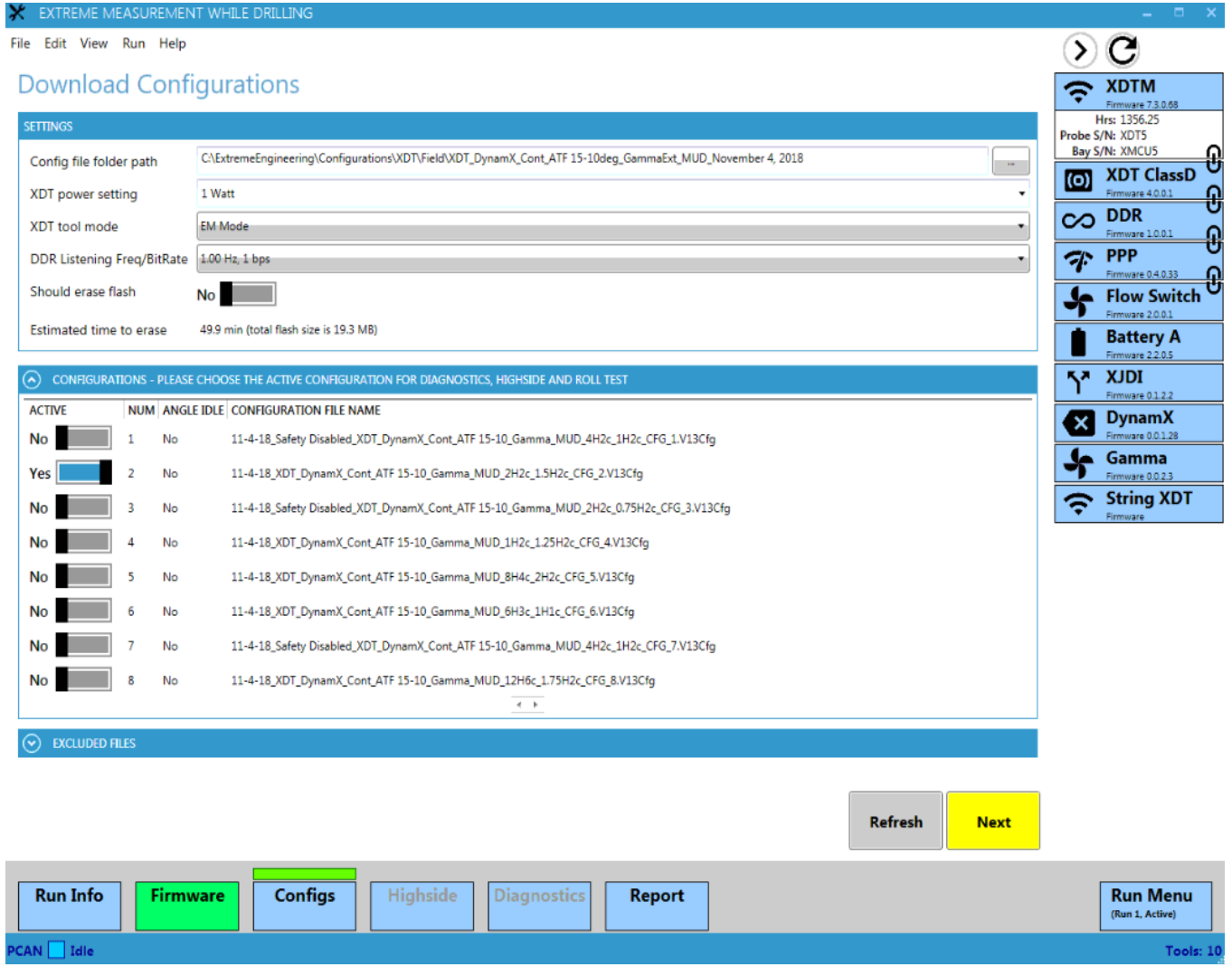
Example:

8-5-19_XDAG_Cont_ATF_MUD_XDT_4Hz-4c_XP1Hz-2c_CFG_2

- Safety Disabled means that pressure safety is disabled and the tool will transmit when vibrated, regardless of pressure
  - This configuration is utilized when the pressure sensor fails downhole
- 8-5-19 is the date the configuration was created
- XDAG shows that configs are set up for XDAG gamma/D&I
- Cont shows that config contains continuous Inc/Azi data
- ATF means that tool is set up for auto toolface based on last survey taken by tool
- MUD refers to flow switch vibrations settings
  - MUD drilling has low “flow off” vibration setting
  - AIR drilling has high “flow off” vibration setting
- 4Hz-4C is standard EM data rate for config
- XP1Hz-2C is standard MP data rate for config
- CFG 2 represents config number

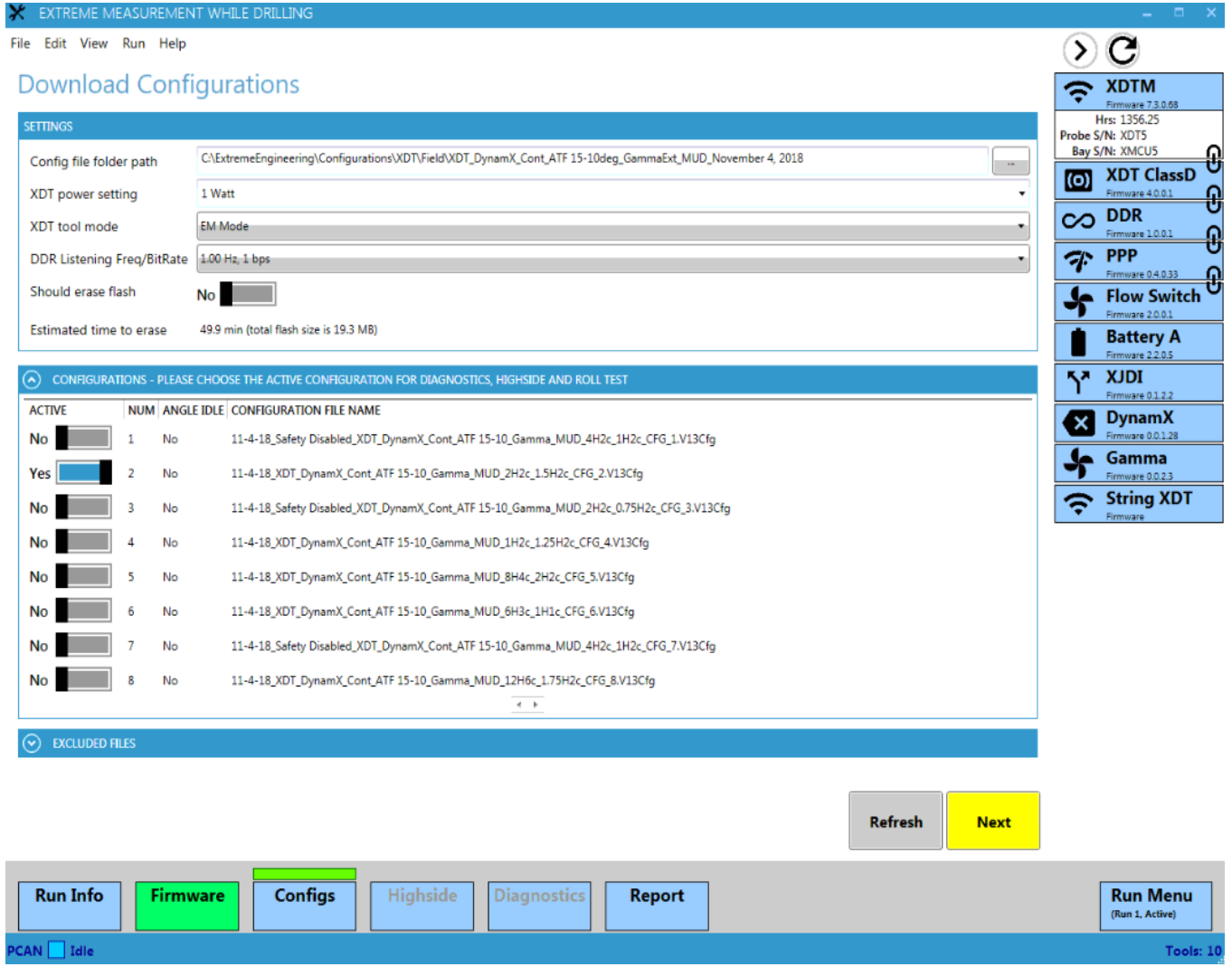
Tool Programming – Configuration Download – Extreme Probes

- Select config folder path
  - Verify DynamX and Gamma configs are selected
- Select power setting on tool
  - Selection based on local best practice
  - If unsure, program with 5 watts and adjust via EM downlink downhole
- Select XDT tool mode
  - If programming in DT mode, it's recommended to start with MP mode for bank test work flow



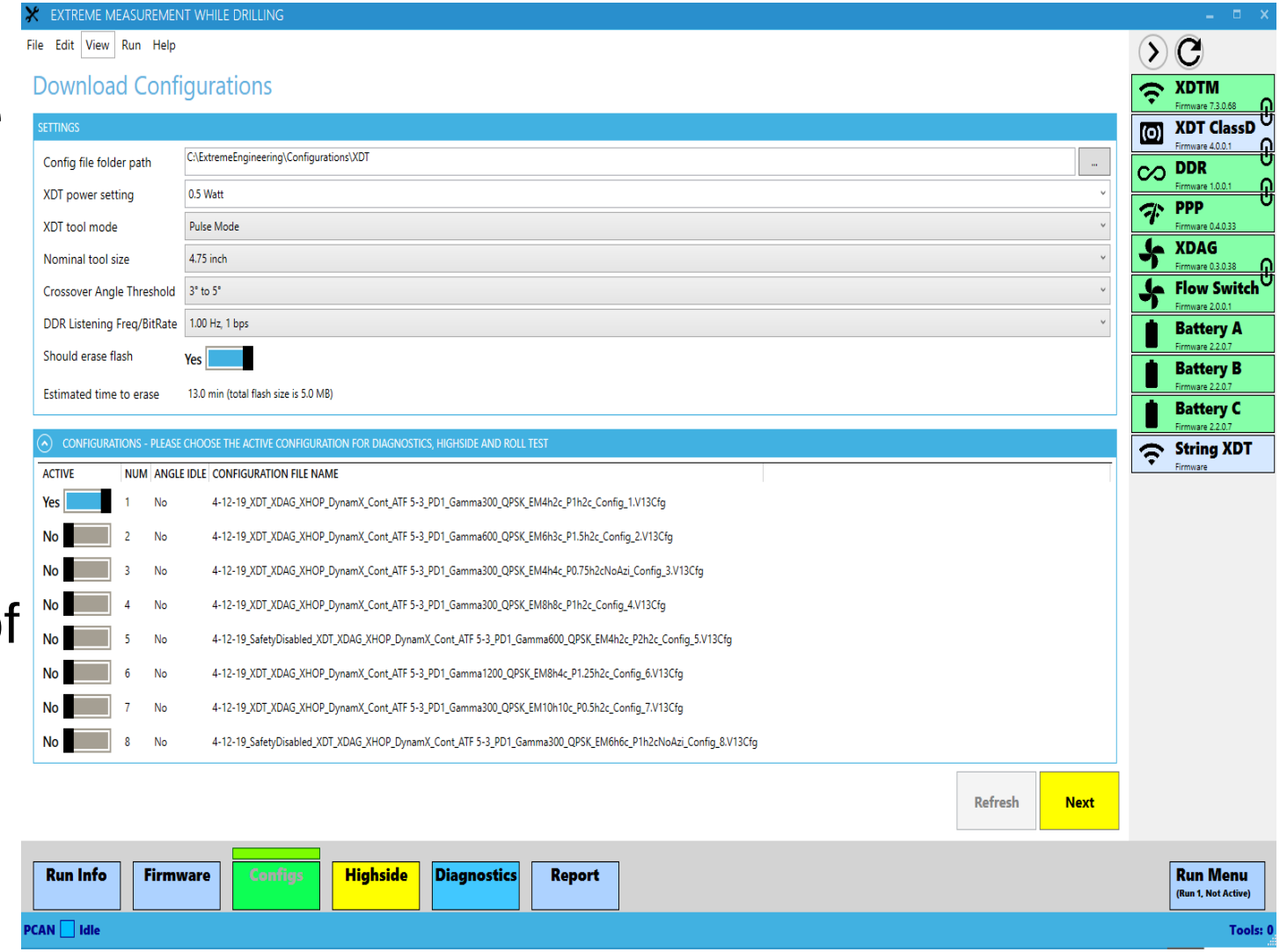
Tool Programming – Configuration Download – Extreme Probes (cont.)

- Select DDR listening freq/bit rate
  - 4Hz/4BPS most common in field
  - If other EM tools are used in the area, keep their uplink and downlink bit rates/frequencies in mind
- Choose flash erase option
  - If first run on probe or memory already dumped, set erase flash to yes
  - If reprogramming due to troubleshooting, do not erase flash
- Select desired config for run
  - Do not start run with safety disabled config



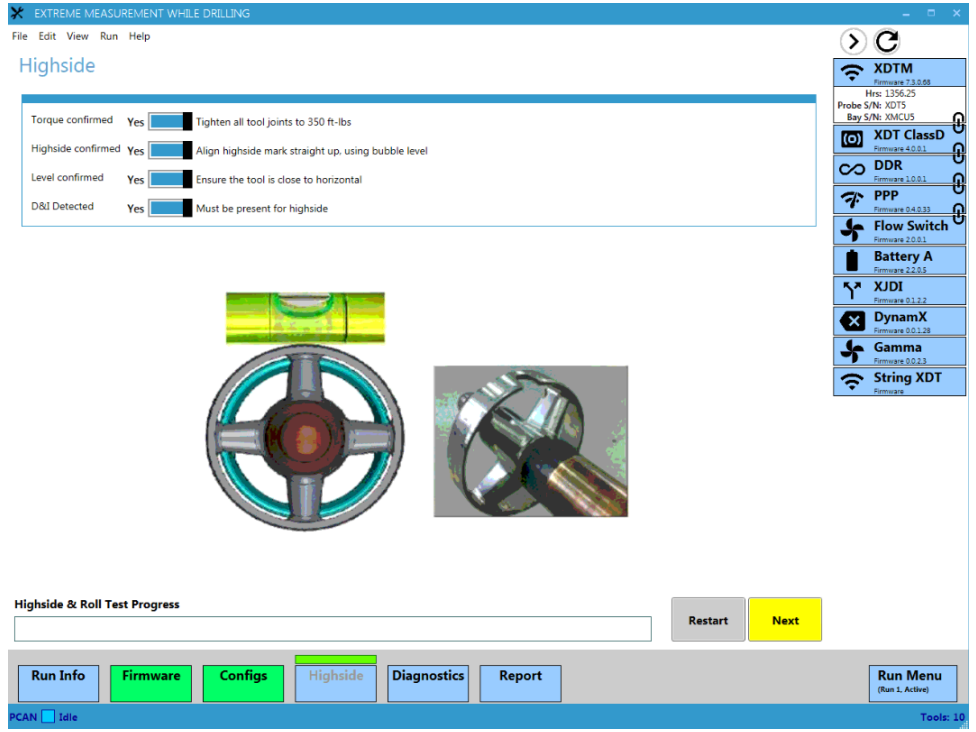
Tool Programming – Configuration Download – xBolt Probes

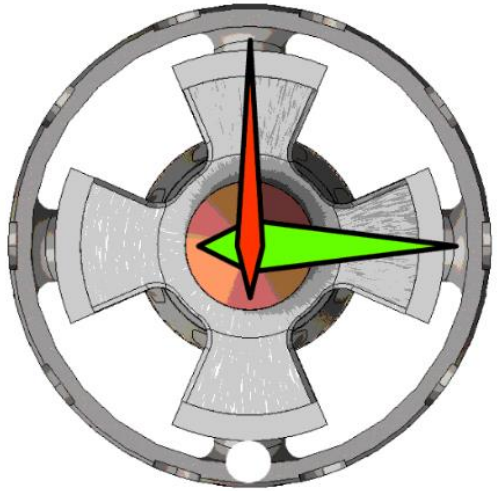
- Ensure XDAG config files are selected
- Select nominal tool size for XDAG gamma correction
  - Be mindful of OD/IDs where gamma cartridge is located
  - In 675 flex collar, select 475 tool size if gamma is in flex portion of collar
- Crossover angle programmable in software instead of configuration

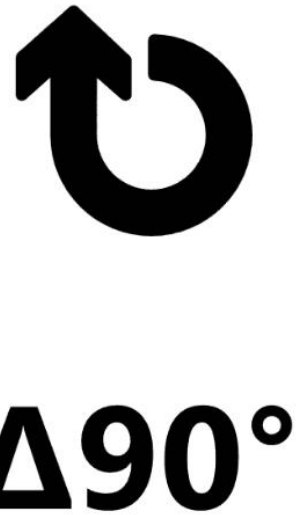


Tool Programming – Highside

- Highside tool
- Check all SWIs once tasks complete
- Begin roll test, wait for calibration/survey then:
  - Roll to 90R, wait for survey
  - Roll to 180, wait for survey
  - Roll to 90L, wait for survey

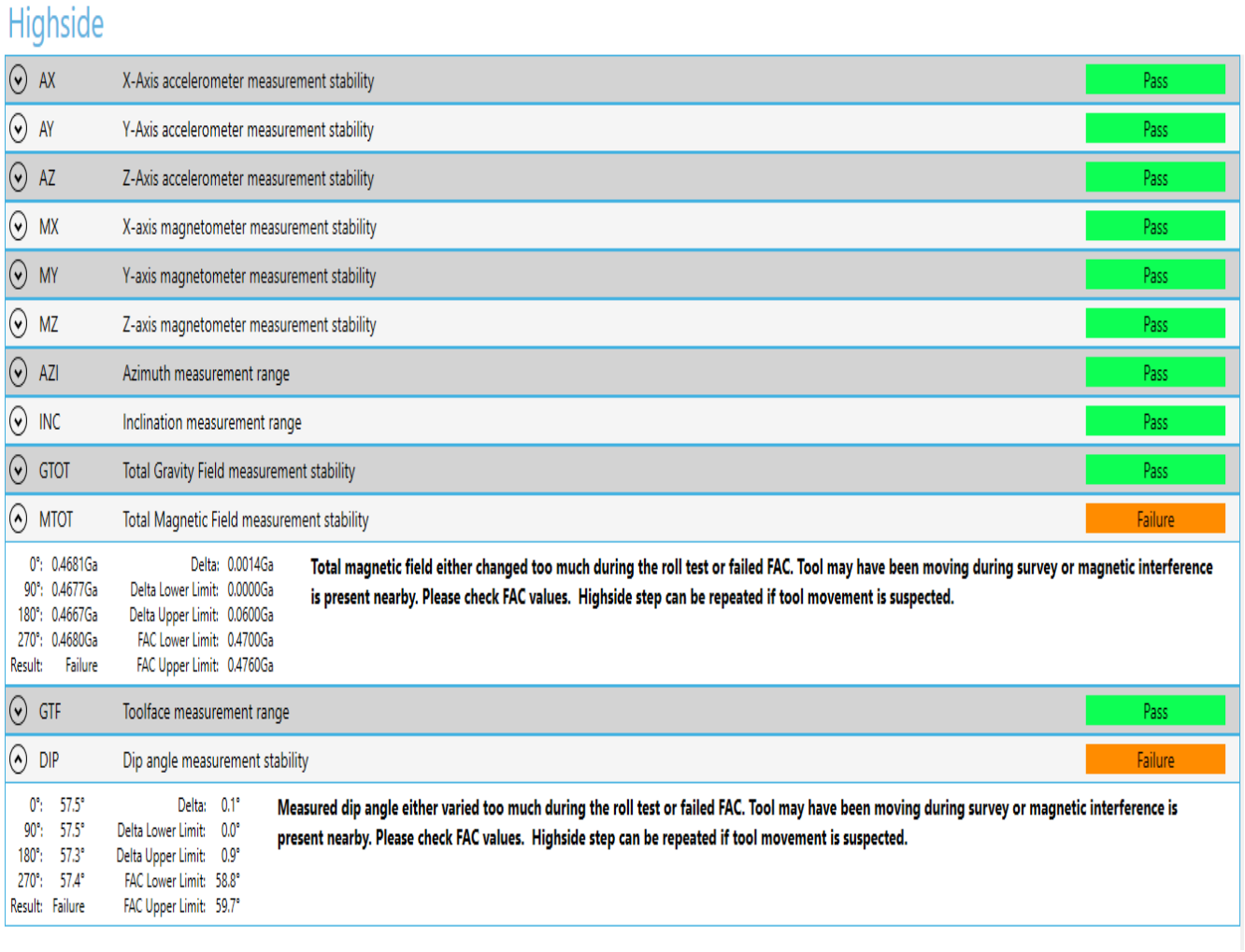






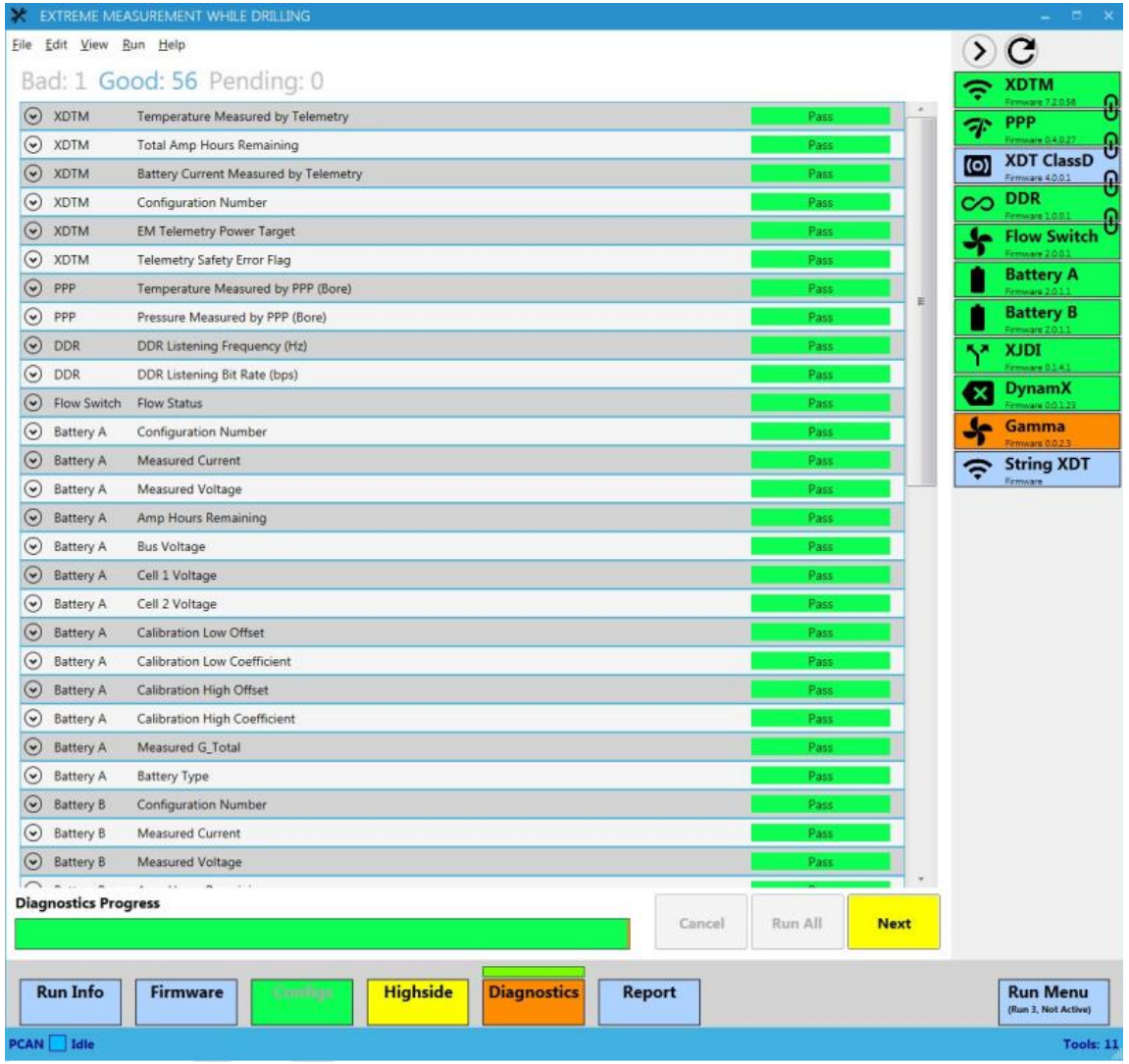
Tool Programming – Highside Diagnostics

- Confirm highside diagnostics
- All diagnostics should pass except DIP and MTOT
  - Verify DIP and MTOT delta limits not exceeded
  - If other magnetics are out of FAC, move tool away from magnetic interference (specifically jack stands) and redo roll
  - If any other measurements fail, investigate potential causes
    - Check FAC inputs in “Survey” tab



Tool Programming – Pre Run Diagnostics

- Run diagnostics, all checks should pass
- Common failures
  - Temperature exceeding range on multiple nodes, normal during summer
  - Battery bus voltage and measure voltage failure, if showing ~17V, turn tool power off on XM4 and re-run diagnostics
- When diagnostics complete, generate pre-run report for OSC QC



xBolt Tool Pre-Run Preparations

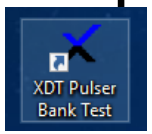
Bank Test

Bank Test – Mud Pulse Bank Test Preparation

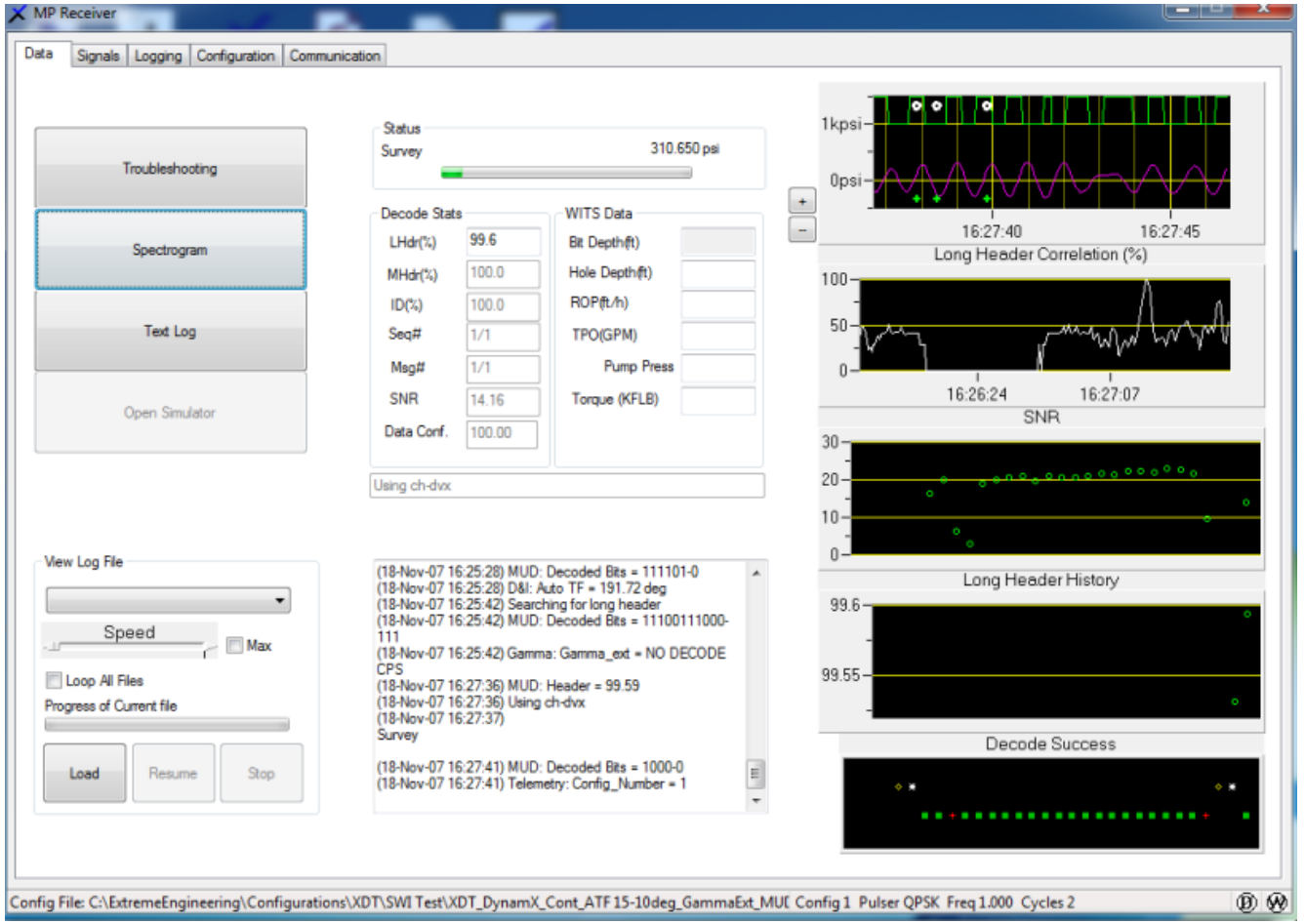
- Install vibrator on tool
  - Preferably on 1.75” barrel
  - Away from connections
  - NOT on battery probes
  - Isolate barrel from vibrator with electrical tape
- Highside tool

Bank Test – Mud Pulse Bank Test

- Close tool setup window in XDirect



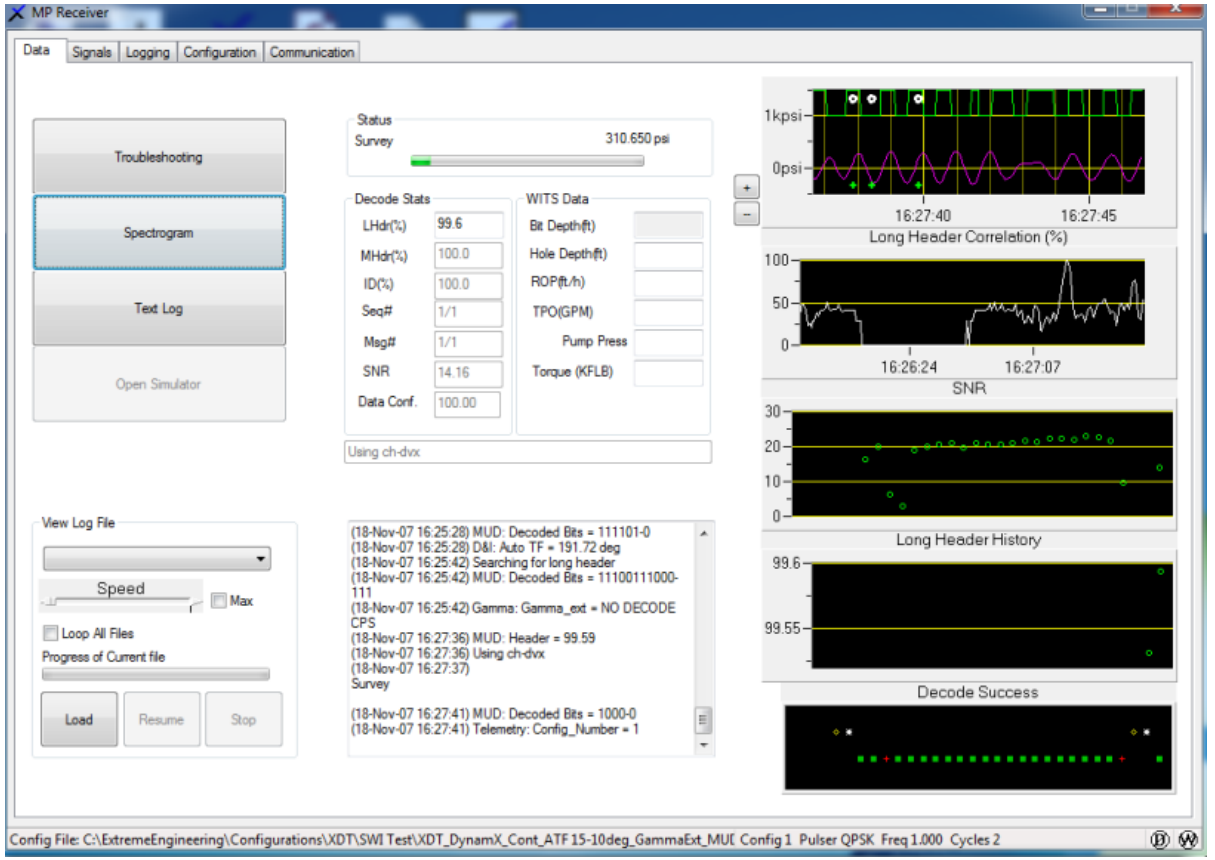
- Open XDT Pulser Bank Test
- Select datafile and programmed config
- Verify trace begins scrolling in XDT Pulser Bank Test receiver
- Plug in vibrator to begin bank test



Decode over CAN for MP bank test can lead to poor decode. Recommend to decode at 1BPS or less

Bank Test – Mud Pulse Bank Test (cont.)

- If DT:
  - Decode one full survey and toolface frame, verify all dpoints are reading normal values
  - EM Downlink to EM mode
- If MP Only:
  - Decode one full survey and toolface frame
  - Change inclination and azimuth by a minimum of 2°
  - Recyle flow to get second survey (turn vibrator off for 30 second and turn back on)
  - Roll toolface to 90R, 180 and 90L during bank test
  - Verify all dpoints are reading normal values

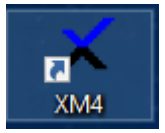


Decode over CAN for MP bank test can lead to poor decode. Recommend to decode at 1BPS or less

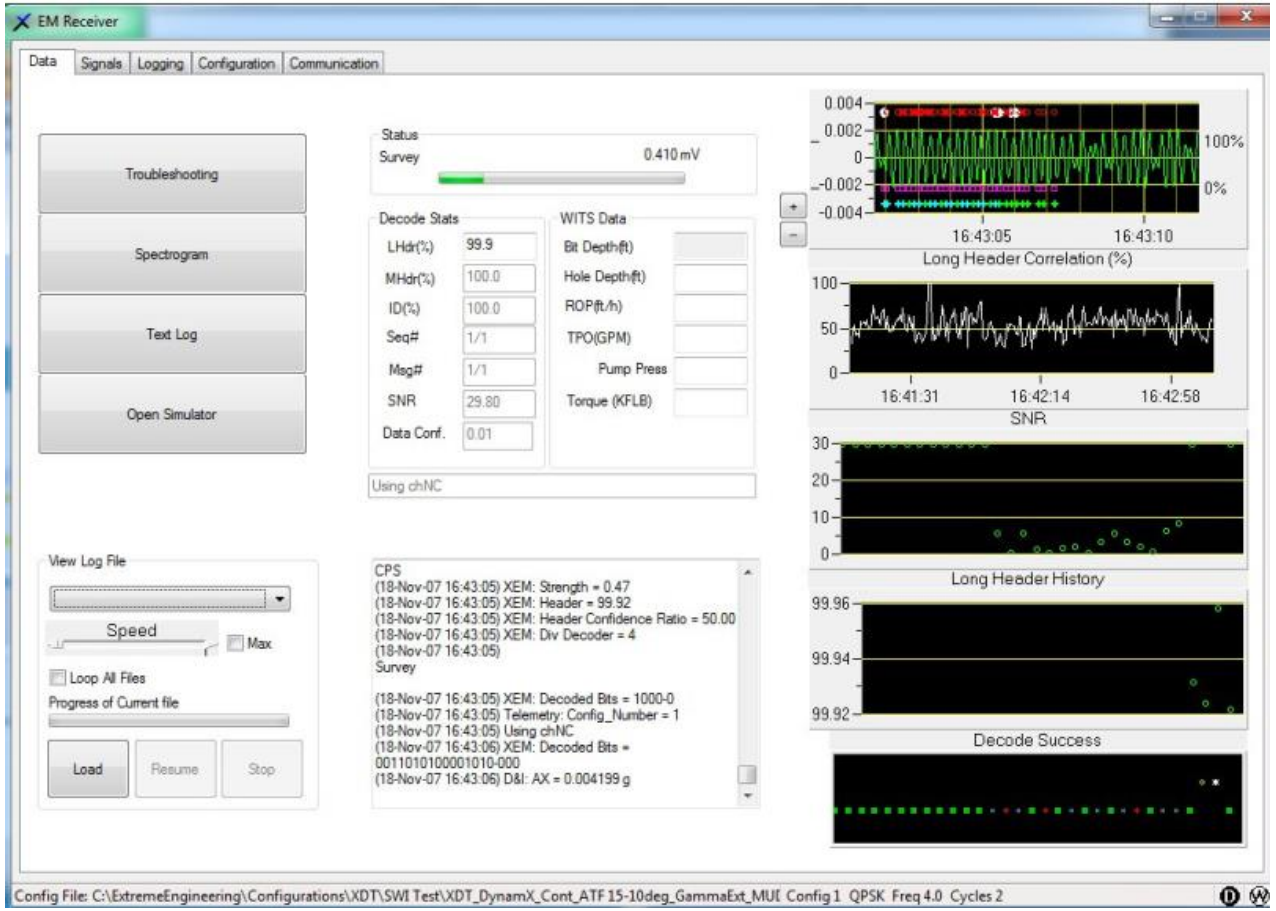
Bank Test – EM Bank Test Preparation

- Install bike pump with bore pressure test clamp and pressure up to ~150psi
- **<u>Clamp XLR clamps above and below gap probe plastic sleeve</u>**
  - For R Tool, connect above spring
  - For L Tool, connect on landing ring
  - For EM, connect to EM Fishing Head
  - For connection below gap, clamp to bow springs or jack stand that is touching tool
- Remove HHROTC and install/torque end termination

Bank Test – EM Bank Test

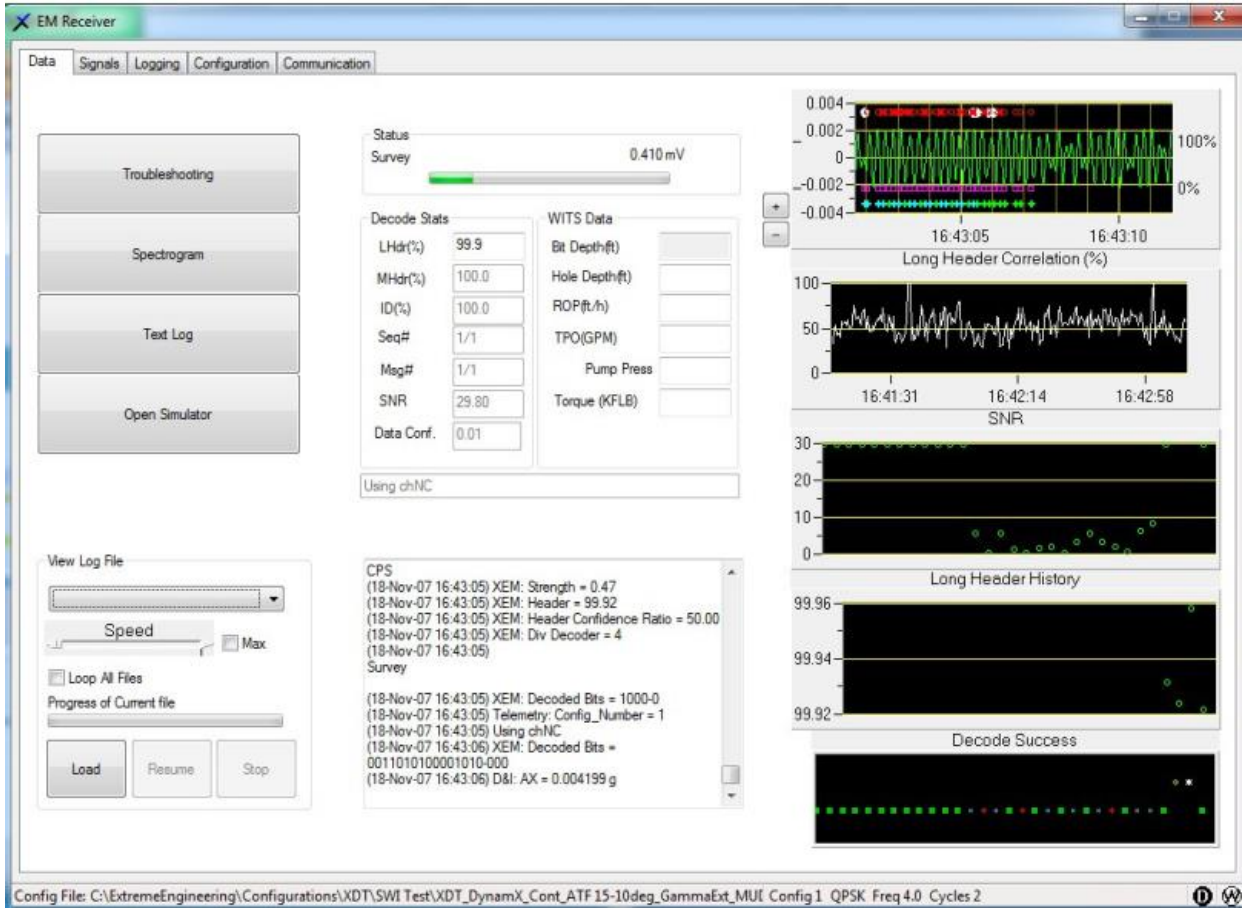
- Open XM4 Receiver 

- Select datafile and programmed config
- Verify trace begins scrolling in XM4 receiver
- Plug in vibrator to being bank test



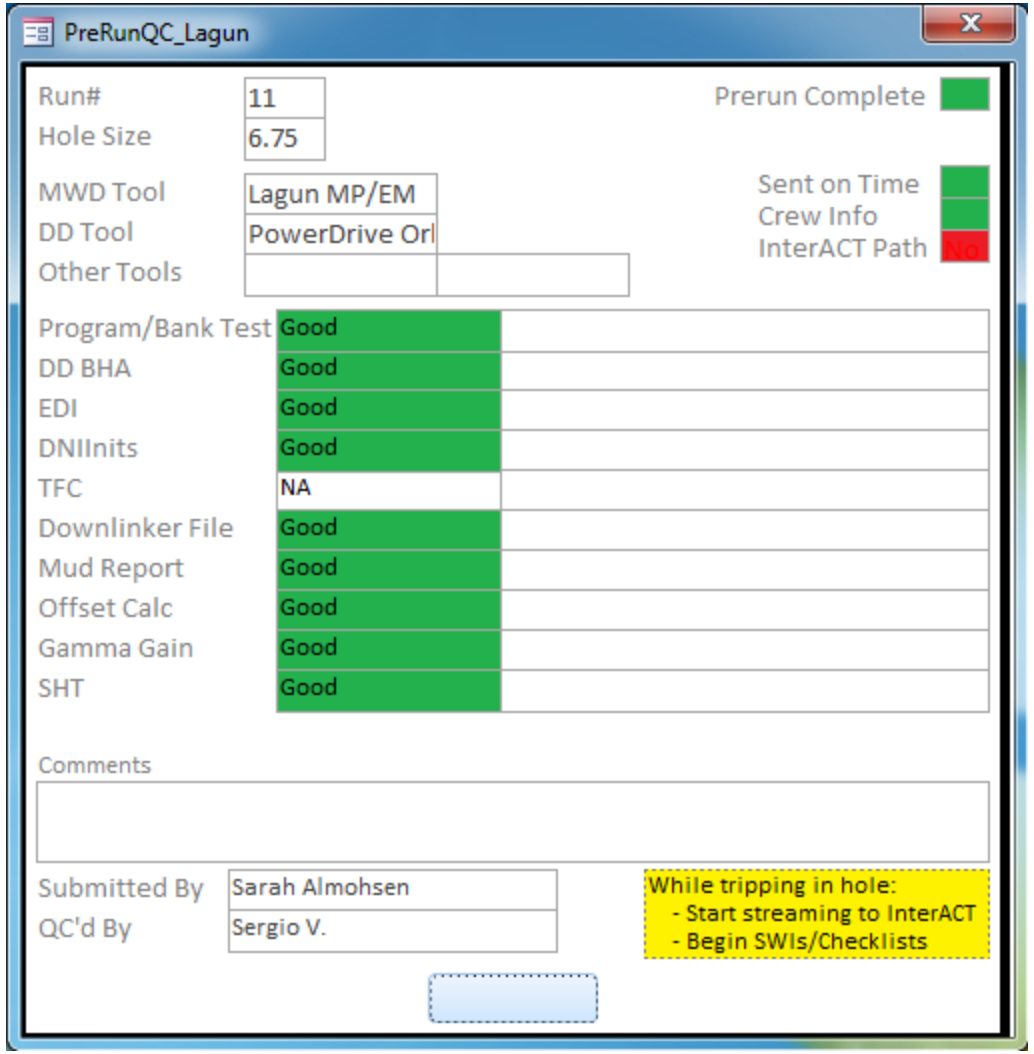
Bank Test – EM Bank Test (cont.)

- Decode one full survey and toolface frame
- Change inclination and azimuth by a minimum of 2°
- Recyle flow to get second survey (turn vibrator off for 30 second and turn back on)
- Roll toolface to 90R, 180 and 90L during bank test
- Minimum of 2 EM downlinks should be sent during course of bank
- Verify all dpoints are reading normal values
- Ensure tool is in desired settings prior to P/U tool



Bank Test – Pre-Run Files

- Recommended pre-run deliverables
  - XDirect Pre-Job Report
  - XM4 decode logs from bank test
  - X-Pulse decode logs from bank test
  - EMDownlinkerLogFile
  - Local Pre-Run Requirements



xBolt Tool Pre-Run Preparations

Equipment Checks and Preparation

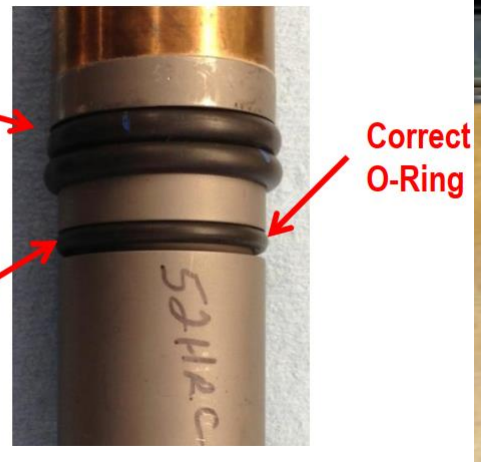
Equipment Checks and Preparation – XDT Bore Pressure Port Protector

- Once bank test complete and approved by OSC, install bore pressure port protector into XDT
- “+” side of protector goes into tool
- Protects against wash and debris collection inside pressure port

(03XEM0048)

Equipment Checks and Preparation – Muleshoe Sleeve & R-Pulser

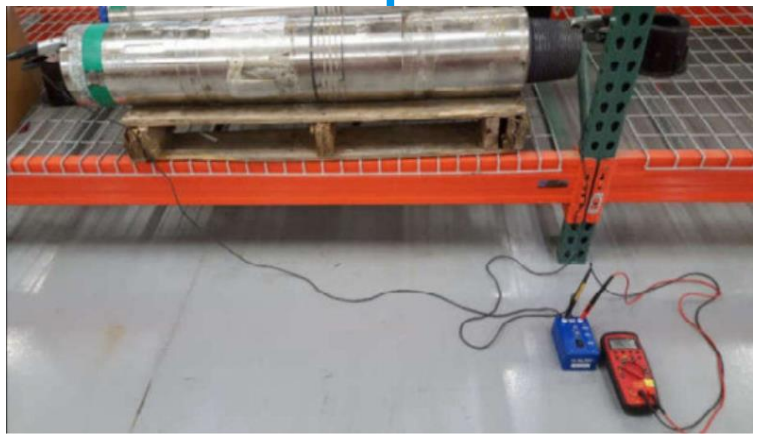
- Assemble the muleshoe sleeve
  - Verify orifice is proper selection for planned run flow rate
  - Inspect outer sleeve for damage and wear, replace external o-rings between runs
  - Inspect internal helix and key seat for wash
- Verify pulser o-rings installed correctly
  - Two #325 o-ring uphole
  - One #220 o-ring downhole



Muleshoe OD	Sleeve OD	Orifice OD	Orifice #	Jet Holes	Jet Hole ID	Max Flow	Med Flow	Min Flow	TFA (sq-in)
9 ½" – 6¼"	3 ¾"	2.75"	10	8	0.375	1000	850	700	1.669
			9	8	0.348	900	750	600	1.546
			8	8	0.328	800	675	550	1.461
			7	6	0.348	700	575	450	1.356
			6	6	0.328	550	475	400	1.292
			5	5	0.339	500	425	350	1.053
			4	4	0.328	450	375	300	.939
			3	3	0.328	350	275	200	.855
4 ¾"	3 ¼"	2.50"	3	3	0.328	350	275	200	.855
			2	3	0.281	280	230	170	.780
			1	2 (flutes)	.390 (wide)	220	180	130	.681

Equipment Checks and Preparation – Gap Sub

- Complete electrical test on gap sub
  - Electrically solate gap sub by putting on wooden pallet
  - Clean any dope off connections where clamps will be installed
  - Install clamps (22CABL0071) to box and pin end of gap sub and plug into XEM Gap Sub Tester (22XEM 0014)
  - For full procedure refer to ITC# 7024808



Application	Resistance	Voltage (AC)
OBM	>3k Ohms	>4V(AC)
WBM	>60 Ohms	>0.5V (AC)
Failed	<60 Ohms	<0.5V (AC)

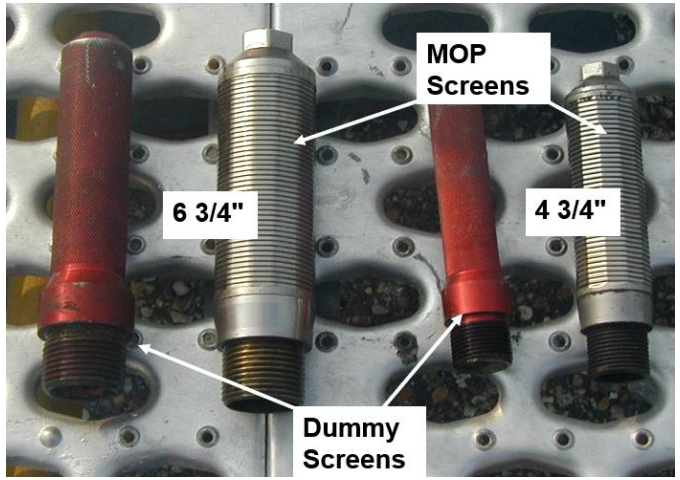
Equipment Checks and Preparation – Gap Sub (cont.)

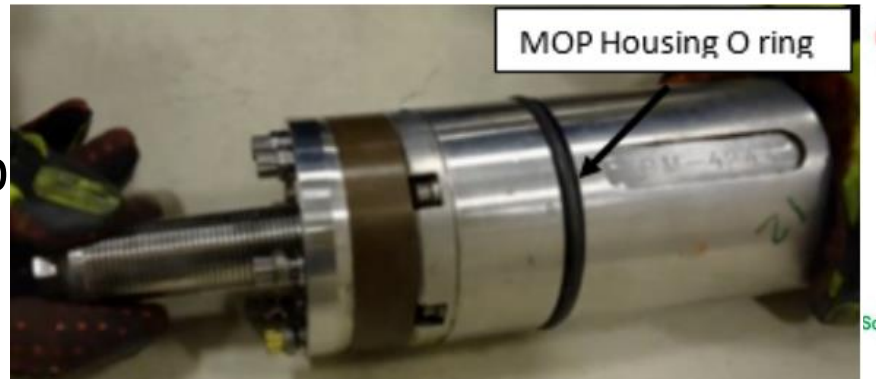
- xBolt Uses Same Gap Subs as XEM
  - If using 8” Gap Sub, remove O-Rings from Sub ID Prior to picking up tools with gap sub o-ring pick (02JIGS5001)
  - If O-Rings are left in sub, o-rings could potentiall jam pulser, RSS or bit

(02JIGS5001)

Equipment Checks and Preparation – MOP Screens & PolyPacks

- Remove dummy screens from MOP
- Install MOP Screens into MOP prior to P/U BHA and torque to specification
  - 80 ft/lb – LF MOP Screen
  - 40 ft/lb – Mini-MOP Screen
- Install PolyPack/O-Ring to MOP
  - Mini MOP O-ring - 000-40836 (Alternate - 779-25854)
  - LF MOP Housing O-ring + Backup ring/Polypack - 777-94545 + 777-94548 (Alternate 000-35425





Summary

- Learn how to assemble all xBolt tool string
- Know how to strap xBolt equipment for run
- Setup surface software for job
- Understand how to program and test tools
- Finalize equipment setup to pick up for run