





OPERATIONS MANUAL CHAPTER 8 XEM RECIEVER CONFIGURATION

REV A: 2013 August 22

XFLD-0008



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 5. 5 5 5 5 5 5 5 	Sta Caj .1. .2. .3. .4. .5. .6. .7.	at Page pture Tab Data Grid Text Log Window Trouble shooting Tool Face Rose bud D&I No Response WITS Data Decoding-Status, Gain, Signal Display	33 34 34 42 44 49 52 53 53
 5. 5 5 5 5 5 5 5 5 	Sta Caj .1. .2. .3. .4. .5. .6. .7. .8.	at Page pture Tab Data Grid Text Log Window Trouble shooting Tool Face Rose bud D&I No Response WITS Data Decoding-Status, Gain, Signal Display Config File and Config Number	33 34 34 42 44 49 52 53 53 57 59
 5. 5 	Sta Caj .1. .2. .3. .4. .5. .6. .7. .8. .9.	at Page pture Tab Data Grid Text Log Window Trouble shooting Tool Face Rose bud D&I No Response WITS Data Decoding-Status, Gain, Signal Display Config File and Config Number Decoding and WITS indicators	33 34 34 42 44 49 52 53 53 57 59 60
 5. 5 5 5 5 5 5 5 5 6. 	Sta Caj .1. .2. .3. .4. .5. .6. .7. .8. .9. Dat	at Page pture Tab Data Grid Text Log Window Trouble shooting Tool Face Rose bud D&I No Response WITS Data Decoding-Status, Gain, Signal Display Config File and Config Number Decoding and WITS indicators ta Tab	33 34 34 42 44 49 52 53 57 59 60 63
 5. 5 5 5 5 5 5 5 5 6. 7. 	Sta Caj .1. .2. .3. .4. .5. .6. .7. .8. .9. Dat Gra	at Page pture Tab Data Grid Text Log Window Trouble shooting Tool Face Rose bud D&I No Response WITS Data Decoding-Status, Gain, Signal Display Config File and Config Number Decoding and WITS indicators ta Tab aphic Signal Tab	33 34 34 42 44 49 52 53 57 59 60 63 65

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This chapter shows how to configure the XEM Receiver on surface to decode the signal from the XEM Tool.

Prior to setting up the XEM Receiver you will have to:

- 1. Complete the Surface equipment hardware setup as described in Chapter 5.
- 2. Prepare the XEM Tool as described in Chapter 6.
- 3. Program the XEM Tool as described in Chapter 7.



1. LAUNCH XEM RX

1. Launch the the XEM Rx (XEM receiver) from the short cut on the desk top.

Or from,

START> Extreme Engineering > XEM> Rx.



Figure 1 XEM RX launch

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2. The XEM Receiver will appear displaying the Capture Tab.

EM Receiver Example Rig 4 E	XABCOOOL	ler e l		
oture Data Graphic Signals Sign	als FFT Logging Configuratio	n Sufface Box	Decoder Page Com	mmunication Stat Page
Enable Editing (Warning: Turn off	unless editing.)	Text Log	Troubleshoot	True North - Mag Dec: 0.0 Dell Offset: 0.0 Gamma Factor: 1.0
D&I: Inclination	D&I: Azimuth	D&I:	GTotal	Gamma Offset: 0.0 -30 -45 -45
89.88 Deg	166.09 Deg	0.99	990 g	-60
12:22:36 2013-Mar-11	12:22:39 2013-Mar-11	12:22:42	2013-Mar-11	
D&I: MTotal	DPG: Annular Pressur	D&I: MAG	G Dip Angle	-75
0.4516 Gauss	7.96 psi	55.5	5 Deg	(L) -90 (
12:22:43 2013-Mar-11	12:23:20 2013-Mar-11	12:22:46	2013-Mar-11	-105 105
Telemetry: Config File#	D&I: Auto TF-F	D&I: /	Auto TF	
1 #	Gravity	0.00) Deg	-120
12:22:34 2013-Mar-11	12:23:03 2013-Mar-11	12:24:13	2013-Mar-11	-135
elemetry: Amp Hrs Remair	Telemetry: Batt Voltage	Felemetry: Tr	rans Pow Leve	-165 180 165
15.63 AH	13.75 Volt	3	3 #	WITS Data
12:23:14 2013-Mar-11	12:23:15 2013-Mar-11	12:23:10	2013-Mar-11	Bit Depth(ft) ROP(ft/h) Pump Press (PSI)
ClassD: Meas. Load Cur.	ClassD: Scale Current	ClassD: C	lassd tar curr	Hole Depth(t) TPO (GPM) Torque (KFLB)
0.000 A	81.25 %	1.0	16 A	Toolface Logging
12:23:57 2013-Mar-11	12:24:06 2013-Mar-11	12:23:11	2013-Mar-11	Total Gain = 2 * 10 * 5 * 5 = 500
DynamX: Shk Lat Level	DynamX: StickSlip Level	Dynam>	(: Reverse	
	-		-	
	-		-	-10V
51- 02 01 12 VEM D		CE- 11/10/1		

Figure 2 Capture Tab



2. CONFIGURATION TAB

1. Click on the configuration Tab.

Capture Data Graphic Sig Message Info Carrier Frequency: 6.0 H	nals Signals I z C	FT Loggin		tion Surface Bo	x Decoder Page Communication Stat Page Rx Buffer Status
Frame	Num Bits	Seconds	Messages	Sequences	
Survey	292	50.00	1	1	Time Zone:
Toolface	0	20.00	1	1	CMT E Set
Toolface Logging	150	27.00	6	1000	
Logging w Rotatin	g 152	27.00	6	1000	
Logging Only	0	13.00	1	1	- I ool Corrections
Survey Por	up	Show Sun	vey Window		Drill Offset 0 Degrees
	0				
Software Version: 4.1.22.1	;			- 1	Gamma Corr. Factor
Software Version: 4.1.22.1	5 Qualif	ìers	Unit I	Editor	Gamma Corr. Factor 1 Gamma Comp. Offset 0 Feet

Figure 3 Configuration Tab

The Configuration Tab is used to configure the XEM Rx prior to the run. Specifically to:

- Load the Configuration file in the XEM Rx; this has to match the Configuration file in the XEM.
- Enable or Disable the Survey to POP up when received from the XEM.
- Select the Units for the different measurements to be used on files and displays.
- Set the Qualifiers to flag Survey measurements, which will warn the FST when the measurements fall outside the User defined tolerance range.
- Set the Tool Corrections including the North reference for Magnetometer measurements, Drill offset (Tool offset), Gamma Correction factor and the Gamma Computation offset.



2.1. LOAD CONFIGURATION FILE

If this is the first time this XEM Rx is being run or a Down link has been performed.

2. Click on the Load Configuration File button.

Frame	Num Bits	Seconda	Messages	Sequences	Sequence Errors 1 Update
Survey	292	50.00	1	1	
Toolface	0	20.00	1	1	Time Zone:
Toolface Logging	150	27.00	6	1000	GMT -5 Set
Logging w Rotating	152	27.00	6	1000	
Logging Only	0	13.00	1	1	Tool Corrections
Status	24	5.00	1	1	N
Survey Pop-up Window Settir Survey Popu	1g	Show Surv	rey Window		True North V Mag Dec 0 Deg
Survey Pop-up Window Settin	1g	Show Surv	vey Window		North Reference True North Mag Dec 0 Drill Offset 0 Degrees
Survey Pop-up Window Settir Survey Popu Software Version: 4.1.22.15	ng IP	Show Surv	/ey Window		North Reference True North Mag Dec 0 Drill Offset 0 Gamma Corr. Factor
Survey Pop-up Window Settir Survey Popu Software Version: 4.1.22.15 Downlink	ng p Qualifie	Show Surv	/ey Window	Editor	North Reference True North Mag Dec 0 Drill Offset 0 Degrees Gamma Corr. Factor 1 Gamma Comp. Offset 0 Feet
Survey Pop-up Window Settir Survey Popu Software Version: 4.1.22.15 Downlink Configuration Info	ng p Qualifie	Show Sur	vey Window	Editor	North Reference True North Mag Dec 0 Drill Offset 0 Degrees Gamma Corr. Factor 1 Gamma Comp. Offset 0 Feet
Survey Pop-up Window Settir Survey Popu Software Version: 4.1.22.15 Downlink Configuration Info	ng Qualifie	Show Sun	vey Window	Editor	North Reference True North Mag Dec 0 Drill Offset 0 Degrees Gamma Comp. Offset 0 Feet

Figure 4 Load Configuration File



3. The Load Configuration window will appear:

rganize 🔻 New folde	8	<u>∦</u> ≣ ▼	
Favorites	Name	Date modified	Туре
Cesktop	03-01-13_Safety Disabled_XEM_DynamX_ATF 5-3 deg_Gamma_QPSK_2Hz_2c_Config_3.V10Cfg	3/1/2013 11:29 PM	V10CFG
Downloads	03-01-13_Safety Disabled_XEM_DynamX_ATF 5-3 deg_Gamma_QPSK_6Hz_2c_Config_8.V10Cfg	3/1/2013 11:34 PM	V10CFG
Secent Places	03-01-13_XEM_DynamX_ATF 5-3 deg_Gamma_BPSK_8Hz_2c_Config_6.V10Cfg	3/1/2013 11:32 PM	V10CFG
	03-01-13_XEM_DynamX_ATF 5-3 deg_Gamma_BPSK_10Hz_2c_Config_5.V10Cfg	3/1/2013 11:31 PM	V10CFG
Libraries	03-01-13_XEM_DynamX_ATF 5-3 deg_Gamma_QPSK_1Hz_2c_Config_4.V10Cfg	3/1/2013 11:30 PM	V10CFG
Documents	03-01-13_XEM_DynamX_ATF 5-3 deg_Gamma_QPSK_2Hz_2c_Config_2.V10Cfg	3/1/2013 11:25 PM	V10CFG
J Music	03-01-13 XEM DynamX ATF 5-3 deg. Gamma QPSK 4Hz 2c Config 7.V10Cfg	3/1/2013 11:33 PM	V10CFG
E Pictures	03-01-13_XEM_DynamX_ATF 5-3 deg_Gamma_QPSK_6Hz_2c_Config_1.V10Cfg	3/1/2013 11:24 PM	V10CFG
H Videos	default-12Hz-3c-1.V10cfg	2/21/2013 2:07 PM	V10CFG
Computer			
🚣 Local Disk (C:)			
EXTREME (E:)			
YPulseSOC (\\xfv +			

Figure 5 Select Configuration file

4. Select ONLY 1 X configuration file; this is the config the tool will be operating in.

When the operator first programs the tool, the tool will typically have configuration 1, however if the operator has performed a downlink or changed the configuration file setting in the tool using XConnect, another Configuration file may have to be selected.

5. Click on Open.



6. Confirm the File Name from the configuration info. The File Name should match the configuration loaded in the previous step.

apture Data Graphic Signa - Message Info Carrier Frequency: 6.0 Hz	ls Signals I	FFT Loggi	ng Configura	tion Surface B	ox Decoder Page Communication Stat Page - Rx Buffer Status
Frame	Num Bits	Seconds	Messages	Sequences	Sequence Errors
Survey	292	50.00	1	1	T 7
Toolface	0	20.00	1	1	
Toolface Logging	150	27.00	6	1000	GMT -5 Set
Logging w Rotating	152	27.00	6	1000	
Logging Only	0	13.00	1	1	- Tool Corrections
Status	24	5.00	1	1	North Reference
	e	JHOW SUI	vey wildow		Drill Offset 0 Degrees
Software Version: 4.1.22.15					Gamma Corr. Factor
Downlink	Qualif	iers	Unit	Editor	Gamma Comp. Offset 0 Feet
Configuration Info	ering\XEM\Co	onfigurations	a OPSK 6Hz	2c Config 1 V1	I/Cfa

Figure 6 Message and configuration information

- 7. The Message info shows:
 - The XEM Signal Carrier Frequency.
 - Number of Bits and the time duration of the Frames.
 - $\circ~$ In Figure 6 the Survey has 292 bits and is transmitted in 50 seconds.



2.2. SURVEY POPUP

8. Click on the Survey POP-UP check box. This allows Surveys to POP up in a separate Window when received from the Tool.

Capture Data Graphic Signa Message Info Carrier Frequency: 6.0 Hz	ls Signals I	FFT Loggir ycles Per 2	ng Configura	ion Surface Box	Decoder Page Communication Stat Page Rx Buffer Status
Frame	Num Bits	Seconds	Messages	Sequences	
Survey	292	50.00	1	1	- Time Zene:
Toolface	0	20.00	1	1	Time Zone.
Toolface Logging	150	27.00	6	1000	GMT -5 Set
Logging w Rotating	152	27.00	6	1000	
Logging Only	0	13.00	1	1	Tool Corrections
Status	24	5.00	1	1	North Reference
🔽 Survey Popuş	0	Show Sun	vey Window		Drill Offset Degrees
Software Version: 4.1.22.15					Gamma Corr. Factor
Downlink	Qualif	iers	Unit	Editor	Gamma Comp. Offset 0 Feet
Configuration Info					
File Path: C:\ExtremeEngine	ering\XEM\Co vnamX ATF 5	onfigurations -3 deg Gamma	a QPSK 6Hz	2c Config 1.V100	Gra
Load Configura	tion File				

Figure 7 Survey POPUP window

9. Click on the Show Survey Window Button.

Survey	X
(2013-Jul-05 11:03:24) Telemetry: Config_Number = 1 (2013-Jul-05 11:03:27) D&I: Inclination = 75.74 deg (2013-Jul-05 11:03:31) D&I: Azimuth = 294.81 deg (2013-Jul-05 11:03:35) D&I: GTotal = 0.9000 g (2013-Jul-05 11:03:38) D&I: MTotal = 0.5234 gauss (2013-Jul-05 11:03:41) D&I: Mag Dip Angle = 56.43 der (2013-Jul-05 11:03:46) D&I: AX = 0.2055 g (2013-Jul-05 11:03:50) D&I: AY = 0.2245 g (2013-Jul-05 11:03:54) D&I: AZ = -0.7710 g (2013-Jul-05 11:03:58) D&I: MX = 0.2556 gauss	g
K	•
c	lose

Figure 8 Survey POP up

10. Click on Close.



2.3. UNIT EDITOR

11. Click on the Unit Editor.

Toolface	292	SD DD			
TOOTTACE	0	20.00	1	1	Time Zone:
Toolface Logging	150	20.00	6	1000	GMT -5 Set
Logging w Rotating	152	27.00	6	1000	
Logging Only	0	13.00	1	1	Tool Corrections
Status	24	5.00	1	1	⊢ North Reference
					Dhironset Degrees
Software Version: 4.1.22.15					Come Con Frates 1
					Gamma Cont. Pactor
Downlink	Qualifi	ers	Unit	Editor	Gamma Comp. Offset 0 Feet
					,

Figure 9 Unit Editor Button

12. The Unit Editor allows the user to define the unit system that will be used in the :

- Decoded log files.
- Data sent through WITS.
- Data on the PTK logs.
- Information displayed on the XEM Rx including:
 - Data below the Rosebud on the Capture Tab.
 - \circ Data on the Data grid in the Capture Tab.
 - The Gamma Computation Offset in the Configuration Tab.
 - Data on the Survey pop-ups when Surveys are taken.



- 13. Units are defined for:
 - Depth (Meter or Feet).
 - Temperature (Celsius or Fahrenheit).
 - Pressure (Kpa or psi).
 - Flow (Litres/Minute, Meter³ /Minute, Gallons per Minute).
 - Magnetic Field (Gauss or Nano Tesla).
- 14. Select the units in the top half of the Unit editor to be used for Files.

al

Figure 10 Units for Files



15. Select the units in the bottom half of the Unit editor.

These are used for displays in the Capture Tab and the Gamma Computation offset in the Configuration Tab.

16. Click on OK.

Depth	-Temperature	Pressure	Flow	Magnetic Field
C Meter	C Celsius	СКРа	С L/M С M^3/	M Gauss
• Feet	Fahrenheit		GPM	CnT
C Meter	C Celsius	C KPa	С L/M С M^3/	M Gauss
- rect		1.51		

Figure 11 Unit Editor

17. Units on the displays will only be updated when new values are received.



2.4. QUALIFIERS

18. Click on the Qualifiers button.

Frame	Num Bits	Seconds	Messages	Sequences	Sequence Errors 1 Update
Survey	292	50.00	1	1	Time 7
Toolface	0	20.00	1	1	
Toolface Logging	150	27.00	6	1000	GMT -5 Set
Logging w Rotating	152	27.00	6	1000	
Logging Only	0	13.00	1	1	Tool Corrections
Status	24	5.00	1	1	└─ North Reference ─────
Survey Popul	p	Show Surv	vey Window		
I⊻ Survey Popu	p	Show Surv	vey Window		Drill Offset Degrees
Software Version: 4.1.22.15	p	Show Sun	vey Window		Drill Offset 0 Degrees Gamma Corr. Factor 1
Software Version: 4.1.22.15	p Oustif	Show Sun	vey Window	Editor	Drill Offset 0 Degrees Gamma Corr. Factor 1
Software Version: 4.1.22.15	p Qualif	Show Sun	vey Window Unit I	Editor	Drill Offset 0 Degrees Gamma Corr. Factor 1 Gamma Comp. Offset 0 Feet
Software Version: 4.1.22.15 Downlink	p Qualif	Show Sun	Unit I	Editor	Drill Offset 0 Degrees Gamma Corr. Factor 1 Gamma Comp. Offset 0 Feet
Software Version: 4.1.22.15 Downlink Configuration Info	p Qualif	Show Sun	Unit I	Editor	Drill Offset 0 Degrees Gamma Corr. Factor 1 Gamma Comp. Offset 0 Feet

Figure 12 Qualifier Button

19. The Qualifiers window will appear.

GTotal	MTotal (Gauss)	Indination (degree)
🔲 Enable	🗌 Enable	Vertical
Max 1.003	Reference 100000	Todination Max 5
Min 0.997	Deviation +/- 500	
Gemperature (C) Telemetry	D&I Dip Angle (degree)	[
Enable	🗌 Enable	
High 125	Reference 1	
Max 150	Deviation +/- 0.45	OK Cancel

Figure 13 Qualifiers Window

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- 20. Click on the "Enable" check boxes for the G Total, M Total, DIP, Inclination, Temperature and Dip Angle.
- 21. Consult the Coordinator for the specific tolerances to be used on the job.
- 22. Recommended tolerances for G Total, M Total and DIP can be calculated as follows:
 - I. Reference values for G Total, M Total and DIP for the location are obtained from the Schlumberger Survey Tool box.
 - II. G Total
 - G Total Max = G Total Reference + 0.0025
 - G Total Min = G Total Reference 0.0025

If the G total Reference value is 1.000, the G total Max will be 1.0025 and the G Total Min will be 0.9975.

- III. M Total
 - The M Total Reference value is taken from the Survey Tool Box.
 - M Total Deviation = M Total Reference +/- 0.003 Gauss.
- IV. DIP Angle
 - The DIP Angle Reference value is taken from the Survey Tool Box.
 - The DIP Angle Deviation from the DIP Angle Reference value is +/- 0.45°.

23. Type the Min and Max value for the G Total, M total and DIP Angle in the Qualifiers Window.

Qualifers	
GTotal	MTotal (Gauss)
F Enable	F Enable
Max 1.0025	Reference 0.513
Min 0.9975	Deviation +/- 0.003
Temperature (C) Telemetry D&I	Dip Angle (degree)
Enable	Enable
High 125	Reference 1
Max 150	Deviation +/- 0.45°

Figure 14 Qualifiers for G total, M total and DIP Angle

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If the Values fall outside the Tolerances the Survey will be flagged on the capture tab. More information on the type of flags is given in the Capture Tab (Section 5).

24. Enter the Qualifiers for Temperature.

- The Temperature "High" value flags on the Capture Tab data grid if the Temperature exceeds the set value (Normally set at 125°C).
- The Temperature "Maximum" value flags on the Capture Tab data grid if the Temperature exceeds the set value (Normally set at 150°C).

25. If the Well is Vertical check the Vertical check Box.

• The Inclination value is flagged when the Inclination exceeds the set value to indicate that the well is no longer vertical.

The Inclination and Temperature qualifiers can be modified according to user preference.

Qualifers		×
GTotal	MTotal (Gauss)	Inclination (degree)
🔽 Enable	🔽 Enable	Vertical
Max 1.0025	Reference 0.513	Indination Max 5
Min 0.9975	Deviation +/- 0.003	
Temperature (C) Telemetry D&I	Dip Angle (degree)	
🔽 Enable	🔽 Enable	
High 125	Reference 1	
Max 150	Deviation +/- 0.45°	OK Cancel

Figure 15 Qualifiers

NOTE: If the Qualifiers for G total, M total and the DIP Angle fall out of the specified tolerances during the job it does not always indicate a Tool or Sensor failure; it could also indicate:

- That the String may have been moving when the Pumps were switched off. This will affect the G Total value; In this case the Survey needs to be retaken.
- Drill string or External Magnetic interference from the Casing, nearby well or a Fish causing interference on the M-Total and DIP Angle values.



• Magnetic formation or Material in the Mud that may cause the M Total or DIP to fall out of tolerance.

2.5. TOOL CORRECTIONS

26. Click on the Drop Down box below the North Reference.

- 27. Select the North Reference from the drop down list:
 - True North.
 - Magnetic North.
 - Grid North.

Set
Set
Set
501
3

Figure 16 North Correction reference

The XEM acquires measurements referenced to the Magnetic North.

- If the Reference North is Magnetic North no Corrections are required.
- If the Reference North is True North, Magnetic Declination has to be added.
- If the Reference North is Grid North, Total Grid Correction has to be added.
 - Total Grid Correction = Magnetic Declination Grid Convergence.
 - 0



28. Type the value of the correction to be used in the Box with Degrees.

As an Example

If the North is referenced to the True North and the Declination is 1.1° (Magnetic North is East of True North).

Type 1.1° in the Box outlined with Red color in Figure 17 North Correction value

More information on the corrections is given in Chapter 3, Section 3.7.

XEM Receiver Example Ri	g 4 EXABC	0001			
Capture Data Graphic Signa	ls Signals F	FT Loggi	ng Configura	tion Surface B	ox Decoder Page Communication Stat Page
r Message Info					Rx Buffer Status
Carrier Frequency: 6.0 Hz	C.	ycles Per 2			Services From 1 Update
Frame	Num Bits	Seconds	Messages	Sequences	Sequence Errors
Survey	292	50.00	1	1	Ting 7
Toolface	0	20.00	1	1	Time Zone.
Toolface Logging	150	27.00	6	1000	GMT -5 Set
Logging w Rotating	152	27.00	6	1000	
Logging Only	0	13.00	1	1	Tool Corrections
Status	24	5.00	1	1	North Reference
Survey Pop-up Window Settin	g p	Show Sur	vey Window		Drill Offset Degrees
Software Version: 4.1.22.15					Gamma Corr. Factor
Downlink	Qualif	iers	Unit	Editor	Gamma Comp. Offset 0 Feet
Configuration Info File Path: C:\ExtremeEngine File Name: 03-01-13_XEM_D	ering\XEM\Co ynamX_ATF 5- tion File	nfigurations 3 deg_Gamma	a_QPSK_6Hz_	2c_Config_1.V1	OCfg

Figure 17 North Correction value



29. Enter the Drill offset in Degrees, This is also known as the tool face offset.

This is the Angular offset between the Gap Sub Scribe Mark and the Motor Scribe Line when looking down hole in a Clockwise direction.

An explanation of how to measure this Angle is given in Chapter 9.

It is important to enter the Drill offset before commencing Drilling in a Deviated well; there is a potential for the well to be drilled in the wrong direction.

Carrier Frequency: 6.0 Hz	C.	ycles Per 2	Messages	Semiences	Sequence Errors 1 Update
Survey	292	50 00	1 1	1	
Toolface	0	20.00	1	1	Time Zone:
Toolface Logging	150	27.00	6	1000	GMT -5 Set
Logging w Rotating	152	27.00	6	1000	
Logging Only	0	13.00	1	1	Tool Corrections
Status	24	5.00	1	1	
Software Version: 4.1.22.15					Gamma Corr. Factor 1
	Qualif	iers	Unit	Editor	Gamma Comp. Offset 0 Feet
Downlink					
Downlink Configuration Info					
Downlink Configuration Info					

Figure 18 Drill Offset



30. Type the Gamma Correction Factor.

The Gamma Corr. factor is used to correct the Gamma ray acquired by the XEM for the effects of collar thickness and Mud weight.

The 07-CALC-0004_MPT-EMT_Tool_Length_calculator spreadsheet is used to calculate the Gamma Corr. Factor.

This factor needs to be calculated in order to have correct Gamma values on Logs.

Carrier Frequency: 6.0 Hz	C Num Bits	vcles Per 2	Messages	Sequences	Sequence Errors 1 Update
Survey	292	50.00	1	1	
Toolface	0	20.00	1	1	Time Zone:
Toolface Logging	150	27.00	6	1000	GMT -5 Set
Logging w Rotating	152	27.00	6	1000	
Logging Only	0	13.00	1	1	Tool Corrections
Status	24	5.00	1	1	_ North Reference
Software Version: 4.1.22.15					Gamma Corr. Factor
Downlink	Qualif	iers	Unit	Editor	Gamma Comp. Offset 0 Feet
Configuration Info File Path: C:\ExtremeEngine File Name: 03-01-13_XEM_D	eering\XEM\Co lynamX_ATF 5	nfigurations 3 deg_Gamma	a_QPSK_6Hz_	2c_Config_1.V1	DCfg

Figure 19 Gamma Correction Factor



31. Enter the Gamma computation offset. This is the distance from the Bit to the Gamma Sensor. Depth Data is received through WITs at Bit Depth.

The Gamma Comp.offset allows the Log to be referenced to the Gamma sensor depth (the position at which the Gamma measurements are acquired).

The 07-CALC-0004_MPT-EMT_Tool_Length_calculator spreadsheet is used to calculate the Gamma Comp offset. The calculation is illustrated in Chapter 4.

Frame	C. Num Bits	cles Per 2	Messages	Sequences	Sequence Errors 1 Update
Survey	292	50.00	1	1	
Toolface	0	20.00	1	1	Time Zone:
Toolface Logging	150	27.00	6	1000	GMT -5 Set
Logging w Rotating	152	27.00	6	1000	
Logging Only	0	13.00	1	1	Tool Corrections
Status	24	5.00	1	1	⊢ North Reference
Survey Pop-up Window Settin	9 0	Show Sun	vey Window		
Survey Pop-up Window Settin	0	Show Surv	vey Window		Drill Offset
Software Version: 4.1.22.15	g	Show Sun	vey Window	1	Drill Offset 0 Degrees
Software Version: 4.1.22.15	g p Qualif	Show Sun	vey Window	Editor	Drill Offset 0 Degrees Gamma Corr. Factor 1 Gamma Comp. Offset 0 Feet
Software Version: 4.1.22.15 Downlink	g P Qualif	Show Sun	vey Window	Editor	Independent Drill Offset 0 Degrees Gamma Corr. Factor 1 Gamma Comp. Offset 0 Feet
Software Version: 4.1.22.15 Downlink Configuration Info	g Qualif ering\XEM\Co	Show Sun	vey Window	Editor	Independent Drill Offset 0 Degrees Gamma Corr. Factor 1 Gamma Comp. Offset 0 Feet

Figure 20 Gamma Comp. offset

32. The initializations to start the job in the configuration tab are now complete



2.6. DOWN LINK

- 33. If this is the initial run or the first time the XEM Rx is being configured for the job, Downlink is not required.
- 34. The XEM is equipped with a vibration sensor that senses the downlinking pattern from the pumps turning on and off or from the rotary table starting and stopping.
- 35. Typically you can perform downlink to:
 - Increase the Tool Config Number up
 - Example; change the Config in the tool from Config 1 to Config 2
 - Decrease the Tool configuration Number Down
 - Example; change the Config in the tool from Config 4 to Config 3
 - There can be up to 8 configurations stored in the Tool. You can downlink to the tool to increase or decrease the configuration
 - When downlinking to increase or decrease the config # the current target level will not change.
 - Increase the Target Current up
 - Example; change the Target current up from 0.3 to 1 Amps
 - Increase the Target Current up
 - Example; change the Target current up from 3.5 to 2 Amps
 - There are 6 x Power Levels (Target Level settings) currently in the standard version of the tool.

There are 4 steps associated with Down Linking

STEP -1 Initiate the Downlink

- 36. Confirm with the Driller that it is safe to perform the Down link and there are no issues in the Zone; The Drill string will have to be picked off Bottom and rotation has to be stopped prior to Downlinking Operation. The String will have to be stationary and the Pumps OFF and ON during the Downlink Operation.
- 37. Click on the Downlink Button.



Frame	Num Bits	Seconds	Messages	Sequences	
Survey	292	50.00	1	1	Time Zone:
Toolface	0	20.00	1	1	CMT E Set
Toolface Logging	150	27.00	6	1000	Givit J - 3 Jet
Logging w Rotating	152	27.00	6	1000	Taal Competiens
Status	24	13.00	1	1	- Tool Conections
Software Version: 4 1 22 15		-			Drill Offset
		1			Gamma Corr. Factor 1
Downlink	Qualif	iers	Unit	Editor	Gamma Comp. Offset 0 Feet
Configuration Info				100	
oornigerenorr nino					
ooningenetion in the					

Figure 21 Downlink Button

- 38. The Downlink pattern will appear.
- 39. Select the Desired Pattern (Config Up, Config Down, Target Current Up, Target current down).

Downlink Pattern	the states of	The second	X
Note: The Status He	ader Detection will be enab	led for 30 minutes when you o	click the 'Start' button.
Config Up	C Config Down	C Target Current Up	C Target Current Down
			Start

STEP 2 Follow the Timed Pattern

40. The Pumps have to be OFF in the first sequence.

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41. Click on "START".

link Pattern		- 11 mar	
Note: The Status He	ader Detection will be enab	led for 30 minutes when you o	lick the 'Start' button.
Config Up	C Config Down	C Target Current Up	C Target Current Down
			Start

Figure 22 Down link Pattern

42. A color-coded timer begins as shown in Figure 24. The timer starts off red in color for Flow Off and changes to Green for Flow On. The current position in the timing sequence is highlighted by the blue status line (orange arrow). The remaining time for the entire Operation is given below.

detection will be disabled at 10:57. Config Up Config Down Target Current Up Target Current Down 5 Minutes and 30 Seconds Left 4 Minutes and 58 Seconds Left 4 Minutes and 58 Seconds Left Flow Off: 30 Stop Flow On: 28 Stop	vnlink Pattern Note: The Status Header Detection has been enabled for 30 minutes starting	at 10:27. The Status Header	Downlink Pattern	s Header Detection has been e	nabled for 30 minutes starting	at 10:53. The Status Header
5 Minutes and 30 Seconds Left Flow Off: 30 Stop Flow On: 28 Stop	detection will be disabled at 10:57.	C Target Current Down	etection will be	c Config Down	C Target Current Up	C Target Current Down
5 Minutes and 30 Seconds Left 4 Minutes and 58 Seconds Left 51 Stop 51 Flow On: 28 Stop 51 Sto						
Flow Off: 30 Stop Flow On: 28 Stop	5 Minutes and 30 Seconds Left			4 Minutes and	58 Seconds Left	
	Flow Off: 30	Stop		Flow Or	n: 28	Stop

Figure 23 Initial Pumps off sequence

- 43. The Blue Progress Bar below the Pattern indicates the progress during the Sequence. The Time in the Red Bar provides the count down when the Pumps have to be Turned ON.
- 44. The Down Link pattern can be stopped and restarted at any time.



STEP 3 Confirm the Downlink

- 45. The software looks for this header message for 30 minutes from the time the Downlink is initiated.
- 46. After the user follows the pattern and preforms a successful downlink, the tool will send up a status message in the original configuration file setting, the status message will tell the user that the tool is now going to start sending data in the new configuration files setting. The STATUS Header message in Figure 25 confirms the Tool has successfully been downlinked to Config 2#.

Note: The Status Header Detection will be enabled for 30 minutes when you click the 'Start' button.

ure Data Graphic Signals Sign	als FFT Logging Configuration	Surface Box Decoder Page Com	munication Stat Page	
Enable Editing (Warning: Turn off	unless editing.)	Dialog	6 Care 1 000	22
D&I: Inclination	D&I: Azimuth	2013-Jul-05 11:03	:24) Telemetry: Confia Num	nber : 2
89.88 Deg	166.09 Deg			
12:22:36 2013-Mar-11	12:22:39 2013-Mar-11	-		
D&I: MTotal	DPG: Annular Pressur			
0.4516 Gauss	7.96 psi			
12:22:43 2013-Mar-11	12:23:20 2013-Mar-11			
Telemetry: Config File#	D&I: Auto TF-F			-
2 #	Gravity		III	Þ
13:35 : 45 2013-Mar-11	12:23:03 2013-Mar-11			
elemetry: Amp Hrs Remair	Telemetry: Batt Voltage			Close
15.63 AH	13.75 Volt			CIOSE
12:23:14 2013-Mar-11	12:23:15 2013-Mar-11			
ClassD: Meas. Load Cur.	ClassD: Scale Current	ClassD: Classd tar curr	Hole Depth(t)	Torque (KFLB)
0.000 A	81.25 %	1.016 A	Toolface Logging	
12:23:57 2013-Mar-11	12:24:06 2013-Mar-11	12:23:11 2013-Mar-11	Total Gain = 2 * 10	*5*5=500
DynamX: Shk Lat Level	DynamX: StickSlip Level	DynamX: Reverse		
	-	-		
		-	-10V-12:24:05 12	:24:10 12:24:15
File 02.01.12 YEM Dup any AT		Config 1 V10Cfg	Config 1 OBSK Ereg 6.0 Curley 2.4	uto Gaia 500

Figure 24 Status Header

Figure 25 Downlinked Confirmed

NOTE: The status message is the only message that the tool will transmit regardless of bore pressure, this means that in any configuration file (even non-safety disabled configuration) the Private. Copyright © Extreme Engineering 2013. Unpublished Work. All rights reserved.



tool will transmit a status update without the need to have the minimum 100 psi across the bore pressure /annular pressure sensor.

The status message is the last message sent from the XEM tool in the old configuration. All subsequent transmissions are sent in the new configuration. The configuration on the XEM Receiver must be changed to properly decode the new transmissions.

- 47. Proceed to the Next Stage if Downlinking is confirmed.
- 48. Do not proceed to Step 4 if the downlink is not confirmed. One of following two events has occurred:
 - a. The downlink was not successful and the XEM tool is continuing to send telemetry data in the existing configuration.
 - b. The downlink was successful, but the confirmation message was not decoded.

If the Downlink involves changing to a new configuration where the Frequency is modified, click on the FFT tab to display the Tool Frequency. This should match the Frequency in the new config.



Figure 26 Current FFT tab

49. If the Downlink change involves a change in the tool power, proceed to step 4 to confirm in the Survey or tool face Logging frame that the Power Level settings have been modified to confirm a change.

STEP 4 Change the Configuration code



50. Load the Configuration file.

XEM Receiver Example Ri Capture Data Graphic Signa	g 4 EXABC	0001 FT Loggi	ng Configura	tion Surface B	ox Decoder Page Communication Stat Page
Carrier Frequency: 6.0 Hz	Cycles Per 2			Sequence Errors 1 Update	
Frame	Num Bits	Seconds	Messages	Sequences	
Survey	292	50.00	1	1	- Time Zone:
Toolface	0	20.00	1	1	
Toolface Logging	150	27.00	6	1000	GMT -5 Set
Logging w Rotating	152	27.00	6	1000	
Logging Only	0	13.00	1	1	Tool Corrections
Status	24	5.00	1	1	North Reference
Software Version: 4.1.22.15	Qualif	Show Sun	vey Window	Editor	Drill Offset 0 Degrees Gamma Corr. Factor 1 Gamma Comp. Offset 0 Feet
Configuration Info File Path: C:\ExtremeEngine File Name: 03-01-13_XEM_D	ering\XEM\Co ynamX_ATF 5- tion File	nfigurations 3 deg_Gamma	a_QPSK_6Hz_	l	l0Cfg

Figure 27 Load Configuration File

- 51. Load the Configuration file.
- 52. Select the Config File
- 53. Click "Open"

X Load Configuration	CARDO TOTAL CONTRACTOR		X
Comp	uter + Local Disk (C:) + ExtremeEngineering + XEM + Configurations	Search Configuration	15 P
Organize 👻 New f	older	JII 🔹	
☆ Favorites	A Name	Date modified	Туре
Nesktop	03-01-13_Safety Disabled_XEM_DynamX_ATF 5-3 deg_Gamma_QPSK_2Hz_2c_Config_3.V10Cfg	3/1/2013 11:29 PM	V10CFG File
🗼 Downloads	03-01-13_Safety Disabled_XEM_DynamX_ATF 5-3 deg_Gamma_QPSK_6Hz_2c_Config_8.V10Cfg	3/1/2013 11:34 PM	V10CFG File
Recent Places	03-01-13_XEM_DynamX_ATF 5-3 deg_Gamma_BPSK_8Hz_2c_Config_6.V10Cfg	3/1/2013 11:32 PM	V10CFG File
1100-1200 A	03-01-13_XEM_DynamX_ATF 5-3 deg_Gamma_BPSK_10Hz_2c_Config_5.V10Cfg	3/1/2013 11:31 PM	V10CFG File
词 Libraries	ODEK 112 YEM Dynam Y ATES 2 dag Camma ODEK 111-24 Canfig AMOCK	2/1/2012/11/20 014	MOCEC File
Documents	03-01-13_XEM_DynamX_ATF 5-3 deg_Gamma_QPSK_2Hz_2c_Config_2.V10Cfg	3/1/2013 11:25 PM	V10CFG File
🚽 Music	03-01-13_XEM_DynamX_ATF 5-3 deg_Gamma_QPSK_4Hz_2c_Config_7.V10Cfg	3/1/2013 11:33 PM	V10CFG File
Pictures	03-01-13_XEM_DynamX_ATF 5-3 deg_Gamma_QPSK_6Hz_2c_Config_1.V10Cfg	3/1/2013 11:24 PM	V10CFG File
🚼 Videos	default-12Hz-3c-1.V10cfg	2/21/2013 2:07 PM	V10CFG File
Computer	Cload Configuration Image: Computer Configuration Organize New folder Image: Computer Configuration Image: Computer Configuration Image: Computer Configuration Image: Computer Configuration Image: Configuration Image: Computer Configuration Image: Computer Image: Computer Image: Computer Image: Computer Image: Computer Image: C		
EVTPEME (E-)			
XPulseSOC (\\vfu			
Fil	e name: 03-01-13_XEM_DynamX_ATF 5-3 deg_Gamma_QPSK_2Hz_2c_Config_2.V10Cfg	Config (*.V10cfg)	•
		Open 🔻	Cancel

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3. SURFACE BOX

1. Click on the Surface Box Tab.

	Canada CET Lanaina	Configuration Surface Box Door	der Base Communication Stat B
e Data Graphic Signat	Signals FF1 Logging	Configuration	der Page Communication Stat P
		Firmware Ve V0.0.1.2	27
Gain Control			
Auto Gain	Manual Gain	Current Gain	
Auto Gain Mode	Manual Gain Mode	Auto Gain Mode	GET
	Total Gain	Chin 1 Chin 2	Colo 2 Golo 4
			
		' '° '	P
C. 1		0	
Bandpass Frequency		Camer Frequency from Cor	tigure
Low Frequency 4.1	3 Hz	Carrier Frequency	6.0 Hz
High Frequency 7.8	8 Hz	Cycles Per Bit	2
GET	CET	Resend to S	urface Box
Operation	1	1	1
Operation	Denne Data	Test Made	On a setting Marda
Operation Pause Data	Resume Data	Test Mode	Operation Mode
Operation Pause Data Transmit Status Transmit	Resume Data	Working Mode: Operation	Operation Mode
Operation Pause Data Transmit Status Transmit	Resume Data	Working Mode: Operation	Operation Mode
Operation Pause Data Transmit Status Transmit Surface Box Voltages	Resume Data	Working Mode: Operation	Operation Mode
Operation Pause Data Transmit Status Transmi Surface Box Voltages +12V Battery	Resume Data	Working Mode: Operation	Operation Mode
Operation Pause Data Transmit Status Transmi Surface Box Voltages +12V Battery -12V Battery	Resume Data	Working Mode: Operation	Mode
Operation Pause Data Transmit Status Transmi Surface Box Voltages +12V Battery -12V Battery	Resume Data	Working Mode: Operation	Operation Mode



This Surface Box is used to:

- Check the Firmware Version of the XTR.
- Confirm the XTR Power Voltages are ok.
- Put the XEM in Operations Mode.
- Put the Tool in Test Mode (This functionality is not required with the XEM Rx program).
- Confirm the Gain applied by the XEM Rx to Amplify the EM signal on surface (The troubleshooting utility in the Capture Window is now used for this).



- Set the XEM Rx in Auto Gain Mode or Manual Gain Mode (The Troubleshooting utility in the Capture Window is now used for this).
- Set the Band pass filter settings (The Troubleshooting utility in the Capture Window is now used for this).

3.1. XTR FIRMWARE VERSION

2. Check the Firmware version of the XTR.

The XTR should have a Firmware of V0.0.1.27 as illustrated in Figure 29

ure Data Graphic Signals	Signals FFT Logging	Configuration Surface Box	Decoder Page	Communication Stat Pa
Gain Control		Firmware Version:	V0.0.1.27	
Auto Gain Auto Gain Mode	Manual Gain Manual Gain Mode	Current Gain Auto Gain Mode		GET
	Total Gain	Gain 1 Gain 2	Gain 3	Gain 4
Bandpass Frequency Low Frequency 4.13 High Frequency 7.88	Hz Hz	Carrier Frequency fro Carrier Freque Cycles Pe	m Configure mcy 6.0 r Bit 2	Hz
GET	SET	Resen	d to Surface Box	
Operation				
Pause Data	Resume Data	Test Mode	Op	eration Mode
	ng	Working Mode: Op	eration Mode	
Transmit Status Transmitti				
Transmit Status Transmitti				
Transmit Status Transmitti Surface Box Voltages +12V Battery	Volts Get	1		
Transmit Status Transmitti Surface Box Voltages +12V Battery -12V Battery	Volts Get]		

Figure 29 Firmware Version



3.2. OPERATION MODE

- 3. Confirm the Tool "Working Mode" is in "Operation Mode."
- 4. If the Tool Working mode is displayed as Test Mode click on the "Operation Mode" Button.

		R	mware Version:	V0.0.1.27	
Gain Control	Manual Gain	-Current Gain			
Auto Gain Made	Magual Gain Mode	Auto Gain M	ode		GET
Auto Gain Mode	Table in Mode	Puto Gain M	ode		GET
	Totai Gain	Gain 1	Gain 2	Gain 3	Gain 4
		<u> </u>	ļ	P	
- Bandhase Fraguancy		-Car	ier Frequency fro	m Configure	
Low Frequency 4.13	Hz	Cui	Carrier Freque	ncy 6.0	Hz
			ound freque	10) 1	
High Frequency 1/88	11-		Cycles Per	Bit 2	
High Frequency 7.88	Hz		Cycles Pe	Bit 2	
High Frequency 7.88	Hz		Cycles Per	rBit 2 d to Surface Bo	x
GET Operation	Hz		Cycles Per Resen	^r Bit [2 d to Surface Bo	x
High Frequency 7.88	Hz SET Resume Data		Cycles Per Resen Test Mode	Bit 2 d to Surface Bo	x peration Mode
High Frequency 7.88 GET Operation Pause Data Transmit Status Transmitti	Hz SET Resume Data		Cycles Per Resent Test Mode	Bit 2 d to Surface Bo O eration Mode	x peration Mode
High Frequency 7.88 GET Operation Pause Data Transmit Status Transmitti Surface Box Voltages	Hz SET Resume Data	Wo	Cycles Per Resent Test Mode	Bit [2 d to Surface Boo o eration Mode	x peration Mode
High Frequency 7.88 GET Operation Pause Data Transmit Status Transmitti Surface Box Voltages +12V Battery	Hz SET Resume Data		Cycles Per Resent Test Mode	Bit 2 d to Surface Bo	x peration Mode

Figure 30 Operation Mode



3.3. SURFACE BOX VOLTAGES

- 5. Click on the "Get" Button.
- 6. The XTR +12V, -12V and 5V supply Voltages will be displayed. The Box Voltages should be within +/- 0.5V of the reference value indicated.

If the values are out of Range replace the XTR Surface Box.

Receiver Example Rig 4 EXABC0001	Configuration Surface Box	Decoder Page	Communication Stat Page
Gain Control	Firmware Version:	V0.0.1.27	
Auto Gain Manual Gain Manual Gain Manual Gain Mode	Current Gain		GET
Total Gain	Gain 1 Gain 2	Gain 3	Gain 4
Bandpass Frequency Low Frequency 4.13 Hz High Frequency 7.88 Hz GET SET	Carrier Frequency fro Carrier Freque Cycles Per Resence	m Configure ncy 6.0 Bit 2 d to Surface Box	Hz
Operation	- 1		
Pause Data Resume Data	Test Mode	Op	eration Mode
Transmit Status Transmitting	Working Mode: Op	eration Mode	
-Surface Box Voltages +12V Battery 12.0 Volts -12V Battery -12.2 Volts]		
+12V Battery 12.0 Volts Get -12V Battery -12.2 Volts +5V Battery 5.0 Volts]		

Figure 31 XEM Receiver Surface Box Voltages

3.4. GAIN CONTROL

With the V10 software it is recommended to set the Gains in the Trouble shooting Utility located in the Capture Tab. This is explained in Section 4.4 of this Chapter.



3.5. BAND PASS FILTER FREQUENCY SETTING

With the V10 software it is recommended to adjust the Band Pass filter in the Capture Tab: Trouble shooting utility. This is explained in Section 4.4 of this Chapter.



4. STAT PAGE TAB

- 1. Upload the Job Information in the Fields provided. This includes the:
 - XRT#, Client, Rig Name, Well Name, FST and Extreme Job
- 2. Upload the Service Type, Checking the box for the particular type of Service being provided.

The Information appears on the Top bar of the XEM Rx Window making it easy for the Command center to identify the Job Information and Service provided.

ne Data Grap		guaron Sonace box	Decoder rage Commo	Contraction 1
-Job Information -				
XRT#	100			
	Clear All			
Client	Test			
Rig Name & #	Example			
Well Name	Fort Worth			
FST	User			
Extreme Job #	EX-ABC-0001			
-Service Type -				
Inc Only	Survey 🔽 Tool Face 🗆 Gamma			
PWD	□ Continuous Inc/Azim □ XHop			
Service Record				

Figure 32 STAT Page



5. CAPTURE TAB

1. Click on the Capture Tab

5.1. DATA GRID

Data or signals transmitted from the tool are displayed in the data grid shown in the box with red outline in Figure 33.

××	EM Receiver Example Rig 4 E	XABC0001							
Ca	pture Data Graphic Signals Sign	nals FFT Logging Configuration	Surface Box	Com	nmu	nication Stat Pag	e		
Г			Tester	Testhebert	٦	True North - Mag (Dec: 0.0		
L	Enable Editing (Warning: Turn off	unless editing.)	Text Log	Iroubleshoot		Drill Offset: 0.0 Gamma Factor: 1.	-15	15	
L	D&I: Inclination	D&I: Azimuth	D8	d: GTotal		Gamma Offset: 0	45	45	
L	89.88 Deg	166.09 Deg	0.9	992 g	L	-60/			60
L	12:11:16 2013-Mar-11	12:11:19 2013-Mar-11	12:11:2	2 2013-Mar-11	L		YXX	XX-Y	
	D&I: MTotal	D&I: Gravity TF	D&I: N	Magnetic TF		-75		XIII	75
L	0.4516 Gauss				(L) -90			90 (R)	
L	12:11:23 2013-Mar-11				L	-105	1 Var	<u>~</u>	-/105
L	D&I: Temperature	D&I: Auto TF-F	D&I: Auto TF 0.00 Deg			XX +		120	
L		Gravity				-120			,
L		12:11:43 2013-Mar-11	12:11:4	5 2013-Mar-11	L		150	150	·
Т	Gamma: Gamma CPS	Telemetry: Motor Voltage	Telemetry	: Motor Current	L		-165 180	165	= 0.00 /G) Rinht
L	0.0 CPS				L	WITS Data			
Т	12:12:02 2013-Mar-11				L	Bit Depth(tt)	ROP(tt/h)	Pump Press (I	PS0
	ClassD: Meas. Load Cur.	ClassD: Scale Current		:	L	Hole Depth(tt)	TPO (GPM)	Torque (KF	·LB)
L	0.000 A	81.25 %			L	Waiting f	or long header		
	12:11:47 2013-Mar-11	12:11:46 2013-Mar-11					Total Gain = 1 * 1	0*5*5=250	
	DynamX: Shk Lat Level	DynamX: StickSlip Level	Dynan	nX: Reverse		10V- 5V-			
				-		0V-			
				-		-5V	12:16:45	12:16:50	
Conf	ig File: 03-01-13_XEM_DynamX_AT	F 5-3 deg_Gamma_QPSK_6Hz_2c_0	Config_1.V10	Cfg		Config 1	QPSK Freq 6.0 Cycles 2	Auto Gain 250	0000

Figure 33 Editing the Data Grid



2. Each Signal has a header, value and time stamp.



Figure 34 Direction & Inclination Signal

- 3. In the Figure 34;
 - The Signal is D&I Inclination.
 - The value is 89.88°.
 - The time is 12:11:16 and the Date is 2013 March 11; this is the time when the value displayed was received by the XEM Rx.



The arrangement of signals in the data grid can be modified according to user preference.

4. Check the "Enable Editing" checkbox.

Remember to disable this checkbox once you have completed this exercise.

	ADCOUL		
ure Data Graphic Signals Signa	als FFT Logging Configuration	Surface Box Decoder Page Con	mmunication Stat Page
Enable Editing (Warning: Turn off up	miess editing.)	Text Log Troubleshoot	True North - Mag Dec: 0.0 Drill Offset: 0.0 Germa Factor: 1.0
D&I: Inclination	D&I: Azimuth	D&I: GTotal	Gamma Offset: 0.0 -30 30 45
89.88 Deg	89.88 Deg 166.09 Deg		-60 60
12:11:16 2013-Mar-11	12:11:19 2013-Mar-11	12:11:22 2013-Mar-11	
D&I: MTotal	D&I: Gravity TF	D&I: Magnetic TF	-75 - 75
0.4516 Gauss			(L) -90 90 (L) -90 (L)
12:11:23 2013-Mar-11	XEM-RX		105
D&I: Temperature	D&		
Gamma: Gamma CPS	Telemet		OK 65 180 165 GTF = 0.00 (G) R
12:12:02:2012 Mar 11		and the second se	
12.12.02.2013-War-11			Bit Depth(tt) ROP(tt/h) Pump Press (PSI)
ClassD: Meas. Load Cur.	ClassD: Scale Current	1	Bit Depth(t) ROP(tt/h) Pump Press (PSI) Hole Depth(t) TPO (GPM) Torque (KFLB)
ClassD: Meas. Load Cur. 0.000 A	ClassD: Scale Current 81.25 %	3 1 8	Bit Depth(t) ROP(tt/h) Pump Press (PSI) Hole Depth(t) TPO (GPM) Torque (KFLB) Status Waiting for long header
ClassD: Meas. Load Cur. 0.000 A 12:11:47 2013-Mar-11	ClassD: Scale Current 81.25 % 12:11:46 2013-Mar-11	(1) 	Bit Depth(t) ROP(tt/h) Pump Press (PSI) Hole Depth(t) TPO (GPM) Torque (KFLB) Status Waiting for long header
ClassD: Meas. Load Cur. 0.000 A 12:11:47 2013-Mar-11 DynamX: Shk Lat Level	ClassD: Scale Current 81.25 % 12:11:46 2013-Mar-11 DynamX: StickSlip Level	: DynamX: Reverse	Bit Depth(t) ROP(tt/h) Pump Press (PSI) Hole Depth(t) TPO (GPM) Torque (KFLB) Status Waiting for long header
ClassD: Meas. Load Cur. 0.000 A 12:11:47 2013-Mar-11 DynamX: Shk Lat Level	ClassD: Scale Current 81.25 % 12:11:46 2013-Mar-11 DynamX: StickSlip Level	: DynamX: Reverse	Bit Depth(t) ROP(tt/h) Pump Press (PSI) Hole Depth(t) TPO (GPM) Torque (KFLB) Status Waiting for long header
ClassD: Meas. Load Cur. 0.000 A 12:11:47 2013-Mar-11 DynamX: Shk Lat Level	ClassD: Scale Current 81.25 % 12:11:46 2013-Mar-11 DynamX: StickSlip Level - -	: DynamX: Reverse - -	Bit Depth(t) ROP(tt/h) Pump Press (PSI) Hole Depth(t) TPO (GPM) Torque (KFLB) Status Waiting for long header

Figure 35 Enable Editing in the Data grid



5. If you need to add a Signal to the data grid;

Click on the Signal box in the data grid where you need to add the signal.

6. As an example Annular pressure needs to be added on the signal box labeled A. Click on the Signal box with the label "A".



Figure 36 Capture Screen Signal selection Example



- 7. The Signal Selection box will appear;
- 8. Click on DPG Annular Pressure.
- 9. Click OK.



Figure 37 Signal Selection



XEM Receiver Example Rig 4 E	XABC0001						×
apture Data Graphic Signals Sign	als FFT Logging Configuration	n Suface I	Box Decoder Page Com	munication Stat Page			
Enable Editing (Warning: Turn off	unless editing.)	Text Log	Troubleshoot	True North - Mag Dec: 0. Drill Offset: 0.0 Gamma Factor: 1.0	-15	15	
D&I: Inclination	D&I: Azimuth	D&I: GTotal		Gamma Offset: 0.0	-30	30 45	
89.88 Deg	166.09 Deg	0	.9992 g	-60		60	
12:11:16 2013-Mar-11	12:11:19 2013-Mar-11	12:11	:22 2013-Mar-11	14	X	XX	
D&I: MTotal	DPG: Annular Pressur	D&I: MAG Dip Angle		-75		75	
0.4516 Gauss	Α			(L) -90		90	(R)
12:11:23 2013-Mar-11				-105		105	
Telemetry: Config File#	D&I: Auto TF-F	D	D&I: Auto TF		X +	×	
	Gravity	0.	.00 Deg	-120	XOT		
	12:11:43 2013-Mar-11	12:11	:45 2013-Mar-11	-135	150	150	
elemetry: Amp Hrs Remain	Telemetry: Batt Voltage	Felemetr	y: Trans Pow Leve		-165 180	165	inkt
				WITS Data			g
				Bit Depth(ft)	ROP(ft/h)	Pump Press (PSI)	
ClassD: Meas. Load Cur.	ClassD: Scale Current	Class): Classd tar curr	Hole Depth(ft)	TPO (GPM)	Torque (KFLB)	
0.000 A	81.25 %			Waiting for long	g header		
12:11:47 2013-Mar-11	12:11:46 2013-Mar-11			1	otal Gain = 4 * 10 * 11	0*5=2000	
DynamX: Shk Lat Level	DynamX: StickSlip Level	Dyn	amX: Reverse	10V-			
	-		-	0V-			
			-	-5V-	12:20:25	12:20:30	
					12.20.20	12.20.00	
ig File: 03-01-13_XEM_DynamX_AT	F 5-3 deg_Gamma_QPSK_6Hz_2c	_Config_1.V	10Cfg	Config1 QPSk	Freq 6.0 Cycles 2 Aut	to Gain 2000	Ø

Figure 38 DPG Annular pressure selected



EM Receiver Example Rig 4 E	XABC0001		
oture Data Graphic Signals Sign	als FFT Logging Configuratio	n Surface Box Decoder Page Com	munication Stat Page
Enable Edting (Warning: Turn off	unless editing.)	Text Log Troubleshoot	True North - Mag Dec: 0.0 Dell Offset: 0.0 Gamma Factor: 1.0
D&I: Inclination	D&I: Azimuth	D&I: GTotal	Gamma Offset: 0.0 45
89.88 Deg	166.09 Deg	0.9990 g	-60
12:22:36 2013-Mar-11	12:22:39 2013-Mar-11	12:22:42 2013-Mar-11	
D&I: MTotal	DPG: Annular Pressur	D&I: MAG Dip Angle	-75
0.4516 Gauss	7.96 psi	55.55 Deg	(L) -90 90 (R)
12:22:43 2013-Mar-11	12:23:20 2013-Mar-11	12:22:46 2013-Mar-11	105
Telemetry: Config File#	D&I: Auto TF-F	D&I: Auto TF	
1 #	Gravity	0.00 Deg	-120
12:22:34 2013-Mar-11	12:23:03 2013-Mar-11	12:24:13 2013-Mar-11	150 150
elemetry: Amp Hrs Remain	Telemetry: Batt Voltage	Felemetry: Trans Pow Leve	-165 180 165
15.63 AH	13.75 Volt	3 #	WITS Data
12:23:14 2013-Mar-11	12:23:15 2013-Mar-11	12:23:10 2013-Mar-11	Bit Depth(t) ROP(t/h) Pump Press (PSI)
ClassD: Meas. Load Cur.	ClassD: Scale Current	ClassD: Classd tar curr	Hole Depth(t) IPO (GPM) Iorque (KFLB)
0.000 A	81.25 %	1.016 A	Toolface Logging
12:23:57 2013-Mar-11	12:24:06 2013-Mar-11	12:23:11 2013-Mar-11	Total Gain = 2 * 10 * 5 * 5 = 500
DynamX: Shk Lat Level	DynamX: StickSlip Level	DynamX: Reverse	
	-	8 - 1	
		-	-10V
			12.24.00 12.24.10 12.24.10

Figure 39 Capture Screen with parameters

12. Commonly displayed parameters for a Directional job are as follows:

- D&I Inclination, Azimuth, G Total, M Total, Mag DIP, Auto Tool face, Tool face
- Telemetry Configuration File, Telemetry Transmitted power Level, Transmitter Voltage Level Tx, Telemetry Amp Hours, Telemetry battery voltage.
- Class D Measure Load Current, Class D Scale Current, Class D Target Current. Gamma and Annular pressure can be added if the measurements are provided.

13. Prior to the run during the bank test it is recommended to retake the Surveys.



1. A green color value with a grey color header indicates a properly decoded Signal which falls within the tolerances specified in the qualifiers window in the configuration tab.

G Total			
999.95			
12:22:36 2013-Mar-11			

Figure 40 Properly Decoded Signal within qualifier range

2. A green color value with a red color header indicates a properly decoded signal **that falls outside** the tolerances specified in the qualifiers window in the configuration tab. This could indicate a possible failure for a particular sensor or that the qualifiers have been set incorrectly.

G Total	
995.5	
12:22:36 2013-Mar-11	

Figure 10 Properly Decoded value outside qualifier range

3. A red color value with a red color header indicates a poorly decoded signal that also **falls outside the** qualifier range. If the value is a bad decode the red header can be ignored.

G Total
888.1
12:22:36 2013-Mar-11

Figure 11 Poorly Decoded value outside qualifier range

4. If the signal was noisy and the Receiver had to apply a correction to decode the signal, the value will appear in blue color.

G Total				
999.99				
12:22:36 2013-Mar-11				

Figure 12 Corrected value in qualifier range

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5. The Temperature value is flagged yellow when it is between the "High" and "Max" thresholds; red when it exceeds the "Max".

5.2. TEXT LOG WINDOW

wineceiver Example Rig 4 Ex	KABC0001			
ture Data Graphic Signals Signa	als FFT Logging Configuratio	n Surface B	lox Decoder Page Com	munication Stat Page
				True North - Mag Dec: 0.0
Enable Editing (Warning: Turn off unless editing.)		Text Log Troubleshoot		Drill Offset: 0.0 Gamma Factor: 1.0
D&I: Inclination	D&I: Azimuth	D&I: GTotal		Gamma Offset: 0.0 -30 -45 -45
89.88 Deg	166.09 Deg	0.9990 g		-60
12:22:36 2013-Mar-11	12:22:39 2013-Mar-11	12:22:42 2013-Mar-11		
D&I: MTotal	DPG: Annular Pressur	D&I: MAG Dip Angle		-75
0.4516 Gauss	7.96 psi	55.55 Deg		(L) -90 90
12:22:43 2013-Mar-11	12:23:20 2013-Mar-11	12:22:46 2013-Mar-11		-105 105
Telemetry: Config File#	D&I: Auto TF-F	D	&I: Auto TF	
1 #	Gravity	0.	00 Deg	-120 120
12:22:34 2013-Mar-11	12:23:03 2013-Mar-11	12:24	13 2013-Mar-11	-135
elemetry: Amp Hrs Remain	Telemetry: Batt Voltage	Felemetry	: Trans Pow Leve	-165 180 165
15.63 AH	13.75 Volt		3 #	WITS Data
12:23:14 2013-Mar-11	12:23:15 2013-Mar-11	12:23	:10 2013-Mar-11	Bit Depth(t) ROP(tt/h) Pump Press (PSI)
ClassD: Meas. Load Cur.	ClassD: Scale Current	ClassD	: Classd tar curr	Hole Depth(tt) TPO (GPM) Torque (KFLB)
0.000 A	81.25 %	1	.016 A	Toolface Logging
12:23:57 2013-Mar-11	12:24:06 2013-Mar-11	12:23	:11 2013-Mar-11	Total Gain = 2 * 10 * 5 * 5 = 500
DynamX: Shk Lat Level	DynamX: StickSlip Level	Dyna	amX: Reverse	
	-		-	
			-	10/-10/-12:24:05 12:24:10 12:24:15

Figure 41 Select Text Log

- 6. Click on the Text Log Button.
- 7. This opens the "Text log" window.



- 8. The Text Log window shows the Decoded parameters and the time stamp at which they are updated.
- 9. Click on the Auto Scroll Option if you need to keep updating the parameters. The parameters can be cleared or erased from the list by clicking on "Clear All'. If required the Parameters can be copied by clicking on the "copy all" button.

Clear All	Copy All 🔽 Auto Scroll	Close
(13-Mar-11 12:25	:48) D&I: Auto TF = 0.00 (G) Deg	*
(13-Mar-11 12:25	:50) DynamX: Shk Lat Max = 8 g	
(13-Mar-11 12:25	:52) XEM: Decoded Bits = 000000000-111	
(13-Mar-11 12:25	:52) Gamma: Gamma CPS = 0.0 CPS	
(13-Mar-11 12:25 (13 Mar-11 12:25	(53) XEM: Decoded Bits = 000000-1	
(13-Mar-11 12:25 (12-Mar-11 12:25	:53) Dat: Auto IP = 0.00 (G) Deg	
(13-Mar-11 12:25	:54) ClassD: Scale Ourrent = 81,25 %	
(13-Mar-11 12:25	:56) XEM: Decoded Bits = 000000000-111	
(13-Mar-11 12:25	:56) Gamma: Gamma CPS = 0.0 CPS	
(13-Mar-11 12:25	:57) XEM: Decoded Bits = 000000-1	
112 14 14 12 27	ET DOT. 4. 4. TE - 0.00 (0) Das	

Figure 42 Text Log

10. Click on the close button to exit the Text log window and to return to the Capture Window.



5.3. TROUBLE SHOOTING

11. On the capture screen click on the "Troubleshoot" button.

Enable Editing (Warning: Turn off unless editing.)		Text Log Troubleshoot		True North - Mag De Drill Offset: 0.0	: 0.0	•	
D&I: Inclination	D&I: Azimuth		0&I: GTotal	Gamma Factor: 1.0 Gamma Offset: 0.0	-30 -15		30
89.88 Deg	166.09 Deg	0.9990 g		-50	X		×**
12:22:36 2013-Mar-11	12:22:39 2013-Mar-11	12:22:42 2013-Mar-11		7-	AX.		X . Y . Y
D&I: MTotal	DPG: Annular Pressur	D&I: MAG Dip Angle		-75	- [X		75
0.4516 Gauss	7.96 psi	55.55 Deg		(L) -90		X	90
12:22:43 2013-Mar-11	12:23:20 2013-Mar-11	12:22	46 2013-Mar-11	-105	-1-X		1-1-105
Telemetry: Config File#	D&I: Auto TF-F	D&I: Auto TF			X	40	
1#	Gravity	0.	00 Deg	-120	XD		120
12:22:34 2013-Mar-11	12:23:03 2013-Mar-11	12:24	13 2013-Mar-11	-13	100		135
elemetry: Amp Hrs Remair	Telemetry: Batt Voltage	Felemetry	: Trans Pow Leve		-165	180 165	
15.63 AH	13.75 Volt		3#	WITS Data			GTF = 0.00 (G) F
12:23:14 2013-Mar-11	12:23:15 2013-Mar-11	12:23	10 2013-Mar-11	Bit Depth(t)	ROP	/h)	Pump Press (PSI)
ClassD: Meas. Load Cur.	ClassD: Scale Current	ClassD	: Classd tar curr	Hole Depth(t)	TPO (GP	M)	Torque (KFLB)
0.000 A	81.25 %	1	.016 A	Toolface L	ogging 📃		-
12:23:57 2013-Mar-11	12:24:06 2013-Mar-11	12:23	:11 2013-Mar-11		Total Gain	-2*10*5*5	- 500
DynamX: Shk Lat Level	DynamX: StickSlip Level	Dyna	amX: Reverse	10V-			ALC: UNK
	-		-	0∨-		in a second s	
				-10V-	يتوكي المتركية		الكر تقنت فكالكوال

Figure 43 Troubleshooting Button



- 12. The troubleshooting Window appears displaying a number of parameters in a graphic format.
- 13. A description of each of the graphs is given in Figure 44.





- A. The FFT (Fast Fourier transform) display shows the tool signal frequency and amplitude. The display in Figure 44 shows an XEM operating at 4Hz and having a frequency spread from 2.75Hz to 5.25 Hz with a good amplitude.
- B. The filtered data display shows the tool Signal that has been decoded by the XEM Rx; the decoded signal should have amplitude of 3V if the Auto gain is in use.
 - If Manual gain is in use: Filtered signal output = Input Signal x Manual Gain.
- C. The Long header correlation (%) display shows the ease with which the Long header can be decoded. The display in Figure 44 shows a confidence value of approximately 40%, This number will go up when the XEM Rx will actually decode a long header, the confidence should appear as a spike as shown in Figure 45(The Header is 95%).





Figure 45 Long Header Correlation 95%





- D. The Signal to Noise ratio plot compares the signal to noise. This number should be > 6 for good decoding. In Figure 44 the SNR is between 13 and 15 indicating good signal quality as compared with Noise.
- E. The Gain plot shows the gain applied by the XEM receiver to decode the signal. In the Figure 44 below the Gain is 2000. Typically if the Gain < 20,000 the signal can be decoded. Private. Copyright © Extreme Engineering 2013. Unpublished Work. All rights reserved.



F. The Band pass filter settings including the Lower and Upper Frequency limits are set automatically by the software based on the configuration file. When decoding the tool signal, the XEM Rx ignores the Frequencies above the Upper frequency limit cutoff and below the lower frequency cut off.

For Example, if the XEM Tool is operating at 4 Hz and 2 cycles per symbol, the symbol rate is 2 symbols per second as shown in Figure 47.

- The low pass frequency will be set at 2.75Hz
- The high pass frequency will be set at 5.25Hz.

The Lower and upper frequency values can be fine-tuned making the band narrow in order to remove Noise at the edges.

- G. The Configuration File Tab input allows the user to verify the configuration file being used by the XEM Rx.
- H. The Notch filter can be used to spike out or remove a select frequency. This can be done by typing the value of the unwanted frequency in the "Frequency" box and clicking the "Enable" checkbox. More information on the Notch Filter is given in Chapter 3, Section 2.4



Figure 47 Trouble shooting Window (Repeat)

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- I. "Gain" allows the Amplifier Gain to be set manually or computed automatically.
 - <u>AUTO GAIN</u>: Leave the Auto Gain box checked; it is preferred to use Auto Gain allowing the Receiver to calculate the Gain automatically. The Output signal is automatically adjusted such that it has amplitude of 3V. The Auto Gain computed by the XEM Rx is 2000 in the Figure 47.
 - <u>MANUAL GAIN</u>: If it is required to adjust the gain manually; select the desired value of the Total Gain to be set from the drop down value. Setting a value > 20,000 for Gain does not normally help decode the signal. If Manual gain is in use:
 - Filtered signal output = Input Signal x Manual Gain.



Figure 48 Manual Gain

- J. The default values for the Header Decode threshold are set at;
 - Not decoding 70%; When the XEM Rx is not decoding Signal from the tool.
 - Decoding 80%; When the XEM Rx is decoding Signal from the tool.

If it is difficult for the XEM Rx to start decoding the Signal, the "Not decoding" threshold can be reduced. If the XEM Rx keeps locking on to wrong signal the "Not Decoding" threshold can be increased. If while Decoding the XEM Rx keeps loosing signal at the end of each frame the "Decoding" threshold can be reduced.

If while Decoding the XEM Rx locks on to the wrong frames and the signal is clean the "Decoding" threshold can be increased.

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14. Exit the Troubleshooting Window by clicking on the Windows close button "X" to return to the Capture Screen.

5.4. TOOL FACE ROSE BUD

15. On the XEM capture window locate the Tool face rose bud.



Figure 49 Tool face Rose Bud



16. As an Example In the Rose Bud Below:

The Last 5 x Tool Face values are seen on the rose bud.

The Last Tool Face value is 143.2 ° to the Right

The Blue Letter G in the background indicates that this is Gravity Tool Face.



Figure 50 Tool Face Rose Bud

- 17. The corrections appear on the Top Left Hand corner of the screen. These are entered in the configuration editor. Ensure that these are all updated before the run.
 - True North Mag Dec: 0.2°
 - Drill offset : 143.2°
 - Gamma Factor : 5.2
 - Gamma offset: 30 ft





The green Letter M in the background indicates that this is Magnetic Tool Face.

Figure 51 Magnetic tool face



If the Receiver software receives a signal from the tool but does not get directional information in the signal possibly due to an internal communication error in the tool:

- A red and white banner will appear on the Rose bud stating; "Error: No Response from D&I".
- The Signal (Inclination, Azimuth, Tool face) values will be 8888.00 Deg.

Enable Editing (Warning: Turn aff	unicss editing.]	Ticubleshoot	Neg North - Consetien: 0.0 N Drill Offset: 0.0 345 0 15 Gramme Barger: 10 345 15
D&I: Inclination	D&: Azimuth	D&I: GTotal	Camma Offset: 24.4 330 30 45
-8888.00 Deg	-8888.00 Deg	0.9000 g	300 60
11:44:01 2013-Feb-28	11:44:05 2013-Feb-28	11:44:08 2013-Feb-28	
D&I: MTotal	D&I: Gravity TF	D&I: Magnetic TF	
0.3000 Gauss			ERROR: NO RESPONSE FROM D&
11:44:11 2013-Feb-28			
D&I: Temperature	D&I: Auto TF-F	D&I: Auto TF	
	Magnetic	-8888.00 Deg	240
	11:44:41 2013-Feb-28	00:10:31 2013-Mar-03	225
Gamma: Gamma CPS	WITS: Depth Bit (meas)	VVITS: Depth Hole (vert)	195 180 165
13.9 CPS			WITS Data
00:10:38 2013-Mar-03			BiDepth(m) 7.75 ROP(m/h) 355.00 PumpPress(kPa)
ClassD: Meas, Load Cur.	ClassD: Scale Current	4	HoleDepth(m) 545.45 TPO (GPM) Torque (KPLB)
0.010 A	81.25 %		Toollace Logging
00:10:35 2013-Mar-03	00:10:07 2013-Mar-03		Total Gain = 1 * 10 * 5 * 5 = 250
DynamX: Shk Lat Level	DynamX: StickSlip Level	DynamX: Reverse	10V
	-	-	
	12	(L)	-10V-

Figure 52 No Response from D&I

The D&I No error Response is triggered when

- The Inclination value decoded is > 180°.
- The tool face or Azimuth values decoded are > 360°.
- A good Tool signal is received by the receiver; one of the directional values is not updated.
- 3 x Directional values decoded by the receiver in a consecutive frame are corrected.



5.6. WITS DATA

- 18. Data received through WITS is displayed below the Rose Bud. This currently includes:
 - Bit depth, when the bit is;
 - On bottom this box will have black text with a grey background.
 - \circ $\,$ Off bottom this box will have green text on black background.
 - Hole depth
 - ROP
 - Pump Pressure
 - Surface Torque
 - TPO (Total Pump Output)

19. The Units for the WITS data can be modified in the configuration TAB.



Figure 53 WITS Data Tab





Figure 54 Bit Depth, ROP and Pump pressure received through WITS

- 20. WITS data will only update once received by the XEM Receiver.
- 21. When a Sensor value fails on WITS -8888.0 is displayed
- 22. If it is required to input additional WITs data into the capture Tab Click on the Communication Tab
- 23. Click on INPUT.

XEM Receiver Example Rig 4 EXABC0001
Capture Data Graphic Signals Signals FFT Logging Configuration Surface Box Decoder Page Communication Stat Page
Remote Connection For Raw Data
Send data C Receive data
X-Server IP Address 127 . 0 . 0 . 1 Connect
WITS Network Connection
Extreme Server Host IP 127 . 0 . 0 . 1 Connect
Input
✓ Do not send non-decode values
C Do not send corrected values

Figure 55 Communication Tab



- 24. On the COM Input Window Select the WITs Record from the Window on the Left
- 25. Click on >> to move the WITs record to the Right
- 26. Update the Time Interval as needed.
- 27. Click on OK

ITS Records	- Selected Input WITS
 Bernet Construction of the sector o	Image: Distance of the image
WITS ID: 0110 Description: Depth Hole (meas) Metric Units: M FSD Units: F Long Mnemonic: DEPTMEAS Short Mnemonic: DMEA	Update Time Interval (seconds)

Figure 56 WITs COMM parameter Window

28. These selected WITS inputs will now be added to the decoded log file at the interval selected in this window. They will also now be available as signals for use on the capture Tab.



- 29. Click on Capture Tab
- 30. Check the Enable Editing on the Data Grid
- 31. Additional WITS data can be added by enabling the Edit box in the Data Grid.

Teaching Edition Milantian Teach	ls FFT Logging Configuration	Surface Box Decoder Page Con	mmunication Stat Page
IV Chable Editing (Warning: Tum off ur	niess editing)	ng Troubleshoot pot	True North - Mag Dec: 0.0 Drill Offset: 0.0 Gamma Factor: 1.0
D&I: Inclination	D&I: Azimuth	D&I: GTotal	Gamma Offset: 0.0 -30 -30 -30 -45 -45
89.88 Deg	166.09 Deg	0.9992 g	-60
12:11:16 2013-Mar-11	12:11:19 2013-Mar-11	12:11:22 2013-Mar-11	
D&I: MTotal	D&I: Gravity TF	D&I: Magnetic TF	-75
0.4516 Gauss			(L) -90 90 (F
12:11:23 2013-Mar-11	XEM-RX		105
D&I: Temperature	D&		120
	G A Warning:	: You must disable this checkbox a	ofter you are done editing.
Gamma: Gamma CPS	12:11: Telemet		65 180 165
0.0 CPS			OK GTF = 0.00 (G) Rig
12:12:02 2013-Mar-11			Bit Depth(ft) ROP(ft/h) Pump Press (PSI)
ClassD: Meas. Load Cur.	ClassD: Scale Current	:	Hole Depth(t) TPO (GPM) Torque (KFLB)
0.000 A	81.25 %		Valting for long header
	12:11:46 2013-Mar-11		
12:11:47 2013-Mar-11	DynamX: StickSlip Level	DynamX: Reverse	
12:11:47 2013-Mar-11 DynamX: Shk Lat Level			
12:11:47 2013-Mar-11 DynamX: Shk Lat Level	-	-	

Figure 57 Enable Editing on the Data Grid



32. The Desired WITS signal can be selected from the Signal Selection Window .



Figure 58 WITS signal Selection

33. The WITs signal will then be added on the Data Grid in the Capture Tab.

WITS: Depth Bit (meas)	VVITS: Depth Hole (vert)



5.7. DECODING-STATUS, GAIN, SIGNAL DISPLAY

34. "STATUS" below the WITS parameter provides information on the frame that is being received.

XEM Receiver Example Rig 4 E	XABC0001		
apture Data Graphic Signals Sign	als FFT Logging Configuratio	n Surface Box Decoder Page Con	munication Stat Page
Enable Editing (Warning: Turn off	unless editing.)	Troubleshoot	True North - Mag Dec: 0.0 Drill Offset: 0.0 Gmma Factor 10
D&I: Inclination	D&I: Azimuth	D&I: GTotal	Gamma Offset: 0.0 -30 -45 -45
89.88 Deg	166.09 Deg	0.9990 g	-60
12:22:36 2013-Mar-11	12:22:39 2013-Mar-11	12:22:42 2013-Mar-11	
D&I: MTotal	DPG: Annular Pressur	D&I: MAG Dip Angle	-75
0.4516 Gauss	7.96 psi	55.55 Deg	(L) -90 (R)
12:22:43 2013-Mar-11	12:23:20 2013-Mar-11	12:22:46 2013-Mar-11	-105 105
Telemetry: Config File#	D&I: Auto TF-F	D&I: Auto TF	
1 #	Gravity	0.00 Deg	-120
12:22:34 2013-Mar-11	12:23:03 2013-Mar-11	12:24:13 2013-Mar-11	-135
elemetry: Amp Hrs Remain	Telemetry: Batt Voltage	Felemetry: Trans Pow Leve	-165 180 165
15.63 AH	13.75 Volt	3 #	WITS Data
12:23:14 2013-Mar-11	12:23:15 2013-Mar-11	12:23:10 2013-Mar-11	Bit Depth(ft) ROP(ft/h) Pump Press (PSI)
ClassD: Meas. Load Cur.	ClassD: Scale Current	ClassD: Classd tar curr	Hole Depth(t) TPO (GPM) Torque (KFLB)
0.000 A	81.25 %	1.016 A	Toolface Logging
12:23:57 2013-Mar-11	12:24:06 2013-Mar-11	12:23:11 2013-Mar-11	Total Gain = 2 * 10 * 5 * 5 = 500
DynamX: Shk Lat Level	DynamX: StickSlip Level	DynamX: Reverse	
	-	-	
			12:24:05 12:24:10 12:24:15
ig File: 03-01-13_XEM_DynamX_AT	F 5-3 deg_Gamma_QPSK_6Hz_2c	Config_1.V10Cfg	Config 1 QPSK Freg 6.0 Cycles 2 Auto Gain 500

Figure 59 Status bar on Capture Window

In Figure 60, the "Tool face Logging Frame' is being received. The progress bar indicates how far the frame has progressed and when the next frame is expected to start

Status	
Tool Face Logging	

Figure 60 Status Bar



35. As an Example, In the Window below the Total Gain = $2 \times 5 \times 10 \times 1 = 100$.



Figure 61 Total Gain

- A. The green colored sinusoidal signal curve represents the tool signal. If Auto gain is set, the filtered signal will automatically be amplified so that the output filtered voltage has amplitude of 3V.
- B. The pink boxes around green signal show the signal confidence; For QPSK telemetry the higher the Pink box from the bottom of the display window the better the signal quality.



Hiah Qualitv Decode

Medium Quality Decode

C. The + sign above the signal shows a good quality decode.



D. Successive signal decodes are colored red and white so that they can be distinguished easily. The "0" denotes a Zero; the X denotes a "1"





5.8. CONFIG FILE AND CONFIG NUMBER

36. Identify the Configuration File and the Configuration # at the bottom of the Window Tab.



Figure 62 Status bar on Capture Window

It is important to have the correct configuration File and the correct Configuration# in the XEM Rx particularly after downlinking otherwise the XEM Rx will not be able to decode the information from the Tool.

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5.9. DECODING AND WITS INDICATORS

Enable Editing (Warning: Turn off	unless editing.)	Troubleshoot	True North - Mag Dec: Drill Offset: 0.0 Gamma Eactor: 1.0	-15	15
D&I: Inclination	D&I: Azimuth	D&I: GTotal	Gamma Offset: 0.0	-30	30 45
89.88 Deg	166.09 Deg	0.9990 g	-60	\times	60
12:22:36 2013-Mar-11	12:22:39 2013-Mar-11	12:22:42 2013-Mar-11	17		XXX
D&I: MTotal	DPG: Annular Pressur	D&I: MAG Dip Angle	-75		75
0.4516 Gauss	7.96 psi	55.55 Deg	(L) -90		90 (
12:22:43 2013-Mar-11	12:23:20 2013-Mar-11	12:22:46 2013-Mar-11	-105	T.V.	105
Telemetry: Config File#	D&I: Auto TF-F	D&I: Auto TF		(X)	
1 #	Gravity	0.00 Deg	-120	X	120
12:22:34 2013-Mar-11	12:23:03 2013-Mar-11	12:24:13 2013-Mar-11	-135	100	135
elemetry: Amp Hrs Remair	Telemetry: Batt Voltage	felemetry: Trans Pow Leve		-165 180	165
15.63 AH	13.75 Volt	3 #	WITS Data		GTF = 0.00 (G) Rg
12:23:14 2013-Mar-11	12:23:15 2013-Mar-11	12:23:10 2013-Mar-11	Bit Depth(ft)	ROP(ft/h)	Pump Press (PSI)
ClassD: Meas. Load Cur.	ClassD: Scale Current	ClassD: Classd tar curr	Hole Depth(ft)	TPO (GPM)	Torque (KFLB)
0.000 A	81.25 %	1.016 A	Toolface Lo	gging	
12:23:57 2013-Mar-11	12:24:06 2013-Mar-11	12:23:11 2013-Mar-11		Total Gain = 2 * 10 *	*5*5=500
DynamX: Shk Lat Level	DynamX: StickSlip Level	DynamX: Reverse	10V-		
	-	1-1			
		2.29	-10V-	a dimensional distribution	

Figure 63 Decode and WITS Update window

37. Locate the Decode and WITS update windows at the bottom of the XEM Rx Window.

38. When the Receiver is decoding data from the tool "D" will appear in white with a black background.



39. When the Receiver is getting data through WITs "W" will appear in white with a black background.



Figure 64 Receiver Decoding and receiving data through WITs

40. When the Receiver is not getting data through WITs or Not Decoding the letters will appear in black crossed out with a white background.

Auto Gain 250	00

Figure 65 Receiver Not decoding data and Not getting information through WITS

The Decode status is set to ok (D is black), if more than 65% of the expected signals have been decoded in the past 200 seconds. The WITs status is set to ok (W is black) if any single WITs has been received in the past 200 seconds.



6. DATA TAB

1. Click on the Data Tab

The Data Tab is used ONLY by the Engineering Experts for Analyzing the Decoder Performance.



Figure 66 Data Tab showing Clean Signal

- 2. The following graphs are included in the Data Tab
 - A. Tool Signal : The tool signal graph has been discussed in Section 5.7
 - B. Long Header Correlation (%): The Long Header correlation graph has been discussed in Section 5.3
 - C. Decode Success: shows instances of successfully decoded frames as dots. The Dots are colored green (OK), Blue (corrected) and red (Not corrected).
 - D. SNR (Signal to Noise Ratio): Shows the Signal to Noise ratio of the frames.
 - E. Long Header History: Shows the history of the Long Header correlation in %.



F. The Constellation Plot shows how the receiver identifies the phase detection. These can be seen as cluster of Dots represented on a Y-X axis Clusters of Dots placed together to indicate good signal quality. Dots in a cloudy pattern indicate poor Signal quality.



Figure 67 Constellation Poor Signal



Constellation Good Signal

G. Eye Diagram Real: This shows a number of Lines: Lines far away from one another indicate good signal quality; Lines close to one another indicate poor signal quality.



Figure 68 Good quality Signal



Eye Diagram Good Signal

H. The View Log file is used to Load and Play back Receiver Log files if required.

S	peed	⊢ Max
LUOP A		
rogress of	Current file	

Figure 69 Play back Log Files



7. GRAPHIC SIGNAL TAB

1. Click on the Graphic Signals Tab.

XEM Receiver	Transfer of the local data	
Capture Data	Graphic Signals Signals FFT Logging Configuration Surface Box Decod	er Page Communication Stat Page
	D&I: Inclination	D&I: Azimuth
40 39		213-
	D&I: Cs Inc Sri	Gamma: Gamma CPS
40-		34 - + + + + + + + + + + + + + + + + + +
	D&I: AX	D&I: MK
1 — D —		1-
	D&I: Cs AX	D&I: Cs MX
1 — D —		0.06
* Double Click	k Graph to Change Signal.	
Config File: C:\tem	np/xrt029_8Hz_2Cycle\SLB-0138-no-safety_2.V8Cfg	Config = 2, Frequency = 8.0, Cycles/Bit = 2, Gain = 0.

Figure 70 Graphic Signals

- 1. This utility allows any signal from the tool to be displayed in a graph.
- 2. The Graphs are based on discrete signal values (not time).
- 3. Signals can be added by clicking on the desired signal graph.



8. SIGNALS

1. Click on the Signal Tab

The list of signals transmitted is displayed with the:

- Time stamp when the data was received by the XEM Rx
- Message type (Survey, Tool face Logging)
- Name of the Signal
- Tool Name: Node in the probe responsible for acquiring the measurement
- Value (The value of the signal)
- Unit used
- WITS ID

oture Data Graphic Sign	nals Signals FFT Logging Cor	nfiguration Surface Box Dec	oder Page Communication	n Stat Page			
Timestamp	Message	Name	Tool Name	Value	Unit	WITS ID	
3-Mar-11 12:39:15	Survey	Gamma CPS	Gamma	0.0	CPS	824	
3-Mar-11 12:39:13	Survey	Safety Err	Telemetry	OFF	ON/OFF	0	
3-Mar-11 12:39:13	Survey	Annular Pressur	DPG	7.96	psi	922	
3-Mar-11 12:39:10	Survey	Bore Pressure	DPG	145.36	psi	914	
3-Mar-11 12:39:07	Survey	Batt Voltage	Telemetry	13.75	Volt	8813	
3-Mar-11 12:39:07	Survey	Amp Hrs Remain	Telemetry	15.63	AH	8815	
3-Mar-11 12:39:05	Survey	Temperature	Telemetry	18.0	F	8908	
3-Mar-11 12:39:04	Survey	Classd tar curr	ClassD	1.016	А	0	
3-Mar-11 12:39:03	Survey	Trans Pow Level	Telemetry	3	#	Ō	
3-Mar-11 12:39:02	Survey	VTx Target	ClassD	7.9	Vms	0	
3-Mar-11 12:39:00	Survey	Meas Load Cur	ClassD	0.005	A	8819	
3-Mar-11 12:38:59	Survey	Scale Current	ClassD	81.25	%	8820	
3-Mar-11 12:38:58	Survey	Auto TE	DAI	352.66 (G)	Dea	8917	
3-Mar-11 12:38:56	Survey	Auto TE-E	DAI	Gravity	bog	9015	
3.Mar.11 12:38:56	Survey	MZ	Dal	-0.1254	Gauss	9021	
3.Mar.11 12:38:53	Survey	MY	Dal	-0.3564	Gauss	9020	
2 Mar 11 12:30:55	Survey	MY	DEL	0.3304	Gouss	9019	
2.Mar.11 12:30:30	Survey	47	Dal	-0.2473	Gauss	9024	
2.Mar.11 12:30:40	Survey		Dal	-0.924	y	9024	
2 Mar 11 12:30:44	Survey		Del	0.000	9	002.3	
2 Maa 11 12:30:42	Survey	MAG Die Anele	Del	0.0020 EE 4C	y Dee	JUZZ 0014	
3-Mar-11 12:38:39	Survey	MAG DIP Angle	Del	D.4540	Deg	9014	
3-Mar-11 12:38:36	Survey	Milotal	Dal	0.4516	Gauss	9016	
3-Mar-11 12:38:30	Survey	Giotal	Del	0.9990	g	9017	
3-Mar-11 12:38:32	Survey	Azimuth	Dai	100.10	Deg	/10	
3-Mar-11 12:38:30	Survey	Inclination	Dai	89.79	Deg	/13	
3-Mar-11 12:38:27	Survey	Config File#	Telemetry		., #	8910	
3-Mar-11 12:38:25	Looltace Logging	VIx larget	ClassD	4.6	Vms	0	
3-Mar-11 12:38:24	Looltace Logging	Auto IF	Dai	138.75 (G)	Deg	8917	
3-Mar-11 12:38:22	Looitace Logging	Gamma CPS	Gamma	NO DECODE	CPS	824	
3-Mar-11 12:38:20	Toolface Logging	Shk Axl Max	DynamX	0	g	8921	
3-Mar-11 12:38:19	Toolface Logging	Auto TF	D&I	104.06 (G)	Deg	8917	
3-Mar-11 12:38:18	Toolface Logging	Gamma CPS	Gamma	15.8	CPS	824	
3-Mar-11 12:38:16	Toolface Logging	Scale Current	ClassD	31.25	%	8820	
3-Mar-11 12:38:15	Toolface Logging	Auto TF	D&I	57.81 (G)	Deg	8917	
3-Mar-11 12:38:14	Toolface Logging	Gamma CPS	Gamma	NO DECODE	CPS	824	
3 Mar 11 12:38:12	Toolface Logging	Shk Lat Max	DynamX	904	g	8919	
3-Mar-11 12:38:11	Toolface Logging	Auto TF	D&I	225.47 (G)	Deg	8917	
3-Mar-11 12:38:09	Toolface Logging	Gamma CPS	Gamma	NO DECODE	CPS	824	
3-Mar-11 12:38:07	Toolface Logging	Meas. Load Cur.	ClassD	NO DECODE	Α	8819	
3-Mar-11 12:38:05	Toolface Logging	Auto TF	D&I	352.66 (G)	Deg	8917	
3-Mar-11 12:38:04	Toolface Logging	Gamma CPS	Gamma	0.0	CPS	824	
3-Mar-11 12:38:00	Toolface Logging	Gamma CPS	Gamma	0.0	CPS	824	
2.Mar.11 12:37:58	Toolface Longing	VTv Tarnet	ClaseD	79	Vime	0	

Figure 71 Tool Signals



9. FFT

The FFT spectrogram provides a historic plot of the Tool signal;

- 1. Click on the FFT Tab.
- 2. Click on the Update FFT History checkbox



Figure 72 FFT showing a relatively clean signal

The FFT Tab has 3 x Displays:

- 1. Signal Voltage shows the current Tool Signal voltage.
- 2. Current FFT showing the current Tool Signal Amplitude over a Range of frequency. The center frequency is at 6Hz in Figure 72.
- 3. FFT Spectrogram: shows a historical plot of the Tool signal and noise sources. A strong signal has Red color while a weak signal has blue color.

Section 2.5 in the theory chapter provides guidelines on interpreting the FFT spectrogram.



10.REFERENCES

- 07-DCMT-1055 V8 Deep Sleep Software /Firmware Manual: Barry Buternowsky
- 07-MANL-0018 A V10 User guide: May Kuy, Hoan Chau,
- XEM FST Training Reference Material: Dan Bukovec