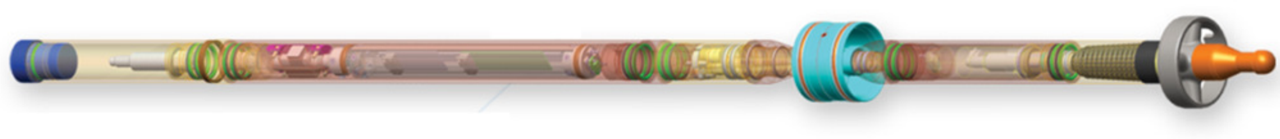

OPERATIONS MANUAL

CHAPTER 10 XHop Field procedures

REV A: 2013 December 22, 2013

XFLD-0010

Table of Contents

This chapter describes the XHop probe and provides recommended procedures to include the XHop probe in the XEM tool string. Prior to adding the XHop in the XEM tool-string;

1. Complete the surface equipment hardware setup as described in Chapter 5.
2. Prepare the XEM as described in Chapter 6.
3. Program the XEM as described in Chapter 7.
4. Configure the XEM Rx as described in Chapter 8. After the XHop is tested and attached to the XEM, the Bank test with the XEM Rx can be completed.
5. Instructions in the Job execution Chapter- 9 can be used to pick-up and install the tool in the collar for the run.

1. INTRODUCTION

This chapter provides an overview of the XHop probe.

1.1. DESCRIPTION

The XHop probe can be installed at the bottom of the XEM tool string instead of the Bull nose or the Can Terminator. It allows information from a Schlumberger RSS (Rotary Steerable system) such as Archer, Power Drive, and Power V to be transmitted through the XEM to the surface. The RSS typically collects information including:

- Inclination
- Azimuth
- Gravity /Magnetic total
- Real Time Control unit Status Bits (RTSTAT)
- Steering
- Stick Slip
- Gamma

The SLB Archer Rotary Steerable tool shown in Figure 1 can be used to point the Bit at the desired orientation. This facilitates steering to optimize the well trajectory during rotation.

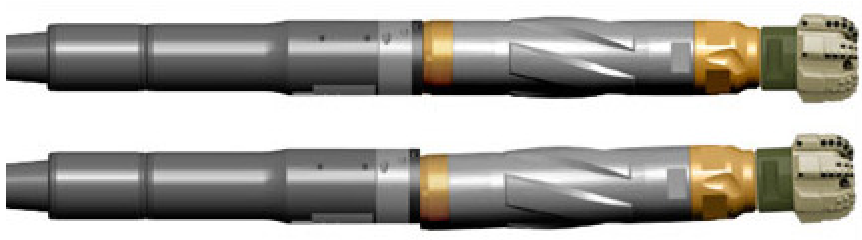

Figure 1 RSS pointing the bit for steering

This information can be transmitted to the Telemetry node from the XHop and sent along with other XEM signals to the surface and or stored in the Telemetry flash memory. The XHop also has an internal flash memory.

1.2. THE XHOP SYSTEM

The XHop is connected with other nodes in the XEM tool through the Can Bus. The CAN bus protocol allows microcontrollers in the different nodes to communicate with each other without having a CPU to communicate with each microcontroller.

The XHop receives the RSS transmission, decodes it and forwards the appropriate signals to the Telemetry node via the CAN bus. The XEM Telemetry transmits the information from the XHop and other probes to the surface.

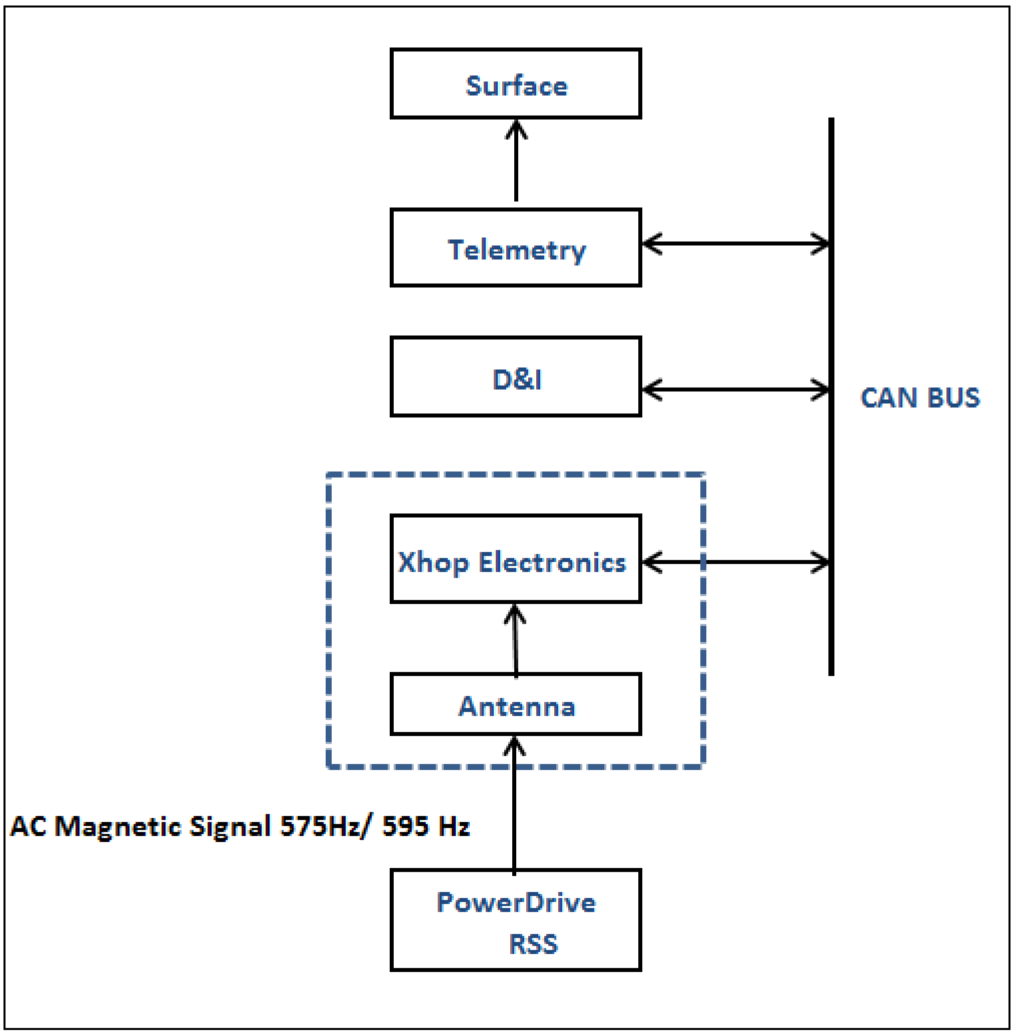

Figure 2 XHop Connected with Other Nodes

The XHop hardware system consists of the following:

1- Antenna

The Antenna receives the signal from the RSS and passes it to the Analog Front End.

2- Analog Front End

The Analog Front End contains amplifiers, filters and Gain control for improving the Strength and quality of the signal.

3- DSP Digital Signal Processor

The Digital Signal processor receives the signal from the Analog Front End and decodes it.

4- Memory

There is an 8MB flash memory for storing the received RSS data in the XHop.

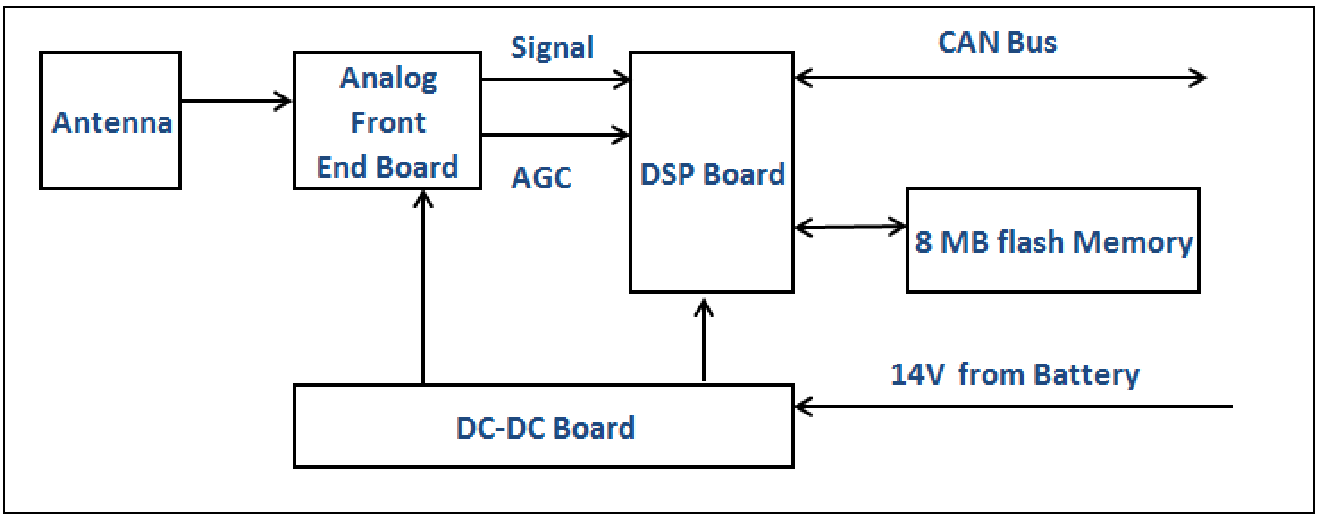

Figure 3 XHop Hardware Interface

1.3. SIGNAL FLOW

The RSS transmits the information in binary form (1s and 0s) at 2 separate frequencies. A "1" is transmitted at a frequency of 575Hz and a "0" is transmitted at a frequency of 595Hz.

The signal is received by the XHop Antenna and passed on to the Analog Front End where it is amplified and filtered.

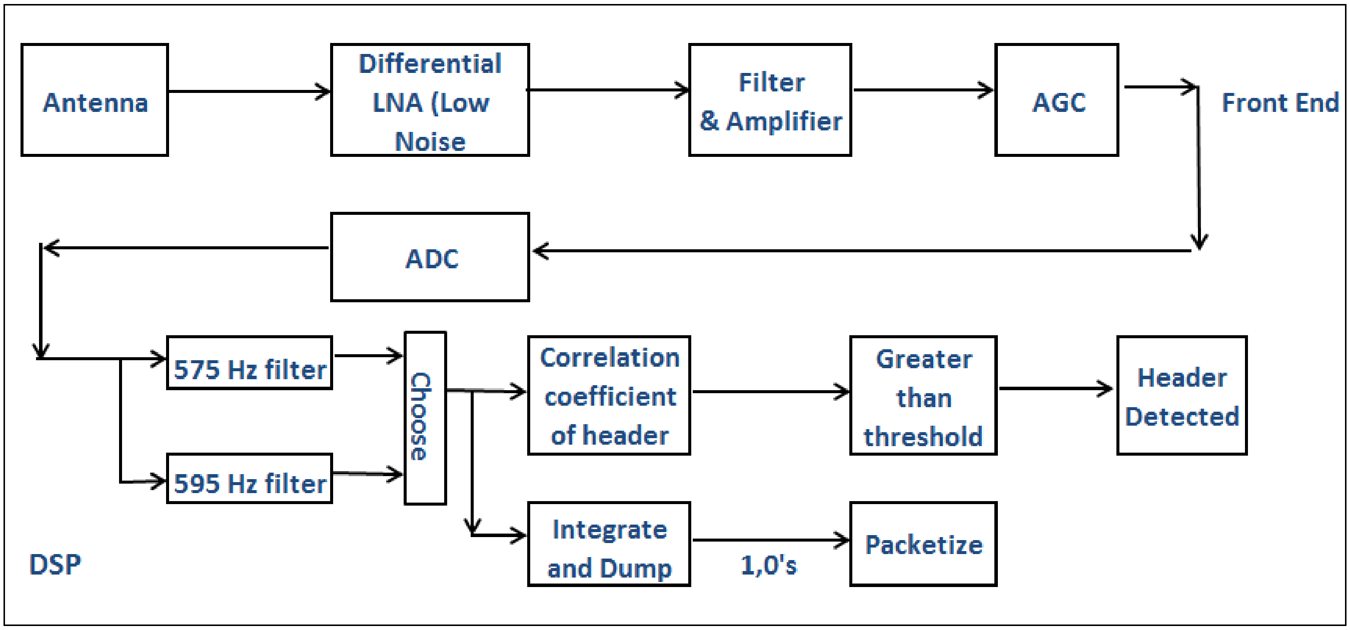

Figure 4 XHop Information flow

An AGC (Automatic gain control) controls the power level so that the output signal remains at a constant level. The XHop will report the strength of the signal and noise in "Ticks". Ticks can be converted to dB using the formula below:

$$gain\ dB = \left(\frac{tick}{4096} * 3.3 - 0.75\right) * 50 + 4.4 + 86.4$$

For example, the gain of the AGC is:

- AGC Tick of 500 = 73.44 dB
- AGC Tick of 800 = 85.5 dB

This Signal is then digitized by the 12 bit Analog to Digital Converter at 4000 samples per second. The DSP (Digital Signal processor) searches for the header of packet by computing the correlation coefficient of the input signal with a known reference. This produces a correlation in the range of 0-100%.

A correlation of 100% means the input signal is a perfect match. When the correlation coefficient is greater than the threshold the decoder decodes the bits. By default the threshold is set at 80%; If the correlation coefficient is 80% or greater the decoder will decode the bit. The bytes are assembled and the packet checksum is calculated. If the computed checksum matches the transmitted checksum the packet is accepted and only then will it be transmitted to Telemetry on the CAN Bus and recorded on the XHop Flash.

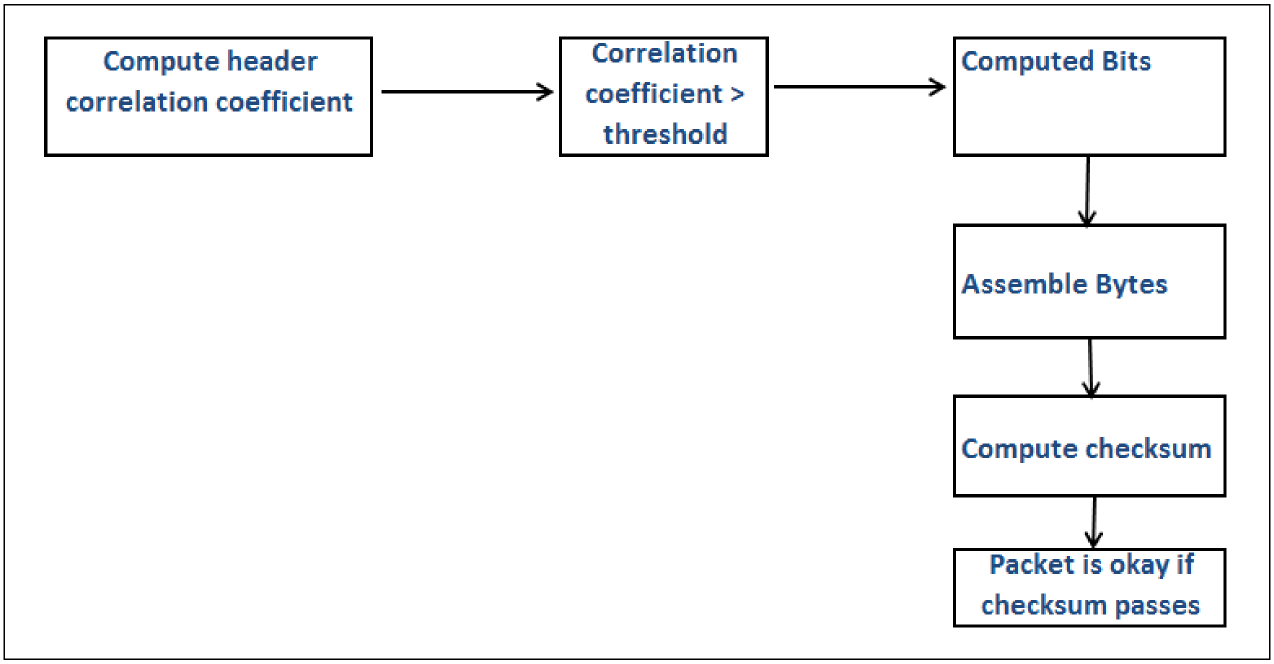

Figure 5 Flow of information through the tool

The decoder stores the received data-points. Each data point is 2 bytes. There are 2 possible types of packets; these are the Gamma and survey packets. The Decoder can determine which packet is transmitted by looking at the Data point 3.

1.4. MECHANICAL FEATURES

There are 2 versions of the XHop

- The short version of the XHop probe is 71” Long.
- The regular version of the XHop probe is 76” Long

The centralizers on the probe can be adjusted according to the collar size.

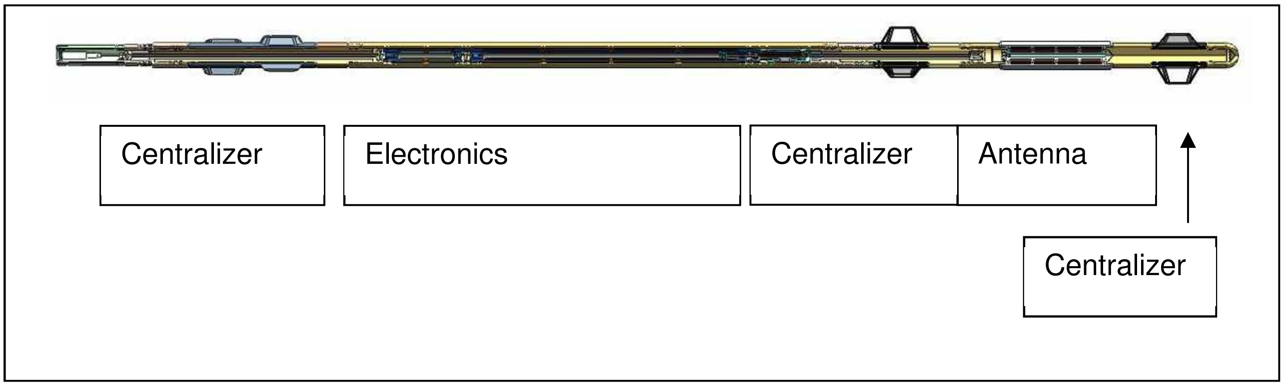

Figure 6 Mechanical Parts

A description of the Antenna Module is given in Figure 7.

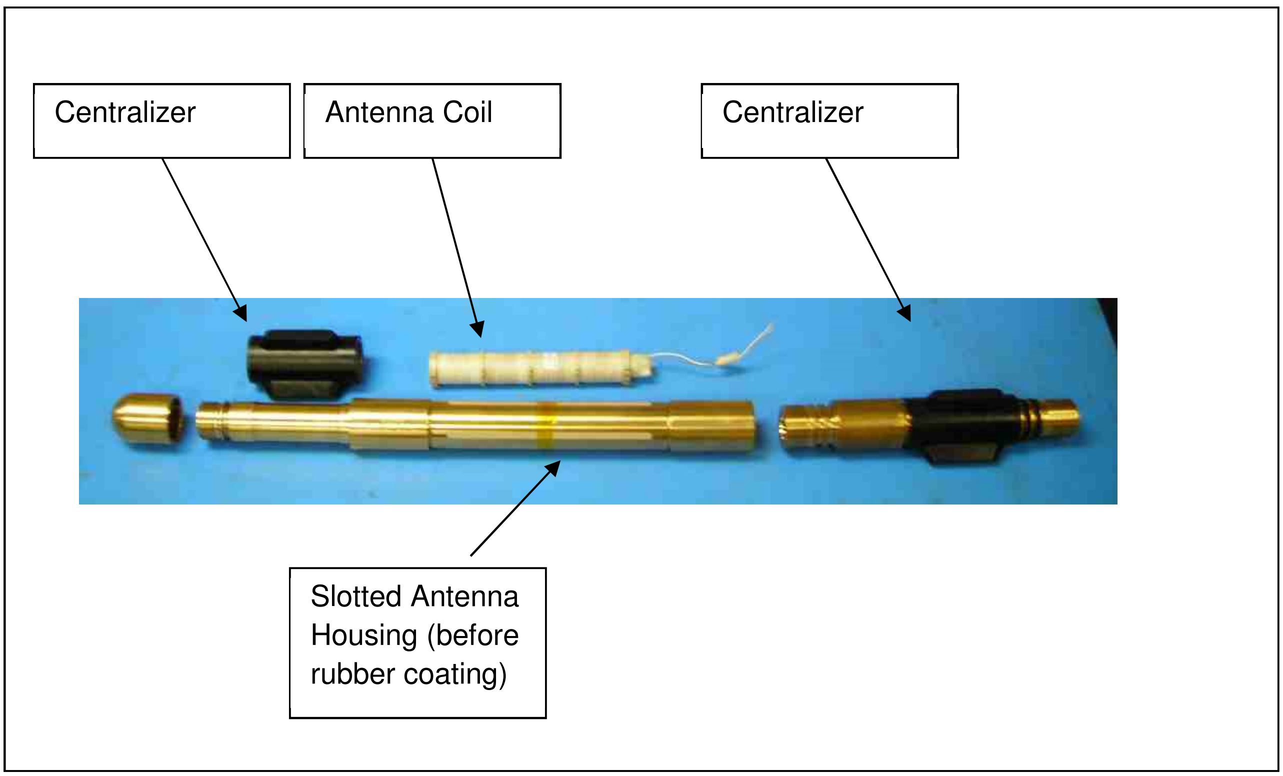

Figure 7 Antenna Module

2. XHOP SIGNALS

2.1. POWER DRIVE DATA POINTS

A list of the Power-Drive Data Points is provided inTable 1. These are supported and can be transmitted through XHop.

Parameter	Name	Size (Bits)	Scale	Offset	Unit	Description
1	INCL	12	0.05	0	deg	Inclination (Continuous survey)
2	AZIM	12	0.1	0	deg	Azimuth (Continuous survey)
3	GT	6	0.5	984	mG	Total G
4	BT[*3]	11	48	0	nT	Total B(H)
5	RTSTAT	12	1	0		PD Real Time Status Word
6	STEER	8	1	0		Steer d-point
7	TFDS	6	6	0	deg	Demand Tool face (Steering Vector from IH)
8	PRDS	4	10	0	%	Demand proportion (Steering Vector from IH)
9	TFHI	12	0.1	0	deg	Measured Tool face (MTF or GTF) high Resolution
10	INCLQ[*3]	4	0.8	0	deg	Inclination Quality (std dev)
11	AZIM[*3]	4	1.6	0	deg	Azimuth Quality (std dev)
12	SHKRSK	2	1	0		Shock Risk/ Severity
13	STKSLP	4	1	0		Stick Slip amplitude and frequency severity
14						Not assigned
15						Not assigned
16	AZIMLO	10	0.4	0	deg	Azimuth- low resolution
17	TF	6	6	0	deg	Measured Tool face (MTF or GTF) low Resolution
18	SIG	12	1	0		Short hop(S/H) receiver signal strength
19	SIGLO	6	1	0		S/H Receiver signal strength-low resolution
20	SIGQ	4	1	0		S/H Receiver status word
21	AGE	16	1	0	sec	Time since last receipt of good packet by S/H receiver at LTB Modem
22	DLINK	9	1	0	-	Last Received Fast Downlink Command (see action below)
23	IH_TURN	6	4	-100	%	Inclination Hold Turn setting
24	PROPEFF	4	10	0	%	Effective steering proportion
25	IH_TRGT	12	0.05	0	deg	Inclination Hold Target
26	RTTOTSHK	2	1	0	-	RT Total Shock
27	PCNTSTCK	2	1	0	-	Percent Stuck
28	CCRPM	8	2	0	rpm	Controller Collar Rpm

Parameter	Name	Size (Bits)	Scale	Offset	Unit	Description
30	LTRPM	6	100	0	rpm	Lower Torquer Rpm
31	GRAV	7	1*1	0	cps	Gamma Ray average
32	GRUP	7	1*1	0	cps	Gamma Ray Up
33	GRLF	7	1*1	0	cps	Gamma Ray Left
34	GRDN	7	1*1	0	cps	Gamma Ray Down
35	GRRT	7	1*1	0	cps	Gamma Ray Right
36	GRAV_ext	9	1*2	0	cps	Extended Gamma Ray Average
37	GRUP_ext	9	1*2	0	cps	Extended Gamma Ray Up
38	GRLF_ext	9	1*2	0	cps	Extended Gamma Ray Left
39	GRDN_ext	9	1*2	0	cps	Extended Gamma Ray Down
40	GRRT_ext	9	1*2	0	cps	Extended Gamma Ray Right
41	SS_AMPL	7	4	0	rpm	Stick -Slip Amplitude
42	SHK_AMPL	6	80	0	m/S^2	Shock Amplitude
43	RTSTAT2	12	1	-	-	PD Real Time Status Word #2
44	RTSTAT3	6	1	0	-	PD Real Time Status Word #3
45	RTSTAT4	6	1	0	-	PD Real Time Status Word #4
46	POSSUM	7	2	-100	%	Integral Control Term, Possum
47	PDTEMP	8	1	-40	deg	PD CU Temperature
48	PD12B1	8	1	0	-	PD Generic 12 bit d-point #1
49	PD8B1	8	1	0	-	PD Generic 8 bit d-point #1
50	PD8B2	8	1	0	-	PD Generic 8 bit d-point #2
51	PD6B1	6	1	0	-	PD Generic 6 bit d-point #1
52	PD6B2	6	1	0	-	PD Generic 6 bit d-point #2
53	PD6B3	6	1	0	-	PD Generic 6 bit d-point #3
54	PD6B4	6	1	0	-	PD Generic 6 bit d-point #4
55	PD6B5	6	1	0	-	PD Generic 6 bit d-point #5
56	PD4B1	4	1	0	-	PD Generic 4 bit d-point #1
57	PD4B2	4	1	0	-	PD Generic 4 bit d-point #2
58	PD4B3	4	1	0	-	PD Generic 4 bit d-point #3
59	PD4B4	4	1	0	-	PD Generic 4 bit d-point #4
60	PD3B1	3	1	0	-	PD Generic 3 bit d-point #1
61	PD3B2	3	1	0	-	PD Generic 3 bit d-point #2
62	PD3B3	3	1	0	-	PD Generic 3 bit d-point #3
63	PD3B4	3	1	0	-	PD Generic 3 bit d-point #4
64	PD3B5	3	1	0	-	PD Generic 3 bit d-point #5

Table 1 Power Drive D Points

Notes for Table-1

1) Gamma d-points are compressed from 8 to 7 bit by an exponential compression: X = Sqrt (Gamma*64). Uncompressed by Gamma = X2 / 64. The RSS protocol sends the values as shown in the excerpt from the protocol document in Figure 8.

3.2.3 Gamma Data Packet Definition (Packet# 1)

The table below lists the definition of the internal parameters available in Packet #1.

Word	Size	Bit Location	Scale	Offset	Unit	Name
1	7	6 – 0	*1)	0	Cps	GRAV
2	7	6 – 0	*1)	0	Cps	GRUP
3	5	11 – 7	-	-	-	FrameID = 00101
	7	6 – 0	*1)	0	Cps	GRLF
4	7	6 – 0	*1)	0	Cps	GRDN
5	7	6 – 0	*1)	0	Cps	GRRT
6-14	-	-	-	-	-	Not Defined
15	12	11 – 0	-	-	-	Reserved for Checksum

1) Gamma d-points compressed from 8 to 7 bit by an exponential compression: X = Sqrt(Gamma*64). Uncompress by Gamma = X^2 / 64.

Figure 8 -RSS Protocol Gamma Packet definition

2) Extended gamma d-points are compressed from 10 to 9 bit by an exponential compression: X = Sqrt (Gamma*256). Uncompressed by Gamma = X2 / 256.
3) AZIMQ, INCLQ, BT are now used to send “hidden parameters” as specified in Table 2 below.

Original Parameter	“Hidden” Parameter	RSS Firmware Version
INCLQ	Effective Steering Proportion (units = 10%)	5.25
AZIMQ	LTRPM	5.23 and 5.25
BT	TARGETINC	5.23 (units=-0.05) and 5.25 (units = 0.1)

Table 2 Hidden /New versus Original Parameters

2.2. XHOP DIAGNOSTIC SIGNALS

XHop has unique signals that can be sent to surface and used for diagnostics as shown in Table 3.

Name	Units	Range	Description
Decode Count		0-127	Increments every time a RSS packet is received successfully (Checksum passes)
Decode Rate	Msgs/min	0.0-2.0	Average of successful RSS packet over 10 minutes (see Decode Count)
Header Count		0-127	Increments every time a RSS packet is received unsuccessfully (Checksum fails)
Header Rate	Msgs/min	0.0-2.0	Average of unsuccessful RSS packets over 10 minutes (see Header Count)
RSS STR_Signal	Ticks	0-1000	AGC level during RSS Packet
RSS STR_Noise	Ticks	0-1000	AGC level not during RSS Packet

Table 3 Troubleshooting Signals

Decode Count and Decode Rate

The Decode Count and Decode Rate are used to determine how well XHop is receiving survey and Gamma packets. If any RSS packet is received successfully, the Decode Count is incremented. As well, the receiver keeps track of how many successful packets were received over the past 10 minutes, and calculates the average. The RSS sends 1 survey and 4 Gamma packets every 3 minutes. Therefore, the maximum Decode Rate is 5/3 = 1.66 Msgs/min (a Msg is defined as one packet).

Header Count and Header Rate

The Header Count and Header Rate are used to determine how well the XHop is receiving survey and Gamma packets. If any RSS packet is received unsuccessfully (header received, but data was corrupt), the Header Count is incremented. As well, the receiver keeps track of how many unsuccessful packets were received over the past 10 minutes, and calculates the average. The RSS sends 1 survey and 4 Gamma packets every 3 minutes. Therefore, if every packet was corrupt, the maximum Header Rate is 5/3 = 1.66 Msgs/min (one Msg is defined as one packet).

Table 4 summarizes the RSS –XHop link scenarios.

RSS-XHop Link	Decode Count	Header Count	Decode Rate (Msgs/Min)	Header Rate (Msgs/Min)
Very Good	Increments quickly (5 counts/3 min)	Increments slowly or not at all (packets may be corrupted when flow stops)	1.6	0.0
Ok	Increments moderately (4 counts/3 min)	Increments slowly (1 count/3 min)	1.3	0.3
Poor	Increments Slowly (1 count/3 min)	Increments quickly (4 counts/3 min)	0.3	1.3
Very poor	Doesn't increment	Increments slowly (1 count/3 min)	0.0	0.3
None	Doesn't increment	Doesn't increment	0.0	0.0

Table 4 RSS XHop Link Summary

2.3. SIGNAL AND NOISE STRENGTH

The signal and noise strength signals provide assistance in diagnostics about the signal and noise that the receiver is processing.

Table **5** shows the ranges of these signals. The best link is attained when the Signal is much stronger than the Noise.

Values	Description
1000	Very weak
700	Moderate
500	Very strong
200	Very very strong

Table 5 Description of values

A few scenarios with Signal/ Noise are shown in Table 6.

RSS-XHop Link	Signal	Noise	Signal-Noise
Very Good	600	1000	-400
Ok	900	1000	-100
Poor	1000	1000	0
None	1000	500	500

Table 6 Signal/ Noise for different scenarios

3. JOB PREPARATION

3.1. TOOL LENGTH SPACING CONSIDERATIONS

1. Use the **Tool Length Calculator with XHop** spreadsheet to confirm spacing's and collar requirements prior to the job.
2. Select the tool string components (probes) from the drop - down list. The Length for each selected probe is automatically displayed.

Tool 1	**DPG**	0.7m	(19.5")
Tool 2	**Transmitter HV**	1.995m	(78.565")
Tool 3	**Battery**	1.93m	(76")
Tool 4	**Directional – DynX**	1.42m	(56")
Tool 5	**Battery**	1.93m	(76")
Tool 6	**Gamma**	1.37m	(54")
Tool 7	**XHop- Regular**	1.93m	(76")

Table 7 Tool String

In some cases an Extension is added to ensure the XHop Antenna is as close to the RSS as possible. Ideally it is required to have Bullnose of the XHop in the Pin of the Pony Collar that is mated to the RSS. The Extension module consists of a male and female ROTC, and a centralizer. A straight-through one-to-one cable connects the ROTC's. There are no electronics in the Extension Module. A short 18" extension and a long 32" Extension are available.

An Extension module is typically added above the XHop probe. This can however be added anywhere in XEM tool-string as shown in Table 8.

Tool 1	**DPG**	0.7m	(19.5")
Tool 2	**Transmitter HV**	1.995m	(78.565")
Tool 3	**Battery**	1.93m	(76")
Tool 4	**Directional – DynX**	1.42m	(56")
Tool 5	**Battery**	1.93m	(76")
Tool 6	**Gamma**	1.37m	(54")
Tool 7	**Long Extension**	0.81m	(32")
Tool 8	**XHop- Regular**	1.93m	(76")

Table 8 Tool string with Long extension

3. Measure the distances on the Gap Sub as shown in Figure 9 below before each run:
   - (A) Distance from the Set screw to the bottom of the Gap sub.
   - (B)Total length of the Gap Sub

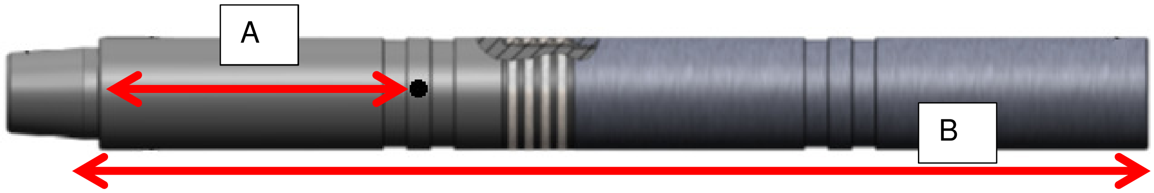

Figure 9 Gap Sub with Distances

- Collar 1 Length: Length of the Monel below the Gap Sub.
- Collar 2 Length: The Length of an XEM tool with the XHop probe may be longer than the Gap Sub + Monel. An additional Pony Monel may be required; this is referred to as collar 2. It is not recommended to place any float or filter subs between the XHop and the RSS.
- Length of the BHA below collar 2 (listed in the BHA).
- Distance from the shoulder (Box) to the RSS (Internals) Measured physically.

4. Enter the distances along with other information in the Tool Length Calculator with XHop as shown in Table 9.

Is this an Xpulse or XEM string?	XEM
Is Xhop in the string?	Yes
Measure distance from DPG set screw to gap sub bottom face (pin)	0.3m (0.984ft)
Measure total length of the gap sub	1.1m(3.6")
Collar 1 length	9.5m(31.17ft)
Collar 2 length	3m (9.84ft)
Length of BHA below collars	10m(32.8)
Distance from the shoulder (Box) of Power Drive to the internals	0.4m(1.31)

Table 9 Measured distances: Tool Length calculator

5. Review the computed distance provided by the Tool Length calculator as shown in Table 10 below.

The distance from the Power-Drive internals to the end of the XEM tool string is important as the transmitted magnetic signal is affected with distance.

This Bull Nose in the XHop probe needs to be as close as possible to the Pin of Collar above the RSS. This also needs to be recorded to monitor success/failure in of Real Time communications.

The lesser the distance the stronger the signal received by the XHop.

Distance from Power Drive Internals to end of tool string	0.415m (1.36ft)

Table 10 Computed Distances: Tool Length Calculator

Transmission is also affected by collar size; larger collars create weaker signals. The distance should be less than the recommended maximum distances provided in Table 11 for the specific Collar OD Size. If the distance is greater than the recommended Maximum distance the string components will have to be adjusted.

OD Collar Size (inches)	Maximum Distance (feet)
4 ¾	5
6 ½	4
8	3

Table 11 Recommend Maximum Distance between XHop and RSS transmitter

3.2. RSS SOFTWARE

6. Request the following information from the D&M/Pathfinder team responsible for mobilizing the Power-Drive.
   - PD Software Version
   - PD CPU Version, either X5 or X6
   - PD Control Unit File Code.
   - Compare the information with the list in Table 12.

DHS Type	CPU	Control Unit file code	PD Software Version	XHop Configuration
1	X5	pd15_25c_03	AM	Use PD0 Signals
2	X6	V1_7c_04	AP	UsePD1 Signals
3	X6	V1_9b_02	AP	Use PD1 signals
4	**X6**	**V1_8b06 (retired)**	**AP**	**Use PD1 Signals**

Table 12 Software compatibility

There are 4 types of DHS currently in use.

- DHS Type 1 and 2 are both commercially available releases for RX 5 and Rx6
- DHS Type 3 and 4 are both restricted field versions for X-6. DHS type 3 replaces 4.

7. The Configurations file for the XEM& the XHop are currently created by the Ops Engineering team. Based on the DHS type the configuration will either be created with PD 0 or PD 1 signals.
   - A description of the Power Drive Signals is given in Section 2.1.
   - A description of the XHop Diagnostic Signals is given in Section 2.2.
   - The Configuration files contain the Signals from the XEM in addition to the Power Drive and XHop Diagnostic signals from XHop. The configuration files also specify the order in which information will be transmitted and recorded in the Flash memory.

3.3. XEM CONFIGURATION

8. The Configuration files have to be downloaded into the all the Nodes in the XEM. Follow the Instructions provided in Chapter # 7 for configuring the XEM tool and performing the Bank Test prior to addition of the Can terminator - Chapter7 Section 6.9.

   DO NOT CONFIGURE THE XEM TOOL WITH THE XHOP. THE XHOP HAS TO BE CONFIGURED SEPARATELY.

9. Do not add the Can terminator at the bottom of the XEM Tool. The XHop will be used in place of the Can terminator.

3.4. XHOP TESTER

10. An XHop Tester 22XHop0005 should be available and used to configure and test the XHop. The XHop tester:
    - Allows all other Nodes in the XEM and the XHop to be monitored simultaneously.
    - Can be used for simulating RSS signals which can be detected by the XHop confirming tool functionality
    - Will transmit messages whenever powered ON.
    - Should be upgraded to FW version V.0.0.1.1 in the lab prior to the job.

Figure 10 XHop Tester

11. Connect the 120V AC port on the XHop Tester to the Mains supply with 22-CABL-0037.
12. Connect the Rx Box Port on the XHop Tester to the HHROTC port on the XTR with 22-CABL-0016.
13. Connect the XHop Port on the XHop Tester to the top of the XHop probe using a Male Rotatable 02ROTC0028 connector (Figure 12 & 13).

LEAVE THE TOOL PORT UNCONNECTED ON THE XHOP TESTER WHEN CONFIGURING THE XHOP

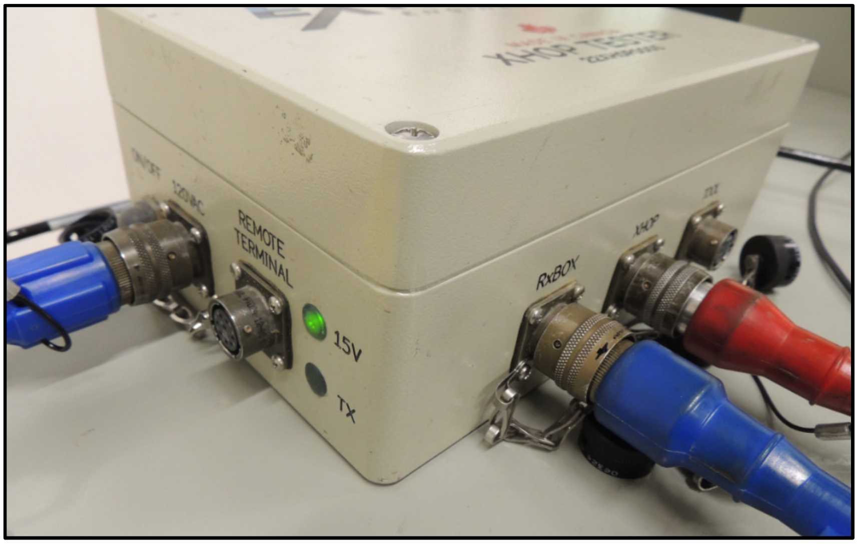

Figure 11 XHop Tester connections

Figure 12 Male ROTC Connector

Figure 13 Male ROTC Connected to the XHop probe

3.5. BOOTLOADER

14. Run the Boot Loader application from the Start Menu under Extreme Engineering> Common. The Boot loader application is required to verify the Firmware of the XHop tester.

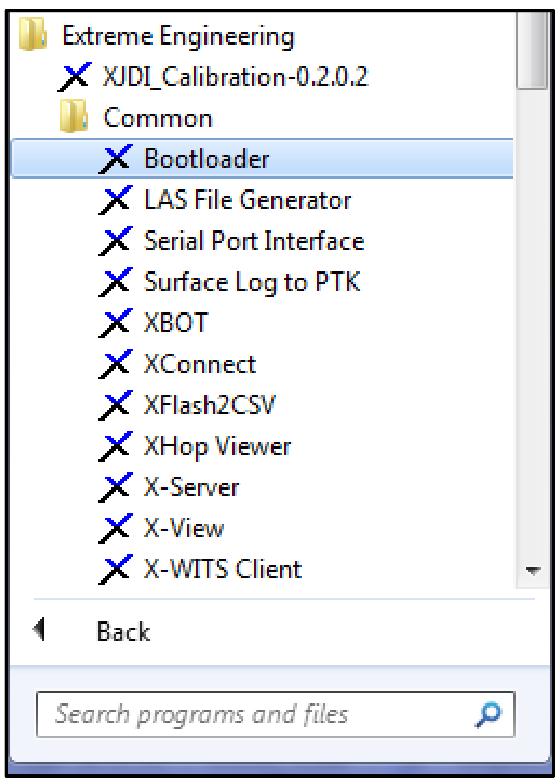

Figure 14 Boot Loader

15. On the Boot loader confirm the Firmware Version for the XHop and the XHop tester XHop should be Rev 0.0.0.6; XHop Tester should be Rev 0.0.11.

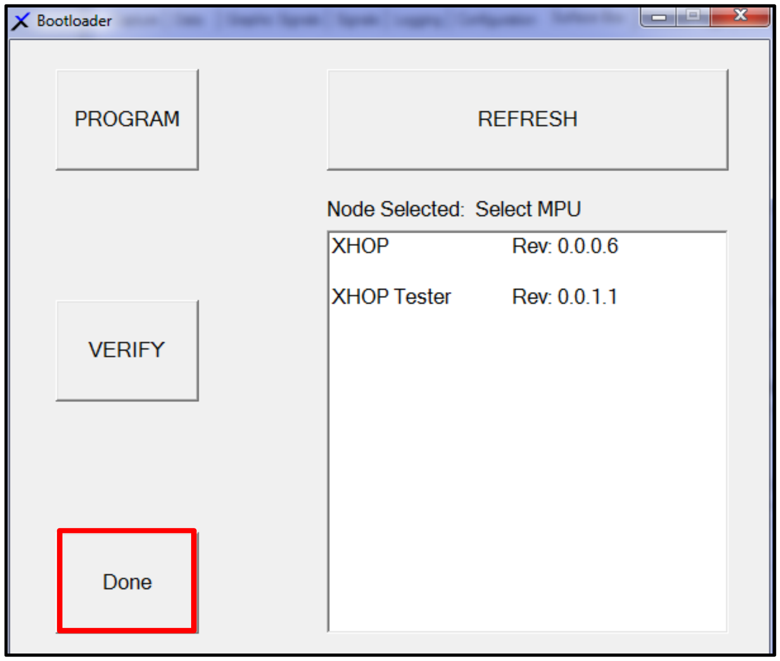

Figure 15 Boot loader

16. Click Done to Exit the Boot-loader.

17. Launch XConnect
    - Ensure the XHop Node is active on XConnect. The XHop SW is 0.0.0.6 as illustrated in Figure 16.
    - If the XHop Node does not appear; hit the refresh button. This may be required a couple of times.
18. Click on “Download Config”.

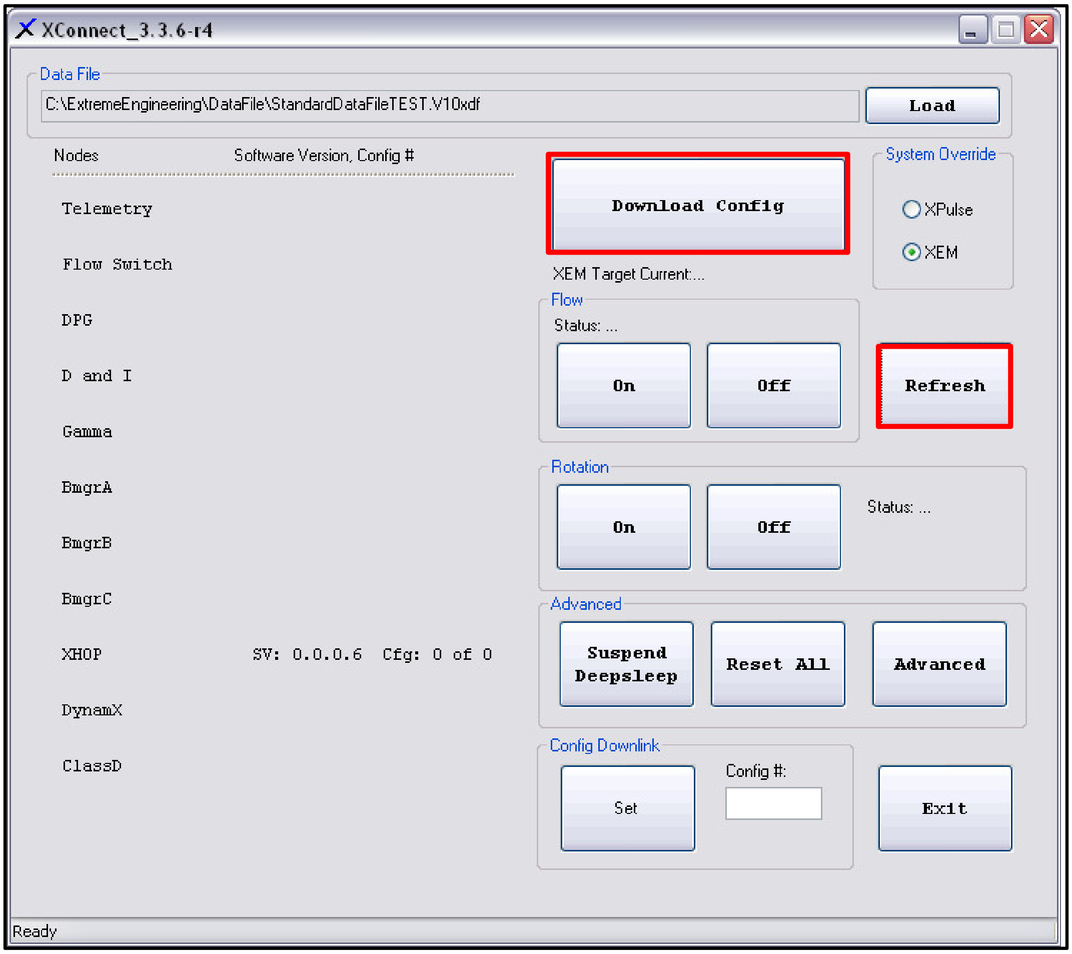

Figure 16 XHop Node XConnect

19. Select the configuration that needs to be downloaded.
20. Click on Open.

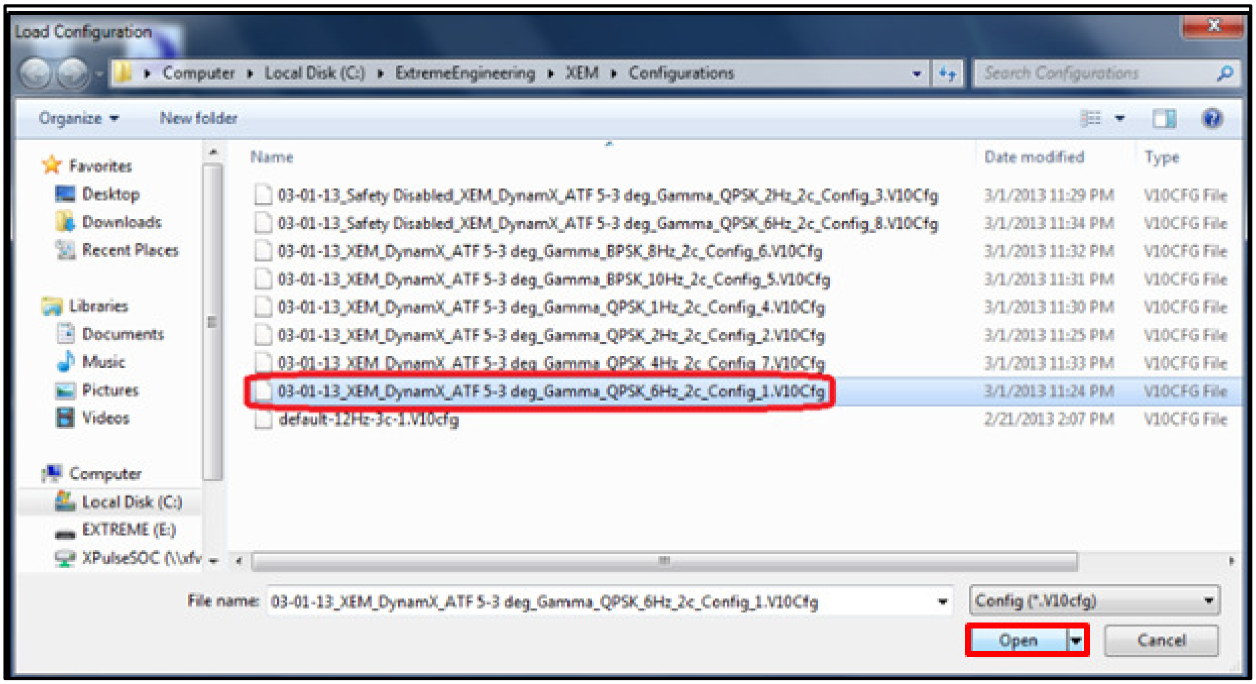

Figure 17 Select Configuration

Only 1 x Configuration needs to be downloaded to the XHop.

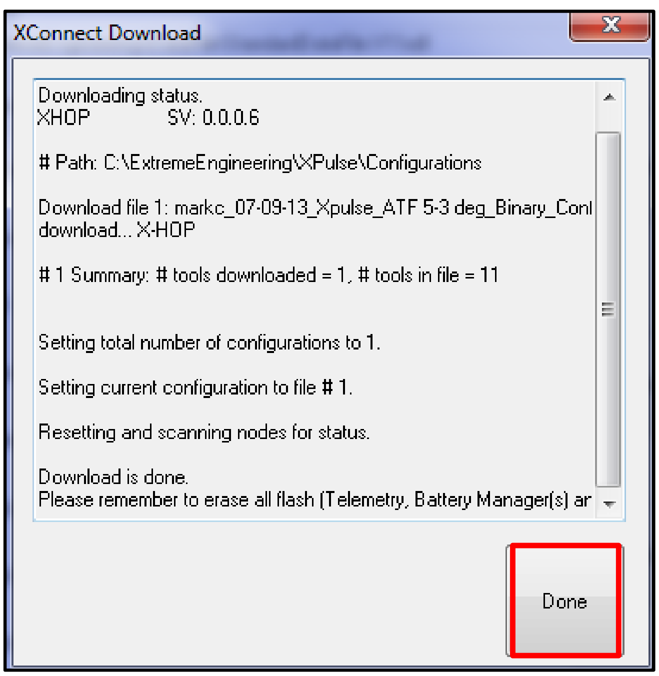

Figure 18 Download complete

21. Click on Done once Download is complete.

On XConnect the XHop node should appear with the configuration information updated.

22. Click on Refresh if the XHop Node does not appear.

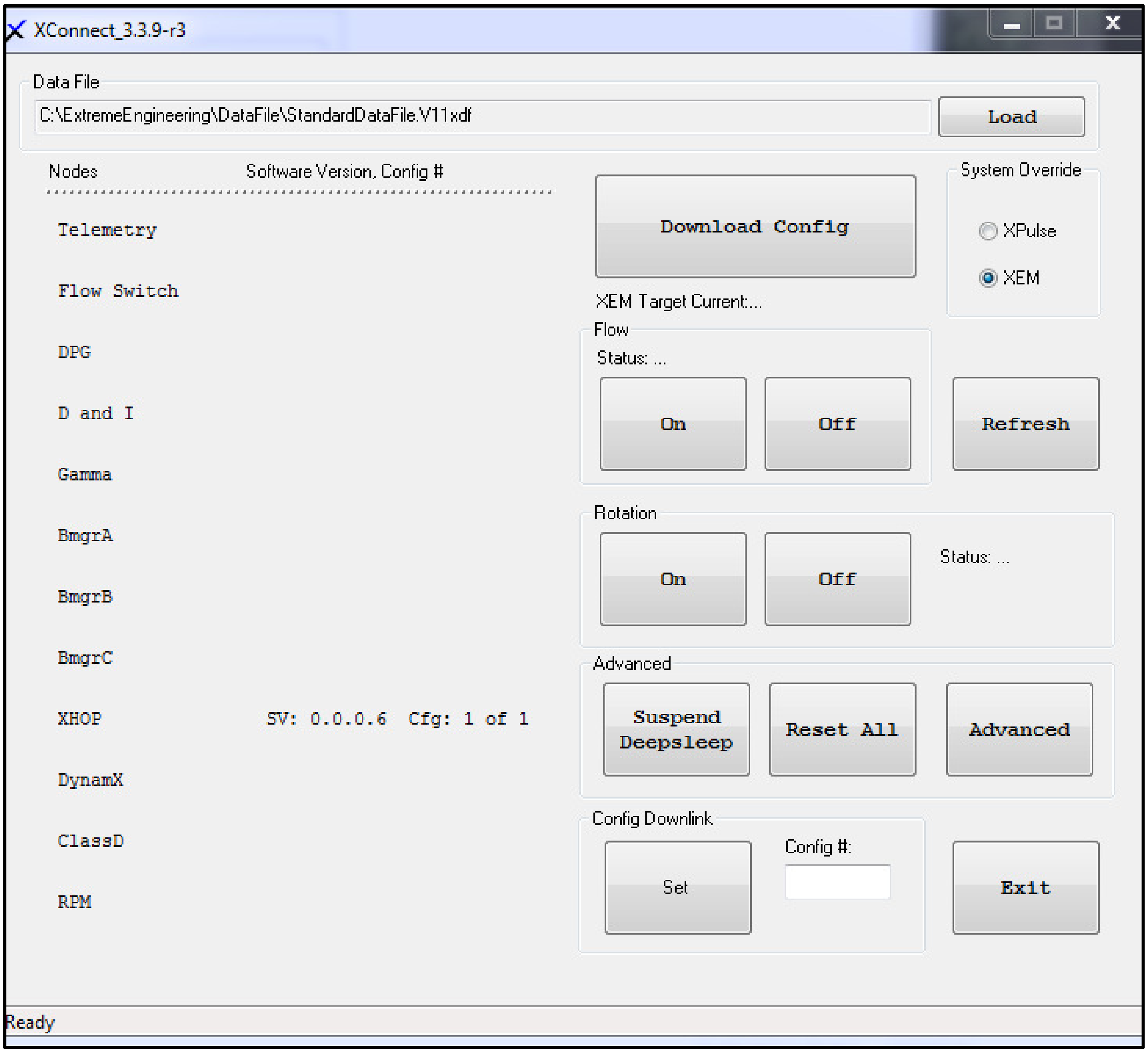

Figure 19 XConnect after Configuration upload

NOTE:

A default XHop Dialog showing the default configuration is illustrated in Figure 20. This is used in most applications.

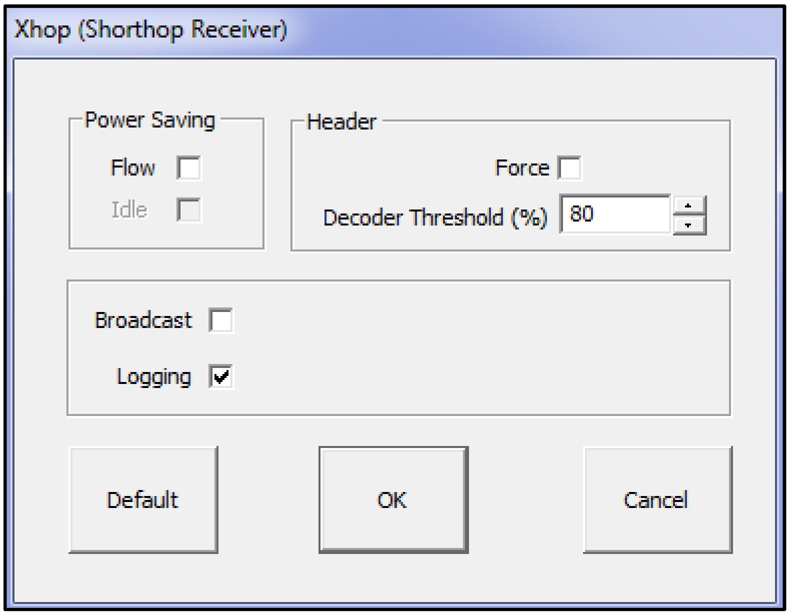

Figure 20 XHop Configuration

The following can be modified if required:

Power Saving

- The **Flow** check Box can be checked if it required to save the battery, this turns the Analog board off and stops logging when the flow is off.

Header

- The **Decoder threshold %** (typically set at 80%) specifies the value for the correlation coefficient to detect the packet headers**.** If the correlation coefficient is below this value it will not be decoded.

Logging

- **Logging**: the received samples will be stored on the Memory.

23. Click on the XHop Node on Connect

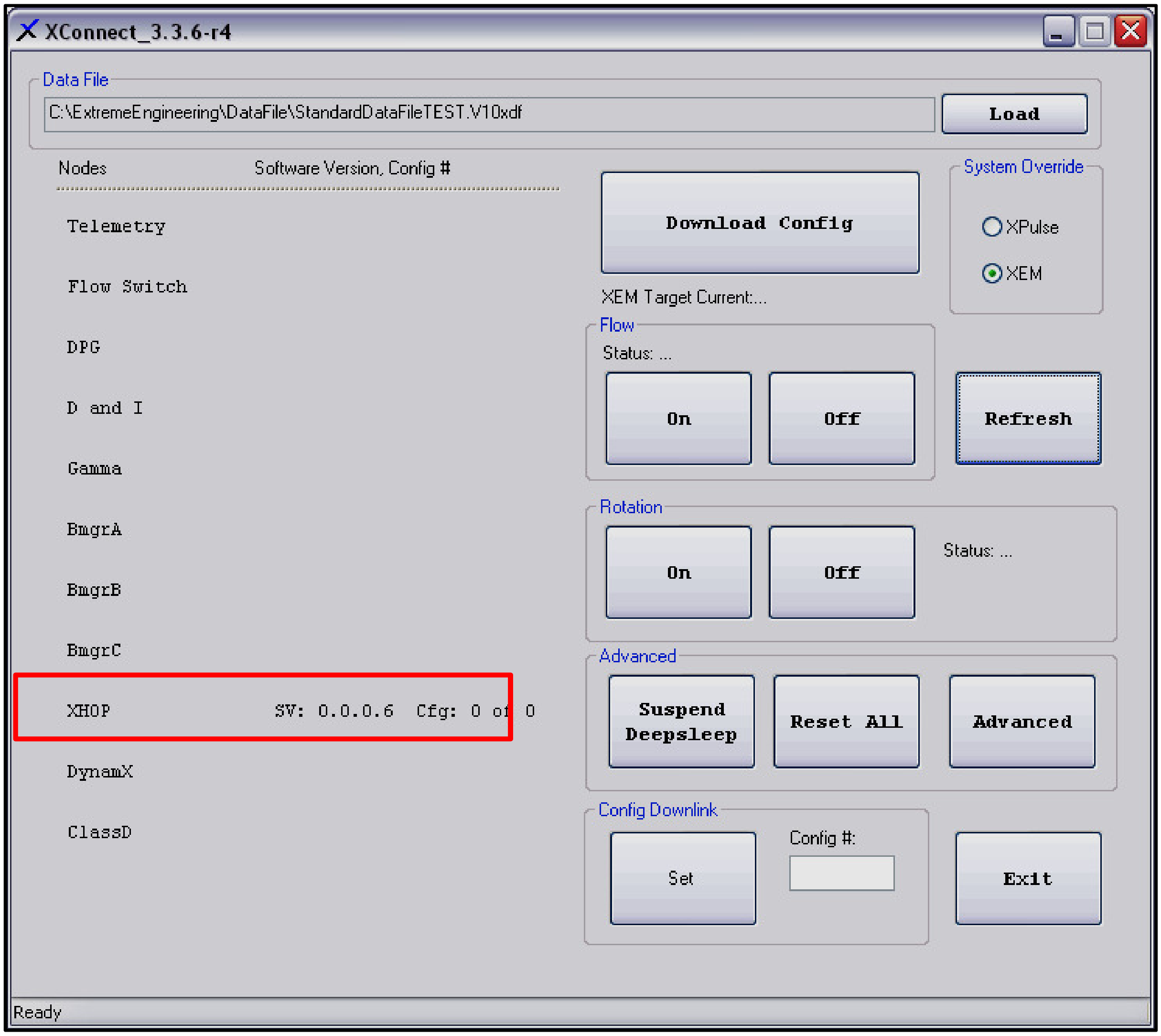

Figure 21 XConnect with Nodes

NOTE: The values on XConnect for XHop will update if an XHop tester is transmitting nearby.

24. Select Flash

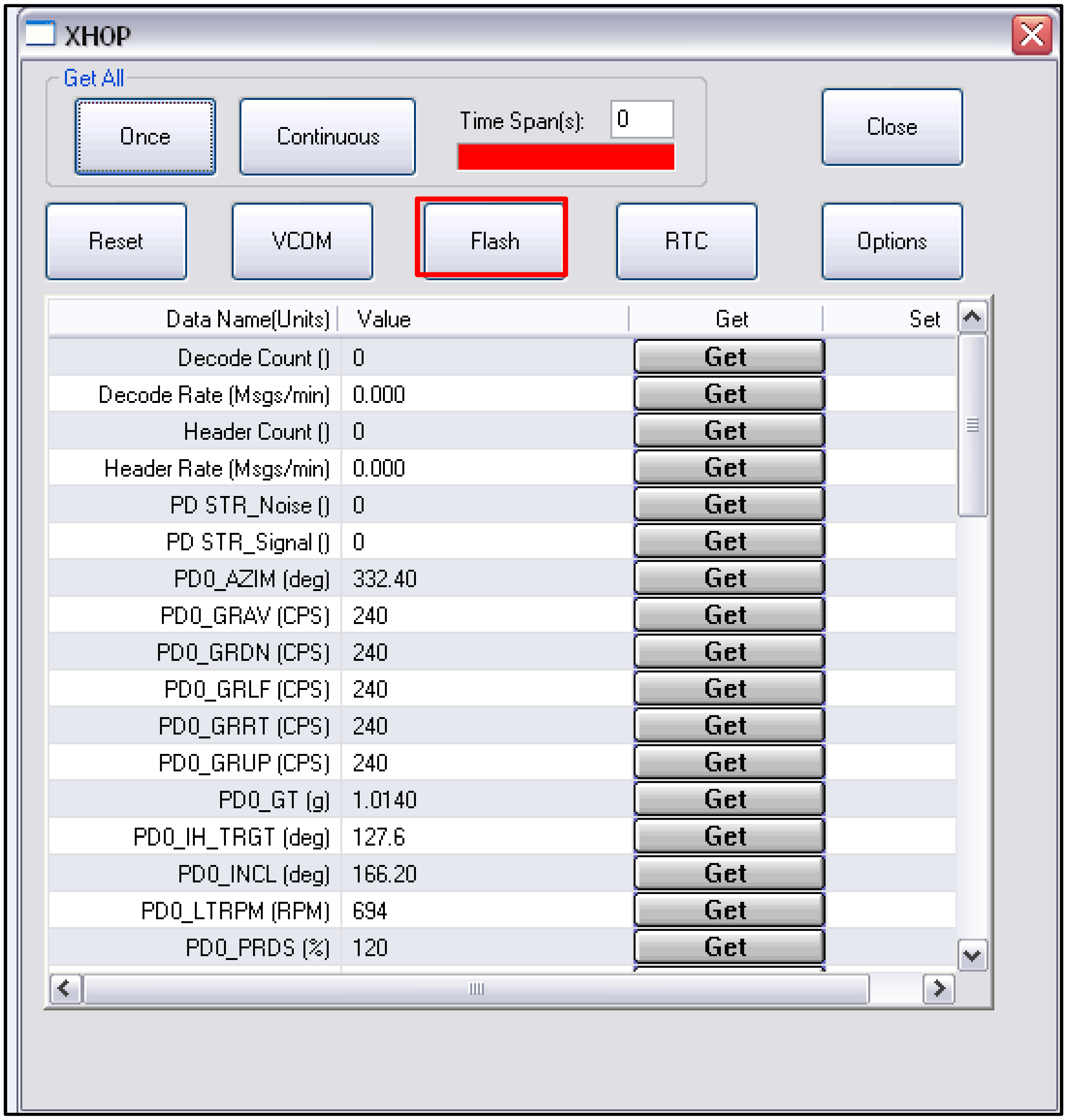

Figure 22Flash Selected on XHop Node

25. Click on Erase and wait for the Flash Memory to be erased; this could take a few moments.
    It is recommended to erase the Flash memory prior to the Job.
    At the end of the Job the XHop Flash needs to be uploaded as other Flash memory in the tool and the data needs to be sent to the command center along with the other Nodes. This is described in chapter # 9.

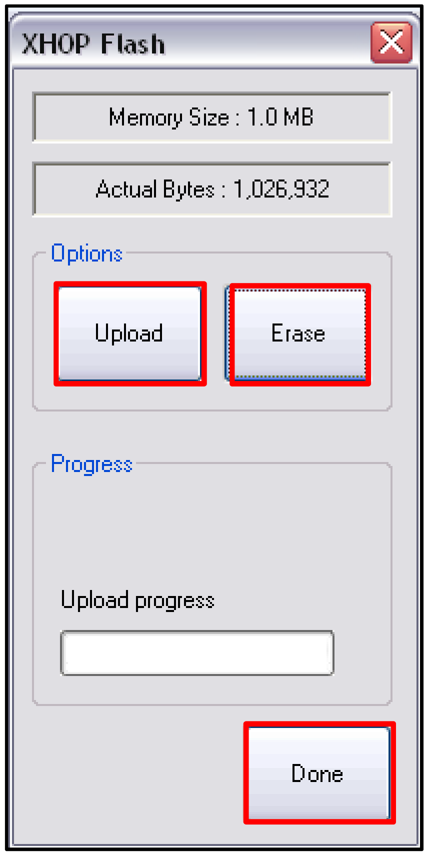

Figure 23 Erase Flash

26. Click on Done once completed.
27. The XHop is now configured.
28. All Nodes in the XEM tool other than XHop should have been configured separately as described in chapter 7.
29. The XEM need to connected to the XHop Tester

30. Connect one end of a 22-CABL-0016 to the Tool Port on the XHop tester.

Figure 24 Tool Port on XHop tester connected

31. Connect the other end of the 22-CABL-0016 to a Female Rotatable connecter 02ROTC0038 attached to the bottom of the XEM. A 22-CABL-0030 can be added if required.

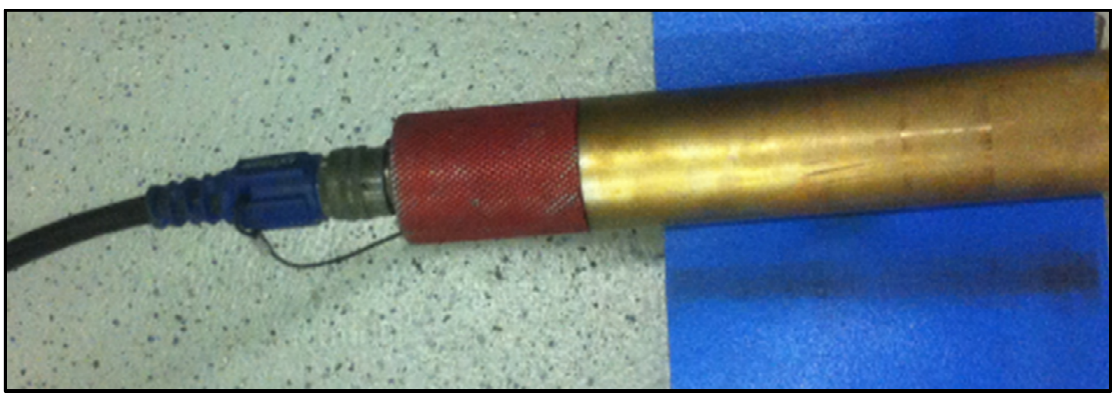

Figure 25 Female ROTC attached to the bottom of the XEM

32. The Telemetry Receiver (XTR), XHop Tester, XHop and the XEM tool string should be connected as shown in Figure 26.

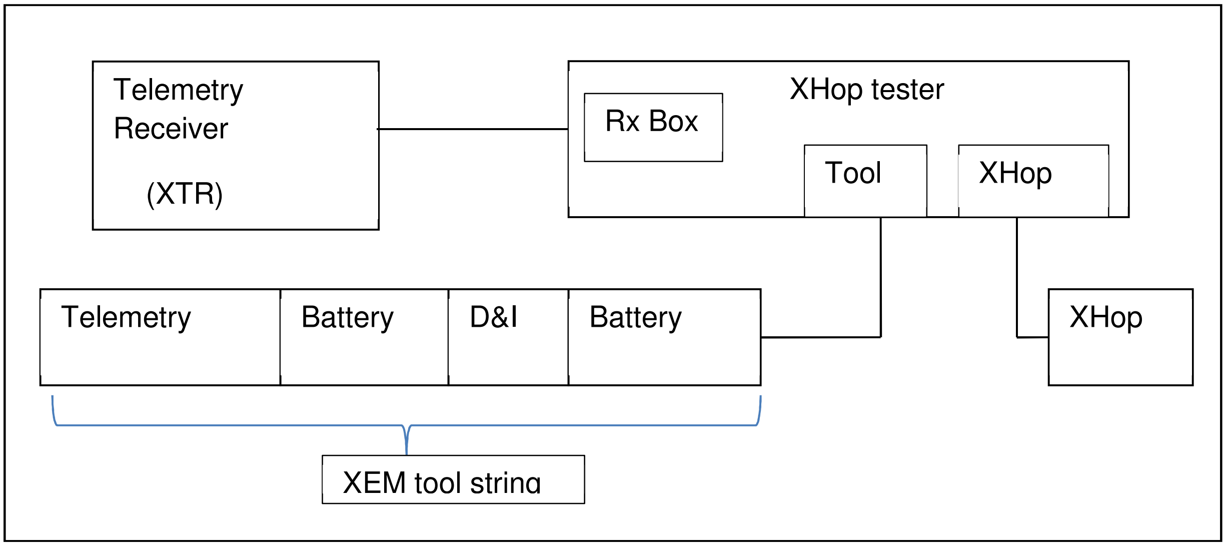

Figure 26 XHop Tester, XEM, XHop and XTR

33. The XHop Node should be displayed along with all other Nodes on XConnect.

34. **Do not download configurations when the XHop and other nodes are connected.**

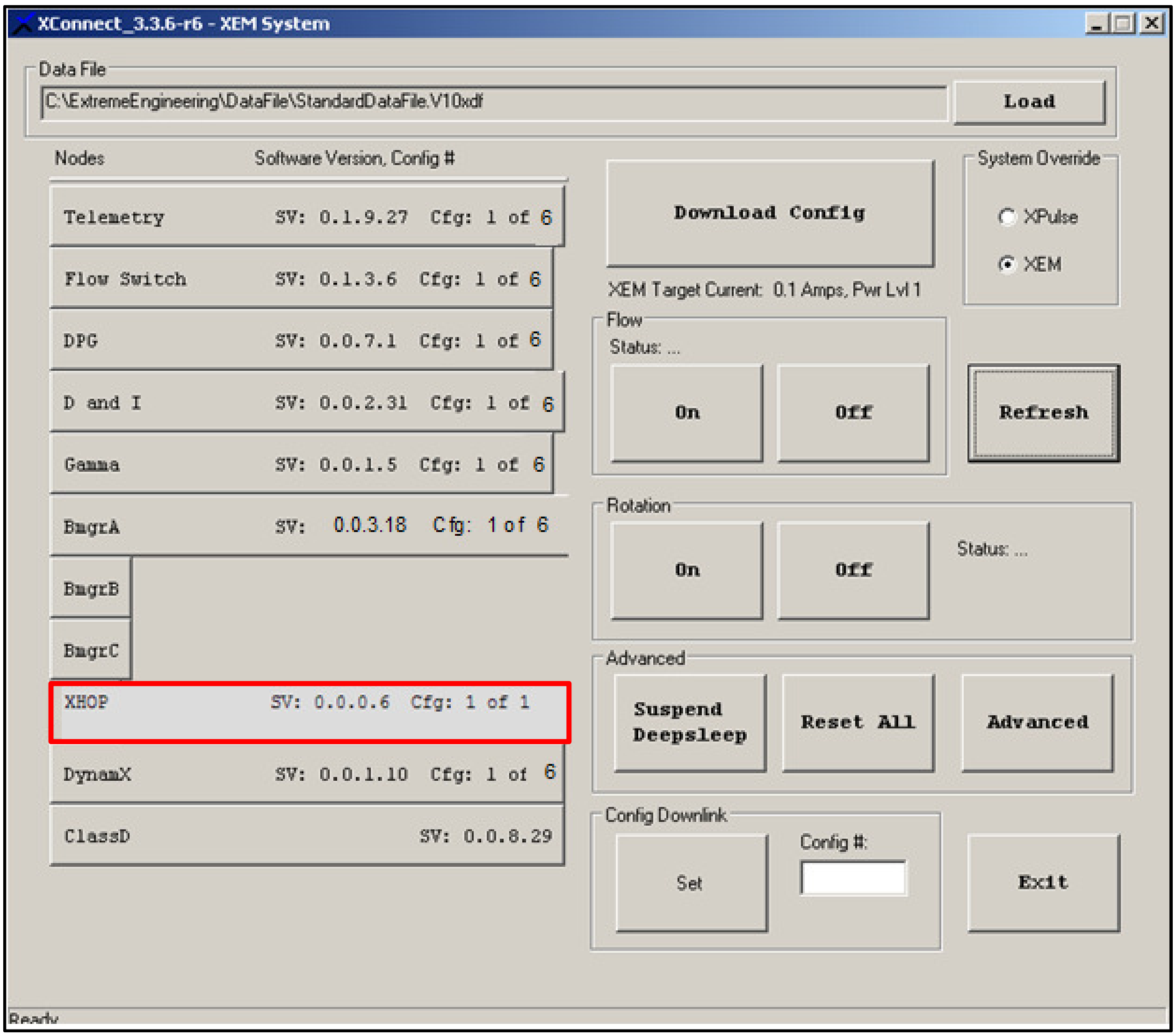

Figure 27 XConnect with Nodes

35. Click on Continuous

    The values will update if an XHop Tester is transmitting close to the XHop.

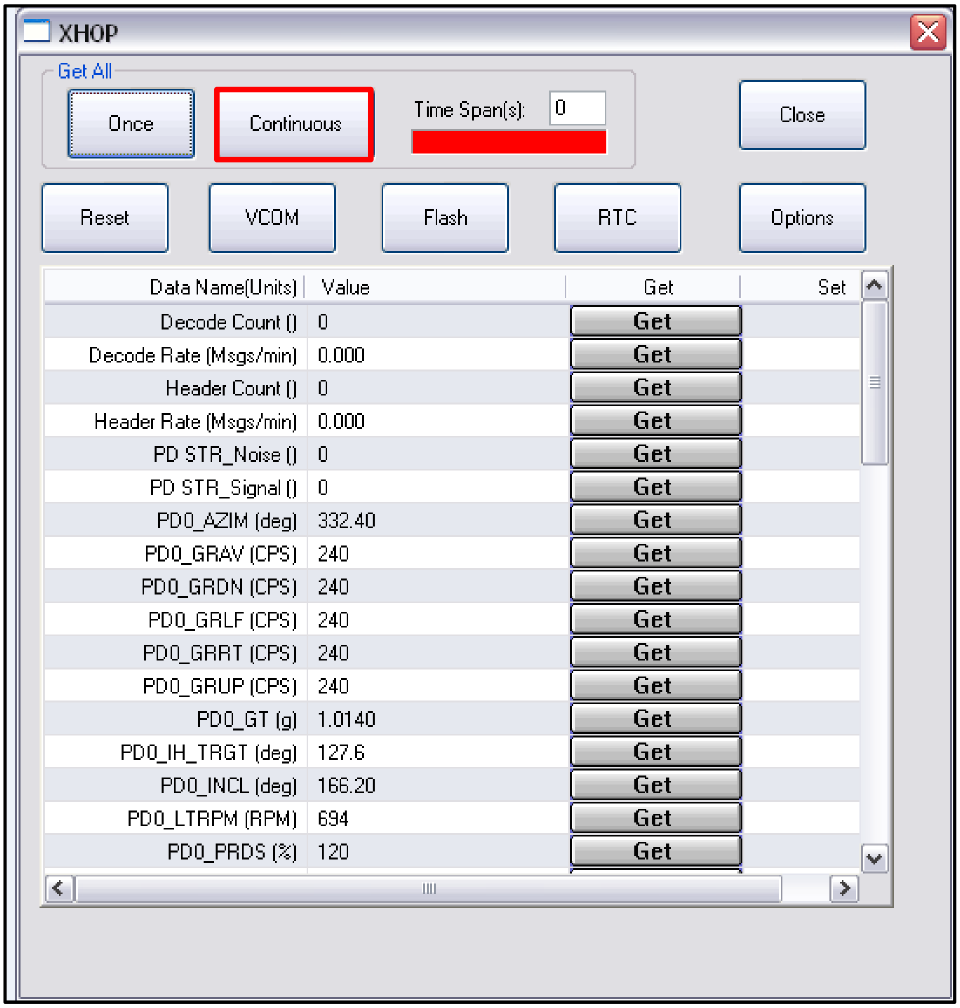

Figure 28 XHop Node

36. Remove the Female HHROTC from the XEM and the Male HHROTC from the XHop.
37. Connect the XEM and the XHop.
38. Torque the connection using Barrel Wrenches to 350ftlb.

39. Complete the Bank Test on the XEM tool; this will be the similar to the instructions after adding the Can terminator according to instructions in Chapter 7 Section 6.4.

You will need to:

40. Add an air pump (Chapter 7 Section 6.5).
41. Connect the tool to the XEM Rx (Chapter 7 Section 6.6).
42. Attach a vibrator (Chapter 7 Section 6.7).
43. Confirm the tool is on High side (Chapter 7 Section 6.8).
44. Apply 100psi pressure and turn the vibrator ON to take a survey.
45. Monitor the survey and ensure the Tool face = 0.
46. Monitor the XHop and all other signals on the XEM Rx to confirm tool functionality.(Chapter 8)
47. Place the Test box and XHop probe within 5 feet, and watch the messages from the Test Box on the XEM Rx. The XHop data points should change.
48. On the High side wizard - XConnect, confirm a survey was taken and print a Bank test report.
49. Disconnect the accessories and cables from the XEM to prepare for installation in collar(s).

3.6. SLB SHORT HOP TEST BOX

Schlumberger D&M/Pathfinder personnel use a Test box which can transmit and receive RSS/Short Hop signals. The SLB test box values can be compared to the values received by the Extreme XEM Rx.

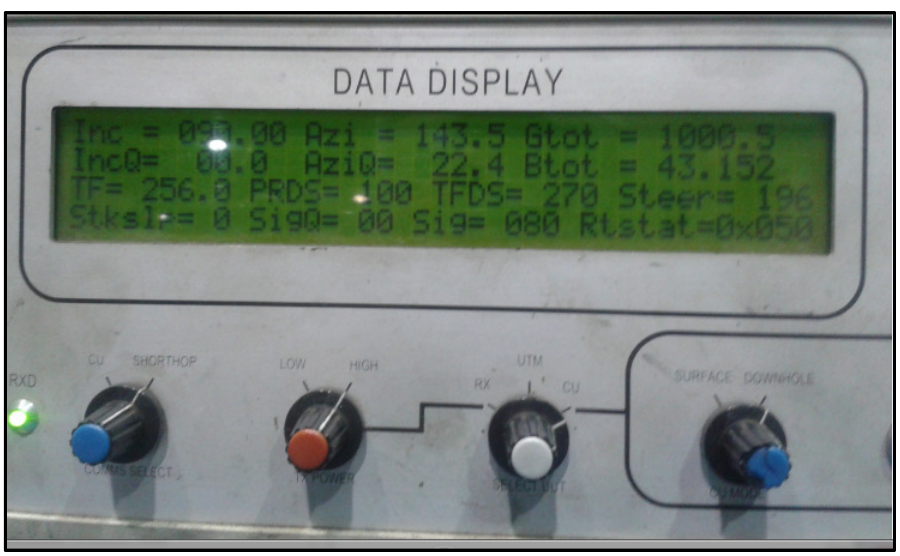

Figure 29 Short Hop Test Box

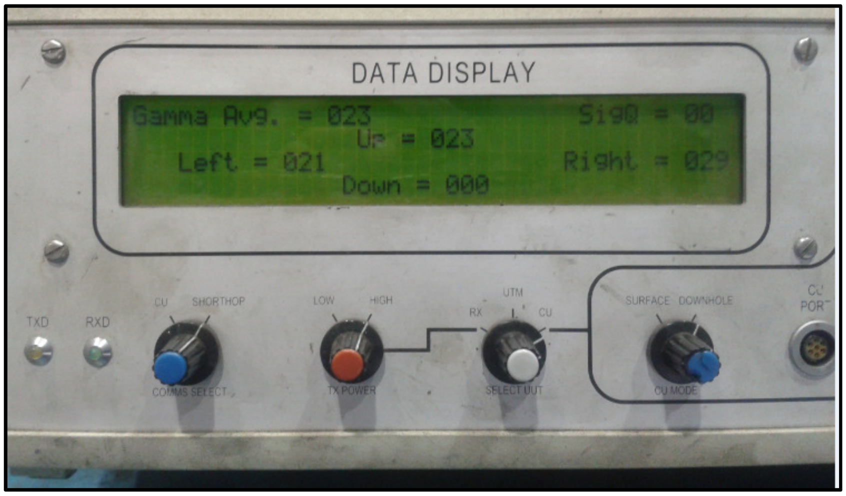

Figure 30 SLB Test Box

The Gamma values displayed on the SLB test box reflect the transmitted values. They do not represent the Actual values.

SLB Test Box	Actual Gamma (Extreme Rx)
10	1.5625
11	1.890625
12	2.25
13	2.640625
14	3.0625
15	3.515625
16	4
17	4.515625
18	5.0625
19	5.640625
20	6.25
21	6.890625
22	7.5625
23	8.265625
24	9
25	9.765625
26	10.5625
27	11.390625
28	12.25
29	13.140625
30	14.0625

Table 13 XEM Rx versus SLB test values

4. REFERENCES

1. 07-DCMT-1034-B XHop Theory of Operations: Buternowsky
2. Power Drive_Archer_XHop Service Alert: Ryan Kirby
3. Bank Test Training Instructions : Dan Bukovec
4. XHop probe pictures and programming screenshots: Sean Ruddy
5. Tool Length Calculator: Sean Ruddy
6. References on XHop software functionality: Ryan Kirby
7. 100589780 AM – Specification – D Points and Short-hop protocol: Ryan Kirby
8. 100589780 AP_100589780 AP-Specifications – D Point and short-hop protocol: Ryan Kirby
9. Tool Set Up Andrew Thies
10. XHop Tester Power Up sequence Dan Klimuk

5. TECHNICAL REVIEWS

1. Ryan Kirby
2. Michael Li
3. Michael Campbell