EXTREME™ ENGINEERING

XEM™

OPERATIONS MANUAL

CHAPTER 6 TOOL ASSEMBLY PROGRAMMING HARDWARE

REV A: 2013 July7

XFLD-0006

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1. TOOL ASSEMBLY

This section of the manual provides instructions on how to assemble the XEM tool for a typical job. Tool assembly depends on the nature of the job.

1.1. ITEMS REQUIRED

Prior to assembling the tool, confirm availability of the equipment listed in Table-1 and displayed in Figure-1.

Label	Part Number	Description	Qty
A	02PULS0059	High side level	1
B	03X-EM0046	Bore pressure test jig	1
	02X-EM0025	Knob assembly	
C	22X-EM0022	DPG shock pump w/ male quick connect	1
	03X-EM0044	Bore pressure test fitting	
	09ORNG0004	Bore/Annular test jig O-rings 004	
D	22CABL0071	Cable test clamps	2
E	22X-EM0021	XEM system tester	1
F	22CABL0063	BOP/ANT test cables	2
G	22CABL0016	Female handheld ROTC cable	2
H	22CABL0030	Handheld ROTC Extension cable	1
I	02PULS0033	Vibration motor	1
J	02ROTC0038	Female handheld ROTC	1

Table 1 Items required for tool assembly

Figure 1 Items required for tool assembly

1.1. PROBES

1. Confirm availability of the necessary probes to assemble the XEM tool string according to the desired configuration. A short description of the probes is given in Table 2 and a detailed description of the probes is provided in the specifications chapter.

Probe	Description
DPG	Dual Pressure Gauge
XTX	Transmitter
BO	Battery
DO	Directional module or DynamX which includes shock, rpm, stick & slip sensors.
XGM	Gamma
Can Term or XHOP	CAN Terminator XHOP is used instead if communication with a Schlumberger RSS is required.

Table 2 Probes used in XEM

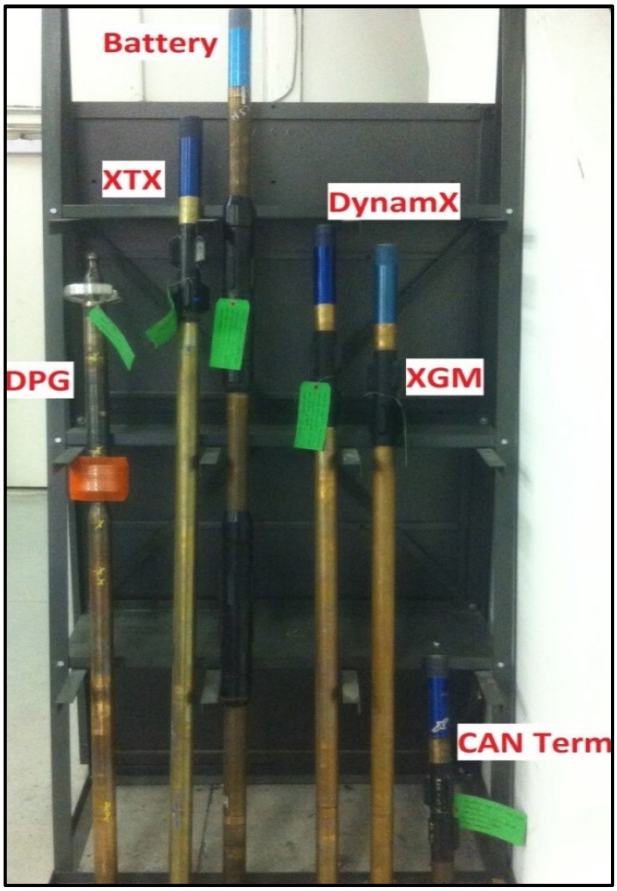


Figure 2 Probes used in XEM

It is recommended to wear gloves as the probe housing assembly is made with Beryllium Copper.

1.2. GREEN TAG DATA AND SERIAL NUMBER

2. Record the information on the green tag for all the probes that will be assembled.

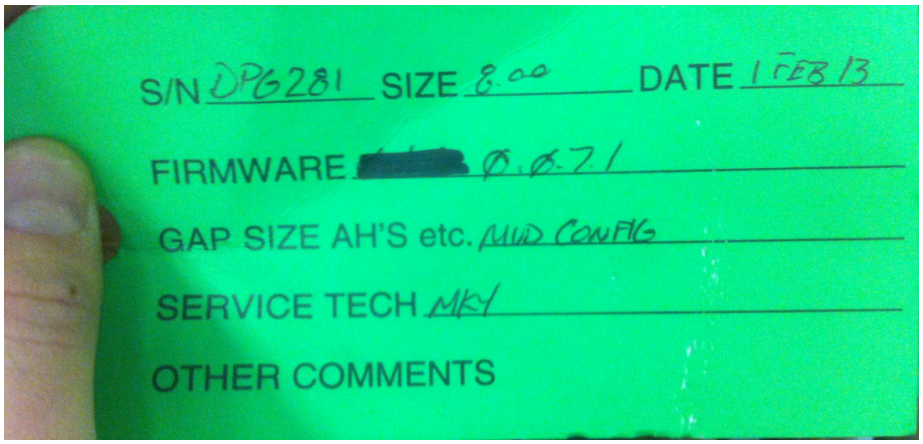


Figure 3 Green tag information

3. Verify the probe serial number on the housing for all the probes that will be assembled.

Figure 4 Serial number etched on probe housing

In this particular case DPG probe # 281 is used.

1.3. CENTRALIZER

4. Confirm the size of the 6 fin and mid probe centralizers on all the probes.
   All the probes should have the correct size for the centralizers when they arrive from the shop;

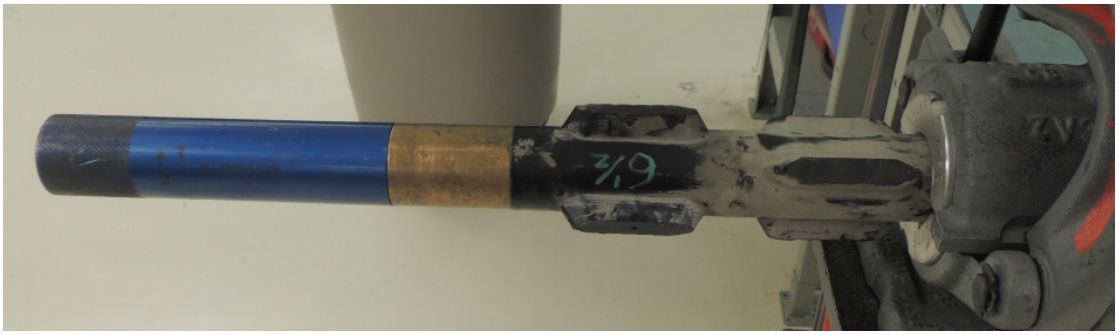


Figure 5 Probe centralizer

The centralizer sizes for the different tool string configurations are:

- 2 11/16" for the 4 ¾" size
- 2 13/16" for the 6 ½" size
- 3 ¼" for the 8" size
- **It is strongly recommended NOT to resize the centralizers at the well site; however there may be some rare occasions where it may be required to down size the centralizers. In that case please use the procedure below.**

I. Obtain the cutting jig (Correct size)and a knife.

Figure 6 centralizer cutting jig

The cutting jigs for different sizes look similar but have different dimensions and part numbers. The size is etched or labeled on the surface with a marker. The following jigs are commonly used:

- 03JIGS0430 4.75” centralizer cutting jig
- 03JIGS0431 4.75” mid-probe centralizer cutting jig
- 03JIGS0432 6.5” centralizer cutting jig
- 03JIGS0433 6.5” mid probe centralizer cutting jig
- 03JIGS0434 8” centralizer cutting jig
- 03JIGS0434 8” mid-probe centralizer cutting jig

II. Place the probe horizontally. The probe should be secured in a Vise Grip at the Mechanic shop or with barrel wrenches.

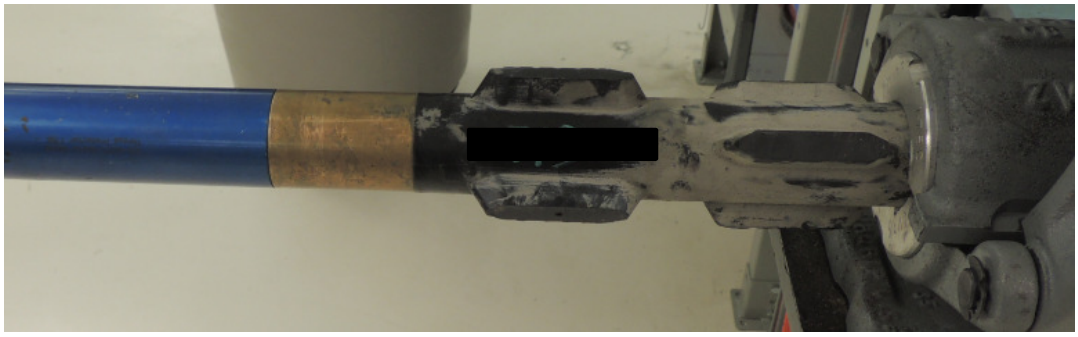


Figure 7 Probe centralizer

III. Place the cutting jig on a centralizer fin and tap it so that it fixes on the probe surface. The rubber on top of the fin will appear through the hole in the jig.

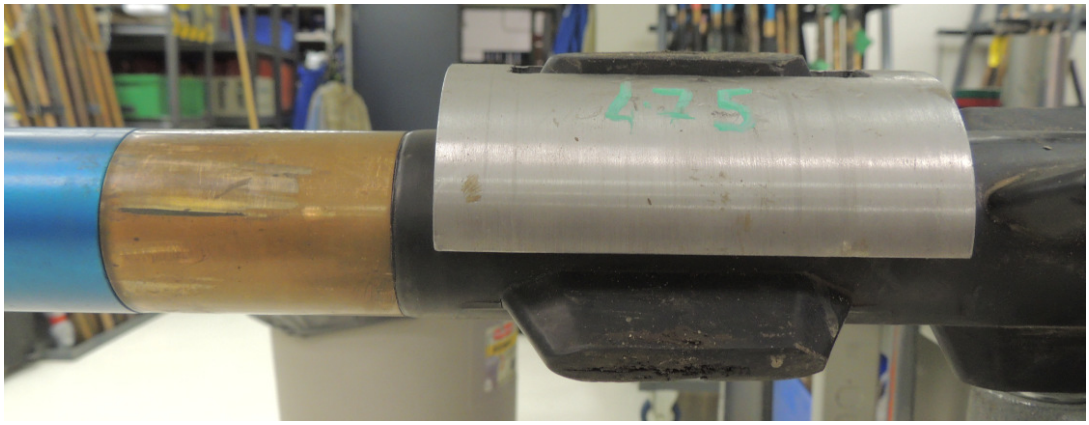


Figure 8 Cutting jig placed on the top centralizer fin

IV. Shave of the excess rubber above the cutting jig with a knife. **Use extreme caution while using the knife to ensure that it does not slip and swing after cutting the rubber.**

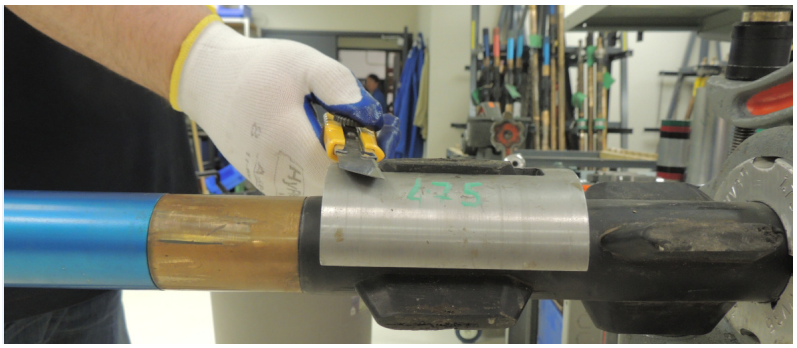


Figure 9 shaving the rubber of the centralizer fin

I. The jig with the rubber shaved off should appear as below.

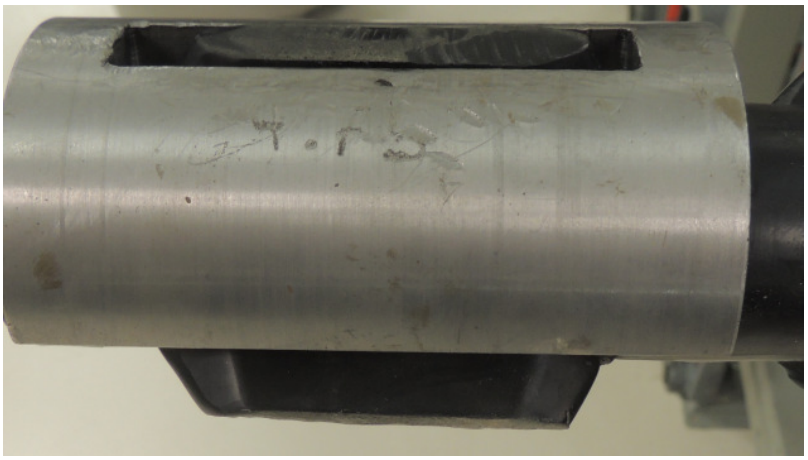


Figure 10 Rubber removed from 1 x centralizer fin

I. Repeat the same for all the fins on the probe.

Figure 11 Rubber removed from all centralizer fins

5. Lay the probes according to the desired tool configuration.

   The DPG and XTX must be connected together and are always the first 2 x probes in the tool. All the other probes can be interchanged depending on requirement.

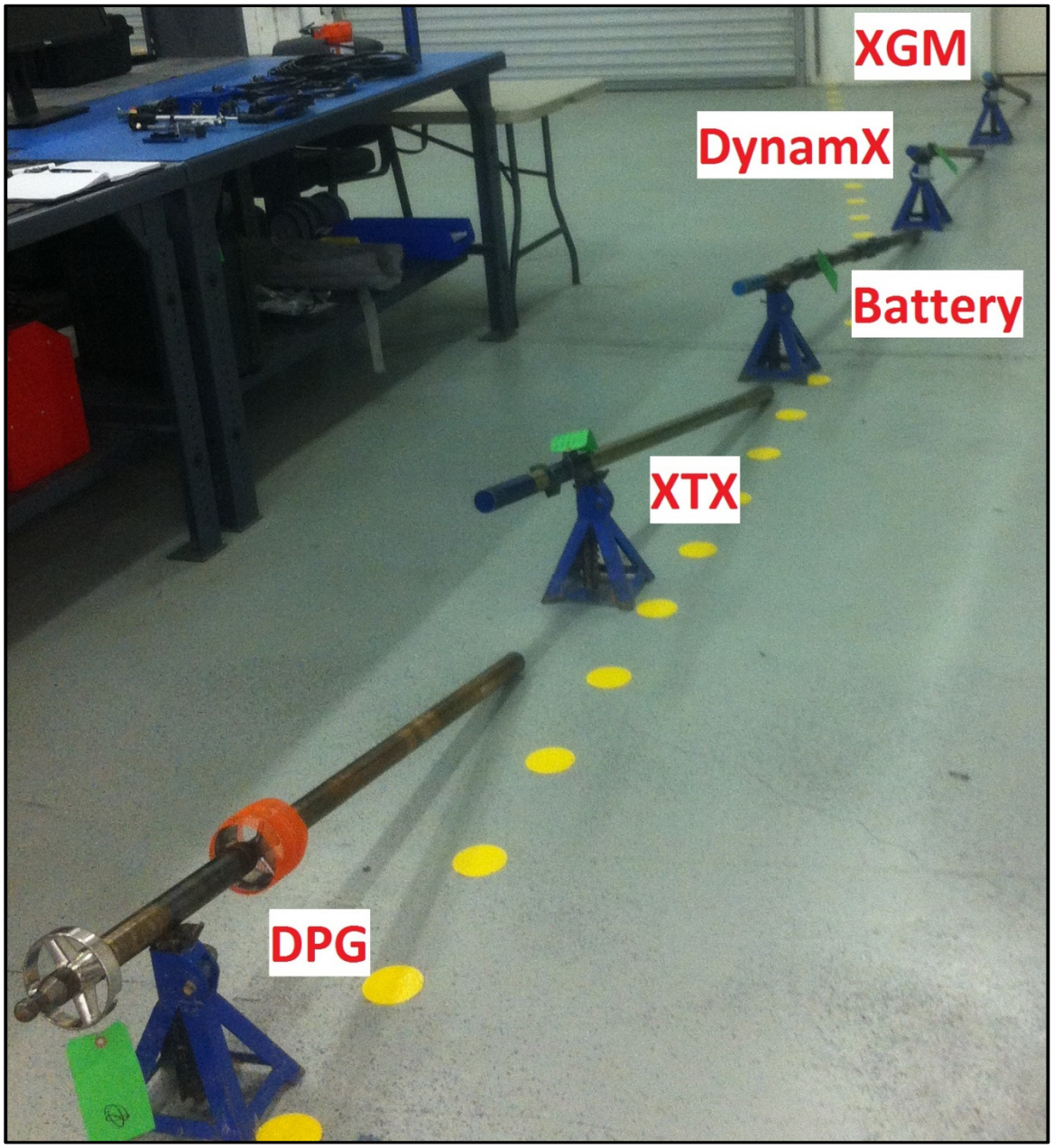


Figure 12 DPG-XTX-Battery-DynamX-XGM probes

The tool configuration is DPG-XTX-Battery-DynamX-XGM and Can terminator. An additional battery probe is normally included between the DynamX and XGM probe. The next step is to connect the probes together.

1.4. CONNECTING THE DPG AND XTX PROBES

6. Remove the dust cap from the top end of XTX probe.
7. Remove the end cap from the bottom end of the DPG probe. Each probe has a female connection on top and a male connection on the bottom.

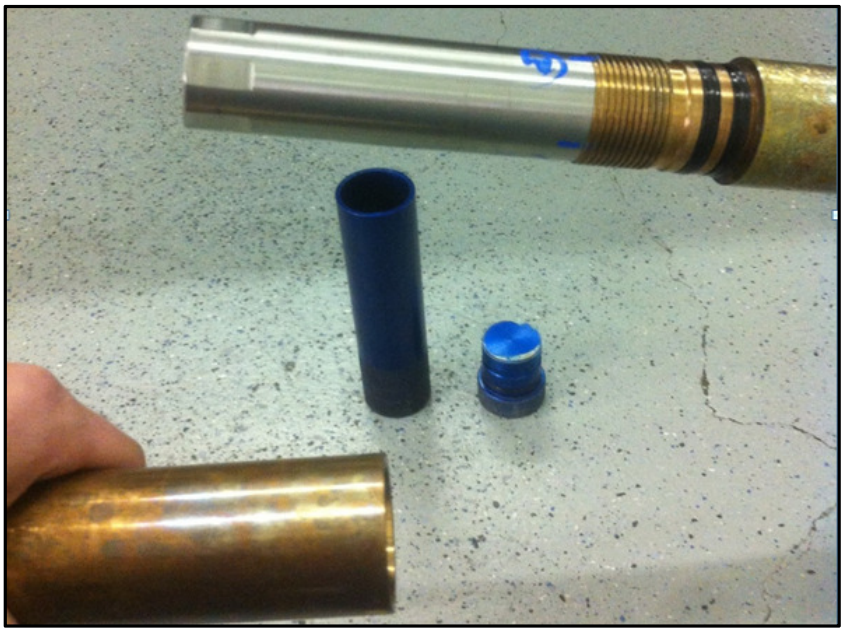


Figure 13 DPG (Male) & XTX (Female) ends

8. Inspect the female connector on top of the XTX probe for damage. If there are any signs of damage the probe should be replaced.

Figure 14 XTX female connector

9. Inspect the male connector at the bottom of the DPG probe for loose items.

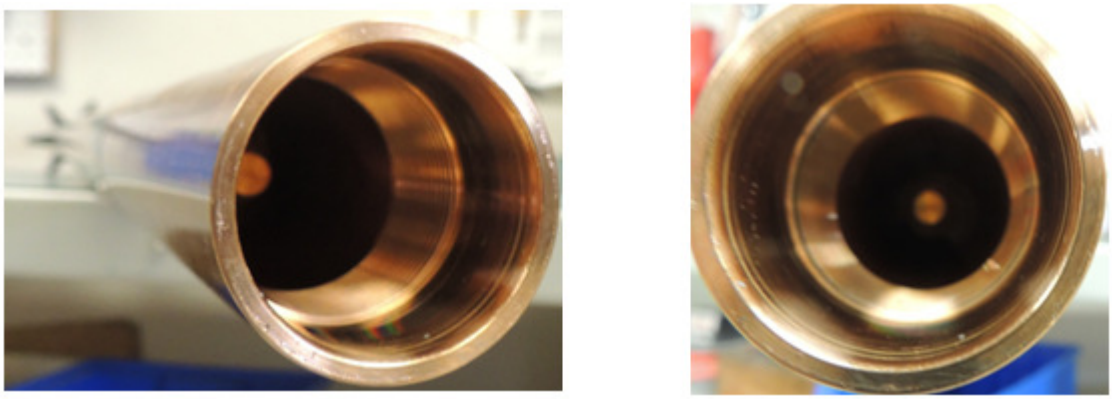


Figure 15 DPG male connector

10. Secure the DPG with a barrel wrench placed at the bottom end to prevent it from rotating.
11. Insert the XTX in to the DPG and rotate it clockwise.

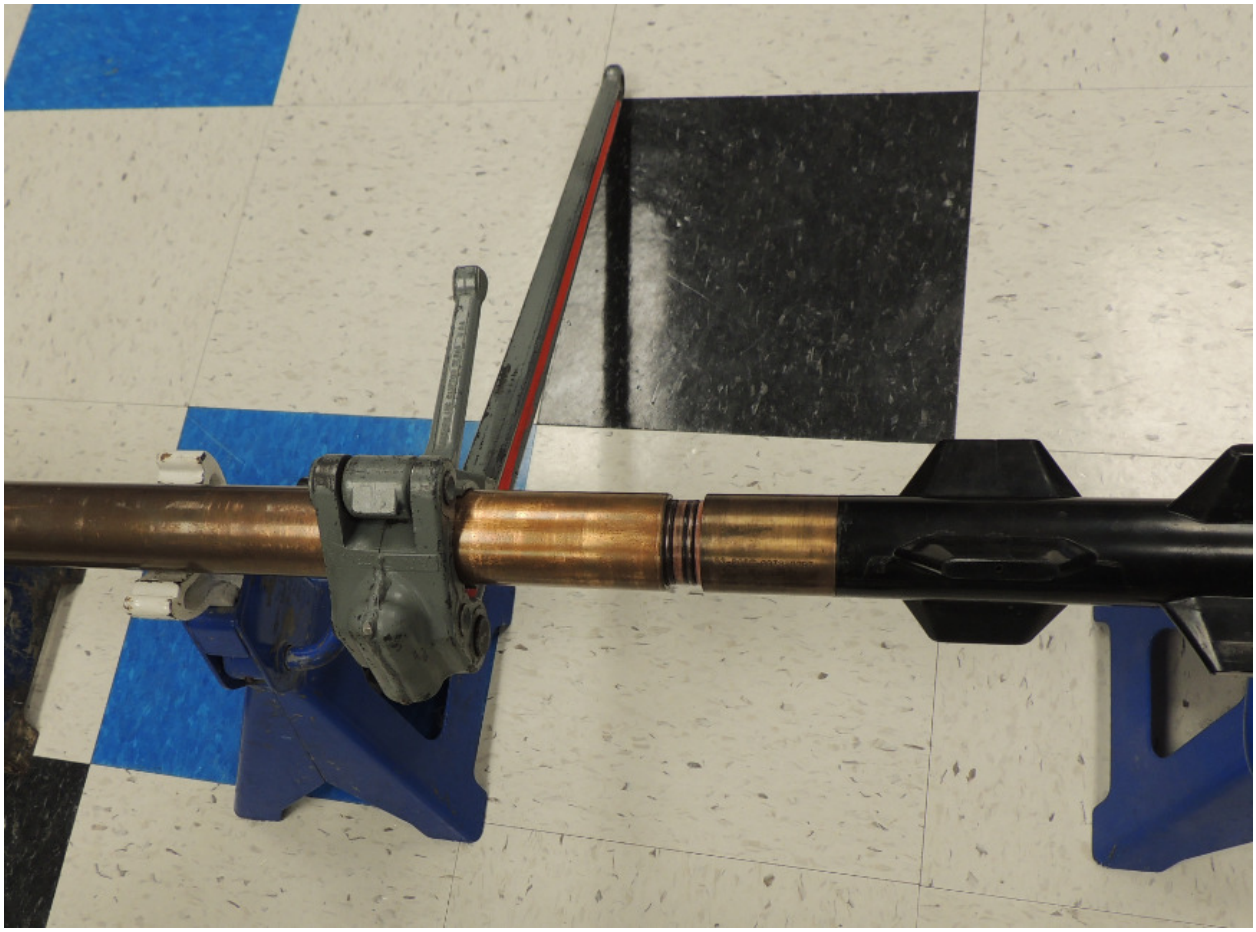


Figure 16 Barrel wrench on DPG

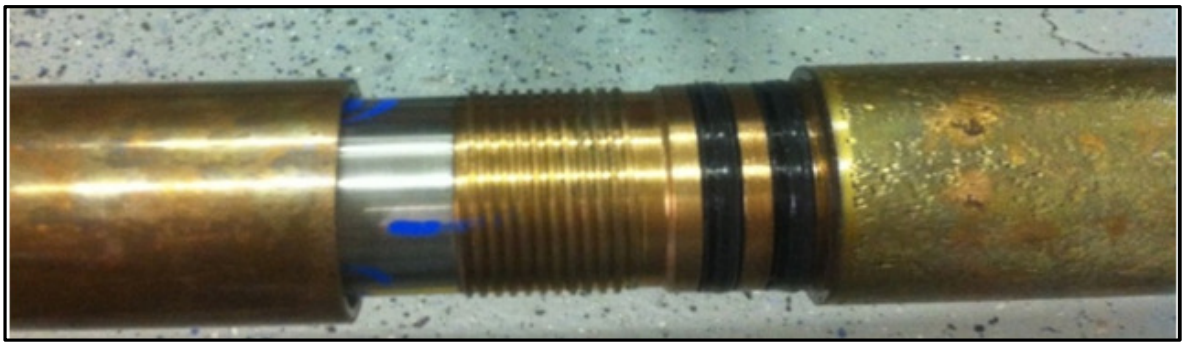


Figure 17 DPG and XTX probes before connection

12. Continue to rotate the XTX probe into the DPG until the connection is made up.

Figure 18 XTX screwed into the DPG

Use proper SIPP techniques when working with the barrel wrenches.

Do not jump or stand on the wrenches; use hands and gloves.

Do not use welded wrenches.

13. Place the other barrel wrench on the top of the XTX probe and apply 350lb force to “torque” the connection.

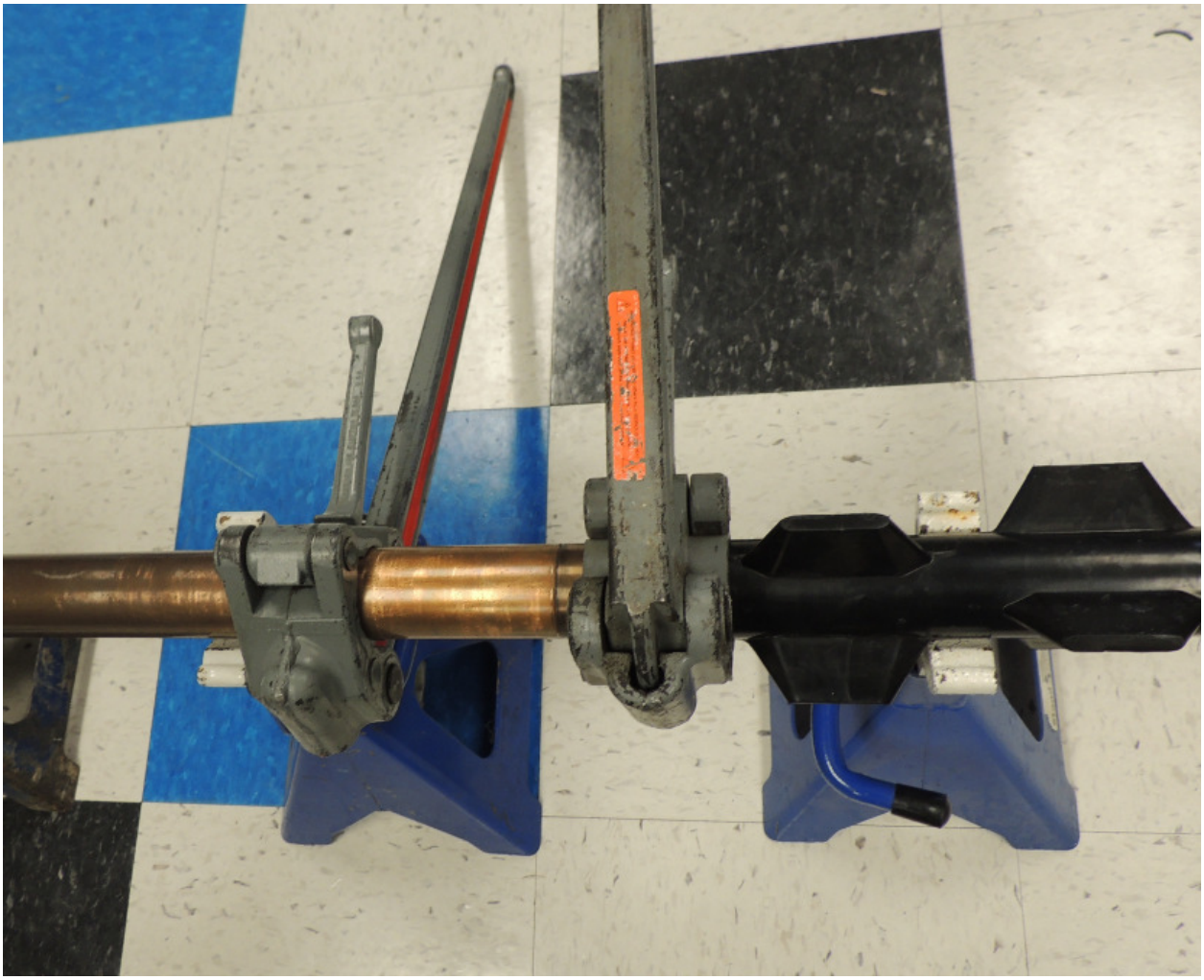


Figure 19 XTX & DPG – Torque applied on connection

14. The DPG and XTX connection should appear as below after torque has been applied.
15. Remove the barrel wrenches and move them to the next connection.

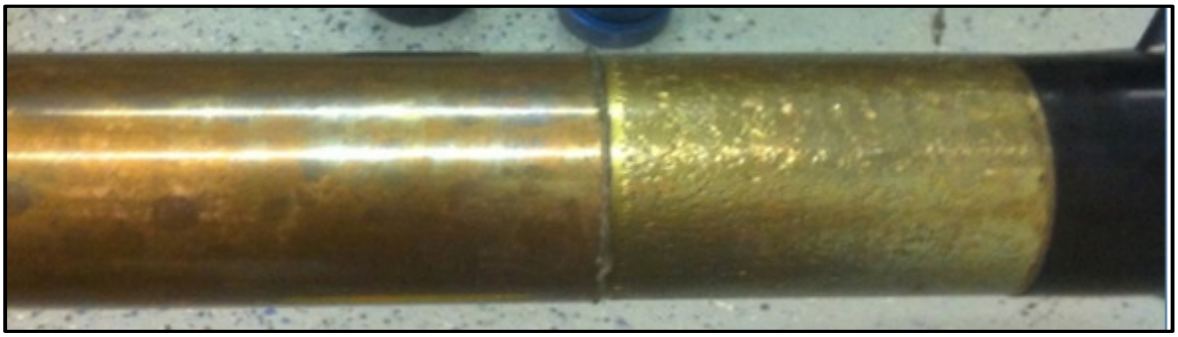


Figure 20 DPG XTX Connection made up and torqued

16. Connect the dust cap and end cap together to ensure they stay clean and dry.

Figure 21 Dust and End Caps connected

1.5. BATTERY

17. Cconnect and torque the battery with the XTX.

Follow the procedure described in Section 1.4.

The battery is typically the third probe in the string and connected below the XTX.

Prior to connecting the battery, Ensure:

- **The battery has adequate life.**
- **A battery spill kit is available.**
- **There are no signs of fumes or trapped pressure.**

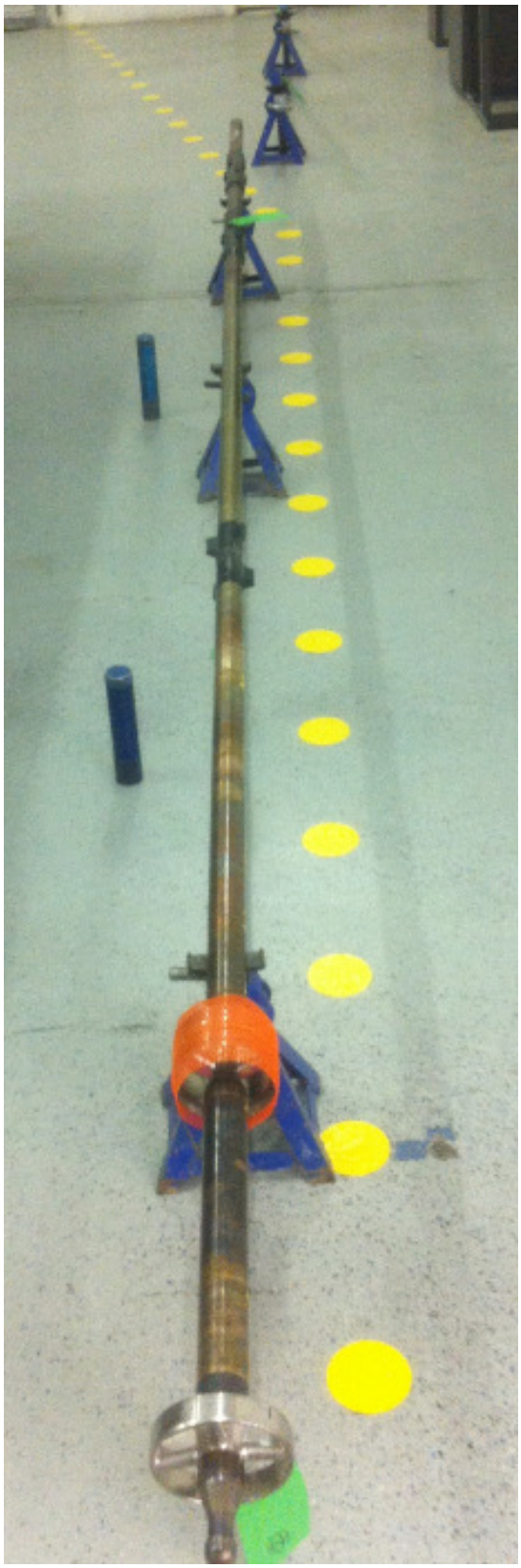


Figure 22 DPG-XTX-battery

1.6. DYNAMX / DIRECTIONAL

18. Connect and torque the DynamX with the battery.

Follow the procedure described in Section 1.4.

The DynamX probe contains Shock, RPM, stick & slip sensors in addition to directional sensors.

The Standard directional probe does not contain Shock RPM or Stick & slip sensors.

On adding the DynamX probe the tool string will have the configuration DPG - XTX - Battery – DynamX.

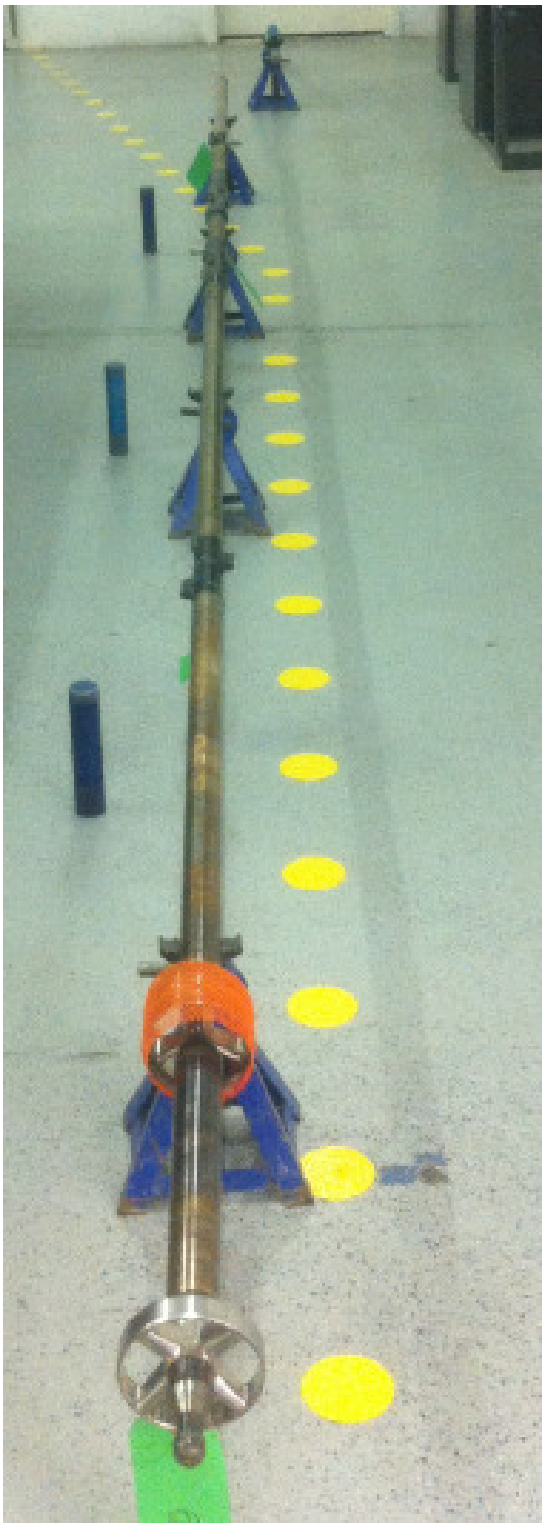


Figure 23 DPG- XTX Battery & DynamX

1.7. ADDITIONAL BATTERY

Only 1 x battery is used here in the example, however 2 or more batteries can be connected to the string to increase the run duration. If needed the additional battery is typically connected below the DynamX Probe, but could be placed anywhere else as well.

The tool string with 2 x batteries will normally have the following configuration:

- DPG- XTX- Battery- DynamX- Battery

The batteries are utilized in a sequential order; If 2 or more batteries are used, the tool will use the first battery below the XTX probe till it is depleted before switching to the next battery.

If however during the job the first battery is unable to provide power, other batteries may be used to provide power. The batteries do not need to be joined together.

1.8. XGM

The XGM is only used when Gamma logs are provided.

19. **If Gamma service is provided**, connect the XGM below the DYNAMX module. The probe configuration will be as follows:

- DPG- XTX- Battery- DynamX- Battery- XGM (With 2 Batteries)
- DPG- XTX- Battery-DynamX-XGM (With 1 battery)

The XGM is typically the last probe as this allows the Gamma ray sensor to be closer to the bit and allows the geologist to know as soon as there is a change in the log responses.

20. **If Gamma service is NOT** provided proceed to the next step.

1.9. COMPLETE TOOL STRING

21. Collect all the Dust and End Caps together and store them.

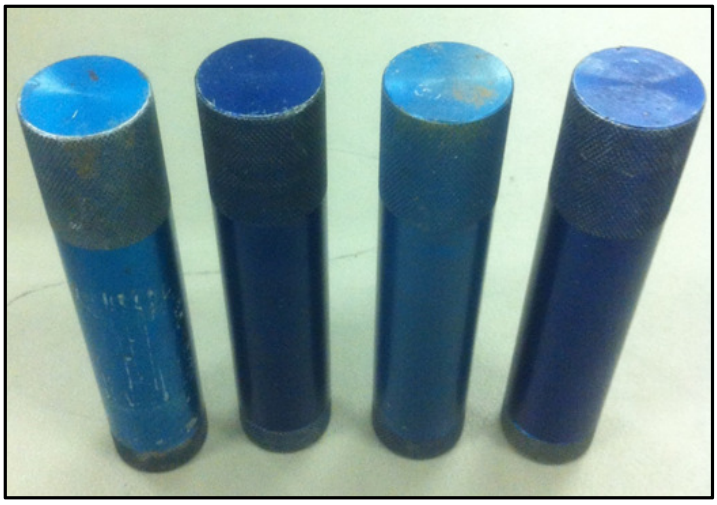


Figure 24 Collect and Store Dust and End caps

The tool String in this case appears as per the figure on the next page with the DPG-XTX-Battery-DynamX- XGM probe.

The order of assembling the probes does not matter as long as the DPG is on the top and connected to the XTX directly, everything below can be assesmbled in any order.

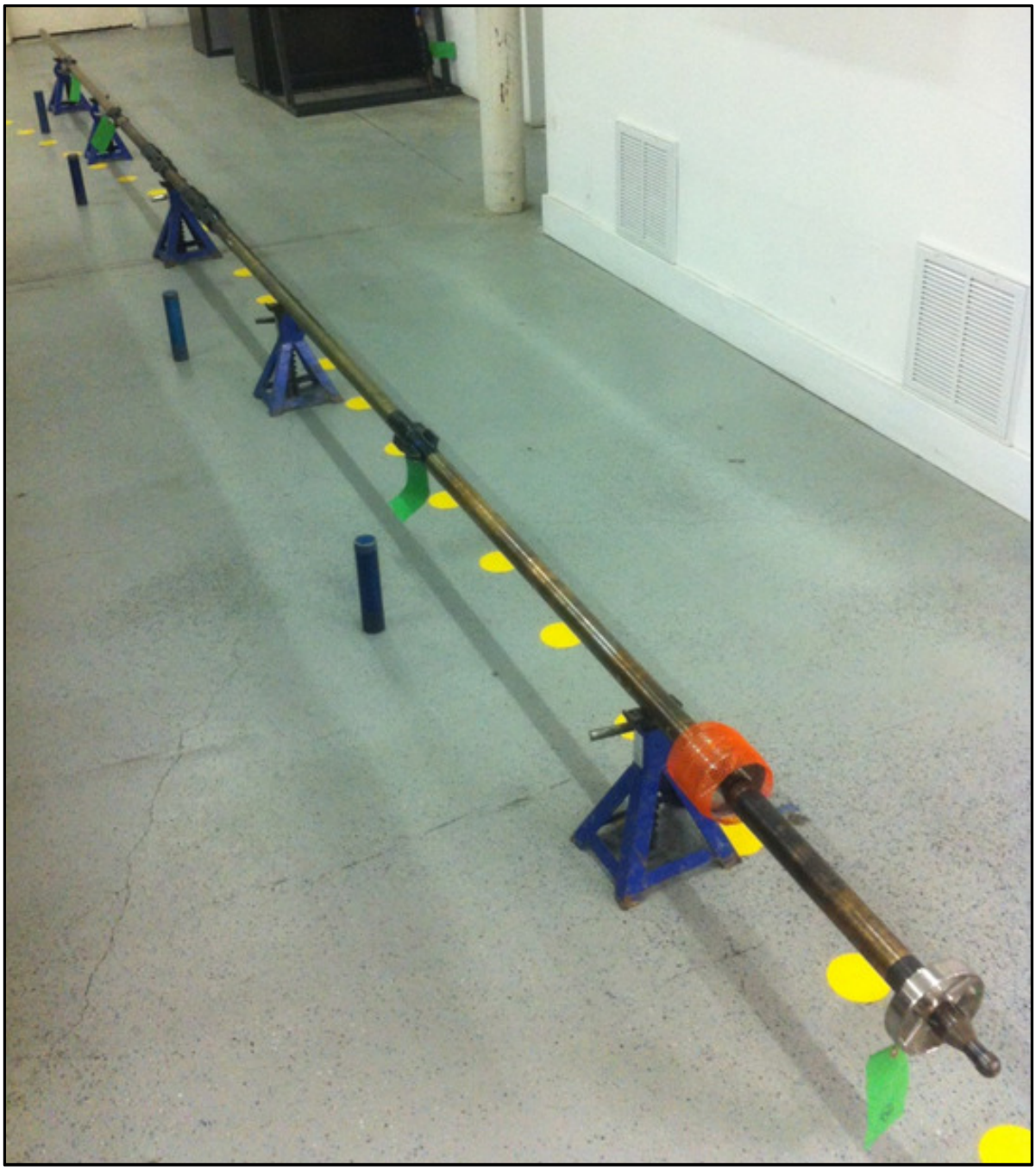


Figure 25 XEM Tool String with DPG, XTX, Battery, DynamX, XGM

The tool string is now ready to be programmed.

A female HHROTC adapter has to be connected to the bottom of the last probe.

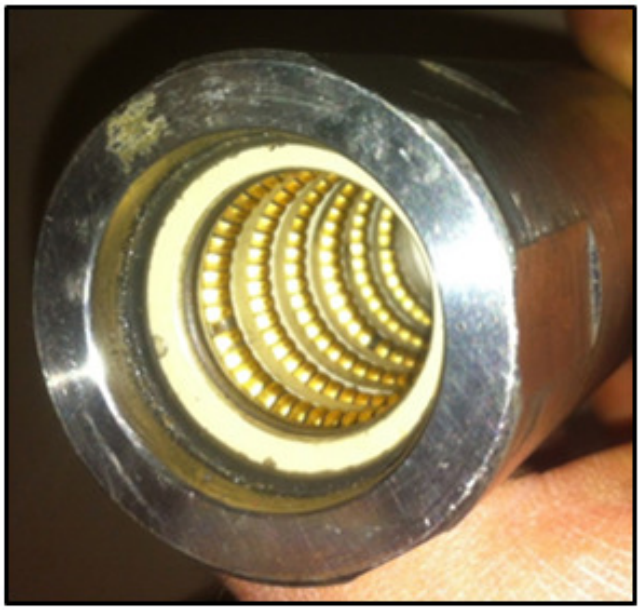
1.10. HH ROTC 02ROTC0038

The female hand held rotatable connector (02ROTC0038) is connected to the bottom of the last probe in the tool string to program the tool.

The XGM is the last probe in this assembly.

HHROTC

HHROTC Dust cap

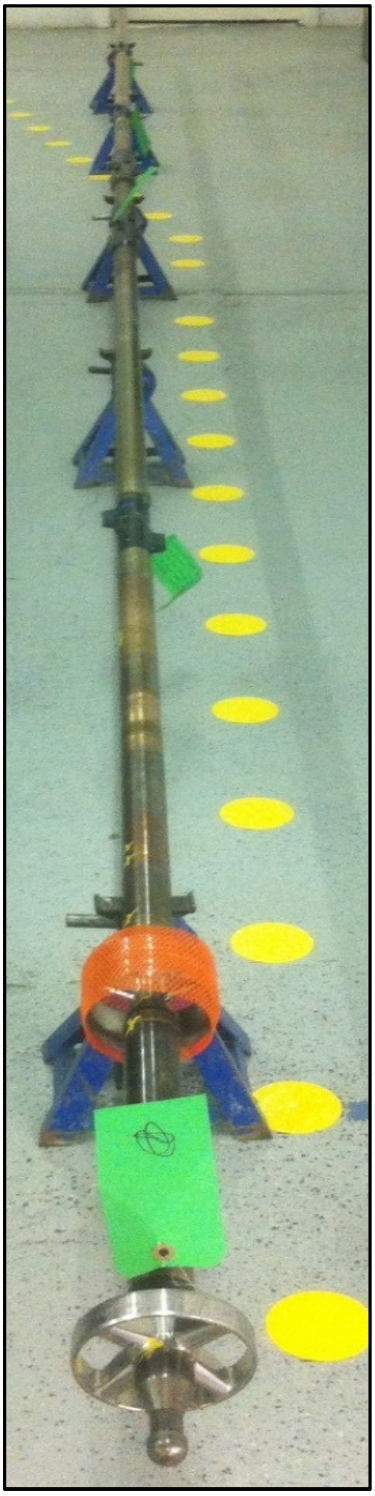


HHROTC Female Connector

Figure 26 Female HHROTC connector 02ROTC0038

22. Remove the end cap from the last probe.
23. Insert the HHROTC into the bottom of the XGM probe and push it in all the way; it does not need to be screwed.

Figure 27 HHROTC inserted into the XGM



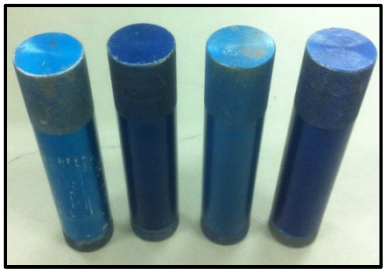


Figure 28 Tool with female HHROTC connection

1.11. ISOLATION FROM MAGNETIC INTERFERENCE

It is necessary to minimize Magnetic Interference and ideally keep the directional/ DynamX 30ft away from any source of magnetic interference; however it is not practical and possible to do this at the well site.

24. Remove any metallic objects close to the Directional/DynamX module. The metallic objects include hand tools (e.g. Jack stand).

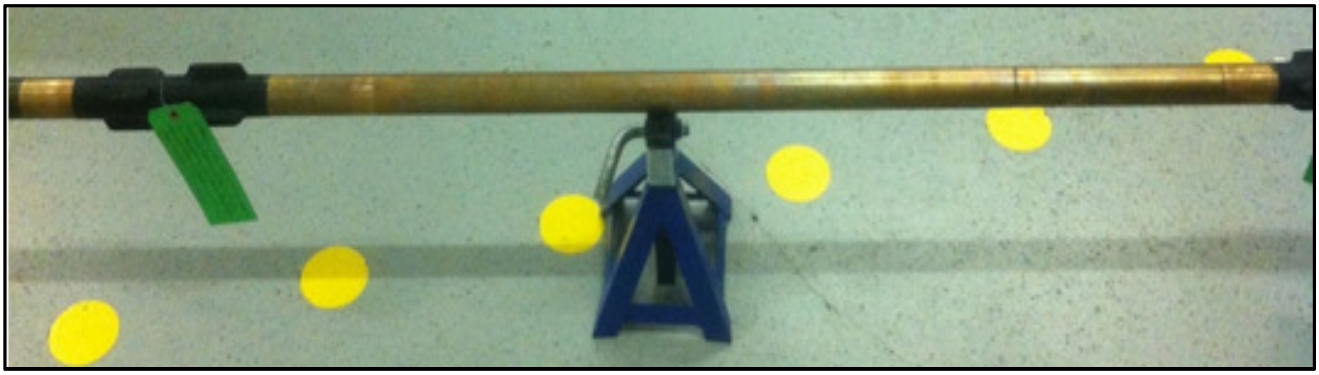


Figure 29 DynamX Module on Jack Stand

Figure 30 DynamX Module (Jack stand support removed)

1.12. ISOLATION FROM ELECTRICAL GROUND LOOPS

When the tool is being tested on surface it needs to be electrically isolated from any object through which a ground loop could be achieved. An electrical ground loop can potentially damage the tool.

Figure 31 Tool electrically connected to the ground through the jack stand

25. Place an insulating material (This can be a card board/ wood or plastic sheet) between the jack stand and the probe thus electrically isolating the probe from the ground.

Figure 32 Probe electrically isolated from the jack stand and ground

1.13. GREEN TAGS

26. Ensure green tags are removed from all the probes.

Figure 33 Green tag attached to probe

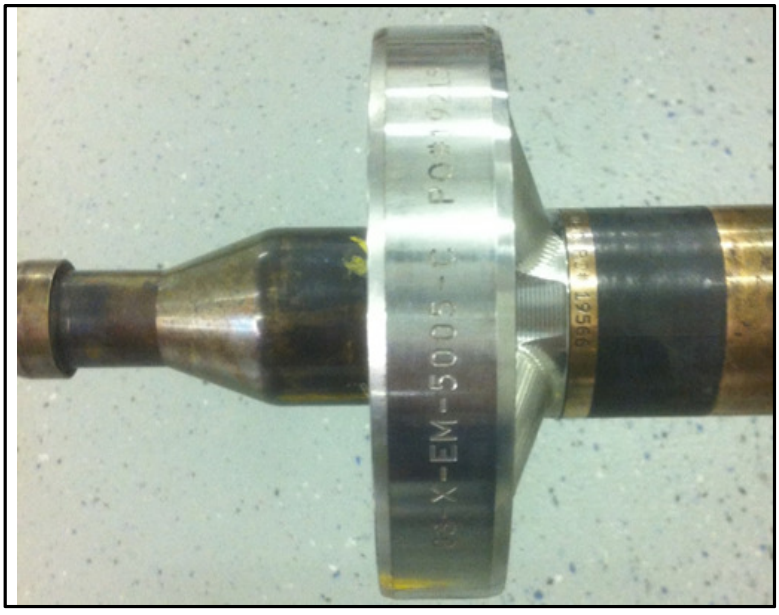


Figure 34 Green tag removed from probe

27. Store the green tags and record the information.

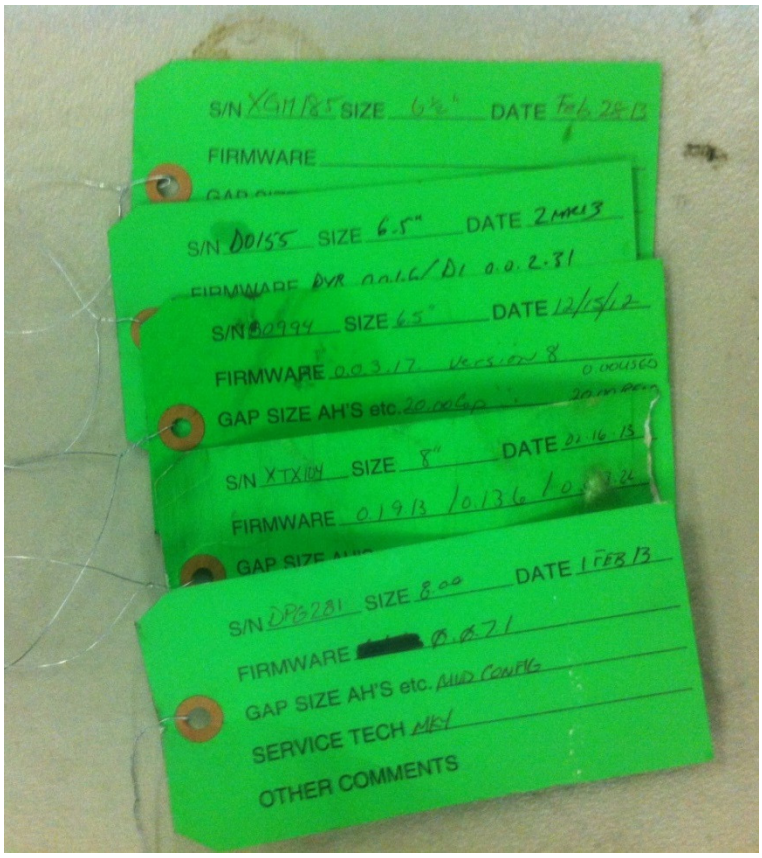


Figure 35 Green tag collected from all probes

2. HARDWARE SETUP FOR PROGRAMMING

2.1. SUMMARY

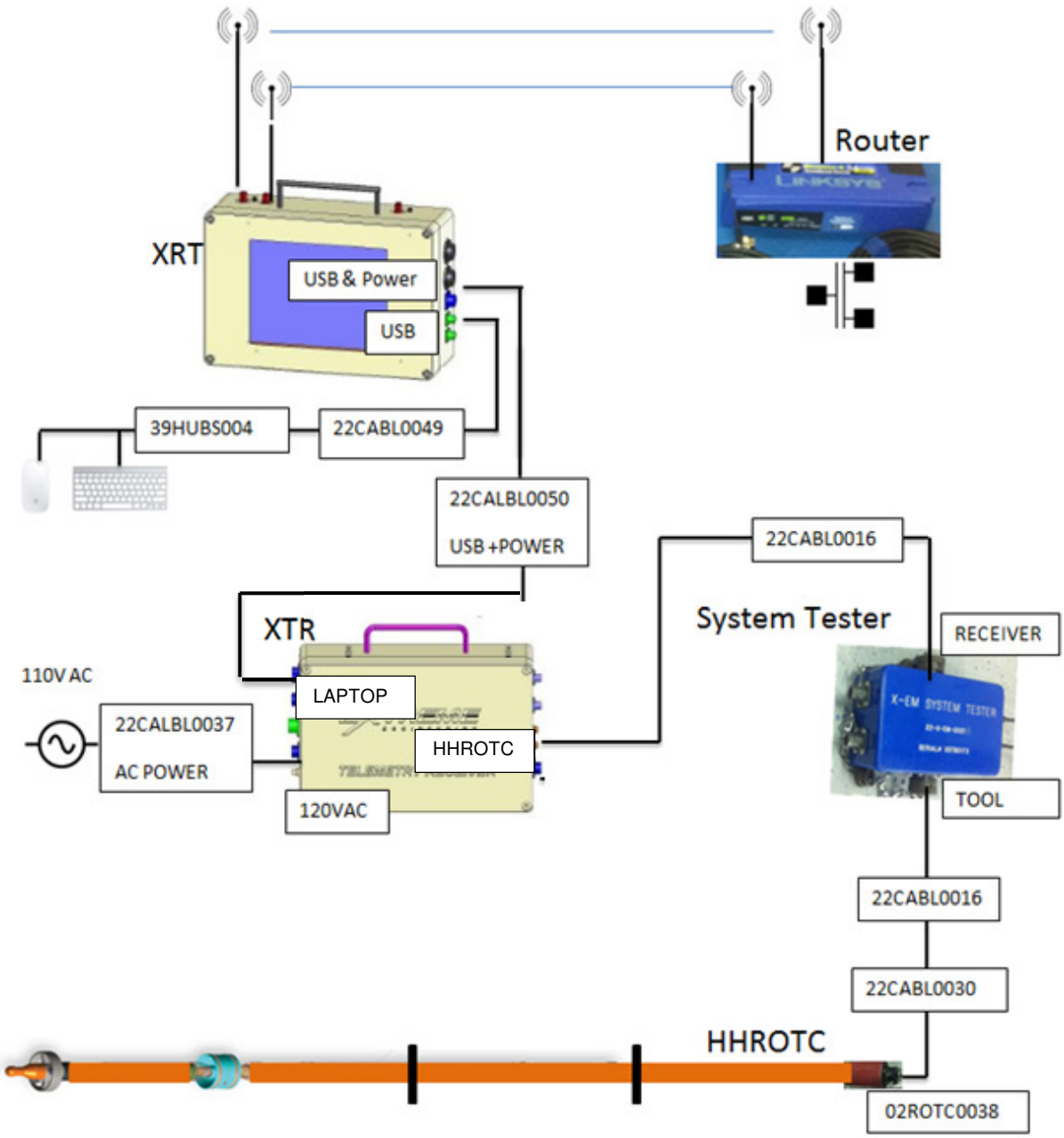


Figure 36 Hardware setup for programming the tool

The XRT and XTR should be completed as per instructions in the surface equipment chapter. The tool should be configured with the Hand held rotatable connector 02ROTC0038 installed at the bottom of the string.

The following additional equipment is needed:

- 22CABL0030: ROTC extension cable
- 22CABL0016: ROTC handheld cable x 2
- 22X-EM0021: X-EM System tester

The detailed procedure on setting up the hardware equipment is given in the following sub sections.

2.2. 22CABL0030

1. Obtain 1 x ROTC extension cable 22CABL0030; this has both male and female connectors.

Figure 37 ROTC extension cable 22CABL0030

Figure 38 ROTC extension Cable 22CABL0030 Male/ female connectors

2. Connect the male end of 22CABLE0030 to the female connector on the 02ROTC0038 hand held rotatable connector at the end of the tool string.

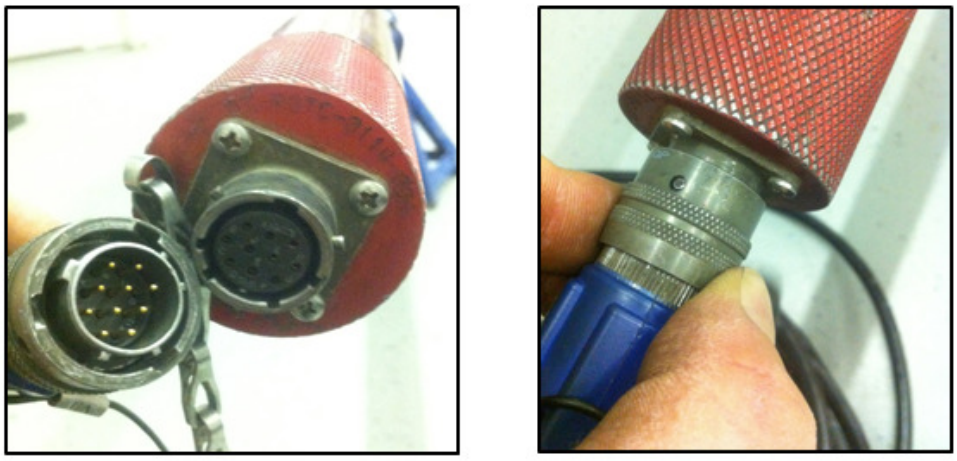


Figure 39 22CABL0030 connected to the HHROTC

The cable end has a small hole, the connector has a corresponding pin; the cable is turned clockwise until these are aligned. The 22CABL0030 ROTC extension cable and 02ROTC0038 HHROTC should now be connected.

3. Route the other end of 22CABL0030 near the DPG probe.

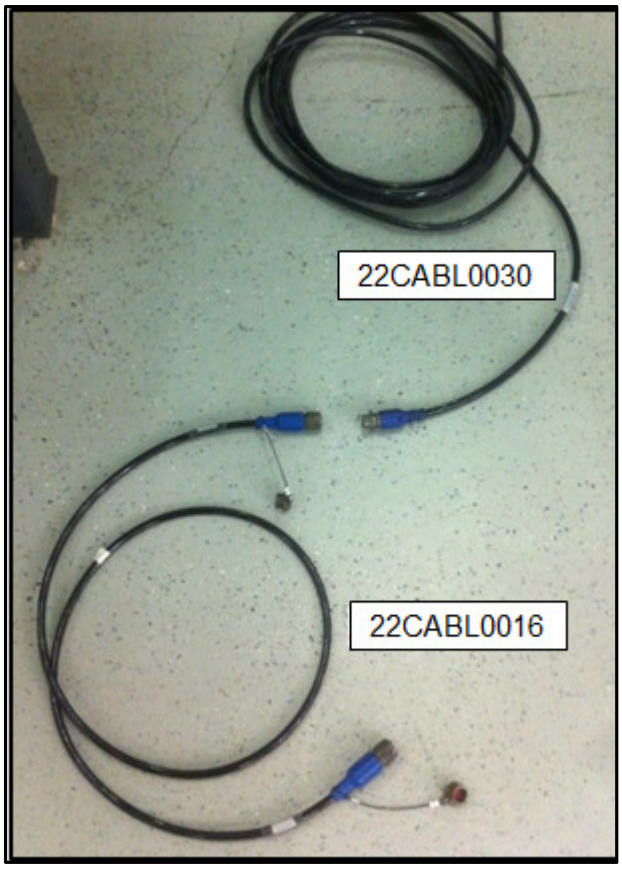
Figure 40 ROTC22CABL0030 extension cable routed near the DPG

2.3. 22CABL0016

4. Obtain the 1 x Handheld ROTC cable 22CABL0016. This cable has male connectors on both ends.

Figure 41 ROTC 22CABL0016

5. Connect the loose female end of 22CABL0030 with 1 of the male ends from 22CABL0016.



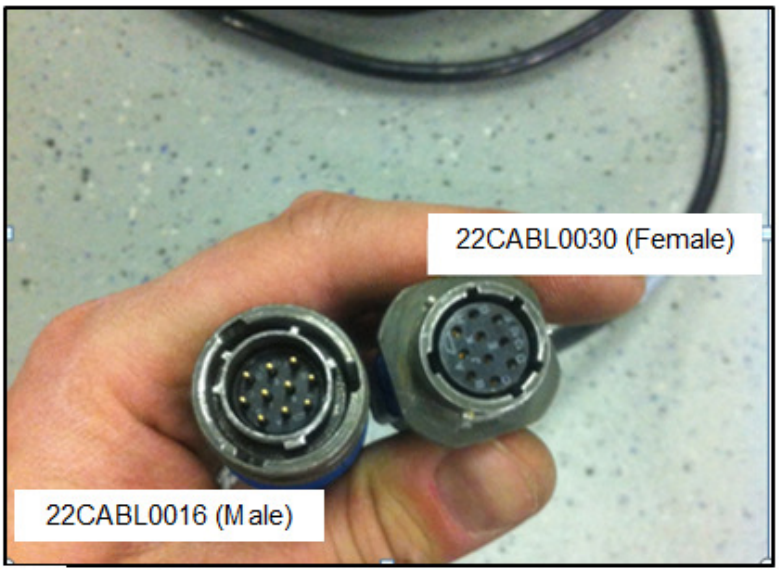


Figure 42 22CABL0016 & 22CABL0030

2.4. 22X-EM SYSTEM TESTER

6. Obtain the X-EM System tester 22X-EM0021.

Figure 43 XEM System tester

7. Connect the loose end of 22CABL0016 to the "TO TOOL' connector port on the XEM System Tester. The cable end has a small hole, and the connector has a corresponding pin; to make up the cable with the connector twist the cable till the pin and slots are aligned.

Figure 44 22CABL016 connected to the system tester

The setup (In progress) should look like the figure below:

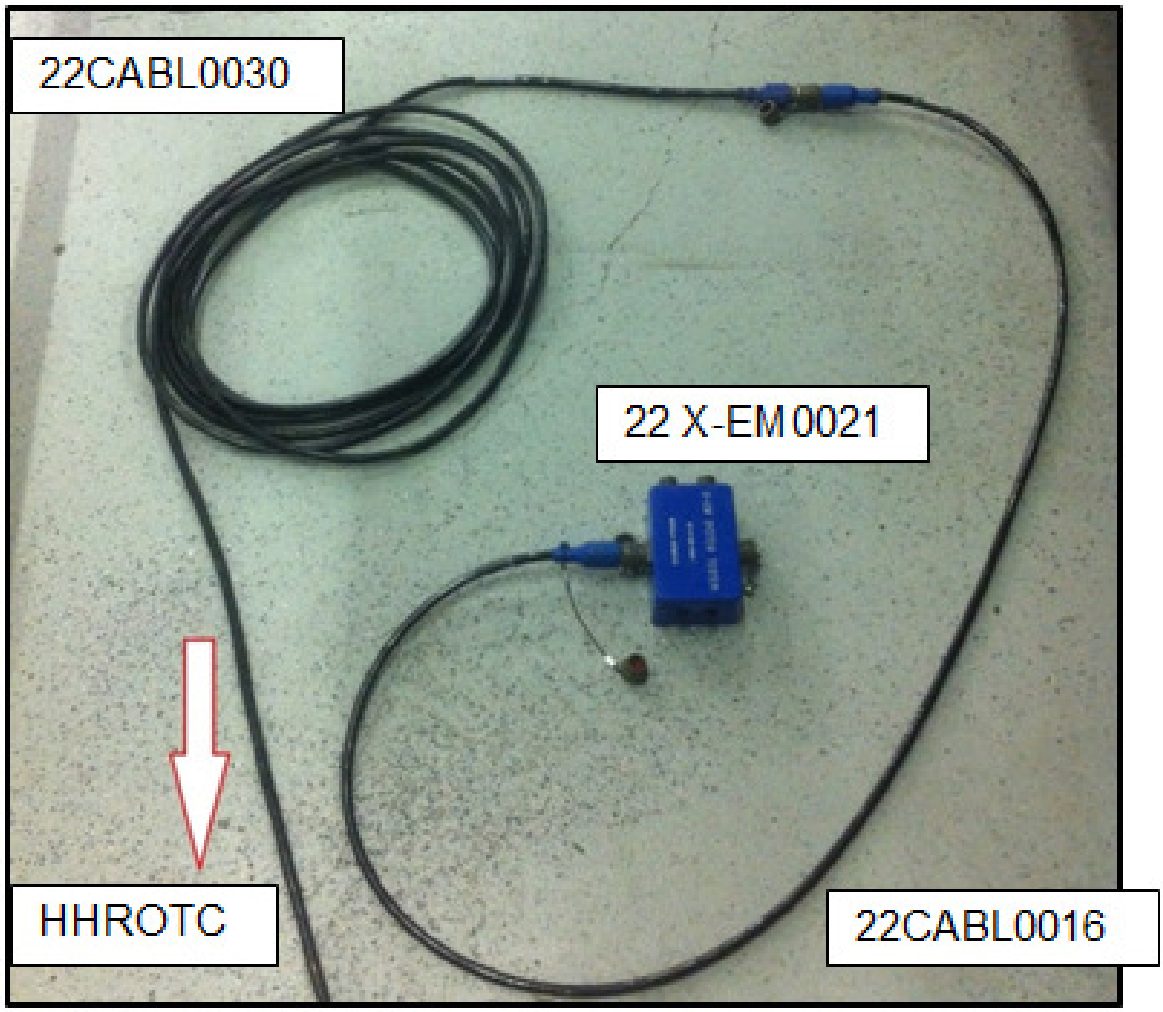


Figure 45 Hardware setup for programming the tool (In progress)

2.5. XTR- HHROTC

8. Identify the HHROTC Port on the XTR.

Figure 46 HHROTC Port on the XTR

2.6. 22CABL0016

9. Obtain the other Hand held cable ROTC cable 22CABL0016.

Figure 47 ROTC CABLE 22CABL0016

10. Connect 1 x end of 22CABL0016 to the “HH ROTC” connector on the XTR.
    The cable end has a small hole, and the connector has a corresponding pin; the cable is twisted until these are aligned.

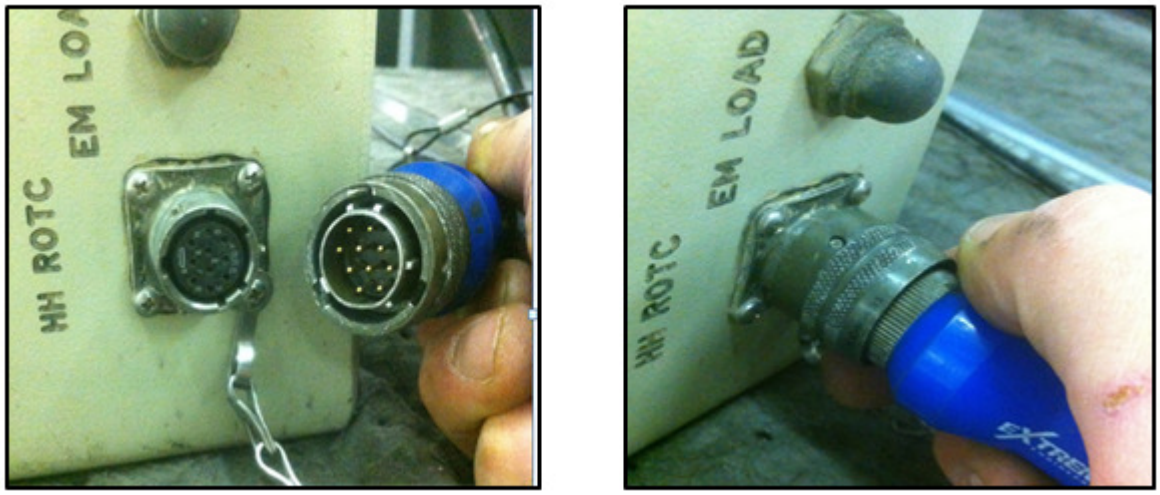


Figure 48 22CABL0016 connected to the “HH ROTC” port on the XTR

11. Connect the other end of 22CABL0016 to the other end of the XEM System Tester at the connector labeled ‘TO RECEIVER’.

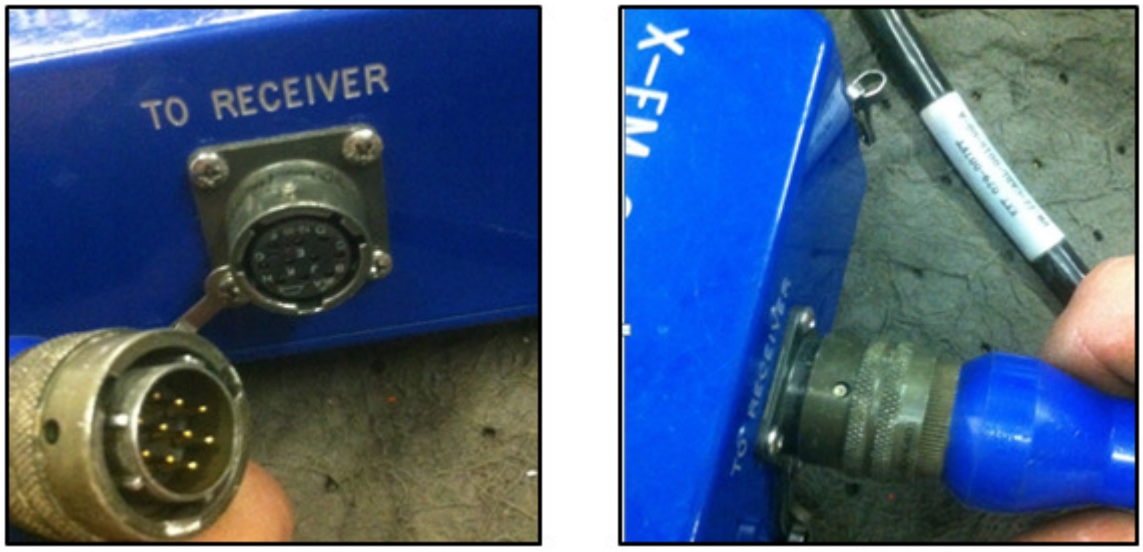


Figure 49 22CABL0016 connected to the “TO RECEIVER” port on the tester

2.7. COMPLETE SETUP

The complete hardware setup including the XTR, 22CABL0016, XEM System tester, 22CABL0016, 22CABL0030, HHROTC and tool should appear as in the figure below:

Figure 50 Complete hardware setup

3. REFERENCES

XEM School Training Material: Dan Bukovec

Centralizers: Andrew Thies