

Maintenance and Operation Manual

DataCan Memory Gauges V1.1.7

1 Table of Contents

1	TABLE OF CONTENTS	2
2	ABOUT THIS GUIDE	5
2.1	SOFTWARE GUIDES	6
2.2	QUICK START AND OPERATING SHEET	6
3	INTRODUCTION.....	7
4	INTRODUCTION TO GAUGE OPERATION	8
4.1	BASIC MEMORY GAUGE OPERATION.....	8
4.2	ABOUT PIEZO GAUGES	9
4.3	QUARTZ SENSOR TECHNOLOGY.....	10
4.4	GEOTHERMAL FLASK TECHNOLOGY	11
4.5	GAUGE ACCURACIES AT LOW PRESSURE.....	12
5	RECOMMENDED MAINTENANCE SCHEDULE.....	14
6	TOOL ASSEMBLY AND OPERATION	15
6.1	PRESSURE GAUGES.....	15
6.1.1	Tool Inspection.....	15
6.1.2	Operating Sequence	15
6.1.3	1/2" Piezo Tool Assembly.....	16
6.1.4	3/4" Piezo Tool Assembly.....	17
6.1.5	3/4" Welded Piezo Tool Assembly.....	19
6.1.6	1 1/4" Piezo Tool Assembly	21
6.1.7	1 1/4" Piezo Welded II Tool Assembly.....	23
6.1.8	1 1/4" Burst Memory Pressure Gauge Tool Programming	24
6.1.9	1 1/4" Burst Memory Pressure Gauge Tool Assembly.....	25

6.1.10	1 ¼" Welded III Piezo Tool Assembly	27
6.1.11	1 ¼" Welded Piezo RTD Tool Assembly.....	29
6.1.12	1 ⅜" Piezo Welded Tool Assembly	31
6.1.13	1" Piezo Sidepocket Tool Assembly.....	33
6.1.14	1 ½" Piezo Sidepocket Tool Assembly.....	35
6.1.15	¾" Quartz DXB II Tool Assembly	37
6.1.16	¾" Quartz DXB II Tool Memory Module Replacement.....	39
6.1.17	1" Quartz DXB Tool Assembly	41
6.1.18	1 ¼" Quartz DXB Tool Assembly.....	43
6.1.19	1 ¼" Quartz DXB 2 Tool Assembly.....	45
6.1.20	1 ¼" Quartz SRO Tool Assembly	48
6.1.21	1 11/16" Geothermal (Flask) Tool Assembly	50
6.1.22	1 ¾" Geothermal (Flask) PTF Tool Assembly.....	52
6.1.23	1 ½" Mini Logging Tool (MLT) Assembly.....	56
6.1.24	Frac Ball	58
6.2	O-RING BASICS.....	61
6.2.1	Installation.....	61
6.2.2	Removal	62
6.2.3	Elastomer Selection Guide.....	63
6.2.4	Failure Modes	65
6.2.5	Storage.....	69
6.3	BATTERY PACK BASICS.....	70
6.4	WELLHEAD LOGGER	71
6.4.1	Installation.....	71
6.4.2	Operating the Wellhead Logger.....	72

History of Changes

Rev. No.	Date	Pages	Description of Changes
1.0.0	Nov - 2007		Initial Draft
1.1.0	March 12, 2018		Added maintenance schedule.
1.1.1	July 18, 2019	21-23	Added Burst Tool Assembly Section Added Burst Tool Operation Section Added Basic Memory Gauge Operation Section
1.1.2	June 7, 2022	51-55	Added Geothermal PTF Assembly Section
1.1.3	Sept 2023	33-34	Updated 1" Piezo Sidepocket Tool Assembly Section
1.1.4	April 2024	55-57	Added MLT Assembly Section
1.1.5	June 2024	12-13	Added Gauge Accuracies at Low Pressure Section
1.1.6	January 2025	41-45	Added 1" Quartz DXB Tool Assembly Section Added Bullnose/Crossover Torque spec for 1.25" Quartz DXB and DXB 2
1.1.7	June 2025	58-60	Added Frac Ball Assembly Section

2 About This Guide

This document is intended as a supplement to formal training. DataCan is constantly working to improve its products. We must therefore reserve the right to change designs, materials, specifications and prices without notice. DataCan declines any liability that may arise out of the potential inaccuracies in this guide.

This guide assumes that you have some computing and tool knowledge. For more information, contact your local service representative.

www.datacan.ca

info@datacan.ca

We thank you for any feedback or comments that will help us to continue to improve our products and service.

2.1 Software Guides

Please refer to the “DataCan Software User Manual – VX.X.X.pdf” for detailed instructions on how to program, download and graph gauge data. The DataCan Download Software also:

- Allows users to generate reports.
- Has a detailed battery usage calculator.
- Provides a way to troubleshoot problems with the gauge electronics.

2.2 Quick Start and Operating Sheet

DataCan also provides a “Quick Start Guide.compressed.pdf” and “DataCan Gauge Operation Sheet.compressed.pdf” which should be used and referred to prior to using a gauge each run. These are available for download on our website and are also contained on the USB flash drive provided with DataCan gauges.

3 Introduction

DataCan Services Corp. provides technology driven downhole measurement solutions that deliver productivity, quality and safety. We design, manufacture and service 200°C plus hybrid platform instruments, patent pending multi-cycle instant close shut-in tools, reservoir management systems and a suite of quartz and piezo-resistive pressure measurement instruments. We offer specialized solutions that will help you improve productivity in your applications.

We are the leader in ultra-high temperature circuit design, manufacturing and packaging.

- Our part selection process ensures the best long term reliability is provided.
- Our fully automated surface mount assembly procedures ensure the highest quality circuit is constructed every time with minimal heat impact.
- Our Hybrid design and construction techniques will enable DataCan and its customers to reliably enter the 177°C to 225°C market.
- Our metal to metal seal and fully welded designs prevent potential leaks.

4 Introduction to Gauge Operation

4.1 Basic Memory Gauge Operation

One of the goals at DataCan is to make the operation of any product that we make as easy as possible for the user. One of the ways we do this is to make piezo and quartz memory gauges function very similar to one-another. Common to most DataCan memory gauges:

- They use a DataCan Download cable to connect the user's computer to the DataCan memory gauge.
- They use the DataCan Download Software to program, download, graph and diagnose / test gauges.
- The LED (light) on the battery pack should flash 16 times (1 blink per second) after the battery is first plugged in. This shows that the gauge is operating correctly.
- The user needs to record the date and time that the battery is plugged into the gauge. This information is used when the gauge is downloaded.
- The first program step in memory is usually a default 1 second per sample for 64 samples. This step is set by the DataCan Download Software. This program step helps the battery LED flash at the required 1 second rate and writes samples to memory that a user can download after just over a minute.
- Most gauges write samples to memory every 6 or 8 samples. That means caution should be taken at the end of a job to wait long enough for the gauge to write the most recent data to the gauge memory. As an example, if the user sample rate is 1 minute, you should wait at least 8 minutes after the gauge is pulled from the well before unplugging the battery to download data.
- The health of the gauge sampling circuit can be checked by running the "Utilities -> Diagnostic Mode" in the DataCan Download Software and clicking "Start Sampling".

- Memory gauges need a battery to operate, a battery barrel to protect the battery and electronics, o-rings to prevent leaks and a bull-nose or cross-over to protect the sensor.
- O-rings and batteries need to be looked at after every job. The user must also determine if new o-rings or a new battery should be used.
 - o Make sure the correct o-ring material is used for every single job.
 - o DataCan recommends using a new battery for each job.
- It is recommended that gauges are recalibrated by DataCan every year (or more frequently if you suspect a problem with the data).
- The Battery Calculator in the DataCan Download Software should be used before running a gauge to determine the best program settings / battery size for the expected job conditions (length of time, gauge type, expected bottom hole pressure).
- Downloaded data consists of a .txt file and a .bin file. Both file types should be kept as the .bin file can help DataCan support staff with troubleshooting problems.
- Once data is erased from memory it is permanently deleted. If you think you have data in the gauge memory that you cannot access, please contact DataCan support for help. Do not erase the gauge memory until you know you have downloaded all of the data the you need.

4.2 About Piezo Gauges

The piezo resistive sensor (or Silicon strain gauges, or Sapphire sensor) is small Silicon drum that uses changes in resistance to measure pressures and temperatures. A set of resistors are assembled in a Wheatstone bridge arrangement on the skin of the drum. As pressure acts on the drum, the skin and corresponding resistors stretch. The change in size of the resistors causes a change in the value of their resistance. DataCan measures the change in resistance and correlates this back to pressure values.

4.3 Quartz Sensor Technology

Quartz has two excellent characteristics which makes it an excellent material choice for pressure measurement

- 🍁 Quartz is Piezo-Electric
- 🍁 Quartz is a crystal

Piezo-Electric

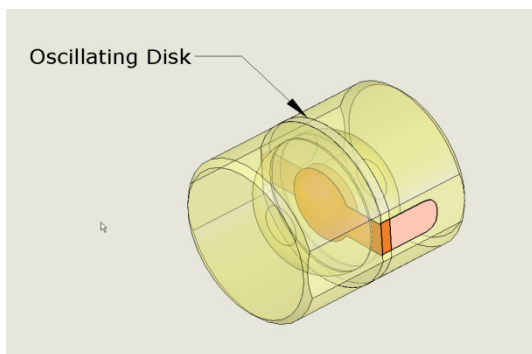
When a voltage is applied across quartz it will move. Conversely, if a force is applied to a quartz crystal a voltage will be produced. This piezo-electric property provides an opportunity for measuring forces. In a basic sense, a force such as pressure can be applied to a crystal of quartz and the resulting voltage can be measured electronically.

Crystal

Perfect crystalline structures are perfectly elastic and a perfectly elastic structure has no creep and therefore exhibits no hysteresis. When a force is applied to a piece of quartz the shape of the quartz will change, but when that force is removed, the shape of the quartz will return to its exact original shape. In non-crystalline structures, once the force is removed the material will maintain some residual stresses and never come back to its exact original shape.

DataCan uses the Quartzdyne® DXB pressure transducer in all of its quartz sensing products.

The Quartzdyne transducer uses a shear mode crystal disk assembled between two matching quartz crystal drums.

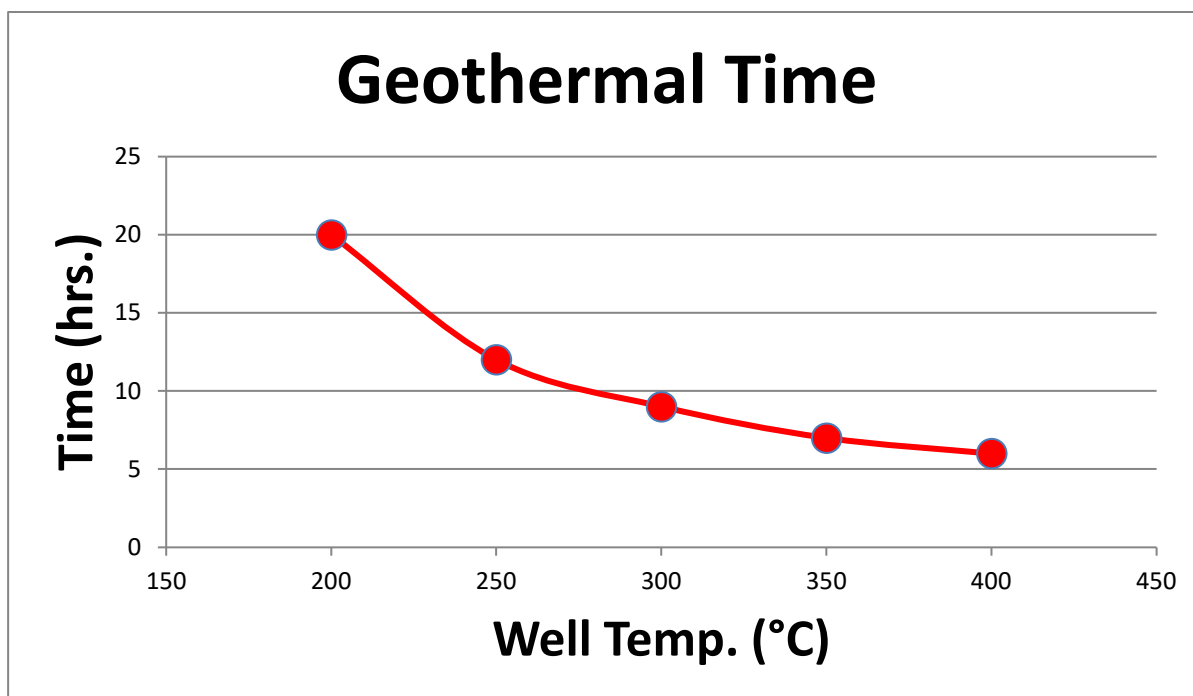


A signal is fed to the two metallic connections which causes the disk to oscillate like a drum. When the pressure surrounding the crystal assembly increases the oscillating disk is stretched and the frequency of oscillation changes.

4.4 Geothermal Flask Technology

The geothermal flask housing insulates internal electronics from the external environment. This allows DataCan to operate a tool at a much higher temperature for short periods of time.

The higher the external temperature, the shorter the tool assembly can be operated. Below is a basic graph showing the relationship between external temperature (Well Temp) and run time.



4.5 Gauge Accuracies at Low Pressure

Many of Datacan's customers function test equipment at atmospheric conditions. As such, apparent anomalies are often reported and questions about the accuracy of our products at atmospheric conditions have been raised. This section is included to help you understand how pressure sensors should be used.

The first thing to remember is that Datacan does not manufacture barometers. Barometers are specialized instruments for accurately measuring atmospheric pressure. Datacan's products are focused toward customers intending to measure very high pressures and as such, different types of sensor technologies are used. These technologies function for their intended purpose very well but have limitations for low pressure measurement, so it is important to understand that the atmospheric condition is not the intended usage.

Gauge Type	Low Pressure Threshold	Expected Accuracy at Low Pressure
Piezo	50 psi	0.25%
Quartz	200 psi	0.1%
Burst	1000 psi	None

Accuracy below the low pressure threshold is not guaranteed. Datacan guarantees that the instruments will meet stated accuracy specifications from the low pressure threshold to full scale. Below the low pressure threshold non-linear effects may increase ambient pressure readings. Operational range is from 0 to full scale.

For piezo and quartz gauges, Datacan uses a window of 9-19 psia (+/-5psi) as an acceptable atmospheric reading at time of shipping

5 Recommended Maintenance Schedule

	Recommended Frequency
O-rings	Each job (every time a gauge is run in a well) the user should change the o-rings. IMPORTANT: Make sure the correct o-ring material is used for the well conditions.
Batteries	Each job (every time a gauge is run in a well) a new battery should be used. IMPORTANT: Make sure the battery temperature rating is above the well temperature as batteries will explode if run above their rating.
Calibration / Inspection / Maintenance	Annually, gauges should be returned to DataCan to be recalibrated, have the sensor o-ring(s) changed and have the gauge put through DataCan's quality control process to ensure the highest gauge reliability.
Housings, bullnoses, crossovers, carriers	Before and after each job inspect the mechanical components of the gauge and accessories. If anything is damaged it must be replaced. If anything is showing signs of wear, contact DataCan to determine if it should be replaced.

6 Tool Assembly and Operation

6.1 Pressure Gauges

6.1.1 Tool Inspection

- Every DataCan memory gauge is shipped in its assembled state without the battery pack. Ensure that the shipment includes all of the components and accessories that were requested.
- Record the serial number of each gauge making sure that the pressure and temperature rating of the tool match your job requirements.
- It is very important that the operating temperature of the battery pack supplied exceeds the bottom hole temperature of the job.
- Unless otherwise specified each piezo memory gauge will be shipped with Viton® 90 O-Rings on the battery barrel connection. Refer to the “O-Ring Selection Guide” in 6.2.3 to ensure that the default Viton® 90 elastomer is suitable for your environment. If new O-Rings are required refer to the O-Ring removal and installation guideline below. Ensure that the O-Rings are adequately lubricated using a minimal amount of O-Ring grease. Inspect the male threads; they should be clean and undamaged.

6.1.2 Operating Sequence

In general, the following sequence of events is required to operate a DataCan memory pressure gauge:

- Connect the gauge to a computer using the DataCan communication cable.
- Program the gauge using DataCan Download Software for Windows®
- Disconnect the gauge from the DataCan communication cable.

- Assemble the tool (see Section 6.1.3-6.1.24)
- Ensure tool specs meet requirements for the job
- Ensure battery temperature rating exceeds the downhole temperature
- Run the tool down hole.
- Remove the tool from the well.
- Remove the battery housing and unplug the battery pack. This action stops the gauge.
- Reconnect the DataCan communication cable to the gauge and computer to down load and process the data

6.1.3 ½" Piezo Tool Assembly

The following sequence of events is required to assemble a DataCan 0.50" Piezo gauge.

- Start with the piezo sensor assembly.



- Install a 2-011 o-ring on the housing as shown (see Section 6.2 for proper o-ring installation).



- Thread the bullnose or crossover onto the assembly.



- Align the male key or lug on the battery pack to the female key on the electronics assembly. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the memory module. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



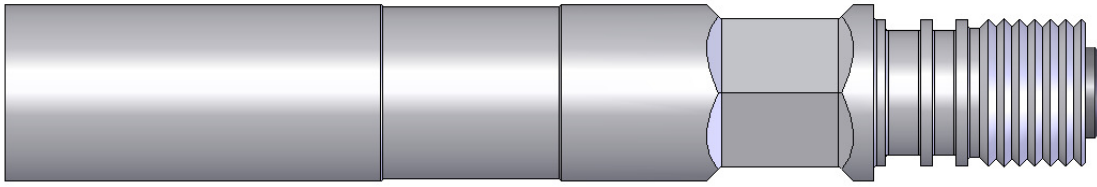
- Thread on the battery housing.



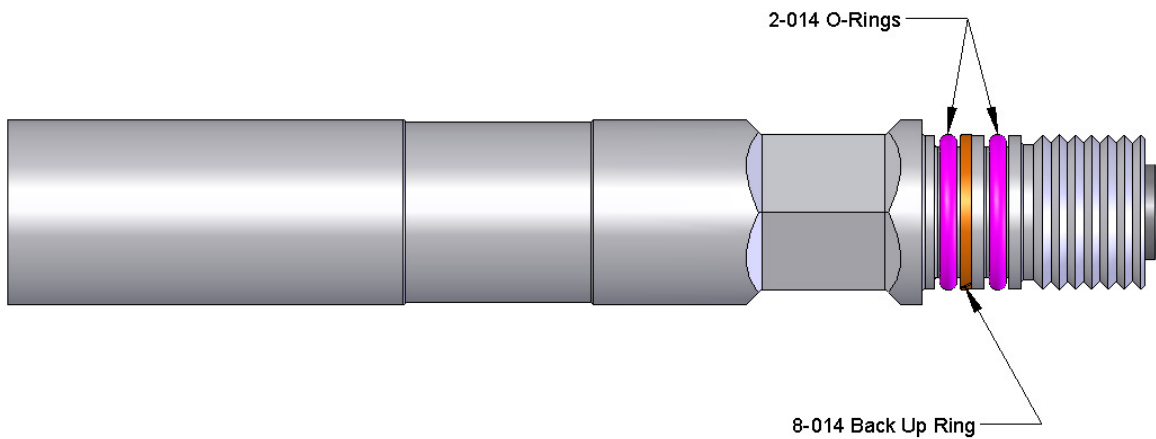
6.1.4 ¾" Piezo Tool Assembly

The following sequence of events is required to assemble a DataCan 0.75" Piezo gauge.

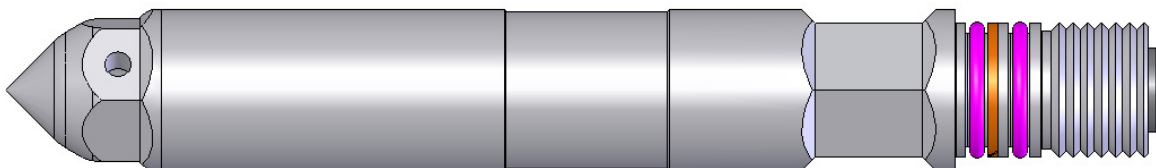
- Start with the piezo sensor assembly.



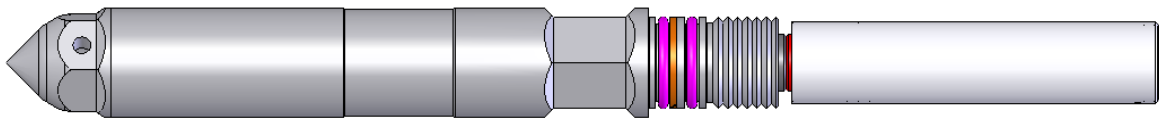
- Install a 2-014 o-ring and a 8-014 back up ring on the housing as shown (see Section 6.2 for proper o-ring installation).



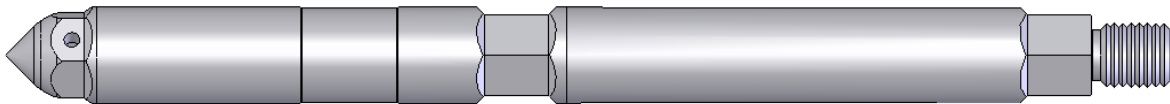
- Thread the bullnose or crossover onto the assembly.



- Align the male key or lug on the battery pack to the female key on the electronics assembly. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the memory module. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



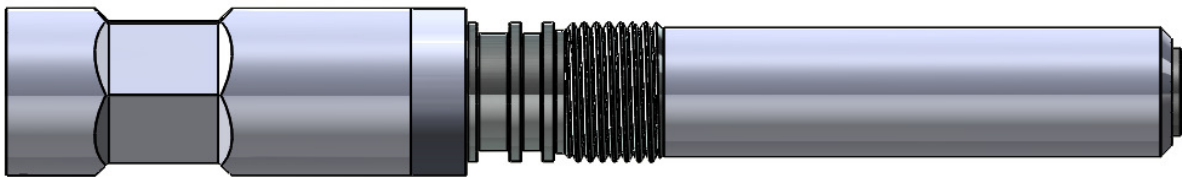
- Thread on the battery housing.
-



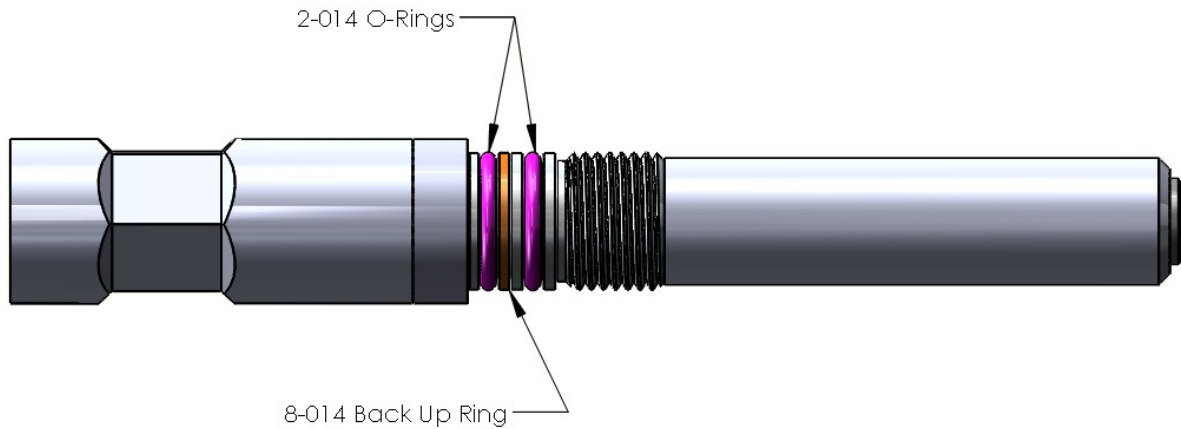
6.1.5 ¾" Welded Piezo Tool Assembly

The following sequence of events is required to assemble a DataCan 0.75" Welded Piezo gauge.

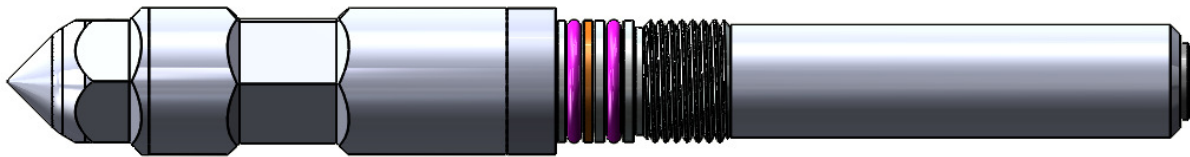
- Start with the piezo sensor assembly.



- Install a 2-014 o-ring and a 8-014 back up ring on the housing as shown (see Section 6.2 for proper o-ring installation).



- Thread the bullnose or crossover onto the assembly.



- Align the male key or lug on the battery pack to the female key on the electronics assembly. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the memory module. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



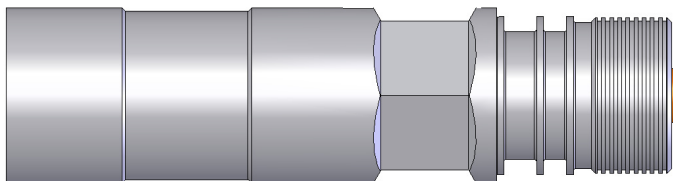
Thread on the battery housing.



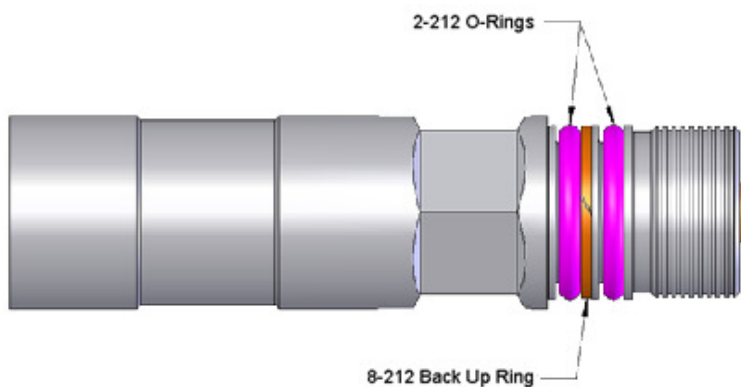
6.1.6 1 1/4" Piezo Tool Assembly

The following sequence of events is required to assemble a DataCan 1.25" Piezo gauge.

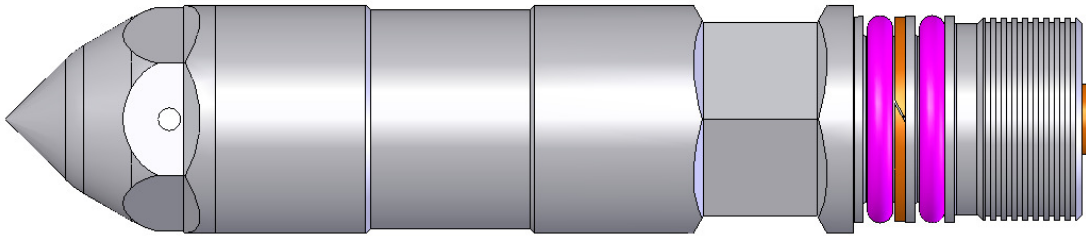
- Start with the piezo sensor assembly.



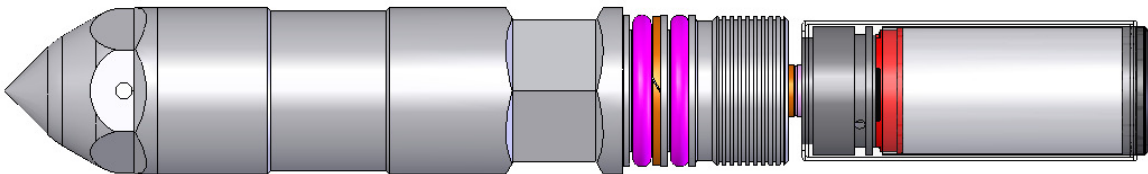
- Install two 2-212 o-rings and an 8-212 back up ring on the housing as shown (see Section 6.2 for proper o-ring installation).



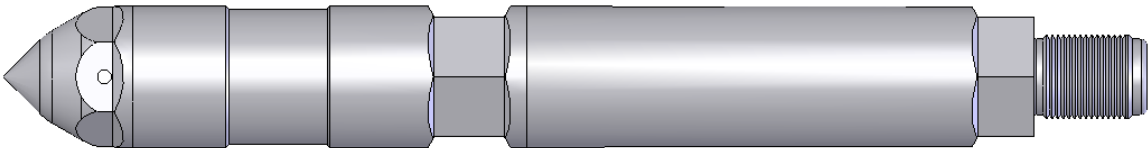
- Thread the bullnose or crossover onto the assembly.



- Align the male key or lug on the battery pack to the female key on the electronics assembly. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the electronics assembly. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



- Thread on the battery housing.



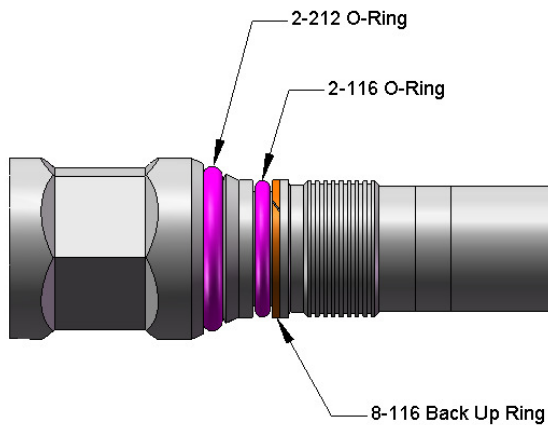
6.1.7 1 ¼" Piezo Welded II Tool Assembly

The following sequence of events is required to assemble a DataCan 1.25" Welded II Piezo gauge.

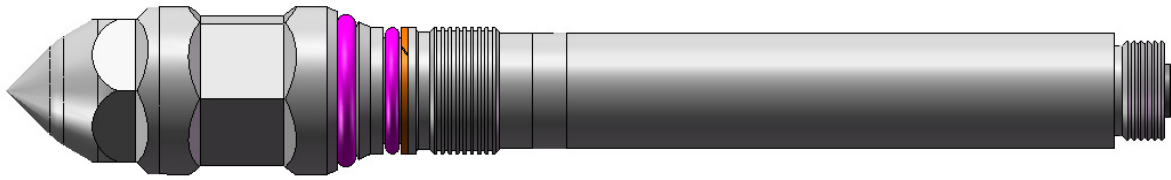
- Start with the piezo sensor assembly



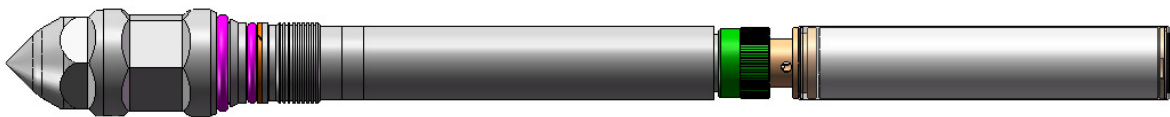
- Install a 2-212 o-ring, 2-116 o-ring and an 8-116 back up ring on the housing as shown (see Section 6.2 for proper o-ring installation).



- Thread the bullnose or crossover onto the assembly.



- Align the male key or lug on the battery pack to the female key on the electronics assembly. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the memory module. Thread the battery pack into the electronics housing. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



- Thread on the battery housing



6.1.81 ¼" Burst Memory Pressure Gauge Tool Programming

Section 7.4 of the "DataCan Software User Manual" describes programming the burst gauge.

The most commonly used program is:

Step 1: Default

Step 2: 1 second sample rate with a 30 day duration, "DeltaP" "Trigger Mode"

The most commonly used "DeltaP" mode settings (see section 7.4.4 of the "DataCan Software User Manual") are:

- Pressure Change (psi) – 300
- Burst Rate (sample / second) – 32 kHz (16 seconds)
- Window Length (milliseconds) – 35.0

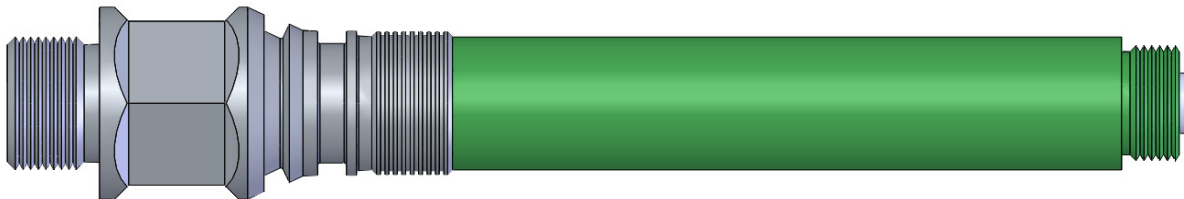
The Burst Memory Pressure Gauge operates like a standard memory tool in “Off” “Trigger Mode”. When in “AbsoluteP” or “DeltaP” “Trigger Mode” the gauge samples normal pressure and temperature data at the user programmed (slow) sample rate, but is also recording fast data at 10,000 samples / second. This 10,000 samples / second data is used to determine when the gauge should trigger a burst. When a burst is triggered, the gauge will temporarily stop sampling slow data and start sampling at the user programmed “Burst Rate” (either 16 kHz or 32 kHz). Once the trigger event is complete, approximately 0.9 seconds of 10,000 samples / second data from immediately before the trigger event occurred (called “pre-burst data”) is also written to the gauge memory. Once this memory write is complete, the gauge goes back to sampling slow data to memory and sampling fast data at 10,000 samples per second, checking for the next trigger event. There should be less than a 1 second gap between both:

- the slow data and the start of a burst event; and,
- the end of a burst event and the slow data starting again.

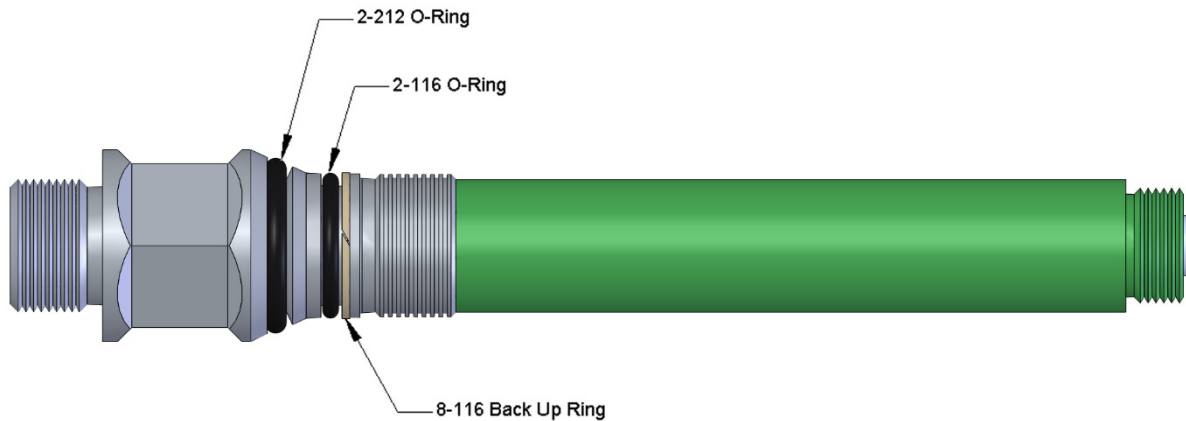
6.1.9 1 ¼” Burst Memory Pressure Gauge Tool Assembly

The following sequence of events is required to assemble a DataCan 1.25” Burst gauge.

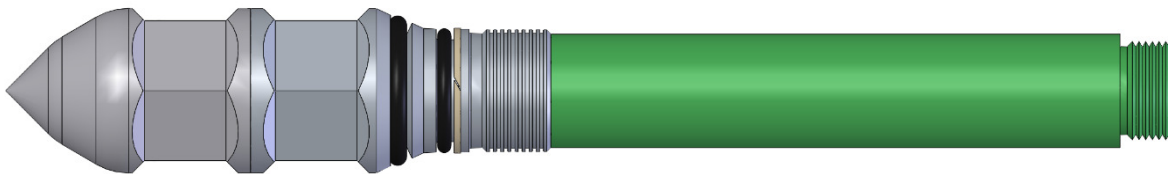
- Start with the Burst gauge sensor assembly.



- Install a 2-212 o-ring, 2-116 o-ring and an 8-116 back up ring on the housing as shown (see Section 6.2 for proper o-ring installation).



- Thread the bullnose or crossover onto the assembly.



- Align the male key or lug on the battery pack to the female key on the electronics assembly. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the memory module. Thread the battery pack into the electronics housing. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



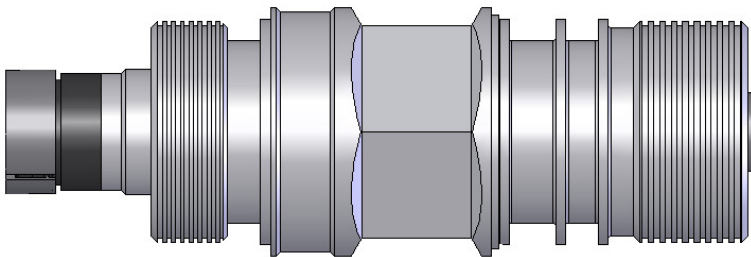
- Thread on the battery housing



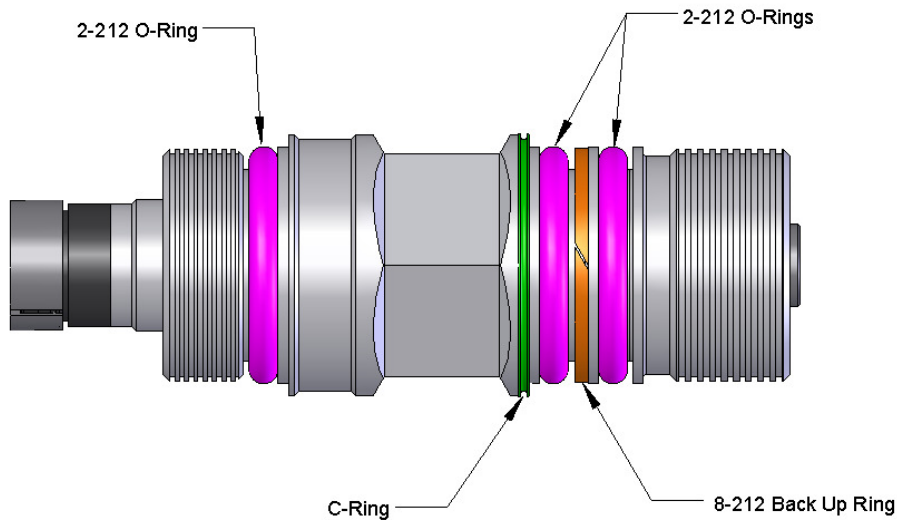
6.1.10 1 ¼" Welded III Piezo Tool Assembly

The following sequence of events is required to assemble a DataCan 1.25" Welded III Piezo gauge.

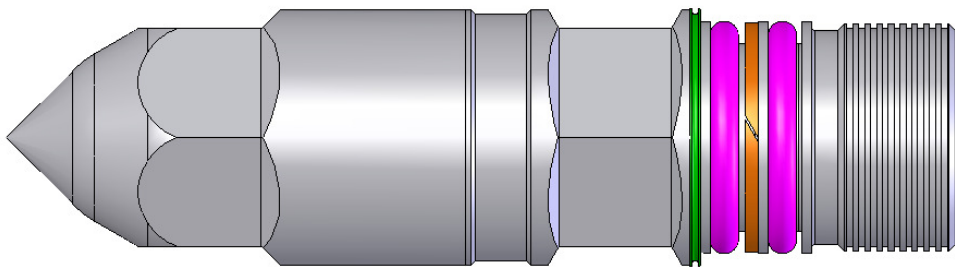
- Start with the piezo sensor assembly



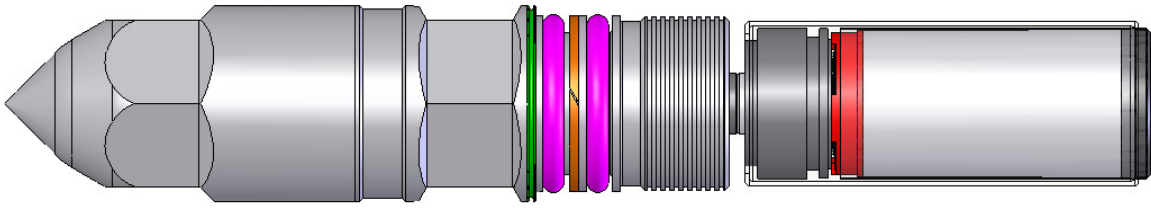
- Install three 2-212 o-rings, the 8-116 back up ring and the c-ring on the housing as shown (see Section 6.2 for proper o-ring installation).



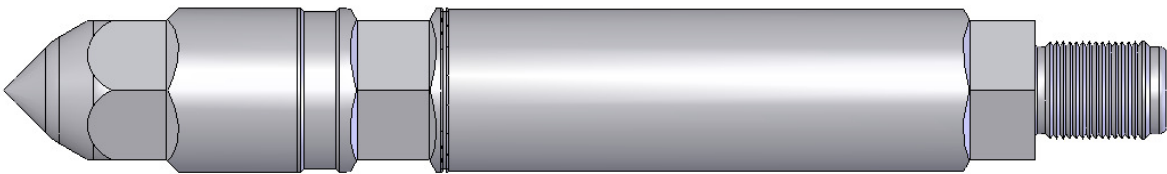
- Thread the bullnose or crossover onto the assembly.



- Align the male key or lug on the battery pack to the female key on the electronics assembly. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the memory module. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



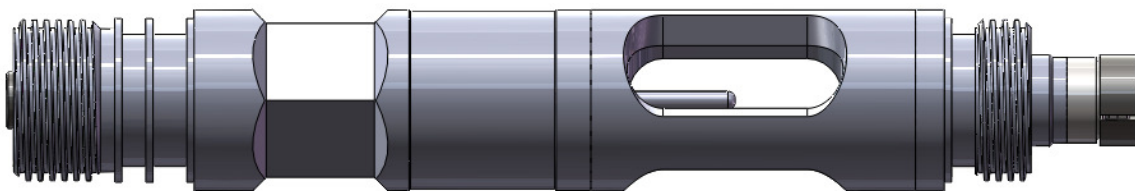
- Thread on the battery housing



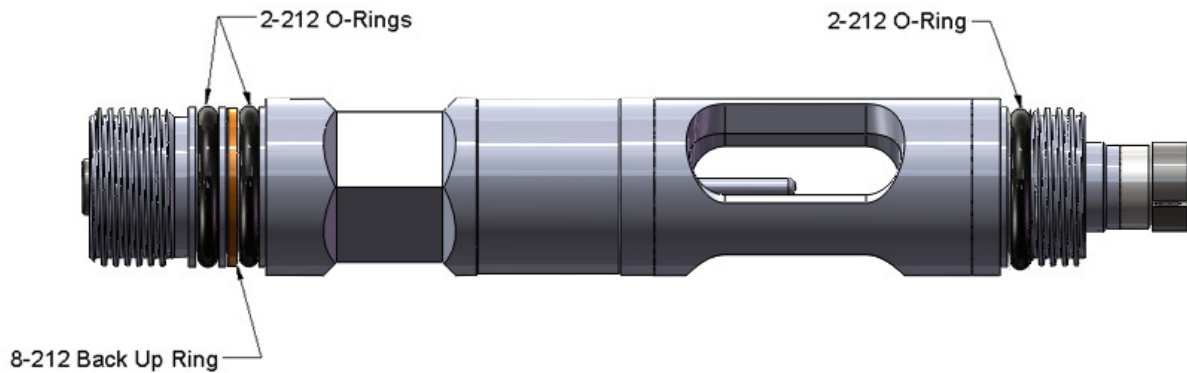
6.1.11 1 1/4" Welded Piezo RTD Tool Assembly

The following sequence of events is required to assemble a DataCan 1.25" Welded Piezo RTD gauge.

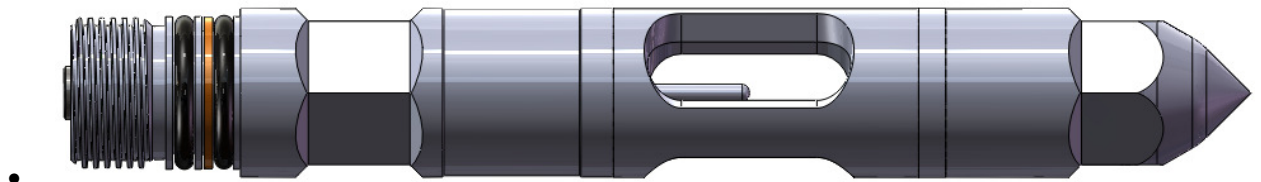
- Start with the piezo sensor assembly



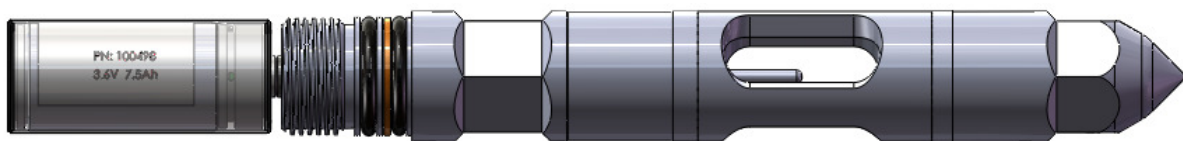
- Install three 2-212 o-rings and a 8-212 back up ring on the housing as shown (see Section 6.2 for proper o-ring installation).



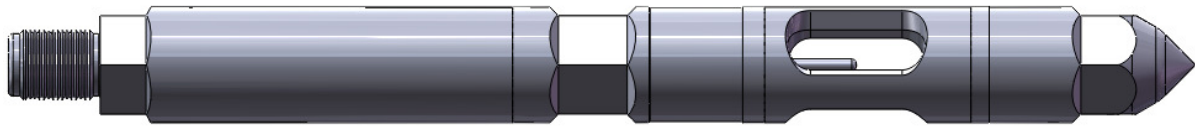
- Thread the bullnose or crossover onto the assembly.



- Align the male key or lug on the battery pack to the female key on the electronics assembly. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the memory module. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



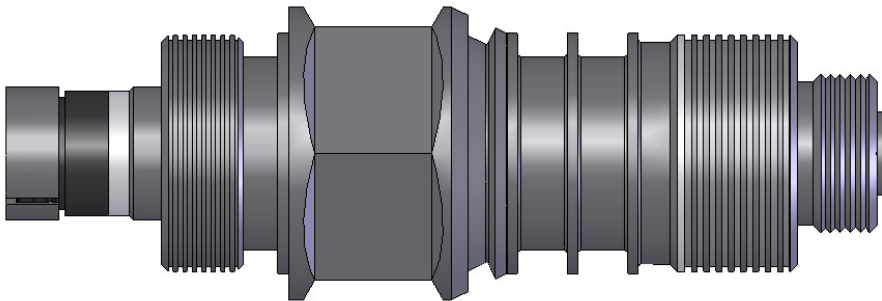
- Thread on the battery housing



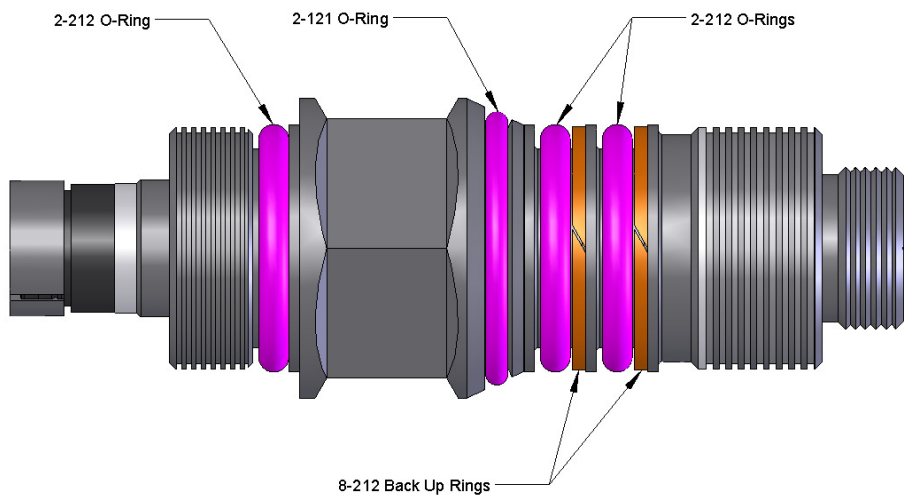
6.1.12 1 3/8" Piezo Welded Tool Assembly

The following sequence of events is required to assemble a DataCan 1.375" Welded Piezo gauge.

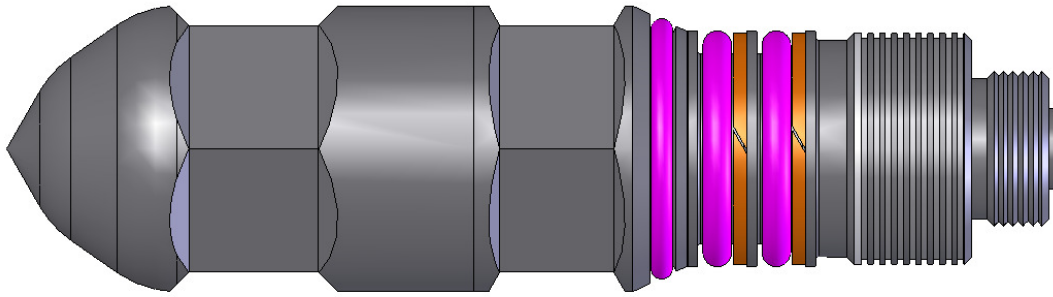
- Start with the piezo sensor assembly



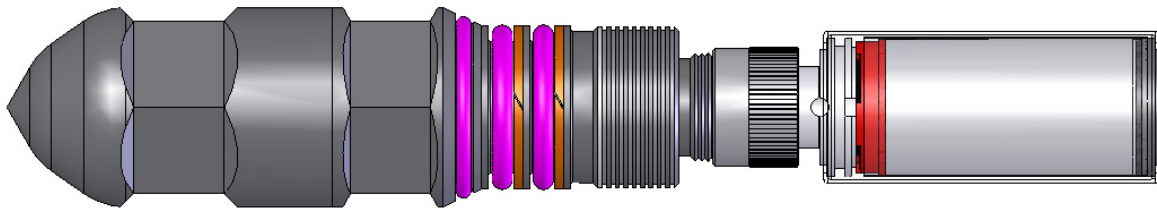
- Install a 2-121 o-ring, three 2-212 o-rings and two 8-212 back up rings on the housing as shown (see Section 6.2 for proper o-ring installation).



- Thread the bullnose or crossover onto the assembly.



- Align the male key or lug on the battery pack to the female key on the electronics assembly. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the memory module. Thread the battery pack into the electronics housing. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



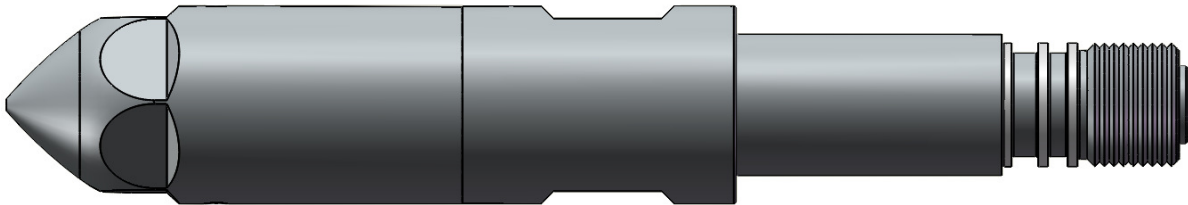
- Thread on the battery housing



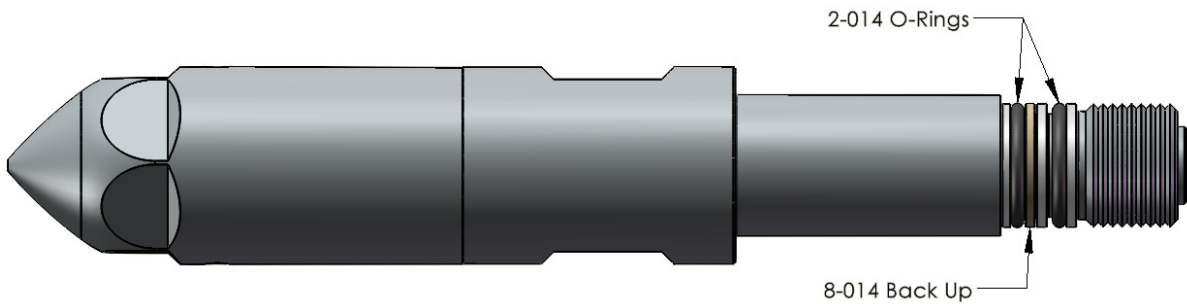
6.1.13 1" Piezo Sidepocket Tool Assembly

The following sequence of events is required to assemble a DataCan 1.0" Sidepocket Piezo gauge.

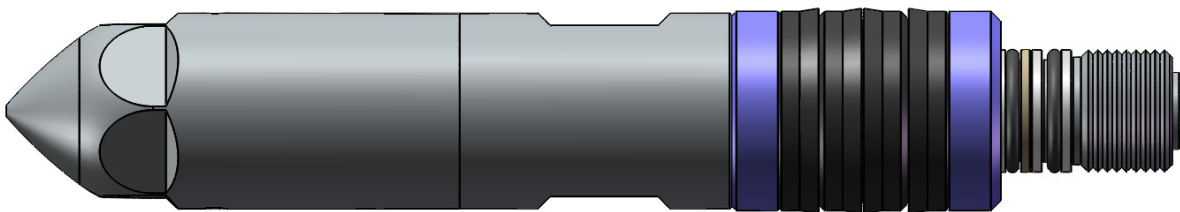
- Start with the piezo sensor assembly. The bullnose should already be attached.



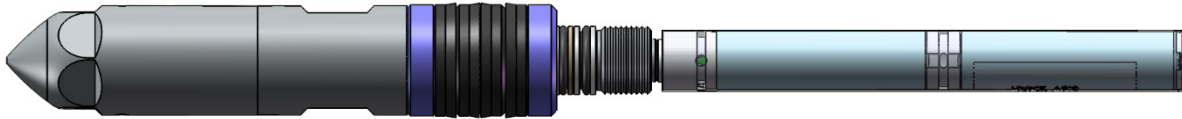
- Install two 2-014 o-rings on the housing as shown (see Section 6.2 for proper o-ring installation).



- Slide first vee-packing set onto the assembly.



- Align the male key or lug on the battery pack to the female key on the electronics assembly. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the memory module. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



- Thread on the battery housing.



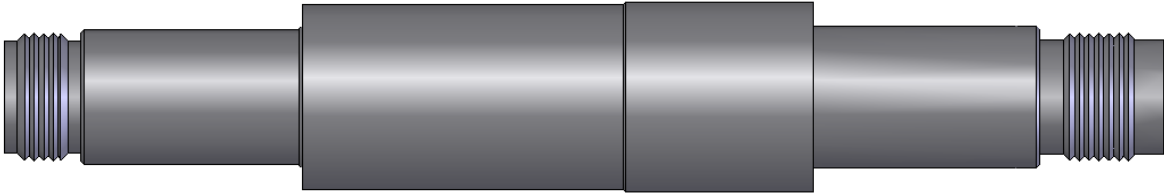
- Slide on second v-packing.



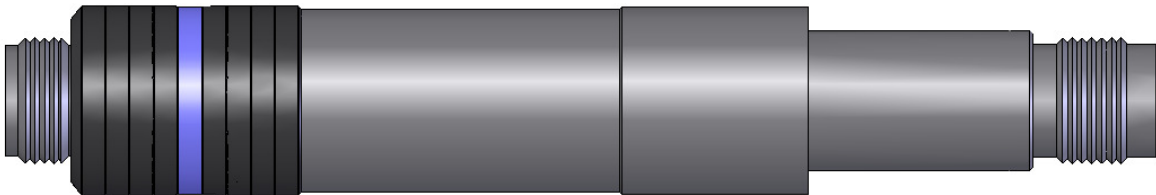
6.1.14 1 ½" Piezo Sidepocket Tool Assembly

The following sequence of events is required to assemble a DataCan 1.5" Sidepocket Piezo gauge.

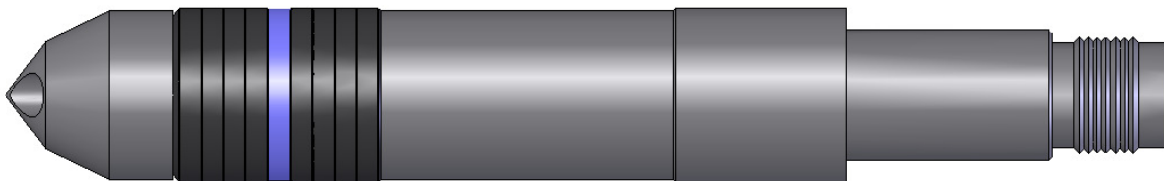
- Assemble a 0.75 piezo tool (Section 6.2) with a bullnose and a 1 x AA battery pack.
- Start with the lower housing of the sidepocket piezo



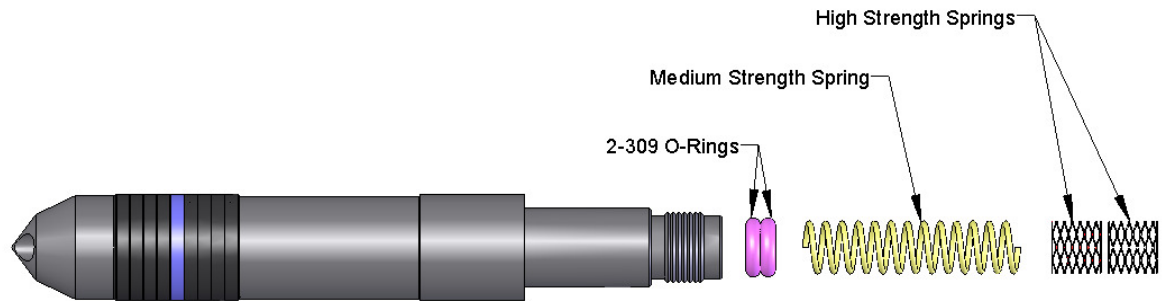
- Slide lower assembly vee-packing (smaller one) onto the bottom of the lower housing.



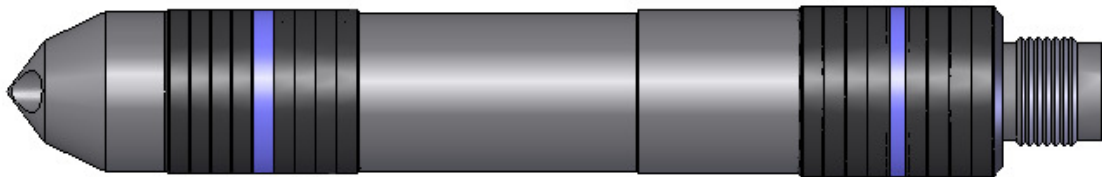
- Thread the bullnose onto the lower housing.



- Insert two high strength springs into the lower housing followed by a medium strength spring and two 2-309 o-rings.



- Slide upper assembly vee-packing onto other end of lower assembly.



- Insert two high strength springs into the upper housing followed by a medium strength spring and two 2-309 o-rings



- Place assembled piezo gauge into the lower housing with the bullnose on the inside.



- Thread the upper housing onto the lower housing



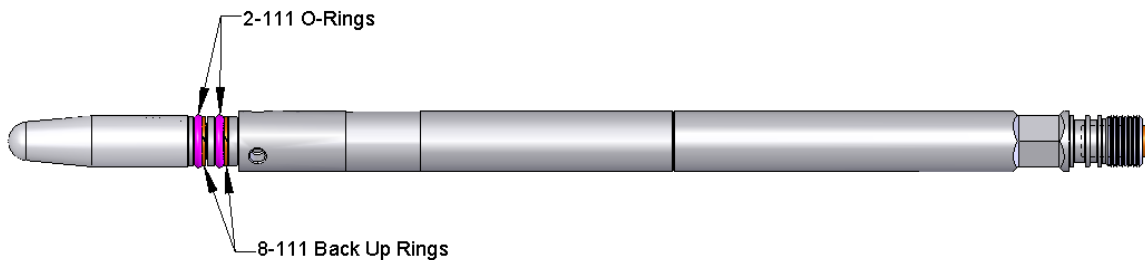
6.1.15 3/4" Quartz DXB II Tool Assembly

The following sequence of events is required to assemble a DataCan 0.75" Quartz DXB II gauge.

- Start with the Quartzdyne sensor assembly



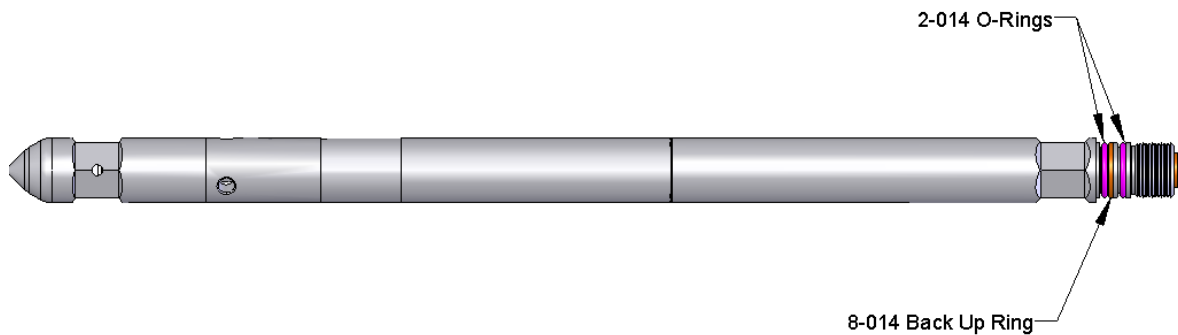
- Thread the o-ring installation tool on to the transducer as shown to protect the sensor. Install two 2-111 o-rings and two 8-116 backup rings (see Section 6.2 for proper o-ring installation) on the Quartzdyne transducer as shown. Remove the o-ring installation tool when finished. These o-rings are not for normal operation and therefore do not need to be replaced after every job. They are used in applications where the gauge is used with a pressure fitting.



- Thread the bullnose or crossover on to the Quartzdyne transducer



- Install two 2-014 o-rings and a 8-014 back up ring (see Section 6.2 for proper o-ring installation) on the pressure sub as shown



- Align the male key or lug on the battery pack to the female key on the electronics assembly. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the electronics assembly. Thread the battery pack into the electronics housing. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



- Thread on the battery housing



6.1.16 3/4" Quartz DXB II Tool Memory Module Replacement

The following sequence of events is required to replace the memory module of an already assembled DataCan 0.75" Quartz DXB gauge.

- Starting with the Quartzdyne sensor and battery housing assembly



- Unthread the battery housing from the electronics housing



- Next remove the battery pack. Pull the battery pack away from the electronics assembly without turning or twisting.



- Remove the 2-014 o-rings and 8-014 back-up from the electronics housing. New o-rings should be used and will be added in a future step.



- Remove the electronics housing by unthreading it from the transducer housing



- Unthread the collar of the memory module from the transducer housing. Without turning or twisting, pull the memory module away from the transducer assembly.



- Remove the two 2-014 o-rings and 8-014 back-up from the transducer housing. Replace with new o-rings and back-up (see Section 6.2 for proper o-ring installation).



- Align the 7-pin male key on the transducer assembly to the 7-pin female key on the replacement memory module assembly. Without turning or twisting, push the memory module towards the transducer assembly. Thread the collar of the memory module into the transducer housing.



- Replace the electronics housing by sliding it over the memory module and threading it onto the transducer housing.



- This is how the 3/4" Quartz DXB II gauge is shipped. Finish assembling the gauge by following the sequence of events required to assemble a DataCan 0.75" Quartz DXB II gauge listed in the previous section (3/4" Quartz DXB II Tool Assembly).

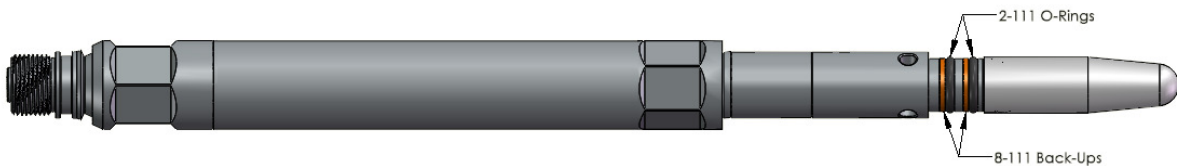
6.1.17 1" Quartz DXB Tool Assembly

The following sequence of events is required to assemble a DataCan 1.0" Quartz DXB gauge:

- Start with the Quartzdyne sensor assembly



- Thread the o-ring installation tool on to the transducer as shown to protect the sensor. Install the 2-111 o-rings and 8-111 back-ups (see Section 6.2 for proper o-ring installation) on the Quartzdyne transducer as shown. Remove the o-ring installation tool when finished. These o-rings are not for normal operation and therefore do not need to be replaced after every job. They are used in applications where the gauge is used with a pressure fitting.



- Thread the bullnose or crossover on to the Quartzdyne transducer. The recommended torque is 45 ft*lbs.



- Install a 2-115 O-ring followed by a 2-016 O-ring and 8-016 backup (see Section 6.2 for proper O-ring installation) on the pressure sub as shown



- Align the male key or lug on the battery pack to the female key on the gauge. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the gauge. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



- Thread on the battery housing.



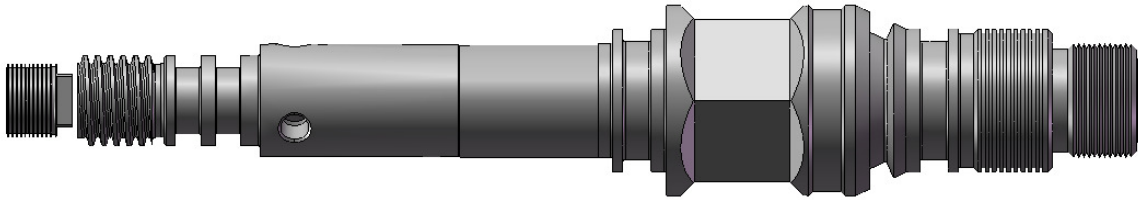
Note: When using the HF4 crossover (PN 114237), the recommended make up torque for the HF4 connection is 60 ft*lbs.



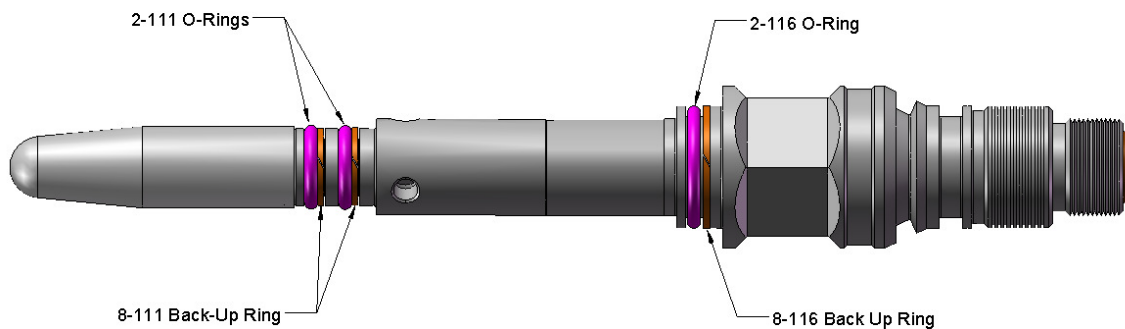
6.1.18 1 ¼" Quartz DXB Tool Assembly

The following sequence of events is required to assemble a DataCan 1.25" Quartz DXB gauge:

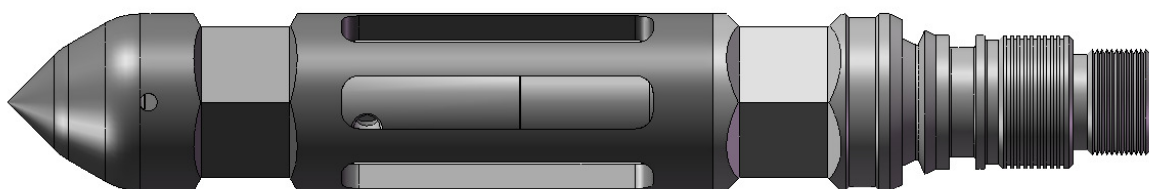
- Start with the Quartzdyne sensor assembly



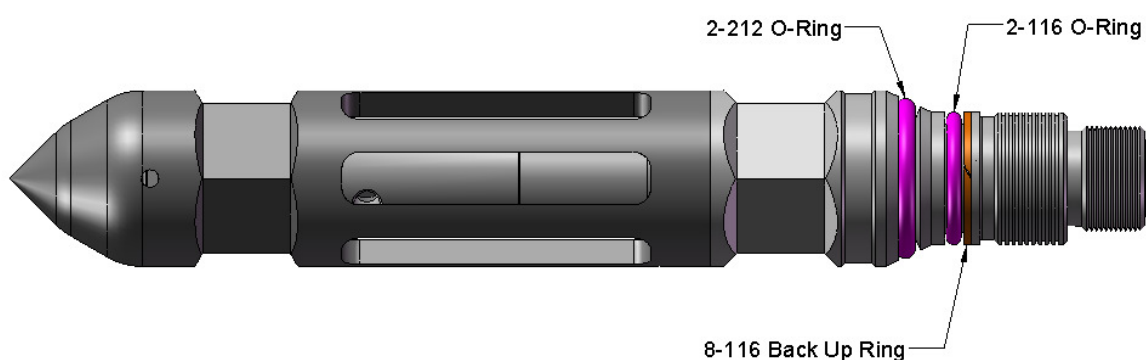
- Thread the o-ring installation tool on to the transducer as shown to protect the sensor. Install a 2-116 o-ring and an 8-116 backup followed by the 2-111 o-rings and 8-111 back-ups (see Section 6.2 for proper o-ring installation) on the Quartzdyne transducer as shown. Remove the o-ring installation tool when finished. These o-rings are not for normal operation and therefore do not need to be replaced after every job. They are used in applications where the gauge is used with a pressure fitting.



- Thread the bullnose or crossover on to the Quartzdyne transducer. The recommended torque is 45 ft*lbs.



- Install a 2-212 o-ring followed by a 2-116 o-ring and 8-116 backup (see Section 6.2 for proper o-ring installation) on the pressure sub as shown



- Align the male key or lug on the memory module to the female key on the electronics assembly. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the memory module towards the electronics assembly. Thread the memory module onto the electronics housing.



- Align the male key or lug on the battery pack to the female key on the memory module. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the memory module. Thread the battery pack into the memory module. The LED located at the top of the battery pack

should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



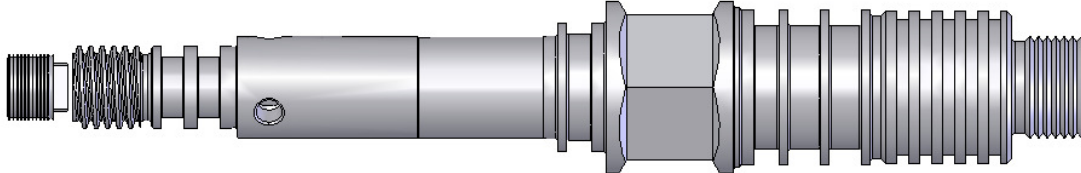
- Thread on the battery housing and tighten to 90 ft·lbs using the provided torque wrench



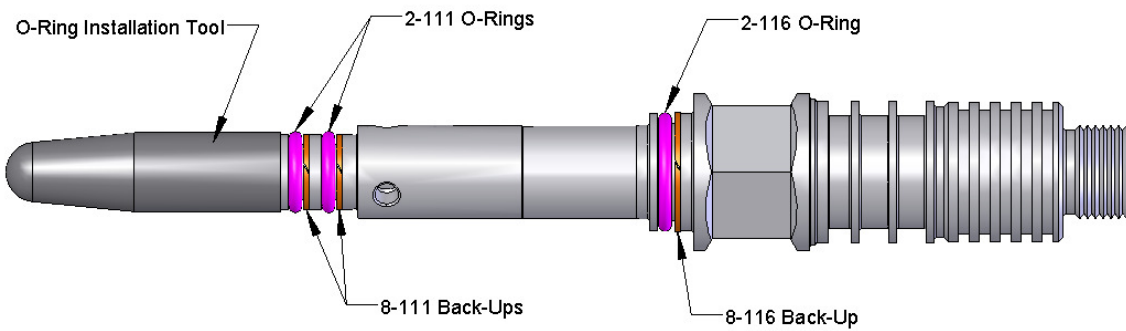
6.1.19 1 ¼" Quartz DXB 2 Tool Assembly

The following sequence of events is required to assemble a DataCan 1.25" Quartz DXB 2 gauge:

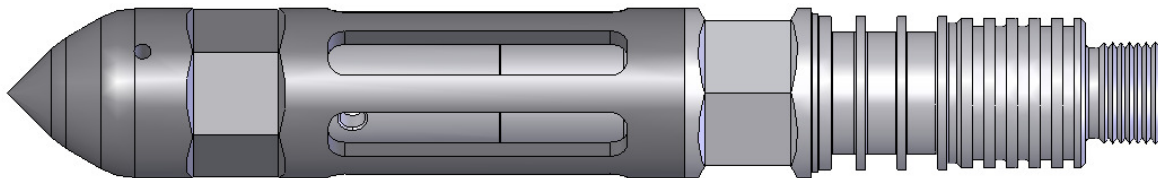
- Start with the Quartzdyne sensor assembly



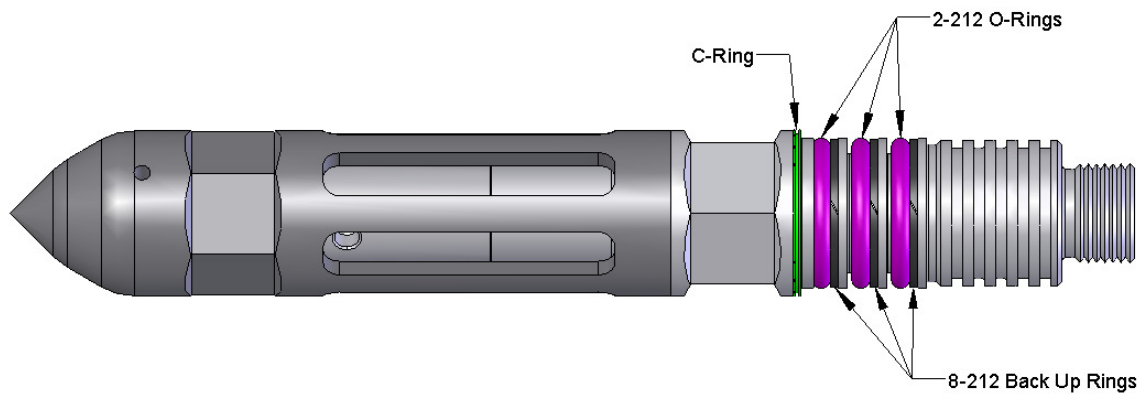
- Thread the o-ring installation tool on to the transducer as shown to protect the sensor. Install a 2-116 o-ring and an 8-116 backup followed by the 2-111 o-rings and 8-111 back-up rings (see Section 6.2 for proper o-ring installation) on the Quartzdyne transducer as shown. Remove the o-ring installation tool when finished. These o-rings are not for normal operation and therefore do not need to be replaced after every job. They are used in applications where the gauge is used with a pressure fitting.



- Thread the bullnose or crossover on to the Quartzdyne transducer. The recommended torque is 45 ft*lbs.

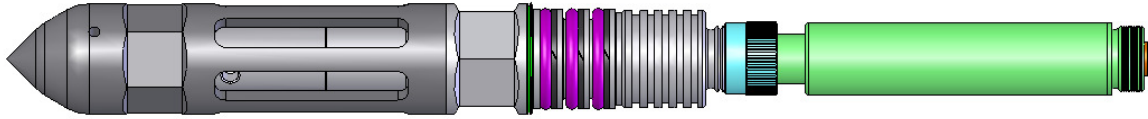


- Install three 2-212 o-rings, three 8-212 back up rings (see Section 6.2 for proper o-ring installation) and a c-ring on the pressure sub as shown



- Align the male key or lug on the memory module to the female key on the electronics assembly. A small red dot on the connectors indicates the position of the respective keys.

Without turning or twisting, push the memory module towards the electronics assembly.
Thread the memory module onto the electronics housing.



- Align the male key or lug on the battery pack to the female key on the memory module. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the memory module. Thread the battery pack into the memory module. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



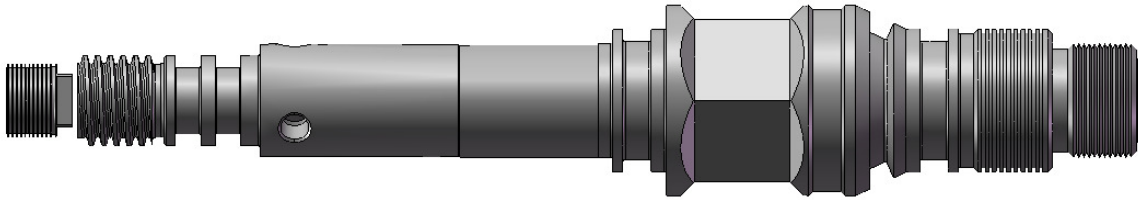
- Thread on the battery housing and tighten to 90 ft-lbs using the provided torque wrench



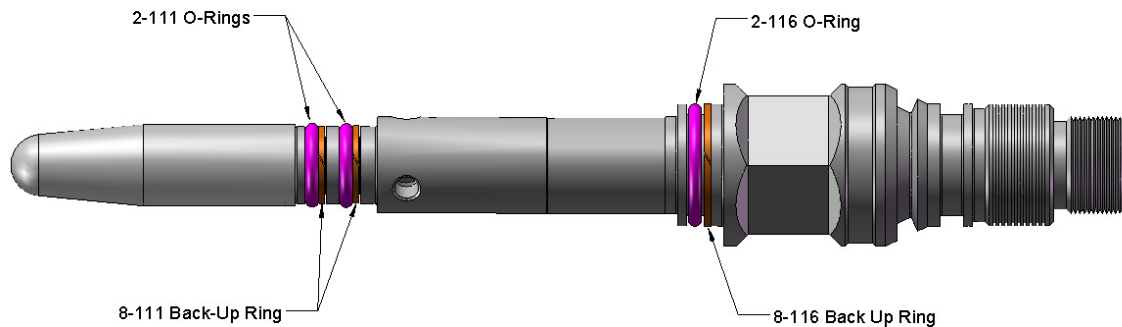
6.1.20 1 ¼" Quartz SRO Tool Assembly

The following sequence of events is required to assemble a DataCan 1.25" Quartz SRO gauge:

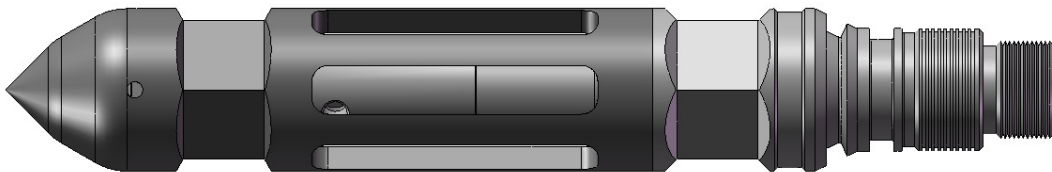
- Start with the Quartzdyne sensor assembly.



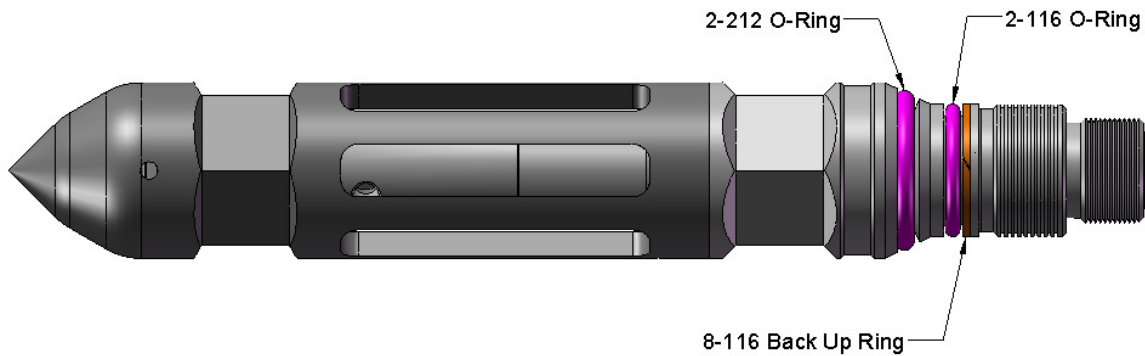
- Thread the o-ring installation tool on to the transducer as shown to protect the sensor. Install a 2-116 o-ring and an 8-116 backup followed by the 2-111 o-rings and 8-111 back-ups (see Section 6.2 for proper o-ring installation) on the Quartzdyne transducer as shown. Remove the o-ring installation tool when finished. These o-rings are not for normal operation and therefore do not need to be replaced after every job. They are used in applications where the gauge is used with a pressure fitting.



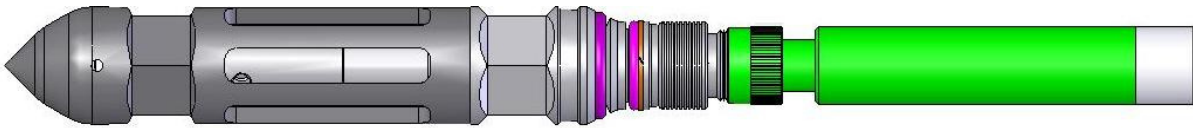
- Thread the bullnose or crossover on to the Quartzdyne transducer



- Install the 2-212 o-ring, followed by the 2-116 o-ring and 8-116 back-up (see Section 6.2 for proper o-ring installation) on the pressure sub as shown



- Align the male key or lug on the SRO module to the female key on the Quartzdyne transducer assembly. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the memory module towards the electronics assembly. Thread the SRO module onto the Quartzdyne transducer assembly.



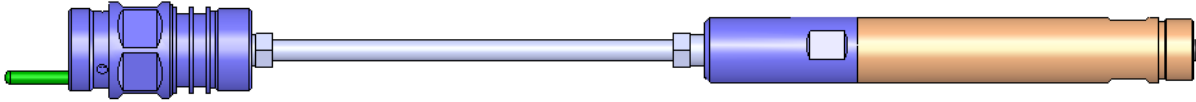
- Thread on the SRO housing



6.1.21 1 11/16" Geothermal (Flask) Tool Assembly

The following sequence of events is required to assemble a DataCan 1.6875" Geothermal gauge:

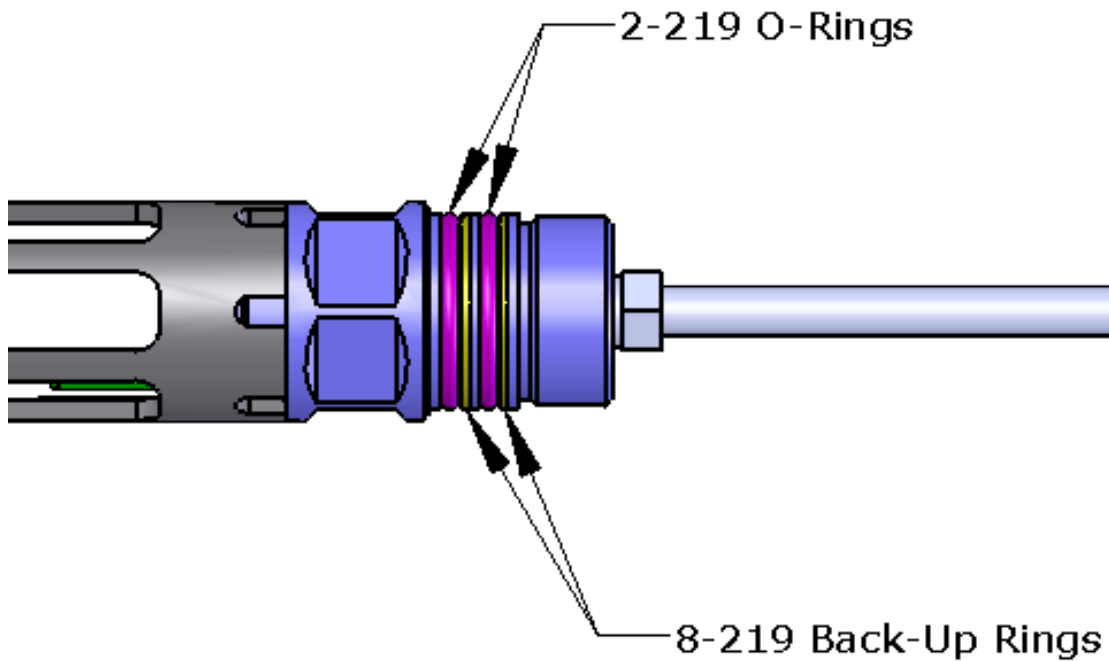
- Start with the sensor and RTD assembly



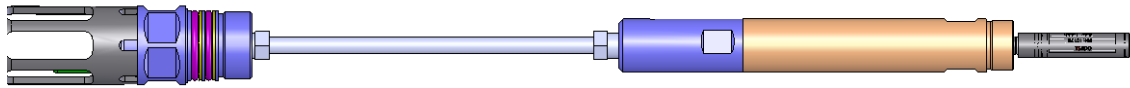
- Thread the bullnose onto the tool as shown.



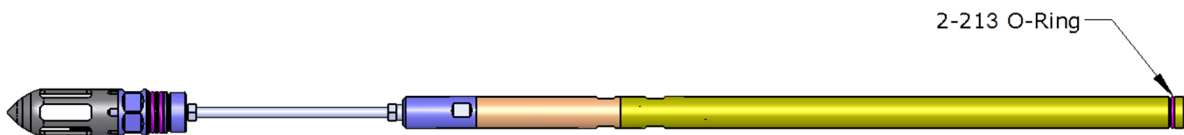
- Install the 2-219 o-rings and the 8-219 backups (see Section 6.2 for proper o-ring installation) on the RTD housing as shown.



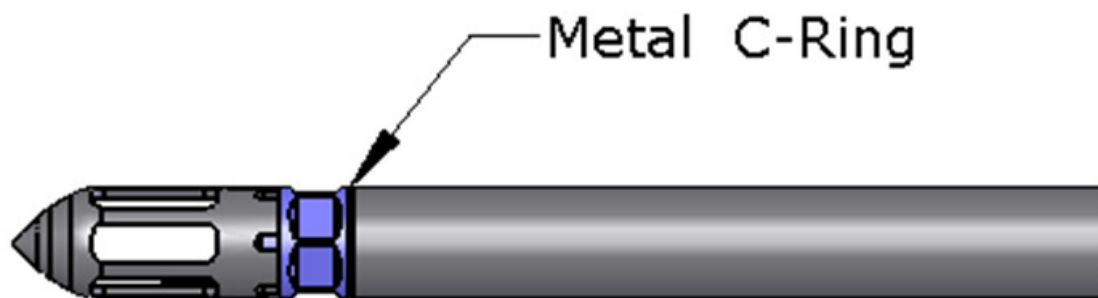
- Align the male key or lug on the battery pack to the female key on the electronics housing. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the memory module. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



- Thread the battery housing onto the tool as shown. Install a 2-213 o-ring on the battery housing as shown.



- Place the metal c-ring onto the RTD housing in the position shown. Thread the flask housing onto the tool and tighten to 80-90 ft*lbs of torque. **The geothermal tool must be positioned in a vertical manner while threading on the flask housing, attempting to thread the housing onto the tool while horizontal places too much strain on the threads.**

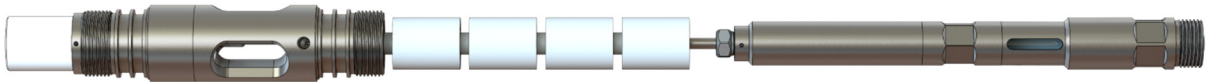


- Tighten the flask housing to a torque of 80-90 ft*lbs. This will energize the Metal C-Ring.

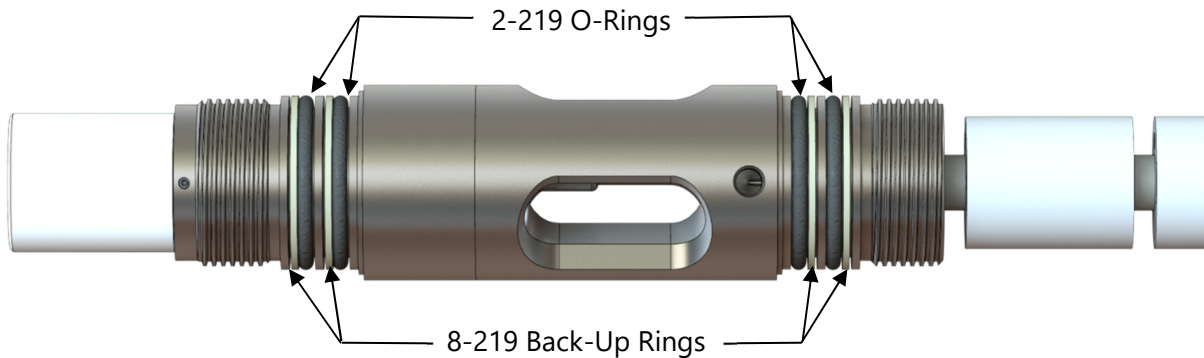
6.1.22 1 3/4" Geothermal (Flask) PTF Tool Assembly

The following sequence of events is required to assemble a DataCan 1.75" Geothermal PTF gauge:

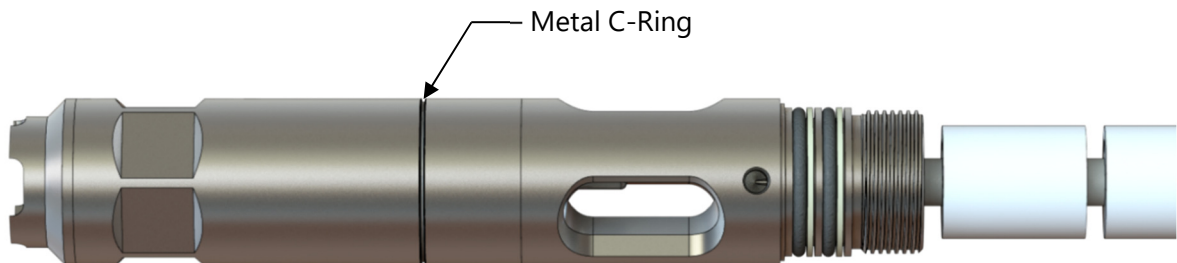
- Start with the sensor and RTD assembly



- Install the 2-219 o-rings and the 8-219 backups (see Section 6.2 for proper o-ring installation) on the RTD housing as shown.



- Place the metal c-ring onto the RTD housing in the position shown. Thread the flow sensor sub onto the RTD housing and tighten to 80-90 ft*lbs of torque. This will energize the metal c-ring.



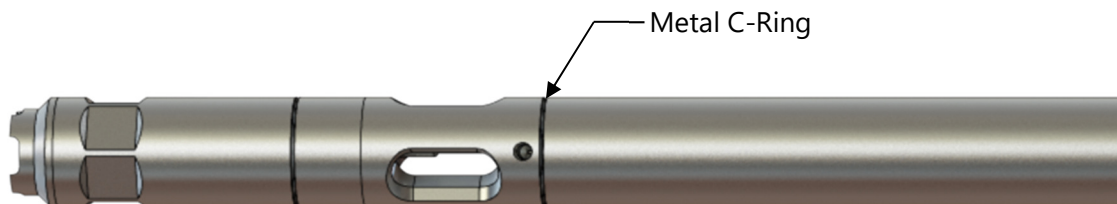
- Align the male key or lug on the battery pack to the female key on the electronics housing. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the tool. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



- Thread the battery housing onto the tool. Install a 2-213 o-ring on the battery housing as shown.



- Place the metal c-ring onto the RTD housing in the position shown. Thread the flask housing onto the tool and tighten to 80-90 ft*lbs of torque. This will energize the metal c-ring. **The geothermal tool must be positioned in a vertical manner while threading on the flask housing, attempting to thread the housing onto the tool while horizontal places too much strain on the threads.**

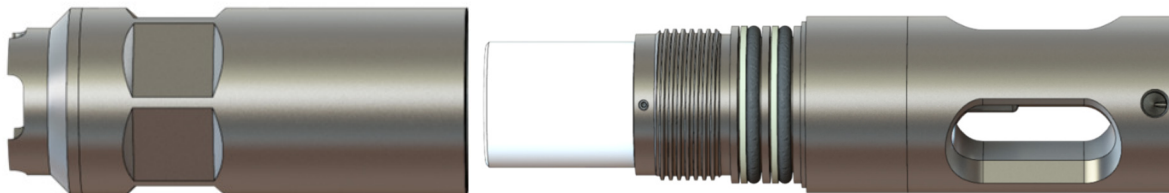


- Thread either the fullbore spinner or continuous spinner onto the flow sensor sub. The continuous spinner is pictured below. Secure it in place with a socket head cap screw.

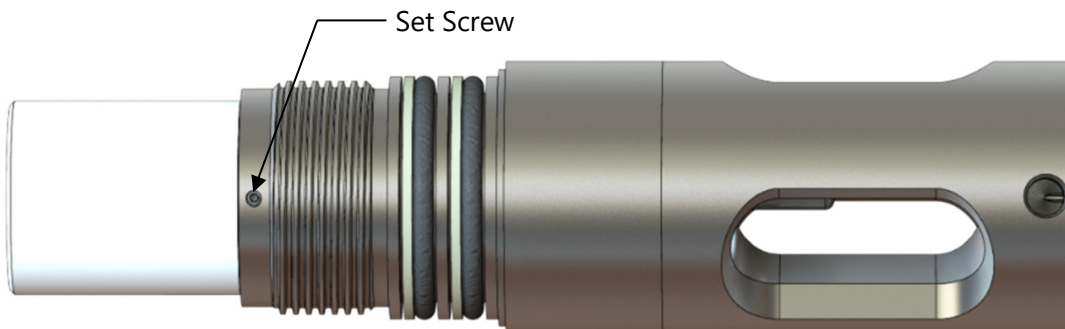


It is recommended to replace the reed switch replacement module after each job. To do this, follow the below sequence of events:

- Remove the flow sensor sub from the bottom end of the tool.

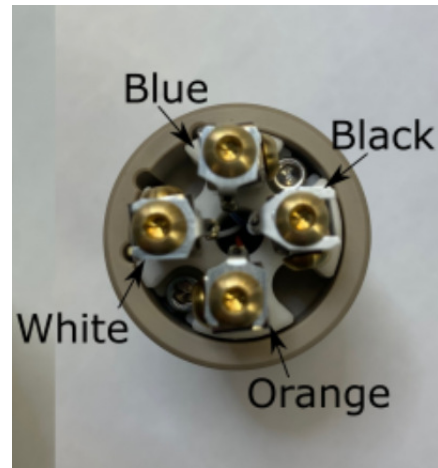
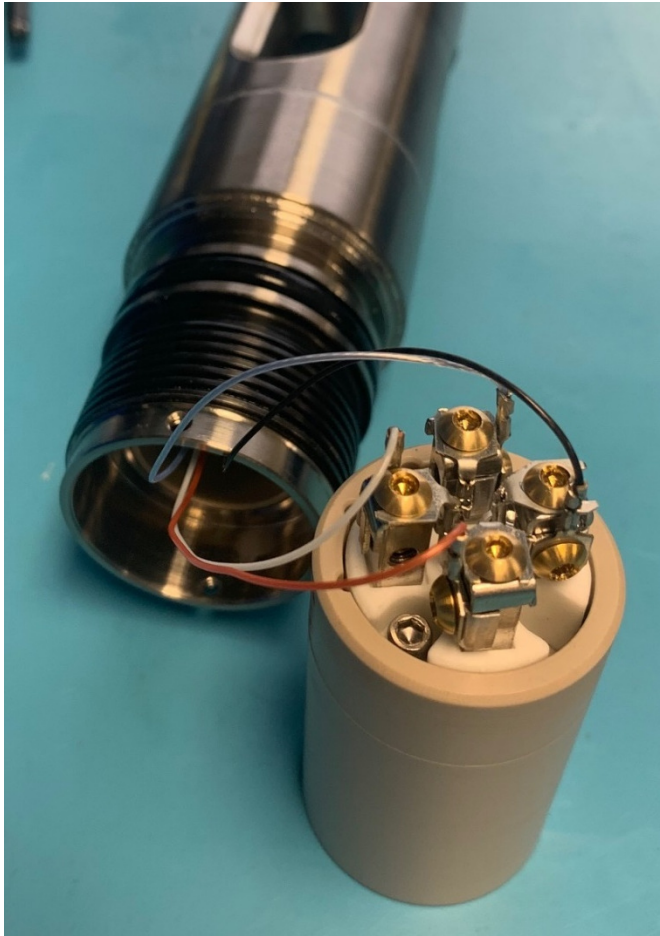


- Using an allen key, unthread the two set screws holding the replacement module in place. Pull the replacement module straight out from the end of the tool exposing the connecting wires.

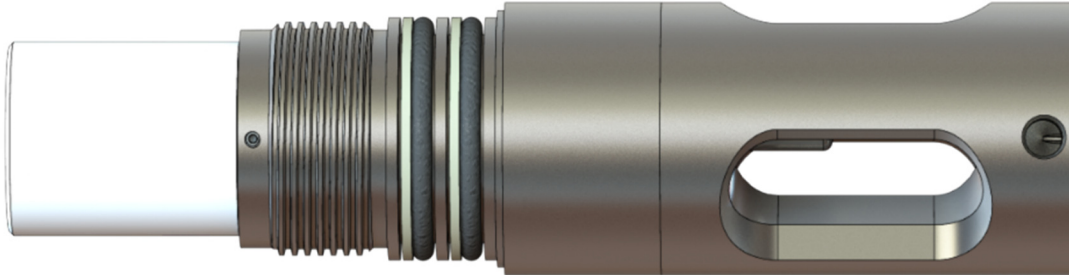


- Unthread the screws on the side of the terminal block to release the reed switch module from the wires to the gauge. **Do not unthread the screws on the top of the terminal block.**
- Connect the wires from the tool to the new replacement module. Ensure the wire colors are in the correct order.

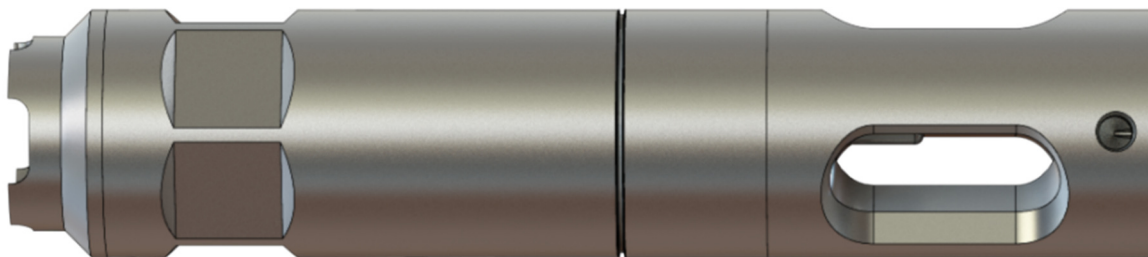
Note: The ground (black) connection on the reed switch replacement module has a slightly larger spade connector.



- Insert the replacement module back into the end of the tool, ensuring no wires are being pinched. Secure in place with the 2 set screws.



- Rethread the flow sensor sub onto the RTD housing and tighten to 80-90 ft*lbs of torque. This will energize the metal c-ring.



6.1.23 1 1/2" Mini Logging Tool (MLT) Assembly

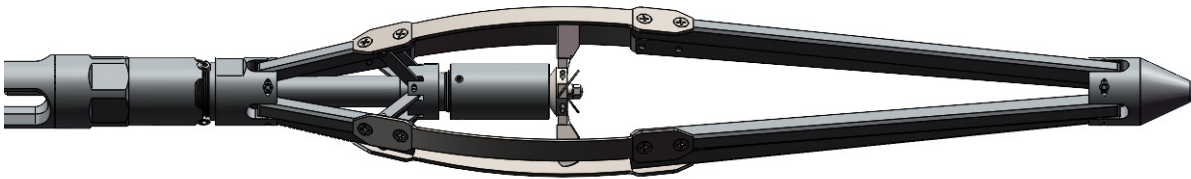
- Start with the MLT sensor assembly



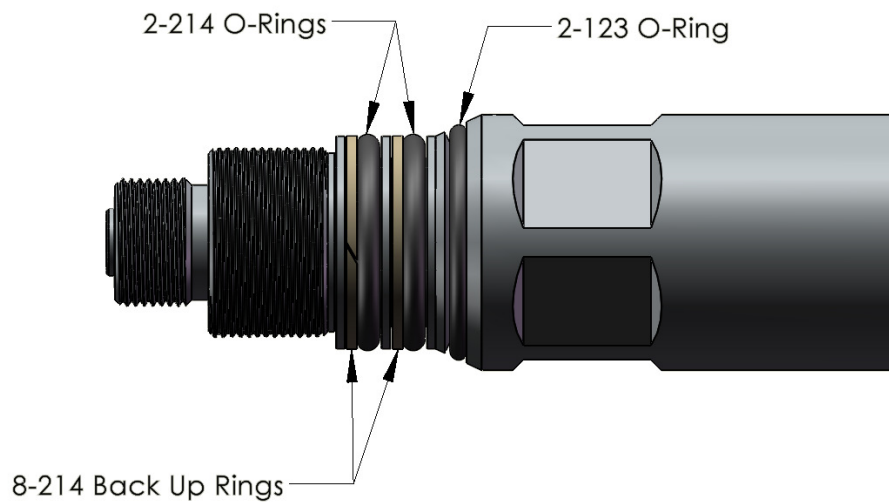
- Remove the socket head cap screw and male thread protector from the bottom of the tool.



- Thread the spinner (continuous or fullbore) onto the bottom of the tool and reinstall the socket head cap screw.



- Install one 2-123 O-ring, two 2-214 O-rings, and two 8-214 back up rings as shown below (see Section 6.2 for proper o-ring installation).



- Align the male key or lug on the battery pack to the female key on the tool. A small red dot on the connectors indicates the position of the respective keys. Without turning or twisting, push the battery pack towards the tool. Thread the battery pack into the tool. The LED located at the top of the battery pack should blink 16 times indicating that the gauge is now running. This action powers the gauge and initiates the gauge program.



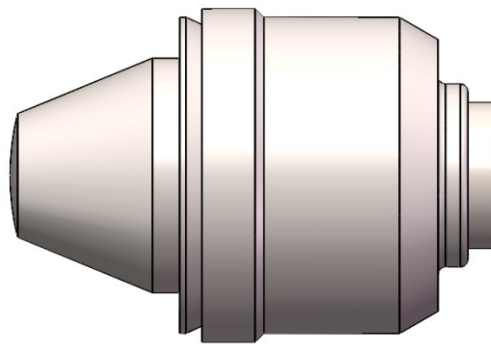
- Thread on the battery housing.



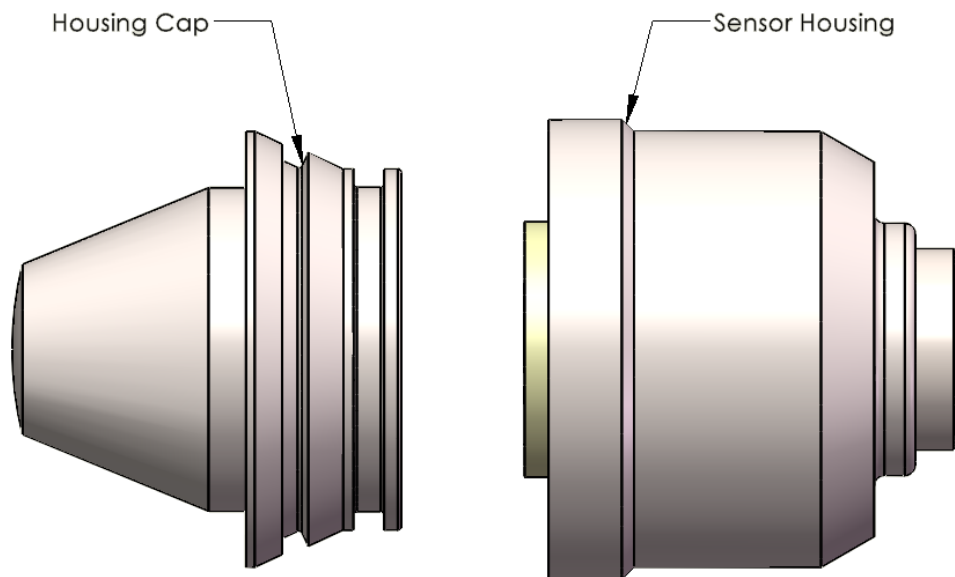
6.1.24 Frac Ball

The following sequence of events is required to assemble a Frac Ball gauge:

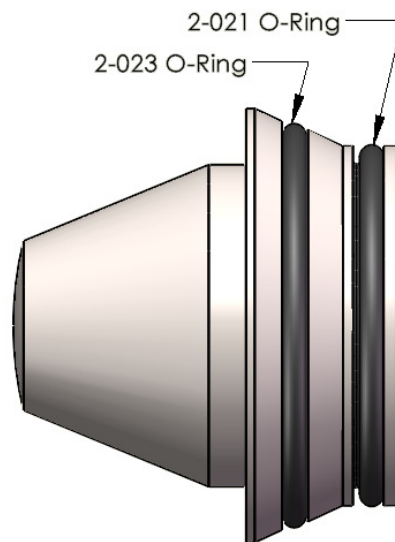
- Start with the Frac Ball core assembly.



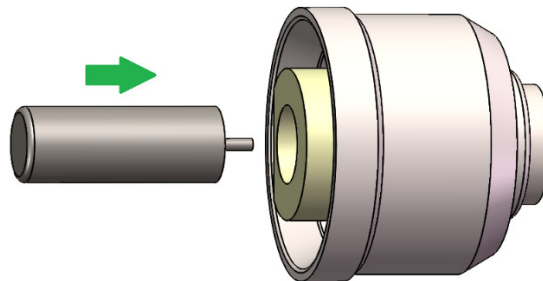
- Remove the housing cap from the sensor housing by pulling straight apart.



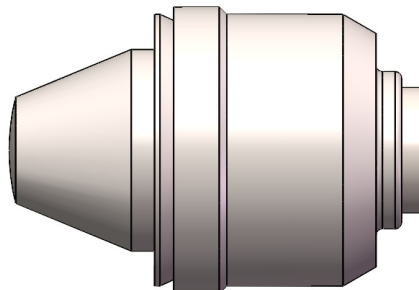
- Install a 2-021 O-ring and a 2-023 O-ring onto the housing cap as shown below (see Section 6.2 for proper o-ring installation).



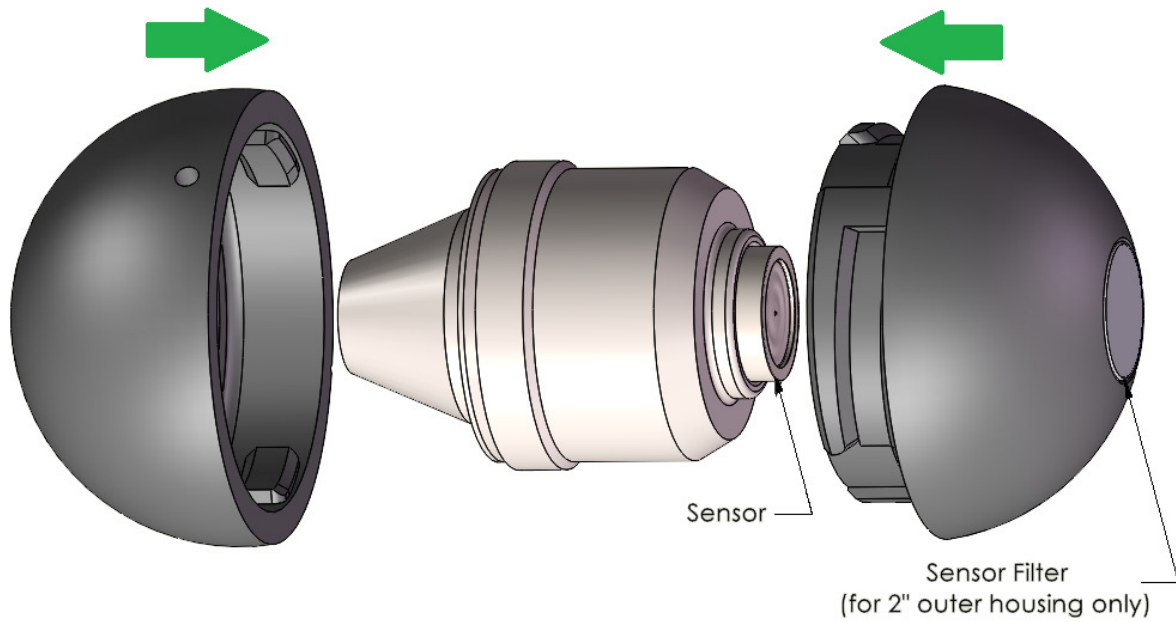
- Install the battery pack by pushing the battery pack into the Sensor housing without turning or twisting, as shown below. This action powers the gauge and initiates the gauge program.



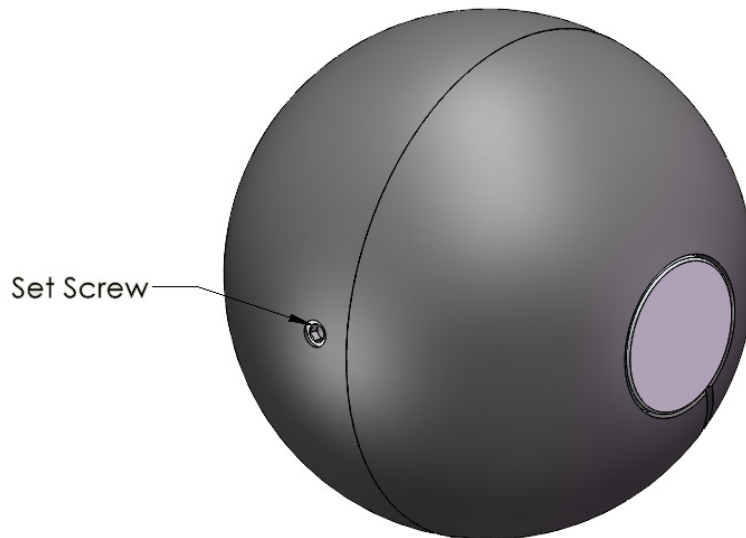
- Re-insert the housing cap into the sensor housing.



- Install the PEEK outer housing over the core assembly. Ensure the sensor filter (for 2" outer housing) or the smaller sensor holes (for larger sizes) are on the sensor side of the core assembly.



- Twist PEEK outer housing together and secure in place with a #6-32 set screw.



6.2 O-Ring Basics

6.2.1 Installation

DataCan recommends that each O-Ring located on the electronics to battery barrel connection be replaced after every job. Refer to the “O-Ring Selection Guide” in Appendix C to ensure that your current O-Ring elastomer is suitable for your upcoming job conditions. To install an O-Ring without damaging the O-Ring or seal gland the following procedure should be followed:

- Refer to the O-Ring Selection Guide in Appendix C to ensure the correct O-Ring elastomer has been chosen
- Cut a 1-2 foot length of wax string (dental floss)
- Place the wax string through the O-Ring
- Use the wax string to “walk” the O-Ring over the threads and into the O-Ring gland
- Ensure that the O-Ring is placed on the pressure side of the Back-Up
- Apply a minimal amount of O-Ring lubrication to the O-Rings. DataCan recommends using a high temperature silicone lubricant such as Parker® Super-O-Lube or Lubriplate L-461. **Do not put any petroleum-based grease products inside the gauge.**



6.2.2 Removal

DataCan recommends that each O-Ring located on the electronics to battery barrel connection be replaced after every job. In order to maintain a reliable o-ring gland seal structure, the following procedure should be followed:

- Using a soft O-Ring pick, lift the o-ring from the gland
- Cut the O-Ring in half

When lifting the ring, be careful not to scratch the O-Ring gland.



6.2.3 Elastomer Selection Guide

The four elastomers that are most commonly used in the oilfield industry are Nitrile, Viton, Aflas, and Chemraz. Generally, as you move from Nitrile to Chemraz you gain chemical resistance and cost, but lose mechanical strength.

Hydrogenated Nitrile (HNBR. HSN) Nitrile

Nitrile is a low temperature performer with limited chemical resistance. Superior mechanical characteristics, particularly high strength, help reduce extrusion and wear. Do not use with ketones, esters, strong acids, or chlorinated hydrocarbons.

Fluorocarbon (FKM) Viton

Viton has an excellent resistance to high temperatures, ozone, oxygen, mineral oil, synthetic hydraulic fluids, fuels, aromatics and many organic solvents and chemicals. Low temperature resistance is generally not favorable. Do not use with glycol, organic acids, or steam.

Tetrafluoroethylene-Propylene (TFE) Aflas

This elastomer has an excellent chemical resistance across a wide range of aggressive media. Do not use with aromatics, ketones, or chlorides.

Perfluoroelastomer (FFKM) Chemraz

Perfluoroelastomer (FFKM) currently offers the highest operating temperature range, the most comprehensive chemical compatibility, and the lowest off-gassing and extractable levels of any rubber material.

Property		Elastomeric Sealing Materials			
Material Code		HNBR	FKM	TFEP	FFKM
Chemical Nature		Hydrogenated Nitrile	VF2 Fluoro Elastomer	TFE/P Fluoro Elastomer	Perfluoro Elastomer
Common Trade Name		HSN	Viton	Aflas	Chemraz
Low Temp Duty (°C)		-20°C	-10°C	30°C	0°C
High Temp Duty (°C)		150°C	200°C	220°C	230°C
Aliphatic Hydrocarbons		Good	Good	Fair	Good
Aromatic Hydrocarbons		Fair	Good	Fair	Good
Crude Oil @ < 120°C		Good	Good	Fair	Good
Crude Oil @ > 120°C		Fair	Fair	Fair	Good
Sour Crude Oil		Good	Fair	Fair	Fair
Sour Natural Gas		Good	Fair	Fair	Fair
Oil Base Mud		Good	Good	Fair	Good
Water Base Mud		Fair	Good	Good	Good
Water		Good	Fair	Good	Good
Steam		Fair	Poor	Good	Good
Amino Corrosion Inhibitors		Fair	Fair	Good	Good
Brines:	CaCl ₂ /CaBr ₂	Good	Good	Good	Good
	ZnBr ₂	Fair	Good	Good	Good
	Sea Water	Good	Good	Good	Good
Control Fluids :	Mineral Oils	Good	Good	Fair	Good
	Glycol Based	Good	Good	Good	Good

	Phosphate Ester	Poor	Good	Good	Good
Methanol		Good	Fair	Good	Good
Acids:	HCL (dill)	Fair	Good	Good	Good
	HCL (Conc)	Good	Good	Good	Good
	HF (<65% cold)	Fair	Good	Good	Good
Chlorinated Solvents		Fair	Good	Poor	Good
Methane		Good	Good	Fair	Good
Carbon Dioxide		Good	Fair	Good	Good
H ₂ S @ < 80°C < 100ppm		Good	Good	Good	Good
H ₂ S @ < 150°C < 15%		Poor	Fair	Fair	Good
Physical Properties					
Tear Resitance		Good	Good	Fair	Fair
Abrasion Resistance		Good	Good	Fair	Fair
Compression Set Resistance		Good	Good	Fair	Poor
Resilience		Fair	Poor	Poor	Poor
Gas Impermeability		Good	V. Good	Good	V. Good

6.2.4 Failure Modes

The premature failure of an o-ring can usually be attributed to a combination of causes and not merely a single failure mode. It is important to maximize sealing life and reliability by reducing the probability of seal failure at the onset by the use proper compound selection, installation and continued education of personnel.

Abrasion



The seal or parts of the seal exhibit a flat surface parallel to the direction or motion. Loose particles and scrapes may be found on the seal surface. Rough sealing surfaces, excessive temperatures, environments containing abrasive particles, or poor elastomer surface finish may lead to an abrasion failure.

Use recommended gland surface finishes, consider internally lubricated elastomers or eliminate abrasive components.

Compression Set



The seal exhibits a flat-sided cross-section, the flat sides correspond to the mating seal surfaces. Excessive compression and temperature, excessive volume swell in chemical, and specific elastomers with high compression set lead to this failure mode.

Low compression set elastomers, proper gland design and material compatibility are all suggested solutions to a compression set failure mode.

Chemical Degradation



The seal may exhibit many signs of degradation including blisters, cracks, voids or discoloration. In some cases, the degradation is observable only by measurement of physical properties.

The selection of a more chemically resilient elastomer will prevent degradation.

Explosive Decompression



The seal exhibits blisters, pits, or pockets on its surface.

Absorption of gas at high pressure and the subsequent rapid decrease in pressure results in gas that was once trapped inside the elastomer to explosively decompress and exit the seal. The absorbed gas blisters and ruptures the surface as the pressure is rapidly removed.

High modulus or a harder elastomer, as well as a slower decompression rate will prevent this mode of failure.

Extrusion



The seal develops ragged edges (generally on the low pressure side) which appear tattered. Excessive seal clearances, excessive pressure, low modulus or hardness elastomers, or improper sizing will lead to an extruded seal.

Decreasing gland clearances or use of a back-up ring will prevent extrusion.

Installation Damage



The seal or parts of the seal may exhibit small cuts, nicks or gashes. Sharp edges on the glands or components, improper sizing, or a low modulus/hardness elastomer may lead to installation damage.

Remove all sharp edges, and follow the installation guidelines to prevent damage.

Over-compression



The seal exhibits parallel flat surfaces (corresponding to the contact areas) and may develop circumferential splits within the flattened surface.

Gland design should take into account material responses to chemical and thermal environments.

Spiral Failure



The seal exhibits cuts or marks which spiral around its circumference. Difficult or tight installation clearances without proper lubrication may lead to this mode of failure. Excessive gland width is also a known cause.

Ensure adequate lubrication, or ensure the back-up ring is installed to reduce gland volume.

Thermal Degradation



The seal may exhibit radial cracks located on the highest temperature surfaces. In addition, certain elastomers may exhibit softening, or a shiny surface as a result of excessive temperatures.

Selection of an elastomer with improved thermal stability is a suggested solution.

6.2.5 Storage

The effective storage life of an O-Ring varies with the inherent resistance of each individual elastomer to normal conditions. The following conditions are suggested for maximum storage life:

- Ambient temperature not exceeding 49°C (120°F)
- Exclusion of air (oxygen)
- Exclusion of contamination
- Exclusion of light (particularly sunlight)
- Exclusion of ozone generating electrical devices
- Exclusion of radiation

Generally, sealed polyethylene bags stored in larger cardboard containers ensure optimal storage life.

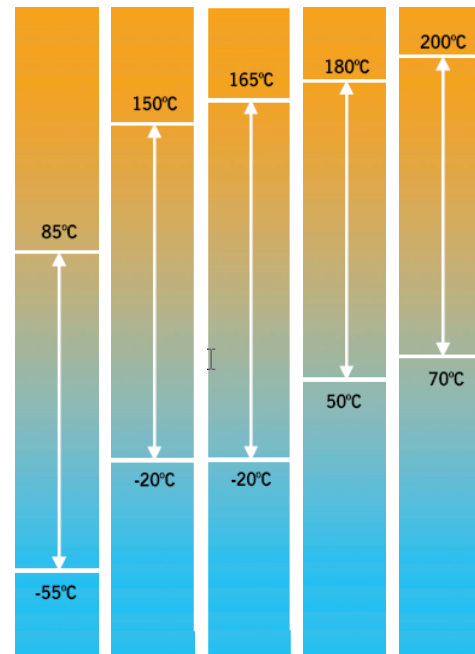
6.3 Battery Pack Basics

Battery Pack Options

DataCan offers a wide variety of lithium battery pack options. Single or multi-cell combinations can be provided. Each type of pack is also available in a series of temperature ranges. Refer to the Catalog in Appendix B for a detailed listing of current packs.

Temperature Limits

Each lithium cell has a lower and upper temperature limit. It is important to know that the 180°C and 200°C packs have a lower limit temperature rating of 40°C and 70°C respectively.



The poor low temperatures performance is due to the construction of the cells. The 180°C and 200°C cells are manufactured using solid-state lithium. Solid-state lithium allows the cells to operate at higher temperatures. At high temperatures above 50 and 70°C, the solid-state lithium melts and turns into liquid lithium. Lithium in its solid state does not react as well as it does in its liquid state.

It is very important to not exceed the temperature rating of the battery pack. Lithium is a volatile chemical. Overheating a pack could result in the pack exploding. Refer to Appendix A - "Safe Handling of Lithium Batteries" for more information.

Power Consumption

DataCan's unique gauge is designed to generate the lowest power consumption on the market. The power consumption of the gauge differs between a low rate sleep current and a higher consumption sample rate.

Each lithium cell has a different amount of available power. Consult the Catalog in Appendix B or the label on your battery pack to ensure that your power potential exceeds the job requirements.

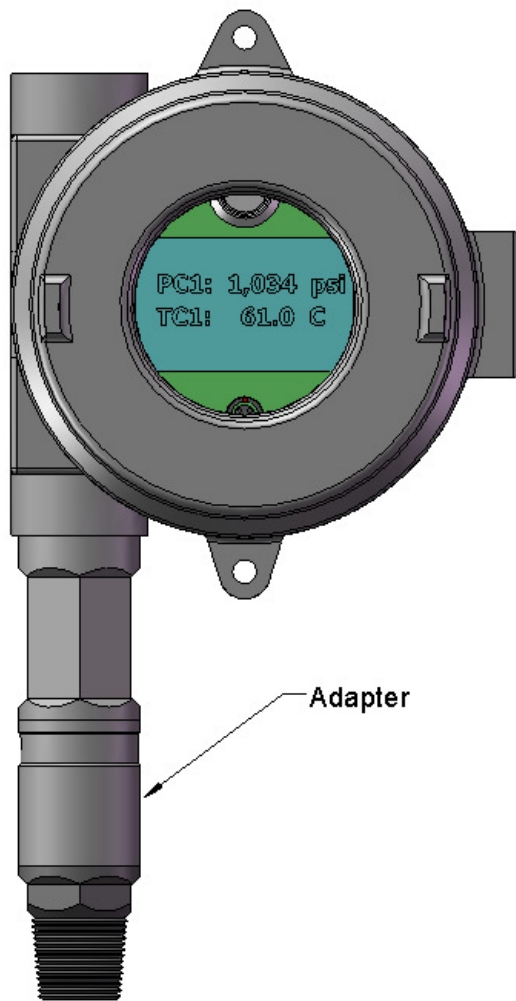
6.4 Wellhead Logger

6.4.1 Installation

The DataCan wellhead logger is shipped with an adapter ($\frac{1}{2}$ " NPT, $\frac{1}{4}$ " NPT or Autoclave) that allows it to be mounted almost anywhere.

- Thread the adapter to the wellhead logger using the appropriate size of wrench

Note: Failure to use a wrench for attaching fittings and mounting the logger can result in damage to the logger.



- Using a wrench, attach the wellhead logger assembly to the pressure source

6.4.2 Operating the Wellhead Logger

- Unscrew the front face of the display housing.
- Connect the logger to a computer using the DataCan communication cable. Program the surface box using DataCan Download Software as outlined previously in this manual

- Press the on/off switch located above the display. When the LED light on the button is green the logger is turned on.
- Replace the front of the display housing.
- The display will show the real time pressure and temperature data while the logger records this data.
- To obtain data remove the front of the case again and connect the logger to a computer. Use the DataCan Download Software to download the data.