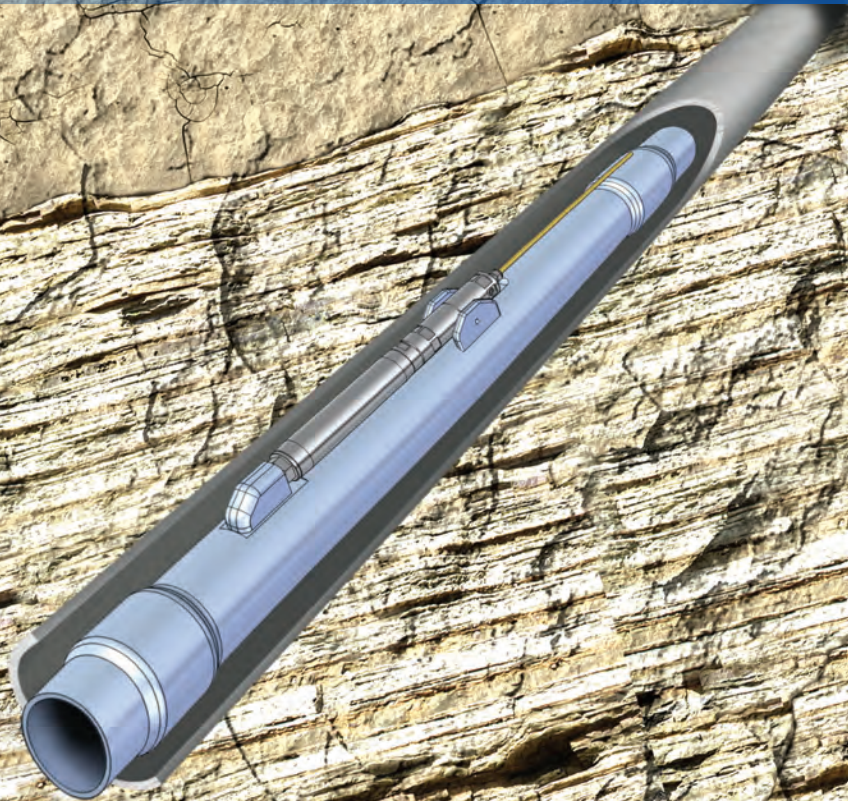


ARTIFICIAL LIFT

FORTRESS PCP SENSING



C SERIES FIELD INSTALLATION MANUAL

 **GRC**
A SERCEL BRAND

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MODEL:
C Series Field Installation Manual

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1. AMERADA C-4000/4500 Gauge Overview

Sercel-GRC's FORTRESS AMERADA C-4000 gauge is compatible with AMERADA C completions. The FORTRESS AMERADA C-4000 utilizes a TEC wire to power and communicate with the downhole sensor. The FORTRESS AMERADA C-4000 gauge is carrier mounted and is installed above the pump. The AMERADA C-4000 can measure intake or discharge pressure. The real-time monitoring feature provided by the FORTRESS AMERADA C-4000 sensor gives the operator immediate information to protect the pump and reduce premature failures. Our patented "metal-to-metal" seal with unmatched ruggedness and reliability also protects the sensor's pressure transducer and circuitry. The FORTRESS AMERADA C gauge incorporates GRC's patented Gap-Capacitance transducer technology designed to deliver superior reliability in oilfield applications. Below is an example of the advantages using the SERCEL-GRC AMERADA C Series gauge.

Intake pressure sensor (Monitors well fluid level)

- Allows correcting the VFD RPM's to obtain a constant production flow rate equal to the reservoir transfer flow rate to the well.
- Alerts a low fluid level which can prevent pumping dry by stopping the pump or lowering the VFD RPM's.

Temperature sensor (Monitors the system temperature)

- Alerts for high temperatures that could damage the bottomhole gauge and pump. Allows stopping the pump to prevent damage.

AMERADA C-4500

- The AMERADA C-4500 is identical to the 4000 gauge except it also measures downhole vibration.

Vibration sensor (Monitors system vibration)

- Alerts for unusual vibration on the completion string.

2. AMERADA C-4001T Gauge Overview

Sercel-GRC's C-4001T gauge utilizes a single conductor TEC wire to power and communicate with the downhole sensor. The C-4001T gauge is designed to be used in applications that use an ESP motor connected to a Progressive Cavity Pump (PCP). The ESP motor is powered by a 3-phase AC power cable which induces significant noise into the TEC line preventing other gauges from communicating with service equipment. The C-4001T's unique design will communicate in the noisiest environments ensuring needed data always reaches the surface equipment. The C-4001T measures intake temperature and pressure. The real-time monitoring feature provided by the C-4001T sensor gives the operator immediate information to protect the pump and reduce premature failures. The C-4001T gauge incorporates GRC's patented Gap-Capacitance transducer technology designed to deliver superior reliability in oilfield applications. Below is an example of the advantages using the C-4001T series gauge.

Intake pressure sensor (Monitors well fluid level)

- Allows correcting the VFD RPM's to obtain a constant production flow rate equal to the reservoir transfer flow rate to the well.
- Alerts a low fluid level which can prevent pumping dry by stopping the pump or lowering the VFD RPM's.

Temperature sensor (Monitors the system temperature)

- Alerts for high temperatures that could damage the bottomhole gauge and pump. Allows stopping the pump to prevent damage.

3. AMERADA C-5000/5500 Gauge Overview

GRC's FORTRESS AMERADA C-5000 gauge is compatible with AMERADA C completions. The FORTRESS AMERADA C-5000 utilizes a TEC wire to power and communicate with the downhole sensor. The FORTRESS AMERADA C-5000 gauge is carrier mounted, runs above the pump and measures both intake and discharge pressure. This system provides the operator with the ability to increase production, extend performance and reduce total cost of operations. Because the FORTRESS AMERADA C-5000 and C-5500 gauges provide the operator with both intake and discharge pressure/temperature real-time monitoring, the operator can protect the pump and reduce premature failures. The FORTRESS AMERADA C-5000 gauge also incorporates GRC's patented Gap-Capacitance transducer technology designed to deliver superior reliability in oilfield applications. The FORTRESS AMERADA C-5500 gives the added protection of a vibration sensor. Below is an example of the advantages of using the SERCEL-GRC AMERADA C gauge.

Intake pressure gauge (Monitors well fluid level)

- Allows correcting the VFD RPM's to obtain a constant production flow rate equal to the reservoir transfer flow rate to the well.
- Alerts a low fluid level which can prevent pumping dry by stopping the pump or lowering the VFD RPM's.

Temperature gauge (Monitors the system temperature well + pump).

- Alerts for high temperatures that could damage the bottomhole gauge and pump. Allows for stopping the pump.

Vibration gauge (Monitors system vibration)

- Alerts for unusual vibration on the completion string.

Intake & discharge pressure gauges (Monitors pressure differential across the pump)

- Allows estimating the pump's wear rate to estimate its life over time. Aids in establishing of a proper schedule for well re-completion, avoiding early failures and overall costs.

4. AMERADA C Specifications

	AMERADA C-4000	AMERADA C-4500	AMERADA C-5000	AMERADA C-5500	AMERADA C-4001T
TRANSDUCER TYPE	Single Capacitive	Single Capacitive	Dual Capacitive	Dual Capacitive	Single Capacitive
PRESSURE RANGE	15-10,000 PSIA (Intake)	15-10,000 PSIA (Intake)	15-10,000 PSIA (Intake/Discharge)	15-10,000 PSIA (Intake/Discharge)	15-10,000 PSIA (Intake)
PRESSURE ACCURACY	0.10% FS	0.10% FS	0.10% FS	0.10% FS	0.10% FS
PRESSURE RESOLUTION	+/- 0.01PSI	+/- 0.01PSI	+/- 0.01PSI	+/- 0.01PSI	+/- 0.01PSI

TEMPERATURE RANGE	77-302F (25-150C)	77-302F (25-150C)	77-302F (25-150C)	77-302F (25-150C)	77-302F (25-150C)
VIBRATION	-	18G	-	18G	-
VIBRATION RESOLUTION	-	0.01G	-	0.01G	-
NUMBER OF FSK COMMUNICATION CHANNELS USED	1	2	2	3	0
CARRIER DIAMETER	3-1/2" (8.9cm) * 4-1/2" (11.4cm) 5-1/2" (14cm)	3-1/2" (8.9cm) * 4-1/2" (11.4cm) 5-1/2" (14cm)	3-1/2" (8.9cm) * 4-1/2" (11.4cm) 5-1/2" (14cm)	3-1/2" (8.9cm) * 4-1/2" (11.4cm) 5-1/2" (14cm)	-
CARRIER LENGTH	60" (152.4 cm)	60" (152.4 cm)	60" (152.4 cm)	60" (152.4 cm)	-
CARRIER MATERIAL	N80	N80	N80	N80	-
HOUSING MATERIAL	17-4	17-4	17-4	17-4	17-4

5. AMERADA C Pre-Installation Procedure

The AMERADA C should be connected to the surface readout (SRO) to check for proper operation before beginning installation procedure.

6. Introduction

This document outlines the correct way to install an AMERADA C gauge. Please follow the steps precisely to ensure a successful installation. Any shortcuts taken will compromise the integrity of the installation and may affect the life span of the system. If the client representative has any questions about why the installation is taking place in a particular manner, please let him view this document or contact a Field Service Engineer at Sercel-GRC for further explanation.

7. Safety Meeting on Location

The following points should be made while conducting the safety meeting on location.

- The TEC cable is very fragile. You must mind its position at all times, especially in the sheave wheel.
- ALWAYS COVER THE HOLE WHEN INSTALLING BANDS OR CLAMPS.
- Make sure that any cabling connected from the spooling unit and slip ring is well marked so that personnel do not trip over it.
- Watch all pinch points while installing the bands and/or clamps.
- Wear the proper PPE (Personal Protection Equipment) for the job at all times.
- Anytime the cable is being cut, always wear hand gloves.

- When making the wire connections and crimp connections, do not wear hand gloves for added dexterity.
- Make sure that the location of all personnel is known at all times.
- Do not stand next to the cable or the spooling unit unless absolutely necessary. The tubing can part at any time causing the spool to turn rapidly and uncontrollably.
- The AMERADA C should be connected to the proper SRO data acquisition system to check for proper operation before beginning installation procedure.

8. Rigging Up of Spooling Unit, TEC Sheave and Slip Ring

1. Upon arrival on location, check in with the client representative and introduce yourself and all members of your crew. Let him know what role each representative has in the installation.
2. Place the rope in the TEC sheave.
3. Hold both ends of the rope in one hand and allow the rig crew to install the sheave wheel in the derrick as shown in Figure 1.



Figure 1. Rigging the spooling unit.

4. Locate the spooling unit so that the TEC sheave is in the center of the spool and the ends of the spool are parallel to the TEC sheave.
5. Connect the air lines from the spooling unit to the air supply on the rig.
6. Actuate the spooling unit in both directions fully to ensure proper functionality of the spooling unit. Make sure that the TEC is tied down properly so that it will not come off the reel.
7. Attach the rope to the TEC. Loop the rope around the TEC and use duct tape around the loops. Tape the end of the cable thoroughly so that the end of the cable slides through the sheave smoothly. Figure 2.



Figure 2. Attaching the rope to the TEC.

8. Connect the slip ring to the spooling unit. Figure 3.

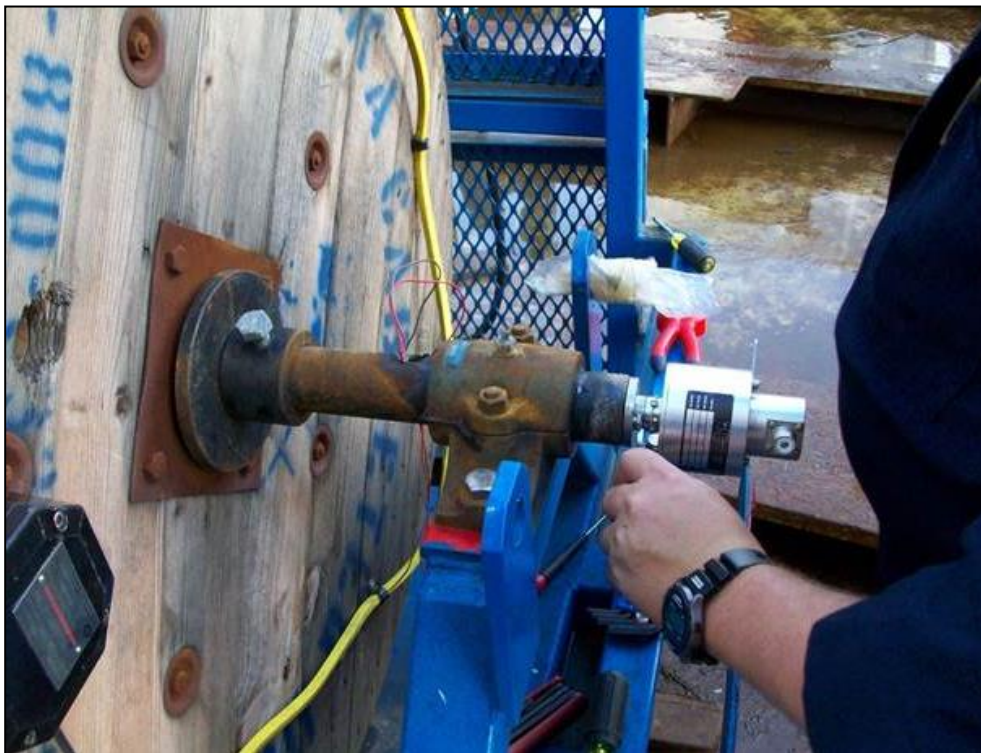


Figure 3. Connecting the Slip Ring to the Spooling Unit.

- 8.1 Cut the end of the TEC and expose the conductor.
- 8.2 Place the TEC inside the metal junction box using an NPT to Swagelok fitting.
- 8.3 Connect the conductor wire on the slip ring to the conductor wire on the TEC cable, preferably using a terminal connection as shown in the picture above (red positive (+) and brown is negative (-).
- 8.4 Connect the ground wire on the slip ring to a screw terminal that is conductive with the body of the metal junction box.
- 8.5 Test the conductive side of the connection and the ground side of the connection with an ohmmeter to ensure that the connection was made correctly.
- 8.6 Connect the SRO (Surface Readout) to the slip ring.

9. Installing the AMERADA C-4000/4500 in the Gauge Carrier

1. The gauge must be installed in the carrier before making the cable connection. Once the cable is connected to the gauge, the gauge must not be turned. Doing so will damage the cable connection to the gauge.
2. Apply anti-seize lubricant on threads of gauge and carrier inlet threads. Use Super O-Lube on O-rings. Figure 4.

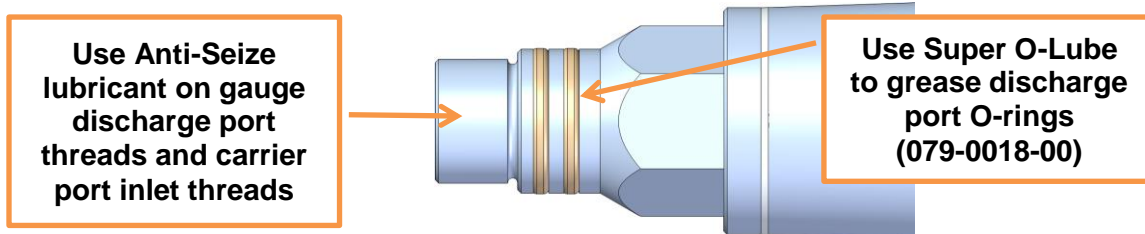


Figure 4. Apply anti-seize to threads and Super O-Lube to O-rings.

3. Place the AMERADA C gauge into the gauge carrier by sliding the port end of the gauge into the carrier gauge inlet and hand tighten.
4. Torque gauge to 90 ft-lbs.

10. Installing the Amerada C-4000/4500 in the Gauge Carrier 65B2260

1. The Nut (65B2263) should be fed on TEC cable before the gauge is installed.
2. Cable heads should be made up per procedure number 11 AMERADA C Cable Head Connection **BEFORE** the gauge is installed into the carrier.
3. Install O-rings (079-0018-00) and Super O-Lube as per **Figure 4**.
4. Feed gauge with TEC, Nut, and cable heads through protective tube and apply Loctite 243 to threads of Nut.
5. Torque nut to 55 ft-lbs. Figure 5 and Figure 6.

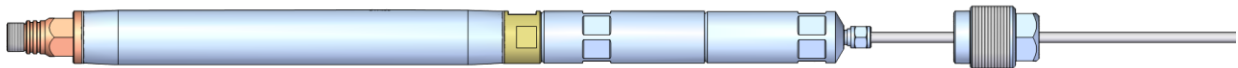


Figure 5. Gauge with TEC, Cable Heads, and Nut installed

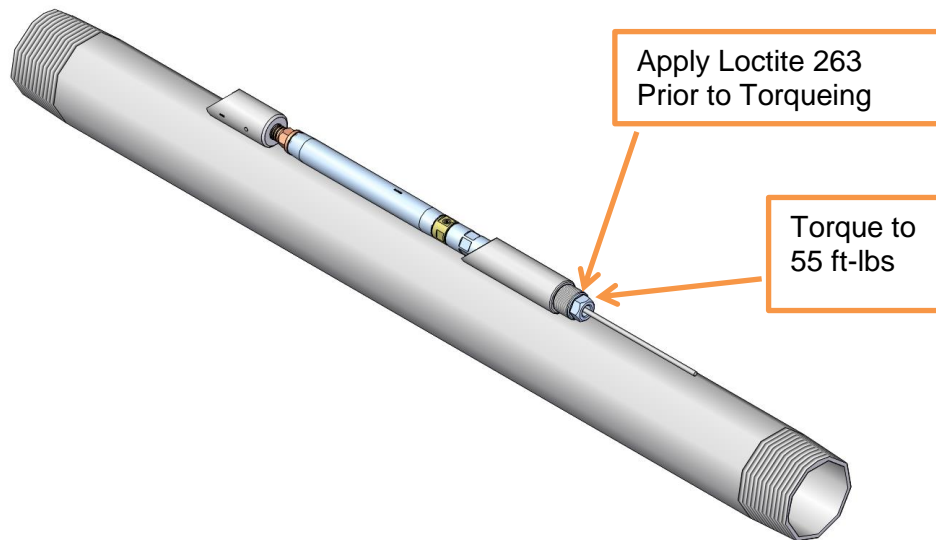


Figure 6. Gauge installed in carrier prior to torqueing nut.

11. Installing the AMERADA C-5000/5500 in the Gauge Carrier

1. Follow procedure number 11 in the next section to attach the AMERADA C cable head connections before installing the gauge into the carrier.
2. Use Super O-Lube on gauge discharge port O-rings. Figure 7.
3. Place the AMERADA C gauge into the gauge carrier by sliding the port end of the gauge into the carrier gauge inlet. Figure 7.
4. Place the gauge lock block over the other end of the gauge and screw the 2 bolts in until they are hand tight. Figure 7.
5. Torque bolts to 70 in-lbs. Figure 7.

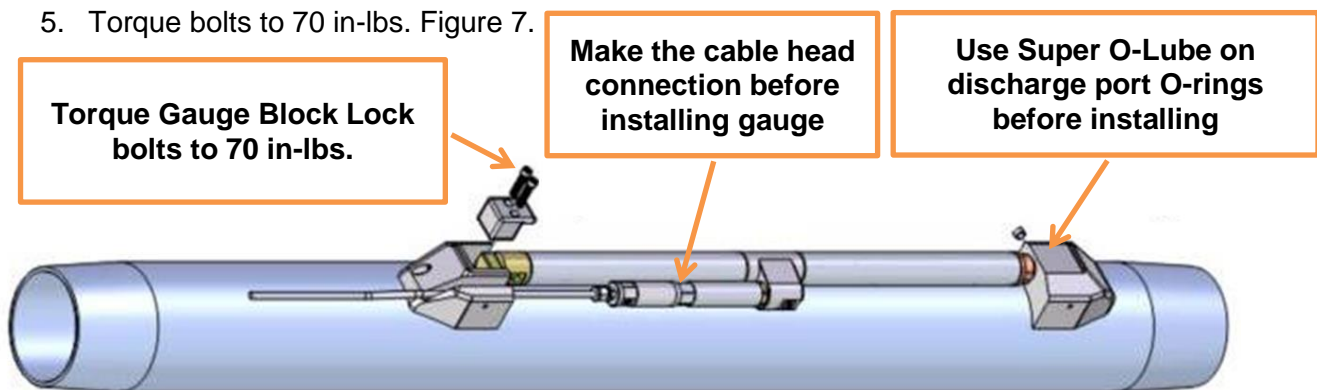


Figure 7. Installing the AMERADA C-5000/5500 in the gauge carrier.

12. AMERADA C Cable Head Connection

1. Unpack the gauge and visually check to ensure that no damage has occurred.
2. Very carefully remove the top connector housings of the gauge.
3. It is suggested that the cable be run through the sheave at this time. Alternatively, develop a plan and verify the gauge can be run through the sheave after it.

4. Take a resistance check of the gauge with an ohm meter. Connect the positive lead to the pin connector of the gauge and ground the negative lead to the gauge housing at some point. Make a note of these resistances. The positive reading (forward) should not be lower than approximately 5 to 10 MΩ and the negative (reverse) should be infinity.
5. Remove the Santoprene jacket from the tubing for approximately 15". Make sure the 1/4" tubing is smooth, straight, and free of any nicks and/or scratches. Figure 8.

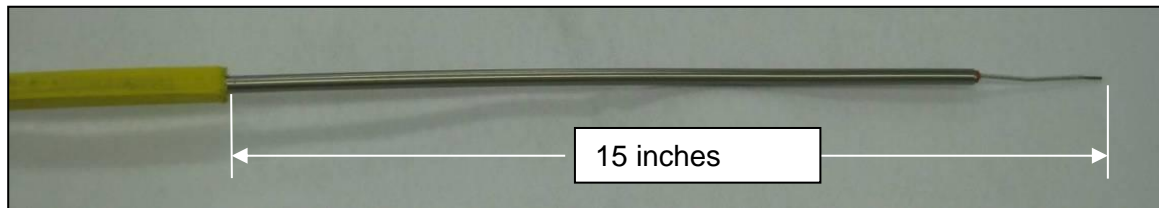


Figure 8. Preparing the TEC for connection.

6. Cut off approximately 2-1/2" of the 1/4" tubing and remove the filler. Strip approximately 3/8" of the wire insulation. Twist wires into a straight condition. See Figure 9 for strip dimensions.

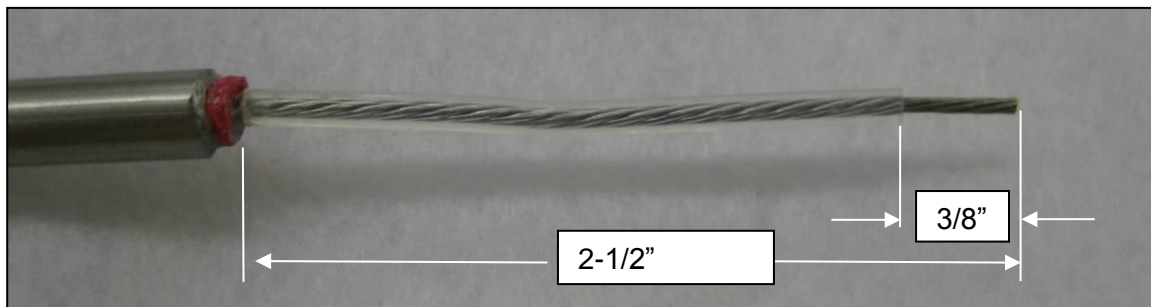


Figure 9. Trimming the cable.

7. Lightly grease the 1/4" tubing. Slide the connector housings over the 1/4" tubing. To do this, it may be necessary to loosen the nuts on the tubing fittings. Figure 10.

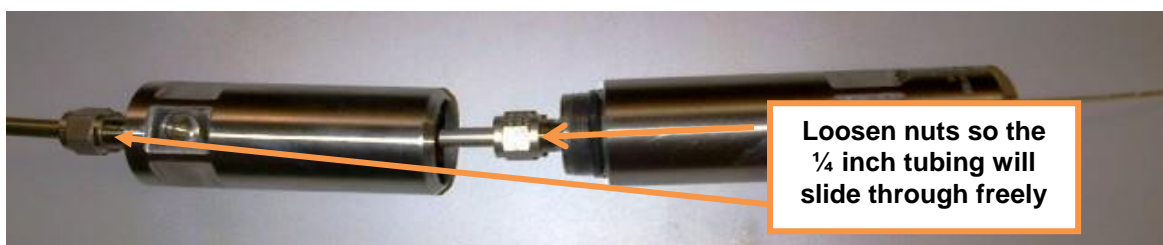


Figure 10. Installing the connector housing over the 1/4" tubing.

Note: Once ferrules and nut are on the TEC cable, verify they are in the correct order. Make sure at least two set of eyes have verified orientation of ferrules. Figure 11 shows the correct orientation of the ferrules on a safety changer.



Figure 11. Correct orientation of ferrules as shown on Safety Changer.

8. Grease the wire insulation with Super O-Lube. Push some grease inside the seal boot. Slide the seal boot retainer and the seal boot over the insulation of the wire. See Figure 12.



Figure 12. Installing the seal boot and the seal boot retainer.

9. Crimp pin on wire. Figure 13. Meg cable prior to installation of pin, if desired. Short inner and outer conductors to discharge cable before attaching pin to cable.



Figure 13. Crimping the pin.

**Crimp
pin on
wire**

10. Push the boot over the pin until it's fully exposed. Slide the crimped pin over the gauge pin. Figure 14.

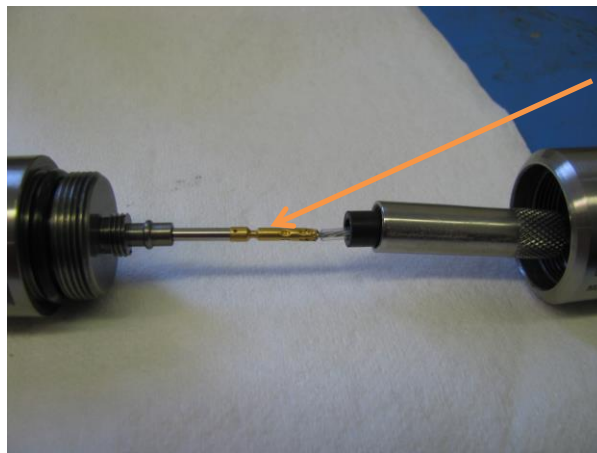
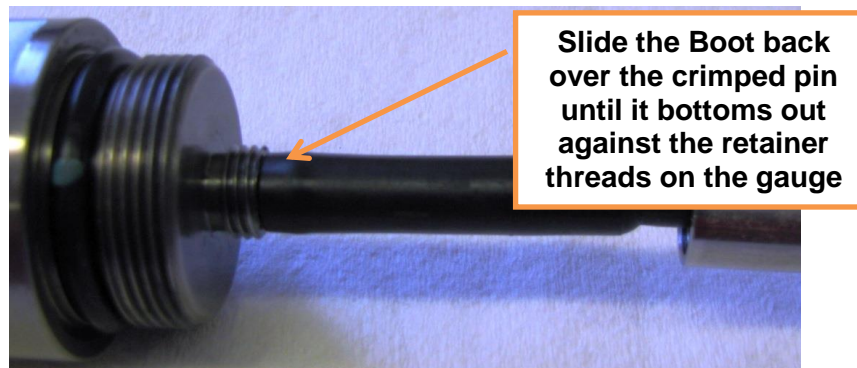


Figure 14. Slide the crimped pin over the gauge pin

**Slide the
crimped pin over
the gauge pin**

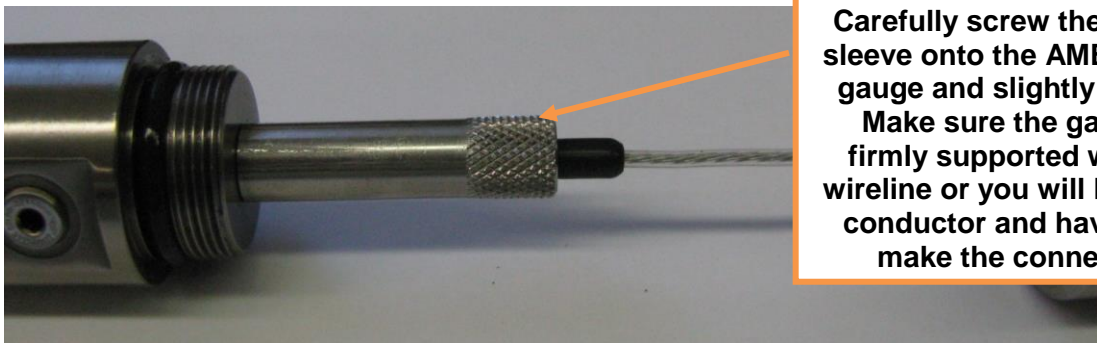
11. Slide the boot over the crimped pin until it bottoms out against the retainer threads. Figure 15.



Slide the Boot back over the crimped pin until it bottoms out against the retainer threads on the gauge

Figure 15. Slide the Boot over the crimped pin.

12. Lightly grease the outside of the boot. Slide the seal boot retainer down over the boot and thread into position, slightly tightening. Figure 16.



Carefully screw the locking sleeve onto the AMERADA C gauge and slightly tighten. Make sure the gauge is firmly supported with the wireline or you will break the conductor and have to re-make the connection

Figure 16. Installing the seal boot retainer.

13. Before threading the first cablehead onto the gauge, the metal-to-metal seal section of the cablehead and gauge should be absolutely clean. **Apply a small amount of anti-seize lubricant to the threads and metal to metal seal surfaces. Slightly grease O-rings with Super O-lube.** Tighten to torque specified below or marked on the housing. Figure 17. Be sure to grip wrench flats on C-5000/5500 when torquing cableheads.

Torque:

The C-4000/4001T/4500 cable head torque is 90 ft*lbs.

The C-5000/5500 cable head torque is 35 ft*lbs.

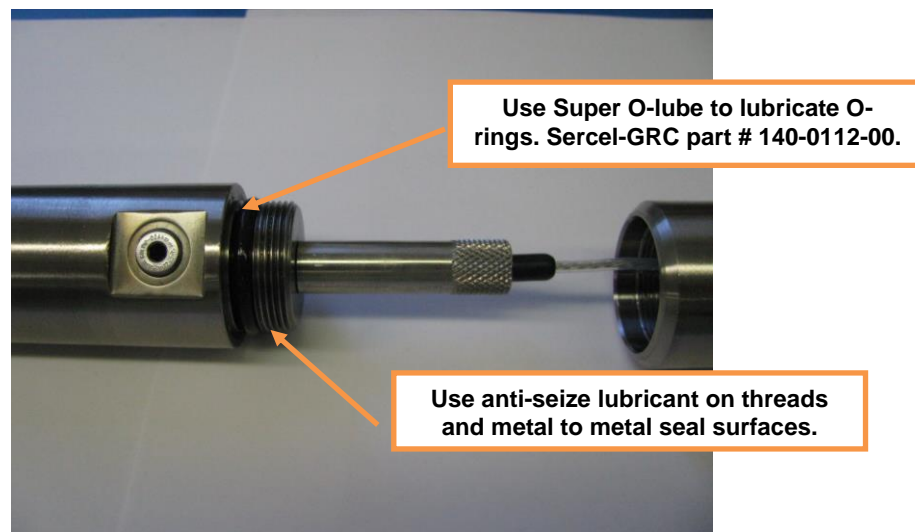


Figure 17. Installing the seal boot retainer

14. Hand tighten the tube fitting nut on top of the cablehead. Before fully tightening complete the next step.
15. Verify that the gauge is reading through the TEC wire by powering on the SRO and checking the pressure and temperature readings. Make sure that the SRO is properly connected to the slip ring with the slip ring cable. Power down the SRO and continue the steps below.
16. Further tighten tube fitting nut with wrench 1-1/4 turns.
17. Prepare to install the second cablehead. Before threading this cablehead onto the gauge, the metal-to-metal seal section of the cablehead and gauge, should be absolutely clean. **Slightly grease threads and metal to metal seal surfaces with the anti-seize lubricant. Slightly grease O-rings with Super O-Lube.** Tighten to torque specified below or marked on the housing. See Figure 18. Be sure to grip wrench flats on C-5000/5500 when torqueing cableheads.

Torque:
 The C-4000/4001T/4500 cable head torque is 90 ft*lbs.
 The C-5000/5500 cable head torque is 35 ft*lbs.

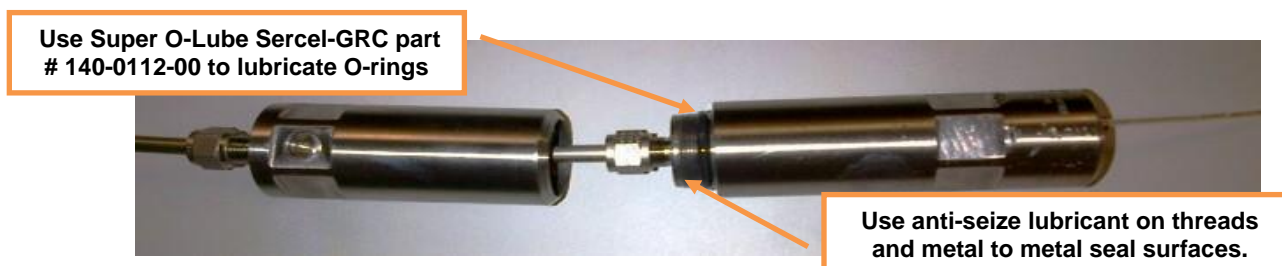


Figure 18. Installing the connector housing.

18. Hand tighten the fitting nut. Further tighten nut with wrench 1-1/4 turns.

13. Cablehead Pressure Test

1. Remove 1/8" NPT plug from cablehead.
2. Connect hydraulic line from 5000 PSI Hydraulic pump and Barton Recorder to the 1/8" NPT hole on the cable head.
3. Fill cablehead with fluid and purge air.
4. Pressure cablehead to 1500 PSI and hold for 3 min.
5. Pressure cablehead to 5000 PSI and hold for 15 min.
6. Remove Barton chart and present with field service report identifying the pressure and time.
7. Replace the 1/8" NPT plug. Figure 19.



Figure 19. Pressure testing the cable head.

14. Tubing Clamp Gauge Carrier (Mid Joint Type)

1. After gauge is connected to the TEC cable place gauge inside clamp pocket.
2. Place clamp around tubing. Use a clamp closing tool to close clamp. Figure 20.
Note: Clamp closing tool shown is manual but a pneumatic tool may be used.

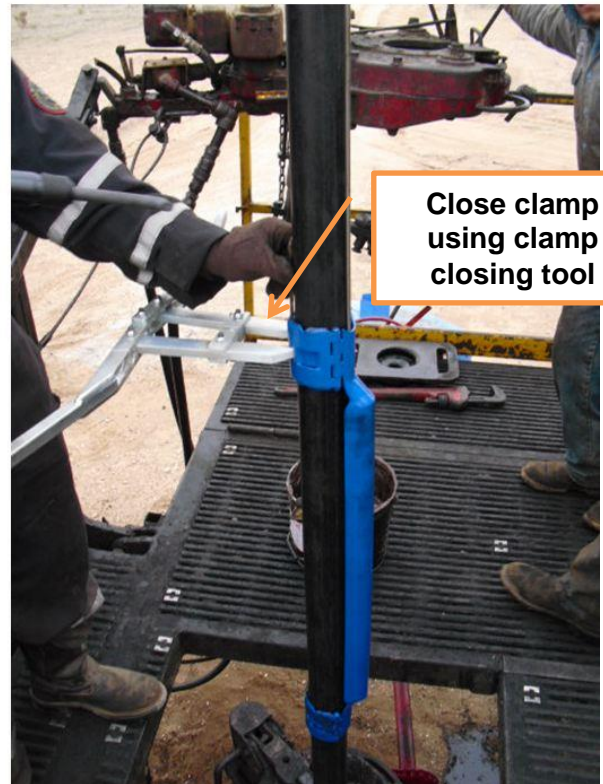


Figure 20. Install clamp on tubing and use a clamp closing tool to close clamp.

3. Use a pneumatic hammer to drive the locking pin into the clamp. Figure 21.

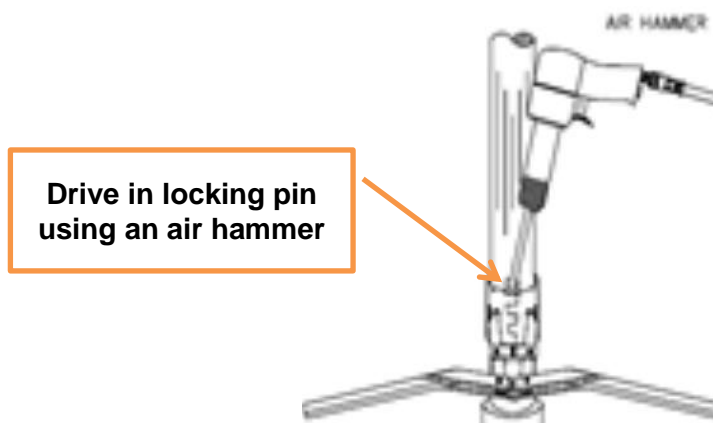


Figure 21. Use a pneumatic air hammer to drive locking pin in place.

15. RIH with the AMERADA C and Production Tubing

1. Hold a pre-job safety meeting on the rig floor and make sure that all personnel are aware of the role that they will carry as the job is conducted.
2. Align the rotary table so that the groove on the bushing is oriented so that the TEC will pass through the groove.
3. Place and band on above and below the collar on top of the AMERADA C carrier.
4. Once the tubing is lowered and the slips are set, pull and hold the TEC back out of the way so that the next tubing joint can be installed and the tubing tongs do not damage the cable.
5. As the tubing continues to be installed, place a band above and after each collar and one band in the middle of the joint.

NOTE: DO NOT PUT ANY BACK TENSION ON THE SPOOLING UNIT UNTIL AT LEAST 4 BANDS HAVE BEEN PLACED ON THE TUBING STRING.

16. TUBING WRAP PROCEDURE

1. Shut the air off at the spooling unit and bleed the pressure off so that the drum can spin freely.
2. Determine the length of cable needed outside the well head with a minimum length of 3 feet.
3. Multiply that length by 3 and mark the cable at the tubing hanger or well head outlet
4. Measure off a length of cable equal to the value of Step 3.
5. Assemble the tubing hanger or well head flange onto the tubing.
6. Raise the tubing to a height equal to the measured length from Step 3.
7. Place a band or clamp on the tubing string below where the wraps will be oriented.
8. Tightly wrap the cable around the tubing so that the length of the cable is twice the length of the measurement taken in Step 2.
9. If there is a connection on the bottom of the tubing hanger or well head outlet, slide the compression fitting over the cable and double check the ferrule configuration.
10. Feed the cable through the well head outlet or tubing hanger.
11. Place a compression fitting or TEC to connect to a tubing hanger or place the compression fitting or well head outlet onto the TEC once the well head is landed.
12. Continue with nipple down procedure and prepare to terminate the well head outlet.

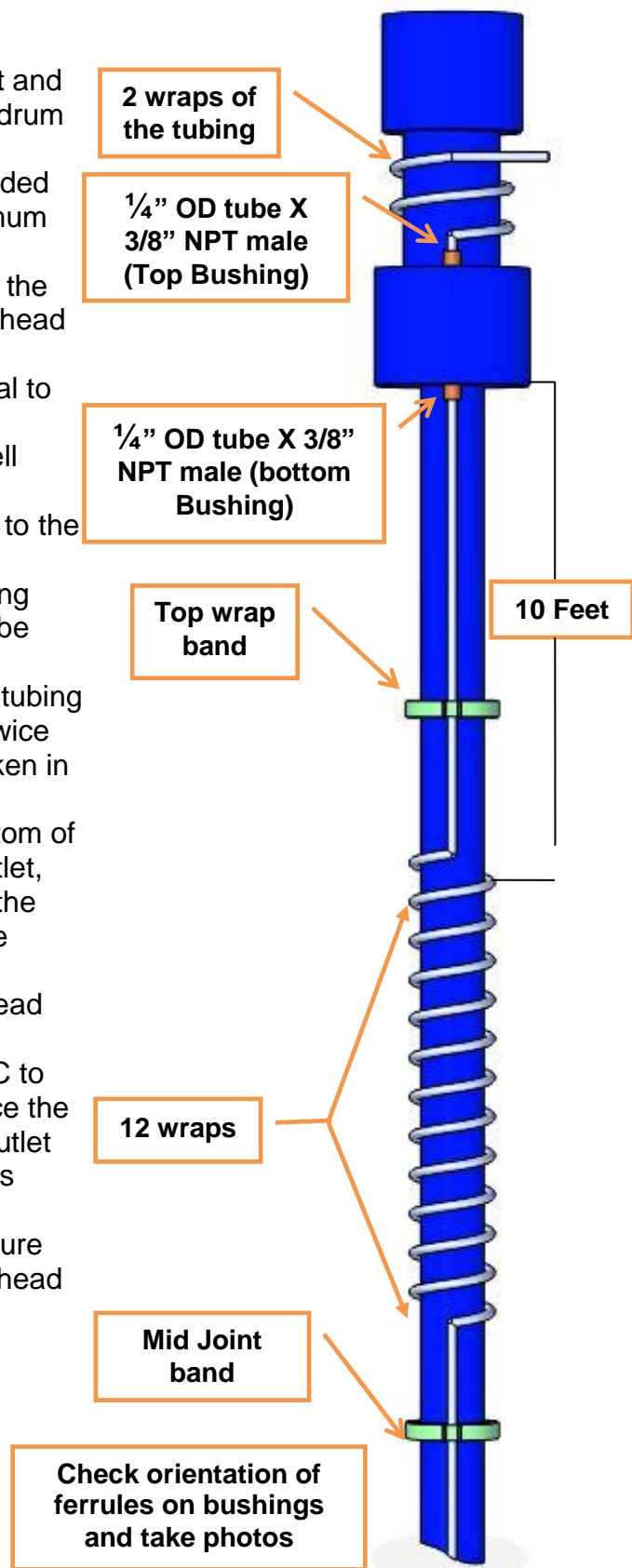


Figure 22. Wellhead exit.

17. Communicating with the AMERADA C-4000/4500/5000/5500

17.1 FIC-4000

The FIC-4000 surface controller is used to communicate with Sercel-GRC FSK AMERADA C gauges using FSK communication. The information provided here is for reference purposes only. For complete operations instruction please consult the FIC-4000 operations manual Sercel-GRC document number 006-0199-00. The system contains an FSK surface controller powered by a 100-240 VAC power supply. For more information on the operation of the FSK surface board see the FSK Surface Board Technical Reference Manual, Sercel-GRC document number 006-0196-00.

The FIC-4000 can communicate with up to 6 FSK channels (1 channel = 1 pressure/temperature sensor) for 1 FSK surface controller. The FIC-4000 is standard equipped with 1 FSK surface controller but can support 2 if equipped. Figure 23.

- A minimal FSK system consists of an external power source, surface interface box, a single conductor TEC cable, and a downhole tool.
- An example system with our least complex surface interface (**FIC-4000**) is shown to the right.
- Additionally, the **Datalogger-4000** provides extensive I/O and SD card removable memory as a standard feature.
- **Datalogger-4000** I/O includes 16 channels each of digital and analog inputs, 8 analog outputs, 9 relay outputs, 4-20mA, RS-485, RS-232, USB, with an onboard LCD display.

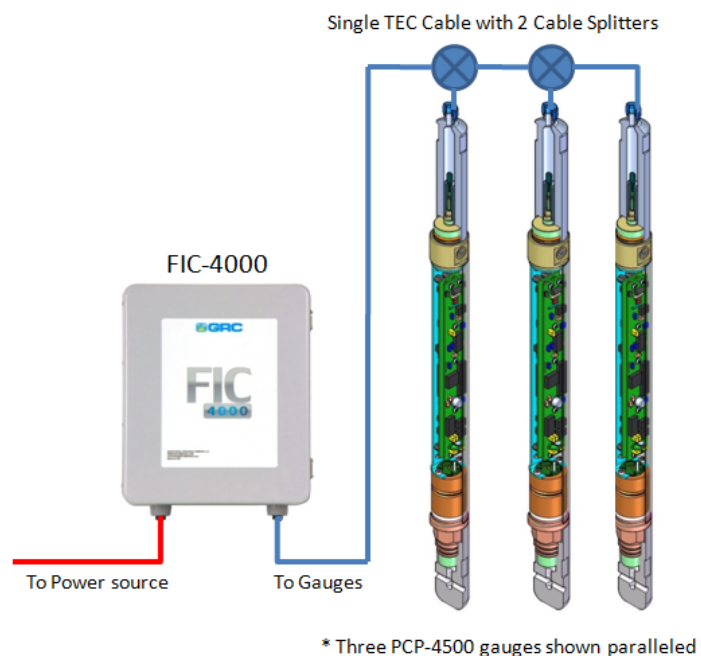



Figure 23. FIC-4000.

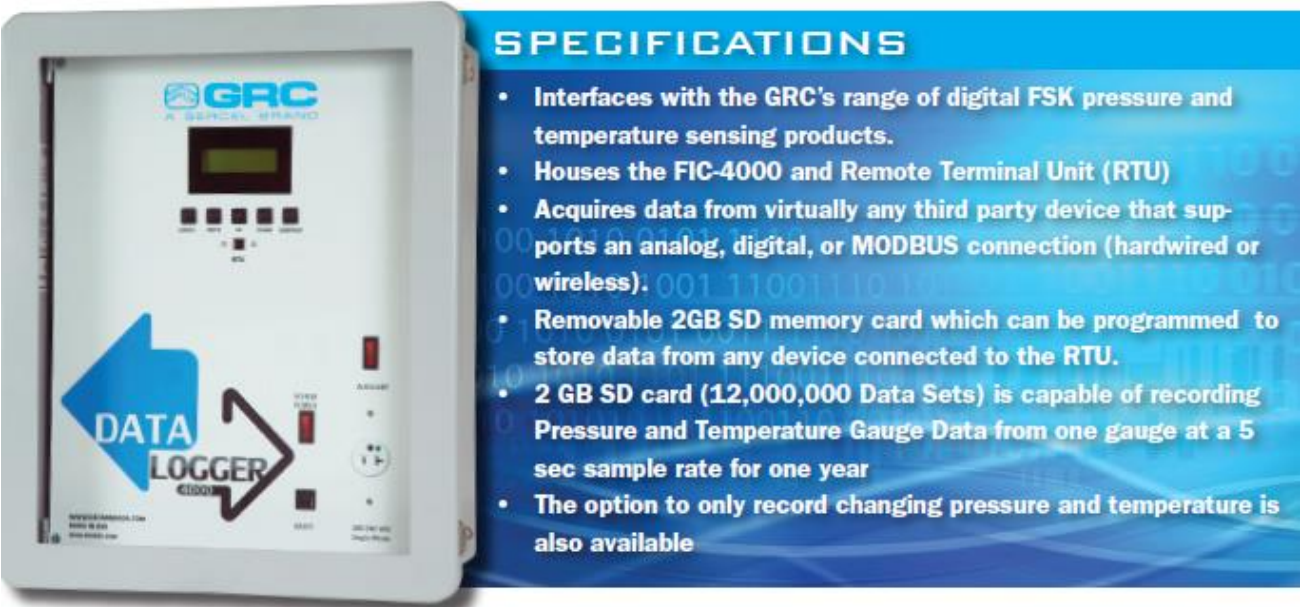
17.2 Datalogger 4000

The Sercel-GRC Datalogger-4000™ is a high performance Remote Terminal Unit (RTU) designed to interface with the GRC suite of FSK pressure and temperature sensing products. It is capable of acquiring data from virtually any third party device that supports an analog, digital or Modbus connection (hard wired or wireless). Data may be stored using removable SD data cards (2 megs) in ASCII coded text files that can be addressed by Excel or any similar program. Data can also be transmitted to other remote devices using Modbus protocol. Support for an onboard or remote display for all remote and locally connected signals allows for easy data display and control entry.

The Sercel-GRC Datalogger-4000™ may be configured using the keypad and LCD, a local PC via a built-in USB, RS-232 or RS-485 ports, serial link, or a radio connection. The Sercel-GRC Datalogger-4000™ can use virtually any commercial radio modem connected via RS-232 or RS-485. All digital & analog signals are acquired, processed and output at a minimum resolution of 16 bits and Modbus support includes acquiring 32 bit resolution data from other devices. The 8 analog outputs may be driven by any local or remote signal source, and the flexible scaling scheme covers virtually any field application. Nine relays on the board may also be driven by multiple sources, such as adjustable tank controls and control of oil field pumps dependent upon wellbore pressures. The Sercel-GRC Datalogger-4000™ is a very powerful recorder that can be configured for almost any data gathering and recording task. Figure 24.



DATALOGGER-4000™
HIGH PERFORMANCE SURFACE
MONITORING AND AUTOMATION
SYSTEM



SPECIFICATIONS

- Interfaces with the GRC's range of digital FSK pressure and temperature sensing products.
- Houses the FIC-4000 and Remote Terminal Unit (RTU)
- Acquires data from virtually any third party device that supports an analog, digital, or MODBUS connection (hardwired or wireless).
- Removable 2GB SD memory card which can be programmed to store data from any device connected to the RTU.
- 2 GB SD card (12,000,000 Data Sets) is capable of recording Pressure and Temperature Gauge Data from one gauge at a 5 sec sample rate for one year
- The option to only record changing pressure and temperature is also available

Figure 24. Datalogger-4000.

17.3 Datalogger 4200

The Sercel-GRC Datalogger-4200™ is a high performance surface monitoring and automation system designed to interface with Sercel-GRC's suite of digital downhole sensors. Device control is provided to allow alarm signaling using (2) high current relays. External devices may be monitored and controlled using one of the (3) analog inputs, and (2) analog outputs. USB and TCP/IP are provided for additional interface for data collection and downhole monitoring.

Remote control and data collection communication is via Modbus, RS-232, and RS-485. Data may be stored internally (2 megs) in ASCII coded text files that can be addressed by any Excel or similar program. Data can also be transmitted to other remote devices using MODBUS protocol. Data may also be down loaded to a USB memory stick (thumb drive). Protection from the environment is provided by a NEMA enclosure. The Sercel-GRC Datalogger-4200™ is a very powerful recorder that can be configured for almost any data gathering and recording task. Figure 25.



Figure 25. Datalogger 4200.

18. Communicating with the AMERADA C-4001T using the SPS-1501

The **SPS-1501** surface controller is used to communicate with Sercel-GRC FSK AMERADA C 4001T **gauges**. The information provided here is for reference purposes only. For complete operations **instruction please consult the SPS-1500/1501** operations manual Sercel-GRC part # 006-0202-00.

Appendix 1 – ACC-092 Kit for FORTRESS AMERADA C- 4000/4500

The following replacement parts and accessories may be purchased from Sercel-GRC Customer Service. They may be purchased individually or as a kit.

Accessory Kit part number: ACC-092

Component Part	Description	Quantity
079-0212-00	O-RING,7/8 X 1-1/8 X 1/8,#212	1
135-0026-00	NICKEL ANTI-SEIZE 2600°F	1
037-0132-01	CONTACT,#16 AWG CRIMP/SOLDER	1
067-0067-03	SLEEVE,316SS LOCKING 1509	1
074-0034-01	BOOT,A1FS-FA BLACK VITON 1533	1
089-0400-00	PLUG, PIPE,1/8-27 NPT H.PRES,	2
089-0239-00	FITTING,SAFETY CHANGER NUT&FER	1
140-0010-00	TAPE, TEFLON SEALANT	1
140-0112-00	PARKER SUPER O-LUBE, ½ OZ	1

Appendix 2 – ACC-091 Kit for FORTRESS AMERADA C- 5000/5500

The following replacement parts and accessories may be purchased from Sercel-GRC Customer Service. They may be purchased individually or as a kit.

Accessory Kit part number: ACC-091

Component Part	Description	Quantity
089-0400-00	PLUG, PIPE,1/8-27 NPT H.PRES,	1
140-0010-00	TAPE,TEFLON SEALANT	1
079-0115-02	O-RING, 75 DUR VITON, SIZE 115	2
082-0001-34	SCREW,3/8-16UNC-2Ax5" FULL THD	1
135-0026-00	NICKEL ANTI-SEIZE 2600°F	1
140-0112-00	PARKER SUPER O-LUBE, ½ OZ	1
074-0034-01	BOOT, A1FS-FA BLACK VITON 1533	1
037-0132-01	CONTACT, #16 AWG CRIMP/SOLDER	1
067-0067-03	SLEEVE, 316SS LOCKING 1509	1

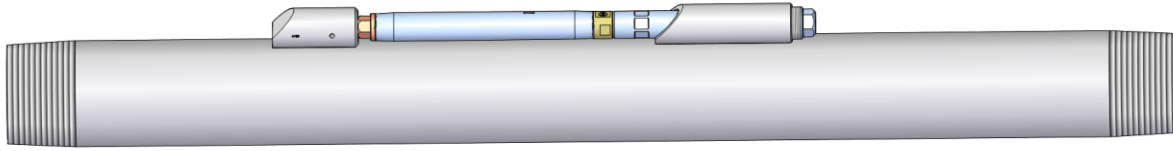
Doc No 006-0214-00 Rev AF



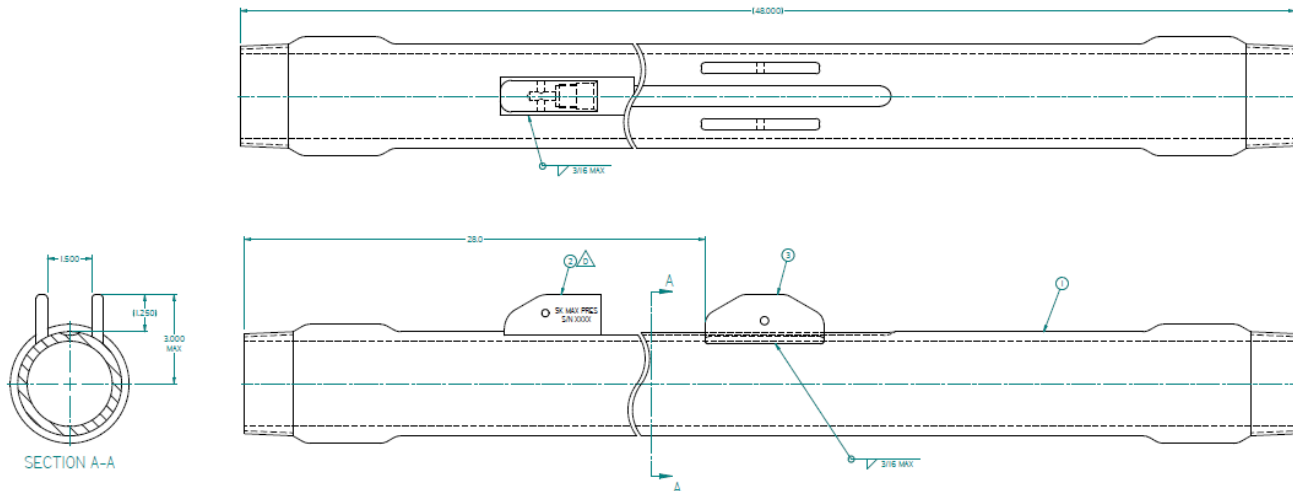
NOTE: THE FOLLOWING DRAWINGS ARE FOR REFERENCE ONLY. PLEASE CONTACT SERCEL-GRC CUSTOMER SERVICE FOR SPECIFIC PART NUMBERS AND SPECIFICATIONS.

Technical drawing of a 1/2" 20 TPI x 3.00" long stainless steel shaft. The drawing includes a side view with dimensions (48.0), (1.312), 1.50, 2.50 MAX, and 28.0. It also shows a cross-section labeled 'SECTION A-A' and a detail view of the end with dimensions 3/16 MAX and 2X (3). The shaft has a central hole and a threaded section.

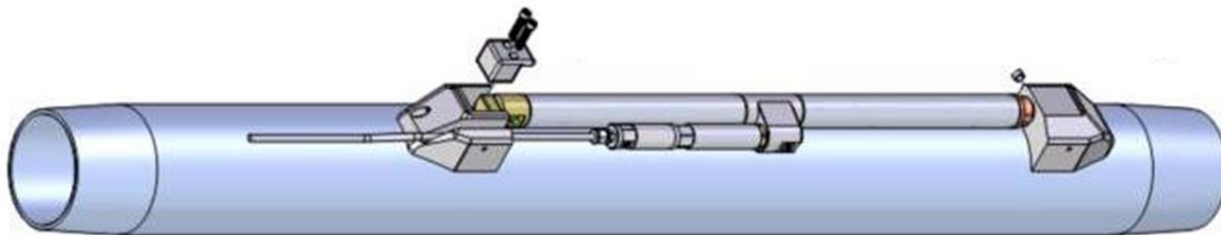
65B2260 Welded AMERADA C Intake Gauge Carrier, 5-1/2" LTC



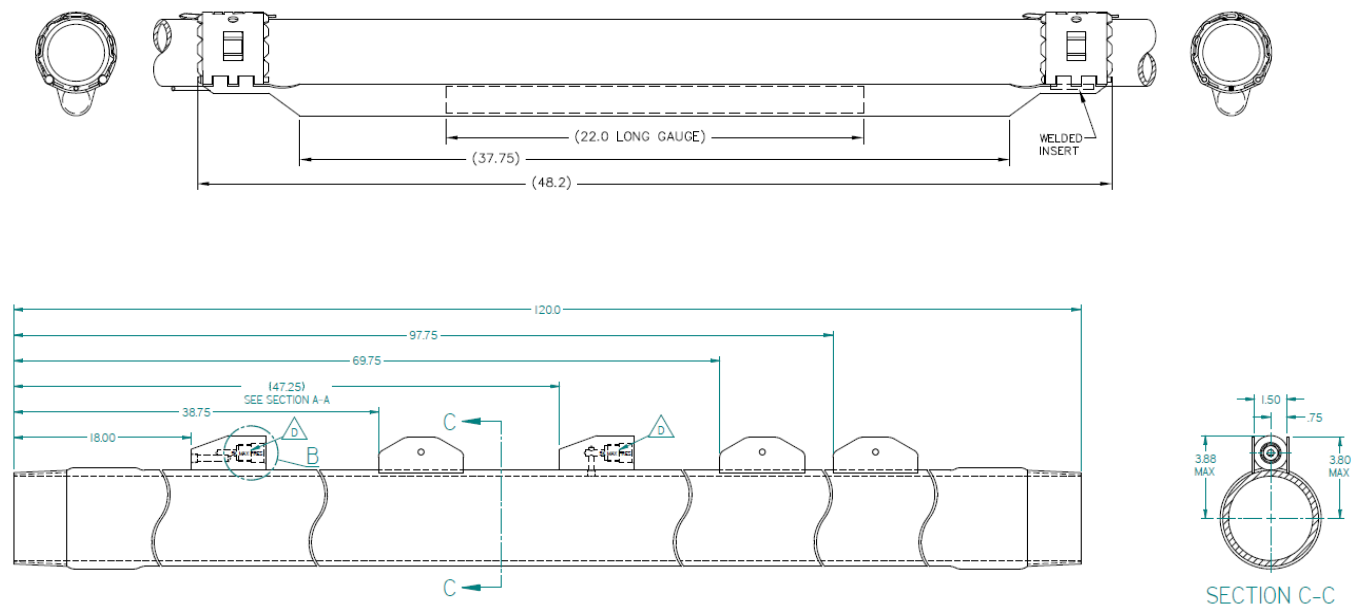
65D2250 Welded 3-1/2" PUP JOINT ANNULUS



Appendix 5 – AMERADA C-5000/5500 Dual Gauge configuration



Appendix 6 – 089-0410-00 Gauge Carrier Clamp



ANYWHERE. ANYTIME. EVERYTIME.

Sercel-GRC Corp. is a worldwide leader in downhole data acquisition and the leader in proprietary technology for measuring, recording and delivering reliable and accurate well data with extremely high resolutions.

Sercel-GRC provides gauges and surface readout tools for permanent, memory, mechanical and artificial lift applications and is the manufacturer of the Amerada® mechanical gauge used for over 80 years in the oil and gas industry.

For more information on this product or any of the quality monitoring and data acquisition solutions Sercel-GRC offers, contact us.

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