# BARTON® MODEL J8A TEMPERATURE/PRESSURE RECORDER-RECEIVER

## User Manual

Manual No. 9A-15165001, Rev. 03
January 2010

## Contents

## Safety Information

Before installing this instrument, become familiar with the installation instructions in Section 3.

**WARNING: This symbol identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.**

**CAUTION:** **Indicates actions or procedures which if not performed correctly may lead to personal injury or incorrect function of the instrument or connected equipment.**

IMPORTANT: Indicates actions or procedures which may affect instrument operation or may lead to an instrument response that is not planned.

# Section 1—Introduction

## General

The Barton Model J8A Temperature and Pressure Recorder-Receiver is a versatile and rugged instrument designed for general temperature and pressure applications. It records monitored temperature and pressure on an 8-inch diameter chart. Up to four elements or bellows-type receiver elements may be used in any combination to operate up to four individual recording pens.

## Main Components

### *Static Pressure Systems*

The static pressure system consists of a helical bourdon tube connected through tubing to system piping. The static pressure element measures the static pressure in a piping system for 0-30 inches of mercury vacuum to 0-30,000 psi. For a list of elements and ranges, see Table 7.3—Static Pressure Elements on page 30.

### *Thermal Systems*

The thermal systems consist of a spiral bourdon tube, a capillary, and a bulb. All parts are made of stainless steel. The bulb is fitted with a bendable extension, and the capillary is protected with stainless steel armor.

### *Receiver Bellows*

The J8A may be connected to a pneumatic transmitter to record the 3-15 or 6-30 psi output signal of the transmitter. The instrument may also be connected to record the output of a pneumatic transmitter simultaneously with the direct system pressure.

### *Recording Mechanism*

The recording mechanism is a linkage and pen system that permanently records data. It converts mechanical inputs from the pressure, temperature, and receiver elements to link lines on a revolving chart. All operative parts of the recorder mechanism are made of stainless steel for a longer field life. The pen mount is exceptionally rugged. All lines are adjustable. Screw adjustments for zero, range, and linearity assure fast and accurate calibration.

### *Chart Drive*

A variety of chart drives are available. Both electrical and spring-wound chart drives fit a wide variety of chart speeds and time intervals that reduce maintenance time (See Section 5—Troubleshooting on page 19). All chart drives are

interchangeable and fitted with a recorder hub clip that features a simple yet positive method of locking the chart in place. Explosion-proof electrical chart drives are available.

### *Case*

The J8A is housed in an aluminum case with a hinged door providing access for chart changes and calibration adjustment. The case is finished in a black, polyurethane electrostatic powder paint that is highly resistant to weathering, scratches, marring, and industrial fumes. The Model J8A connects to the system or transmitter through fittings in the bottom of the case.

# Section 2—Theory of Operation

## General

Pressure, temperature, and receiver elements in the J8A are connected by tubing or pipe to measure system pressure, system temperature, and transmitter output (Figure 2.1).

The capillary tubes from the static pressure element and receiver element connect directly to the piping system and are filled with the process system fluid. The thermal system is Class V mecury filled system. See Instrument Specifications on page 33 for details.

A chart drive mechanism turns the chart at a selected speed. The chart may be either an electrical motor or a mechanical, spring-wound type motor (see Table 7.2—Chart Drives on page 29).

## Static Pressure Element

The sensor element, a bourdon tube, consists of a slightly flattened cross-section of tubing coiled into a helix or flat spiral. The outer end of the tubing is sealed and attaches to a drive arm (see lever arm assembly diagram). The open end of the tubing at the base connects to the tubing. The tubing connection attaches to the tubing of the static pressure connection on the back of the recorder case. The static pressure connection connects the static pressure element to the system piping.

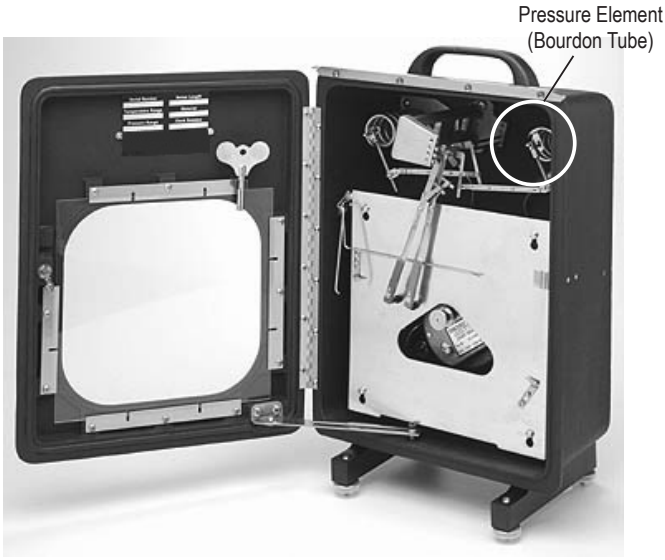


Figure 2.1—J8A recorder components

Static pressure introduced through the tubing into the static pressure element causes the spiral or helix to unwind. Conversely, a reduction of pressure within the tubing causes the element to wind up more tightly. This motion is transmitted through the lever arm assembly and its intermediate linkage to the pen shaft, which controls the movement of the recorder pen. The pen transcribes the motion onto a rotating chart to permanently record changes in static pressure in the process system.

## Temperature Element

The thermal system senses temperature changes, using the thermal expansion principle. Temperature changes cause thermal expansion and contraction of mercury in the bulb. When heated mercury expands, it increases in volume, causing the bourdon tube to exert mechanical force. The bourdon tube movement is transmitted through mechanical linkage to a recording pen (Figure 2.2—Temperature element on page 7).

### *Thermal Bulb*

The thermal bulb acts as the sensing element. Its physical and dimensional characteristics determine response time of the system. Large surface area to volume, minimum wall thickness, and high heat conductivity are desirable for high speed temperature response. The metal used in thermal bulb fabrication should have a minimum coefficient of expansion and low specific heat factor — stainless steel is used in the Model J8A thermal bulb.

### *Capillary Tubing*

The capillary tubing provides a thermal seal between the temperature bulb and bourdon tube. The tubing, fabricated from thick-walled stainless steel, minimizes the internal volume for mercury. The capillary is provided with 1/4-inch spiral armor to assure a strong and pliable transmission line between the primary element and the secondary mechanism (bourdon tube).

### *Filling Fluid*

Mercury is used as the filling fluid, because of its high energy generation per unit of temperature change, wide temperature ranges, and relatively low effect due to ambient temperature variations. Consult your nearest Cameron representative for information on other filling fluids.

### *Secondary Mechanism*

The measuring element is a precision-wound stainless steel bourdon tube, which converts the volumetric expansion and contraction of the mercury-fill

to an angular output of 17 degrees nominal for the full temperature range.

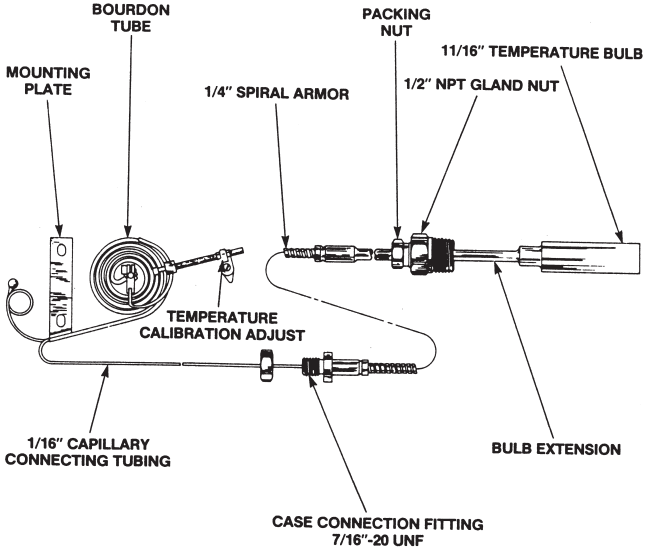



Figure 2.2—Temperature element

# Section 3—Installation

## General

The instrument should be inspected at time of unpacking to detect any damage that may have occurred during shipment.

The following practices should be observed upon installation:

Distances — The distances between the temperature bulb and the recorder case should be minimized. Maximum allowable distances are:

VA (fully compensated system): 100 feet
VB (case compensated system): 20 feet

Elevation — Maximum elevation of the temperature bulb with respect to the recorder must not exceed 30 feet. The percent of zero shift can be calibrated by the following:

$$\text{Percent Zero Shift} = \frac{5\ X \pm \text{Elevation (feet)}}{\text{Span (Degree Fahrenheit)}}$$

Process Temperature — The normal operating temperature ranges for Class V systems are listed in the Specifications list on page 33. The maximum (momentary) overrange limit is 20% of the total temperature range, while the (momentary) underrange temperature limit of a properly pre-loaded system is -50°F (-45°C).

Vibration — Vibration can be minimized by mounting the instrument on a secure support.

## Mounting

IMPORTANT: The instrument should be mounted as level as possible. Limit drill penetration and remove chips. Temperature bulb capillary must precede the recorder case through the panel cutout. Do not apply wrench or bar pressure to the recorder case, when using a thread mount.

### *Flush or Panel Mounting*

To use a flush or panel mount, perform the following steps:

1. Cut opening in panel to the dimensions shown in Section 6, Outline Dimension Drawings.
2. Drill out pilot holes located on top and bottom of case. Use a No. F drillbit (0.257 in.) and a 5/16 in.-18 tap as required.
3. Attach two flush mounting brackets to bottom of case using the enclosed self-tapping screws.

4. Pass instrument through the panel cutout.
5. Attach remaining flush mounting bracket and install panel mounting screws.

### *Pipe Mounting*

To mount the recorder to a 2-in. pipe, perform the following steps:

1. Place a suitable length of 2-inch pipe into a well-secured floor or wall flange; or if preferred, attach the 2-inch pipe to existing pipe with a saddle that is fitted with a 2-inch pipe.
2. Attach the recorder to the pipe, orient the instrument, and tighten retaining screws.

### *Bulb Mounting*

IMPORTANT—When locating the thermal bulb within a furnace, tank, line, etc., avoid dead spots where fluid circulation is sluggish and temperature is not responsive. Elevation of the temperature bulb, with respect to the recorder, will cause a slight zero shift.

To install the temperature element, perform the following steps. Refer to Figure 2.2—Temperature element on page 7 as needed.

1. If the temperature system is furnished with a thermal well, thread the thermal well into a 3/4-inch NPT threaded connection and secure with a 1-1/8-inch wrench. If no thermal well is used, proceed with step 3.
2. If a thermal well is being used, insert the temperature bulb into the thermal well to its full depths.
3. If no thermal well is being used, insert the bulb to the desired depth.
4. Secure the gland nut into the thermal well or existing 1/2-inch NPT connection with a 7/8-inch wrench.
5. With the bulb properly installed, secure the packing nut into the gland nut.

Adjust the zero at the recorder to compensate for zero shift due to elevation. See Temperature Pen Calibration on page 13 for the adjustment procedure.

## Chart Installation

Perform the following steps to install the chart:

1. Open the recorder door.
2. Release the chart lock (located on the chart drive hub).
3. Raise the pen lifter arm.
4. Slide the chart between the pen(s) and the chart plate. Insert the chart in the chart guides in the chart plate, and locate the hole in the chart onto the chart hub. Place the pressure chart onto the chart hub.

5. Lower the pen lifter arm and position the chart to place the pen(s) on the desired chart time line.
6. Secure the chart in place with the chart hub lock.

## Calibration Check

### *Pressure System*

Check the calibration of the pressure system prior to placing the recorder into service. Refer to the illustration and photo on the next page.

1. Connect the instrument into the calibration setup as shown on next page.
2. Apply zero pressure (3 or 6 psi for pneumatic transmitter output pressure recording) and adjust the pen to chart zero (zero adjust screw).
3. Apply 100% pressure. Verify that the pen moves across scale to the 100% pressure indication.
4. Apply 50% pressure. Verify that the pen indicates 50% pressure on the chart.
5. If the pen does not accurately indicate the pressure being applied, further adjustments are necessary; perform the calibration procedure outlined in Static Pressure Pen Calibration on page 14.

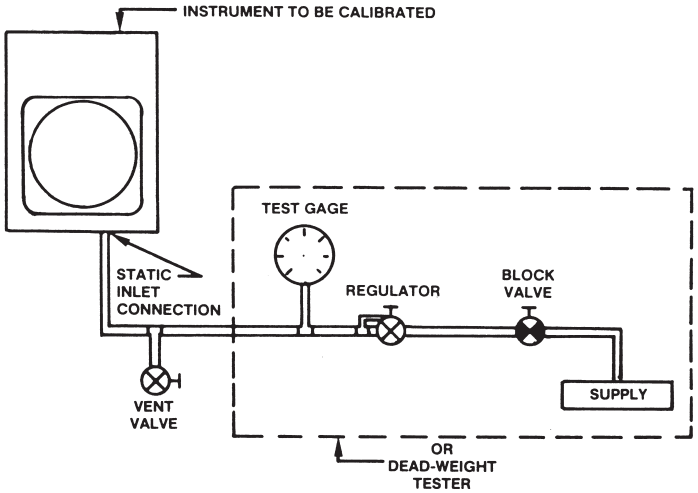



Figure 3.1—Pressure system calibration

### *Temperature System*

All instruments are calibrated at the factory and normally do not require more than a check before startup. The Model J8A has been calibrated at 0, 25, 50, 75, and 100% of full temperature range and checked for proper overtravel. Because of the extensive procedure and elaborate test stand requirements

needed to simulate operating conditions, it is recommended that only a zero check be performed. If the temperature system appears to be out of calibration, a complete calibration should be performed as outlined in Temperature Pen Calibration on page 13.

## Piping

Connect the pressure element to the system pressure or transmitter output using tubing or pipe. The pressure connection on the outside of the recorder case is 1/4-inch NPT, female.

## Operation

To place the instrument into operation, proceed as follows:

1. Turn on the drive. Verify that the pen has ink and is in contact with chart.
2. Turn on the pressure to the recorder.

To remove the instrument from service:

1. Turn off the pressure to the recorder.
2. Turn off the chart drive.
3. Lift the pen from the chart.

# Section 4—Maintenance and Calibration

## Maintenance

Generally, Barton recorders require no maintenance other than replacement of the chart, replacement of pens, winding of the spring-wound chart drives, and occasional calibration. In addition, the operator should periodically check the door seal for wear and the pressure fittings for tightness. See Table 4.1 for a list of tools required for routine maintenance.

**Table 4.1—Required Tools**

| Tool | Purpose |
|---|---|
| 1/8-inch open-end wrench | Calibration adjustment (zero adjust) |
| 5/64-inch Allen wrench | Calibration adjustment |
| 5/64-inch open-end wrench | Capillary mounting nut |
| 1-1/8-inch open-end wrench | Thermal well |
| 7/8-inch open-end wrench | Gland nut |
| 3/4-inch open-end wrench | Packing nut |
| Phillips screwdriver | Adjustments |

### *Periodic Maintenance*

Periodically inspect and clean the thermal well. In services where the temperature bulb or thermal well is in contact with semisolids, sludge build up can appreciably affect the heat conductivity of the sensing element. Inspect and clean the temperature bulb or well in the following manner:

1. Carefully remove the temperature bulb from the thermal well by loosening the packing nut and slipping it back on the bulb extension. Loosen the jam nut and remove the temperature bulb.
2. Remove the thermal well from the socket.
3. With a fine grade steel wool, remove excess residue from the temperature bulb and thermal well.
4. Examine the capillary tubing for damage or kinking.

## Temperature Pen Calibration

IMPORTANT: Verify that all linkage is free. Adjust range arm and drive arm at precisely the same distance back of the case. Adjust the lever arm and pen zero adjust screws to their midpoints all 90° midscale linkage angles must be measured.

Calibrate the temperature pen after replacing the thermal element. The complete calibration procedure is as follows:

1. Apply 50% of the total temperature range.

2. Adjust the drive arm and the driven arms to approximately 90° angles with the intermediate arms.
3. Reduce temperature to zero or starting point of the temperature range. Reset zero with zero adjusting screw.
4. Apply 100% temperature and set the pen to full scale by turning the adjusting screw.
5. Reduce temperature to zero or starting point and check zero reading. If pen is correct, proceed with step 7.
6. If zero adjustment is required, repeat steps 3 through 5 until desired accuracy is maintained.
7. Apply 50% temperature and observe pen indication.
   a. If pen indicates high or low, adjust drive link to make a correction approximately 40 times the error — in the direction of the error.
   b. Reset the pen to the 50% line by slipping the pen at the range arm pivot point.
   c. Repeat this step (7), as necessary.
8. Reduce temperature to zero or starting point and reset zero.
   a. If zero offset is minor, reset zero with zero adjust screw.
   b. If zero offset is major, reset zero by loosening bourdon mounting screws and rotate to approximately zero. Set precise zero w/zero adjust screw.
9. Repeat steps 4 through 8 until desired accuracy is maintained.

### Static Pressure Pen Calibration

To calibrate the static pressure pen and linkage, proceed as follows:

1. Adjust the static range arm and drive arm at precisely the same distance from the back of the case.
2. Place static drive link in the fourth hole from the pen shaft of the range arm.
3. Adjust static pressure linkage to form 90° angles between the drive link (see above illustration) and pivot points of the associated linkage, as follows:
   a. Apply 50% static pressure, center thumb nut on the drive arm, and arrange static linkage as shown in illustration above.
   b. Set a 90° angle between drive arm & link. Tighten clamp block screw.
   c. Vary the length of link to get a 90° angle between range arm and link.
   d. Slip the range arm on pen shaft to 50% on chart.
4. Release pressure and reset the pen to zero indication, using pen zero adjust screw for fine adjustment (10% or less). For major adjustments (more than 10%), loosen range arm lock screw and slip the pen to zero on chart and retighten lock screw.

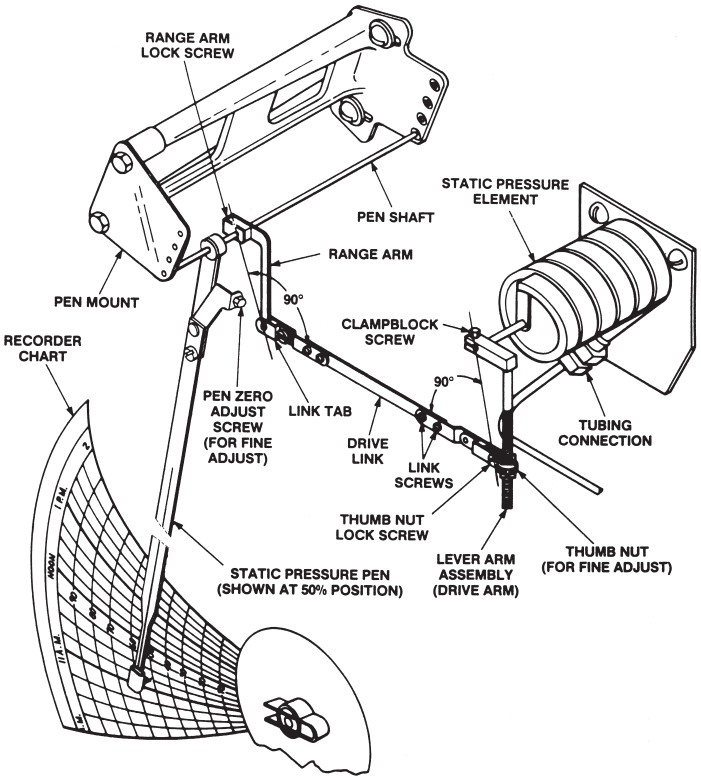



Figure 4.1—Static pressure pen calibration

IMPORTANT—It may be necessary to raise or lower the pivot point of the drive link on the range arm, as in step 3. If counterclockwise movement of thumb nut (step 5) does not increase span sufficiently, move the pivot pin up to next pivot hole; if clockwise, movement of the thumb nut does not decrease span sufficiently, move pivot pin down to the next pivot hole.

5. Apply 100% pressure and observe the pen. Make the necessary adjustments by turning the drive arm thumb nut counterclockwise if the pen is slightly underranged and clockwise if the pen is slightly overranged. Repeat zero and 100% adjustment until calibration at these two points is achieved.
6. Apply 50% pressure and observe pen indication.
   a. If pen indicates high or low, adjust drive link to make a correction approximately 40 times the error — in the direction of the error.
   b. Reset the pen to the 50% line by slipping the pen shaft at the range arm pivot point.
   c. Repeat this step (7), as necessary.

8. Release pressure and reset the pen to zero indication, using pen zero adjust screw for precise adjustment.
9. Repeat steps 4 through 8 until calibration of zero, linearity, and span (0%, 50%, and 100% indication) is achieved.
10. Assure that range arm lock screws, thumb nut lock screw, and link screws are tight.
11. Unlock the recorder hub clip and remove temporary calibration chart.
12. Replace the chart plate by sliding it into the chart plate retainer brackets and engaging each side into the chart plate latches.

### Static Pressure Element Replacement

If the static pressure element needs replacement, proceed as follows:

1. Close all valves and turn off the power switch to the recorder.
2. Separate the drive link arm by opening the link table and disengaging the pivot pin from the clamp.
3. Loosen the clamp block screw on the lever arm assembly and separate the drive arm from the static pressure element shaft.
4. Disconnect the tubing from the static pressure element at the tubing connection (refer to Figure 4.1—Static pressure pen calibration on page 15).
5. Remove the mounting screws from the static pressure element and discard the damaged element.
6. Install the new element, using the old mounting screws.
7. Connect tubing to the element at the tubing connection.
8. Assemble the lever arm assembly onto the static pressure element shaft; do not tighten the clamp block screw yet.
9. Connect the drive link to the drive arm by engaging the pivot pin and locking the link tab into place.
10. Align the static pressure linkage (range arm, drive link, and drive arm) so that it lies in the same plane without binding or bending.
11. Tighten clamp block screw.
12. Calibrate in accordance with the procedure outlined in Static Pressure Pen Calibration on page 14.

### Temperature System Replacement

Perform the following steps to replace the temperature system:

1. Loosen packing and gland nuts. Remove temp. bulb from thermal well.
2. Loosen capillary retaining nut and slip back on tubing.
3. Remove four temperature element connection screws located on the back side of the recorder case where capillary tubing enters the case.
4. Remove union bracket by slipping the bracket onto the capillary connecting tubing. Slip the bracket through the slit provided.
5. Remove the intermediate drive arm from bourdon drive extension.

6. Remove the bourdon mounting screws and remove complete temperature unit by feeding the capillary through the entry hole provided.
7. To install new element, reverse above procedure.
8. Calibrate in accordance with procedures outlined in Temperature Pen Calibration on page 13.

### Chart Drive Replacement

To replace the chart drive, proceed as follows:

1. Release the pressure to the recorder.
2. Turn off the chart drive.
3. Raise the pen lifter and remove the chart and chart plate.
4. Remove the chart drive mounting screws and remove the chart drive from the recorder case.
5. Position the new chart drive at the back of the recorder case and attach with mounting screws.
6. Replace the chart plate and the chart. Lower the pen to the recording position.
7. Check the time line on first pen from chart, zero, and span elements.

### Linkage Adjustments

Tightening the range arm and drive arm lock screws fingertight is often not tight enough; tightening them more than a full turn will often break them.

To correctly tighten linkage screws, perform the following steps. Refer to Figure 4.2 - Linkage adjustments on page 18 as needed.

1. Tighten the lock screw until snug.
2. Hold the drive arm at the clamp block by hand or with a 1/4-inch open end wrench. If a wrench is used, place it between the torque tube shaft or bearing. (In the case of the range arm lock screw, place the wrench between the pen shaft and lock screw.)
3. Tighten the lock screw 1/3 to 1/2 turn beyond snug.
4. Test for tightness by moving the free end of drive arm approximately 1/2-inch in either direction. The drive arm should spring back with no yielding.

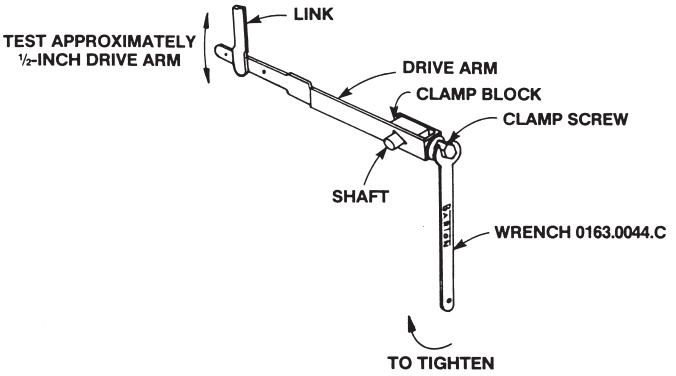


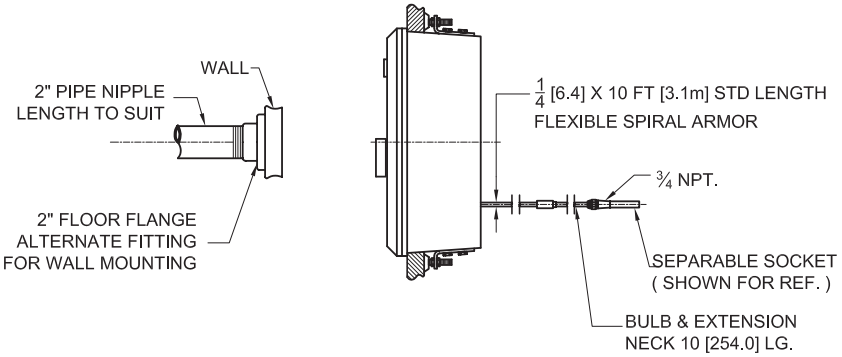

Figure 4.2 - Linkage adjustments

# Section 5—Troubleshooting

**Table 5.1—Troubleshooting Guide**

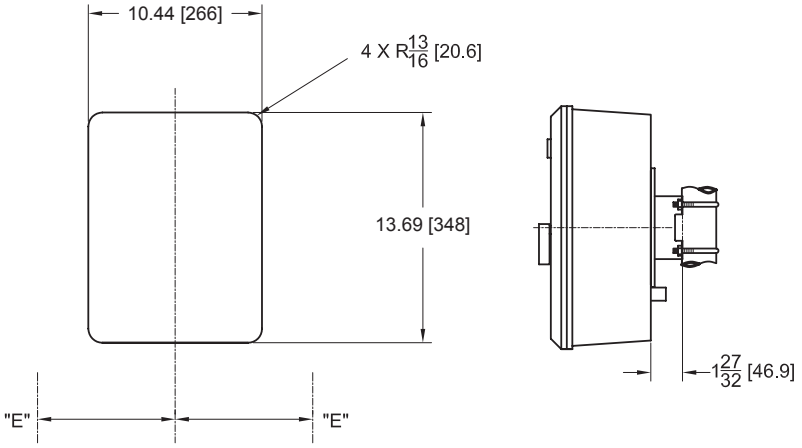
| Problem | Source | Probable Cause | Corrective Action |
|---|---|---|---|
| Low or No Indication | Excessive residue formation on temperature bulb | Heating conductivity of temperature bulb is impaired | Remove from service and clean element |
| | Mechanism | Loose links or movements | Tighten or replace |
| | | Out of calibration | Recalibrate |
| | | Corrosion or dirt in mechanism | Clean or replace |
| | | Pen arm loose | Tighten |
| | Loss of fill | Capillary cracked, kinked, or broken | Replace temperature bulb |
| | Element | Defective element | Replace element |
| | Tubing | Loose connection | Tighten connections |
| | | Tubing plugged | Clear tubing |
| | Pen arm | Pen arm bent | Straighten or replace pen arm |
| High Indication | Mechanism | Loose links or movements | Tighten or replace |
| | | Out of calibration | Recalibrate |
| Erratic Indication | Mounting | Excessive vibration | Secure the means of mounting |
| | Mechanism | Linkage dragging or dirty | Adjust or clean |
| | | Excessive pen pressure on chart | Adjust |
| No Chart Rotation | Fuse | Fuse Blown | Check and replace fuse |
| | Chart Drive | Electric drive not turned on | Turn on chart drive |
| | | Clock motor not wound | Wind chart drive |
| | | Defective drive | Replace drive |
| Wrong Chart Speed | Chart Hub Lock | Lock not latched | Latch hub lock |
| | Chart Drive | Wrong chart drive | Replace with proper chart drive |

## Section 6—Installation/Dimensional Drawings




WALL MOUNTING
SIDE VIEW

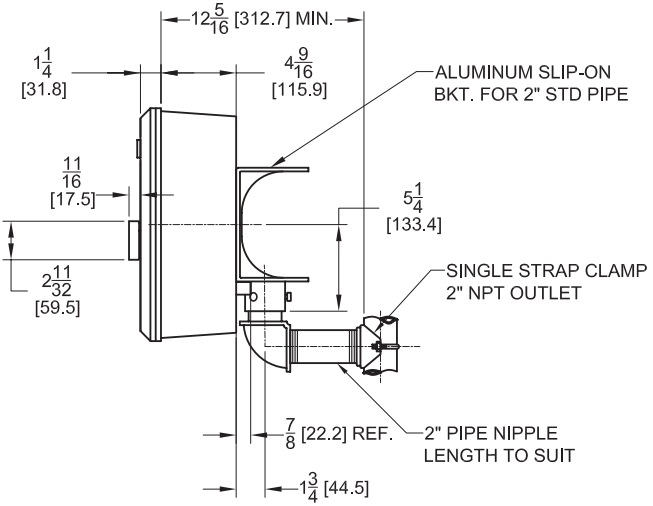
PANEL MOUNTING
SIDE VIEW
SHOWN WITH TEMP. CONNECTION ONLY



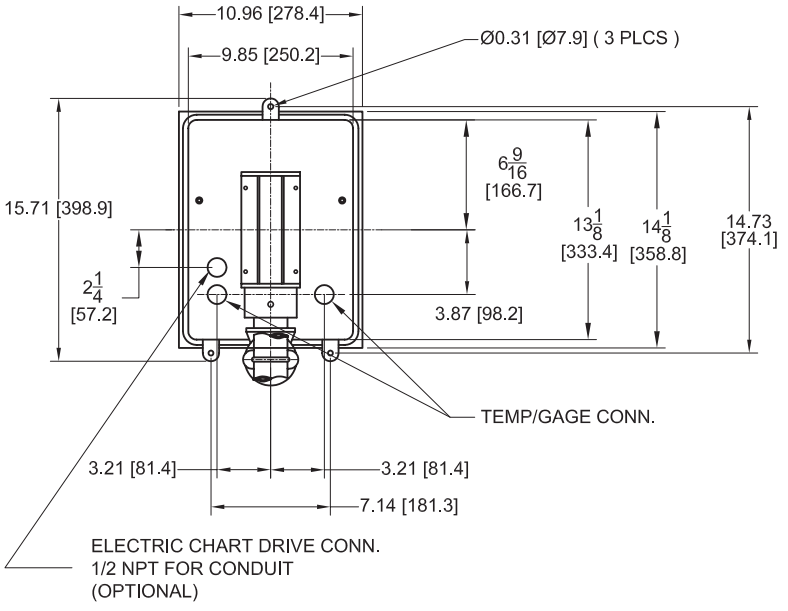

PANEL MOUNTING CUTOUT
"E" = ALLOW A SPACE OF 8 [203.2] FROM
SIDE OF OTHER APPARATUS TO ℄ OF INSTRUMENT

YOKE MOUNTING
SIDE VIEW

Figure 6.1—J8A mounting options




PIPE MOUNTING BKT., SLIP-ON
SIDE VIEW




PIPE MOUNTING BKT., THREADED
REAR VIEW

Figure 6.2—J8A mounting options (cont'd)

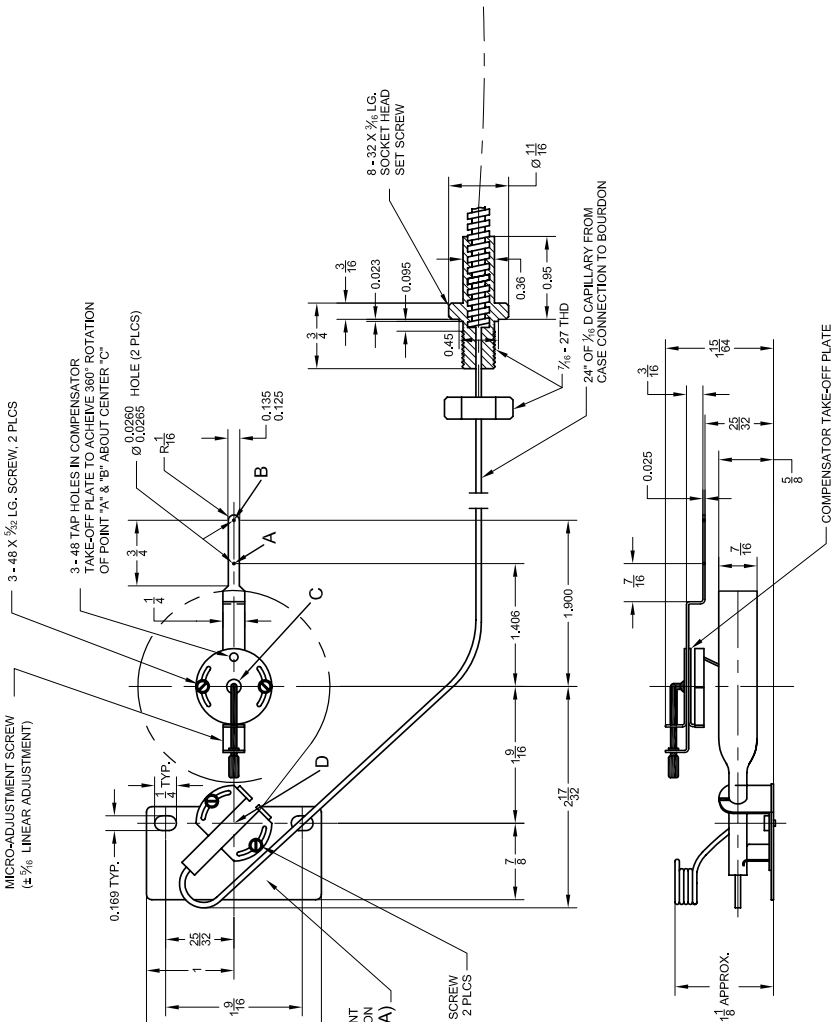



Figure 6.3—Typical thermal well installation

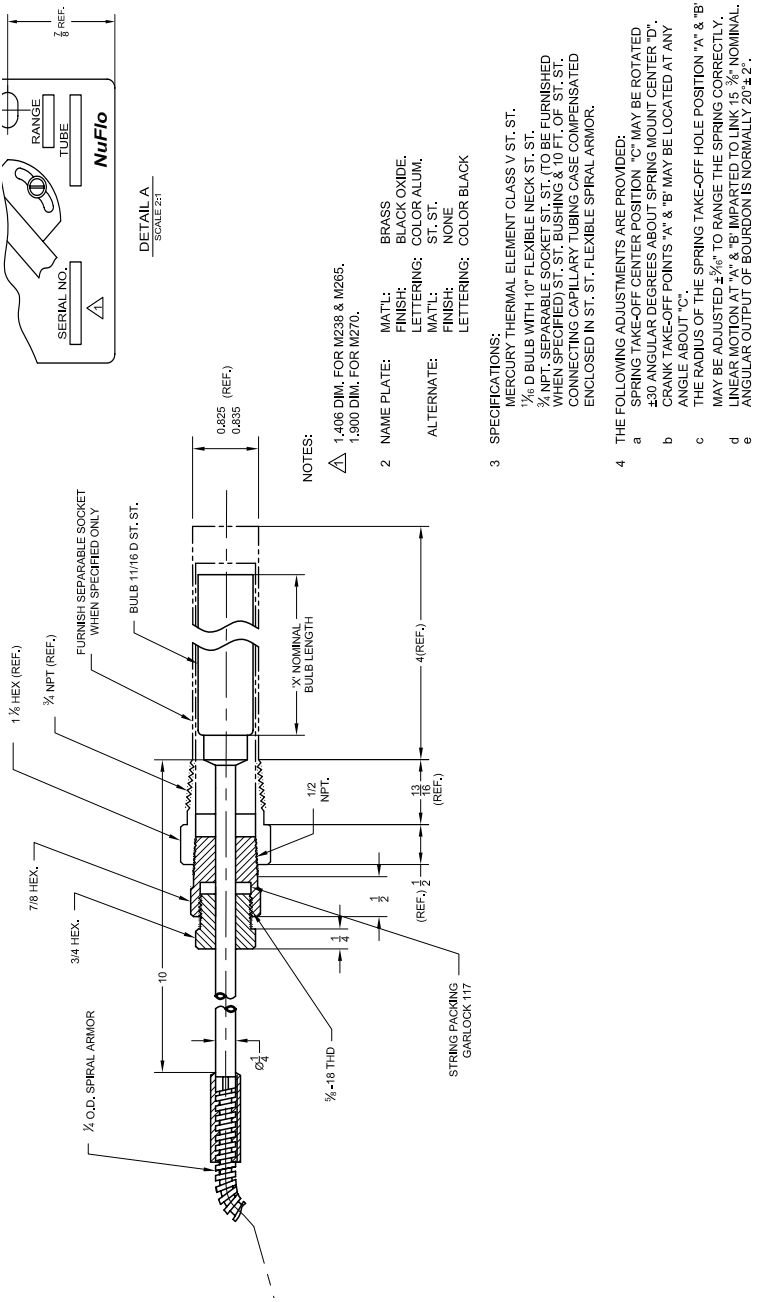



Figure 6.4—Typical thermal well installation (cont'd)

# Section 7—Assembly Drawings and Parts Lists

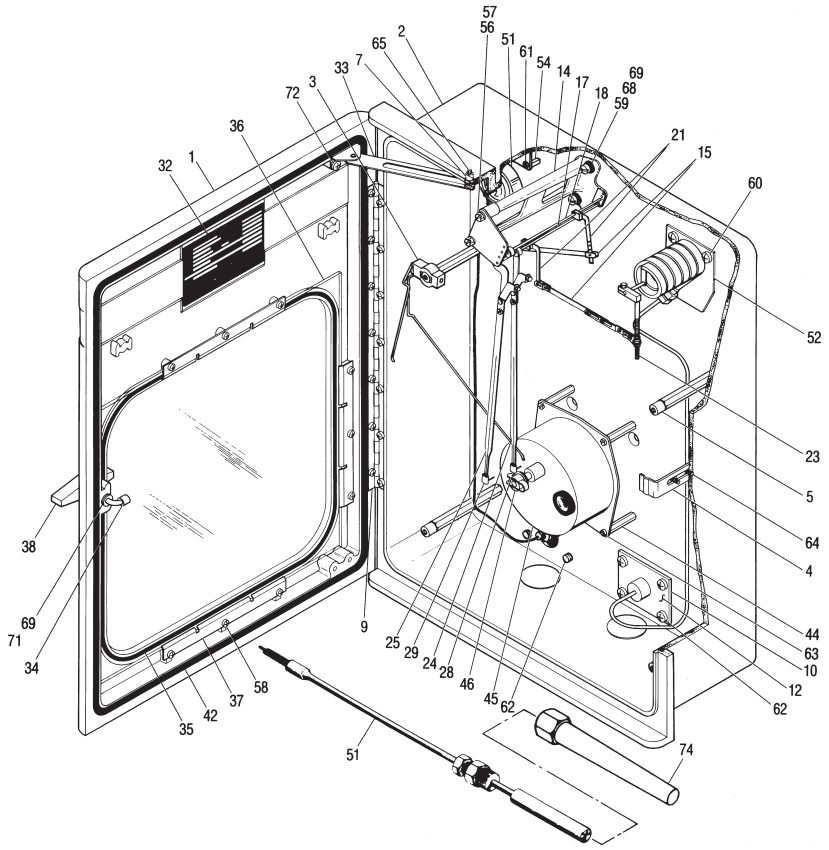



Figure 7.1— J8A assembly

**WARNING: Use only spare parts identified in this manual. Cameron bears no legal responsibility for the performance of a product that has been serviced or repaired with parts that are not authorized by Cameron.**

**Table 7.1—J8A Parts List**

| Item | Part No. | Description | Qty/Unit |
|---|---|---|---|
| 1 | 9A-5600185 | Door Assembly, Recorder | 1 |
| 2 | 9A-5600180 | Case, Recorder | 1 |
| 3 | 9A-4828530 | Pen Lifter Assembly (New Style) | 1* |

**Table 7.1—J8A Parts List**

| Item | Part No. | Description | Qty/Unit |
|---|---|---|---|
| 4 | 9A-4827956 | Latch, Door (Sub-Assy) | 1 |
| 5 | 9A-4861300 | Riser, Chart Plate | 4 |
| 7 | 9A-4527858 | Bushing, Door Stop | 1 |
| 8 | 9A-0238-1019C | Screw, CAP 1/4-20x5/8 (Not Shown) (Used w/Riser) | 1 |
| 9 | 9A-5600115 | Hinge, Door | 1 |
| 10 | 9A-0238-0019C | Entrance Plate Gasket (Static Line) | 1** |
| 12 | 9A-5600135 | Connection, Static Pressure | 1** |
| 14 | | Pen Mount Assembly | 1 |
| 14A | 9A-4547856 | 2 Pen | 1 |
| 14B | 9A-4547858 | 1 Pen (Not Shown) | |
| 15 | 9A-0238-0015B | Link Assembly (First or Second Pen) | 1** |
| 17 | 9A-0238-0006B | Shaft, Pen Arm 1st | 1 |
| 18 | 9A-0238-0007B | Shaft, Pen Arm 2nd | 1 |
| 21 | 9A-0202-0034B | Pen Shaft Arm Assy. (90 Degree Range Arm) | 1** |
| 23 | 9A-0238-0031B | Static Drive Arm (Alternate P/N 9A-400-754) | 1** |
| 24 | 9A-80-36-1670-01 | Arm, Pen (First from Chart) | 1** |
| 25 | 9A-80-36-1670-01 | Arm, Pen (Second from Chart) | 1** |
| 28*** | Disposable Pen, 1st from Chart, 6 per pkg | | A/R |
| | Blue, Scanner, High Temp. | 9A-BDP-S-1-BL-S-6 | |
| | Blue Scanner, Low Temp. | 9A-BDP-S-1-BL-L-6 | |
| | Black, Scanner, High Temp. | 9A-BDP-S-1-BK-S-6 | |
| | Black Scanner, Low Temp | 9A-BDP-S-1-BK-L-6 | |
| | Blue, Integrator, High Temp. | 9A-BDP-I-1-BL-S-6 | |
| | Blue Integrator, Low Temp. | 9A-BDP-I-1-BL-L-6 | |
| | Black, Integrator, High Temp. | 9A-BDP-I-1-BK-S-6 | |
| | Black Integrator, Low Temp. | 9A-BDP-I-1-BK-L-6 | |

**Table 7.1—J8A Parts List**

| Item | Part No. | Description | Qty/Unit |
|---|---|---|---|
| | Blue, Universal, High Temp. **** | 9A-BDP-U-1-BL-S-6 | |
| | Blue Universal, Low Temp. **** | 9A-BDP-U-1-BL-L-6 | |
| | Black, Universal, High Temp. **** | 9A-BDP-U-1-BK-S-6 | |
| | Black Universal, Low Temp. **** | 9A-BDP-U-1-BK-L-6 | |
| | High Temp = +20° to +120° F (-7° to 48°C); Low Temp = -40° to +90° F (-40° to 32° C) | | |
| 29*** | Disposable Pen, 2nd from Chart, 6 per pkg | | A/R |
| | Red, Scanner, High Temp. | 9A-BDP-S-2-RD-S-6 | |
| | Red Scanner, Low Temp. | 9A-BDP-S-2-RD-L-6 | |
| | Red, Integrator, High Temp. | 9A-BDP-I-2-RD-S-6 | |
| | Red Integrator, Low Temp | 9A-BDP-I-2-RD-L-6 | |
| | Red, Universal, High Temp. *** | 9A-BDP-U-2-RD-S-6 | |
| | Red Universal, Low Temp *** | 9A-BDP-U-2-RD-L-6 | |
| | High Temp = +20° to +120° F (-7° to 48°C); Low Temp = -40° to +90° F (-40° to +32°C) | | |
| 30*** | Disposable Pen, 3rd from Chart, 6 per pkg (Not shown) | | A/R |
| | Green, Scanner, High Temp. | 9A-BDP-S-3-GN-S-6 | |
| | Green Scanner, Low Temp. | 9A-BDP-S-3-GN-L-6 | |
| | Green, Integrator, High Temp. | 9A-BDP-I-3-GN-S-6 | |
| | Green Integrator, Low Temp. | 9A-BDP-I-3-GN-L-6 | |
| | Green, Universal, High Temp. **** | 9A-BDP-U-3-GN-S-6 | |

**Table 7.1—J8A Parts List**

| Item | Part No. | Description | Qty/Unit |
|---|---|---|---|
| | Green Universal, Low Temp **** | 9A-BDP-U-3-GN-L-6 | |
| | High Temp = +20° to +120° F (-7° to 48°C); Low Temp = -40° to +90° F (-40° to 32°C) | | |
| 31*** | Disposable Pen, 4th from Chart, 6 per pkg (Not shown) | | A/R |
| | Purple, Universal, High Temp. **** | 9A-BDP-U-4-PL-S-6 | |
| | Purple Universal, Low Temp. **** | 9A-BDP-U-4-PL-L-6 | |
| | High Temp = +20° to +120° F (-7° to 48°C); Low Temp = -40° to +90° F (-40° to +32°C) | | |
| 32 | 9A-0238-1026G | Plate, Data Recorder | 1 |
| 33 | 9A-6531018 | Door Stop Assembly | 1 |
| 34 | 9A-0238-0029B | Door Latch Assembly Hook | 1 |
| 35 | 9A-5600141 | Gasket, Cover Glass | 1 |
| 36 | 9A-5600091 | Cover, Glass | 1 |
| 37 | 9A-5600095 | Clip, Cover Glass | 4 |
| 38 | 9A-7927909 | Handle | 1 |
| 39 | 9A-4528372 | Bushing, Door Handle (Not Shown) | 1 |
| 42 | 9A-5600140 | Gasket, Recorder Door | 1 |
| 43 | 9A-5600089 | Plate, Chart (Not Shown) | 1 |
| 44 | 9A-0238-0007C | Riser, Chart Drive | 3 |
| 45 | See Table 7.2 | Drive, Chart | 1 |
| 46 | See Table 7.2 | Hub, Chart | 1 |
| 51 | See Tables 7.4, 7.5 | Element, Temperature | |
| 52 | See Table 7.3 | Element, Pressure | |
| 57 | 9A-0003-0036K | Washer, Lock, No. 8 | 2 |
| 58 | 9A-0938-0001J | Screw, Round Head, 6-32 x 1/4 | 26 |
| 59 | 9A-0114-0031J | Screw, Fil. Head, 10-32 x 1/2 | 2 |
| 60 | 9A-0111-0085J | Screw, Round Head, 10-32 x 5/16, Element Mounting (Pressure) | 2*** |
| 61 | 9A-0111-0085J | Screw, Round Head, 10-32 x 5/16, Element Mounting (Temperature) | 2** |
| 62 | 9A-0946-0002J | Screw, Self-tapping, 10-24 x 1/4, Pressure Connections | 4** |
| 63 | 9A-0114-0017C | Screw, 6-40 x 1/4 | 3 |

**Table 7.1—J8A Parts List**

| Item | Part No. | Description | Qty/Unit |
|---|---|---|---|
| 66 | 9A-0111-0086J | Screw, Round Head, 10-32 x 1/4 (Not Shown) | 1 |
| 67 | 9A-0111-0085J | Screw, Round Head, 10-32 x 5/16 (Not Shown) | 6 |
| 68 | 9A-0003-0047K | Washer, Flat, No. 10 | 2 |
| 69 | 9A-0003-0033K | Washer, Shakeproof, No. 10 | 3 |
| 70 | 9A-0320-0010J | Set Screw, Handle, 8-32 x 1/4 (Not Shown) | 1 |
| 71 | 9A-0003-1064K | Washer, Flat | 2 |
| 75 | | Mounting Bracket Assy., Slip-on (Not Shown) | |
| 75A | 9A-0199-1514C | Bracket Assembly, Recorder-Slip-on | 1 |
| 75B | 9A-0240-0009J | Screw, Flat Head, 1/4-20 x 1/2 | 4 |
| 76 | | Mounting Bracket Assy., Threaded (Not Shown) | |
| 76A | 9A-0199-1190B | Bracket, Threaded | 1 |
| 76B | 9A-0240-0009J | Screw, Flat Head, 1/4-20 x 1/2 | 4 |
| 77 | | Mounting Bracket Assy., Panel (Not Shown) | |
| 77A | 9A-0202-1004B | Panel Mounting Kit (Not Shown) | 1 |
| 77B | 9A-0238-0068C | Bracket, Panel Mounting | 3 |
| 77C | 9A-0238-0069C | Pad, Pressure | 3 |
| 77D | 9A-0238-0070C | Panel, Mounting Screw, 5/16-18 | 3 |
| 77E | 9A-0911-0004J | Screw, 1/4-20 x 5/8 | 6 |
| 77F | 9A-0500-0033J | Nut, Hex., 5/16-18 | 6 |
| 77G | 9A-0240-0009J | Screw, Flat Head, 1/4-20 x 1/2 | 4 |

*Old Style Part No. 9A-5600120
**Multiply by number of pens used.
***Recommended spare parts
**** Universal type pens are required for (4) four pen meters
A/R As Required

**Table 7.2—Chart Drives**

| Part No. | Description |
|---|---|
| **Mechanical (Spring Wound)** | |
| 9A-0042-0015T | 24 Hour/9 Day |
| 9A-0042-0016T | 7 Day |
| 9A-0042-0017T | 24 Hour/7 Day |
| 9A-0042-1008T | 24 Hour/7 Day |
| 9A-0042-0030T | 8 Day |

**Table 7.2—Chart Drives**

| Part No. | Description |
|---|---|
| **Mechanical (Spring Wound)** | |
| 9A-0042-0031T | 24 Hour/8 Day |
| 9A-0042-1004T | 31 Day |
| 9A-0042-1003T | 2 Hour/8 Hour |
| 9A-0042-0024T | 4 Hour |
| 9A-0042-1007T | 1 Hour/15 Minute |
| 9A-0042-0020T | 96 Minute/24 Hour |
| 9A-0042-1009T | 1 Hour/3 Hour |
| 9A-0042-1015T | 24 hour |
| **Battery Driven (1.5 VDC - C Cell Alkaline)** | |
| 9A-0043-1002T | 11 Selectable Speeds |
| 9A-0043-1003T | 11 Selectable Speeds (Foxboro) |
| 9A-0043-1004T | 11 Selectable Speeds (CSA Approved) |
| 9A-0043-1005T | 12 Selectable Speeds (Including 4 Hour) |
| 9A-0043-2001T | Fast Slow Speeds |
| 9A-0043-2002T | Fast/Slow (Foxboro) |
| **Chart Drive Accessories** | |
| 9A-0238-0033B | One Piece Hub |
| | Hub (Used w/ 625G070) |
| | Cap & Chain (Used w/ 725G198) |
| | Univ Mounting Plate |
| | Wind Key |
| | Wind Key, Long Shank |
| | Push/Pull Hub (Foxboro) |

**Table 7.3—Static Pressure Elements**

| Part No. | Standard Ranges |
|---|---|
| **Helical Elements (316 SST; 1/8” Union Connection; Ranges in PSIG)** | |
| 9A-B17SL-25 | 0-25 |
| 9A-B17SL-35 | 0-35 |
| 9A-B17SL-50 | 0-50 |
| 9A-B17SL-75 | 0-75 |
| 9A-B17SL-100 | 0-100 |
| 9A-B17SL-150 | 0-150 |
| 9A-B17SL-200 | 0-200 |
| 9A-B17SL-250 | 0-250 |

**Table 7.3—Static Pressure Elements**

| Part No. | Standard Ranges |
|---|---|
| 9A-B17SL-300 | 0-300 |
| 9A-B17SL-350 | 0-350 |
| 9A-B17SL-400 | 0-400 |
| 9A-B17SL-500 | 0-500 |
| 9A-B17SL-600 | 0-600 |
| 9A-B17SL-750 | 0-750 |
| 9A-B17SL-1000 | 0-1000 |
| 9A-B17SL-1500 | 0-1500 |
| 9A-B17SL-2000 | 0-2000 |
| 9A-B17SL-2500 | 0-2500 |
| 9A-B17SL-3000 | 0-3000 |
| 9A-B17SL-3500 | 0-3500 |
| 9A-B17SL-4000 | 0-4000 |
| 9A-B17SL-5000 | 0-5000 |
| 9A-B17SL-6000 | 0-6000 |
| 9A-B17SL-8000 | 0-8000 |
| 9A-B17SL-10MU | 0-10,000 |
| **High Pressure (9/16-18 Aminco Process Connection)** | |
| 9A-B17SL-10M | 0-10,000 (W/18” Welded Connection Line) Autoclave Conn. |
| 9A-B17SL-15M | 0-15,000 (W/18” Welded Connection Line) Autoclave Conn. |
| 9A-B17SL-20M | 0-20,000 (W/18” Welded Connection Line) Autoclave Conn. |
| 9A-B17SL-25M | 0-25,000 (W/18” Welded Connection Line) Autoclave Conn. |
| 9A-B17SL-30M | 0-30,000 (W/18” Welded Connection Line) Autoclave Conn. |
| 9A-SS44M-7-4 | 1/4”HP x 1/4” FNPT High Pressure Adapter |
| **Capsular** | |
| 9A-BCR3-15SL | SST: Range (PSI): 3-15 |
| **Monel** | |
| B17MK-XXXX (“XXXX” = range in PSIG) | Monel element. Available in ranges from 0-250 PSIG thru 0-6000 PSIG (W/18” Welded Connection Line. 1/4” FNPT Conn.) |

**Table 7.4—Case-Compensated Temperature Elements**

| Class VB, Mercury Filled, 1/8" capillary w/armor, 11/16" diameter sensing bulb | | | |
|---|---|---|---|
| **Temp (°F)** | **10 ft (3 m)** | **15 ft (4.57 m)** | **20 ft (6 m)** |
| 0-100 | 9A-CO-100F10F9A | 9A-CO-100F15F9A | 9A-CO-100F20F9A |
| 0-150 | 9A-CO-150F10F9A | 9A-CO-150F15F9A | 9A-CO-150F20F9A |
| 0-200 | 9A-CO-200F10F9A | 9A-CO-200F15F9A | 9A-CO-200F20F9A |
| 0-300 | 9A-CO-300F10F9A | 9A-CO-300F15F9A | 9A-CO-300F20F9A |
| 0-500 | 9A-CO-500F10F9A | 9A-CO-500F15F9A | 9A-CO-500F20F9A |
| **Class IB, Hydrocarbon Filled, 1/8" capillary w/armor, 3/8" diameter sensing bulb** | | | |
| **Temp (°F)** | **10 ft (3 m)** | **15 ft (4.57 m)** | **20 ft (6 m)** |
| 0-100 | 9A-CO-100F10F7B | 9A-CO-100F15F7B | 9A-CO-100F20F7B |
| 0-150 | 9A-CO-150F10F7B | 9A-CO-150F15F7B | 9A-CO-150F20F7B |
| 0-200 | 9A-CO-200F10F7B | 9A-CO-200F15F7B | 9A-CO-200F20F7B |
| 0-300 | 9A-CO-300F10F7B | 9A-CO-300F15F7B | 9A-CO-300F20F7B |
| 0-500 | 9A-CO-500F10F7B | 9A-CO-500F15F7B | 9A-CO-500F20F7B |

**Table 7.5—Fully Compensated Temperature Elements**

| Class VA, Fully Compensated, Mercury Filled, 1/8" capillary w/armor, 11/16" diameter sensing bulb | | | |
|---|---|---|---|
| **Temp (°F)** | **20 ft (6 m)** | **25 ft (7.6 m)** | **30 ft (9.1 m)** |
| 0-100 | 9A-F0-100F20F8A | 9A-F0-100F25F8A | 9A-F0-100F30F8A |
| 0-150 | 9A-F0-150F20F8A | 9A-F0-150F25F8A | 9A-F0-150F30F8A |
| 0-200 | 9A-F0-200F20F8A | 9A-F0-200F25F8A | 9A-F0-200F30F8A |
| 0-300 | 9A-F0-300F20F8A | 9A-F0-300F25F8A | 9A-F0-300F30F8A |
| 0-500 | 9A-F0-500F20F8A | 9A-F0-500F25F8A | 9A-F0-500F30F8A |
| **Class IA, Fully Compensated, Hydrocarbon Filled, 1/8" capillary w/armor, 3/8" diameter sensing bulb** | | | |
| **Temp (°F)** | **20 ft (6 m)** | **25 ft (7.6 m)** | **30 ft (9.1 m)** |
| 0-100 | 9A-F0-100F20F6B | 9A-F0-100F25F6B | 9A-F0-100F30F6B |
| 0-150 | 9A-F0-150F20F6B | 9A-F0-150F25F6B | 9A-F0-150F30F6B |
| 0-200 | 9A-F0-200F20F6B | 9A-F0-200F25F6B | 9A-F0-200F30F6B |
| 0-300 | 9A-F0-300F20F6B | 9A-F0-300F25F6B | 9A-F0-300F30F6B |
| 0-500 | 9A-F0-500F20F6B | 9A-F0-500F25F6B | 9A-F0-500F30F6B |

## Instrument Specifications

### *General:*

| | |
|---|---|
| Case | Die-cast aluminum, black polyurethane electrostatic powder paint, hinged glass-front door, neoprene gasket seal |
| Chart Drive | Spring-wound or battery-operated |
| Chart Size | 8-inch diameter |
| Chart Rotation | 60 minutes to 31 days |
| Number of Pens | 1 to 4 (one for each element) |
| Pen Style | Disposable |

### *Element:*

| | |
|---|---|
| Type | Pressure: Helical (bourdon);<br>Output: Bellows (capsule);<br>Temperature: Helical (bourdon), Class V mercury filled |
| Number | 1 to 4 (any combination) |
| Range | Bellows: (3-15 or 6-30 psi);<br>Helical: (0-30" Hg vacuum to 0-30,000 psi) |
| Accuracy | Bellows: ±0.5% of full scale<br>Static Pressure: ±1% of full scale<br>Temperature: ±1% of full scale |
| Material | Bellows: Stainless Steel<br>Helical: Stainless Steel and K-Monel |

### *Class V Thermal System:*

(Ambient Temperature Compensated)

| | |
|---|---|
| Class VA | Fully compensated<br>-40° to 600°F (-40° to 315°C) |
| Class VB | Case compensated<br>-40° to 600°F (-40° to 315°C) |

### *Class I Thermal System: (Ambient Temperature Compensated):*

| | |
|---|---|
| Class IA | Fully compensated |
| Class IB | Case compensated |
| Class I Range Limits: | |
| Ethyl-Benzene (EB) | -125° to 350°F (-87° to 177°C) |
| Kerosene (KER) | -20° to 500°F (-29° to 260°C) |
| Alcohol (ALC) | -200° to 150°F (-129° to 66°C) |

## Product Warranty

A. Warranty
Cameron International Corporation ("Cameron") warrants that at the time of shipment, the products manufactured by Cameron and sold hereunder will be free from defects in material and workmanship, and will conform to the specifications furnished by or approved by Cameron.

B. Warranty Adjustment
1. If any defect within this warranty appears, Buyer shall notify Cameron immediately
2. Cameron agrees to repair or furnish a replacement for, but not install, any product which within one (1) year from the date of shipment by Cameron shall, upon test and examination by Cameron, prove defective within the above warranty.
3. No product will be accepted for return or replacement without the written authorization of Cameron. Upon such authorization, and in accordance with instructions by Cameron, the product will be returned shipping charges prepaid by Buyer. Replacements made under this warranty will be shipped prepaid.

C. Exclusions from Warranty
1. THE FOREGOING WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER EXPRESSED OR IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE.
2. Components manufactured by any supplier other than Cameron shall bear only the warranty made by the manufacturer of that product, and Cameron assumes no responsibility for the performance or reliability of the unit as a whole.
3. "In no event shall Cameron be liable for indirect, incidental, or consequential damages nor shall the liability of Cameron arising in connection with any products sold hereunder (whether such liability arises from a claim based on contract, warranty, tort, or otherwise) exceed the actual amount paid by Buyer to Cameron for the products delivered hereunder."
4. The warranty does not extend to any product manufactured by Cameron which has been subjected to misuse, neglect, accident, improper installation or to use in violation of instructions furnished by Cameron.
5. The warranty does not extend to or apply to any unit which has been repaired or altered at any place other than at Cameron's factory or service locations by persons not expressly approved by Cameron.

## Product Brand

Barton® is a registered trademark of Cameron International Corporation ("Cameron").

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