

Fulscope® 76J Series Model C
Pneumatic Recorder

Instructions



ABB INSTRUMENTATION

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
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Use of Instructions

 **Warning.** An instruction that draws attention to the risk of injury or death.

 **Note.** Clarification of an instruction or additional information.

 **Caution.** An instruction that draws attention to the risk of the product, process or surroundings.

 **Information.** Further reference for more detailed information or technical details.

Although Warning hazards are related to personal injury, and **Caution** hazards are associated with equipment or property damage, it must be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process system performance leading to personal injury or death. Therefore, comply fully with all **Warning** and **Caution** notices.

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Health and Safety

To ensure that our products are safe and without risk to health, the following points must be noted:

1. The relevant sections of these instructions must be read carefully before proceeding.
2. Warning Labels on containers and packages must be observed.
3. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given or injury or death could result.
4. Normal safety procedures must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
5. Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
6. When disposing of chemicals, ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual may be obtained from the Company address on the back cover, together with servicing and spares information.

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1 INTRODUCTION

1.1 DESCRIPTION

Fulscope 76J Pneumatic Recorders measure and record process variables such as temperature, gage and absolute pressures, vacuum, liquid level, and flow. The recorders offer a selection of many different measuring elements which have been designed to permit direct connection of the instrument in a wide variety of process applications.

The measured process variables are recorded on a 12-inch circular chart. As many as three variables can be recorded simultaneously using different ink colors. The pen arrangement and ink colors are shown in Figure 1.

The process variable actuates the measuring element which positions the pen through a mechanical linkage. The measuring element is mounted inside the case in back of the chart. Multiple-pen recorders have a measuring element for each pen to provide independent chart records.

The recorder is housed in a weatherproof aluminum case. It is suitable for either panel or surface mounting.

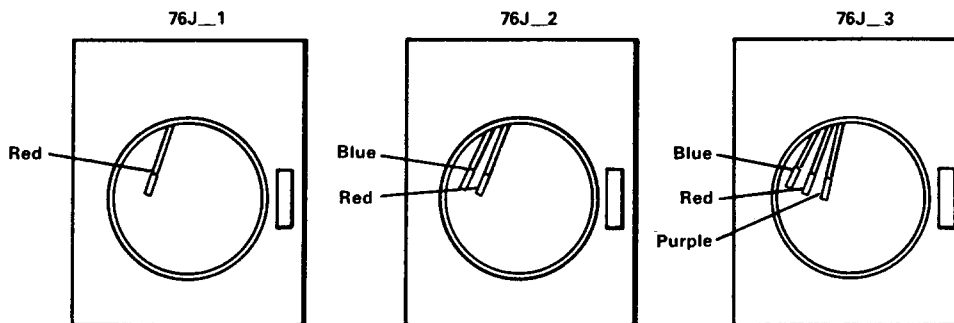


Figure 1. Pen Arrangement

INTRODUCTION

1.2 TECHNICAL CHARACTERISTICS

Process Connections	Bottom or Back connected (3 maximum)
Air Supply and Output Connections	Bottom connected or Back connected (1/4 inch internal NPT)
Chart Drive (Electric)	
General purpose construction	120 or 240V, 50 or 60 Hz
Power Consumption	at 60 Hz: 5W, at 50 Hz: 3.4W
Chart Drive (Spring Wound)	9 day wind period
Chart Drive (Battery operated)	
General purpose	Requires 1 "C" -cell (included)
Quartz movement	1-year running time
Calibrated Accuracy (Error Limits)	±1% of span maximum, 0.7 % typical
Ambient Temperature Limits	-25 to 180°F (-32 to 82°C)
Electric Chart Drive	
General Purpose:	-25 to 180°F (-32 to 82°C)
Spring Wound Drive:	-20 to 160°F (-29 to 71°C)
Battery Operated.	-40 to 170°F (-40 to 77 °C)
Inking Systems	
V-Type and Reservoir Pens:	-25 to 150°F (-32 to 66°C)
Fiber-Tipped Pens:	-5 to 140°F (-21 to 60°C)
Overrange Protection	Determined by the measuring element selection. Please refer to the Measuring Element section for details
PHYSICAL SPECIFICATIONS	
Case and Door - NEMA 3	
Material:	Cast aluminum housing
Finish:	Corrosion-resistant textured paint The door is beige; the case is light brown
Window	Choice of Glass or Acrylic
Chart	12 in. (305 mm) circular
Mounting	Choice of Panel, Surface, Vertical pipe mount, or, Free standing and portable.
Size (approximate)	
Height	17-17/32 in. (445 mm)
Width	13-25/32 in. (350 mm)
Depth	5-5/32 in. (131 mm)
Weight (approximate)	22 lb (10 kg) plus measuring element
Pens	
Choice of:	
• V-type with 1/2 oz bottle of ink (1 and 2 pen instruments)	
• Reservoir with 1/2 oz bottle of ink (3 pen instruments)	
• Fiber-tipped pens	

1.3 PRODUCT IDENTIFICATION

The serial number stamped on the data plate consists of the catalog number and a sequential identification number. The catalog number describes the construction of the recorder.

For measuring element actuation ordering information, refer to the appropriate specification Sheet located in the **Measuring Element** tab section.

Code No.	Description
	BASE NUMBER - 1st through 3rd Characters
76J	FULSCOPE Recorder
	NUMBER OF RECORDING PENS - 4th Character
1	1 Pen
2	2 Pens
3	3 Pens
	PEN 1 MEASURING ELEMENT TYPE - 5th Character
	Temperature (filled system) Fill fluid:
G	Gas, SAMA class IIIB
M	Mercury, SAMA class VA and VB
V	Vapor, SAMA class II A, B, C, or, D
R	Monolex™, SAMA class IB
S	Ducalex™, SAMA class IA
	Pressure Elements (letter codes, C, J, P, and Z are ALWAYS installed in the upper left (second pen) position. For 2 or 3 pen instruments they can only be in pen 2 position)
A	Absolute Pressure Capsule
C	Differential Pressure meter body. Termination's 183 through 186: see pen 2 code. can only be selected once per instrument
Z	Differential Pressure meter body. Termination's 191 through 197 see pen 2 code. can only be selected once per instrument
D	Differential Pressure: Low Pressure unit
F	Gauge Pressure: low pressure units or Bourdon Springs
N	Gauge Pressure: Remote seal Filled system
	Electrical input to motion converter
T	Electrical to motion element
	Measuring element not included
L	Set-up for but no supply measuring element. Not valid for set-up for type 183 to 186, and 191 to 197 Differential pressure meter body.
J	Set-up for but no supply type 183 to 186 Differential pressure meter body
P	Set-up for but no supply type 191 to 197 Differential pressure meter body
	PEN 2 MEASURING ELEMENT TYPE - 6th Character
O	Second pen not installed
	Temperature (filled system) Fill fluid:
G	Gas, SAMA class IIIB
M	Mercury, SAMA class VA and VB
V	Vapor, SAMA class II A, B, C, or, D
R	Monolex™, SAMA class IB
S	Ducalex™, SAMA class IA

INTRODUCTION

Pressure Elements (letter codes, C, J, P, and Z are ALWAYS installed in the upper left (second pen) position. For 2 or 3 pen instruments they can only be in pen 2 position.)

- A** Absolute Pressure Capsule
- C** Differential Pressure meter body. Termination's 183 through 186 required position for 2-pen instruments can only be selected once
- Z** Differential Pressure meter body. Termination's 191 through 197 required position for 2-pen instruments can only be selected once
- D** Differential Pressure: Low Pressure unit
- F** Gauge Pressure: low pressure units or Bourdon Springs
- N** Gauge Pressure: Remote seal Filled system
- Electrical input to motion converter**
- T** Electrical to motion element
- Measuring element not included**
- L** Set-up for but no supply measuring element. Not valid for set-up for type 183 to 186, and 191 to 197 Differential pressure meter body. Not valid unless pen code 2 is selected
- J** Set-up for but no supply type 183 to 186 Differential pressure meter body can only be selected once Not valid unless pen code 2 is selected
- P** Set-up for but no supply type 191 to 197 Differential pressure meter body can only be selected once Not valid unless pen code 2 is selected

PEN 3 MEASURING ELEMENT TYPE - 7th Character

- O** Third pen not installed
- Temperature (filled system) Fill fluid:**
- G** Gas, SAMA class IIIB
- M** Mercury, SAMA class VA and VB
- V** Vapor, SAMA class II A, B, C, or, D
- R** Monolex™, SAMA class IB
- S** Ducalex™, SAMA class IA

Pressure Elements.(Differential pressure elements can not be installed in this position)

- A** Absolute Pressure Capsule
- F** Gauge Pressure: low pressure units or Bourdon Springs
- N** Gauge Pressure: Remote seal Filled system
- Electrical input to motion converter**
- T** Electrical to motion element
- Measuring element not included**
- L** Set-up for but no supply measuring element . Not valid unless pen code 3 is selected.

DOOR OPTIONS - 8th Character

- 1** Glass chart window
- 2** Glass chart window and door lock
- 3** Acrylic chart window
- 4** Acrylic chart window and door lock

INTRODUCTION**MOUNTING CONFIGURATION** - 9th Character

- 1 Panel Mount (connections are at the back of the case)
- 2 Wall Mount (connections are at the bottom of the case)
- 3 2 inch vertical pipe mounting brackets
- 4 Handle and feet
- 5 Handle and feet - with power cord
- 6 2 inch vertical pipe mounting brackets for pen codes C, J only
- 7 Panel Mount for pen codes C, J, P, or Z (connections are at the back of the case)
- 8 2 inch vertical pipe mounting brackets for pen codes P and Z only

INKING SYSTEM - 10th Character

- F Fiber-tipped ink capsule
- V V- tip, Not available for 3-pen instruments, valid on 1-pen or 2-pen instruments only.
- R Reservoir

CHART DRIVE TYPE - 11th Character

- A Electric (general purpose only) 120 V, 60Hz
- B Electric (general purpose only) 120 V, 50Hz
- C Electric (general purpose only) 240 V, 60Hz
- D Electric (general purpose only) 240 V, 50Hz
- E Spring wound, 9 day wind
- F Spring wound , 9 day wind, Dual speed
- G Battery operated

CHART DRIVE ROTATION PERIOD - 12th and 13th Characters
(Other rotation periods are available.)

- 22 7- Day
- 25 24 - Hour
- 26 12 - Hour
- 72 24 - Hour or 7 - Day (switch selectable)
- 24 2- Day
- 69 8 Day
- 70 31- Day

TAGGING AND CERTIFICATIONS - 14th character

- 0 No tags or certifications required
- 1 Custom Information Included on the instrument data plate
- 2 Custom Information stamped on a 316 Stainless Steel tag and wired to the instrument (Specify 316 Stainless Steel wire or plastic tie-wrap)
- 3 Customer Information stamped on a 316 Stainless Steel tag and permanently attached to the instrument
- 4 3- point Certificate of Calibration
- 5 Combination of codes 1 and 4
- 6 Combination of codes 2 and 4
- 7 Combination of codes 3 and 4

REVISION LEVEL - 15th character

- C Revision level C

76J1FOO11FA220C SAMPLE MODEL NUMBER

INTRODUCTION

1.4 RELATED DOCUMENTATION

Additional documentation related to the use of the 440R can be found in the following documents.

- **IB-04F109** 1401L - 1405L Model D Electrical-to-Motion Element (EME) for 76J, 120R. The 1400L Series EME units, are solid-state electro-mechanical units that convert electrical input signals to a mechanical movement compatible with the instrument linkage systems. An optional fitting allows an instrument having any type of actuation (filled systems) to be converted to accommodate an EME.
- Measuring Elements Section of Specification Book

2 INSTALLATION

2.1 UNPACKING

Unpack and visually inspect the recorder. Normal shipment includes the following:

- Box of 100 Charts.
- Pen assortment for each recorder pen
If the recorder has either the V-type pens or reservoir pens, the pen assortment consists of a 1/2 ounce bottle of ink with a dropper assembly for each pen color. When the recorder has the optional fiber-tip pens, the assortment consists of a spare pen clip and three pen cartridges for each pen color.
- Clock key for spring-wound clock.
A clock key is supplied in a small envelope taped to the recorder door for the spring wound clock.
- "C" cell battery for battery operated clock.

The recorder door is wrapped in plastic to prevent scratches during shipping and handling. It is recommended that the plastic be left in place until the recorder is installed.

2.2 MOUNTING

Select a mounting location where there is minimum vibration. The ambient temperature should be within the limits listed under **1.2 Technical Characteristics**.

If the recorder has a thermal system or volumetric pressure system, untie capillary being careful not to kink it. Unwind the capillary by unrolling, and make ready for connection to the process. Do not remove protective covering from bulbs or seal elements until ready to make the process connection.

Mount the recorder in a vertical position. Mounting dimensions are shown in Figure 2 for either panel or surface mounted using the reversible mounting brackets (MD-J-076-17 at back of book). Additional mounting diagrams are in the back of the book. See MD-J-076-19 for the handle and feet option. See MD-J-076-20 for the 2 inch vertical pipe option. See MD-J-076-21 for the differential or absolute pressure meter body element options.

Pressure, volumetric pressure, thermal system, and electrical connections enter the recorder through either the bottom or back of the case. Allow for access to these connections when mounting. Note that connections enter through both the bottom and back on 3-pen recorders.

INSTALLATION

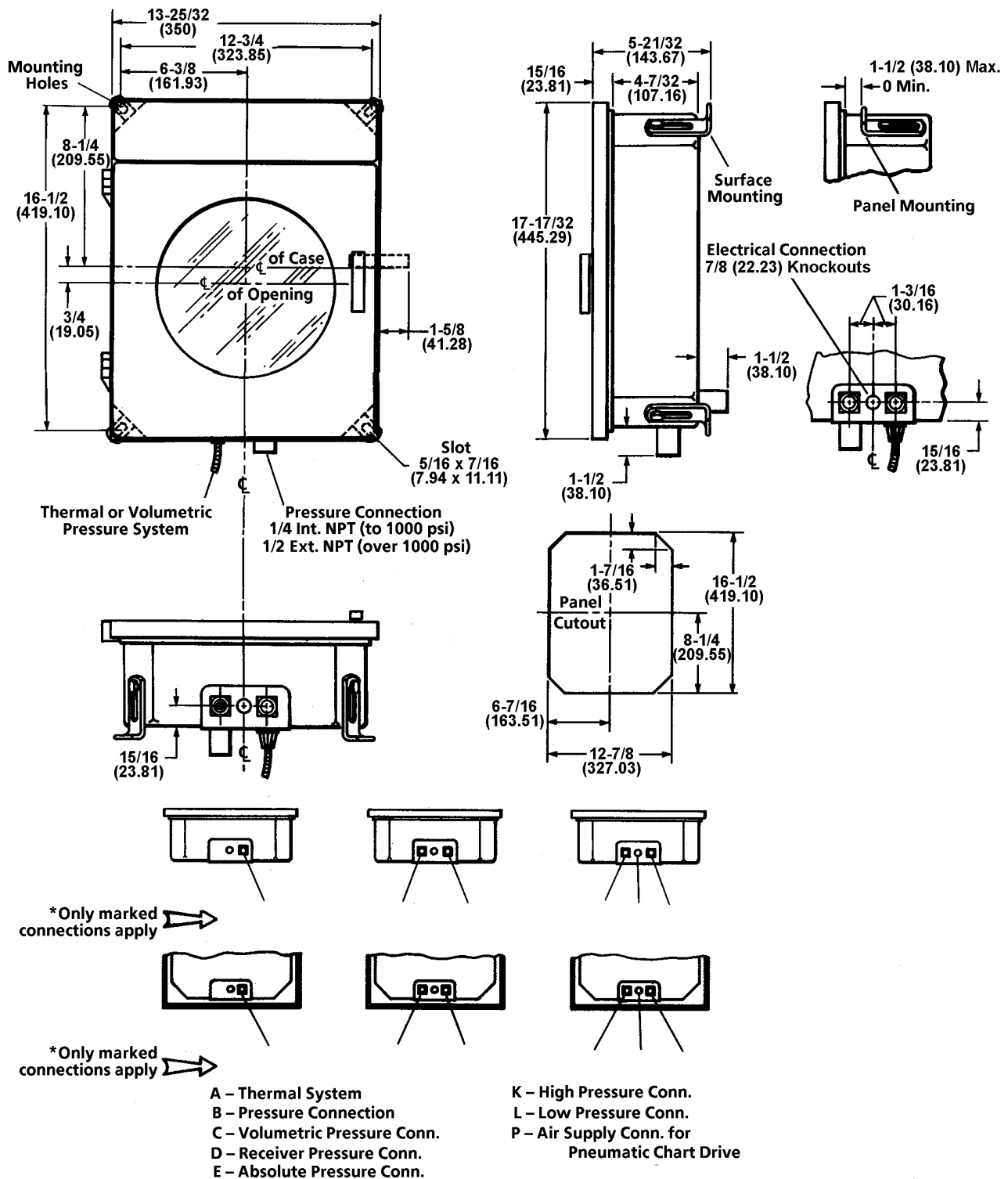


Figure 2. Recorder Panel and Wall Mounting Dimensions (Connections at Back or Bottom)

2.3 PROCESS CONNECTIONS

CAUTION When installing thermal systems or volumetric type pressure systems never cut the flexible capillary tubing, and do not make bends smaller than a 3" (76 mm) radius.

2.3.1 Thermal Systems

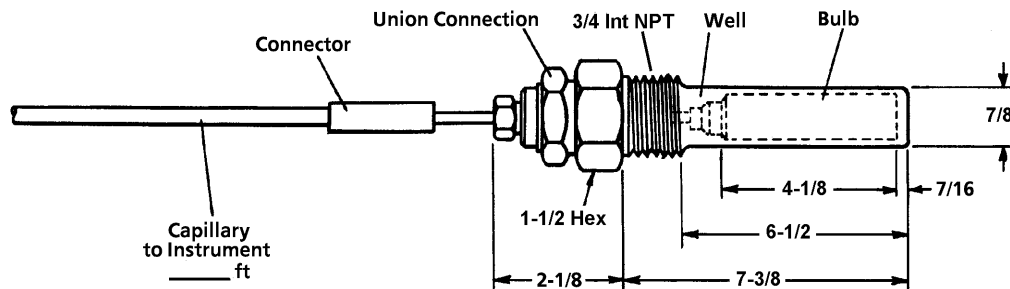
Locate flexible connecting capillary tubing where it will not contact extremely hot or cold surfaces. When it is necessary to fasten tubing to rigid supports, use staples or heavy wire. Do not drive staples so tight that they collapse tubing.

If capillary tubing is too long, coil surplus at some convenient point. Wind surplus tubing in coils not smaller than 24" (609.6 mm) in diameter.

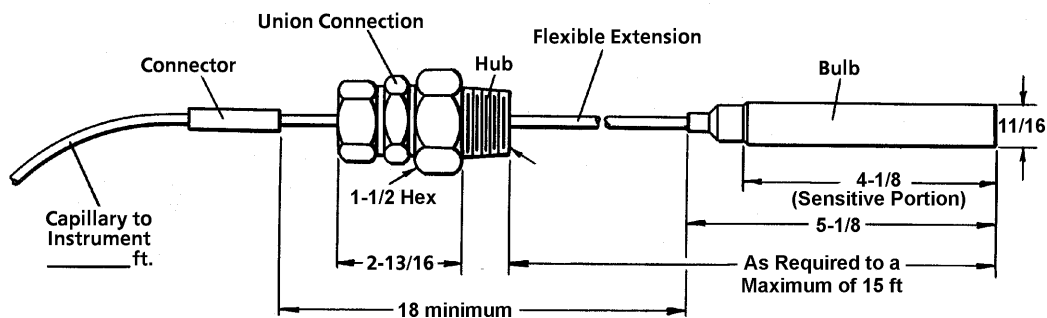
Install the tube system bulb, Figure 3, in the process at the point where measurement is required. For accurate measurement there should be good circulation of process fluid around the bulb.

If a separable well is used, make certain the Thermospeed sleeve, Figure 4, is inserted between the well and the bulb. Push the bulb completely to the bottom of the well. Avoid sharp bends along the connecting capillary tubing.

Do not subject bulb to higher temperatures than maximum range of chart. If process requires higher cleaning temperatures than maximum range, remove bulb before cleaning.



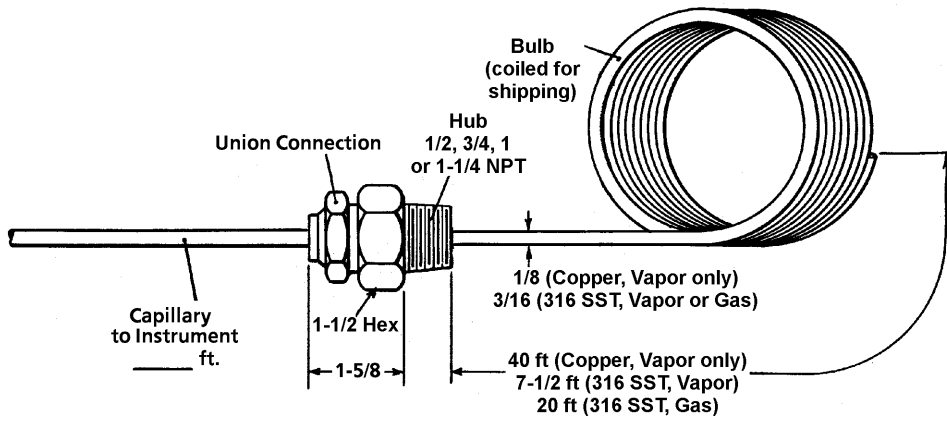
Plain Bulb, Flexible Extension with Union Connection and Well, Termination No. 25



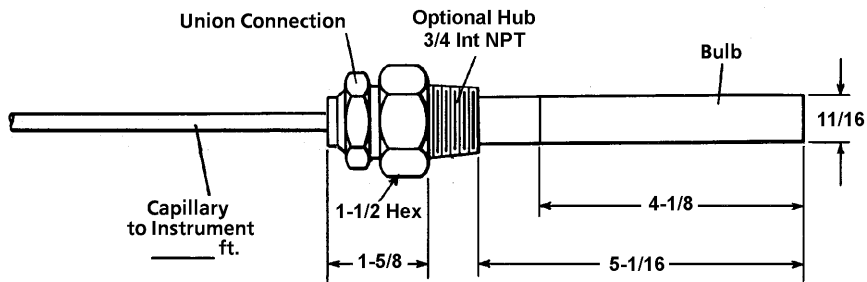
Plain Bulb, Flexible Extension with Union Connection, Termination No. 31

Figure 3a. Mounting dimensions of Common Thermal Elements

INSTALLATION



Plain Capillary Bulb, Flexible Extension with Threaded Union Connection, Termination No. 14



Fixed Dimension Bulb, with Rigid Extension, Threaded Union Connection, Termination No. 23

Figure 3b. Mounting dimensions of Common Thermal Elements

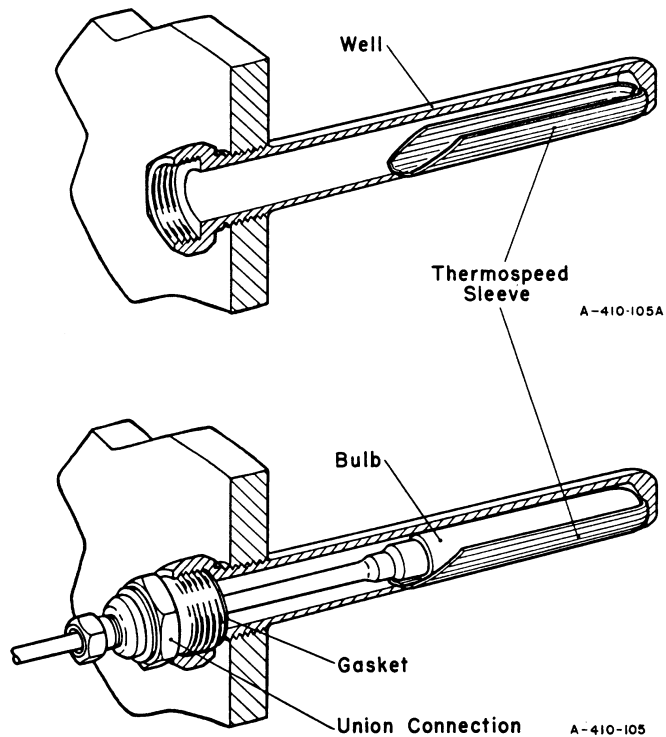


Figure 4. Installing Thermospeed Sleeve

2.3.2 Pressure Systems

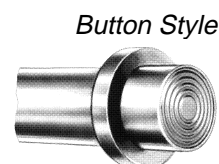
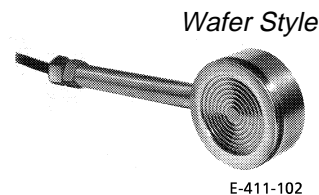
Open Element Type

The open element type pressure system has a pressure connection at the bottom or back of the recorder case, Figure 2. Connect the process line to the 1/4" NPT port in the case fitting. If necessary, a pulsation damping unit can be installed in the liquid filled process line to reduce the effect of pulsations on the record.

Volumetric Type

The volumetric system isolates the process fluid from the measuring element by means of a remote seal element. The remote seal limits process contact to the surface of the seal diaphragm. Pressure is transmitted to the recorder case through a liquid filled tube system.

Locate the flexible connecting capillary tubing where it will not contact extremely hot or cold surfaces. When it is necessary to fasten the tubing to rigid supports, use staples or heavy wire. Do not drive staples so tight they collapse tubing.



CAUTION Do not remove protective covers from seal elements until ready to connect them to the process.

2.4 ELECTRICAL CONNECTIONS

WARNING Avoid electrical *shocks*. AC power wiring must not be connected to the ac source until all connections within the recorder have been completed

All wiring connections are made to the terminal block located at the bottom of the case. Wiring can be run through either of the 7/8" knockouts in the back or bottom of the case, Figure 2. Check the voltage and frequency stamped on the recorder data plate before making any connections. Make connections as indicated on the wiring diagram, Figure 5. It is recommended that a switch be installed in the external power circuit.



INSTALLATION

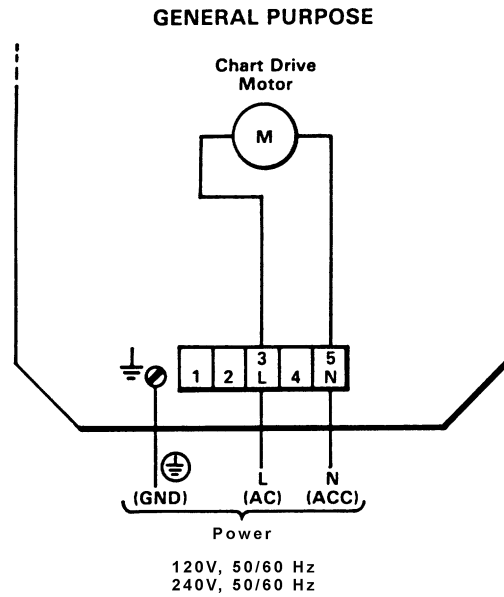


Figure 5. Electrical Connections

2.5 SETTING SPRING WOUND DUAL SPEED CHART DRIVE SWITCH

Set the rotation period for the spring wound dual speed chart drive by setting the switch for either Hours or Days. Reference Table 3 and Figure 29 in the Parts List section.

2.6 SETTING BATTERY OPERATED CHART DRIVE JUMPER

Set the rotation period for the battery operated chart drive by placing the jumper as indicated in Figure 6.

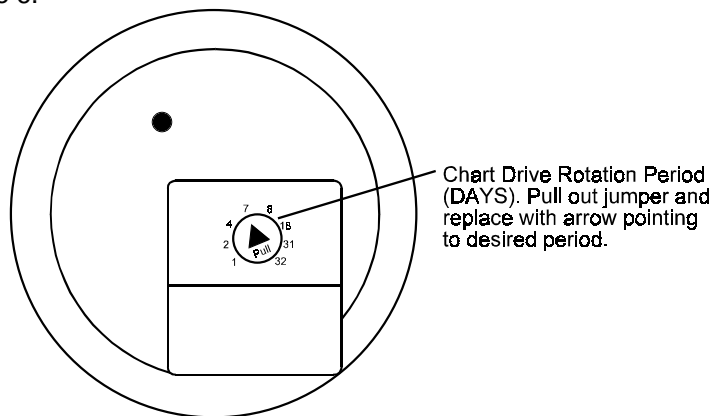


Figure 6. Battery Operated Chart Drive Jumper

3 OPERATION

3.1 PREPARING RECORDER FOR OPERATION

1. Pull pen lifter forward to raise pen off chart, Figure 7.
2. Start chart drive as follows:
 - a. Electric Chart Drive - Turn power on.
 - b. Spring-Wound chart drive - Lift clamp in chart hub and remove chart. Wind clock using key supplied with recorder, then replace chart.
3. Check to see that edge of chart is engaged under retainer tabs.
4. Lift clamp in chart hub and rotate chart until correct time line on chart is aligned with **PEN ARC** reference on chart plate.
5. Push clamp down to retain chart on hub at adjusted position.
6. Prepare pen(s) as follows:
 - a. V-type Pen - Fill each pen with Taylor recorder ink using dropper supplied with ink. Do not fill pen completely because ink may absorb moisture and spill over.

* NOTE When pen is new, a slight oil residue may prevent ink from flowing. Remove residue by washing pen in an oil dissolving solvent.

 - b. Fiber-Tip Pen - Remove cap from pen tip. Pen will begin to write when it touches chart.
 - c. Optional Reservoir Pen - Fill pen by following instructions supplied.
7. Push pen lifter inward to allow pen(s) to contact chart surface.

Recorder is now ready for operation.

OPERATION

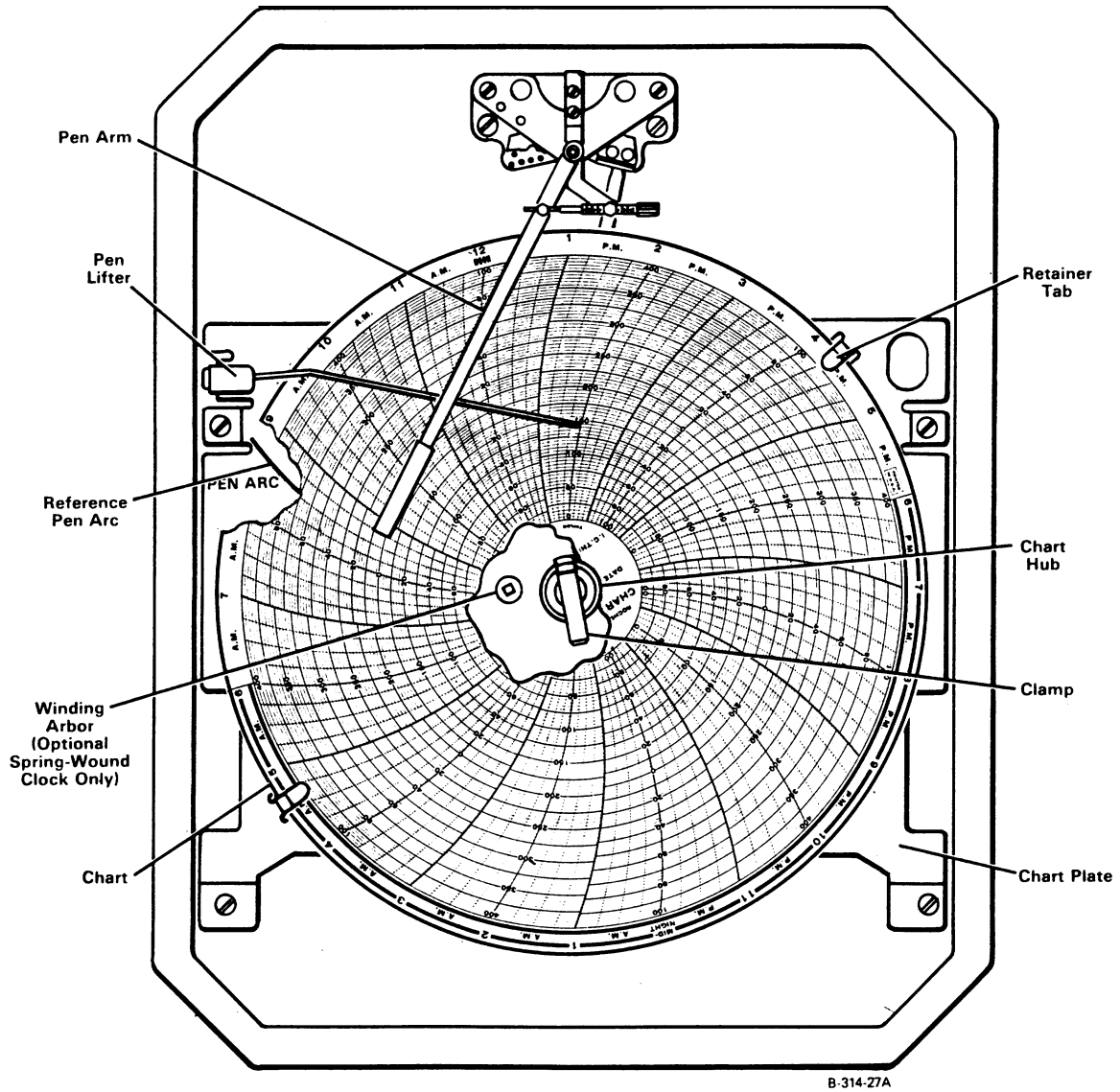


Figure 7. Chart Plate and Chart Drive Components

3.2 PEN IDENTIFICATION

One-pen recorders are always supplied with a red pen. The measuring element is located on the upper right-hand side of the case. The location of the measuring elements and their associated pens is shown in Figure 8. The elements and pens are color coded for easy identification.

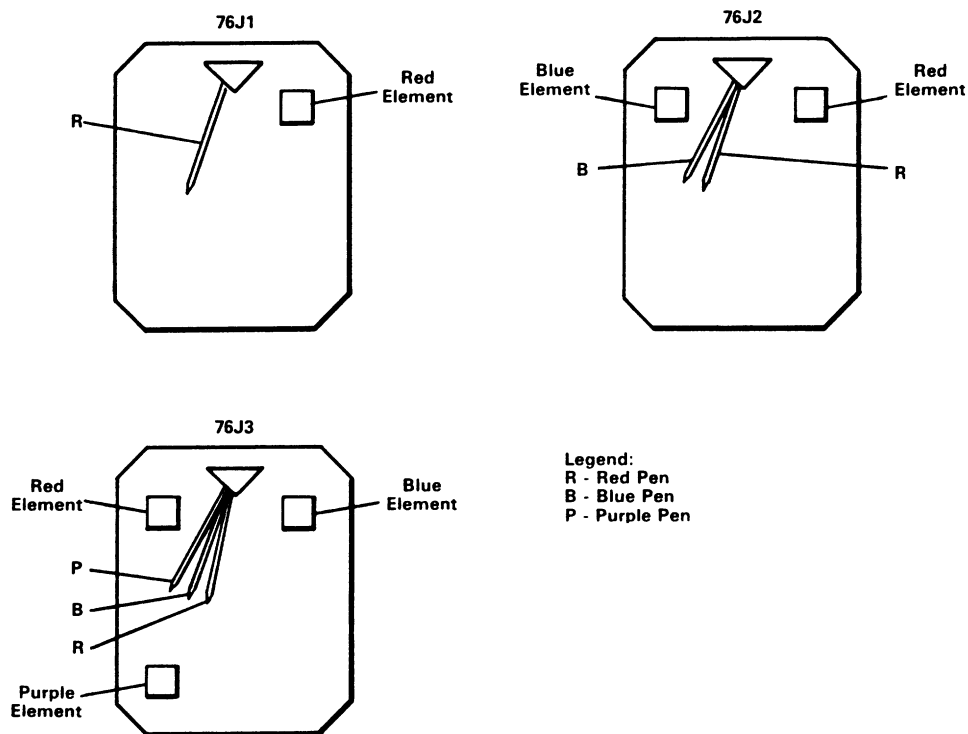


Figure 8. Location of Measuring Elements and Pens

OPERATION

4 MAINTENANCE

4.1 CHANGING CHART

1. Pull pen lifter forward to raise pens off chart, Figure 9.
2. Lift clamp in chart hub and remove used chart.
3. Insert new chart on hub and engage edge of chart under chart retainer tabs.
4. Rotate chart until correct time mark on chart perimeter is aligned with **PEN ARC** reference on chart plate.
5. Push clamp down to lock chart on hub at adjusted position.

4.2 CHANGING FIBER-TIP PENS

If the recorder is equipped with fiber-tip pen(s), the plastic pen cartridge is disposable and must be replaced when empty. Proceed as follows:

1. Pull pen lifter forward to raise pen(s) off chart, Figure 7.
2. Remove used pen from pen arm; Figure 9.
3. Remove cap from new pen.
4. Press end of new pen into clip near end of pen arm, then slide pen upward until it is fully engaged on pen arm.
5. Push pen lifter inward to return pen(s) to chart surface.

4.3 CARE OF PENS

4.3.1 V-Type Pens

Occasionally wash out pens with clean hot water or alcohol.

If the pen fails to touch the chart paper due to insufficient tension on pen arm, bend the pen arm slightly toward the chart so that the pen bears lightly against the chart.

4.3.2 Fiber-Tip Pens

Remove any dust and paper particles that may accumulate at the pen tip. This will ensure low ink consumption. Under most conditions the pen will provide a continuous record for more than two months.

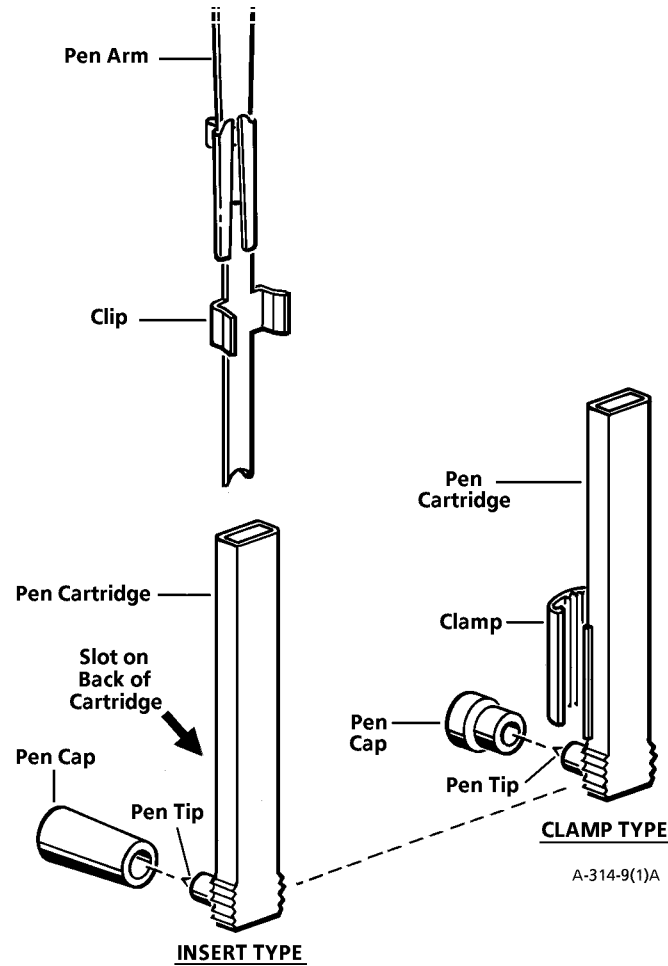
MAINTENANCE

Figure 9. Fiber-Tip Pen

If the pen fails to touch the chart paper bend the pen arm slightly as described in paragraph 4.3.1.

When the recorder is not in use, place the pen cap on the tip of the pen to protect and seal the tip from evaporation. The shelf life of the pen is a minimum of 12 months.

4.4 PEN CALIBRATION

The following calibration procedure is used to set the Zero, Span, and Linearity adjustments of the recorder. It is based on applying 0, 100, and 50% of span to the measuring element of the pen(s) being calibrated. If the recorder has multiple pens, each is calibrated independently in the same manner as a single pen.

The input range appears on the data plate located on the door of the recorder and may be verified by the tagging attached to each measuring element. Some input ranges are not zero based such as 3 to 15 psig and 30 to 130°F. When calibrating the recorder, care should be taken to always express input values in % of span. When determining the actual input value for calibrating a recorder with a non zero based input range, always add the lower range value to the span value.

For example, a typical thermal system has a range of 30 to 130°. First determine the span.

$$\text{Span} = \text{Upper Range Value} - \text{Lower Range Value}$$

or

$$\text{Span} = 130^{\circ}\text{F} - 30^{\circ}\text{F} = 100^{\circ}\text{F}$$

Next, determine the actual input value for 0, 100, and 50% of span for calibrating purposes.

$$\text{Input Value at Required \%} = (\text{Required \%} \times \text{Span}) + \text{Lower Range Value}$$

$$\text{Input Value at 0\%} = (0 \times 100^{\circ}\text{F}) + 30^{\circ}\text{F} = 30^{\circ}\text{F}$$

$$\text{Input Value at 100\%} = (1 \times 100^{\circ}\text{F}) + 30^{\circ}\text{F} = 130^{\circ}\text{F}$$

$$\text{Input Value at 50\%} = (.5 \times 100^{\circ}\text{F}) + 30^{\circ}\text{F} = 80^{\circ}\text{F}$$

Regulated compressed air with a tee connected gauge or manometer may be used in applying the required input value for pressure elements. For thermal elements, calibrating baths with test thermometers may be used. Gauges or thermometers used should be accurate to $\pm 0.5\%$ the input span.

When 0, 100, and 50% inputs are not available, alternate known values may be used as shown in Table 1. Alternate values should not exceed the values shown.

Table 1. Input Values for Pen Calibration

Calibration Adjustment	Input Values Recommended	% of Span Alternate
Zero	0%	0 to 20%
Span	100%	80 to 100%
Linearity	50%	40 to 60%

4.4.1 Test Setup

1. Prepare a pressure input hookup or temperature bath. Refer to Figure 10 or 11.
2. Make sure instrument is mounted in a vertical position.
3. Select proper chart for instrument and cut away a section to allow access to calibration adjustments through opening near top of chart plate.
4. Clamp cut-away chart on chart hub to provide chart record during calibration.

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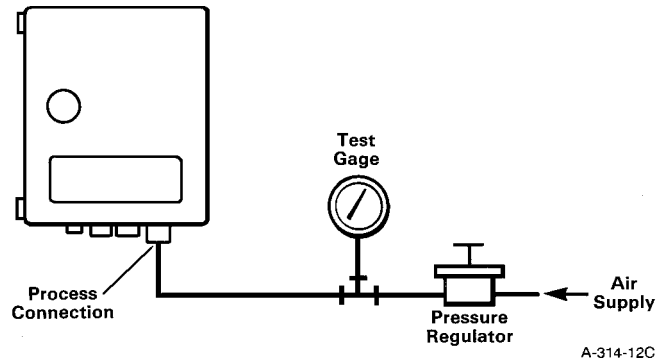


Figure 10. Test Hookup for Pressure Calibration

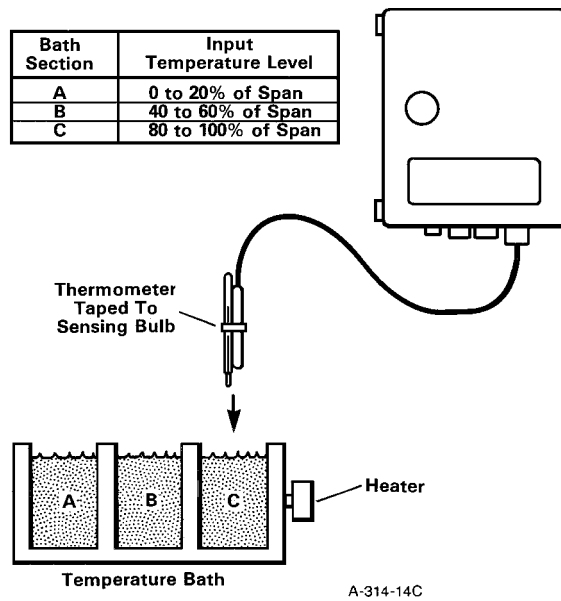


Figure 11. Test Hookup for Temperature Calibration

4.4.2 Precalibration Alignment

- * NOTE: Precalibration alignment is required only if the recorder has been disassembled or if a major component has been replaced.

If instrument has not been disturbed and requires only calibration, proceed to **4.4.3 Zero Adjustment**.

1. Remove connecting link at lower end, noting which pivot hole was used. The hole selected in original manufacture is identified by a scribed circle. See Figure 12.
2. See that upper end of link is attached to yoke arm pivot as originally manufactured. If position is unknown, refer to Figure 12 and use pivot hole B or G.

When link is on correct side of yoke, (either pivot hole B or G) pen will move in the required direction on chart. This may be checked by temporarily reconnecting link to measuring element, applying an input and verify correct pen direction.

3. Center the micrometer screw on pen arm. If equal thread exposure cannot be obtained, remove screw and start both small and large diameter threads simultaneously. See Figure 13.
4. Hold pen at the mechanical center of chart. (50% on a uniform chart.) The yoke, Figure 13, should be vertical. If it is not, check for parallel assembly of pen arm to yoke in the area of the 2 mounting screws. Adjust if necessary.

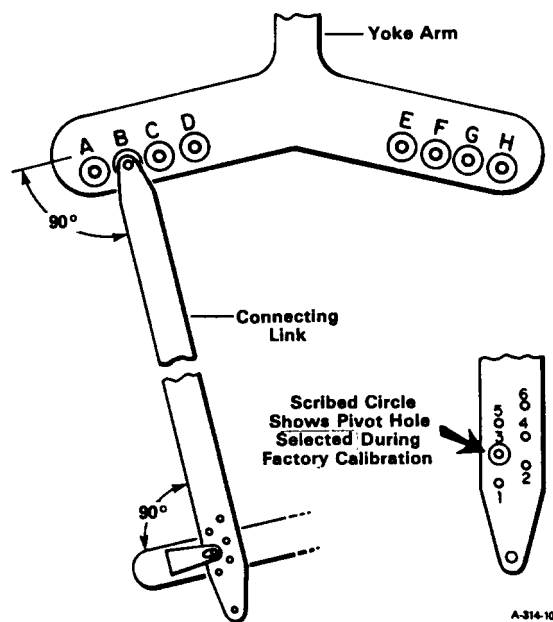


Figure 12. Scribed Pivot Holes

MAINTENANCE

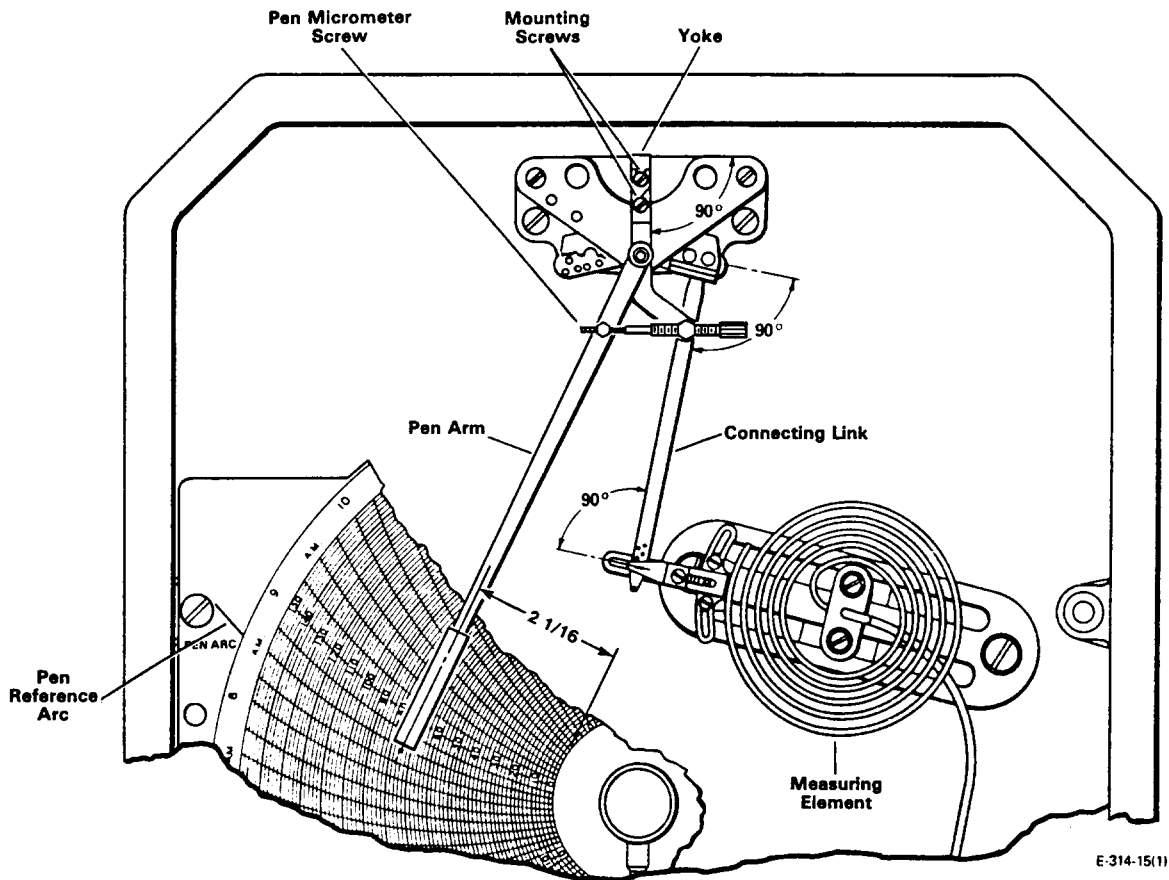


Figure 13. Adjusting Pen Arm Micrometer Screw

5. Rotate chart and place pen on a time line near 0%. Move pen up scale and observe if pen point follows the arc of the time line.
 - If pen point tracks above the time line, slide the pen up the arm.
 - If pen point tracks below the time line, move the pen down the pen arm.
 - Repeat pen location adjustment and test until pen tracks the time line.
6. Refer to Figures, 14, 15 and 16 and select measuring element view that resembles type being adjusted. Center measuring element in mounting screw slots and tighten screws.
7. Center span adjustment in slot of take-off arm.
8. Apply 50% input as indicated on test gage or thermometer.
9. Connect link to take-off arm pivot using scribed hole, Figure 13.
10. Loosen coarse zero lock screw(s) and adjust coarse zero for midchart pen position.

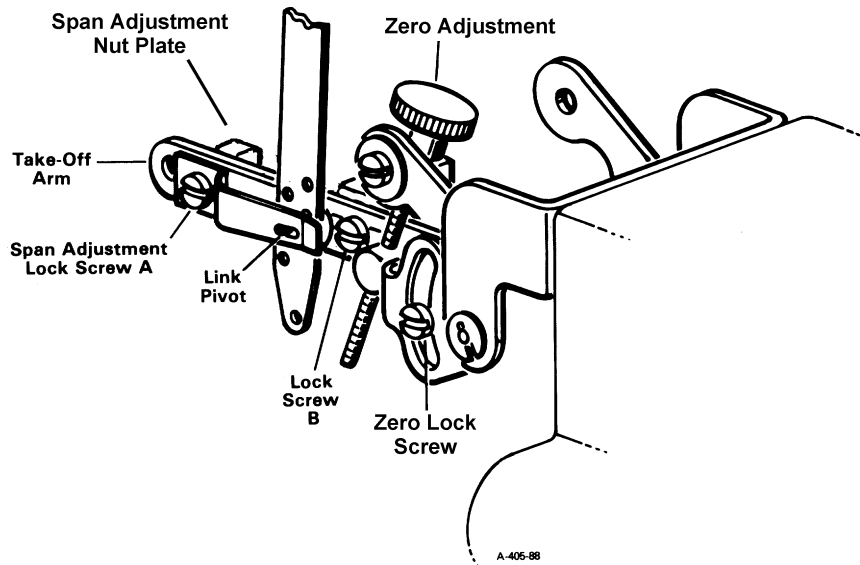


Figure 14A. Fine Span Adjustment on Receiver Bellows



Figure 14B. Receiver Bellows

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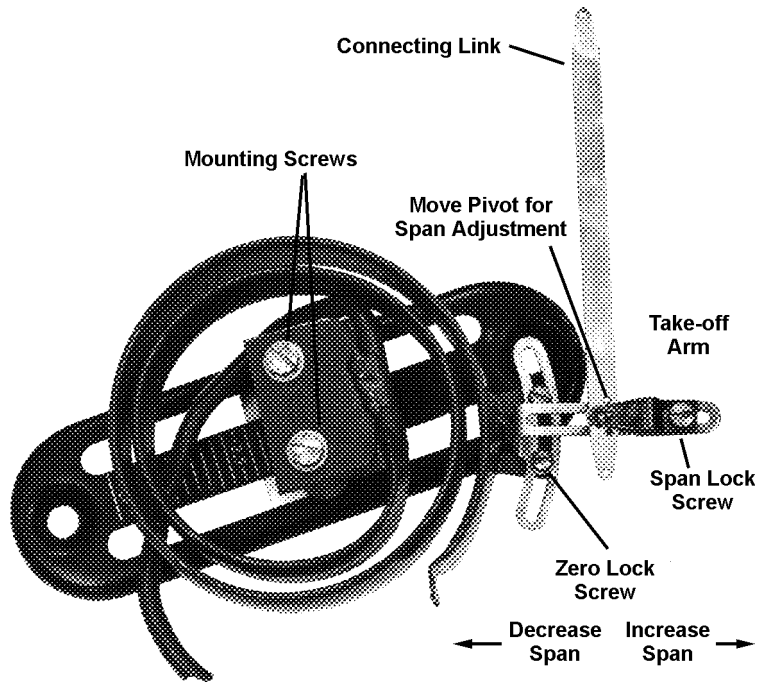


Figure 15. Spiral Bourdon Spring

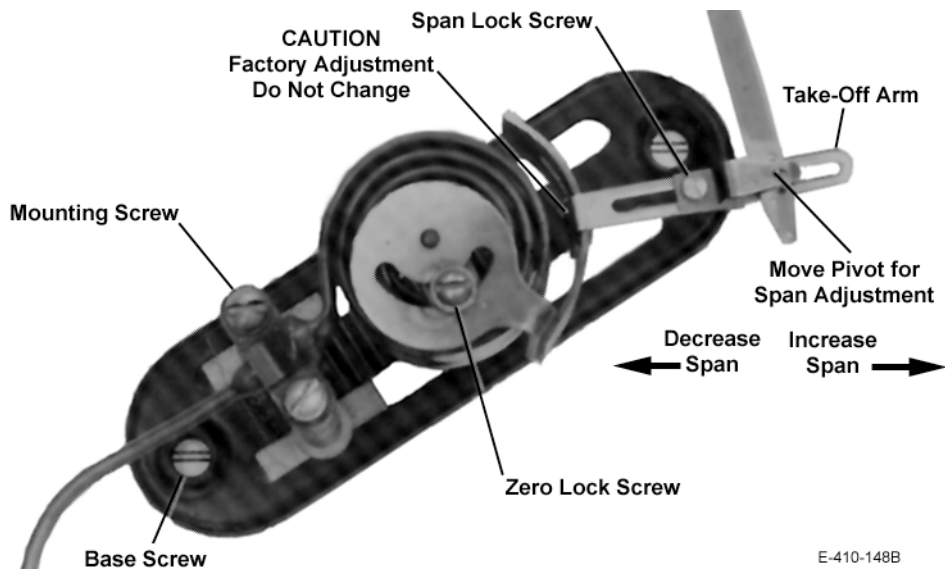


Figure 16. Gas Bourdon with Case Temperature Compensation

11. Observe linkage angles as shown in Figure 13. Continue changing pivot hole selection and Coarse zero adjustment until 90° angles appear with pen at midchart. Linkage is now square and aligned for calibration.

4.4.3 Zero Adjustment

Refer to Figures 14, 15, and 16 for similar measuring element and locate related adjustments. Loosen lock screws prior to adjustment and tighten after adjustment is made.

1. Apply 0% of input. (Lower Range Value)
2. Set the pen to read the correct value on the chart. Use the coarse zero adjustment on measuring element for errors of 3% or more. Use the micrometer screw, Figure 13, for errors of less than 3%.

4.4.4 Span Adjustment

1. APPLY 100% of input (Upper Range Value).
2. Pen should be at 100% of chart. If it is not, loosen span lock screw and move adjustment as follows:

If pen reads **high**, move the span adjustment along the take-off arm **toward** the measuring element.

If pen reads **low**, move the span adjustment along the take-off arm **away** from the measuring element.

Tighten span lock screw after adjustment.

- * NOTE: When adjusting span, do not observe pen. A Zero shift occurs during span changes and it must be corrected in the following step before result of span adjustment may be viewed.
3. Repeat **4.4.3 Zero Adjustment** and **4.4.4 Span Adjustment** until required accuracy is obtained (usually $\pm 0.5\%$ of span for receiver bellows and $\pm 1\%$ for other elements).

4.4.5 Linearity Adjustment

1. Apply 50% of input (midchart value). If pen indicates input value within the required accuracy of measuring element and calibration is complete.
2. To correct linearity errors, select another hole in link as follows. Refer to Figure 12.

If pen reads **low**, use next higher numbered hole, i.e., **shorten** the connecting link.

If pen reads **high**, use next lower numbered hold, i.e., **lengthen** the connecting link.

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3. Repeat **Zero**, **Span** and **Linearity** adjustments for required accuracy.

* NOTE: Changing hole selection from hole No. 1 to No. 6 changes linearity approximately 2%. If link appears to be too long or short, it may be necessary to move measuring element for additional correction as follows:

With 50% input, loosen measuring element mounting screws and slide element in the same direction as the pen should move to read correctly. Tighten mounting screws.

Repeat **Zero**, **Span** and **Linearity** adjustments.

4.5 MEASURING ELEMENT REPLACEMENT

4.5.1 Pressure System

1. Turn off all electrical power to recorder.
2. Remove chart plate and connecting link, Figure 13.
3. Disconnect piping to measuring element.
4. Remove screws and move terminal block to disconnect measuring element. If case fitting is part of measuring element, disconnect case fitting from access plate. Remove access plate to remove element. Refer to Figure 17.

Low pressure bellows element inputs may be disconnected at the bellows element without disturbing case fittings or terminal block. Figure 14A.

5. Remove measuring element base screws and element.
6. If input piping to element is behind chart motor, remove motor.

* NOTE: The replacement pressure element has been factory calibrated with a specific link length and pivot selection. **Use this Link on the New Element and Refer to Yellow Instruction Tag for Important Information**, Figure 18.

7. Install replacement element in case making sure horizontal position is indexed to previously scribed mark.
8. Connect measuring element link.
9. Install case fitting, piping, access plate, terminal block, chart motor, and wiring if removed.
10. Proceed to **4.4 Pen Calibration** for preliminary information and **4.4.3 Zero Adjustment** to touch-up micrometer screw.
11. Verify span and linearity adjustments.

4.5.2 Thermal System

1. Turn off all electrical power to Fulscope.
2. Remove chart plate and connecting link.
3. Remove terminal block mounting screws and necessary wires to move terminal block for access to case opening. Refer to Figure 17.
4. Remove upper screws in access plate.
5. If capillary is behind chart motor remove motor.
6. Remove measuring element base screws Figure 17.

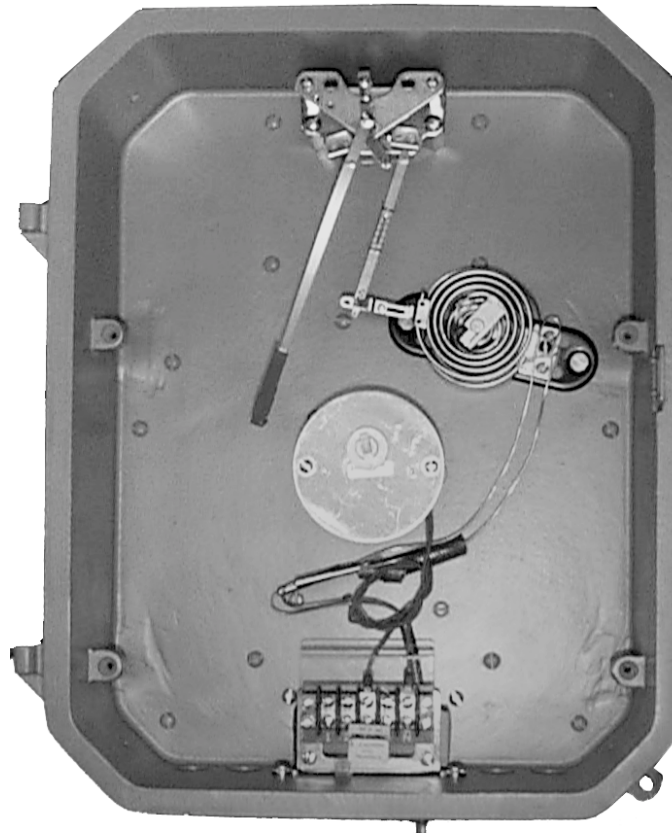


Figure 17. Removing System from Case

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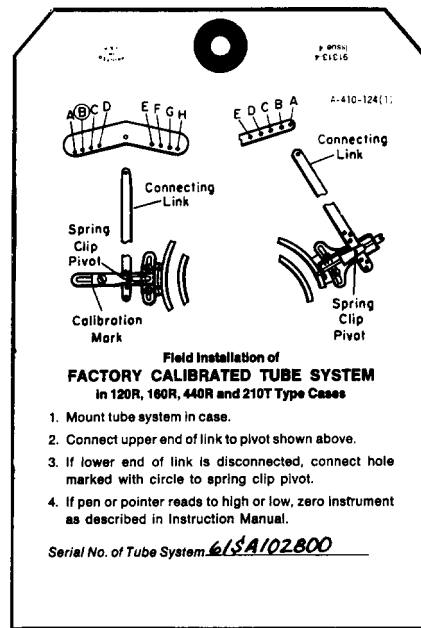


Figure 18. Field Installation Calibration Tag

7. Remove case fitting from access plate.

* NOTE: In either of the following steps it may be necessary to release instrument mounting brackets to extend bottom of case forward for full access opening clearance. Refer to Figure 2.

If Bourdon spring will clear lower opening, remove thermal system **downward** through case.

If Bourdon spring will not clear lower opening, remove thermal system **upward** through case.

* NOTE: Refer to Figure 19. The replacement thermal system has been factory calibrated with a specific link length and pivot selection. **Use this Link on New Element and Refer to Yellow Instruction Tag for Installation Information.**

8. Install new thermal system by reversing the removal procedure. If a Bourdon spring must be moved on subbase for access to base screws, mark position and return assembly to this position prior to calibration. Install case fitting, access plate, terminal block, chart motor, and wiring.
9. Proceed to 4.4 Pen Calibration for preliminary information and 4.4.3 Zero Adjustment to touchup micrometer screw.
10. Verify span and linearity adjustments.

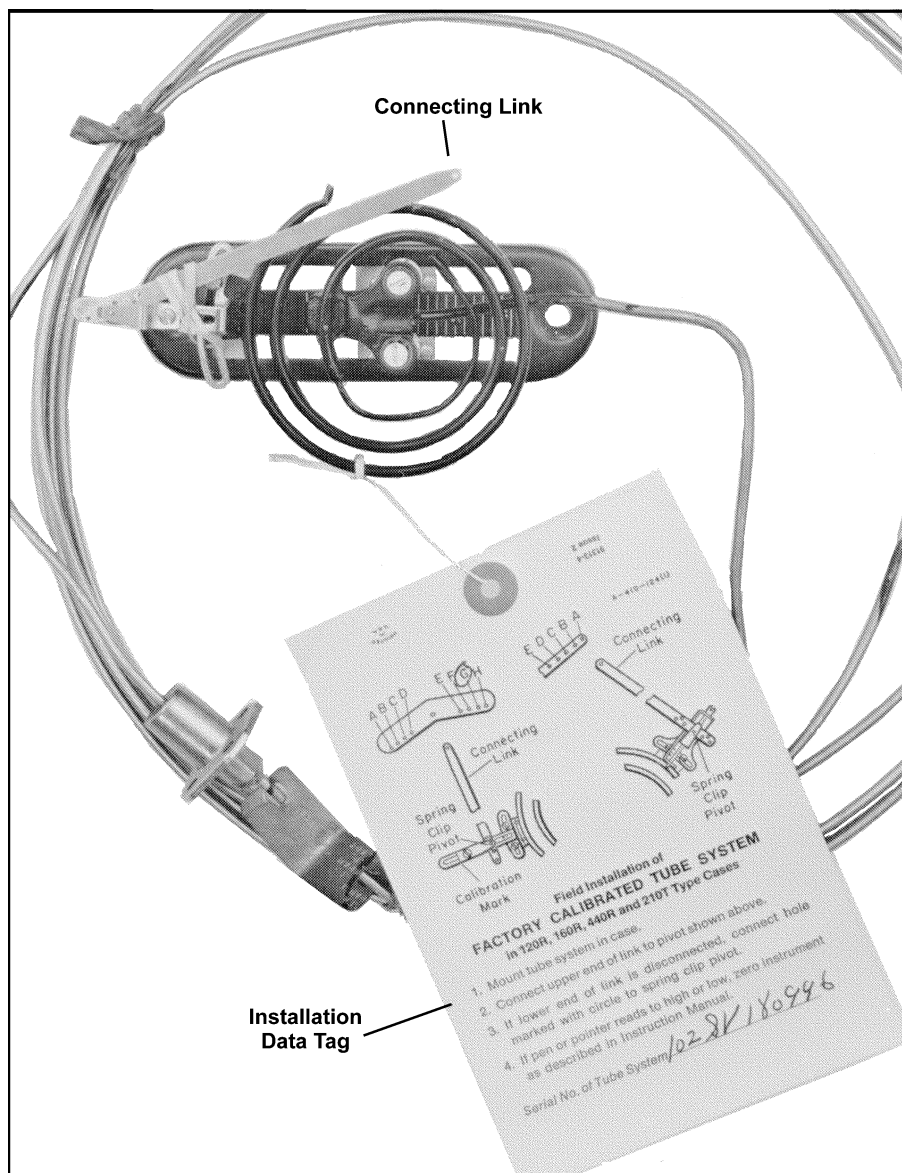


Figure 19. Typical Replacement Measuring Element

MAINTENANCE

5 PARTS LIST

5.1 ORDERING INFORMATION

When ordering parts always specify the complete serial number of the instrument.

5.2 RECOMMENDED SPARE PARTS

A plus (+) sign before the item number indicates that the item is a recommended spare part.

5.3 PARTS AVAILABILITY

The parts list may contain parts that are not salable. These parts are identified with an asterisk (*) in the part number column. They are listed and shown as required to provide a comprehensive breakdown of assembly.

5.4 PARTS AND COMPONENTS IDENTIFICATION

An assembly or subassembly (SA) in the parts description may be followed by part descriptions which have bullets preceding them. These bullets indicate the parts are components of that assembly or SA.

5.5 UNIDENTIFIED ITEMS AND PARTS

A dash (–) in the item number column indicates that the part is not illustrated in the referenced figure. A dash (–) in the part number column indicates there is no part identification available (not for sale; go to the next level). A bullet (●) in the part number column indicates the part is locally available.

5.6 UNDERSCORE IDENTIFICATION

Underscores in place of characters in a catalog number (e.g. 76J _ _ _ _ _ _ _ _ _ _ C) indicate any character may apply. Refer to **Section 1.3 Product Identification**.

5.7 PARTS LISTS

76J Recorders parts listings follow.

PARTS LIST

5.7.1 DOOR SUBASSEMBLIES

Refer to Figure 20.

- 3S1249A1 Door S.A., Glass
- 3S1249A2 Door S.A., Glass and Door Lock
- 3S1249C1 Door S.A., Acrylic
- 3S1249C2 -Door S.A., Acrylic and Door Lock

Item	Part No.	Description	No. Req'd
1	3P1820	Door	1
2	7P218	Hinge Pin	2
3	7P317	Latch Pin	1
4	22P1455	Latch Spacer	1
5	32P1185	Chart Window Retaining Clip	12
6	34P129	Chart Window, Glass	1
6	SK9418	Chart Window, Acrylic	1
7	43S10	Door Gasket and Cement	1
8	43S13	Window Gasket and Cement	1
9	70P677	Handle	1
20	53S30	Door Lock	1
21	*	Data Plate	1
22	*	Application Data Plate	1

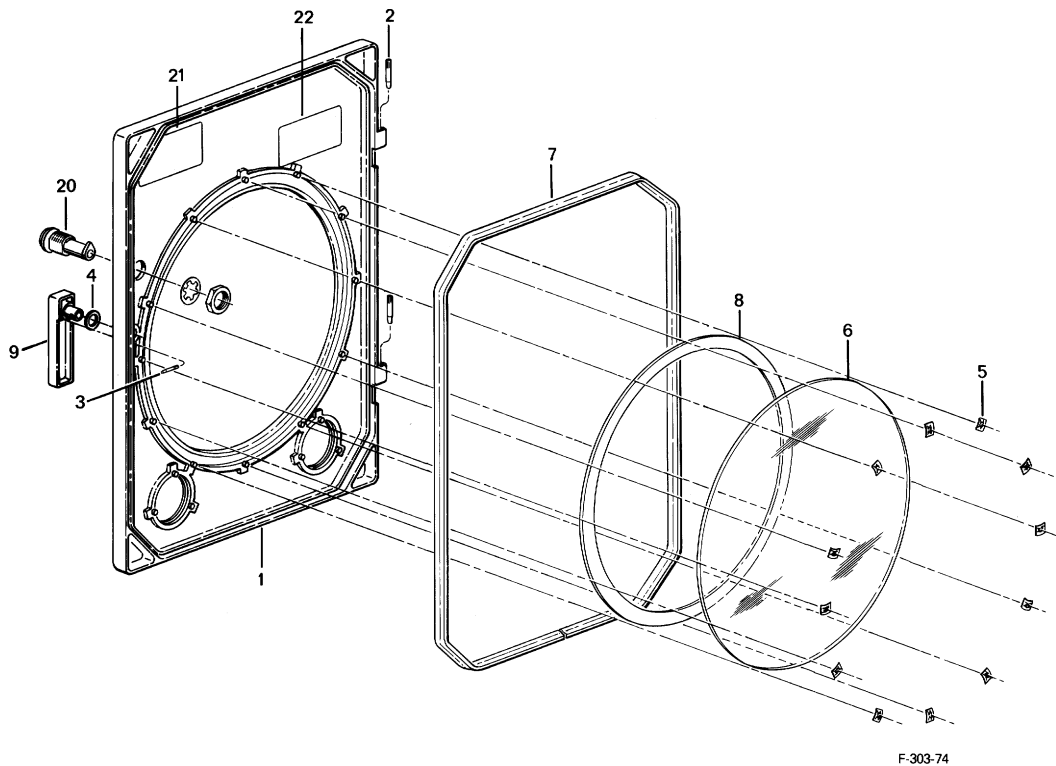


Figure 20. Door Subassemblies

5.7.2 CHART SUB-ASSEMBLIES

Refer to Figure 21.

Item	Part No.	Description	No. Req'd
2		Case Mounting Lug, 5/16 - 18 x 1/2 Hex Hd Screw	4
3		Washer, 5/16 x 1/16 Thick	4
4	79P368B	Case Mounting Lug	4
5	6S371B	System Entry Plate	1
5	6S1122B	System Entry Plate	1
7	43P209	Gasket	1
8	6S1634	Chart Plate	1
9	90S277	Chart Hub	1
10		Access Plate mounting Screw, #10-32 x 1/4" Rd. Hd.	2
11		Access Plate mounting Screw, #10-32 x 3/8" Rd. Hd.	2

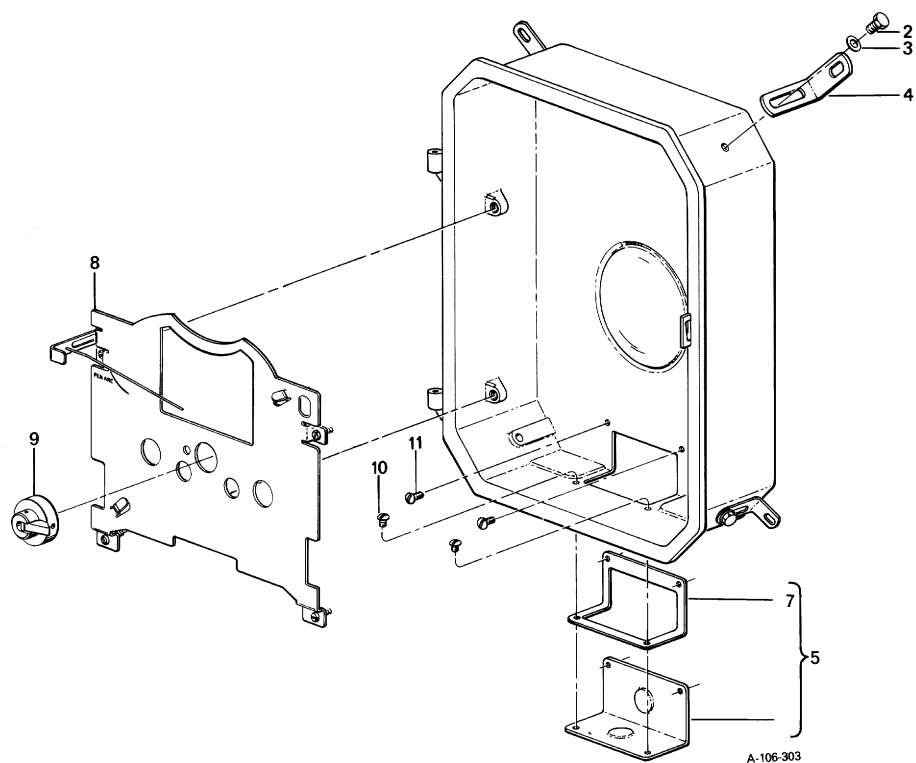


Figure 21. Chart Plate Case

PARTS LIST

5.7.3 PEN MOVEMENT SUB-ASSEMBLIES

Item	Part No.	Description	No. Req'd
+-	93S114	One Pen Movement (See Figure 22)	1
+-	93S115	Two Pen Movement (See Figure 23)	1
+-	93S99	Three Pen Movement (See Figure 24)	1
19	51P226	Pivot Clip (one for each movement)	1, 2 or 3
41	59P106	Pillar for One Pen Movement	2
40	59P97	Pillar for Two and Three Pen Movement	2

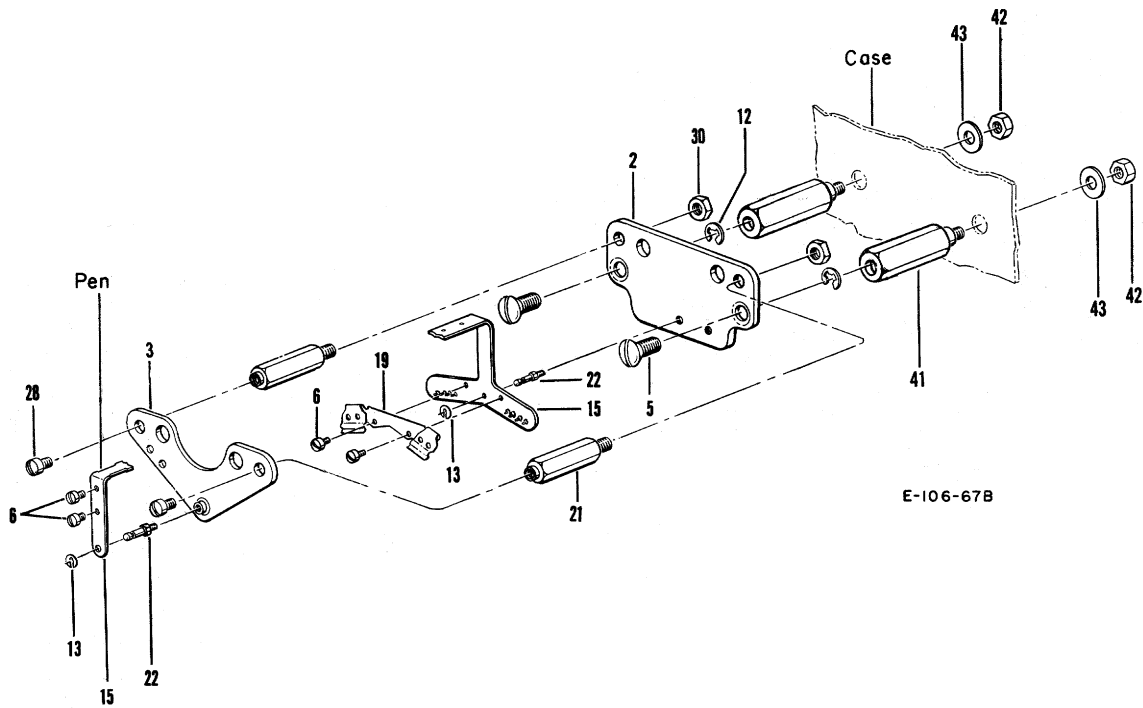


Figure 22. One Pen Movement 93S114

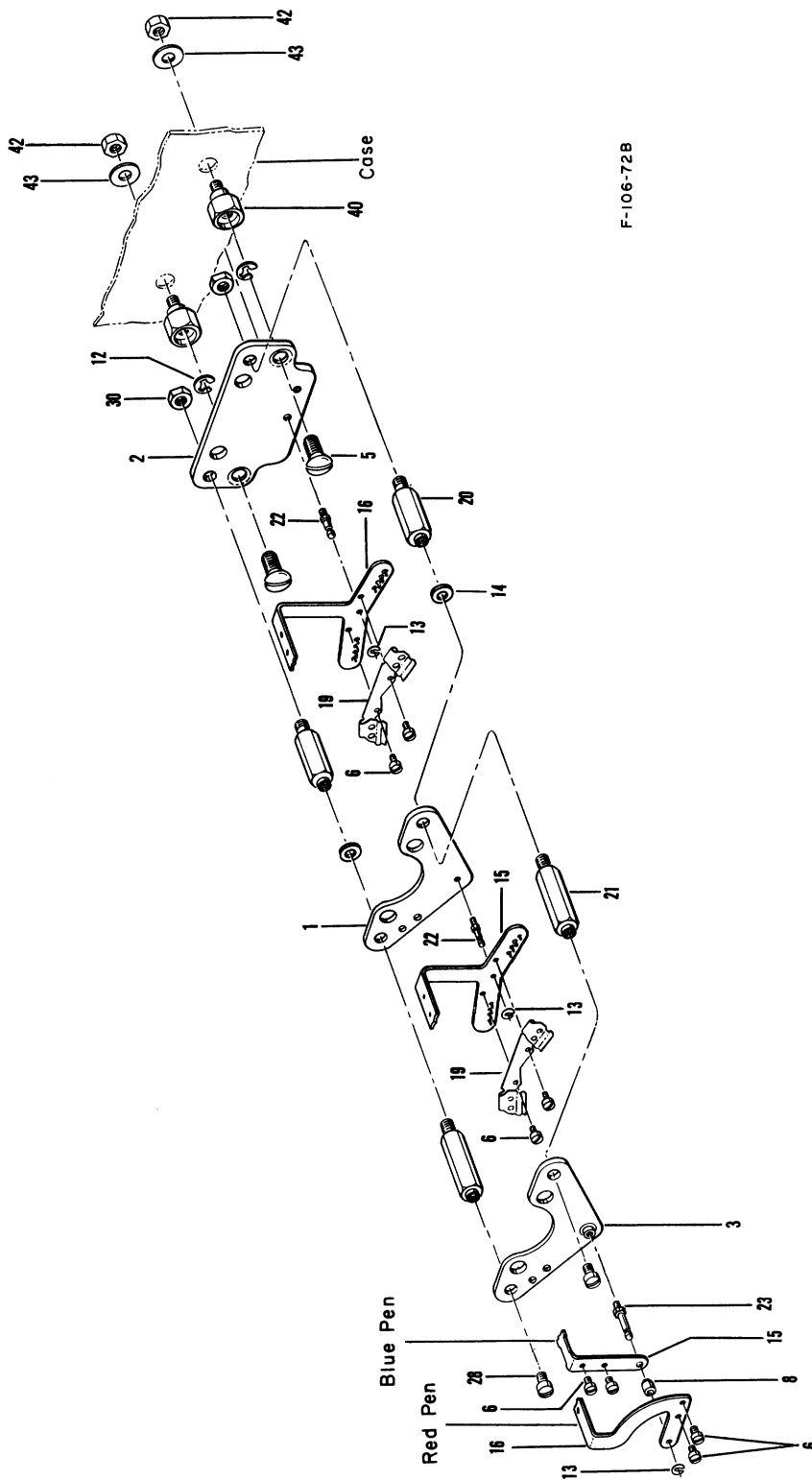


Figure 23. Two Pen Movement 93S115

PARTS LIST

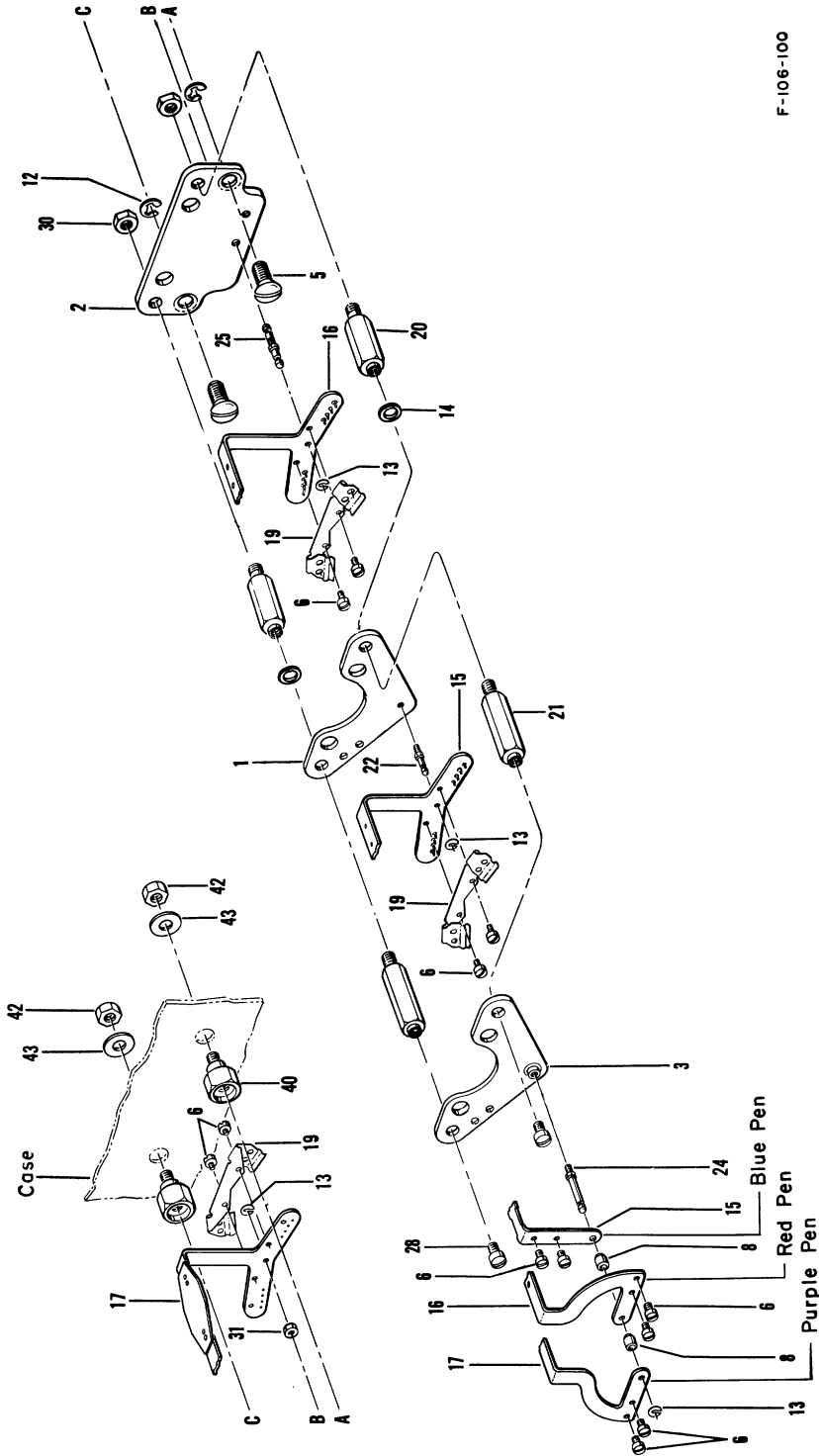


Figure 24. Three Pen Movement 93S99

PARTS LIST

5.7.4 PEN ARM SUB-ASSEMBLIES

One Pen Recorder - Ref. to Figure 25

Item	Part No.	Description	No. Req'd
1	79S122	Pen Arm S. A.	1
10	9P916	Adjustment Screw	1
+14	54S18	V-Pen, Long	1
+15	54S14	Reservoir Pen, Medium	1
18	75P24	Cleaning Wire for Reservoir Pen (0.004 Dia.)	1
20	9P742	Pen Arm S.A. Mounting Screw	2
25	155S175-3	Disposable Fiber-tip Pen Kit (Red)	1

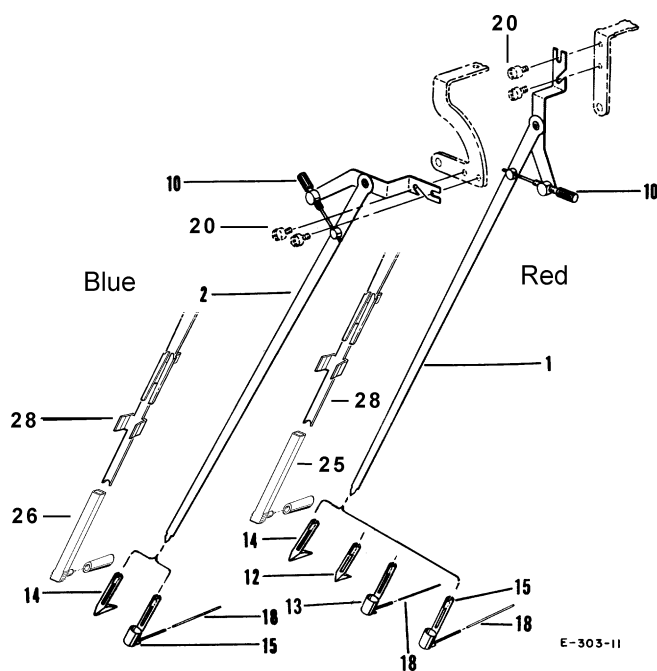


Figure 25. Pen Arm Subassembly for One and Two Pen Recorders

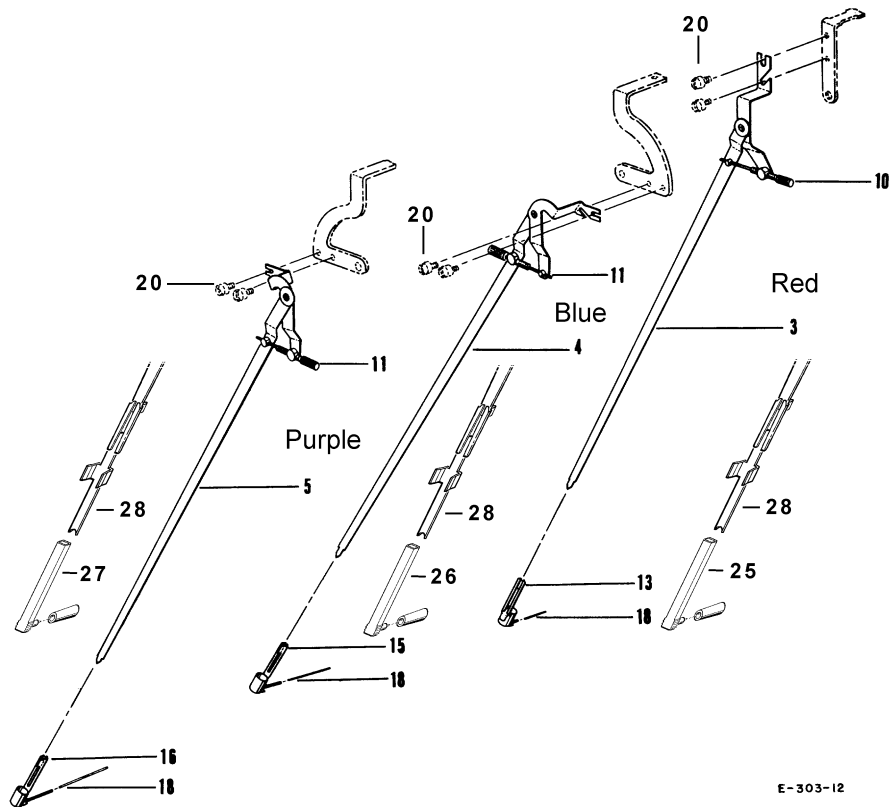
Two Pen Recorder - Ref. to Figure 25

Item	Part No.	Description	No. Req'd
1	79S122B	Pen Arm S. A., Red Pen	1
2	79S123A	Pen Arm S. A., Blue Pen	1
10	9P916	Adjustment Screw	1
+12	54S17	V-Pen, Short (Standard for Red Pen)	1
+13	54S15	Reservoir Pen, Short (Optional for Red Pen)	1
+14	54S18	V-Pen, Long (Standard for Blue Pen)	1
+15	54S14	Reservoir Pen, Medium (Optional for Blue Pen)	1
18	75P24	Cleaning Wire for Reservoir Pen (0.004 Dia.)	1
20	9P742	Pen Arm S.A. Mounting Screw	4
25	155S175-3	Disposable Fiber-tip Pen Kit (Red)	1
26	155S175-6	Disposable Fiber-tip Pen Kit (Blue)	1

PARTS LIST

Three Pen Recorder - Refer to Figure 26

Item	Part No.	Description	No. Req'd
3	79S131B	Pen Arm S. A., Red Pen	1
4	79S129A	Pen Arm S. A., Blue Pen	1
5	79S128	Pen Arm S.A., Purple Pen	1
10	9P916	Adjustment Screw - Red Pen	1
11	9P917	Adjustment Screw - Blue and Purple Pens	
+13	54S15	Reservoir Pen, Short - Red Pen	1
+15	54S14	Reservoir Pen, Medium - Blue Pen	1
+16	54S16	Reservoir Pen, Long - Purple Pen	
18	75P24	Cleaning Wire for Reservoir Pen (0.004 Dia.)	1
20	9P742	Pen Arm S.A. Mounting Screw	4
25	155S175-3	Disposable Fiber-tip Pen Kit (Red)	1
26	155S175-6	Disposable Fiber-tip Pen Kit (Blue)	1
27	155S175-8	Disposable Fiber-tip Pen Kit (Purple)	1



E-303-12

Figure 26. Pen Arm Subassembly for Three Pen Recorders

Table 2. Recording Pen Ink

Bottle size	Red	Blue	Purple	Black	Green	Quick Drying Red	Quick Drying Blue
2 ounce	96S8	96S12	96S10	96S11	96S92	96S55	96S56
½ Pint	96S13	96S16	96S15	96S17	96S93	96S77	96S78
1 Pint	96S57	96S59	96S61	96S58	96S94	96S62	96S63
1 Quart	96S64	96S66	96S67	96S65	96S95	96S68	96S69
1 Gallon	96S71	96S73	96S74	96S72	96S96	96S75	96S76

5.7.5 DISPOSABLE FIBER-TIP PEN KITS FOR CIRCULAR CHARTS

Each kit contains three pen cartridges and one mounting clip (51P713). Clip is only required for conversion. Refer to Figure 27.

Pen Color	Pen Kit Number		
	#1 Pen	#2 Pen	#3 Pen
Red	155S175-3	155S175-5	--
Blue	155S175-4	155S175-6	--
Purple	--	--	155S175-8

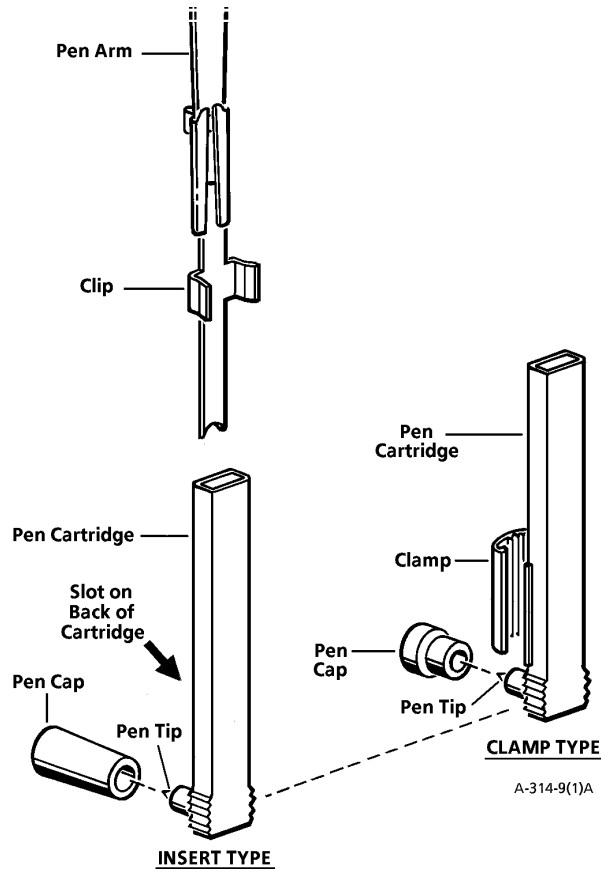
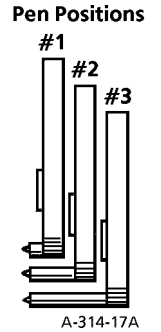


Figure 27. Disposable Fiber-Tip Pen Kits for Circular Charts

PARTS LIST

5.7.6 ELECTRIC CHART DRIVE

Refer to Figure 28.

Item	Part No.	Description	No. Req'd
+1	68S232-__	Electric Chart Drive (Refer to Table 3 to obtain part number suffix which specifies rotation, voltage and frequency.	1
2	59P112	Chart Drive Mounting Pillar	2
3	90S277	Chart Hub	1
4	•	Set Screw, #8-32 x 1/4" Allen Hd Cup Pt	1
5	•	Chart Drive Mounting Screw, #8-32 x 1" Oval hd	2

Table 3. Suffix Numbers for 68S232 - Electric Chart Drive

ROTATION	MOTOR SPEED	VOLTAGE	PART NO. SUFFIX	
			60 Hz	50 Hz
7 Day	1/168 R.P.H.	120	CM22	CL22
		240	DM22	DL22
4 Day	1/96 R.P.H.	120	CM23	CL23
		240	DM23	DL23
2 Day	1/48 R.P.H.	120	CM24	CL24
		240	DM24	DL24
24 Hour	1/24 R.P.H.	120	CM25	CL25
		240	DM25	DL25
12 Hour	1/12 R.P.H.	120	CM26	CL26
		240	DM26	DL26
8 Hour	1/8 R.P.H.	120	CM27	CL27
		240	DM27	DL27
6 Hour	1/6 R.P.H.	120	CM28	CL28
		240	DM28	DL28
4 Hour	1/240 R.P.M.	120	CM29	CL29
		240	DM29	DL29
2 Hour	1/120 R.P.M.	120	CM33	CL33
		240	DM33	DL33
1 Hour	1/60 R.P.M.	120	CM34	CL34
		240	DM34	DL34
30 Minute	1/30 R.P.M.	120	CM35	CL35
		240	DM35	DL35

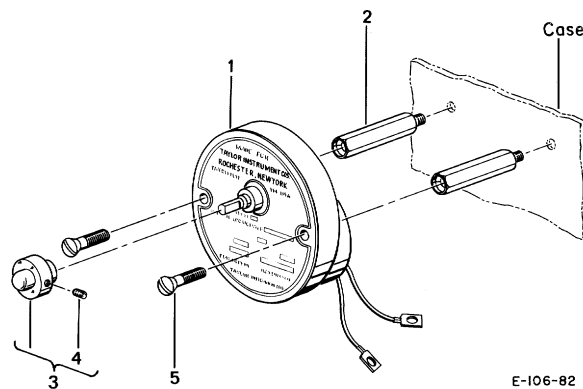


Figure 28. Electric Chart Drive

5.7.7 TERMINAL BLOCK ASSEMBLY 113S50

Refer to Figure 29.

Item	Part No.	Description	No. Req'd
1	14P789	Mounting Bracket	1
2	29P236	Insulator	1
5	113S49	Terminal Block, 6 Place	1
6	•	Screw, #6-32 x 5/16" Binding Hd	10
7	•	Terminal Block Mounting Screw, #8-32 x 5/8" Rd Hd	2
8	•	Terminal Block Mounting Nut, #8-32 Hex	2
9	•	Terminal Block Mounting Lockwasher, #8 Ext Tooth	2

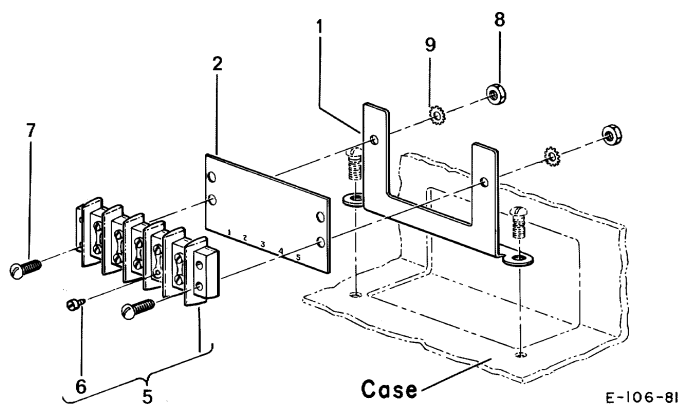


Figure 29. Terminal Blocks

PARTS LIST

5.7.8 SPRING WOUND CHART DRIVE KITS

Refer to Figure 30.

Item	Part No.	Description	No. Req'd
1	6P4173	Adapter Plate	1
2	10P1740	Adapter Plate Mounting Pillar	3
3	83S401__	Chart Drive (Refer to Table 3 for part number suffix)	1
4	90S277	Chart Hub SA	1
5	•	Hub Mtg Set Screw, #8-32 x 1/4" Allen Hd Cup Pt	1
6	•	Chart Drive Mtg Screw, #4-40 x 3/16" Fil Hd	3
7	•	Adapter Plate Mtg Screw, #10-32 x 1" Flat Hd	3

Table 4. Part Numbers for Chart Drive Kits

CHART DRIVE KIT NUMBERS	ROTATION	CHART DRIVE SUFFIX NUMBER SINGLE SPEED 83S401__	CHART DRIVE SUFFIX NUMBER DUAL SPEED 83S401__	CHART DRIVE WIND
155S110-24	48 Hour	24		9 Day
155S110-26	12 Hour	26		9 Day
155S110-29	4 Hour	29		2 Day
155S110-69	8 Day	69		9 Day
155S110-70	31 Day	70		32 Day
155S110-72	24 Hour/7 Day		72	9 Day
155S110-73	2 Hour/8 Hour		73	2 Day
155S110-74	15 Min/1 Hour		74	7 Hour
155S110-75	24 Hour/3 Day		75	9 Day

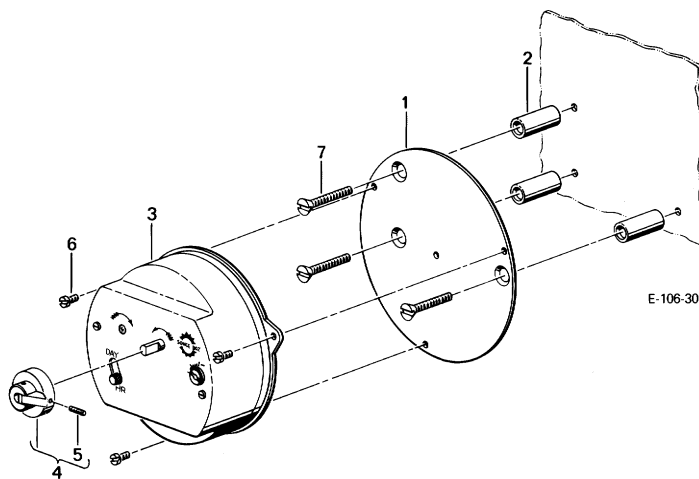


Figure 30. Spring Wound Chart Drive

5.7.9 BATTERY OPERATED CHART DRIVE KIT SK19535B

Refer to Figure 31.

Item	Part No.	Description	No. Req'd
1	-	23-A31 Adapter Kit	1
2	-	Pillar	3
3	SK19535C	W.253 Chart Drive	1
4	90S277	Hub Chart	1
5	•	Set Screw, #8-32 x 1/4" Allen hd Cup Pt	1
8	•	1.5V "C" Battery	1

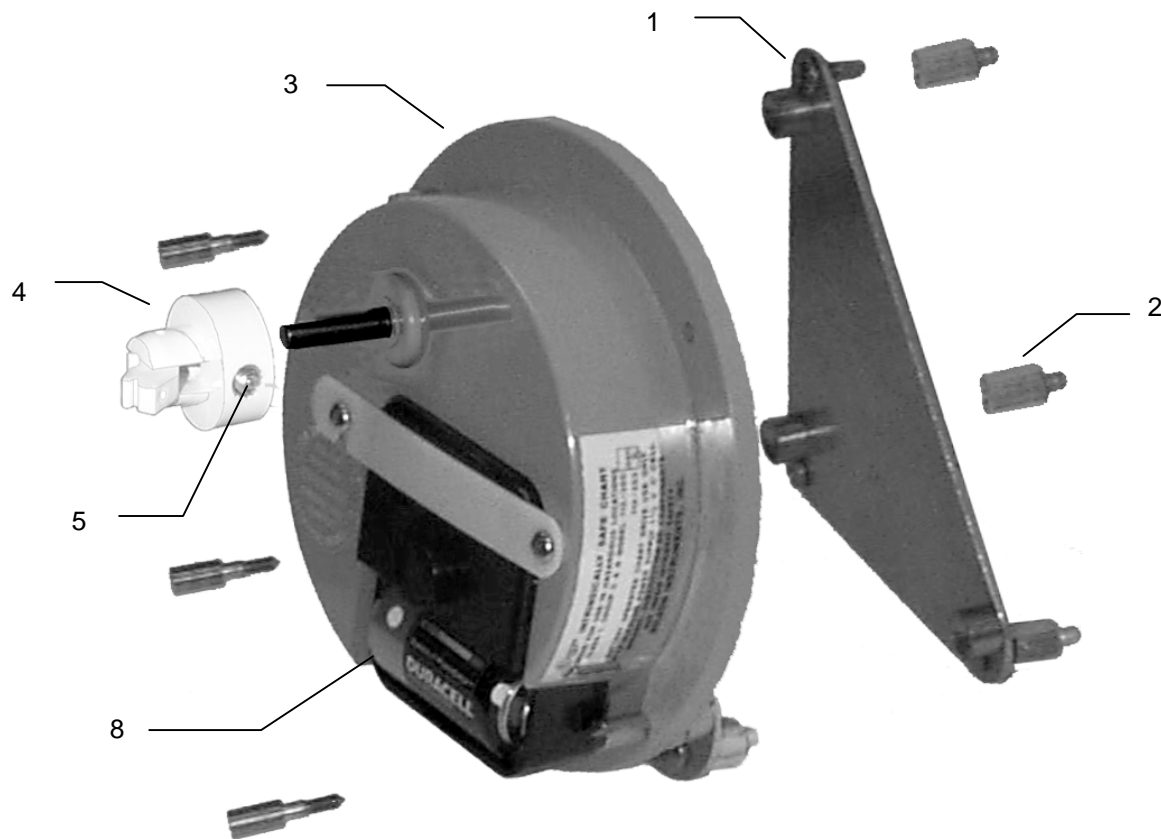


Figure 31. Battery Operated Chart Drive

PARTS LIST**5.7.10 PIPE MOUNTING BRACKETS**

Refer to Figure 32.

Item	Part No.	Description	No. Req'd
60	14S109	Pipe mounting Bracket for 2" Pipe	2
60A	14P641	Bracket	1
60B	•	Case to Bracket Mounting Screw 1/4" - 20 x 1/2" rd Hd	2
60C	•	Bracket mounting Screw, 5/16" - 18 x 3/4" Sq Hd Cup Pt	1

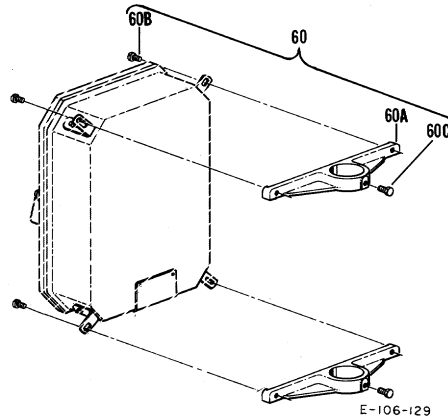


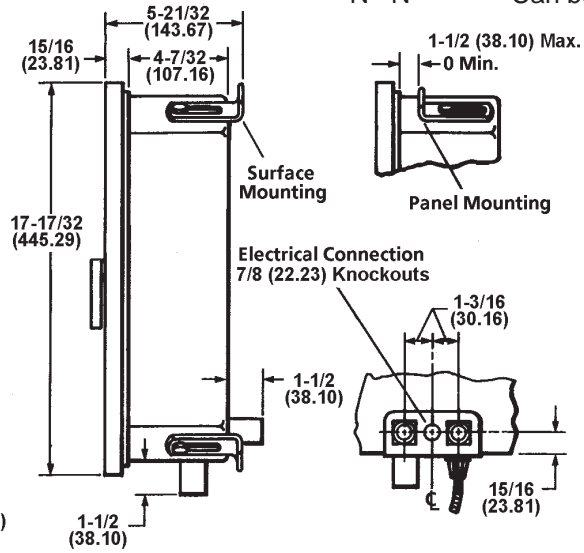
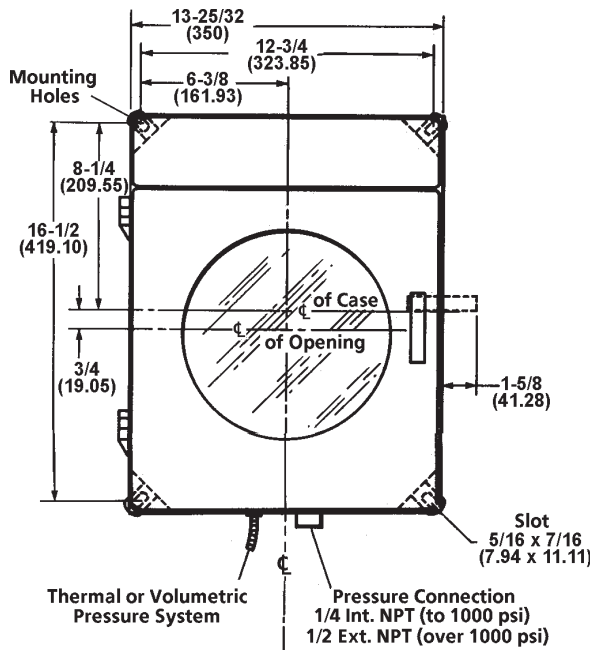
Figure 32. Pipe Mounting Brackets

Notes:

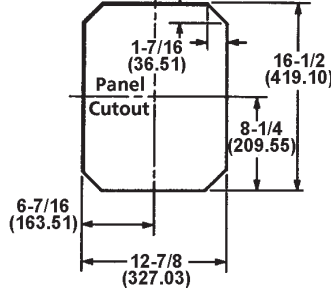
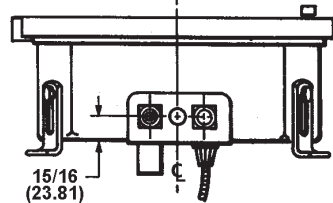
1. Drawing doesn't apply to Catalog termination Nos. 183-186, 191, 192, 194, 196 and 197 (see MD-J-076-21).
2. Refer to MD-J-076-20 for pipe mounting dimensions.
3. Refer to MD-J-076-19 for Handle & Feet mounting option.

Drawing applies only to the following Cat. Nos.:

76J * G G G * 1 * * * * C
 M M M 2
 V V N
 R R R
 S S S
 A A A
 D D F
 F F N
 N N * Can be any digit.



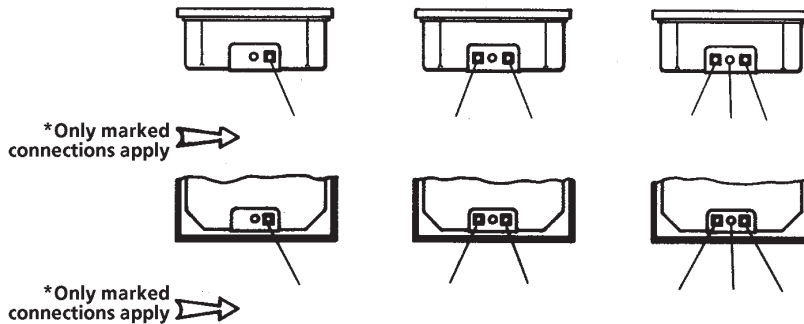
Thermal or Volumetric Pressure System
 Pressure Connection
 1/4 Int. NPT (to 1000 psi)
 1/2 Ext. NPT (over 1000 psi)



MOUNTING BRACKET

- Panel Mounting
- Surface Mounting

Dimensions shown in inches (mm).
 Only designated items apply.
 All air connections 1/4 Int. NPT unless otherwise marked.



- A - Thermal System (5-7th = G,M,R,S,V)
- B - Pressure Connection (5-7th = A,F,N)
- C - Volumetric Pressure Conn. (5-7th = A,F,N)
- D - Receiver Pressure Conn. (5-7th = F)
- E - Absolute Pressure Conn. (5-7th = A)
- K - High Pressure Conn. (5-6th = D)
- L - Low Pressure Conn. (5-6th = D)



Not for construction unless certified.

Cat. No. _____
 Cust. No. _____ ABB No. _____
 Also Refer to Dwgs. _____
 Certified by _____ Date _____

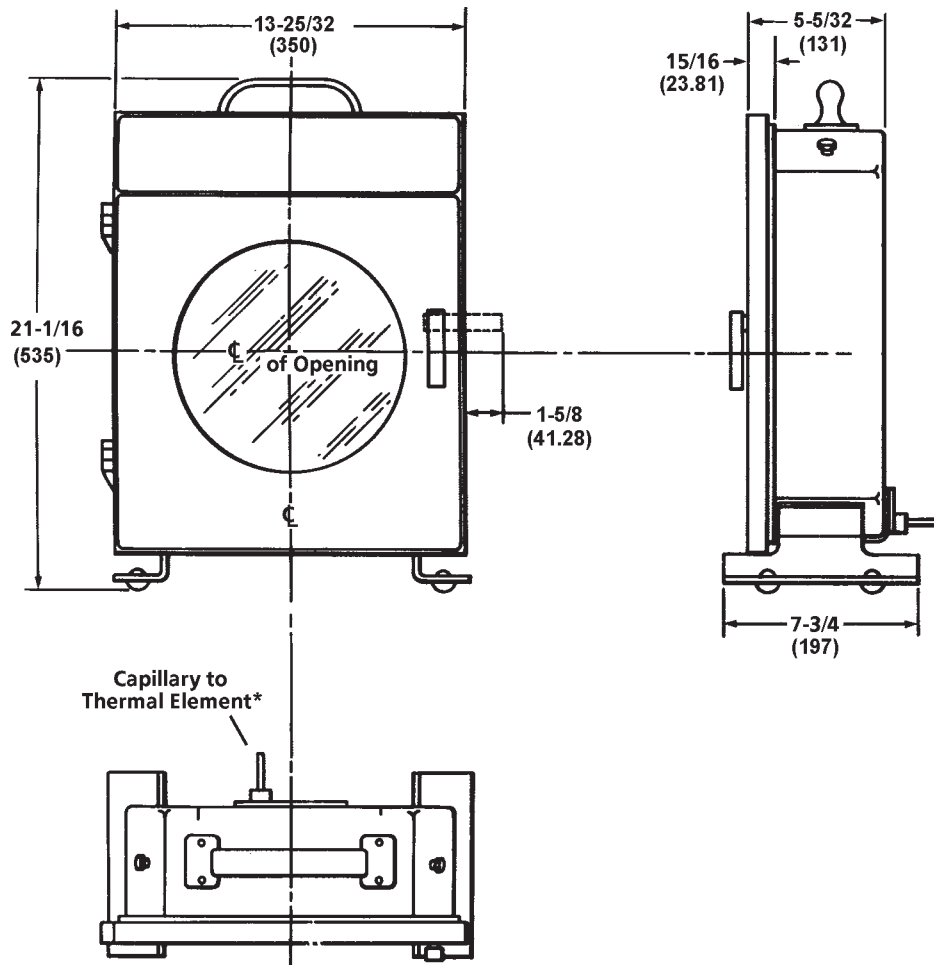
ABB Instrumentation		
MOUNTING DIMENSIONS		
76J Model C FULSCOPE Recorder for Panel or Surface Mounting		
MD-J-076-17	Issue 2	Sheet 1 of 1

Drawing applies only to the following Cat. Nos.:

76J * * * * * 4 * * * * * C

5

* Can be any digit.



Dimensions shown in inches (mm).

Drawing only applies to handle and feet mounting. Refer to drawing indicated below for connections and other dimensions.



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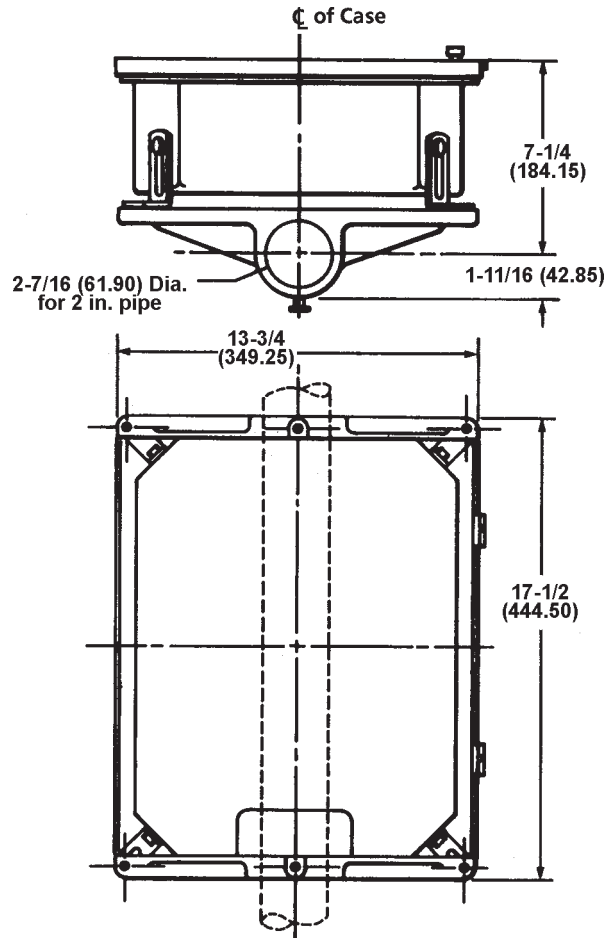
Cat. No. _____
 Cust. No. _____ ABB No. _____
 Also Refer to Dwgs. _____
 Certified by _____ Date _____

ABB Instrumentation		
MOUNTING DIMENSIONS		
76J Model C FULSCOPE Recorder for 2 Inch Vertical Pipe Mounting		
MD-J-076-19	Issue 2	Sheet 1 of 1

Drawing applies only to the following Cat. Nos.:

76J * * * * * 2 * * * * * C
 6
 8

* Can be any digit.



Dimensions shown in inches (mm).

Drawing only applies to Mounting Brackets.
 Refer to drawing indicated below for case dimensions.



Not for construction unless certified.

Cat. No. _____
 Cust. No. _____ ABB No. _____
 Also Refer to Dwgs. _____
 Certified by _____ Date _____

ABB Instrumentation		
MOUNTING DIMENSIONS		
76J Model C FULSCOPE Recorder for 2 Inch Vertical Pipe Mounting		
MD-J-076-20	Issue 2	Sheet 1 of 1

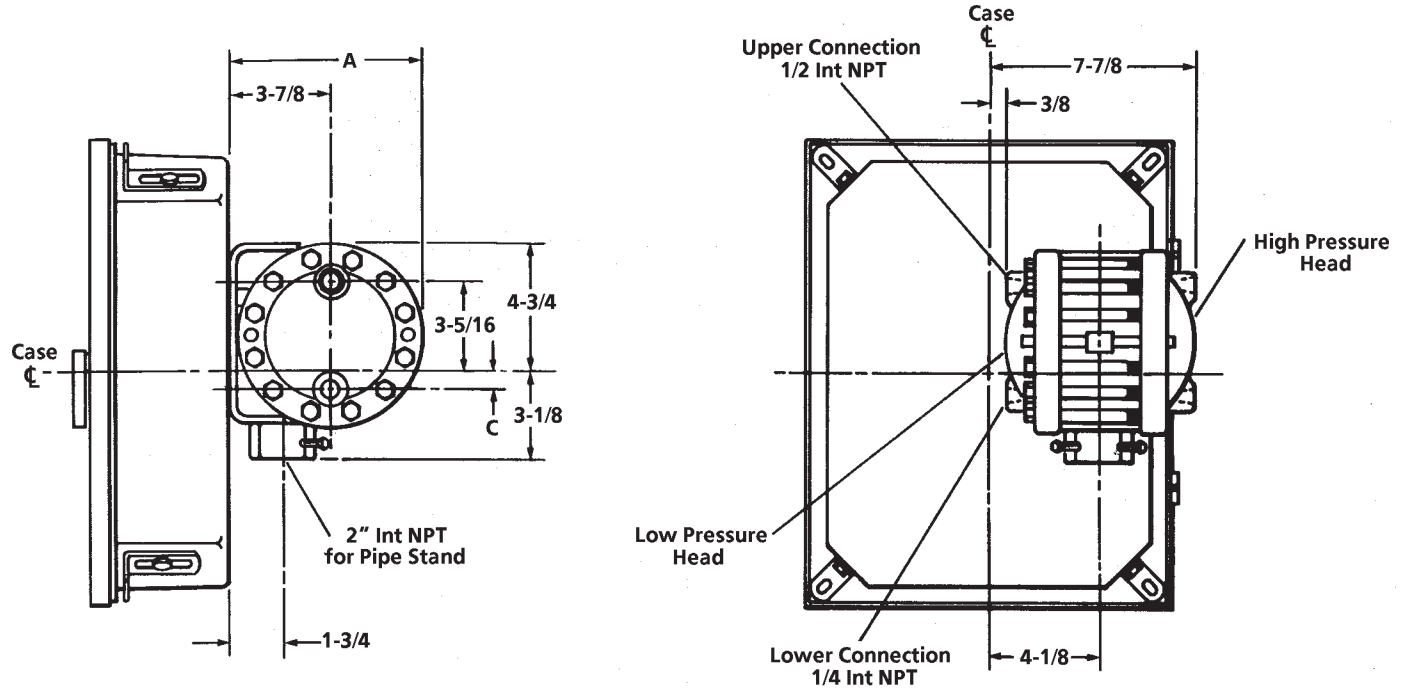
Drawing applies only to the following Cat. Nos.:

76J * C C O * * * * * C

Z Z

* Can be any digit.

Model 199 Aneroid (Termination Nos: 183 to 186)



B-106-277

INCHES	mm
1/4	6.35
3/8	9.53
1/2	12.70
1-3/4	44.40
1-7/8	47.63
2	50.80
2-1/16	52.39
2-15/16	74.61
3-1/8	79.80
3-1/4	82.55
3-5/16	84.13
3-7/8	98.43
4-1/8	104.78
4-3/4	120.65
7-7/8	200.03

Term No	Working Pressure	Body Material	Upper Pressure Connections	Lower Pressure Connections	A	C
<input type="checkbox"/> 183	2,500 psi	Forged Steel	1/2" NPT	1/4" NPT	2-1/16	2-15/16
<input type="checkbox"/> 184	3,000 psi	Forged 316 SST Monel	1/2" NPT	1/4" NPT	2	3-1/4
<input type="checkbox"/> 185	4,500 psi	Forged Steel	1/2" NPT	1/4" NPT	1-7/8	3-1/4
<input type="checkbox"/> 186	6,000 psi	Forged Steel	1/2" NPT	1/4" NPT	1-7/8	3-1/4
<input type="checkbox"/> 186	6,000 psi	Forged 329 SST	9/16" 18 UNF	9/16" 18 UNF	1-7/8	3-1/4

Notes:
Dimensions shown in inches (mm).

1/2" and 1/4" Pressure Connections can be reversed by rotating heads 180°.

Dimensions apply only to Meter Body. Refer to the following drawing for case dimensions:

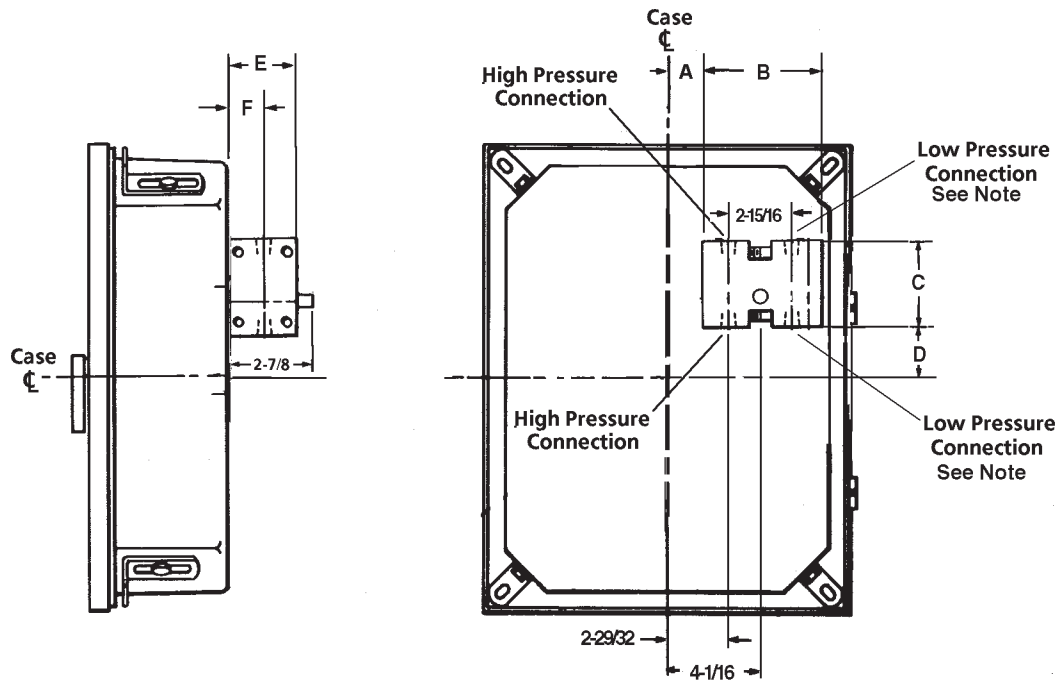


Not for construction unless certified.

Cat. No. _____
 Cust. No. _____ ABB No. _____
 Also Refer to Dwgs. _____
 Certified by _____ Date _____

ABB Instrumentation		
MOUNTING DIMENSIONS		
76J Model C FULSCOPE Recorder with Differential or Absolute Pressure Meter Body and Term. Nos. 183-186, 191, 192, 194, 196, 197		
MD-J-076-21	Issue 3	Sheet 1 of 2

Model 224 Manometer (Termination Nos: 191 to 197)



Term No	Working Pressure	Body Material	Upper Pressure Connections	Lower Pressure Connections	A	B	C	D	E	F
<input type="checkbox"/> 191	1,000 psi	Bar Stock Brass	1/8" NPT	1/8" NPT	2-1/16	4	2-15/16	2-1/32	2	1
<input type="checkbox"/> 192	1,500 psi	Cold Rolled Steel Forged 316 SST	1/4" NPT	1/4" NPT	2-1/16	4	2-15/16	2-1/32	2	1
<input type="checkbox"/> 194	3,000 psi	Cold Rolled Steel	1/2" NPT	1/4" NPT	2	4-1/8	3-1/4	1-7/8	2-1/4	1-1/8
<input type="checkbox"/> 196	6,000 psi	Cold Rolled Steel Forged 316 SST	1/2" NPT	1/4" NPT	1-7/8	4-3/8	3-1/4	1-7/8	2-1/4	1-1/8
<input type="checkbox"/> 197	10,000 psi	Forged Alloy Steel	1/4" NPT	1/4" NPT	1-7/8	4-3/8	3-1/4	1-7/8	2-1/4	1-1/8

Note: Absolute pressure meter body available in Termination Numbers 191 and 192 only.

INCHES	mm
1/8	3.18
1/4	6.35
1/2	12.70
1	25.40
1-1/8	28.58
1-7/8	47.63
2	50.80
2-1/32	51.59
2-1/16	52.39
2-1/4	57.15
2-7/8	73.03
2-29/32	73.82
2-15/16	74.61
3-1/4	82.55
4	101.60
4-1/16	103.39
4-1/8	104.78
4-3/8	111.13



Drawing applies only to the following Cat. Nos.:
 Recorder: 76 J * † † † * * * * * C

† Any digit except T (EME)
 * can be any digits

CHART DRIVE TYPE ELECTRIC ONLY

GENERAL PURPOSE

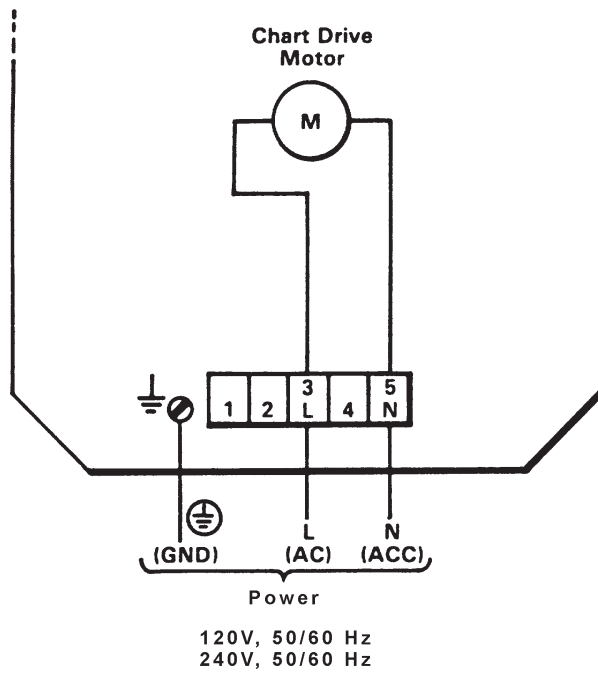


CHART DRIVE TYPE

- Electric (General Purpose) 120V, 60Hz
- Electric (General Purpose) 120V, 50Hz
- Electric (General Purpose) 240V, 60Hz
- Electric (General Purpose) 240V, 50Hz
- Spring Wound, 9 Day wind
- Spring Wound, 9 Day wind
- Battery Operated



Not for construction unless certified.

ABB Instrumentation

Connection Diagram

76J Recorders

Cat. No. _____

Cust. No. _____ ABB No. _____

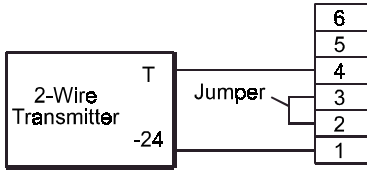
Also Refer to Dwgs. _____

Certified by _____ Date _____

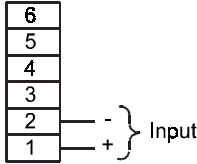
WD-J-076-2

Rev 3

Sheet 1 of 1



Typical Connections for Two-Wire Transmitter (4 to 20 mA dc Input) (See Note 1)



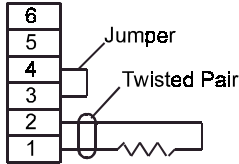
Voltage or Current Input (See Note 1)

Drawing applies only to the following Cat. Nos.:

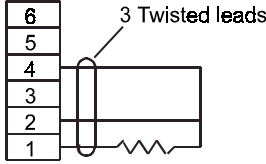
Recorder: 76 J * T O O * * * * * C
T T

Element: 1401 L A * * * * * D
1402
1403
1404

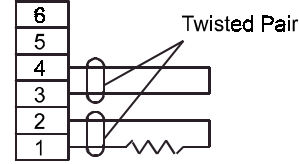
* can be any digits



Resistance Element with 2 Lead Wires (See Note 1)



Resistance Element with 3 Lead Wires (See Notes 1 and 2)



Resistance Element with 4 Lead Wires (See Notes 1 and 2)

Input Signal	1401L	1402L	1404L
Resistance Element			
4 to 20 mA dc			
0.25 to 1.25V dc			
0 to 1V dc			
0 to 5V dc			

CHART DRIVE TYPE

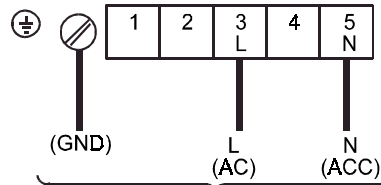
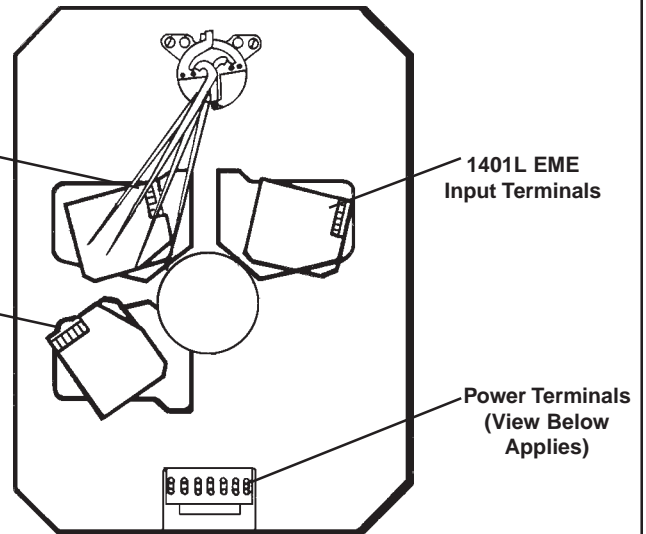
- Electric (General Purpose) 120V, 60Hz
- Electric (General Purpose) 120V, 50Hz
- Electric (General Purpose) 240V, 60Hz
- Electric (General Purpose) 240V, 50Hz
- Spring Wound, 9 Day wind
- Spring Wound, 9 Day wind
- Battery Operated

NOTES:

- Do not use wire larger than 16 ga for voltage, current or resistance element input connections. 24 ga or 0.5 mm wire is recommended for mV and thermocouple input connections and must be a twisted shielded pair or a twisted pair in conduit.
- Run all signal wires in same conduit to minimize temperature effects.
- L - Hot (live) wire

- Ground (earth) wire

N - Common (neutral) wire



AC Power (See Note 3)



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Connection Diagram

76J Recorders with
1401, 1402, 1403, 1404 EME Elements

Cat. No. _____

Cust. No. _____ ABB No. _____

Also Refer to Dwg. _____

Certified by _____ Date _____

WD-J-076-6

Rev 5

Sheet 1 of 1

PRODUCTS AND SERVICING

A Comprehensive Instrumentation Range

Sensors, transmitters and related instruments for flow, temperature, pressure, level and other process variables

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electromagnetic, ultrasonic, turbine, differential pressure, Wedge, rotary shunt, coriolis.

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electronic and pneumatic.

Temperature

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Pressure transmitters

Level

sensors and controllers.

Tank gauging systems

Cable-length measuring systems

Indicators, recorders, controllers and process management systems

Recorders

circular and strip-chart types - single and multi-point - for temperature, pressure, flow and many other process measurements.

Controllers

digital display, electronic, pneumatic. Discrete single-loop and multi-loop controllers which can be linked to a common display station, process computer or personal computer.

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Sensors

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Monitors and Analyzers

for water quality monitoring in environmental and power generation and general industrial applications.

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Tel: (0344) 58111
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