

SERIES 180A

Precision Recorders

Operator's Manual



WARRANTY

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of 13 months from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal one (1) year product warranty to cover handling and shipping time. This ensures that our customers receive maximum coverage on each product. If the unit should malfunction, it must be returned to the factory for evaluation. Our Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. However, this WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive current, heat, moisture, vibration, or misuse. Components which wear or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

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To avoid processing delays, also please be sure to include:

1. Returnee's name, address, and phone number.
2. Model and Serial numbers.
3. Repair instructions.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. That way our customers get the latest in technology and engineering.

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SECTION 1 INTRODUCTION

1.1 GENERAL DESCRIPTION

The OMEGA® Series 180A line of linearized precision temperature control instruments offers precise measuring and recording information. Each instrument is simple in design, yet rugged in application. Operating controls are conveniently located for easy accessibility. Also easily accessible are ink, pen and paper replacements located in the front or inside a pull out drawer. A fluorescent light illuminates the scale and chart paper for bright, easy-to-read recordings. The OMEGA Series 180A line is equally flexible for process and environmental temperature monitoring and measuring applications. The recorder's precision and durability should provide reliable information during years of productive service.

1.1.1 Continuous Recorders (See Figure 1-1)

The continuous temperature recorders are available with 1, 2, or 3 independent inputs. Standard recorders can measure temperature or millivolts. Millivolt models have precision linear electronics and directly read out the millivolts on the chart paper. Thermocouple models have cold junction compensation and direct temperature reading chart paper.

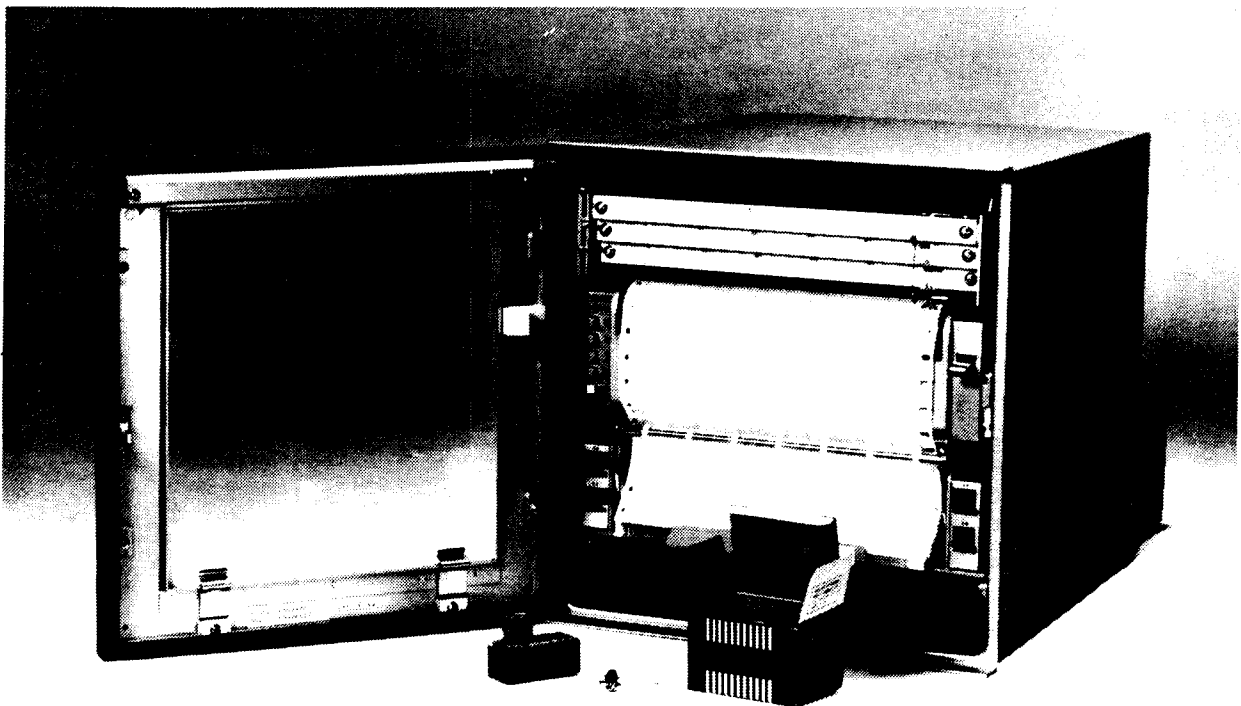


Figure 1-1. Continuous Temperature Recorder

All models listed below are essentially the same, only the number of channels and input electronics are different.

| Model Number | Type | Channel Inputs |
|--------------|---------------------------|----------------|
| 180A-01 | Millivolt Thermocouple | 1 |
| 180A-02 | Millivolt Thermocouple | 2 |
| 180A-03 | Millivolt Thermocouple | 3 |

1.1.2 Multipoint Recorders (See Figure 1-2)

The OMEGA Series 180A multipoint temperature recorders contain a unique color-coded recording system. The chart paper and pens are controlled by separate mechanisms. Models listed below are essentially the same, only the number of channels and input electronics are different.

| Model Number | Type | Channel Inputs |
|--------------|---------------------------|----------------|
| 180A-06 | Millivolt Thermocouple | 6 |
| 180A-12 | Millivolt Thermocouple | 12 |

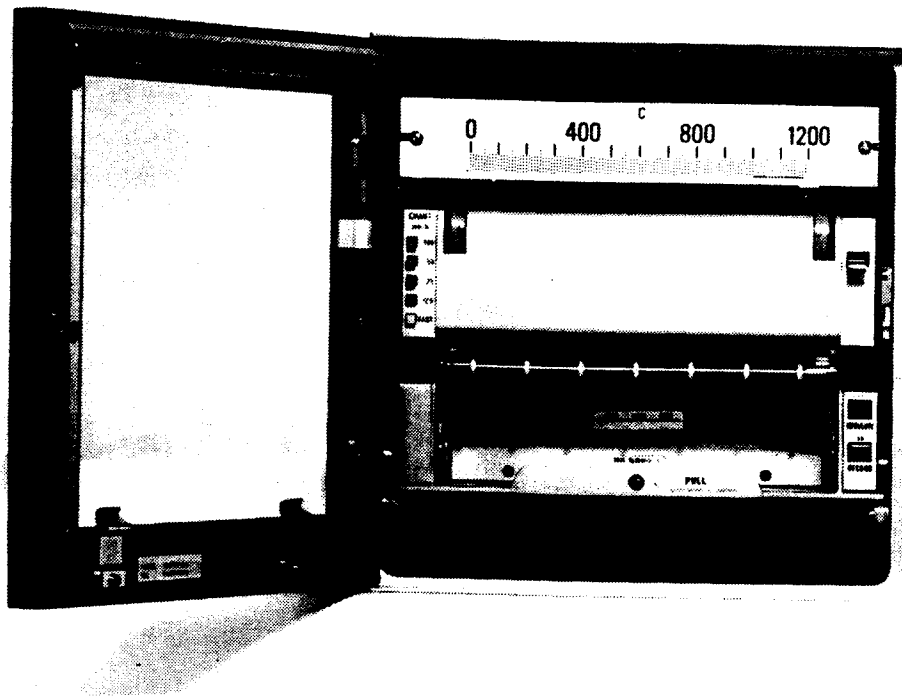


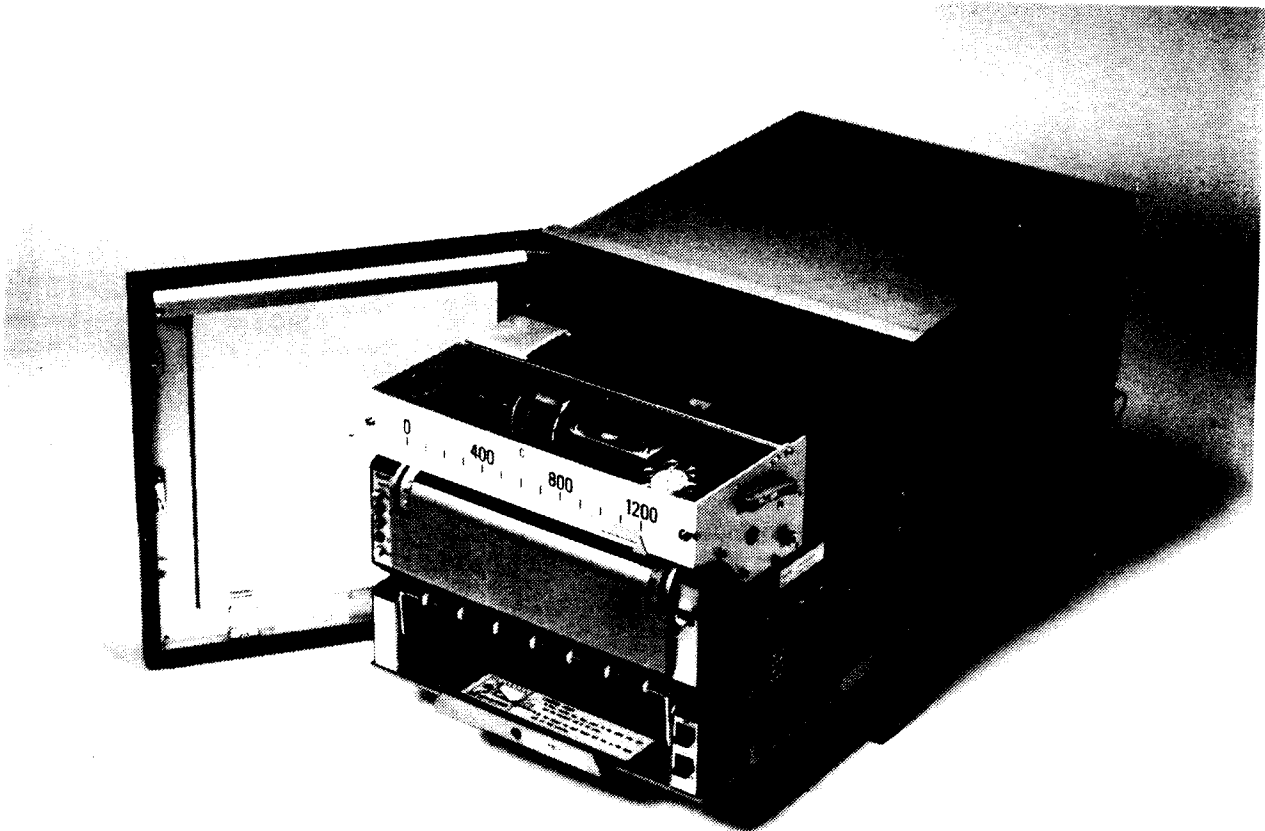
Figure 1-2. Multipoint Temperature Recorder

1.2 RANGES

Thermocouple Types J, K, T, E, and R cover many ranges and each recorder can be configured to match your system. If you require a different range in the future, simply return the recorder to OMEGA. OMEGA can retrofit your recorder to accept any input range listed in Table 1. Custom ranges are also available.

TABLE 1

| THERMOCOUPLE RANGES | | |
|---------------------|----------------|-------------|
| Input | Range | Range Code |
| J | 0 to 500°F | J-0/ 500°F |
| | 0 to 800°F | J-0/ 800°F |
| | 0 to 1000°F | J-0/1000°F |
| | 0 to 400°C | J-0/ 400°C |
| K | 0 to 1000°F | K-0/1000°F |
| | 0 to 1500°F | K-0/1500°F |
| | 0 to 2400°F | K-0/2400°F |
| | 0 to 800°C | K-0/ 800°C |
| | 0 to 1000°C | K-0/1000°C |
| T | - 100 to 400°F | T-100/400°F |
| | 0 to 200°C | T-0/200°C |
| E | 0 to 1000°F | E-0/1000°F |
| | 0 to 500°C | E-0/ 500°C |
| R | 0 to 1600°C | R-0/1600°C |
| mV | 0 to 100mV | mV-0/100 |



SECTION 2 INSTALLATION

2.1 UNPACKING

Remove the Packing List to check off actual equipment received. If you have any questions on your shipment, please call the OMEGA Customer Service Department at (203) 359-1660.

Upon receipt of shipment, inspect the container for any signs of damage in transit. Especially take note of any evidence of rough handling. Report any apparent damage immediately to the shipping agent.

NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination.

After examining and removing contents, save packing material and carton in the event reshipment is necessary. Locate the finger grip on the right center of the mainframe. The catch is spring loaded, so pull the finger grip firmly. The protective glass door will open from right to left.

To protect the recorder during shipment, the chassis has been secured with a screw. See Figure 2-1 when you're ready to install the pen, etc., simply back off the retaining screw and use the hand grip in the middle of the chart bin to roll out the chassis. After your recorder has been loaded with pens and paper, retighten the screw.

Pull the hand grip forward to roll out the mainframe shelf. The pen mechanism, located in the upper right corner, has been secured to the chassis to prevent damage during shipment. Remove the tie wrap.

NOTE

Always secure the pen mechanism when recorder is being shipped.

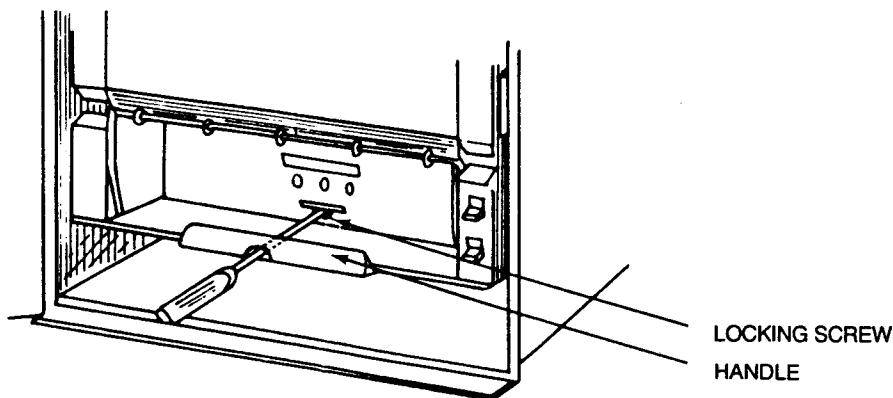


Figure 2-1. Unlocking Chassis Screw

2.2 MOUNTING

Standard instruments are rack mounted. However, desktop mounting is available. If you plan to use desktop mounting, be sure you have ordered and received the carrying handle and feet option.

When selecting a location for your recorder, choose a site free from dust, moisture, corrosive gas and vibrations. Room temperature should be between 14° and 122°F (–10° and 50°C). Avoid areas with large fluctuations in temperature.

2.2.1 Rack Mounting

Four metal brackets and four screws are in your accessory box. Locate the four screw slots on the recorder: Two on the left and two on the right. Loosen the screws. Slide bracket down. Tap the bracket down firmly so everything is pulled tight. See Figure 2-2.

2.3 INK SYSTEM

OMEGA Series 180A recorders provide weeks of recording without adding ink.

2.3.1 Continuous Recorder

Continuous recorders have sapphire-tipped pens for durability and easy maintenance. Each channel has its own pen. Only put ink in the channels being used, following this procedure.

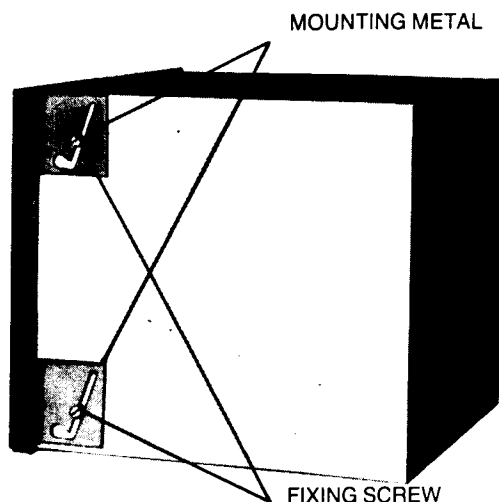


Figure 2-2. Rack Mounting

1. Open the protective glass door. Grasp the hand grip and roll out the chassis. Pen Lifts are the levers on the left side of the scale. Press each of the pen lifts up to remove pen tips from the chart paper. See Figure 2-3.
2. The ink bottles supplied in your accessory box are the ink reservoirs. Take the ink reservoir out of the accessory box and remove the outer lid. Then remove the plastic plug from the reservoir.
3. The tube connector is also in your accessory box. Place the tube connector into the ink reservoir and replace the outer lid.
4. To connect the coil from Pen 1 with the tube connector on the ink reservoir, place the pen tube over the smaller vent. See Figure 2-4.
5. Cover the larger vent (air pipe) with a piece of tape and hold the tape on with your index finger.
6. Gently squeeze the bottle between your thumb and second finger to force ink through the capillary tube and down to the pen. Watch ink flow through the coil. Reduce pressure when ink nears the pen. When ink comes from the pen, remove tape from the air vent and relieve pressure on the reservoir.

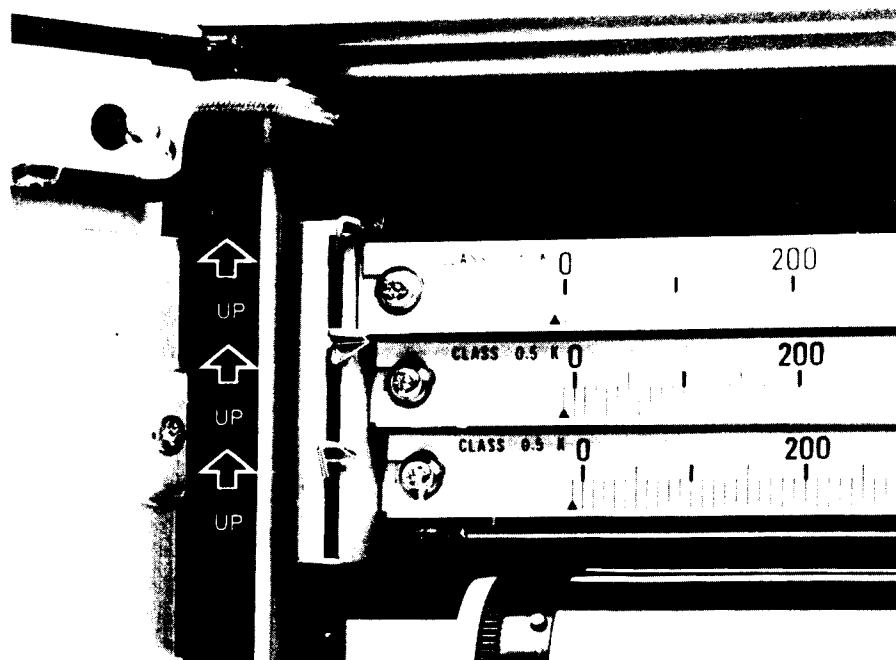


Figure 2-3. Pen Lifts

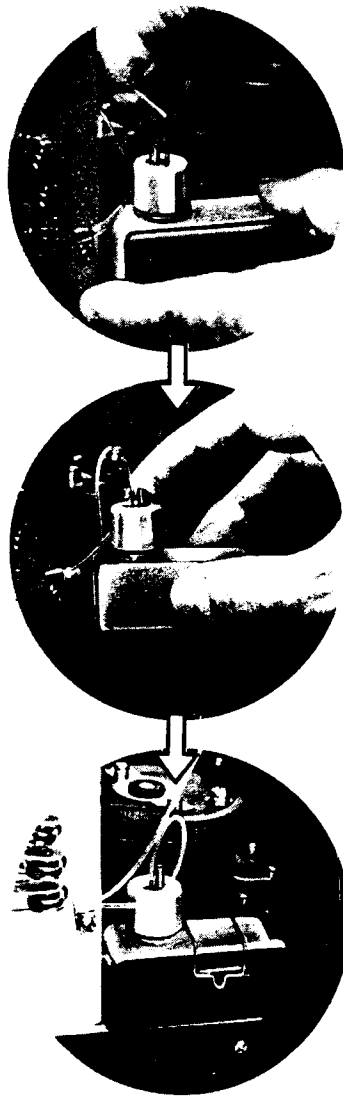


Figure 2-4. Placing Pen Tube Over Vent

7. Place the ink reservoir in the reservoir holder on the right side of the recorder. See Figure 2-4.
8. Pens 2 and 3 are filled in the same manner using the appropriate color ink. If you are ready to record, push the chassis back to its original position. Pull down all pen lifts to place pen tips on the paper.

2.3.2 Multipoint

The multipoint recorders have a unique color-coded recording system. The pre-inked colors in the pad wheel correspond to the colors on the indicator card on the front panel to clearly identify each input.

Although the color pads can be placed in different locations on the pad wheel, the indicator card will not match if such a change is made. To begin, no inking is necessary. See Figure 2-4. Simply insert the pre-inked wheel supplied in your accessory box and the process is complete.

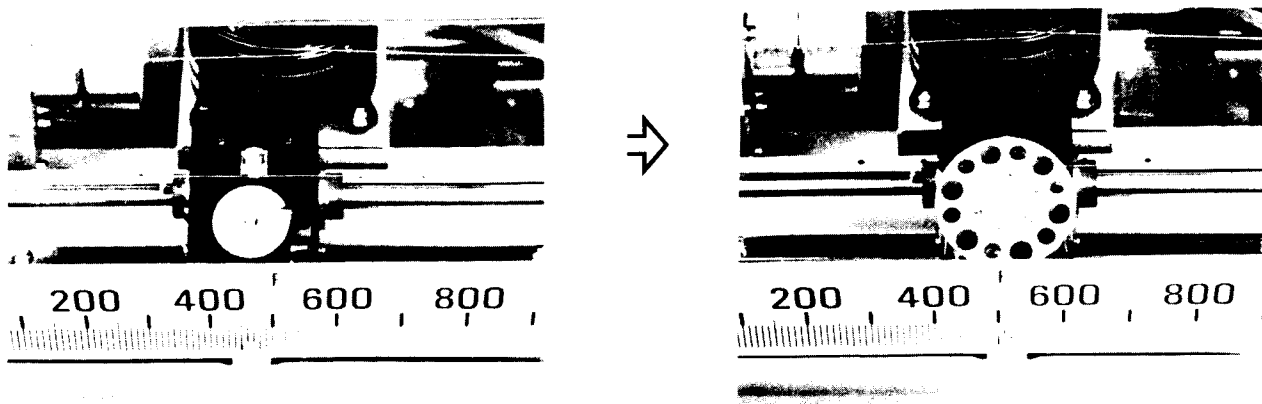


Figure 2-5. Installing Ink Pad Wheel

1. Take the pad wheel out of the accessory box. Open the protective glass door. Grasp the hand grip and roll out the chassis. The pad carriage is located on the top left side of the recorder. Place the pad wheel on the pad carriage with the pad wheel pin fitting into the pad groove. See Figure 2-5.
2. If you are ready to record, return the chassis to its original position and close the protective door.
3. To ink the non-inked pad supplied in your accessory box, take the non-inked pad and the bottle of ink out of the accessory kit. Snip tip off the ink bottle. Add 4 or 5 drops of ink to the pad to re-ink.

NOTE

When ink is added to pad for the first time, add 6 or 7 drops.

2.4 PAPER INSTALLATION

Each range uses a different set of matching chart paper, amplifier and range scales. Depending upon the chart speed selected, the intervals correspond to either two hours, one hour, 20 minutes, 10 minutes, 4 minutes and 2 minutes. There are six selectable chart speeds: 12.5 mm per hr.; 25 mm per hr.; 75 mm per hr.; 150 mm per hr.; 375 mm per hr.; and 750 mm per hr.

If you are recording at 25 mm per hour, the chart paper should last approximately one month. However, the chart paper is marked with the notation "Prepare The New Chart Paper" to indicate when new paper should be installed.

1. Pull finger grip firmly to open the protective glass door. The Chart Rack Release Lever is on the upper right side of the paper platen. Push the lever up to unlock the chart platen. Chart platen will swing forward to allow easy access to the paper bin. See Figure 2-6.
2. Remove wrapping from a packet of paper in your accessory box. Make a triangular point at the end of the paper (opposite end from end notation). Fan the paper thoroughly from each end several times. Be sure no pages are stuck together.
3. Place paper into the paper tray with the triangular end facing towards you.
4. Pull the paper forward and feed it across the sprocket teeth. Match the oval holes on the right side of the paper to the sprocket teeth first, then the round holes on the left. See Figure 2-7.
5. Push the platen up to its vertical locked position. Pull forward the chart guide so the paper can pass behind it. See Figure 2-8.
6. Manually turn the chart driving knobs at the top of the paper platen to bring forward about 12" (30 cm) of paper. Pass the paper under the chart guide, then fold into the bin receptacle. Return chart paper guide to original position. If you're ready to record, close the protective glass door.

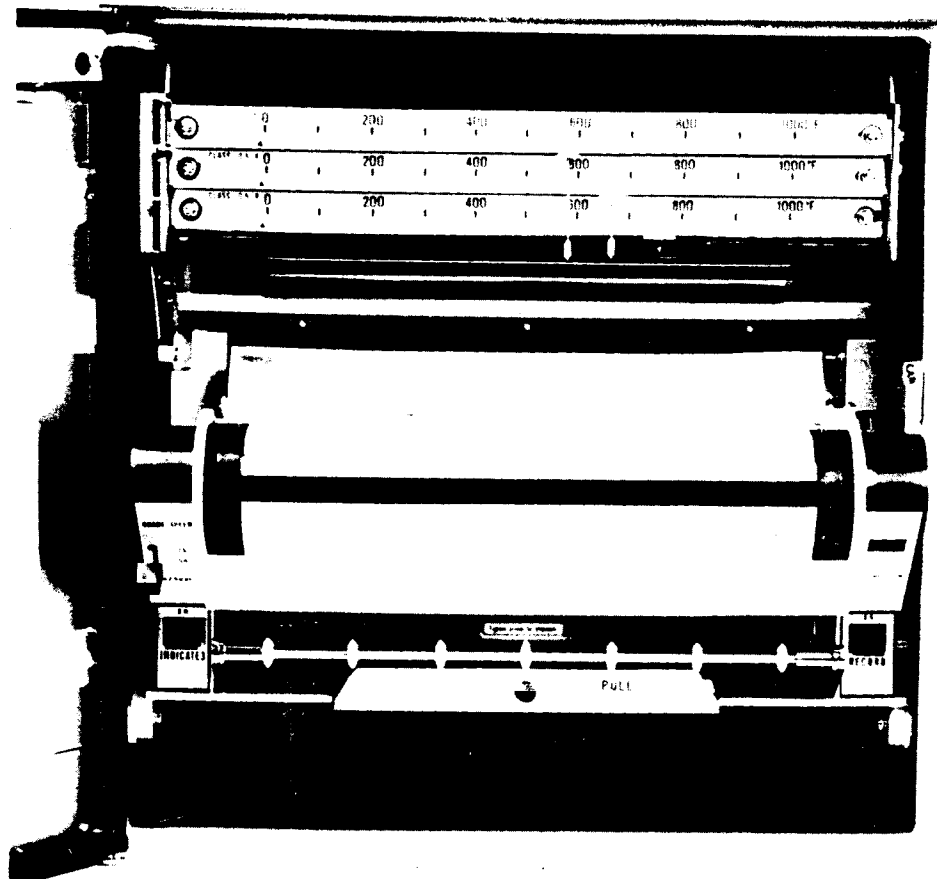


Figure 2-6. Inserting Paper

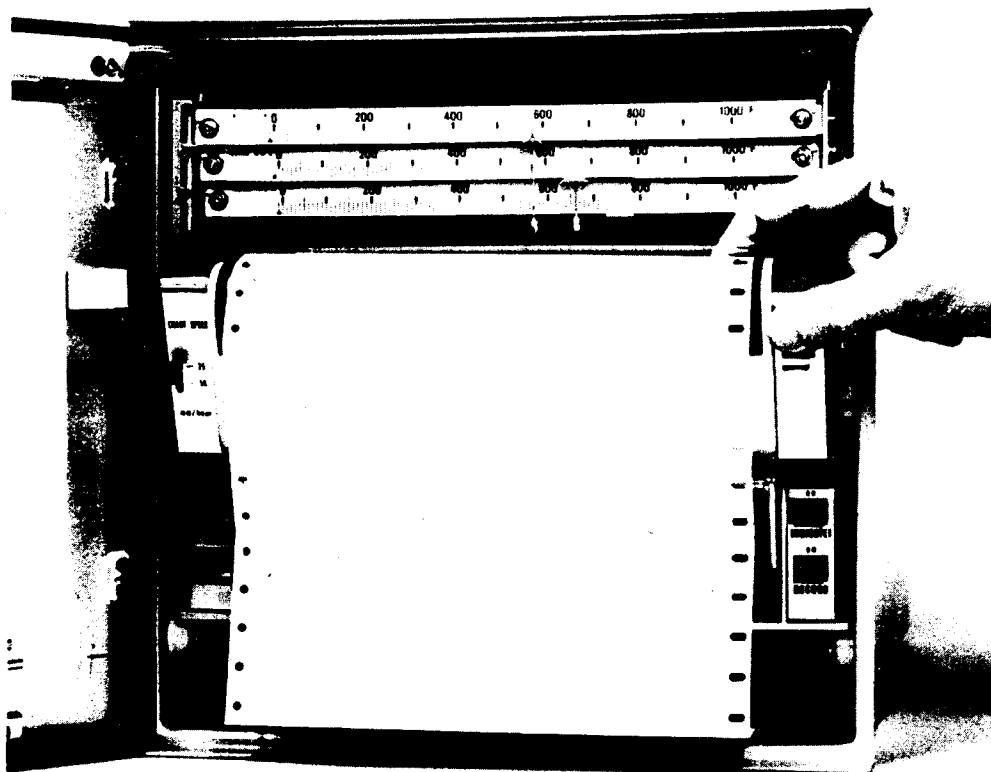


Figure 2-7. Paper Feeding Across Sprocket Teeth

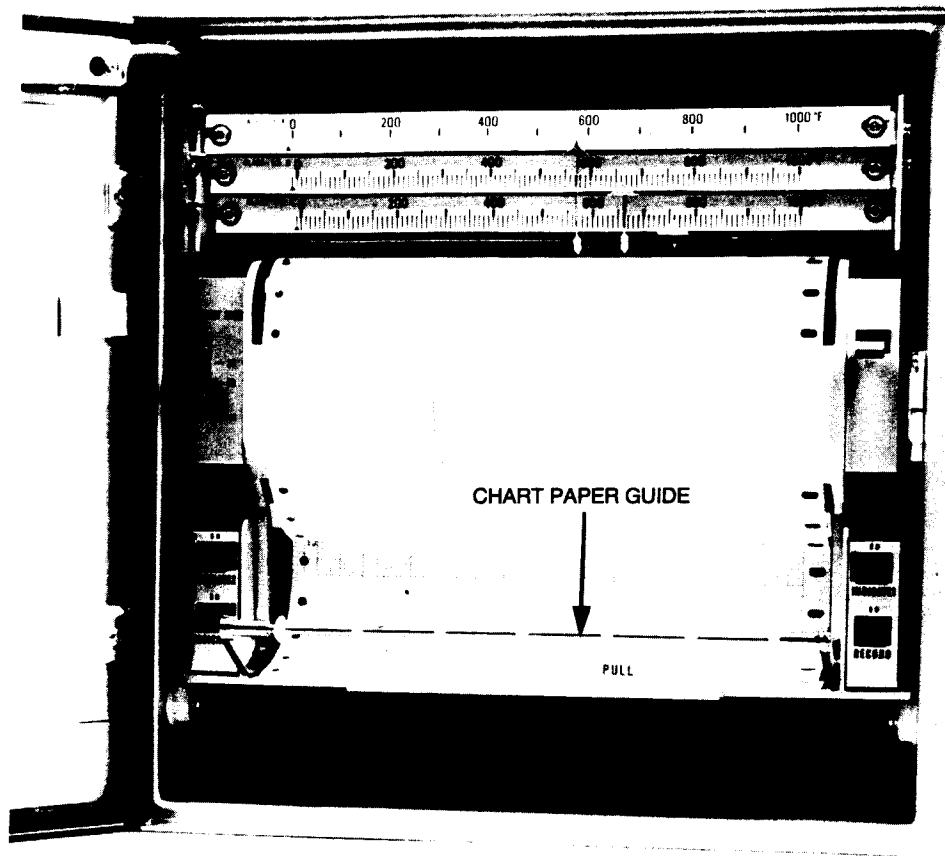


Figure 2-8. Pulling Forward Chart Guide

2.5 POWER AND INPUT CONNECTIONS

Power and input connections are easily accessible at the rear of the terminal.

2.5.1 Power Connection

Terminals require a 110 V ac power source

Warning

Remove line voltage from the power cord and instrument before making any connections.

Be sure the Indicate and Record switches are OFF.

Loosen the four screws on the rear terminal cover and slide the cover up and off.

Feed the power wires into the grommets on top.

Connect the unenergized power cord wires to the terminals as shown. See Figure 2-9.

Caution

Do not use power source which is subject to severe voltage change. This will cause errors in the recording.

2.5.2 Input Connection

Warning

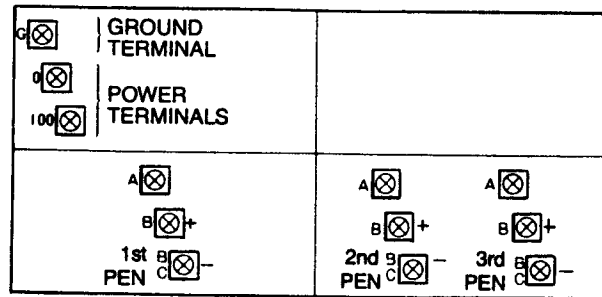
Make Sure There Is No Voltage On The Thermocouple Wires Before Making Connection.

Loosen the four screws on the rear terminal cover and slide the cover up and off. Run the feed wires in through the lower set of grommets to keep them separate from the power. Connect the lead wire to input terminals. See Figure 2-10.

NOTE

If there is line noise or the pen is erratic, the wires are fed incorrectly. Keep sensor circuit more than 12" (305 mm) from other heavy current carrying conductors.

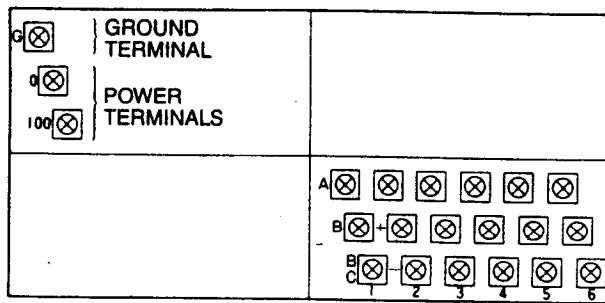
• 3 PEN RECORDER



Thermocouple, mV input \oplus \ominus terminals

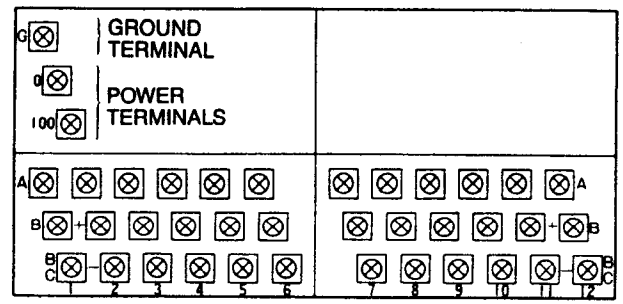
Continuous Model

• 6 MULTIPOINT RECORDER



Thermocouple, mV input \oplus \ominus terminals

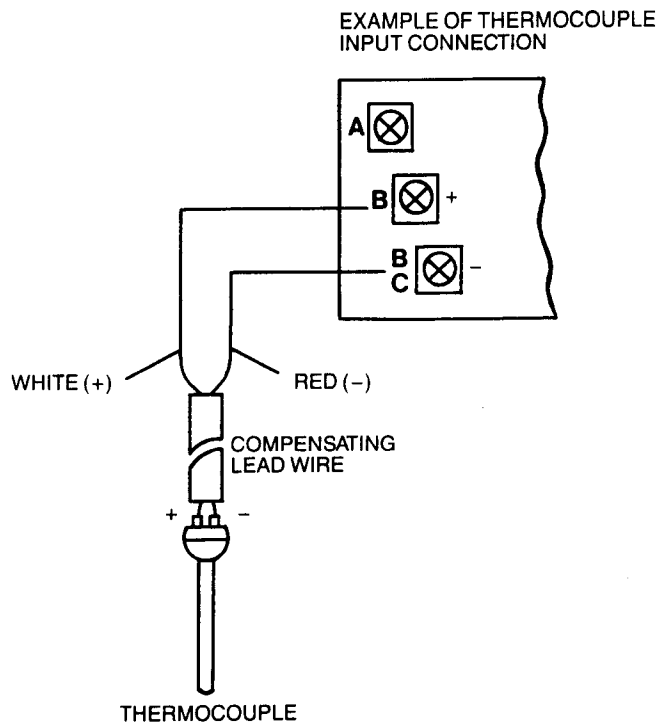
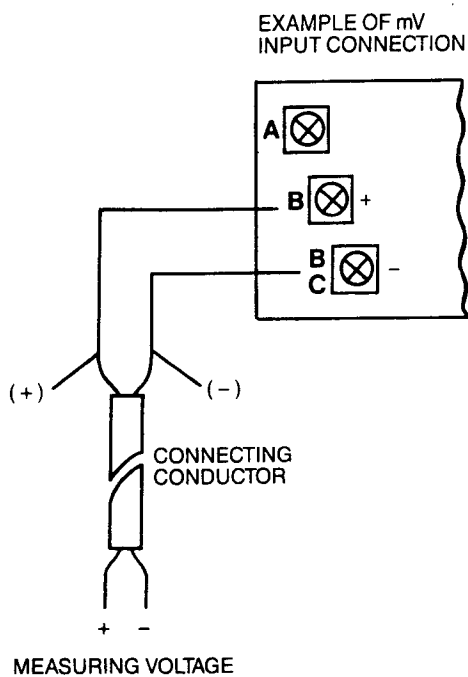
• 12 MULTIPOINT RECORDER



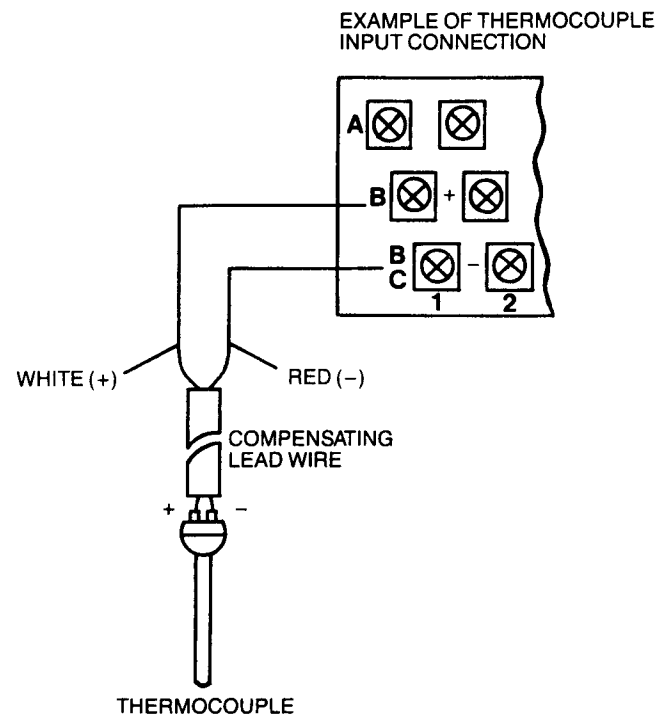
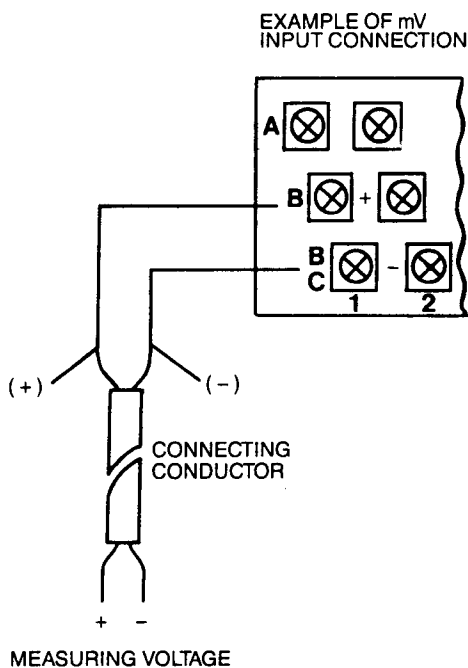
Thermocouple, mV input \oplus \ominus terminals

Multipoint Model

Figure 2-9. Power Connection



Continuous Model



Multipoint Model

Figure 2-10. Input Connection

SECTION 3 OPERATION

Switch INDICATE to "ON" to turn on fluorescent light and Pen 1.

Turn INDICATE switch "ON" for Pens 2 and 3 (Continuous Models Only).

Set CHART SPEED lever to desired speed.

Turn RECORD switch "ON" to start paper flow.

SECTION 4 ADJUSTMENTS AND CALIBRATIONS

4.1 CONTROLS

All of the Series 180A recorders have a six speed chart drive that is switch selectable.

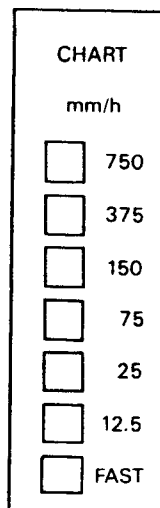


Figure 4-1. Six Speed Switchable Chart Drive

Individual switches for the pen and chart systems provide added flexibility.

4.2 CHART AND PEN DRIVE

The CHART SPEED switch on standard recorders controls the time graduations on the chart paper. The "12.5 mm" setting corresponds to an interval of two hours per graduation, the "25 mm" setting corresponds to an interval of one hour, the "75 mm" corresponds to 20 minutes, the "150 mm" corresponds to 10 minutes, the "375 mm" corresponds to 4 minutes, and the "750 mm" corresponds to 2 minutes.

The CHART SPEED control is located on the left center of the recorder.

4.2.1 Continuous Recording Models

The INDICATE switch on the lower left side controls Pen #1 and the fluorescent lamp. Indicator switch for Pens 2 and 3 are located on the lower right side of the recorder.

4.2.2 Multipoint Models

The INDICATE switch is located on the lower right side and controls the dotting system and the fluorescent lamp.

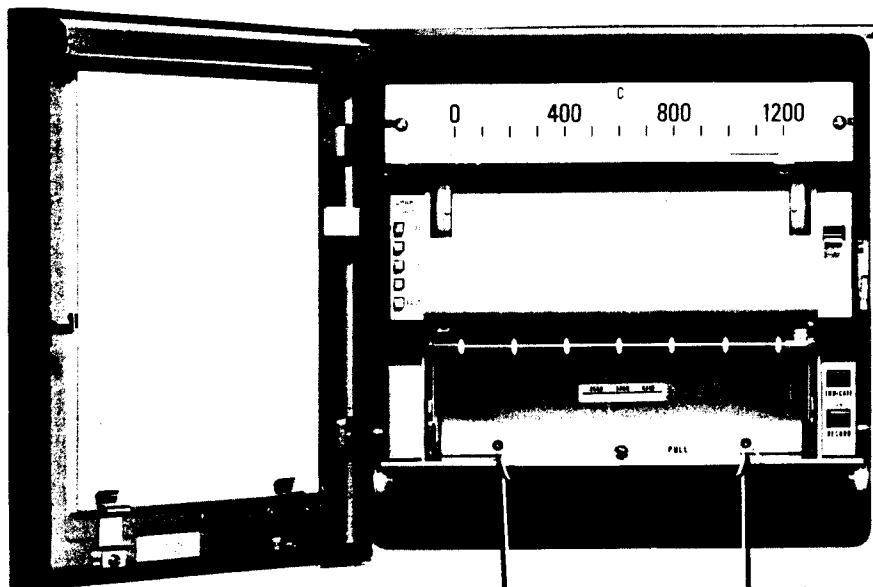
4.2.3 Record

The RECORD switch is located on the lower right side of the recorder and controls the paper. When the switch is turned on, paper begins flowing.

4.3 PERFORMANCE CHECKS

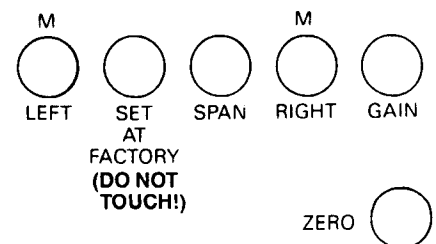
This section contains instructions for span calibration, pen carriage alignment, zero adjustment, span adjustment and damping alignment. The SPAN, ZERO and DAMPING controls for these adjustments are accessible at the rear of the chart bin (refer to Figure 4-2).

The OMEGA Series 180A recorders meet the highest performance standards. Even after components have been replaced, only five adjustments are necessary.



Remove these screws and flip panel to expose calibration adjustments

Figure 4-2. Calibration Adjustments



4.3.1 Span Calibration

Before making a calibration adjustment, check the following three items:

1. Disconnect the sensor to be sure the input is open. (The recorder's high input impedance and frequency response can cause a frequency jitter).
2. Be sure that no noise has been picked up in the signal.
3. Check for high level, high frequency transients in the signal.

If span calibration is necessary:

1. Connect a precision dc voltage source with enough range to cover the recorder's span.
2. On models with millivolt inputs, connect from the mV source directly to the recorder. For models with thermocouple inputs, attach a cold reference junction between the recorder and the mV source. See Figure 4-3.
3. Waterproof the thermocouple wire to copper wire junction. Then immerse in a slush of ice and water.
4. Apply the calibration through the transition junction, monitoring it at the mV source. The millivolt level must from the thermocouple tables. (Refer to technical section of OMEGA's Temperature Measurement Handbook.)
5. Apply a mV signal corresponding to the low end of the span. Using the ZERO control, adjust the pen position to read zero on the low value on the chart.
6. Then apply a mV signal corresponding to full scale. Using the SPAN control, adjust the pen position to full scale reading on the chart.

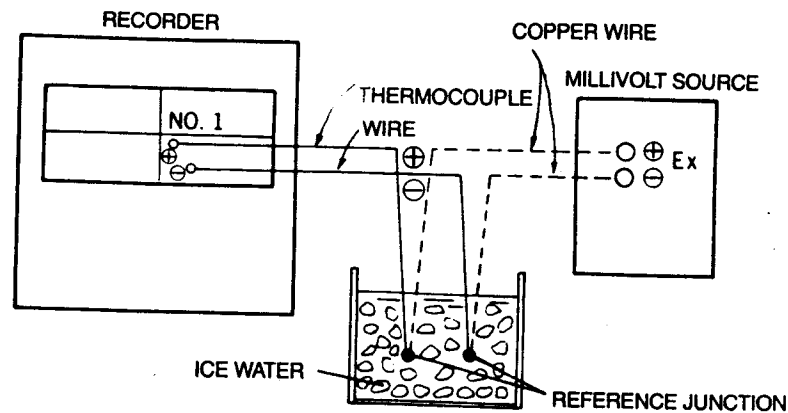


Figure 4-3. Hook-up Thermocouple

4.3.2 Pen Carriage Alignment (See Figure 4-4)

Following installation of a new cable, it is necessary to align the pen carriage with the servo feedback potentiometer.

1. Turn the INDICATE and RECORD switches "OFF".
2. Pull out the chassis drawer.
3. Turn the pulley carriage fully counterclockwise to move the pen past the zero position on the chart paper.
4. Set the pointer to the mark to the left of zero on the scale. If the pointer does not move all the way to the left of zero or if the pulley is not fully counterclockwise, loosen the screw on top of the carriage to disengage the carriage from the cord. Move the carriage to align the pointer with the mark to the left of zero on the scale when the pulley is fully counterclockwise. Tighten the screw to secure the carriage assembly to the string.
5. Return the chassis to its original position.

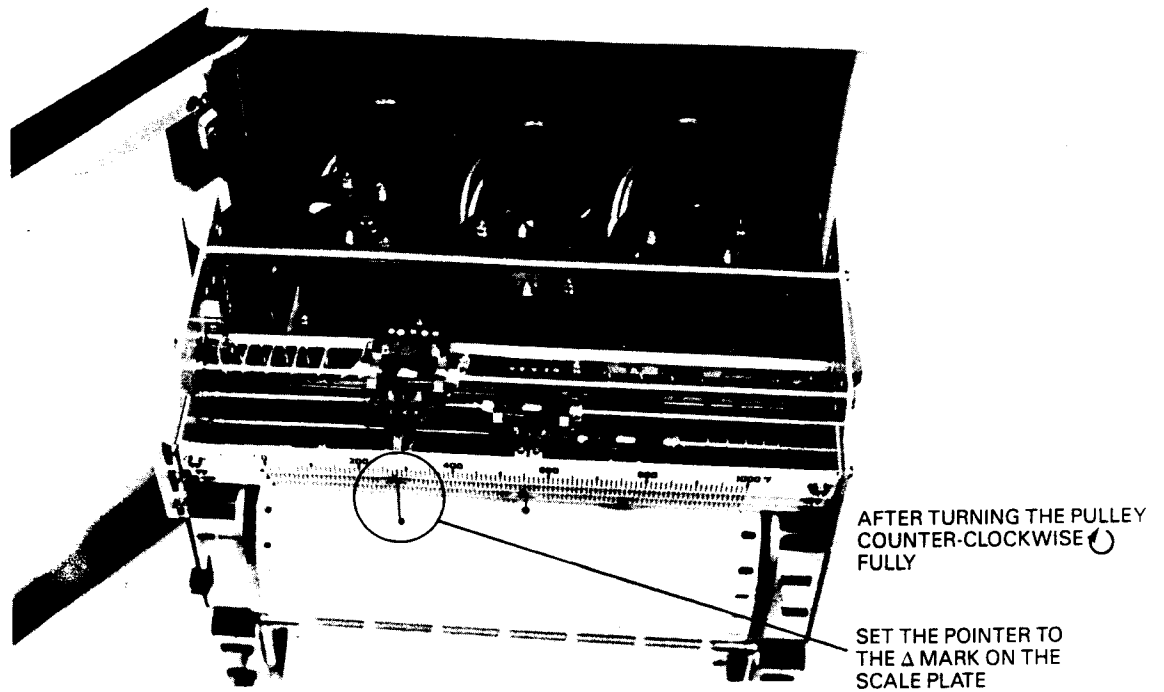


Figure 4-4. Pen Carriage Alignment

4.3.3 Zero Adjustment (See Figures 4-2 and 4-5)

1. Check the Carriage Alignment as described in paragraph 4.3.2. If carriage is aligned correctly, continue with Zero Adjustment.
2. Turn the RECORD switch "OFF".
3. Turn the INDICATE switch "ON".
4. Remove the used chart paper from the paper bin to gain access to controls at rear of the paper bin.
5. To adjust the ZERO control, turn clockwise to increase; counterclockwise to decrease.

If you have the thermocouple recorder, use the cold reference junction described in paragraph 4.3.1. Put zero input in through the cold reference junction. Using ZERO control, adjust for zero indication.

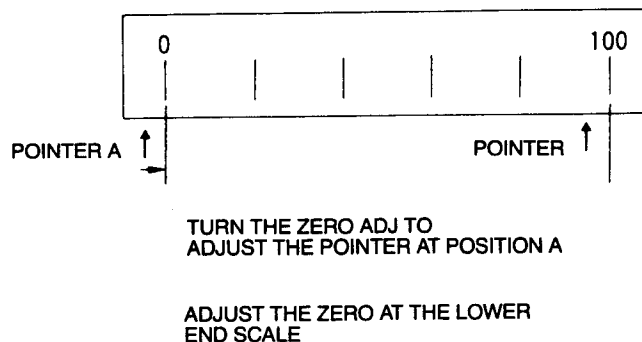


Figure 4-5. Zero Adjustment

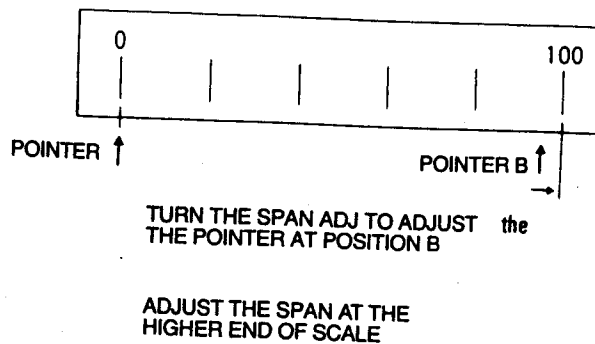


Figure 4-6. Span Adjustment

4.3.4 Span Adjustment (See Figures 4-2 and 4-6)

1. Check the Carriage Alignment as described in paragraph 4.3.2.
2. Turn the RECORD switch "OFF."
3. Turn the INDICATE switch "ON."
4. Remove the used chart paper from the paper bin. The adjustment control panel is at the rear of the paper bin.
5. To adjust the SPAN control, turn clockwise to increase; counterclockwise to decrease. For thermocouples, input the equivalent millivolts of full scale through a transition junction as described in paragraph 4.3.1. Use the SPAN Adjustment to adjust the pen position on the paper for full scale indication.

4.3.5 Damping Adjustment (See Figure 4-2)

Damping does not normally need adjustment. However, if your instrument shows excessive overshoot when step change inputs are applied, or if the pen becomes sluggish, damping adjustment is necessary.

If the pen is sluggish, turn DAMP control counterclockwise to reduce the damping. If you experience overshoot, turn clockwise to increase the damping and reduce overshoot.

SECTION 5 SERVICE INFORMATION

5.1 SERVICING YOUR RECORDER

The OMEGA 180A Series has been designed to provide years of trouble free operation. Although each instrument meets exacting standards, occasional maintenance may be necessary. Tools and spare parts have been provided in the accessory kit for your convenience.

5.1.1 Pen Cleaning

A pen cleaner has been provided in your accessory kit. If a pen tip becomes clogged with dry ink, remove the pen tip by turning it counterclockwise. Run hot water over the pen tip and use the pen cleaner to remove the old ink.

5.1.2 Fuse Replacement

Warning
Disconnect The Unit From Power Before Replacing The Fuse.

First make sure the power is off. The fuse is located on the right side of the chassis. To remove, simply pull out the fuse with your fingernail. Replace it with the spare 1A fuse in your accessory kit.

5.1.3 Drive Cord Replacement

1. Turn the pulley carriage clockwise for one complete rotation. Pen mechanism should now be on the right. See Figure 5-1.
2. Take a spare drive cord and attach one end of the cord to the right side of the drive cord fixture with a screw.
3. Pull the drive cord through the carriage hole and down through the lower slot.
4. Hook it to the left roller, then around through the drive cord fixture located behind the pen mechanism.
5. Hook it to the right roller.
6. Pull the cord tightly and wind it around the carriage pulley.
7. Pass the cord through the upper slot on the carriage and attach end to screw.
8. Turn the carriage counterclockwise to move pen mechanism to the left.
9. When the pointer coincides with the mark to the left of zero on the scale, tighten the screw holding the drive cord.

5.1.4 Power Frequency

The Series 180A recorders will operate on 50 Hz or 60 Hz without any adjustments in the instrument.

5.1.5 Light Bulb Replacement

If fluorescent bulb burns out, simply twist off to remove. Replace with bulb of same wattage available at any lighting store. Bulb number is FL-6W.

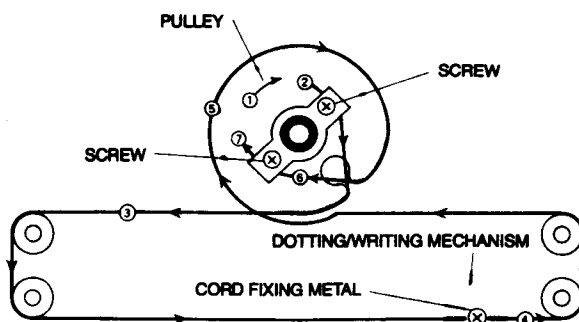


Figure 5-1. Drive Cord Replacement

SECTION 6 SPECIFICATIONS

GENERAL SPECIFICATIONS

| | |
|-----------------------------|---|
| MEASURING SYSTEM: | Potentiometer mV and thermocouple types |
| INPUT SPAN | See Table 1 |
| RECORDING MODE: | 1, 2 or 3 pen continuous writing (removable cartridge pen tip) or multipoint dotting with 6 or 12 points. (Ink pad dotting with a different color ink at each point.) |
| BALANCING SPEED: | 2.5 sec. (50 Hz), 2.1 sec. (60 Hz) |
| CHART PAPER: | Z-fold, 180 mm calibrated width, 20 m long |
| DOTTING INTERVAL: | 5 sec. (60 Hz), 6 sec. (50 Hz) |
| ACCURACY: | $\pm 0.5\%$ of full scale |
| DEAD BAND: | 0.1% of full scale |
| CHART SPEED: | 12.5, 25, 75, 150, 375, 750 mm/hr., 6 position switch selectable |
| AMBIENT TEMPERATURE: | -10° to 50°C (14° to 122°F) |
| CASE: | Steel plated case |
| ILLUMINATION: | Fluorescent lamp, FL-6W |
| POWER SUPPLY: | 115 V ac $\pm 10\%$, 50 or 60 Hz |
| INPUT IMPEDANCE: | 100 k Ω |
| SOURCE RESISTANCE: | Up to 10 k Ω |
| INPUT ISOLATION: | Measuring terminals to ground terminal: 20 M Ω at 500 V dc. Power supply to ground terminal: 20 M Ω at 100 V dc |
| DIELECTIC STRENGTH: | Measuring terminals to ground terminal: 500 V ac, 1 minute. Power terminal to ground terminal: 1000 V ac 1 minute. |
| RECORDING: | Single pen type One point continuous writing Dotting type: 2, 3, 4, 6, 12 points dotting Dotting color (standard) 1st—red, 2nd—black, 3rd—light blue, 4th—green, 5th—brown, 6th—purple, 7th—orange, 8th—gray, 9th—blue, 10th—greenish brown, 11th—scarlet, 12th—violet Dotting speed... Once in 6 sec. 50 Hz or in 5 sec. 60 Hz |
| ALARM OPTION | |
| SETTING ACCURACY: | $\pm 0.5\%$ of full scale |
| SETTING RANGE: | Full scale |
| DEAD BAND: | 0.3% of full scale |
| CAPACITY: | 100 V ac, 1 A |
| NUMBER: | 1 point |
| DIMENSIONS: | See Figure 6-1 |
| WEIGHT: | 38.5 lbs (17.5 kg) |

6.1 ACCESSORIES

Packaged with each recorder in the OMEGA 180A Series is an accessory kit including ink, chart paper, tools and spare parts. Specific contents of kit for each type of recorder are listed below.

6.1.1 Continuous Recorders

6.1.2 Multipoint Recorder

| ITEM | QUANTITY | ITEM | QUANTITY |
|-------------------|---------------------------|-------------------------|---------------------------|
| Chart Paper | 1 Box (3 packets per box) | Chart Paper | 1 Box (3 packets per box) |
| Drive Cord | 1 Set of 2 | Drive Card | 1 Set of 2 |
| Fuse (1A) | 2 | Fuse (1A) | 2 |
| Mounting Brackets | 4 Pieces | Mounting Brackets | 4 Pieces |
| Screws | 4 | Screws | 4 |
| Screwdriver | 2 | Screwdriver | 2 |
| Tweezers | 1 Pair | Tweezers | 1 Pair |
| Wrench | 1 | Wrench | 1 |
| Ink Reservoir | 3 Bottles | Ink Containers | 1 Set |
| Pen | 1 Set | Pre-inked Pad Wheel | 1 |
| Tube Connector | 1 Set | Non-inked Pad Wheel | 1 |
| Pen Cleaner | 1 for Each Plan | Measuring Pt. Ind. Card | 2 |
| Lubricating Oil | 1 Bottle | Lubricating Oil | 1 Bottle |

6.1.3 Reordering Supplies

When reordering supplies, please list Model Number of Recorder and Catalog Number (if available).

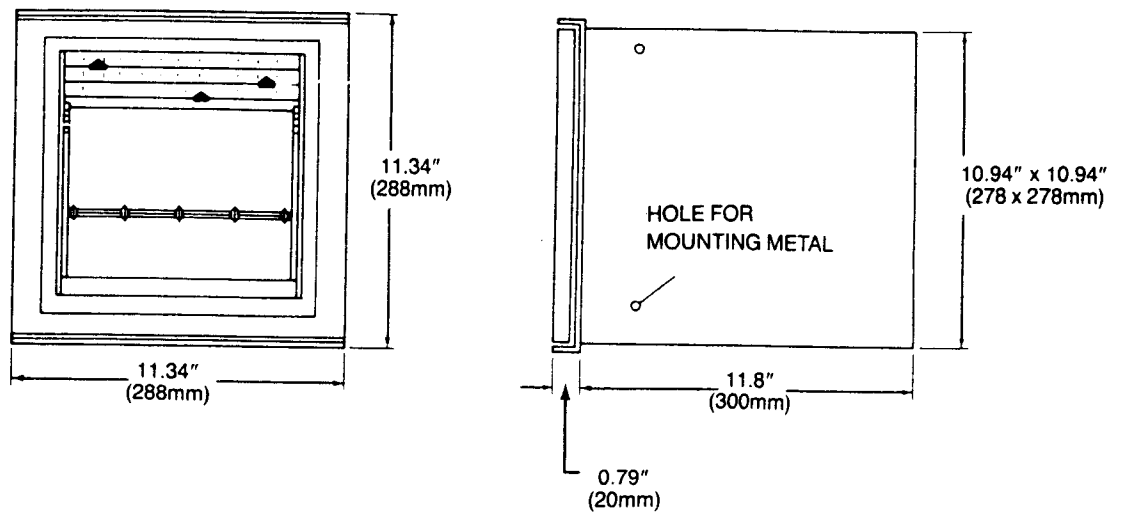
| ITEM | DESCRIPTION | CATALOG NO. |
|-----------|---|------------------------------|
| Paper | Z-fold Strip Chart 180 mm wide, 20 mm long | 180A-CP-INPUT TYPE AND RANGE |
| Pen Tip | Continuous Recorders | 180A-PEN |
| Ink (C) | 1 Channel, 3 Bottles | 180A-INK-01 |
| | 2 Channel, 3 Bottles | 180A-INK-02 |
| | 3 Channel, 3 Bottles | 180A-INK-03 |
| Pad Wheel | 6 Channel, ink pad | 180A-PAD-06 |
| | 12 Channel, ink pad | 180A-PAD-12 |
| Ink (M) | 6 Channel, 6 colors | 180A-INK-06 |
| | 12 Channel, 12 colors | 180A-INK-12 |

C = Continuous Recorder
M = Multipoint Recorder

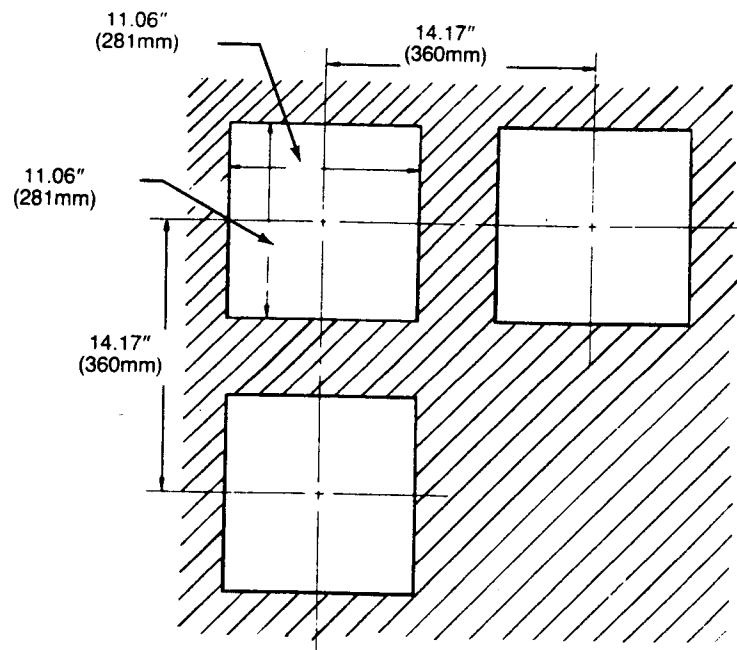
6.1.4 Options

Optional accessories are also available from OMEGA.

| ITEM | DESCRIPTION |
|-------------------------|-----------------------------|
| Carrying Handle/Feet | |
| Analog Output | 0 to 1V |
| Pen Event Marker | For one pen models only |
| High & Low Limit Alarms | Multipoint 6/12 Models Only |

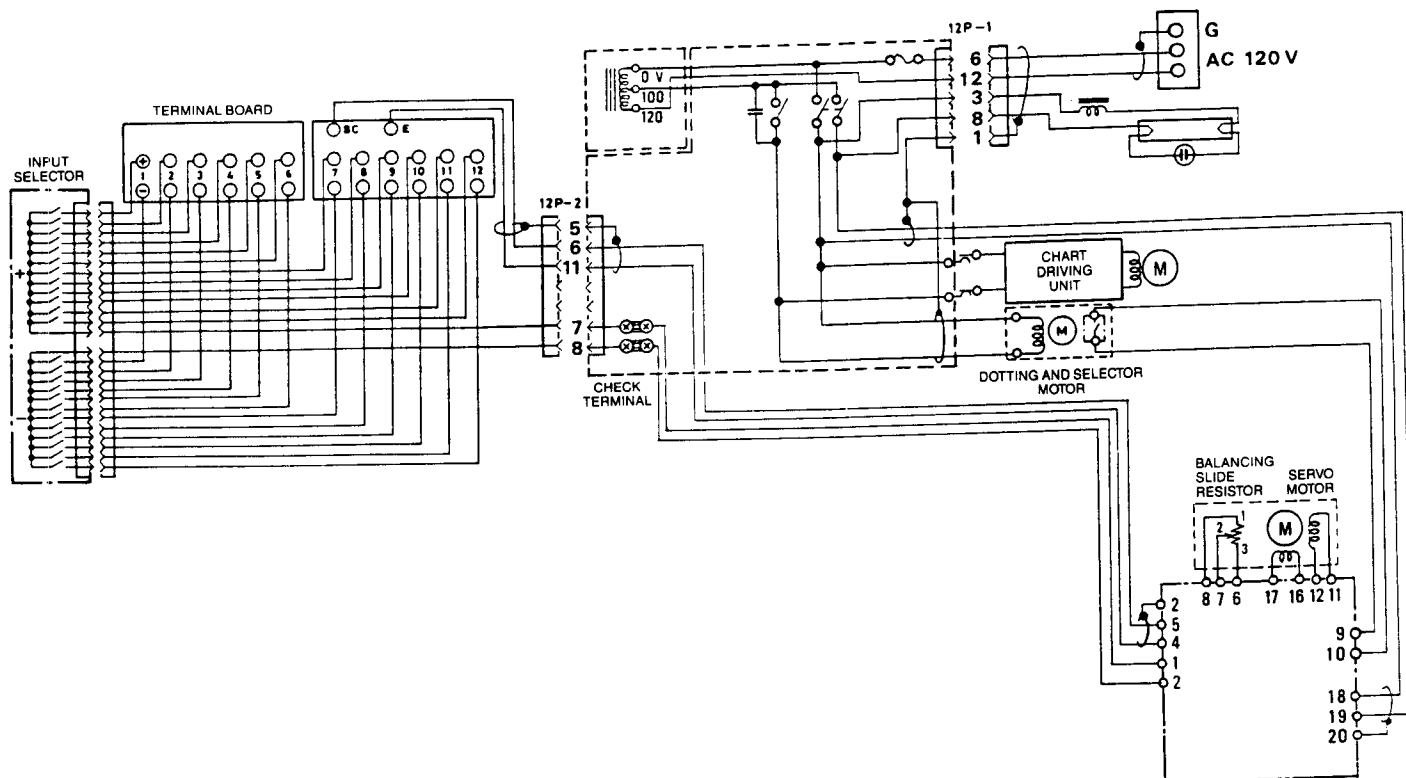


EXTERNAL DIMENSIONS

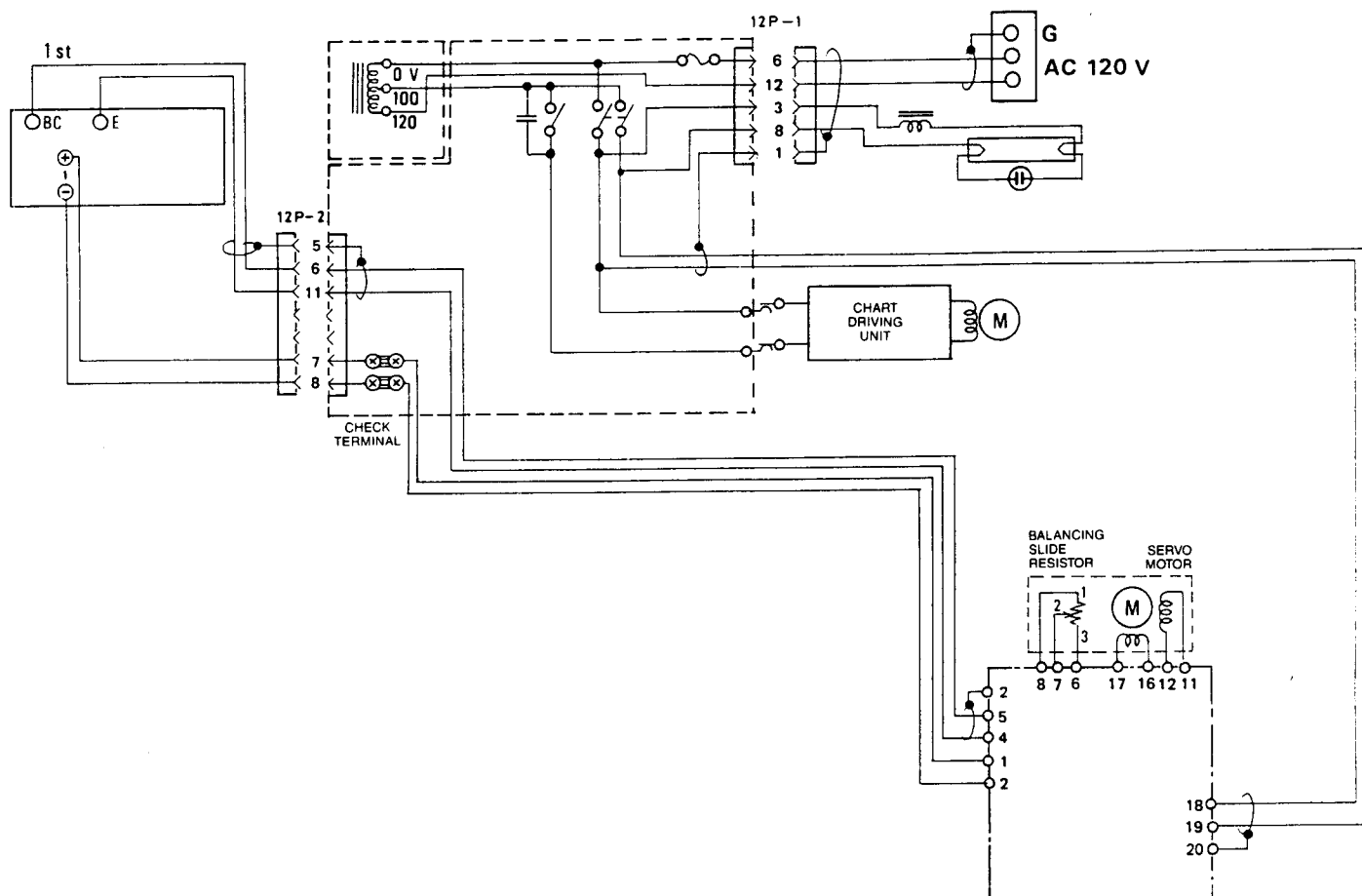


PANEL CUTOUT AND MOUNTING CLEARANCE

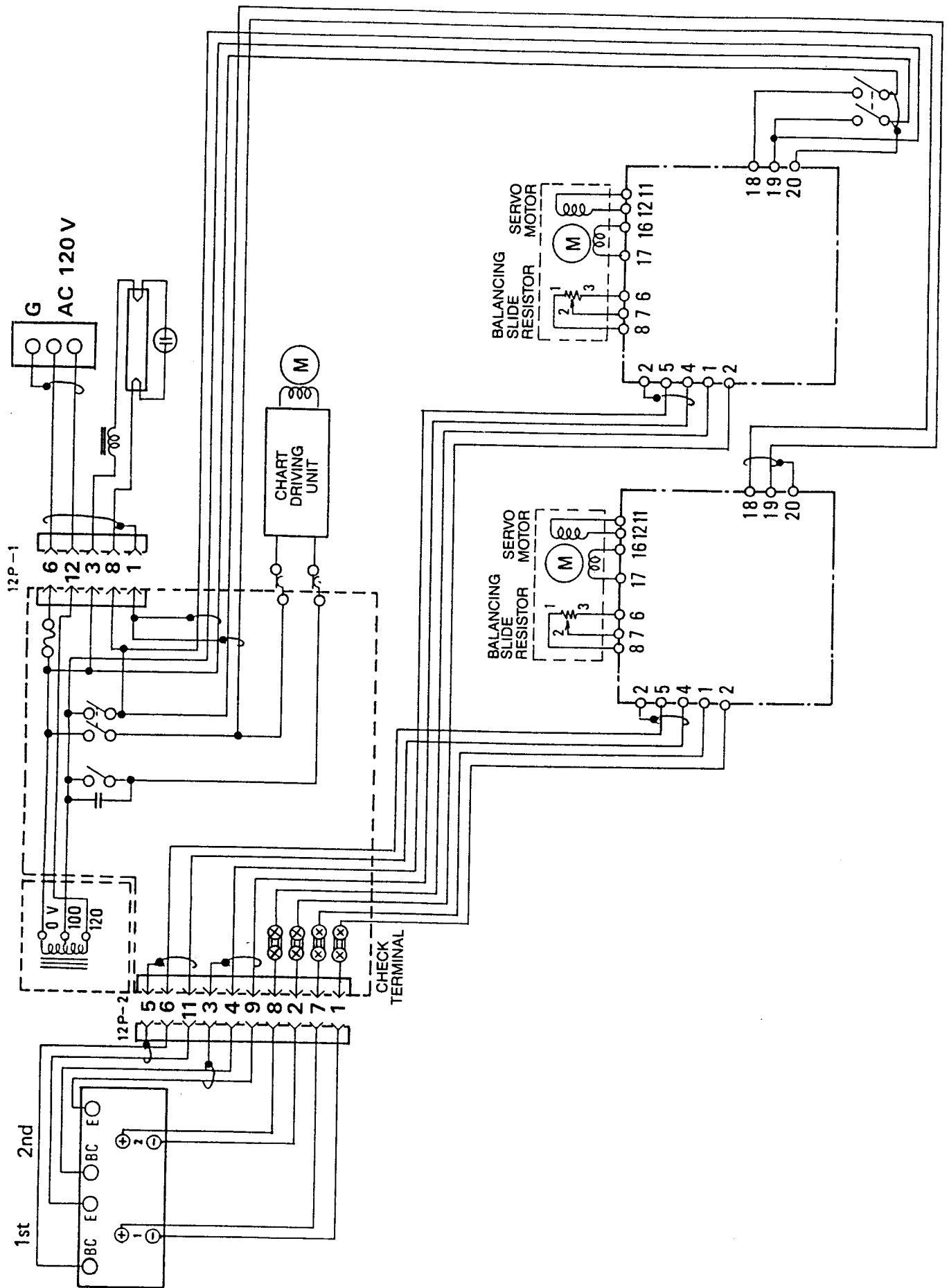
Figure 6-1. Series 180 Dimensions



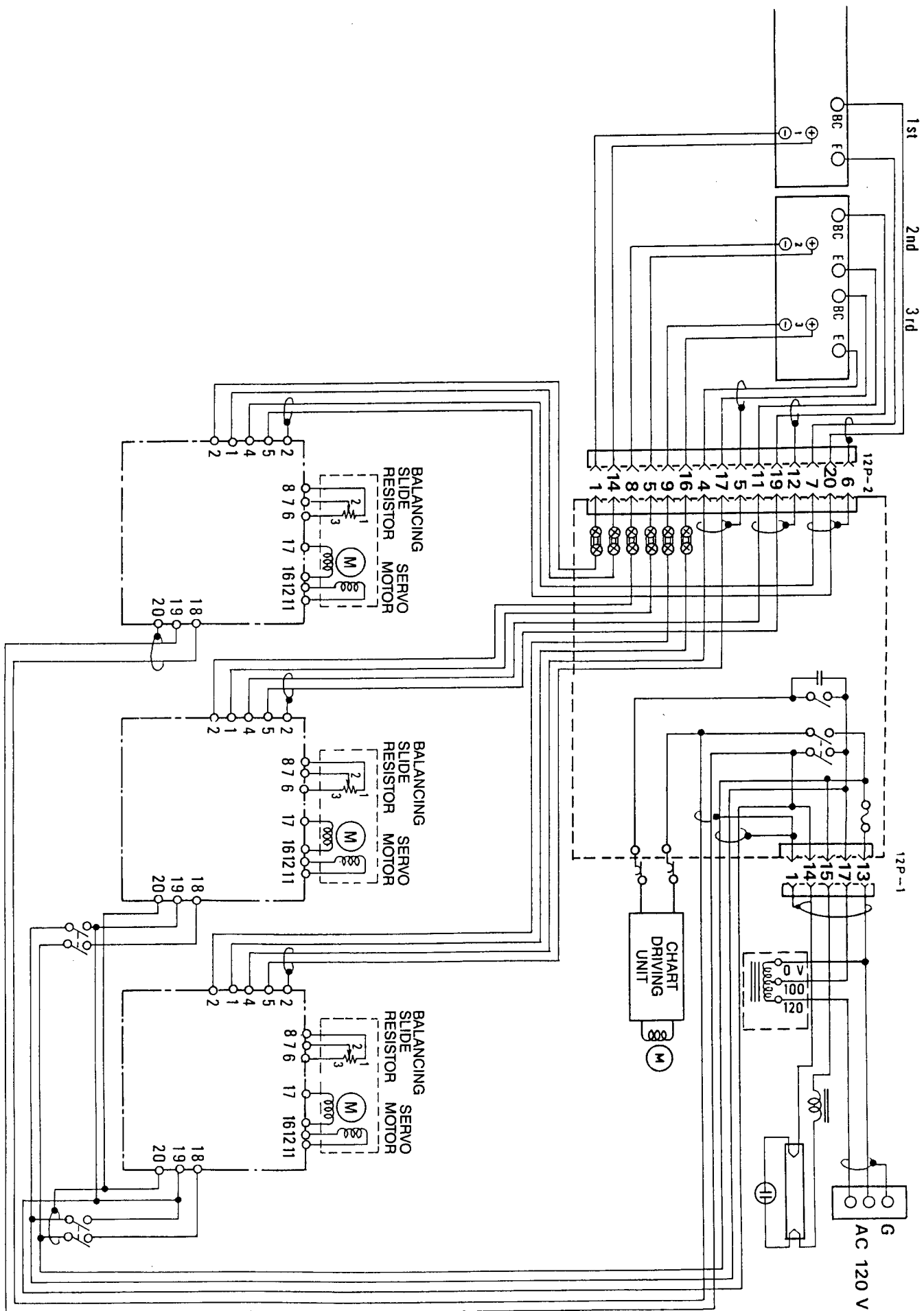
Wiring Diagram for Multipoint Recorder



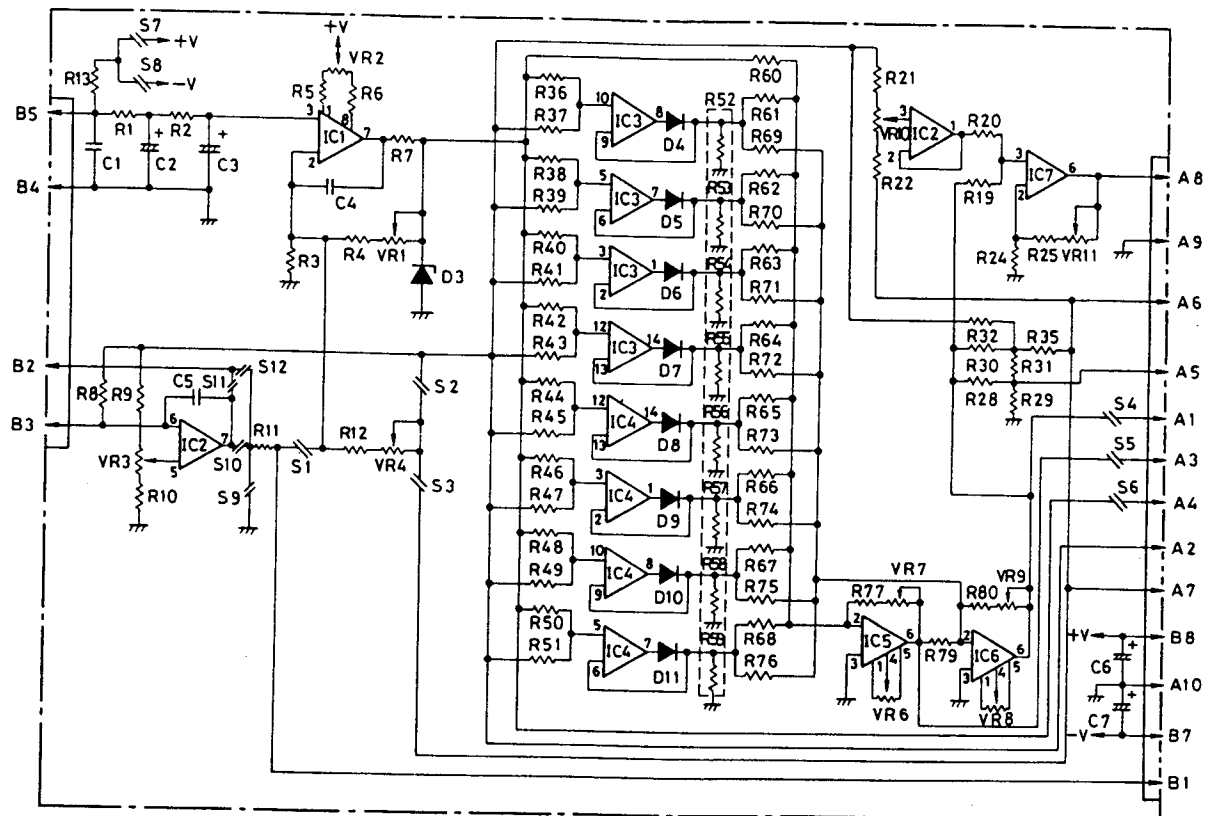
Wiring Diagram for One Pen Continuous Recorder



Wiring Diagram for Two Pen Continuous Recorder

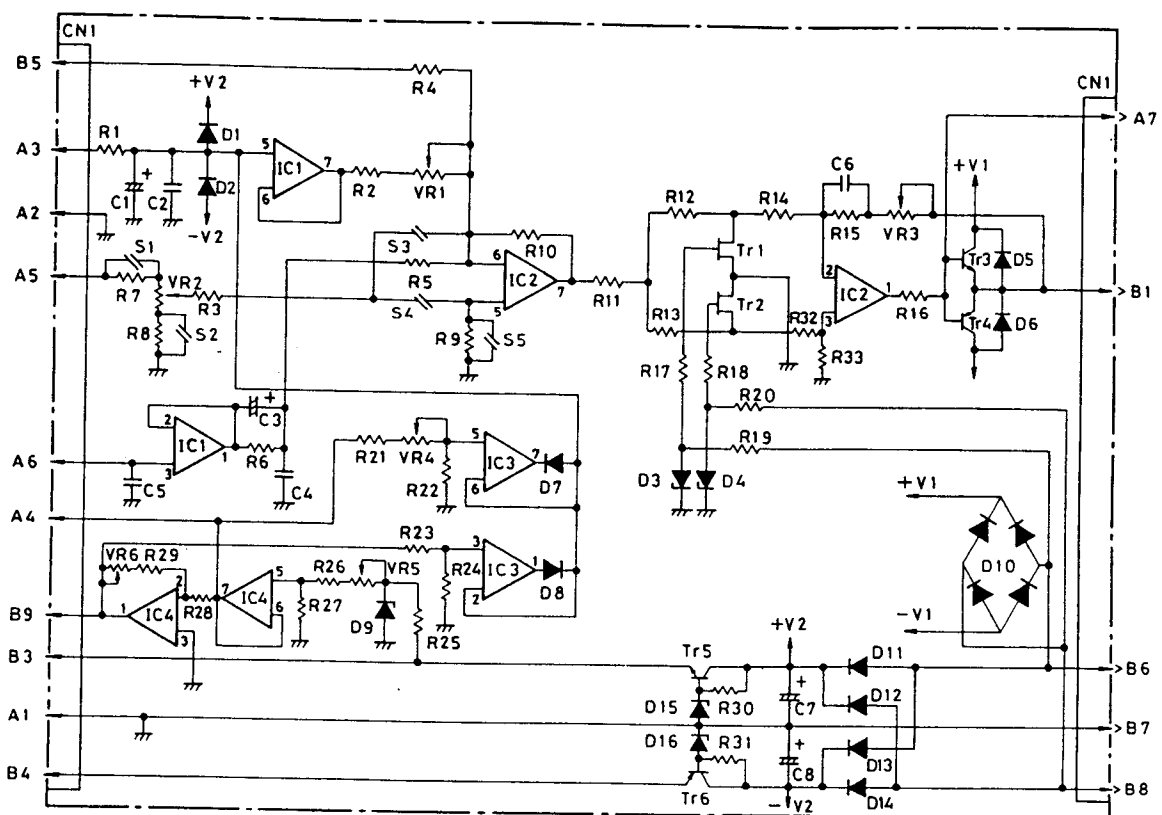


Wiring Diagram for Three Pen Continuous Recorder

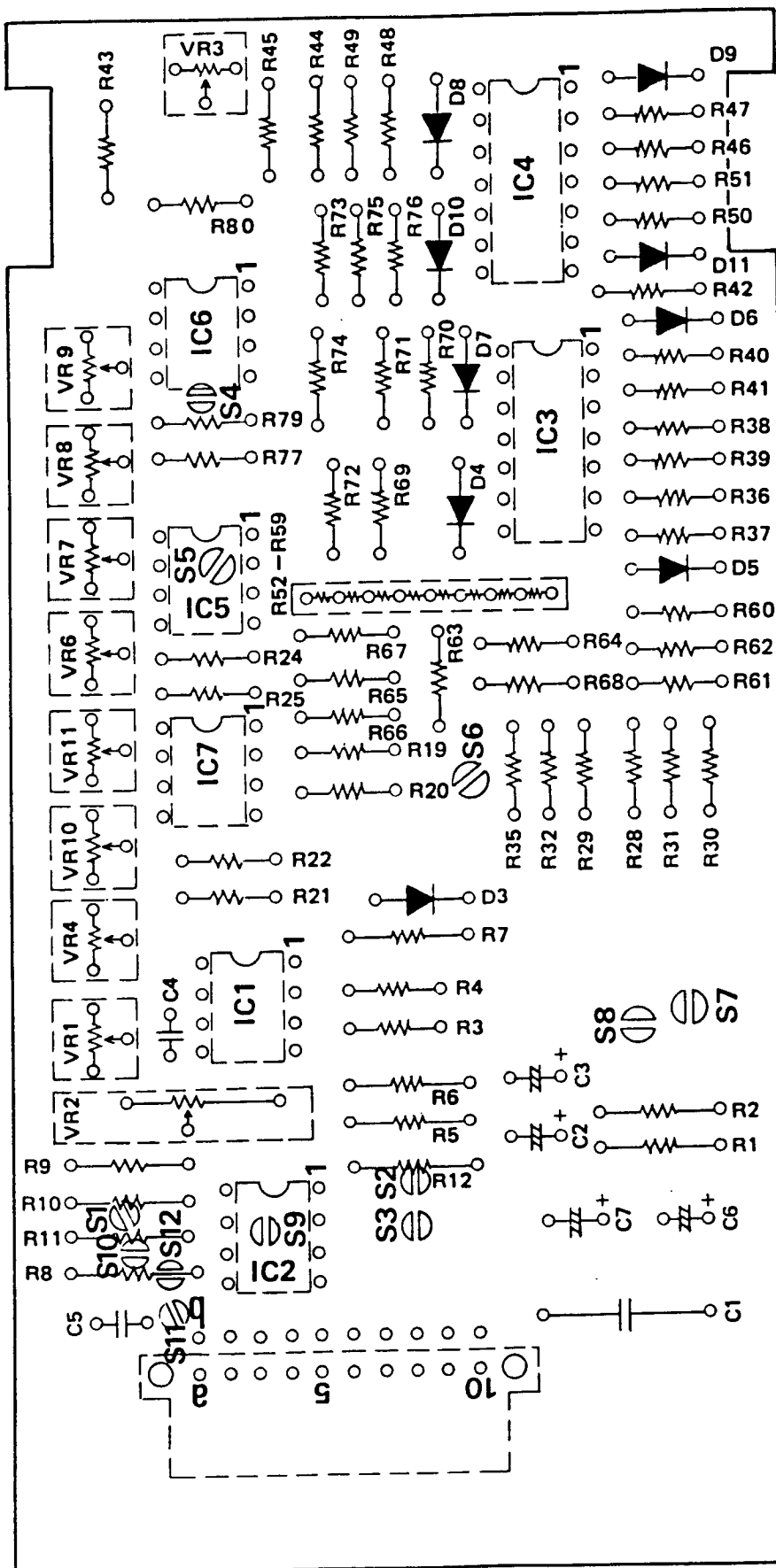


Note: For R36-R76, D4-D11, and IC3, 4, the number of elements employed differs according to the kinds of linear scales.

Schematic for Thermocouple Type Range Unit



Schematic for Servoamplifier Unit



IC1: μ PC354D
 2: μ PC1458C
 3: HA17902PS
 4: HA17902PS
 5: μ PC801C
 6: μ PC801C
 7: μ PC801C

D 3: HZ-5 C-1
 4-11: 1S953

C 1: 0.22/250
 2: 4.7/25
 3: 4.7/25
 4: 0.0047/50
 5: 0.01/50
 6: 100/16
 7: 100/16

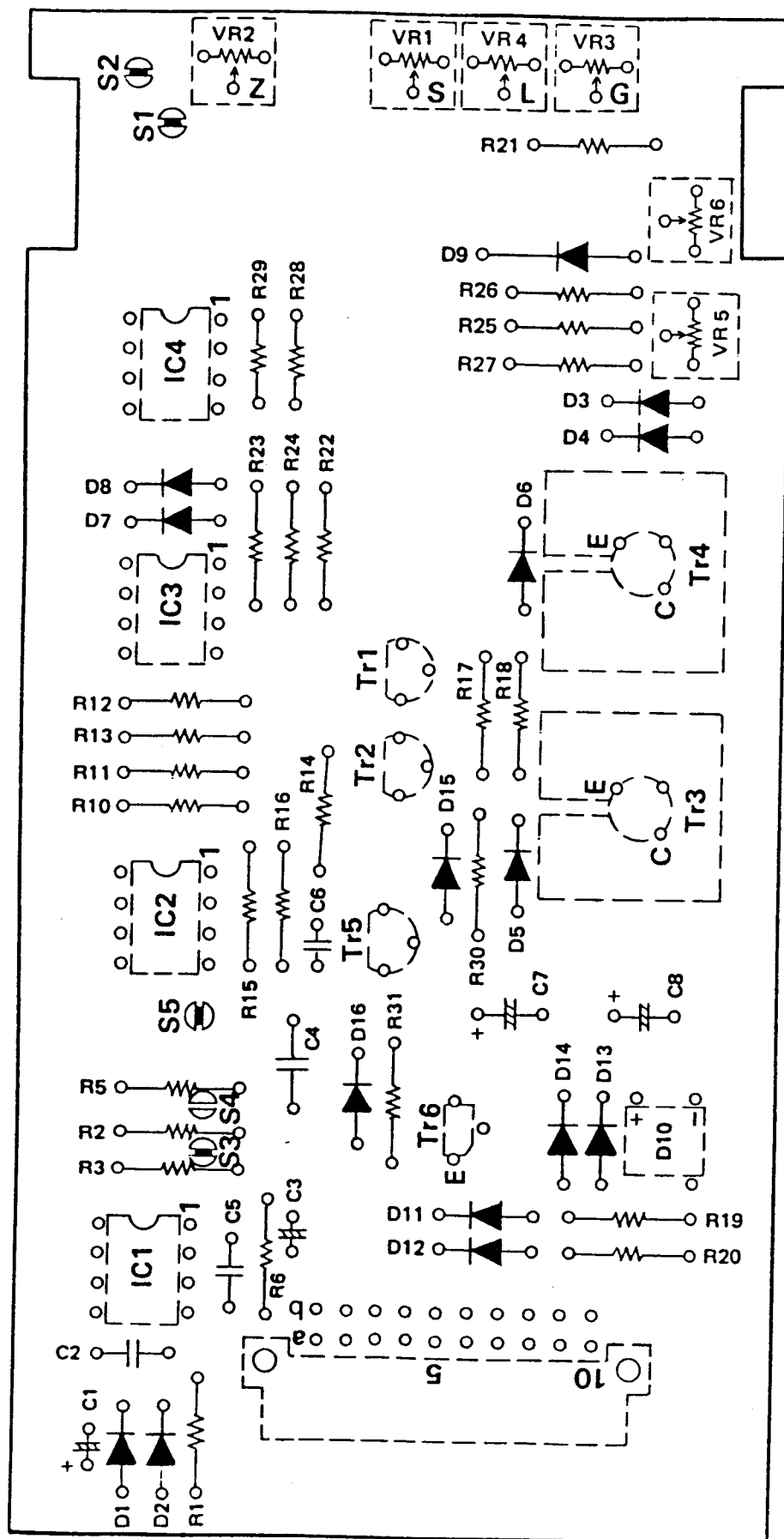
R 1: 4.32K
 2: 4.32K
 3: 100
 4: *
 5: 7.5K
 6: 7.5K
 7: 511
 8: 12.1K
 9: 53.6K
 10: 6.34K
 11: *
 12: *
 19: 34K
 20: 51K
 21: *
 22: *
 24: 10K
 25: *
 28: *
 29: *
 30: *
 31: *
 32: *
 35: *
 52-59: 330K
 77: *
 79: *
 80: *

VR1: *
 2: 5K
 3: 500
 4: *
 6: 100K
 7: *
 8: 100K
 9: *
 10: *
 11: *

Unit; R: Ohm, C: μ F/WV

* The resistance value differs according to the scales.

Thermocouple Type Range PC Board



IC1:HA17458PS

2:μPC4558C

3:μPC4558C

4:μPC4558C

Tr1:2SK186C

2:2SK186C

3:2SC959

4:2SA606

5:2SC1364

6:2SA678

D1,2:1S953

3,4:HZ-7 B-2

5-8:1S953

9:1N4577A

10:1D4B42

11-14:1S958

15,16:RD11EB

C 1:4.7/16

2:0.047/50

3:2.2/16

4:0.1/50

5:0.047/50

6:0.01/50

7:100/25

8:100/25

R 1:10K

2:9.53K

3:220K

5:3.01K

6:12.1K

10:220K

11:3.01K

12:3.74K

13:100K

14:5.11K

15:100K

16:511

17:10K

18:10K

19:100K

20:100K

21:2.67K

22:6.19K

23:20K

24:51.1

25:1.3K

26:100

27:6.19K

28:10.1K

29:9.76K

30:511

31:511

VR1:2K

2:10K

3:100K

4:1K

5:500

6:1K

Unit; R:Ohm, C:μF/WV

Servoamplifier PC Board