

MODEL RD250

Precision Recorder

Operator's Manual



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2. Model and Serial numbers.
3. Repair instructions.

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SECTION 1 INTRODUCTION

1.1 GENERAL DESCRIPTION

The OMEGA® Series RD250 line of linearized precision electronic process recorders offer 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 RD250 is available as either a single - channel continuous recorder or as a multipoint recorder in 6, 12, or 24 channel models. The OMEGA Series RD250 line is equally flexible for process and environmental temperature monitoring and measuring applications. The recorder's precision and durability should provide reliable information for years of productive service.

1.1.1 Continuous Recorders (See Figure 1-1)

The RD250 Continuous Recorders are available with a single channel for mV, V, thermocouple or RTD input. Millivolt and volt models have precision linear electronics and directly read out the millivolts or volts on the chart paper. Thermocouple models have cold junction compensation. Thermocouple and RTD models are linearized, giving direct temperature readings.

Model Number	Type	Channel Inputs
RD 250-01	Millivolt	1
	Volt	
	Thermocouple	
	RTD	

1.1.2 Multipoint Recorders

The OMEGA Series RD250 multipoint process 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
RD 250-06	Millivolt	6
	Volt	
	Thermocouple	
	RTD	
RD 250-12	Millivolt	12
	Volt	
	Thermocouple	
	RTD	
RD 250-24DS	Millivolt	24
	Volt	
	Thermocouple	
	RTD	

1.2 INPUT 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 1-1.

TABLE 1-1
INPUT RANGES

Input	Range	Range Code
J	0 to 500°F	J-0/ 500F
	0 to 800°F	J-0/ 800F
	0 to 1000°F	J-0/1000F
	0 to 400°C	J-0/ 400C
K	0 to 1000°F	K-0/1000F
	0 to 1600°F	K-0/1600F
	0 to 2400°F	K-0/2400F
	0 to 800°C	K-0/ 800C
	0 to 1000°C	K-0/1000C
T	-100 to 400°F	T-100/400F
	0 to 200°C	T-0/200C
E	0 to 1000°F	E-0/1000F
	0 to 500°C	E-0/ 500C
R	0 to 1600°C	R-0/1600C
mV	0 to 100 mV	mV-0/100
V	0 to 5 V	V-0/5
RTD	0 to 200°C	RTD-0/200C

SECTION 2 INSTALLATION

2.1 UNPACKING

Remove the Packing List to check off actual equipment received. If there are any questions about the shipment, please contact the OMEGA Customer Service Department at (203) 359-1660.

Upon receipt of shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage 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 of the RD250 Recorder. 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 retaining screw at the rear of the unit (see Figure 2-1). To install pen, paper, etc., loosen the retaining screw and use the hand grip in the middle of the chart bin to roll out the chassis. After the recorder is loaded with pens/paper, retighten the screw.

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

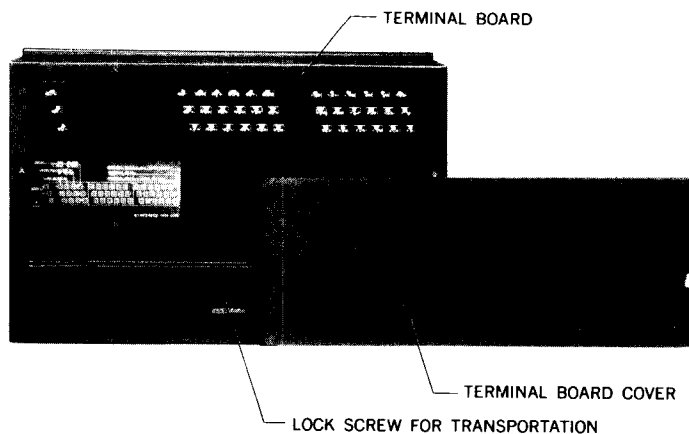


Figure 2-1. Unlocking Chassis Screw

2.3 MOUNTING PEN FOR CONTINUOUS RECORDERS

The continuous recorders use a cartridge pen (with a color line on the front of the pen). To insert pen:

1. Face color-line on pen frontwards and insert right protrusion on cartridge into pen holder.
2. Turn cartridge pen clockwise to secure pen in pen holder.
3. To detach pen, turn counterclockwise while pushing the left protrusion on cartridge downwards.
4. Detach and cap pen when not in use.

NOTES

The pen tip is made of nylon fiber. Handle carefully so as not to break off the tip.

To start ink flow in a new cartridge pen, rub tip lightly onto a piece of paper.

2.4 MOUNTING INK PAD FOR MULTIPOINT RECORDERS

1. Take ink pad case out of accessory box. The ink pad is pre-inked in the following color sequence:

6 Channel Multipoint:	1: Red; 2. Black; 3: Sky Blue; 4: Green; 5: Brown; 6: Purple;
12 Channel Multipoint:	1: Red; 2: Black; 3: Sky Blue; 4: Green; 5: Brown; 6: Purple; 7: Orange; 8: Gray; 9. Blue; 10: Light Green; 11: Scarlet; 12: Violet
24 Channel Multipoint:	Repetition of 12 channel, and 1 to 24 numerical printing

2. Pull chassis out of case (see paragraph 2-1).
- 3a. (For 6 and 12 channel): Insert ink pad case onto the pad shaft of the dotting mechanism (see Figure 2-3), making sure that the pad case pin is fitted into the pad groove.
- 3b. (For 24 channel): Lift ink pad shaft and insert the pad case from the side, so that the ink pad shaft pin is inserted into the groove of pad case. (See Figure 2-4).
4. Push chassis back into case.
5. When the ink pad needs re-inking, use only one or two drops (of each color in it's respective sequence).

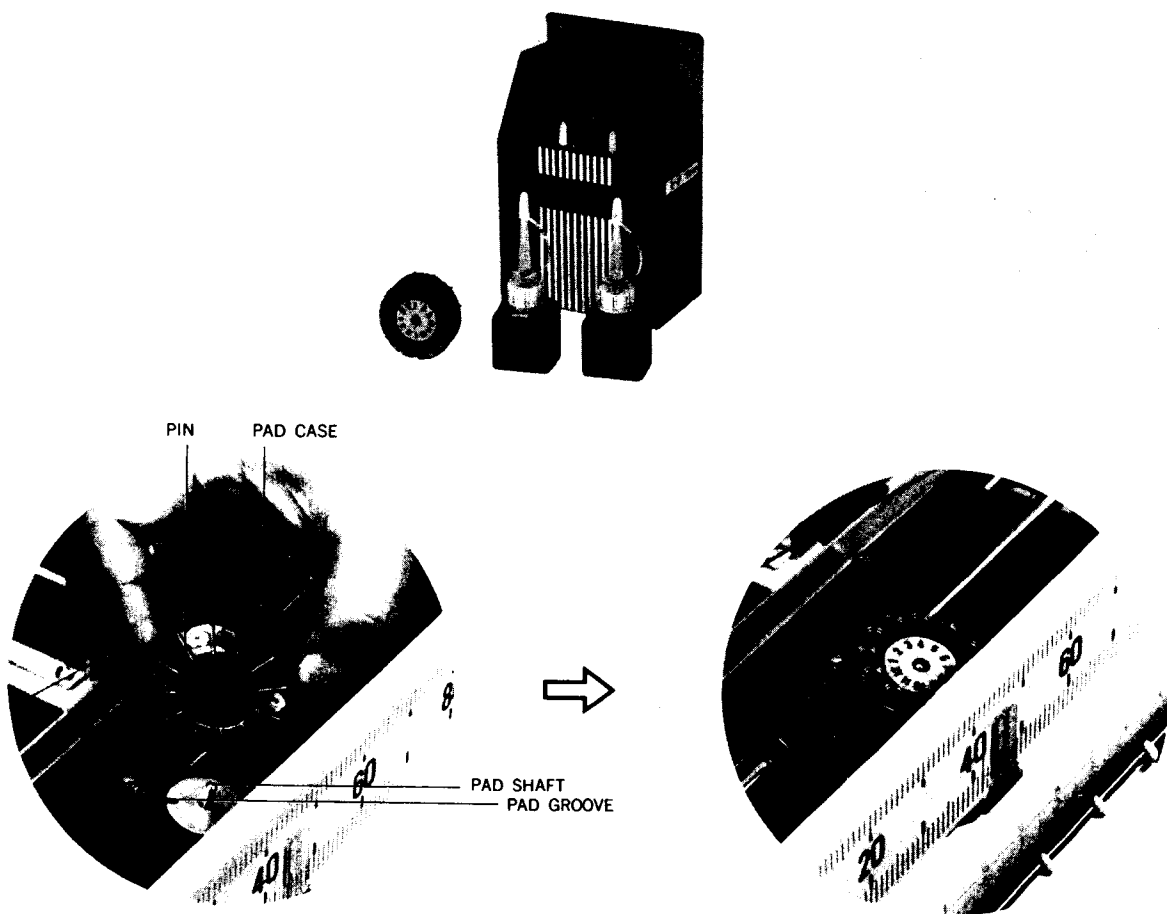


Figure 2-3. Installing Ink Pad Case Into RD250 6 and 12 Channel Multipoint Recorder

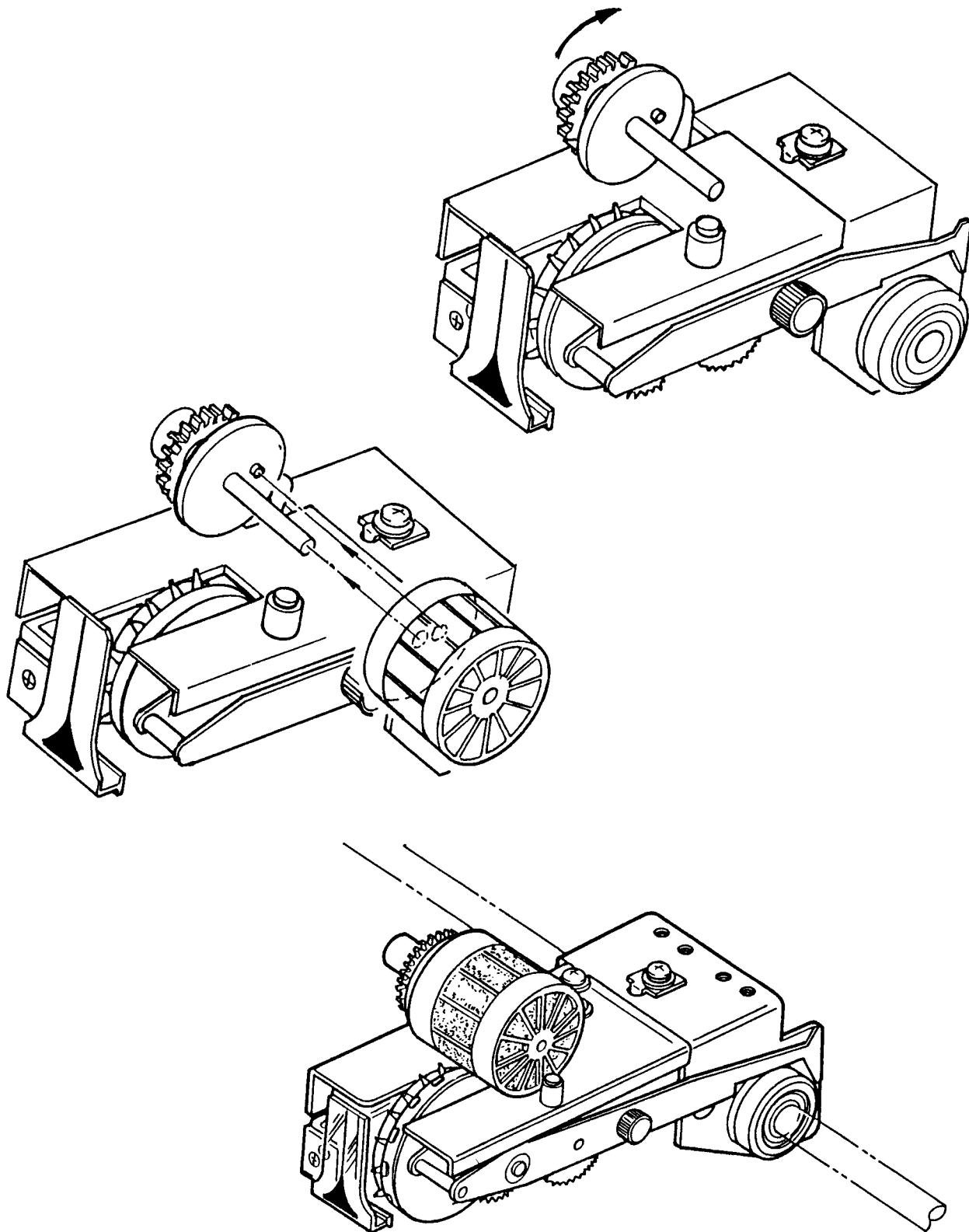


Figure 2-4. Installing Ink Pad Case Into RD250 24 Channel Multipoint Recorder

2.5 PAPER INSTALLATION (See Figure 2-5)

1. Pull finger grip firmly to open the protective glass door. Pull out the chassis with the Chart Rack Handle.
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 rectangular holes on the right side of the paper to the sprocket teeth first, then the square holes on the left.
5. Pull the chart holder guide forward so that the paper can pass behind it.
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 holder guide, then fold into the bin receptacle. Return chart holder guide to original position. Push chassis back into case. If you're ready to record, close the protective glass door.
7. Replace with a new chart when a red border appears on right edge of paper.

2.6 POWER AND INPUT CONNECTIONS

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

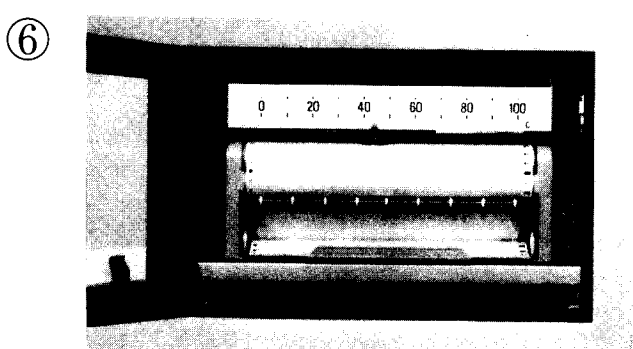
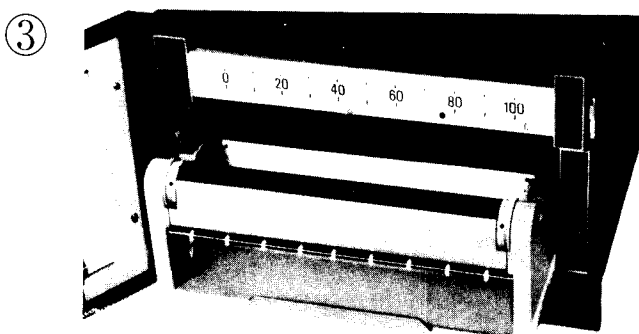
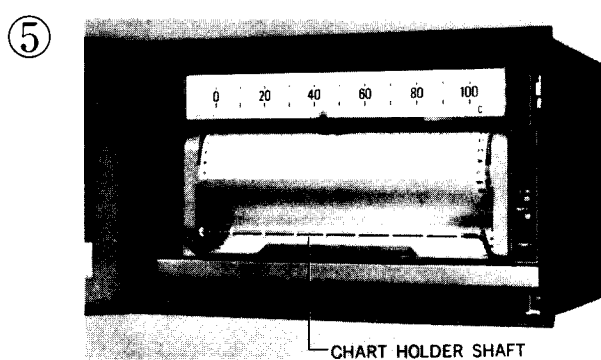
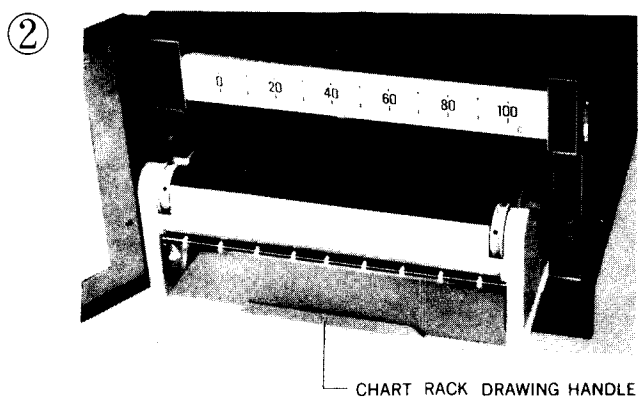
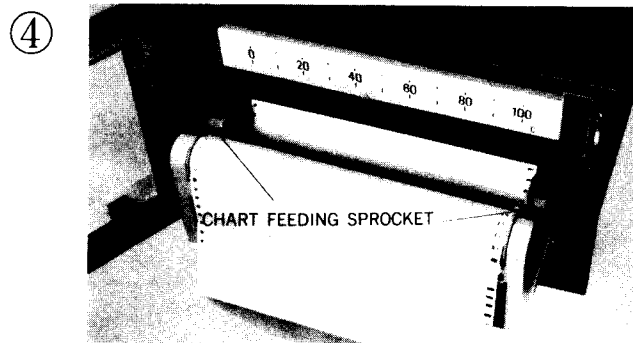
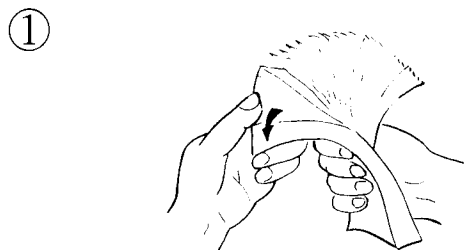


Figure 2-5. Chart Paper Installation

2.6.1 Power Connection

Terminals require a 110 V ac power source.

WARNING

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

CAUTION

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

Be sure the Indicate and Record switches are OFF. Loosen the two screws on the rear terminal cover and slide the cover up and off. Connect the power wires to the upper left side of terminal board. Connect the unenergized power cord wires to the terminals as shown (see Figures 2-6 through 2-9).

2.6.2 Input Connection

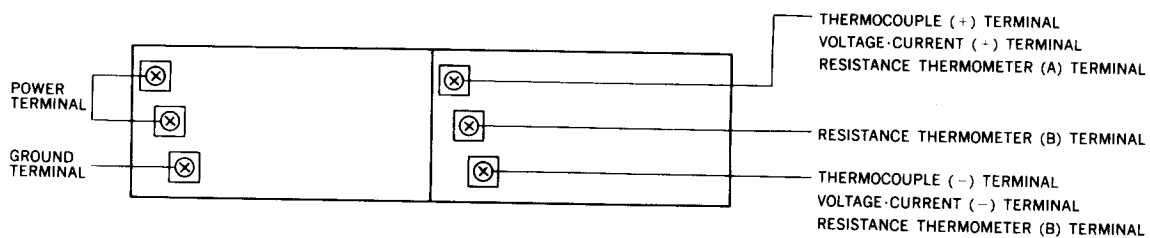
WARNING

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

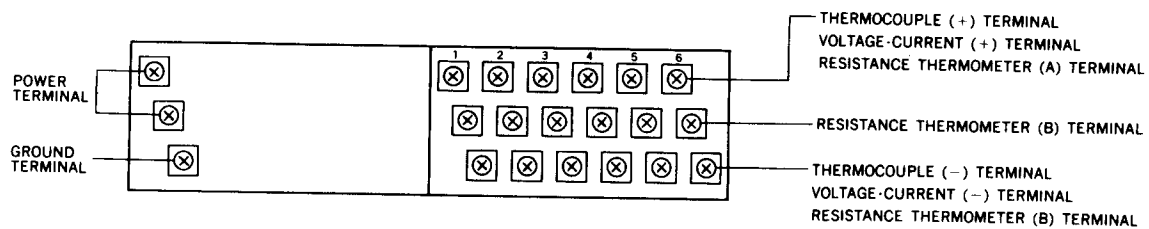
Loosen the two screws on the rear terminal cover and slide the cover up and off. Run the feed wires to the right side of the terminal board to keep them separate from the power. Connect the lead wire to input terminals (see Figures 2-6 through 2-9).

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.



**Figure 2-6. Power and Input Connections
For RD250 Continuous Recorders**



**Figure 2-7. Power and Input Connections
For RD250 6 Channel Multipoint Recorders**

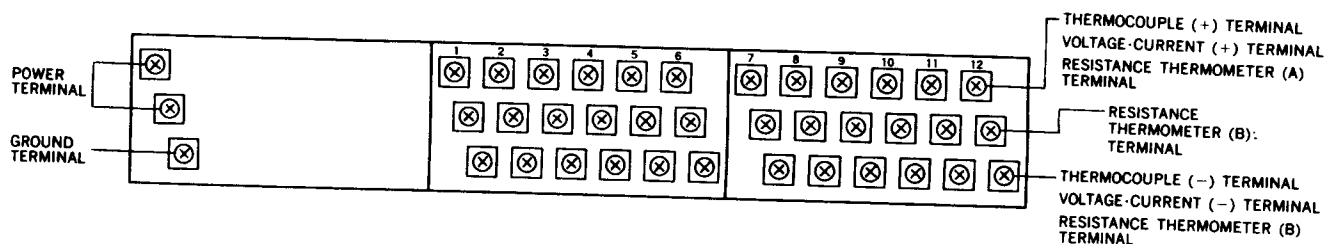


Figure 2-8. Power and Input Connections
For RD250 12 Channel Multipoint Recorders

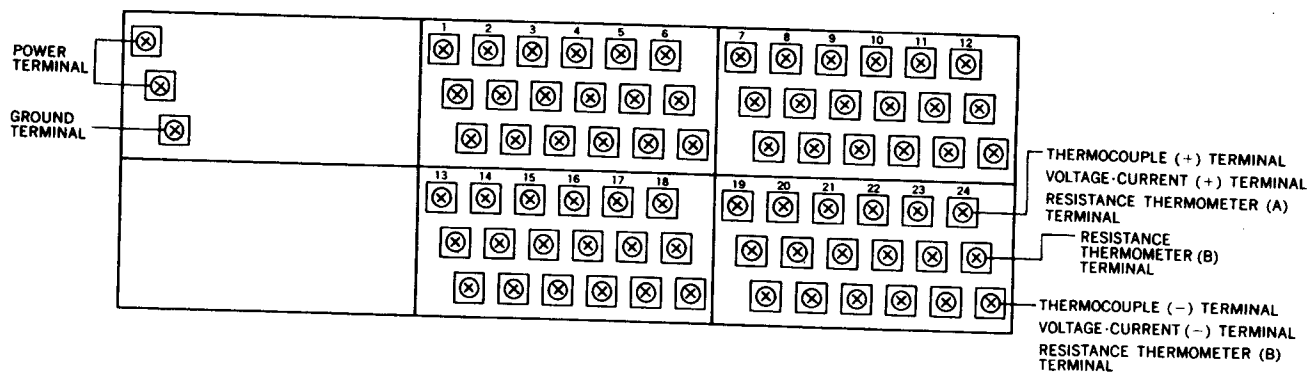


Figure 2-9. Power and Input Connections
For RD250 24 Channel Multipoint Recorders

SECTION 3 OPERATION

3.1 SETTING CHART SPEED

The chart speed can be set to 15, 30 or 60 mm/H (see Figure 3-1). The chart can also be fast fed by pressing the RAPID FEED Switch. Set the chart speed by depressing one of the CHART SPEED SETTING Switches (15, 30, 60 mm/H). Depress the CHART DRIVE Switch and the chart will be fed at the pre-set speed. To stop the chart, press the CHART DRIVE Switch again and release.

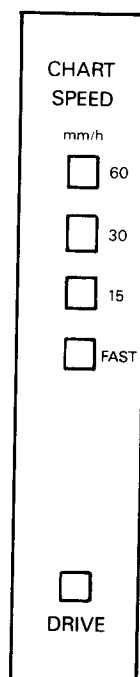


Figure 3-1. Setting Chart Speed

3.2 OPERATING PROCEDURE FOR RD250 CONTINUOUS RECORDERS (see Figure 3-2).

1. Turn POWER Switch "ON" (fluorescent lamp will light).
2. Turn INDICATE Switch "ON", and pointer will deflect to indicate measured value.
3. Set PEN LIFT LEVER down.
4. Press CHART DRIVE Switch, and chart will begin feeding at pre-set speed.

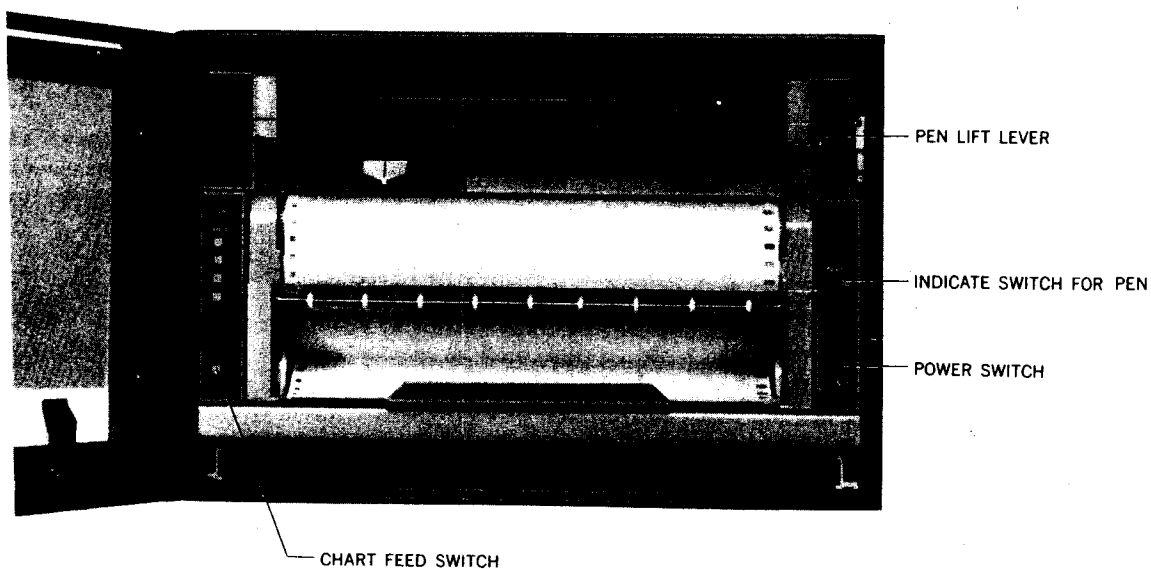


Figure 3-2. Front Panel Controls for the RD250 Continuous Recorders

3.3 OPERATING PROCEDURE FOR RD250 6 and 12 CHANNEL MULTIPOINT RECORDERS (SEE FIGURE 3-3).

1. Turn POWER Switch "ON" (fluorescent lamp will light).
2. Turn INDICATE Switch ON, and pointer deflects to indicate measured value.
3. Turn RECORD Switch ON, and the dotting mechanism will begin to plot measured value.
4. Press the CHART DRIVE Switch, and chart will begin feeding at pre-set speed.

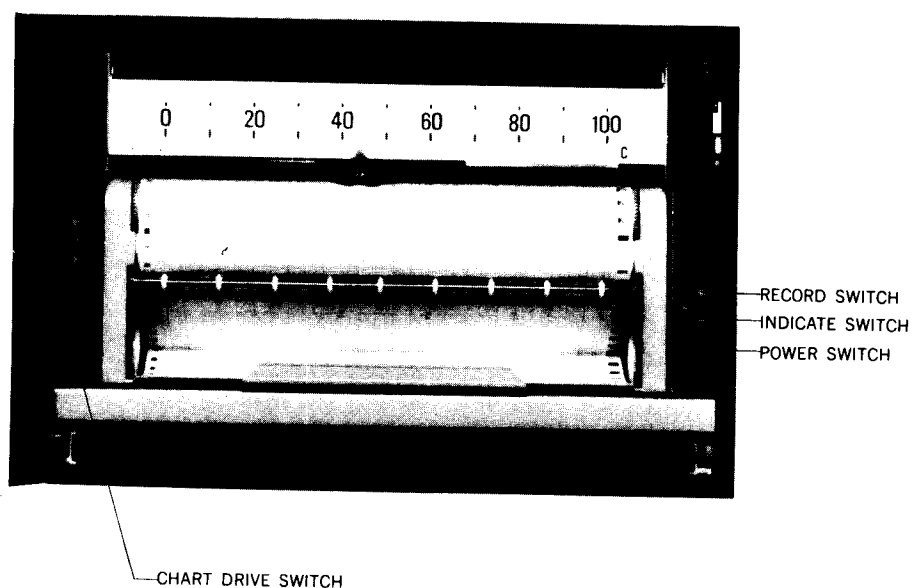


Figure 3-3. Front Panel Controls for RD250 6 and 12 Channel Multipoint Recorders.

3.4 OPERATING PROCEDURE FOR RD250 24 CHANNEL MULTIPOINT RECORDERS.

The operating procedure for the 24 Channel Multipoint Recorder is essentially the same as that for the 6 and 12 channel, with a few additional features.

3.4.1 Setting RECORD SELECTOR Switches

The 24 Channel Recorder has 24 RECORD SELECTOR Switches which enable you to select those channels you wish to record (see Figure 3-4). For each channel you wish to record, flip the corresponding selector switch on (up). For channels you do not want to record, flip the corresponding selector switch off (down).

NOTE

Each off channel is passed in approximately 0.4 seconds

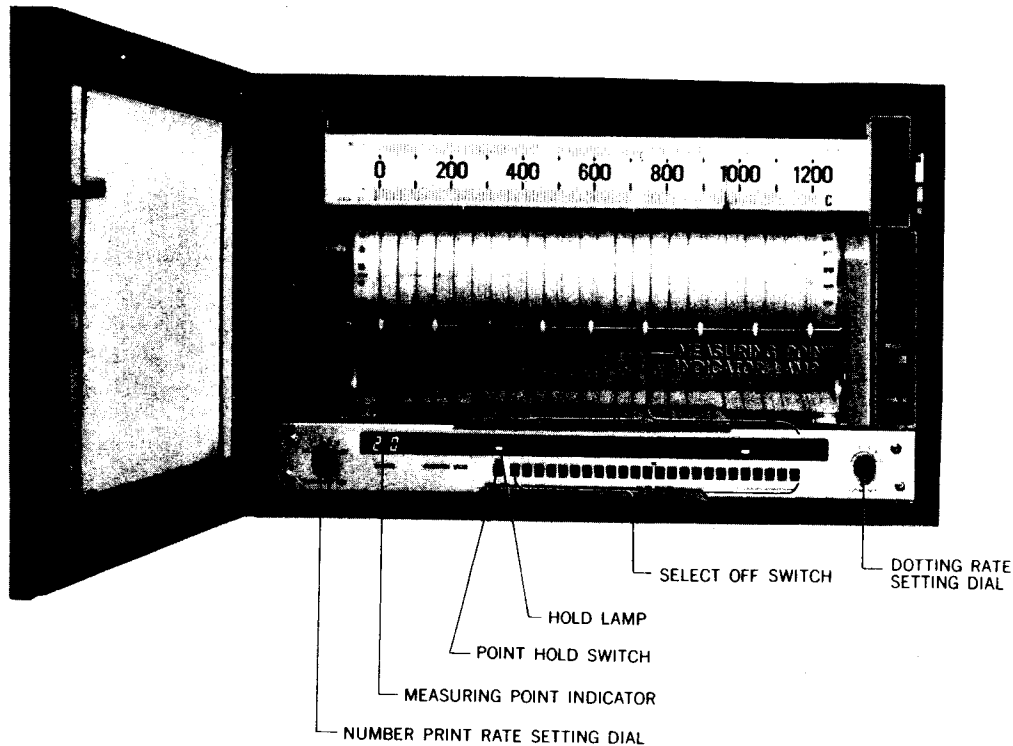


Figure 3-4. Front Panel Controls for the RD250 24 Channel Multipoint Recorder

3.4.2 Setting POINT HOLD Switch

The POINT HOLD Switch enables you to hold on a particular channel. When the POINT HOLD Switch is turned on, the dotting mechanism stops and a light is lit under the channel being held. The LED readout will display the held channel and the measured value.

Turn the POINT HOLD Switch to the off position for regular operation.

3.4.3 Setting SEC DOTTING RATE Dial

The dotting intervals are set by the SEC DOTTING RATE Dial. Dotting intervals can be set at 1, 2, 5, 10, 30, and 60 seconds.

3.4.4 Setting CYCLE NUMBER PRINT RATE

The RD250 24 Channel Recorder can digitally print measuring points at selected intervals by using the CYCLE NUMBER PRINT RATE (see Table 3-1).

TABLE 3-1
CYCLE/ NUMBER PRINT RATE

Setting	Number Print Rate
ALL	Printing every dot
1	Printing every 25 dots (one cycle)
2	Printing every 49 dots (two cycles)
4	Printing every 97 dots (four cycles)
8	Printing every 193 dots (eight cycles)
OFF	No printing is made

SECTION 4 CALIBRATION ADJUSTMENTS

4.1 PERFORMANCE CHECKS

This section contains instructions for scale test (to determine whether or not calibration is necessary), pointer adjustment, zero adjustment, span adjustment and overshoot alignment. The SPAN, ZERO and LIMIT (overshoot) controls are easily accessible. Pull out chassis drawer. All three controls are located at the rear center module in the chassis. (See Figure 4-1).

The OMEGA Series RD250 recorders meet the highest performance standards. Even after components have been replaced, only five adjustments are necessary.

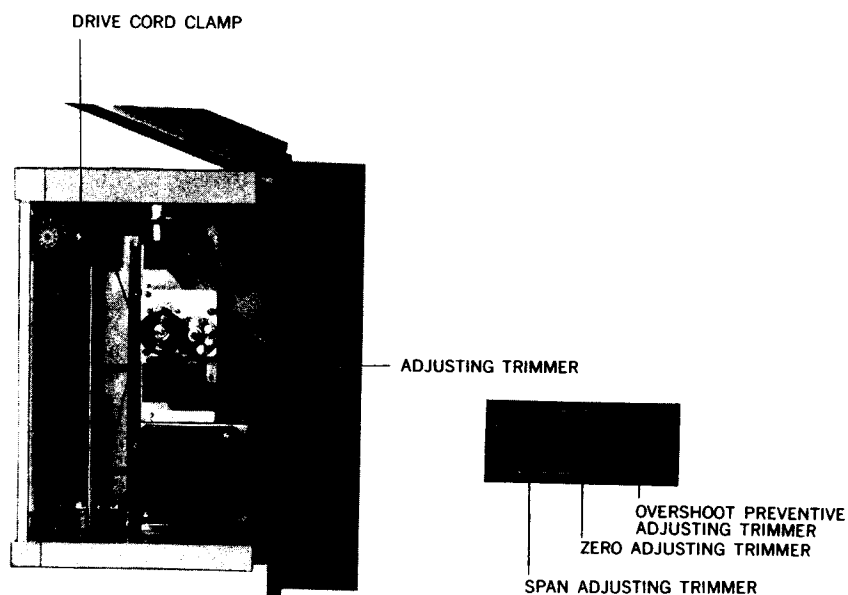


Figure 4-1. SPAN, ZERO, and LIMIT Controls

4.1.1 Scale Test

Before making a Scale Test, 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 scale test is necessary:

1. Turn on POWER and INDICATE Switches. Allow recorder to warm up for 30 minutes.
- 2a. For thermocouple and voltage models: Connect a precision dc voltage source with enough range to cover the recorder's span. On models with mV/ or V inputs, connect from the mV and V source directly to the recorder. For models with thermocouple inputs, attach a cold junction reference between the recorder and the mV source. See Figure 4-2.
- 2b. For RTD Models: Connect a precision variable resistor with enough ohms to cover recorder's span to A, B, B. (See Figure 4-2).
3. Read the indicated value. If error is within the specified accuracy, calibration is not necessary. The accuracy of the RD250 is: $\pm 0.5\%$ for thermocouple and RTD input; and $\pm 0.25\%$ for voltage input.

4. Test the recorder at the low, high and center span values.
5. If error exceeds accuracy specifications, calibration is necessary. See paragraphs 4.1.2 - 4.1.5.

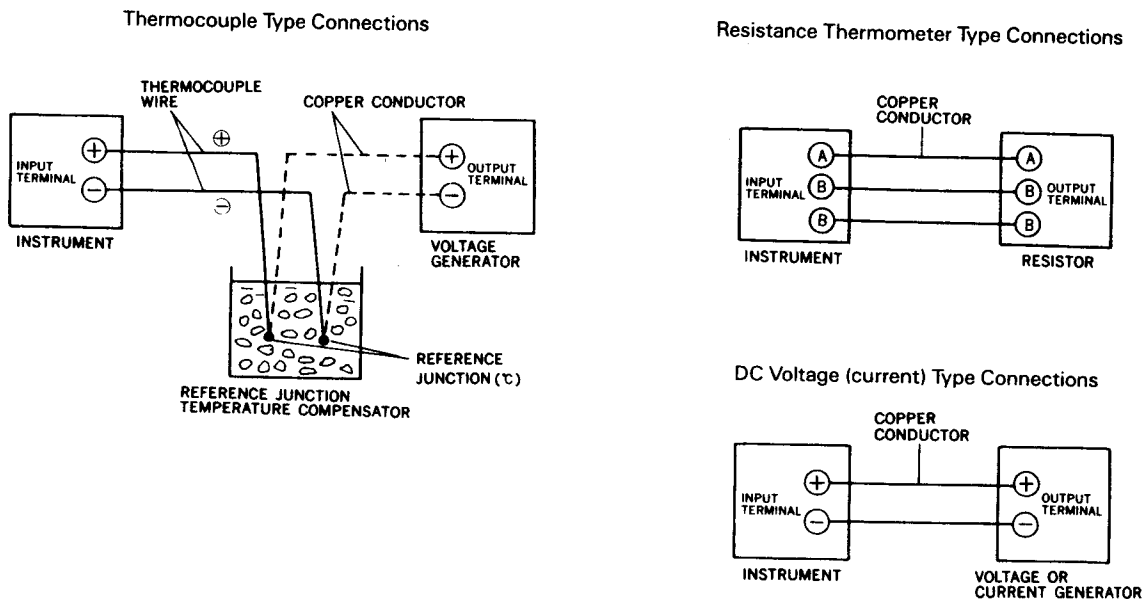


Figure 4-2. Thermocouple, Voltage and RTD Connections for Scale Test

4.1.2 Pointer Adjust

Following installation of a new cable, it is necessary to align the pointer (▲) on the scale plate with the servo feedback potentiometer.

1. Turn POWER and INDICATE Switches OFF.
2. Pull out chassis drawer.
3. Turn the pulley carriage fully counterclockwise to move the pointer (▲) past the zero position on the scale plate.
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.

When the pointer adjust is correct, turn RECORD/DRIVE Switch OFF and turn the POWER and INDICATE Switches ON. Allow recorder to warm up for 30 minutes, then continue with ZERO, SPAN and OVERSHOOT adjustments (refer to paragraph 4.1.3 for location of ZERO, SPAN and OVERSHOOT controls).

4.1.3 ZERO Adjust (Left-hand margin) See Figure 4-3.

1. Set a dc standard voltage generator or precision variable resistor to an input value corresponding to the minimum scale.

2. To adjust the ZERO control, turn clockwise to increase; counterclockwise to decrease, until pointer is on zero (or minimum value).

If you have the thermocouple recorder, use the cold junction reference described in paragraph 4.1.1. Put zero input in through the cold junction reference. Using ZERO control, adjust for zero indication.

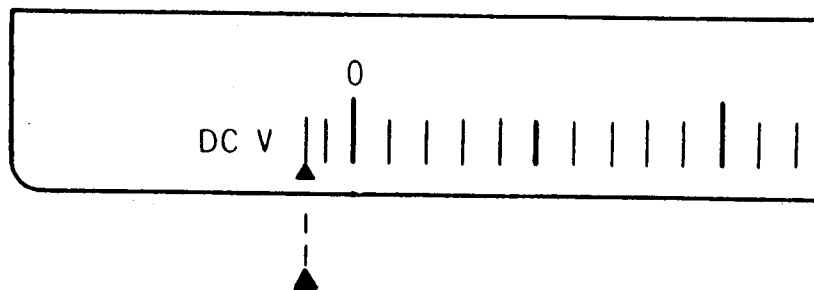


Figure 4-3. ZERO Adjust

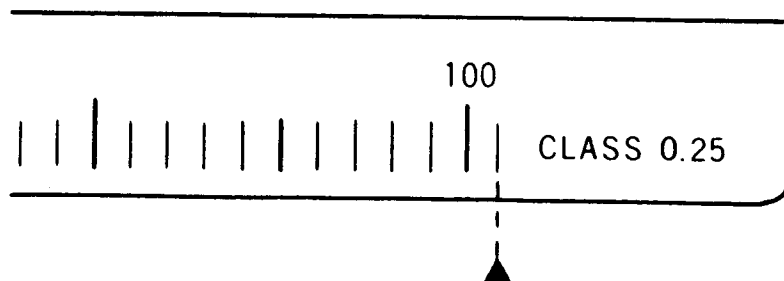


Figure 4-4. SPAN Adjust

4.1.4 SPAN Adjust (Right Margin) See Figure 4-4

1. Set a dc standard voltage generator or precision variable resistor to an input value corresponding to the maximum scale.
2. Turn the overshoot preventive adjusting trimmer (LIMIT) fully counterclockwise.
3. Adjust the SPAN trimmer by turning it with a (-) screwdriver until the pointer meets the maximum scale of the scale plate.

4.1.5 OVERSHOOT Adjust (LIMIT)

1. Set the dc standard voltage (current) generator or precision variable resistor to a value higher than the input value corresponding to the maximum scale by about 10%.
2. To dampen the overshoot, adjust the LIMIT trimmer by turning it with a (-) screwdriver until the pointer meets the upper end line of the scale plate.

SECTION 5 SERVICE INFORMATION

5.1 SERVICING YOUR RECORDER

The OMEGA RD250 Series has been designed to provide years of trouble-free operation. Although each instrument meets exacting standards, occasional maintenance may be necessary.

5.1.1 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, detach fuse cover and simply pull out the fuse with your fingernail. Replace it with the spare 1A fuse in your accessory kit.

5.1.2 Drive Cord Replacement

1. Fasten one end of the drive cord (see Figure 5.1) to the pulley detent with its holdfast (#1).
2. Attach the drive cord according to the sequence shown in Figure 5-1. Pull the cord firmly and pass it over the pulley twice, then fasten it to the pulley holdfast.
3. Set the dot-printing element (or the pen) to the extreme left of the chart (pointer will be at minimum reading of the scale plate). Then adjust the scale plate, if necessary.
4. Turn the pulley fully counterclockwise, set the pointer to the ▲ mark of the scale plate, and fasten the drive cord with the holdfast mounted on the dot-printing mechanism (or the pen-writing mechanism).
5. Check that the pointer can move smoothly from side to side.

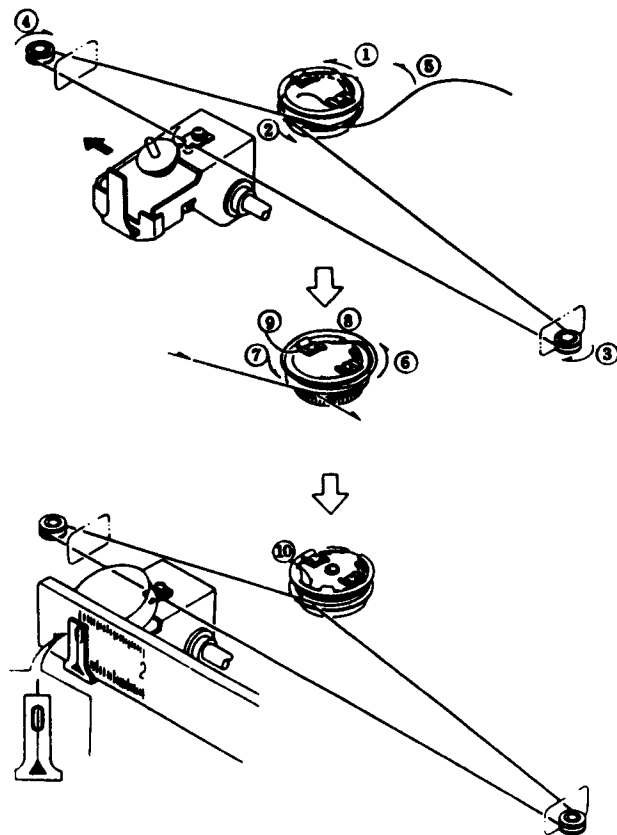


Figure 5-1. Drive Cord Replacement

SECTION 6 SPECIFICATIONS

MEASURING SYSTEM:	Self-balancing potentiometer
INPUT SPAN:	See Table 1-1
SCALE LENGTH:	250 mm
RECORDING MODE:	1 channel continuous; 6, 12 or 24 channel multipoint
BALANCING SPEED:	Continuous type: Approx. 0.3 sec; Multipoint type: Approx. 0.5 sec
CHART PAPER:	Z-fold, effective width 250 mm x 15m

SPECIFICATIONS (continued)

DOTTING INTERVAL:	6 and 12 multipoint type 5 sec @ 60 Hz; 6 sec @ 50 Hz; 24 multipoint type, selectable 1,2,5,10,30 and 60 sec.
ACCURACY:	Thermocouple or RTD input $\pm 0.5\%$ of FS; dc voltage input $\pm 0.25\%$ of FS
DEADBAND:	< 0.1% FS
CHART SPEEDS:	15, 30 60 mm/Hr. and Fast (60 cm/min)
AMBIENT TEMPERATURE:	15° to 40°C
CASE:	Steel plate with die-cast aluminum front door.
ILLUMINATION:	Fluorescent Lamp
DIMENSIONS:	H: 10.24" x W: 15.79" x D: 14.68"
WEIGHT:	1 pen model 36.3 lbs. Multipoint 6-12 channel 38.5 lbs. Multipoint 24 channel 46.2 lbs.
ELECTRICAL	
POWER SUPPLY:	120 Vac, 50/60 Hz

SPECIFICATIONS (continued)

INPUT IMPEDANCE:	DC voltage 4 mV \leq span voltage \leq 500 mV (Approx. 8 megohms) $500 \text{ mV} \leq$ span voltage \leq 100 V (Approx. 1 kilohm) Thermocouple: Approx. 8 megohms
ALLOWABLE SIGNAL SOURCE RESISTANCE	
DC VOLTAGE:	$4 \text{ mV} \leq$ span voltage \leq 500 mV Lower than 10 kilohms $500 \text{ mV} \leq$ span voltage \leq 100 V (Lower than 1 kilohm)
THERMOCOUPLE:	Without burnout - lower than 10 kilohms with burnout - lower than 150 ohms
RTD:	Lower than 10 ohms/line
MAXIMUM ALLOWABLE INPUT DC VOLTAGE:	Span voltage \leq 500 mV 50 V dc $500 \text{ mV} \leq$ span voltage \leq 100 V 250 V dc
THERMOCOUPLE:	15 V dc
RTD:	4 V dc
MAXIMUM COMMON MODE VOLTAGE:	250 V ac, 500 V dc

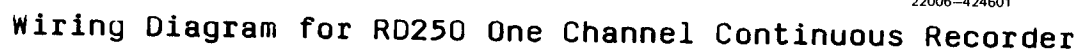
SPECIFICATIONS (continued)

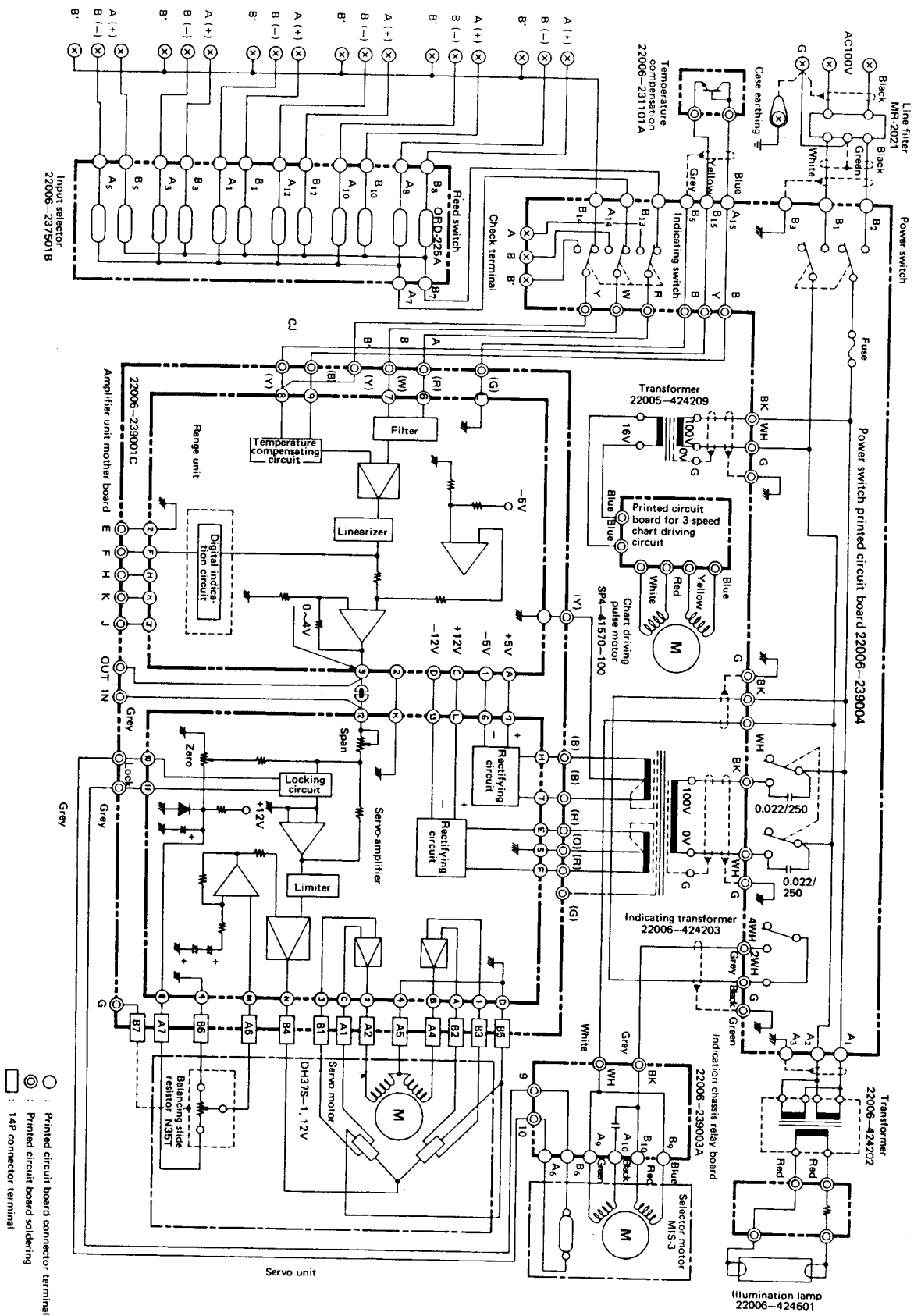
COMMON MODE REJECTION RATIO: More than 160 dB (dc or at power frequency)

NORMAL MODE REJECTION RATIO: More than 50 dB (at power frequency)

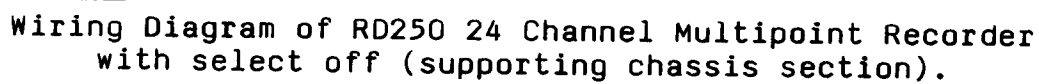
6.1 ACCESSORIES

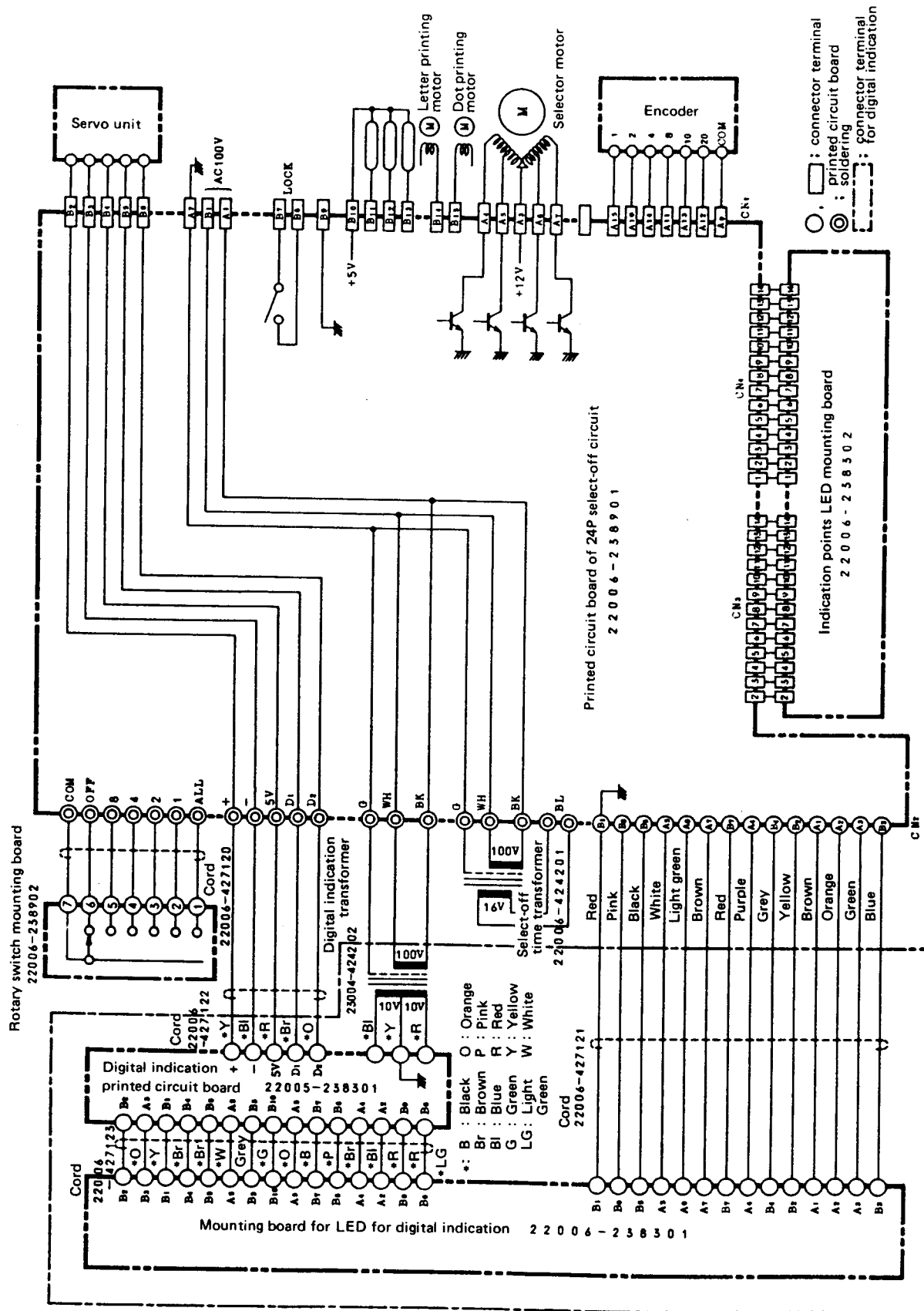
ITEM	DESCRIPTION	CATALOG NO.
Z- Fold Paper	250 mm wide x 15 meters long	RD 250-CP
Ink (Continuous)	Cartridge Pen, Red	250-PEN-Rd
	Cartridge Pen, Green	250-PEN-Gr
	Cartridge Pen, Blue	250-PEN-B1
	Cartridge Pen, Brown	250-PEN-Br
	Cartridge Pen, Black	250-PEN-Bk
Ink (Multipoint)		
	Ink, 6 Channel Box of 6 Colors	180A-INK-06
	Ink, 12/24 Channel Box of 12 Colors	180A-INK-12
	24 Channel Ink Pad Wheel	250-Pad-24
	6/12 Channel Ink Pad Wheel	250-Pad-06/12





Wiring Diagram of RD250 6 and 12 Channel Multipoint Recorders





Wiring Diagram of RD250 24 Channel Multipoint Recorder with select off (unit section).

NOTES