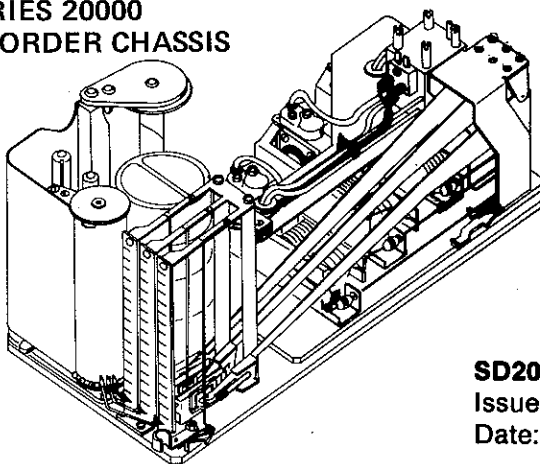




SERVICE INSTRUCTIONS

SERIES 20000 6 x 6 RECORDER CHASSIS



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GENERAL DESCRIPTION

The Moore Series 20000 Recorder Chassis is a pneumatic receiver which continuously records and/or indicates 3 to 15 psig input signals from one, two, or three sources. It utilizes a 4" strip chart, fiber-tip pens, and disposable, slip-in ink cartridges.

Each pen and indicator is furnished with its own indicator scale and is driven vertically by a pneumatic servo which insures an accurate relationship between the input signal and pen position. The chart magazine is removable for convenience of chart renewal and holds sufficient chart for 31 days of operation at the standard chart speed of 7/8" per hour. The chart is rewound by a high-speed, low-torque motor which provides a rewind speed of 3"/second with free-running chart. This allows easy removal and rewind of chart for past record review.

CHASSIS PART NUMBERS

Number of Pens	Chassis No.
1 pen	20000-1
2 pens	20000-2
3 pens	20000-3
1 pen, 1 indicator	20000-11
2 pens, 1 indicator	20000-21

OPTIONAL FEATURES

Ink Cartridges—for very active processes and high ambient temperatures. These should last two to three times longer.

Red	—	Part No. 14230-424
Blue	—	Part No. 14230-425
Green	—	Part No. 14230-426

On/Off Switch—for the chart drive.

Timing Motors—for other voltages, frequencies and chart speeds. The parts list identifies the various motors available for 115V, 60Hz service.

Alarm Switches—for single or dual alarm points on each pen.

Pneumatic Chart Drive—for 7/8" per hour chart speed. An external generator provides the impulse to drive the chart motor.

Other options are available for various Recording Stations; consult the factory. For detailed information applicable to the pneumatic chart drive or alarm switches, consult the Options section of this Instruction.

SPECIFICATIONS

Supply Air Requirements 20 psig \pm 2 psig normal
 30 psig maximum

Electrical Requirements 115V \pm 10%, 60 Hz - 8 watts normal

Air Consumption per Pen 0.035 scfm

Calibration Accuracy
 (including linearity, hysteresis
 and span errors)..... \pm 0.5% full scale

Repeatability..... 0.25% full scale

Hysteresis..... 0.2% full scale

Dead Spot 0.1% full scale

Response Time for a full-
 scale input change..... upscale approx. 4 sec.
 downscale approx. 5 sec.

Response Level (resolution)
 approx. 0.05% full scale

Input..... 3-15 psig normal
 Span adjust range:
 10.5 to 13.5 psig
 Zero adjust range:
 0 to 7 psig

Overrange Limit Application of 30 psig to
 input will not damage unit.

Supply Pressure Effect 0.12% per psi

Ambient Temperature Effect
 for 50°F temp. change \pm 0.25% full scale

Ambient Temperature Limits
 with relative humidity
 between 20% and 90% +10°F to +100°F with
 standard ink
 -25°F to +130°F with
 optional ink

FUNCTIONAL DESCRIPTION

GENERAL

The pen is operated by a pneumatic servo actuator which receives the input signal and positions the pen on the chart to correspond with any change in the input signal. The chart is driven past the pen by a timing motor. The rewind motor winds the chart on a rewind spool after recording.

ACTUATOR (See Fig. 1)

A 20 psig air supply is fed through the supply restriction to the nozzle and to the actuator chamber. The passage to the actuator chamber has a stabilizing restriction in it to provide smooth pen motion.

The input signal is fed to the input bellows. The bellows positions the force beam which is pivoted at the flexure. The force beam acts as the baffle in a nozzle-baffle circuit.

As the input signal increases, the bellows expands. The force exerted by the bellows causes the force beam to pivot at the flexure and thus reduce the beam/nozzle clearance. The decreased clearance causes back pressure to build up within the actuator chamber. The increased pressure causes the diaphragm assembly to move the motion arm. The motion arm pivots at one end and pulls the pen linkage and pen upscale. As the motion arm moves, it increases the spring tension on the force beam by extending the range spring. The motion arm continues to move until the force exerted by the bellows is balanced by the range spring force. At this point, the actuator is in balance. The force beam is positioned so that the beam/nozzle clearance holds the back pressure in the actuator chamber at the value required to balance the forces which act on the beam. This force balance condition maintains the motion arm and pen at the new position.

The preceding actions are reversed for a decreasing input signal.

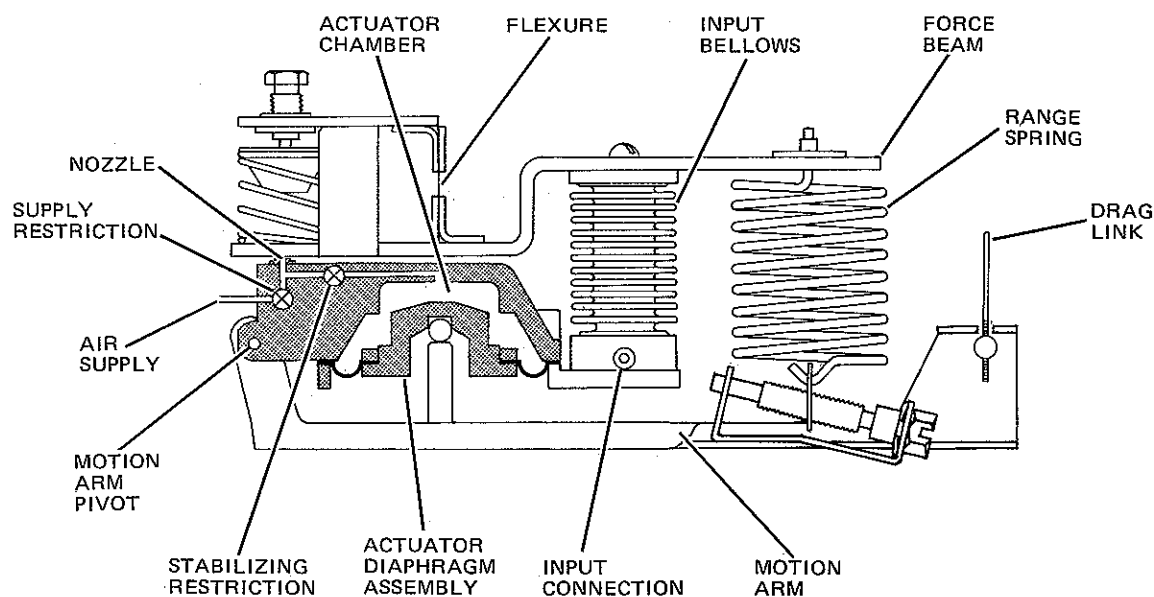


FIGURE 1 Actuator System

PEN AND LINKAGES (See Fig. 2)

The drag link, controlled by the actuator, pulls the pen arm upward as the input signal increases. The pen arm drives the pen carriage on a guide rod which is parallel to the chart surface. The pen assembly and ink cartridge are retained in

the carriage by a clip. Gravity returns the pen to a lower position as the input signal decreases. The fiber-tip pen rides on the chart, and a tension spring on the carriage maintains even pen pressure.

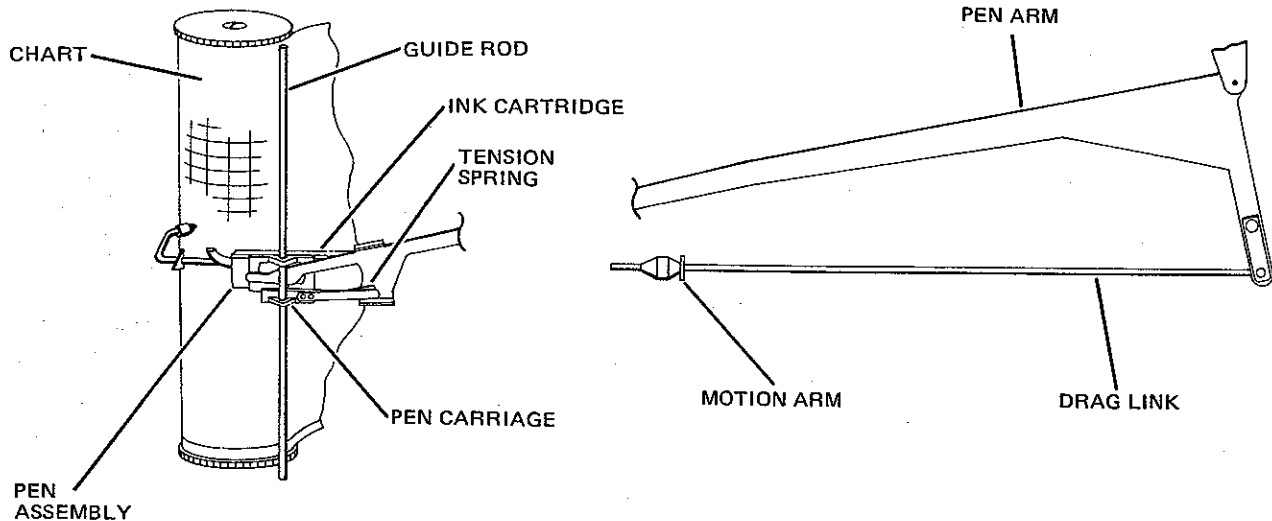


FIGURE 2 Pen Linkage System

CHART DRIVE AND MAGAZINE (See Fig. 3)

Magazine

The chart magazine consists of the chart feed rod, guide post, timing drum, and rewind spool. It is easily removed for servicing the chart. It is not necessary to remove the magazine for chart inspection.

Timing Motor

The timing motor pinion drives the timing drum. The sprocket teeth of the timing drum engage the chart holes and drive the chart past the pens.

Rewind Motor

The rewind motor drives the rewind spool which draws up the slack in the chart and rewinds it on an empty chart spool. The rewind motor is geared for high speed and low torque. This permits the chart to be pulled out from the rewind spool for examination while the chart drive is in operation (see Fig. 4). Upon release of the chart, the rewind motor will automatically take up the slack and rewind the chart.

NOTE: The rewind motor operates with a surface temperature of approximately 130°F.

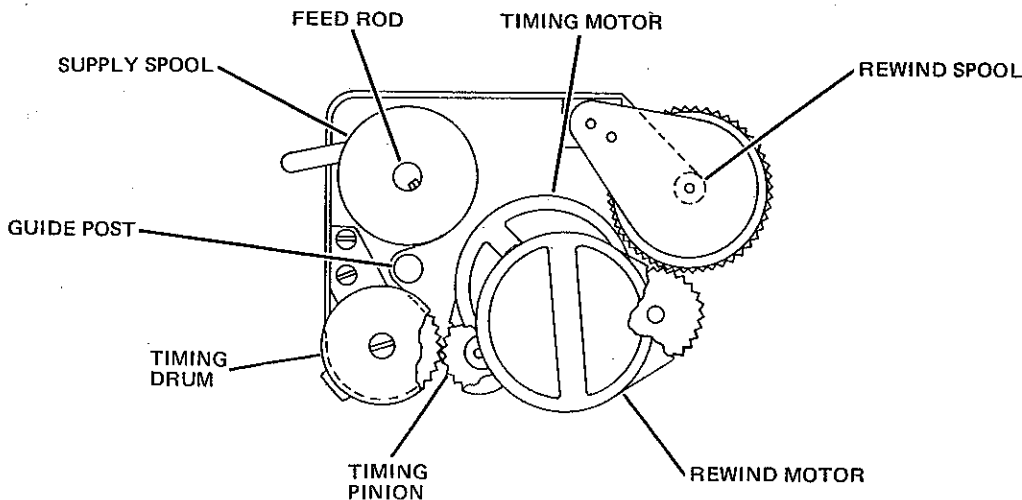


FIGURE 3 Chart Drive

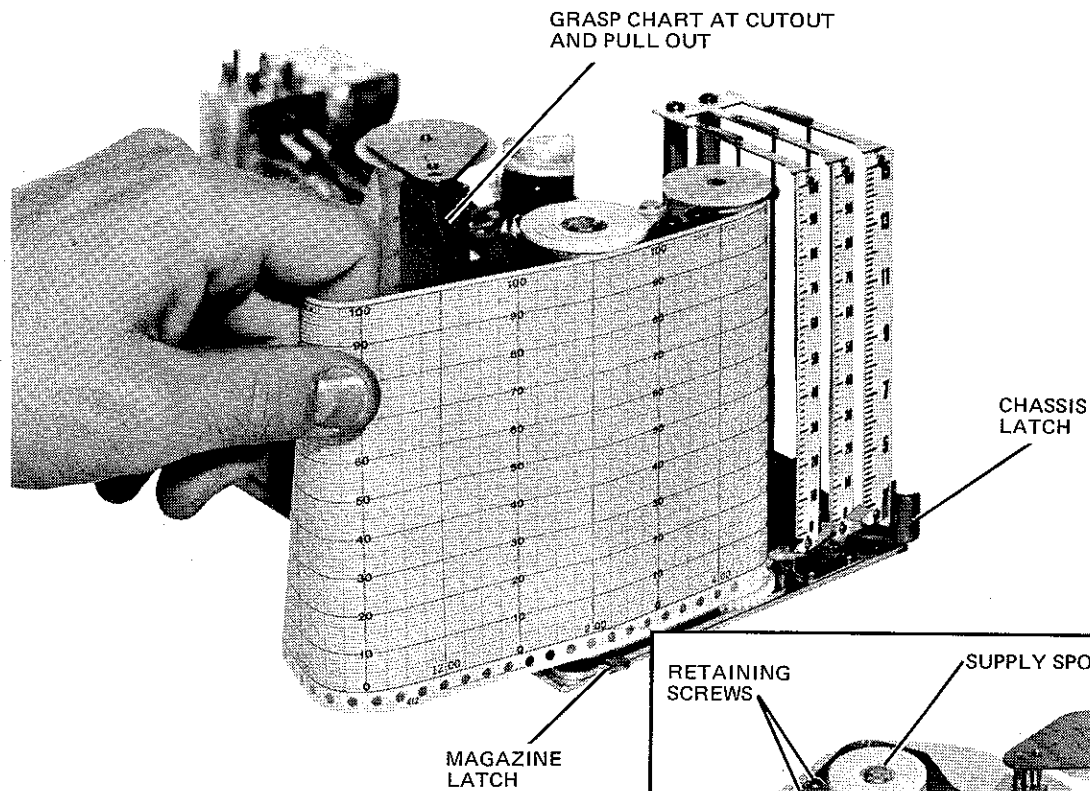


FIGURE 4 Chart Inspection

CONNECTION BLOCK

The Chassis Connection Block provides all the pneumatic and electrical connections to the chassis. The station's Umbilical Block is mated to it. The station's block has self-sealing shut-offs which permit chassis removal without loss of any process signal.

INSTALLATION

GENERAL

The recorder chassis is normally supplied as part of a station. It is to be installed as described in the Service Instructions which are applicable to the particular model.

CHASSIS WITHDRAWAL (Service Position)

To gain access to the recorder's components, it is necessary to place the chassis in the service position. This procedure is performed as follows:

1. Open the door to gain access to the chassis' latch (see Fig. 4).
2. Move the latch to the left and pull the chassis (via the latch) until the safety latch is engaged.

To return the chassis to its normal operating position, push on the chassis latch or chart magazine until the primary latch is engaged. Do not push on the scales.

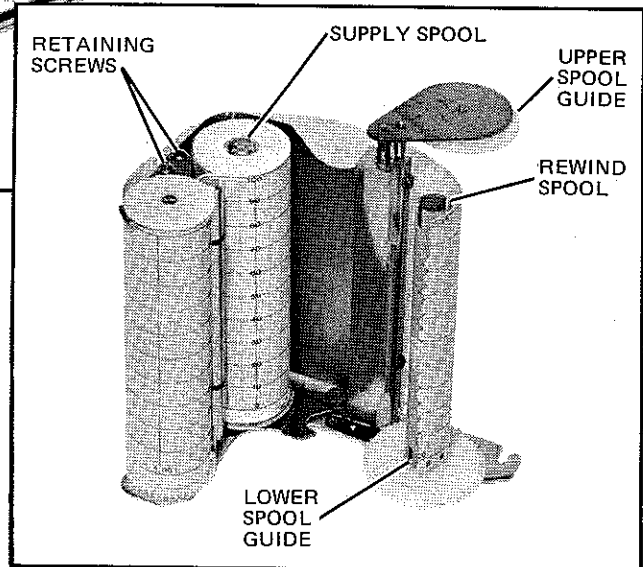


FIGURE 5 Chart Installation

CHART INSTALLATION

1. Place the chassis in the service position.
2. Push the magazine latch (see Fig. 4) to the left.
3. Swing the magazine 90° to the left.
4. Pull the magazine forward to disengage it from the pivot post.
5. Install a new chart roll and thread it as shown in Figure 5.
6. Tape the end of the chart to the rewind spool.
7. Replace the magazine in the recorder chassis. The rewind motor will take up the slack automatically.
8. To set the chart forward, turn the timing drum clockwise. To set the chart backward, swing the magazine out until the timing motor is disengaged; the timing drum can now be turned counterclockwise.

Caution: Do not attempt to set the chart backward while the timing drum and motor are engaged.

PEN AND INK CARTRIDGE INSTALLATION

For shipping, the pens and ink cartridges are packaged separately. The recorder is calibrated at the factory using the pens shipped with the chassis. Do not intermix the pens with those of another chassis.

Ink Cartridge (See Fig. 6)

Insert the cartridge into the pen as follows:

1. Hold the cartridge on a flat surface with the indentation up.
2. Push the pen tube into the indentation so that the cartridge fits snugly into the pen assembly. Avoid squeezing the cartridge while accomplishing this step.
3. Be sure that the pen tube and vent tube are fully inserted into the cartridge.

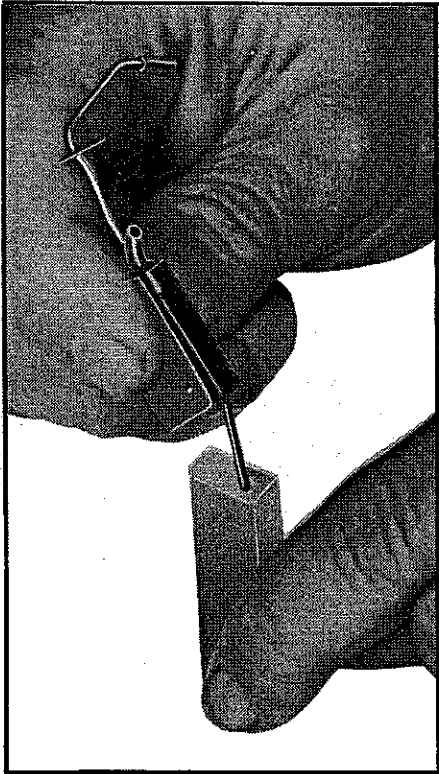


FIGURE 6 Ink Cartridge Installation

4. Prime the pen by closing the vent and gently squeezing the cartridge. Open the vent and release the fingers from the cartridge.

NOTE: Avoid touching the fiber tip; oil hinders inking performance.

Pen Assembly (See Fig. 7)

To install the pen, proceed as follows:

1. Lift the pen arm and pen carriage to the top.
2. Push the pen assembly into the pen carriage so that the spring clip is between the pen assembly and the cartridge. The pen assembly must be fully engaged under the spring clip.

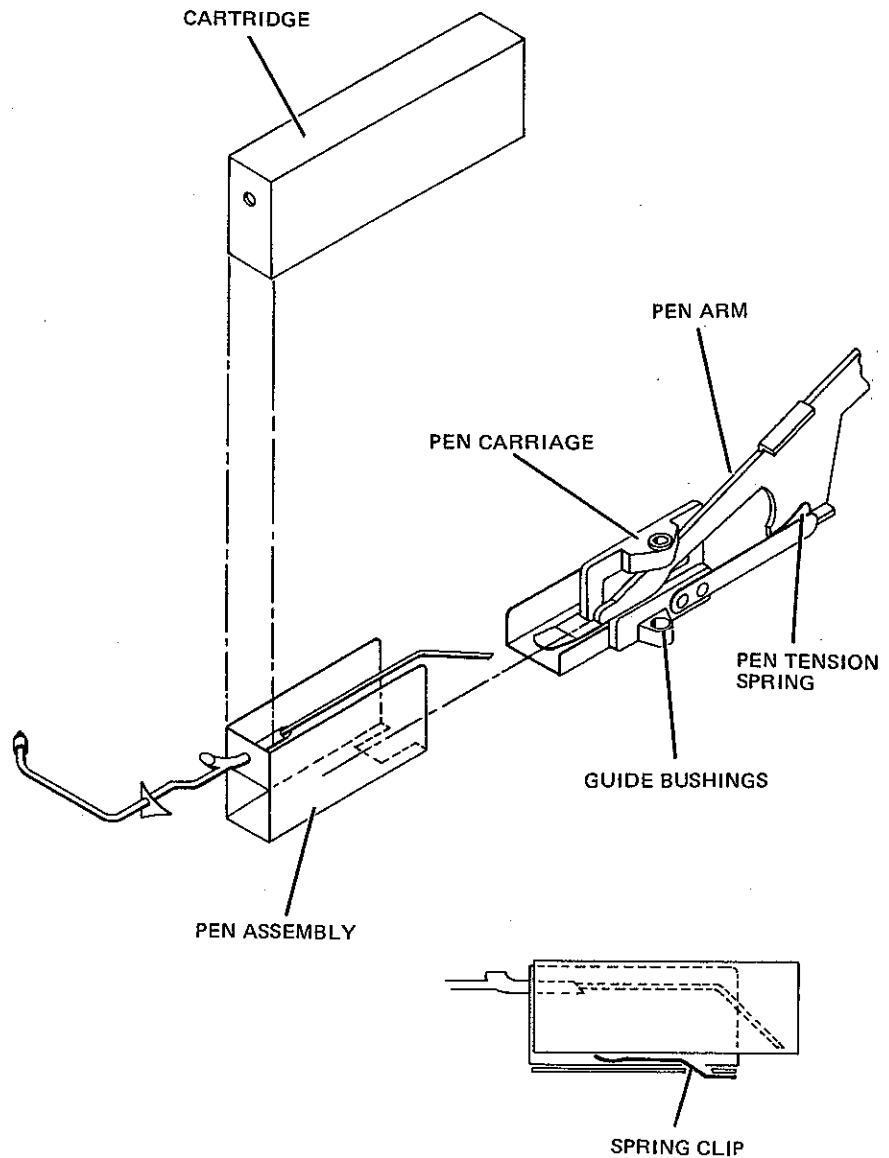


FIGURE 7 Pen Installation

CALIBRATION

GENERAL

The recorder has been calibrated at the factory. A zero adjustment may be required upon initial setup. Further calibration should be necessary only after parts replacement. Calibration at the workbench is recommended. When calibrating, either of two test hook-ups may be used:

1. Connect a test block as shown in Figure 8 to the chassis connection block, or
2. Connect 1/4" O.D. plastic tubing to the connection block barbs as shown in Figure 9.

NOTE: When using this method, it is possible for the tubing to slip off when pressure is applied.

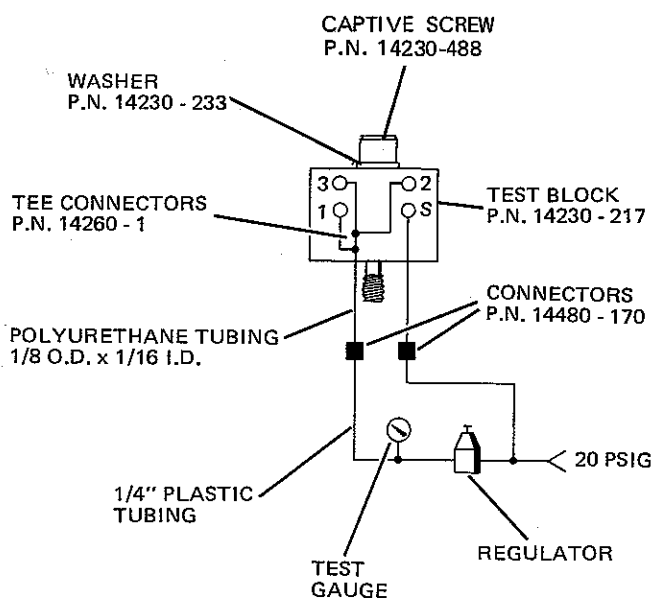


FIGURE 8 Calibration Test Hook-Up Method 1

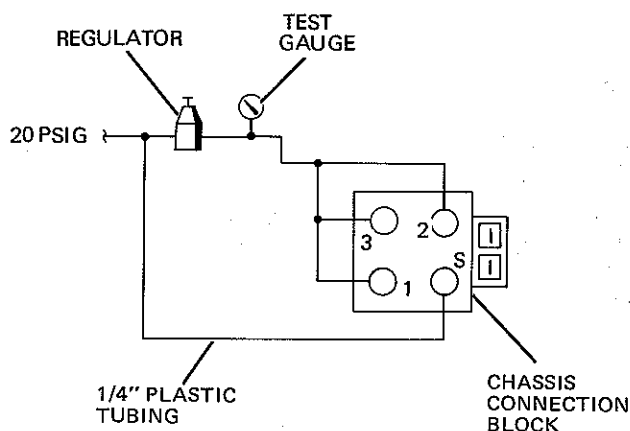


FIGURE 9 Calibration Test Hook-Up Method 2

PRELIMINARY ADJUSTMENTS

Lower Pen Stop

With a zero psig input, the pen should rest on the lower pen stop and ride approximately 1/32" below the zero line of the chart as shown in Figure 10. The pen should not contact the sprocket teeth. If the pen has been bent, it may be necessary to adjust the clearance; remove the pen assembly (see Maintenance section) and carefully straighten the tube.

Caution: Do not bend the tube while the pen assembly is mounted in the pen carriage; the guide rod or pen carriage can be damaged.

Time Line Adjustment

When the pen is operated from 3 to 15 psig, it should track the vertical time line on the chart. If it does not, proceed as follows:

1. Loosen the two retaining screws identified in Figure 5. The timing drum can now be moved slightly in any direction.
2. Position the timing drum so that when the pen rises to full scale it is on the same time line as it was at zero scale.
3. Tighten the screws.
4. Operate the pen through full scale and check that the pen contacts the chart properly, especially at the upper end of scale. If it does not, repeat steps 1 to 4.

Scale Alignment (See Figure 10)

Apply an on scale input, and check that the pen pointer indication agrees with the ink trace. If it does not, loosen the screw at the bottom of the scale, and slide the scale up or down as required.

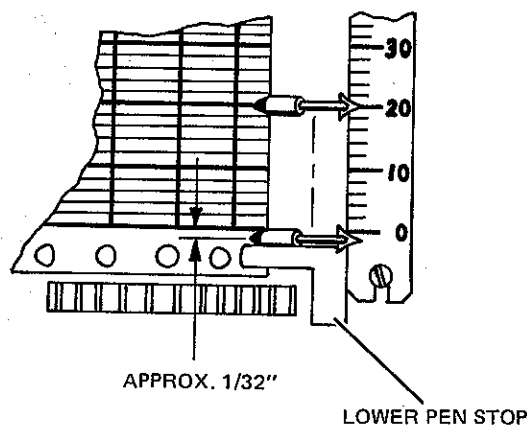


FIGURE 10 Pen Alignment

CALIBRATION PROCEDURE

Zero Adjustment (See Fig. 11)

1. Set the regulator to 4.20 psig (10 percent of input range).
2. Rotate the zero adjustment so that the pen is at 10 percent of scale. Each turn will move the pen approximately 1.6%.

Span Adjustment (See Fig. 11)

1. Make a zero adjustment before adjusting the span.
2. Set the regulator to 13.8 psig (90 percent of input range).
3. Turn the fine span adjustment so that the pen is at 90% of scale. Each clockwise turn reduces the pen span approximately 1.0%.

NOTE: If the span error is more than 5%, a coarse span adjustment may be required.

4. The span adjustment has an effect on the zero. Repeat the zero and span adjustments until the calibration is correct at 10% and 90% of scale.

Coarse Span Adjustment (See Fig. 12)

This adjustment is required only if the travelling washer is about to disengage from the threads of the fine span adjustment. Usually this would occur only if the actuator has been repaired.

The object of this adjustment is to keep the range spring centerline approximately parallel to the input bellows and to keep the travelling washer close to the center of the span adjustment screw.

To make a coarse span and adjustment, lift the disc end of the range spring away from the force beam until the smaller diameter of the range spring is free to slip through the slot to the next hole.

Linearity

After making the zero and span adjustments, check for linear pen travel. Set the regulator output to 9.0 psig (50 percent of input range), and observe that the pen is at mid-scale.

Normally the pen response is linear. It should be noted that there is no linearity adjustment. Check the following items if the pen response is non-linear:

1. Inspect the guide rods for dirt, dried ink, and straightness.
2. Check the pen arm and actuator movement for binding.
3. Check the actuator adjustment.

NOTE: When the actuator adjustment is properly set, the motion arm and force beam are parallel when a 9 psig input is applied to the bellows. This action produces linear pen travel. The actuator adjustment, however, is not to be set with a 9 psig input; it is set as described in the next topic, Actuator Adjustment.

Actuator Adjustment

This adjustment normally is not required unless the actuator has been repaired. It is factory set for optimum performance. If satisfactory linearity cannot be obtained, perform the following procedure:

1. Set the regulator for a 3.0 psig input.

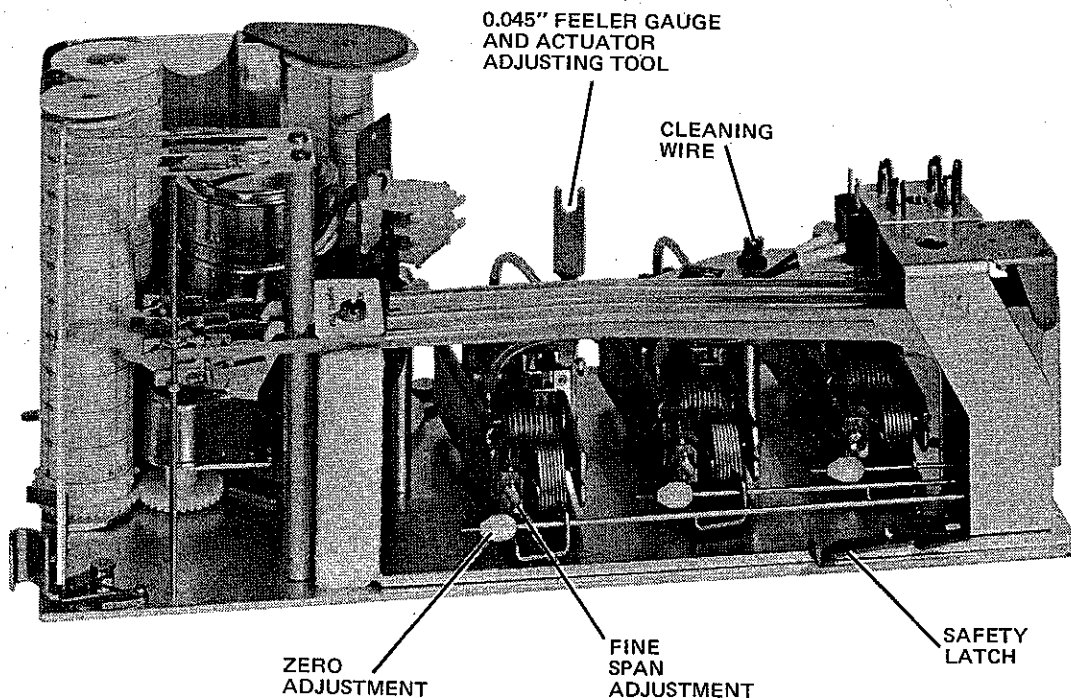


FIGURE 11 Adjustments and Tools

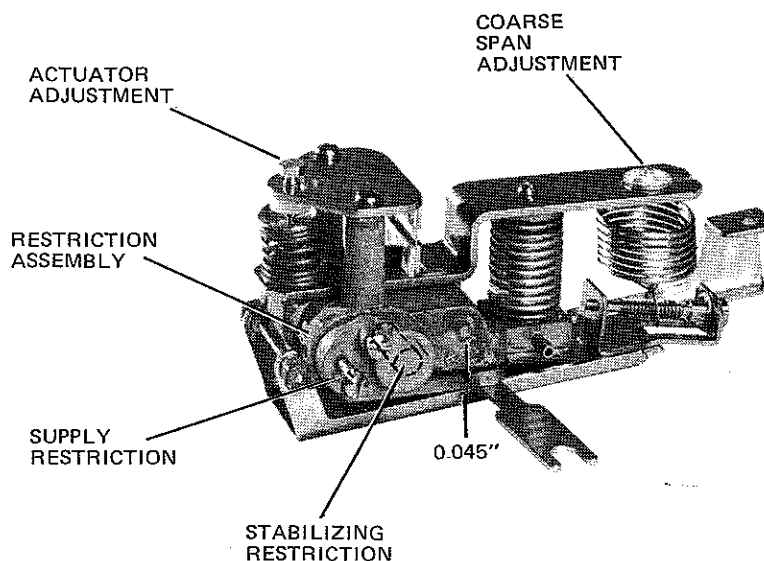


FIGURE 12 Actuator

2. Use the adjusting tool (see Fig. 11) as a feeler gauge to check for a 0.045 inch gap between the motion arm and actuator body. Check the gap at the point shown in Figure 12.
3. If an adjustment is required, use the wrench end of the adjusting tool to turn the actuator adjustment. Turning the screw clockwise increases the gap.
4. Repeat the zero and span adjustments as described previously.

Caution: If the drag link is disconnected for any reason, do not apply an input signal greater than 15 psig. The actuator might be damaged by excessive motion.

MAINTENANCE

GENERAL

The routine maintenance procedures required are changing charts, ink cartridges, and pen tips. Cleaning is required as local conditions dictate. No lubrication is required; none is recommended.

CHART REPLACEMENT

1. Place the chassis in the service position.
2. Push the magazine latch (see Fig. 4) to the left.
3. Swing the magazine 90° to the left.
4. Pull the magazine forward to disengage it from the pivot post.
5. Lift the upper spool guide and swing it out.
6. Remove the used chart.
7. Install the empty spool on the lower spool guide (plastic keys must enter slots in the bottom of the spool).
8. Swing the upper spool guide into position to engage the spool.

9. Install a new chart roll and thread it as shown in Figure 5.
10. Tape the end of the chart to the rewind spool.
11. Replace the magazine in the recorder chassis. The rewind motor will take up the slack automatically.
12. To set the chart forward, turn the timing drum clockwise. To set the chart backward, swing the magazine out until the timing motor is disengaged; the timing drum can now be turned counterclockwise.

Caution: Do not attempt to set the chart backward while the timing drum and motor are engaged.

SERVICING THE PEN

General

The fiber tip pens do not require adjustment for pressure. If the pen has been bent, or if a new pen is installed, some adjustment may be required for horizontal contact angle; refer to the Calibration section—Lower Pen Stop. When servicing the pen, avoid touching the fiber tip; oil hinders inking performance.

Pen Assembly

REMOVAL

1. Place the chassis in the service position.
2. Lift the pen arm to the top; pull the pen forward and then up through the scale frame.

INSTALLATION

1. Lift the pen arm and pen carriage to the top.
2. Insert the pen assembly so that the pen carriage spring clip is between the pen assembly and the cartridge (see

Fig. 7). The pen assembly must be fully engaged under the spring clip.

Ink Cartridge Replacement

1. Remove the pen assembly.
2. Hold the pen firmly and pull the cartridge out.
3. Hold the new cartridge on a flat surface with the indentation up.
4. Push the pen tube into the indentation, as shown in Figure 6, until the pen tube and vent tube are fully inserted into the cartridge. Avoid squeezing the cartridge while accomplishing this step.
5. Prime the pen by closing the vent and gently squeezing the cartridge. Open the vent and release the fingers from the cartridge.
6. Reinstall the pen assembly.

Fiber Tip Replacement

1. Remove the pen assembly.
2. Push the tip off the pen tube.
3. Push a new fiber tip (P/N 14230-247) onto the pen tube.
4. Prime the pen.
5. Reinstall the pen assembly.

Pen Cleaning

1. Remove the pen assembly.
2. Remove the ink cartridge.
3. Remove the fiber tip.
4. Flush the pen tube with water.
5. Be sure that the vent tube is completely open.
6. Replace the fiber tip.

NOTE: If the pen tube was clogged, a new fiber tip should be installed.

7. Install a new ink cartridge.
8. Prime the pen.
9. Reinstall the pen assembly.

ACTUATOR

General

Most actuator malfunctions can be prevented by using a clean, dry, oil-free instrument air supply. Refer to the Instrument Society of America's "Quality Standard for Instrument Air" (ISA-S7 .3). Supply air should be regulated to 20 psig (30 psig max.).

Supply Restriction

To clean the actuator supply restriction, proceed as follows:

1. Remove the tubing from the actuator supply restriction (Fig. 12).

2. Take the cleaning wire (Fig. 11) and push it through the supply restriction.
3. Reinstall the tubing on the supply restriction.

Stabilizing Restriction

The stabilizing restriction cannot be repaired. If it is defective, replace it as follows:

1. Remove the two screws on the restriction assembly (Fig. 12).
2. Pull the restriction assembly off the actuator.
3. Remove and replace the stabilizing restriction. Orientation of the new restriction is not important.
4. Inspect the gasket on the restriction assembly; replace it if necessary.
5. Reinstall the restriction assembly.

Disassembly/Assembly

Refer to Parts List No. 14662PL if the Actuator is to be disassembled. When reassembling the Actuator, apply a light coating of a silicone lubricant to the edge area of the Diaphragm Assembly (Part No. 14187-145) that comes in contact with the body (Part No. 14187-139).

Dow Corning DC-200 Silicone Fluid, 60,000 centistokes viscosity, is suitable for this application. A filled syringe (Part No. 12740-442) is available for this purpose.

GUIDE ROD AND PEN CARRIAGE

The guide rods should be kept free of dried ink and dirt. They may be cleaned by using soapy water; rinse thoroughly.

If the guide rods are bent, they should be straightened or replaced.

Removal (See Fig. 13)

1. Remove the pen assembly as described previously.
2. Move the leaf spring away from the guide rod by lifting it slightly and pivoting it to one side.
3. Lift the guide rod out of the pen carriage, through the hole in the scale frame.
4. Separate the pen carriage from the pen arm.

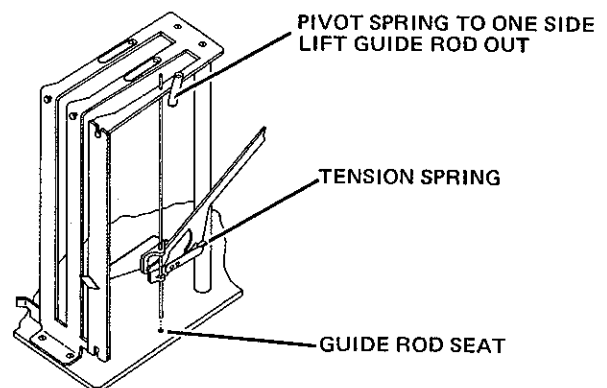


FIGURE 13 Guide Rod

Installation (See Fig. 13)

1. Lower the pen arm and install the pen carriage with the tension spring between the guard and the pen arm.
2. Insert the guide rod through the scale frame and then through the guide bushings in the pen carriage.
3. Seat the guide rod in the chassis hole.
4. Move the leaf spring so that it is seated over the point of the guide rod.
5. Replace the pen.

TROUBLESHOOTING

Symptoms are listed from most to least common. Probable causes for a symptom are listed from most to least likely. If more than one remedy is listed for a probable cause, consider the remedies in the sequence listed.

SYMPTOM	PROBABLE CAUSE	REMEDY
Pen will not write.	No ink in cartridge.	Replace cartridge.
	Pen lost its prime.	Prime the pen.
	Plugged pen or vent.	Clean pen and vent.
		Replace fiber tip.
Pen not touching chart.	Push pen assembly home in pen carriage.	
	Pen tension spring is not in proper position to force pen against chart. See Maintenance-Pen Servicing.	
Ink flooding on chart.	Plugged vent.	Clean vent and pen.
Chart is not winding up properly.	Wet ink on chart back-up plate.	Clean the back-up plate.
	No voltage.	Check connections and power supply.
	Rewind motor out of order.	Replace rewind motor.
Sprocket teeth tear chart.	Wet ink on sprocket teeth.	Clean sprocket teeth.
Chart is not turning.	No voltage or loose connection.	Check voltage at rear of recorder and umbilical disconnect.
	Loose timing pinion.	Tighten set screw.
	Timing Motor out of order.	Replace timing motor.
Pen travel is slow rising and fast dropping.	Supply restriction partially clogged.	Clean supply restriction. See Maintenance-Actuator.
Pen travel is sluggish in both directions.	Stabilizing restriction partially clogged.	Replace stabilizer. See Maintenance-Actuator.
Pen oscillates	Sleeve on stabilizing restriction enlarged by oil or solvents.	Replace stabilizer.
Pen has an excessive dead spot (more than .2% full scale).	Dirty or bent guide rod.	Clean, straighten, or replace guide rod.
	Pen is binding on the scale.	Adjust scales so they are perpendicular to the base plate and have 1/8" clearance between them.
	Supply restriction partially clogged.	Clean supply restriction.
	Pen carriage guide bushings damaged or disengaged.	Replace pen carriage.
	Friction in pen carriage or linkage.	Eliminate binding in pivots of the pen arm or drag link.
Pen will not follow vertical time line.	Timing drum needs adjustment.	Adjust the timing drum. See Calibration--Time Line Adjustment

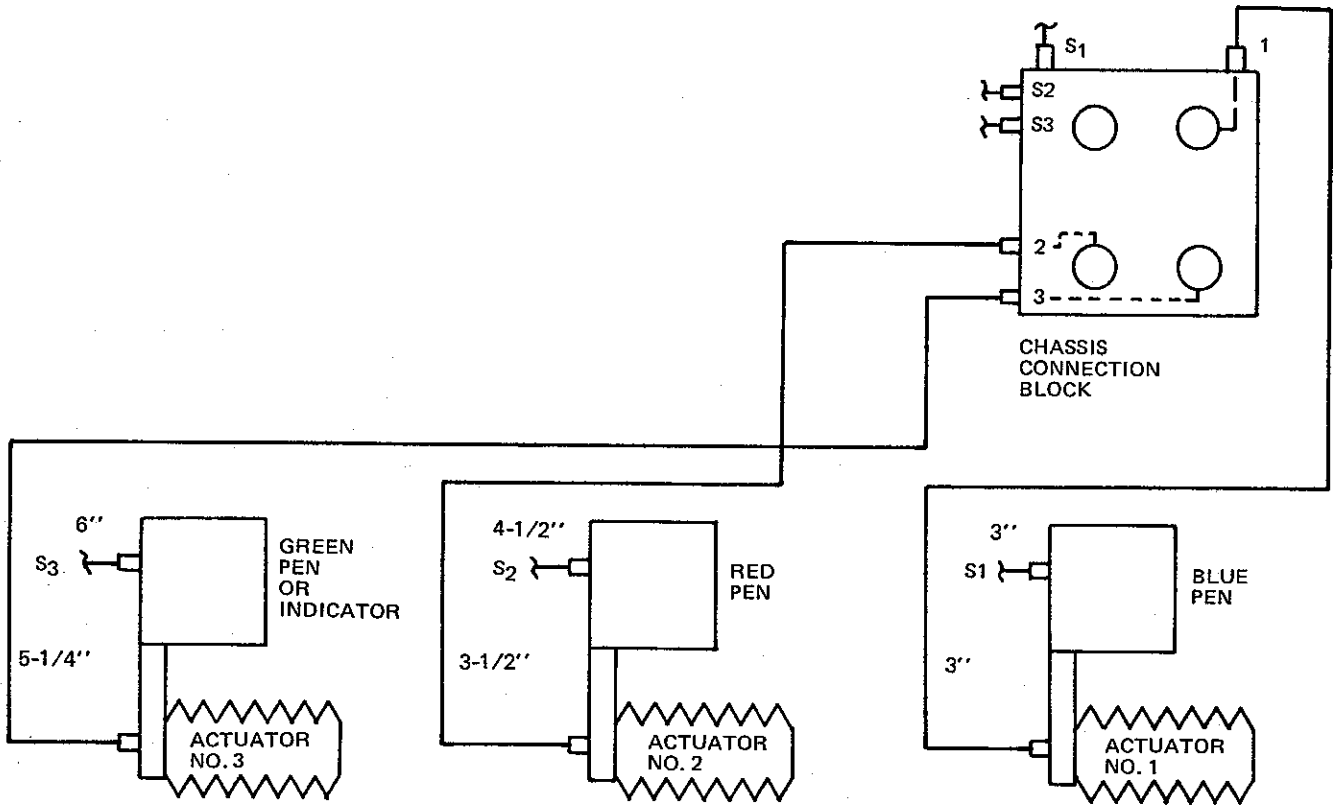


FIGURE 14 Tubing Diagram

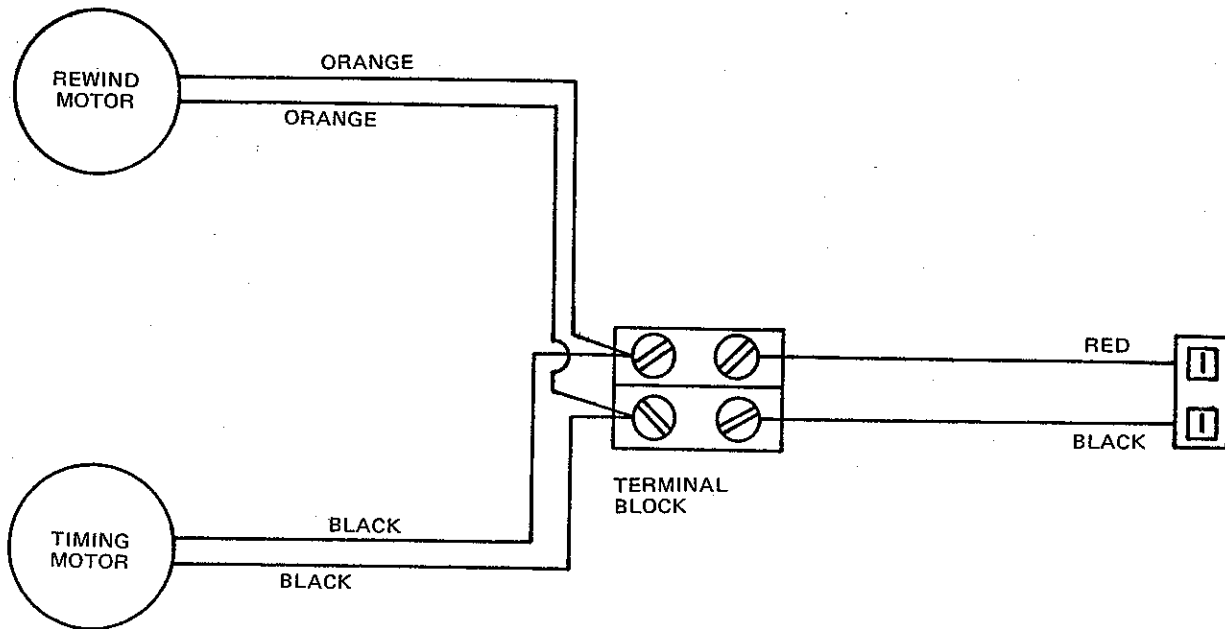


FIGURE 15 Wiring Diagram

REPLACEMENT PARTS

General

All parts for the Recorder can be obtained from Moore Products Co. (in Canada, Moore Instruments Ltd./Ltee.). See Warranty statement for address.

When ordering parts, include the following information.

1. Description of Instrument (e.g., 2-pen Recorder).
2. Complete Nameplate Information
MODEL (e.g., 5320)
B/M (e.g., 20001-2 ___)
CAL (e.g., 3-15 PSI)
3. If applicable, Part Number, Description and issue number of major subassembly (e.g., P/N 20000-2 Recorder Chassis).
4. Part Number and description of component needed (e.g., P/N 14230-165, Blue Pen Assembly).

Recommended Spares

All recommended on-hand spare parts are identified by an asterisk (*) on the Parts Lists at the rear of this instruction.

OPTIONS

PNEUMATIC CHART DRIVE

A recorder equipped with a pneumatic chart drive has the following items removed from the chassis (see Parts List No. 20000PL): 21, 22, 23, 28, 29, 31, 33, 34, 35, 36, 37, 58 and the associated mounting hardware.

The following items are added to the chassis:

Qty.	Part No.	Description
1	14230-438	Impulse Motor
1	14480-184	Tubing Connector
2	Screw	#4-40 X 3/16" Long Flat Head
7-1/2"	Tubing	1/8 O.D. X 1/16 I.D. Polyurethane

Refer to Parts List No. 14230-470PL.

In addition to the chassis modifications, an external Master Impulse Generator is needed (consult the factory). This generator provides four 20 psig pulses per minute that operate the ratcheted impulse motor. The impulse motor drives the chart at a speed of 7/8" per hour. Chart rewind is accomplished by a slip clutch which is part of the impulse motor.

NOTE: The generator is capable of supplying up to fifty recorders.

A recording station which includes this option will have an additional instruction supplied with the standard Service Instructions. Information applicable to variations in station connections and required parts will be included.

ALARM SWITCHES

General

A recorder can be supplied with single or dual alarm switches for each pen. Figure 16 shows a typical installation of an alarm switch on the chassis. If two switches are provided for a single pen, the second switch is mounted immediately above the first.

Wire terminations are made with push-on pin receptacles to allow use of either the normally open (NO) or normally closed (NC) contacts. As shipped, the normally open contacts are used. The flexure assembly on the actuator motion arm actuates the switch. Switching action is adjustable to any point within the limits of pen travel by turning the adjustment screw.

Refer to Figure 17 for the wiring diagrams.

Electrical Rating

The switches are SPDT. They are rated as follows:

Recorders with 1, 2 or 3 switches
(Each Switch) 230 Vac, 30 Vdc
2 amps per switch

Recorders with 4, 5 or 6 switches
(Each Recorder) 230 Vac, 30 Vdc
3 amps per Recorder

WARRANTY

The Company warrants all equipment manufactured by it and bearing its name plate, and all repairs made by it, to be free from defects in material and workmanship under normal use and service. If any part of the equipment herein described, and sold by the Company, proves to be defective in material or workmanship and if such part is within twelve months from date of shipment from the Company's factory, returned to such factory, transportation charges prepaid, and if the same is found by the Company to be defective in material or workmanship, it will be replaced or repaired, free of charge, f.o.b. Company's factory. The Company assumes no liability for the consequence of its use or misuse by Purchaser, his employee or others. A defect in the meaning of this warranty in any part of said equipment shall not, when such part is capable of being renewed, repaired or replaced, operate to condemn such equipment. This warranty is expressly in lieu of all other warranties, guaranties, obligations, or liabilities, expressed or implied by the Company or its representatives. All statutory or implied warranties other than title, are hereby expressly negated and excluded.

Warranty repair or replacement requires the equipment to be returned to one of the following addresses.

Equipment manufactured or sold by MOORE PRODUCTS CO.:

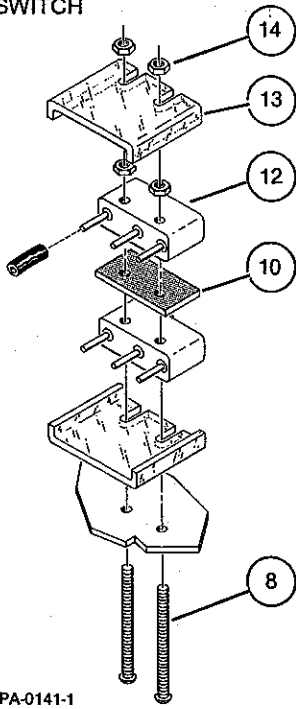
MOORE PRODUCTS CO.
Sumneytown Pike
Spring House, PA 19477

Equipment manufactured or sold by MOORE INSTRUMENT CO.:

MOORE INSTRUMENTS LTD/LTEE
2KM West of Mississauga Rd. Hwy. 7
Brampton, Ontario, Canada

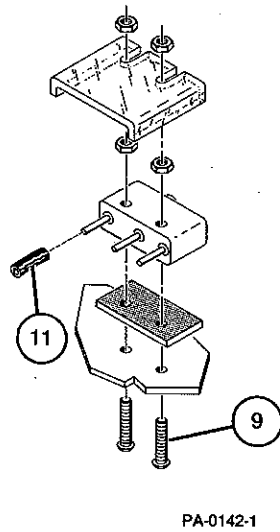
The warranty will be null and void if repair is attempted without prior authorization by a member of the MOORE PRODUCTS CO. Service Department.

DUAL SWITCH



PA-0141-1

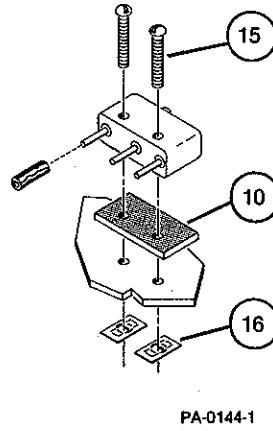
SINGLE SWITCH



PA-0142-1

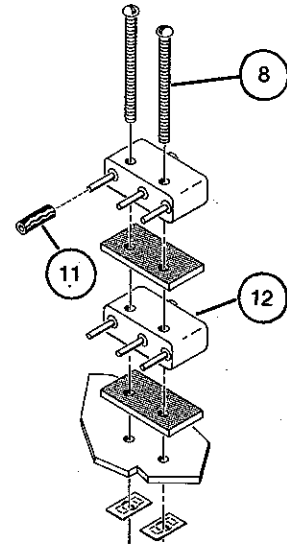
LATEST DESIGN

SINGLE SWITCH



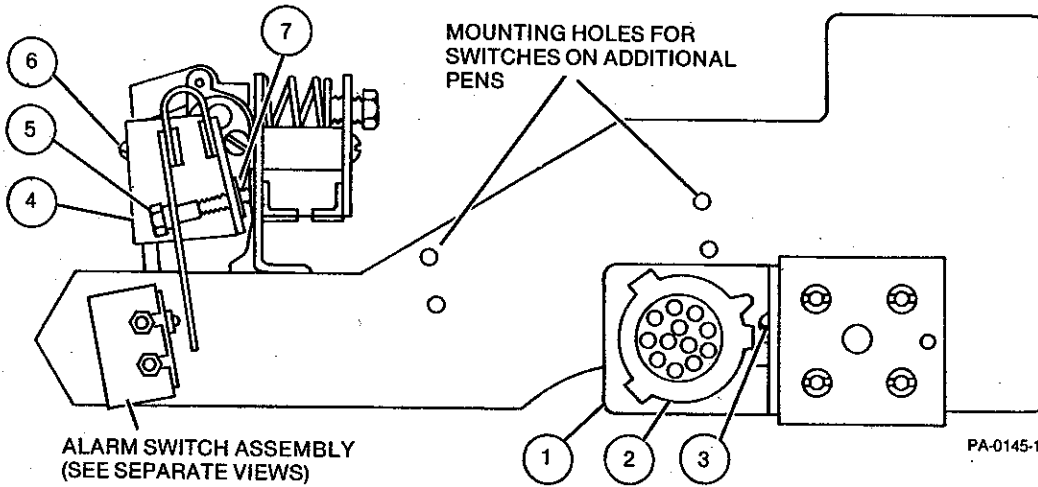
PA-0144-1

DUAL SWITCH



PA-0143-1

PREVIOUS DESIGN (OBSOLETE)



ALARM SWITCH ASSEMBLY
(SEE SEPARATE VIEWS)

PA-0145-1

Item	Part No.	Description	No. of Alarm Switches					
			1	2	3	4	5	6
1	14629-38	Bracket	1	1	1	1	1	1
2	14629-33	Plug Housing	1	1	1	1	1	1
3	Screw	#2-56 x 3/16 Lg. Rd. Hd.	1	1	1	1	1	1
4	14629-22	Flexure Assy. (Incl. Items 4a, 5 and 7)						
4a	14629-19	Dual Flexure		one per actuator with alarm				
5	14629-13	Adjustment Screw		one per actuator with alarm				
6	Screw	#4-40 x 1/4 Lg. Rd. Hd., Type "F" Self Tapping		two per actuator with alarm				
7	14187-185	Threaded Insert		two per actuator with alarm				
8	Screw	#2-56 x 1 Lg. Rd. Hd.		two per dual alarm				
9	Screw	#2-56 x 3/4 Lg. Rd. Hd.		two per single alarm				
10	14629-23	Insulating Spacer		one per actuator with alarm				
11	M0260	Insulating Sleeve (5/16 Lg.)	1	2	3	4	5	6
12	8528-30	Micro Switch	1	2	3	4	5	6
13	14960-205	Shield	1	2	3	4	5	6
14	Nut	#2-56 Hex Nut		four per actuator with alarm				
15	Screw	#2-56 x 1/2 Lg. Rd. Hd.		two per single alarm				
16		#2 Speed Nut		two per actuator with alarm				

FIGURE 16 Alarm Switch Parts

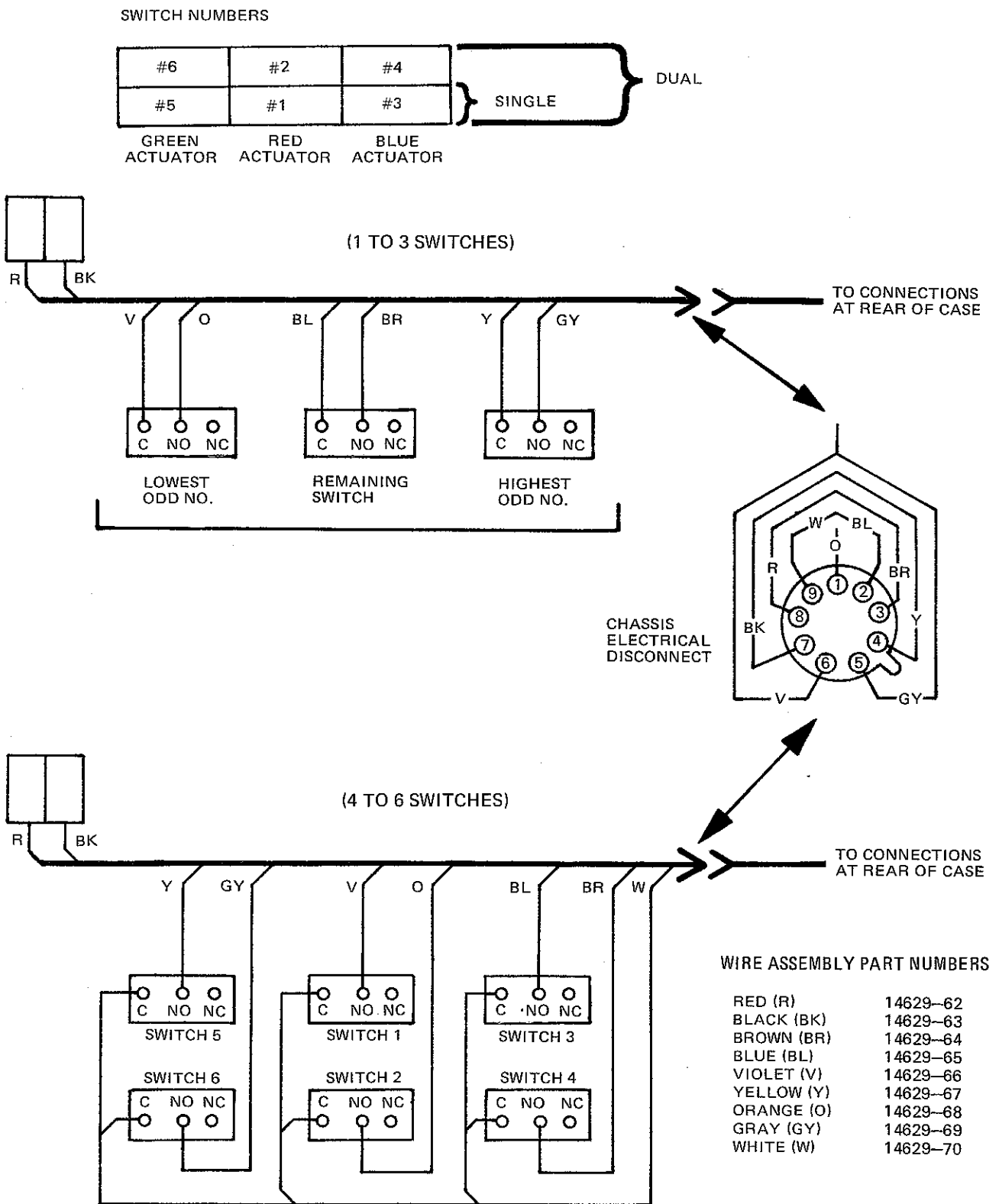
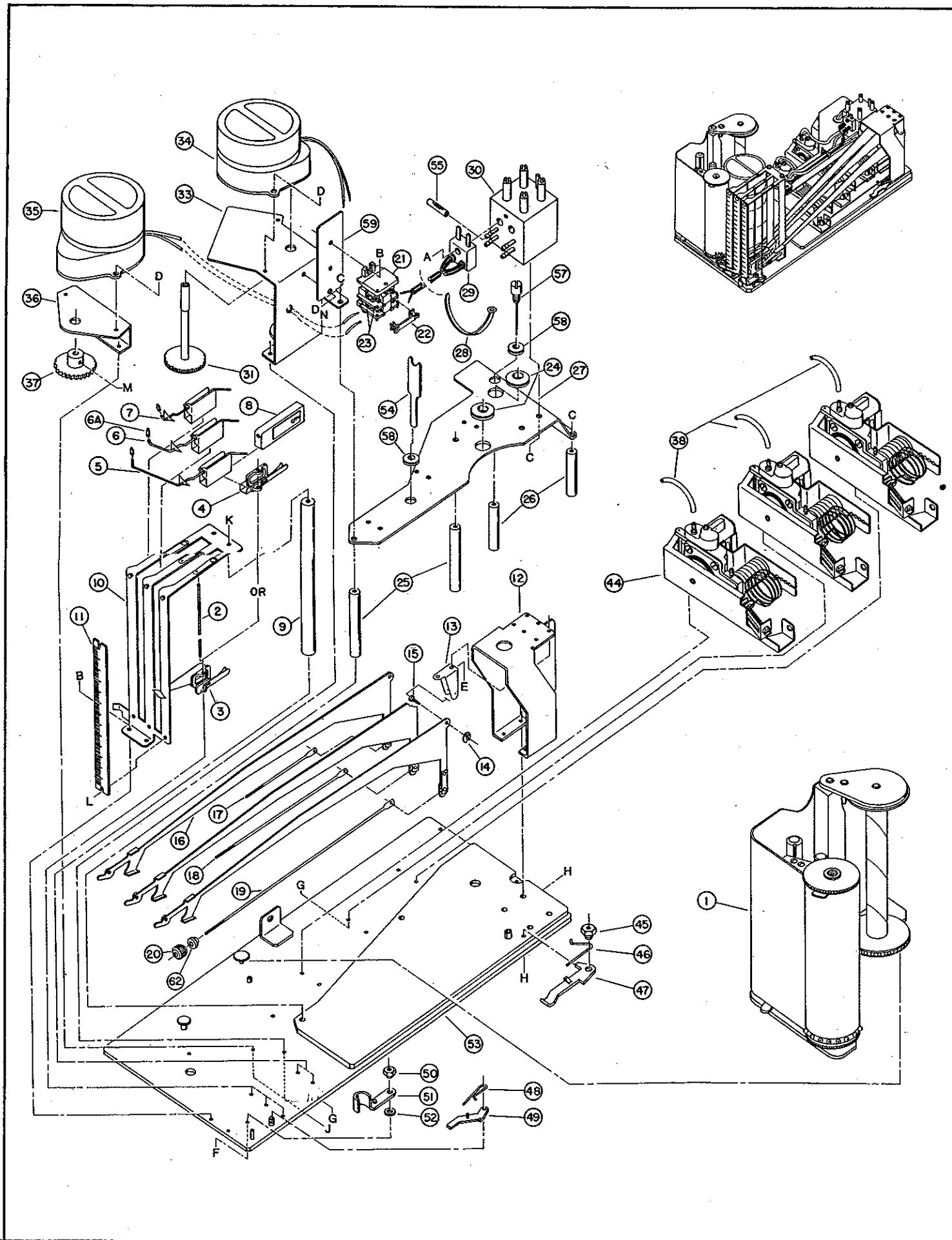


FIGURE 17 Alarm Switch Wiring Diagrams



PARTS LIST



CHASSIS ASSEMBLY 6 X 6 PNEUMATIC RECORDER

Drawing No. 20000PL

P/N

20000-1 Issue 19 1 Pen
 20000-2 Issue 19 2 Pens
 20000-3 Issue 18 3 Pens
 20000-11 Issue 19 1 Pen, 1 Ind.
 20000-21 Issue 18 2 Pens, 1 Ind.

USED ON: Model Series 5310, 5311, 5318, 5320,
 5321, 5328, 5330 and 5338

Item No.	Part No.	Description	Req'd.					Item No.	Part No.	Description	Req'd.					
			1 PEN	2 PENS	3 PENS	1 PEN, 1 IND.	2 PENS, 1 IND.				1 PEN	2 PENS	3 PENS	1 PEN, 1 IND.	2 PENS, 1 IND.	
1	14230-291	Magazine Assy. (See Spare Parts Dwg. 14230-291PL)	1	1	1	1	1	51	14230-236	Latch Lever (primary)	1	1	1	1	1	
2	14230-613	Guide Rod	1	2	3	2	3	52	14230-242	Spacer	1	1	1	1	1	
3	14230-594	Indicator	—	—	—	1	1	53	14230-587	Base Plate	1	1	1	1	1	
4	14230-593	Pen Carriage	1	2	3	1	2	*54	14187-184	Adjusting Tool	1	1	1	1	1	
5	14230-167	Pen Assy. (Green) (Incl. Item 6a)	—	—	1	—	—	55	14230-298	Barb Cap	4	2	—	2	—	
6	14230-166	Pen Assy. (Red) (Incl. Item 6a)	1	1	1	1	1	*57	1033-22	Cleaning Wire	1	1	1	1	1	
6a	14230-247	Pen Tip	1	2	3	1	2	58	4951-10	Grommet	2	2	2	2	2	
7	14230-165	Pen Assy. (Blue) (Incl. Item 6a)	—	1	1	—	1	59	14230-476	Terminal Block Mounting Bracket	1	1	1	1	1	
8a	14230-273	Ink Cartridge (Blue)	—	1	1	—	1	62	14187-229	Pivot, Drag Link	1	2	3	2	3	
8b	14230-274	Ink Cartridge (Red)	1	1	1	1	1	A	1-0321	#2-56 x 3/8 Lg. Rd. Hd. Screw	1	1	1	1	1	
8c	14230-275	Ink Cartridge (Green)	—	—	1	—	—	B	1-0535	#4-40 x 1/8 Lg. Rd. Hd. Screw	4	4	4	4	4	
8d	14230-424	Ink Cartridge (Red)	1	1	1	1	1	C	1-0630	#4-40 x 1/4 Lg. Rd. Hd. Screw	6	6	6	6	6	
8e	14230-425	Ink Cartridge (Blue)	—	1	1	—	1	D	1-0558	#4-40 x 3/16 Lg. Fill. Hd. Screw	2	4	6	4	6	
8f	14230-426	Ink Cartridge (Green)	—	—	1	—	—	F	1-0245	#2-56 x 1/4 Flat Hd. Screw	1	1	1	1	1	
9	14230-243	Support Post	2	2	2	2	2	G	1-0675	#4-40 x 5/16 Lg. Flu. Screw	8	10	12	10	12	
10	14230-612	Scale Frame	1	1	1	1	1	H	1-0716	#4-40 x 3/8 Lg. Flat Hd. Screw	5	5	5	5	5	
11	20020-Item	Scale (See Bulletin 9003) (As Specified On Order)	1	2	3	2	3	J	1-0546	#4-40 x 5/32 Lg. Flu. Screw	4	4	4	4	4	
12	14230-179	Pen Arm Bracket	1	1	1	1	1	K	1-0555	#4-40 x 3/16 Lg. Bind. Hd. Screw	2	2	2	2	2	
13	14230-178	Pen Arm Clip	1	2	3	2	3	L	1-0026	#0-80 x 1/8 Pan Hd. Screw	3	3	3	3	3	
14	7044-1	Retaining Ring	1	2	3	2	3	M	1-5327	#2-56 x 1/8 Lg. Soc. Set Screw Cup Pt.	1	1	1	1	1	
15	14230-111	Pen Arm Pivot	1	2	3	2	3	N	1-7238	#4 Lockwasher	1	1	1	1	1	
16	14230-175	Pen Arm	1	2	3	2	3									
17	14230-180	Drag Link (Blue Pen)	—	1	1	—	1									
18	14230-181	Drag Link (Red Pen)	1	1	1	1	1									
19	14230-182	Drag Link (Green Pen)	—	—	1	1	1									
20	14187-231	Adjusting Nut	1	2	3	2	3									
21	7418-136	Terminal Block End	1	1	1	1	1									
22	7418-137	Terminal Block Cover	2	2	2	2	2									
23	7418-135	Terminal Block Section	2	2	2	2	2									
24	4951-8	Grommet	2	2	2	2	2									
25	14230-213	Post	2	2	2	2	2									
26	14230-212	Post	2	2	2	2	2									
27	14230-490	Mounting Plate	1	1	1	1	1									
28	12984-1	Ty-Rap	2	2	2	2	2									
29	14230-483	Wiring Harness (Incl. Items 29a, 29b, 29c)	1	1	1	1	1									
29a	14230-296	Plug	1	1	1	1	1									
29b	14168-253	Insulating Sleeve	2	2	2	2	2									
29c		#22 AWG Wire	As Req'd.													
30	14230-215	Chassis Connection Block	1	1	1	1	1									
31	14230-486	Gear Assy.	1	1	1	1	1									
33	14230-203	Rewind Motor Bracket	1	1	1	1	1									
34	9210-34	Rewind Motor	1	1	1	1	1									
35	See Table	Timing Motor	1	1	1	1	1									
36	14230-205	Timing Motor Bracket	1	1	1	1	1									
37	14230-204	Timing Pinion	1	1	1	1	1									
38	M1165	Tubing 1/8 O.D. x 1/16 I.D.	1'	2'	3'	3'	3'									
*44	14662-	Actuator Assy. (See Parts Dwg. 14662PL)	1	2	3	2	3									
45	14230-196	Latch Pivot (secondary)	1	1	1	1	1									
46	14230-207	Latch Spring (secondary)	1	1	1	1	1									
47	14230-206	Chassis Latch (secondary)	1	1	1	1	1									
48	14230-241	Latch Spring (primary)	1	1	1	1	1									
49	14230-281	Latch (primary)	1	1	1	1	1									
50	14230-237	Latch Pivot (primary)	1	1	1	1	1									

* Recommended On-Hand Spare Parts. Always Specify Range, Serial No., or Other Nameplate Information When Ordering Spare Parts.

Chart Speeds With A 115 Volt, 60 Hz Motor

Speed	Part No.	Time Value Per Division		Chart Duration
		Major	Minor	
7/8" per hr.	9210-33	60 min.	15 min.	30 days
1-3/4" per hr.	14230-517	30 min.	7.5 min.	15 days
2-5/8" per hr.	14230-500	20 min.	5 min.	10 days
13-1/8" per hr.	14230-501	4 min.	1 min.	2 days
7/8" per min.	14230-502	1 min.	15 sec.	12 hrs.
2-5/8" per min.	14230-503	20 sec.	5 sec.	4 hrs.
5-1/4" per min.	14230-504	10 sec.	2.5 sec.	2 hrs.
13-1/8" per min.	14230-505	4 sec.	1 sec.	48 min.

PARTS LIST

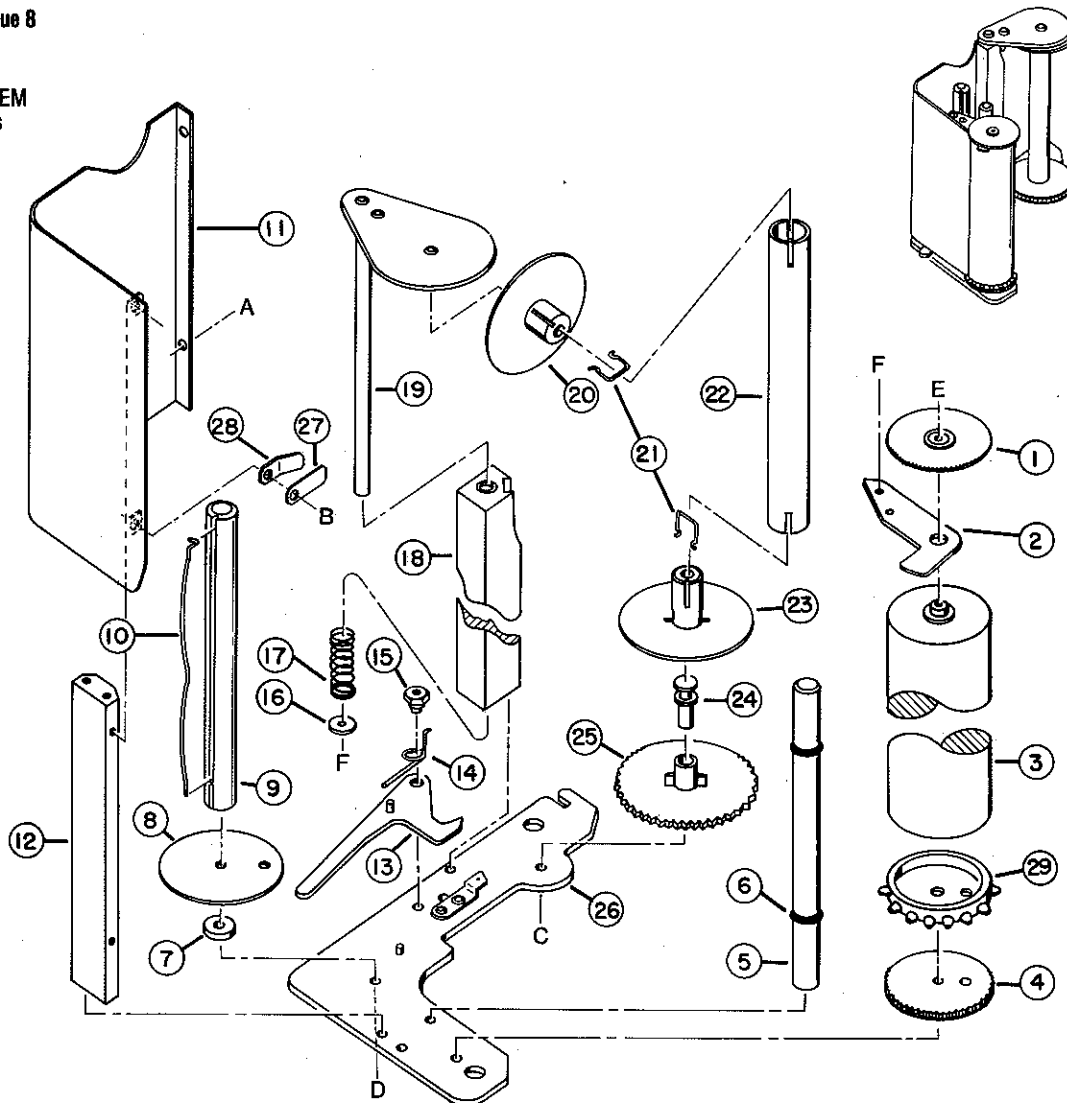


CHART MAGAZINE
(6 X 6 PNEUMATIC RECORDER)

Drawing No. 14230-291 PL

P/N 14230-291 Issue 8

USED ON:
Part No. 20000-ITEM
Recorder Chassis



Item No.	Part No.	Description	Req'd.
1	14230-190	Thumb Wheel	1
2	14230-189	Retaining Bracket	1
3	14230-272	Timing Drum Assy. (Incl. Items 4 & 29)	1
4	14230-184	Timing Gear	1
5	14230-33	Guide Post	1
* 6	2938-11	"O" Ring	2
7	14230-194	Spacer	1
8	14230-193	Disc	1
9	14230-191	Feed Rod	1
10	14230-192	Spring	1
11	14230-188	Back Up Plate	1
12	14230-187	Front Support Bar	1
13	14230-280	Latch Lever	1
14	14230-198	Latch Spring	1
15	14230-196	Latch Pivot	1
16	14230-266	Guide Washer	1
17	14230-267	Spring	1
18	14230-264	Rear Support Bar	1
19	14230-268	Spool Guide Plate	1
20	14230-260	Upper Spool Guide	1

Item No.	Part No.	Description	Req'd.
21	14230-261	Retaining Spring	2
22	10700-62	Chart Spool	1
23	14230-258	Lower Spool Guide	1
24	14230-257	Lower Spindle	1
25	14230-256	Rewind Gear	1
26	14230-199	Base Plate	1
27	14230-431	Bearing Strip	1
28	14230-348	Leaf Spring	1
29	14230-356	Sprocket	1
A	1-0535	#4-40 x 1/8 Lg. Rd. Hd. Screw	2
B	1-0572	#4-40 x 3/16 Lg. Rd. Hd. Screw	2
C	1-0608	#4-40 x 1/4 Lg. Flat Hd. Screw	7
D	1-0716	#4-40 x 3/8 Lg. Flat Hd. Screw	1
E	1-0718	#4-40 x 3/8 Lg. Flat Hd. "Loc-Well" Screw	1
F	1-0578	#4-40 x 3/16 Lg. Truss Hd. Screw	3

* Recommended On-Hand Spare Parts. Always Specify Range, Serial No., or Other Nameplate Information When Ordering Spare Parts.

PARTS LIST



PNEUMATIC ACTUATOR FOR 6 X 6 RECORDER

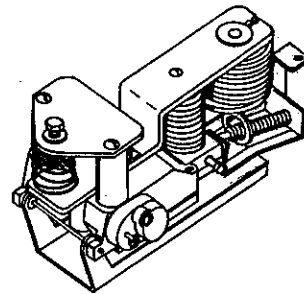
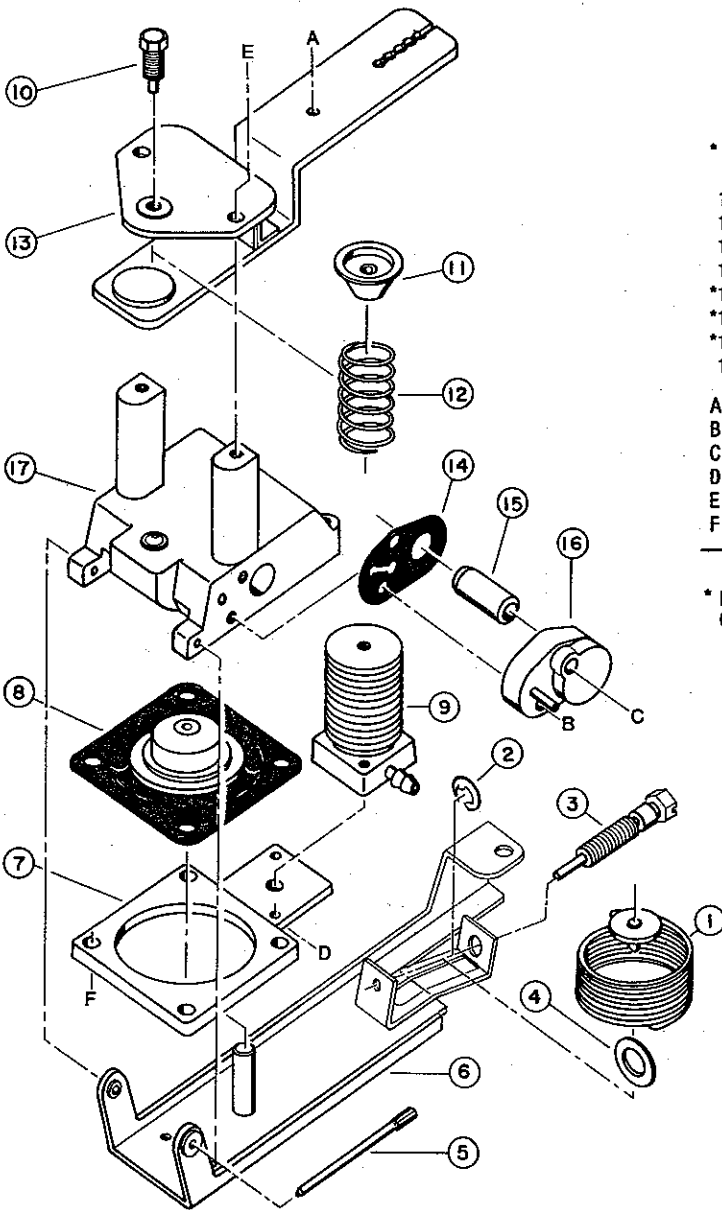
Drawing No. 14662PL

P/N 14662 Issue 4

USED ON:
Part No. 20000-ITEM
Recorder Chassis

Item No.	Part No.	Description	Req'd.
1	14187-164	Range Spring	1
2	12351-3	Retaining Ring	1
3	14151-144	Span Adjustment Screw	1
4	14187-134	Travelling Washer	1
5	14187-150	Pivot Shaft	1
6	14662-3	Motion Arm	1
7	14187-141	End Plate	1
8	14187-145	Diaphragm	1
9	14187-162	Bellows Assy.	1
10	14187-159	Actuator Adjustment Screw	1
11	14187-174	Spring Seat	1
12	14187-157	Spring	1
13	14187-156	Force Beam	1
*14	14187-172	Gasket	1
*15	14187-209	Stabilizing Restriction	1
*16	14187-171	Restriction Assy.	1
17	14187-139	Body	1
A	1-0220	#2-56 x 3/16 Lg. Rd. Hd. Screw	1
B	1-0713	#4-40 x 3/8 Lg. Fill. Hd. Screw	1
C	1-0763	#4-40 x 1/2 Lg. Fill. Hd. Screw	1
D	1-0045	#0-80 x 3/16 Lg. Flat Hd. Screw	2
E	1-0572	#4-40 x 3/16 Lg. Rd. Hd. Screw	2
F	1-0675	#4-40 x 5/16 Lg. Flu. Screw	4

* Recommended On-Hand Spare Parts. Always Specify Range, Serial No., or Other Nameplate Information When Ordering Spare Parts.





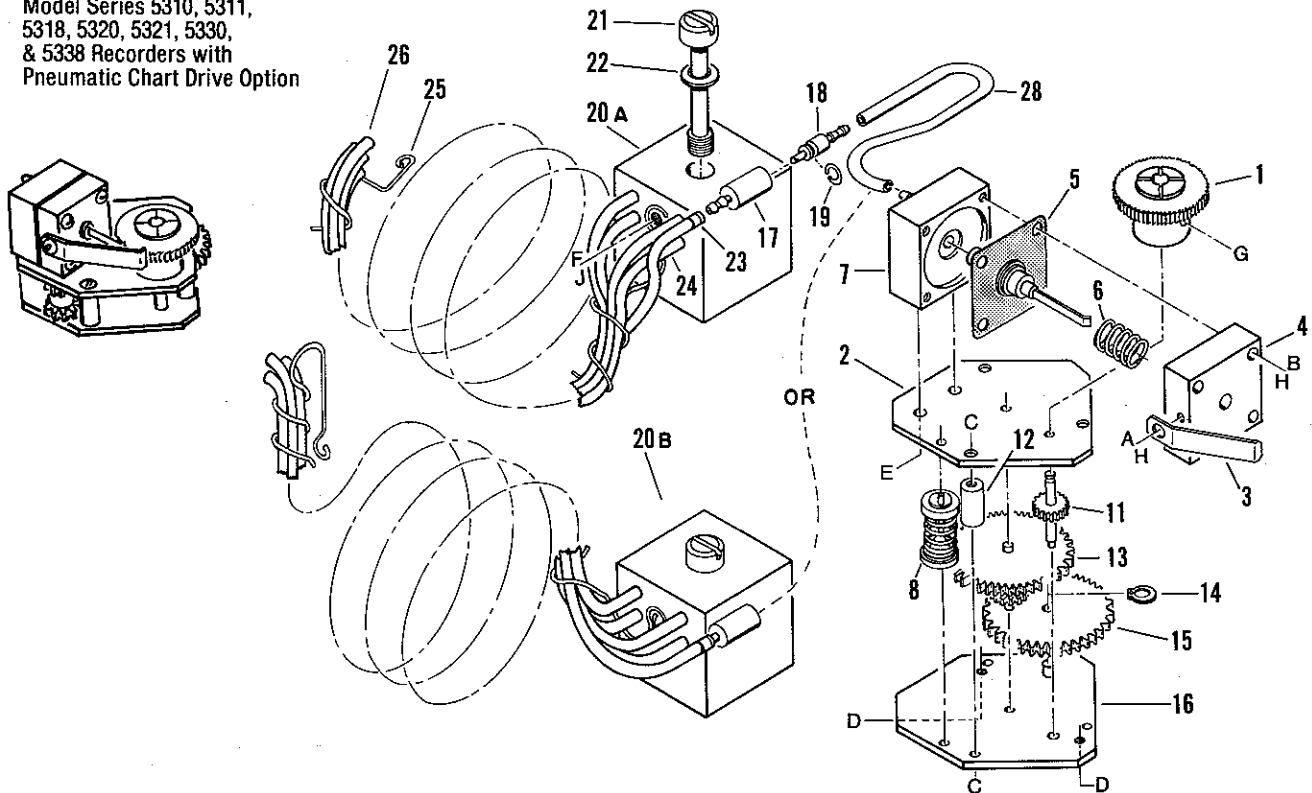
**IMPULSE MOTOR ASSEMBLY
& UMBILICAL ASSEMBLIES
6 X 6 PNEUMATIC RECORDERS**

PARTS LIST

Drawing No. 14230-470PL

IMPULSE MOTOR P/N 14230-438 Issue 7
UMBILICAL ASSY. (6 X 6 SYNCRO) P/N 14230-466 Issue 7
UMBILICAL ASSY. (6 X 6 M/P) P/N 14230-455 Issue 7

USED ON:
 Model Series 5310, 5311,
 5318, 5320, 5321, 5330,
 & 5338 Recorders with
 Pneumatic Chart Drive Option



Item No.	Part No.	Description	Req'd.	Item No.	Part No.	Description	Req'd.
1	14230-423	Ratchet Gear	1	21	14230-488	Captive Screw	1
2	14230-544	Top Mounting Plate	1	22	14230-233	Washer	1
* 3	14230-446	Pawl	1	23	9217-4	Wire Marker 4	2
4	14960-134	Impulse Drive Assy. (Incl. Items 3, 4a, 5, 6 & 7)	1	24	14570-0480	Tubing	5
4a	14230-439	Top Housing	1	25	10752-368	Spring Retractor	1
* 5	14230-445	Diaphragm Assembly	1	26a	9217-1	Wire Marker 1 (Not Shown)	1
* 6	14230-429	Spring	1	26b	9217-2	Wire Marker 2 (Not Shown)	1
7	14230-453	Bottom Housing	1	26c	9217-3	Wire Marker 3 (Not Shown)	1
8	14230-492	Rewind Assy.	1	26d	14188-19	Wire Marker S (Not Shown)	1
11	14230-412	Ratchet Shaft	1	28	M1165	Tubing 1/8 O.D. x 7-1/2 Lg.	1
12	14230-407	Stand Off	3	A	1-0535	#4-40 x 1/8 Lg. Rd. Hd. Screw	1
13	14230-415	Idler Shaft	1	B	1-0798	#4-40 x 5/8 Lg. Rd. Hd. Screw	4
14	14632-1	Grip Ring	1	C	1-0245	#2-56 x 1/4 Lg. Flat Hd. Screw	6
15	14230-184	Timing Gear	1	D	1-0561	#4-40 x 3/16 Lg. Flu. Screw	2
16	14230-546	Bottom Mounting Plate	1	E	1-0675	#4-40 x 5/16 Lg. Flu. Screw	2
17a	14480-183	Tubing Disconnect Assy. (Incl. Items 17b, 18, 19)	1	F	1-0650	#4-40 x 1/4 Lg. Truss Hd. Screw	1
17b	14480-183	Socket	1	G	1-5390	#4-40 x 3/16 Lg. Cone Pt. Soc. Set Screw	1
18	14480-184	Barb (Incl. Item 19)	1	H	1-7238	#4 Lockwasher	5
* 19	14480-182	Spring Lock	1	J	1-7236	#4 Int. Tooth Lockwasher	1
20a	14230-455	Umbilical Assy. (R.H. Wound Incl. 17b, 20c, 21, 22, 23, 24, 25 & 26)	1				
20b	14230-466	Umbilical Assy. (L.H. Wound Incl. 17b, 20c, 21, 22, 23, 24, 25 & 26)	1				
20c	14230-217	Top Connecting Block	1				

* Recommended On-Hand Spare Parts. Always Specify Range, Serial No., or Other Nameplate Information When Ordering Spare Parts.