

OPERATION AND MAINTENANCE MANUAL

HELICORDER®, MODEL RV-301B

990-38700-9800

TELEDYNE GEOTECH
3401 Shiloh Road
Garland, Texas

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1. INTRODUCTION

The Helicorder, Model RV-301B, is a drum recorder for producing traces of analog data on a sheet of heat-sensitive paper. The trace is a helix that translates with each turn of the drum. A variety of chart speeds and leads can be chosen, permitting as much as 72 hours of continuous data to be recorded on a single sheet of paper. As many as three pen motors can be installed in the unit. The Helicorder can be either rack mounted or installed in a carrying case for field use. Modification kits are available for installing additional channels in single- and dual-channel units. Also, the unit can be supplied with ink writing pens for use on paper.

A photograph of the RV-301B is shown in figure 1-1.

A Helicorder Amplifier, Model AR-320, is designed for use as a companion unit for each recording channel. It provides a high-impedance input with adjustable voltage gain and a timing input.

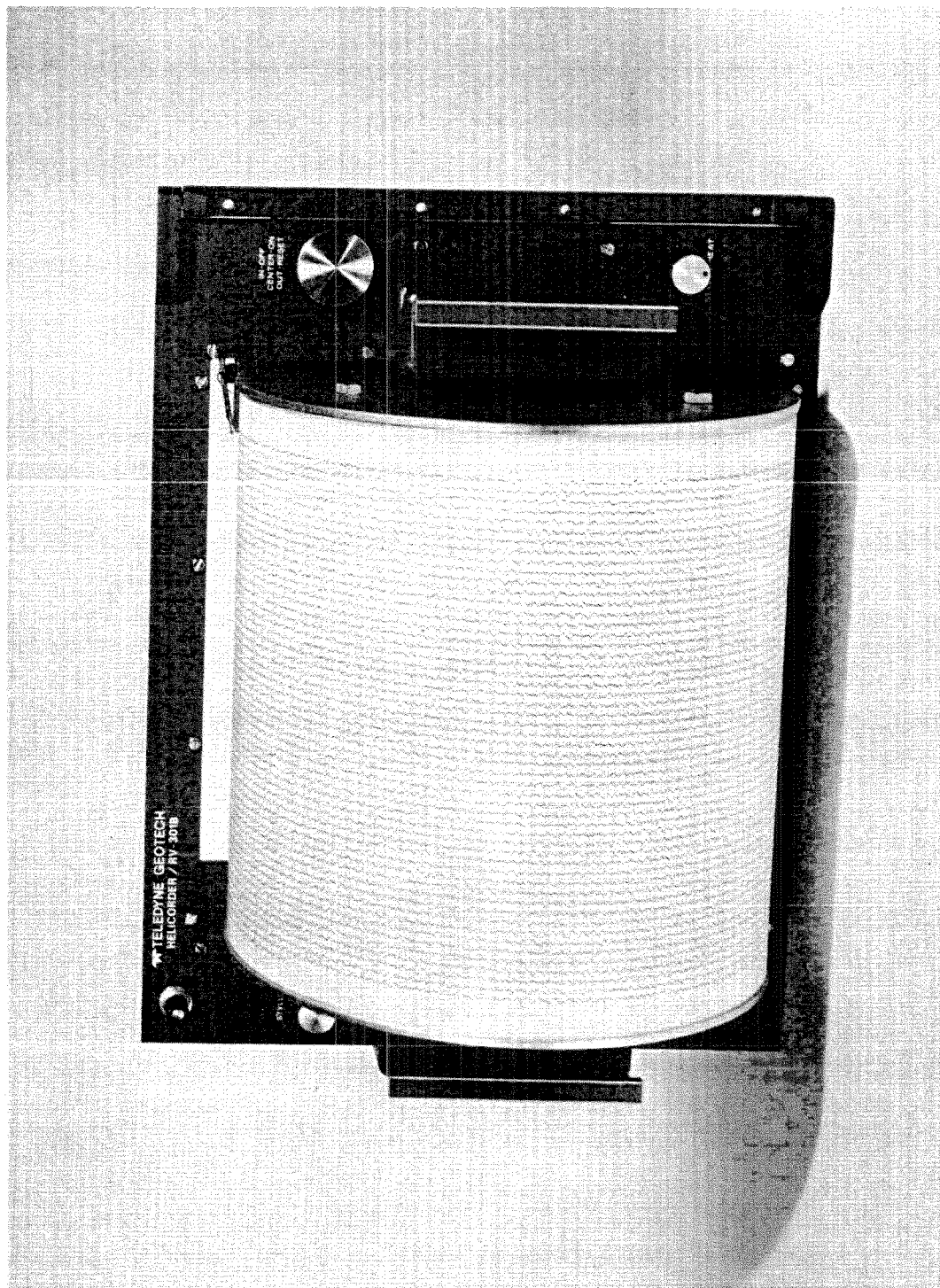


FIGURE 1-1. HELICORDER/RV-301B

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2. DESCRIPTION

2.1 General

The Helicorder, Model RV-301B, is a basic unit. It may be supplied with 1, 2, or 3 recording channels. Differences between the modifications and the basic unit will be indicated as they occur in the manual.

2.2 SPECIFICATIONS

2.2.1 Technical Characteristics

Number of pen motors	Up to 3, rectilinear (curvilinear optional)
Coil resistance	10 Ω nominal
Maximum deflection	50 mm (1.970 in.) p-p, rectilinear pen 100 mm (3.940 in.) p-p, curvilinear pen
Stylus recording radius (curvilinear option)	190 mm (7.5 in.)
Line Width	0.127 mm (0.005 in.) average
Stylus heat voltage	Approximately 0.25 V (depends on stylus temperature)
Linearity	The p-p straight line pen excursion related to input signal voltage is linear to within 2% (pen motion is rectilinear, curvilinear with option)
Frequency response	Flat within \pm 1dB from dc to 30 Hz at 50 mm p-p pen deflection; down 2 dB at 35 Hz, when used with the Model AR-320 amplifier
Maximum sensitivity	2 mV/mm when used with the Model AR-320 amplifier
Recording medium	Heat-sensitive paper, 965 mm x 300 mm (38 in. x 11.89 in.), Geotech #3790; heat sensitive paper, direct copying, 965 mm x 300 mm (38 in. x 11.89 in.), Geotech #9817

DRUM ROTATION (1 REV = 900 MM)							
90	60	30	15	10	MINUTES/REVOLUTION		
10	15	30 *	60	90	MILLIMETERS/MINUTE		
45	30	15	7.5	5	8 hours	4 hours	160 mins.
30	20	10	5	3.3	12 hours	6 hours	4 hours
15	10	5 *	2.5	1.7	24 hours *	12 hours	8 hours
7.5	5	2.5	1.3	.8	48 hours	24 hours	16 hours
5	3.3	1.7	.8	.6	72 hours	36 hours	24 hours
PEN CARRIAGE MOTION (Trace Separation) MILLIMETERS/REVOLUTION					1 Pen	2 Pens	3 Pens
					RECORD DURATION		

*The indicated combination is; at 30 mm/min chart speed, and 5 mm trace separation, the record duration for a one-pen recorder is 24 hours. See figure 4-3 for the required gears.

2.2.2 Power Requirements

Power input

Frequency regulated power	7.5 W @ 115/230 V, 50 or 60 Hz
Commercial power	4.5 W @ 115/230 V, 50 or 60 Hz for single-channel version; add 2 W/additional channel

2.2.3 Dimensions

The Helicorder is built to mount in a standard 19 in. rack. Its panel is 355 mm (14 in.) high x 483 mm (19 in.) wide and extends 280 mm (11 in.) behind the panel. The drum protrudes forward 170 mm (6.687 in.) from the front panel.

2.2.4 Weight and Volume

Net	13.6 kg (30 lb)
Packaged for shipment	43.1 kg (95 lb) 0.24 ³ (3.7 cu ft)

3. INSTALLATION

3.1 UNPACKING

The Helicorder is shipped in a reusable container. Lift the Helicorder by its handles when unpacking.

3.2 INSPECTION

3.2.1 Check the component parts

Check the component parts unpacked against the packing list.

3.2.2 Report any discrepancies

Report any discrepancies to Teledyne Geotech, 3401 Shiloh Road, Garland, Texas 75041.

3.2.3 Visually inspect the Helicorder

Visually inspect the Helicorder. Note any damage incurred during shipment, and record for use in preparing a claim against the carrier. Note that the pen motor units are shipped disassembled from the recorder and are located in the top of the shipping crate.

3.3 MOUNTING

3.3.1 General

3.3.1.1 The Helicorder will mount in a standard 19-inch rack or may be supplied mounted in a carrying case for portable use.

3.3.1.2 The Helicorder is mounted by a hinge, which allows it to be swung out of the rack or carrying case to gain access to the change gears, pen-pressure control, and pen-heat controls.

3.3.1.3 It is recommended that, when mounting the unit in a rack, the bottom of the panel be placed from 32 to 36 inches above the floor. This places the drum and controls in the most convenient position for the average operator.

3.3.2 Mounting

In the upper left corner of the Helicorder front panel, there is an adjustable pawl fastener. Turn the knob of the fastener to position the pawl so it will clear the rack flanges. Place the Helicorder in the rack and secure the hinge bar to the right side of the rack. Check to see that the Helicorder swings free and opens far enough to provide adequate access to the change gears, etc. located on the right side of the recorder.

4. OPERATION

4.1 CONTROLS AND INDICATORS

4.1.1 Stylus - Lift Control and Pressure Adjust

This control (STYLUS LIFT) is the knob located on the upper left of the front panel and is locked for shipment. To unlock, turn the knob counterclockwise several turns until it can be pulled out from the panel approximately 3/4 inch. This action raises the pen to its full up position. Lower the pen by pushing in and rotating the knob one-fourth to one-half turn so that it catches and cannot be pulled out. With a properly adjusted stylus (see section 4.2.3), the STYLUS LIFT knob can now be used as a fine pen pressure adjustment by rotating it clockwise to increase pressure and counterclockwise to reduce pressure.

NOTE

Always put the stylus in the full up position when manually changing its position as in a carriage reset operation. Failure to do so could result in damaging the end-of-travel limit-switch operation, or the lead cable assembly.

4.1.2 Carriage Reset Control - Power Switch

This control (IN-OFF, CENTER-ON, OUT-RESET) is located on the upper right of the front panel. There are three positions along the axis of this control that affect the power switch and the lead-reset clutch. When the control is pushed all the way in, the power is off. In the center position, power is on and the lead clutch is engaged. When the control is all the way out, the power is off and the reset clutch is engaged in preparation for resetting the pen motor carriage. When the carriage is at the extreme right of its travel and the STYLUS LIFT control is in the stylus down position, the carriage is locked and may not be moved. To unlock the carriage, lift the stylus by pulling out the STYLUS LIFT control. The carriage may now be reset by pulling the carriage reset-power switch control all the way out and turning the control counterclockwise. This will move the carriage to the left. Clockwise rotation of the control will move the carriage to the right. Before transporting the instrument, always lock the STYLUS LIFT control; move the carriage all the way to the right to lock it; and push the reset control all the way in.

4.1.3 Stylus Temperature Control

The main stylus temperature control (STYLUS HEAT) is located in the lower right of the front panel. This control is adjusted to produce the desired trace width. See Section 4.2.3 for the recommended adjustment procedure. A range control (PEN HEAT) is located on the rear panel of the Helicorder and

is used to set the operating range of the main control. The range control is a locking shaft type with a slotted shaft for screwdriver adjustment. On multichannel versions of the Helicorder, there is a range control on the rear panel for each stylus. See section 4.2.2 for the recommended adjustment procedure.

4.1.4 Stylus Pressure Adjust Screw

This screw is located directly behind the pen-motor shaft on the pen-motor bracket (figure 4-1, item 5). Clockwise rotation increases the pressure of the stylus on the paper. Counterclockwise rotation decreases the pressure. See section 4.2.3 for the recommended adjustment procedure.

4.1.5 Paper Pull-down Assembly

The paper release levers are located on each end of the drum and extend from under the paper pull-down wheels. When viewing the right lever from the right side of the drum or the left lever from the left side of the drum, counterclockwise rotation of the levers will allow the paper pull-down rollers to clamp a piece of paper between them. Clockwise rotation of the levers separates the rollers, releasing the paper.

4.1.6 Paper Pull-down Wheels

One of these knurled wheels is located on each end of the drum near the slot and extends slightly beyond the body of the drum to permit easy turning. Each wheel is connected to one of the rollers in the paper pull-down mechanism and, because these rollers contact each other, normally turn simultaneously in opposite directions. When viewing the right wheel from the right side of the drum or when viewing the left wheel from the left side of the drum, turning either wheel clockwise causes paper to be pulled into the slot in the drum. Reversing the direction of rotation of the wheels will move the paper out of the slot.

4.1.7 Speed-change Gears

The rates with which the drum rotates and the pen motor leads are controlled by separate pairs of change gears. These gears, mounted on their respective shafts as they operate in the Helicorder, are shown in figure 4-2. The upper two (item 9) are the lead change gears; the lower two (item 8) are the drum speed-change gears. Additional gears of different sizes are supplied to provide a variety of drum speeds and leads. These gears are mounted on shafts that extend from the left side of the Helicorder and are accessible when the instrument is swung out of the rack or carrying case. A change-gear chart, fastened to the top of the Helicorder, shows the positions in which the change gears can be installed to provide the drum speeds and leads specified in paragraph 2.2. This chart is also shown in figure 4-3.

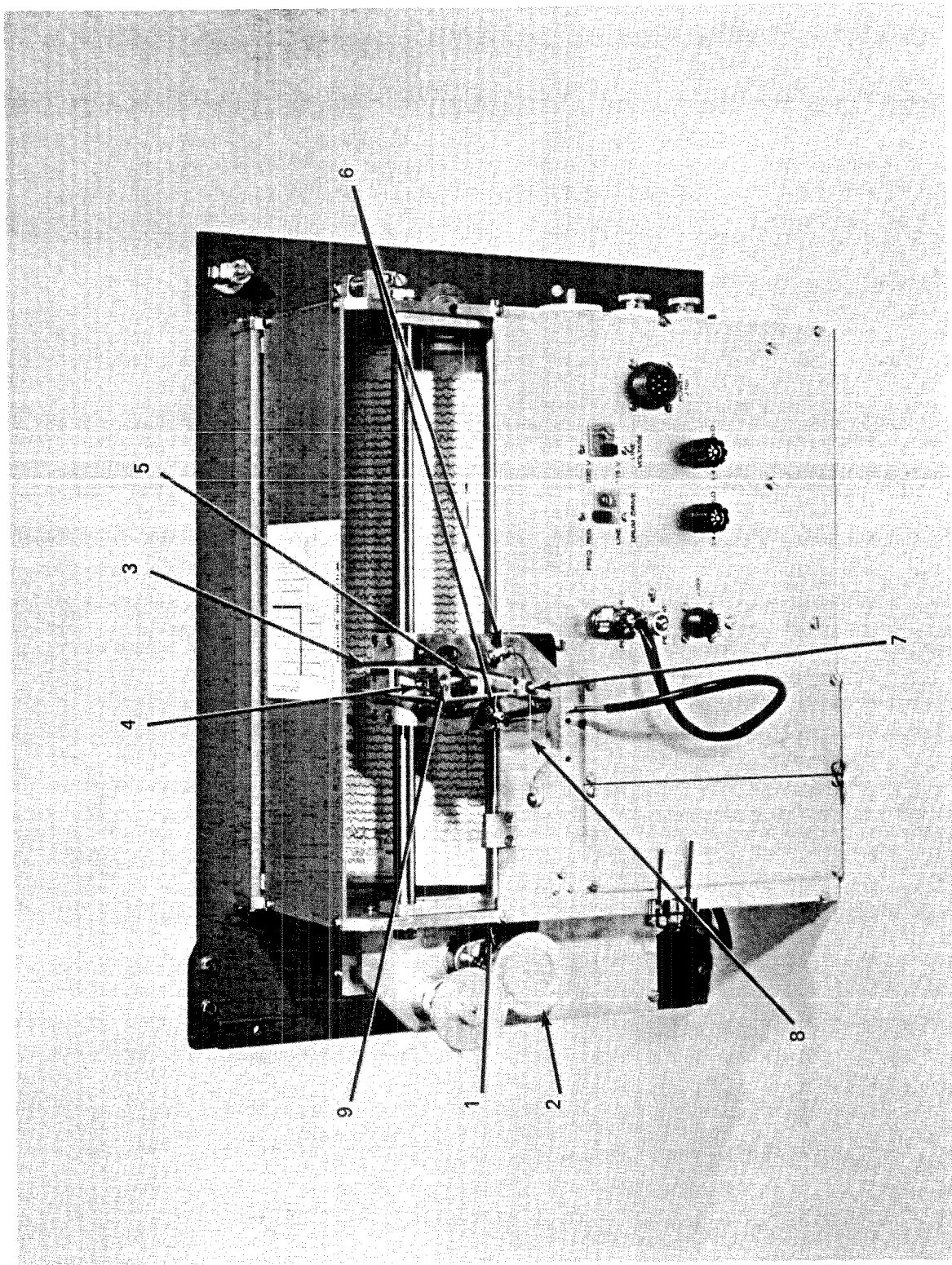
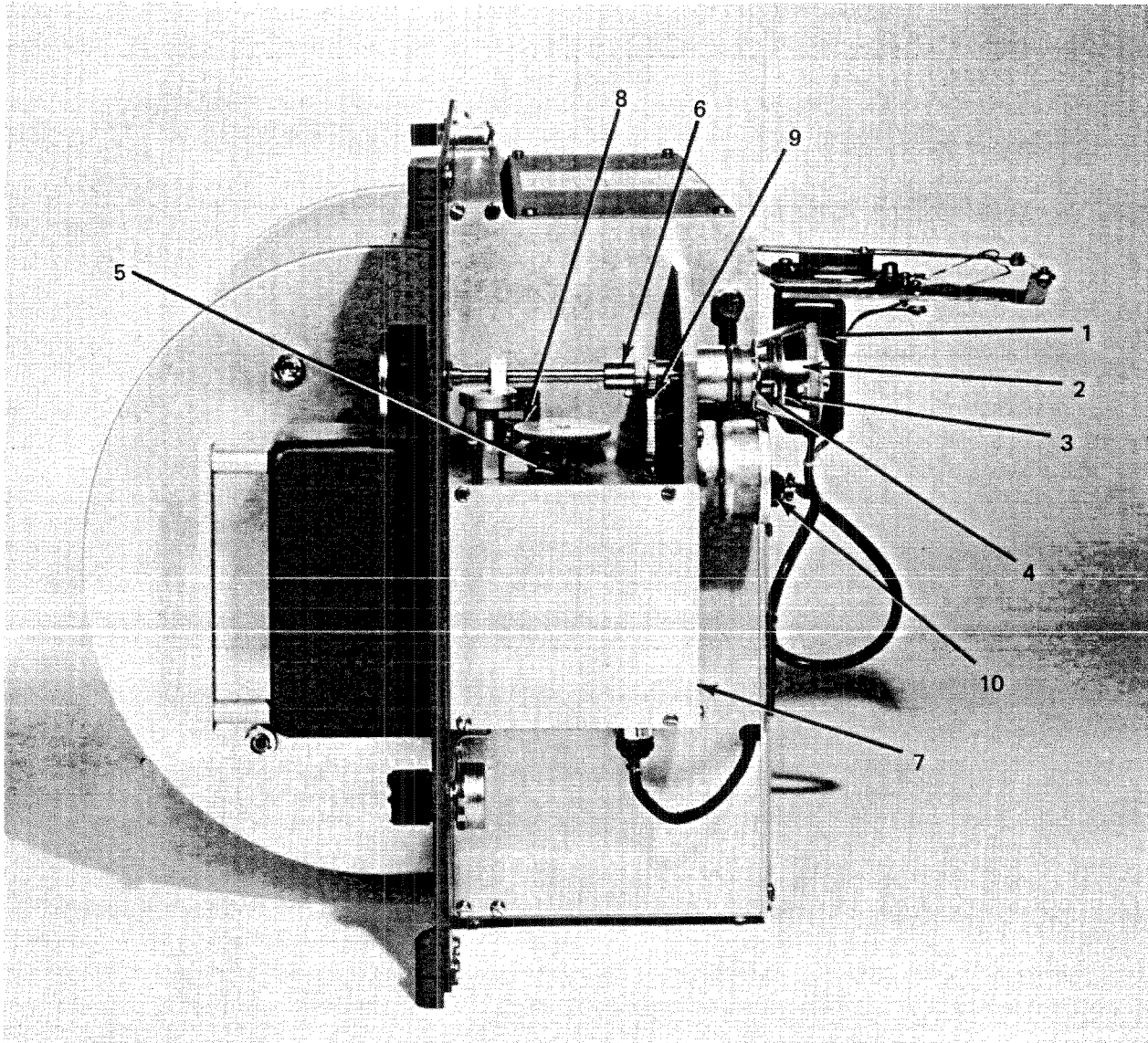


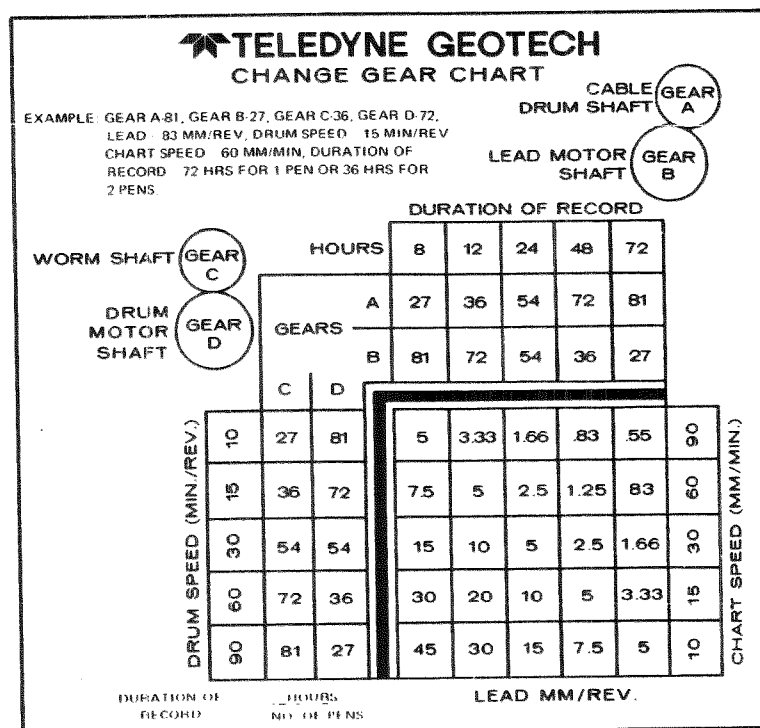
FIGURE 4-1. HELICORDER/RV-301B, REAR VIEW

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FIGURE 4-2. HELICORDER/RV-301B, END VIEW



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FIGURE 4-3. REVISED PHOTO OF GEAR CHANGE CHART

4.2 SETUP PROCEDURES

4.2.1 Loading Paper Onto Drum

Recording is done on the whiter side of the paper, which is heat sensitive and should face away from the drum. Paper ends are inserted into a slot in the drum and are held by the paper pull-down mechanism that consists of two rubber-covered paper-holding rollers, their associated turning wheels, and a roller-lift lever. Proceed as follows to load the drum:

- a. Rotate the STYLUS LIFT counterclockwise until free, and pull control to raise the stylus.
- b. Insert one end of the paper into the slot until it is in contact with the rollers. Turn one of the paper pull-down wheels to pull the paper in about 1/2 inch.
- c. Rotate the drum, wrapping the paper around it.
- d. Insert the other end of the paper into the slot, and turn the rollers to tighten the paper about the drum. The paper will usually tighten on one end of the drum and remain loose on the other end. If this is the case, operate the paper release on the end of the drum where the paper is tight. This will separate the rollers on that end while leaving them in contact with the paper on the other end. Turn the rollers to pull the paper down on the loose end. Operate the release lever to bring the rollers in contact with the paper again, and rotate the rollers to bring the paper smoothly about the drum.

4.2.2 Range Control Adjustment

CAUTION

This procedure, if not carefully followed, can result in melting the pen tip solder joints which will destroy the pen. Also, this procedure need not be performed unless a new pen or pen power supply has been installed.

- a. Turn off the Helicorder power.
- b. Turn the main stylus temperature control (STYLUS HEAT) to its maximum position (full clockwise).
- c. Turn the range control (PEN HEAT) located on the power supply panel to its minimum position (full counterclockwise). On multi-pen versions, do this to all range controls.
- d. Turn on the Helicorder power.
- e. With the pen raised off the paper, adjust the range control clockwise until the pen tip just starts to glow red and then quickly back off

counterclockwise until the glow disappears. On multi-pen versions, do this to all range controls.

f. Set the STYLUS HEAT control to minimum stylus temperature by turning it to its full counterclockwise position.

g. Lower the stylus onto the paper with the STYLUS LIFT control, and rotate the STYLUS LIFT control approximately one-fourth turn clockwise or until control catches and cannot be pulled out.

h. Turn the stylus pressure-adjust screw (item 5, figure 4-1) until the stylus tip just touches the surface of the paper. On multi-pen versions, do this to all pressure adjust screws.

i. Apply sinusoidal signal large enough to produce a deflection of approximately 2 inches peak-to-peak. On multi-pen versions, apply the signal to all inputs at the same time.

j. Slowly turn the STYLUS HEAT control clockwise until stylus writes over the full range of the pen swing.

k. Adjust stylus pressure with STYLUS LIFT control and temperature with PEN HEAT control, choosing a compromise combination that gives the best line over the full pen swing. The minimum stylus pressure required to produce a good line should be used at all times. Do this to all pens of multi-pen versions.

l. Lock the range control(s) by tightening the lock-nut on the control shaft(s).

4.2.3 Trace Adjustment

Line width and darkness of trace depend on both stylus pressure and temperature. An increase in pressure, temperature, or both serves to widen and to darken the line. In addition, stylus pressure affects the frequency response characteristics of the Helicorder. Excessive pressure causes the stylus to dig into the paper, increasing stylus drag and reducing high-frequency response. The best compromise adjustments are realized when a light pressure and a moderate temperature are used.

To set the stylus temperature and pressure correctly for both rectilinear and curvilinear versions, proceed as follows:

- a. Start with the power off (carriage reset control all the way in).
- b. Load paper on drum, following procedures in section 4.2.1.
- c. Set the stylus temperature control to minimum stylus temperature by turning it to its maximum counterclockwise position.
- d. Turn power on (carriage reset control in mid-position).

e. Lower the stylus onto the paper with the STYLUS LIFT control, and rotate approximately one-fourth turn or until control catches and cannot be pulled out.

f. Turn the stylus pressure-adjust screw (item 5, figure 4-1) until the stylus tip just touches the surface of the paper. This adjustment is a coarse adjustment and should only be required at initial installation or after stylus replacement.

g. Apply sinusoidal signal large enough to produce a deflection of approximately 2 inches peak-to-peak.

h. Slowly turn the stylus temperature control clockwise until stylus writes.

i. Remove sinusoidal test signal and apply typical signal.

j. Adjust stylus pressure with STYLUS LIFT control and temperature with STYLUS HEAT control, choosing a compromise combination that gives best line for the type of signal being recorded. The minimum stylus pressure required to produce a good line should be used at all times.

k. On multiple-channel instruments, adjust the stylus pressure, adjust screws for equal light pressure, and adjust the individual range controls for equal line width. Then, adjust the stylus temperature control.

CAUTION

Excessive stylus pressure will sometimes cause the stylus tip to hang in the paper hold-down slot and be damaged. Stylus pressure should never be used to damp out high-frequencies.

4.2.4 Ink Writing Pen Adjustment

a. Install the pen arm and ink pen assembly with the hardware supplied. Figure 4-4 is a photograph of a single ink writing pen installation.

b. Align pen arm and pen assembly so that the pen tip, pen motor shaft, drive arm screw and guide wire clamp screw are all in line. Twist pen if necessary to make it perpendicular to the drum surface. The pen extension should be .031 above the drum when the pen tip is in contact with its surface. This relationship permits the pen to cross the drum slot in either direction without damage.

c. Install paper on drum.

d. Install ink system and connect to pen assembly. Make sure gasket is in place then screw ink bottle firmly into adapter cap. (Caution: Do not squeeze bottle.) Vent tube on adapter cap must point up. Make sure bottle is installed in mounting clip in such a manner that it will clear adjacent recorder components as the carriage is traversed.

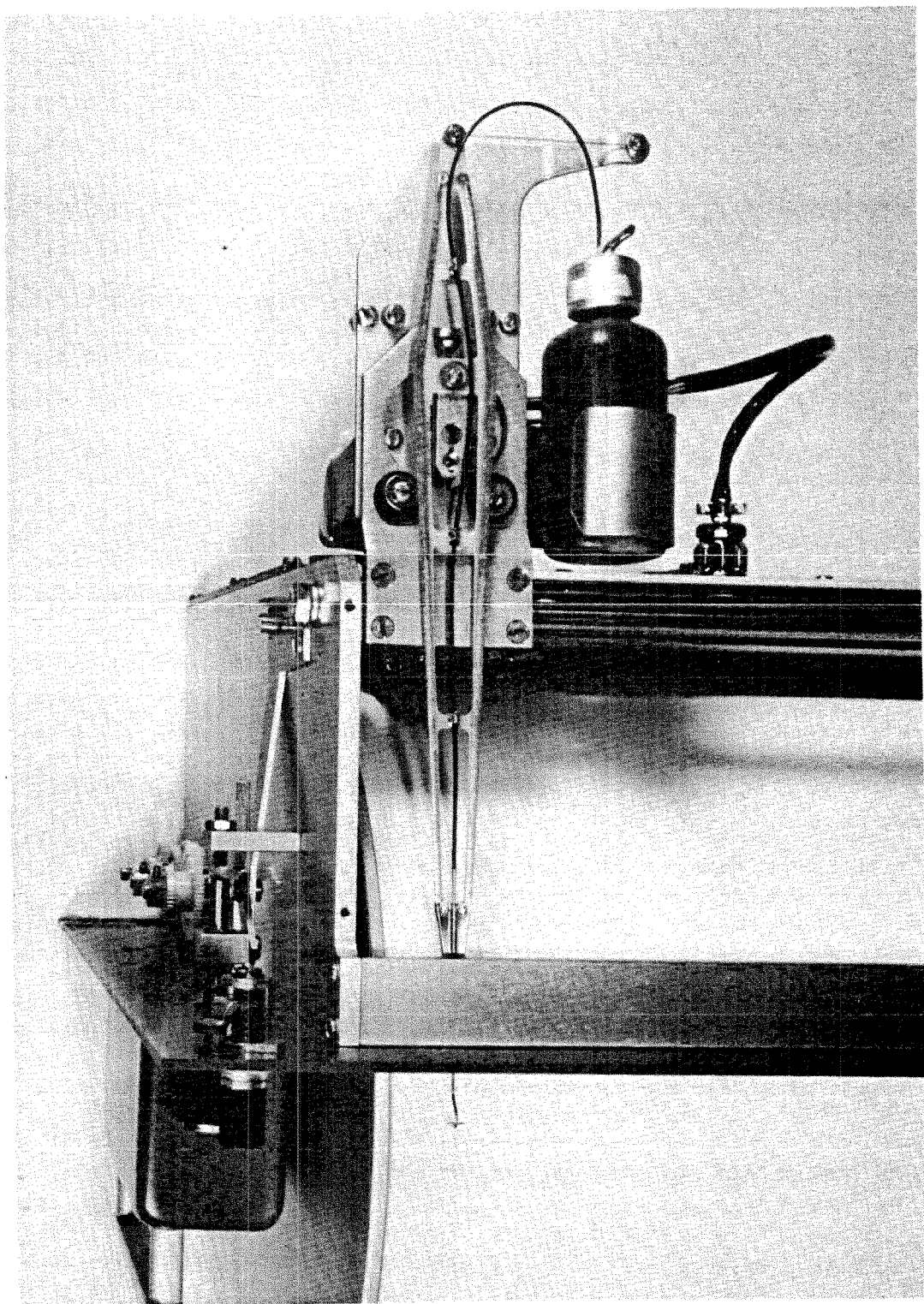


Figure 4-4. INK PEN INSTALLATION VIEW

e. Raise pen tip, place kleenex, paper towel, rag or other similar absorbent material under the tip. Place finger over vent tube and squeeze ink bottle gently to charge system with ink, then remove blotter material. If necessary, slide extra plastic tube included in ink kit over pen tip and using syringe pull the ink through the pen to charge it. (Always flush syringe with water after use.)

f. Start recorder drum rotating and lower pen tip to paper. Pen should write a line .007-.010 in. wide. (Note: Pen will write a broad line for a short time after pressurizing vent tube.) If pen fails to write, or writes too wide, lapping of the tip may be required. Place the piece of 600 grit lapping tape under the tip and lap by moving the pen tip back and forth approximately 1 in. p-p for 8-10 strokes. Flush pen tip, as described in 4.6. Pen should write smoothly now. Avoid excessive lapping of the tip as it severely reduces pen tip life.

4.3 NORMAL OPERATION

After the Helicorder has been installed as described in section 3 and after the adjustments described in section 4.2 have been made, the unit is ready for normal operation. For normal operation, proceed as follows:

- a. Load paper on drum as in paragraph 4.2.2.
- b. Lift the stylus and move it to extreme left of paper, using the carriage reset control (pulled all the way out).
- c. Lower stylus tip onto the paper with the STYLUS LIFT control and rotate approximately one-fourth turn.
- d. Turn on power (carriage reset control in center position), and adjust stylus pressure if required.

5. MAINTENANCE

5.1 GENERAL

Maintenance of the Helicorder follows the general procedures used with laboratory-type electro-mechanical instruments. It is recommended that only persons experienced in the use of such instruments be allowed to perform servicing operations.

5.2 INSPECTION

To assure optimum performance at all times, the Helicorder should be inspected at regular intervals. Inspect recordings for changes in recording quality. Insufficient lubrication, broken electrical connections, and loose or worn mechanical components will be indicated by irregularities or breaks in the recorded trace.

5.3 ADJUSTMENTS AND REPLACEMENTS

NOTE

All power should be removed from the unit for the following adjustments and replacements.

5.3.1 Lead and Reset Clutch Adjustment

5.3.1.1 The primary components of the lead and reset clutch are shown in figure 4-2. When this clutch is properly adjusted, items 2 and 3 will not move relative to each other while the Helicorder is operating normally, but will slip if the pen motor jams in one position or if undue forces are applied to the pen motor or the cable-drive mechanism.

5.3.1.2 When the clutch requires adjustment, proceed as follows:

a. Test for proper adjustment by removing lead change gears, figure 4-2, and pushing the pen motor toward the right as viewed from the back of the Helicorder. Apply force to the point at which the cable is fastened to the carriage assembly. The clutch pressure is properly adjusted when a force of 3 to 3-1/2 lb causes the clutch to slip.

b. To adjust the clutch, move the carriage reset control to CENTER-ON position. Loosen the right setscrew on the coupler (item 6, figure 4-2) and remove the outer cone (item 1). Loosen the setscrew on the inner cone (item 3) and adjust to clear screw heads that attach clutch fingers (item 4) by approximately .012 in. Reinstall outer cone and tighten the right screw on the coupler. Loosen the left setscrew on the coupler, and adjust the outer cone until the end of the clutch fingers line up with the outside edge of the clutch band on the outer cone. The clutch band on the outer cone should not drag on the clutch fingers.

When the clutch is properly adjusted, it will slip as in paragraph a. when the carriage reset control is in the CENTER-ON or IN-OFF position. When this control is in OUT-RESET position, the outer cone will engage the clutch fingers, spreading them enough to disengage them from the inner cone. The clutch fingers will grasp the outer cone, such that it does not slip when the carriage reset control is rotated in either direction, to move the carriage manually.

5.3.2 Drum Motor Replacement

To replace a drum motor (item 5, figure 4-2), proceed as follows:

- a. Remove the side plate (item 7, figure 4-2).
- b. Remove the three wire nuts that retain the motor leads.
- c. Remove the gear from the motor shaft.
- d. Remove the screw that holds the capacitor in place, and pull the capacitor out of the cavity in which it is mounted. Let it hang by the wires fastened to it.
- e. Remove the two nuts that retain the motor. Remove the motor down and out of the cavity.
- f. Install the new motor by reversing the above procedure. Refer to the schematic (figure 6-1 at end of manual) for wiring the motor leads in the circuit.
- g. Replace the gear on the motor and loosen the nuts that retain the motor. Tap the motor lightly to adjust the backlash in the gears to a minimum (without binding the gears) and tighten the nuts.

5.3.3 Lead Motor Replacement

To replace a defective lead motor (item 10, figure 4-2), proceed according to the following instructions:

- a. Remove the side plate (item 7, figure 4-2), and remove the two wire nuts that retain the motor leads.
- b. Remove the gear from the lead-motor shaft.
- c. Remove the two screws (item 1, figure 4-1) that retain the lead motor (item 2, figure 4-1), and remove the motor.
- d. Install a new lead motor, and connect the motor wires to the connector according to the schematic (figure 6-1). Leave the lead-motor screws loose.
- e. Install the gear on the motor shaft, and adjust the motor for minimum backlash (without binding the gears). Tighten the motor retaining screws.

5.3.4 Pen Motor Replacement

To replace a defective pen motor, proceed as follows:

- a. Disconnect the pen motor cable connector from the power supply. (A schematic diagram of the power supply is shown in figure 6-2 at end of manual.)
- b. Remove the stylus (item 3, figure 4-1) and stylus arm or clamp (item 4, figure 4-1) from the pen motor shaft.
- c. Remove the four pan head screws that mount the pen motor to the carriage assembly, and unsolder the two wires from the terminal lugs beneath the carriage.
- d. Install the new pen motor, reversing the above procedure.

5.3.5 Adjustment for Parallel Pen Traverse Across Drum (reference figure 4-1)

- a. Disconnect the pen motor cable and power supply input cable (at J104 and J102).
- b. Remove the six screws holding the back panel and then set the power supply aside.
- c. Rotate the STYLUS LIFT knob fully clockwise.
- d. There are two parallel carriage rods held in alignment by brackets at each end. Each bracket has two 10-32 setscrews in the lower end and bottom of the bracket. Tighten the setscrews in the right-hand bracket (facing back of instrument) and leave intact.
- e. Loosen the setscrews in the left-hand bracket, but do not remove them.
- f. Using the adjusting screw on the pen motor, raise the pen off the drum about 1/8 inch with the carriage reset control, manually traverse the pen motor across the entire drum
- g. By pushing the bottom of the left carriage rod bracket in or out, the stylus can be kept at the same height above the drum for its entire travel. When this is achieved, tighten the setscrews in the left bracket.

NOTE

Place the pen motor near center of travel to prevent damaging the microswitch arms while installing the power supply.

- h. Reinstall power supply panel, and reconnect the two cables removed in paragraph a.

i. Check stylus travel across the drum; and if the pressure is uneven (paragraph 4.2.3), readjust according to the above procedures.

5.3.6 Replacement and Adjustment of Rectilinear Stylus

To remove the stylus, disconnect the flexible leads (item 6, figure 4-1) from the terminals on the pen motor support. Loosen the screw (item 7, figure 4-1) at the rear of the stylus, and disconnect the wire link (item 8, figure 4-1). Remove the remaining screw (item 9, figure 4-1) holding the stylus to the pen arm. Install the new stylus with the VEE tip down by reversing the above procedure.

With no signal applied and with the pen motor arm (item 5, figure 4-1) centered, loosen the screw (item 7, figure 4-1) at the rear of the stylus and adjust the length of the wire link (item 8, figure 4-1) to the center stylus with respect to the hole in the front edge of the pen motor mounting bracket.

If the stylus tip does not move in a straight line when a signal is applied to the Helicorder, recheck centering of the pen motor arm and/or stylus and adjust as necessary.

5.4 LUBRICATION

Every 12 months, the Helicorder should be lubricated at the points and with the materials indicated below.

- a. Remove the side plate (item 6-2, figure 4-2), and apply a small amount of light-weight grease (e.g., Royco No. 2) to worm if required.
- b. Apply a small quantity of light-weight grease (e.g., Royco No. 2) to the shaft of the STYLUS LIFT control.

5.5 INK PEN MAINTENANCE

- a. Periodic removal of "fuzz" from pen tip will result in a finer line. (Before starting a record.)
- b. "Parking" the pen tip on a small patch of cellophane tape will prevent drying of ink in the pen tip when not in use for a few days.
- c. The pen tip may be cleaned if obstructed by use of a .0031 inch diameter wire furnished and back flushing with the syringe.
- d. The entire pen assembly and ink tube should be washed with water when not in frequent use, when clean, the pen will spray a stream of water 20 in. when pressurized with the syringe.
- e. Moderate pen pressure will extend pen life and make a better record.

6. REPLACEABLE PARTS LIST

TABLE 6-1. MECHANICAL REPLACEMENT PARTS

Geotech Part Number	Description	Reference Figure - Item
990-29868-0101	Service cord assembly	
990-30901-0101	Worm gear	
990-38709-0101	Change gear set	
990-38735-0101	Drum clutch plate	
990-37967-0101	Reset clutch cone	4-2 1
990-37961-0101	Lead clutch cone	4-2 3
042-11124-6747	O-ring for lead clutch cone	4-2 3
030-13110-1000	Lead coupling	4-2 6
990-20125-0101	Switch lock (for slide switches)	
044-51090-2002	Stylus lift knob	4-1 1
044-17175-0100	Power switch knob	4-1 2
044-51090-2242	Stylus heat knob	4-1 3
990-38725-0101	Drum assembly	
990-29816-0101	Drum shaft	
990-29768-0101	Lead cable assembly	
042-73031-0000	Lead cable spring	
990-38719-0101	Cable drum assembly	4-2 4
990-37962-0101	Clutch reset leaf spring	4-2 2
990-37964-0101	Cable drum	
038-56106-0000	No. 2 lock washer	
035-25007-0200	2-56 x 1/8 pan HD screw	4-2 4
990-38718-0101	Switch link block	
990-03090-0101	Clutch spring washer	

TABLE 6-2. MOTOR OPTIONS

Geotech Part Number	Description
030-07260-0400	Motor, drum drive, 60 Hz
030-07300-0200	Motor, drum drive, 50 Hz
990-51851-0101	Motor, lead drive, 60 Hz
990-51851-0102	Motor, lead drive, 50 Hz

TABLE 6-3. RECTILINEAR HEAT WRITING PARTS

Geotech Part Number	Description
990-38692-0201	Rectilinear pen interim, single pen
990-38692-0202	Rectilinear pen interim, double pen
990-38692-0203	Rectilinear pen interim, triple pen
990-38548-0101	Pen arm assembly
990-03790-0101	Paper for heat writing

TABLE 6-3a. RECTILINEAR PEN INTERIM PARTS

Geotech Part Number	Description
990-30469-0102	Pen motor assembly
990-38701-0101	Pivot plate
990-38699-0101	Support plate, one pen
990-38699-0102	Support plate, two pens
990-38699-0103	Support plate, three pens
990-38696-0101	Pressure Adjust screw
990-38694-0101	Sleeve spacer
990-38698-0101	Drive arm
990-38697-0101	Drive shaft
990-29931-0101	Terminal board assembly
990-38695-0101	Guide wire
031-07402-9800	Drive arm bearing

TABLE 6-4. CURVILINEAR HEAT WRITING PARTS

Geotech Part Number	Description
990-29765-0101	Carriage Assembly, single pen
990-29765-0102	Carriage Assembly, double pen
990-29765-0103	Carriage Assembly, triple pen
990-29803-0101	Stylus clamp
990-03197-0103	Stylus assembly
990-03790-0101	Paper for heat writing

TABLE 6-4a. CARRIAGE ASSEMBLY PARTS

990-29931-0101	Terminal Board Assembly
990-29789-0101	Pen pressure adjust plate
990-29801-0102	Pen pressure screw
990-29802-0101	Pen pressure bar
990-29812-0101	Motor bracket, single pen
990-29812-0102	Motor bracket, double pen
990-29812-0103	Motor bracket, triple pen
990-30122-0101	Spacer
990-30469-0101	Pen motor assembly

TABLE 6-5. RECTILINEAR INK WRITING PARTS

Geotech Part Number	Description
990-41416-0101	Paper for ink writing
990-38692-0201	Rectilinear pen interim, single pen
990-38692-0202	Rectilinear pen interim, double pen
990-38692-0203	Rectilinear pen interim, triple pen
990-39700-0201	Ink kit
990-52066-0101	Connector panel

TABLE 6-5a. INK KIT PARTS

Geotech Part Number	Description
990-41402-0101	Mounting clip
990-41403-0101	Ink tube
990-41408-0101	Ink reservoir
990-41414-0101	Pen assembly
990-41415-0101	Pen arm
069-12822-0348	3cc syringe

TABLE 6-6. HELICORDER ELECTRONICS

Geotech Part Number	Description	Figure 6-1 Reference
990-29766-0101	Pen head control board	
selected	Capacitor, 1.0 F, 220 Vac	C101
002-41093-9704	Capacitor, 0.01 F, 1000 V	C102, 103
002-53366-9727	Capacitor, 0.33 F, 200 V	C104
002-62066-8225	Capacitor, 2.0 F, 200 V	C105, 106
004-10200-5005	Fuse, 3 AG, 1/2 Amp	F101, 102
007-01621-3300	Receptacle, power	J101
007-29126-2190	Receptacle, drive motor	J102
007-01033-1300	Receptacle, input	J103
007-29126-2180	Connector, pen motor	J104
007-05162-1200	Plug, power	
007-29126-2220	Plug, Drive motor	P102
007-05103-3230	Plug, input	
007-29126-2170	Plug, pen motor	
001-16250-9328	Potentiometer, 25K	R101
990-30491-0101	Potentiometer, heat control	R102
001-04100-2032	Resistor, 100 ohm, 1/2 W	R103
006-39000-0500	Switch, DPDT slide	S101, 102
006-04000-1100	Switch, limit	S103, 104
990-30492-0101	Switch, power	S105
010-11006-8400	Transformer, 115-230/115	T101
010-11006-1400	Transformer, 115/	T102

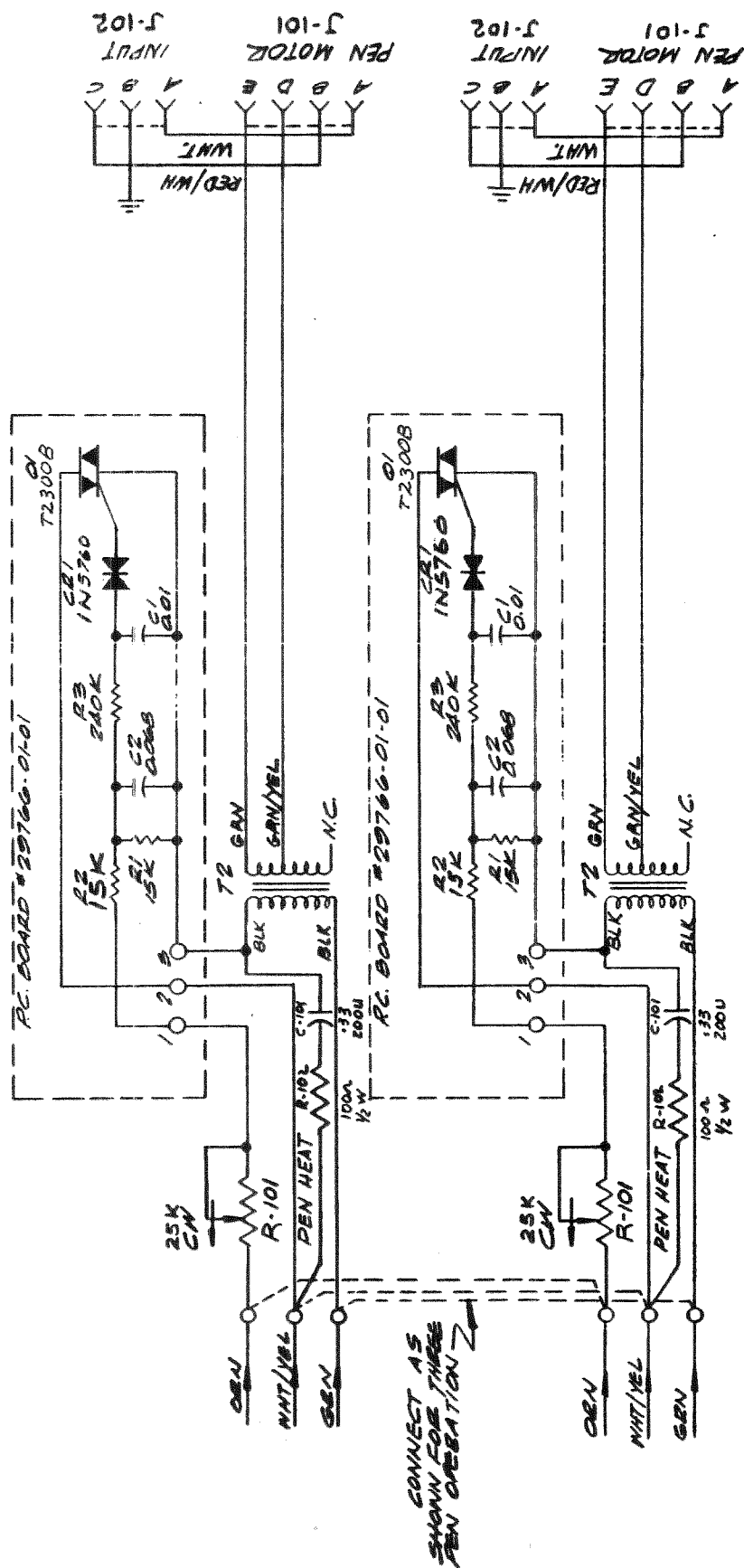
TABLE 6-7. PEN HEAT CONTROL BOARD

Geotech Part Number		Figure 6-1 Reference
002-41056-0716	Capacitor, 0.01 F, 80V	C1
002-46866-0716	Capacitor, 0.068 F, 200 V	C2
012-01057-6000	Diode, IN 5760	CR1
012-07023-0020	Triac, T 2300 B	Q1
001-06150-2032	Resistor, 15K, 1/2 W	R1, 2
001-07240-2032	Resistor, 240K, 1/2 W	R3

TABLE 6-8. POWER SUPPLY SUB ASSEMBLY

Geotech Part Number		Figure 6-2 Reference
990-29766-0101	Pen heat control board	
002-53366-9727	Capacitor, 0.33 F, 200 V	C101
007-29126-2180	Receptacle, pen motor	J101
007-01033-1300	Receptacle, input	J102
001-16250-9328	Potentiometer, 25K	R101
001-04100-2032	Resistor, 100 ohm, 1/2 W	R102
010-11006-1400	Transformer	T2

NOTE: THIS DRAWING SHOWS SCHEMATIC OF TWO POWER SUPPLIES AND THEIR INTERCONNECTION.



CONNECT AS SHOWN FOR THOSE PEN OPERATION

FIGURE 6-2. POWER SUPPLY SUBASSEMBLY, SCHEMATIC DIAGRAM