



OPERATING AND SERVICE MANUAL

MODEL 297A

SERIALS PREFIXED: 139 -

SWEEP DRIVE

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1501 PAGE MILL ROAD, PALO ALTO, CALIFORNIA, U.S.A.



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Figure 1-1. Model 297A Sweep Drive

SECTION I

GENERAL INFORMATION

1-1. GENERAL DESCRIPTION.

1-2. The Model 297A, formerly called the Model AC-97C, is a two-speed motor driven unit designed to sweep oscillators and other tunable devices through their ranges automatically. The Model 297A reverses automatically when it reaches a preset clockwise or counterclockwise limit. The limits can be set for a very narrow or broad range. The Model 297A has two speeds: HIGH SPEED gives an output shaft rotation of 10 rpm, LOW SPEED gives an output shaft speed of 1.0 rpm. An output voltage, useful for driving x-y recorders, oscilloscopes, or other devices, is supplied to output terminals. The output voltage is proportional to output shaft rotation. Figure 1-1 illustrates the Model 297A, with brackets for mounting on the Model 302A.

1-3. USES.

1-4. The Model 297A was designed primarily for use with the Φ Model 302A Wave Analyzer and is supplied with necessary hardware to mount on the Model 302A. The Model 297A can be used with other devices that do not require excessive torque. For applications other than with the Model 302A, the Model 297A is available with a bench stand. When the bench stand is used; the Model 297A can be adjusted between 4 and 12 inches in

height. The Model 297A is supplied with two flexible couplers so that it may be used with either Φ Model 302A or 310A.

1-5. INSTRUMENT IDENTIFICATION.

1-6. Hewlett-Packard uses a two-section eight-digit serial number (000-00000). If the first three digits of the serial number on your instrument do not agree with those on the title page of this manual, change sheets supplied with the manual will define differences between your instrument and the Model 297A described in this manual.

1-7. POWER CABLE.

1-8. For the protection of operating personnel, the National Electrical Manufacturers' Association (NEMA) recommends that the instrument panel and cabinet be grounded. This instrument is equipped with a three-conductor power cable which, when plugged into an appropriate receptacle, grounds the instrument. The offset pin on the power cable three-prong connector is the ground pin.

1-9. To preserve the protection feature when operating the instrument from a two-contact outlet, use a three-prong to two-prong adapter and connect the green pigtail on the adapter to ground.

Table 1-1. Specifications

SWEEP RANGE: 64 revolutions (see Sweep Voltage Output specifications).	STARTING AND RUNNING TORQUE: 9 oz-in at 10 rpm. Friction clutch limits torque at 1 rpm to approximately 12 oz-in.
SWEEP LIMITS: Any interval from 64 revolutions to 10 degrees.	MOTOR: Reversible synchronous capacitor type reluctance motor; may be stalled indefinitely.
SWEEP SPEED WITH Φ 302A: 170 cps per second and 17 cps per second.	OUTPUT SHAFT: 1/4 inch diameter with 7/16 coupler inch for Φ Model 302A.
SHAFT SPEED: 10 rpm, 1 rpm, and neutral; quick change speed transfer without stopping. Neutral permits manual operation.	POWER: 115 volts \bullet 10%, 50 to 60 cps, 12 watts, running or stalled.
SWEEP OUTPUT: 15 volts maximum. Change of output proportional to change in shaft position and zero output may be set for any shaft position. Full output may be obtained with either 2.1 revolutions or with 50 revolutions of the output shaft. When shaft speed control is in High Speed, sweep output control cannot be set to Short Sweep.	MOUNT: Mounts on front panel of Φ Model 302A.
	DIMENSIONS: 3-1/2 inches high, 7 inches wide, 5-1/4 inches deep, shaft extends 13/16 inch behind case.
	ACCESSORIES AVAILABLE: Bench stand(11505A) Adjust shaft height from 4 to 12 inches.



Figure 2-1. Model 297A Mounted on 302A

SECTION II

INSTALLATION

2-1. GENERAL INFORMATION.

2-2. The Model 297A is shipped from the factory with two flexible couplers. One is suitable for connecting the 297A to the 302A; it has a 1/4-inch adapter on one end and a 7/16-inch adapter on the other end. The other is suitable for connecting the 297A to the 310A; it has a 1/4-inch adapter on both ends.

2-3. MECHANICAL INSPECTION.

2-4. Unpack the instrument upon receipt and inspect it for signs of physical damage such as scratched panel surfaces, broken knobs, etc. If there is any apparent damage, file a claim with the carrier and refer to the warranty page in this manual.

2-5. MOUNTING.

2-6. MOUNTING ON THE 302A WAVE ANALYZER.

2-7. To mount the Model 297A on the Model 302A, proceed as follows:

- a. Remove the fine vernier knob on the Model 302A.
- b. Set the Model 302A on its back so controls are facing upwards.
- c. Counting from right to left on the 302A, remove second and third screws nearest the top of the 302A. These screws will be the two nearest the FREQUENCY dial (see figure 2-1).
- d. Carefully slide the 297A output shaft coupler over the 302A vernier drive shaft. Tighten the output shaft coupler screws.
- e. Align holes in the two mounting lugs with holes made by removal of two screws on the Model 302A.
- f. Carefully insert screws in holes of mounting lugs and finger tighten. Be careful. There may be three shims under each screw-hole of the Model 302A. If jarred, they may fall into the mechanism. Be sure the output shaft rotates freely before tightening the screws.

2-8. MOUNTING ON THE BENCH STAND.

2-9. To mount the Model 297A on the 11505A bench stand, proceed as follows:


- a. Remove the four screws at the rear that secure the mounting bars to the back of the Model 297A.
- b. Attach the two bench stand brackets to the back of the Model 297A, using the four extra screws supplied with the bench stand.
- c. Insert the two rods supplied with the bench stand into the holes in the stand. Tighten the screws at the rear of the stand to secure the rods (see figure 2-2).
- d. Slide the Model 297A mounting brackets over and down on the rods (see figure 2-3). Adjust the Model 297A to the proper height (make sure the output shaft

rotates freely when coupled to the instrument to be driven), then tighten the screws on the mounting bars to hold the Model 297A in place.

Note

The 297A drive shaft has a bushing - band friction clutch: care is required in mounting the flexible coupler on the 297A drive shaft to ensure that the friction clutch performs properly. The appropriate coupler should be mounted as follows:

- a. Place coupler on shaft and align one of setscrews with opening in steel band on shaft and tighten aligned setscrew moderately.
- b. Tighten other setscrews.

CAUTION: When mounting flexible clutch on  Model 310A shaft, setscrews must be flat - rather than cup-ended.

- c. Torque required for slippage in friction clutch should be approximately 20 inch-ounces. Readjustment of aligned setscrew may be necessary

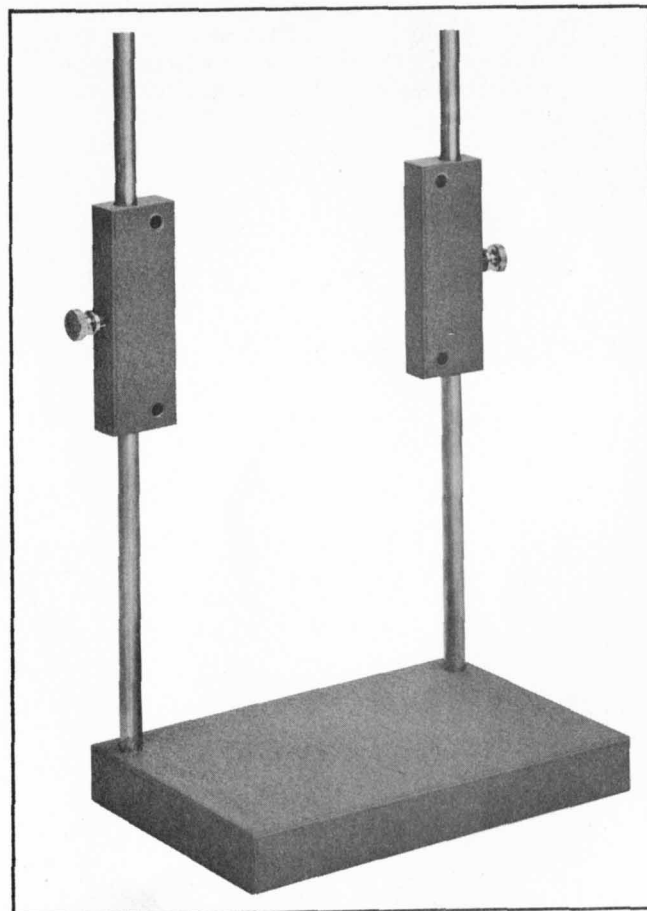


Figure 2-2. Assembled 11505A Bench Stand

2-10. POWER REQUIREMENTS.

2-11. The Model 297A operates from a 50- to 60-cycle, 115-volt power source. If 230-volt operation is desired, a suitable 230- to 115-volt step-down transformer, such as the Φ 9100-0007 can be used.

2-12. IN-CABINET PERFORMANCE CHECK.

2-13. If an in-cabinet performance check is desired, refer to section V of this manual.

2-14. RESHIPMENT.

2-15. To protect electronic equipment during storage or shipment, always use the best packaging methods available. Contract packaging companies in many cities can provide dependable packing on short notice. The following packaging methods are recommended:

a. Original. Place instrument in original container. Replace all packing pads and fillers in the exact position they originally occupied.

b. Rubberized Hair. Cover painted surfaces of instrument with protective wrapping paper. Pack instrument securely in strong corrugated container (350 lb/square inch bursting test) with 2-inch rubberized hair pads placed along all surfaces of the instrument. Insert filler between pads and container to insure a snug fit on all surfaces of the instrument.

c. Excelsior. Cover painted surfaces with protective wrapping paper. Pack instrument in a strong corrugated container (350 lb/square inch bursting test) with a layer of excelsior about 6 inches thick, packed firmly against all surfaces of the instrument.

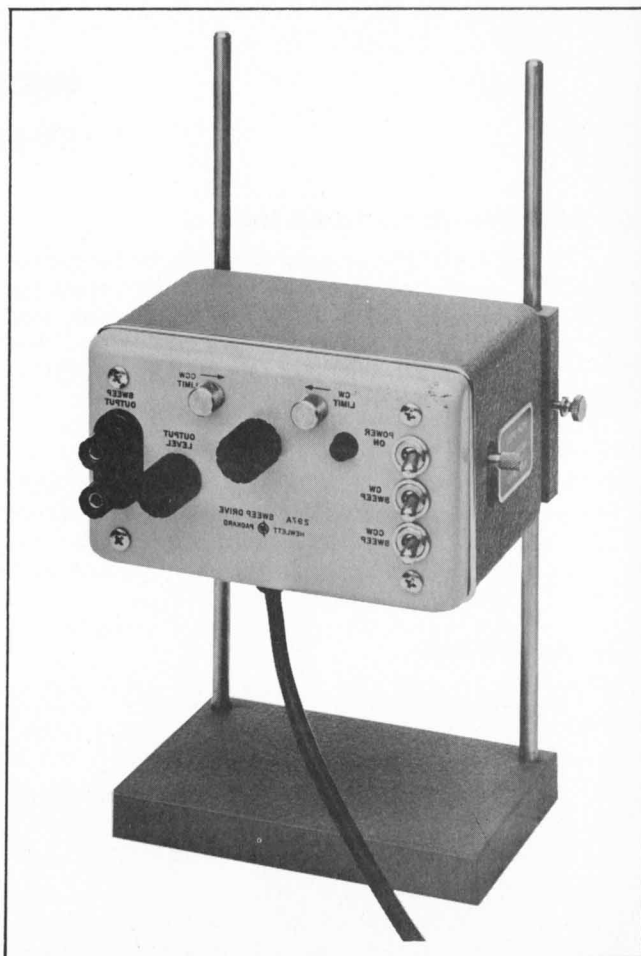


Figure 2-3. Model 297A Mounted on 11505A Bench Stand

SECTION III OPERATION

3-1. GENERAL INFORMATION.

3-2. The Model 297A supplies power for driving such instruments as signal generators, potentiometers, and other devices to give a constant change or frequency, resistance, or some other parameter. The rate and amount of change can be controlled to close tolerances with the panel controls. An output voltage proportional to the amount of rotation is supplied to output terminals. The output voltage can be connected to any kind of indicating device having a relatively high input impedance. The remainder of section III fully describes the operation of the Model 297A.

3-3. OPERATING CONTROLS.

3-4. For a description of the operating controls, refer to figure 3-1.

3-5. SWEEP SECTOR OPERATION.

3-6. SWEEP SECTOR OPERATION WITH MODEL 302A.

3-7. To set the Model 297A for sweep sector operation with a Model 302A, proceed as follows:

- a. Set all switches of the Model 297A to the OFF position.
- b. Set the speed-change lever at the left side of the Model 297A to NEUTRAL and pull the CW LIMIT and CCW LIMIT knobs to the disengaged position.

Note

As the Model 302A (CPS) FINE control is rotated in a clockwise direction, dial frequency decreases.

- c. Using the Manual Sweep knob on the 297A, rotate the frequency dial in a clockwise direction until the desired lower frequency limit is reached. Then rotate the CW LIMIT knob in a clockwise position until it reaches the mechanical stop. Then push the CW LIMIT knob "in" to the engaged position.

- d. Using the Manual Sweep knob, rotate the output shaft counterclockwise until the desired upper frequency limit is reached.

- e. Rotate the CCW LIMIT knob in a counterclockwise direction until it reaches the mechanical stop.

- f. Push the CCW LIMIT knob "in" to the engaged position.

- g. Set the speed-change lever at the left side to LOW SPEED, and the POWER switch to ON.

Note

When using the Model 297A with the Model 302A, the speed changer must be set to LOW SPEED. The Model 302A has very narrow pass-band, and if the dial frequency is rapidly changed, the output circuits will not respond to changes.

- h. Set both the CW and CCW switches to the SWEEP position. The Model 297A will continuously rotate the frequency dial from the lower to upper frequency position.

- i. If only a clockwise sweep is desired, set the CCW switch to the OFF position. If a counterclockwise sweep is desired, set the CW SWEEP switch to the OFF position, CCW switch to ON position.

- j. Setting the speed-change lever to LOW SPEED will cause the output shaft to rotate at 1.0 rpm. HIGH SPEED causes the output shaft to rotate at 10 rpm.

3-8. SWEEP SECTOR OPERATION WITH DEVICES OTHER THAN THE MODEL 302A.

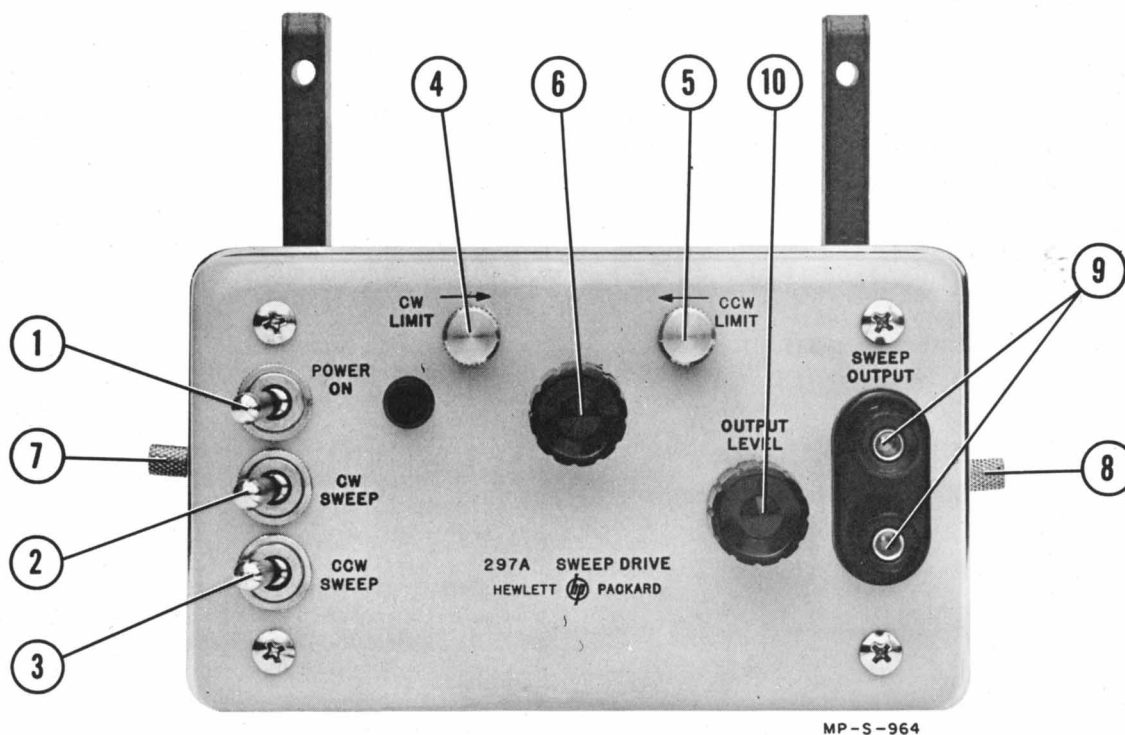
3-9. Sweep operation of other devices is similar to operation with the 302A, but the bench stand must be used. When the bench stand is used, be sure the output shaft rotates freely when the Model 297A is connected to the device. The sector to be swept is set the same as when the Model 297A is used with the 302A.

3-10. SWEEP VOLTAGE OUTPUT.

3-11. The sweep voltage output can be used to drive recorders, oscilloscopes, and other devices used to define coordinates of a point. The OUTPUT LEVEL control sets the voltage to any level between 0 and 15 volts. This adjustment allows the operator to establish a reference level or zero a recorder. The adjustment is made by holding firm the Manual Sweep (center knob) and rotating the OUTPUT LEVEL control.

3-12. When rotating the OUTPUT LEVEL knob in either direction and the potentiometer limits are reached, the knob will continue to turn, but the potentiometer wiper will stop because the knob is connected to the potentiometer through a slip clutch.

3-13. Maximum output impedance is 25K ohms. This will decrease as OUTPUT LEVEL is varied. To obtain best linearity, use highest load impedance practical. For example, a load impedance of 2.5 megohms with OUTPUT LEVEL set to mid-position would give a tracking error of approximately 1.0%.



1. POWER ON applies power to the 297A.
2. CW SWEEP allows clockwise sweep.
3. CCW SWEEP allows counterclockwise sweep.
4. CW LIMIT limits amount of clockwise rotation of the output shaft.
5. CCW LIMIT limits amount of counterclockwise rotation of the output shaft.
6. Manual Sweep permits manual rotation of output shaft (speed changer in NEUTRAL).
7. Speed Changer:
Permits output shaft rotation of 10 rpm when in HIGH SPEED, output shaft rotation of 1 rpm in LOW SPEED.

8. Potentiometer Speed Changer:
Uses the full range of the OUTPUT LEVEL potentiometer for 50 rotations of the output shaft when in FULL SWEEP. SHORT SWEEP gives a much larger change of sweep voltage for a given output shaft rotation. Potentiometer Speed Changer cannot be set to SHORT SWEEP when Speed Changer (7) is in HIGH SPEED.
9. SWEEP OUTPUT provides the sweep output voltage for use with a recorder or other instrument.
10. OUTPUT LEVEL adjusts the output voltage to any value between 0 and 15 volts for any output shaft position. Allows the operator to set a reference level.

Figure 3-1. Operating Controls

SECTION IV PRINCIPLES OF OPERATION

4-1. INTRODUCTION.

4-2. Section IV contains information relating to the theory of operation for the Model 297A. All references will be to the schematic diagram in figure 5-1.

4-3. POWER SUPPLY.

4-4. The power supply consists of transformer T1, diodes CR1 and CR2, filter C1, R2 and R3, and CR3. The output of T1 is rectified by CR1 and CR2, then filtered by C1 and applied to breakdown diode CR3. The sweep-voltage potentiometer R3 is connected directly across CR3. The voltage drop across CR2 is 15 volts and is constant because of the breakdown

characteristics of the diode. This supplies the SWEEP OUTPUT potentiometer with a constant 15 volts.

4-5. MOTOR.

4-6. Motor B1 is a reversible synchronous capacitor-type motor. It uses a capacitor to obtain a phase-shifted voltage to give a rotating magnetic field. The motor is reversed by changing the position of microswitch S4. This causes the current in one-half of the stator winding to either lead or lag the current in the other half of the stator winding. The microswitch determines the side of the stator winding that has the leading or lagging current, which in turn determines the motor rotation.

SECTION V MAINTENANCE

5-1. INTRODUCTION.

5-2. Section V contains information relating to lubrication, mechanical parts replacement, and an in-cabinet performance check.

5-3. CABINET REMOVAL.

5-4. To remove the cabinet, proceed as follows:

- a. Remove the Model 297A from the Model 302A or other driven device.
- b. Remove the screws at the corners (screws securing the mounting bars to the rear of the Model 297A).
- c. Unloosen the allen screws securing the output shaft coupler, then slide off the output shaft coupler.
- d. Lift off the cabinet.

5-5. LUBRICATION.

5-6. Lubrication is required only between bearings and rotating shafts. Do not lubricate the gear teeth.

Lubricate the bearings annually with one drop each of light machine oil.

5-7. TEST EQUIPMENT.

5-8. The test equipment or its equivalent listed in table 5-1 is recommended for an in-cabinet performance check and troubleshooting of the Model 297A.

5-9. TROUBLESHOOTING.

5-10. POWER SUPPLY.

5-11. Troubles in the power supply can be found by using the vacuum tube voltmeter listed in table 5-1, and making voltage and resistance measurements. The dc voltage at the SWEEP OUTPUT terminals should be 15 ± 1 volt with the OUTPUT LEVEL control fully counterclockwise. Maximum ripple present should not exceed 10 mv.

5-12. GEAR TRAINS.

5-13. Troubles in the gear trains can be found by studying gear action, then referring to the exploded

Table 5-1. Test Equipment

Instrument Type	Required Characteristics	Use	Instrument Recommended
Stop watch	0-2 min, 1 sec divisions	check shaft rotation	
Vacuum Tube Voltmeter	0-15 vdc 0-10 mv ac	voltage and resistance measurements	Ⓢ 410B and Ⓢ 400D
Torque screwdriver with 1/4 in. insert	0-9 oz-in.	check torque	Ⓢ 8730-0012 and 8830-0013

view in figure 6-1. Gears that show excessive wear should be replaced. If a particular gear does not have a reference number on the exploded view, then the gear must be replaced as an assembly.

5-14. MOTOR AND GEAR REPLACEMENT.

5-15. MOTOR REPLACEMENT.

5-16. The motor has a sealed gear box attached. If motor replacement becomes necessary, the motor and gear box are replaced as a unit. Use the exploded view in figure 6-1 for location, disassembly, assembly, and reference to ϕ stock numbers.

5-17. GEAR REPLACEMENT.

5-18. If gear replacement becomes necessary, refer to the exploded view in figure 6-1 to location, disassembly, and assembly. Any combination of gears that has one reference number must be replaced as an assembly. The numbers on the exploded view are referenced to ϕ stock numbers in the table of Replaceable Parts.

5-19. IN-CABINET PERFORMANCE CHECK.

5-20. RPM CHECK.

5-21. To determine if the Model 297A has the correct rpm, set the speed changer at the left of the Model 297A to the HIGH SPEED position. Put a mark on the output shaft, for a reference point. Adjust the CW SWEEP knob for longest clockwise sweep. Set the CW SWEEP

switch to the ON position. Set the POWER ON switch to the ON position, at the same time start the stop watch. Allow the output shaft to rotate for exactly two minutes. As the output shaft is rotating, count the number of revolutions using the mark as a reference. At the end of two minutes, the output shaft should have completed 20 rotations.

Note

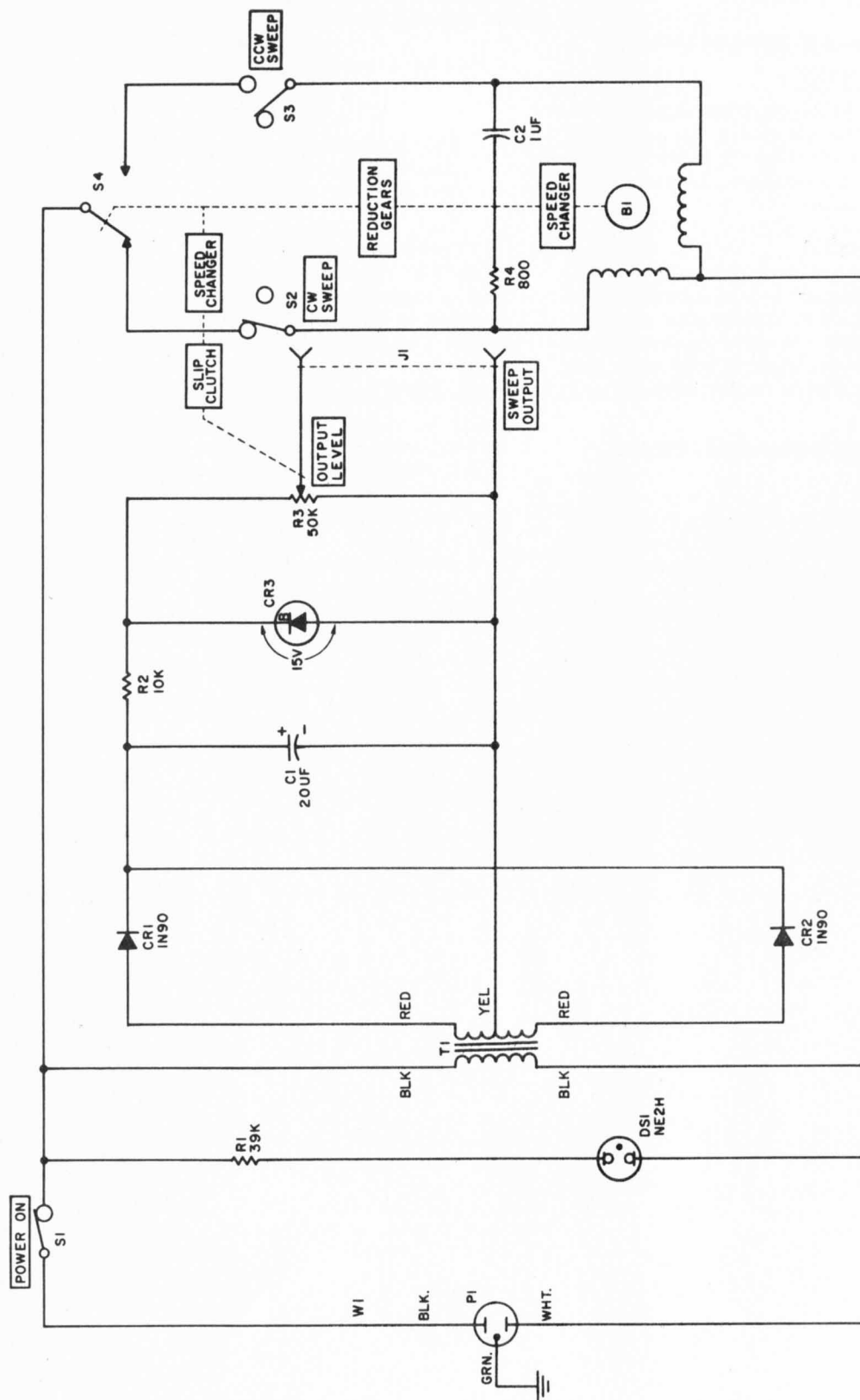
The line frequency must be 60 cps, as the motor speed will increase or decrease as line frequency increases or decreases.

5-22. TORQUE CHECK.

5-23. To check the torque of the Model 297A, connect a torque gauge to the output shaft. Set the speed changer to HIGH SPEED. Apply power to the Model 297A. The torque gauge must register at least 9 oz-in.

5-24. POWER SUPPLY CHECK.

5-25. To check the power supply, set the OUTPUT LEVEL control fully counterclockwise. Apply power to the Model 297A. Measure the dc output voltage. The voltage should be 14 to 16 volts. The ripple voltage should be 10 mv or less. Adjust the OUTPUT LEVEL control slowly in a clockwise direction. The dc output should decrease steadily to zero. The output should be zero when the OUTPUT LEVEL control is fully clockwise.



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Figure 5-1. Schematic Diagram

SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION.

6-2. This section contains information for ordering replacement parts. Table 6-1 lists electronic parts in order of reference designator. Table 6-2 lists mechanical parts in order of item number shown in Figure 6-1. The tables give the following information:

- a. Description of the part (see list of abbreviations below).
- b. Typical manufacturer of the part in a five-digit code; see list of manufacturers in appendix.
- c. Manufacturer's stock number.
- d. Total quantity used in the instrument (TQ column).
- e. Recommended spare part quantity for complete maintenance during one year of isolated service (RS column).

6-3. ORDERING INFORMATION.

6-4. To order a replacement part, address order or inquiry to your local Hewlett-Packard field office (see rear of manual).

6-5. Specify the following information for each part:

- a. Model and complete serial number of instrument.
- b. Hewlett-Packard stock number.
- c. Circuit reference designator or item number, referring to Figure 6-1.
- d. Description.

6-6. To order a part not listed in Tables 6-1 and 6-2 give a complete description of the part and include its function and location.

REFERENCE DESIGNATORS

A = assembly	F = fuse	P = plug	V = vacuum tube, neon bulb, photocell, etc.
B = motor	FL = filter	Q = transistor	W = cable
C = capacitor	J = jack	R = resistor	X = socket
CR = diode	K = relay	RT = thermistor	Y = crystal
DL = delay line	L = inductor	S = switch	Z = network
DS = device signaling (lamp)	M = meter	T = transformer	
E = misc electronic part	MP = mechanical part		

ABBREVIATIONS

A = amperes	ELECT = electrolytic	MOM = momentary	RH = round head
A.F.C = automatic frequency control	ENCAP = encapsulated	MTG = mounting	RMO = rack mount only
AMP = amplifier		MY = mylar	RMS = root-mean-square
	F = farads	NC = normally closed	ROT = rotary
B.F.O. = beat frequency oscillator	FH = flat head	NE = neon	
BE CU = beryllium copper	FIL H = fillister head	NI PL = nickel plate	S-B = slow-blow
BH = binder head	FXD = fixed	NO = normally open	SE = selenium
BP = bandpass		NPO = negative positive zero (zero temperature coefficient)	SECT = section(s)
BRS = brass	GE = germanium	NSR = not separately replaceable	SEMICON = semiconductor
BWO = backward wave oscillator	GL = glass		SI = silicon
	GRD = ground(ed)	OBD = order by description	SIL = silver
CER = ceramic	H = henries	OH = oven head	SL = slide
CMO = cabinet mount only	HEX = hexagonal	OX = oxide	SPL = special
COEF = coefficient	HG = mercury		SST = stainless steel
COM = common	HR = hour(s)		
COMP = composition	IMPG = impregnated	P = peak	TA = tantalum
CONN = connector	INCD = incandescent	PC = printed circuit board	TD = time delay
CP = cadmium plate	INS = insulation(ed)	PF = picofarads = 10^{-12} farads	TI = titanium
CRT = cathode-ray tube	K = kilo = 1000	PH BRZ = phosphor bronze	TOG = toggle
DEPC = deposited carbon	LIN = linear taper	PIV = peak inverse voltage	TOL = tolerance
EIA = Tubes or transistors meeting Electronic Industries' Association standards will normally result in instrument operating within specifications; tubes and transistors selected for best performance will be supplied if ordered by stock numbers.	LK = lock	POLY = polystyrene	TRIM = trimmer
	LOG = logarithmic taper	POR = porcelain	TWT = traveling wave tube
	LPF = low pass filter	POS = position(s)	
		POT = potentiometer	U = micro = 10^{-6}
	M = milli = 10^{-3}	PP = peak-to-peak	VAC = vacuum
	MEG = meg = 10^6	PT = point	VAR = variable
	METFLM = metal film		W = watts
	MFR = manufacturer	RECT = rectifier	W/ = with
	MINAT = miniature	RF = radio frequency	W/O = without
			WW = wirewound

Table 6-1. Replaceable Parts, Electrical

Ref Design	Stock No.	Description #	Mfr.	Mfr. Part No.	TQ	RS
B1	3140-0029	MOTOR:SYNCHRONOUS 115V	02771	MODEL 830	1	1
C1	0180-0049	C:FXD ELECT 20 UF 50VDCW	56289	30D198A1	1	1
C2	0169-0003	C:FXD MY 1 UF 10% 400VDCW	56289	118P10594S2	1	1
CR1	1910-0004	SEMICON DEVICE:DIODE GE 1N90	73293	1N90	2	2
CR2	1910-0004	SEMICON DEIVCE:DIODE GE 1N90	73293	1N90		
CR3	1902-0154	SEMICON DEVICE:DIODE 15V	28480	1902-0154	1	1
DS1	1450-0039	LAMP:NEON,RED,NE-2H	08717	1450-0035	1	1
J1	0510-0007	BINDING POST:BLACK	28480	0510-0007	1	0
	0510-0006	BINDING POST:RED	28480	0510-0006	1	0
R1	0687-3931	R:FXD COMP 39K OHM 10% 1/2W	01121	EB 3931	1	1
R2	0690-1031	R:FXD COMP 10K OHM 10% 1W	01121	GB 1031	1	1
R3	2100-0264	R:VAR WW 50K OHM 3% 5W	28480	2100-0264	1	1
R4	0816-0004	R:FXD WW 800 OHM 10% 10W	35434	TYPE C10	1	1
S1	3101-0001					
S2						
S3		SWITCH:TOGGLE SPST	04009	80994-H	3	1
S4	3102-0009	SWITCH:SENSITIVE SPDT	80207	USMW	1	1
T1	9100-0120	TRANSFORMER:POWER	28480	9100-0120	1	1
W1	8120-0037	CORD:POWER	70903	8120-0037	1	1

See introduction to this section

Table 6-2. Replaceable Parts, Mechanical, Figure 6-1

Item No.	Stock No.	Description #	Mfr.	Mfr. Part No.	TQ	RS
1	297A-12B	BRACKET:MOUNTING	28480	297A-12B	2	0
2		C:FXD (REFER TO C2)				
3	297A-104B	FLYWHEEL	28480	297A-104B	2	0
4	297A-91B	SPRING:LEAF	28480	297A-91B	1	1
5	297A-95L	ASSY:CW STOP-SET SHAFT	28480	297A-95L	1	1
6	297A-95K	ASSY:CCW STOP-SET SHAFT	28480	297A-95K	1	1
7	297A-65A	ASSY:RECTIFIER BOARD	28480	297A-65A	1	0
8	297A-57	NUT:POTENTIOMETER	28480	297A-57	1	1
9	297A-37D	HUB:HELIPOT	28480	297A-37D	1	0
10	297A-95G	ASSY:POTENTIOMETER SHIFT PLATE	28480	297A-95G	1	1
11	297A-74A	KNOB:SHIFT	28480	297A-74A	2	1
12	297A-91A	SPRING:DETENT	28480	297A-91A	2	1
13	297A-95C	ASSY:POTENTIOMETER GEAR	28480	297A-95C	1	1
14	297A-74B	KNOB:LIMIT SET	28480	297A-74B	2	1
15	0370-0025	KNOB:BLACK, 3/4"	28480	0370-0025	2	1
16		SWITCH:SENSITIVE(REFER TO S4)				
17		LAMP:INDICATOR(REFER TO DS1)				
18	297A-95J	ASSY:FRONT PLATE	28480	297A-95J	1	0
19		SWITCH:TOGGLE(REFER TO S3)				
20	297A-24T	CAM:STOP	28480	297A-24T	1	1
21	3050-0024	WASHER:SPRING, 17/32" ID X 1/1/4" OD				
		BE CU (NOTE 1)	28480	3050-0024	1	1
22	297A-95H	ASSY:STOP GEARS	28480	297A-95H	1	1
23	297A-95B	ASSY:MAIN SHAFT	28480	297A-95B	1	1
24	297A-95D	ASSY:DRIVE GEAR	28480	297A-95D	1	1
25	297A-95E	ASSY:SLOW-SPEED GEAR	28480	297A-95E	1	1
26	297A-24E	HUB:GEAR, 45-TOOTH	28480	297A-24E	1	1
27		SAME AS ITEM 12				
28	297A-95F	ASSY:TRANSMISSION PLATE	28480	297A-95F	1	0
29		SAME AS ITEM 11				
30	297A-95A	ASSY:BACK PLATE	28480	297A-95A	1	0
31		TRANSFORMER:POWER(REFER TO T1)				
32	5040-0225	COUPLER:FLEXIBLE(FOR 302A)	28480	5040-0225	1	1
	5040-0210	COUPLER:FLEXIBLE(FOR 310A)	28480	5040-0210	1	1
33	5020-0271	ADAPTER:RING,FLEX COUPLER	28480	5020-0271	1	1
34	297A-24A	PINION:MOTOR, 18 TOOTH	28480	297A-24A	1	1
35		RESISTOR(REFER TO R4)				
36		MOTOR:SYNCHRONOUS(REFER TO B1)				
37		RESISTOR(REFER TO R3)				
38	297A-44A	ASSY:CABINET	28480	297A-44A	1	0
39	6990-0003	TRIM:WIRE	28480	6990-0003	1	1
40	297A-12C	BRACKET:MOTOR MOUNTING	28480	297A-12C	1	0
41	0340-0039	INSULATOR:TERMINAL POST	08145	0340-0039	8	2
42	1600-0002	ASSY:CAPACITOR BRACKET	28480	1600-0002	1	1
43	1410-0063	BALL:STEEL, 1/8" DIA	76210	1410-0063	4	1
44	3050-0163	WASHER:SHIM, LAMINATED(NOTE 2)	28480	3050-0163	1	1
45	0510-0122	RING:RETAINER, FITS 11/16" DIA SHAFT	90970	0510-0122	1	1
46	5040-0013	COLLAR:SET, 1/4" ID	28480	5040-0013	1	1
47	297A-2	PANEL:FRONT	28480	297A-2	1	0
48	0340-0090	INSULATOR:BINDING POST DOUBLE	28480	0340-0090	1	1

See introduction to this section

Table 6-2. Replaceable Parts, Mechanical, Figure 6-1 (Cont'd)

Item No.	Stock No.	Description #	Mfr.	Mfr. Part No.	TQ	RS
49	0510-0123	FASTENER	78553	0510-0123	1	1
50		CORD:POWER(REFER TO W1)				
51	0510-0080	RING:RETAINER,FITS 1/2" SHAFT	28480	0510-0080		
52	297A-107	BAR:RETAINING	28480	297A-107	1	1
53	1410-0075	BALL:STEEL,5/32" DIA	76210	1410-0075	2	1
54		BINDING POST(REFER TO J1)				
55	5040-0013	PLATE:BINDING POST	28480	5040-0013	1	1
56	3030-0001	SCREW:SET,8-32 X 3/16 ALLEN CUP PT	70276	3030-0001	6	2
57	3030-0005	SCREW:SET,8-32 X 1/8 ALLEN CUP PT	70276	3030-0005	4	1
58	3030-0020	SCREW:SET,8-32 X 3/16 ALLEN FLAT PT	70276	3030-0020	2	1
59	3030-0022	SCREW:SET,6-32 X 1/8 ALLEN CUP PT	70276	3030-0022	2	1
60	3030-0033	SCREW:SET,6-32 X 3/16 ALLEN CUP PT	70276	3030-0033	4	1
61	3030-0051	SCREW:SET,4-40 X 3/32 ALLEN CUP PT	70276	3030-0051	6	2
62	2540-0003	SCREW:FILL H,8-32 X 1 1/4 SST	83385	2540-0003	4	1
63	2360-0020	SCREW:RH,6-32 X 2 SST	80120	2360-0020	1	0
64	2390-0007	SCREW:BIND H,6-32 X 5/16 SST W/LK	73076	2390-0007	9	2
65	2470-0001	SCREW:BIND H,6-32 X 1/4 BRS,NL PL	73734	4132	8	2
66	0520-0022	SCREW:RH,2-56 X 1/2, SST	73734	0520-0022	2	1
67	2390-0009	SCREW:BIND H,6-32 X 3/8 SST W/LK	73076	2390-0009	2	1
68	2920-0007	SCREW:RH,10-24 X 1 3/4 SST	77075	2920-0007	2	1
69	2510-0001	SCREW:PHL H,8-32 X 5/8 SST	70319	2510-0001	4	1
70	3050-0021	WASHER:FIBER,3/8 OD	73734	3050-0021	4	1
71	3050-0066	WASHER:FLAT, #6 X 3/8 OD	73734	3050-0066	6	2
72	3050-0016	WASHER:FLAT, #6 X 9/32 OD	85053	3050-0016	4	1
73	2190-0007	WASHER:INT LK, #6	00000	2190-0007	2	1
74	2190-0008	WASHER:EXT LK, #6	78452	2-618-BC	2	1
75	2420-0001	NUT:HEX,6-32 X 5/16 W/LK	78189	2420-0001	11	3
76	2820-0002	NUT:HEX,10-32 X 5/16	73734	8041	4	1
77	2190-0014	WASHER:INT LK, #2	78189	1902-00-00-2480	2	1
78	0610-0002	NUT:HEX,2-56 X 3/16	76210	0610-0002	2	1
79	2190-0011	WASHER:INT LK, #10	78452	2190-0011	4	1
80	0360-0007	LUG:SOLDER, #10	73734	910	2	1
81	2950-0035	NUT:SW, 15/32 X 32	73076	2950-0035	3	1
82	0590-0012	RING:SW, 15/32 X 32	00000	0590-0012	3	1
83	0510-0045	RING:RET,FIL 3/16" SHAFT	00000	0510-0045	4	1
84	0340-0037	TERMINAL POST:TURRET TYPE	28480	0340-0037	8	2
85		RESISTOR(REFER TO R1)				
86	4360-0015	TIE POINT:2 SOLDER LUG, ONE GROUND	28480	4360-0015	1	0
87		DIODE(REFER TO CR3)				
88		DIODE(REFER TO CR1)				
89		DIODE (REFER TO CR2)				
90		CAPACITOR(REFER TO C1)				
91		RESISTOR(REFER TO R2)				
92	5000-0206	WASHER:SPRING,1/4" ID	28480	5000-0206	1	1
93	0400-0010	GROMMET:VINYL 3/8"	01538	#375	1	1
94	1400-0042	CLIP:CAPACITOR	14655	21368-1	2	1

NOTE 1: BEND SLIGHTLY TO FORM COMPRESSION BETWEEN ITEMS 20 AND 51.

NOTE 2: TRIM TO THICKNESS AS REQUIRED TO MINIMIZE END PLAY OF ITEM 10.

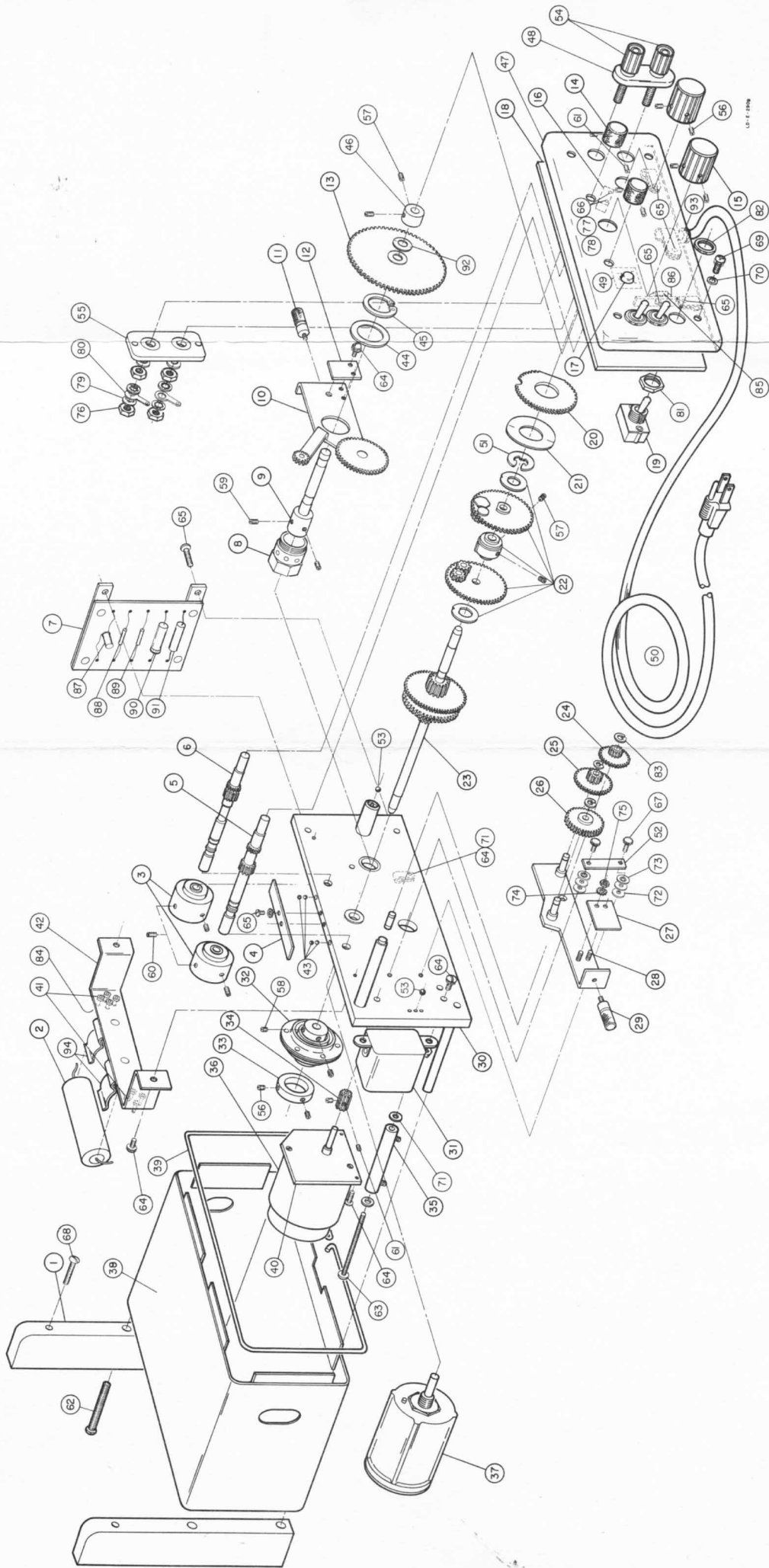


Figure 6-1. Exploded View, Model 287A

MANUAL CHANGES

MODEL 297A

SWEEP DRIVE






Manual Serial Prefixed 139-
Manual Printed 11/61

To adapt this manual to instruments with other serial prefixes check for errata below, and make changes shown in tables.

Instrument Serial Prefix	Make Manual Changes	Instrument Serial Prefix	Make Manual Changes
297A (230V Model)	1		

CHANGE 1

The 297A manual applies to the H03-297A with the following changes:

- B1: Change to Motor, synchronous, 220V 50 cps  Stock No. 3140-0032
- C2: Change to Capacitor, fixed, mylar, 0.27 μ f  Stock No. 0160-0041
- R1: Change to Resistor, fixed, composition, 150K ohms $\pm 10\%$ 1/2 W,
 Stock No. 0687-1541
- R4: Change to Resistor, fixed, wirewound, 3K ohms $\pm 10\%$ 10 W,
 Stock No. 0816-0002
- R5: Add Resistor, fixed, composition, 39K ohms $\pm 10\%$ 2 W
 Stock No. 0693-3931. Connect R5 in series with black lead of T1 and the junction of S1, R1, and S4.