5085A STANDBY POWER SUPPLY

OPERATING AND SERVICE MANUAL

HEWLETT hp PACKARD

HP 5085A

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CERTIFICATION

The Hewlett-Packard Company certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from the factory. The Hewlett-Packard Company further certifies that its calibration measurements are traceable to the U.S. National Bureau of Standards to the extent allowed by the Bureau's calibration facility.

WARRANTY AND ASSISTANCE

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OPERATING AND SERVICE MANUAL

MODEL 5085A
STANDBY POWER SUPPLY

SERIALS PREFIXED: 604-

This manual applies directly to ℌ Model 5085A Standby Power Supplies having serial number prefix 604-.

OLDER INSTRUMENTS

This manual with changes provided in Appendix I applies to older models having serial number prefix 524-.

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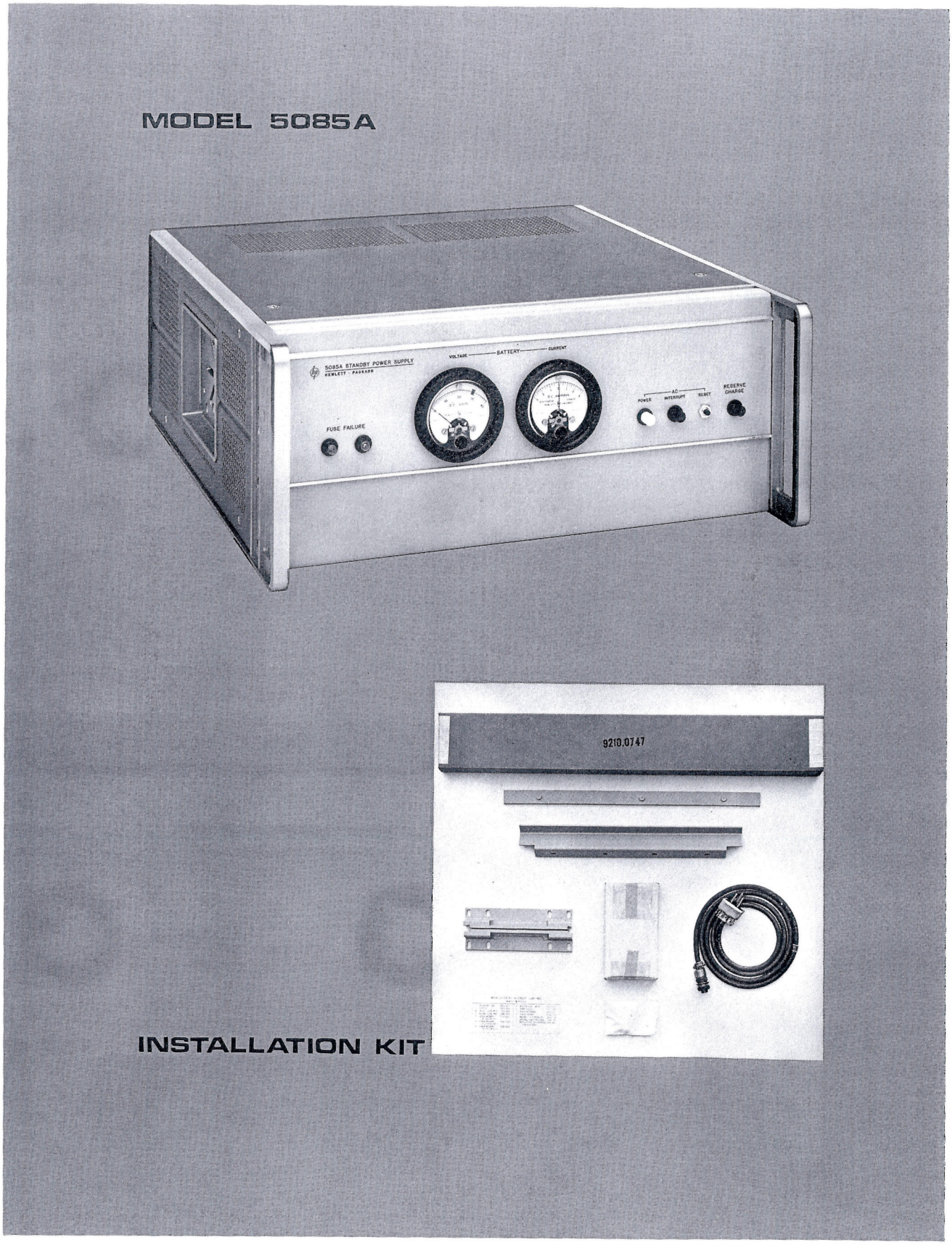


Figure 1-1. Model 5085A

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. DESCRIPTION.

1-3. The Hewlett-Packard Model 5085A Standby Power Supply provides uninterrupted regulated 24 volts dc at a 2-ampere rated output. With the internal batteries at normal (60%) charge, the Model 5085A has a standby capability of 14 ampere-hours at +25°C. A reserve-charge feature permits charging the batteries to full capacity, providing 21 ampere-hours of standby power. The Model 5085A is designed to be rack-mounted; hardware necessary for rack installation is supplied with the instrument (except screws for attaching to rack).

1-4. The Standby Power Supply consists of: 1) ac-to-dc supply; 2) battery supply regulator; 3) output voltage regulator; 4) standby storage battery; 5) relay and indicator circuits. When operating from ac line voltage, the supply provides regulated 24 volts dc to the load and charging current to the standby storage battery. When ac power is interrupted, the battery immediately supplies power to the load, the relay switches, and the AC INTERRUPT light indicates the interruption of line power. When ac power to the Model 5085A resumes, the circuits automatically return to the original condition of supplying the load and charging the battery, except that the AC INTERRUPT light remains on until manually reset by pressing the RESET button. Normally, the internal battery is charged to 60 per cent of its ampere-hour capacity. The internal Normal Charge/Reserve Charge switch enables charging the battery to full capacity.

1-5. INSTRUMENT IDENTIFICATION.

1-6. Hewlett-Packard uses a two-section, eight-digit serial number to identify instruments. This serial number is engraved on a serial plate located on the instrument rear panel. The first three digits are a serial prefix number and the last five digits refer to your specific instrument. If the first three digits of your instrument serial number do not appear on the title page of this manual, there are differences between the manual and your instrument which are described in a change sheet included with the manual. If the change sheet is missing, the information can be supplied by your nearest Hewlett-Packard field office.

1-7. SPECIFICATIONS.

1-8. Table 1-3 lists the technical specifications for the Model 5085A Standby Power Supply.

1-9. EQUIPMENT SUPPLIED.

1-10. Table 1-1 lists equipment supplied with the Model 5085A Standby Power Supply.

1-11. ACCESSORIES.

1-12. Table 1-2 lists accessories for HP Model 5085A Standby Power Supply (not furnished with instrument).

Table 1-1. Equipment Supplied

HP Part No.	Description
05085-6011	Installation Kit, inc. following items:
114B-16A	AC Power Cable
0403-0051	Extension Slides (pair)
0403-0052	Adapter Set
05085-2011	Mounting Bracket (left)
05085-2012	Mounting Bracket (right)
05085-0011	Battery Shield (two)
5040-0164	Filler Strip
	Hardware for installing batteries and mounting strips
1420-0012	Battery (Sonotone #23957) (two)
5951-0401	Battery Manual
1420-0013	Wrench (for battery caps)
(Batteries and wrench shipped in separate package from instrument).	

Table 1-2. Accessories

HP Part No.	Description
103A-16A	2-conductor cable, male to female, for J5
113A-16E	2-conductor cable, male to female, for J4 only
1251-0127	4-pin male connector (mates with J3 or J4)
1251-0129	5-pin male connector (mates with J5)
1251-0145	6-pin female connector (mates with J2)
BENCH MOUNTING ACCESSORIES	
5060-0763	Handle Assembly (2 required)
5060-0765	Retainer-Handle Assembly (2 required)
5060-0767	Foot Assembly (5 required)
5000-0052	Trim Strip (2 required)
NOTE: Use of tilt stand with this instrument not recommended.	

1-13. SPECIAL APPLICATIONS.

1-14. In installations where standby reliability is of utmost importance, or where many deep discharge-charge cycles are expected, it is advisable to provide a spare battery (HP Part No. 1420-0012) and an auxiliary power supply such as Harrison Labs Model 510A.

Table 1-3. Specifications

OUTPUT VOLTAGE: 24 ± 2 volts dc at rated current.

MAXIMUM RATED CURRENT (total external load): 2 amperes. *

STANDBY CAPACITY: (At 25°C. **) 14 ampere hours after 10 days normal operation. 21 ampere hours after 4 days in reserve charge mode.

ALARM INDICATORS: Panel lamps indicate: (1) FUSE FAILURE, (2) AC POWER, (3) AC INTERRUPT, (4) RESERVE CHARGE.

REMOTE ALARM PROVISIONS: SPDT relay contacts provided at rear terminals for operating remote alarm from separate power system. Contacts rated at 3 amps (resistive) at 115 v ac or 28 v dc.

PANEL METERS: Voltmeter and ammeter indicate battery voltage and battery charge/discharge current.

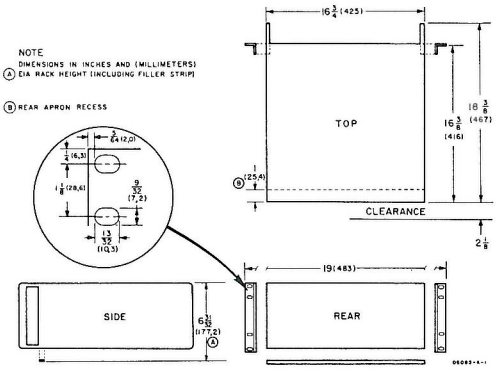
POWER REQUIREMENTS: 115 or 230 ± 10% v ac; 50 to 1,000 Hertz (cps) (2. 0 amps max. at 115 v line).

OUTPUT CONNECTORS. (Oscillator & Clock):
Mate with 106A/B, 107AR/BR, 115CR & 5060A power cables.
Oscillator Power: Cannon #MS3102R14S-5P
Clock Power: Cannon #MS3102R14S-2S.

BATTERY (supplied): Vented nickel-cadmium,25 ampere-hours rated capacity. Periodic maintenance required.

ADDITIONAL (external) BATTERY PROVISION: MS3102R14S-2S female connector at rear.

DIMENSIONS:



WEIGHT: Net 75 lbs (34, 1 Kg). Shipping 101 lbs (45, 9 Kg) including battery.

EQUIPMENT SUPPLIED
AC Power Cable, 6 feet long (1830 mm).
Instrument Extension Slides for std. 24" (610 mm) deep rack
Instrument Mounting Brackets

ACCESSORIES AVAILABLE:
- 103A-16A, 2-conductor cable, male to female, for J5 (Osc. Output)
- 113A-16E, 2-conductor cable, male to female, for J4 (Clock Output)
- 1251-0129, 5-pin male Connector (for Oscillator Output)
- 1251-0127, 4-pin male Connector (for Clock Output)
- 1251-0145, 6-pin female Connector (External ALARM)

*2. 5 amperes for 30 minutes.
**Derate capacity to 75% at +50°C and 0°C.

SECTION II
INSTALLATION

2-1. INTRODUCTION.

2-2. This section includes instructions for unpacking, inspection, storage, shipment, and installation of the Standby Power Supply.

2-3. UNPACKING AND INSPECTION.

2-4. INSTRUMENT. If the shipping carton is damaged, ask that the carrier's agent be present when the instrument is unpacked. Inspect the instrument for damage (scratches, dents, broken parts, etc.). If the instrument is damaged or fails to meet specifications, notify the carrier and the nearest Hewlett-Packard field office immediately. Retain the shipping carton and the padding material for the carrier's inspection. The field office will arrange for the repair or replacement of your instrument without waiting for the claim against the carrier to be settled.

2-5. BATTERIES. Batteries for the Model 5085A are shipped in a cardboard box separate from the instrument. Unpack batteries per Paragraph 2-4. Check to see if any liquid has spilled into the shipping container. This may be a sign of a damaged battery cell. Test screws and nuts on all terminals for tightness -- poor electrical contact may damage the battery. Check vent plugs to be sure they are not obstructed. Check to be sure there is liquid in every cell -- tip battery, if necessary. If no liquid is present, 10 cc of distilled water may be added to cell. Avoid personal contact with electrolyte (refer to Paragraphs 2-30 through 2-37.)

2-6. STORAGE AND SHIPMENT.

2-7. INSTRUMENT. To protect valuable electronic equipment during storage or shipment, always use the best packaging methods available. Your Hewlett-Packard field office can provide packing material such as that used for original factory packaging. Contract packaging companies in many cities can provide dependable custom packaging on short notice. Two recommended packing methods are given below. Remove batteries from instrument before packaging. Fasten battery leads to keep them from flexing during shipment. If batteries are to be shipped, they should be packed separately (see Paragraph 2-9).

a. RUBBERIZED HAIR. Cover painted surfaces of instrument with protective wrapping paper. Pack instrument securely in a strong corrugated container (350 lb/sq in. bursting test) with 2-inch rubberized hair pads placed along all surfaces of the instrument. Insert fillers between pads and container to ensure a good fit. Tape or strap carton securely.

b. EXCELSIOR. Cover painted surfaces of instrument with protective wrapping paper. Pack instrument in a strong container (350 lb/sq in. bursting test) with a layer of excelsior about 6 inches thick packed firmly against all surfaces of the instrument. Tape or strap carton securely.

2-8. Conditions during storage and shipment of the instrument should normally be limited as follows:

a. Minimum temperature: -40°F (-40°C)

b. Maximum temperature: +167°F (+75°C).

2-9. BATTERIES. The batteries used in the Standby Power Supply should be packaged for shipping as follows:

a. Remove from instrument (see Paragraph 2-49).

b. Pack in original shipping container. Take care to protect terminals and caps against breakage.

2-10. PREPARATION FOR USE.

2-11. ENVIRONMENT.

2-12. VENTILATION. The Model 5085A requires a free flow of air about the rear and sides of the instrument to cool the power transistors and remove oxygen and hydrogen which are produced during battery charging (see Paragraph 2-66).

2-13. When operating within the specified 0°C to +50° C range, the standby capability of the Model 5085A is reduced by 1% for each degree Centigrade difference between ambient temperature and +25°C. In Normal Charge mode, 100% is 14 ampere-hours. In Reserve Charge mode, 100% is 21 ampere-hours. Ambient temperatures during operation should be limited as follows:

a. Minimum temperature: +32°F (0°C)

b. Maximum temperature: +122°F (+50°C).

2-14. RACK MOUNTING.

2-15. The Model 5085A is supplied with extension slides as an accessory. These slides permit sliding the instrument out of its rack and tilting for repair or maintenance. Parts necessary to prepare the Standby Power Supply for operation as a slide-mounted rack instrument are supplied as an installation kit with the instrument. (See Figure 2-1.)

2-16. RACK. The extension slides supplied with the Model 5085A are designed to be used in a standard 24-inch deep rack. Three sets of mounting holes at the rear of each slide, combined with the mounting slots in the brackets provide a 2-3/4-inch range of adjustment to accommodate other rack depths. Standard EIA-drilled rack flanges are required at front and rear to support the slides.

2-17. BRACKETS. Four "U"-shaped brackets are furnished in the slide adapter kit. The long slots at the bottom of the "U" mate with the slides, while the holes on the sides mate with the rack flanges. One side of the "U" has four holes and the other side has five -- use the sides with four mounting holes.

2-18. Each slide mounts onto a pair of brackets. The brackets in each pair are not identical, but are "mirror images" of each other. To find a pair of mating brackets, hold two brackets together in the manner in which they will be mounted (5-hole sides together, forming a "double-U"). The slide-mounting slots in the brackets should line up; if they don't, try the remaining brackets until a mate is found. When one pair of brackets has been found, the remaining two are a pair. The only difference between brackets is in the position of the slide-mounting slots; when slides are properly mounted, they will not be centered vertically on the brackets, but will have larger spaces at the top.

2-19. Mount brackets in rack as follows:

a. Lay off the nominal panel height (7 inches) of the Model 5085A in the desired position on the rack flanges. For safety and ease in checking electrolyte level, the Model 5085A should not be mounted more than 4 feet above floor.

b. Mark center of panel height on rack flanges.

c. Hold instrument mounting brackets against rack flanges at top of this space to be sure mounting holes will line up.

d. Select one of the pairs of brackets mated per Paragraph 2-18.

e. Hold the pair vertical, with the slide mounting slots closer to the top end than to the bottom.

f. Mount the front bracket of the pair to the inside (rear) of the front rack flange, using the side of the bracket with four holes. Center the bracket vertically on the instrument vertical center-line marked on the rack. The bottom of the "U" must be toward the center of the rack. If necessary, to avoid interference with the instrument mounting brackets, countersink the rack flange holes and use flat-head screws.

g. Mount rear bracket to inside (front) of rear rack flange, selecting flange holes which will make the slide horizontal.

h. Mount brackets for opposite side in similar manner.

2-20. Attach slides to brackets as follows:

a. Use 6-32 flathead screws and lock-nuts provided.

b. Hold one nut behind upper slot in one front bracket.

c. Hold one slide so upper front hole is lined up with nut.

d. Put flathead screw through slide hole and into nut.

e. Pull inner slides out, exposing mounting holes at rear of slide assembly. (Be sure that front screw is in far enough to clear slide.)

f. Attach slide to rear bracket, using mounting holes that line up with slots in bracket.

g. Install remaining front screw.

h. Push stationary section of slide as far as possible toward rear of rack.

i. Tighten all mounting screws.

j. Install opposite slide in similar manner.

2-21. ROTATING ADAPTERS. To mount rotating adapters, refer to Figure 2-1 and proceed as follows:

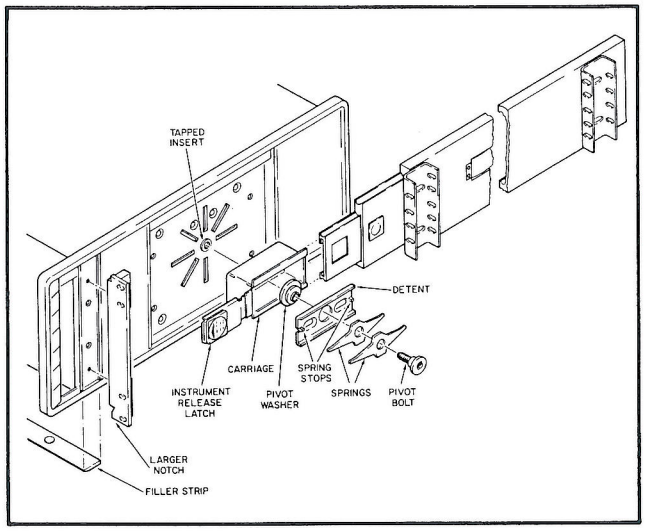


Figure 2-1. Rack and Slide Mounting

a. Apply Lubriplate or similar lubricant to casting surfaces where detent will ride, to both sides of pivot washer, and to underside of pivot-bolt head. Do not lubricate pivot-bolt threads or threads of tapped inserts in side castings. Apply lubricant liberally to inside corners at top and bottom of carriage (see Figure 2-1) where detent will ride as instrument is rotated into and out of detent positions.

b. Assemble adapter parts in the order shown in Figure 2-1. The tapped inserts supplied with the adapter kit are not needed, since the Model 5085A castings have inserts installed. If the detent springs have different curvature, place the spring with the greater curvature on top. See that springs are centered against spring stops while tightening bolt. The instrument release latch, labeled DEPRESS THEN REMOVE, faces toward front of instrument.

c. Attach filler strip to bottom of instrument front panel.

d. Attach instrument mounting brackets to side castings. Use 8-32 hardware provided. Larger notches on brackets should be toward bottom of instrument.

e. With adapters mounted on each side of the instrument, extend the slides to their locked position and fit the adapters into the inner slide rails.

f. Push DEPRESS THEN REMOVE latches and push instrument into place.

g. Rotate instrument to test detent action. The instrument should rotate freely without undue scraping sound. If scraping sound persists, or detent action is harsh, relubricate per Paragraph 2-21a, especially inside corners of carriage.

h. Remove instrument from slides, and disassemble adapters. Apply Loctite sealant (supplied) to the threads of the pivot bolts. Reassemble adapters and tighten bolts securely.

2-22. FINAL ADJUSTMENTS. Final slide adjustment is done with instrument in slides.

a. Check alignment of front panel when instrument is pushed into rack.

b. If alignment is not correct, pull instrument out of rack and reposition front slide brackets slightly as needed for good fit.

c. Check action of instrument in slides to be sure that it rolls in and out freely.

2-23. USE OF THE EXTENSION SLIDES. With the instrument slide-mounted, access may be obtained by removing the instrument mounting bracket retaining screws, and sliding the instrument out until the slides lock in their extended position. The Model 5085A in its rotating adapters may be turned to any convenient position for observation or testing. (Do not turn upside down or into a vertical position while batteries are charging; electrolyte might be forced out through battery vents.) To return the instrument to its normal operating position, push the latches marked DEPRESS THEN CLOSE, slide instrument into place, and bolt instrument mounting brackets to rack flanges.

2-24. REMOVING INSTRUMENT FROM RACK. To remove instrument from rack, remove instrument mounting bracket retaining screws, then slide instrument out to its locked position. Disconnect cables from rear of instrument. Push the DEPRESS THEN REMOVE latches and slide instrument outward.

CAUTION

The Model 5085A Standby Power Supply weighs 75 lbs (34, 1 kg) with batteries installed. Disengagement from slides when removing instrument starts after 2 inches (50 mm) of outward movement. Be sure that the instrument is adequately supported beyond this point.

2-25. To return the instrument to the rack, first extend the slides to their full locked position. Fit the adapters to the inner slide rails, and slide the instrument in until it stops. Push the DEPRESS THEN REMOVE latches and push the instrument in until the latches engage in the slides. Push the DEPRESS THEN CLOSE latches, slide the instrument into place, and bolt the instrument mounting brackets to the rack flanges.

2-26. BENCH MOUNTING.

2-27. Accessories available for converting the Model 5085A for bench operation are listed in Table 1-2. With the instrument not slide-mounted, and the battery not installed, proceed as follows:

a. Install five feet on bottom cover. Put foot into large holes at ends of mounting slots, press foot-release button, slide foot to edge of cover as far as it will go.

b. Attach handles. Handles mount with the ⓗⓟ symbol visible and right-side-up on both sides of the instrument. The handle assembly retainers mount with the bottom part (part with largest area) behind bottom of handle and top part covering handle and handle spring. The free ends of the springs should be pointing away from the side castings and toward the bottom of the instrument. Fasten handle assembly retainers with 8-32 x 3/8 Phillips screws.

c. Check operation of handles. If a handle does not work smoothly, remove handle from side casting and smooth points that rub. Reattach handle to side casting.

d. Pull handles about 1 inch out from their normal closed positions; the handle springs should have enough tension to pull them securely back into place. If a spring does not keep its handle snugly against the handle assembly retainer plate, remove handle and rotate end of spring outward to increase tension.

e. Attach trim strips. Remove protective paper from both sides of strips. Mount strips in places on side castings where instrument mounting brackets would be attached if instrument were to be mounted in rack. The strips are slightly shorter than the openings where they are mounted, and should be mounted at the tops of these openings, leaving a space at the bottom on each side.

2-28. BATTERY SAFETY PRECAUTIONS.

2-29. To avoid personal injury and damage to batteries, the WARNING and CAUTION information Paragraphs 2-30 through 2-42 should be read before handling batteries.

2-30. WARNING - GENERAL.

2-31. The electrolyte in the battery is caustic, poisonous, and dangerous to eyes, skin, and clothes. If electrolyte spills or sprays on body or clothing, wash the affected area thoroughly, with cold water only, until all soapy feeling is gone and skin feels clean.

2-32. WARNING - EYES.

2-33. If electrolyte gets into eye, irrigate the eye immediately with cold water. If possible, hold head so water runs from inner corner to outer corner of

eye. Roll eye while irrigating to ensure complete irrigation of eyeball. Do not be afraid of using too much water; extra irrigation does no harm, too little may allow caustic solution to remain. SEEK IMMEDIATE MEDICAL ATTENTION after first aid.

2-34. WARNING - SKIN.

2-35. If electrolyte sprays on body or clothing, remove clothing from affected area to prevent further contact with solution. Wash the affected area thoroughly in cold water until all soapy feeling is gone. Do not apply other chemicals or ointments to burn area. Wrap burn area tightly with sterile dressing to prevent blistering; excluding air reduces pain of burn.

2-36. VENT PLUGS - REMOVING.

2-37. To prevent spraying of electrolyte, vent plugs should be removed as follows:

a. Place special wrench (supplied) on vent plug.

b. Cover wrench and vent plug with a clean cloth as protection against electrolyte that may spray due to gas pressure in cell. (Vent valves open at about 10 psi and close at about 2 psi.)

c. Keep face away from vent plugs when they are being loosened.

d. Turn wrench counterclockwise as far as possible without forcing. (The hiss is the sound of gas escaping from cell.) The vent plug is now loose, and may be removed.

2-38. CAUTION - TOOLS.

2-39. Do not use items or tools that have previously been used with acid batteries. Acid ruins an alkali battery.

2-40. CAUTION - WATER.

2-41. Only distilled or demineralized water should be added to an alkali battery. Do not use water labeled "water for batteries". This is distilled water shipped in carboys which may also have been used for sulfuric acid. As such, it is suitable for lead-acid batteries but will ruin alkali batteries.

2-42. CAUTION - ACID.

2-43. Never add acid to the batteries in the Model 5085A. Acid ruins an alkali battery.

2-44. BATTERY INSTALLATION

2-45. Instrument should be removed from rack before installing or replacing batteries.

2-46. Install batteries as follows:

a. Remove top and side covers.

b. Loosen the 18 screws holding front battery bracket to side castings.

c. Pull front battery bracket as far forward as possible. If necessary, remove instrument mounting brackets or trim strips, loosen 8 screws holding front panel to side castings, and 10 screws holding main deck assembly to side castings.

d. Install batteries. Positive (+) terminals of both batteries should be toward left front of instrument.

e. Push front battery bracket against batteries and tighten 18 screws holding it to side castings.

f. Install two battery shields. Horizontal sections without holes are "up", pointing away from each other. Battery must be disconnected.

g. Tighten all other screws loosened in Paragraph 2-46, b, c.

h. Attach red wire to positive (+) terminal of left battery.

i. Attach yellow wire to negative (unmarked) terminal of right battery.

j. Complete series circuit by connecting the short orange jumper between the batteries. The spark that occurs when making this connection is normal and is caused by C1 and C3 charging before ac power is applied.

k. Install top and side covers, and mounting brackets or trim strips, as necessary.

2-47. Note battery condition on front panel meters. A battery voltage of approximately 26 volts will cause a discharging current of approximately 75 ma. If battery voltage is approximately 10 volts, a discharging current of approximately 20 ma will be indicated.

2-48. If the battery voltage is more than 10 volts, the AC INTERRUPT light will light as soon as the battery is connected. Switching to Reserve Charge by using the internal Normal Charge/Reserve Charge switch will cause the RESERVE CHARGE light to light.

2-49. To remove a battery, reverse procedure of Paragraph 2-46. Lift battery out of instrument by running strong twine or other non-conductor under connecting bars at front and rear of battery and lifting.

2-50. POWER REQUIREMENTS

2-51. The Model 5085A can be operated from either 115- or 230-volt (±10%) 50- to 1000-Hertz (cps) ac power lines. A slide switch on the rear panel permits quick conversion for operation from either voltage. Insert a narrow blade screwdriver in the switch slot and set the switch to expose the correct numbers ("115" or "230") for the line voltage to be used. The line fuses installed are rated at 2 amperes for 115 vac operation, and should be replaced with 1 ampere fuses when the instrument is to be operated from a 230-volt power line (see Table 2-1).

CAUTION

Before connecting ac power to the instrument, be certain slide switch is correctly positioned.

Table 2-1. 115/230-Volt Conversion

Conversion	115 Volts	230 Volts
Slide switch	up ("115")	down ("230")
AC line fuses	2-amp slow-blow (℗ #2110-0006)	1-amp slow-blow (℗ #2110-0007)

2-52. ELECTRICAL CONNECTIONS

2-53. POWER CABLE.

2-54. The Standby Power Supply is equipped with a detachable three-conductor power cable. Install as follows:

a. Connect the round, three-conductor female plug to the AC LINE jack on the instrument rear panel.

b. Connect male plug (two-blade with round grounding pin) to three-conductor (grounded) outlet. There is no ON/OFF switch; the Model 5085A is "on" as soon as it is plugged into the line. Exposed portions of the instrument are grounded through the round pin for safety; when only two-conductor outlets are available, use connector adapter (℗ part number 1251-0048), and connect short wire from adapter to a suitable ground. The capacitors in the line filter can produce a shock hazard; therefore the instrument should always be grounded through the third wire in the power cord when operating from the line.

2-55. OSCILLATOR POWER AND CLOCK POWER.

2-56. Connect instrument to be powered to the appropriate 5- or 4-pin connector on the Model 5085A rear panel. Output voltage is 24 volts dc. Total current output through both connectors must not exceed 2 amperes (2.5 amperes during the first 30 minutes of Model 5060A warmup). With the ac power cord disconnected, the Model 5085A can safely supply 4 amperes without damage. To prevent overheating in the output voltage regulator transistors, maximum current should be limited to two amperes when the ac power cord is connected.

2-57. EXTERNAL ALARM.

2-58. Relay contact closure connects terminals A and B of the rear panel EXT. ALARM 6-pin male connector when ac power fails. The circuit between terminals B and C is opened. Since no power is supplied to terminals A, B, and C, the external alarm circuit must supply its own power. Provision can be made for the Model 5085A to power an external alarm, but this would cause the standby time to be decreased.

2-59. EXTERNAL BATTERY.

2-60. To provide additional standby time, an external battery can be connected to the EXTERNAL BATTERY 4-pin female connector on the rear panel. Use only two 10-cell vented nickel-cadmium (℗ stock no. 1420-0012) batteries for extended periods of unattended operation. Use of other batteries as external battery is covered in Paragraphs 2-64 and 2-65.

2-61. Connect external battery as follows:

a. Turn rear panel EXTERNAL BATTERY CURRENT potentiometer fully counter-clockwise to MIN. This resistor limits surge current between the external and internal batteries when a potential difference exists.

b. Connect the ungrounded external batteries in series to the rear panel EXTERNAL BATTERY connector with positive (+) terminal to pin B and negative (-) terminal to pin A.

c. Slowly rotate EXTERNAL BATTERY CURRENT potentiometer clockwise, keeping BATTERY CURRENT meter reading on-scale, until reaching MAX current position. Internal and external batteries are now connected in parallel, except that the BATTERY CURRENT meter monitors only the internal battery current.

2-62. No external battery should be connected to the Model 5085A when charging in the Reserve Charge mode. Differences in battery charging characteristics may cause either the internal or external battery to over-charge, causing gassing problems. (For explanation of gassing, see Paragraph 2-68.)

2-63. Only the external battery described in Paragraph 2-59 should be charged by the Model 5085A, and only when the Model 5085A is charging in Normal Charge mode. This battery is identical to the internal battery, and the Normal Charge mode prevents the Standby Power Supply from overcharging either battery.

2-64. LEAD-ACID BATTERIES. Lead-acid batteries may be used as external batteries for the Model 5085A when vented ni-cad batteries are not available. These batteries should not be charged from the Model 5085A, because their charging characteristics are different from the internal nickel-cadmium batteries. NEVER USE ANY TOOL ON A NICKEL-CADMIUM BATTERY AFTER IT HAS BEEN USED ON A LEAD-ACID BATTERY.

2-65. SEALED NICKEL-CADMIUM BATTERIES. Use of sealed nickel-cadmium batteries with the Model 5085A is not recommended.

2-66. RESERVE CHARGE.

2-67. When the internal battery is being charged in Reserve Charge mode, it should be checked twice weekly to replace electrolyte lost due to gassing (see Paragraph 2-68).

2-68. BATTERY GASSING.

2-69. When the batteries are being charged, oxygen and hydrogen are created by the electrolysis of the water in the electrolyte. This reaction causes each battery cell to lose approximately 1 cc of fluid per day for each 100 ma of charging current. The electrolyte in the battery cells should not be permitted to get more than 25 cc low; this is about at the bottom of the windows. In Reserve Charge mode, each cell will lose about 6 cc of water per day, so electrolyte levels

should be checked twice weekly. The Normal Charge mode causes each cell to lose about 1 cc of water per day, so electrolyte level should be checked every three weeks. Add only distilled water to bring electrolyte to proper level.

2-70. MATING CONNECTORS

2-71. Table 2-2 lists the instrument connectors and the mating connectors required on the external cables. Refer to Table 1-2 for cables.

Table 2-2. Mating Connectors

Instrument Connector		Mating Connector	
Description	hp Part No.	hp Part No.	Description
J1 AC LINE 3-pin male	1251-0039	1251-0100	3-pin female, Cannon MS3106E14S-7S (series ME)
J2 EXTERNAL ALARM 6-pin male	1251-0144	1251-0145	6-pin female, Cannon MS3106E14S-6S (series ME)
J3 EXTERNAL BATTERY 4-pin female	1251-0128	1251-0127	4-pin male, Cannon MS3106E14S-2P (series ME)
J4 CLOCK OUTPUT 4-pin female	1251-0128	1251-0127	4-pin male, Cannon MS3106E14S-2P (series ME)
J5 OSCILLATOR OUTPUT 5-pin female	1251-0130	1251-0129	5-pin male, Cannon MS3106E14S-5P (series ME)

SECTION III
OPERATION

3-1. INTRODUCTION.

3-2. The Model 5085A is automatic in operation and, other than for periodic maintenance, needs a minimum of attention during operation. In normal operation, with the AC POWER indicator lit and battery on Normal Charge, the Standby Power Supply requires only a daily meter check and a periodic check of battery electrolyte level. (When charging the battery in the Reserve Charge mode, electrolyte level should be checked every three days.)

3-3. Observe front panel meters and indicator lights daily to be sure instrument is operating properly, and that ac line power has not been interrupted. A daily log of instrument condition and meter readings is helpful for maintenance and repair purposes.

3-4. FRONT PANEL CONTROLS AND INDICATORS

3-5. Figure 3-1 illustrates the instrument front panel controls and indicators.

3-6. METERS. The condition of the instrument internal batteries is monitored by the front panel BATTERY VOLTAGE and BATTERY CURRENT meters. Battery output voltage is indicated by the left meter. The battery charging or discharging current is indicated by the right meter. These meters do not indicate the output voltage or current of the Standby Power Supply.

3-7. INDICATOR LIGHTS AND RESET BUTTON. Each FUSE FAILURE light is connected in parallel with one of the ac line fuses. When a FUSE FAILURE light is on, a fuse has blown and the power supply circuits should be checked.

3-8. There is no ON/OFF switch in the Model 5085A, thus the AC POWER light is normally on when the instrument is plugged into the ac line (see Paragraph 3-14). Should the AC INTERRUPT light also be on, it is an indication that the ac line voltage has been interrupted and some of the battery's standby time used. The AC INTERRUPT light is turned off by pressing the RESET button. When the AC INTERRUPT light is on while the AC POWER light is off, line voltage is not being supplied to the instrument and it is operating from its standby batteries.

3-9. The RESERVE CHARGE light is on when the instrument internal Normal Charge/Reserve Charge switch is set to Reserve Charge. This mode of operation charges the battery to full capacity and increases the standby capability from 14 ampere-hours to 21 ampere-hours. (Refer to Paragraph 2-66.)

3-10. REAR PANEL CONNECTORS & INDICATORS , FUSES, & SWITCH.

3-11. All connections for input and output power are made at the rear-panel connectors (see Figure 3-2). Two ac line fuses are installed in holders in the upper right corner of the rear panel. The 115/230-volt switch provides for operation from either 115- or 230-volt, 50- to 1000-Hertz (cps) power lines. Set this switch to expose the correct marking ("115" or "230") for the line voltage used. The ac line voltage is applied through the 3-pin male AC LINE jack.

3-12. The OSCILLATOR POWER and CLOCK POWER output connectors provide the dc output voltage to power loads with appropriate mating connectors. An external battery can be connected to the EXTERNAL BATTERY jack to increase standby time (refer to Paragraphs 2-59 through 2-65). The EXT. ALARM jack provides connections to complete an external, self-powered alarm circuit when ac line power fails. (see Paragraph 2-57).

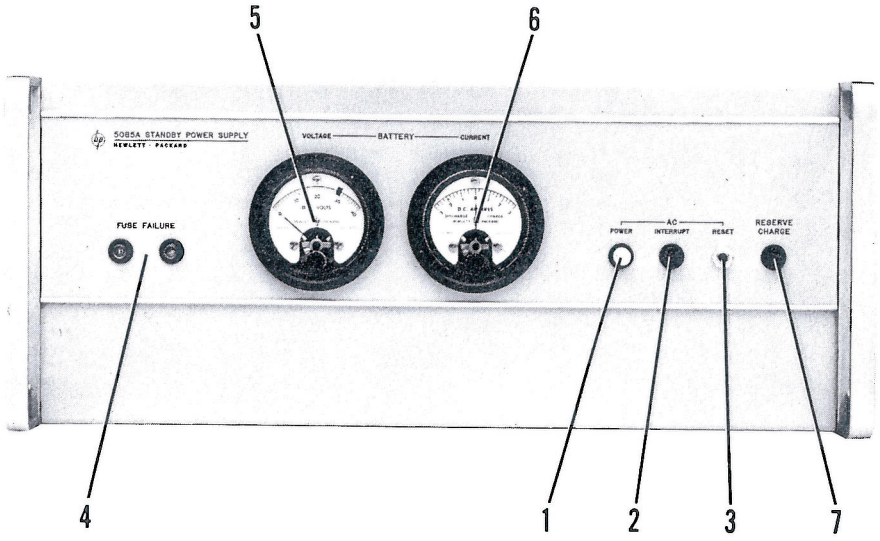
3-13. Table 3-1 lists current requirements at turn-on and ambient temperatures of 0°, +25°, and +50°C for several hp instruments which may be operated by a Model 5085A Standby Power Supply.

Table 3-1. Current Requirements (typical values)

hp Instrument	Warm-up	Temperature		
		0°C*	+25°C	+50°C*
106A/B Quartz Oscillators	460 ma (8 hrs)	400 ma	275 ma	200 ma (40°C max)
107AR/BR Quartz Oscillators	600 ma (4 hrs)	540 ma	420 ma	300 ma
113BR Freq. Divider & Clock	----	1.0 amp	1.0 amp	1.0 amp
115A/B/C Freq. Divider & Clock	----	115 ma	115 ma	115 ma
115 W/encoders	----	350 ma	350 ma	350 ma
5060A Cesium Beam Freq. Standard	2.5 amp (30 min)	2.0 amp	1.5 amp	1.25 amp
5085A (in addition to load)	----	50 ma	50 ma	50 ma

*Derate 5085A standby capacity to 75%.

FRONT PANEL



1. AC POWER light. Indicates Standby Power Supply is operating from ac line power.

2. AC INTERRUPT light. Lights when ac power to instrument has been interrupted and internal batteries have supplied standby power to load.

3. RESET button. Must be pressed to turn off AC INTERRUPT light.

4. FUSE FAILURE lights. Light to indicate when instrument is not operating from ac line power due to a fuse failure.

5. BATTERY VOLTAGE meter. Indicates voltage of internal standby batteries. The normal operating voltage is between 28 and 30 volts, indicated by the red area on the meter face. This meter does not show the output voltage of the Standby Power Supply.

6. BATTERY CURRENT meter. Indicates the charging or discharging current through the internal standby batteries.

7. RESERVE CHARGE light. Lights when internal Normal Charge/Reserve Charge switch is set to Reserve Charge. In this mode the standby batteries are charged to full capacity. When operating in Reserve Charge mode, check level of battery electrolyte twice weekly. Charging batteries to full capacity requires 48 hours starting from Normal (60%) Charge, or 96 hours with a discharged battery; after this time, return to Normal Charge operation.

Figure 3-1. Front Panel Controls and Indicators

REAR PANEL

1. 115/230-VOLT switch. Allows selection of either 115- or 230-volt line. Slide up for 115 volts, down for 230 volts. Be sure switch is in correct position before connecting ac power.

2. AC LINE jack. Accepts round female connector on power cable supplied.

3. Ac line fuses. Use 2-ampere slow-blow for 115-volt operation; 1-ampere slow-blow for 230-volt operation.

4. OSCILLATOR OUTPUT connector. 5-pin female connector. Provides 24 volts dc between terminals A (+) and C (-). Total current output through 4 and 5 connectors should not exceed 2 amperes.

5. CLOCK OUTPUT connector. Four-pin female connector. Provides 24 volts dc between terminals D (+) and C (-). Total current output through 4 and 5 connectors should not exceed 2 amperes.

6. EXTERNAL BATTERY CURRENT potentiometer. Controls surge currents when external batteries are connected to the Standby Power Supply. Turn potentiometer counter-clockwise to MIN before connecting external batteries. After batteries are connected, slowly turn toward MAX, keeping BATTERY CURRENT meter reading on-scale.

7. EXTERNAL BATTERY jack. Four-pin female connector. When extended standby time is desired, two external batteries identical with the internal batteries may be connected in series between terminals B (+) and A (-). (Read BATTERY PRECAUTIONS, Paragraphs 2-43 through 2-47 before doing this.)

8. EXT. ALARM jack. Six-pin male connector. Provides switching circuit for external self-powered, ac power failure alarm, Terminals A, B normally open, terminals B, C normally connected. Power failure causes internal relay to switch, connecting terminals A, B and opening terminals B, C.

Figure 3-2. Rear Panel Controls and Indicators

3-14. NORMAL OPERATION.

3-15. Table 3-2 lists normal indications for the Model 5085A lights and meters. Normal operation occurs when the instrument is plugged into an operating ac line, the Normal Charge/Reserve Charge switch is set to Normal Charge, and the load is warmed-up and operating normally. (Some of these indications may not occur when instrument is first turned on; refer to Paragraph 3-16 for explanation.)

Table 3-2. Normal Indications

AC POWER light	on
AC INTERRUPT light	off
RESERVE CHARGE light	off
FUSE FAILURE lights	off
BATTERY VOLTAGE meter	28 to 30 volts
BATTERY CURRENT meter	0.05 to 0.75 ampere* (charging current)
*Current will initially be .75 ampere, and should have decreased to about 0.075 ampere within 3 days. Batteries are float-charged at about 0.075 ampere rate in Normal Charge mode.	

3-16. If the battery in the Model 5085A is discharged to a point where the BATTERY VOLTAGE meter indicates 10 volts or less, either at turn-on or after having supplied standby power, some of the normal indications will not occur immediately when the instrument is plugged into the ac power line. The AC POWER, AC INTERRUPT, and RESERVE CHARGE lights will not light with normal brilliance until the battery voltage is approximately 15 volts. If the battery has been completely discharged, it may take as long as 5 minutes for these lights to come on after the instrument has been plugged into the power line. It may take as long as 20 minutes for the BATTERY VOLTAGE meter to come to a reading of about 24 volts.

3-17. BATTERY CHARGING.

3-18. In normal operation the internal battery is charged to approximately 60% to 70% of its capacity, providing 14 ampere-hours of standby power capability. This is sufficient to power the ℔ Model 5060A Cesium Beam Frequency Standard for 9 hours at 25°C ambient temperature.

3-19. When standby power is expected to be required for an extended period, the Normal Charge/Reserve Charge switch can be set to Reserve Charge for 48 hours (96 hours for completely discharged battery), allowing the internal battery to be charged to full capacity. When fully charged, the battery provides 21 ampere-hours of standby power (14 hours of standby power for the ℔ Model 5060A). After charging for 96 hours at the Reserve Charge rate, return the instrument to Normal Charge mode; batteries will be float-charged at whatever level of charge was attained in Reserve Charge mode. (Check electrolyte level, see Paragraph 2-66.)

3-20. EXTENDING STANDBY TIME.

3-21. Standby time can be increased in three ways:

a. The internal battery of the Standby Power Supply can be brought to full charge using the Normal Charge/Reserve Charge switch (see Paragraph 2-66).

b. An external battery can be connected to the Model 5085A (see Paragraphs 2-59 through 2-65).

c. More than one Model 5085A may be connected in parallel. When this is done the total current still should not exceed 2 amperes because one Standby Power Supply may be supplying all the current.

3-22. GROUND.

3-23. GENERAL.

3-24. The output of the Model 5085A is isolated from chassis ground and may be used to power instruments operating up to ±100 volts dc away from ground potential.

3-25. CONNECTING TWO INSTRUMENTS.

3-26. Two instruments may be powered at the same time by one Model 5085A Standby Power Supply, provided their grounds have the same polarity and their combined current requirement does not exceed 2 amperes. Two methods for checking the compatability of two instruments that are to be powered by the Model 5085A are given below.

3-27. FIRST METHOD. This method may be used when momentary loss of power to an instrument connected to the Model 5085A is not important. (A short circuit across the output of the Standby Power Supply would interrupt power to an instrument connected to it.)

a. Disconnect the Standby Power Supply from ac power. (With ac power removed, the reading of the BATTERY CURRENT meter is nearly identical with the output current of the Model 5085A.)

b. Connect one of the instruments to the Model 5085A output and note the amount of current it draws.

c. Determine the amount of current the second instrument should draw, either by connecting it separately to the Model 5085A or by referring to its specifications. (Table 3-1 lists current requirements for several ℔ instruments which may be powered by the Model 5085A.)

d. Plug the two instruments into their proper connectors, while watching the BATTERY CURRENT meter. The instrument should show the sum of the currents required to operate each instrument separately. (Maximum current should not exceed 2.75 amperes.) If current is appreciably greater than this, immediately disconnect instruments from 5085A and check for short circuits and different polarity ground connections.

e. If instruments are compatible for operation with the Model 5085A, plug the Standby Power Supply into the ac line.

3-28. SECOND METHOD. This method should be used where one instrument is already plugged into the Model 5085A, and must not lose power. (A short across the output of the Standby Power Supply would interrupt power to an instrument connected to it.)

a. Disconnect Standby Power Supply from ac power line.

b. Turn EXTERNAL BATTERY CURRENT potentiometer to MIN.

c. Connect positive power input of second instrument to pin B of EXTERNAL BATTERY jack and negative power input to pin A of jack. (Voltage across these terminals is about 30 volts; be sure instrument connected here will not be damaged by this voltage.)

d. Slowly rotate EXTERNAL BATTERY CURRENT potentiometer toward MAX, keeping BATTERY CURRENT meter on-scale. Maximum current should be 2.75 amperes (discharging); if more current is drawn, the instruments are incompatible, and must be modified or connected to separate Standby Power Supplies.

e. Disconnect instrument from EXTERNAL BATTERY jack. If instruments are compatible with each other, plug this instrument into the appropriate connector on the rear panel of the Model 5085A.

f. Plug the Standby Power Supply into ac line.

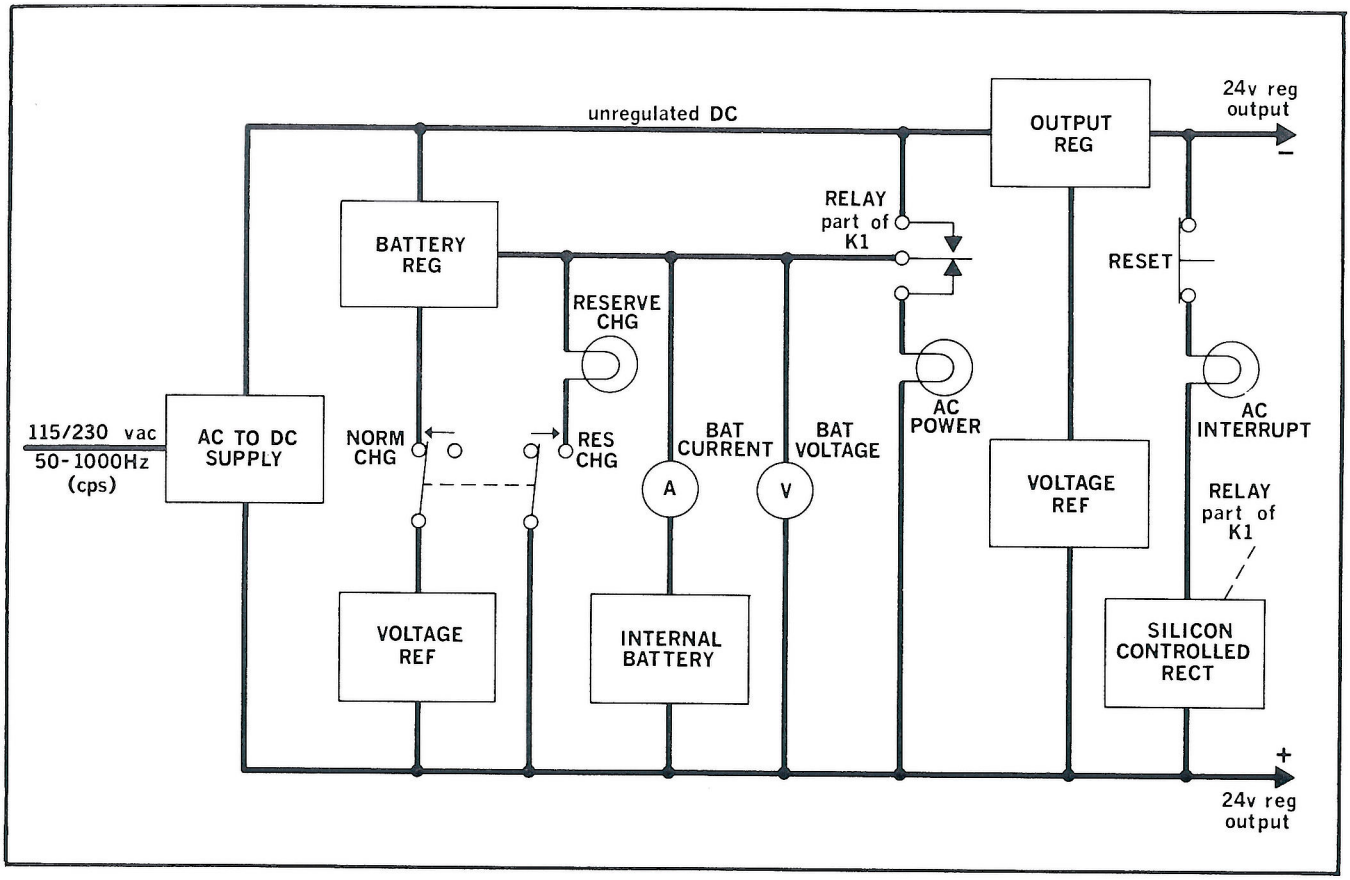


Figure 4-1. Block Diagram

SECTION IV
THEORY OF OPERATION

4-1. INTRODUCTION.

4-2. This section describes how the Model 5085A operates. As illustrated in the block diagram (Figure 4-1), the Standby Power Supply consists of the following functional sections: 1) ac-to-dc supply, 2) output voltage regulator, 3) battery supply regulator, 4) internal battery, and 5) relay and indicator circuits. Line power is converted to unregulated dc by the ac-to-dc power supply. The regulators, operating from the unregulated dc power, provide the 24-volt output and current to charge the battery and drive the indicator lamps. The relay, connected across the ac line, controls the AC POWER and AC INTERRUPT lights and drive current for the output regulator in addition to providing switching contacts for an external alarm circuit.

4-3. AC-TO-DC SUPPLY.

4-4. Switch S1 connects the primary windings of the transformer in parallel for 115-volt line operation or in series for 230-volt operation. Line voltage is stepped down by the transformer to about 32 volts, rectified by the full-wave bridge rectifier circuit CR1, 2, 3, 4, and filtered by C1. Output of the ac-to-dc supply is unregulated 33 to 45 volts, depending on output load current and input line voltage.

4-5. REGULATORS.

4-6. GENERAL.

4-7. The battery supply regulator and output voltage regulators are both basically simple transistor series voltage regulators with current limiting, as shown in Figure 4-2. In this circuit, transistor Q1 is connected as an emitter follower, with the output load, R_L, as the emitter resistor. Breakdown diode CR1 provides the reference voltage at the transistor base. Resistor R1 provides a path for drive current to the breakdown diode and transistor base. Because the resistance of a forward-biased base-emitter junction is low, changes in output current have little effect on the output (emitter) voltage, which must remain nearly the same as the reference (base) voltage. Changes in the unregulated input voltage are not seen by the transistor base, and have no effect on the output voltage.

4-8. Diode CR2 and resistor R2 in the simple series regulator (Figure 4-2) provide current limiting. The diode is, in effect, connected between the input and output terminals of the regulator. The value of R2 is chosen so that excessive current will produce enough voltage drop across the regulator to cause the diode to conduct. When the diode conducts, its current through R1 reduces the current available for Q1 base, thus preventing further increase in Q1 conduction.

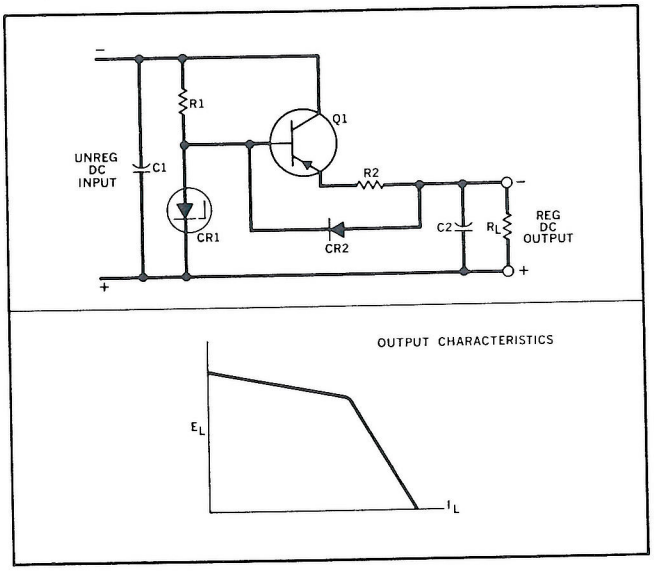


Figure 4-2. Series Regulator with Current Limiting

4-9. OUTPUT VOLTAGE REGULATOR.

4-10. The output voltage regulator consists of four series voltage regulators connected in parallel and driven by Q4 for more current gain. Transistor Q4 operates at a reference level determined by CR12, 13, and obtains its drive current from the battery circuit through R11, 12. This transistor supplies drive current to the bases of regulating transistors Q5, 6, 7, 8, at the voltage level determined by CR12,13. Resistors R13, 14, 15, 16 equalize output currents among the transistors and, with CR14, provide current limiting for the output regulator.

4-11. Resistor R17 provides a path for the collector-base currents (I_{CO}) that occur in the regulator transistors when the Standby Power Supply is operating with little or no load at the output. If this resistor were removed (or open) these currents would cause the voltage at Q4 emitter to increase, turning off that transistor and allowing the output voltage to rise toward the unregulated supply voltage.

4-12. The output voltage regulator must normally develop a voltage drop of 12 to 15 volts when operating from the ac line versus a maximum voltage drop of 4 to 6 volts when operating from battery power. This is accomplished by having relay K1 short R11 during battery operation, increasing drive current to Q4 base and reducing the voltage drop across the output voltage regulator. Output voltage of the Model 5085A depends on the voltage at Q4 base. When the battery has discharged to about 25 volts, CR12, 13 cease conduction and the voltage drop between the battery and regulator is equal to Q4 base current times

the resistance of R12. Shorting R11 for battery operation reduces the resistance between the battery and the output voltage regulator, keeping the output voltage up for a longer time near the end of battery life.

4-13. BATTERY SUPPLY REGULATOR.

4-14. GENERAL. The battery supply regulator consists of transistors Q1, 2, 3, and associated components. This regulator supplies charging current for the battery, drive current for the output voltage regulator, current for the AC POWER light, and current for the RESERVE CHARGE light when in the Reserve Charge mode of operation. The Normal Charge/Reserve Charge switch changes the characteristics of the battery supply regulator to provide for charging the battery to full capacity or float charging to about 60% of full capacity.

4-15. Figure 4-3 shows the relationship between current available through the battery supply regulator and the battery voltage. The line representing non-battery current requirements (current required by R11,12,DS4, and DS3) is not drawn with its true slope to make its relation to the total available current more apparent. Current available for battery charging is equal to the current available through the regulator at a given battery voltage minus the non-battery current requirements. At higher battery voltages the non-battery currents are increased, while the current available from the regulator decreases, reducing the current available for battery charging.

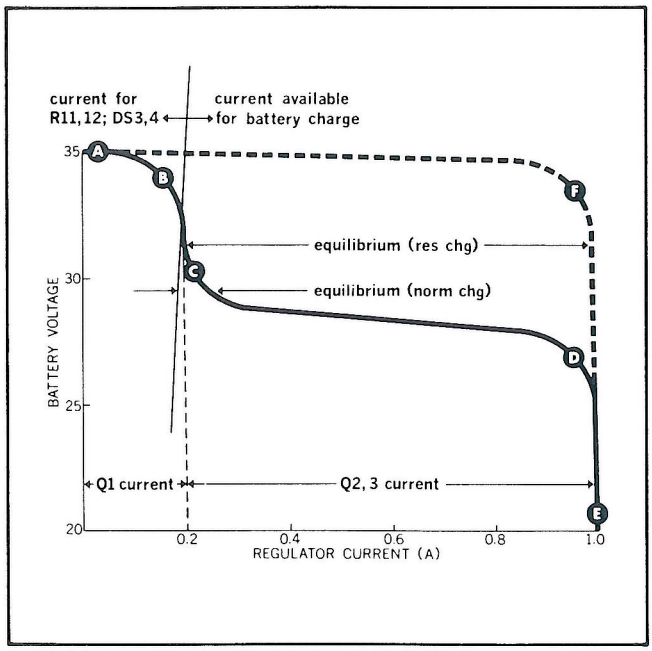


Figure 4-3. Battery Supply Regulator Characteristics

4-16. As the battery is charged in either charging mode, its voltage rises and charging current decreases until equilibrium is reached, and voltage and current remain constant. The charged battery normally reaches equilibrium in Normal Charge mode with a charging current of 50 to 125 ma. and voltage of 28.7 to 29.5 volts. At equilibrium in the Reserve Charge mode, current continues at a rate nearly equal to the initial charging current, about 550 ma. at 31 to 32 volts. The charging current at the equilibrium point of the Normal Charge curve is enough to allow the battery to retain whatever level of charge it had attained in the Reserve Charge mode. Note that the initial charging rates for both Normal Charge and Reserve Charge modes are identical.

4-17. Transistor Q1 is responsible for the portion of the characteristic curve through ABC (Figure 4-3). CR8 across Q1 base-emitter circuit limits the voltage across R5 to approximately 0.6 volt, thus the current through R5 and Q1 is limited to about 230 ma.

4-18. Transistors Q2, 3 connected in parallel are responsible for the CDE portion of the Normal Charge characteristic curve, and for the BFE portion of the Reserve Charge characteristic curve. Diodes CR9A/B limit the voltage across the Q2, 3 regulator circuit to about 1.2 volts, and the current through this transistor pair to about 0.5 ampere.

4-19. NORMAL CHARGE. In Normal Charge operation the bases of Q2, 3 are operated at a reference voltage established by CR6, 7 (removing the short across CR5 raises the level of CDE about 0.6 volt, providing slightly greater charge on the battery in Normal Charge). Initially the battery is charged by the maximum current through all three transistors (E on graph, Figure 4-3). As the battery voltage increases toward the level of the reference voltage on the bases of Q2, 3 (D on graph), the curve knee is reached where a small increase in voltage is accompanied by a large decrease in charging current as Q2, 3 reduce conduction. When the battery voltage is greater than the reference voltage for Q2, 3, these transistors cease conduction and the battery continues to be charged by current through Q1 only.

4-20. RESERVE CHARGE. Setting the Normal Charge/Reserve Charge switch to Reserve Charge disconnects the reference voltage from the bases of Q2, 3, and these transistors operate in parallel with Q1, charging the batteries toward the voltage of the unregulated dc supply (dotted line, Figure 4-3). In this mode an equilibrium is reached wherein the batteries gas due to electrolysis of the water in the electrolyte by the charging current (see Paragraph 2-68).

4-21. AC INTERRUPT LIGHT CIRCUIT.

4-22. The AC INTERRUPT light circuit is connected across the output of the Model 5085A. Current for the light is controlled by silicon controlled rectifier CR10. An SCR is similar to a thyratron in that once triggered into conduction, the control element loses control and conduction continues until the anode current is interrupted. In the Model 5085A, the conduction signal is supplied when relay K1 switches, connecting R4 to the positive battery terminal, causing the SCR gate electrode to go about 1.5 volts more positive than the cathode. Conduction continues after ac power is resumed until the anode circuit is interrupted by pressing the RESET button. Capacitor C2 provides filtering to prevent the SCR being triggered by noise.

SECTION V
MAINTENANCE

5-1. INTRODUCTION.

5-2. This section provides maintenance and service information for the Model 5085A. An in-cabinet performance check and a performance check record card are included to verify proper operation of the Standby Power Supply. Component location views and the schematic diagram are Figures 5-1 through 5-4 at the end of this section. Table 5-5 is included as troubleshooting aid.

5-3. SAFETY.

5-4. Paragraphs 5-5 through 5-11 contain the basic WARNING and CAUTION information required to prevent personal injury or damage to the instrument while performing maintenance and servicing operations. (Read Paragraphs 2-28 through 2-43 for details.)

5-5. WARNING.

5-6. The electrolyte in the battery is caustic, poisonous, and dangerous to eyes, skin, and clothing. If electrolyte sprays or spills on body or clothes, remove clothing from the affected area to prevent continuing contact with the solution and wash the area thoroughly with cold water until the soapy feeling is gone. If electrolyte gets into eye, wash eye immediately and completely in cold water, then seek medical attention. Seek proper First Aid and/or medical attention for any alkali burn.

5-7. Do not tilt instrument more than 45° while batteries are charging. Gas pressure may force electrolyte through vent plugs.

5-8. Do not turn batteries upside down. Electrolyte may seep through or around vent caps.

5-9. To protect against spraying electrolyte when removing vent caps, the following procedure should be used:

a. Place special wrench (supplied) on vent plug.

b. Cover wrench and vent plug with a clean cloth to protect against electrolyte that may be sprayed.

c. Keep face away from vent plugs when they are being loosened.

d. Turn wrench counterclockwise as far as possible without forcing. The vent plug is now loose, and may be removed.

5-10. CAUTION.

5-11. Do not use items or tools that have previously been used with acid batteries. Only pure distilled or demineralized water should be added to alkali batteries (do not use water labeled "water for batteries," which may have been shipped in carboys formerly used for sulfuric acid). Keep acid away from alkali batteries--acid ruins an alkali battery.

5-12. INSTRUMENT COVER REMOVAL.

5-13. To remove top cover, turn special fasteners about 1/4 turn counterclockwise, unlocking them. Slide cover toward rear of instrument, lifting front end of cover so fasteners will clear mating parts mounted on side castings. To replace cover, reverse procedure; check mating of flange at front edge of cover with front panel of instrument.

5-14. To remove bottom cover, unscrew and remove four countersunk phillips-head screws securing cover to instrument. Slide cover toward rear of instrument. To replace cover, reverse procedure.

WARNING

115/230 vac and battery connections are exposed with either top or bottom cover removed. Use appropriate caution when working on instrument with either cover off. Be careful when working around battery; a short circuit may cause current in excess of 100 amperes.

5-15. COMPONENT LOCATION.

5-16. Figures 5-1 and 5-2 show the location of components in the Standby Power Supply.

5-17. GENERAL INSTRUMENT MAINTENANCE.

5-18. The Standby Power Supply functions automatically, and normally needs a minimum amount of attention. General instrument maintenance is as follows:

a. Check front panel meters and indicator lights daily to be sure instrument is operating properly. Keeping a daily log of light indications and meter readings is a good way to ensure this check being made. The instrument log should include information on when electrolyte is checked, and how much is added to bring it up to the required level. Table 5-1 is a suggested heading arrangement for such a log.

Table 5-1. Typical Daily Log

AC POWER light	AC INTER light (off/on)	RES. CHG. light (off/on)	BATTERY CUR.	BATTERY VOLT	ELECTRO-LYTE CHECKED (amt. added) (comments)	By	Date

b. Keep electrolyte at correct level. When battery is fully charged, electrolyte should be 1/16 to 1/8 inch above top of plates in each cell. Do not allow electrolyte to go below bottom of window in side of battery. Check electrolyte level every three days in Reserve Charge mode; every three weeks in Normal Charge mode.

c. Clean instrument and battery by using a clean dry brush to remove dust and potassium carbonate (white powder-deposits) from panel, battery, and chassis. This should be done before removing vent plugs each time electrolyte is added.

d. The Model 5085A may be thoroughly washed by hosing it with water. To do so, disconnect the instrument, remove it from the rack (see Paragraph 2-24) and remove top and bottom covers (see Paragraph 5-12). All components, including meters, transformer, and line filter, are hermetically sealed and will not be damaged by water. After washing, tip the instrument on its side and use compressed air to dry it and the batteries completely before returning to rack.

c. Clean battery at least once a year (see Paragraphs 5-20 to 5-22).

5-19. BATTERY MAINTENANCE

5-20. CLEANING BATTERY.

5-21. Harmless potassium carbonate (a white powdery substance) will accumulate on the battery and vent plugs. Remove such deposits with a brush or a warm-water-dampened rag or sponge. Wipe battery dry with a clean dry cloth. At least once a year, remove complete vent plug assemblies and wash in warm water; dry them and replace on battery. For further instructions, refer to battery manual.

5-22. The batteries may be washed in warm water. Remove the batteries from the Standby Power Supply per Paragraph 2-49. Wash by running warm tap water over the tops of the batteries, with vent plugs in place. Tip batteries on side and use compressed air to dry them completely before replacing in instrument.

WARNING

Avoid personal contact with electrolyte. (See Paragraph 5-6.)

5-23. CHECKING ELECTROLYTE LEVEL.

5-24. Prevent spilling of, or contact with, electrolyte when checking level in battery. Protect eyes against spraying electrolyte when removing vent plugs (Paragraph 5-9).

5-25. In a discharged Sonotone battery, electrolyte level may not be above the plates. When batteries are installed in Standby Power Supply, electrolyte should be visible above bottom of windows in batteries before charging begins; add water as necessary to bring electrolyte level into view. If the level of the electrolyte is below the top of the plates after the battery voltage reaches 28 to 30 volts, add distilled or demineralized water until electrolyte level is 1/16 to 1/8 inch above the plates.

WARNING: Avoid personal contact with electrolyte (see Paragraph 5-5).

CAUTION: Do not contaminate electrolyte with acid (see Paragraph 5-10).

5-26. TEST EQUIPMENT.

5-27. Table 5-2 lists test equipment and loads recommended for in-cabinet performance checks and other

Table 5-2. Recommended Test Equipment and Loads

Instrument Type	Critical Requirements	Recommended Instrument
Variable voltage line source with meter	Variable from 103 to 127 vac (207 to 253 vac). Current capability of 2 amperes (1 ampere)	
DC voltmeter	Voltage range 0 to 50 volts. Accuracy ± 1% of full scale.	hp Model 412A
AC voltmeter	Voltage range 0 to 5 mv. Accuracy ± 3% of full scale.	hp Models 403A/B
DC ammeter	Current capability 0 to 10 amperes. Accuracy ± 3% of full scale.	hp Model 428B Clip-on DC milliammeter
Adjustable DC power supply	Current capability of 7 amperes at 35 volts.	Harrison Model 510A
LOAD: 300 ma		Resistor, fixed: 100 ohms, 15 watts minimum.
LOAD: 0.5 ampere		Resistor, fixed: 48 ohms, 15 watts minimum.
LOAD: 2.0 ampere	50 watts actual dissipation.	Resistor, fixed: 12.5 ohms, 50 watts minimum

servicing of the Model 5085A. Test instruments other than those recommended may be used, provided they meet the critical requirements listed.

5-28. VARIABLE LINE VOLTAGE.

5-29. When operating from ac power for performance checks and servicing, the Model 5085A should be connected to line power through a variable voltage device so input operating voltage may be varied ±10% from nominal line to assure proper operation under various supply conditions. Table 5-3 lists nominal, high, and low line voltages for 115- and 230-volt operation.

Table 5-3. Line Voltage

Nominal Voltage	115	230
High line	127	253
Low line	103	207

5-30. IN-CABINET PERFORMANCE CHECKS.

5-31. The in-cabinet performance checks (Table 5-4) and the PERFORMANCE CHECK TEST RECORD should be used to verify specifications and provide a permanent record of the performance of the instrument. The in-cabinet performance checks also verify proper operation of the Model 5085A and should be used:

a. As a check of instrument performance before connecting load instruments.

b. Periodically, to assure continuing performance within specifications.

c. As part of a troubleshooting procedure to locate malfunctioning circuits.

d. After any repairs or adjustments, before returning instrument to regular service.

Table 5-4. In-Cabinet Performance Checks*

*Before making any of the in-cabinet performance checks, charge the batteries at the Reserve Charge rate for 96 hours. Switch Normal Charge/Reserve Charge switch to Normal Charge before beginning any of these checks.
1. OUTPUT VOLTAGE: 24 volts ±2 volts dc at rated current.
Disconnect load instruments. Connect 2.0 ampere load (Table 5-2) to terminals A (+) and C (-) Oscillator Power output connector. a. Connect Standby Power Supply to ac power line through variable-voltage device (Table 5-2). Measure voltage across load at high, nominal, and low line voltages (Table 5-3). Voltage must be between 22 and 26 volts. Record value at nominal line on Performance Check Test Record. Measure voltage between terminal D (+) and C (-) of Clock Power output jack at nominal line. Must be same as voltage at Oscillator Power output. b. Disconnect instrument from ac line. Measure voltage across load. Must between 22 and 26 volts. Record value on Performance Check Test Record.
2. MAXIMUM RATED CURRENT: 2 amperes (2.5 amperes for 30 minutes).
Disconnect load instruments. Connect 2.0 ampere load between terminals A (+) and C (-) of Oscillator Power jack. Connect 0.5 ampere load between terminals D (+) and C (-) of Clock Power jack. Connect instrument to ac line through variable-voltage device. Operate at nominal line voltage (115- or 230-volts). After 30 minutes, measure output voltage and disconnect loads. (Output voltage must be 22 to 26 volts.)
3. STANDBY CAPACITY: 14 ampere-hours after 10 days Normal Charge charging. 21 ampere-hours after 4 days charging in Reserve Charge mode.
Ambient temperature during test must be between +20°C and +30°C. Model 5085A output voltage should be observed carefully, particularly near end of test. Make test only when it is certain that someone is available to monitor battery and ac power system, especially during final stages of test. Perform test as follows: a. Charge battery for 48 hours in Reserve Charge mode, being sure to replace electrolyte lost due to gassing. b. Disconnect Model 5085A from ac line power. c. Using system as load, record hourly indications of BATTERY CURRENT and BATTERY VOLTAGE meters.

Table 5-4. In-Cabinet Performance Checks (cont'd)

3. STANDBY CAPACITY (cont'd)
d. As BATTERY VOLTAGE meter reading decreases toward 22. 5 volts, check voltage more frequently and accurately record time of drop to 22. 5 volts. e. Reconnect Model 5085A to line power. f. To determine the available ampere hour capacity of the Model 5085A, multiply current flow from the battery by the discharge time to 22. 5 volts. If this figure is not more than rated capacity (21 ampere-hours), attempt to restore battery capacity by using the procedure of Paragraph 5-36.
4. ALARM INDICATORS
a. FUSE FAILURE. Plug Standby Power Supply into ac power line. Remove one ac line fuse. One FUSE FAILURE light lights. Replace fuse. Remove second ac line fuse. Second FUSE FAILURE light lights. Replace fuse. b. AC POWER. Connect Standby Power Supply to ac power line. AC POWER light lights. Disconnect from ac power line. AC POWER light goes out. c. AC INTERRUPT. Connect Standby Power Supply to ac power line. Press RESET button. AC INTERRUPT light is off. Remove ac power from instrument. AC INTERRUPT light lights. Apply ac power to instrument. AC INTERRUPT light remains on. Press RESET button. AC INTERRUPT goes off and remains off. d. RESERVE CHARGE. Remove instrument top cover. (Paragraph 5-12.) Switch Normal Charge/Reserve Charge switch to Reserve Charge. RESERVE CHARGE light lights. Switch Normal Charge/Reserve Charge to Normal Charge. RESERVE CHARGE light does not light. Replace top cover.
5. REMOTE ALARM
Connect Model 5085A to ac line. EXTERNAL ALARM pins A, B shorted; pins B, C open. Disconnect power: A, B open; B, C shorted.
6. PANEL METERS
a. BATTERY VOLTAGE meter. Remove top cover. Connect dc voltmeter (range 0 to 50 volts minimum, accuracy ±1%) in parallel with the BATTERY VOLTAGE meter. Compare the readings of the two meters. The BATTERY VOLTAGE meter reading should be within 2. 6 volts of reading on test voltmeter. b. BATTERY CURRENT meter. Disconnect Standby Power Supply from ac line. Disconnect load instruments. Remove top cover. Connect ammeter (range 0 to 3. 0 ampere minimum, accuracy ±3%) across orange jumper between batteries. Disconnect orange jumper. (When using a clip-on milliammeter, clip probe around orange jumper and leave jumper connected between batteries.) Connect 2. 0 ampere load (Table 5-2) between terminals A and C of Oscillator Power jack. Note current readings of both meters. BATTERY CURRENT meter should be within 0. 2 ampere of reading on test ammeter.

5-32. TROUBLESHOOTING AND REPAIR.

5-33. If the Model 5085A seems to be operating improperly, refer to Table 5-5 (Troubleshooting Aids), for possible causes.

5-34. DETERMINING AMPERE-HOUR CAPACITY OF BATTERY.

5-35. The ampere-hour capacity of a battery will gradually decrease with age and with the number and depth of discharge-charge cycles. If the Model 5085A is used in standby service only, the loss of capacity will be very small; but if frequent and deep discharge cycles are encountered, the loss of capacity may be serious and may occur early. To determine the ampere-hour capacity of the batteries in the Model 5085A, perform a controlled discharge test as described in Section 3 of In-Cabinet Performance Checks (Table 5-4).

5-36. To restore a battery that has lost ampere-hour capacity due to aging or repeated deep discharge-charge cycling:

a. Connect adjustable dc power supply to terminals B (+) and C (-) of rear panel EXTERNAL BATTERY jack (refer to Table 2-2 for mating connector). Adjust power supply to deliver 7 amperes charging current to battery for 6 hours. Battery voltage will rise to about 32 volts. Model 5085A must be plugged into ac line.

PERFORMANCE CHECK TEST CARD

Hewlett-Packard Model 5085A
Standby Power Supply
Serial No. ___ - _____

Tests performed by _____
Date _____

CHECK	INDICATION
1. OUTPUT VOLTAGE	
a. 115/230-volt line	22.0 v. ☐ 26.0 v.
b. Battery operation	22.0 v. ☐ 26.0 v.
2. MAXIMUM RATED CURRENT	☐
3. STANDBY CAPACITY	
Normal Charge (Charge for 10 days before test)	14 amp-hrs. ☐ amp-hrs.
Reserve Charge (Charge for 4 days before test)	21 amp-hrs. ☐ amp-hrs.
4. ALARM INDICATORS	
a. FUSE FAILURE	☐
b. AC POWER	☐
c. AC INTERRUPT	☐
d. RESERVE CHARGE	☐
5. REMOTE ALARM	☐
6. PANEL METERS	
a. BATTERY VOLTAGE	☐
b. BATTERY CURRENT	☐

b. Check battery electrolyte level during charging. Add water to replace electrolyte lost due to gassing.

c. Repeat discharge procedure of Table 5-4, Item 3.

d. If battery capacity remains less than 21 ampere-hours, the procedure of Paragraphs 5-36,e through 5-36,l below may be used to attempt to restore the lost capacity.

e. Disconnect Model 5085A from ac line. Operate system from Model 5085A internal battery until battery voltage drops to 22.5 volts.

f. Connect an external battery per Paragraph 2-41.

g. Disconnect Model 5085A internal battery and remove from instrument (see Paragraph 2-49).

h. Refer to Sonotone Battery Manual, Part III-B-1, "APPARENT LOSS OF CAPACITY", for instructions.

i. Replace batteries in Model 5085A. Reconnect batteries. (See Paragraphs 2-46 through 2-48.) Disconnect external batteries and repeat battery life test, Table 5-4, Item 3.

j. If battery capacity is not 21 ampere-hours or greater, repeat procedure of Paragraphs 5-36e through 5-36i.

k. If battery capacity is 21 ampere-hours or greater after second restoration attempt, leave in Model 5085A and disconnect external battery.

l. If battery capacity is less than 21 ampere-hours, the battery must be returned to the Sonotone Corporation for overhaul. Contact the Sonotone Corporation, Elmsford, New York, for instructions.

5-37. DAMAGED BATTERY/BAD ELECTROLYTE.

5-38. If the battery is damaged in use, or electrolyte has wrong specific gravity or has been contaminated by foreign material (especially acid), the battery (or individual cells) should be returned directly to Sonotone Corporation, Battery Service Department. Sonotone Corporation specifically recommends that the battery user not attempt to readjust the specific gravity of the battery unless it is impractical to remove it from service long enough to have this done at the factory. Refer to Sonotone battery manual, Parts III-A-5 ("ELECTROLYTE SPECIFIC GRAVITY"), III-A-6 ("REPAIR AND REPLACEMENT"), and III-B ("Troubleshooting").

5-39. SELECTION OF DIODES CR6 AND CR12.

5-40. The resistor board assembly is manufactured with bare wire in place of CR6 and CR12. During production testing at the factory, the voltage across each breakdown diode (CR7, 13) is measured and the diodes are padded, as necessary, to produce the proper reference voltages at Q2, 3 bases and Q4 base.

5-41. If CR6, 7, 12, or 13 is bad or suspected to be bad, or if the resistor board assembly is replaced, the following procedure should be used to obtain the proper reference voltage. Instrument should be operating in ambient temperature of +25°C, at normal line voltage.

a. Disconnect the Model 5085A from ac line power.

b. Remove any load instruments from output.

c. Remove top cover.

d. Connect 300 ma load (refer to Table 5-2) in place of battery. (Disconnect orange jumper between batteries. Connect 300 ma load across yellow and red battery leads.)

e. Connect 2.0-ampere load (see Table 5-2) to Oscillator Power jack (terminals A and C).

f. Set Normal Charge/Reserve Charge switch to Reserve Charge.

g. Plug instrument into ac line, operating at nominal voltage (115 or 230 volts).

h. Measure voltage at TP1 or TP2 (see Figure 5-4). Voltage at TP1 should be 24.8 to 25.8 volts; voltage at TP2 should be 28.7 to 29.6 volts. If either of these voltages is outside its allowable range, measure the voltage at junction of CR12, 13, or CR6, 7, and refer to Table 5-6 to determine amount of padding required.

i. When installing padding diodes, disconnect instrument from line power.

j. Connect to ac power and measure voltage at TP1 and/or TP2 after installing padding diode(s).

k. When installation and tests are complete, disconnect from ac line power. Disconnect all loads. Connect orange jumper between batteries (the spark is normal). Replace top cover.

5-42. PARTS REPLACEMENT

5-43. GENERAL. In most cases, replacement of parts in the Model 5085A is a straightforward procedure. Except for parts on the front board of the resistor board assembly, power transistors mounted on the heat sinks, and FUSE FAILURE lights, it is necessary only to remove the top (or top and bottom) cover(s) to be able to change any part in the instrument. Parts identification numbers or names are silk-screened on the main deck, panels, and resistor board assembly; parts location information is also provided in Figures 5-1 and 5-2.

5-44. LIGHTS AND METERS. The AC POWER, AC INTERRUPT, and RESERVE CHARGE lights are replaced by unscrewing the lens and removing the bulb. The instrument need not be removed from its rack location to do this. The neon lamps in the FUSE FAILURE indicators are integral parts of the indicator assemblies; if a FUSE FAILURE lamp is bad, the

whole assembly must be replaced. The batteries may have to be removed to provide access to replace the FUSE FAILURE lamps.

5-45. The meters mount from the front of the instrument. Remove the top cover to allow access to nuts on meter mounting screws.

CAUTION

Be careful not to short battery when working in Standby Power Supply. It is possible to draw currents in excess of 100 amperes, resulting in damage to battery.

5-46. TRANSISTORS AND DIODES. To replace one of the power transistors (Q5-8) mounted on heat sinks at the rear of the instrument, the heat sink must be removed to provide access for soldering iron and wrench. Silkscreened identification for transistors Q5-8 is located on rear panel between fins of heat sinks. Use nylon bushings (hp Part No. 1200-0081) to insulate mounting screws for power transistors Q1-4 from main deck.

5-47. Silicone grease (hp Part No. 8500-0059) is used on all anodized aluminum insulating washers and heat sinks to increase heat transfer from semiconductor components mounted on them. Silicone grease is also used on heat sink flanges that attach to the rear panel of the Model 5085A. When replacing any of the power transistors Q1-8, or diodes CR1-4, 7, 13, be sure to renew the silicone compound on the insulating washers and heat sinks as required to ensure good heat transfer between the transistor or diode and the mounting surface.

Table 5-5. Troubleshooting Aids

Trouble	Possible Cause
1. AC POWER light doesn't come on when instrument is plugged into operating line.	a. Battery voltage less than 15 volts. b. Lamp burned out. c. Relay K1 faulty. d. 115-230 v switch in 230 v.
2. AC INTERRUPT light doesn't come on when instrument is not operating from ac.	a. Battery voltage less than 15 volts. b. Lamp burned out. c. CR10 faulty. d. R4 or K1 faulty.
3. Battery charging current higher than normal. (Reserve CHARGE light off.)	a. Diode CR5, 6, or 7 open. b. Diode CR8 or 9 open. c. RESERVE CHARGE light burned out. (Check position of S2.)
4. Battery charging current less than normal.	a. R5, 6, 7 open. b. CR8, or 9A/B shorted. c. Battery electrolyte weak. d. Battery electrolyte level too low.
5. Battery supply voltage (BATTERY VOLTAGE meter reading) too high.	a. Open circuit in battery (check orange jumper and battery connecting bars). b. CR8 or 9A/B open. c. Excessive charging current. d. Low ambient temperature.
6. Battery supply voltage (BATTERY VOLTAGE meter reading) too low.	a. R1, 3, 5, 6, 7 open. b. Q1, 2, 3 open. c. Reference voltage at Q2, 3 bases too low. d. R13, 14, 15, 16 open. e. Q5, 6, 7, 8 open. f. AC power off.

Table 5-5. Troubleshooting Aids (cont'd)

Trouble	Possible Cause
7. Output voltage too low.	a. Output load draws too much current. b. Reference voltage at Q4 base low. c. Insufficient drive current to Q4 base or Q5-8 bases. d. R13, 14, 15, 16 open. e. Q5, 6, 7, 8 open. f. Ac power off.
8. Output voltage too high.	a. Reference voltage at Q4 base too high. b. Too much drive current to Q4 base or to Q5-8 bases. c. R17 open (light or no load on output). d. High battery voltage.
9. Output current too high.	a. Load draws too much current. b. CR14 open or has high resistance. c. R11, 12, or K1 faulty.
10. AC INTERRUPT light remains on while AC POWER light is on after RESET button is pressed.	a. CR10 shorted. b. K1 faulty. c. RESET switch faulty.
11. Output current low.	a. CR14 shorted. b. Insufficient drive current to Q4 base or Q5-8 bases. (Check R11, 12, K1, R17) c. R13, 14, 15, 16 open. d. R17 shorted. e. Q5, 6, 7, 8 open.
12. High ripple content in output DC.	a. Load draws too much current. b. Q5, 6, 7, 8 open. c. R13, 14, 15, 16 open. d. C1 or C3 open. e. Battery not connected. f. Ground loops.

Table 5-6. Selection of CR12 and CR6

CR12, 13 Junction Voltage	CR6, 7 Junction Voltage	For CR12 (CR6)
Greater than 25.8	Greater than 29.6	Replace breakdown diode (CR13, 7)
24.8 to 25.8	28.7 to 29.6	No padding required. Use wire in place of CR12 (CR6)
24.6 to 24.8	28.4 to 28.7	Install germanium diode (0.3 volt) hp Part No. 1910-0016
24.0 to 24.6	27.7 to 28.4	Install silicon diode (0.7 volt) hp Part No. 1901-0022
Less than 24.0	Less than 27.7	Replace breakdown diode (CR13, 7)

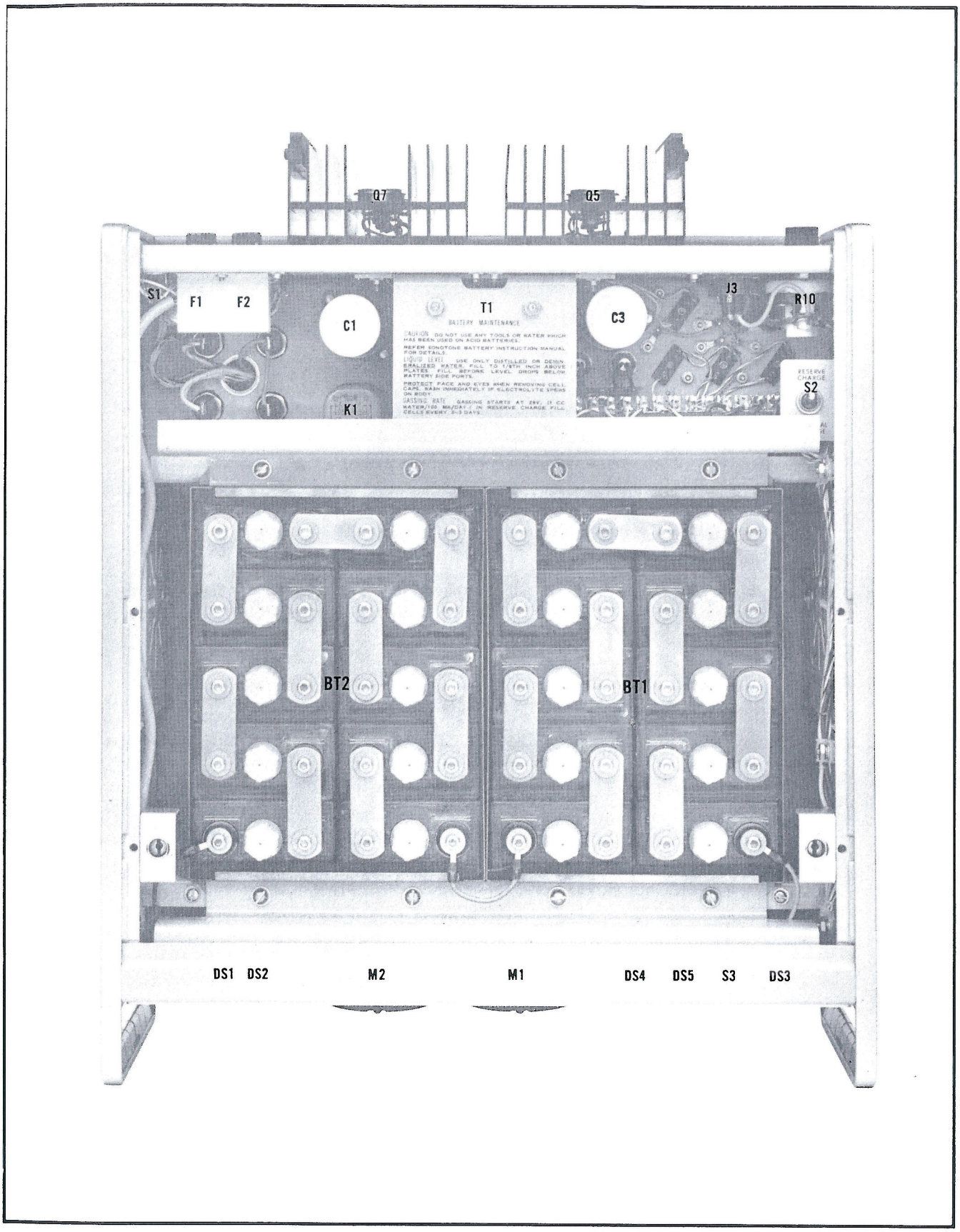


Figure 5-1. Model 5085A, Top View

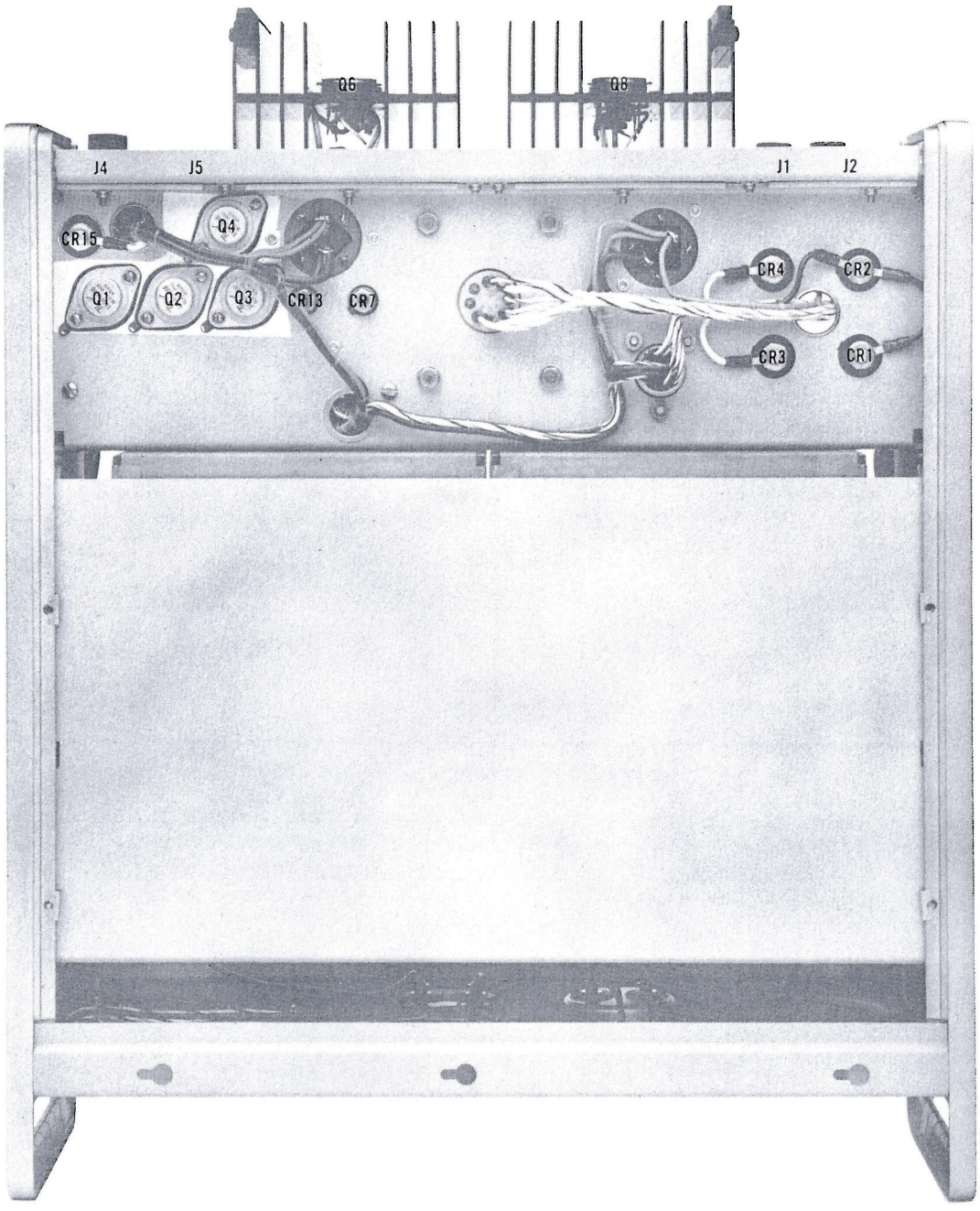


Figure 5-2. Model 5085A, Bottom View

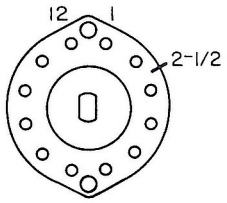
SYMBOLS

- FRONT PANEL
- REAR PANEL
- KNOB CONTROL
- SCREWDRIVER ADJUST
- MAIN SIGNAL PATH
- FEEDBACK PATH
- CONDUCTING ELEMENT
- WIPER MOVES TOWARD "CW" WHEN CONTROL IS ROTATED CLOCKWISE
- POWER LINE GROUND
- CIRCUIT COMMON GROUND
- TEST POINT
- "AND" GATE
- INHIBIT GATE
- "OR" GATE

WAVEFORMS SHOWN ARE TYPICAL

SWITCH DESIGNATIONS

A3S1BR(2-1/2)



A3S1	SWITCH S1 WITHIN ASSEMBLY A3
B	2ND WAFER FROM FRONT (A=1ST, ETC)
R	REAR OF WAFER (F=FRONT)
(2-1/2)	TERMINAL LOCATION ($2\frac{1}{2}$) (VIEWED FROM FRONT)

REFERENCE DESIGNATIONS

REFERENCE DESIGNATIONS WITHIN ASSEMBLIES ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.

ASSEMBLY	ABBREVIATION	COMPLETE DESCRIPTION
A25	C1	A25C1
A25A1	CR1	A25A1CR1
NO PREFIX	J3	J3

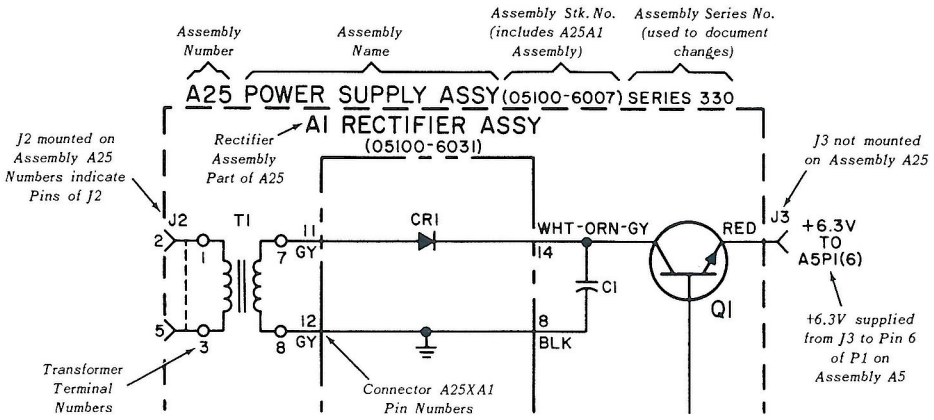
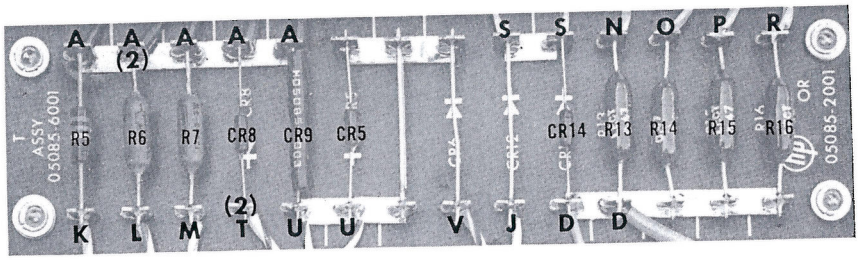
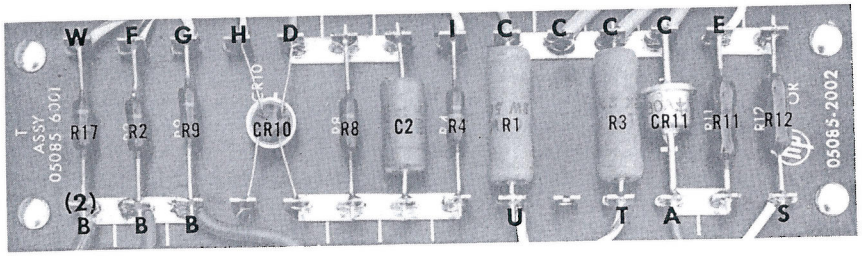
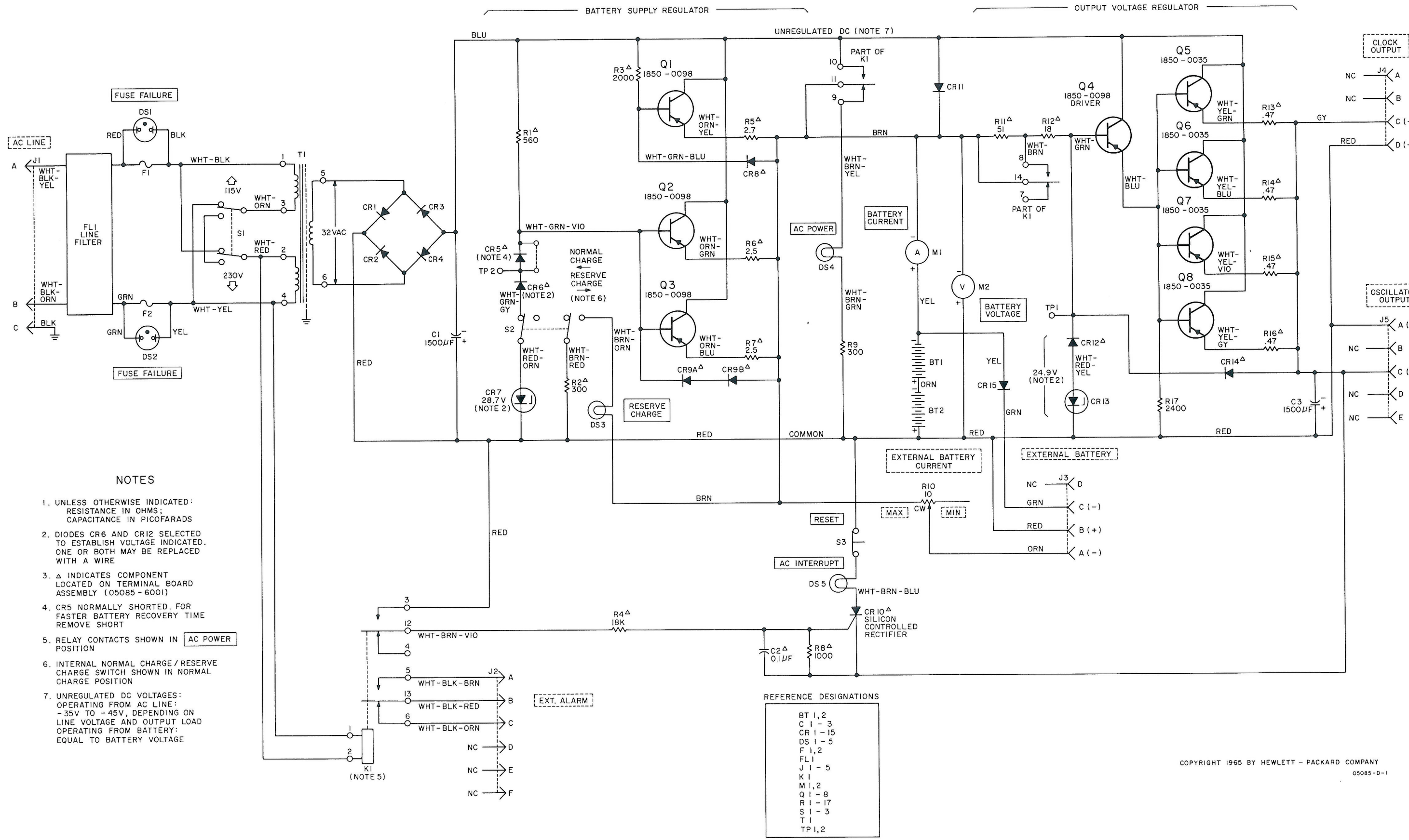


Figure 5-3. Schematic Diagram Notes



	JUMPER COLOR				JUMPER COLOR		
A	BRN			L	WHT	ORN	GRN
B	RED			M	WHT	ORN	BLU
C	BLU			N	WHT	YEL	GRN
D	GY			O	WHT	YEL	BLU
E	WHT	BRN		P	WHT	YEL	VIO
F	WHT	BRN	RED	R	WHT	YEL	GY
G	WHT	BRN	GRN	S	WHT	GRN	
H	WHT	BRN	BLU	T	WHT	GRN	BLU
I	WHT	BRN	VIO	U	WHT	GRN	VIO
J	WHT	RED	YEL	V	WHT	GRN	GY
K	WHT	ORN	YEL	W	WHT	BLU	





NOTES

1. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS
2. DIODES CR6 AND CR12 SELECTED TO ESTABLISH VOLTAGE INDICATED. ONE OR BOTH MAY BE REPLACED WITH A WIRE
3. Δ INDICATES COMPONENT LOCATED ON TERMINAL BOARD ASSEMBLY (05085-6001)
4. CR5 NORMALLY SHORTED. FOR FASTER BATTERY RECOVERY TIME REMOVE SHORT
5. RELAY CONTACTS SHOWN IN AC POWER POSITION
6. INTERNAL NORMAL CHARGE/RESERVE CHARGE SWITCH SHOWN IN NORMAL CHARGE POSITION
7. UNREGULATED DC VOLTAGES: OPERATING FROM AC LINE: -35V TO -45V, DEPENDING ON LINE VOLTAGE AND OUTPUT LOAD OPERATING FROM BATTERY: EQUAL TO BATTERY VOLTAGE

REFERENCE DESIGNATIONS

BT 1,2
C 1 - 3
CR 1 - 15
DS 1 - 5
F 1,2
FL 1
J 1 - 5
K 1
M 1,2
Q 1 - 8
R 1 - 17
S 1 - 3
T 1
TP 1,2

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05085-D-1

Figure 5-4. Schematic Diagram and Component Lo

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION.

6-2. This section contains information for ordering replacement parts. Table 6-1 lists parts in alpha-numerical order of their reference designators and indicates the description and hp stock number of each part, together with any applicable notes. Table 6-2 lists parts in alpha-numerical order of their hp stock number and provides the following information on each part;

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 Table 6-3.

c. Manufacturer's part number.

d. Total quantity used in the instrument (TQ column).

6-3. Miscellaneous parts are listed at the end of Table 6-1.

6-4. ORDERING INFORMATION.

6-5. To obtain replacement parts, address order or inquiry to your local Hewlett-Packard Field Office (see lists at rear of this manual for addresses). Identify parts by their Hewlett-Packard stock numbers.

6-6. To obtain a part that is not listed, include:

a. Instrument model number.

b. Instrument serial number.

c. Description of the part.

d. Function and location of the part.

REFERENCE DESIGNATORS

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

ABBREVIATIONS

A = amperes	GE = germanium	N/C = normally closed	RMO = rack mount only
A. F. C. = automatic frequency control	GL = glass	NE = neon	RMS = root-mean square
AMPL = amplifier	GRD = ground(ed)	NI PL = nickel plate	RWV = reverse working voltage
		N/O = normally open	
B. F. O. = beat frequency oscillator	H = henries	NPO = negative positive zero (zero temperature coefficient)	S-B = slow-blow
BE CU = beryllium copper	HEX = hexagonal		SCR = screw
BH = binder head	HG = mercury		SE = selenium
BP = bandpass	HR = hour(s)	NRFR = not recommended for field replacement	SECT = section(s)
BRS = brass			SEMICON = semiconductor
BWO = backward wave oscillator	IF = intermediate freq	NSR = not separately replaceable	SI = silicon
	IMPG = impregnated		SIL = silver
CCW = counter-clockwise	INCD = incandescent		SL = slide
CER = ceramic	INCL = include(s)	OBD = order by description	SPL = special
CMO = cabinet mount only	INS = insulation(ed)	OH = oval head	SST = stainless steel
COEF = coefficient	INT = internal	OX = oxide	SR = split ring
COM = common	K = kilo = 1000	P = peak	STL = steel
COMP = composition		PC = printed circuit	TA = tantalum
CONN = connector	LIN = linear taper	PF = picofarads = 10^{-12} farads	TD = time delay
CP = cadmium plate	LK WASH = lock washer	PH BRZ = phosphor bronze	TGL = toggle
CRT = cathode-ray tube	LOG = logarithmic taper	PHL = Phillips	TI = titanium
CW = clockwise	LPF = low pass filter	PIV = peak inverse voltage	TOL = tolerance
		P/O = part of	TRIM = trimmer
DEPC = deposited carbon	M = milli = 10^{-3}	POLY = polystyrene	TWT = traveling wave tube
DR = drive	MEG = meg = 10^{6}	PORC = porcelain	U = micro = 10^{-6}
	MET FLM = metal film	POS = position(s)	VAR = variable
ELECT = electrolytic	MET OX = metallic oxide	POT = potentiometer	VDCW = dc working volts
ENCAP = encapsulated	MFR = manufacturer	PP = peak-to-peak	
EXT = external	MINAT = miniature	PT = point	W/ = with
	MOM = momentary	PWV = peak working voltage	W = watts
F = farads	MTG = mounting	RECT = rectifier	WIV = working inverse voltage
FH = flat head	MY = "mylar"	RF = radio frequency	
FIL H = fillister head		RH = round head	WW = wirewound
FXD = fixed	N = nano (10^{-9})	RIV = reverse inverse voltage	W/O = without

01194-11

Table 6-1. Reference Designation Index

Reference Designation	℗ Stock No.	Description #	Note
	05085-6001	ASSY:RESISTOR BOARD	x
	05085-2001	BOARD:BLANK RESISTOR	x
	05085-2002	BOARD:BLANK RESISTOR	x
	5020-0242	SUPPORT:RESISTOR BOARD	x
BT1 AND BT2	1420-0012	BATTERY:RECHARGEABLE, VENTED NI-CAD	
C1	0180-0040	C:FXD ELECT 1500 UF 50VDCW	
C2	0170-0055	C:FXD 0.1 UF 20%	x
C3	0180-0040	C:FXD ELECT 1500 UF 50VDCW	
CR1 THRU CR4	1901-0032	DIODE:SILICON 15 AMP 100 PIV	
CR1 THRU CR4	1200-0088	INSULATOR:ANOD. ALUM W/ 1 HOLE (2 EACH)	
CR5	1901-0022	DIODE:SILICON 0.56V AT 1 MA	x
CR6		FACTORY SELECTED PART	x
CR7	1902-1188	DIODE BREAKDOWN:28.7V	
	1200-0080	INSULATOR:ANOD. ALUM. W/ 1 HOLE(2 EACH)	
CR8	1901-0022	DIODE:SILICON 0.56V AT 1 MA	x
CR9	05085-6003	ASSY:DIODE, INCLUDES CR9A, CR9B	x
CR10	1884-0003	SWITCH:SILICON CONTROLLED 3N58	x
CR11	1901-0409	DIODE:SILICON 3 AMP 50V	x
CR12		FACTORY SELECTED PART	x
CR13	1902-0166	DIODE ASSY:BREAKDOWN VOLTAGE 24.9V	
	1200-0080	INSULATOR:ANOD. ALUM. W/ 1 HOLE(2 EACH)	
CR14	1901-0022	DIODE:SILICON 0.56V AT 1 MA	x
CR15	1901-0032	DIODE:SILICON 15 AMP 100 PIV	
DS1	1450-0031	ASSY:FUSE FAILURE LIGHT	
DS2	1450-0031	ASSY:FUSE FAILURE LIGHT	
DS3	2140-0025	LAMP:INCANDESCENT 28V, GE# 327	
	1450-0127	LAMPHOLDER:RED,AC INTERRUPT	
DS4	2140-0025	LAMP:INCANDESCENT 28V, GE# 327	
	1450-0041	LAMPHOLDER:WHITE, AC POWER	
DS5	2140-0025	LAMP:INCANDESCENT 28V, GE# 327	
	1450-0127	LAMPHOLDER:RED, RESERVE CHARGE	
F1	2110-0006	FUSE: 2 AMP 115V	
F1	2110-0007	FUSE: 1 AMP 230V	
F2	2110-0006	FUSE: 2 AMP 115V	
F2	2110-0007	FUSE: 1 AMP 230V	
FL1	9110-0014	FILTER: AC LINE	
J1	1251-0039	CONNECTOR:3 PIN, MALE, AC LINE	
J2	1251-0144	CONNECTOR:6 PIN, MALE, EXT. ALARM	
J3	1251-0128	CONNECTOR:4 PIN, FEMALE, EXT. BATTERY	
J4	1251-0128	CONNECTOR:4 PIN, FEMALE, CLOCK OUTPUT	
J5	1251-0130	CONNECTOR:5 PIN, FEMALE, OSCILLATOR OUTPUT	
K1	0490-0033	RELAY:4PDT, 115VAC	
M1	1120-0400	METER:BATTERY CURRENT	
M2	1120-0117	METER:BATTERY VOLTAGE	
		NOTE:"X" PART OF ASSY: RESISTOR BOARD, 05085-6001	

See list of abbreviations in introduction to this section

Table 6-1. Reference Designation Index (Cont'd)

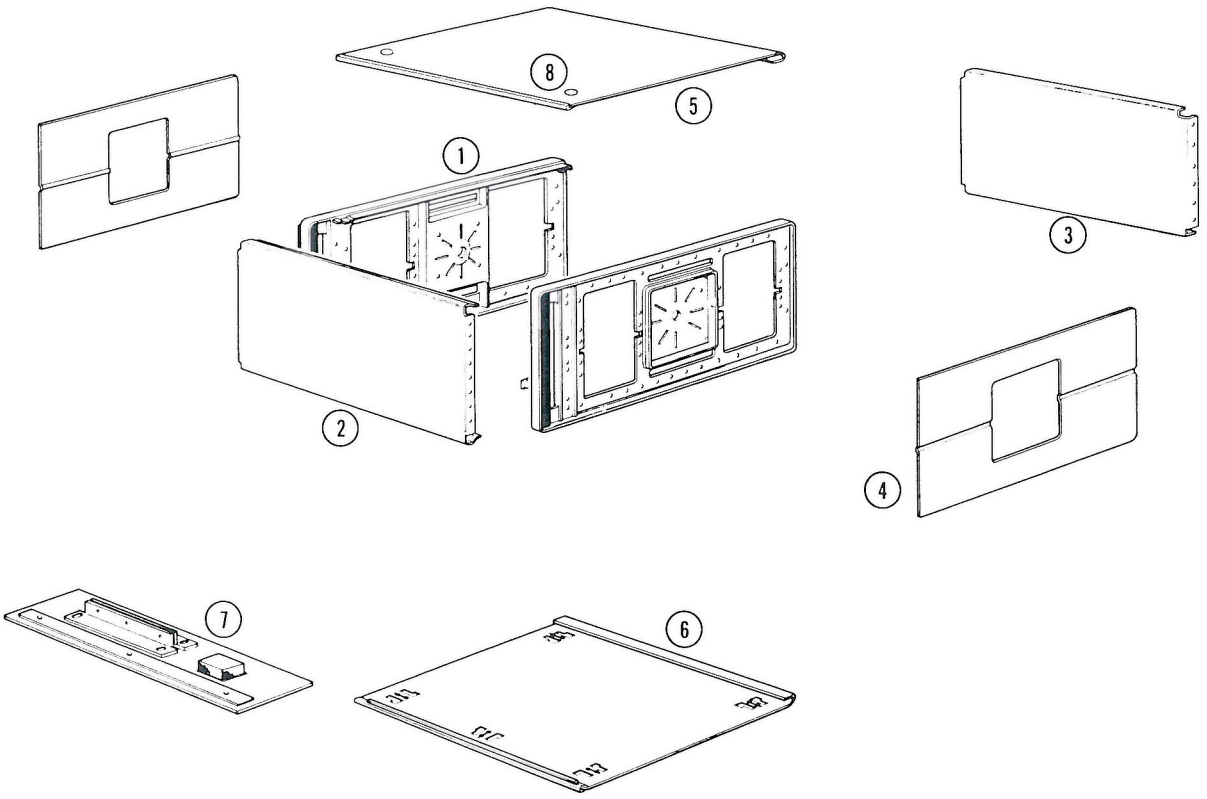
Reference Designation	℗ Stock No.	Description #	Note
Q1 THRU Q4	1850-0098	TRANSISTOR:GERMANIUM PNP 2N3132	
Q1 THRU Q4	1200-0081	INSULATOR:BUSHING, SCREW, NYLON (2 EACH)	
Q1 THRU Q4	1200-0043	INSULATOR:ANOD. ALUM. W/ 4 HOLES	
Q5 THRU Q8	1850-0035	TRANSISTOR:GERMANIUM 2N174	
Q5 THRU Q8	1200-0080	INSULATOR:ANOD. ALUM. W/ 1 HOLE	
Q5 THRU Q8	1200-0079	INSULATOR:ANOD. ALUM. W/ 4 HOLES	
R1	0767-0002	R:FXD MET OX 560 OHM 5% 3W	x
R2	0758-0016	R:FXD MET OX 300 OHM 5% 1/2W	x
R3	0766-0033	R:FXD MET OX 2.0K OHM 2% 3W	x
R4	0758-0019	R:FXD MET OX 18K OHM 5% 1/2W	x
R5	0699-0001	R:FXD COMP 2.7 OHM 10% 1/2W	x
R6	0811-0982	R:FXD WW 2.5 OHM 1% 3W	x
R7	0811-0982	R:FXD WW 2.5 OHM 1% 3W	x
R8	0758-0003	R:FXD MET OX 1K OHM 5% 1/2W	x
R9	0758-0016	R:FXD MET OX 300 OHM 5% 1/2W	x
R10	2100-0252	R:VAR WW 10 OHM 10% LIN 25W	
R11	0760-0012	R:FXD MET OX 51 OHM 2% 1W	x
R12	0812-0012	R:FXD WW 18 OHM 5% 3W	x
R13	0812-0021	R:FXD WW 0.47 OHM 5% 3W	x
R14	0812-0021	R:FXD WW 0.47 OHM 5% 3W	x
R15	0812-0021	R:FXD WW 0.47 OHM 5% 3W	x
R16	0812-0021	R:FXD WW 0.47 OHM 5% 3W	x
R17	0758-0034	R:FXD MET OX 2.4K OHM 5% 1/2W	x
S1	3101-0033	SWITCH:SLIDE DPDT (115V/ 230V)	
S2	3101-0038	SWITCH:TOGGLE, NORMAL/RESERVE CHARGE	
S3	3101-0097	SWITCH:PUSHBUTTON, RESET	
XF1	1400-0084	FUSEHOLDER:EXTRACTOR POST TYPE	
XF2	1400-0084	FUSEHOLDER:EXTRACTOR POST TYPE	
		MISCELLANEOUS	
	05085-2006	BAR:BOTTOM RETAINING,1/8" X 3/8" X 13-1/2"	
	05085-2014	BAR:FRONT RETAINING,1/8" X 3/8" X 2-1/2"	
	05085-2004	BAR:REAR RETAINING,1/8" X 3/8" X 4-1/2"	
	05085-2009	BAR:STIFFENING,3/8" X 1" X 15-27/32"	
	05085-2013	BAR:VERTICAL RETAINING,1/4" X 1/2" X 3-9/16"	
	05085-0002	BRACKET:FRONT BATTERY	
	05085-0007	BRACKET:SWITCH	
	05085-0006	BRACKET:TRANSFORMER	
	05085-6005	CABLE:AC	
	05085-6010	CABLE:BATTERY JUMPER,ORANGE	
	05085-6009	CABLE:BATTERY, NEGATIVE,YELLOW	
	05085-6008	CABLE:BATTERY, POSITIVE,RED	
	05085-6007	CABLE:FUSE	
	05085-6004	CABLE:MAIN	
	05085-2015	GUARD:HEAT SINK	
		NOTE:"X" PART OF ASSY: RESISTOR BOARD, 05085-6001	

See list of abbreviations in introduction to this section

Table 6-1. Reference Designation Index (Cont'd)

Reference Designation	℗ Stock No.	Description #	Note
		MISCELLANEOUS (CONT'D)	
	1205-0051	HEAT SINK	
	05085-6011	INSTALLATION KIT INCLUDES:	
	0403-0052	ADAPTER SET	
	05085-2011	BRACKET:LEFT INSTRUMENT MOUNTING	
	05085-2012	BRACKET:RIGHT INSTRUMENT MOUNTING	
	1148-16A	CABLE:AC POWER	
	0403-0051	EXTENSION SLIDES, PAIR	
	05085-0011	BATTERY SHIELD	
	5040-0164	STRIP:FILLER	
	0370-0026	KNOB	
	05085-0008	SHIELD:AC	
	05085-0009	SUPPORT:FASTENER, TOP COVER	

= See list of abbreviations in introduction to this section



Item	Description	Qty	℗ Part No.
1	Frame, painted	2	05085-8001
2	Front Panel	1	05085-0001
3	Rear Panel	1	05085-0004
4	Side Cover	2	5000-0743
5	Top Cover	1	05085-6006
6	Bottom Cover	1	5060-0752
7	Rack Mounting Brackets		
	Left	1	05085-2011
	Right	1	05085-2012
8	Fastener	2	0510-0147

Figure 6-1. Modular Cabinet Parts

Table 6-2. Replaceable Parts

℗ Stock No.	Description #	Mfr.	Mfr. Part No.	TQ
1148-16A	CABLE:AC POWER	28480	1148-16A	1
0170-0055	C:FXD 0.1 UF 20%	28480	0170-0055	1
0180-0040	C:FXD ELECT 1500 UF 50VDCW	56289	D32475	2
0370-0026	KNOB	28480	0370-0026	1
0403-0051	EXTENSION SLIDES, PAIR	28480	0403-0051	
0403-0052	ADAPTER SET	28480	0403-0052	
0490-0033	RELAY:4PDT 115 VAC	89474	APP DIV 3S2790G127	1
0699-0001	R:FXD COMP 2.7 OHM 10% 1/2W	01121	EB 27G1	1
0758-0003	R:FXD MET OX 1K OHM 5% 1/2W	28480	0758-0003	1
0758-0016	R:FXD MET OX 300 OHM 5% 1/2W	28480	0758-0016	3
0758-0019	R:FXD MET OX 18K OHM 5% 1/2W	28480	0758-0019	1
0758-0034	R:FXD MET OX 2.4K OHM 5% 1/2W	28480	0758-0034	1
0760-0012	R:FXD MET OX 51 OHM 2% 1W	28480	0760-0012	1
0766-0033	R:FXD MET OX 2.0K OHM 2% 3W	28480	0766-0033	1
0767-0002	R:FXD MET OX 560 OHM 5% 3W	28480	0767-0002	1
0811-0982	R:FXD WW 2.5 OHM 1% 3W	28480	0811-0982	2
0812-0012	R:FXD WW 18 OHM 5% 3W	28480	0812-0012	1
0812-0021	R:FXD WW 0.47 OHM 5% 3W	28480	0812-0021	4
1120-0117	METER:BATTERY VOLTAGE	28480	1120-0117	1
1120-0400	METER:BATTERY CURRENT	28480	1120-0400	1
1200-0043	INSULATOR:ANOD. ALUM. W/ 4 HOLES	71785	293011	4
1200-0079	INSULATOR:ANOD. ALUM. W/ 4 HOLES	71785	294665	4
1200-0080	INSULATOR:ANOD. ALUM. W/ 1 HOLE	71785	294834	8
1200-0081	INSULATOR:BUSHING,SCREW,NYLON	26365	974 SPECIAL	8
1200-0088	INSULATOR:ANOD. ALUM. W/ 1 HOLE	71785	293201	4
1205-0051	HEAT SINK	05820	NC-423K	2
1251-0039	CONNECTOR:3 PIN,MALE, AC LINE	02660	MS3102A10SL-3P	1
1251-0128	CONNECTOR:4 PIN,FEMALE	02660	MS102R14S-2S	2
1251-0130	CONNECTOR:5 PIN,FEMALE	02660	MS3102R14S-5S	1
1251-0144	CONNECTOR:6 PIN,MALE	02660	MS3102R14S-6P	1
1400-0084	FUSEHOLDER:EXTRACTOR POST TYPE	75915	342014	2
1420-0012	BATTERY:RECHARGEABLE,VENTED NI-CAD	28480	1420-0012	2
1450-0031	ASSY:FUSE FAILURE LIGHT	03797	EG-3-WCB-NE2E-100K	2
1450-0041	LAMPHOLDER:WHITE	07137	RDL-A1-F9-000	1
1450-0127	LAMPHOLDER:RED	07137	RDL-A1-F2-000	2
1850-0035	TRANSISTOR:GERMANIUM 2N174	04713	2N174	4
1850-0098	TRANSISTOR:GERMANIUM PNP 2N3132	28480	1850-0098	4
1884-0003	SWITCH:SILICON CONTROLLED 3N58	03508	3N58	1
1901-0022	DIODE:SILICON 0.56V AT 1 MA	28480	1901-0022	3
1901-0032	DIODE:SILICON 15 AMP 100 PIV	04713	1N3209	5
1901-0409	DIODE:SILICON 50V, 3 AMP	28480	1901-0409	1
1902-0166	DIODE ASSY:BREAKDOWN VOLTAGE 24.9V	28480	1902-0166	1
1902-1188	DIODE BREAKDOWN 28.7V	28480	1902-1188	1
2100-0252	R:VAR WW 10 OHM 10% LIN 25W	44655	H-0145	1
2110-0006	FUSE:2 AMP 115V	75915	OBD	2
2110-0007	FUSE:1 AMP 230V	75915	313001	2
2140-0025	LAMP:INCANDESCENT 28V, GE# 327	89473	327	3
3101-0033	SWITCH:SLIDE DPDT (115V, 230V)	42190	4633	1
3101-0038	SWITCH:TOGGLE DPDT	04009	83054-B	1
3101-0097	SWITCH:PUSHBUTTON SPST	81073	30-2	1
5020-0242	SUPPORT:RESISTOR BOARD	28480	5020-0242	2
5040-0164	STRIP:FILLER	28480	5040-0164	1
9110-0014	FILTER:AC LINE	28480	9110-0014	1

See list of abbreviations in introduction to this section

Table 6-2. Replaceable Parts (Cont'd)

℗ Stock No.	Description #	Mfr.	Mfr. Part No.	TQ	
05085-0002	BRACKET:FRONT BATTERY	28480	05085-0002	1	
05085-0006	BRACKET:TRANSFORMER	28480	05085-0006	1	
05085-0007	BRACKET:SWITCH	28480	05085-0007	1	
05085-0008	SHIELD:AC	28480	05085-0008	1	
05085-0009	SUPPORT:FASTENER, TOP COVER	28480	05085-0009	2	
05085-0011	BATTERY SHIELD	28480	05085-0011	2	
05085-2001	BOARD:BLANK RESISTOR	28480	05085-2001	1	
05085-2002	BOARD:BLANK RESISTOR	28480	05085-2002	1	
05085-2004	BAR:REAR RETAINING, 1/8" X 3/8" X 4-1/2"	28480	05085-2004	2	
05085-2006	BAR:RETAINING, 1/8" X 3/8" X 13-1/2"	28480	05085-2006	1	
05085-2009	BAR:STIFFENER, 3/8" X 1" X 15-27/32"	28480	05085-2009	1	
05085-2011	BRACKET:LEFT INSTRUMENT MOUNTING	28480	05085-2011	1	
05085-2012	BRACKET:RIGHT INSTRUMENT MOUNTING	28480	05085-2012	1	
05085-2013	BAR:VERTICAL , 1/4" X 1/2" X 3-9/16"	28480	05085-2013	2	
05085-2014	BAR:FRONT RETAINING,1/8" X 3/8" X2-1/2"	28480	05085-2014	2	
05085-2015	GUARD:HEAT SINK	28480	05085-2015	2	
05085-6001	ASSY:RESISTOR BOARD	28480	05085-6001	1	
05085-6003	ASSY:DIODE	28480	05085-6003	1	
05085-6004	CABLE:MAIN	28480	05085-6004	1	
05085-6005	CABLE:AC	28480	05085-6005	1	
05085-6007	CABLE:FUSE	28480	05085-6007	1	
05085-6008	CABLE:BATTERY,POSITIVE,RED	28480	05085-6008	1	
05085-6009	CABLE:BATTERY,NEGATIVE,YELLOW	28480	05085-6009	1	
05085-6010	CABLE:BATTERY,JUMPER,ORANGE	28480	05085-6010	1	
05085-6011	INSTALLATION KIT	28480	05085-6011	1	

See list of abbreviations in introduction to this section

TABLE 6-3.

CODE LIST OF MANUFACTURERS

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) and their latest supplements. The date of revision and the date of the supplements used appear at the bottom of each page. Alphabetical codes have been arbitrarily assigned to suppliers not appearing in the H4 handbooks.

Code No.	Manufacturer	Address
00000	U.S.A. Common	Any supplier of U.S.
00136	McCoy Electronics	Mount Holly Springs, Pa.
00213	Sage Electronics Corp.	Rochester, N.Y.
00334	Humidial	Colton, Calif.
00373	Garlock Inc., Electronics Products Div.	Camden, N.J.
00656	Aerovox Corp.	New Bedford, Mass.
00779	Amp, Inc.	Harrisburg, Pa.
00781	Aircraft Radio Corp.	Boonton, N.J.
00815	Northern Engineering Labortories, Inc.	Burlington, Wis.
00853	Sangamo Electric Co., Pickens Div.	Pickens, S.C.
00866	Goe Engineering Co.	Los Angeles, Calif.
00891	Carl E. Holmes Corp.	Los Angeles, Calif.
01121	Allen Bradley Co.	Milwaukee, Wis.
01255	Litton Industries, Inc.	Beverly Hills, Calif.
01281	TRW Semiconductors, Inc.	Lawndale, Calif.
01295	Texas Instruments, Inc. Transistor Products Div.	Dallas, Texas
01349	The Alliance Mfg. Co.	Alliance, Ohio
01589	Pacific Relays, Inc.	Van Nuys, Calif.
01930	Amerock Corp.	Rockford, Ill.
01961	Pulse Engineering Co.	Santa Clara, Calif.
02114	Ferroxcube Corp. of America	Saugerties, N.Y.
02286	Cole Rubber and Plastics Inc.	Palo Alto, Calif.
02660	Amphenol-Borg Electronics Corp.	Chicago, Ill.
02735	Radio Corp. of America, Semiconductor and Materials Div.	Somerville, N.J.
02771	Vocaline Co. of America, Inc.	Old Saybrook, Conn.
02777	Hopkins Engineering Co.	San Fernando, Calif.
03508	G.E. Semiconductor Prod. Dept.	Syracuse, N.Y.
03705	Apex Machine & Tool Co.	Dayton, Ohio
03797	Eldema Corp.	Compton, Calif.
03877	Transitron Electric Corp.	Wakefield, Mass.
03888	Pyrofilm Resistor Co.,Inc.	Cedar Knolls, N.J.
03954	Singer Co., Diehl Div., Finderne Plant	Somerville, N.J.
04009	Arrow, Hart and Hegeman Elect. Co.	Hartford, Conn.
04013	Taurus Corp.	Lambertville, N.J.
04062	Elmenco Products Co.	New York, N.Y.
04222	Hi-Q Division of Aerovox	Myrtle Beach, S.C.
04354	Precision Paper Tube Co.	Chicago, Ill.
04404	Dymec Division of Hewlett-Packard Co.	Palo Alto, Calif.
04651	Sylvania Electric Products, Microwave Device Div.	Mountain View, Calif.
04713	Motorola, Inc., Semiconductor Prod. Div.	Phoenix, Arizona
04732	Fitron Co., Inc., Western Div.	Culver City, Calif.
04773	Automatic Electric Co.	Northlake, Ill.
04796	Sequoia Wire Co.	Redwood City, Calif.
04811	Precision Coil Spring Co.	El Monte, Calif.
04870	P.M. Motor Company	Westchester, Ill.
05006	Twentieth Century Plastics, Inc.	Los Angeles, Calif.
05277	Westinghouse Electric Corp. Semi-Conductor Dept.	Youngwood, Pa.
05347	Ultronix, Inc.	San Mateo, Calif.
05593	Illumitronic Engineering Co.	Sunnyvale, Calif.
05616	Cosmo Plastic (c/o Electrical Spec. Co.)	Cleveland, Ohio
05624	Barber Colman Co.	Rockford, Ill.
05728	Tiffen Optical Co.	Roslyn Heights, Long Island, N.Y.
05729	Metro-Tel Corp.	Plainview, N.Y.
05783	Stewart Engineering Co.	Santa Cruz, Calif.
05820	Wakefield Engineering Inc.	Wakefield, Mass.
06004	The Bassick Co.	Bridgeport, Conn.
06175	Bausch and Lomb Optical Co.	Rochester, N.Y.
06402	C.T.A. Products Co. of America	Chicago, Ill.
06475	Western Devices Inc.	Burbank, Calif.
06540	Amatom Electronic Hardware Co., Inc.	New Rochelle, N.Y.
06555	Beede Electrical Instrument Co., Inc.	Penacook, N.H.
06666	General Devices Co., Inc.	Indianapolis, Ind.
06751	Nuclear Corp. of America U.S. Semcor Div.	Phoenix, Ariz.
06812	Torrington Mfg. Co., West Div.	Van Nuys, Calif.
06980	Eitel-McCullough Inc.	San Carlos, Calif.
07088	Kelvin Electric Co.	Van Nuys, Calif.
07115	Corning Glass Works Electronic Components Dept.	Bradford, Pa.
07126	Digitran Co.	Pasadena, Calif.
07137	Transistor Electronics Corp.	Minneapolis, Minn.
07138	Westinghouse Electric Corp. Electronic Tube Div.	Elmira, N.Y.
07149	Filmohm Corp.	New York, N.Y.
07233	Cinch-Graphik Co.	City of Industry, Calif.
07261	Avnet Corp.	Los Angeles, Calif.
07263	Fairchild Camera & Inst. Corp., Semiconductor Div.	Mountain View, Calif.
07322	Minnesota Rubber Co.	Minneapolis, Minn.
07387	The Britcher Corp.	Los Angeles, Calif.
07700	Technical Wire Products Inc.	Cranford, N.J.
07910	Continental Device Corp.	Hawthorne, Calif.
07933	Raytheon Mfg. Co., Semiconductor Div.	Mountain View, Calif.
07966	Shockley Semi-Conductor Laboratories	Palo Alto, Calif.
07980	Boonton Radio Corp.	Rockaway, N.J.
08145	U.S. Engineering Co.	Los Angeles, Calif.
08289	Blinn, Delbert, Co.	Pomona, Calif.
08358	Burgess Battery Co.	Niagara Falls,Ontario, Canada
08664	The Bristol Co.	Waterbury, Conn.
08717	Sloan Company	Sun Valley, Calif.
08718	ITT Cannon Electric Inc., Phoenix Div.	Phoenix, Arizona
08792	CBS Electronics Semiconductor Operations, Div. of C.B.S.,Inc.	Lowell, Mass.
08984	Mel-Rain	Indianapolis, Ind.
09026	Babcock Relays Div.	Costa Mesa, Calif.
09134	Texas Capacitor Co.	Houston, Texas
09145	Atohm Electronics	Sun Valley, Calif.
09250	Electro Assemblies, Inc.	Chicago, Ill.
09569	Mallory Battery Co. of Canada, Ltd.	Toronto, Ontario, Canada
10214	General Transistor Western Corp.	Los Angeles, Calif.
10411	Tri-Tal, Inc.	Berkeley, Calif.
10646	Carborundum Co.	Niagara Falls, N.Y.
11236	CTS of Berne,Inc.	Berne, Ind.
11237	Chicago Telephone of California, Inc.	So. Pasadena, Calif.
11242	Bay State Electronics Corp.	Waltham, Mass.
11312	Microwave Electronics Corp.	Palo Alto, Calif.
11534	Duncan Electronics Inc.	Costa Mesa, Calif.
11711	General Instrument Corp., Semiconductor Div., Products Group	Newark, N.J.
11717	Imperial Electronic, Inc.	Buena Park, Calif.
11870	Melabs, Inc.	Palo Alto, Calif.
12136	Philadelphia Handle Co.	Camden, N.J.
12697	Clarostat Mfg. Co.	Dover, N.H.
12859	Nippon Electric Co., Ltd.	Tokyo, Japan
12881	Metex Electronics Corp.	Clark, N.J.
12930	Delta Semiconductor Inc.	Newport Beach, Calif.
13103	Thermalloy	Dallas, Texas
13396	Telefunken (G.M.B.H.)	Hanover, Germany
13835	Midland-Wright Div. of Pacific Industries, Inc.	Kansas City, Kansas
14099	Sem-Tech	Newbury Park, Calif.
14193	Calif. Resistor Corp.	Santa Monica, Calif.
14298	American Components,Inc.	Conshohocken, Pa.
14493	Hewlett-Packard Company	Loveland, Colo.
14655	Cornell Dubilier Electric Corp.	Newark, N.J.
14960	Williams Mfg. Co.	San Jose, Calif.
15203	Webster Electronics Co.	New York, N.Y.
15291	Adjustable Bushing Co.	N.Hollywood, Calif.
15558	Micron Electronics	Garden City, Long Island, N.Y.
15772	Twentieth Century Coil Spring Co.	Santa Clara, Calif.
15818	Amelco Inc.	Mt. View, Calif.
15909	Daven Div. Thomas A. Edison Ind. McGraw-Edison Co.	Long Island City, N.Y.
16037	Spruce Pine Mica Co.	Spruce Pine, N.C.
16352	Computer Diode Corp.	Lodi, N.J.
16688	Ideal Prec. Meter Co., Inc. De Jur Meter Div.	Brooklyn, N.Y.
16758	Delco Radio Div. of G.M. Corp.	Kokomo, Ind.
17109	Thermonetics Inc.	Canoga Park, Calif.
17474	Tranex Company	Mountain View, Calif.
18476	Ty-Car Mfg. Co.,Inc.	Holliston, Mass.
18486	Radio Industries	Des Plaines, Ill.
18583	Curtis Instrument, Inc.	Mt. Kisco, N.Y.
18873	E.I. DuPont and Co.,Inc.	Wilmington, Del.
19315	The Bendix Corp., Eclipse-Pioneer Div.	Teterboro, N.J.
19500	Thomas A. Edison Industries, Div. of McGraw-Edison Co.	West Orange, N.J.
19701	Electra Mfg. Co.	Independence, Kansas
20183	General Atronics Corp.	Philadelphia, Pa.
21226	Executone, Inc.	New York, N.Y.
21520	Fansteel Metallurgical Corp.	No. Chicago, Ill.
21335	The Fafnir Bearing Co.	New Britain, Conn.
24455	G.E. Lamp Division	Nela Park, Cleveland, Ohio
24655	General Radio Co.	West Concord, Mass.
26365	Gries Reproducer Corp.	New Rochelle, N.Y.
26462	Grobet File Co. of America, Inc.	Carlstadt, N.J.
26992	Hamilton Watch Co.	Lancaster, Pa.
28480	Hewlett-Packard Co.	Palo Alto, Calif.
33173	G.E. Receiving Tube Dept.	Owensboro, Ky.
35434	Lectrohm Inc.	Chicago, Ill.
36196	Stanwyck Coil Products Ltd.	Hawkesbury, Ontario, Canada
37942	P.R. Mallory & Co.,Inc.	Indianapolis, Ind.
39543	Mechanical Industries Prod. Co.	Akron, Ohio
40920	Miniature Precision Bearings, Inc.	Keene, N.H.
42190	Muter Co.	Chicago, Ill.
43990	C.A. Norgren Co.	Englewood, Colo.
44655	Ohmite Mfg. Co.	Skokie, Ill.
47904	Polaroid Corp.	Cambridge, Mass.
48620	Precision Thermometer & Inst. Co.	Southampton, Pa.
49956	Raytheon Company	Lexington, Mass.
52090	Rowan Controller Co.	Westminster, Md.
52983	Sanborn Co.	Waltham, Mass.
54294	Shallcross Mfg. Co.	Selma, N.C.
55026	Simpson Electric Co.	Chicago, Ill.
55933	Sonotone Corp.	Elmsford, N.Y.
55938	Raytheon Co. Commercial Apparatus & Systems Div.	So. Norwalk, Conn.
56137	Spaulding Fibre Co.,Inc.	Tonawanda, N.Y.
56289	Sprague Electric Co.	North Adams, Mass.
59446	Telex, Inc.	St.Paul, Minn.
59730	Thomas & Betts Co.	Elizabeth, N.J.
60741	Triplett Electrical Inst. Co.	Bluffton, Ohio
61775	Union Switch and Signal, Div. of Westinghouse Air Brake Co.	Pittsburgh, Pa.
62119	Universal Electric Co.	Owosso, Mich.
63743	Ward-Leonard Electric Co.	Mt. Vernon, N.Y.
64959	Western Electric Co.,Inc.	New York, N.Y.
65092	Weston Inst. Div. of Daystrom, Inc.	Newark, N.J.
66295	Wittek Mfg. Co.	Chicago, Ill.
66346	Revere Wollansak Div. Minn. Mining & Mfg. Co.	St. Paul, Minn.
70276	Allen Mfg. Co.	Hartford, Conn.
70309	Allen Mfg. Co.	Hartford, Conn.
70318	Allmetal Screw Product Co. Inc.	Garden City, N.Y.
70485	Atlantic India Rubber Works, Inc.	Chicago, Ill.
70563	Amperite Co.,Inc.	Union City, N. J.
70903	Belden Mfg. Co.	Chicago, Ill.
70998	Bird Electronic Corp.	Cleveland, Ohio
71002	Birnbach Radio Co.	New York, N.Y.
71041	Boston Gear Works Div. of Murray Co. of Texas	Quincy, Mass.
71218	Bud Radio, Inc.	Willoughby, Ohio
71286	Camloc Fastener Corp.	Paramus, N.J.
71313	Cardwell Condenser Corp.	Lindenhurst L.I., N.Y.
71400	Bussmann Mfg. Div. of McGraw-Edison Co.	St. Louis, Mo.
71436	Chicago Condenser Corp.	Chicago, Ill.
71447	Calif. Spring Co.,Inc.	Pico-Rivera, Calif.
71450	CTS Corp.	Elkhart, Ind.
71468	ITT Cannon Electric Inc.	Los Angeles, Calif.
71471	Cinema Engineering Co.	Burbank, Calif.
71482	C.P. Clare & Co.	Chicago, Ill.
71590	Centralab Div. of Globe Union Inc.	Milwaukee, Wis.
71616	Commercial Plastics Co.	Chicago, Ill.
71700	The Cornish Wire Co.	New York, N. Y.
71744	Chicago Miniature Lamp Works	Chicago, Ill.
71753	A.O. Smith Corp., Crowley Div.	West Orange, N.J.
71785	Cinch Mfg. Co., Howard B. Jones Div.	Chicago, Ill.
71984	Dow Corning Corp.	Midland, Mich.
72136	Electro Motive Mfg. Co.,Inc.	Willimantic, Conn.
71707	Coto Coil Co.,Inc.	Providence, R.I.
72354	John E. Fast Co., Div. Victoreen Instr. Co.	Chicago, Ill.
72619	Dialight Corp.	Brooklyn, N.Y.
72656	Indiana General Corp., Electronics Div.	Keasby, N.J.
72765	Drake Mfg. Co.	Chicago, Ill.
72825	Hugh H. Eby Inc.	Philadelphia, Pa.
72928	Gudeman Co.	Chicago, Ill.
72964	Robert M. Hadley Co.	Los Angeles, Calif.
72982	Erie Technological Products, Inc.	Erie, Pa.
73061	Hansen Mfg. Co., Inc.	Princeton, Ind.
73076	H.M. Harper Co.	Chicago, Ill.
73138	Helipot Div. of Beckman Inst., Inc.	Fullerton, Calif.
73293	Hughes Products Division of Hughes Aircraft Co.	Newport Beach, Calif.
73445	Amperex Electronic Co., Div. of North American Phillips Co., Inc.	Hicksville, N. Y.
73506	Bradley Semiconductor Corp.	Hamden, Conn.
73559	Carling Electric, Inc.	Hartford, Conn.
73682	George K. Garrett Co., Div. MSL Industries Inc.	Philadelphia, Pa.
73734	Federal Screw Products Inc.	Chicago, Ill.
73743	Fischer Special Mfg. Co.	Cincinnati, Ohio
73793	The General Industries Co.	Elyria, Ohio
73846	Goshen Stamping & Tool Co.	Goshen, Ind.
73899	JFD Electronics Corp.	Brooklyn, N.Y.
73905	Jennings Radio Mfg. Corp.	San Jose, Calif.
74276	Signalite Inc.	Neptune, N.J.
74455	J.H. Winns, and Sons	Winchester, Mass.
74861	Industrial Condenser Corp.	Chicago, Ill.
74868	R.F. Products Division of Amphenol-Borg Electronics Corp.	Danbury, Conn.
74970	E.F. Johnson Co.	Waseca, Minn.
75042	International Resistance Co.	Philadelphia, Pa.
75378	James Knights Co.	Sandwich, Ill.
75382	Kulka Electric Corporation	Mt. Vernon, N.Y.
75818	Lenz Electric Mfg. Co.	Chicago, Ill.
75915	Littlefuse, Inc.	Des Plaines, Ill.
76005	Lord Mfg. Co.	Erie, Pa.
76210	C.W. Marwedel	San Francisco, Calif.
76433	General Instrument Corp., Micamold Div.	Newark, N.J.
76487	James Millen Mfg. Co.,Inc.	Malden, Mass.
76493	J.W. Miller Co.	Los Angeles, Calif.
76530	Monadnock Mills	San Leandro, Calif.
76545	Mueller Electric Co.	Cleveland, Ohio
76854	Oak Manufacturing Co.	Crystal Lake,Ill.
77068	The Bendix Corp. Bendix Pacific Div.	No. Hollywood, Calif.
77075	Pacific Metals Co.	San Francisco, Calif.
77221	Phanostran Instrument and Electronic Co.	South Pasadena, Calif.
77252	Philadelphia Steel and Wire Corp.	Philadelphia, Pa.
77342	American Machine & Foundry Co. Potter & Brumfield Div.	Princeton, Ind.
77630	TRW Electronic Components Div.	Camden, N.J.
77638	General Instrument Corp., Rectifier Div.	Brooklyn, N.Y.
77764	Resistance Products Co.	Harrisburg, Pa.
77969	Rubbercraft Corp. of Calif.	Torrance, Calif.
78189	Shakeproof Division of Illinois Tool Works	Elgin, Ill.
78283	Signal Indicator Corp.	New York, N.Y.
78290	Stuthers-Dunn Inc.	Pitman, N.J.
78452	Thompson-Bremer & Co.	Chicago, Ill.
78471	Tilley Mfg. Co.	San Francisco, Calif.
78488	Stackpole Carbon Co.	St. Marys, Pa.
78493	Standard Thomson Corp.	Waltham, Mass.
78553	Tinnerman Products, Inc.	Cleveland, Ohio
78790	Transformer Engineers	San Gabriel, Calif.
78947	Ucinite Co.	Newtonville, Mass.
79136	Waldes Kohinoor Inc.	Long Island City, N.Y.
79142	Veeder Root, Inc.	Hartford, Conn.
79251	Wenco Mfg. Co.	Chicago, Ill.
79727	Continental-Wirt Electronics Corp.	Philadelphia, Pa.
79963	Zierick Mfg. Corp.	New Rochelle, N.Y.
80031	Mepco Division of Sessions Clock Co.	Morristown, N.J.
80120	Schnitzer Alloy Products Co.	Elizabeth, N.J.
80130	Times Telephoto Equipment	New York, N.Y.
80131	Electronic Industries Association. Any brand Tube meeting EIA standards-Washington, D.C.	
80207	Unimax Switch, Div. Maxon Electronics Corp.	Wallingford, Conn.
80223	United Transformer Corp.	New York, N.Y.
80248	Oxford Electric Corp.	Chicago, Ill.
80294	Bourns Laboratories, Inc.	Riverside, Calif.
80411	Robertshaw Controls Co.	Hillsboro, Ohio
80486	All Star Products Inc.	Defiance, Ohio
80509	Avery Adhesive Label Corp.	Monrovia, Calif.

00015-40
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TABLE 6-3.

CODE LIST OF MANUFACTURERS (Continued)

Code No.	Manufacturer	Address
80583	Hammarlund Co., Inc.	New York, N.Y.
80640	Stevens, Arnold, Co., Inc.	Boston, Mass.
81030	International Instruments Inc.	Orange, Conn.
81073	Grayhill Co.	LaGrange, Ill.
81095	Triad Transformer Corp.	Venice, Calif.
81312	Winchester Electronics Co., Inc.	Norwalk, Calif.
81349	Military Specification	.....
81415	Wilkor Products, Inc.	Cleveland, Ohio
81483	International Rectifier Corp.	El Segundo, Calif.
81541	The Airpax Products Co.	Cambridge, Mass.
81860	Barry Controls, Div. Barry Wright Corp.	Watertown, Mass.
82042	Carter Precision Electric Co.	Skokie, Ill.
82047	Sperti Faraday Inc., Cooper Hewitt Electric Div.	Hoboken, N.J.
82142	Jeffers Electronics Division of Speer Carbon Co.	Du Bois, Pa.
82170	Fairchild Camera & Inst. Corp., Defense Prod. Division	Clifton, N.J.
82209	Maguire Industries, Inc.	Greenwich, Conn.
82219	Sylvania Electric Prod. Inc. Electronic Tube Division	Emporium, Pa.
82376	Astron Division, Renwell Industries Inc.	East Newark, N.J.
82389	Switchcraft, Inc.	Chicago, Ill.
82647	Metals & Controls Inc. Spencer Products	Attleboro, Mass.
82768	Phillips-Advance Control Co.	Joliet, Ill.
82866	Research Products Corp.	Madison, Wis.
82877	Rotron Mfg. Co., Inc.	Woodstock, N.Y.
82893	Vector Electronic Co.	Glendale, Calif.
83053	Western Washer Mfg. Co.	Los Angeles, Calif.
83058	Carr Fastener Co.	Cambridge, Mass.
83086	New Hampshire Ball Bearing, Inc.	Peterborough, N.H.
83125	General Instrument Corp., Capacitor Div.	Darlington, S.C.
83148	ITT Wire and Cable Div.	Los Angeles, Calif.
83186	Victory Engineering Corp.	Springfield, N.J.
83298	Bendix Corp., Red Bank Div.	Red Bank, N.J.
83315	Hubbell Corp.	Mundelein, Ill.
83330	Smith, Herman H., Inc.	Brooklyn, N.Y.
83385	Central Screw Co.	Chicago, Ill.
83501	Gavitt Wire and Cable Co. Div. of Amerace Corp.	Brookfield, Mass.
83594	Burroughs Corp. Electronic Tube Div.	Plainfield, N.J.
83740	Eveready Div. National Carbon Div. Union Carbide Corp.	New York, N.Y.
83777	Model Eng. and Mfg., Inc.	Huntington, Ind.
83821	Loyd Scruggs Co.	Festus, Mo.
84171	Arco Electronics Inc.	Great Neck, N.Y.
84396	A.J. Glesener Co., Inc.	San Francisco, Calif.
84411	TRW Capacitor Div.	Ogallala, Neb.
84970	Sarkes Tarzian, Inc.	Bloomington, Ind.
85454	Boonton Molding Company	Boonton, N.J.
85471	A.B. Boyd Co.	San Francisco, Calif.
85474	R.M. Bracamonte & Co.	San Francisco, Calif.
85660	Koiled Kords, Inc.	Hamden, Conn.
85911	Seamless Rubber Co.	Chicago, Ill.
86197	Clifton Precision Products Co., Inc.	Clifton Heights, Pa.
86579	Precision Rubber Products Corp.	Dayton, Ohio
86684	Radio Corp. of America, Electronic Comp. & Devices Div.	Harrison, N.J.
87216	Philco Corporation (Lansdale Division)	Lansdale, Pa.
87473	Western Fibrous Glass Products Co.	San Francisco, Calif.
87664	Van Waters & Rogers Inc.	San Francisco, Calif.
87930	Tower Mfg. Corp.	Providence, R.I.
88140	Cutler-Hammer, Inc.	Lincoln, Ill.
88220	Gould-National Batteries, Inc.	St. Paul, Minn.
88421	Federal Telephone & Radio Corp.	Clifton, N.J.
88698	General Mills, Inc.	Buffalo, N.Y.
89231	Graybar Electric Co.	Oakland, Calif.
89473	General Electric Distributing Corp.	Schenectady, N.Y.
89665	United Transformer Co.	Chicago, Ill.
90179	US Rubber Co., Consumer Ind. & Plastics Prod. Div.	Passaic, N.J.
90970	Bearing Engineering Co.	San Francisco, Calif.
91260	Connor Spring Mfg. Co.	San Francisco, Calif.
91345	Miller Dial & Nameplate Co.	El Monte, Calif.
91418	Radio Materials Co.	Chicago, Ill.
91506	Augat Inc.	Attleboro, Mass.
91637	Dale Electronics, Inc.	Columbus, Nebr.
91662	Elco Corp.	Willow Grove, Pa.
91737	Gremar Mfg. Co., Inc.	Wakefield, Mass.
91827	K F Development Co.	Redwood City, Calif.
91929	Honeywell Inc., Micro Switch Div.	Freeport, Ill.
91961	Nahm-Bros. Spring Co.	Oakland, Calif.
92180	Tru-Connector Corp.	Peabody, Mass.
92367	Elgeet Optical Co., Inc.	Rochester, N.Y.
92196	Universal Industries, Inc.	City of Industry, Calif.
92607	Tensolite Insulated Wire Co., Inc.	Tarrytown, N.Y.
93332	Sylvania Electric Prod. Inc. Semiconductor Div.	Woburn, Mass.
93369	Robbins and Myers, Inc.	New York, N.Y.
93410	Stevens Mfg. Co., Inc.	Mansfield, Ohio
93788	Howard J. Smith Inc.	Port Monmouth, N.J.
93929	G.V. Controls	Livingston, N.J.
94137	General Cable Corp.	Bayonne, N.J.
94144	Raytheon Co., Comp. Div., Ind. Comp. Operations	Quincy, Mass.
94148	Scientific Electronics Products, Inc.	Loveland, Colo.
94154	Tung-Sol Electric, Inc.	Newark, N.J.
94197	Curtiss-Wright Corp. Electronics Div.	East Paterson, N.J.
94222	South Chester Corp.	Chester, Pa.
94310	Tru-Ohm Products Memcor Components Div.	Huntington, Ind.
94330	Wire Cloth Products, Inc.	Bellwood, Ill.
94682	Worcester Pressed Aluminum Corp.	Worcester, Mass.
95023	George A. Philbrick Researchers, Inc.	Boston, Mass.
95236	Allies Products Corp.	Miami, Fla.
95238	Continental Connector Corp.	Woodside, N.Y.
95263	Leecraft Mfg. Co., Inc.	Long Island, N.Y.
95264	Lerco Electronics, Inc.	Burbank, Calif.
95265	National Coil Co.	Sheridan, Wyo.
95275	Vitramon, Inc.	Bridgeport, Conn.
95348	Gordos Corp.	Bloomfield, N.J.
95354	Methode Mfg. Co.	Chicago, Ill.
95712	Dage Electric Co., Inc.	Franklin, Ind.
95987	Weckesser Co.	Chicago, Ill.
96067	Huggins Laboratories	Sunnyvale, Calif.
96095	Hi-Q Div. of Aerovox Corp.	Olean, N.Y.
96256	Thordarson-Meissner Div. of Maguire Industries, Inc.	Mt. Carmel, Ill.
96296	Solar Manufacturing Co.	Los Angeles, Calif.
96330	Carlton Screw Co.	Chicago, Ill.
96341	Microwave Associates, Inc.	Burlington, Mass.
96501	Excel Transformer Co.	Oakland, Calif.
97464	Industrial Retaining Ring Co.	Irvington, N.J.
97539	Automatic & Precision Mfg.	Englewood, N.J.
97979	Reon Resistor Corp.	Yonkers, N.Y.
97983	Litton System Inc., Adler-Westric Commun. Div.	New Rochelle, N.Y.
98141	R-Tronics, Inc.	Jamaica, N.Y.
98159	Rubber Teck, Inc.	Gardena, Calif.
98220	Francis L. Moseley	Pasadena, Calif.
98278	Microdot, Inc.	So. Pasadena, Calif.
98291	Sealectro Corp.	Mamaroneck, N.Y.
98405	Carad Corp.	Redwood City, Calif.
98731	General Mills Inc., Electronics Div.	Minneapolis, Minn.
98821	North Hills Electronics, Inc.	Glen Cove, N.Y.
98925	Semiconductor Div. of Clevite Corp.	Waltham, Mass.
98978	International Electronic Research Corp.	Burbank, Calif.
99109	Columbia Technical Corp.	New York, N.Y.
99313	Varian Associates	Palo Alto, Calif.
99515	Marshall Ind. Elect. Products Div.	San Marino, Calif.
99707	Control Switch Division, Controls Co. of America	El Segundo, Calif.
99800	Delevan Electronics Corp.	East Aurora, N.Y.
99848	Wilco Corporation	Indianapolis, Ind.
99934	Renbrandt, Inc.	Boston, Mass.
99942	Hoffman Electronics Corp. Semiconductor Div.	El Monte, Calif.
99957	Technology Instrument Corp. of Calif.	Newbury Park, Calif.

THE FOLLOWING H-P VENDORS HAVE NO NUMBER ASSIGNED IN THE LATEST SUPPLEMENT TO THE FEDERAL SUPPLY CODE FOR MANUFACTURERS HANDBOOK.

0000F	Malco Tool and Die	Los Angeles, Calif.
0000M	Western Coil Div. of Automatic Ind., Inc.	Redwood City, Calif.
0000Z	Willow Leather Products Corp.	Newark, N.J.
000AA	British Radio Electronics Ltd.	Washington, D.C.
000AB	ETA	England
000AK	Siemens-America Components Div.	White Plains, N.Y.
000BB	Precision Instrument Components Co.	Van Nuys, Calif.
000MM	Rubber Eng. & Development	Hayward, Calif.
000NN	A "N" D Mfg. Co.	San Jose, Calif.
000QQ	Cooltron	Oakland, Calif.
000SS	Control of Elgin Watch Co.	Burbank, Calif.
000WW	California Eastern Lab.	Burlington, Calif.
000YY	S.K. Smith Co.	Los Angeles, Calif.

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APPENDIX I - MANUAL CHANGES

This manual applies directly to Ⓗ Model 5085A Standby Power Supplies having serial number prefix 604-. With the appropriate changes listed below this manual will also apply to older models having serial number prefix 524-.

Serial Number Prefix:	Change No.
524-	1

CHANGE 1: Figure 5-4, Schematic Diagram

Delete CR15

Connect yellow wire between BT1 negative terminal and J3C.

HP SALES AND SERVICE OFFICES IN THE U.S. AND CANADA

ALABAMA

Huntsville, 35801
Hewlett-Packard
Southern Sales Division
Holiday Office Ctr., Suite 18
(205) 881-4591
TWX: 510-579-2204

ARIZONA

Scottsdale, 85251
Hewlett-Packard
Neely Sales Division
3009 No. Scottsdale Rd.
(602) 945-7601
TWX: 602-949-0111

Tucson, 85716
Hewlett-Packard
Neely Sales Division
232 So. Tucson Blvd.
(602) 623-2564
TWX: 602-792-2759

CALIFORNIA

Los Angeles Area
Hewlett-Packard
Neely Sales Division
3939 Lankershim Blvd.
North Hollywood 91604
(213) 877-1282 and 766-3811
TWX: 910-499-2170

Sacramento, 95821
Hewlett-Packard
Neely Sales Division
2591 Carlsbad Ave.
(916) 482-1463
TWX: 916-444-8683

San Diego, 92106
Hewlett-Packard
Neely Sales Division
1055 Shafter Street
(714) 223-8103
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1101 Embarcadero Rd.
Palo Alto 94303
(415) 327-6500
TWX: 910-373-1280

COLORADO

Englewood, 80110
Hewlett-Packard
Neely Sales Division
7965 East Prentice
(303) 771-3455
TWX: 303-771-3056

CONNECTICUT

Middletown, 06458
Hewlett-Packard
Yewell Sales Division
589 Saybrook Rd.
(203) 346-6611
TWX: 710-428-2036

FLORIDA

Miami, 33125
Hewlett-Packard
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2907 Northwest 7th St.
(305) 635-6461

Orlando, 32803
Hewlett-Packard
Florida Sales Division
621 Commonwealth Ave.
(305) 425-5541
TWX: 305-275-1234

St. Petersburg, 33708
Hewlett-Packard
Florida Sales Division
410-150th Ave., Madeira Beach
(813) 391-0211
TWX: 813-391-0666

GEORGIA

Atlanta, 30305
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Southern Sales Division
3110 Maple Drive, N. E.
(404) 233-1141
TWX: 810-751-3283

ILLINOIS

Chicago, 60645
Hewlett-Packard
Crossley Sales Division
2501 West Peterson Ave.
(312) 275-1600
TWX: 910-221-0277

INDIANA

Indianapolis, 46205
Hewlett-Packard
Crossley Sales Division
3919 Meadows Dr.
(317) 546-4891
TWX: 317-635-4300

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Hewlett-Packard
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Suite 4, 3411 Bardstown Rd.
(502) 459-4140
TWX: 810-535-3128

MARYLAND

Baltimore, 21207
Hewlett-Packard
Horman Sales Division
6660 Security Blvd.
(301) 944-5400

Washington, D. C. Area
Hewlett-Packard
Horman Sales Division
941 Rollins Avenue
Rockville 20852
(301) 427-7560
TWX: 710-828-9684

MASSACHUSETTS

Boston Area
Hewlett-Packard
Yewell Sales Division
Middlesex Turnpike
Burlington 01804
(617) 272-9000
TWX: 710-332-0382

MICHIGAN

Detroit, 48235
Hewlett-Packard
Crossley Sales Division
14425 West Eight Mile Road
(313) 342-5700
TWX: 313-342-0702

MINNESOTA

St. Paul, 55114
Hewlett-Packard
Crossley Sales Division
842 Raymond Avenue
(612) 646-7881
TWX: 910-563-3734

MISSOURI

Kansas City, 64131
Harris-Hanson Company
7916 Paseo Street
(816) 444-9494
TWX: 816-556-2423

St. Louis, 63144
Harris-Hanson Company
2814 South Brentwood Blvd.
(314) 647-4350
TWX: 314-962-3933

NEW JERSEY

Asbury Park Area
Hewlett-Packard
Robinson Sales Division
Shrewsbury
(201) 747-1060

Englewood, 07631
Hewlett-Packard
RMC Sales Division
391 Grand Avenue
(201) 567-3933

NEW MEXICO

Albuquerque, 87108
Hewlett-Packard
Neely Sales Division
6501 Lomas Blvd., N. E.
(505) 255-5586
TWX: 910-989-1665

Las Cruces, 88001
Hewlett-Packard
Neely Sales Division
114 S. Water Street
(505) 526-2486
TWX: 505-524-2671

NEW YORK

New York, 10021
Hewlett-Packard
RMC Sales Division
236 East 75th Street
(212) 879-2023
TWX: 710-581-4376

Rochester, 14625
Hewlett-Packard
Syracuse Sales Division
800 Linden Avenue
(716) 381-4120
TWX: 716-221-1514

Poughkeepsie, 12601
Hewlett-Packard
Syracuse Sales Division
82 Washington St.
(914) 454-7330
TWX: 914-452-7425

Syracuse, 13211
Hewlett-Packard
Syracuse Sales Division
5858 East Molloy Rd.
(315) 454-2486
TWX: 710-541-0482

NORTH CAROLINA

High Point, 27262
Hewlett-Packard
Southern Sales Division
1923 N. Main Street
(919) 882-6873
TWX: 510-926-1516

OHIO

Cleveland, 44129
Hewlett-Packard
Crossley Sales Division
5579 Pearl Road
(216) 884-9209
TWX: 216-888-0715

Dayton, 45409
Hewlett-Packard
Crossley Sales Division
1250 W. Dorothy Lane
(513) 299-3594
TWX: 513-944-0090

PENNSYLVANIA

Camp Hill
Hewlett-Packard
Robinson Sales Division
(717) 737-6791

Philadelphia Area
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Robinson Sales Division
144 Elizabeth Street
West Conshohocken 19428
(215) 248-1600 and 828-6200
TWX: 215-828-3847

Pittsburgh Area
Hewlett-Packard
Crossley Sales Division
2545 Moss Side Blvd.
Monroeville 15146
(412) 271-5227
TWX: 710-797-3650

TEXAS

Dallas, 75209
Hewlett-Packard
Southwest Sales Division
P.O. Box 7166, 3605 Inwood Rd.
(214) 357-1881 and 332-6667
TWX: 910-861-4081

Houston, 77027
Hewlett-Packard
Southwest Sales Division
P.O. Box 22813, 4242 Richmond Ave.
(713) 667-2407
TWX: 713-571-1353

UTAH

Salt Lake City, 84115
Hewlett-Packard
Neely Sales Division
1482 Major St.
(801) 486-8166
TWX: 801-521-2604

VIRGINIA

Richmond, 23230
Hewlett-Packard
Southern Sales Division
2112 Spencer Road
(703) 282-5451
TWX: 710-956-0157

WASHINGTON

Seattle Area
Hewlett-Packard
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11656 N. E. 8th St.
Bellevue 98004
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TWX: 910-443-2303

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Hewlett-Packard (Canada) Ltd.
8270 Mayrand Street
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Ottawa, Ontario
Hewlett-Packard (Canada) Ltd.
1762 Carling Avenue
(613) 722-4223
TWX: 610-562-1952

Toronto, Ontario
Hewlett-Packard (Canada) Ltd.
1415 Lawrence Avenue West
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TWX: 610-492-2382

GOVERNMENT CONTRACTING OFFICES

Middletown, Pa. 17057
Hewlett-Packard
Contract Marketing Division
Olmsted Plaza
(717) 944-7401
TWX: 717-760-4816

West Conshohocken, Pa. 19428
Hewlett-Packard
Contract Marketing Division
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(215) 753-1811
TWX: 215-820-3847

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ARGENTINA
Mauricio A. Saurez
Telecomunicaciones
Carlos Calvo 224, Buenos Aires
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AUSTRALIA
Sample Electronics (Vic.) Pty. Ltd.
9-11 Cremorne Street
Richmond E. 1, Victoria
Tel: 42-4757 (3 lines)

Sample Electronics (N.S.W.) Pty. Ltd.
4 Grose Street, Glebe, N.S.W.
Tel: 69-6338 (6 lines)

AUSTRIA
UNILABOR H.m.b.H.
Wissenschaftliche Instrumente
Rummelhardtgasse 6/3
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BELGIUM
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20-24 Rue de l'Hopital, Brussels 1
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BRAZIL
CIENTAL IMPORTACAO E COMERCIO LTDA
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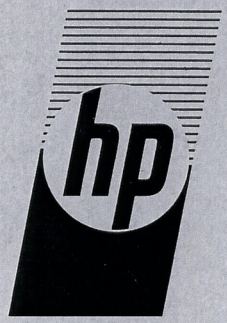
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