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OPERATING AND SERVICE MANUAL

# MEASURING SYSTEM 5300A



HEWLETT PACKARD

#### 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.

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This Hewlett-Packard product is warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery, or, in the case of certain major components listed in the manual, for the specified period. We will repair or replace products which prove to be defective during the warranty period provided they are returned to Hewlett-Packard. No other warranty is expressed or implied. We are not liable for consequential damages.

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For any assistance, contact your nearest Hewlett-Packard Sales and Service Office.

# MANUAL CHANGES

M O D E L 5 3 0 0 A

MEASURING SYSTEM

Manual Part No.: Manual Printed: 05300-90010 MAR. 1972

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

Instrument Serial Prefixes

1130G-01361 and above

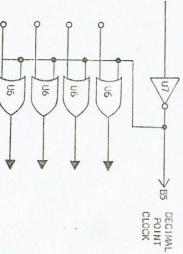
and above

Make Manual Changes

1 - 2

ERRATA: Page 4-11, Figure 4-10

Change connection between U7 and U6 as follows:



Page 6-2, Table 6-1 Add 0510-0207 Add 1205-0012

6,1973

Nut : Captive Dissipator : Heat

MODEL 5300A

Change: CHANGE 1: In Section VI, Replaceable Parts and pertaining Schematics:

-hp- Stock No.

0160-2910 1820-0424 1200-0478 1200-0478

1853-0020

A106,015 A1U7 to C:fxd., 4700 pF, -20+100%, 500 WVDC IC to Socket: IC Socket: IC

A1A1XA MISC ATUXA MISC.

Transistor PNP to

For instruments equipped with German "Schuko" Power Cable change W1 Cable Assy Power to Cable Assy Power to 8120-1689

Change A2Q7 to 1854-0023; Delete from description "(SELECTED FROM 2N3704)"

Change: A1 U6 IC to

820-0584

ERRATA:

Page 4-17, Paragraph 4-84a: Change 2nd sentence to read "An asterisk is presented when the overflow light in the 5300A display is on."

Page 6-3, Table 6-1:

Change A1U1 from 1820-0635 to 1820-1060.

Add A1R31, 32 0698-6241 R:fxd., comp. 750 Ohm, 5%, 1/8W A1R31 is connected between A1U4 (3) and +5V A1R32 is connected between A1U3 (14) and +5V.

Page 6-4, Table 1-6: 0905-0479 GASKET

Delete MP2 and MP9 Add 5040-6000 CAT Add 5040-7001 CAT CATCH - SLIDE RH CATCH - SLIDE LH

Page 6-5, Table 6-2 Change A2S1

switch slide to

3101-0543

-2-

MODEL NUMBER: 5300A

Measuring System

HEWLETT-PACKARD WELCOMES YOUR EVALUATION OF THIS MANUAL. CHECK THE APPROPRIATE BOXES, AND LIST ANY COMMENTS YOU MAY HAVE.

DOES EACH SECTION CONTAIN THE INFOR- MATION YOU NEED?	SECTION I II III IV V VI VII VIII YES NO
2. IS THE PRESENTATION OF MATERIAL CLEAR AND EASY TO UNDERSTAND?	YES NO
3. IS THE ORGANIZATION OF EACH SECTION SATISFACTORY FOR YOUR PURPOSES?	YES NO
4. IN WHICH SECTION(S) IF ANY, WOULD YOU PREFER TO HAVE A MORE EXPANDED TREATMENT?	
5. IN WHAT WAYS DO YOU FIND THE MAN- UAL MOST USEFUL?	
OPERATIONAL PROCEDURES	
TROUBLESHOOTING INFORMATION	
PARTS LIST INFORMATION	
SPECIFICATIONS	VICE THE RESERVE AT SECTION ASSESSMENT
PERFORMANCE TESTS	.32 (13)
ALIGNMENT AND CALIBRATION PROCEDURES	
SCHEMATICS	
6. IN THE SPACE PROVIDED BELOW, LIST ANY IMPROVEMENTS YOU WOULD LIKE.	
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THOM: WANTE	ADDRESS
MANUAL STOCK NUMBER	

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#### HP MODEL 5300A MEASURING SYSTEM

Record of Revisions (Manual Change Pages)

REVISION NUMBER	DATE ISSUED	DATE INSERTED	INSERTED BY

#### HP MODEL 5300A MEASURING SYSTEM

Record of Revisions (Manual Change Pages)

REVISION NUMBER	DATE ISSUED	DATE INSERTED	INSERTED BY
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## **MEASURING SYSTEM** 5300A

#### 5300A SERIAL PREFIX 1208A-02161 5310A SERIAL PREFIX 1128A-0051 10533A SERIAL PREFIX 1128A

This manual applies directly to HP Model 5300A Measuring System Mainframes having serial prefix number 1208A-02161.

Section IX of this manual has been reserved for the addition of various plug-on module information. The documentation is shipped with the modules and must be inserted into Section IX by the user. The serial prefix numbers to which this information applies is listed on the title page of the respective plug-on module.

#### NEWER INSTRUMENTS

This manual with enclosed "Manual Changes Sheets" applies directly to HP Model 5300A Measuring System mainframes having prefix numbers above 1208A-02161.

#### **OLDER INSTRUMENTS**

Changes required to back date this manual for older instruments are in Section VII.

HEWLETT-PACKARD COMPANY

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Printed: MAR 1972

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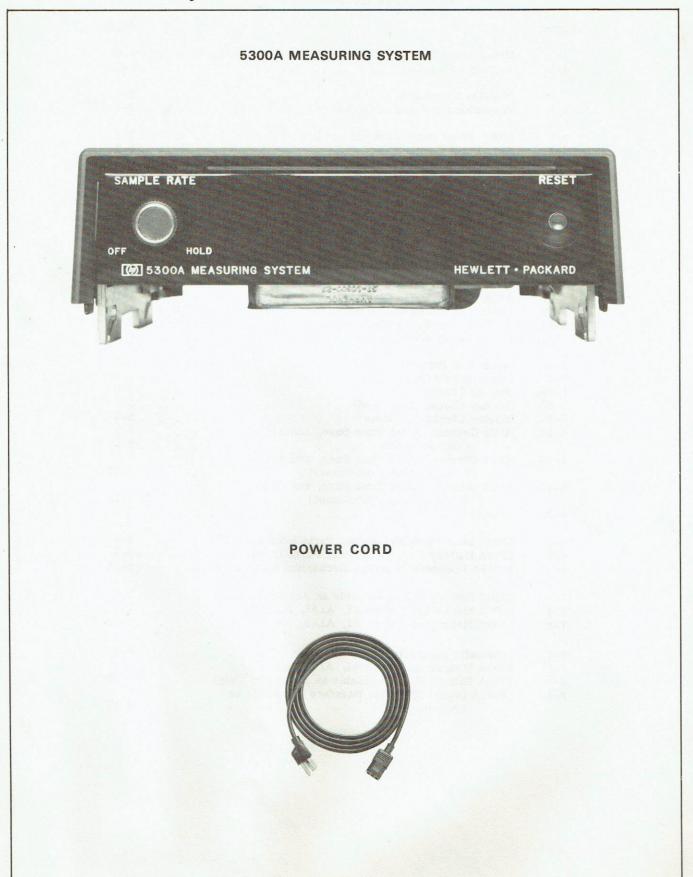
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Figure 1-1. Model 5300A Measuring System Mainframe



### SECTION I GENERAL INFORMATION

#### 1-1. INTRODUCTION

#### 1-2. Description

- 1-3. The Hewlett-Packard Model 5300A Measuring System Mainframe is a rugged, compact, all solid state measuring instrument that is used with a variety of plug-on modules to measure a wide range of parameters. The system has a six-digit light-emitting-diode (LED) display assembly. The plug-on feature enables the user to select plug-ons which will provide him with a maximum measurement capability for a particular need. The electrical and mechanical specifications for the 5300A Measuring System, 5310A Battery Pack, and 10533A Recorder Interface are listed in Tables 1-3, 1-4, and 1-5, respectively. Several plug-ons are available for the 5300A Measuring System, some of these are shown in Figure 1-2.
- a. HP Model 5301A 10 MHz Counter. When combined with the 5300A, frequency measurements to 10 MHz can be made.
- b. HP Model 5302A 50 MHz Universal Counter. When combined with the 5300A; Frequency, Period, Period Average, Time Interval, Ratio, and Totalizing measurements can be made.
- c. HP Model 5303A 500 MHz Counter. When combined with the  $5300\,\mathrm{A}$ , frequency measurements to 500 MHz can be made.
- d. HP Model 5304A Timer/Counter. When combined with the 5300A, frequency measurements to 10 MHz and time interval measurements to 500 nsec can be made.
- e. HP Model 5310A Battery Pack (available accessory). When installed between the 5300A and a plugon, a completely portable instrument is available with 4 to 8 hours of operating time.

#### 1-4. PURPOSE AND USE OF MANUAL

- 1-5. This manual provides operating and service instructions for the 5300A Measuring System. When the information package, which is included with the plugon purchased, is inserted into Section IX, the manual becomes an operating and Service manual for the 5300A Measuring System and its respective plugons.
- 1-6. The manual is intended to familiarize the user with his unit. Included are operation, theory, maintenance information and schematic diagrams, component locators, and parts lists.

#### 1-7. APPLICATIONS

1-8. The 5300A Measuring System can be used in airborne and ground radio communications and radar servicing, industrial electronics servicing, and various other electronics-related fields. The Battery

Pack (HP 5310A) enables the 5300A Measuring System to be used in field-service situations where ac power is not available or in applications which require isolation from power lines.

#### 1-9. INSTRUMENT IDENTIFICATION

- 1-10. Hewlett-Packard uses a two-section nine-digit serial number (0000A00000) mounted internally, near the power transformer to identify the instrument.
- 1-11. The first four digits specify the serial prefix and the last five digits refer to the specific instrument. If the serial prefix on your instrument differs from that listed on the title page of the manual, there are differences between the manual and your instrument.
- 1-12. Lower serial prefixes are documented in Section VII and higher serial prefixes are covered by a manual change sheet included with the manual. If the change sheet is missing contact the nearest Hewlett-Packard Sales and Service Office listed in Section VI of this manual.

#### 1-13. MANUAL CHANGES AND OPTIONS

1-14. The title page lists the serial prefix number to which this manual directly applies. If the serial prefix number is different from the one listed, a manual change sheet is included, describing the required changes. If the change sheet is missing the information can be supplied by a Hewlett-Packard Sales and Service office listed in Section VI of this manual. Options are listed in Section VII of this manual.

# 1-15. EQUIPMENT SUPPLIED AND ACCESSORIES AVAILABLE

1-16. Table 1-1 lists equipment supplied and Table 1-2 lists accessories available.

Table 1-1. Equipment Supplied

DESCRIPTION	HP PART NO.
Detachable Power Cord (I. E. C. type approved)	8120-1348

Table 1-2. Accessories Available

DESCRIPTION	HP PART NO.
Digital Recorder Interface	10533A
Service Support Package	10547A
Diagnostic Cards	10548A
Battery Pack: 12 Vdc, 4—8 hrs. operating time	5310A
Rack Mount Kit	10576A

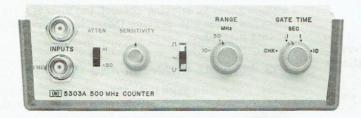
Figure 1-2. Available Plug-ons



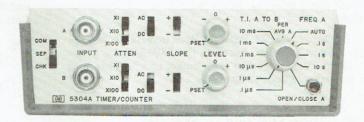
5301A



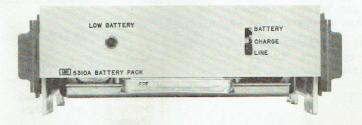
#### 5302A



#### 5303A



#### 5304A



5310A

Mainframe unit provides system with power, reference frequency, display, counting logic, and timing control.

#### TIME BASE

Crystal frequency: 10 MHz

Stability: Aging rate <3 parts in 10<sup>7</sup>/month

Temperature  $<\pm 5$  parts in  $10^6$ ,  $0^\circ$ C to

50°C

Line voltage  $<\!\pm\,1$  part in  $10^7$  for 10%

line variation

Oscillator output: 10 MHz, 1 Vrms at rear panel BNC.  $100\Omega$  source impedance

External input: 100 kHz to 10 MHz, 1 V rms into  $500\Omega$ 

#### GENERAL

SAMPLE RATE: Sample rate control adjusts the delay from the end of one measurement to the start of a new measurement. Continuously variable from less than 50 msec to approximately 5 seconds.

In HOLD position the display can be held indefinitely. HOLD input on rear panel connector also provides sample rate control or hold by contact closure to ground.

RESET: Front panel pushbutton switch resets all registers and initiates new measurement. Reset input by contact closure to ground also available on rear panel connector.

DISPLAY: 6-digit all solid-state LED display (gallium arsenide phosphide light-emitting diodes) including decimal points and units.

LED overflow light indicates when display range is exceeded.

OPERATING TEMPERATURE: 0° to 50°C

POWER REQUIREMENTS:  $115 \text{ or } 230 \text{ volts } \pm 10\%$ , 50 to 400 Hz, 25 VA maximum (depends on plug-on module).

Mainframe power without plug-ons typically 5 watts

BATTERY OPERATION: With 5310A rechargeable pack, a minimum of 3 hours (typically 5 hours) of operation at 20°C to 30°C operating and charging temperatures, depending on the plugin used. Battery pack may be recharged from the 5300A power supply.

DIGITAL OUTPUT: Digit serial, 4-bit BCD parallel available at rear panel connector.

Code: 4-line 1-2-4-8 BCD, "1" state low, TTL logic levels.

Decimal point: Decimal point code (Binary 1111) automatically inserted at correct digit position.

Print Command: Positive step, TTL output

Holdoff: Contact closure to ground or TTL low level inhibits start of new measurement cycle.

Connector: 20 pin pc connector. Mating connector Viking 2VH10/1JN or equivalent.

Parallel Data Output: Available with recorder interface accessory, 10533A (Table 1-5).

WEIGHT: (Without plug-on module.) Net 3.3 lbs. (1.5 kg). Shipping 5.5 lbs. (2.5 kg).

DIMENSIONS: (With plug-on module.)

Height: 3-1/2 inches (89 mm) Width: 6-1/4 inches (160 mm) Depth: 9-3/4 inches (248 mm)

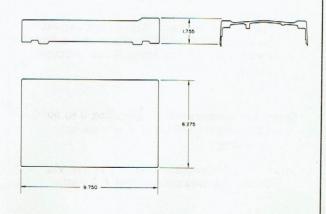


Table 1-4. Accessory Battery Pack Specifications

#### 5310A BATTERY PACK

Provides battery power to 5300A mainframe and plug-on modules from rechargeable Nickel-Cadmium cells.

Battery voltage: 12 Vdc.

Battery capacity: Nominal 48-watt hours.

Operating time: Minimum of 3 hours operation (typically 5 hours) at 20°C to 30°C operating and charging temperatures, depending on plug-on used.

Recharging Power: Provided by 5300A mainframe. 18 hours recharge time from minimum level (indicated by LOW BATTERY indicator) to full charge.

#### CAUTION

Maximum recharge time is 24 hours.

Low voltage indicator: Solid state warning light begins to glow when battery voltage drops below minimum level (approximately 10% remaining charge).

Line failure protection: Allows instrument to be operated in LINE position with automatic switch-over to batteries if line voltage fails.

Operating temperature: Operating 0 to 50°C. Charging 0 to 40°C, mainframe not operating.

Power requirements: Charging power via 5300A mainframe nominal 7.5 watts.

Weight: Net 5 lbs. (2.3 kg). Shipping 6-1/4 lbs. (2.9 kg).

Dimensions: When battery pack is installed between 5300A mainframe and plug-on module. Overall height is increased by 1.5 inches (38.4 mm).

Warranty: Batteries are not warranted.

## Table 1-5. Accessory Recorder Interface Specifications

#### 10533A RECORDER INTERFACE

The 10533A interface accessory provides an interface between the 5300A system mainframe and a standard parallel-input recorder such as HP 5050B, when used with an option 050 or 051 only, or 5055A. The interface module is connected to the 5300A by 6-feet of flexible cable, and provides the conversion from the 5300A serial data output to a standard parallel format which includes floating decimal point, overflow indication and units expressed as a true exponent.

Output Format: 10 parallel digits, including 6 data, 1 decimal point, 1 overflow, 1 exponent and 1 exponent sign.

Code: 4-line 1-2-4-8 BCD, "1" state low, TTL levels.

Decimal Point: Floating decimal point automatically inserted at correct digit position. Coded 1111 ("\*" on standard 5050B or 5055A print wheel). Internal jumper wire can remove decimal point from data format if required.

Overflow: Code 1111 ("\*") printed in first printer column when 5300A overflow light is on.

Exponent: ±0,±3,±6 corresponding with 5300A measurement units.

Print command: Negative step, TTL levels.

Inhibit Input: +2.0~V or higher prevents the 5300A from recycling.

Power requirements: 100 mA at 5 volts provided by 5300A.

# SECTION II

#### 2-1. UNPACKING AND INSPECTION

2-2. If the shipping carton is damaged, ask that the carrier's agent be present when the instrument is unpacked. Inspect the instruments for damage, such as, scratches, dents, broken knobs, etc. If the instrument is damaged or fails to operate when used with the respective plug-on, notify the carrier and the nearest Hewlett-Packard Sales and Service office immediately. Operating procedures are located in Section IX and sales and service offices are listed in Section VI of this manual. Retain the shipping carton and the padding material for the carrier's inspection. The Sales and Service office will arrange for the repair or replacement of the instrument without waiting for the claim against the carrier to be settled.

#### 2-3. STORAGE AND SHIPMENT

- 2-4. PACKAGING. To protect valuable electronic equipment during storage or shipment always use the best packaging methods available. Your Hewlett-Packard Sales and Service Office can provide packaging material such as that used for original factory packaging. Contract packaging companies in many cities can provide dependable custom packaging on short notice. Here is one recommended packaging method:
- a. The original container is a corrugated card-board box with 200 lbs. burst test (HP Part No. 9211-1619). The instrument is secured and protected, while in the box by a top and bottom molded frame of polystyrene foam (HP Part No. 9220-1545). Also included with the instrument is a plastic dust-protection cover (HP Part No. 05300-80004) and up to two card-board filler pads for the top of the package (HP Part No. 9220-1736). These filler pads are designed to take up the space formerly used by the operating and service manual(s).
- 2-5. ENVIRONMENT. Conditions during storage and shipment should normally be limited as follows:
  - Maximum altitude: 25,000 feet.
  - b. Minimum temperature: -40°F (-40°C).
  - c. Maximum temperature: +167°F (+75°C).

# 2-6. POWER CONNECTION (I.E.C. Approved) (International Electronics Consortium)

#### CAUTION

Before plugging instruments into ac power line be sure the slide switch is properly positioned and fuse is changed.

2-7. LINE VOLTAGE. The counter may be operated from either 115 Vac or 230 Vac  $\pm$  10%. The instrument is supplied with a 115 V fuse; be sure to change this fuse for 230 V operation (see Table 2-1). The

Input Power Line Module is designed so that the 115V/230V switch cannot be changed unless the ac power cord is disconnected and the fuse is removed.

Table 2-1. 115/230 Volt Conversion

Slide Voltage Conversion	115 V	230 V
Slide Switch	115	230
AC Line Fuse	.3 Amp slow- blow (HP 2110- 0044)	.15 Amp slow- blow (HP 2110- 0320)

- 2-8. The unit is shipped ready for 115 Vac operation; check your line voltage in use prior to applying ac power to the 5300A. To change the 115V/230V switch and the fuse proceed as follows:
  - a. Disconnect power cord from 5300A.
- b. Move sliding plastic door to left-most travel (until it covers ac power receptacle).
- c. Pull fuse extractor handle (marked "pull") until fuse "pops" out.
- d. With fuse extractor handle pulled out, slide the 115V/230V switch (located just below the extractor handle) to the desired position (left or right).
- 2-9. POWER CABLE. The instrument is equipped with a detachable 3-wire power cable. See CAUTION NOTE and proceed as follows for installation:
- a. Connect the plug (3-socket connector) to ac line jack at the rear of the instrument. Ensure fuse and voltage setting are correct.
- b. Connect the plug (2-blade with round ground pin) to 3-wire (grounded) power outlet.
- 2-10. Instrument chassis is grounded through the round pin on the plug; if a two-blade outlet is available use connector adapter (HP Part No. 1251-0048), then connect the short wire from the side of the adapter to the ground.

# 2-11. INSTALLATION AND REMOVAL OF PLUG-ON MODULES

- 2-12. The 5300A Measuring System must be used with a mating Plug-On before any measurements can be made. To mate the 5300A Measuring System with a plug-on use Figure 2-1 steps a to c and proceed as follows:
- a. Disconnect ac power and set the plug-on (on its feet), on a flat surface with the front-panel facing you.
- b. Turn the 5300A right-side up with front-panel facing you (ON-OFF-SAMPLE RATE on left side) and slide the side-casting latches all the way to the rear

Figure 2-1. Plug-on Installation



- of the unit. The latch handles must be pressed gently away from the center of the unit to "unlock" them before sliding rearward.
- c. With latch handles fully extended rearward, mate the 5300A to the plug-on by placing the 5300A on top of the plug-on.
- d. With the latches fully extended rearward and the 5300A properly positioned on the plug-on, an equal space should be visible (about 1/8-inch wide) where castings meet.
- e. Press down gently on top of 5300A casting and push the left and right latches forward. Castings will be brought together. (see CAUTION).
- f. Check the position of the latches to ensure that castings are properly mated and latched. When properly latched, latches should not protrude past rear edge of casting and there should be a paper-thin space between plug-on and 5300A.
- g. To separate the 5300A from the plug-on, pull the two-side casting latches fully rearward, (again it is necessary to press the latch handles gently away from the center of the instrument to unlock them).
- h. When latches are fully extended rearward, the  $5300\,\mathrm{A}$  and plug-on castings should be separated by about 1/8-inch.
  - i. Lift 5300A gently away from plug-on.

#### CAUTION

DO NOT force latches forward; if difficulty is encountered, check latches and castings for obstructions.

#### 2-13. DIGITAL RECORDER OUTPUT

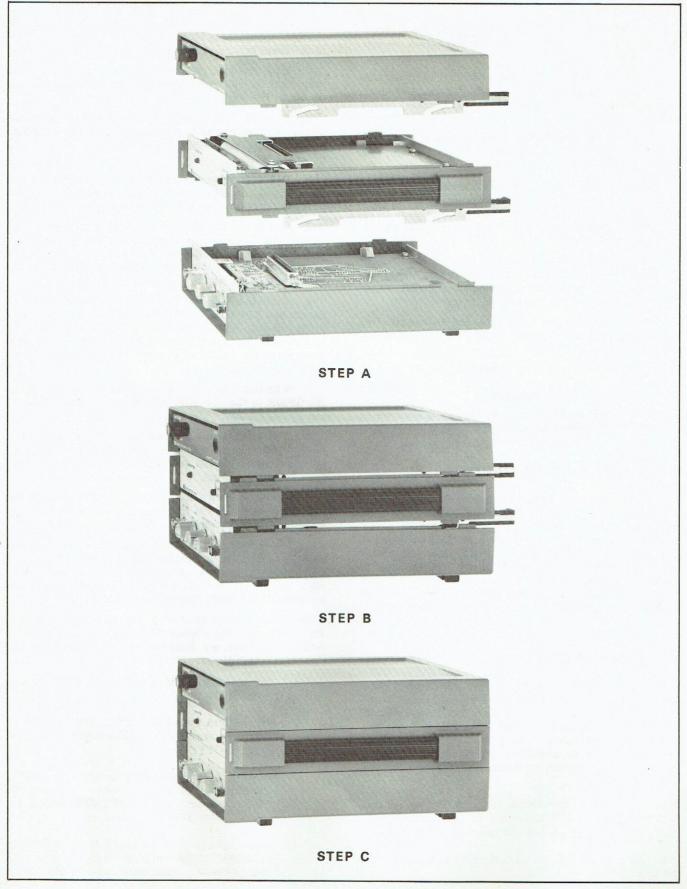
2-14. To supply the 5300A Measuring System display information to HP Models 5050B and 5055A Digital Recorders, the HP 10533A Recorder Interface cable must be used. This cable converts the serial-form data from the 5300A to parallel-form data for processing by the digital recorders. The HP 10533A Recorder Interface cable is listed in Tables 1-2 and 1-5 as available accessories. Documentation is also included in Section IV through VIII of this manual.

#### 2-15. PORTABLE OPERATION

- 2-16. The use of the HP Model 5310A Battery Pack enables the Measuring System to be used in areas removed from ac power sources. The Battery Pack provides up to 8 hours portable operating time before recharging. Tables 1-2 and 1-4 lists the HP 5310A Battery Pack as an available accessory. Documentation is also included in Section IV through VIII of this manual.
- 2-17. To prepare the 5300A for portable operation, turn POWER to OFF (full ccw), disconnect ac power cord, refer to Figure 2-2 and proceed as follows:
- a. Set the plug-on, on its feet on a flat surface with the front-panel facing you.

- b. Turn the 5310A Battery Pack right-side up (LOW BATTERY LAMP on the left) with front-panel facing you and slide the side-casting latches all the way to the rear of the unit. The latch handles must be pressed gently away from the center of the unit to "unlock" them before sliding rearward.
- c. With the latches extended rearward, mate the plug-ontothe 5310A Battery Pack by placing the 5310A on top of the plug-on.
- d. With the 5310A properly positioned on the plugon and the latches fully extended rearward, an equal space should be visible (about 1/8-inch wide) where castings meet.
- e. Press down gently on top of the 5310A and push the left and right latches forward. Castings will be brought together (see CAUTION in Paragraph 2-12).
- f. Check the position of the latches to ensure that castings are properly mated and latched. When properly latched, latches should not protrude past rearedge of casting and there should be a paper-thin space between plug-on and 5310A Battery Pack.
- g. Turn the 5300A right-side up with front-panel facing you (ON-OFF-SAMPLE-RATE on left side) and slide the side-casting latches all the way to the rear of the unit. The latch handles must be pressed gently away from the center of the unit to "unlock" them before sliding rearward.
- h. With latch handles fully extended rearward, mate the 5300A to the 5310A by placing the 5300A on top of the Battery Pack.
- i. With the latches fully extended rearward and the 5300A properly positioned on the 5310A Battery Pack, an equal space should be visible (about 1/8-inchwide) where castings meet.
- j. Press down gently on top of 5300A casting and push the left and right latches forward; castings will be brought together (see CAUTION in Paragraph 2-12).
- k. Check the position of the latches to ensure that castings are properly mated and latched. When properly latched, latches should not protrude past rearedge of casting and there should be a paper-thin space between 5310A Battery Pack and 5300A.
- l. When the selected plug-on, the 5310A Battery Pack and the 5300A Measuring System are interconnected and securely latched, perform the check-out procedure as follows:
  - Set 5310A BATTERY-LINE-CHARGE switch to BATTERY.
  - 2. Turn 5300A POWER switch to ON(ccw out of OFF) and ensure that 5310A BATTERY LOW lamp is OFF.
  - 3. If BATTERY LOW lamp is on, turn 5300A POWER to OFF and connect ac power to 5300A and set 5310A BATTERY switch to CHARGE for 18 hours minimum.
  - If unit fails to operate, check interconnection of 5300A, 5310A and plug-on in use (if problem persists, refer to Section V MAINTE-

Figure 2-2. Preparing for Portable Operation



- NANCE, Paragraph 5-61, Battery Pack information).
- Refer to Section IX for the plug-on module used and perform the performance check procedures for that plug-on.
- 5300A display should be as listed in the respective plug-on performance check.
- m. To separate the 5300A, 5310A, and plug-on in use, pull the two-side casting latches on the 5300A fully rearward, (again it is necessary to press the latch handles gently away from the center of the unit to "unlock" them).

- n. When latches are fully extended rearward, the  $5300\,\mathrm{A}\,\mathrm{and}\,5310\,\mathrm{A}\,\mathrm{castings}$  should be separated by about 1/8 inch.
  - o. Lift the 5300A gently away from the 5310A.
- p. To separate the 5310A Battery Pack from the plug-on in use, repeat steps m, n, and o.

#### 2-18. SERVICE AIDS (Table 2-2.)

 $2\text{--}19.\;$  To assist you in maintaining and servicing the 5300A Measuring System mainframe, the following list of components and equipment is recommended.

Table 2-2. Diagnostic Service Kit (HP Part No. 10548A)

COMPONENT/EQUIPMENT	HP PART NO.	USE
Shorting Plug	5080-0058, 2 ea.	Implements codes on Diagnostic Cards.
Diagnostic Interface Connector	05300-60004, 1 ea.	Interface between 50-pin connector and 44-pin connector.
Diagnostic Card "A" Diagnostic Card "B" Diagnostic Card "C" Diagnostic Card "D"	05300-20011 05300-20012 05300-20013 05300-20014	Provides fixed tests to check 5300A circuits, including the display.

# SECTION III OPERATION

#### 3-1. INTRODUCTION

3-2. The operation of the 5300A is very simple since there are only two controls. By itself, the 5300A is not useable for measurements, therefore the pertinent operating information for the 5300A and plug-on used is in Section IX.

#### 3-3. ACCURACY

3-4. The basic measuring accuracy is determined by the plug-on module in use. Refer to Section IX for more information on specific plug-on accuracy.

#### 3-5. FRONT PANEL

3-6. The 5300A front panel (Figure 3-1) contains the ON-OFF switch and SAMPLE RATE control, the RESET switch, the Solid State Display, and the Annunciators.

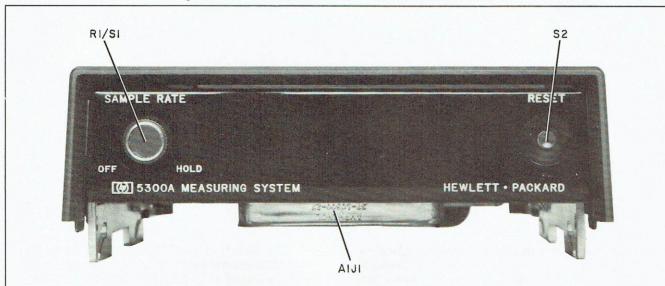
#### 3-7. REAR PANEL

- 3-8. The 5300A rear panel (Figure 3-2) contains the ac Input Power Module and Fuse, the External Clock jack and the Digital Recorder Connector.
- 3-9. INT-EXT Switch. The INT-EXT switch located near the power transformer allows the use of an external 10 MHz frequency source instead of the internal oscillator.

#### 3-10. OPERATING PROCEDURES

3-11. The operating procedures for the 5300A Measuring System and it's plug-on's are located in the respective plug-ons operating and service information section (Section IX). For example: The operating information for HP Model 5301A 10 MHz Counter is Section IXA. The operating information for HP Model 5302A 50 MHz Universal Counter is Section IXB.

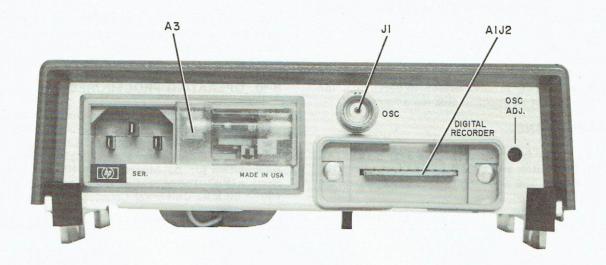
Figure 3-1. 5300A Front Panel Controls and Indicators



- 1. SAMPLE RATE. Ac power is turned on or off.
  - SAMPLE RATE is adjustable from less than 50 msec to more than 5 seconds.
  - HOLD position retains the display information
- RESET. When pressed, the instrument circuits are reset and a new measurement is initiated.
- A1J1. 50-pin connector provides interconnection with plug-on used.
- 4. Display/Annunciator. Hz, kHz, MHz: lights when measurement occurs in Hz, kHz, or MHz range respectively.

- S, MS,  $\mu$ S: lights when measurements occur in seconds, milliseconds, or microseconds, respectively.
- C: lights when instrument Main Gate is open.
- Overflow Light: Lights when the measurement exceeds the display capacity.
- Display: 6-digit display of data.

Figure 3-2. Rear Panel Connectors



- 1. Ac Power Module. Input Power module contains the I.E.C. approved connector, the fuse, (.3 Amp 115 Vac, .15 Amp 230 Vac), the 115/230 line voltage switch and filter capacitors. Design of module prevents fuse or switch change when ac power line in connected. The switch cannot be changed unless the fuse is pulled out.
- 2. OSC Jack. When INT-EXT switch located near the 5300A power transformer is in INT, the instrument uses its internal 10 MHz

Oscillator, and a 10 MHz signal (1 V rms into 100-ohms) is available at the BNC jack. When the switch is in EXT, the internal oscillator is disabled and an external 100 kHz to 10 MHz, 1 V rms into 500-ohms frequency source can be used.

- DIGITAL RECORDER Connector. BCD serial output with a floating decimal point is available.
- 4. OSC ADJ. Internal 10 MHz oscillator frequency can be adjusted to 1 part in 10<sup>6</sup>.

# SECTION IV THEORY OF OPERATION

#### 4-1. INTRODUCTION

4-2. This section describes the basic and overall instrument theory of operation and detailed individual assembly operation.

#### 4-3. BINARY LOGIC AND GATING

4-4. The 5300A Measuring System and its associated plug-ons use integrated circuits. It is necessary to understand basic logic symbols and their application gating. In the circuit diagrams, AND gate, OR gate, NAND gate, NOR gate, Inverted Input gate, Inverter and Amplifier symbols are used. The following paragraphs and illustrations introduce logic symbols and their application.

4-5. Two states exist in the binary system, 1 and 0.  $\rm HIGH~(H)~and~LOW~(L)~are~used$  to represent the levels of 1 and 0.  $\rm HIGH~always~represents$  the more positive level whether it be positive or negative logic. Figure 4-1 shows four pairs of logic symbols that have the same truth tables and can be used interchangeably. The same function is performed by two different logic symbols.

4-6. GATES. Figure 4-2A represents a basic AND gate. The AND gate output is HIGH if all inputs are HIGH. An AND gate may have two or more inputs.

Figure 4-2B represents the basic OR gate. The OR gate output is HIGH if one or more of its inputs is HIGH. The OR gate may have two or more inputs.

Figure 4-2. Gate Symbols

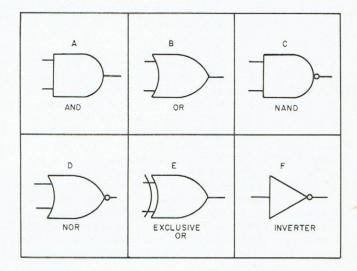


Figure 4-1. Logic Comparison Diagrams

A $\longrightarrow$ B $\longrightarrow$ Z = $\overline{A} \cdot \overline{B}$ A $\longrightarrow$ Z = $A + B$			A — B — B —	$Z = A \cdot B$ $Z = \overline{A} + \overline{B}$	— z >>— z	A ——  A ——  B ——	$ \begin{array}{c} C \\ Z = \overline{A} \cdot \overline{B} \\ \end{array} $ $ Z = \overline{A} + B $	}— z >>— z	$Z = \overline{A \cdot B}$ $Z = \overline{A \cdot B}$ $Z = \overline{A + B}$			
А	В	z	A	В	z	A	В	Z	A	В	z	
L	L	L	L	L	L	L	L	Н	L	L	н	
L	Н	н	L	н	L	L	Н	L	L	Н	н	
Н	L	н	н	L	L	н	L	L	Н	L	н	
Н	Н	Н	Н	н	Н	Н	Н	L	Н	н	L	

4-7. INVERSION. AND and OR gates are shown in Figure 4-2 (A, B). The circle on the output of a logic symbol indicates a LOW when activated, as shown in Figure 4-2 (C, D). Thus, a circle indicates inversion. An AND gate with an inverted output is called a NAND gate; an OR gate with an inverted output is called a NOR gate. The unit gain amplifier with an inverted output is called an inverter, Figure 4-2 (F).

#### 4-8. FIELD EFFECT TRANSISTOR (FET)

4-9. Field effect transistors have three terminals: source, drain, and gate which correspond in function to emitter, collector, and base of junction transistors. Source and drain leads are attached to the same block (channel) of N or P semiconductor material. A band of oppositely doped material around the channel (between the source and drain leads) is connected to the gate lead.

4-10. In normal FET operation, the gate-source voltage reverse-biases the PN junction, causing an electric field that creates a depletion region in the source-drain channel. In the depletion region the number of available current carriers is reduced as the reverse-biasing voltage increases, making source-drain current a function of gate-source voltage. With the input (gate-source) circuit reverse-biased, the FET presents a high impedance to its signal sources (as compared with the low impedance of the forward-biased junction transistor base-emitter circuit). Because there is no input current, FET's have less noise than junction transistors. Figure 4-3 shows the schematic symbol and biasing for N channel and P channel field effect transistors.

#### 4-11. LIGHT EMITTING DIODES

4-12. A light emitting diode (L.E.D.) is a p-n junction device which is designed to emit visible radiation (light) when its p-n junction is forward biased.

4-13. The type of diodes used in the 5300A Display are Gallium Arsenide Phosphide L.E.D.'s which emit radiation in the red region (6400 Angstroms). The addition of the red front-panel filter enhances the visibility of emitted radiation. Additional subject information is available from the HP Journal, July 1970, and HP Applications Note 931.

#### 4-14. INTEGRATED CIRCUIT OPERATION

4-15. The operation of integrated circuits A1U1, A1U2, A1U3, A1U4, and A1U5 is found in paragraphs 4-30 through 4-40.

#### 4-16. OVERALL OPERATION

4-17. Figure 4-4 is an overall block diagram of the 5300A Measuring System and a typical plug-on (5301A Plug-On). The 5300A Measuring System mainframe contains the major counting, timing, and display circuitry which is the basis of all measurements in the 5300A Measuring System.

Figure 4-3. Field Effect Transistor Operation

A. FET Amplifier Characteristics						
	+V S	+V				
CHARACTERISTIC	COMMON SOURCE	COMMON DRAIN (Source Follower)				
Input Impedance Output Impedance Voltage Gain Power Gain	IMΩ-15MΩ 50KΩ-100KΩ 10-200 60dB-100dB	IMΩ-I5MΩ IKΩ-IOKΩ <1 40dB-80dB				
	B. FET Biasing					
TYPE						
N-CHANNEL  DRAIN  GATE SOURCE	OV MAXIMUM CURRENT FLOW	INCREASING DECREASES CURRENT FLOW				
P-CHANNEL  DRAIN  GATE  SOURCE	OV MAXIMUM CURRENT FLOW	INCREASING DECREASES CURRENT FLOW				

4-18. The functional modules of the mainframe are shown in Figure 4-4 simplified block diagram. These are:

a. Display. A six-digit scanned solid-state L.E.D. display (A1A1DS7).

b. Scanner (A1U1). A self-contained scanning circuit which drives the vertical columns of the display and provides an address code used to identify the displayed digit.

c. Character Generator (A1U2). A decoding and driving circuit which converts the four-line data code to a 10-line pattern used to drive the horizontal lines of the display matrix.

d. Counter (A1U3). A six-digit, 10 MHz counting and storage register.

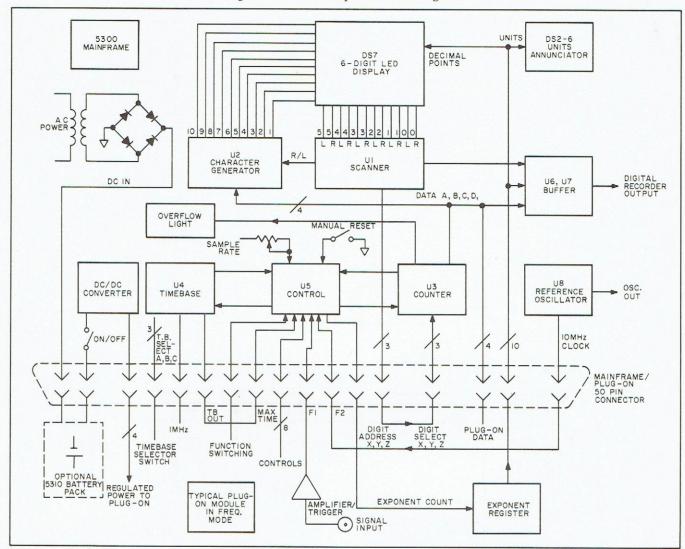


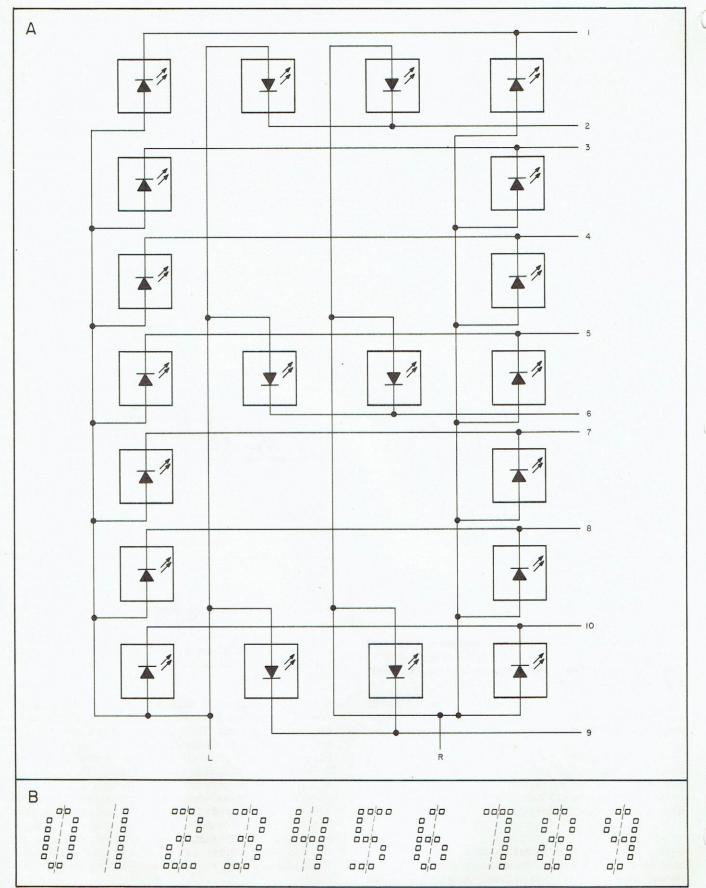
Figure 4-4. 5300A Simplified Block Diagram

- e. Time base (A1U4). An eight-decade 10 MHz, automatic time-base divider.
- f. Control (A1U5). Provides the basic control functions and gating for counting and timing measurements cycles, including auto-ranging, transfer, reset and sample rate control.
- g. Reference Oscillator (A1U8 and Y1). A 10 MHz crystal-controlled oscillator which provides the basic frequency and time references for the system.
- h. Power Supply. Provides regulated voltages to the mainframe and all plug-on modules and charging power to the optional battery pack module. Power Supply Input can be 115 Vac or 230 Vac line voltage or dc power from the battery pack.
- 4-19. These basic functional blocks of the mainframe may be interconnected in many ways to provide different measurement capabilities. A typical system

interconnected for frequency measurement is shown in the block diagram, Figure 4-4. The major signal and control lines are all routed via the plug-on connector and the plug-on module, which determines measurement function as well as providing the input signal interfaces.

4-20. The four-wire data buss carries the system data between modules in a binary-coded-decimal, digit-serial format. Data can flow from counter A1U3 to DS7 display or to the digital recorder output or the plug-on module, or from the plug-on module to DS7 display and to digital recorder output. The transfer of data to the display is controlled by a 3-bit binary code (Digit Address) which is generated by the scanner A1U1. A 3-bit code (Digit Select) controls the data output from the counter. With most plug-on modules the displayed information is the stored contents of counter A1U3, which can be obtained by wiring the digit address lines to the corresponding digit select lines.

Figure 4-5. Light Emitting Diode Matrix



4-21. The time base U4 is also programmed by a 3-bit time base code which can select any time base division factor in powers of 10, from 10 to 10<sup>8</sup>. The time base output may also be selected automatically over the same range. In the auto-ranging mode the range is indicated by a number of exponent pulses generated by the time base and the control module. These pulses are counted, stored, and decoded by an exponent register in the plug-on module, which then provides the drive to the appropriate decimal point and units indicators in the mainframe.

4-22. The input signals to the counter and the time base are routed through the control module. For a typical frequency measurement as shown in the block diagram, the F1 input to the counter is derived from the input amplifier of the plug-on module and the time base input F2 is the reference frequency from the crystal oscillator. In a period average measurement, which is the reciprocal of frequency, these signals are reversed. In addition to the F2 input, a 1 MHz input to the time base is provided which bypasses the first time base decade and the control module and allows auto-ranging down to a single cycle of the input signal.

#### 4-23. A1, 10 MHz OSCILLATOR OPERATION

4-24. The 10 MHz oscillator (Figure 8-2) generates 10 MHz clock signals for the 5300A Measuring System and its plug-on's. The oscillator section consists of U8A, Y1, buffer amplifier U8B, and output amplifier Q1. U8A operates as a positive feed-back amplifier. The non-inverted output maintains signals to 10 MHz crystal Y1.

4-25. The inverted output from U8A, is sent through buffer amplifier U8B and output amplifier Q1. The output from Q1 connects through the INT-EXT switch to the input of U7A. The output from U7A is sent to A1J1 where it is available to plug-ons as the "CLOCK" signal. A second output from U7A is sent through U7B and the INT-EXT switch to the rear-panel OSC jack. The OSC jack provides 1 volt rms.

# 4-26. A1A1 LIGHT EMITTING DIODE ASSEMBLY (L.E.D.)

4-27. The display in the 5300A is a 6-digit, scanned, light-emitting diode display. The display is formed by a matrix of dots, each dot consisting of a Gallium Arsenide diode which emits red light when current is passed through it in a forward direction.

4-28. Twenty diodes are used for each digit position, with the diodes arranged in a  $4\times7$  matrix as shown in Figure 4-5A. For ease of driving, the diodes are rearranged electrically into a  $2\times10$  matrix.

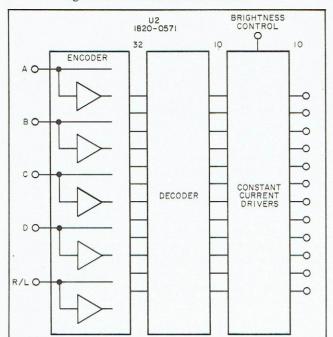
4-29. This divides the digit into symmetrical left and right halves as in Figure 4-5B. Each half digit has a column drive line connected to the anodes of all 10 diodes and 10 cathode drive lines which are connected to the same diode position in every half digit.

#### 4-30. A1U1 SCANNER

4-31. In operation each half-digit is scanned by the circuitry shown in Figure 4-6B. The display is scanned from right to left with each half-digit position being driven for one/twelth the total cycle time. Integrated circuit SCANNER U1 generates the scanning sequence to drive the display via 12 buffer drive transistors Q6 to Q17. The scanner has a free-running internal clock whose frequency is set by the external capacitor C17. The scanning frequency is approximately 10 kHz so that the complete display is refreshed in about 1.2 milliseconds. The scanner also provides a four-bit code which identifies the half digit being driven. The first bit identifies the right and left hand halves of each digit and is high when the right hand half is on.

The other three bits, lines X, Y, and Z, identify the digit being displayed. These address the digit location in the data source which sends the digit information as a binary coded decimal code to the character generator U2.

Figure 4-6A. U2 Character Generator

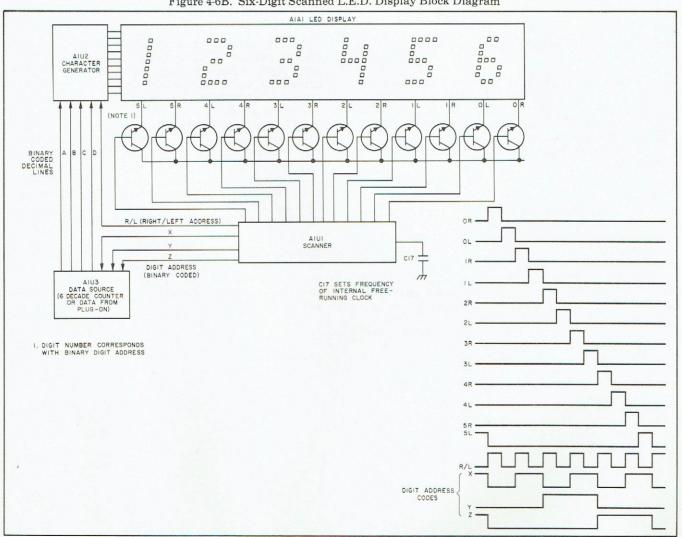


#### 4-32. A1U2 CHARACTER GENERATOR

4-33. The character generator decodes the digit information along with the right-left code and generates the pattern on its 10 output lines for the half-digit being addressed. A list of output codes for all allowable digit codes is shown in Table 4-1 and should be used in conjunction with Figure 4-5. A diagram is shown in Figure 4-6A and B. The CHARACTER GEN-ERATOR also controls the brightness of the display, by regulating the current provided to each diode.

4-34. In the 5300A the data source can be in the plugon module but is normally the six decade counter A1U3. If A1U3 COUNTER is to be used, the digit address lines X, Y, and Z are connected to the digit select lines X, Y, and Z via the plug-on connector. This automatically connects the counter data to the CHAR-ACTER GENERATOR as well as to the plug-on module.

Figure 4-6B. Six-Digit Scanned L.E.D. Display Block Diagram



If the digit select lines are left open or held high, the COUNTER will be disconnected from the CHARACTER GENERATOR allowing data from the plug-on module to be displayed. Mainframe and plug-on data can also be combined in the display with the correct combination of digit address code and digit select code. The digit address code always identifies the digit position in this display with digit 0 being the least significant digit. The digit select code always identifies the digit position in the mainframe counter with zero selecting the least significant digit position.

#### 4-35. A1U3 COUNTER (see Caution)

4-36. The information displayed on the 5300A is normally counted in A1U3 COUNTER integrated circuit. This circuit consists of six, decade-counting elements, an overflow register, a 25-bit latch and output multiplexing circuits. Figure 4-7 is a basic block diagram of A1U3. The counter can accumulate and store up to

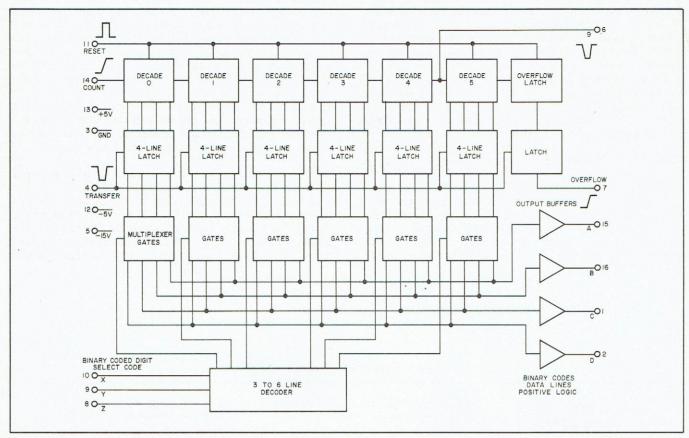
1 million pulses at its input. The input triggers on the positive-going edge of the input pulse, which is derived from the control circuit A1U5. The A1U5 input signal is the F1 input signal from the plug-on. The transfer input at A1U3(4), transfers data from the decade counters to the latch circuits when the transfer line is low. When the transfer line is high, data is stored in the latch circuits. The reset input at pin 11, resets the decades when the reset signal is high. One million or more input counts into the counter sets the overflow register, which causes the overflow output at pin 7, to go high following a transfer signal.

4-37. The counter output is available one-digit at a time as a four-bit binary-coded-decimal signal (logical 1 is high). The digit selected at the output is determined by the binary-coded digit-select code at pins 8, 9, and 10. Binary 0 (all low) selects the least significant decade. Binary 5 selects the most significant decade in the register. A select code of binary 7 will

Table 4-1. Character Generator Coding

CHARACTER	A1U2 INPUTS			A1U2 OUTPUTS "ON" (L. E. D. INPUTS)											
(NUMBER DISPLAYED)	<u>A</u>	<u>B</u>	<u>C</u>	D	<u>R</u>	1	2	3	<u>4</u>	<u>5</u>	<u>6</u>	7	8	9	10
U2 PINS →	17	14	15	16	18	5	6	7	10	11	9	4	20	2	1
0	L	L	L	L	-		X	X	Х	Х		X	X		X
1 LEFT	Н	L	L	L	L										
1 RIGHT	Н	L	L	L	Н	X		X	X	X		X	X	X	
2 LEFT	L	Н	L	L	L	X	X				X	X	X	X	X
2 RIGHT	L	Н	L	L	Н		X	X	X		X			X	X
3 LEFT	Н	Н	L	L	L	X	X				X			X	X
3 RIGHT	Н	Н	L	L	Н		X	X	X		X	X	X	X	
4 LEFT	L	L	H	L	L	X		X	X	X	X				
4 RIGHT	L	L	Н	L	H			X	X	X	X	X	X	X	
5 LEFT	Н	L	Н	L	L	X	X	X	X	X	X			X	X
5 RIGHT	Н	L	H	L	H	X	X				X	X	X		X
6 LEFT	L	Н	Н	L	L		X	X	X	X	X	X	X		X
6 RIGHT	L	H	H	L	Н		X				X	X	X		X
7 LEFT	Н	H	Н	L	L	X	X								
7 RIGHT	Н	H	Н	L	H	X	X	X	X	X		X	X	X	
8	L	L	L	Н	-		X	X	X		X	X	X		X
9 LEFT	Н	L	L	H	L		X	X	X		X				X
9 RIGHT	Н	L	L	Н	Н		X	X	X	X	X	X	X		X
MINUS	L	L	Н	Н	-					X	X				
BLANK	-	Н	Н	Н	-										

Figure 4-7. A1U3 6-Decade Counter Block Diagram



set all outputs high which allows other data from the plug-on to be inserted in place of the counter data. If no other data is presented the display remains blank. In normal operation the digit select lines, X, Y, and Z are driven by the digit address lines X, Y, and Z from the display scanner. This multiplexes the six decades of information into the six-digit position of the display. When a count of 90,000 has been registered in the counter (decades 0 to 4), the output labeled "9" goes low. This signal is used during auto-ranging, to register a reading of 9% or greater of full scale.

#### CAUTION

This counter is a large-scale MOS integrated circuit. Its inputs are susceptible to damage by high voltages (+5.6 volts) and static charges. Particular care should be exercised when servicing this circuit or handling it under conditions where static charges can build up.

#### 4-38. A1U4 TIME BASE

4-39. The A1U4 Time Base is a large scale integrated circuit containing 8 decade-divider elements. Figure 4-8 shows a basic block diagram. It accepts a maximum input frequency of 10 MHz which gives an output of one pulse every 10 seconds from the last decade-divider. The outputs of all decade dividers are multiplexed into a single time-base output line at A1U4(11). The number of stages used to divide the input signal is determined by a 3-bit binary-coded select code (pins 7, 8, and 9). Division factors of 10 through 108 can be selected. The first decade stage may be bypassed by a second input whose maximum frequency is 1 MHz. This input can be divided by scaling

factors of 1 through  $10^7$ . The precision timing and autoranging required for frequency and period average measurements is provided by the LOG OUTPUT at pin 1. During the first 10 seconds of a frequency measurement following reset, this output provides only 9 pulses. The first pulse triggers the gate opening at time 0, thereafter pulses are obtained at 1, 10, and  $100~\mu \rm sec$ , 1, 10, and  $100~\mu \rm sec$ , 1, 10, and  $100~\mu \rm sec$ , are of these pulses is automatically selected to trigger the gate closing. After the measurement is in progress, each pulse is precisely referenced to the Start Pulse at Time 0, which enables the Stop Pulse to be selected. The time base can be cleared to zero by a positive reset pulse at pin 14.

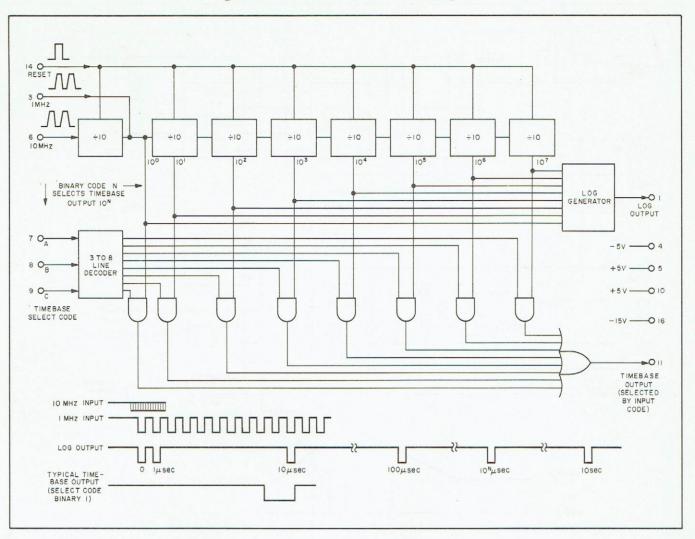
TIME BASE CODE/U4

GATE TIME	TBC	TBB	TBA
1 μs	0	0	0
10 μs	0	0	1
.1 ms	0	1	0
1 ms	0	1	1
10 ms	1	0	0
.1 S	1	0	1
1 S	1	1	0
10 S	1	1	1

#### CAUTION

This time base is a large-scale MOS integrated circuit. Its inputs are susceptible to damage by high voltages and static charges. Particular care should be exercised when servicing this circuit or handling it under conditions where static charge can build up.

Figure 4-8. A1U4 Time Base Basic Block Diagram



#### 4-40. A1U5 CONTROL

4-41. The signal gating and measurement cycle control for the 5300A Measuring System is provided by A1U5 control integrated circuit. Figure 4-9 shows a basic block diagram. The functions provided are: Gating of signals to the COUNTER and TIME BASE, sample rate control and provision for RESET and TRANSFER signals.

4-42. The F1 and F2 inputs are shaped by Schmitt-Triggers and then gated out to pins 5 and 20 as the TIME BASE and DCA signals. These signals are in phase with the input. To maintain optimum drive to the MOS circuits, these outputs are not routed through the plug-on. During RESET each output remains in a high state until the opening of the gates.

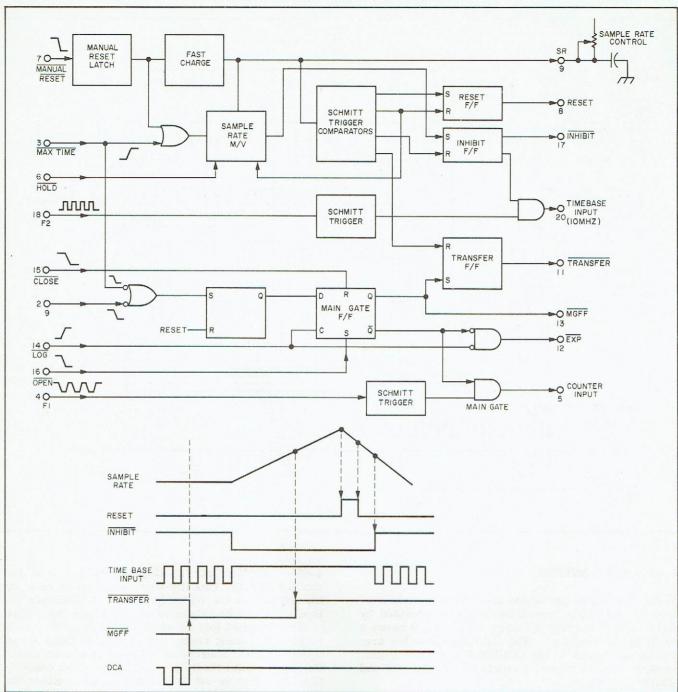
#### CAUTION

Particular care should be taken during servicing to avoid excessive capacitive loading of these outputs with probes.

4-43. The Main Gate flip-flop controls gating of the counted signals. This flip-flop can be set or reset by low signals at the OPEN (pin 16) or CLOSE (pin 15) inputs, or can be triggered by a positive going edge at the LOG input (pin 14) which comes from the TIME BASE. Following reset, the first LOG input Pulse opens the gate. Subsequent LOG inputs will not affect the flip-flop until the D input is driven from an enabling flip-flop which is set by the low signal at either the "9" input or the MAX TIME input. Setting this flip-flop enables the next LOG pulse to close the Main Gate and terminate the measurement.

4-44. During manual operation, the MAX TIME signal selected by the TIME BASE switch enables the closing of the gate at the predetermined gate time. During automatic operation after the counter has reached 90% of full scale, the "9" input enables the closing of the gate on the following LOG Input Pulse, which always occurs before 90% full scale is reached. The number of LOG pulses occurring while the main gate is open appears at the EXP output (pin 12). This number of pulses indicates the number of ranges through which the Time Base has automatically stepped and is used

Figure 4-9. A1U5 Control Basic Diagram



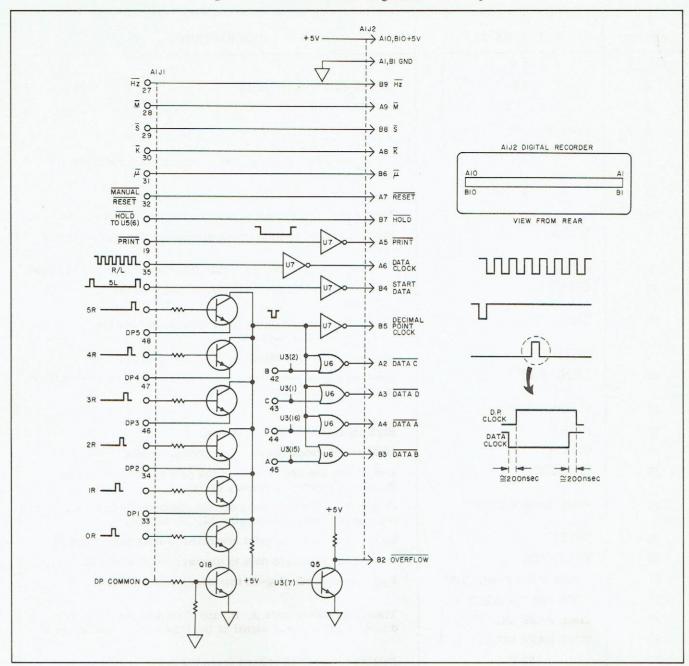
to determine the correct decimal point and units indication.

4-45. As soon as the main gate closes, a transfer flip-flop triggers to provide a low output to transfer data from the counter to the display. The display cycle is initiated by the rising edge at the MAX TIME input which triggers the SAMPLE RATE M. V. and begins charging through the front-panel SAMPLE RATE control. At a point approximately halfway up the charging curve the transfer signal is removed. When the peak charging voltage is reached the Reset

flip-flop is triggered providing a high signal at the RESET output. At this point the discharge of the SAMPLE RATE capacitor is initiated with a discharge time of a few milliseconds. At a point halfway down the discharge curve the reset signal is removed.

4-46. At the beginning of the display cycle the time base input is gated off by an inhibit flip-flop. The inhibit signal is removed at the end of the capacitor discharge. The time base input is gated on, beginning a new measurement cycle. An INHIBIT signal is available to the plug-on providing a low signal during the

Figure 4-10. 5300A Mainframe Digital Recorder Output



display cycle. The displayed information may be held indefinitely by switching to the HOLD position on the front panel. This opens the charging potentiometer circuits to the SAMPLE RATE capacitor and prevents the capacitor from charging up. The display may also be held by a contact closure to ground from the rear panel to the HOLD input. This allows the charging of the capacitor to take place, but inhibits the Discharge and the Reset cycle. If the HOLD signal is removed after the capacitor is fully charged, the Reset and Inhibit cycles are completed within a few milliseconds and a new measurement begins. The system can be CLEARED by alow signal at the MANUAL RESET input from the front panel RESET switch or from the rear panel.

#### 4-47. A1J1 CONNECTOR

4-48. Inputs to the 5300A Measuring System mainframe and programming of its functions are provided from the plug-on module via a 50-pin connector (A1J1) in the center of the instrument. The connector signals are as listed in Table 4-2.

#### 4-49. DIGITAL RECORDER OUTPUT

4-50. The 5300A rear-panel connector A1J2 provides data outputs to a digital recorder or similar device (Figure 4-10). The digital and decimal-point information is carried as a character-serial, four-bit

Table 4-2. A1J1 Signals

PIN NO. SIGNAL NAME		DESCRIPTION					
1	+5 V						
2	-5 V	Circuit operating voltages					
3	-17 V						
4	GROUND	Ground					
5	F1	Signal to be accumulated in the counter after gating by the control circuit.					
6	''9''	Goes low when the counter reaches 9% full scale.					
7	F2	Input signal to the time base gated by the control circuit.					
8	INHIBIT	High during the measurement cycle, low during the display cycle.					
9	OPEN	Low signal forces the main gate flip-flop to the open position					
10	CLOSE	Low signal forces the main gate flip-flop to the close position.					
11	LOG	Logarithmic output pulse train from time base triggers main gate flip-flop on rising edge.					
12	MGFF	Main gate flip-flop signal is low when gate is open.					
13	EXPONENT	Inverted log pulses while main gate is open indicates number of auto-ranging steps.					
14	NO CONNECTION						
15	RESET	High signal resets all registers.					
16	CLOCK	10 MHz reference signal from crystal oscillator					
17	MAX TIME	Low signal enables closing of the gate on next log pulse. Rising edge initiates display cycle.					
18	TIME BASE OUTPUT	Output from the time base decade position selected by the time base select code on pins 22, 23, and 24.					
19	PRINT	Low signal provides print command to rear panel connector.					
20	TRANSFER	Low signal transfers data to display. High signal stores data					
21	1 MHz TIME BASE INPUT	Input direct from plug-on bypasses control circuit.					
22	TIME BASE SELECT A						
23	TIME BASE SELECT B	Time base select code A, B, and C selects the time base					
24	TIME BASE SELECT C	division factor of the signal at the time base output at pin 18.					
25	+22 V	Full wave rectified voltage from the power transformer secondary. Provides power to charge the battery pack. If no battery pack is used, pin 25 is connected via the plug-on to pin 50 (DC-IN).					
26	+17 V						
27	<u>Hz</u>						
28 29	$\begin{bmatrix} \overline{M} \\ \overline{S} \\ \overline{K} \end{bmatrix}$	Pins 27 through 31 provide the drive to the annunciator lights on the front panel. A low signal lights the corre-					
30 31	K	sponding indicator.					
32	MANUAL RESET	Low signal from front panel pushbutton switch on rear panel input clears the system to zero.					
33	DP1	Low signal activates decimal point 1.					
	at , sti the entire						

Table 4-2. A1J1 Signals (Continued)

PIN NO.	SIGNAL NAME	DESCRIPTION				
34	DP2	Low signal activates decimal point 2.				
35	RIGHT/LEFT	Code indicating half character which is being addressed. High when right-hand of character is displayed.				
36	DIGIT ADDRESS X	Digit address code X, Y, Z from the display scanner				
37	DIGIT SELECT X	indicates a digit being displayed.				
38	DIGIT ADDRESS Y	Digit select code X, Y, Z is the corresponding code which				
39	DIGIT SELECT Y	selects the digit at the output of the counter. If the main-				
40	DIGIT ADDRESS Z	from counter is displayed directly the corresponding lines of the digit address code and the digit select code are con-				
41	DIGIT SELECT Z	connected together.				
42	DATA "D"					
43	DATA "C"	The data code A, B, C, D represents the digit to be displayed in binary coded decimal form. Data lines can carry the				
44	DATA "B"	counter output information to the plug-on as well as to the				
45	DATA "A"	display or can bypass the counter and bring plug-on data to the display.				
46	DP3	Low signal activates decimal point 3.				
47	DP4	Low signal activates decimal point 4.				
48	DP5	Low signal activates decimal point 5.				
49	GROUND	Ground				
50	DC IN	DC power to power supply from battery pack or from 22 volt input power from pin 25.				

parallel code, with the decimal point inserted at the correct position. Parallel output lines carry the units and overflow information and the output control signals. Data is derived from Counter U3 or from the plug-on module as a four-bit parallel code, and is buffered by the U6 gates. The displayed information is outputted, one-digit at a time starting with the last significant digit. The output information is synchronized with the display scan and is continuously recycled with the display. The buffered Data Clock signal at A1J2(A6) is derived from Scanner U1 right/left (R/L) code. The data changes immediately after the Data Clock goes low.

4-51. A START DATA signal at A1J2(B4) is derived from the Scanner U1 5L output. This signal immediately precedes the start of a new scan cycle. Although the new scan may begin with a decimal point, the START DATA signal always corresponds with the last or most significant digit and never with a decimal point. The decimal point is included in the data sequence and is inserted at the correct position as a binary 15 code. This code corresponds with a printed asterisk (\*) on the standard print wheel of HP Digital Recorders. The asterisk is used to imply a decimal point and the decimal point code is inserted during the time when the right-hand half of the corresponding digit is being scanned. A positive decimal clock pulse is simultaneously generated by an array of common

collector transistors Q19 to Q24. The Q19 to Q24 emitters are tied to the decimal point driving lines and the bases are driven from the Scanner U1 outputs. The appropriate transistor is turned on when the Scanner reaches the decimal point position. This forces all outputs of buffer gates U6 to a high level (binary 15) and provides the decimal point clock to buffer inverter U7. If no decimal point is lighted, the decimal-point-common voltage increases and turns on Q18. This inserts an implied decimal point to the right of the display.

4-52. The measurement units information (MHz, kHz, Hz, etc.) is sent to the digital recorder output as direct signals from the plug-on connector in parallel with the signals to the display annunciator. The print command from the plug-on connector, A1J1(19), is buffered to provide a positive print command to the digital recorder. This signal is normally derived from the U5 Control transfer output and is connected via A1J1(19) and (20). The HOLD signal from the digital recorder output to U5 control prevents the instrument from recycling until the digital recorder has accepted the data. A low signal on the Hold line inhibits the display cycle prior to the Reset signal.

4-53. The reset signal line is a bi-directional line in parallel with the Manual Reset button on the 5300A front panel. It may be used as an input to reset the instrument from the rear-panel or an output to inhibit

the printing of all zeros when the instrument is reset. The overflow output is in parallel with the overflow light in the Display Assembly and goes low when display overflow occurs. The +5 volt supply line is available at A1J2 Digital Recorder Connector for external logic.

4-54. A standard parallel output for use with digital recorders such as the HP 5055A or HP 5050B may be obtained with a recorder interface accessory HP Part No. 10533A. This accessory provides the serial-to-parallel conversion and includes 6-feet of cable to connect between the 5300A and digital recorder.

#### 4-55. A2 POWER SUPPLY ASSEMBLY

#### 4-56. Theory of Operation

#### 4-57. INTRODUCTION

4-58. This power supply is a small, high efficiency power converter capable of supplying the necessary

output voltages for the analog circuits, Light-Emitting-Diode (L. E. D.), Display, and digital circuits. The unit will operate from 115 Vac or 230 Vac 50 to 400 Hz or from an accessory battery pack, such as the HP 5310A, which has nominal output voltage of 12 V. The power supply consists of three basic sections (Figure 4-11):

- a. Power Input Section. Consists of input transformer T1 and A1 bridge rectifiers CR1, CR2, CR3, CR4. This section converts ac input power to rectified dc.
- b. A2 Over Voltage Protection Circuit: Consists of A2Q4, Q6, Q8, Q9, and associated components. Shuts the power supply off, if a component fails and causes excessively high output voltages.
- c. Dc-to-Dc Converter. Consists of the remaining power supply components and operates from a dc voltage of 10 V to 30 V; provides  $\pm$  17 Vdc,  $\pm$ 5 Vdc, and  $\pm$ 3.5 Vdc output. The dc input voltage is from the rectified dc supplied by T1 or from the accessory battery pack (when used).

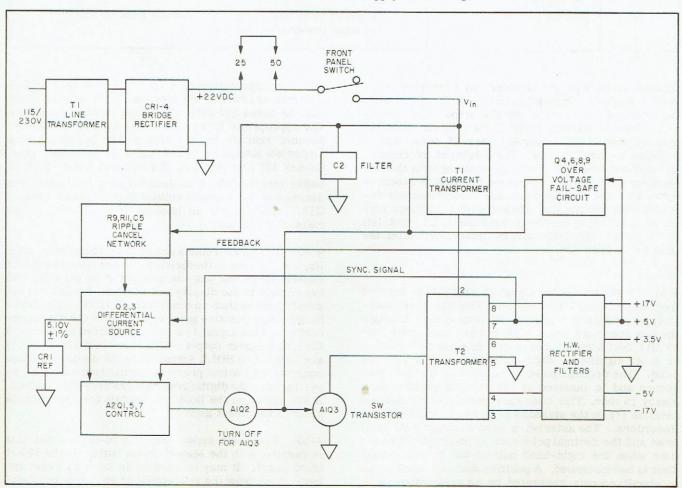


Figure 4-11. 5300A Power Supply Block Diagram

4-59. Operation of Power Input Section. 115 Vac or 230 Vac power is stepped down by T1 and rectified by bridge rectifier's A1CR1 to A1CR4. Capacitor A1C6 protects these rectifiers from high voltage transients in T1 and A1R14 prevents A1C6 from charging to an excessivley high voltage. The dc output voltage from the bridge rectifiers is nominally +22 volts, when fully loaded by the mainframe dc-to-dc converter and the battery pack under CHARGE conditions.

4-60. Operation of the Overvoltage Failsafe Circuit. If the +5V increases to more than +5.8V, emitter-to-collector current flows through A2Q4 and charges capacitor A2C3. For short transient overvoltages A2C3 does not charge enough to activate A2Q6. For continuous overvoltages A2C3 continues to charge and current is coupled through A2CR3 into the gate element of SCR A2Q6. This causes A2Q6 to fire, pulling its anode down to about zero volts. This turns on A2Q8, which turns on A2Q9. A1Q3 base current is then shunted through A2Q9 to ground, such that A1Q3 receives no drive voltage. This shuts the power supply off.

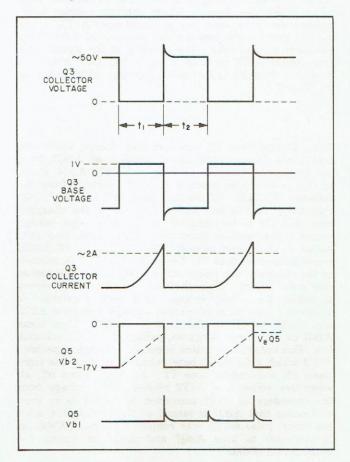
4-61. A2Q6 remains on however, as long as the input voltage is present. The circuit is reset by removing the ac input, for about 5 seconds which allows A1C2 to discharge through A2R15 and A2R16.

4-62. Operation of the Dc-to-Dc Converter. This is basically a blocking oscillator converter using a single switch transistor A1Q3 with the dc input voltage available across A1C2. Resistor A1R11 supplies initial start current into the base of A1Q3 to start oscillations. Diode A1CR5 allows base current to flow to A1Q3 during normal operation with capacitor A1C4 as an ac bypass. Printed circuit wiring is such that no drive voltage is applied to A1Q3 if A2 Regulator Assembly is removed from its socket. During normal operation A1Q3 alternately switches on into saturation and then off. With A1Q3 "on", an increasing current flows through A1T1 and the primary of A1T2.

4-63. The polarity of the rectifiers on the secondary of A1T2 is such that when A1Q3 is turned on, they do not conduct. Thus, the dc input voltage sees only the primary inductances of A1T1 and A1T2. A1T1 is a small current-transformer and drops very little voltage across primary pins 1 and 3. A2Q1 collector current builds up linearly when it is turned on. The turns ratio of A1T1 is such that about 1/15th the Q1Q3 collector current flows into its base which is sufficient to keep it in saturation. After a period of time, designated time T1, and controlled by the rest of the circuit (Figures 4-11 and 4-12) A1Q3 switches off. The magnetic energy stored in the core of A1T2 transfers into the secondaries and current flows through each of the rectifiers A1CR7, 8, 9, 10, and 13, until the magnetic flux in the core of A1T2 is zero which defines the end of time T2. Time T1 is the time A1Q3 is turned on and time T2 is the time A1Q3 is turned off. During time T1, energy builds up in the core of transformer A1T2. Time T2 is defined by the amount of time it takes flux in transformer A1T2 to reach zero and is a function of the transformer and load only.

4-64. Time T1 is varied by the regulating circuit to provide the proper amount of energy storage so that secondary voltages are regulated at their proper value. The secondary voltages are all held in fixed ratios with respect to one another and are determined by the turns ratios of the secondary windings. The +5 V is compared to a reference voltage on regulator board A2 and regulated to +5 V ± . 1 volts. This regulates the other voltages at their correct values. Capacitors A1C12, 9, 11, 13, and 14 filter the secondary voltages. The -15 V bias for the MOS circuits is provided by resistor A1R17 and zener diode A1CR11. A1CR12 is across the -17 volts supply to prevent the output voltages from overshooting a large amount when the supply is initially turned on; it does not conduct during normal operation.

Figure 4-12. Power Supply Waveforms



### 4-65. OPERATION OF THE REGULATION CIRCUITS

4-66. The regulation circuit must generate time T1, to properly regulate output voltages and must sense the end of time T2 so that a new cycle may be initiated.

4-67. A2CR1 generates the reference voltage which is compared with the +5 V. This comparison takes place in the differential current source A2Q2 and A2Q3. Resistors A2R12, A2R5, A2R3, and capacitor A2C2 provide a frequency-selective compensation network to ensure fast regulator response and prevent oscillation of the feedback loop. Resistor A2R1 biases zener diode A2CR1 from the +17 V supply and A2R2 supplies a relatively constant current to the differential pair A2Q2 and A2Q3. Resistor A2R9 helps keep the output voltages constant as the input voltage varies over a wide range. A2C6 and A2R11 provide instantaneous voltage compensation to minimize 120 Hz ripple on the regulated output voltages.

4-68. The collector of A2Q2 supplies a current to unijunction transistor A2Q5 and capacitor A2C4. This current varies depending on the difference between the regulated +5 V and the reference voltage from A2CR1.

A2Q1 is a series-gating transistor for unijunction transistor A2Q5. Its base is driven through resistor A2R4 which goes to the secondary of transformer A1T2. Diode A2CR2 protects the base-emitter junction of A2Q1 from excessive reverse bias. The phasing of the signal from transformer A1T2 to A2Q1 is such that UJT A2Q5 has a voltage from B1 to B2 during the time A1Q3 is turned on (Time T1).

4-69. During time T2, A2C4 cannot charge, since current flows through the diode junction of A2Q5 from the emitter to base 1. During time T1, A2C4 starts to charge at a rate determined by the current from the collector of A2Q2. If the regulated +5V is high, A2Q2 collector current is also high. This causes the charging rate of A2C4 to be relatively high. When the voltage across A2C4 reaches about 12V, A2Q5 fires, and generates a 6V, 1-microsecond pulse at base 1 of A2Q5, which terminates time T1. The greater the +5V is, relative to the reference, the faster A2C4 charges and the sooner this pulse occurs. This shortens time T1 which serves to reduce the output voltages and thus, regulation is achieved. This pulse is coupled through capacitor A2C5 and diode A2CR4 to the base of A2Q7. This turns A2Q7 on and turns A1Q2 on, pulling the A1Q2 collector low. This negative excursion is coupled through capacitors A1C3 which pulls A1Q3 base negative, turning this transistor off and ending time T1. As A1Q3 turns off, all secondary voltages of A1T2 reverse. The voltage from the secondary of A1T2 connected to A2R14 is in such a direction that A2Q7 is turned on through A2R14, after the initial pulse which was coupled through A2CR4. It is necessary to keep A2Q7 and A1Q2 on during the entire period of time T2.

4-70. At the end of time T2, when the flux in the core of transformer A1T2 is zero, the secondary voltages automatically reverse. This voltage again is coupled through A2R14 and turns A2Q7 off, which allows A1Q3 to turn on again, continuing the cycle. Diode A2CR5 prevents excessive reverse bias across the base-emitter junction of A1Q3. To ensure that A2Q5 is definitely off A2C1, in the emitter of UJT A2Q5, couples a negative spike to the emitter at the beginning of time T1.

#### 4-71. 5310A BATTERY PACK

4-72. The 5310A Battery Pack is an accessory for the 5300A Measuring System. It connects between the 5300A Measuring System Mainframe and any of the 5300 series plug-ons. The batteries are sealed Nickel Cadmium type which provide about 48-watt hours capacity with a normal output voltage of +12 volts. When the battery pack is locked between the two halves of the system, all connections are made to charge the batteries or supply power to the instrument.

4-73. A battery use-time, typically greater than four hours-per-charge can be expected, depending on the particular plug-on used. Recharge time for completely discharged batteries is 18 hours. However, to achieve full charge in this time the batteries must be recharged with the mainframe power switch set to OFF. The 5300A mainframe must be plugged into an ac source and the battery pack switch set to CHARGE.

4-74. A light-emitting-diode on the battery pack frontpanel glows when batteries are nearing the end of discharge.

4-75. When the batteries are fully charged they should not be left charging while operating the mainframe. For optimum long-term battery life the instrument should not be used for more than 10 minutes *after* the LOW BATTERY lamp begins to glow.

4-76. The three-position slide switch on the front panel has the following function:

a. BATTERY. The instrument gets its power from the internal batteries whether the ac line cord is plugged in or not.

b. CHARGE. The batteries are charged when the line cord is plugged in.

c. LINE. The batteries are charged at a trickle-charge rate. This is the normal position when the batteries are fully charged.

- 4-77. In either the LINE or CHARGE position, with the line cord plugged in, a power failure switches operation to the battery pack automatically. Battery life will be approximately 10% shorter than it would be if the front panel switch were in BATTERY position. The three positions of the front panel switch are used as follows:
- a. BATTERY. When instrument is used away from ac line power.
- b. CHARGE. When instrument batteries are charged regardless of whether the mainframe is used or not.
- c. LINE. For normal operation from the ac power line.
- 4-78. The 5310A electronics circuitry can be divided into two parts.
  - a. The current regulator for charging the battery.
- b. The circuit to indicate when the battery voltage is low.
- 4-79. Transistors A2Q1, A2Q2, and A2Q3 in combination with A2R2, A2R1 perform the function of a current regulator. Unregulated voltage from the 5300A mainframe, which is present whenever the line cord is plugged in, is applied to TOP connector A1P1 (25). In the CHARGE position this voltage is applied to the current regulator. Normal voltage is about +22 volts, the battery voltage in CHARGE position is typically +14 volts. The current regulator supplies a constant current of about .3 AMP independent of line voltage to the batteries when the switch is in CHARGE position. A2R2 is the current sample resistor. A2CR1 prevents base-to-emitter breakdown of A1Q1 due to current flowing out of the battery backwards through Q1, when the line power is turned off.
- 4-80. A trickle-current of about 10 mA is supplied to the battery through A2R4 in LINE position of the front panel switch. A2CR4, A2CR3, and light-emitting diode DS1, with resistors A2R3 and A2R5, and transistor A2Q4 indicate when battery voltage is getting low and nearing the end of discharge. A regulated +5.0 volts from the mainframe is supplied to the emitter of A2Q4. Battery voltage is sent, through A2CR2 and A2CR3 to A2Q4 base. When battery voltage becomes low, A2Q4 turns on through resistor A2R3 and A2CR3. A2CR3 protects A2Q4 from base-to-emitter breakdown in the reverse direction when the battery voltage is high.
- 4-81. When the battery voltage drops below 11-1/2 to 12 volts A2Q4 turns on. This completes a path for the +5 volts from the mainframe, through A2R5 and the light-emitting-diode glows. This diode also glows if the batteries have been fully discharged with the 5300A turned on, when the voltage has not reached +12 V. Normally, this occurs for a few minutes at the beginning of a charge cycle. Fuse F1 is in series with the battery to prevent damage from accidental

shorts. A2CR4 allows current to flow from the battery into the mainframe if line power fails. A2C2 is in parallel with the 5300A filter capacitor on the unregulated 22 V line from the 5300A mainframe. It provides additional filtering for the additional current drawn by the batteries when the battery pack is being used. Continuous overcharge of the batteries will not damage them as long as the 5300A is not turned on. However, for longest life it is recommended that the batteries are not continuously overcharged for long periods of time. Discharging far past the point where the front panel light comes on is also undesirable.

## 4-82. 10533A DIGITAL RECORDER INTERFACE ASSEMBLY

#### NOTE

HP Model 10533A does not work with 5050B unless an Option 050 or 051 is used.

- 4-83. The digital recorder output from the 5300A provides data in a character serial format. The serial method allows flexibility in adapting to many different serial or parallel output interfaces. The most common interface is a standard parallel BCD output as used in the HP 5050B or 5055A Digital Recorders. This standard conversion can be obtained with the 10533A Digital Recorder Interface accessory. The 10533A accessory accepts serial information from the 5300A and stores it in parallel latches which drive the digital recorder. The units information from the 5300A is decoded in the 10533A to provide exponent magnitude and sign.
- 4-84. Ten columns of information are available to the digital recorder in binary-coded-decimal form. Negative logic is used with logic 0 about 3 volts and logic 1 about 0 volts:
- a. Column 1 overflow digit. An asterisk presented when the overflow light in the 5300A display in on.
- b. Columns 2 through 8. Six digits of data and the decimal point. The decimal point is coded binary 15 and is inserted at the correct position. On the standard HP Digital Recorder wheel this is decoded and printed as an asterisk (\*).
- c. Column 9. Exponent sign; either + or -. Coded binary 10 for +, binary 11 for -.
- d. Column 10. Exponent magnitude; either 0, 3, or6. The exponent information is coded as follows:

+0Hz: kHz: +3+6 MHz: -0 sec: -3 msec: -6 μsec: no units: -0 M: -3 -6 и:

(These are the only allowable combinations of units in the 5300A.)

4-85. Each column of data is stored in a 4-bit latch. The data is scanned into the locations by the outputs from the shift register U1. The shift register is scanned by the Data Clock and the Decimal Point Clock via the exclusive-OR gate U2. The Decimal Point Clock is always delayed with respect to the Data Clock, by about 200 nsec, and is high when the Data Clock is low. Therefore, the output from the exclusive OR gate is a short pulse at the beginning and after the end of the Decimal Point Clock. The pulse width is equal to the 200 nsec delay between the two clock lines. The leading pulse "clocks" the decimal-point-code into the corresponding latches and the trailing pulse "clocks" the data into the next digit position. The scan sequence is synchronized with the scanning of the 5300A display by the START DATA signal which inserts a low state into the shift register. The low state is then scanned by the clock pulses through the seven outputs of the shift register.

4-86. A positive print command is received and digitally delayed by U3B. The delay allows one complete scan cycle to occur and enter new data into the latches.

After a delay of one-scan cycle, a print command is sent from U3B to the digital recorder. If a RESET signal is received the print command to the digital recorder is inhibited.

4-87. The 5300A may be inhibited from beginning a new measurement cycle by a saturated-transistor inhibit signal from the digital recorder. The output from the 10533A is a 50-pin Amphenol microribbon connector which mates directly with the input connector of digital recorders such as the HP 5050B or HP 5055A. The input to the 10533A is a 20-pin connector which mates directly with the A1J2 rear-panel connector on the 5300A. It is connected to the plastic housing containing the logic module by a 6-foot length of screened cable. Non-standard interface modules for use with other recorder systems may be obtained on special order from Hewlett-Packard.

# SECTION V MAINTENANCE

#### 5-1. INTRODUCTION

# 5-2. This section contains maintenance and service information for Model 5300A Measuring System. Included are adjustment procedures, tests, trouble-shooting tables and diagrams to localize, isolate and locate defective components. Performance check procedures are not included, since a plug-on must be used. These procedures are included with the respective plug-on.

#### 5-3. RECOMMENDED TEST EQUIPMENT

5-4. Test equipment recommended for maintaining, troubleshooting, and servicing the 5300A Measuring System is listed in Table 5-1. Test equipment with equivalent characteristics may be substituted for equipment listed.

Table 5-1. Recommended Test Equipment

INSTRUMENT TYPE	REQUIRED CHARACTERISTICS	RECOMMENDED INSTRUMENT
Oscilloscope	50 MHz Band Width 5 mV cm	HP 180A/HP 1801A/HP 1820A
Test Oscillator	Range: 10 Hz to 10 MHz Output: 5 V p-p into 50-Ohm	HP 651B
Feed-thru Termination	50-Ohm male to female BNC connectors	HP 11048B
Pulse Generator	Repetition Rate: 10 Hz to 10 MHz Peak Voltage: 10 V into 50-Ohm Pulse Width: 30 nsec to 5 msec Pulse Polarity: + or -	HP 222A
Digital Recorder	Accuracy: Equal to input device used Printing Rate: 10 lines/sec (min) Data Input: Parallel entry, BCD (-8 4 2 1)	HP 5050B (Opt. 050 or 051) or 5055A
Digital Recorder Interface	Serial to Parallel conversion for 5300A Recorder output information	HP 10533A
Logic Probe	Indicate logic levels	HP 10525A
Electronic Counter	.1 Hz to 10 MHz frequency measurements	HP 5245L/M
DC Voltmeter	0 to 200 Vdc, 1% accuracy	HP 412A
DC Power Supply	0 to 20 V at 1.5 AMP	HP 6200B
Diagnostic Test Cards A, B, C, and D	Preset tests for 5300A Mainframe	HP Part Number's 05300-20011 05300-20012 05300-20013 05300-20014
50-Pin Female Connector	50-pin Female blue-ribbon connector	HP Part Number 1251-0101 (CINCH 57-20500-375)
Diagnostic Interface Card	50-pin blue-ribbon to 22-pin Printed Circuit	HP Part Number 05300-60004

#### 5-5. INSTRUMENT ACCESS

- 5-6. For access to mainframe assembly separate the 5300A from plug-on used as follows:
  - a. Turn ac power OFF and disconnect power cord.
- b. Pull the two side casting latches fully rearward (it is necessary to press the latch handles gently away from the center of the instrument to unlock them).
- c. When latches are fully extended rearward, the 5300A and plug-on castings should be separated by about 1/8 inch.
  - d. Lift the 5300A gently away from the plug-on.
- e. Separate 5300A LOGIC BOARD ASSEMBLY from 5300A casting as follows (refer to Figure 5-1):
  - Remove retaining screw located near power transformer.
  - Press rear, plastic-nylon retaining clips on each side of the 5300A casting and lift the rear of the Logic Board Assembly to release it from the casting.
  - Press front plastic-nylon retaining clips on each side of 5300A casting and lift the front of the Logic Board Assembly to release it from the casting.
  - 4. Lift Logic Board Assembly from the casting.
- f. Mate the 5300A Logic Board Assembly to the plug-on used and reapply ac power.

#### 5-7. PERIODIC MAINTENANCE

5-8. To determine if the 5300A is operating properly within specifications, perform the In-Cabinet Performance Checks listed with the plug-on information and the troubleshooting methods and procedures listed in Paragraphs 5-13.

#### 5-9. MAINTENANCE AND REPAIR (See Caution)

- 5-10. BOARD REMOVAL. When removing the printed circuit board for replacement, repair or servicing, always remove ac power and separate the board from the casting using steps a to e of Paragraph 5-6.
- 5-11. COMPONENT REPLACEMENT (see Caution). When replacing a circuit board component use a low heat soldering iron. Heat must be used sparingly as damage to the circuit foil may result. Mounting holes may be cleaned out with a toothpick while heat is applied. Connection should be cleaned with a cleaning solution after component removal and replacement.
- 5-12. INTEGRATED CIRCUIT REPLACEMENT (see Caution). Two methods are recommended for removing integrated circuits (with exception of U1, U2, U3, U4, and U5):
- a. Solder Gobbler. Solder is removed from board by a soldering iron with a hollow tip connected to a

vacuum source. The IC is removed intact so it may be reinstalled if diagnosis is wrong.

b. Clip Out. This method is used when an IC is proven defective. Clip leads close to case, apply heat and remove leads with long nose pliers. Clean board holes with toothpick and cleaning solution.

#### CAUTION

A1U3, A1U4, A1U5 are large-scale MOS integrated circuits whose inputs are susceptible to damage from high voltage and static charges. Particular care should be taken to avoid excessive capacitive loading with probes or when handling under conditions where static charges can build up.

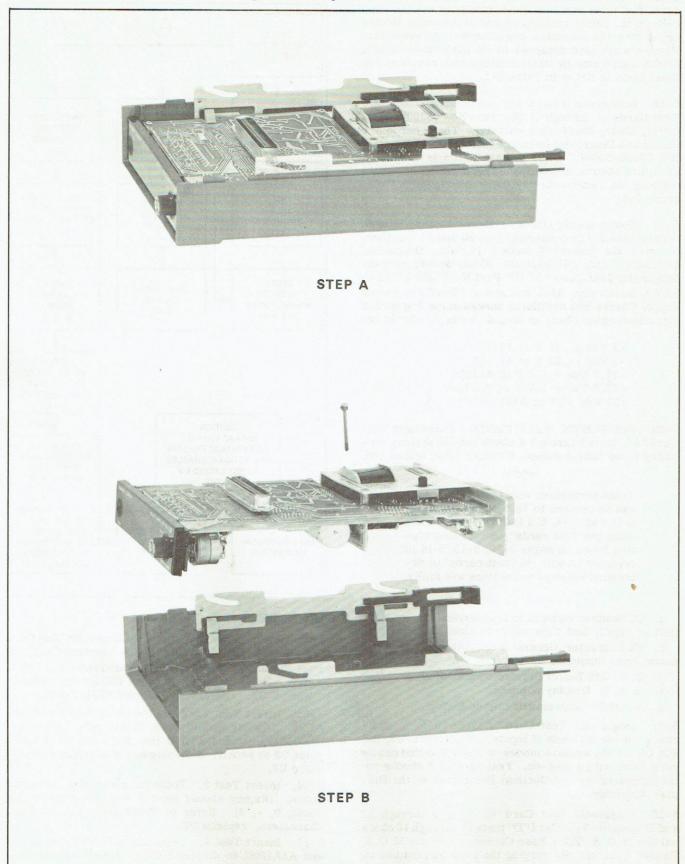
#### 5-13. INSTRUMENT TROUBLESHOOTING

- 5-14. GENERAL. Trouble isolation can best be accomplished by first obtaining all possible information from controls, connectors, and indicators; then logically using this information to locate the defective component.
- 5-15. MODULE SUBSTITUTION. Maintenance procedures in the 5300A may be simplified by isolating the problem to one or a group of the Integrated Circuits and replacing the suspected bad IC's with known good spares. Here is a recommended list of spares which will assist you in quickly troubleshooting and servicing the 5300A:

		HP Part No.
U1, L.S.I.	L.E.D. Scanner	1820-0635
	(Light-Emitting-Diode)	
U2, L.S.I.	Character Generator	1820-0571
U3, MOS	6-Decade Counter	1820-0634
U4, MOS	Time Base	1820-0633
U5, L.S.I.	Control	1820-0632
A2	Power Supply Regula- tor Board	05300-60003
A1Q3	Power Transistor	1854-0487
A1A1 DS1—DS6 and DS8	Light Emitting Diodes	1990-0325

- 5-16. TROUBLESHOOTING. Three methods of troubleshooting are available. These are:
- a. 5300A mated to the plug-on in use. Tests located in Paragraph 5-20 and Figures 5-2 and 5-3A (steps 6 to 13 can be performed with plug-on mated to the mainframe. Additional tests can be performed with a plug-on, using performance and maintenance checks in the plug-on section.
- b. Diagnostic Test Cards. Test Cards 05300-20011, 20012, 20013, and 20014, and Diagnostic Interface card 05300-60004 are factory available cards which have fixed programs used in exercising the 5300A circuits. This is the preferred and recommended method. This method enables the user to troubleshoot the 5300A without a plug-on.
- c. Alternate Method. This is the second preferred method. The user can hard wire certain connections on the 5300A 50-pin connector and can troubleshoot the 5300A without having a plug-on connected.

Figure 5-1. Separation Procedures



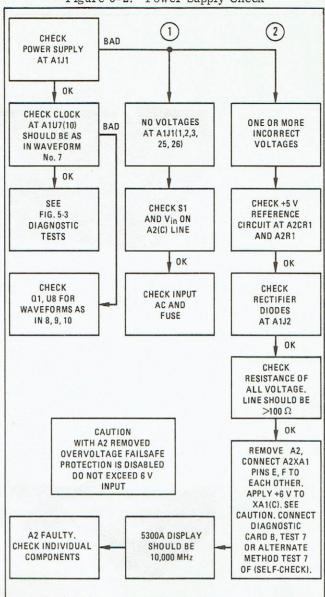
- 5-17. The following paragraphs and tables are procedures and tests designed to exercise the various circuits in the 5300A mainframe and to logically isolate and locate the defective component(s) or assembly. The tests are also designed to be performed using a 5300A mainframe by itself. Equipment required for these tests is listed in Table 5-1.
- 5-18. Subsequent tests are made using Diagnostic Test Cards A through D (HP Part No. 05300-20011, 20012, 20013, 20014, respectively). These cards are mated to a Diagnostic Interface extender card HP Part No. 05300-60004. When a malfunction is suspected or failure occurs, separate the 5300A mainframe from the plug-on, remove the casting as instructed in Paragraph 5-5.
- 5-19. Power Supply Checks. Power supply voltages may be checked by connecting pins 50 and 25 together, however the preferred method is using Diagnostic Interface Card, HP Part No. 05300-60004; connect Diagnostic Test Card "B" HP Part No. 05300-20012 to 5300A mainframe A1J1 connector. Perform Power Supply Checks and oscillator checks using Figure 5-2 Troubleshooting Chart as an aid. Voltages should be:
  - $+5 \text{ Vdc} \pm .15 \text{ V at A1J1(1)}$
  - -5 Vdc  $\pm$  . 25 V at A1J1(2)
  - -17.5 Vdc ± 1.7 V at A1J1(3)
  - +17.5 Vdc ± 1.7 V at A1J1(26)
  - $+24 \text{ Vdc} \pm 2\text{V} \text{ at A1J1}(25, 50)$
- 5-20. DIAGNOSTIC TEST CARDS. Diagnostic Test Card "A", tests 1 through 4 check out the display circuitry to its fullest extent. Circuits bring tested are:

#### NOTE

Tests performed with the "Test Cards" can be related to tests on pages 5-12, 5-13 and 5-14. If a failure occurs when using the "test cards", use the description listed on pages 5-12, 5-13, 5-14 in conjunction with the "test cards" to determine which program lines are faulty.

- a. U1 Scanner circuits to test vertical columnlines (left or right), and digit address lines X, Y, and Z.
- b. U2 Character Generator circuits to test horizontal lines (upper or lower).
- c. Q6 to Q17 Buffer Drivers which act as interface to the L. E. D. Display columns.
  - d. A1A1DS7 light-emitting diode matrix.
- 5-21. Diagnostic Test Card "B" tests 5, 6, and 7 check out the majority of inputs and outputs to U3, U4, and U5 for the various modes of operation that can be performed with a plug-on. Test number 8 checks out the Annunciators and Decimal Point lines of the Display Assembly.
- 5-22. Diagnostic Test Card "C" tests 9 through 12 and Diagnostic Test Card "D" tests 13 through 16 check out the M. O. S. Time Base Circuitry and the M. O. S. Decade Counter. By varying the input and outputs on U3 and U4 with a fixed program, the special circuits are exercised.

Figure 5-2. Power Supply Check



#### 5-23. Diagnostic Test Card "A"

- 5-24. Insert Test 1. To use the Diagnostic Test Card "A", connect this card through the Interface Card, HP Part No. 05300-60004, to 5300A mainframe A1J1 connector. Prior to each test press RESET and refer to Figure 5-3A. Display should read 543210 only.
- 5-25. Insert Test 2. Tests the remaining numerical digits. Display should read 987610 only. If display is 107610, check DATA D line for a low level. Replace U2 to repair. If display has a bad character replace U2.
- 5-26. Insert Test 3. Tests the remaining character codes. Display should read X 9 X  $\circ$  8 (blank, 9, blank, 0, -, 8). Refer to Table 5-4. For any bad characters, replace U2.
- 5-27. Insert Test 4. Tests U2, U3, F1 input to U5, and A1A1DS7 to display 6 digits simultaneously and to cycle them (6 at a time) from 0 to 9. Refer to Figure 5-3C, Test 4. "C" lamp is on all the time.

Figure 5-3A. Display Checks

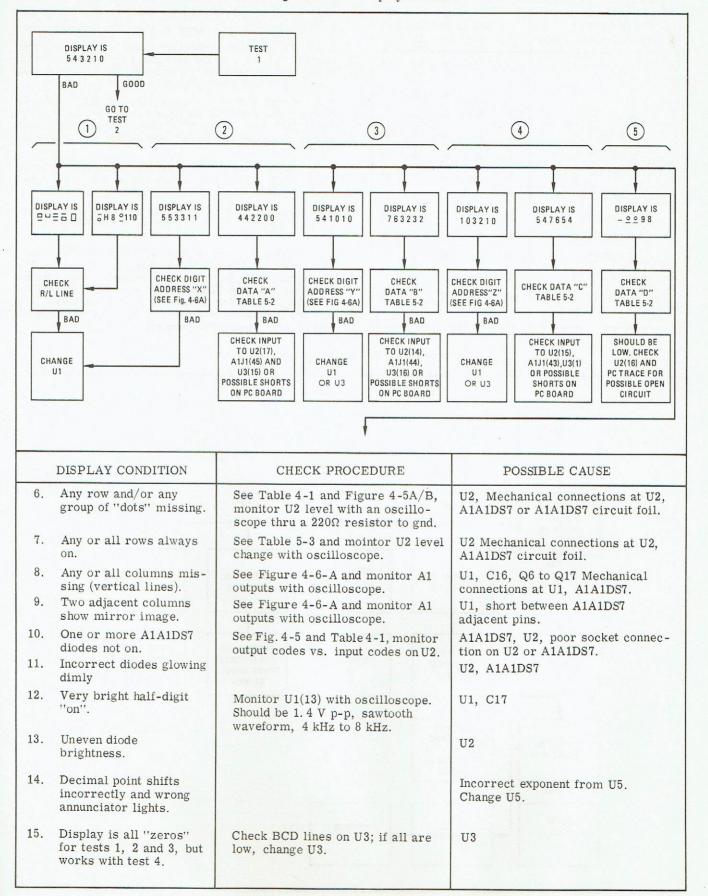


Table 5-2. Character Generator Input Codes

CHARACTER (NUMBER DISPLAYED)	<u>A</u>	A1U B	2 INF C	D D	R
	17	14	15	16	18
0	L	L	L	L	-
1 LEFT	Н	L	L	L	L
1 RIGHT	Н	L	L	L	Н
2 LEFT	L	Н	L	L	L
2 RIGHT	L	H	L	L	H
3 LEFT	Н	H	L	L	L
3 RIGHT	Н	Н	L	L	H
4 LEFT	L	L	H	L	L
4 RIGHT	L	L	H	L	Н
5 LEFT	Н	L	Н	L	L
5 RIGHT	Н	L	H	L	H

#### 5-28. Diagnostic Test Card "B" = overflow

5-29. Insert Test 5. Checks U3, U4, U5. Display should be \*\* 888888. "C" lamp and overflow should cycle.

5-30. To use Diagnostic Test Card "B", connect this card through the interface card, HP Part No. 05300-60004, to 5300A mainframe A1J1 connector. Prior to each test, press RESET and refer to Figure 5-4A.

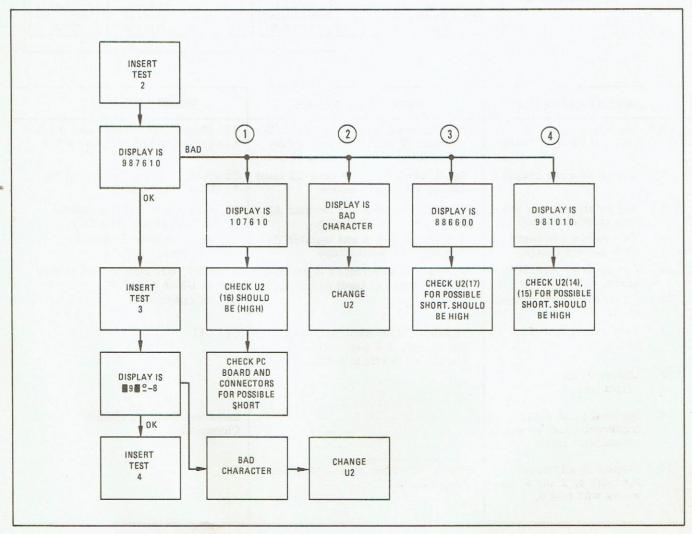
5-31. Insert Test 6. Checks U3, U4, U5. Refer to Figure 5-4B. SAMPLE RATE set to 1/2 cw from power OFF. "C" lamp cycles, "\*" cycles. Display should read at turn on 000007, one second later 000008, and 10 seconds later 000009.

5-32. Insert Test 7. Checks U3, U4, U5. Refer to Figure 5-4C. Turn Sample Rate 1/2 cw. Display should be  $10.0000\,\mathrm{MHz}$  ±1 count. "C" lamp cycling.

5-33. Insert Test 8. Checks Annunciators and Decimal Points 1 through 5. Display should be  $10.0000~\text{MHz}~\pm 1~\text{count.}$  "C" lamp cycling.

5-34. Using a shorting plug, HP Part No. 5080-0058, to connect various points, on test card B, test 8, the Annunciators (Hz, M, S, K,  $\mu$ ) and decimal points 1 through 5 are verified. See Figure 8-2 for schematic information. To light a particular annunciator or decimal point, plug shorting bar into the corresponding holes for that annunciator of decimal point. "C" lamp off.

Figure 5-3B. Display Checks (Continued)



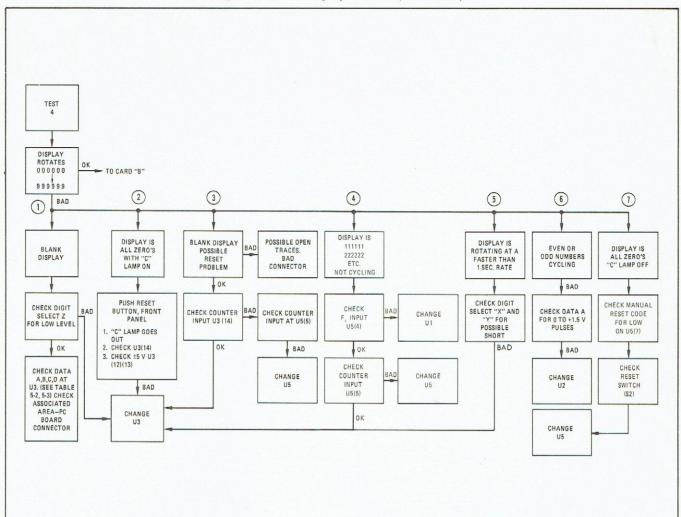


Figure 5-3C. Display Checks (Continued)

#### 5-35. Diagnostic Test Card C

- 5-36. Insert Test 9 through 12. To use Diagnostic Test Card "C", connect this card through the interface card HP Part No. 05300-60004, to 5300A mainframe A1J1 connector. Prior to each test, press RESET.
- 5-37. These tests check out U3, U4, by programming the Time Base input codes to provide Time Base output signal in decade steps.
- 5-38. Test No. 9. Fixed program tests the 10-second Time Base output. Display should accumulate one-count every 10 seconds starting with digit 0, least-significant digit. "C" lamp on.
- 5-39. Test No. 10. Fixed program tests the 1-second Time Base output. Display should accumulate one-count every second starting with digit 0, least-significant digit. "C" lamp on.

- 5-40. Test No. 11. Fixed program tests the .1-Second Time Base output. Display should accumulate one-count every second in digit 1, second from the right. "C" lamp on.
- 5-41. Test No. 12. Fixed program tests the 10 msec Time Base output. Display should accumulate one-count every second in digit 2, third from the right. "C" lamp on.

#### 5-42. Diagnostic Test Card D'

- 5-43. Insert Test 13 through 16. To use Diagnostic Test Card "D" connect this card through the interface card, HP Part No. 05300-60004 to 5300A mainframe A1J1 connector. Prior to each test, press RESET. These tests check out U3 and U4 by programming the time base input codes to provide Time Base output signals in decade steps.
- 5-44. Test No. 13. Fixed program tests the 1 msec Time Base output. Display should accumulate one-count every second in digit 3, fourth from the right. "C" lamp on.

Table 5-3. Character Generator Output Line Codes

CHARACTER (NUMBER DI	SPLAYED)			AIUZ	OUTTO	715 01	(1.1	J. D. 1.	NPUTS)		
\(\frac{1}{2}\)	LINE	1	2	3	4	5	6	7	8	9	10
	PIN	5	.6	7	10	11	9	4	20	2	1
0			X	X	X	X		X	X		X
1 LEFT											
1 RIGHT		X		X	X	X		X	X	X	
2 LEFT		X	X				X	X	X	X	Х
2 RIGHT			X	X	X		X			X	X
3 LEFT		X	X				X			X	X
3 RIGHT			X	X	X		X	X	X	X	
4 LEFT		X		X	X	X	X				
4 RIGHT				X	X	X	X	X	X	X	
5 LEFT		X	X	X	X	X	X			X	Х
5 RIGHT		X	X				X	X	X		X

Table 5-4. Character Generator Input/Output Codes for Remaining Characters

CHARCTER		A1U	2 INP	UTS				A1U2	2 OU	rpur:	s ''ON'	'' (L.	E, D.	INPU	JTS)	
NUMBER DISPLAY	A	В	С	D	R	Line	1	2	3	4	5	6	7	8	9	10
PIN	17	14	13	16	18	PIN	5	6	7	10	11	9	4	20	2	1
6 LEFT	L	Н	H	L	L			X	X	X	X	X	X	X		X
6 RIGHT	L	H	H	L	H			X				X	X	X		X
7 LEFT	Н	H	H	L	L		X	X								
7 RIGHT	H	Н	Н	L	H		X	X	X	X	X		X	X	X	
8	L	L	L	H	-			X	X	X		X	X	X		X
9 LEFT	H	L	L	Н	L			X	X	X		X				X
9 RIGHT	Н	L	L	Н	H			X	X	X	X	X	X	X		X
MINUS	L	L	H	H	-						X	X				
BLANK	-	Н	Н	H	-											
REMAINING CHARACTERS AVAILABLE	A	В	С	D				DISI	PLAY							
10 ( <u>0</u> Degree <u>0</u> )	0	1	0	1			0	X	X	0						
11 ( <u>0</u> Degree)	1	1	0	1			0	X	X	X						
12 (- Minus -)	0	0	1	1			-	X	X	-						
13 (Blank)	1	0	1	1			В	X	X	X						
14 (Blank-Blank)	0	1	1	1			В	X	X	В						
15 (Blank)	1	1	1	1			В	X	X	X						
X = any character B = blank																

Figure 5-4A. A1U3 Counter, A1U4 Time Base, and A1U5 Control Checks

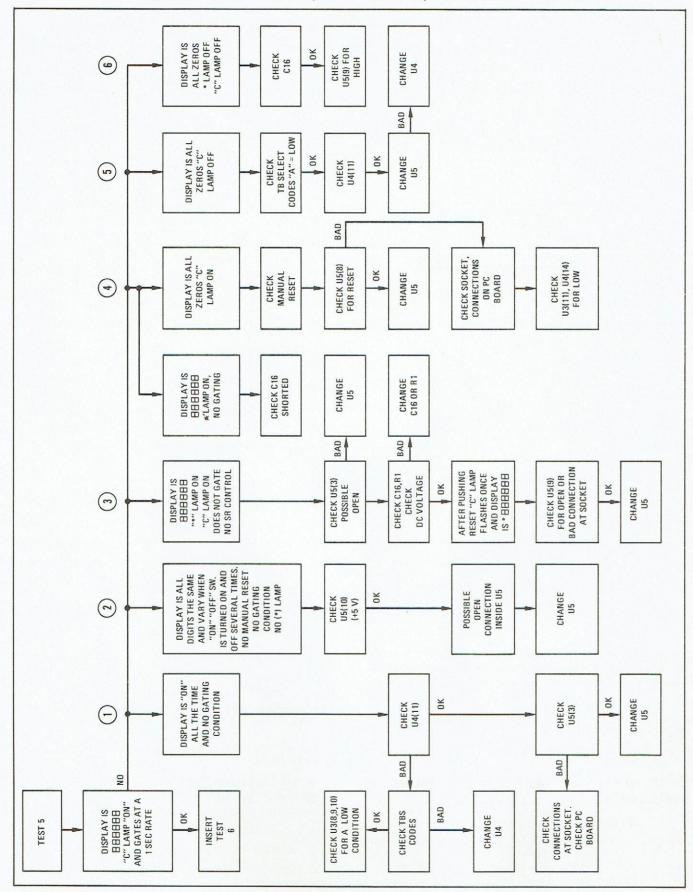
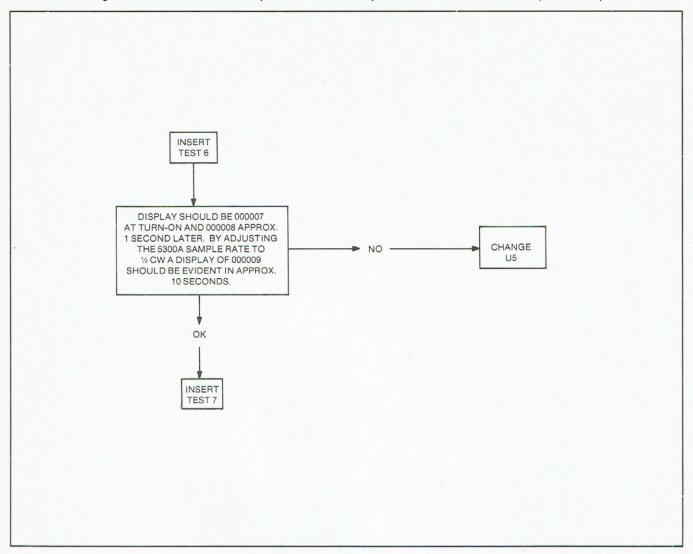


Figure 5-4B. A1U3 Counter, A1U4 Time Base, and A1U5 Control Checks (Continued)



5-45. Test No. 14. Fixed program tests the 1 msec Time Base output. Display should accumulate one-count every second in digit 4, fifth from the right. "C" lamp on.

5-46. Test No. 15. Fixed program tests the  $10~\mu \, \rm sec$  Time Base output. Display should accumulate one-count every second in digit 5, sixth from the right. "C" lamp on. \* = overflow lamp on after 10 seconds.

5-47. Test No. 16. Fixed program tests the 1  $\mu$ sec Time Base output *overflow lamp should light* and remain on after 1 second. "C" lamp on.

## 5-48. ALTERNATE METHOD OF TROUBLE ISOLATION

5-49. Obtain a female 50-pin connector HP Part No. 1251-0101, (CINCH 57-20500-375) and hard-wire the following listed programs by soldering short pieces of wire to the selected pins (observe CAUTION during soldering and use).

#### CAUTION

DURING SOLDERING AND USE, do not short adjacent pins to each other or to the connector case. Damage to the 5300A may result.

5-50. The following hard wired programs, tests 1 through 4, check out the display circuitry to its fullest extent. Circuits being tested are:

 a. U1 Scanner circuits to test vertical columnlines (left or right).

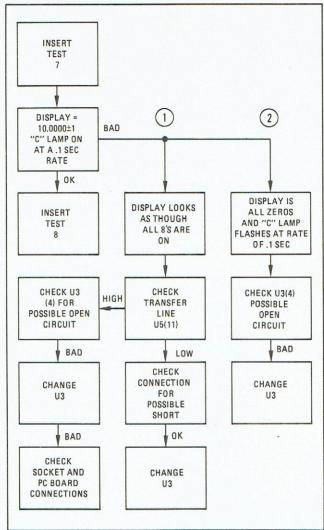
b. U2 Character Generator circuits to test horizontal lines (upper or lower).

c. Q6 to Q17 Buffer Drivers which act as interface to the L. E.D. Display columns.

d. A1A1DS7 light-emitting-diode matrix.

e. Integrated circuit sockets and mechanical connections.

Figure 5-4C. A1U3 Counter, A1U4 Time Base, and A1U5 Control Checks (Continued)



- 5-51. Tests 5, 6, and 7 check out the majority of inputs and outputs to U3, U4, and U5 for the various modes of operation that can be performed with a plugon. Test number 8 checks out the Annunciators and Decimal Point lines of the Display Assembly.
- 5-52. Test 9 through 12 and tests 13 through 16 check out the M.O.S. Time Base Circuitry and the M.O.S. Decade Counter. By varying the input codes and outputs on U3 and U4 with a fixed program, the special circuits are exercised.
- 5-53. Inputs to the 5300A system mainframe and programming of its functions are provided from the plugon module via a 50-pin connector in the center of the instrument. For the alternate method of trouble-shooting, perform tests listed on pages 5-12 to 5-14 (connector signals are listed in Table 4-2, A1J1 Signals).

#### 5-54. OSCILLATOR ADJUSTMENT

- 5-55. Two methods of oscillator adjustment are available:
- a. Using an electronic counter to measure the  $5300\,\mathrm{A}$  10 MHz oscillator frequency at the  $5300\,\mathrm{A}$  rear-panel OSC jack.
- b. Using the oscilloscope-drift method to compare the 5300A oscillator drift against a reference or "house" standard.

#### 5-56. Oscillator Measurement

- 5-57. The 5300A oscillator can be easily measured by connecting an electronic counter, whose time base oscillator stability is at least 10 times better than the 5300A oscillator, to the 5300A rear-panel OSC jack. To measure the 5300A oscillator frequency proceed as follows:
- a. Obtain an HP Model 5245L/M Electronic Counter and connect the 5300A OSC jack to the 5245L/Minput.
- b. Set 5245L/M controls for a minimum 7-digit stable display.
- c. The 5245L/M display should read 10.00000 MHz  $\pm\,1$  count.
- d. If the  $5245 \, L/M$  does not indicate this frequency, adjust the  $5300 \, A$  OSC adjustment until the display is correct.
- 5-58. The 5300A 10 MHz oscillator can be adjusted through the rear panel access hole. Adjustment should be made with the 5300A mated to a plug-on as part of a periodic maintenance cycle.

#### 5-59. Oscilloscope Drift Method

- 5-60. The 5300A oscillator may be adjusted against a reference or "house" standard using the oscilloscope drift method. With this method, drift in "parts in  $10^8$ " can be monitored. To adjust the oscillator proceed as follows:
- a. Connect 5300A rear panel OSC jack to oscilloscope vertical input.
- b. Connect the Standard Reference 5 MHz source to the oscilloscope external input jack.
- c. Set the oscilloscope time/cm to its fastest sweep time. Set the oscilloscope triggering to external.
- d. Adjust the oscilloscope vertical amplifier controls and the time base controls until the oscilloscope display is exactly 10 cycles of the oscillator waveforms.

Pin No.	Connected To Pin No.	Description	Display Should Be
(4)	<b>→</b> (42)	Gnd/Data ''D''	
(36)	<del>→</del> (45)	Digit Address "X"/Data "A"	
(38)	<b>───</b> (44)	Digit Address "Y"/Data "B"	543210
(40)	<b>→</b> (43)	Digit Address "Z"/Data "C"	
(50)	→ (25)	DC-IN (+22 V)	
(36)	TE (45)	OST 2 (SAME AS DIAGNOSTIC CARD NO. A) Digit Address ''X''/Data ''A''	
(38)	—————————————————————————————————————	Digit Address "Y"/Data "B", "C"	
(00)	(44)	Digit Address 1 /Data B, C	
(40)	<del></del>	Digit Address "Z"/Data "D"	987610
(50)	→ (25)	DC-IN (+22 V)	
	TE	CST 3 (SAME AS DIAGNOSTIC CARD NO. A)	
(36)	<b>→</b> (43)	Digit Address "X"/Data "C"	
(38)	<del></del>	Digit Address "Y"/Data "B"	[
(40)	→ (45)	Digit Address "Z"/Data "A"	9-0-8
(50)	→ (25)	DC-IN (+22 V)	
	TE	ST 4 (SAME AS DIAGNOSTIC CARD NO. A)	
(4)	<b>──</b> (9)	Gnd/Open, Digit Select "Z", Print and Transfer	
	(41)		
(38)	(20), (1		cycle to 000000
	<del>→</del> (5)	Digit Address "Y"/F <sub>1</sub>	999999
(50)	→ (25)	DC-IN (+22 V)	
	TE	ST 5 (SAME AS DIAGNOSTIC CARD NO. B)	
(4)	<b>→</b> (9)	Gnd/Open, DS "X", DS "Y", DS "Z", Print and	
	(37) (39)	Transfer, TBS "A"	
	(41)	0)	* 888888 с
	(20), (1 (22)	9)	
(5)	→ (16)	F <sub>1</sub> /Clock	
(17)	<del>→</del> (18)	MAXTIME/Time Base Output	
(43)	<b>→</b> (21)	Data ''C''/1 MHz Input	
(50)	→ (25)	DC-IN (+22 V)	

Pin No.	Connected To Pin No.	Description	Display Should Be
(4)	→ (9) (20), (1	Gnd/Open, Print and Transfer,	At turn on:
(5)	→ (13)	F <sub>1</sub> /Exponent	1 sec after turn on:
(7)	→ (16)	F <sub>2</sub> /Clock	000008
(36)	→ (37)	Digit Address "X"/Digit Select "X"	Adjust Sample Rate 1/2 cw
(38)	→ (39)	Digit Address "Y"/Digit Select "Y"	10 sec after turn on
(40)	→ (41)	Digit Address "Z"/Digit Select "Z"	000009
(50)	→ (25)	DC-IN (+22 V)	
	TEST 7	SELF-CHECK (SAME AS DIAGNOSTIC CARD N	О. В)
(1)	→ (6)	+5 V/9	
(4)	(27) (28) (22) (23) (47)	Gnd/TBS "A", "B", Hz, M, DP4	
(5)	→ (7) (16)	$F_1/F_2$ , Clock	* 10.0000 MHz
(17)	→ (18)	MAXTIME/Time Base Output	(11.5.1)
(36)	→ (37)	Digit Address "X"/Digit Select "X"	(±1 Count)
(38)	→ (39)	Digit Address "Y"/Digit Select "Y"	
(40)	→ (41)	Digit Address "Z"/Digit Select "Z"	
(50)	→ (25)	DC-IN (+22 V)	
	l l	TEST 8 (SAME AS DIAGNOSTIC CARD NO. B)	
(4)	→ (42)	Gnd/Data ''D''	
(36)	→ (45)	Digit Address "X"/Data "A"	
. (38)	<b>→</b> (44)	Digit Address "Y"/Data "B"	543210
(40)	→ (43)	Digit Address "Z"/Data "C"	
(50)	→ (25)	DC-IN (+22 V)	
(4)	→ (27)	Gnd (4) $0 \longrightarrow 0$ $\overline{\text{Hz}}$	Hz
	(28)	o <u>M</u>	M
	(29)	o <u>s</u>	S
	(30)	0 0 <u>K</u>	K
	(31)	0 0 $\overline{\mu}$	μ
	(33)	0 DP1	54321.0
	(34)	o DP2	5432.10
	(46)	0 DP3	543. 210
	(47)	$ \begin{array}{ccc}                                   $	54. 3210

	Connected To Pin No.	Description	Display Should Be
.(4)	(9) (20), (1	Gnd/Open, Print and Transfer	
(5)	<b>→</b> (18)	F <sub>1</sub> /Time Base Output	
(7)	<b>→</b> (16)	F <sub>2</sub> /Clock	Same as Paragraph 5-38
(36)	→(37)	Digit Address "X"/Digit Select "X"	
(38)	→(39)	Digit Address "Y"/Digit Select "Y"	
(40)	<b>→</b> (41)	Digit Address "Z"/Digit Select "Z"	
(50)	→(25)	DC-IN (+22 V)	
	Connect pins listed in T	C CARD NO. C) or Test 9. EST 9 and ground pin 22, Time Base Select "A".	Same as Paragraph 5-39
		C CARD NO. C) or Test 9. EST 9 and ground pin 23, Time Base Select "B".	Same as Paragraph 5-40
TEST 12	(SAME AS DIAGNOSTIC	C CARD NO. C) or Test 9.	
	Connect pins listed in T Select "A", "B"	EST 9 and ground pins 22 and 23, Time Base	Same as Paragraph 5-41
TEST 13	Select "A", "B"	EST 9 and ground pins 22 and 23, Time Base	
ΓEST 13	Select "A", "B" (SAME AS DIAGNOSTIC	EST 9 and ground pins 22 and 23, Time Base	Same as Paragraph 5-41 Same as Paragraph 5-44
TEST 14	Select "A", "B"  (SAME AS DIAGNOSTIC  Connect pins listed in T  (SAME AS DIAGNOSTIC	EST 9 and ground pins 22 and 23, Time Base C CARD NO. D) or Test 9. EST 9 and ground pin 24, Time Base Select "C" C CARD NO. D) or Test 9. EST 9 and ground pins 22 and 24, Time Base	
TEST 14	Select "A", "B"  (SAME AS DIAGNOSTIC  Connect pins listed in T  (SAME AS DIAGNOSTIC  Connect pins listed in T  Select "A", "C"	EST 9 and ground pins 22 and 23, Time Base C CARD NO. D) or Test 9. EST 9 and ground pin 24, Time Base Select "C" C CARD NO. D) or Test 9. EST 9 and ground pins 22 and 24, Time Base	Same as Paragraph 5-44
TEST 14	Select "A", "B"  (SAME AS DIAGNOSTIC Connect pins listed in T  (SAME AS DIAGNOSTIC Connect pins listed in T Select "A", "C"  (SAME AS DIAGNOSTIC	EST 9 and ground pins 22 and 23, Time Base C CARD NO. D) or Test 9. EST 9 and ground pin 24, Time Base Select "C" C CARD NO. D) or Test 9. EST 9 and ground pins 22 and 24, Time Base C CARD NO. D) or Test 9. EST 9 and ground pins 23 and 24, Time Base	Same as Paragraph 5-44
ΓEST 14 ΓEST 15	Select "A", "B"  (SAME AS DIAGNOSTIC Connect pins listed in T  (SAME AS DIAGNOSTIC Connect pins listed in T Select "A", "C"  (SAME AS DIAGNOSTIC Connect pins listed in T Select "B", "C"	EST 9 and ground pins 22 and 23, Time Base C CARD NO. D) or Test 9. EST 9 and ground pin 24, Time Base Select "C" C CARD NO. D) or Test 9. EST 9 and ground pins 22 and 24, Time Base C CARD NO. D) or Test 9. EST 9 and ground pins 23 and 24, Time Base	Same as Paragraph 5-44 Same as Paragraph 5-45

e. The oscilloscope display should be a stationary pattern. Unless the 5300A oscillator frequency and reference standard frequency are identical, the display on the oscilloscope will drift left or right. A left drift indicates the counter oscillator frequency is higher than the standard frequency. A right drift indicates the counter oscillator frequency is lower than the standard frequency. The rate of movement is related to the frequency difference between the 5300A oscillator and the standard frequency as shown in the following example.

Example. A 5 MHz frequency is used to trigger the oscilloscope sweep; the oscilloscope vertical amplifier signal is the 5300A oscillator frequency.

The time required for the pattern to drift the width of one cycle for the display is (in this example) 10 seconds. The frequency error is:

$$\frac{\Delta f}{f} = \frac{\Delta t}{t} = \frac{2 \times 10^{-7}}{1 \times 10} = 2 \times 10^{-8} = 2 \text{ parts in } 10^8 \text{ error.}$$

- f. Longer measurement periods are required to observe smaller frequency differences.
- g. If frequency difference (drift) is excessive adjust 5300A rear-panel OSC jack.

#### 5-61, HP 5310A BATTERY PACK

#### 5-62. Battery Capacity Check

#### CAUTION

#### Maximum recharge time is 24 hours.

- 5-63. The condition of the batteries in Model 5310A Battery Pack can be checked using equipment listed in Table 5-1 as follows:
- a. Mate the 5310A Battèry Pack to the 5300A Measuring System mainframe and the plug-on in use using procedure in Paragraphs 2-15, 2-16, and 2-17.
- b. Unplug the 5300A ac line cord and set 5310A switch to BATTERY so that the battery pack is operating with normal load and  $\sup plying$  power to the Measuring System/Plug-on combination.
- c. If the LOW BATTERY lamp starts to glow the Battery Pack should be recharged as follows:
  - Connect ac line power to 5300A. (Note: it is not necessary to have plug-on connected to charge batteries.
  - 2. Set Battery switch to CHARGE for 18 hours.
  - 3. After 18 hours, disconnect ac power and set Battery switch to BATTERY.
- d. If the LOW BATTERY lamps still glows with instrument turned or if short battery life is experienced, recharge battery then separate the Battery Pack from the 5300A and plug-on combination:
  - Remove the Battery Pack top cover by removing 6 screws.
  - Obtain a 10-ohm, 25 W resistor and a 50-pin, female connector HP Part No. 1251-0101 (CINCH 57-20500-375).
  - Solder the resistor between pins 25 and 49 of this connector.
- e. Ensure that Battery Pack switch is set to LINE. Connect the loaded female connector to Battery Pack A1J1, Bottom Connector.
  - f. Set Battery Pack switch to BATTERY.
- g. Check the voltage conditions of each of the five batteries with a dc voltmeter. The normal voltage for each battery should be greater than 2 volts (about 2.3 to 2.8 V depending on time since charge) and each battery should be nearly the same level. A difference in voltage level between batteries is a good indication of a faulty battery or cell and should be replaced.
- h. Following an 18-hour charge, the Battery Pack should operate with a 10-ohm load for about 3 hours. The total battery voltage after this time should be greater than +11 volts dc.
- i. If above tests indicate the battery capacity is lower than normal, full capacity can sometimes be regained by exercising the batteries through several charge-discharge cycles.
- j. The battery pack should be checked and recharged every 30 days as part of a regular maintenance cycle.
- k. When the battery pack is used for 4 to 8 hours consecutively (depending on plug-on used) the 5310A should be recharged over night, for every day of use.

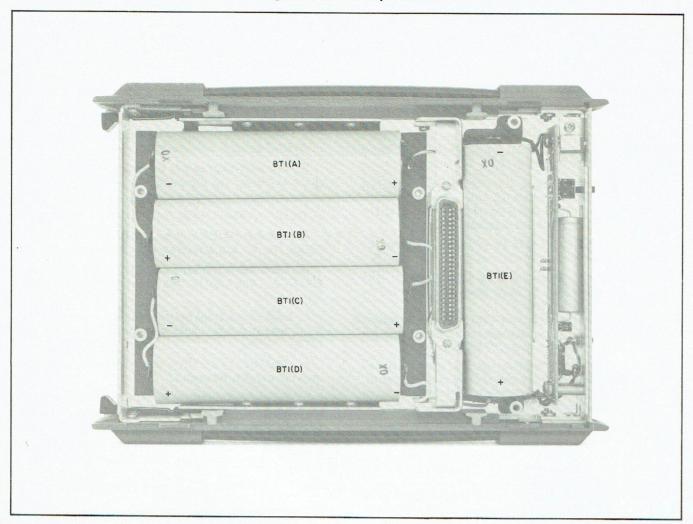
### 5-64. Replacing Internal Battery Supply (see Figure 5-5)

- 5-65. If the procedure of Paragraph 5-62 establishes that the 5310A internal batteries do not provide power for the normal operating time, replace the batteries. The batteries must be replaced with power removed and battery pack separated from the 5300A and plug-on used. Do not short battery leads to each other or to ground when soldering battery connection. Proceed as follows:
- a. Removefuse F1 (located on A2 Assembly at front of 5310A) using a non-conductive tool.
- b. Remove 6 screws in top cover plate and lift off plate to expose the 5 batteries.
- c. Unsolder (see CAUTION) WHT-BLK-RED wire, at BT1A(+), which leads from A2(H) to BT1A(+).
- d. Unsolder WHT wire at BT1D(-). Four batteries, BT1A, B, C, and D will be free for removal.
- e. Unsolder WHT wire at BT1E(+) and BLK wire at BT1E(-). The last section of the battery will be free for removal.
- f. Interconnections between the 4 sections of BT1A, B, C, and D can be made with the batteries out of the 5310A casting.
- g. The battery sections can be reinstalled by reversing steps a through f.
- h. When the 5 sections of BT1 have been installed, the plate removed in step b can be replaced and the 6 screws installed.
- i. Mate the 5310A Battery Pack to the 5300A and the plug-on used as in Paragraph 2-15.

#### 5-66. Removing A2 Power Supply Board

- 5-67. To remove the A2 Power Supply Board, remove the batteries using procedures in Paragraph 5-65 steps a to e. Remove the A2 board as follows:
  - a. Unsolder the BLK wire connected to A2(A).
- b. Unsolder the WHT-BLK-ORN wire connected to A2(C).
- c. Unsolder the BLK wire from LOW BATTERY lamp connected to A2(D) and the GRN wire connected to A2(E).
  - d. Unsolder WHT-RED wire connected to A2(F).
- e. Unsolder the WHT-BRN-RED wire connected to A2(G).
- f. Unsolder the WHT-BLK-RED wire connected to A2(H).
  - g. Unsolder the BLK wire connected to A2(B).
- h. Using an offset pozidriv $^{\mathbb{R}}$  screwdriver, remove the three screws securing A2. Loosen screw securing the plastic power transistor.
  - i. The A2 Assembly should now be free for removal.
- j. To install A2 Assembly, reverse the procedures of steps a to i.
- ® Registered trademark, Stanley Company.

Figure 5-5. Battery Removal



# 5-68. DIGITAL RECORDER OUTPUT AND HP 10533A RECORDER INTERFACE

- 5-69. The operation of Model 10533A Recorder Interface and the 5300A Digital Recorder output, can be checked as follows (refer to Table 5-1 for test equipment requirement):
  - a. Connect ac power to 5300A ac receptacle.
- b. Connect the small counter interface connector to the 5300A rear-panel DIGITAL RECORDER connector.
- c. Connect the opposite end of the cable containing the 50-pin male connector to the HP 5055A Digital Recorder. Ensure that the recorder is set to -8421 code.
- d. Obtain a 50-pin female connector as listed in Table 5-1. Interconnect the following pins:

Pin 4 to Pins 5, 9, 15, 37, 39, 41. Pin 8 to Pin 17 Pin 19 to Pin 20

Pin 19 to Pin 20 Pin 25 to Pin 50.

- e. Connect the hard-wired, 50-pin connector to the 5300A A1J1 connector.
- f. Turn 5300A ac power on with SAMPLE RATE control then press RESET. The 5300A display will initially be 000000 and will continuously cycle as follows:

111111	444444	777777
222222	555555	888888
333333	666666	999999

g. Turn on the HP 5055A Digital Recorder. The recorder will print out lines of digits corresponding to the particular digits being displayed on the 5300A. A 10- to 15-second printout should be sufficient to record the complete cycle of 5300A display.

### SECTION VI REPLACEABLE PARTS

#### 6-1. INTRODUCTION

- 6-2. This section contains information for ordering replacement parts. Tables 6-1, 6-2, and 6-3 list parts used in the HP 5300A, 5310A, and 10533A respectively. The table lists parts in alpha-numerical order of their reference designators and provides the following information on each part:
  - a. Hewlett-Packard part number.
  - b. Description of part (see abbreviations below).
- c. Total quantity used in the instrument (the first time that the part appears in the list, the total quantity of that part number is printed).
- d. Typical manufacturer of the part in a five-digit code (see list of manufacturers in Table 6-4).
  - e. Manufacturer's part number.

6-3. Miscellaneous parts are listed at the end of Table 6-1, 6-2, and 6-3.

#### 6-4. ORDERING INFORMATION

- 6-5. To obtain replacement parts, address order or inquiry to your local Hewlett-Packard Sales and Service office (see lists at rear of this Section for addresses). Identify parts by their Hewlett-Packard part number. 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 DESI	IGNATORS					
A	=		F		fuse	MP	=	mechanical part	U	=	integrated circuit
В	=	motor	FL		filter	P	=	plug	V	=	vacuum, tube, neo
BT	=	battery	IC		integrated circuit	Q	=	transistor			bulb, photocell, et
C		capacitor	J		jack	R	=	resistor	VR	=	voltage regulator
CP	-	coupler	K	=	relay	RT	=	thermistor	W	=	cable
CR	=		L	=	inductor	S	=	switch	X	=	socket
DL	=	delay line	LS	=	loud speaker	T	=	transformer	Y	=	crystal
DS		device signaling (lamp)	M	=	meter	TB	=	terminal board	Z	=	tuned cavity,
E	-	misc electronic part	MK	=	microphone	TP	=	test point			network
					ABBREVIAT	IONS					
A			Н		henries	N/O		normally open		=	rack mount only
AFC	=		HDW		hardware	NOM	=	nominal	RMS	=	root-mean square
AMPL	=	amplifier	HEX	=	hexagonal	NPO	-	negative positive zero	RWV	=	reverse working
			HG	=	mercury			(zero temperature			voltage
BFO		beat frequency oscillator	HR	=	hour(s)			coefficient)	S-B	=	slow-blow
BE CU			HZ	=	hertz	NPN	=	negative-positive-	SCR	-	stow-blow screw
BH	=	binder head						negative		_	
BP	=		IF	=	intermediate freq	NRFR	=	not recommended for		_	selenium
BRS	=	brass	IMPG		impregnated			field replacement	SEMICON		section(s) semiconductor
BWO	=	backward wave oscillator	INCD	=	incandescent	NSR	=	not separately		=	
			· INCL	=	include(s)			replaceable	01		silicon
CCW	=	counter-clockwise	INS	=	insulation(ed)				~~~	=	silver
CER	=	ceramic	INT	=	internal	OBD		order by description	SL	-	slide
CMO	=		17		1:1 1000	OH		oval head	SPG	=	spring
COEF	=	coefficient	K	=	kilo = 1000	OX	-	oxide	SPL	=	special
COM	=	common	LH	=	left hand	P	=	peak	~~.	=	stainless steel
COMP	=	composition	LIN	=	linear taper	PC	=	printed circuit	DIL	=	split ring
COMPL	=	complete	LK WASH	=	lock washer	PF	=	picofarads = 10-12	STL	=	steel
CONN	=	connector	LOG	=	logarithmic taper			farads	TA	=	tantalum
CP .	=	cadmium plate	LPF		low pass filter	PH BRZ	=	phosphor bronze	TD	=	time delay
CRT	=	cathode-ray tube				PHL	_	Phillips	TGL	=	toggle
CW	=	clockwise	M	=	milli = 10 <sup>-3</sup>	PIV	=	peak inverse voltage	THD	=	thread
			MEG	=	meg = 106	PNP		positive-negative-	TI	=	titanium
DEPC		deposited carbon	MET FLM	=	metal film			positive	TOL	=	tolerance
DR	=	drive	MET OX	=	metallic oxide	P/O	=	part of	TRIM	=	trimmer
FIFCT	-	electrolytic	MFR	=	manufacturer	POLY	=	polystyrene	TWT	=	traveling wave tub
		encapsulated	MHZ	=	mega hertz	PORC	=	porcelain	II	=	micro = 10-6
EXT		external	MINAT	=	miniature	POS	=	position(s)	U	=	micro = 10
			MOM	=	momentary	POT	=	potentiometer	VAR	=	variable
F		farads	MOS	=	metal ozide substrate	PP	=	peak-to-peak	VDCW	=	dc working volts
FH		flat head	MTG	=	mounting	PT	=	point			
		fillister head	MY	=	"mylar"	PWV		peak working voltage	w/	=	with
FXD		fixed							W	=	watts
G		giga (10 <sup>9</sup> )	N	=	nano (10-9)	RECT	=	rectifier	WIV	=	working inverse
GE	=	germanium	N/C		normally closed	RF		radio frequency	-		voltage
GL	=	glass	NE		neon	RH		round head or	ww	=	wirewound
GRD	=	ground(ed)	NIPL	=	nickel plate	12.207.0		right hand	W/O	=	without
								**9			

Table 6-1. Replaceable Parts for 5300A

Reference Designation	HP Part Number	Oty	Description	Mfr Code	Mfr Part Number
A1 A1C1 A1C2 A1C3 A1C4	05300-20001 0150-0012 0180-2357 0180-0210 0180-0291	1 1 1 1	BOARD ASSY:LOGIC BLANK C:FXD MY.01 UF 20% 200 VDCW C:FXD TA 950 UF 90 VDCW C:FXD ELECT 3.3 UF 10% 20 VDCW C:FXD ELECT 1 UF 10% 20 VDCW	28480 56289 28480 56289 56289	05300-60001 192P10292-PTS 0180-2357 150D225X9020A2-DYS 150D225X9020A2-DYS
A1C5 A1C6 A1C7 A1C8 A1C9	0180-0197 0150-0075 0121-0059 0160-2266 0180-2208	2 2 1 1 2	C:FXD ELECT 2.2 UF 10% 20VDCW C:FXD CER 4700 PF +100-20% 500VDCW C:VAR CER 2-8 PF 300VDCW C:FXD CER 24 PF 5% 500VDCW FACT, SELECT C:FXD ELECT 220 UF 10% 10VDCW	56289 72982 28480 72982 56289	150D225X9020A2-DYS 851-000-X5U0-472Z 0121-0059 301-000-CGGC-240J 150D227X9010S2-DYS
A1C10 A1C11 A1C12 A1C13 A1C14	0160-0161 0180-1702 0180-1794 0180-2208 0180-1794	1 1 2	C:FXD MY 0.01 UF 10% 200VDCW C:FXD ELECT 180 UF 20% 6VDCW C:FXD ELECT 22 UF 10% 35VDCW C:FXD ELECT 220 UF 10% 10VDCW C:FXD ELECT 22 UF 10% 35VDCW	56289 56289 56289 56289 56289	192P10392-PTS 150D187X0006R2-DYS 150D226X9035R2-DYS 150D227X9010S2-DYS 150D226X9035R2-DYS
A1C15 A1C16 A1C17 A1C18 A1C19	0150-0075 0180-0229 0160-0156 0180-0106 0140-0198	1 1 2 1	C:FXD CER 4700 PF +100-20% 500VDCW C:FXD ELECT 33 UF 10% 10VDCW C:FXD MY 0.0039 UF 10% 200VDCW C:FXD ELECT 60 UF 20% 6VDCW C:FXD MICA 200 PF 5%	72982 28480 56289 28480 72136	851-000-X5U0-472Z 0180-0229 192P39292-PTS 0180-0106 RDM15F201J3C
A1C20 A1CR1 A1CR2 A1CR3 A1CR4	0180-0197 1901-0028 1901-0028 1901-0028 1901-0028	9	C:FXD ELECT 2.2 UF 10% 20VDCH DIODE:SILICON 0.75A 400PIV DIODE:SILICON 0.75A 400PIV DIODE:SILICON 0.75A 400PIV DIODE:SILICON 0.75A 400PIV	56289 04713 04713 04713 04713	150D225X9020A2-DYS SR1358-9 SR1358-9 SR1358-9 SR1358-9
A1CR5 A1CR6 A1CR7 A1CR8 A1CR9	1901-0050 1902-3381 1901-0028 1901-0028	2	DIODE:SI 200 MA AT 1V DIODE BREAKDOWN:68.1V 400MW DIODE:SILICON 0.75A 400PIV DIODE:SILICON 0.75A 400PIV DIODE:SILICON 0.75A 400PIV	07263 28480 04713 04713	FDA 6308 1902-3381 SR1358-9 SR1358-9 SR1358-9
A1CR10 A1CR11 A1CR12 A1CR13 A1E1	1901-0028 1902-3205 1902-1259 1901-0028 1810-0041	1 1	DIODE:SILICON 0.75A 400PIV DIODE BREAKDOWN:15.0V 5% DIODE BREAKDOWN DIODE:SILICON 0.75A 400PIV R:METWORK,8 RES. 2.7K 0HM 5% (Contains: R2,	04713 28480 28480 04713 28480	SR1358-9 1902-3205 1902-1259 SR1358-9 1810-0041
A101 A102 A103 A104 A105	1854-0054 1854-0452 1854-0487 1853-0020 1854-0071	1 14 1 2 9	R5, R6, R8, F10, R12, R16, R30) TSTR:SI NPN TSTR:SI NPN TSTR:SI PNPN TSTR:SI PNPN(SELECTED FROM 2N3702) TSTR:SI NPN(SELECTED FROM 2N3704)	80131 28480 28480 28480 28480	2N3646 1854-0492 1854-0487 1853-0020 1854-0071
A106 A107 A108 A109 A1010	1854-0452 1854-0452 1854-0452 1854-0452 1854-0452		TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN	28480 28480 28480 28480 28480	1854-0492 1854-0492 1854-0492 1854-0492 1854-0492
A1011 A1012 A1013 A1014 A1015	1854-0492 1854-0492 1854-0492 1854-0492 1854-0492		TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN	28480 28480 28480 28480 28480	1854-0452 1854-0492 1854-0492 1854-0452 1854-0492
A1016 A1017 A1018 A1019 A1020	1854-0492 1854-0492 1854-0071 1854-0071		TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN(SELECTED FRCM 2N3704) TSTR:SI NPN(SELECTED FRCM 2N3704) TSTR:SI NPN(SELECTED FRCM 2N3704) TSTR:SI NPN(SELECTED FRCM 2N3704)	28480 28480 28480 28480 28480	1854-0452 1854-0452 1854-0071 1854-0071 1854-0071
A1021 A1022 A1023 A1024 A1R1	1854-0071 1854-0071 1854-0071 1854-0071 0683-2715	1	TSTR:SI NPN(SELECTED FROM 2N3704) TSTR:SI NPN(SELECTED FROM 2N3704) TSTR:SI NPN(SELECTED FROM 2N3704) TSTR:SI NPN(SELECTED FROM 2N3704) R:FXD COMP 270 OHM 5% 1/4W	28480 28480 28480 28480 01121	1854-0071 1854-0071 1854-0071 1854-0071 CB 2715
A1R2 A1R3 A1R4 A1R5 A1R6	0683-2025 0683-1025	3	PART OF E1 R:FXD COMP 2000 OHM 5% 1/4W R:FXD COMP 1000 OHM 5% 1/4W PART OF E1 PART OF E1	01121 01121	CB 2025 CB 1025
A1R7 A1R8 A1R9 A1R10 A1R11	0683-4715 0683-6815 0683-2035	1 1 1	R:FXD COMP 470 OHM 5% 1/4W Factory Select PART OF E1 R:FXD COMP 680 OHM 5% 1/4W PART OF E1 R:FXD COMP 20K OHM 5% 1/4W	01121 01121 01121	CB 4715 CB 6815 CB 2035
A1R12 A1R13 A1R14 A1R15 A1R16	0683-1025 0683-1055 0698-4037	1 1 1	PART OF E1 R:FXD CCMP 1000 OHM 5% 1/4W R:FXD CCMP 1 MEGOHM 5% 1/4W R:FXD MET FLM 46.4 OHM 1% 1/8W PART OF E1	01121 01121 28480	C8 1025 C8 1055 0698-4037

Table 6-1. Replaceable Parts for 5300A (Cont'd)

Reference Designation	HP Part Number	Oty	Description	Mfr Code	Mfr Part Number
A1R17 A1R18 A1R19 A1R20 A1R21	0683-1525 1 R:FXD CGMP 1500 OHM 5% 1/4W 0683-6805 1 R:FXD CCMP 68 OHM 5% 1/4W 0 0683-1035 7 R:FXD CCMP 10K OHM 5% 1/4W		01121 01121 01121 01121 01121	CB 1025 CB 1525 CB 6805 CB 1035 CB 1035	
A1R22 A1R23 A1R24 A1R25 A1R26	0683-1035 0683-1035 0683-1035 0683-1035 0683-2725	1	R:FXD COMP 10K GHM 5% 1/4W R:FXD COMP 10K OHM 5% 1/4W R:FXD COMP 10K OHM 5% 1/4W R:FXD COMP 10K OHM 5% 1/4W R:FXD COMP 2700 OHM 5% 1/4W	01121 01121 01121 01121 01121	CB 1035 CB 1035 CB 1035 CB 1035 CB 2725
A1R27 A1R28 A1R29 A1R30 A1R3	0683-1035 0683-1015 0683-3315 3101-1596	1 1	R:FXD COMP 10K OHM 5% 1/4W R:FXD COMP 100 OHM 5% 1/4W R:FXD CCMP 330 OHM 5% 1/4W PART OF E1 SWITCH:SLIDE OPDT 0.5A 125V AC/DC	01121 01121 01121 79727	CB 1035 CB 1015 CB 3315 G126-C020
A1T1 A1T2 A1UXA Misc. A1U1 A1U2	9100-3011 9100-3012 1200-0464 1820-0635 1820-0571	1 1 60 1	TRANSFORMER TRANSFORMER:DRIVER SOCKET:INTEGRATED CIRCUIT IC: LSI L, E. D. SCANNER IC: LSI L, E. D. CHARACTER GENERATOR	28480 28480 27264 28480 28480	9100-2011 9100-3012 1938-4 1820-0635 1820-0571
A1U3, U4XA Misc. A1U3 A1U4 A1U5 A1U6 A1U7 A1U8		2 1 1 1 1 1	IC: SOCKET, 16-PIN IC: M. O. S. 6-DECADE COUNTER IC: M. O. S. TIME-BASE IC: L. S. I. CONTROL IC: TIL QUAD 2-INPT NOR GATE INTEGRATED CIRCUIT: TIL HEX INVERTER INTEGRATED CIRCUIT 2-INPUT OR/NOR GATE	28480 28480 28480 01295 01295 04713	1820-0634 1820-0633 1820-0632 SN4467 SN8199 MC1024P
A1J1 A1J2 A1Y1 A1A1 A1A1DS1	1251-2564 1251-0472 0410-0423 05300-60002 1990-0325	1 1 1 7	CONNECTOR:50-PIN BLUE RIBBON CONNECTOR:PC 12 CONTACTS CRYSTAL:QUARTZ BOARD ASSY:DISPLAY DIODE:VISIBLE LIGHT EMITTER	74868 71785 28480 28480 28480	57-10500-27 252-06-30-300 0410-0423 05300-60002 1990-0310
A1A1DS2 A1A1DS3 A1A1DS4 A1A1DS5 A1A1DS6	1990-0325 1990-0325 1990-0325 1990-0325 1990-0325	*	DIODE:VISIBLE LIGHT EMITTER DIODE:VISIBLE LIGHT EMITTER DIODE:VISIBLE LIGHT EMITTER DIODE:VISIBLE LIGHT EMITTER DIODE:VISIBLE LIGHT EMITTER	28480 28480 28480 28480 28480	1990-0310 1990-0310 1990-0310 1990-0310 1990-0310
A1A1DS7 A1A1DS8 A1A1R1 A1A1R2	1990-0311 1990-0325 0683-3305 0683-3305	1 2	DIODE ARRAY:LIGHT EMITTING DIODE:VISIBLE LIGHT EMITTER R:FXD COMP 33 OHM 5% 1/4W R:FXD COMP 33 OHM 5% 1/4W	28480 28480 01121 01121	1990-0311 1990-0310 CB 3305 CB 3305
A1A1XA Misc. A1A1 Misc. A2 A2C1 A2C2	1200-0464 05300-20007 0530C-60003 0140-0145 0180-2355	40 36 1 1	SOCKET:INTEGRATED CIRCUIT CONNECTOR PINS:PRINTED CIRCUIT BOARD ASSY:POWER SUPPLY REGULATOR C:FXD MICA 470 PF 5% C:FXD TA 7.5 UF	27264 28480 28480 72136 28480	1938-4 05300-20007 05300-60003 DM15F471J3S 0180-2355
A2C3 A2C4 A2C5 A2C6 A2C7 A2CR1 A2CR2 A2CR3 A2CR4 A2CR4 A2CR5 A2O1	018C-0106 0160-0259 0160-0155 0160-0180 0160-2327 1902-0889 1501-0040 1901-0040 1901-0040 1501-050 1853-0058	1 1 1 3 1	C:FXD ELECT 60 UF 20% 6VDCW C:FXD MY 1800 PF 10% 200VDCW C:FXD MY 0.0033 UF 10% 200VDCW C:FXD MY 0.033 UF 5% C:FXD MY .001 UF 20% DIODE BREAKDOWN DIODE:SILICON 30MA 30WV DIODE:SILICON 30MA 30WV DICDE:SILICON 30MA 30WV DICDE:SILICON 30MA 30WV DICDE:SILICON 30MA 30WV DICDE:SILICON 30MA 30WV DICTE:SILICON 30MA 30WV DICTE:SILICON 30MA 30WV DICTE:SILICON 30MA 30WV	28480 56289 56289 28480 28480 07263 28480 07263 80131	0180-0106 192P18292-PTS 192P33292-PTS 0160-0180 0160-232T 1902-0689 FDG1088 FDG1088 FDG1088 FDG1088 FDG4088
A2Q2 A2Q3 A2Q4 A2Q5 A2Q6	1853-0086 1853-0086 1853-0020 1855-0367 1884-0201	2 1 1	TSTR:SI PNP TSTR:SI PNP TSTR:SI PNP(SELECTED FROM 2N3702) TSTR:SI UNIJUNCTION (PN) THYRISTOR	80131 80131 28480 04713 28480	2N5087 2N5087 1853-0020 2N4871-5 1884-0201
A207 A208 A209 A2R1 A2R2	1854-0071 1853-0058 1854-0492 0757-0444 0698-0085	1 1	TSTR:SI NPN(SELECTED FROM 2N3704) TSTR:SI PNP TSTR:SI NPN R:FXD MET FLM 12.1K CHM 1% 1/8W R:FXD MET FLM 2.61K CHM 1% 1/8W	28480 80131 26480 28480 28480	1654-0071 2N3644 1854-0492 0757-0444 0698-0085
A2R3 A2R4 A2R5 A2R6 A2R7	0757-0420 0683-1535 0683-3605 0683-2015 0683-1625	2 2 1 1 2	R:FXD MET FLM 750 OHM 1% 1/8W R:FXD COMP 15K OHM 5% 1/4W R:FXD COMP 36 OHM 5% 1/4W R:FXD COMP 200 OHM 5% 1/4W R:FXD COMP 1600 OHM 5% 1/4W	28480 01121 01121 01121 01121	0757-0420 CB 1535 CB 3605 CB 2015 CB 1625
A2R8 A2R9 A2R10 A2R11 A2R12	0683-1035 0698-3456 0683-2025 0698-3515 0757-0420	2 1 1	R:FXD COMP 10K OHM 5% 1/4W R:FXD MET FLM 287K OHM 1% 1/8W R:FXD COMP 2000 OHM 5% 1/4W R:FXD FLM 5900 OHM 1% 1/8W R:FXD MET FLM 750 OHM 1% 1/8W	01121 28480 01121 28480 28480	CB 1035 0698-3456 CB 2025 0698-3515 0757-0420

Table 6-1. Replaceable Parts for 5300A (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2R13 A2R14 A2R15 A2R16 A2R16 A2R17	0663-1035 0683-1535 0686-5115 0686-5115 0683-2715	2	R:FXD CGMP 10K OHM 5% 1/4W R:FXD CGMP 15K OHM 5% 1/4W R:FXD CGMP 510 OHM 5% 1/2W R:FXD CGMP 510 GHM 5% 1/2W R:FXD CGMP 270 OHM 5% 1/4W	01121 01121 01121 01121 01121	C8 1035 C8 1535 E8 5115 EB 5115 CB 2715
A2R18 A3 A3C1 A3C2 A3F1	0683-1625 5060-1189 0160-3333 0160-3333 2110-0044	1 2	R:FXD CCMP 1600 CHM 5% 1/4W POWER LINE MODULE, NON-FILTERED C:FXD CER 5000 PF 20% 250WVAC C:FXD CER 5000 PF 20% 250WVAC FUSE:CARTRIDGE 0.8A 250V SLOW-BLOW	01121 28480 28480 28480 75915	CB 1625 5060-1189 0160-3333 0160-3333 2110-0044
A3F1 A3W1 J1 R1 S2	2110-0320 8120-1348 1250-0083 2100-0318 3101-0052	1 1 1 1	FUSE:0.15A 250V SLOM-BLOW CABLE ASSY:POWER, DETACHABLE CONNECTOR:BNC R:VAR 250K OHM 20% 1/4w/SPST SW SWITCH:PUSHBUTTON SPST	71400 70903 02660 28480 82389	MDL15/100 KHS-7041 31-221-1020 2100-0318 961 LESS HWD
T1 MP1 MP2	9100-3013 0370-2101 05300-00001 05300-00002	1 1 1 2	TRANSFORMER: POWER CHASSIS PARTS & MISCELLANEOUS KNOB:SAMPLE RATE PANEL: FRONT SLIDE	28480 28480 28480 28480	9100-3013 0370-2101 05300-00001 05300-00002
MP3 MP4 MP5 MP6 MP7	05300-00004 05300-20005 05300-20010 05300-40002 05300-40003	1 1 2 4	PANEL:REAR WINDOW CASE:CAST ALUMINUM BLOCK:ANNUNCIATOR SUPPORT:BOARD	28480 28480 28480 28480 28480	05300-00004 05300-20005 05300-20010 05300-40002 05300-40003
MP8 MP9 MP10 MP11 MP12	05300-40004 05300-40005 05300-40006 05300-80002 05300-80003 7122-0097 7124-1755 7124-2017	4 2 1 1 1 1 1	GUIDE:SLIDE CATCH SOCKET:CONNECTOR MASK:ANNUNCIATOR, UPPER MASK:ANNUNCIATOR, LOWER NAME PLATE LABEL:INFO LABEL:PCWER LINE	28480 28480 28480 28480 28480 28480 28480	05300-40004 05300-40005 05300-40006 05300-80002 05300-80003 7122-0097 7124-1759 7124-2017
MP13 MP14 MP15	05300-80004 2200-0180 2190-0003 0624-0208	1 1 1 4	COVER: PLASTIC PROTECTIVE SCREW: PAN HEAD, SST, 4/40" X 1-3/8" WASHER LOCK: NO. 4 SPLIT SCREW: CAD. PLATE, SELF TAP, 6/32" X1/2"	28480	05300-80004

Table 6-2. Replaceable Parts for 5310A

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1 A1J1 A1P1 A2 A2C2	05310-60002 1251-0099 1251-0101 05310-60001 0180-2373	1 1 1 1	BOARD ASSY: INTERCONNECT CONNECTOR: R & P 50 CONTACT (MALE, BOTTOM) CONNECTOR: R & P 50 CONTACT (FEMALE, TOP) BOARD ASSY: POWER SUPPLY C: FXD AL ELECT 580 UF +150-10% 35VDCW	28480 02660 02660 28480 90201	05310-60002 57-10500-375 57-20500-375 05310-60001 TT581H035P3E1N
A2CR1 A2CR2 A2CR3 A2CR4 DS1	1901-0028 1902-0693 1901-0044 1901-0028 1990-0325	2 1 1	DIODE:SILICON 0.75A 400PIV DIODE BREAKDOWN DIODE:SILICON 20MA/1V DIODE:SILICON 0.75A 400PIV DIODE:VISIBLE LIGHT EMITTER	04713 28480 28480 04713 28480	SR1358-9 1902-0693 1901-0044 SR1358-9 1990-0325
A2F1 A2J1 A2J2 A201 A202	2110-0332 1251-1636 1251-1636 1853-0086 1853-0086	1 2 3	FUSE:3A CONNECTOR:FEMALE, FUSE CONNECTOR:FEMALE, FUSE TSTR:SI PNP TSTR:SI PNP	71400 28480 28480 28480 28480	GMW 3 1251-1636 1251-1636 2N5087 2N5087
03 A204 A2R1 A2R2 A2R2 A2R3 A2R4 A2R5	1854-0420 1853-0086 0683-2745 0813-0034 0683-3935 0761-0015 0683-3315	1 1 1 1 1 1 1 1	TSTR:SI NPN TSTR:SI PNP R:FXD COMP 270K OHM 5% 1/4W R:FXD WH 1.8 OHM 3% 1W R:FXD COMP 39K OHM 5% 1/4W R:FXD 1.5K MET FLM, 5%, 1W R:FXD COMP 330 OHM 5% 1/4W	28480 28480 01121 28480 01121	1854-0420 2N5087 CB 2745 0813-0034 CB 3935
A2R6 A2R7 A2R8	0698-3547 0683-5115 0683-2015 0550-0051 2200-0103 2200-0107 2200-0164 2360-0113 2360-0117	1 1 2 14 5 12 3 6	R:FXD COMP, 1 OHM, 5%, 1/2W R:FXD COMP, 510 OHM, 5%, 1/4W R:FXD COMP, 200 OHM, 5%, 1/4W SCREW: MACHINE, 3/48" X 3/8" SCREW: MACHINE, SST, 4/40" X 1/4" Pozidrive SCREW: MACHINE, SST, 4/40" X 3/8" Pozidrive SCREW: MACHINE, SST, 4/40" X 3/16" Pozidrive SCREW: MACHINE, SST, 6/32" X 1/4" SCREW: MACHINE, SST, 6/32" X 1/4" SCREW: MACHINE, SST, 6/32" X 3/8" Pozidrive	01121 01121	CB 5115 CB 2015
A2S1 BT1 W1	3101-1601 1420-0084 05310-60003	1 5	SWITCH: SLIDE BATTERY: 22.50V  CABLE ASSY: INTERCONNECTION	28480 05397 28480	3101-1601 Y5816 05310-60003
MP1	1440-0075		MISCELLANEOUS		
MP2	1440-0096	2	CARRY STRAP HANDLE: METAL WITH PLASTIC SLEEVE	28480	1440-0075 1440-0096
MP4 MP5 MP6 MP7 MP8 MP9	1440-0097  7122-0097 05300-00002 05300-80004 05300-40005 05310-00001 05310-00002 05310-00002 05310-00003	1 2 2 2 2 1 1 1	HANDLE: SHOULDER FLAT PAD WASHER: FLAT BLACK NYLON NAMEPLATE SLIDE COVER: PLASTIC PROTECTION CATCH PANEL: FRONT PANEL: FRAR PANEL: SUB BRACKET: LEFT	28480 28480 28480 28480 28480 28480 28480 28480 28480	1440-0097  7122-0097  05300-00002  05300-80004  05300-40005  05310-00001  05310-00002  05310-00003  05310-00004
MP10 MP11 MP12 MP13	05310-00005 05310-00006 05310-00007 05310-00008	1 1 1	CASE:BATTERY HOLDER:BATTERY COVER:BATTERY BRACKET:RIGHT	28480 28480 28480 28480	05310-00005 05310-00006 05310-00007 05310-00008
MP14 MP15	05310-40001 05310-20004	4 2	GUIDE:SLIDE FRAME:SIDE	28480 28480	05310-40001 05310-20004
MP16	0340-0765	1	Insulator: Transistor (Q3)	28480	0340-0765
MP17 MP18	1400-0826 3050-0017	1	L.E.D. MOUNTING CLIP:PLASTIC WASHER FOR L.E.D. CLIP	28480 28480	1400-0826 3050-0017

Table 6-3. Replaceable Parts for 10533A

ALC	Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1U3	A1C2 A1C3	0180-0197 0180-0106 0150-0072	1 1 1	C:FXD ELECT 2.2 UF 10% 20VDCW C:FXD ELECT 60 UF 20% 6VDCW C:FXD CER 200 PF 5% 1000VDCW	56289 28480 56289	150D225X9020A2aDX\$ 0180-0106 C028B102E201JS27-CDH
A1U2	A1U3 A1U4 A1U5	1820-0614 1820-0614 1820-0614	4	IC:DIGITAL TTL DUAL-QUAD LATCH IC:DIGITAL TTL DUAL-QUAD LATCH IC:DIGITAL TTL DUAL-QUAD LATCH	28480 28480 28480	1820-0614 1820-0614 1820-0614
A1R1	A1U2 A1U7 A101	1820-0282 1820-0274 1854-0094	1 1 1	IC:ITL 2-INPT OR GATE IC:DTL QUAD 2-INPUT OR GATE TSTR:SI NPN	01295 28480 80131	SN13603 1820-0274 2N3646
MP3 2200-0170 2 SCREW:SST POZI DR 4-40 X 0.625" LG 00000 0BD 0000 0BD 00000 0BD 0000 0BD 00000 0BD 000000 0BD 00000 0BD 000000 0BD 00000 0BD 000000 0BD 00000 0BD 000000 0BD 00000 0BD 000000 0BD 00000 0BD 00000 0BD 000000 0BD 000000 0BD 000000 0BD 0000000 0BD 000000 0BD 00000 0BD 00000 0BD 000000 0BD 000000 0BD 0000	A1R1 A1R4 P1 P2 R1 W1 W1	0683-1025 0683-1025 1251-0102 1251-2314 0683-1025 10533-60002 8120-0181	1 1 1 1	R:FXD COMP 1000 OHM 5% 1/4W R:FXD COMP 1000 OHM 5% 1/4W INSER::R & P CONNECTOR 50 MALE CONTACT CONNECTOR:PC (2 X 10)20 CONTACT R:FXD COMP 1000 OHM 5% 1/4W CABLE ASSY CABLE:SHIELDED 21 CONDUCTOR, 6 FT MISCELLANEOUS GROMMET:VINYL 0*250" ID	01121 01121 02660 05574 01121 28480 28480	CB 1025 CB 1025 57-0993-01-375 2VH10/1JV5(079) CB 1025 10533-60002 8120-0181
MP8 10533-20001 1 BOARD:BLANK 28480 10533-20001	MP3 MP4 MP5 MP6	2200-0170 2360-0119 5040-4601 10533-20002	2 1 1 1	SCREW:SST POZI DR 4-40 X 0.625" LG SCREW:SST PAN HD POZIDR 6-32 X 7/16" CONNECTOR HOOD CASE:PLASTIC	00000 00000 28480 28480	080 080 5040-4601 10533-49001
1 Dona David		10 533-80001	1	LABEL	28480	10533-80001
1251-3135 1 NET:POLARIZING FOR P2 END OF CABLE 28480 1251-3135						

Table 6-4. Code List of Manufacturers

5300A			
MFR NO.	MANUFACTURER NAME	ADDRESS	ZIP
01121 01295 02660 04713 07263 27264 28480 56289 70903 71400 71785 72136 72982 75915 79727 80131 82389	ALLEN BRADLEY CO. TEXAS INSTRUMENTS INC. SEMICONDUCTOR COMPONENTS DIV. AMPHENCE CORP. MCTORCLA SEMICONDUCTOR PROD.INC. FAIRCHILD CAMERA & INST. CORP. SEMICONDUCTOR DIV. MULEX PROD. CO. HEWLETI-PACKARD COMPANY SPRAGUE ELECTRIC CG. BULDEN CORP. BUSSMANN MFG. DIV. MC GRAW-EDISON CO. GINCH MFG. CO. DIV UNITED CARR FASTENER CORP. ELECTRO MCTIVE MFG. CO. INC. ERIE TECHNOLOGICAL PROD. INC. LITTELFUSE INC. GONTINENTAL-WIRT ELECTRONICS CORP. ELECTRONIC INDUSTRIES ASSOCIATION SWITCHCRAFT INC.	MILWAUKEE, WIS. DALLAS, TEX. BROADVIEW, ILL. PHOENIX, ARIZ. MOUNTAIN VIEW, CALIF. DCWNERS GROVE, ILL. PALC ALTO, CALIF. N. ADAMS, MASS. CHICAGO, ILL. ST. LOUIS, MO. CHICAGO, ILL. WILLIMANTIC, CONN. ERIE, PA. DES PLAINES, ILL. PHILADELPHIA, PA. WASHINGTON D.C. CHICAGO, ILL.	53204 75231 60153 85008 94040 60515 94304 01247 60644 63017 60624 06226 16512 60016 19144 20006 60630
5310A			
MFR NO.	MANUFACTURER NAME	ADDRESS	ZIP
01121 02660 04713 05397 28480 71400 80131 90201 94222	ALLEN BRADLEY CO.  AMPHENOL CORP.  MOTOROLA SEMICONDUCTOR PROD.INC. UNION CARBIDE CORP. ELECT. DIV. HEWLETT-PACKARD COMPANY BUSSMANN MFG. DIV. MC GRAW-EDISON CO. ELECTRONIC INDUSTRIES ASSOCIATION MALLORY CAPACITOR CO. SOUTHCO INC.	MILWAUKEE, WIS. BROADVIEW, ILL. PHOENIX, ARIZ. NEW YORK, N.Y. PALO ALTO, CALIF. ST. LOUIS, MO. WASHINGTON D.C. INDIANAPOLIS, IND. LESTER, PA.	53204 60153 85008 10017 94304 63017 20006 46206 19113
10533A			
MFR NO.	MANUFACTURER NAME	ADDRESS	ZIP
00000 00000 01121 01295 02660 05574 07263 28480 56289 71616 80131	NO M/F DESCRIPTION FOR THIS MFG NUMBER U.S.A. COMMON ALLEN BRADLEY CO. TEXAS INSTRUMENTS INC. SEMICONDUCTOR COMPONENTS DIV. AMPHENOL CORP. VIKING IND. INC. FAIRCHILD CAMERA & INST. CORP. SEMICONDUCTOR DIV. HEWLETT-PACKARD COMPANY SPRAGUE ELECTRIC CO. COMMERCIAL PLASTICS CO. ELECTRONIC INDUSTRIES ASSOCIATION	ANY SUPPLIER OF U.S.A. MILWAUKEE, WIS. DALLAS, TEX. BROADVIEW, ILL. CHATSWORTH, CALIF. MOUNTAIN VIEW, CALIF. PALO ALTO, CALIF. N. ADAMS, MASS. MUNDELEIN, ILL. WASHINGTON D.C.	53204 75231 60153 91311 94040 94304 01247 60060 20006

Figure 6-1. 5300A Mainframe Mechanical Parts Location

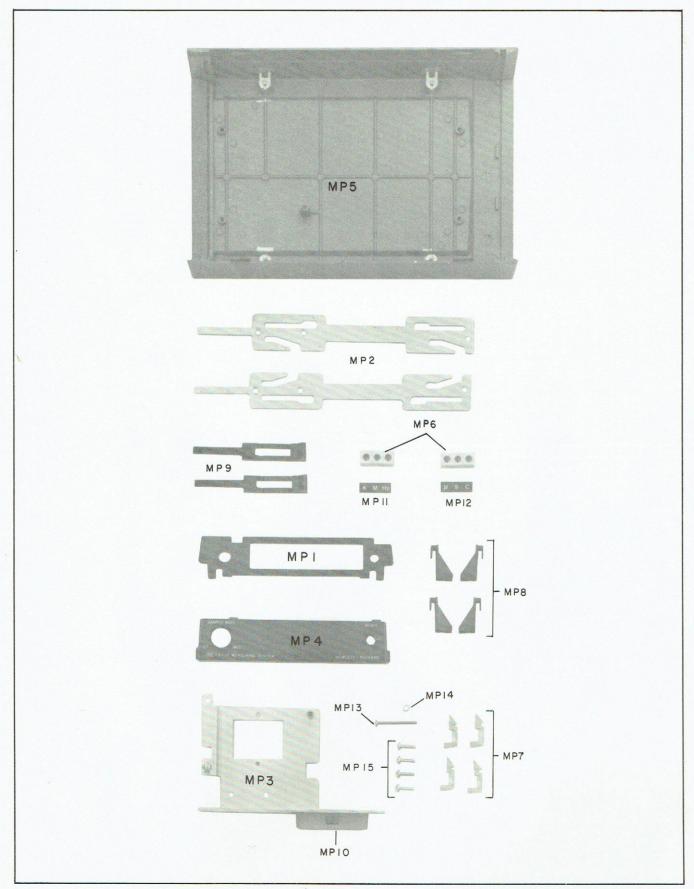


Figure 6-2. 5310A Battery Pack Mechanical Parts Location

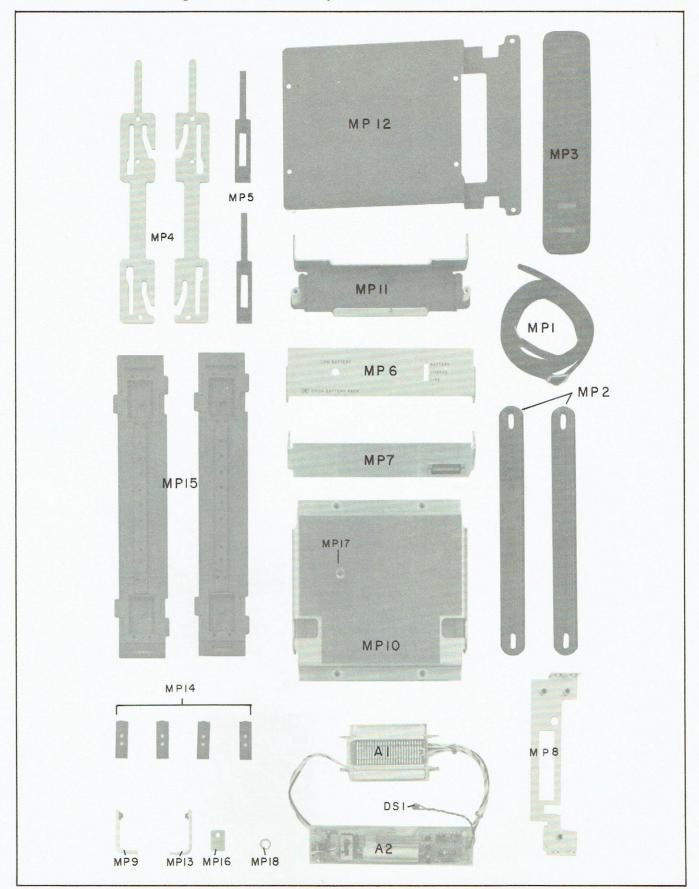
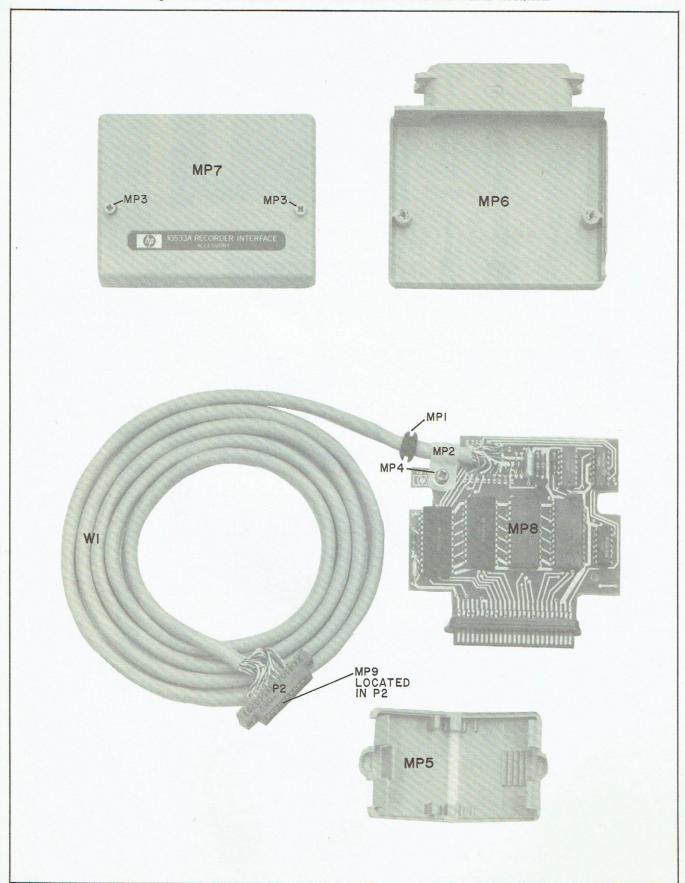


Figure 6-3. 10533A Recorder Interface Mechanical Parts Location



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E 11-71

# SECTION VII MANUAL CHANGES AND OPTIONS

#### 7-1. MANUAL CHANGES

7-2. This manual applies directly to Models 5300A Measuring System, 5310A Battery Pack, and 10533A Recorder Interface Assembly having Serial Prefix Number 1208 A-02161 and above, 1128 A-0051 and above and 1128 A and above, respectively.

#### 7-3. NEW INSTRUMENTS

7-4. As changes are made, newer instruments may have serial prefix numbers not listed in this manual. The manuals for these instruments will be supplied with "manual changes" sheets containing the required information; replace the affected pages with the replacement "manual changes" pages. Contact the nearest Hewlett-Packard Sales and Service Office for information if this sheet is missing.

#### 7-5. OLDER INSTRUMENTS

7-6. 5300A instruments with serial prefix number 1148A-01561 to 1148A-02160: Replace Figure 8-2 component locators and schematic diagram with Figure 7-2, component locators and schematic diagrams. Delete A2C7 from Table 6-1, page 6-3.

7-7. 5300A instruments with serial prefix numbers 1104A-00661 to 1104A-01560: Replace Table 6-1, pages 6-1 and 6-2 with Table 7-1, pages 7-9 and 7-10. Replace Figure 8-2 component locators and schematic diagram with Figure 7-3, component locators and schematic diagram. Delete A2C7 from Table 6-1, page 6-3.

7-8. 5300A instruments with serial numbers below 1104A-00661 have LED Displays with a different stock number. Change Table 6-1, A1A1DS1 to DS6 and DS8 to 1990-0310. 5310A instruments with serial numbers below 1128A-0051 are pilot run instruments and have the following changes.

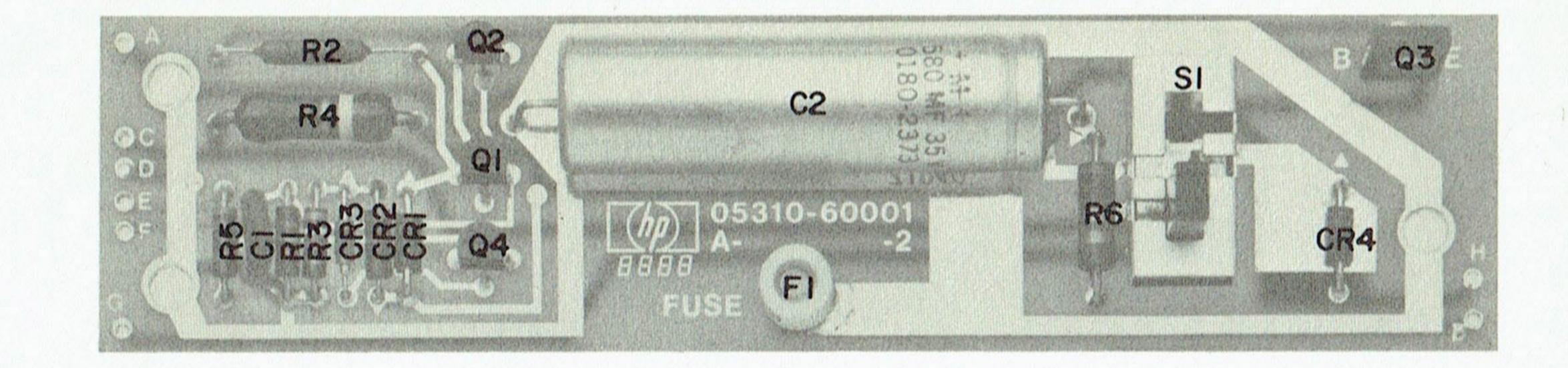
 Figure 8-3, A2 component locator and schematic diagram: Replace with Figure 7-1.

Table 6-2: Delete A2R7, A2R8; change Q3 to A2Q3, 1854-0300.

Change DS1 to 1990-0310.

#### 7-9. OPTIONS

7-10. No options at time of printing.



# NOTES

- I. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
- 2. UNLESS OTHERWISE INDICATED:
  RESISTANCE IN OHMS;
  CAPACITANCE IN PICOFARADS;

# REFERENCE DESIGNATIONS

NO PREFIX	AI	A2
вті		C1,2
201		CRI-4
DSI		FI
	JI PI	
		Q1-4
		RI-6

TABLE OF ACTIVE COMPONENTS

REFERENCE DESIGNATIONS	PART NUMBER
NO PREFIX	
DSI Q3	1990-0325
42	1854-0420
CRI,4	1901-0028
CR2	1902-0693
CR3	1901-0044
Q1,2,4	1853-0086
	05

Manual Changes and Options

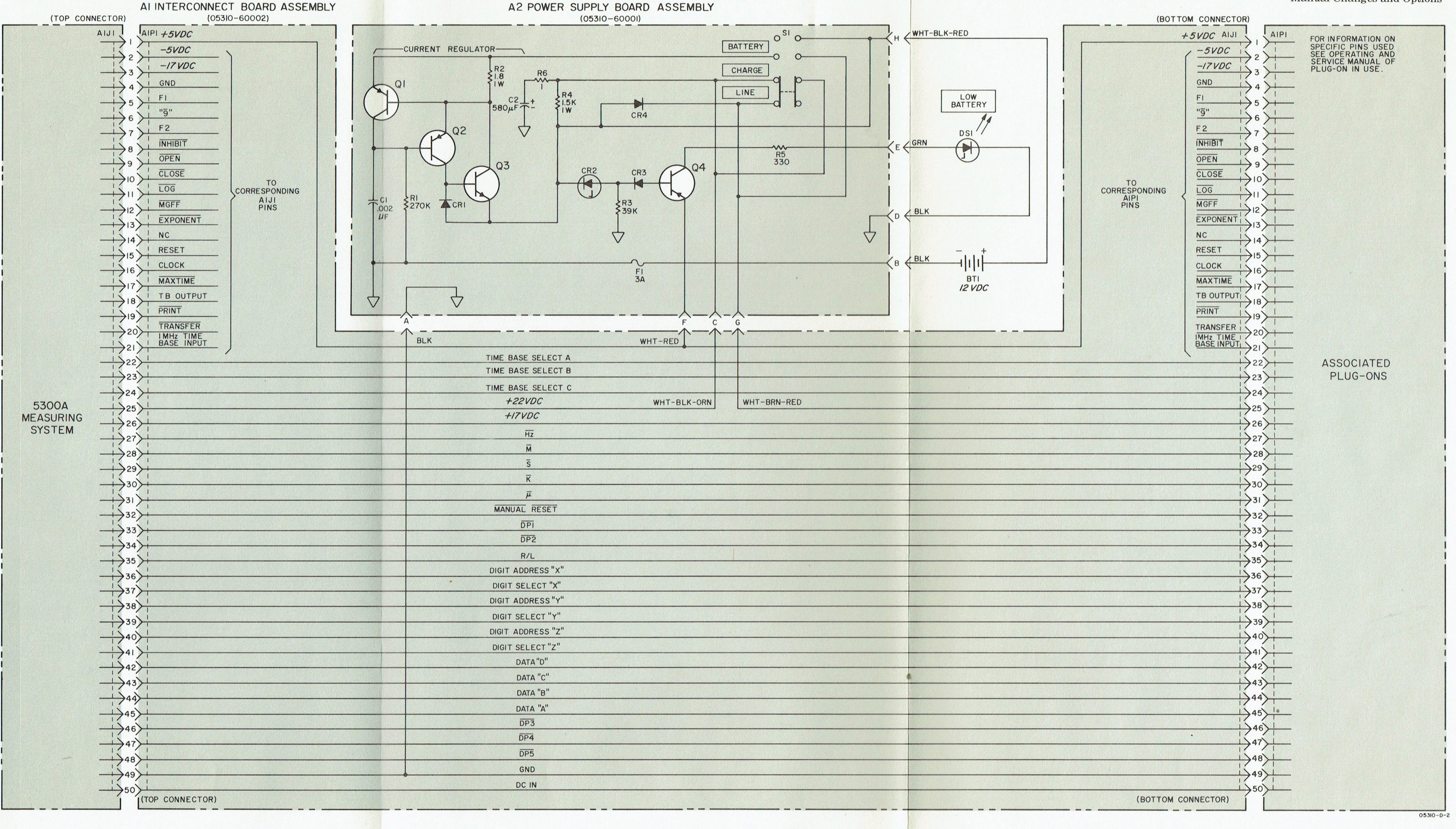
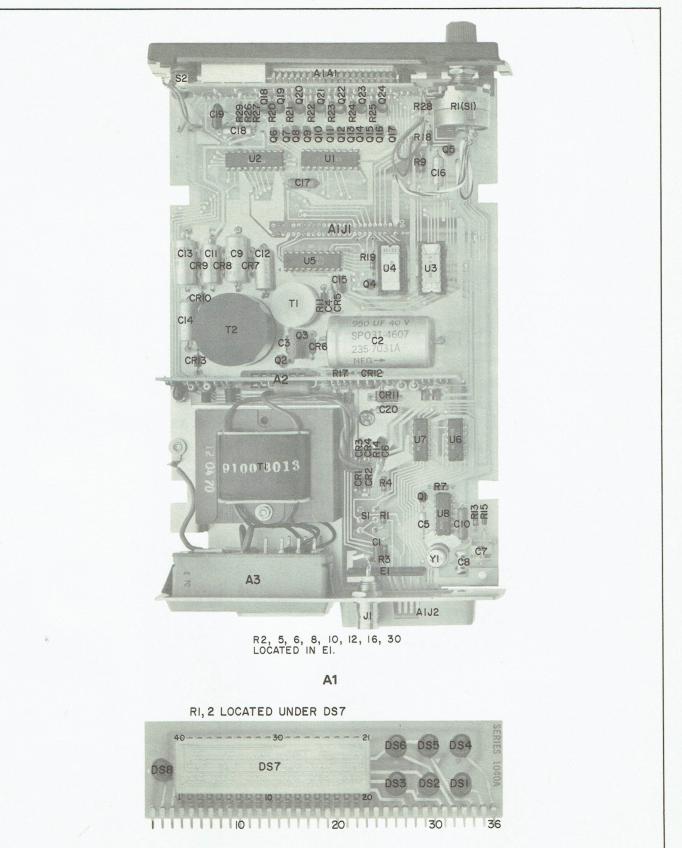
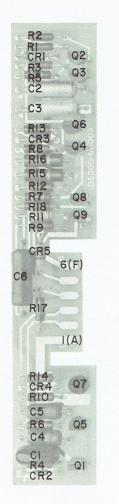


Figure 7-1
5310A Battery Pack
(Available as Accessory Only)
For Series 1128A-0051 and below

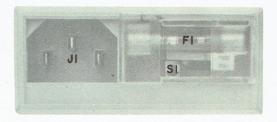


A1A1

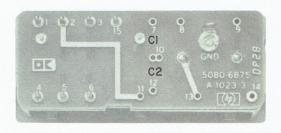
Part of Figure 7-2. 5300A Measuring System A1, A1A1, A2, A3



A2



A3 (FRONT)



A3 (REAR)

#### NOTES

- I. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
- 2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS;
- 3. DISPLAY CONNECTIONS ARE FROM REAR CIRCUIT SIDE

REFERENCE DESIGNATIONS

NO PREFIX	АІ	AIAI	A2	А3
	CI - 20 CRI - 13	DSI-8	CI - 6 CRI - 5	C1,2
	EI	9 11		FI
11	JI,2 QI-24 RI-29	DI O	Q1-9	JI
SI,2	SI TI,2	RI,2	RI - 18	SI
VI	UI - 8 YI			

TABLE OF ACTIVE COMPONENTS

TABLE OF ACTI	VE COMPONENTS
REFERENCE DESIGNATIONS	HP PART NUMBER
AI CRI-4,7-I0,I3 CR5 CR6 CRII CRI2 QI Q2,6-I7 Q3 Q4 Q5,I8-24 UI U2 U3 U4 U5 U6 U7 U7	1901 - 0028 1901 - 0050 1902 - 3381 1902 - 3205 1902 - 1259 1854 - 0094 1854 - 0492 1854 - 0487 1853 - 0020 1854 - 0071 1820 - 0635 1820 - 0635 1820 - 0633 1820 - 0632 1820 - 0328 1820 - 0328 1820 - 0424 1820 - 0578
DS1-6,8 DS7	1990-0325 1990-0311
A2 CRI CR2,3,4 CR5 Q1,8 Q2,3 Q4 Q5 Q6 Q7	1902-0689 1901-0040 1901-0050 1853-0058 1853-0056 1853-0020 1855-0367 1884-0201 1854-0071

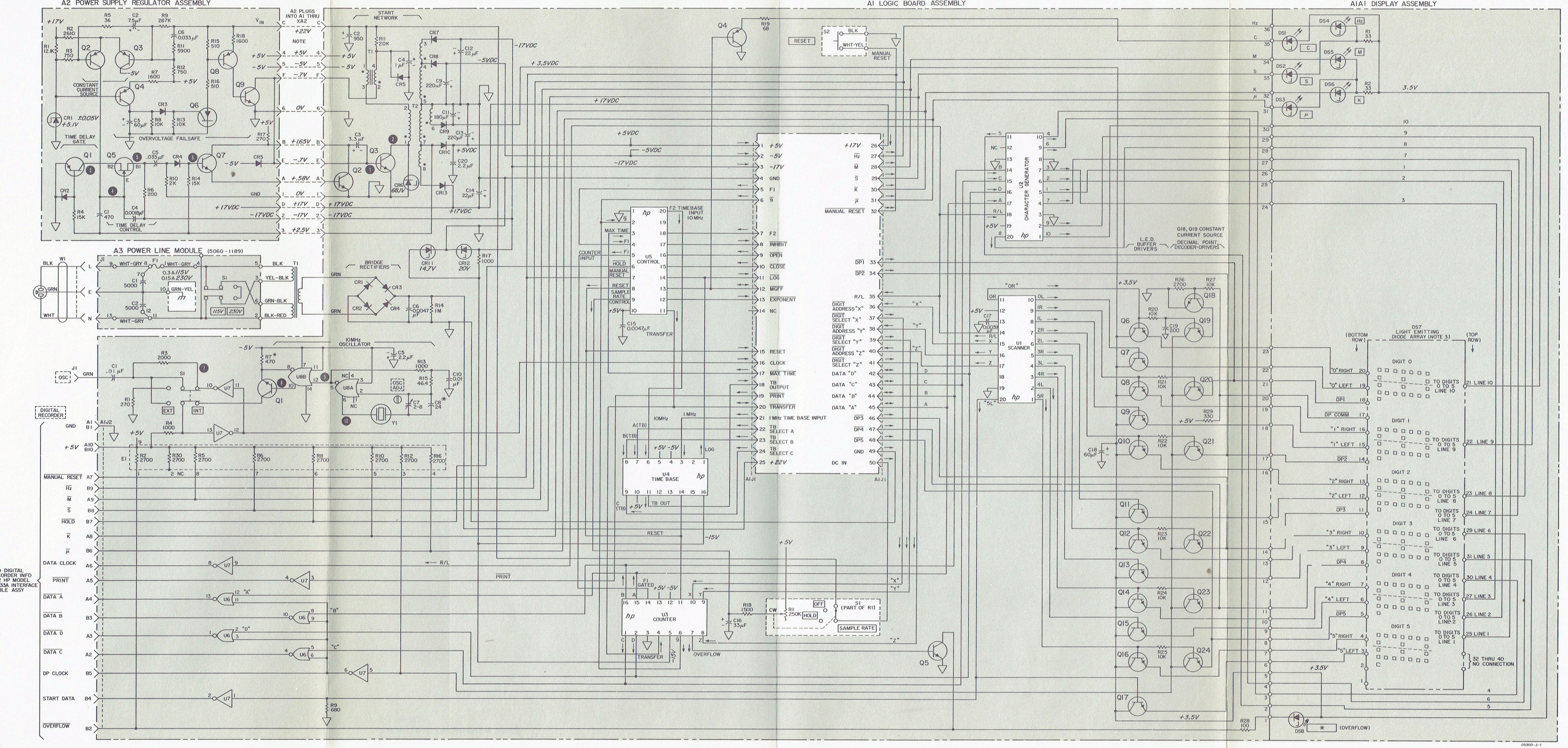


Figure 7-2 00A Measuring System A1 A1A1 A2 A3

### SECTION VI REPLACEABLE PARTS

#### 6-1. INTRODUCTION

- 6-2. This section contains information for ordering replacement parts. Tables 6-1, 6-2, and 6-3 list parts used in the HP 5300A, 5310A, and 10533A respectively. The table lists parts in alpha-numerical order of their reference designators and provides the following information on each part:
  - a. Hewlett-Packard part number.
  - b. Description of part (see abbreviations below).
- c. Total quantity used in the instrument (the first time that the part appears in the list, the total quantity of that part number is printed).
- d. Typical manufacturer of the part in a five-digit code (see list of manufacturers in Table 6-4).
  - e. Manufacturer's part number.

6-3. Miscellaneous parts are listed at the end of Table 6-1, 6-2, and 6-3.

#### 6-4. ORDERING INFORMATION

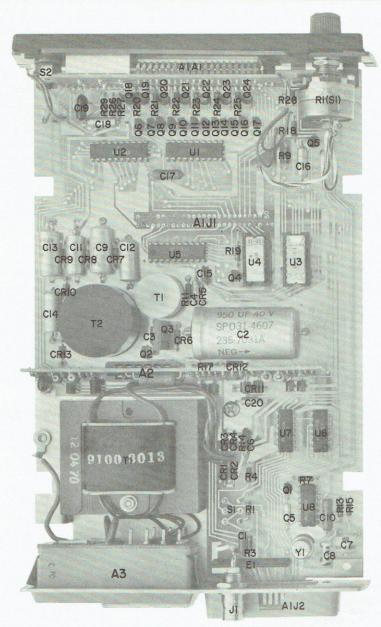
- 6-5. To obtain replacement parts, address order or inquiry to your local Hewlett-Packard Sales and Service office (see lists at rear of this Section for addresses). Identify parts by their Hewlett-Packard part number. To obtain a part that is not listed, include:
  - a. Instrument model number.
  - b. Instrument serial number.
  - c. Description of the part.
  - d. Function and location of the part.

					REFERENCE DESI	GNATORS					
A	=	assembly	F	=	fuse	MP	=	mechanical part	U	=	integrated circuit
В	=	motor	FL	=	filter	P		plug	V	=	vacuum, tube, neo
BT	=	battery	IC	=	integrated circuit	Q		transistor			bulb, photocell, et
C	-	capacitor	J	-	jack	R		resistor	VR		voltage regulator
CP		coupler	K	_	relay	RT		thermistor	W		cable
CR	_	diode	L	=	inductor	S	_	switch		_	socket
DL			LS	=	loud speaker	T		transformer		_	crystal
DS	-		M	_	meter	TB		terminal board	Z		tuned cavity.
E.		misc electronic part	MK			TP			2	=	network
L	-	misc electronic part	MK	-	microphone	TP	-	test point			network
					ABBREVIAT	IONS					
A		amperes	Н		henries	N/O		normally open		=	rack mount only
AFC	=	automatic frequency control	HDW	=	hardware	NOM	=	nominal		=	root-mean square
AMPL	=	amplifier	HEX	=	hexagonal	NPO	=	negative positive zero	RWV	=	reverse working
			HG	=	mercury			(zero temperature			voltage
BFO	=	beat frequency oscillator	HR	=	hour(s)			coefficient)	c D	_	slow-blow
BE CU	=		HZ	=	hertz	NPN	=	negative-positive-	D-D	=	
ВН	=	binder head						negative	SCR	-	screw
BP	=		IF	=	intermediate freq	NRFR	=	not recommended for	UL	=	selenium
BRS	-	brass	IMPG	=	impregnated			field replacement	DECI	=	section(s)
BWO	=	backward wave oscillator	INCD	=	incandescent	NSR	=	not separately	SEMICON		semiconductor
5.,, 0		ouchward wave oscillator	INCL	_	include(s)	non	-	replaceable	01	=	silicon
CCW		counter-clockwise.	INCL	-	insulation(ed)			repraceable	SIL	=	silver
	-			-		OBD	=	order by description	SL	=	slide
CER			INT	=	internal	OH		oval head	SPG	=	spring
CMO	=		K	=	kilo = 1000	OX		oxide	SPL	=	special
COEF	=									=	stainless steel
COM	=		LH		left hand	P		peak	SR	=	split ring
COMP			LIN		linear taper	PC	=	printed circuit		=	steel
COMPL					lock washer	PF	=	picofarads = 10-12	100 100 100 100 100 100 100 100 100 100		
		connector	LOG		logarithmic taper			farads	TA	=	tantalum
CP		cadmium plate	LPF	=	low pass filter	PH BRZ		phosphor bronze	110	=	time delay
CRT		cathode-ray tube				PHL	=	Phillips	TGL	=	toggle
CW	=	clockwise	M	=	milli = 10 <sup>-3</sup>	PIV	=	peak inverse voltage	THD	=	thread
			MEG	=	meg = 106	PNP	=	positive-negative-	TI	=	titanium
DEPC	=	deposited carbon	MET FLM	=	metal film			positive	TOL	=	tolerance
DR		drive	MET OX	=	metallic oxide	P/O	=	part of	TRIM	=	trimmer
			MFR	=	manufacturer	POLY		polystyrene	TWT	=	traveling wave tub
		electrolytic	MHZ	=	mega hertz	PORC		porcelain			
		encapsulated	MINAT	_	miniature	POS		position(s)	U	=	micro = 10 <sup>-6</sup>
EXT	=	external	MOM	-	momentary	POT		potentiometer	VAR	_	variable
F	=	farads	MOS	-	metal ozide substrate	PP		peak-to-peak	VDCW	_	dc working volts
FH		flat head	MTG	=	mounting	PT		peak-to-peak point	VDCW	-	de working voits
FIL H		fillister head	MY	-					w/	=	with
FXD		fixed	MI	-	"mylar"	PWV	-	peak working voltage	W	=	watts
					(10-9)						
G		giga (10 <sup>9</sup> )	N		nano (10-9)	RECT		rectifier	WIV	=	working inverse
GE		germanium	N/C		normally closed	RF		radio frequency			voltage
GL		glass	NE		neon	RH	=	round head or	ww	=	wirewound
GRD	=	ground(ed)	NIPL	=	nickel plate			right hand	W/O	=	without

Table 7-1. Replaceable Parts for 5300A

Reference Designation	HP Part Number	Oty	Description	Mfr Code	Mfr Part Number
A1 A1C1 A1C2 A1C3 A1C4	05300-20001 0150-0012 0180-2357 0180-0210 0180-0291	1 1 1 1	BOARD ASSY:LOGIC BLANK C:FXD MY.01 UF 20% 200VDCW C:FXD TA 950 UF 90VDCW C:FXD ELECT 3.3 UF 10% 20VDCW C:FXD ELECT 1 UF 10% 20VDCW	28480 56289 28480 56289 56289	05300-60001 192P10292-PTS 0180-2357 1500225X9020A2-DYS 1500225X9020A2-DYS
A1C5 A1C6 A1C7 A1C8 A1C9	0180-0197 0150-0075 0121-0059 0160-2266 0180-2208	2 2 1 1 2	C:FXD ELECT 2.2 UF 10% 20VDCW C:FXD CER 4700 PF +100-20% 500VDCW C:VAR CER 2-8 PF 300VDCW C:VAR CER 24 PF 5% 500VDCW FACT. SELECT C:FXD ELECT 220 UF 10% 10VDCW	56289 72982 28480 72982 56289	150D225X9020A2-DYS 851-000-X5UD-472Z 0121-0059 301-000-C0GC-240J 150D227X9010S2-DYS
A1C10 A1C11 A1C12 A1C13 A1C14	0160-0161 0180-1702 0180-1794 0180-2208 0180-1794	1 1 2	C:FXD MY 0.01 UF 10% 200VDCW C:FXD ELECT 180 UF 20% 6VDCW C:FXD ELECT 22 UF 10% 35VDCW C:FXD ELECT 220 UF 10% 10VDCW C:FXD ELECT 22 UF 10% 35VDCW	56289 56289 56289 56289 56289	192P10392-PTS 150D187X0006R2-DYS 150D226X9035R2-DYS 150D227X9010S2-DYS 150D226X9035R2-DYS
A1C15 A1C16 A1C17 A1C18 A1C19	0150-0075 0180-0229 0160-0156 0180-0106 0140-0198	1 1 2 1	C:FXD CER 4700 PF +100-20% 500VDCW C:FXD ELECT 33 UF 10% 10VDCW C:FXD MY 0.0039 UF 10% 200VDCW C:FXD ELECT 60 UF 20% 6VDCW C:FXD MICA 200 PF 5%	72982 28480 56289 28480 72136	851-000-X5UD-472Z 0180-0229 192P39292-PTS 0180-0106 RDM15F201J3C
A1C20 A1CR1 A1CR2 A1CR3 A1CR4	0180-0197 1901-0028 1901-0028 1901-0028 1901-0028	9	C:FXD ELECT 2.2 UF 10% 20VDCW DIDDE:SILICON 0.75A 400PIV DIGDE:SILICON 0.75A 400PIV DIGDE:SILICON 0.75A 400PIV DIGDE:SILICON 0.75A 400PIV	56289 04713 04713 04713 04713	150D225X9020A2-DYS SR1358-9 SR1358-9 SR1358-9 SR1358-9
A1CR5 A1CR6 A1CR7 A1CR8 A1CR9	1901-0050 1902-3381 1901-0028 1901-0028	2	DIGDE:SI 200 MA AT 1V DIGDE BREAKDONN:68.1V 400MW DIGDE:SILICON 0.75A 400PIV DIGDE:SILICON 0.75A 400PIV DIGDE:SILICON 0.75A 400PIV	07263 28480 04713 04713	FDA 6308 1902-3381 SR1358-9 SR1358-9 SR1358-9
AlCRIO AlCRII AlCRI2 AlCRI3 AlEI	1901-0028 1902-3205 1902-1259 1901-0028 1810-0041	1 1	DIGDE:SILICON 0.75A 400PIV DIGDE BREAKDOWN:15.0V 5% DIGDE BREAKDOWN DIGDE:SILICON 0.75A 400PIV R:NETWORK.8 RES. 2.7K OHM 5% (Contains: R2, R5, R6, R8, F10, R12, R16, R30)	04713 28480 28480 04713 28480	SR1358-9 1902-3205 1902-1259 SR1358-9 1810-0041
A101 A102 A103 A104 A105	1854-0054 1854-0452 1854-0487 1853-0020 1854-0071	1 14 1 2 9	R5, R6, R8, F10, R12, R16, R30) TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN TSTR:SI PNP(SELECTED FROM 2N3702) TSTR:SI NPN(SELECTED FROM 2N3704)	80131 28480 28480 28480 28480	2N3646 1854-0492 1854-0487 1853-0020 1854-0071
A106 A107 A108 A109 A1010	1854-0452 1854-0452 1854-0452 1854-0452 1854-0452		TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN	28480 28480 28480 28480 28480	1854-0492 1854-0492 1854-0492 1854-0492 1854-0492
A1011 A1012 A1013 A1014 A1015	1854-0492 1854-0492 1854-0492 1854-0492 1854-0492		TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN	28480 28480 28480 28480 28480	1854-0452 1854-0492 1854-0492 1854-0452 1854-0492
A1016 A1017 A1018 A1019 A1020	1854-0452 1854-0452 1854-0071 1854-0071 1854-0071		TSTR:SI NPN TSTR:SI NPN TSTR:SI NPN(SELECTED FROM 2N3704) TSTR:SI NPN(SELECTED FROM 2N3704) TSTR:SI NPN(SELECTED FROM 2N3704) TSTR:SI NPN(SELECTED FROM 2N3704)	28480 28480 28480 28480 28480	1854-0452 1854-0492 1854-0071 1854-0071
A1021 A1022 A1023 A1024 A1R1	1854-0071 1854-0071 1854-0071 1854-0071 0683-2715	1	TSTR:SI NPN(SELECTED FROM 2N3704) TSTR:SI NPN(SELECTED FROM 2N3704) TSTR:SI NPN(SELECTED FROM 2N3704) TSTR:SI NPN(SELECTED FROM 2N3704) R:FXD COMP 270 OHM 5% 1/4W	28480 28480 28480 28480 01121	1854-0071 1854-0071 1854-0071 1854-0071 CB 2715
A1R2 A1R3 A1R4 A1R5 A1R6	0683-2025 0683-1025	3 1	PART OF E1 R:FXD COMP 2000 OHM 5% 1/4W R:FXD COMP 1000 OHM 5% 1/4W PART OF E1 PART OF E1	01121 01121	CB 2025 CB 1025
A1R7 A1R8	0683-4715	1	R:FXD COMP 470 OHM 5% 1/4W Factory Select	01121	св 4715
A1R9 A1R10	0683-6815	1	R:FXD COMP 680 OHM 5% 1/4W PART OF E1	01121	CB 6815
A1R11 A1R12 A1R13	0683-2035	1	PART OF E1	01121	CB 2035
A1R14 A1R15 A1R16	0683-1025 0683-1055 0698-4037	1 1	RIFXD COMP 1000 OHM 5% 1/4W RIFXD COMP 1 MEGOHM 5% 1/4W RIFXD MET FLM 46°4 OHM 1% 1/8W PART OF E1	01121 01121 28480	CB 1025 CB 1055 .0698-4037

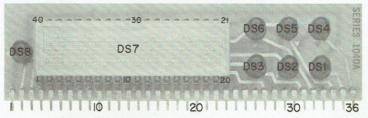
See introduction to this section for ordering information



R2, 5, 6, 8, 10, 12, 16, 30 LOCATED IN EL.

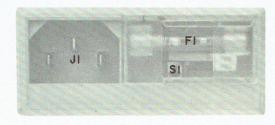
A1

RI, 2 LOCATED UNDER DS7

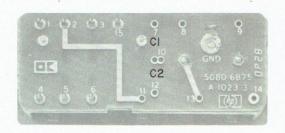


A1A1





A3 (FRONT)



A3 (REAR)

#### NOTES

- I. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
- 2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS;
- 3. DISPLAY CONNECTIONS ARE FROM REAR CIRCUIT SIDE

REFERENCE DESIGNATIONS

NO PREFIX	Al	AIAI	A2	А3
	CI - 20 CRI - 13		CI - 6 CRI - 5	C1,2
	EI	DS1-8		
	-			FI
JI	J1,2 Q1-24		Q1-9	JI
RI	RI - 29	R1,2	RI - 18	
\$1,2	SI			SI
TI	T1,2 U1-8			
WI	01-6			
	YI		Police 1 house	

TABLE OF ACTIVE COMPONENTS

REFERENCE	HP
DESIGNATIONS	PART NUMBER
AI	1901-0028
CRI-4,7-10,13	1901-0050
CR5	1902-3381
CR6	1902-3381
CR10	1902-3205
CR112	1902-1259
QI	1854-0092
Q2,6-17	1854-0092
Q3	1854-0487
Q4	1853-0020
Q5,18-24	1854-0071
U1	1820-0633
U2	1820-0633
U3	1820-0633
U4	1820-0632
U5	1820-0328
U6	1820-0424
U7	1820-0427
U8	0410-0423
DSI-6,8	1990-0325
DS7	1990-0311
CRI CR2,3,4 CR5 Q1,8 Q2,3 Q4 Q5 Q6 Q7 Q9	1902-0689 1901-0040 1901-0050 1853-0058 1853-0086 1853-0020 1855-0367 1884-0201 1854-0071

Figure 7-0A Measuring System A1, A1A1, A2, A

## SECTION VIII CIRCUIT DIAGRAMS

#### 8-1. GENERAL

- 8-2. Section VIII contains:
  - a. Schematic Diagram Notes.
- b. An Assembly Designation/Signal Name Pin list of signals in the instrument listing where they originate and where they go.
- c. Component locators and circuit  $\operatorname{diagrams}$  of assemblies.

Figure 8-1. Schematic Diagram Notes

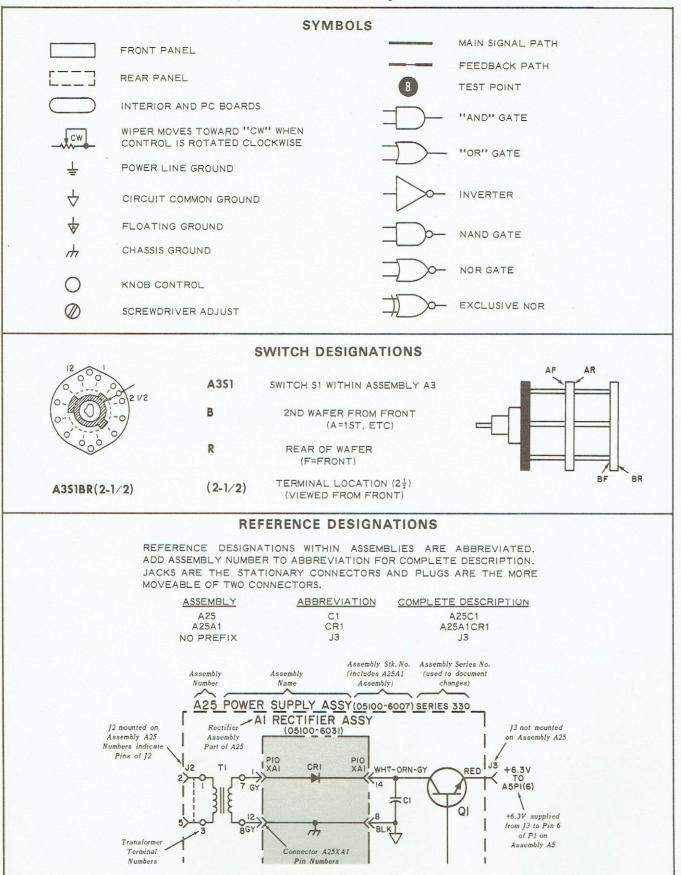


Table 8-1. Assembly Designation/Signal Name List

ASSEMBLY DESIG.	PIN NO.	SIGNAL NAME	ASSEMBLY DESIG.	PIN NO.	SIGNAL NAME
A1A1DS7	1	NC	A1J1	1	+5 V
A1A1DS7	2	NC	A1J1	2	-5V
A1A1DS7	3	COLUMN (5L)+	A1J1	3	-17V
A1A1DS7	4	COLUMN (5R)+	A1J1	4	GND
A1A1DS7	5	DP(5)-	A1J1	5	F1
A1A1DS7	6	COLUMN(4L)+	A1J1	6	11911
A1A1DS7	7	COLUMN(4R)+	A1J1	7	F2
A1A1DS7	8	DP(4)-	A1J1	8	INHIBIT
A1A1DS7	9	COLUMN(3L)+	A1J1	9	OPEN
A1A1DS7	10	COLUMN(3R)+	A1J1	10	CLOSE
A1A1DS7	11	DP(3) -	A1J1	11	LOG OUTPUT
A1A1DS7	12	COLUMN(2L)+	A1J1	12	MGFF
A1A1DS7	13	COLUMN(2R)+	A1J1	13	EXP
A1A1DS7	14	<u>DP(2)</u> -	A1J1	14	NC
A1A1DS7	15	COLUMN(1L)+	A1J1	15	RESET
A1A1DS7	16	COLUMN(1R)+	A1J1	16	CLOCK
A1A1DS7	17	DP COMMON+	A1J1	17	MAX TIME
A1A1DS7	18	DP(1) -	A1J1	18	TIME BASE OUTPUT
A1A1DS7	19	COLUMN(OL)+	A1J1	19	PRINT
A1A1DS7	20	COLUMN(OR)+	A1J1	20	TRANSFER
A1A1DS7	21	LINE(10) -	A1J1	21	TIME BASE INPUT
A1A1DS7	22	LINE(9)-			(1 MHz)
A1A1DS7	23	LINE(8)-	A1J1	22	TIME BASE SELECT
A1A1DS7	24	LINE(7)-	A 1 T1	23	TIME BASE SELECT
A1A1DS7	25	LINE(1) -	A1J1	23	"B"
A1A1DS7	26	LINE(2) -	A1J1	24	TIME BASE SELECT
A1A1DS7	27	LINE(3) -			"C"
A1A1DS7	28	NC NC	A1J1	25	+22V
A1A1DS7	29	LINE(6)-	A1J1	26	+17V
A1A1DS7	30	LINE(4) -	A1J1	27	HZ
A1A1DS7	31	LINE(5) -	A1J1	28	M
A1A1DS7	32	NC	A1J1	29	S
A1A1DS7	33	NC	A1J1	30	K
A1A1DS7	34	NC NC	A1J1	31	Ū
	35		A1J1	32	MAN RESET
A1A1DS7	36	NC NC	A1J1	33	DP(1)-
A1A1DS7	37	NC NC	A1J1	34	DP(2)-
A1A1DS7		$\overline{DP(6)}$ (not used)	A1J1	35	RIGHT/LEFT
A1A1DS7	38		A1J1	36	DIGIT ADDRESS "X"
A1A1DS7	39	NC NC	A1J1	37	DIGIT SELECT "X"
A1A1DS7	40	NC	A1J1	38	DIGIT ADDRESS "Y"

Table 8-1. Assembly Designation/Signal Name List (Continued)

ASSEMBLY DESIG.	PIN NO.	SIGNAL NAME	ASSEMBLY DESIG.	PIN NO.	SIGNAL NAME
A1J1	39	DIGIT SELECT "Y"	A1U2	7 *	LINE(3)-
A1J1	40	DIGIT ADDRESS "Z"	A1U2	8	GND
A1J1	41	DIGIT SELECT "Z"	A1U2	9 *	LINE(5)-
A1J1	42	DATA "D"	A1U2	10 *	LINE(4)-
A1J1	43	DATA "C"	A1U2	11 *	LINE(6)-
A1J1	44	DATA "B"	A1U2	12	BRIGHTNESS
A1J1	45	DATA "A"	A1U2	13	GND
A1J1	46	<u>DP(3)</u> -	A1U2	14	DATA "B"
A1J1	47	<u>DP(4)</u> -	A1U2	15	DATA "C"
A1J1	48	<u>DP(5)</u> -	A1U2	16	DATA ''D''
A1J1	49	GND	A1U2	17	DATA "A"
A1J1	50	DC IN (BATTERY/EXT)	A1U2	18	RIGHT/LEFT
	1 *		A1U2	19	+5V
A1U1		COLUMN (5R)+	A1U2	20 *	LINE(8)-
A1U1	2 *	COLUMN(4L)+			
A1U1	3 *	COLUMN(4R)+	A1U3	1 *	DATA "C"
A1U1	4 *	COLUMN(3L)+	A1U3	2 *	DATA "D"
A1U1	5 *	COLUMN(3R)+	A1U3	3	GND
A1U1	6 *	COLUMN(2L)+	A1U3	4	TRANSFER
A1U1	7 *	COLUMN(2R)+	A1U3	5	-15V
A1U1	8 *	COLUMN(1L)+	A1U3	6 *	11911
A1U1	9 *	COLUMN(1R)+	A1U3	7 *	OVERFLOW
A1U1	10 *	COLUMN (0L)+	A1U3	8	DIGIT SELECT "Z"
A1U1	11 *	COLUMN(0R)+	A1U3	9	DIGIT SELECT "Y"
A1U1	12	+5V	A1U3	10	DIGIT SELECT "X"
A1U1	13	TIMING CAPACITOR	A1U3	11	RESET
A1U1	14 *	RIGHT/LEFT	A1U3	12	-5V
A1U1	15 *	DIGIT ADDRESS "X"	A1U3	13	+5V
A1U1	16 *	DIGIT ADDRESS "Y"	A1U3	14	COUNTER INPUT
A1U1	17 *	DIGIT ADDRESS "Z"	A1U3	15 *	DATA "A"
A1U1	18	NC	A1U3	16 *	DATA "B"
A1U1	19	GND	A1U4	1 *	LOG OUTPUT
A1U1	20 *	COLUMN(5L)+	A1U4	2	NC
A1U2	1 *	LINE(10)-	A1U4	3	TIME BASE INPUT
A1U2	2 *	LINE (9) -	71101	0	(1 MHz)
A1U2	3	GND	A1U4	4	-5V
A1U2	3 4 *		A1U4	5	+5V
A1U2	5 *	LINE(7) - LINE(1) -	A1U4	6	TIME BASE INPUT (10 MHz)
A1U2	6 *	LINE(2)-	A1U4	7	TIME BASE SELECT

Table 8-1. Assembly Designation/Signal Name List (Continued)

ASSEMBLY DESIG.	PIN NO.	SIGNAL NAME	ASSEMBLY DESIG.	PIN NO.	SIGNAL NAME
A1U4	8	TIME BASE SELECT	A1U5	5 *	COUNTER INPUT
A1U4	9	TIME BASE SELECT	A1U5	6	HOLD
A104	Э	"C"	A1U5	7	MAN RESET
A1U4	10	+5V	A1U5	8 *	RESET
A1U4	11 *	TIME BASE OUTPUT	A1U5	9	SAMPLE RATE CONTROL
A1U4	12	NC	A1U5	10	+5V
A1U4	13	NC	A1U5	11 *	TRANSFER
A1U4	14	RESET	A1U5	12 *	EXP
A1U4	15	NC	A1U5	13 *	MGFF
A1U4	16	-15V	A1U5	14	LOG OUTPUT
			A1U5	15	CLOSE
A1U5	1	GND	A1U5	16	OPEN
A1U5	2	<del>"9"</del>	A1U5	17 *	INHIBIT
A1U5	3	MAX TIME	A1U5	18	F2
A1U5	4	F1	A1U5 A1U5	19 20 *	NC TIME BASE INPUT (10 MHz)

Table 8-2. Signal Name/Assembly Designation List

SIGNAL NAME	ASSEMBLY DESIG.	PIN NO.	SIGNAL NAME	ASSEMBLY DESIG.	PIN NO.
+17V	A1J1	26	COLUMN(4L)+	A1A1DS7	6
+22V	A1J1	25	COLUMN(4R)+	A1U1	3 *
+5V	A1J1	1	COLUMN(4R)+	A1A1DS7	7
+5V	A1U1	12	COLUMN(5L)+	A1U1	20 *
+5V	A1U2	19	COLUMN(5L)+	A1A1DS7	3
+5V	A1U3	13	COLUMN(5R)+	A1U1	1 *
+5V	A1U4	5	COLUMN(5R)+	A1A1DS7	4
+5V	A1U4	10	COUNTER INPUT	A1U3	14
+5V	A1U5	10	COUNTER INPUT	A1U5	5 3
-15V	A1U3	5	DATA "A"	A1J1	45
-15V	A1U4	16	DATA "A"	A1U2	17
-17V	A1J1	3	DATA "A"	A1U3	15 '
-5V	A1J1	2	DATA "B"	A1J1	42
-5V	A1U3	12	DATA "B"	A1U2	14
-5V	A1U4	4	DATA "B"	A1U3	16
11911	A1J1	6	DATA "C"	A1J1	43
<del>11911</del>	A1U3	6 *	DATA "C"	A1U2	15
<del>11911</del>	A1U5	2	DATA "C"	A1U3	1 '
BRIGHTNESS	A1U2	12	DATA ''D''	A1J1	44
CLOCK	A1J1	16	DATA ''D''	A1U2	16
CLOSE	A1J1	10-	DATA ''D''	A1U3	2 3
CLOSE	A1U5	15	DC IN (BATTERY/EXT)	A1J1	50
COLUMN(0L)+	A1U1	10 *	DIGIT ADDRESS "X"	A1U1	15
COLUMN(0L)+	A1A1DS7	19	DIGIT ADDRESS "X"	A1J1	36
COLUMN(0R)+	A1U1	11 *	DIGIT ADDRESS "Y"	A1U1	16
COLUMN(0R)+	A1A1DS7	20	DIGIT ADDRESS "Y"	A1J1	38
COLUMN(1L)+	A1U1	8	DIGIT ADDRESS "Z"	A1U1	17
COLUMN(1L)+	A1A1DS7	15	DIGIT ADDRESS "Z"	A1J1	40
COLUMN(1R)+	A1U1	9 *	DIGIT SELECT "X"	A1J1	37
COLUMN(1R)+	A1A1DS7	16	DIGIT SELECT "X"	A1U3	10
COLUMN(2L)+	A1U1	6 *	DIGIT SELECT "Y"	A1J1	39
COLUMN(2L)+	A1A1DS7	12	DIGIT SELECT "Y"	A1U3	9
COLUMN(2R)+	A1U1	7 *	DIGIT SELECT "Z"	A1J1	41
COLUMN(2R)+	A1A1DS7	13	DIGIT SELECT "Z"	A1U3	8
COLUMN(3L)+	A1U1	4 *	DP COMMON +	A1A1DS7	17
COLUMN(3L)+	A1A1DS7	9	DP(1) -	A1J1	33
COLUMN(3R)+	A1U1	5 *	DP(1) -	A1A1DS7	18
COLUMN(3R)+	A1A1DS7	10	DP(2)-	A1J1	34
COLUMN(4L)+	A1U1	2 *	DP(2)-	A1A1DS7	14
			DP(3)-	A1J1	46

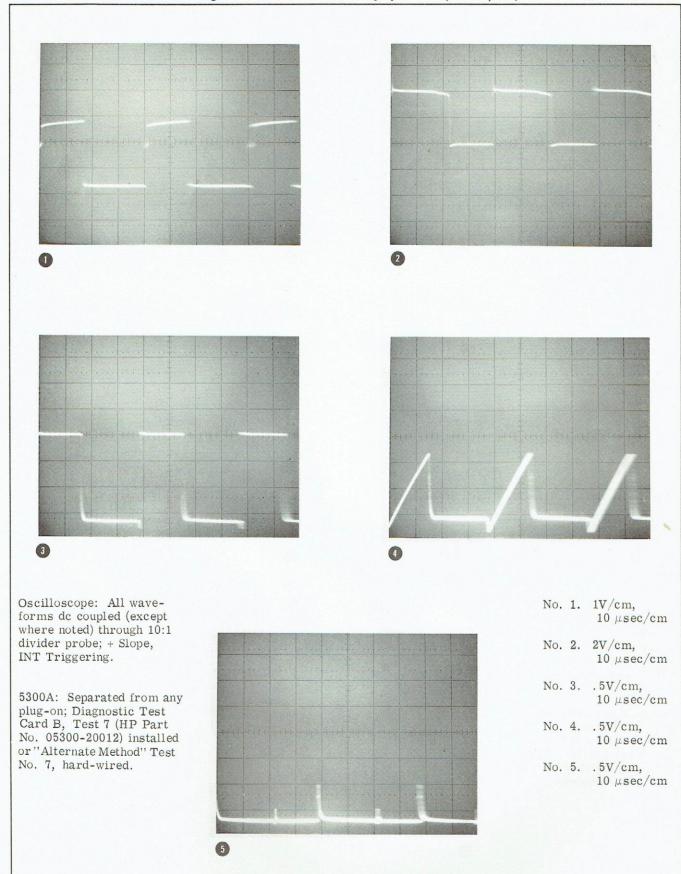
Table 8-2. Signal Name/Assembly Designation List (Continued)

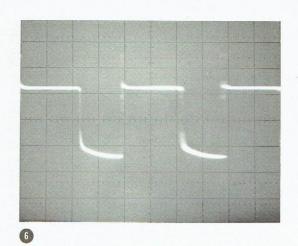
SIGNAL NAME	ASSEMBLY DESIG.	PIN NO.	SIGNAL NAME	ASSEMBLY DESIG.	PIN NO.
DP(3) -	A1A1DS7	11	LINE(8)-	A1U2	20 *
DP(4)-	A1J1	47	LINE(8)-	A1A1DS7	23
DP(4)-	A1A1DS7	8	LINE(9)-	A1U2	2 *
DP(5) -	A1J1	48	LINE(9)-	A1A1DS7	22
DP(5) -	A1A1DS7	5	LINE(10)-	A1U2	1 *
DP(6) (not used)	A1A1DS7	38	LINE(10)-	A1A1DS7	21
EXP	A1J1	13	LOG OUTPUT	A1J1	11
EXP	A1U5	12 *	LOG OUTPUT	A1U4	1
F1	A1J1	5	LOG OUTPUT	A1U5	13
F1	A1U5	4	$\overline{\mathrm{M}}$	A1J1	28
F2	A1J1	7	$\overline{\mathbf{M}}$	A1J2	A9
F2	A1U5	18	MAN RESET	A1J1	32
GND	A1J1	4	MAN RESET	A1J2	A7
GND GND	A1U1 A1J1	19 49	MAN RESET	A1U5	7
GND	A1U2	3	MAX TIME	A1J1	17
GND GND	A1U2 A1U2	13 8	MAX TIME	A1U5	3
GND	A1U3	3	MGFF	A1J1	1.2
GND	A1U5	1	MGFF	A1U5	14*
HOLD	A1U5	6	NC	A1J1	14
HOLD	A1J2	B7	NC	A1U1	18
HZ	A1J1	27	NC	A1A1DS7	1
ΗZ	A1J2	В9	NC NC	A1A1DS7 A1A1DS7	2 28
INHIBIT	A1J1	8	NC	A1A1DS7	32
INHIBIT K	A1U5 A1J1	17 *	NC NC	A1A1DS7 A1A1DS7	33 34
K	A1J2	A8	NC	A1A1DS7	35
LINE(1)-	A1U2	5 *	NC NC	A1A1DS7 A1A1DS7	36 37
LINE(1)-	A1A1DS7	25	NC	A1A1DS7	39
LINE(2)-	A1U2	6 *	NC	A1A1DS7	40
LINE(2)-	A1A1DS7	26	NC NC	A1U4	2
LINE(3)-	A1U2	7 *	NC NC	A1U4 A1U4	12 13
LINE(3)-	A1A1DS7	27	NC NC	A1U4	15
LINE(4)-	A1U2	10 *	NC	A1U5	19
LINE(4)-	A1A1DS7	30	OPEN	A1J1	9
LINE(5)-	A1U2	11 *	OPEN	A1U5	16
LINE(5)-	A1A1DS7	31	OVERFLOW	A1U3	7 *
LINE(6) -	A1U2	9 *	OVERFLOW	A1J2	B2
LINE(6)-	A1A1DS7	29	PRINT	A1J1	19
LINE(7)-	A1U2	4 *	PRINT	A1J2	A5
LINE(7)-	A1A1DS7	24	RESET	A1J1	15

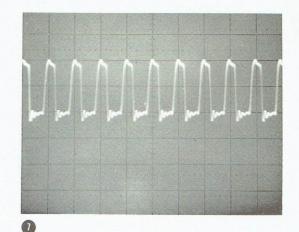
Table 8-2. Signal Name/Assembly Designation List (Continued)

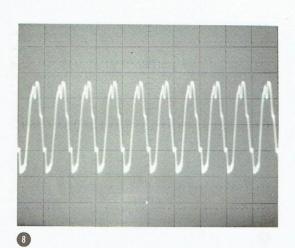
SIGNAL NAME	ASSEMBLY DESIG.	PIN NO.	SIGNAL NAME	ASSEMBLY DESIG,	PIN NO.
RESET	A1U2	18	TIME BASE OUTPUT	A1J1	18
RESET	A1U3	11	TIME BASE OUTPUT	A1U4	11 *
RESET	A1U4	14	TIME BASE SELECT "A"	A1J1	22
RESET	A1U5	8 *	TIME BASE SELECT "A"	A1U4	7
RIGHT/LEFT	A1U1	14 *	TIME BASE SELECT "B"	A1J1	23
RIGHT/LEFT	A1J1	35	TIME BASE SELECT "B"	A1U4	8
S	A1J1	29	TIME BASE SELECT "C"	A1J1	24
S	A1J2	B8	TIME BASE SELECT "C"	A1U4	9
SAMPLE RATE CONTROL	A1U5	9	TIMING CAPACITOR	A1U1	13
TIME BASE INPUT (1 MHz)	A1J1	21	TRANSFER	A1J1	20
TIME BASE INPUT (1 MHz)	A1U4	3	TRANSFER	A1U3	4
TIME BASE INPUT (10 MHz)	A1U4	6	TRANSFER	A1U5	11 *
TIME BASE INPUT (10 MHz)	A1U5	20*	$\overline{\mu}$	A1J1	31
			$\overline{\mu}$	A1J2	В6

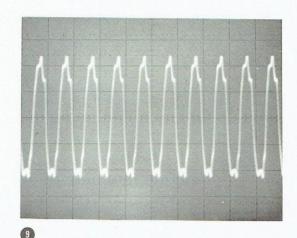
<sup>\*</sup>Asterisk indicates sources of signal.





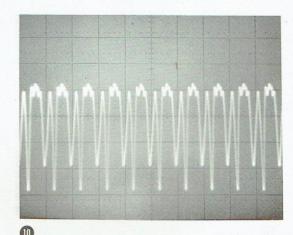






Oscilloscope: All waveforms dc coupled (except where noted) through 10:1 divider probe; + Slope, INT Triggering.

5300A: Separated from any plug-on; Diagnostic Test Card B, Test 7 (HP Part No. 05300-20012) installed or "Alternate Method" Test No. 7, hard-wired.



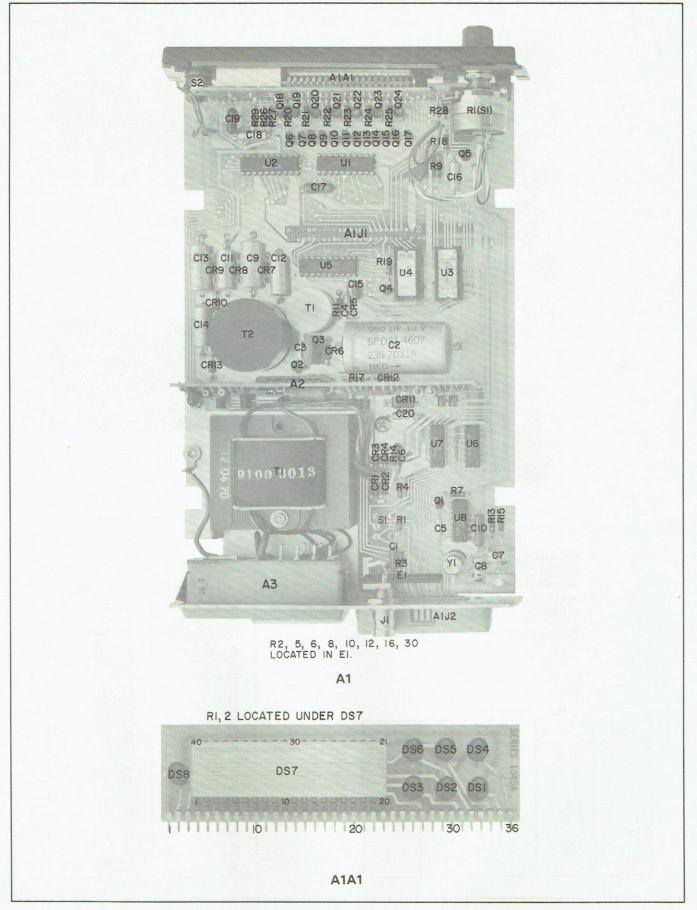
No. 6. .1V/cm, 10  $\mu \rm sec/cm$ 

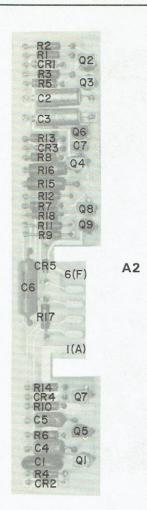
No. 7. .2V/cm, .1  $\mu sec/cm$ 

No. 8. .02V/cm, .1  $\mu sec/cm$  ac coupled

No. 9. .02V/cm, .1  $\mu \rm sec/cm$  ac coupled

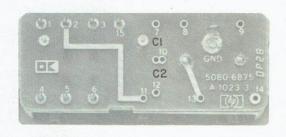
No. 10. .02V/cm, .1  $\mu \rm sec/cm$  ac coupled







A3 (FRONT)



A3 (REAR)

#### NOTES

- I. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
- 2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS;
- 3. DISPLAY CONNECTIONS ARE FROM REAR CIRCUIT SIDE

REFERENCE DESIGNATIONS

NO PREFIX	AI	AIAI	A2	А3
	C1 - 20 CRI - 13	DSI-8	CI - 7 CRI - 5	01,2
	EI	031-6		
JI .	J1,2	100		FI JI
21	Q1-24 R1-29	R1,2	Q1-9 R1-18	
51,2 FI	SI	,-	111110	SI
11	T1,2 U1-8			
N I	YI			

TABLE OF ACTIVE COMPONENTS

REFERENCE	HP
DESIGNATIONS	PART NUMBER
AI	1901-0028
CRI-4,7-10,13	1901-0050
CR5	1902-3381
CR6	1902-3205
CR11	1902-1259
Q2,6-17	1854-0094
Q3,04	1854-0487
Q5,18-24	1853-0020
U1	1854-0071
U2	1820-0635
U3	1820-0634
U4	1820-0632
U5	1820-0632
U6	1820-0632
U7	1820-0424
U8	1820-0423
AIAI DSI-6,8 DS7	1990-0325 1990-0311
A2 CRI CR2,3,4 CR5 Q1,8 Q2,3 Q4 Q5 Q6 Q7 Q9	1902-0689 1901-0040 1901-0050 1853-0058 1853-0086 1853-0020 1855-0367 1884-0201 1854-0492

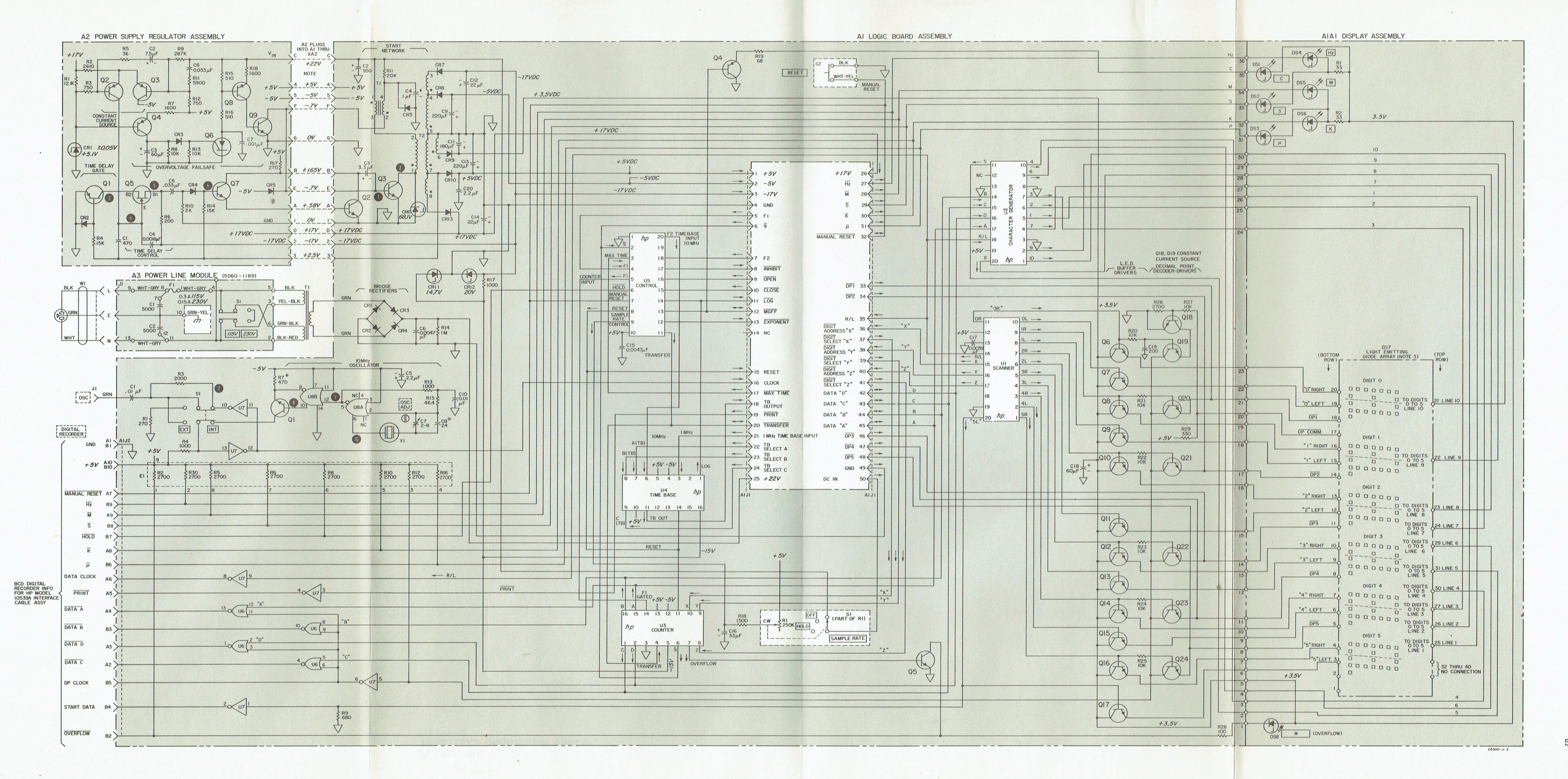
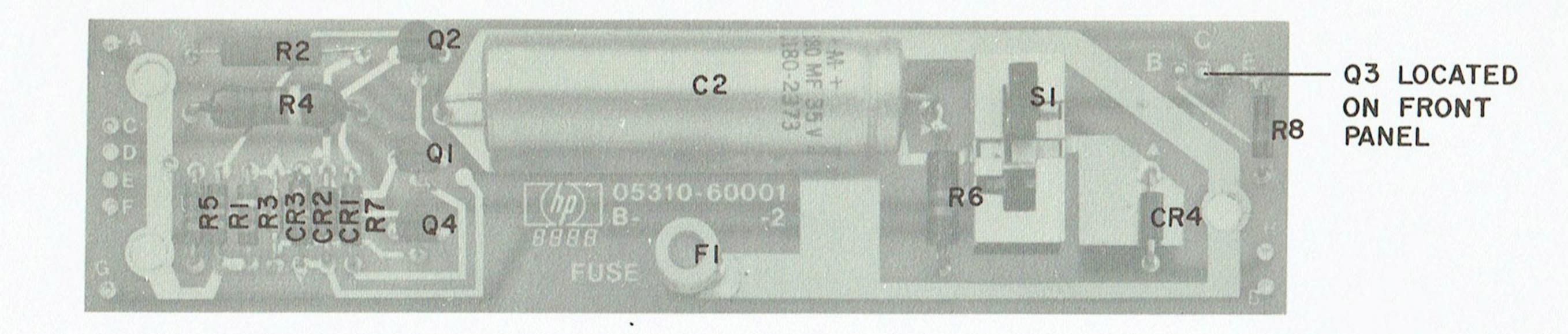


Figure 8-2 5300A Measuring System A1, A1A1, A2, A3

A



## JOTES

- I. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
- 2. UNLESS OTHERWISE INDICATED:
  RESISTANCE IN OHMS;
  CAPACITANCE IN PICOFARADS;

REFERENCE DESIGNATIONS

NO PREFIX	AI	A2
ВТІ		C2
DSI	JI	CRI-4 FI
	PI	Q1-2,4 R1-8 S1

A2CI DELETED A2Q3 DELETED

TABLE OF ACTIVE COMPONENTS

TABLE OF ACTI	VE COMPONENTS
REFERENCE DESIGNATIONS	PART NUMBER
NO PREFIX DSI Q3 A2 CRI,4 CR2 CR3	1990-0325 1854-0420 1901-0028 1902-0693 1901-0044
Q1,2,4	1853-0086

05310-D-I

Model 5300A Circuit Diagrams

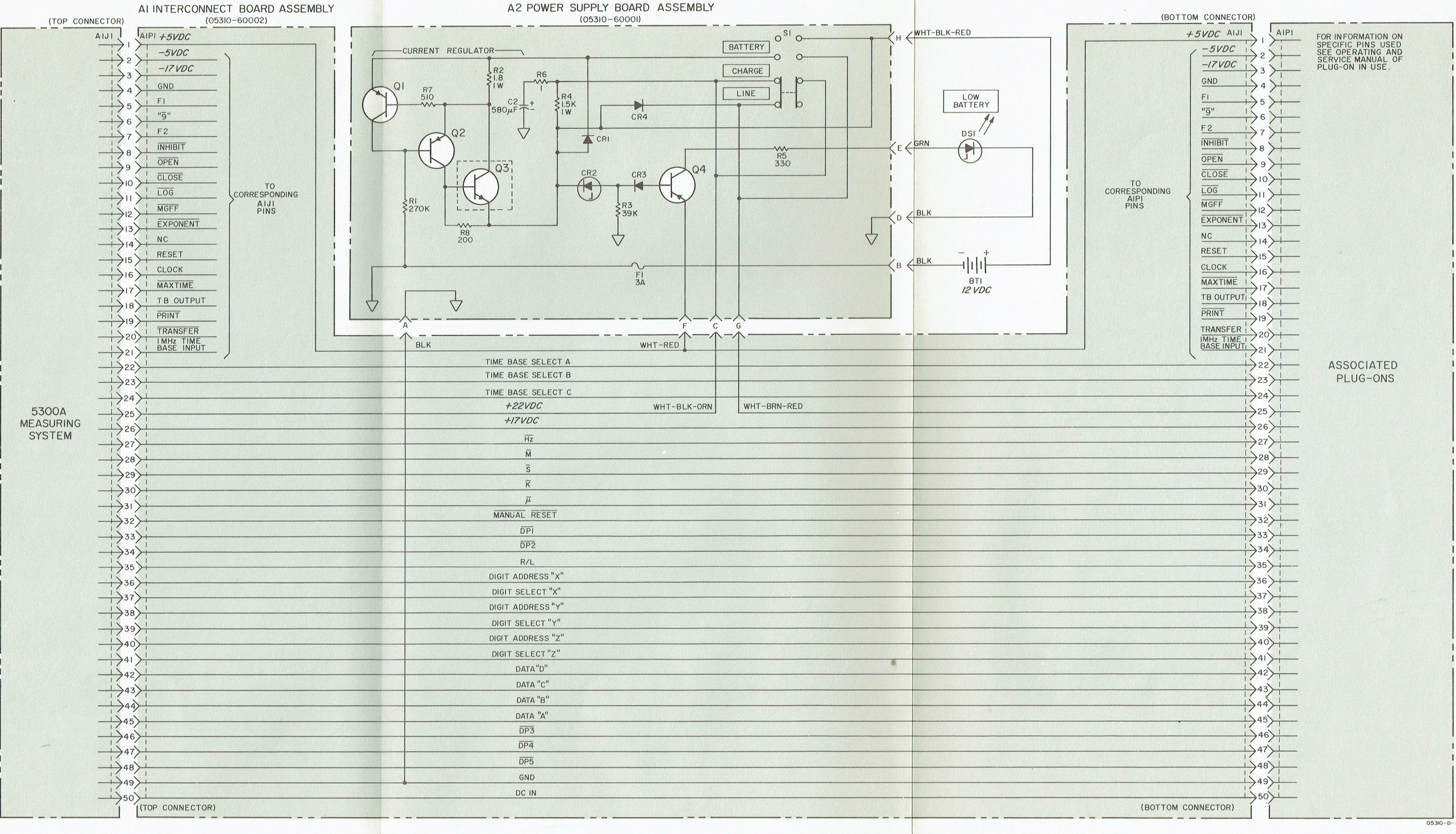
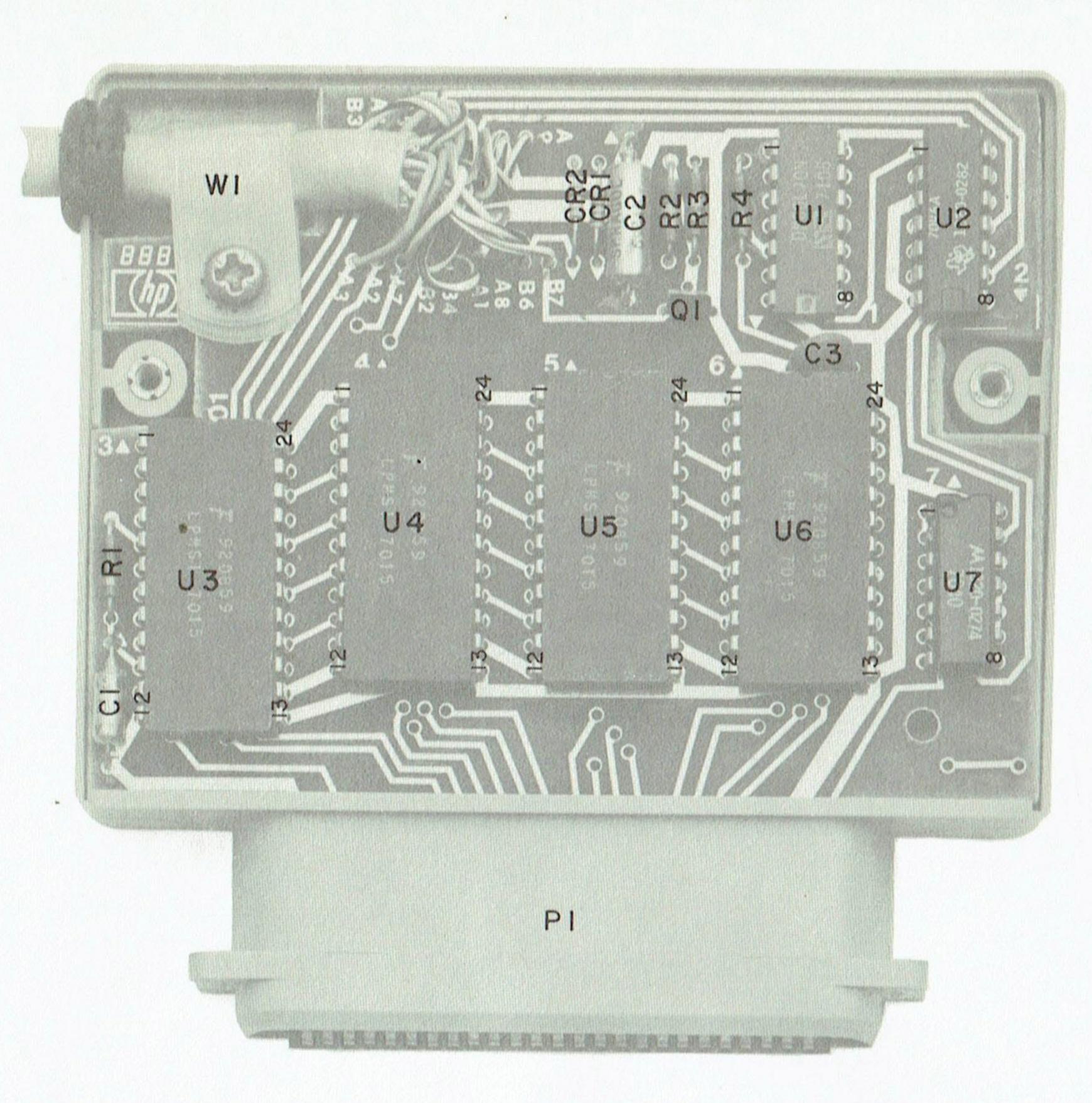


Figure 8-3 5310A Battery Pack tilable as Accessory Only)

3-15

(RI LOCATED AT P2 END OF CABLE)



# NOTES

- . REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
- 2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS;
- 3. TO BE USED WITH HP 5050B OPT 050, 051 AND 5055A RECORDERS DATA SWING = 3.8V TO 4V

# REFERENCE DESIGNATIONS

AI
C1-3
CRI,2
PI
QI
RI-4
UI-7

TABLE OF ACTIVE COMPONENTS

TABLE OF	ACTIVE COMPONENTS
REFERENCE DESIGNATIONS	PART NUMBERS
1	
CRI,2	1901-0050
QI	1854-0094
UI	1820-0602
U2	1820-0282
U3,4,5,6	1820-0614
U7	1820-0274

10533 - D-1

Model 5300A Circuit Diagrams

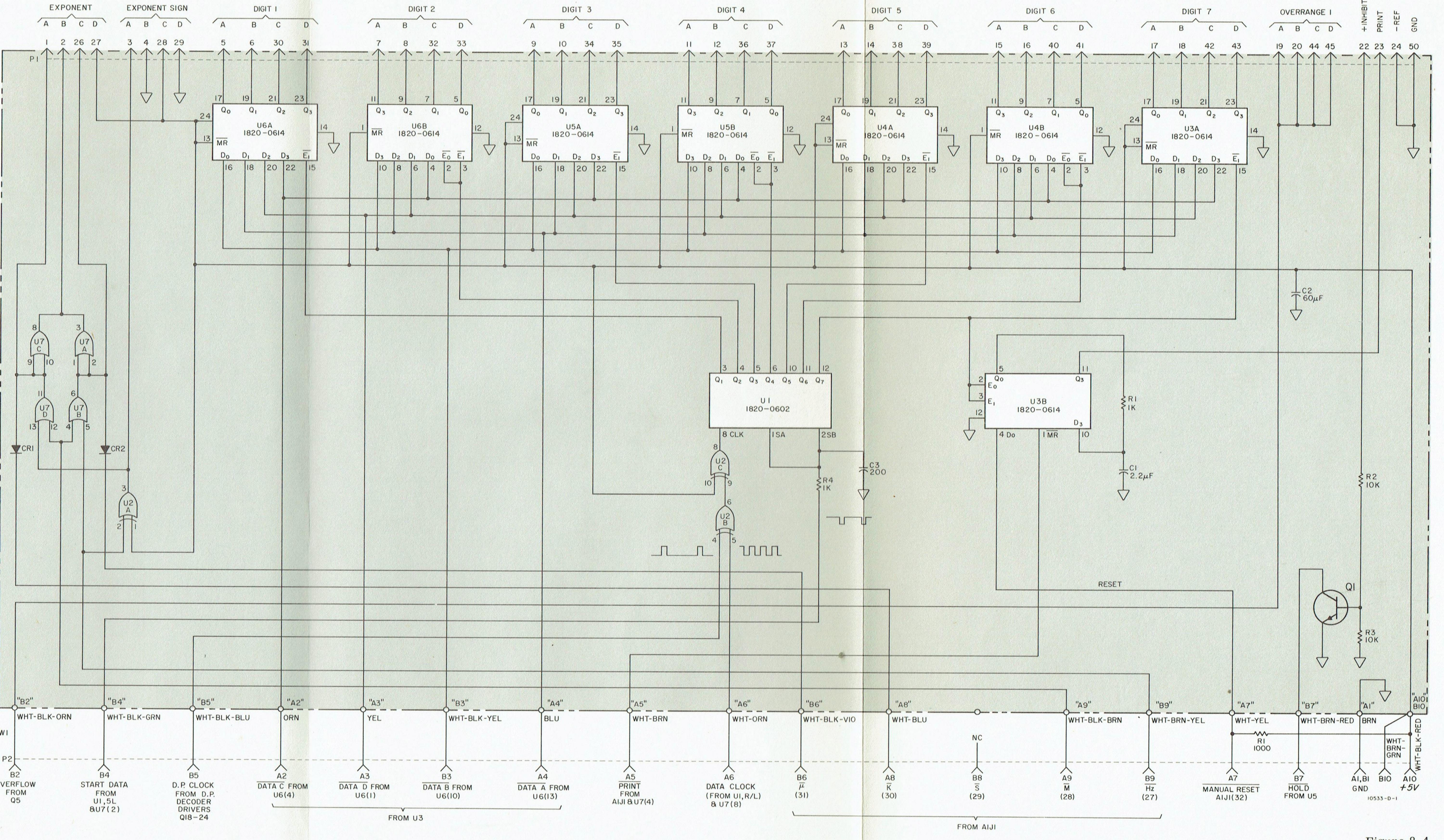


Figure 8-4 10533A Digital Recorder Interface (Available as Accessory Only)