#### **Errata**

Title & Document Type: 5326A/27A Timer Counter Operating and Service Manual

Manual Part Number: 05326-90035

**Revision Date: September 1973** 

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# TIMER COUNTER 5326A/5327A





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The Hewlett-Packara C. mpany certifies that this instrument was thoroughly tested and aspected 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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2 200

# 5326A/5327A TIMER/COUNTER

# **OPERATING AND SERVICE MANUAL**

SERIAL PREFIX: 5326A — 1312A 5327A — 1312A

This manual applies to HP Models 5326A and 5327A having serial prefix 1312A.

# SERIAL PREFIXES NOT LISTED

For serial prefixes above 1312A, a "Manual Supplement" sheet is included with this manual. For serial prefixes below 1312A, refer to Section VII of this manual.

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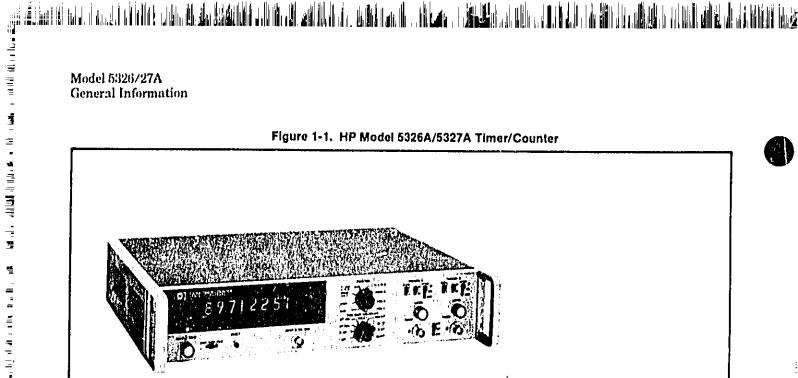
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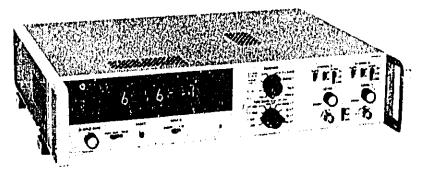
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MODEL 5326A



MODEL 5327A



POWER CORD

#### SECTION I

#### **GENERAL INFORMATION**

#### 1-1. DESCRIPTION

1-2. The Hewlett-Packard Models 5326A/5327A are frequency counters that have a variety of functions. The basic difference between the two models is the addition of the prescaler assumbly in the 5327A. This assembly increases the upper frequency limit from 50 MHz to 550 MHz. The 5326A uses a high-sensitivity, 50-ohm input amplifier in place of the prescaler.

1-3. The instruments measure frequency, period, period average, time interval, time interval average, and ratio. Features include a 7-digit display (8-digits optional), 1M ohm and 50-ohm inputs, display storage, and blanking for insignificant digits in the display. Decimal point and unit readouts are displayed automatically with each operating selection. Two independent input channels are provided for time interval measurements. Each input channel has an attenuator, trigger slope selector, level control, ac-dc coupling, and an oscilloscope marker output. Table 1-1 lists the electrical and mechanical specifications.

#### 1-4. IDENTIFICATION

1.5. Hewlett-Packard uses a two-section serial number mounted on the rear panel. Earlier instruments use an 8-digit serial number (000-00000). The first three digits are a serial prefix number; the last five digits refer to the specific instrument. Later instruments use a 9-digit serial number (0000A00000). The first four digits are the serial prefix and the last five digits refer to the specific instrument. If the serial prefix of your instrument differs from that listed on the title page of this manual, there are differences between this manual and your instrument. Lower serial prefixes are documented in Section VII, and higher serial prefixes are covered with manual change sheets included with the manual. If the change sheet is missing, contact the nearest Hewlett-Packard Sales and Service Office listed on the inside rear cover of this manual.

#### 1-6. APPLICATIONS

1-7. The 5326A/5327A Counters are particularly adaptable to timing measurements such as pulse width, pulse repetition frequency, and propagation

delay. The time interval average mode measures time interval on repetitive signals with resolution better than one nanosecond. When used with microwave test systems, group delay, phase, and level measurements can be performed.

#### 1-8. OPTIONS

1-9. The instrument can be ordered with the following options: Option 001, 8-digit display; Option 002, remote programming; Option 003, digital recorder outputs; Option 004, remote programming for all signal input conditions; Option 010, Temperature Compensated Oscillator; Option 011, HP 10544A Oven Oscillator.

Table 1-1, Equipment Supplied

Description	HP Part No.
Detachable Power Cord, 7½ ft. (231 cm) long	8120-1378
Ruck Mounting Kit	05326-60029

Table 1-2. Accessories Available

Description	HP Part No.
Digital Recorders	5050B, 5055A
Interconnect Cable, Digital Recorder, 6 ft. (183 cm)	562A-16C
50-ohm BNC to BNC Coxial Cable, 4 ft. (122 cm)	10503-6001
Circuit Board Extender, 15-pin (two required)	5060-0049
Input Amplifier Circuit Board Extender	10532-60001
Circuit Board Extender, 18-pin	5060-2041
Extender Board Kit; includes two 5060-0049, and one each 5060-2041, and 10532-60001	10532A

#### Table 1-3. Specifications

#### **INPUT CHANNELS A AND B**

Range:

de coupled: 0-50 MHz ac coupled: 20 Hz 50 MHz

Sensitivity:

0.1 V rms sine wave 0.3 V p-p pulse

8 ns minimum pulse width

Sensitivity can be decreased by 10 or 100 times, using the ATTENUATOR switch.

Impedance: 1 M $\Omega$  shunted by less than 25 pF

Dynamic Input Voltage Range:

0.1 to 3 V rms ac times attenuator setting. ±5 Vdc times attenua.or setting.

Trigger Level:

PRESET to center triggering about 0 V or variable over the range of -3 V to +3 V times attenuator setting. Trigger threshold band <1.0 mV, referred to input at maximum frequency.

**Overload Protection:** 

250 V rms on all attenuator settings, except 25 V rms on X1 above 50 kHz.

Slope:

Independent selection of positive or negative slope,

Channel Inputs: Common or separate lines.

Marker Outputs:

Rear panel BNC's DTL pulse, low for approximately 2  $\mu s$  after trigger point for A and B channels.

#### INPUT CHANNEL C

5327A

Range:

direct: 0-50 MHz, de coupled presculed: 0-550 MHz, de coupled

Sensitivity:

d. rect: 15 mV rms prescaled: 25 mV rms Impedance: 50Ω nominal

Maximum Input: 3.5 volts rms; 5 volts peak

Tripger Level: 0 volts

5326A

Range: 0 to 50 MHz, de coupled

Sensitivity: 5 mV rms Impedance: 50Ω nominal

Maximum Input: 5 volts rms; 7.5 volts peak

Trigger Level: 0 voits

CAUTION

Do not exceed voltage specification or damage will occur.

START (Totalizing and Scaling)

Range: 0 - 10 MHz

Factor: 1 - 10<sup>n</sup> selectable in decade steps Output: Rear panel TIME BASE BNC

Display:

Channel A input divided by scaling factor

#### FREQUENCY

Range:

0 - 50 MHz (5326A) 0 - 550 MHz (5327A)

Input:

Channel A; channel C for direct and for prescaled (switchable). Channel A provides triggered frequency measurement

Gale Times: 0.1 µs to 10 s in decade steps

Accuracy:

t) count displayed\* t time base accuracy

Display:

kHz, MHz, or GHz with positioned decimal poli:

#### TIME INTERVAL

Range: 0.1 μs to 10<sup>8</sup> seconds

Input:

Channels A and B; can be common or separate

Frequency Counted:

10 MHz to 0.1 Hz selectable in decade steps

Accuracy:

±1 count \* time base accuracy \* trigger
error.\*\*

Display:

µs, ms, seconds or 10's of seconds with positioned decimal point

TIME INTERVAL AVERAGE

Range: 0.15 ns to 10 seconds

Intervals Averaged:

I to 10<sup>4</sup> selectable in decade steps

\*When prescaled by 10, ±1 count displayed is ±10 counts of the input signal.

# Table 1-3. Specifications (Continued)

Input:

Start - Channel A; Stop - Channel B can be separate or common

Frequency Counted: 10 MHz

Accuracy: # time base accuracy # 2 as

t (trigger error\*\* +100 ns)

//intervals averaged

Dead Time:

Minimum time between STOP (Channel B trigger) and START (Channel A trigger): 150 ns

Display: ns, µs, with positioned decimal point

#### PERIOD

Range: 0 - 10 MHz Input: Channel A

Frequency Counted:

10 MHz to 0.1 Hz selectable in decade steps

Accuracy:

\*I count \* time base accuracy \* trigger error.\*\*\*

Display:

μs, ms, seconds or 10's of seconds with positioned decimal point

#### **PERIOD AVERAGE**

Range: 0 - 10 MHz

Periods Averaged: 1 to 10° selectable in decade steps.

Input: Channel A

Frequency Counted: 10 MHz

Accuracy:

\* time base accuracy \* 1 count displayed

1 trigger error \*\*\*

Display: ns, μs, with positioned decimal point

#### RATIO

Display: (Any Input Function)

Fext times MULTIPLIER (M).

M = 1 to 10° (10 to 10° when prescaling)
selectable in decade steps

Range:

Input Function: See appropriate Function Section F<sub>ext</sub> (External Oscillator Input) 100 Hz - 10 MHz Mode:

Any Input Function

Accuracy:

Accuracy of selected input function \* trigger error of Foxt.

#### TIME BASE

Crystal Frequency: 10 MHz

Stability:

Aging Rate: <3 parts in 10%mo.

Temperature: ≤22.5 parts in 10°, 0° to 50°C. Line Voltage: ≤21 part in 107 for 10% line

variation.

Short-term Fluctuation: Typically <5 parts in 10° rms (typical), one-second average (at constant temperature).

**Oscillator Output:** 

10 MHz, TTL type output levels, 50Ω series impedance at rear panel BNC.

External Input: 100 Hz - 10 MHz; 1 V rms into 1kΩ

Time Base Output:

Negative pulses, \*3 V to 0 V (open circuit), typically 170 ns wide. In START, output frequency is INPUT A divided by TIME BASE/MULTIPLIER syntch setting. Available at rear panel BNC.

**Gate Output:** 

TTL level pulses; low while gate open, high while gate closed. Aveilable at rear panel BNC.

#### GENERAL

Display: 7 digits (8 optional)

blanking:

Suppresses display of unwanted zeros left of the most significant digit

Display Storage:

Holds reading between samples. Kear panel switch over ides storage

\*\*For any waveshape, trigger error is less than

0,0025 Signal Slope (V/μs)

\*\*\*Trigger error is less than ±0.3% of one period + periods averaged for signals with 40 dB or better signal-to-noise ratio and 100 mV rms amplitude.

## Table 1-3. Specifications (Continued)

# Sample Rate:

FAST position: Continuously variable from less than 100 µs to approximately 20 ms. NORM position: Continuously variable from less than 26 ms to approximately 5 seconds. HOLD position: Display can be held indefinitely.

#### Overflow:

Neon indicates when display range is exceeded.

Operating Temperature: 0° to 50°C.

#### **Power Requirements:**

115 or 230 volts ±10%, 50 to 60 Hz, 70 watts maximum.

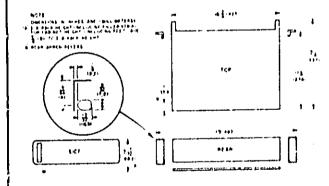
#### Weight:

Net, 16 lb. (7,4 kg). Shipping, 18 lb, 16 oz. (8,7 kg).

#### Accessories Furnished:

Power Cord, 7-1/2 ft. Rack Mount Kit.

#### DIMENSIONS



#### **ACCESSORIES AVAILABLE**

HP 10503A, 50Ω BNC Cable, 4 ft (122 cm).

HP 10532A, Extender Board Kit containing 2 ea. 15-pin extender 5060-0049, 1 ea. 18-pin extender 5060-2041, and 1 ea. Amplifier Extender, 10532-60001.

HP 10542A, Remote Programming Interface enables interfacing between the 5326/27 Series counter with Option 004 and 40-bit Output Register. Includes two (2) 7-bit Digital-to-Analog Converters for level controls and decoding for time base and function selector.

HP Cable 562A-16C, 6 ft. (183 cm) to connect 5326/27 Series with Option 003 to HP 5050B or 5055A Digital Recorder.

#### **OPTIONS**

Option 001: 8-digit display.

# Option 002: Remote programming.

#### Controls:

All front panel controls are single line programmable except:

SEP-COM (separate-common) switch; the check function is programmable.

FAST/NORM Mode. Input Attenuators.

AC/DC Input Signal Coupling.

#### Control Signal:

Single line control using either contact closure to ground or DTL drive on all lines except trigger levels which are analog programmed (±3 Vac).

#### Connector:

Rear panel connector: HP 1251-0085; Amphenol 57-40360-375. (36-pin blue ribbon).

ting connector: HP 1251-0084; Amphenol - 20360-375 (not supplied).

Option 003: Digital output (for numerals and polarity only).

#### Code:

4-line 1-2-4-8 BCD, "1" state high. "0" state +0.25 V at -1 mA; "1" state: +5 V open circuit, 2.5 kΩ source impedance nominal.

#### Print Command:

+5 V to 0 V, de coupled, occurs at end of gate.

#### Storeage:

Buffer storage is provided so BCD output is constant while next measurement is being made.

#### inhibit Input:

Inhibits gate when instrument's cycle time is less than the time required for external equipment to interrogate BCD outputs. Positive inhibit +5 Vdc.

#### Connector:

Rear panel connector: HP 1251-0087; Amphenol 57-40500-375 (50-pin blue ribbon). Mating connector: HP 1251-0086; Amphenol 57-30500-375 (not supplied).

# Table 1-3. Specifications (Continued)

Option 004: Remote Programming including all signal input conditions.

#### Controls:

All front panel controls are programmable except FAST/NORM Mode.

#### Control Signal:

Signal line control using either contact closure to ground or DTL drive on all lines except trigger levels which are analog programmable (±3 Vdc).

# Connector:

Renr panel connector: HP 1251-0087; Amphenol 57-40500-375 (50-pin blue ribbon) Mating Connector: HP 1251-0086; Amphenol 57-30500-375 (not supplied). Option 000: Temperature Compensated Oscillator Aging Rate: <1 x 10-7/month

Temperature Stability (0° to 50°C): <±5 x 10°7 Short Term Fluctuation (1 see avg): <1 x 10°9 rms (typical).

Warmup: Room Temerature Crystal. Line Voltage (10% change): <±5 x 10<sup>-∞</sup>.

Option 011: HP 10544A Oven Oscillator

Aging Rate:  $5 \times 10^{-10}$ /dny.

Temperature Stability (0° to 50°C):  $\leq 3 \times 10^{-9}$ Short Term Fluctuation (1 sec avg):  $\leq 1 \times 10^{-11}$  rms.

Warmup:  $<45 \times 10^{-9}$  in 15 minutes. Line Voltage (10% change):  $<5 \times 10^{-9}$ .

#### SECTION II

# INSTALLATION

#### 2-1 INTRODUCTION

2-2. This section contains information for unpacking, inspection, repacking, storage, and installation. The instructions for remote programming are also given in this section.

# 2-3, UNPACKING AND INSPECTION

2-4. If the shipping carton is damaged, ask that the carrier's agent be present when the instrument is unpacked. Inspect the instrument for damage (scratches, deats, broken knobs, etc.). If the instrument is damaged or fails to self-check (Self-Check Procedures, Table 3-1), notify the carrier and nearest Hewlett-Peckard Sales and Service Office immediately (offices are listed at the back of this manual). Retain the shipping carton and padding material for the carrier's inspection. The sales and service office will arrange for the repair or replacement of your instrument without waiting for the claim against the carrier to be sattled.

# 2-5. STORAGE AND SHIPMENT

- 2.6. 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 packing material such as that used for original factory packaging. Contract packaging companies in many cities can provide dependable custom packaging on short notice. Here are two recommended packaging methods:
- a. RUBBERIZED HAIR. Cover painted surfaces of instrument with protective wrapping paper. Pack instrument securely in strong corrugated container (350 lb/sq. in. bursting test) with 2-inch rubberized hair pads placed along all surfaces of the instrument. Insert fillers between pads and container to ensure a snug fit.
- b. EXCELSIOR. Cover painted surfaces of ininstrument with protective wrapping paper. Puck instrument in strong corrugated container (350 lb/sq. in. bursting test) with a layer of excelsior about six inches thick packed firmly against all surfaces of the instrument.

2-7. FXVIRONMENT. Conditions during storage and shipment should normally be limited as follows:

a. Maximum altitude: 25,000 feet.

b. Minimum temperature: -40°F (-40°C).
 c. Maximum temperature: +167°F (+75°C).

#### 2-8. RACK INSTALLATION

- 2.9. The counter is ready for bench operation as shipped from the factory. Additional parts necessary for rack mounting are packaged with the instrument. To convert to rack installation, proceed as follows:
  - e. Remove tilt stand.
- Remove feet (press the foot-release button, slide foot toward center of instrument, and lift off).
- c. Remove adhesive-backed trim strips at front end of sides.
- d. Attach filler strip along bottom edge of front panel using two screws on outer edges of filler strip. Omit the center screw.
- e. Attach flanges to front end of sides (larger corner notch toward bottom of instrument). Instrument is now ready to mount in standard rack.

#### CAUTION

Ambient temperature in rack during operation should not exceed 122°F (50°C). Be sure instrument position in rack permits adequate air circulation and that nearby equipment does not discharge hot air directly on the instrument.

#### 2-10. POWER CONNECTION

2-11. LINE VOLTAGE. The counter may be operated from either 115 or 230 volt (±10%) power lines with frequencies from 50 to 60 Hz. A slide switch on the rear panel permits quick conversion for operation from either voltage. Insert a narrow-blade screw-driver in the switch slot and slide the switch to the right for 230 volt operation ("230" marking exposed) or to the left for 115 volt operation ("115" marking exposed). The counter is supplied with a 115 volt fuse; be sure to change this fuse for 200 volt operation, see Table 2-1.

#### CAUTION

Before plugging instrument to ac power line be sure slide switch is properly positioned.

Table 2-1. 115/230 Volt Conversion

Line Voltage Conversion	115 Volt	230 Volt
Slide Switch	Left (115)	Right (230)
AC Line Fuse	1.50 Ampere (Slow-Blow) (HP 2110-0304)	0,8 Ampere (Slow-Blow) (HP 21 (0-0020)

- 2-12. POWER CABLE. The counter is equipped with a detachable 3-wire power cable. Proceed as follows for installation.
- a. Connect plug (3-socket connector) to ac line jack at rear of instrument.
- b. Connect plug (2-blade with round grounding pin) to 3-wire (grounded) power outlet. Exposed portions of instrument are grounded through the round pin on the plug for safety; when only 2-blade outlet is available, use connector adapter (HP Part No. 1251-0048), then connect short wire from side of adapter to ground.

## 2-13. REMOTE PROGRAMMING, OPTION 002

2-14. The following paragraphs describe remote programming requirements for the counter with Option 002. See Paragraph 2-33 for Option 004 programming.

#### 2-15. Front Panel Controls

- 2-16. The following front-panel controls are programmable:
  - a. FUNCTION
  - b. TIME BASE/MULTIPLIER
  - e. CHECK function
  - d. SLOPE
  - e. SAMPLE RATE and HOLD
  - f. LEVEL controls
  - g. INPUT C switch (5327A only)
  - h. RESET
- 2-17. The following front-panel controls are NOT programmable:
  - a. AC/DC
  - b. SEP-COM
  - c. FAST/NORM
  - d. ATTEN

2-18. The trigger level controls may be remotely programmed or the front-panel LEVEL controls may be used. It is postfile to program the LEVEL controls without programming the remainder of the front-panel controls. When remote programming is used, the LEVEL controls must be set to PRESET Display time may be remotely programmed and/or the front-panel controls may be used.

#### 2-19. Remote Programming Requirements

- 2-20. All lines may be controlled by TTL or DTL rignals or contact closure to ground when the unit is being remotely programmed: except the trigger levels which are programmed by an analog level (if programmed) and the display time line (Hold), J10 pin 35, which should NOT be pulled up to +5 V by less than 2000 while programming.
- 2-21. When the unit is NOT being programmed (Ext line high), all the lines should be left open or pulled up to \*5 V by not less than  $5k\Omega$ , except the trigger levels, which should be open circuited.

#### 2-22. Remote Programming Procedure

- 2-23. In order to remotely program the counter, the following must be done:
- a. Set FUNCTION switch to any function but START or STOP.
- b. Ground the EXT line at rear-panel REMOTE PROGRAM connector J10(17). This disables the front panel switches. Ground is available at J10(36).
  - c. Select the desired function.
  - d. Select the desired time base.
- e. Select the slope (+ or -) for CHANNEL A and B. This is accomplished by grounding the Slope line for (-) and leaving it open for (+). Slope A line is J10(28). Slope B line is J10(29).
  - f. Select the trigger level for input signal.
  - g. Adjust the display time.
- h. Manual reset is available by grounding (<.7 V) pin 34. Check is available by grounding pin 14.

### 2-24. Function Selection Programming

2.25. To program the desired function, ground (<.7 V) the proper line at J10 as follows:

STOP	Pin 32
START	Pins 1 and 32
PERIOD AVERAGE	Pin 2
T.I. AVG.	Pin 3
T.I. A to B	Pin 4
PERIOD	Pin 5
FREQ. A	Pin 6
FREQ. C DIRECT	Pin 7
FREQ. C + 10	Pins 7 and 18

#### 2-26. Time Base Selection Programming

2.27. To program the Time Base, ground (<,7 V) the proper line at J10 as follows:

•	
.1 με/1	Pin 19
1 με/10	Pin 20
$10\mu\mathrm{s}/10^2$	Pin 21
,1 ms/10 <sup>,1</sup>	Pin 22
1 ms/104	Pin 23
10 ms/105	Pin 24
.1 s/10 <sup>6</sup>	Pin "5
1 s/10 <sup>7</sup>	Pin 26
10 s/10 <sup>s</sup>	Pin 27

#### 2-28. Trigger Level Programming

2.29. To program the trigger level, the LEVEL controls must be set to PRESET. Select the trigger level by placing a dc voltage between -3.0 and +3.0 volts on the level input line (Level A = J10 pin 30, Level B = J10 pin 31). This voltage, times the attenuator setting, is the trigger level. Preset is programmed by leaving the pin open on contact closure to ground. Grounding is preferable if noise exists on the remote programming line.

2:30. The front-panel LEVEL controls may be used manually if programming of the trigger levels is undesirable. Also, note the AC/DC and ATTEN switches on the front-panel must be set manually, as they are NOT programmable.

#### 2-31. Sample Rate Adjustment

2-32. Adjusting the display time can be accomplished in several ways:

a. Manually adjust the display time by using the front-panel SAMPL." RATE controls.

b. Set the SAMPLE RATE control cw and the rAST/NORM/HOLD switch to NORM and connect a 1 megohm pot in scries with a 1.5k ohm resistor from +5 V to pin 35. This will give a display time range of about 10 ms to 5 sec. If a shorter time is desired, set the FAST/NORM/HOLD switch to FAST, which gives a range of about 50 µs to 10 ms.

e. Set the SAMPLE RATE control cw in FAST and hold the Hold line (pin 35) to ground for the desired display time. The display will continue for about 100 µs after the ground is released.

#### 2-33, REMOTE PROGRAMMING, OPTION 004

2-34. The following naragraphs describe remote programming requirements for the counter with Option 004.

#### 2-35. Front Panel Controls

2-36. All front-panel controls are programmable, except the FAST/NORM/HGLD switch. The trigger level controls may be remotely programmed, or the front-panel LEVEL controls may be used. It is possible to program the front-panel LEVEL controls without programming the remainder of the front-panel controls. When remote programming the trigger levels, the LEVEL controls must be set to PRESET. The display time may be remotely programmed and or the front-panel controls may be used.

#### 2-37. Remote Programming Requirements

2-38. All lines may be controlled by TTL or DTL signals or contact closure to ground when the unit is being remotely programmed: except the trigger levels which are programmed by an analog level (if programmed) and the display time line (Hold), J10 pin 16, which should NOT be pulled up to +5 V by less than 200Ω while programming.

2-39. When the unit is NOT being programmed (EXT line high), all the lines should be left open or pulled up to +5 V by not less than  $5k\Omega$ , except the trigger levels, which should be open circuited.

# 2-40. Remote Programming Procedure

- 2-41. In order to remotely program the counter, the following must be done:
- a. Set FUNCTION switch to any position but START or STOP.
- b. Ground the EXT line at rear-panel REMOTE PROGRAM connector J10(34). This disables the front panel switches. Ground is available at J10(1, 2, 15).
  - c. Select the desired function.
  - d. Select the desired time bare.
  - e. Select the signal conditioning.
  - f. Select the trigger level for input signal.
  - g. Adjust the display time.
- h. Manual reset is available by ground (<.7 V) pin 17. Check is available by grounding pin 37.

# 2-42. Function Selection Programming

2-43. To program the desired function, ground (<.7 V) the proper line at J10 as follows:

19

STOP	Pn. 19
START	Pins 46,
PERIOD AVERACE	Pin 47
T.I. AVG.	Pin 45
T.I. A to B	Pin 44
PE_GOD	Pin 43
FREQ. A	Pin 42
FREQ. C DIRECT	Pin 41
FREQ C + 10 (5327A only)	Pin 33

# 2-44. Time Base Selection Programming

2-45. To program the time base, ground (<.7 V) the proper line at J10 as follows:

.1 $\mu$ s/1	Pin 28
1 με/(()	Pin 29
$10\mu\mathrm{s}/10^2$	Pin 27
$.1~\rm ms/10^{\circ}$	Pin 26
1 ms/10 <sup>4</sup>	Pin 25
10 ms/10 <sup>5</sup>	Pin 24
.1 s/10 <sup>6</sup>	Pin 30
1 s/10 <sup>7</sup>	Pin 31
I0 s/10*	Pin 32

# 2-46. Signal Conditioning Programming

2-47. Program the input conditions by grounding the proper line as follows:

CONDITION	LINE J10	INPUT
AC/DC A	11	AC=H DC=L
SLOPE A	23	+=H -=L
ATTENUATOR A	13, 14	13 - H, 14 - H = X1 13 - L, 14 - H = X10 13 - H, 14 - L = X100
AC/DC B	7	AC = H DC = L
SLOPE B	22	+=H -=I,
ATTENUATOR B	9, 10	9 · H, 10 · H = X1 9 · L, 10 · H = X10 9 · H, 10 · L = X100
SEP/COM	6	COM = L, SEP = H
СНЕСК	37	СНК = 1,

#### 2-48. Trigger Level Programming

2-49. To program the trigger level, the LEVEL controls must be set to PRESET. Select the trigger level by placing a de voltage between -3.0 and +3.0 volts on the level input line (Level A = J10 pin 21, Level B = J10 pin 20). This voltage, times the attenuator setting, is the trigger level. Preset is programmed by leaving the pin open or contact closure to ground. Grounding is preferable if noise exists on the remote programming line.

2-50. The front-panel LEVEL controls may be used manually if programming of the trigge vels is undesirable.

# 2-51. Sample Rate Adjustment

2-52. Adjusting the display time can be accomplished in several ways:

- a. Manually adjust the display time by using the front-panel SAMPLE RATE controls.
- b. Set the SAMPLE RATE control cw and the FAST/NORM/HOLD switch to NORM and connect a 1 me, sohm pot in series with a 1.5k ohm resistor from +5 V to pin 16. This will give a display time range of

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about 10 ms to 5 sec. If a shorter time is desired, set the FAST/NORM/HOLD switch to FAST, which gives a range of about 50  $\mu s$  to 10 ms.

c. Set the SAMPLE RATE control ew in FAST and hold the Hold line (pin 16) to ground for the desired display time. The display will continue for about 100 µs after the ground is released.

#### 2-53. SAMPLE RATE DISABLE-COMPUTER INHIBIT

254. The sample rate disable fine is used only with the start command to initiate a totalizing measurement. The sample rate disable command disables autoreset and enables continuous plus and minus transfer commands.

2.55. The computer inhibit command (when Low) inhibits the main gate from opening. This command may be sent from a computer to prevent the counter from making any further measurements. It may also be used as an external sample rate signal, since the command would determine the time between measurements. Auto reset and print command signals are not disabled by computer inhibit.

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#### NOTE

DO NOT ground or other wise program any of the remote programming lines if the unit is not being operated remotely (EXT line HIGH = not programmed remotely). The line should be left open or, at worst, be pulled up to +5 V by a source impedance of not less than 5 k $\Omega$ .

#### 2-56. BLANKING DEFEAT

2-57. This counter is designed to blank insignificant zeros (zeros to left of data). When blanking occurs, the digital recorder output for the blanked columns is BCD 15 (HBHH). To use this instrument with a digit-analog converter, it is necessary to defeat the blanking feature by repositioning the two jumpers on the A9 Display board. Move the jumpers to position 2, as shown in A9 Component Locator (Section VIII). This connects pin 10 of A9U7 and A9U8 to +5 V. Also, lift the pin 1 lead of A8U2 and connect pin 1 to ground (available at U2 pin 7).

#### SECTION III

#### **OPERATION**

#### 3-1. INTRODUCTION

3-2. Section III contains the operating information required to obtain the most effective performance from the instrument. This includes a general description of the operating modes, the function of all controls and indicators, a self-check procedure, and setup procedures for making basic measurements.

#### 3-3. OPERATING MODES

3-4. The following paragraphs describe the operating modes of totalize, frequency, period, time interval, and ratio.

#### 3-5. Totalize Mode

3-6. START and STOP positions on the FUNCTION selector allow manual opening and closing of the counter's main gate. When the switch is in the START position, the counter does not measure frequency, but instead, counts the number of times the signal passes through the trigger point. The input signal, connected to the front-panel CHANNEL A jack, is divided by the MULTIPLIER switch setting prior to c nting. For example, when the MULTIPLIER switch is set to the 1 position, every pulse is counted. When the switch is set to 103, the counter registers every thousandth pulse. When the FUNCTION switch is set to STOP, the counter stops totalizing and holds the displayed count until the RESET switch is pressed or the MULTIPLIER switch setting is changed. FUNCTION switch is again set to START before a reset is generated, the count continues to totalize from the previously displayed value. With the FUNC-TION switch set to START, the sceled input signal is available at the rear-panel TIME BASE OUTPUT jack. The unit indicators and decimal points are blanked during the totalize mode. The C light is on (in START), indicating counting is taking place.

#### 3-7. Frequency Modes

3-8. Three frequency modes are available in the 5327A: Frequency A, Frequency C prescaled, and Frequency C direct. (The prescale operation is not included in the 5326A.) In the Frequency A mode, the input signal connects to the high impedance CHANNEL A input jack and can be conditioned with the LEVEL, SLOPE, and ATTEN controls. In the Frequency C modes, the input signal is connected to the INPUT C jack (50 ohm). The signal is not conditioned by any front-panel controls but may be counted either directly (50 MHz) or by prescaling (550 MHz).

depending on the setting of the INPUT C switch. The C channel of the 5326A model counts the signal directly

#### 3-9. Period Modes

- 3-10. The period and period average modes allow single period measurements or multiple period averages to be made with input frequencies into CHANNEL A of up to 10 MHz. These modes are useful for making low frequency measurements where maximum resolution is desired.
- 3-11. For single period measurements, the MULTI-PLIER switch scales the time base frequency and selects the placement of the decimal point and determines the resolution of the measurement.
- 3-12. The period average mode is used for increased resolution and reduced inaccuracies. For example, if 10<sup>2</sup> period averaging is selected, the counter will display the average of 100 periods with the proper decimal point. In this example, trigger error is 100 times less than in a single period measurement.

### 3-13. Time Interval Modes

- 3-14. Two modes of time interval measurements can be selected: time interval and time interval average. The time interval modes measure the time between points on a single waveform or between separate input signals; thus, pulse width and phase differences can be measured. Separate slope and level controls allow variable triggering levels on either the + or slope. Marker A and B outputs are available at the rear panel to intensity-modulate an HP 180A oscilloscope. The markers indicate the trigger point of the counter's input circuits and provide a visual means of adjusting the trigger points to measure the time interval between any two points and are useful to about 100 kHz.
- 3-15. In time interval measurements, Channel A opens the main gate and Channel B closes the main gate. While the main gate is open, the internal oscillator, divided by the setting of the MULTIPLIER switch, is totalized by the counter and readout on the display. The less the division factor, the more pulses of the internal oscillator there are to count and, therefore, the better the resolution and accuracy.
- 3-16. With time interval average, the main gate is open for the number of time intervals selected by the MULTIPLIER switch. The internal oscillator pulses (not divided) are totalized only during the individual time intervals. Once Channel B triggers, there must

be a time lapse of 150 ns before Channel A can trigger. Averaging of time intervals results in increased resolutions and reduced inaccuracies. For a further explanation of theory, refer to Paragraph 4-27.

#### 3-17. Ratio

3-18. The counter may be used to measure the ratio of two signals in either the frequency or period mode. By setting the rear-panel OSC INT-EXT switch to EXT, the counter will accept an external signal ( $F_{\rm ext}$ ) for use as the internal oscillator. This frequency should be 100 Hz to 10 MHz at 1 V rms minimum to 5 V peak maximum. A second signal ( $F_{\rm A}$ ), applied to either INPUT A or C jack, is used as the comparator signal. The MULTIPLIER switch controls the resolution of the display. For a ratio of frequencies, the Ratio =  $\frac{F_{\rm A}}{F_{\rm ext}}$  =  $\frac{\rm DISPLAYED\ NUMBER}{\rm MULTIPLIER\ SETTING}$ . For a ratio of periods (P), the Ratio =

$$\frac{\frac{P_{c}}{A}}{\frac{P_{ext}}{P_{ext}}} = \frac{\frac{F_{ext}}{F_{A}}}{\frac{F_{c}}{A}} = \frac{DISPLAYED\ NUMBER}{MULTIPLIER\ SETTING}$$

3-19. Disregard the units and decimal point; also, ignore any zeros to the left of the most significant digit. It makes no difference which signal is higher in frequency, as long as the two frequencies are within the specifications of their respective channels.

# 3-20. MARKER OUTPUTS

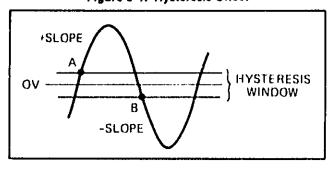
3-21. Two marker output jacks are mounted on the counter's rear panel. These outputs provide a negative-going 2 µs pulse (approx.) at DTL levels each time the input signal passes through the trigger point of Channel A or B. The pulses may be used to trigger other circuits or may be applied to the Z axis of an HP 180 Oscilloscope. When using the pulses to intensity modulate an oscilloscope, note that the actual trigger point is the leading edge of the pulse. The marker's pulse width determines the upper frequency limit of the input signal. The pulses overlap on the oscilloscope trace when the period of the signal is less than the pulse width.

### 3-22. HYSTERESIS

3-23. Each input channel has a small amount of hysteresis (about 100 mV). If the SLOPE switch is set to "+," the trigger pulse occurs at the top of the hysteresis "window." If the SLOPE switch is set to "-," the pulse occurs on the bottom line of the window. In other words, the signal must pass through the entire hysteresis window before a trigger pulse is generated.

3.24. When measuring frequency or period, t. e counter positions the hysteresis band around zero (see Figur 3.1). This assumes a waveform with no de component and the counter's LEVEL control is in the PRESET position. The input amplifier then yields maximum input sensitivity for both positions of the SLOPE switch. The offset introduces no measurement error, since the trigger point is repetitive from cycle to cycle. The trigger point is point A for + clope and point B for - slope.

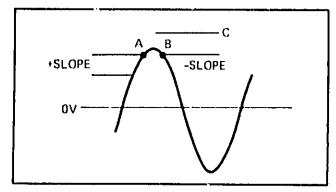
Figure 3-1. Hysteresis Offset



#### 3-25. Time Interval Compensation

3-26. In the time interval modes only, both input amplifiers have an automatic compensation network that keeps the trigger level at the same potential when switching from positive to negative slope (see Figure 3-2). In this example, the window shifts upward to accomplish this. There is the possibility, therefore, that if Point A is near the top of the signal, switching to negative slope will place a portion of the window outside the signal (C). In such case, there would be no triggering. When switching from time interval to frequency, or vice versa, the trigger point shifts by half the hysteresis band.

Figure 3-2. Hysteresis Compensation



#### 3-27. ACCURACY

3-28. FREQUENCY MEASUREMENTS. The basic counter accuracy is determined by two factors. One factor is the aging rate of the 10 MHz crystal standard in the time base (less than 3 parts in 10<sup>7</sup> per month). A second factor is the inherent error of ±1 count of the

display's least significant digit, which is present in all electronic counters. This error is due to phosing between the timing pulse that operates the electronic gate and the pulses that pass through the gate to the counting assembly. The chart in Figure 3-3 shows the error possible for frequency and period measurements.

3-29. The formula for determining the actual frequency is given as follows:

error = 
$$\pm \left(\frac{1}{f_1 \times \text{gate length (sec)}}\right) \pm E$$
The expression
$$\frac{1}{f_1 \times \text{gate length (sec)}}$$

equals the ± 1 count ambiguity, where f1 equals measured frequency (Hz) and gate length equals the selected gate time in seconds. E equals the time base accuracy (monthly drift rate of the individual time base times the number of months since calibration, frequency change due to ambient temperature change, absolute off-set at standardization, and line voltage effects).

3-30. An example of frequency error calculation is as follows:

$$f_1 = 3 \text{ MHz} (3 \text{ X } 10^6 \text{ Hz})$$

gate length = .1 sec (1 X 10-1)

E = 3 parts in  $10^7$  per month times 2 months = 6 parts in 107

error = 
$$\frac{1}{(3 \times 10^6)} \frac{1}{(1 \times 10^{-6})} \pm \frac{6}{10^7}$$

$$\pm 3.3 \times 10^{-6} \pm 6 \times 10^{-7} \pm 3.9 \times 10^{-6}$$
  
or 3.9 parts in  $10^{6}$ 

3-31. PERIOD MEASUREMENTS. There are three factors contributing to the accuracy of period average measurements:

- The aging rate of the 10 MHz crystal standard.
- The # 1 count ambiguity.
- c. The trigger error for one period. Assuming a signal-to-noise ratio of 40 dB, the trigger error is less than 0.3% at rate sensitivity. A general formula for finding the percentage error to be expected under various conditions is as follows:

$$A = 100 (\pm \frac{f_2}{nf_1} \pm \frac{e}{n} \pm E)$$

A Accuracy in percent

f<sub>1</sub> = Time base frequency counted

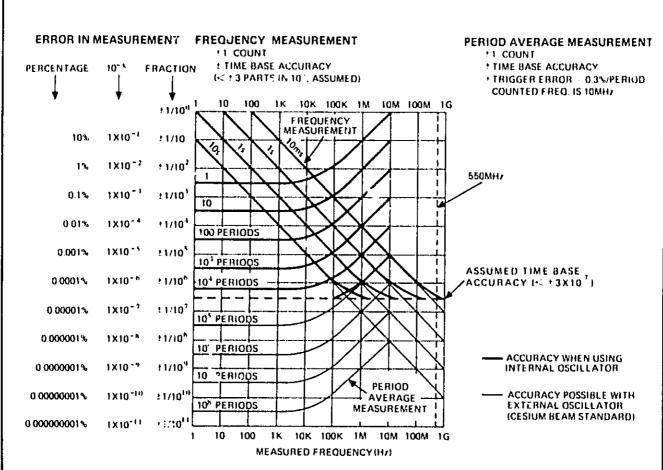
f., = Frequency of input signal (Hz)

n = Number of periods averaged

e = 3 x 10<sup>-3</sup> (trigger error for one period, 40 dB S/N at rated sensitivity.)

E = time base accuracy (monthly drift rate of individual time base times the number of months since calibration. absolute value of off-set at standardization, frequency change due to ambient temperature change, and line voltage effects). A plot of the above formula is shown in Figure 3-3.

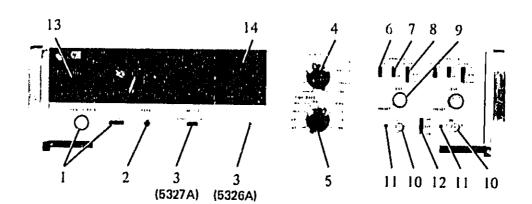
Figure 3-3. Measurement Accuracy



#### NOTE

FOR 550MHZ INPUT ( ÷ 10) USE LINE TO RIGHT OF ACTUAL GATE LENGTH TO DETERMINE ACCURACY OF MEASUREMENT, SINCE 1 COUNT ERROR REPRESENTS ± 10 COUNTS OF INPUT SIGNAL WHEN PRESCALING BY 10.

Figure 3-4. Front Panel Controls and Indicators



- SAMPLE RATE control. Applies primary power. Workds in conjunction with FAST/ NORM/HOLD switch to control interval between measurements.
  - a. FAST Varies display time from <100  $\mu$ s to >20 ms. STORAGE switch (rear panel) must be ON to use this mode,
  - b. NORM Varies display time from <20 ms to >5 seconds.
  - c. HOLD Holds display indefinitely.
- 2. RESET Switch. Resets display and internal count to zero and starts new measurement.
- 3. INPUT C (5327A ONLY). Switch to select DIRECT (0-50 MHz) or +10 (0-550 MHz) operation for INPUT C connector on rear panel. See Figure 3-5.

INPUT C (5326A ONLY). 50-ohm input connector for 0 to 50 MHz frequency measurements. Has de coupling and sensitivity of 5 mV rms sine wave. Trigger level is zero volts. Maximum input is ±5 volts rms referenced to ground (DO NOT EXCEED).

- 4. FUNCTION selector. Selects mode of operation. Blue lettering matches corresponding blue lettering on TIME BASE/MULTIPLIER switch.
  - a. STOP, START Used for totalize mode to manually open and close counter's main gate and to turn scaled output on and off. Frequency input range is 0 to 10 MHz.
  - b. PERIOD AVG A Sets counter to measure period of signal applied to CHAN-NEL A input. Use MULTIPLIER switch to

select number of periods to be averaged. Input frequency range is 0 to 10 MHz.

- c. T. I. AVG A to B Sets counter to measure average time interval, A to B. Channel A starts interval and Channel B stops the interval. Use MULTIPLIER selector to set number of time intervals to be averaged. Time interval input range is 150 ps to 10 sec; there must be a 150 ns deadtime between intervals.
- d. T. I. A to B Sets counter to measure time interval A to B. Channel A starts measurement and Channel B stops the measurement. T. I. input range is 0.1  $\mu s$  to 10° sec. The internal time base frequency is divided by the setting of the MULTIPLIER switch and totalized for subsequent display. The more cycles of the oscillator frequency that are counted during A to B time, the better the resolution. There must be 150 ns deadtime between Channel B and Channel Ab trigger points.
- e. PERIOD A Sets counter to measure a single period of the signal applied to CHANNEL A input. Use MULTIPLIER switch to set counted internal oscillator frequency a 11 therefore the desire resolution. Frequency input range is 0 to 10 MHz.
- f. FREQ A Set counter to measure frequency applied to CHANNEL A input. Use TIME BASE switch to set gate time and resolution. Frequency input range is 0 to 50 MHz.
- g. FREQ C Similar to FREQ A, except sets counter to measure frequency applied to INPUT C jack. 50-ohm input impedance. See INPUT C.

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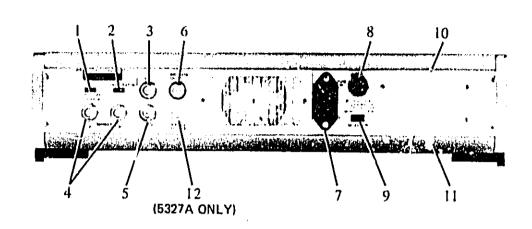
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- 5. TIME BASE/MULTIPLIER switch. The function of the switch changes with each mode of operation:
  - n. TOTALIZE Determines scaling factor for input signal prior to counting.
  - b. PERIOD AVG A Selects number of periods to be averaged.
  - c. T. I. AVG A to B Selects number of time intervals to be averaged.
  - d. T. I. A to B Selects scaling factor for internal oscillator signal.
  - e. PERIOD A Selects scaling factor for internal oscillator signal.
    - f. FREQ A and FREQ C Sets gate time.
- 6. SLOPE switch. Permits triggering on positive or negative slope of input signal.
- AC-DC switch. Selects direct or capacitor coupling for input signal. Minimum input frequency on AC setting is 20 Hz.
- 8. ATTEN switch. Selects attenuation for input signal. Used in conjunction with LEVEL control to set input triggering point. Maximum input: 250 V rms on all ranges except 25 V rms on X1 range above 50 kHz. Recommended input is 0.1 V rms to 2 V rms times ATTEN setting.

- LEVEL control. Used in conjunction with ATTEN switch to determine voltage at which triggering occurs. With X1 attenuator setting, level is variable ±3 V; on X10, ±30 V; and X100, ±300 V.
- 10. Input jacks, Input jacks to Channels A. AND B. Input impedance is 1 M $\Omega$  shunted by less than 25 pF. By using a 10 to 1 divider probe, input impedance can be increased to 10 M $\Omega$ .
- 11. Trigger lamps adjacent to input jacks indicate when amplifier triggering occurs.
- CHK-SEP-COM switch. (Check-separate-common).
  - a. CHK Connects internal 10 MHz time base to Channels A and B circuitry to check that unit is functioning. No indication in T. I. or T. I. Avg; ignore displayed digits in period average.
  - b. COM-SEP Connects A and B inputs in parallel when set to COM position. When applying two separate inputs, set switch to SEP. When set to COM, input impedance is 500 k $\Omega$  shunted with less than 50 pF.
- 13. C (count) light. Lights when counter's main gate is open. For short-duration gate times, the annunciator circuits include a 50 ms oneshot MV to allow a visible flash of the C light.

14. \* (asterisk). Indicates that proper units are not displayed with combination of function/ time base selection. To interpret display, add a zero to the right of least significant digit displayed on the counter.

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- STORAGE switch. When set to ON, provides display storage while new measurement is being made. In OFF position, allows continuous display of counting process.
- 2. OSC INT-EXT swit. position, selects normal counter, cration using internal time base. In EXT position, permits use of external time base.
- 3. OSC jack, With INT-EXT switch set to INT, provides 10 MHz, >3 V p-p output (no load), 50Ω series impedance. With INT-EXT switch set to EXT, allows use of external time base from 100 Hz to 10 MHz at >1 volt rms (5 V peak maximum).
- MARKER A and P. jacks. Provides marker outputs to intensity modulate HP 180 Oscilloscope. Markers begin coincident with channel trigger points.
- 5. GATE jack. Provides >2.4 volts output (open circuit) for external use. Has 500 series impedance. Output is low when counter's main gate is open and high when gate is closed.
- 6. TIME BASE OUTPUT jack. Provides negative going > +3 to 0 V pulses (open circuit), >50 nanoseconds wide. The line has a 500 series impedance. In START, frequency output is CHANNEL A signal divided by MULTI-PLIER setting.

- 7. AC LINE IEC type with offset pin connected to chossis.
- AC LINE FUSE. 1.50 A at 115 V, 800 mA at 230 V.
- 115/230 volt switch. Insert narrow screwdriver and slide switch to show desired voltage.
- 10. DIGITAL RECORDER connector (Option 003 only). 50-pin connector for digital recorder interconnection.
- 11. REMOTE PROGRAM connector. Option 902: 36-pin connector to allow remote control of counter modes and functions.
  - Option 004: 50-pin connector to allow remote control of all counter functions except FAST/NORM.
- 12. INPUT C (5327A only), 50-ohm input for 0 to 50 MHz or 0 to 550 MHz frequency measurements. When INPUT C switch is in + 10 position, frequency range is 0 to 550 MHz, coupling is de, and sensitivity is 25 mV rms sine wave. With INPUT C switch in DIRECT position, frequency range is 0 to 50 MHz, sensitivity is 15 mV rms sin. wave, coupling is de. For either setting of the INPUT C switch, maximum input is 3.5 volts rms referenced to ground (DO NOT EXCEED), and trigger level is zero volts.

Table 3-1, Self-Check

l.	Set SAMPL	E RAPE con	trol slightly clock-	Time Interval Average Self Check			
••	wise out of O		ator oughtry chick-	MULTIPLIER	DISPLAY	ANNUNCIATOR	
				1	.0	ня	
2.	Set FAST/N	ORM/HOLD i	witch to NORM.	10	.00,	μs	
				$10^{2}$	,000	μв	
3,	Set FUNCTI	ON switch to	STOP.	103	,0	ns	
•••	2000			104	,00	ns	
				105	,000	ns	
4,	Set MULTIP	LIER selector	to 1.	106	.0000		
				107	,0000	ns	
5.	Set CHK-SEP-COM switch to CHK.			10*	,00000	ns ns	
<ol> <li>Press RESET and check that counter's right hand column displays a 0 and all other digits are blanked.</li> </ol>				11. Set FUNCTION to T. I. A to B. Rotate MULTIPLIER switch as shown in the following table (Step 12) and check for proper display			
7. Set FUNCTION switch to START and check that counter totalizes and C light is on. Check that OF light goes on as display overflows. Set TIME base/MULTIPLIER to each position and check that counter totalizes in			<ol> <li>Set FUNCTION to PERIOD A. Set MULT PLIER switch as shown in the followin table and check for proper display.</li> </ol>				
	each position	•		Time Interval and Period Self-Check			
0	C . PHARON	ONtalla	emon on a dea	MULTIPLIER	DISPLAY	ANNUNCIATOI	
8,			STOP. Check that	1*	1 4 1		
	C light goes o	out and display	y is neia.	-	,I + 1 count	•	
				10	0	μв	
				$10^{2}$	.00	ms	
9.			IOD AVG A. Set	$10^{5}$	,0	ms	
			in table below and	104	0	ms	
	check for pro	per display. –		105	,00	8	
				10%	.0.	8	
				107	()	8	
	Period	Average Self-	Check	10 <sup>8</sup>	0	•	
MU	LTIPLIER	DISPLAY	ANNUNCIATOR	*NOTE: For	Time Interval S	elf-Check, display i	
1		.1	μв	.0 μs for N	IULTIPLIER se	tting of 1.	
10	1	.10	•	•		•	
			дв				
10		,100	μs	13. Set FUNCT	TON to FREQ.	A. Set TIME BAS	
10		100.0	ns	switch as	shown in tabl	e below and chec	
10		100.00	ns	for proper d			
	i:)	100.000	ns	a to her has a	- •: w :		
10			A4				
10	)6	100.0000	ns	t.v	marian A Calca	'haat	
10 10	<sub>)6</sub> ) <sup>7</sup> Standard	00.0000	ns ns OF	Fr	equency A Self (	Check	
10 10 10	) <sup>6</sup> ) <sup>7</sup> Standard ) <sup>7</sup> Option (101	00.0000 00000,001	ns OF ns				
10 10 10	<sub>)6</sub> ) <sup>7</sup> Standard	0,00000 0,000000 0,000000	ns OF ns ns OF	From TIME BASE	equency A Self ( DISPLAY		
10 10 10 10	) <sup>6</sup> ) <sup>7</sup> Standard ) <sup>7</sup> Option (101	00.0000 00000,001	ns OF ns	TIME BASE	DISPLAY	ANNUNCIATO	
10 10 10 10	) <sup>6</sup> 0 <sup>7</sup> Standard 0 <sup>7</sup> Option 001 0 <sup>8</sup> Standard	0,00000 0,000000 0,000000	ns OF ns ns OF	TIME BASE	DISPLAY #1 count	ANNUNCIATO GHz	
10 10 10 10	) <sup>6</sup> 0 <sup>7</sup> Standard 0 <sup>7</sup> Option 001 0 <sup>8</sup> Standard	00.00000 100.00000 0.000000 00.000000	ns OF ns ns OF	TIME BASE .1 μs .01 1 μs 10	DISPLAY  ±1 count ±1 count	ANNUNCIATO GHz MHz	
10 10 10 10	95 97 Standard 97 Option 001 94 Standard 94 Option 001	00.00000 100.00000 0.000000 00.000000	ns OF ns ns OF ns OF	TIME BASE .1 μs .01 1 μs .10 10 μs .10.0	DISPLAY  #I count #I count #I count	ANNUNCIATO GHz MHz MHz	
10 10 10 10	ps 97 Standard 97 Option 001 94 Standard 94 Option 001 Digits note	00.00000 100.00000 0.000000 00.000000	ns OF ns ns OF ns OF ns OF	TIME BASE .1 μs .01 1 μs 10	DISPLAY  #I count #I count #I count #I count #I count 0 #I count	ANNUNCIATO GHz MHz	

10000,0

±1 count

10000.00 ±1 count

0000,000 ±1 count

10000.000 ±1 count

000,0000 ±1 count

0000,0000 ±1 count

kHz

kHz

kHz OF

kHz (Option 001)

kHz OF

kHz OF (Opt. 001)

 $10 \, \mathrm{ms}$ 

Лв

l s

10 s

10. Set FUNCTION to T.I. AVG A to B. Set

check for proper display.

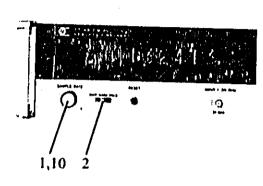
MULTIPLIER as shown in table below and

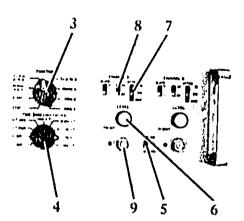
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# Figure 3-6. Frequency A Measurements

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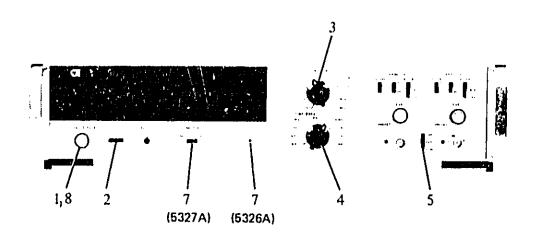
- 1. Set SAMPLE RATE control slightly clockwise out of OFF.
- 2. Set FAST/NORM/HOLD switch to NORM.
- 3. Set FUNCTION switch to FREQ A.
- 4. Set TIME BASE switch for desired gate time.
- 5. Set CHK-SEP-COM switch to SEP.
- Set CHANNEL A LEVEL control to desired trigger level or to PRESET to trigger at zero volts.

- 7. Set ATTEN switch to match input signal amplitude.
- 8. Set AC-DC switch to AC or DC.
- 9. Connect input signal (0 to 50 MHz) to CHANNEL A input jack.
- 10. Adjust SAMPLE RATE control for convenient measurement interval.

#### NOTE

When the input signal is removed from CHANNEL A or the signal level is insufficient to trigger Channel A, the count light (C) will not cycle. This is normal for this counter and does not indicate a malfunction.

Figure 3-7. Frequency C Measurements



- Set SAMPLE RATE control slightly clockwise out of OFF.
- 2. Set FAST/NORM/HOLD switch to NORM.
- 3. Set FUNCTION switch to FREQ C.
- 4. Set TIME BASE switch for desired resolution.
- 5. Set CHK-SEP-COM switch to SEP.
- 6. Set INPUT C switch to DIRECT.
- For 5326A; Connect input signal (0 to 50 MHz, ±7.5 V peak maximum, 5 mV rms minimum) to input C connector. Input impedance is 50 Ω nominal.

For 5327A: Connect input signal (Direct: 0 to 50 MHz, ±5V peak maximum, 15 mV mini-

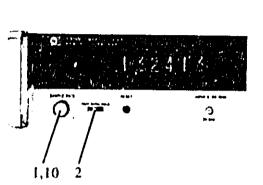
- naum. Prescaled: 0 to 550 MHz, 45V peak maximum 25 mV minimum) to input C connector on the rear panel.
- 8. Adjust SAMPLE RATE control for convenient measurement interval.

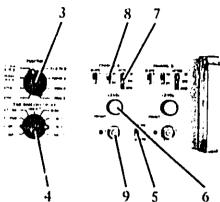
# NOTE

For frequencies from 0 to 550 MHz with minimum levels of 15 mV rms, connect signal to INPUT C jack and place INPUT C switch in < 10 position.

## CAUTION

Damage will occur if INPUT C voltage specifications are exceeded.





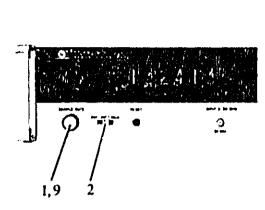
#### Period

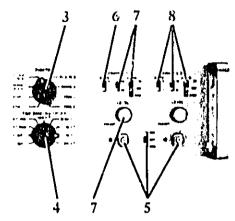
- 1. Set SAMPLE RATE control slightly clockwise out of OFF.
- 2. Set FAST/NORM/HOLD switch to NORM.
- Set FUNCTION switch to PERIOD A.
- 4. Set MULTIPLIER switch for desired resolution.
- 5. Set CHK-SEP-COM switch to SEP.
- Set CHANNEL A LEVEL control to desired trigger level or to PRESET to trigger at zero volts.
- Set ATTEN switch to match input signal's amplitude.
- 8. Set AC-DC switch to AC or DC.

- 9. Connect input signal (0 to 10 MHz) to CHANNEL A input jack.
- Adjust SAMPLE RATE control for a convenient interval between measurements.

#### Period Average

- Set SAMPLE RATE control slightly clockwise out of OFF.
- 2. Set FAST/NORM/HOLD switch to NORM.
- 3. Set FUNCTION switch to PERIOD AVG A.
- 4. Set MULTIPLIER switch to number of periods to be averaged.
- 5. Set CHK-SEP-COM switch to SEP.
- Set CHANNEL A LEVEL control to desired trigger level or to PRESET to trigger at zero volts.
- 7. Set ATTEN switch to match input signal amplitude.
- 8. Set AC-DC switch to AC or DC.
- 9. Connect input signal (0 to 10 MHz) to CHANNEL A input jack.
- 10. Adjust SAMPLE RATE control for convenient measurement interval.





Single Time Interval

- Set SAMPLE RATE control slightly clockwise out of OFF.
- 2. Set FAST/NORM/HOLD switch to NORM.
- 3. Set FUNCTION switch to T.I. A to B.
- 4. Set MUTLIPLIER switch for desired resolution.
- 5. If start-stop signals are from a common source, connect signal to CHANNEL A input and set CHK-SEP-COM switch to COM. If start-stop signals are from separate sources, connect start signal to CHANNEL A input and stop signal to CHANNEL B input and CHK-SEP COM switch to SEP.
- 6. Set CPLANNEL A SLOPE switch to \* for triggering on positive slope of signal or to for triggering on negative slope of signal.
- 7. Set CHANNEL A LEVEL and ATTEN switches to start measurement at desired voltage level. Select AC or DC coupling. For frequencies below 100 kHz, use MARKER A OUTPUT jack on rear panel to display starting point on an oscilloscope.
- 8. Set CHANNEL B, AC-DC, LEVEL, SLOPE, and ATTEN controls to stop measurement at desired level. For frequencies below 100 kHz, use MARKER B OUTPUT to display stopping point on oscilloscope.
- 9. Adjust SAMPLE RATE control for convenient measurement interval.

#### NOTE

There must be at least 150 ns between the STOP pulse (Channel B trigger) and the next START pulse (Channel A trigger).

#### Time Interval Average

- Set SAMPLE RATE control slightly clockwise out of OFF.
- Set FAST/NORM/HOLD switch to NORM.
- 3. Set FUNCTION switch T.I. AVG A.
- 4. Set MULTIPLIER switch to number of time intervals to be averaged.
- 5. If start-stop signals are from a common source, connect signal to CHANNEL. A input and set CHK-SEP-COM switch to COM. If start-stop signals are from separate sources, connect start signal to CHANNEL. A apput and stop signal to CHANNEL B input and CHK-SEP-COM switch to SEP.
- 6. Set CHANNEL A SLOPE switch to \* for triggering on positive slope of signal or to for triggering on negative slope of signal.
- 7. Set CHANNEL A, LEVEL, and ATTEN to start the measurement at desired voltage level. Select AC or DC coupling. For frequencies below 100 kHz, use MARKER A OUTPUT jack on rear panel to display starting point on oscilloscope.

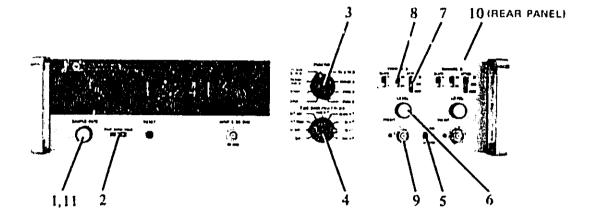
- 8. Set CHANNEL B, AC-DC, LEVEL, SLOPE, and ATTEN to stop the measurement at desired level. For frequencies below 100 kHz, use MARKER B OUTPUT to display stopping point on oscilloscope.
- 9. Adjust SAMPLE RATE control for convenient measurement interval.

#### NOTE

STOP to START delay must be >150 ns and input rate should not be 10 MHz  $\times \frac{M}{N}$  (M and N integers).

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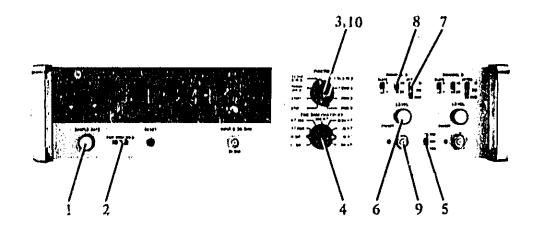
 Set SAMPLE RATE control slightly clockwise out of OFF.

THE REPORT OF THE PARTY OF THE

- 2. Set FAST/NORM/HOLD switch to NORM.
- Set FUNCTION switch to FREQ A or FREQ C, direct or prescaled.
- 4. Set MUTLIPLIER switch to desired dividing factor for F<sub>ext</sub>.
- 5. Set CHK-SEP-COM switch to SEP.
- Set CHANNEL A LEVEL control to desired trigger level or to PRESET to trigger at zero volts.

- 7. Set ATTEN switch to match input amplitude.
- 8. Set AC-DC switch to AC or DC.
- 9. Connect FA (0 to 50 MHz) to CHANNEL A input jack or FC to INPUT C.
- Set OSC INT-EXT switch to EXT (rear-panel).
   Connect F<sub>ext</sub> to OSC jack. F<sub>ext</sub> can be 100 Hz to 10 MHz 1 V rms (min) to 5 V peak maximum.
- 11. Adjust SAMPLE RATE control for convenient measurement interval.
- 12. Ratio =  $\frac{F_{A \text{ or }}F_{C}}{F_{ext}} = \frac{DISPLAY}{MULTIPLIER}$ . Disregard units and decimal point.

Figure 3-11. Totalize Measurements



- Set SAMPLE RATE control slightly clockwise out of OFF.
- 2. Set FAST/NORM/HOLD switch to NORM.
- 3. Set FUNCTION switch to STOP.
- 4. Set MULTIPLIER switch to input signal scaling factor.
- 5. Set CHK-SEP-COM switch to SEP.
- 6. Set LEVEL control to desired trigger level or to PRESET for triggering at zero volts.
- 7. Set ATTEN switch to match input signal's amplitude.
- 8. Set AC-DC switch to AC or DC.
- 9. Connect input signal (0 to 10 MHz) to CHANNEL A input jack.
- 10. Set FUNCTION switch to START.

#### NOTE

A scaled output of the input signal is available at the rear-panel TIME BASE OUTPUT BNC. The division is determined by the MULTIPLIER switch setting.

#### SECTION IV

#### THEORY OF OPERATION

#### 4-1. INTRODUCTION

4-2. This section discusses the general operating principles of the instrument. Assembly description is covered in more detail in Section VIII, opposite each schematic diagram. Logic fundamentals are explained in Paragraphs 4-3 through 4-16.

#### 4-3. LOGIC SYMBOLS

- 4-4. Two states exist in the binary system, I and 0. In positive logic, the 1 state is more positive than the 0 state. High (II) and low (L) are used to represent the 1 and 0 levels. HIGH ALWAYS REPRESENTS THE MORE POSITIVE LEVEL, WHETHER IT BE POSITIVE OR NEGATIVE LOGIC.
- 4-5. A circle at the input line of a logic symbol indicates that a low activates the function. Figure 4-1B shows that a low at both inputs produces

a high output. A circle at the output line of a logic symbol indicates a low when activated, as shown in Figure 4-1C.

#### 4-6. Gating and Logic

4-7. Figure 4-1A represents a basic AND gate. The output is high if all inputs are high. An AND gate may have two or more inputs. Figure 4-1D represents a basic OR gate. The OR gate output is high if one or more of its inputs is high. At OR gate may have two or more inputs. An OK gate with a circle on the output is called a NOR gate. At AND gate with a circle on the output is called a NAND gate. An EXCLUSIVE NOR (Figure 4-1E) has two inputs; and the output will be low if one, but not both, of the inputs is high. The output will be high if the inputs are both low or both high.

Figure 4-1. Gate Symbols and Logic Comparisons

	AND —	41	NVERTED IN	PUT	INVERTE	O OUTPUT		D	_	E NCLUSIV	DO
A	}>— ×			G X : A : B	) x B C		H . x i ä ii		A		
A	B			$\sum_{X \in \overline{A} + \overline{B}}$	>—- х	A B	$\sum_{X\cdotA+B}$	— х	<b>д</b> —	X : Ā + Ē	x
A	В	х	Α	В	×	А	В	×	Α	В	×
н	н	н	н	н	н	н	н	L	н	н	L
н	L	4	н	L	L	н	L	L	н	L	н
L.	н	н	L	н	L	L	н	L	_	н	н
Ŀ	L	L	L	L.	L	L	۳	н	Ļ	L	н

#### 4-8. INTEGRATED CIRCUIT OPERATION

#### 4-9, JK Master-Blave Filip-Flop

4-10. The JK master-slave flip-flop is basically a bistable multivibrator. With simultaneous high inpet to J and K, before the clock pulse, Q and  $\overline{Q}$  will change states after the clock pulse. Refer to Figure 4-2 and Table 4-1. This circuit triggers on the trailing edge (negative transition) of the clock pulse. The set (S) and reset (R) inputs operate as follows; when a low is applied to set input,  $\overline{Q}$  goes low and Q goes high; when a low is applied to reset input, Q goes low and  $\overline{Q}$  goes high. Set or reset can override all other inputs at any time.

Figure 4-2, JK Flip-Flop

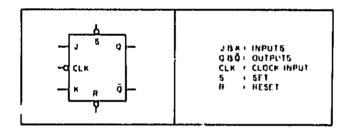


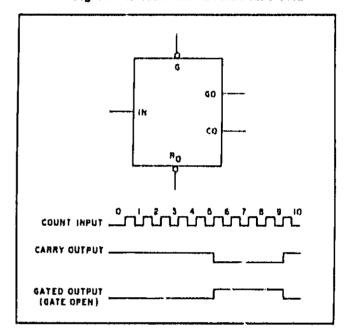
Table 4-1, Truth Table

t <sub>n</sub>		t <sub>n</sub> + 1		t <sub>n</sub> = Before clock pulse		
'1	К	Q	$\overline{Q}$	t <sub>n</sub> + 1 = After clock pulse		
1.	I.	Qn	$\overline{\mathbf{Q}}_{\mathbf{n}}$	If J = L and K = L, then Q and Q will not change from what they were before the clock pulse.		
Н	L	н	1.	If J = H and K = L, then Q will be H and Q will be L after the clock pulse.		
L	H	r	13	If $J = I$ , and $K = H$ , then $Q$ will be $I$ , and $\overline{Q}$ will be $H$ after a clock pulse.		
н	Н	$\overline{\mathbf{Q}}_{\mathbf{n}}$	Qn	If J = H and K = H before the clock pulse, then after the clock pulse Q and Q will change states.		

#### 4-11. Time-Base Decade

4-12. In the reset state, Carry Output (CO) (see Figure 4-3) is high and, if the Gate input (G) is low, Gated Output (GO) is low. Ten pulses on the Gate input produce a negative transition at the Gated Output. If the G input is high, GO is open-circuited regardless of the count. The Carry Output gives a positive transition after 10 pulses.

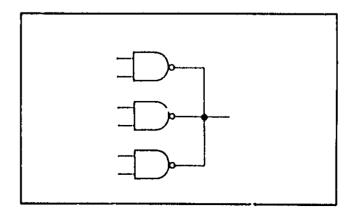
Figure 4-3. Time-Base Decade 1820-0412



#### 4-13. Open-Collector Gate

4-14. The output of an open-collector gate can be paralleled with gates of the same type to perform a wire-OR function, as shown in Figure 4-4. When the outputs are tied to the same line, any one of the gates can pull the line low without damaging itself.

Figure 4-4. Open-Collector Gate 1820-0327



#### 4-15. Logic Levels

4-16. This counter uses three types of logic: TTL (transistor-transistor logic), ECL (emitter-coupled logic), and DTL (diode-transistor logic). See Table 4-2 for specific logic levels.

Table 4-2. Logic Levels

Type	lf (Min)	l. (Max)	Trigger	Supply	
ECL	7 V	-1.4 V	-1.2 V	-5,0 V	
TTI.	2.4 V	0.4 V	1.5 V	5.0 V	
DTL.	2.6 V	0.4 V	1.5 V	5.0 V	

#### 4-17. OVERALL COUNTER OPERATION

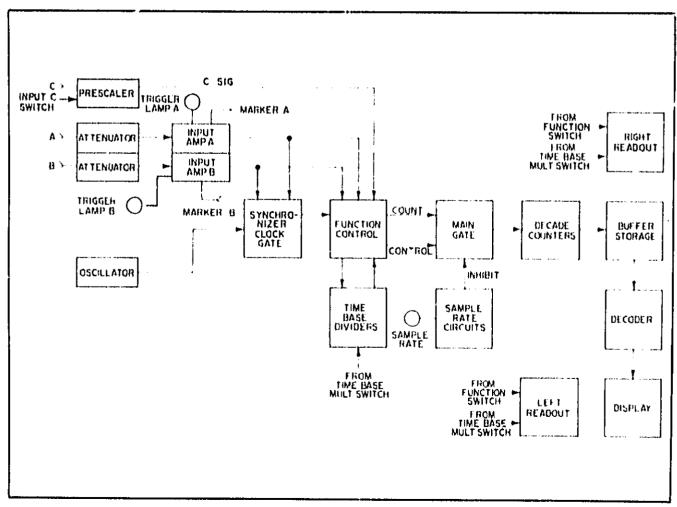
4-18. The signal connected to CHANNEL A is conditioned by the front-panel switches of the Attenuator Assembly (Figure 4-6). These switches set the operating conditions for trigger level, coupling, and

the required slope. The Input Amplifier converts the signal into narrow pulses for more efficient usage throughout the counter. In the 5327A, INPUT C provides an alternate path through the Prescaler Assembly, which divides the signal by 10 or passes it directly to the Function Control Assembly. The path taken is determined by the setting of the front-panel INPUT C switch.

4-10. The Function Control accepts both the input signal and the 10 MHz internal oscillator pulses and routes them in accordance with the mode of operation being used. One of these signals is sent to the A5 Time Base Assembly, which divides the signal as determined by the frent panel TIME BASE/MULTIPLIER switch. The first and last pulse of the divided signal control the length of time the main gate is open. During this time, the other signal is sent directly to the main gate for totalizing in the decade counters and is subsequently displayed. The synchronizer prevents the main gate from opening until an input signal is present.

4-20. The sample rate circuits control the interval between measurements. When the main gate closes, these circuits provide a delay, as controlled by the

Figure 4-5, Functional Block Diagram



front panel SAMPLE RATE controls. When the sample rate period has elapsed, a reset pulse is generated to reset the counter and start a new measurement.

4-21. The signal to be counted, either the internal oscillator or input signal, passes through the main gate to the decade counters. The buffer storage registers store the BCD count before it is translated into a decimal equivalent and displayed on the front panel. Also displayed on the front panel are the units of measurement and the decimal point. The left and light readout assemblies contain the unit indicators and the logic necessary to position the decimal point.

#### 4-22. Frequency Modes

4-23. Frequency is defined as the number of periodic events per unit of time. The counter, therefore, measures an unknown signal (COUNT) for a known length of time (Figures 4-6 and 4-7). The 10 MHz internal oscillator provides the known time and controls the opening of the main gate. The Time Base Assembly divides the oscillator frequency by powers of 10 to open the main gate from 10<sup>-7</sup> seconds to 10 seconds. The longer the gate is open, the more pulses of the unknown frequency are counted and, therefore, the better the resolution and accuracy.

# 4-24. Period Modes

4-25. In the Period Mode, the main gate is open for the period of the input signal (Figure 4-8). The Time Base dividers scale the 10 MHz oscillator

signal by powers of 10 from 1 to 10°, as determined by the MULTIPLIER switch. This oscillator signal (COUNT) is counted during the gate time (period) by the decade counters and is subsequently displayed.

4-26. In the Period Average Mode, the MULTPLIER switch selects the number of periods to be averaged (Figure 4-9). The Time Base dividers count the number of periods selected with the switch and holds the main gate open until this count is complete. The Decade Counter totalizes the oscillator pulses while the main gate is open.

#### 4-27, Time Interval Modes

4-28. In the Time Interval Mode (Figure 4-10), Channel A signal controls the start of the measurement, while Channel B siznal stops the measurement. The two signals—trol the state of the arming flip-flop, which, in turn, enables the Clock Gate to pass oscillator pulses to the Time Base Divider. The oscillator signal is scaled, congruent with the setting of the MULTIPLIER switch, before it is passed through the main gate to the counting assemblies.

4-29. For the Time Interval Average measurements (Figure 4-11), the setting of the MULTIPLIER switch determines the number of intervals that are averaged. The oscillator signal is counted directly for the duration of each, individual time interval that is being averaged. Once the Time Base Divider totalizes the number of elected intervals, the main gate closes and the measurement is displayed. See Page 8-24 for timing diagrams and a technical description.

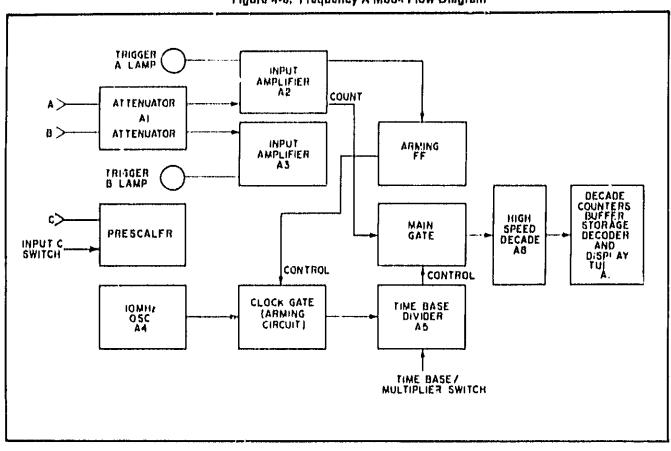
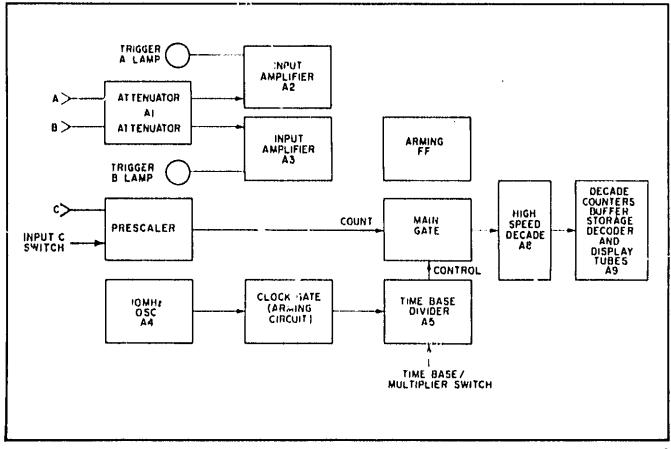


Figure 4-6. Frequency A Mode Flow Dingram





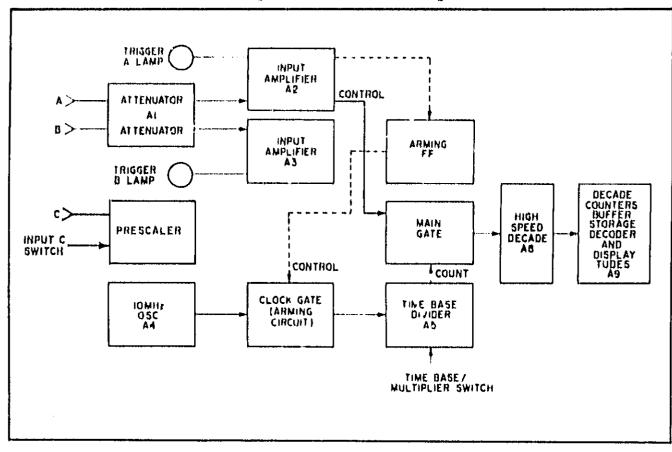


Figure 4-8. Period Mode Flow Diagram



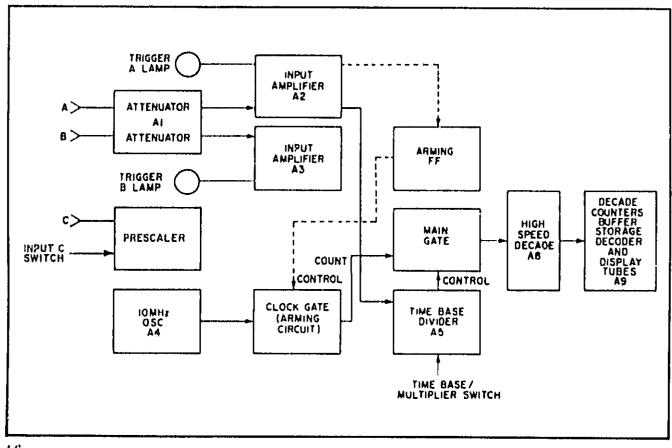


Figure 4-10. Time Interval Mode Flow Dingram

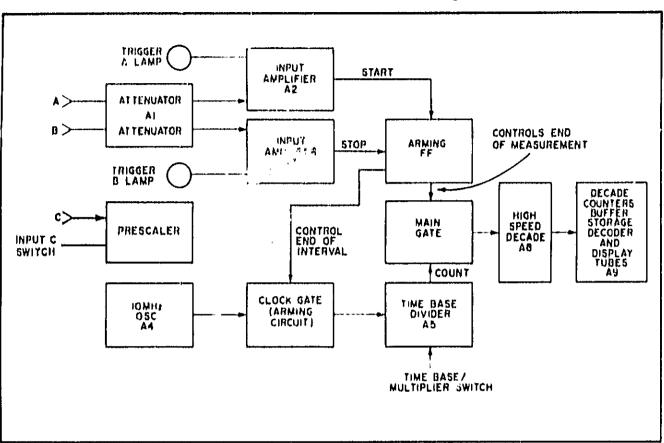
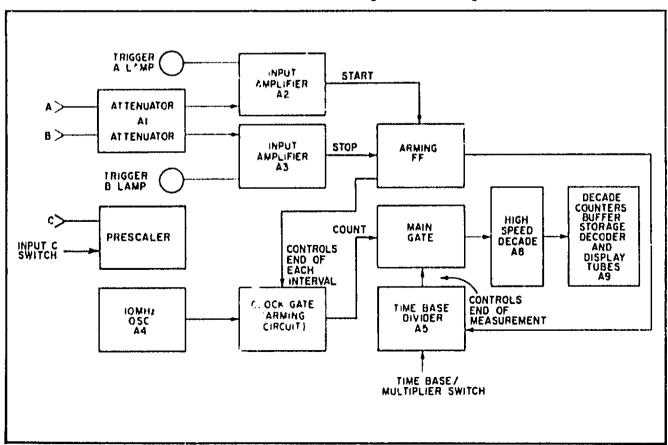


Figure 4-11. Time Interval Average Mode Flow Diagram

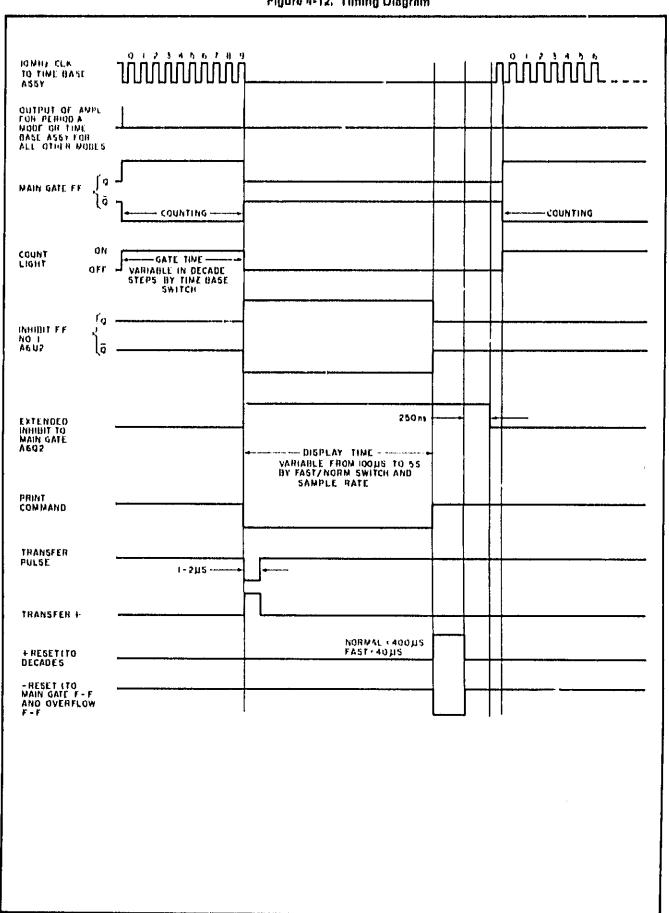


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Figure 4-12. Timing Diagram



#### SECTION V

#### MAINTENANCE

#### 5-1. INTRODUCTION

5-2. This section gives maintenance and service information. Included is a table of assemblies, recommended test equipment, in-cabinet performance checks, which may be used to verify proper counter operations, and adjustments.

#### 5-3. ASSEMBLY DESIGNATIONS

5-4. Table 5-1 lists the designations, name, and Hewlett-Packard part number of assemblies used in this instrument.

# 5-5. TEST EQUIPMENT

5-6. Test equipment recommended for maintaining and checking performance is listed in Table 5-2. Test equipment having equivalent characteristics may be substituted for the equipment listed.

Table 5-1. Assembly Identification

Assembly	Description	HP Part No.
Λ1	Attenuator	05326-60047
Αī	Attenuntor (Option 004)	05327-60034
Λ2	Input Amplifier	05326-60004
A3	Input Amplifier	05326-60004
$\Lambda 4$	Oscillator	05326-60002
Aδ	Time Base Control	05326-60005
A6	Sample Rate	05326-60013
Λ7	Function Control	05327-60031
<b>A8</b>	Display Support	05326-60009
A9	Display	05326-60008
A9	Display (Option 001)	05326-60025
A10	liught Readout	05327-60002
A11	Left Readout	05327-60003
A12	Voltmeter Input Amplifier	Not Used
A13	Voltmeter V-F Converter	Not Used
Λ14	DVM Logic	Not Used
A15	Regulator	05327-60020
A16	Interconnect	05327-60026
Δ17	Input C Amp (5326A)	05326-60031
A18	Presculer (5327A)	05327-60033

#### 5-7. ASSEMBLY CONNECTION IDENTIFICATION

5-8. Throughout the manual, connections to printed circuit assemblies are referred to in abbreviated form. For example, connection to A3, pin 10 is A3(10).

#### 5-9. IN-CABINET PERFORMANCE CHECK

- 5-10. GENERAL. The performance check (Table 5-3) and test card can be used to verify proper operation of all circuits of the counter and may also be used:
- a. As part of an incoming inspection check of instrument specifications.
- b. Periodically, for instruments used in systems where maximum reliability is important.
- c. As part of a procedure to locate defective circuits.
- d. After any repairs or adjustments and before returning instrument to regular service.
- e. As a permanent record of instrument maintenance performed, because the test record pages are perforated and may be removed.
- 5-11. VARIABLE LINE VOLTAGE. During the test (Table 5-3), the counter should be connected to a variable voltage source, so the line voltage may be varied ±10% from nominal (115 or 230 Vac).

# 5-12. INJIRUMENT COVER REMOVAL

5-13. To remove top or bottom cover, remove the four screws that secure cover to instrument. Slide cover toward rear of instrument and lift off. To replace cover, reverse procedure.

#### WARNING

115/230 VAC AND +175 VDC SUPPLY WIRES ARE EXPOSED WHEN EITHER TOP OR BOTTOM COVER IS REMOVED. USE EXTREME CAUTION DURING TROUBLESHOOTING, ADJUSTMENT, OR REPAIR. AVOID DAMAGE TO INSTRUMENT BY REMOVING POWER BEFORE REMOVING OR REPLACING COVERS, ASSEMBLIES, OR COMPONENTS.

#### 5-14. REPAIR

# 5-15. Printed Circuit Component Replacement

5-16. Component lead holes in the circuit boards have plated-through walls to ensure good electrical contact between conductors on opposite sides of the board. To prevent damage to the plating and the replacement component, apply heat sparingly, and work carefully.

# 5-17, Replacing integrated Circuits

- 5-18. Following are two recommended methods of replacing integrated circuits:
- a. SOLDER GOBBLER. This is the best method. Solder is removed from board by a soldering iron with a hollow tip connected to a vacuum source.
- b. CLAP-OUT. This method should be used as a last resort only. Clip the leads as close to the base as possible. With a soldering from and long nose pliers, carefully remove the wires from each hole. Then clean the holes.

#### 5-19, ADJUSTMENTS

- 5-20. The adjustments in Table 5-4 are in the order they should be performed but should not be done unless:
- a. A trouble has been repaired which would affect those values.
- b. The instrument does not meet all specifications while performing the check in Table 5-3 (In-Cabinet Performance Checks).

Table 6-2. Recommended Test Equipment

Instrumer t Type	Required Characteristics	Recommended Type
Frequency Standarc\	1 MHz Gotput	HP 107AR
Oscilloscope Vertical Plug-In Time Base Plug-In	69 MHz Bandwidth 50 mV/cm Sensitivity 50 MHz Bandwidth	HP 180A HP 1801A HP 1820A
Test Oscillator (two required)	10 Hz to 10 MHz at 5 volts peak- to-peak	HP 651B
Audio Oscillator	2 Hz to 100 kHz at 100 mV rms	HP 202C
HF Signal Generator	50 kHz to 50 MHz at 3 V rms	HP 603B
VHF Signal Generator	10 MHz to 480 MHz	HP 608F
Frequency Doubler	240 - 550 MHz	HP 10515A
Pulse Generator	10 MHz repetition rate, 8 ns pulse width, 0.3 volts peak-to-peak output	HP 216A
Electronic Counter	0.1 Hz to 10 MHz Frequency Measurements	HP 5245L
Variable Line Transformer	103 to 127 V rms and 206 to 254 V rms	Electronic Power Stat 3PF116 (115V); 3PF216 (230V)
Digital Recorder	Print Rate: 10 lines/sec. Data Input: +8421 BCD parallel entry, accepts 1 = +5 V, 0 = +0.25 V. Accepts negative going +5 to 0 V print command	HP 5055A
DC Voltmeter	0 to 200 Vdc, I % accuracy	HP 412A
AC VTVM	0 to 250 Vac	HP 400F
RF Voltmeter	1 mV to 3 V	HP 3406A

# Table 5-3, in-Cabinel Performance Check

# TIME BASE STABILITY AND OUTPUT

a. Set counter controls as follows:

S	AMP	ΗĘ,	Ħ	٨	T	ŀ.				,				٠		,				Mid-position
ŀ	AST:	'NO	11	M	1	11	o	١.,	1)						,					NORM
F	UHC'	TIO	N	,				,												FREQ A
T	IM E	ļι <b>Α</b> ,	51	:/	'n	11	11	ľ.	, Î	þ	į,	11	:1	ł		,				10s
S	190.1	٠٨	,				,						,		,			٠		•
٨	C/DC	٠,			٠				,				٠			٠		,		DC
٨	TTE	₹.,	,													,				XI
C	HK-Ł	EP	- (	20	)!	١		,		,									,	SEP
l.	EVE	ì.		,		,						,	,			,				PRESET
S	ronz	(GE				,				,	,					,	,			ON
O	SC.,		٠				,				,						,	,		Lan

#### NOTE

Allow one-hour warm up before proceeding to step b.

- b. Connect I MHz frequency standard to CHANNEL A input.
- c. A counter display of 000, 0000 (1000, 0000 Option 001) indicates that counter time base frequency is exactly 10 MHz. The offset between counter time base and 1 MHz frequency standard can be determined by subtracting 10 MHz from the indicated oscillator frequency.

COUNTER DISPLAY	A4 OSCILLATOR FREQUENCY
999-9950 kHz	10 000 050 Hz
999, 0940	10 000 040
909, 9970	10 000 030
999, 9980	10 000 020
999, 9990	010 000 01
1 000,0000	10 000 000
1 000, 0010	9 999 990
1 000, 0020	9 999 980
1 000,0030	9 999 970
1 000, 0040	9 999 960
1 000, 0050	9 999 950

- d. Record frequency offset on test card. For long-term stability, operate the counter continuously for at least one month. Measure frequency offset at one-month intervals.
- To calibrate the counter time base to the frequency standard, perform time-base adjustment in Table 5-4.

#### NOTE

Temperature must be held constant or compensation for temperature difference must be made whenever a frequency difference is recorded. Unless a record of the temperature and date of last calibration is available, the frequency offset should not be considered drift or aging rate of the 10 MHz crystal.

- 1. To check time base stability vs. line voltage variations, connect variable transformer to counter power cord. Vary line voltage  $\pm 10^{\circ}$  and record frequency difference on test eard; it should be  $\leq 1$  part in  $10^{7}$ .
- g. To check time base stability vs. temperature, vary counter operating temperature between 0 and 50°C. Record trequency difference on test card; it should be \$2.5 parts in 10°.

#### Table 5-3, In-Cabinet Performance Check (Continued)

- b. Connect oscilloscope vertical input to OSC jack on counter rear panel. Use 10:1 probe at OSC jack.
- Oscilloscope should display to MHz nominal at > 2.4 volts peak-to-peak amplitude. Record
  on test card.
- 2. DISPLAY, DECIMAL POINTS, AND DIVIDERS

Proper operation is verified in the Self-Check procedures in Table 3-1. Record on test card.

3. FREQUENCY RESPONSE AND SENSITIVITY

#### CHANNEL A

- n. Set counter controls is in In., except TIME BASE to Is and AC/DC switch to AC.
- b. Connect a BNC T connector to CHANNEL A input jack. Connect sine wave test oscillator output to T connector. Connect oscilloscope vertical input to T connector to monitor input signal amplitude; use a 50-ohm feedthrough at oscilloscope BNC.
- c. Adjust test oscillator from 20 Hz to 50 MHz, maintaining 100 mVrms input amplitude. Counter should properly display all frequencies in this range. Record on test card.
- d. Set audio oscillator frequency to 2 Hz. Counter should not count. Switch AC/DC switch to DC. Counter should count input signal.
- e. Connect a BNC T connector to Z axis input of oscilloscope. Connect counter MARKER A and B outputs to T connector.
- f. Adjust test oscillator output for 1000 Hz at 8 volts peak-to-peak indication.
- g. Set CHANNEL A LEVEL to PRESET and check that osc floscope marker is at 0 volts.
- h. Set CHANNEL A SLOPE to +. Vary CHANNEL A LEVEL control and check that marker is variable over at least -3.0 to +3.0 volts on the positive slope of waveform.
- i. Set CHANNEL A SLOPE to . Vary CHANNEL A LEVEL control and check that marker dot is variable over at least -3.0 to +3.0 volts on the negative slope of waveform. Record on test card.
- Set CHK-SEP-COM switch on COM and repeat marker test for CHANNEL B. Record on test card

INPUT C (For 5327A perform all steps; for 5326A perform steps a and f thru h).

- a. Disconnect oscilloscope and input to CHANNEL A. Remove  $50\Omega$  feedthrough and connect cable to INPUT C jack.
- b. Set FUNCTION selector to FREQ C, TIME BASE to 18, and input selector to (10):5327A).
- c. Use the set of frequency generators (Table 5-2) necessary to cover the input frequency from 0 to 550 MHz, while maintaining 25 mV rms input level. Adjust TIME BASE switch as necessary for best display.
- d. Check for stable count within stability of oscillator. Record on test card.
- e For 5327A, set input selector switch to DIRECT.
- f. Set FUNCTION selector to FREQ C and TIME BASE to 1s.
- g. Use the set of frequency generators necessary to cover the input frequency from 0 = 950 MHz, while maintaining 15 mV rms input level for the 5327A or 5 mV rms for the 5326A. Adjust TIME BASE switch as necessary for best display.

# Table 5-3. In-Cabinet Performance Check (Continued)

g. Check for stable count within stability of oscillator. Record on test eard. Disconnect squp.

#### 4. PULSE OPERATION

a. Set counter controls as follows:

FUNCTION		FREQ A
TIME BASE		l s
SLOPE A		+
AC/DC (A)		DC
ATTEN (A)	, , <i>,</i> ,	X1
LEVEL (A)		PRESET
CHK-SEP-COM		SEP
STORAGE	. , , ,	ON
OSC.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		INT

- b. Connect BNC T connector to oscilloscope vertical input. Connect pulse generator to T. Connect CHANNEL A input to T connector, using 50Ω feedthrough at the counter input.
- c. Adjust pulse generator output for 10 MHz repetition rate, 15 ns pulse width at 0, 3 volts peak-to-peak indication on oscilloscope.
- d. Check that counter displays the repetition rate, count light flashes, and trigger A lamp is on. Record on test card.
- e. Remove input connection from CHANNEL A input jack. Remove 500 feedthrough and connect cable to INPUT C jack. Set FUNCTION selector to FREQ C. Set INPUT C switch to DIRECT.
- f. Set pulse generator output to 10 MHz repetition rate, 15 nsec wide pulses, at 300 mV peak-to-peak.
- g. Check that counter displays repetition rate and count lamp flashes. Record on test card.
- Repeat above check for 10 kHz.

#### 5. PERIOD AND PERIOD AVERAGE

- a. Set counter controls as in step 1a, with FUNCTION to PERIOD A and MULTIPLIER to 103 or as needed. Set audio oscillator to 2 Hz at 190 mV.ms.
- b. Connect oscillator to CHANNEL A input, using BNC T. Connect oscilloscope to T, using  $50\Omega$  feedthrough at oscilloscope BNC.
- c. Vary audio and test oscillator frequency from 2 Hz to 10 MHz, maintaining 100 mVrms input amplitude. Vary MULTIPLIER as needed to maintain meaningful display with change of frequency. Counter should properly display the period of the frequencies in this range within accuracy spec of the instrument. Record on test card.
- d. Set FUNCTION switch to PERIOD AVG A and repeat step c. Record on test card.
- 6. TIME INTERVAL AND TIME INTERVAL AVERAGE
  - a. Set counter controls as follows:

SAMPLE RATE	Mid-position
FAST/NORM/HOLD	NORM
FUNCTION	T. L. A to B
MULTIPLIER	1
SLOPE A	•
SLOPE B	-

(Continued)

## Table 5-3. In-Cabinet Performance Check (Continued)

a. Counter control settings (cont'd):

 AC/DC (A and B)
 AC

 ATTEN (A and B)
 X1

 LEVEL (A and B)
 PRESET

 CHK-SEP-COM
 COM

- b. Connect test oscillator to CHANNEL A input. Set oscillator for 1 MHz output at 300 mVrms. Observedisplay for . 5 µs ±1 count ± trigger error. Record on test card.
- e. Set FUNCTION to T.1. AVG and MULTIPLIER to 10<sup>4</sup>. Set signal source to < 2 MHz. \* Counter should display one half the period of the input signal.

$$\pm 2$$
 as  $\pm \frac{\text{trigger error } \pm 100 \text{ ns**}}{\sqrt{\text{number of intervals averaged}}}$ 

#### 7. TOTALIZE

a. Set counter controls as follows:

- b. C teck that display totalizes, count light (C) is on and trigger A and B lamps light. Record on test card,
- c. Using 10:1 divider probe, connect oscilloscope vertical input to TIME BASE OUTPUT jack on counter rear panel.
- d. Check that oscilloscope indicates 10 MHz negative going pulses at least 3 volts peak-to-peak, typically > 30 nsec at 50% points. Set MULTIPLIER switch to 10 and observe 1 MHz output pulses, typically 190 nsec.
- e. Disconnect oscilloscope from TIME BASE OUTPUT jack and connect TIME BASE OUTPUT to 5245L Electronic Counter input. Set 6245L for frequency measurements.
- f. Set MULTIPLIER as follows, and check for proper counter display. Record on test card.

MULTIPLIER	5245 DISPLAY
i	10 MHz
10	I MHz
102	100 kHz
103	10 kHz
104	1 kHz
105	100 Hz
106	10 Hz
107	1 Hz
108	. 1 Hz

<sup>\*2</sup> MHz must NOT be exact or display will be ambiguous.

<sup>\*\* £1</sup> count.

## Table 5-3, In-Cabinet Performance Check (Continued)

# B. RATIÓ

a. Set counter controls as follows:

FUNCTION	,	٠	,	,	٠	٠		,		,			FREQ A
MULTIPLIER													
SLOPE A		٠				٠			,			,	+
AC/DC													
ATTEN													
CHK-SEP-COM,													
LEVEL A													
OSC (rear panel)	٠	٠			٠	٠	٠	٠	٠		•	٠	EXT

- b. Connect test oscillator to OSC jack, using BNC T. Connect oscilloscope to T connector, using 500 feedthrough at oscilloscope BNC. Set oscillator output for 10 MHz at I Vrms.
- c. Connect BNC T connector to counter's CHANNEL, A jack. Connect second test oscillator to T connector. Connect second channel of dual channel oscilloscope vertical input to T connector, using 50Ω feedthrough at oscilloscope BNC. Set variable oscillator for t(0) kHz at 100 mV rms display on oscilloscope.
- d. Check that counter displays 100. Disregard units and decimal point. Record on test card.
- e. Repeat test using 100 Hz into OSC jack and 100 kHz into CHANNEL A. S. t MULTIPLIER to 104. Display should be ratio of two input frequencies X 104 (approximately 104). Disregard decimal point and units. Record on test card.
- 9. GATE OUTPUT AND SAMPLE RATE
  - a. Disconnect setup.
  - b. Set counter controls as follows:

FUNCTION		,	٠		٠	٠	٠	٠	٠		٠	FREQ
TIME-BASE	,							٠				1 ms
CHK-SEP-COM	٠					٠						CHK
FAST/NORM/HOLD	,						,			,	,	FAST
SAMPLE RATE			,	,		,		٠				max cew

- c. Using 10:1 divider probe, connect oscilloscope vertical input to GATE output and observe positive pulses  $\geq 2.4V$  with a pulse width of < 100  $\mu s$ . Record on test card,
- d. Slowly rotate SAMPLE RATE clockwise and observe that the pulse width increases,
- e. Set the TIME BASE switch to 10 ms and rotate the SAMPLE RATE fully clockwise. Observe that the pulse width is > 20 ms. Record on test and.
- f. Set FAST/NORM/HOLD to NORM and turn SAMPLE RATE fully counterclockwise, just out of OFF. Observe the positive pulse width is < 20 ms. Record on test card.
- g. Slowly rotate the SAMPLE RATE clockwise, observing an increase in the pulse width,
- b. Set TIME BASE to 1s and rotate SAMPLE RATE fully clockwise. Verify that the time between flashes of the count (C) lamp is greater than 5 seconds. Record on test card.
- i. Set FUNCTION to START and check that gate output is TTL Low (< 0, 4V),
- j. Set FUNCTION to STOP and verify that gate output is TTL High (> 2,4V).

# Table 5-3. In-Cabinet Performance Check (Continued)

# 10. DIGITAL RECORDER (Option 003)

n. Set counter controls as follows:

FUNCTION	. FREQ A
TIME BASE	18
COM-SEP-CICK	CHK
FAST/NORM/F LD	NORM
SAMPLE TOPE M	id-position

- b. Connect oscilloscope to J96 a Observe oscilloscope display a print command (drop from >2.4 V to <0.4 V) immediately after the C lamp goes out.
- e. Connect jumper from 39(25) to J9(22).
- d. Check that counter's main gate is inhibited. C light does not flash, and no print command pulses are generated.
- e. Verify proper output by connecting a 5055A printer to J9. Printed output should agree with counter display. Logic probe or voltmeter may be used to verify that output logic levels agree with instrument display. Record on test card.

# Table 5-4, Adjustments

#### 1. POWER SUPPLY A15

- a. Connect counter line cord to variable power transformer. Monitor output voltage with AC VTVM. Adjust transformer for 117 volt indication on VTVM.
- b. Turn counter SAMPLE RATE control clockwise out of OFF.
- e. Connect VTVM to A15 Pin 7 and adjust A15R10 for +16.5 V.
- d, Connect VTVM to A15 Pin 6 and adjust A15R13 for -16,5 V,

#### 2. SENSITIVITY AND OFFSET A2, A3

- a. Connect a BNC T connector to CHANNEL A input jack.
- b. Connect test oscillator output to T connector.
- c. Connect oscilloscope vertical input to T connector, using  $50\Omega$  feedthrough at oscilloscope input BNC.
- d. Connect counter MARKER A output to oscilloscope Z-axis input.
- e. Adjust test oscillator for 1 kHz output at 100 mV rms.
- i. Set counter controls as follows:

FUNCTION	FREQ A
CHK-SEP-COM	SEP
ATTEN	
AC-DC	
LEVEL	

- g. Set SLOPE A switch to and + positions and observe marker position on oscilloscope waveform.
- h. On Input Amplifier board A2, adjust A2R2 SENS pot until + and marker positions have a synmetrical offset about the zero volt axis for + and slope switch positions.
- i. Adjust test oscillator for 1 kHz output at 200 mV rms.
- j. Set counter FUNCTION switch to T.I. A to B.
- k. On Input Amplifier, adjust A2R24 TRIG LEVEL pot until markers are at 0 volts for both + and SLOPE switch positions.
- l. Repeat procedure for CHANNEL B input (Amplifier Board A3).

#### 3. OPTION 004 ATTENUATOR A1

#### Set:

TIME BASE	 ٠				٠.						,		ĺ	),	ļ	80	c.
AC/DC,				. ,											٠	D	C
SEP/COM .	 	 ,					 	,		,			 			31:	P
ATTEN A/B									 							X	10

- a. Using an HP 412A or equivalent, measure voltage at CHANNEL A jack.
- b. Adjust R56 for < ±1 mV reading.
- c. Measure voltage at CHANNEL B jack.
- d. Adjust R9 for < ±1 mV reading.
- e. Set A and B attenuators to X100 position.
- f. Measure voltage at CHANNEL B jack.
- g. Adjust R32 for < ±1 mV rending.
- h. Measure voltage at CHANNEL A jack.
- i. Adjust R33 for < ±1 mV reading.

#### 4. OSCILLATOR A4

- a. Connect 1 MHz frequency standard to CHANNEL A jack,
- b. Set counter controls as follows:

CHK-SEP-COM	,	SEP
FUNCTION		
TIME BASE		
SAMPLF RATE	alip	htly clockwise
	-	and of OFR

- c. Remove top cover.
- d. Using insulated tuning tool, adjust A4C3 until display indicates all zeros with cover on. (Wait 10 seconds between adjustments for counter to make measurement.)

#### NOTE

For standard instruments without Option 001, the counter display will overflow; however, all digits are valid.

#### 5. PRESCALER ADJUSTMENTS A18 (5327A):

a.	Set counter controls as follows:	
FU	INCTION	FREQ C
Ή	ME BASE ,	0.1s
IN	PUT C	+10

b. With no input signal applied, adjust R3 offset pot for 0 V on U2 pin 4.

- e. Adjust R10 bias pot for 0.65 ±.05 V on U2 pin 3.
- d. Adjust R27 bias pot for 0.9 ±.05 V or U2 pin 3.
- e. Check that the previously adjusted voltage on U2 pin 3 is correct. If voltage has shifted, adjust R10 for proper reading and recheck U3 pin 3.
- f. Set HP VHF Signal Generator and doubler for 550 MHz at 1 V rms. Measure the output with an HP 3406A RF Voltmeter using a 500 termination at the probe. Connect signal source to INPUT C of counter.
- g. Reduce output level until counter's display becomes unstable. Adjust R3 for a stable display. Repeat this procedure until unable to obtain a stable reading. Increase signal level until display just becomes stable.
- h. Disconnect input and connect to voltmeter; reading should be 25 mV or less. Check other frequencies within the band.
- i. Set INPUT C switch to DIRECT.

- j. Change input signal to 50 MHz at 15 mV. Counter should display 50 MHz.
- INPUT C AMPLIFIER A17 (5326A)
  - a. Set counter controls as follows:

FUNCTION		,		,									İ	ľ	₹	Ŀ	Q,	(	•
TIME BASE					,		,					,					O,	. i :	i

- b. Set HP 606B HF Signal Generator for equivalent) for 50 MHz at 500 mV rms. Measure the output signal of 606B with an HP 411A RF Millivoltmeter, using a 500 termination. Connect signal source to INPUT C of counter.
- c. Reduce output level until counter's display becomes unstable. Adjust R11 for a stable display. Repeat this procedure until unable to obtain a stable reading. Increase the signal level until display just becomes stable.
- d. Disconnect input and connect to voltmeter, reading should be less than 5 mV. Check other frequencies within the band.

Table 5-5. D.P. and Annunclator Troubleshooting

Punction	Multiplier							Decimal				
Switch	Switch	n	μ	m	B		105	104	101	102	101	100
Period AVG A	1		×		x							x
	10 10 <sup>2</sup>		X		X		1	!		×	×	
	103	x	ŀŤ	<del> </del>	X			<del> </del>	-	<del>  ~</del>		X
	104	X 		ĺ	X					×	×	
	105 105	X X	<del> </del> -	├	X		<del></del>	<del> </del>	x	<u> </u>	<del> </del>	
	107	х			x			x	1			ĺ
	10*	×			X		X					
T.I. AVG A to B	1		x		x							x
	10		x	[	x						×	
	102	×	<u> </u>		X	-			<del> </del>	X		х
	101	x			x						x	
	105	X		<b> </b> -	X	┝		<u> </u>	×	×	ļ	-
	107	x			x			x	Î			
	10*	x			x		x					
T.I. A to B	ı		х		х							x
	10		x		x						۱.,	
	10,			X	X X	-		-	-	-	X	x
	104			x	x				[			
	105				×			<u> </u>	├	<del>                                     </del>	x	
	107				x						i	
	10*			}	:	x						
Period A	1		X		х							x
	10		x		x							
	102			x	x					<b> </b>	X	х
	101			x	х	:						"
	10 <sub>2</sub>				X				ļ	<del> </del>	X	<u> </u>
	10"				X X					}		x
	10*					x					]	

į

Table 5-5. D.P. and Annunciator Troubleshooting (Cont'd)

Function	Multiplier	G	k	M			Decimal				
Switch	Switch	'		141	Hz	101	101	10°	10:	10'	10"
Freq. A	1	X			х	1				x	-
	10	ľ	}	x	х						1
į.	10:		<b> </b>	X	X				L _		X
1	103	Ì		X	) A	ĺ	ŀ			×	
1	10* 105			×	X	ŀ			X		
}-	10"		X	├	X	<b> </b> -					<u> </u>
	10		×		x				x	х	!
	10*		x		x			x	^		
Freq. C DIRECT	1	x			x					x	
,	10	"		x	x					•	
	102			x	x						×
	103			×	×					х	† · <del></del>
j	104	<b> </b>		x	x				x		
<u> </u>	105		х		х						X
	10"		х		x					x	
1	10 <sup>7</sup> 10 <sup>6</sup>	i	λ		×				x		
	10.		X		X			X			
Freq. C PRESCALE	1	x			x						x
	10	x			x				ļ	э;	
ļ	102			X	X						
į	103			x	×					1	x
1	10* 10*			X	X		ļ		ļ	х	
<del> -</del>	10*		x		X	∤	<del></del>	∤	<del> </del>		
1	10 <sup>7</sup>		x		X	1	- 1	ł	- 1	x	x
	10*	1 1	x		^	- 1	ļ		×	^	

# PERFORMANCE CHECK TEST CARD

	Model 5326A/5327A   Test Performed by	
Timer/Counter Serial No.	Date	
	DESCRIPTION	CHECK
	STABILITY AND OUTPUT	
Line Voltage Temperature	< 3 parts in 10 <sup>7</sup> per month e: < 1 part in 10 <sup>7</sup> for 10% line variation e: <±2.5 parts in 10°, 0-50°C MHz, > 2.4 volts peak-to-peak	
?. DISPLAY, D	DECIMAL POINTS, AND DIVIDERS	<del></del>
As per celf-	check procedures, Table 3-1	
3. FREQUENC	y response and sensitivity	
	Range: 0 to 50 MHz Range: 0 to 550 MHz (prescaled 5327A) 0 to 50 MHz (direct)	
] ]	Frequency A: 100 mV rms Frequency C (5326A): 5 mV rms Frequency C (5327A Direct): 15 mV rms Frequency C (5327A Prescaled): 25 mV rms	
Channel A Le Channel B Pi	reset: 0 volts evel: +3.0 to -3.0 volts reset: 0 volts evel: +3.0 to -3.0 volts	
4. PULSE OPER	ATION	
	Sensitivity: 0,3 volts peak-to-peak Pulse Width: 15 ns	
MPUT C:	Sensitivity: 0,3 volts peak-to-peak Pulse Width: 15 ns	**************************************
5. PERIOD AND	PERIOD OPERATION	
Frequency Ra	nge: 0 to 10 MHz at 100 mV	
6. TIME INTERV	VAL AND TIME INTERVAL AVERAGE	
	: 0.5 $\mu$ s at 300 mV Average: 1/2 period of input signal	
7. TOTALIZE		
Range: 0 to 1 Output: Rear Factor: 1 to 1	0 MHz panel TIME BASE BNC 10 <sup>8</sup> in decade steps	

# PERFORMANCE CHECK TEST CARD

8,	RATIO			
	Range Channel A: 0 to 50 MHz Range External Input: 100 Hz to 10 MHz			101-104-11-11
9,	GATE OUTPUT AND SAMPLE RATE:	Output:	Step c Step e Step f Step h	**************************************
10.	DIGITAL RECORDER			
	Print Command: +5V to 0V Output: Corresponds to input data			
	1			
				i

OPERATING AND SERVICE MANUAL

# TIMER COUNTER 5326A/5327A





→ HEWLETT (II) PACKARD

# CERTIFICATION

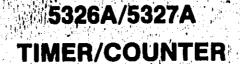
The Hewlett-Packard Company certifies, that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from the factory. The Hewlett-Packard Company further certifies that its calibration measurements are traceable to the U.S. National Bureau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

# WARRANTY AND ASSISTANCE

This Hewlett-Packard product is warranted against defects in materials and workinghship. 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.

Service contracts or customer assistance agreements are available for Hewlett Packard products that require maintenance and repair on site.

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



# OPERATING AND SERVICE MANUAL

SERIAL PREFIX: 5326A — 1136A 5327A — 1120A

This manual applies to HP Model 5326A having serial prefix 1136A and HP Model 5327A having serial prefix 1120A.

# SERIAL PREFIXES NOT LISTED

For serial prefixes above 1136A (5326A) and 1120A (5327A), a "Manual Supplement" sheet is included with this manual. For serial prefixes below 1136A and 1120A, refer to Section VII of this manual.

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HEWLETT (ID) PACKARD

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Figure 1-1. HP Model 5326A/5327A Timer/Counter MODEL 5326A MODEL 5327A POWER CORD

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#### SECTION I

# GENERAL INFORMATION

#### 1-1. DESCRIPTION

1-2. The Hewlett-Packard Models 5326A/5327A are frequency counters that have a variety of functions. The basic difference between the two models is the addition of the prescaler assembly in the 5327A. This assembly increases the upper frequency limit from 50 MHz to 5500 MHz. The 5326A uses a high-sensitivity, 50 ship input amplifier in place of the prescaler.

1-3. The instruments measure frequency, period, period average, time interval, time interval average, and ratio. Features include a 7-digit display (8-digits optional), 1M ohm and 50-ohm inputs, display storage, and blanking for insignificant digits in the display. Decimal point and unit readouts are displayed automatically with each operating selection. Two independent input channels are provided for time interval measurements. Each that channel has an attenuator, trigger slope selection level control, ac-de coupling, and an oscilloscope marker output. Table 1-1 lists the electrical and mechanical specifications.

# 1-4. IDENTIFICATION

1-5. Hewlett-Packard uses a two-section serial number mounted on the rear panel. Earlier instruments use an 18-digit serial number (000-00000). The first three digits are a serial prefix number; the last five digits refer to the specific instrument. Later instruments use a 9-digit serial number (0000A00000). The first four digits are the serial prefix and the last five digits refer to the specific instrument, If the serial prefix of your instrument differs from that listed on the title page of this manual, there are differences between this manual and your instrument. Lower serial prefixes are documented in Section VII, and higher serial prefixes are covered with manual change sheets included with the manual. If the change sheet: is missing, contact the nearest. Hewlett-Packard Sales, and Service Office listed on the inside rear cover of this manual.

# 1-6. APPLICATIONS

14. The 5326A/5327A Counters are particularly adaptable to timing measurements such as pulse width, bulse repetition frequency, and propagation

delay. The time inferval average mode measures time interval on repetitive signals with resolution better than, one nanosecond; When used with microwave test systems, group delay, phase, and level measurements can be performed.

#### 1-8, OPTIONS

119. The instrument can be ordered with the following options: Option 001, 8-digit display; Option 002, remote programming; Option 003, digital recorder outputs; and Option 004, remote programming for all signal input conditions,

Table 1-1. Equipment Supplied

Description	HP Part No.
Detachable Power Cord, 7½ ft. (231 cm) long	8120-1348
Rack Mounting Kit	05326-60029

Table 1-2. Accessories Available

Description	HP Part No.
Digital Recorders , wi Interconnect Cable, Digital Recorder, 6 ft. (183.cm)	5050B, 5055A 562A-16C
50-ohm BNC to BNC Conxial Cable, 4 ft: (122 cm)	10503-6001
Circuit Board Extender, 15-pin (two required)	5060-0049
Input Amplifier Circuit Board , Extender	10532-60001
Circuit Board Extender, 18-pin	5060-2041
Extender Board Kit; includes two 5060-0049, and one each 5060-2041, and 10532-60001	10532A

# INPUT CHANNELS A AND B

Ranger

de coupled: 0-50 MHz ne coupled: 20 Hz - 50 MHz

Sensitivity:

0.1 V rms sine wave 0.3 V p-p pulse 8 ps minimum pulse width

Sensitivity can be decreased by 10 or 100, times, using the ATTENUATOR switch.

impedance: 1 MΩ shunted by less than 25 pF

Dynamic Input Vollage Range:

, 0,1 to 3 V rms ac times attenuator setting ±5 Vdc times attenuator setting.

Trigger Level:

PRESET to center triggering about 0 V or variable over the range of -3 V to +3 V times attenuator setting. Trigger threshold band <1.0 mV, referred to input at maximum frequency.

**Overload Protection:** 

250 V rms on all attenuator settings, except 25 V rms on X1 above 50 kHz.

Slope:

Independent selection of positive or negative slope.

Channel inputs: Common of separate lines.

Marker Oulputs:

Rear panel BNC's DTL pulse, low for approximately 2 µs after trigger point for A and B channels.

INPUT CHANNEL C

5327A

Range:

direct: 1 kHz-50 MHz, ac coupled prescaled: 0-550 MHz, dc coupled

Sensitivity:

direct: 5 mV rms prescaled: 100 mV rms

Impedance: 50Ω nominal

Maximum input: 5 volts rms; 7.5 volts peak

Trigger Level: 0 volts

5326A

Range: 0 to 50 MHz, dc coupled

Sensitivity:

5 mV rms

Impedance: 50Ω nominal Maximum Input: 5 volts rms; 7,5 volts peak

Trigger Level: () volts

CAUTION

Do not exceed voltage specification or damage will occur.

START (Totalizing and Scaling)

Range: 0 - 10 MHz

Factor: 1 - 10<sup>n</sup> selectable in decade steps Output: Rear panel TIME BASE BNC

Display:

Channel A input divided by scaling factor

FREQUENCY

Rang

·0 - 50 MHz (5326A) 0 - 550 MHz (5327A)

Input

Channel A; channel C for direct and for prescaled (switchable). Channel A provides triggered frequency measurement

Gate Times: 0.1 µs to 10 å in decade steps

Accuracy:

Direct: ±1 count ± time base accuracy.

Prescaled: ±10 counts ± time base accuracy

Display:

kHz, MHz, or GHz with positioned decimal point

TIME INTERVAL

Range: 0.1 µs to 10<sup>d</sup> seconds

Input:

Channels A and B; can be common or separate

Frequency Counted:

10 MHz to 0.1 Hz in decade steps

Accuracy: 1

\*1 count \* time base accuracy \* trigger

Display:

μs, ms, seconds or 10's of seconds with positioned decimal point

TIME INTERVAL AVERAGE

Range: 0.15 ns to 10 s

Intervals Averaged:

1 - 10" gelectable in decade steps

\*±10 counts of input frequency (±1 count displayed),

# Table 1-3 [Specifications (Continued)

Input:

Channels A and B; can be common or separate

Frequency Counted: 10 MHz

Minimum Time Stop to Start: , 170 ha

Accuracy: \* time base accuracy \* 2 ns

(trigger error\*\* +100 ns)

Intervals averaged

Display: -ns, us with positioned decimal point

PERIOD

Range: 0-10 MHz

Input: Channel A

Frequency Counted;

10 MHz to 0.1 Hz in decade steps . ?

Accuracy:

+1 count +time base accuracy's trigger

Displak:

μέ, ms, seconds or 10's of seconds with positioned decimal point

**PERIOD AVERAGE** 

Range: 0: 10 MHz

Reriods Averaged: 1 - 10 selectable in decade steps.

. . .

Input: Channel A

Frequency Counted: 10 MHz

Accuracy:

\* time base accuracy \* 1 count \* trigger error\*\*\*

Display: ng, µs, with positioned decimal point

RATIO

Display

FA/Fext or FG/Fext times MULTIPLIER (M).

M = 1 to 10", selectable in decade steps

Range

FA'(Channel A or Channel C) 0 : 50 MHz
Fext (External Oscillator Input) 100 Hz to

Mode:

Operating mode will be either FREQUENCY A or FREQUENCY C

Accuracy:

# 1 count of FA # trigger error of Fext

TIME BASE

Crystal Frequency: 10 MHz

Stability:

Aging Rate: <3 parts in 107/mo;

Temperature: <12.5 parts in 10%, 0° to 50°C.

Line Voltage: <±1 part in 107 for 10% line

Short-term Fluctuation: Typically & parts

in 100, one second average (at con-

stant (emperature)

**Oscillator Output:** 

10 MHz, TTL type output levels, 50Ω series impedance at rear panel BNC

External input: 100 Hz - 10 MHz/ 1 V rms into 1kt/2

Time Base Output;

Negative pulses, #LV to 0 V (open circuit), typically 100 ns wide. In START, output is 10 MHz divided by TIME BASE/MULTIPLIER switch setting. Available at rear panel BNC.

Gale Output:

TTL level pulses; low while gate open, high while gate closed. Available at rear panel BNC

. GENERAL

Display: 7 digits (8 optional)

Blanking

Suppresses display of unwanted keros left of the most significant digit

Display Storage:

Holds reading between samples, Rear panel switch overrides storage

\*\*For any waveshape, trigger error is less than

0.0025

Signal Slope (V/µs)

\*\*Trigger error is less than ±0.3% of one period + periods averaged for signals with 40 dB or better signal-to-noise ratio and 100 mV rms amplitude.

1:3

# Sample Bate:

FAST position: Continuously variable from less than 100 µs to approximately 20 ms. NORM position: Continuously variable from less than 20 ms to approximately 5 seconds. HOLD position: Display can be held indefinitely.

#### Overland

Neon indicates when display range is exceeded.

Operating Temperature: 0° to 50°C

# Power Regulièments:

115 or 230 volts £10%, 50 to 60 Hz, 70 watts

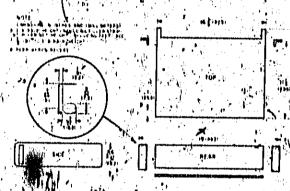
# Weight:

Net, 16 lb,(7,4 kg), Shipping, 18 lb, 16 oz(8,7 kg)

#### Accessories Furnished:

Power Cord, 71/2 ft. Rack Mount Kit.

# DIMENSIONS



# ACCESSORIES AVAILABLE

HP 10503A, 50° BNC Cable, 4 ft (122 cm) HP 10532A, Extender Board Kit containing 2 en. 15-pin extender 5060-0049, 1 en. 18-pin extender 5060-2041, and 1 en. Amplifier Extender, 10532-50001

HP1054 A, Remote Programming Interface enables interfacing between the 5326/5327 Serieu counter with Option 004 and 40 bit Output Register, Includes two (2) 7-bit Digital-to-Analog Converters for level controls and decoding for time base and function, selector.

HP Cable 562A-16C, 6 ft. (183 cm) to connect 5326/5327 Series with Option 003 to HP 5050B or 5055A Digital Recorder

Option 001: B-digit display

Option 002r Remote programming

# Controls:

All front panel controls are single line programmable except:

SEP-COM (Beparate-common) switch; the check function is programmable

- FAST/NORM Mode! Input Attenuators.

ACADO Input Signal Coupling

# Central Signal:

Single line control using alther contact closure to ground or DTL drive on all lines except trigger levels which are analog programmed (#3 Vdc)

#### Connector

Rear panel connector: HP 1251-0085; Amphenal 57-40300-375, (36-pin blue ribbon),

Mating connector: HP 1251-0084; Amphenol 67-30360-375

Option 003: Digital of put (for numerals and polarity only)

#### Code:

i-line 12-4-8 BCD, "1" state high, "0" state ... 10.25 V qt -1 mA; "1" state; +5 V open circuit, 25 kΩ source impedance nominal

#### Print Command:

+5 V to 0 V, de coupled; occurs at end of gate,

#### Storage:

(Buffer storage is provided so BCD output is constant while next measurement is being made

# 'Inhibit Input:

Inhibits gate when instrument's cycle time is less than the time required for external equipment to interrogate BCD outputs.

Positive inhibit +5 Vdc

# Connector:

Rear panel connector: HP 1251-0087; Amphenol 57-40500-375 (50-pin blue ribbon), Mating connector: HP 1251-0088; Amphenol 57-30500-375,

Option 004: Remate Programming includingall signal input conditions.

#### Controls

All front panel controls are programmable except FAST/NORM Mode.

## Control Signal:

Single line control using either contact closure to ground or DTL drive on all lines except trigger levels which are analog programmable (±3 Vdc).

# Connector:

Rear panel connector: HP 1251-0087; Amphenol 57-40500-375 (50-pin litue ribbon) Mating Connector: HP 1251-0086; Amphenol 57-30500-375.

# SECTION II

# INSTALLATION

#### 2-1. INTRODUCTION

2-2. This section contains information for unpacking, inspection, repacking, storage, and installation. The instructions for remote programming are also given in this section.

# 2-3. UNPACKING AND INSPECTION

2-4. If the shipping carton is damaged, ask that the carrier's agent be present when the instrument is unpacked. Inspect the instrument for damage (scratches, dents, broken knobs, etc.). If the instrument is damaged or fails to self-check (Self-Check Procedures, Table 3-1), notify the carrier and nearest Hewlett-Packard Sales and Service Office immediately (offices are listed at the back of this manual). Retain the shipping carton and padding material for the carrier's inspection. The sales and service office will arrange for the repair or replacement of your instrument with out waiting, for the claim against the carrier to be settled.

# 2-5. STORAGE AND SHIPMENT

- 2-6. 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 packing material such as that used for original factory packaging. Contract packaging companies in many cities can provide dependable custom packaging on short notice. Here are two recommended packaging methods:
- a. RUBBERIZED HAIR, Cover painted surfaces of instrument with protective wrapping paper. Pack instrument securely in strong corrugated container (350. lb/sq. in. bursting test) with 2-inch rubberized hair pads placed along all surfaces of the instrument. Insert fillers between pads and container to ensure a snug fit.
- b. EXCELSIOR Cover painted surfaces of ininstrument with protective wrapping paper. Pack instrument in strong corrugated container (350 lb/sq. in. bursting test) with a layer of excelsior about six inches thick packed firmly against all surfaces of the instrument.

- -2-7. ENVIRONMENT. Conditions during storage and shipment should normally be limited as follows:
  - a. Maximum altitude: 25,000 feet,
  - b. Minimum temperature: 40°F (-40°C),
  - c. Maximum temperature: +167°F (+75°C)

# 2-8. RACK INSTALLATION

- 2.9. The counter is ready for bench operation as shipped from the factory. Additional parts necessary for rack mounting are packaged with the instrument. To convert to rack installation, proceed as follows:
  - n. Remove tilt stund.
- b. Remove feet (press the foot release button, slide foot toward center of instrument, and lift off).
- c. Remove adhesive backed trim strips at front end of sides.
- d. Attach filler strip along bottom edge of front panel using two screws on outer edges of filler strip. Omit the center screw.
- e. Attach Ranges, to front end of sides (larger confer notch toward bottom of instrument), Instrument is now ready to mount in standard rack.

#### CAUTION

Ambient temperature in rack during operation should not exceed 122°F (50°C). Be sure instrument position in rack permits adequate air circulation and that nearby equipment does not discharge hot air directly on the instrument.

# 2-10. POWER CONNECTION

241. LINE VOLTAGE. The counter may be operated from either 115 or 230 volt (±10%) power lines with frequencies from 50 to 60 Hz. A slide switch on the rear panel permits quick conversion for operation from either voltage. Insert a narrow-blade screwdriver in the switch slot and slide the switch to the right for 230 volt operation ("230" marking exposed) or to the left for 115 volt operation ("115" marking exposed). The counter is supplied with a 115 volt fuse; be sure to change this fuse for 230 volt operation, see Table 2-1.

#### CAUTION

Before plugging instrument to ac powerline be sure slide switch is properly positioned.

# Table 2-1, 115/230 Volt Conversion

Line Voltage Conversion	115 Volt	230 Volt
Blide Bwitch	Lon (115)	Right (230)
AC Line Fuse	1.50 Ampere (Slow-Blow) (HP 2110-0304)	0.8 Ampere (Slow-Blow) (HP 2110-0020)

- 242. POWER CABLE, The counter is equipped with independent Bwire power cable. Proceed as follows for installation.
- n. Connect plug (3-socket connector) to ac line jack at rear of instrument.
- b. Connect plug (2-blade with round grounding pin) to 3-wire (grounded) power outlet. Exposed portions of instrument are grounded through, the round pin on the plug for safety; when only 2-blade outlet is available, use connector adapter (HP Part No. 1251-0048), then connect short wire from side of inpeer to ground.

# 2-13. REMOTE PROGRAMMING, OPTION 002

2-14. The following paragraphs describe remote programming requirements for the counter with Option 002.1 Sed Paragraph 2-33 for Option 004 programming.

# 2-15. Front Panel Controls

- 2-16. The following front-panel controls are program-mable;
  - n. PUNCTION
  - 6. TIMEBASE/MÜLTIPLIER
  - c. CHECK function
  - al BLOPE
  - West SAMPLE RATE and HOLD
  - f. lEVEL controls
  - g. INPUT Cawitch (5:127A only)
- T h. RESET
- 2-17. The following front-panel controls are NOT programmable:
  - a. AC/DC
  - b, SEP-COM
  - **6 FAST/NORM**
  - d. ATTEN

2-18. The trigger level controls may be remotely programmed or the front-panel LEVEL controls may be used. It is possible to program the LEVEL controls without programming the remainder of the front-panel controls. When remote programming is used, the LEVEL controls must be set to PRESET. Display time may be remotely programmed and/or the front-panel controls may be used.

#### 2-19, Remote Programming Requirements

- 2-20. All lines may be controlled by TTL or DTL signals or contact closure to ground when the unit is being remotely programmed: except the trigger levels which are programmed by an analog level (if programmed) and the display time line (Hold), J10 pin 35, which should NOT be pulled up to +5 V by less than 2007 while programming.
- 2.21.) When the unit is NOT being programmed (Ext. line.high); all the lines should be left open or pulled up to +6 V by not less than 5kff, except the trigger levels, which should be open directled.

## 2-22, Remote Programming Procedure

- 2-23. In order to remotely program the counter, the following must be done:
- n. Bet FUNCTION switch to any function but START or STOP.
- b. Ground the EXT line at rear-panel REMOTE PROGRAM connector J10(17). This disables the front panel switches. Ground is available at J10(36).
  - c. Select the desired function.
  - d. Select the desired time hose.
- B. This is accomplished by grounding the Slope line for (-) and leaving it open for (+). Slope A line is 110(28), Slope B line is 110(28),
  - f. Belect the trigger level for input signal,
  - K. Adjust the display time.
- h. Manual reset is available by grounding (5.7 V) pin 34. Check is available by grounding pin 14.

# 2-24. Punction Selection Programming

2.25. To program the desired function, ground (<.7 V

BTOP	Pin 32		11
START	Pins I a		
PERIOD AVERAGE	Pin 2		(a) s
TJ. AVG.	Pin 3		
	Pill 4		
PERIOD	On 5		
'I'REQ.'A	Pin 6	i ya karajir Tilgan k	
FREQ. O DIRECT	Pin 7		,
FREQ.C+10	Pinu 7 n	nd 18	

# 2-26. Time Base Belection Programming

2-27. To program the Time Base, ground (<,7 V) the proper line at J10 as follows:

1 дв/1	Pin 19
1 με/10	Pin 20
10 μπ/10"	11n 21
:1 ms/10 <sup>3</sup>	Pin 22
1 ms/104	Pin 23
10,ms/10 <sup>b</sup>	Pin 24
.1 a/104	Pin 25,
1 6/107	Pin 26
10#/10"	Pin 27

# 2-28. Trigger Level Programming

2.29. To program the trigger level, the LEVEL controls must be set to PRESET. Select the trigger level by placing a devoltage between 3.0 and +3.0 volts on the level input line (Level A.\* J10 pin, 30, Level B = J10 pin, 31). This voltage, times the attenuator setting, is the trigger level. Preset is programmed by leaving the pin open on contact closure to ground. Grounding is preferable if noise exists on the remote programming line.

2-30. The front-panel LEVEL controls may be used manually if programming of the trigger levels is undesirable. Also, note the AC/DD and ATTEN switches on the front-panel must be set manually, as they are NOT programmable.

# 2-31, Sample Rate Adjustment

2-32. Adjusting the display time can be accomplished in several ways:

- n. Manually adjust the display time by using the front panel SAMPLE RATE controls.
- b Set the SAMPLE RATE control ow and the FAST/NORM/HOLD switch to NORM and connect a linegolim pot in series with a 1.5k olim-resistor from 15% to pin 35. This will give a display time range of about 10 ms to 5 sec. If a shorter time is desired, set the FAST/NORM/HOLD switch to FAST, which gives a range of about 50 µs to 10 ms.
- a. Set the SAMPLE RATE control ow in FAST and hold the Hold line (bin 35) to ground for the desired display time. The display will continue for about 100 µs after the ground is released.

# 2-33. REMOTE PHOGRAMMING, OPTION 004

234. The following puragraphs describe remote programming requirements for the counter with Option 004

# 2-35. Front Penel Controls

2-36. All front-panel controls are programmable, except the FAST/NORM/HOLD switch. The trigger level controls may be remotely programmed, or the front-panel LEVEL controls inny be used. It is possible to programming the remainder of the front-panel controls. When remote programming the tagger levels, the LEVEL controls must be set to PRESET. The display time may be remotely, programmed and/or the front-panel controls may be used.

# 2-37. Remote Programming Requirements

2-38. All lines may be controlled by TTL or DTL algebras or contact closure to ground when the unit is being remotely programmed; except the trigger levels which are programmed by an analog level (if programmed) and the display time line (Hold), J10 pin-16, which should NOT be pulled up to 45 V by less than 2000 while programming.

2-39. When the unit is NOT being programmed (EXT line high), all the lines should be left open or pulled up to 45 V by not less than 5kO, except the trigger levels, which should be open circuited.

# 2-40. Remote Programming Procedure

2-11. In Order to remotely program the counter, the following must be done:

n. Set FUNCTION switch to any position but START or STOP.

b. Ground the EXT line at rear-panel REMOTE PROGRAM connector J10(34). This disables the front panel switches. Ground is available at J10(36),

- c. Select the desired function.
- d. Select the desired time base,
- e. Select the signal conditioning.
- f. Select the trigger level for input signal,
- g. Adjust the display time.

h. Manual reset is available by ground (<.7 V) pin 17. Check is available by grounding pin 37.

# 2-42. Function Selection Programming

2-43. To program the desired function, ground (<.7 V) the proper line at J10 as follows:

втор	Pin 19
START.	4 Pina 46
PERIOD AVERAGE	Pin 47
T.I. AVG.	Pin 45
T.h A to B	., Pin 44
PERIOD	Pin 43
FREQ. A	Pin 42
FREQ. C DIRECT	Pin 41
FREQ C + 10 (5327A only)	Pin 33

# 2-44. Time Base Selection Programming

2-15. To program the time base, ground (<,7 V) the proper line at 110 as follows:

ا/سر ۱	Pin 28
1 μα/10	Pin 20
10 μμ/10*	Pin'27
.1 ma/101	Pin.26
1 ma/10!	Pin 25
F10 ma/103	,Pin 24,
/.1 m/10°	Pin 30
ร้างขากๆ	Pin, 31
10 m/10*	Pin 32 9
	,

#### 2-48. Bignal Conditioning Programming

2-47. Program die input conditions by grounding the proper line in follows:

CONDITION	LINE "	INPUT
AC/DC A	11 4	AC+H DC+L
BLOPE A	23	4.11
ATTENUATOR A	13, 14	13 - H, 14 - H = X1 13 - L, 14 - H = X10 13 - H, 14 - L = X100
AC/DC B SLOPE B	7	AC*H DC*L  +*H >*L  ->
ATTENUATOR B	9,10	9 · H, 10 · H · X1 9 · L, 10 · H · X10 9 · H, 10 · L · X100
верусом з	G	COM = 1., BEP = H
снеск	37	CHK #L

# 2-48. Trigger Level Programming

2-40. To program the trigger level, the LEVEL controls must be set to PRESET. Select the trigger level by placing a de voltage between 3,0 and 43,0 volts on the level input line (Level A = J10 pin 21, Level B = J10 pin 20). This voltage, times the attenuator setting, is the trigger level. Preset is programmed by leaving the pin open or contact closure to ground. Grounding is preferable if noise exists on the remote programming line.

250. The front-panel LEVEL controls may be used manually if, programming of the trigger levels is undesirable.

# 2-51. Sample Rate Adjustment,

2-52. Adjusting the display time can be accomplished in several ways:

in. Manually adjust the display time by using the front-panel BAMPLE RATE controls.

b. Set the SAMPLE RATE control cwand the FAST/NORM/HOLD switch to NORM and connect a megohal pot in series with a 1.5k olim resistor from 5.V to pin 16. This will give a display time range of allout/10 mg to 5.sec. If a shorter time is desired, set the FAST/NORM/HOLD switch to FAST, which gives a range of about 50 µs to 10 ms.

e, set the SAMPLE RATE control ow in FAST, and hold the Rold line (pin 16) to ground for the desired display time. The display will continue for about 100 µs after the ground is released.

# 2-53. BLANKING DEFEAT

2-54). This counter is designed to blank insignificant zeros (zeros to left of data). When blanking occurs, the digital recorder output for the blanked columns is BCD 15 (HHHH). To use this instrument with a digital analog converter, it is necessary to defeat the blanking feature by repositioning the two jumpers on the Ab Display board. Move the jumpers to position 2, as shown in Ab Component Locator (Section VIII). This connects pin 10 of AbU7 and AbUB to 15 V. Also, lift the pin 1 lead of AbU2 and connect pin 1 to ground (ayailable at U2 pin 7).



# SECTION III

# **OPERATION**

# 3-1. INTRODUCTION

3-2. Section III contains the operating information required to obtain the most effective performance from the instrument. This includes a general description of the operating modes, the function of all controls and indicators, a self-check procedure, and setup procedures for making basic measurements.

# 3-3, OPERATING MODES

3-4. The following paragraphs describe the operating modes of totalize, frequency, period, time interval, and ratio.

# 3-5. Totalize Mode

36. START and STOP positions on the FUNCTION selector allow manual opening and closing of the counter's main gate. When the awitch is in the START position, the counter does not measure frequency, but instead, counts the number of times the signal passes through the trigger point. The input signal, connected to the front panel CHANNEL A jack, is divided by the MULTIPLIER switch setting prior to counting. For example, when the MULTIPLIER awitch is set to the 1 position, every pulse is counted. When the switch is set to 10% the counter registers every thousandth pulse. When the FUNCTION switch is set to STOP the counter stops totalizing and holds the displayed count until the RESET switch is pressed or the MULTIPLIER switch setting is changed. If the FUNCTION switch is again set to START before a reset in generated, the count continues to totalize from the previously displayed value. With the FUNC TION switch set to START, the scaled input signal is available at the rear panel TIME BASE OUTPUT jack. The unit indicators and decimal points are blanked during the totalize mode. The Colight is on (in START), indicating counting is taking place.

# 3-7. Frequency Modes

3-8. Three frequency modes are available in the 5327A: Frequency A, Frequency C prescaled, and Frequency C direct. (The prescale operation is not included in the 5326A.) In the Frequency A mode, the input signal connects to the high impedance CHANNEL A input jack and can be conditioned with the LEVEL SLOPE, and AFTEN controls. In the Frequency C modes, the input signal is connected to the INPUT C jack (50 ohm). The signal is not conditioned by any front-panel controls but may be counted either directly (50 MHz) or by prescaling (550 MHz).

depending on the setting of the INPUT C switch. The C channel of the 5326A model counts the signal directly.

#### 3-9. Period Modes

3-10. The period and period average modes allow single period "measurements or multiple period averages to be made with input frequencies into CHANNEL A of up to 10 MHz. These modes are useful for making low frequency measurements where maximum resolution is desired.

3-11. For single period measurements, the MULTI-PLIER switch scales the time base frequency and selects the placement of the decimal point and determines the resolution of the measurement.

3-12. The period average mode is used for increased resolution and reduced inaccuracies. For example, if 10° period averaging is selected, the counter will display the average of 100 periods with the proper decimal point. In this example, trigger error is 100 times less than in a single period measurement.

# 3-13. Time interval Modes

3-14. Two modes of time interval measurements can be selected: time interval and time interval average, time interval modes measure the time between time interval modes measure the time between put signals; thus, pulse width and plass differences can be measured. Separate alope and level, controls allow variable triggering levels on either the 4 or slope. Marker A and B outputs are available at the rear panel to intensity-modulate an HP, 180A oscilloscope. The markers indicate the trigger point of the counters input circuits and provide a visual means of adjusting the trigger points to measure the time interval between any two points and are useful to about 100 kHz.

3-15. In time interval measurements, Channel A opens the main gate and Channel B closes the main gate is open, the internal oscillator, divided by the setting of the MULTIPLIER switch, is totalized by the counter and readout on the display. The less the division factor, the more pulses of the internal oscillator there are to count and, therefore, the better the resolution and accuracy.

3-16. With time interval average, the main gate it open for the number of time intervals selected by the MULTIPLIER switch. The internal oscillator pulses (not divided) are totalized only during the individual time intervals. Once Channel B triggers, there must

3.1

Madel 68267277 Operation

ha a time lapse of 130 ns before Channel A can trigger, Averaging of time intervals results in lineransed resolutions and reduced innouracies. For a further explanation of theory; refer to Paragraph 427.

3-17- Ratio

il 18. The counter may be used to measure the rathe of two signals in either the frequency or period mode. By setting the rear panel OSC INTEXT switch to EXT, the counter will accept an external signal (Fort) for use as the internal oscillator. This frequency should be 100 lis to 10 Mis at 1 V rms minimum to 5 V peak maximum. A second signal (FA), applied to either INPUT A or Q jack, is used as the comparator signal. The MULTPINIER switch controls the resolution of the display. For a ratio of frequencies, the Ratio \* [A], DISPLAYED NUMBER. For a ratio of periods \*(P), the Ratio \*

3-13. Diareghrd the units and decimal point; also, ignore any zeros to the left of the mest significant digit. It makes no difference which signal is higher in frequency, as long as the two frequencies are within the specifications of their respective channels.

## 3-20. MARKER OUTPUTS

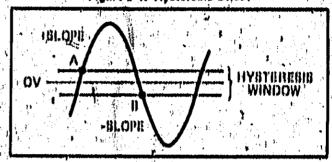
3-21. Two marker output jacks are mounted on the counter's rear panel. These outputs provide a negative going 2 µs pulse (approx.) at DPL levels each time the input signal passes through the trigger point of Channel A or B. The pulses may be used to trigger other circuits or may be applied to the Z axis of an HP 180 Oscilloscope. When using the pulses to intensity modulate an oscilloscope, note that the intensity modulate in oscilloscope, rote that the netual trigger point is the leading edge of the pulse. The marker's pulse width determines the upper frequency limit of the input signal. The pulses overlap on the oscilloscope trace when the period of the signal is less thin the pulse width.

#### 3-22: HYSTERESIS

3-25. Each input channel has a small amount of hysteresis (about 100 mV). If the BLOPK switch is set to "4," the trigger pulse occurs at the top of the hysteresis "window." If the BLOPK switch is set to "5," the pulse occurs on the bottom line of the window." In other words, the signal must pass through the entire bysteresis window before a trigger pulse is generated.

3.24. When measuring frequency or period, the counter positions the hystograss band around zero (see Figure 3-1). This assumes a waveform with no do component and the counter's LiGVICL control is in the PRICHICP position. The input amplifier, then yields maximum input sonsitivity for both positions of the BLOITE switch. The offset introduces no measurement error, since the trigger point is repetitive from cycle to dycle. The trigger point is point A for a slope and point B for slope,

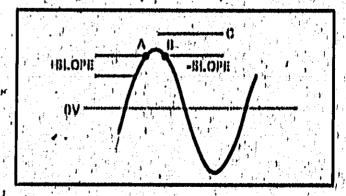
Figure 3-1: Hystoresis Offset



#### 3-25. Time interval Compensation

8-20. In the time interval modes only, both input amplifiers have an automatic compensation network that keeps the trigger level at the same potential when switching from positive to negative slope (see Figure 3-2). In this example, the window shifts upward to accomplish this. There is the possibility, therefore, that if Point A is near the top of the signal, switching to negative slope will place a portion of the window outside the signal (C). In such case, there would be no triggering. When switching from time interval to frequency, or vice verse, the trigger point shifts by half the bysteresis band,

Figure 5-2. Hysteresis Compensation



#### 3-27. ACCURACY

B-28. PRICQUIENCY MICKBLITTEMICNTS. The limbe counter accuracy is determined by two fattors. One factor is the aging rate of the 10 MHz crystal standard in the time base (less than 3 parts in 107 per month). A second factor is the inherent error of 41 count of the

display's least significant digit, which is present in all electronic criticism. This error is due to phissing between the timber pulse that operates the electronic yate and the pulses that pass through the gate to the counting assembly. The chart to Figure 64 shows the error possible for frequency and period measurements.

11-20 The formula for determining the actual frephiomy is given as follows:

The expression

f. X gute length (eps)

equals the 1 count ambiguity, where frequels meansured frequency (lis) and gate length equals the selected gate time in seconds, it equals the time, has accuracy (monthly drift rate of the individual time base times the number of months since calibration, frequency change due to ambient temperature observe, absolute off set at atandardization, and line yoltage effects).

6-30, An example of frequency error calculation is an follows:

(PX 10 to anyth # .1 noo (PX 10 t)

10 • 8 parts in 10" per month (thes 4 months • 0 parts in 10"

\* 0.4 X 10 \* 4 0 X 10 \* 2 0.0 X 10 A

131. Pigniold Micarthumion 13. The View three theory of period average measurements

- Continue rate of the 10 MHz orystal standard
- b. The + Lendistamblenity.
- o. The trigger error for one period.

  Assuming a algorab to noise with or 40 dit, the trigger error is lass than 0.0% at rate sensitivity. A general formula for finding the percentage error to be expected under various conditions is an follower.

A \* Adolivey In percent.

્રિક પૈતાન મુંબેલન frequency counted

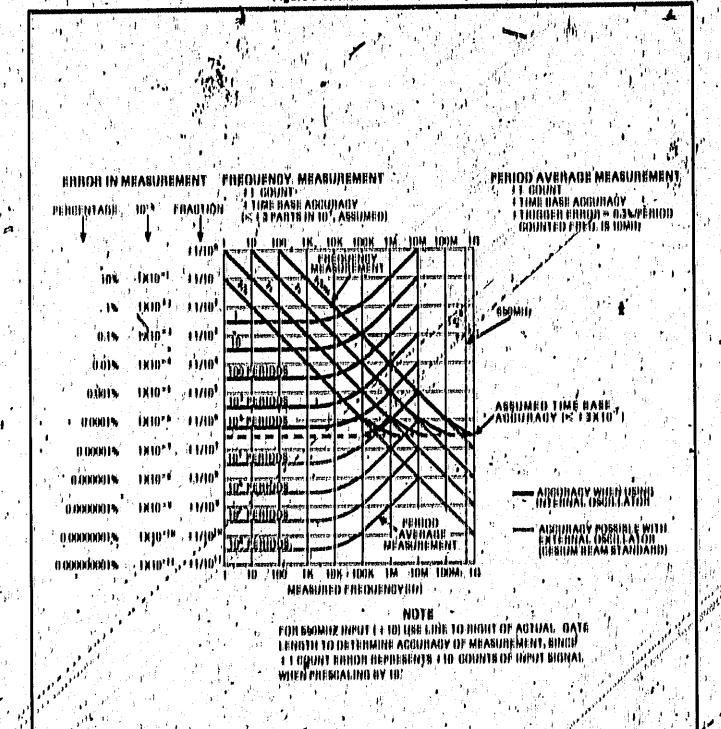
for Prequency of input signal (ilk)

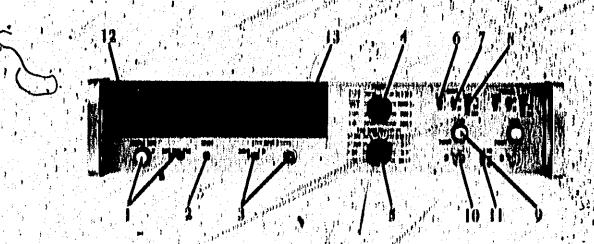
begaren abdired to reduced, \* n

n = 0 x 103 (tripper error for one period, 40 dB 8/N at rated sensitivity.)

It a time base accuracy (monthy driftrate of individual time base times that number of months since calibration, absolute value of affect at standardization, a frequency change, dust to amblent temperature change, and ling voltage effects). A plot of the above formula is shown in Figure 1885.

Figure 3-3. Measure)nent Accuracy





- AMPIAC RATIC control. Applies primary power. Works in confunction with PARTY NORM/HOLD switch to control interval between measurements.
  - a. PABT Varies display time from \$100' ps to >30 ms. BTY3RACIE switch (rear panel) must be ON to use this mode.
  - b. NORM Varibardiaplay time from \$ 30 ma to 20 absords.
  - o, HOLD Holds display indifinitely,
- R. of RIGHOT Awitch. Resets display and internding count to zero and starts new incasurement.
- II. INPUT O (5007Å), books input for 0 to 500, Mile frequency measurements. Her do coupling (with INPUT O switch in + 10 position) and sensitivity of 100 mV role sink wave (500 mV role sink input is 45 voits referenced to ground (100 NOT 10%) Office Office Trigger level is zero voits. The input is secondary roles with the INPUT O switch in 10111100T position. The frequency rough is 1, kills to 50 Mile with a sensitivity of 5 mV.

INPUT O (669)A). Moohm input for 0 to 69 Mis frequency measurements. How do not pling and sensitivity of 5 mV mm sine wave. Trigger level is zero volts. Maximum input is volts, referenced to ground (DO NOT IKOMID).

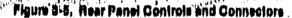
- 4, PUNCTION selector, Helecta mode of operation. Blue lettering matches corresponding blue lettering on TIMIC DARIC/MUL/PPLIER
  - a, ATOP, ATART Used for totalise mode to manually open, and close counter's main gate and to turn scaled output, on and off, Progressy input range is 0 to 10 Mily.

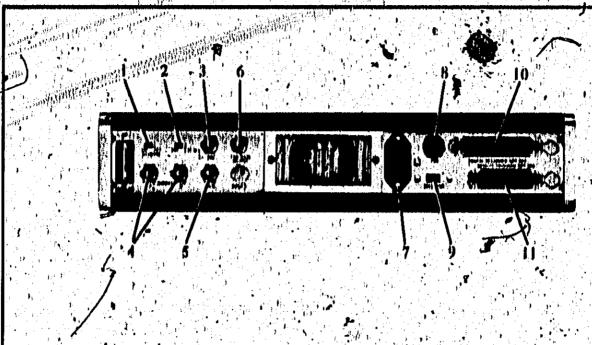
- in the Price of Algeria counter to intenure period of algerial applied to CHANNIC A imput. The MULTIPLISM witch to select number of periods to be averaged. Input frequency range is 0 to 10 Mile.
- e. Th AVG A to B Beta counter to measure average time interval, A to B. Channel A starta interval and Channel B stops the interval. Use MULTIPLIER spleeter to set number of time intervals to be averaged, Time interval input range is 150 ps to 10 seep there must be a 150 ps doubtime between intervals,
- d. 731. A to 11. Bela counter to measure time interval A to 15. Channel A starts measurement, T.J. input range is 0.1 as to 10° sec. The interval time base frequency is divided by the setting of the MULLIPLINITACION. The more oyeles of the oscillator frequency that are equated for subsequent display. The more equated for subsequent display. The more equated during A to 11 time, the better the resolution, There must be 180 as deadling between Channel 11 and Channel A trigger points.
- e, PMRIOD A. Bela counter to measure is single period of the algorith applied to CHANNIST A input. Use MUTTAPLISH witch to set counted internal oscillator froquency and therefore the desire resolution, frequency input range is 0 to 10 MHz,
- f. PRECA between counter to measure frequency applied to CHANNEL A Input. Use TIME DARIS switch to set pate time and resolution. Prequency input range is 0 to 50 MHz.

## Figure 3-4, Front Panel Controls and Indicators (Continued)

- g. PREQTO Bindlar to PREQ A, except sets counter to measure frequency applied to INPUP G Jack, 50 ohm input impedances b.V. rosz. b.V. peak maximum input. Proquency range is 0 to 50 MHz presented or 1 kHz/6 50 kHz direct. For the 53x0B, the frequency range is 0 to 50 MHz. Bee. INPUP G.
- TIME BARRAMULTPLINE awitch, The function of the awitch changes with each mode of operations
  - Addition speciments of the ANATAPOTOR of the footor for input adult prior to your factor of the footor for the
  - b. PRICOD AVO A Bollett Ambiggit
  - e. T.L. AVO A to B. Before number of time intervals to be averaged.
  - od. "131. A to 11 Beleets scaling factor for Internal oscillator signal.
  - o, PRRIOD A Beleets genling factor for Internal agaillator algoral.
    - 6. TRICO A and PRICO C Beta gate time
- 6, Bladpk switch, Permits triggering on positive or negative slope of input signal.
- 7. AC-DC awitch. Belock direct or expector coupling for input signal. Minimum input frequency on AC acting is 20 Hs.
- A. ATPION awitch. Beleets attenuation for input alignal. Used in conjunction with Licvician control to set input triggering point. Masimum input 1200 V mus on all ranges except 20 V mus on all ranges except 20 V mus on XI range above 50 kits. Recommended input is 0.1 V mus to 2 V mus times ATPION setting.

- i. Licviti control. Used in conjunction with ATTEN, switch to determine, voltage at which triggering occurs. With \$1 attenuator setting, level is variable star, on \$10, 480 V, and \$100, 480 V.
- (0) Input Inoke. Input Inoke to Chapmole A and D, Input impedience is 1 MO shunted by less than 125 pF. Ity deling a 10 to 1 divider probe, input impedance can be increased to 10 MO.
- 1. Pringer lamps adheant to input jacks indicate
  When amplifier triggering occurs.
- 19. CHK-8EP-COM-witch. (Check-separate
  - o. Olik Connects internal 10 Mile time base to Channels A and B circuitry to check that unit is functioning. No indication in The or Th. Avg. Ignore displayed digits in period average.
  - b. COM-REP. Compari A-and B Inputa in parallel-when set to COM position. When applying two separate inputs, set switch to BICP. When set to COM, input impedance is DIO kD shunted with less than 50 pt.
- i, C (count) light, Lights when counter's mulning gate is open. For short-duration gate times, the abnunciator circuits include a 60 ms one shot MV to allow a visible flesh of the C light.
- 14. \* (autoriak). Indicates that proper units are not displayed with combination of function/time base selection. To interpret display, add a vero to the right of least significant digit displayed on the counter.





- I. BTORAGE switch, When set to ON, provides display storage while new measurement is being made. In OPP position, allows continuous display, of counting process,
- 2. OBO INTEXT awitch. In INT position, selects normal counter operation using internal time base, In EXT position, permits use of external time base,
- 8. OBC jack, With INT-UXT switch set to INT, provides 10 MHz, >3 Vpp output (no load), 500 series impedance. With INT-EXT switch set to EXT, allows use of external time base from 100 Hz to 10 MHz at >1 volt rms (5 V peak maximum).
- 4, MARKER A and B Jacks. Provides marker outputs to intensity modulate RP 180 Oscilloscops. Markers begin coincident with channel trigger points.
- B. OATH jack, Provides \$2.4 volts output (open circuit) for external use. Has BOR series impedance. Output is low when counter's main gate is open and high when gate is closed.

- 6. TIME BASE OUTPUT jack; Provides negntive going > 43 to 0 V pulses (open effect), >50 manoseconds wide. The line has a 563 series impedance. In START; frequency output is CHANNIELA signal divided by MULTI-PLIER setting.
- 7. AC LINE, IEO type with offeet pin con-
- B. AC LINE PUBE. 1.50 A at 115 V, 800 mA
- 9. 115/230 volt, switch, lineart narrow scrowdriver and slide switch to show desired voltage.
- 0. DIGITAL RECORDER connector (Option (0)3 only). 50-pin connector for digital recorder interconnection.
- 11. REMOTE PROGRAM connector, Option 002: 88-pln connector to allow remote constrol of counter modes and functions.

Option 004: 50-pin connector to allow remote control of all counter functions except FAST/NORM.

#### Table 3-1, Bell-Check

۱,	Bel BAMPLE	RATIO	control.	nlightly	clock-
*	wine out of Olily				

- 2, But FABT/NORM/HOLD switch to NORM.
- 11, But FUNCTION awitch to BTOP
- 4. But MULTIPLIER selector to 1
- 5. Bet CHK-BEP-COM awitch to CHK.
- 6. Press RESET and check that counter's right hand column displays a 0 and all other digits are blanked.
- 7. But FUNCTION switch to START and check that counter totalizes and C light is on. Check that OF light your on as display overflows. But TIME BABEZMULTIPLIER to each position and check that counter totalizes in each position.
- Bet FUNCTION switch to BTOP. Check that C light goes out and display is hold.
- n. Bet FUNCTION to PERIOD AVG A. Bet MULTIPLIER as shown in table below and check for proper display.

### Period Average Belf-Check

М	ULTIPLIER	DISPLAY	ANNU	OFAIDN
	1 10	.1 .10	, h . A A A A A A A A A A A A A A A A A A	ltu- ltu
	10 <sup>1</sup>	100,0 100,0 100,00		DB DB
	10 <sup>6</sup>	100,000		ns no
	10 <sup>7</sup> Standard 10 <sup>7</sup> Option 001	00,00000	1 6	ne OF
. ) <sub>.</sub> .	10" Standard : \ 10" Option 001 .	00,000000		OF

#### NOTE

Digita noted are for feference, actual display may differ by several counts.

10. Bet FUNCTION to T.I. AVG A to B. Set MULTIPLIER as shown in table below and check for proper display.

#### 'Time Interval Average Self Check .

M	ıyını	PLIER	· , J,	<b>Hall</b>	LVA)	. · · · ·	UNN	NÇ	YIAI	)
11 . 1	1	4 4 A	1 : \1.1	(1) (0)	<b>5</b> 1 0	1 33	ja ja	ILB		
, i.	io	$-10^{11}$ $\mathrm{M}_{\odot}$	, ,	.00 .	((	116	20	lin.	1111	١
	101	in the	, ,	000	1.	r (	$h_{J}^{i,j}$ .	μ4	) (N	
	10*	1	$\psi$	01		<b>,</b>	1. 60	118		1
	101			,00	14	•,	$M_{ij}$	air,	`, <u>∦</u> ;	
	103.			.000	$\Omega_{G}$	Α.	$f^{a}f_{a}^{a}$ .	in ii	: (U)	
	104			0000	jyx≀, una			H	1: '	
<u>,</u>	107 ± 104 ×			00 <b>00</b> 0 00 <b>00</b> 0	וא ערא ו		ia d	11	33 ° 1 - 1 - 2	
1.9	YA. 🖍	<i>y</i>		ותתתיק	w	111		116		

- 11. Set FUNCTION to T. I. A to B. Rotate MULTIPLIER switch as shown in the following table (Step 12) and check for proper display.
- 12. Bet FUNCTION to PERIOD A. Bet MULTI-PLIER switch as shown in the following table and check for proper display.

### Time Interval and Period Self-Check

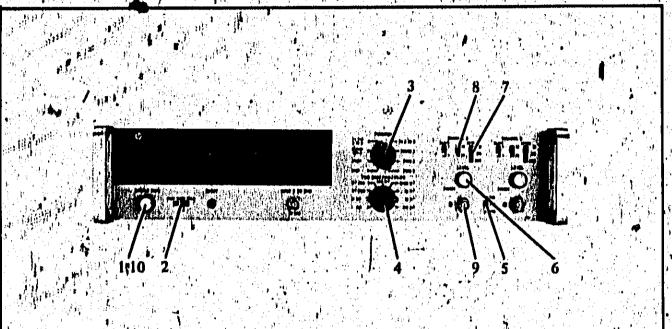
MULTIPLIER	DIBPLAY	ANNUNC
	.1 + 1 count	, µe
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104	.00	m#
10 <sup>3</sup>	<b>.</b> 0,	mm
101	0	្តាំ ma
100	· ,00' , · , .	1. <b>/</b>
106	.0.,	
107	, 0	

13. Set FUNCTION to FREQ A. Set TIME BASE switch as shown in table below and check for proper display.

#### Frequency A Self Check

			ayar <b>Ti</b> angga	1.,
Time base	iald	LAY	ANNUN	CIATOR
. lμs	.01	el count	GI	1.
1 µn	10	*1 count		He
	10,0	±1 count		He
	10.00	#1 count	M	
l mu		£1 count.	M	
10-m#	10000,0	él count :	kl	
		±1 count	. Well	
18	0000,000		kHx	
10 n	10000,000		'kliz (Op kliz	
in a	0000,0000			Opt. 001) .

#### Figure 3-6. Frequency A Measurements



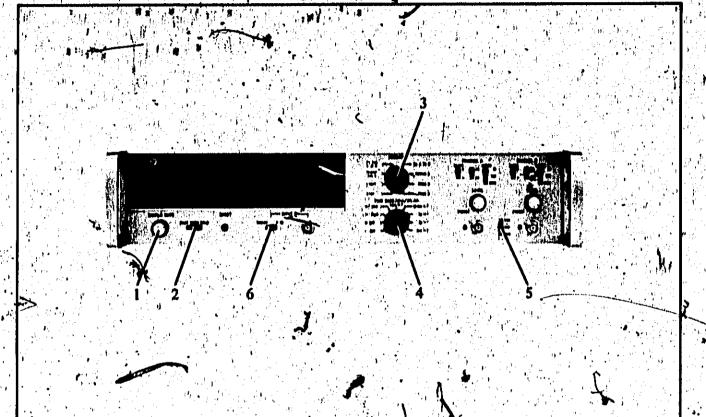
- 1. Set SAMPLE RATE, control slightly clockwise out of OFF.
- 2. Set FAST/NORM/HOLD switch to NORM.
- B. But FUNCTION switch to FREQ A:
- 4. Bet TIME BABE switch for desired gate time.
- 5. Set CHK-SEP-COM switch to SEP.
- 6. Set CHANNEL A LEVEL control to desired trigger level or to PRESET to trigger at zero volts.

- 7. Set ATTEN switch to match input signal amplitude.
- 8. Bel AC-DC switch to AC or DC.
- 9. Connect input signal (0 to 50 MHz) to CHANNEL A input jack.
- 10. Adjust SAMPLE RATE control for convenient measurement interval.

#### NOTI

When the input signal is removed from CHANNEL A or the signal level is insufficient to trigger Channel A, the count light (C) will not cycle. This is normal for this counter and does not indicate a malfunction.

Figure 3-7, Frequency C Measurements



- 1, Set SAMPLE RATE control slightly clockwise out of OFF.
- 2. Set FAST/NORM/HOLD switch to NORM.
- 3. Selfunction switch to FREQC.
- 4. Set TIME BASE switch for desired resolution.
- 5. Set CHK-SEP-COM switch to SEP.
- 6. Bet INPUT Cawitch to DIRECT.
- 7. Connect input signal (1 kHz to 50 MHz, ±5 V peak maximum, 5 mV rms minimum) to INPUT C connector (rear panel). Input impedance is 50Ω nominal. For the 5326A, input frequency is 0 to 50 MHz.

8. Adjust SAMPLE RATE control for con-

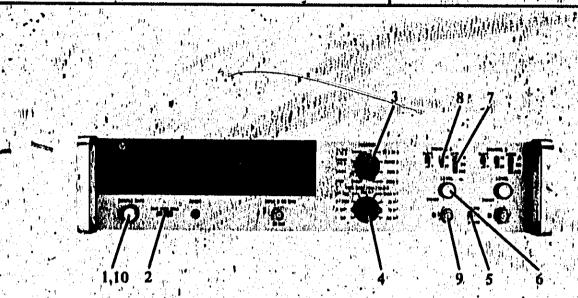
#### NOTE

Eor frequencies from 0 to 550 MHz with minimum levels of 100 mV rms, connect signal to INPUT C jack and place INPUT C switch in +10 position.

#### CAUTION

Damage will occur if INPUT C voltage 5 specifications are exceeded.

Figure 3-8. Period Measurements

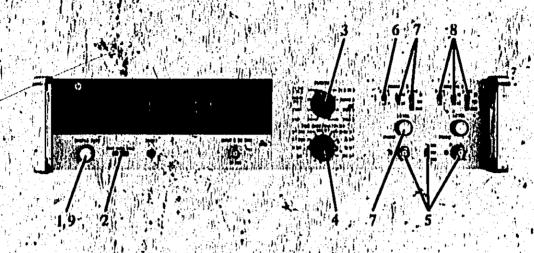


### Period :

- 1. Set SAMPLE RATE control slightly clockwise out of OFF.
- 2. Set FAST/NORM/HOLD switch to NORM.
- 3... Set FUNCTION switch to PERIOD A.
- 4. Set MULTIPLIER switch for desired resolution.
- 5. Set CHK-SEP-COM switch to SEP.
- 6. Set CHANNEL A LEVEL control to desired trigger level or to PRESET to trigger at zero yolts.
- 7. Set ATTEN switch to match input signal's, amplitude.
- '8, Set AC-DC switch to AC or DC.
- 9. Connect input signal (0 to 10 MHz) to CHANNEL A input jack.
- 10. Adjust SAMPLE RATE control for a convenient interval between measurements.

#### Period Average

- 1, Set SAMPLE RATE control slightly clocks wise out of OFF.
- 2. Set FAST/NORM/HOLD which to NORM.
- 3. Set FUNCTION awitch to PERIOD AVG A.
- 4. Set MULTIPLIER switch to number of periods to be averaged.
- 5. Set CHK-SEP-COM switch to SEP.
- 6. Set CHANNEL A LEVEL control to desired trigger level or to PRESET to trigger at zero volts.
- 7. Set ATTEN switch to match input signal amplitude,
- 8. Set AC-DC switch to AC or DC.
- 9. Connect input signal (0 to 10 MHz) to CHANNEL A input jack.
- 10. Adjust SAMPLE RATE control for convenient measurement interval.



#### Single Time Interval

- 1. Set BAMPLE RATE control slightly clockwise out of OFF,
- 2. But FAST/NORM/HOLD switch to NORM
- 3. Bet FUNCTION switch to IT. A to B.
- 4. Set MUTLIPLIER switch for desired
- 5. If start-stop signals are from a common source, connect signal to OHANNEL A input and set CHK-SEP-COM switch to COM. If start-stop signals are from separate sources, connect start signal to CHANNEL A input and stop signal to CHANNEL B input and CHK-SEP-COM switch to SEP.
- 6. Set CHANNEL A SLOPE switch to + for triggering on positive slope of signal or to for triggering on negative slope of signal.
- Set CHANNEL A LEVEL and ATTEN switches to start measurement at desired voltage level. Select AC or DC coupling: For frequencies below 100 kHz, use MARKER A OUTPUT jack on rear panel to display starting point on an oscilloscope.
- 8. Set CHANNEL B, AC-DC, LEVEL, SLOPE, and ATTEN controls to stop measurement at desired level. For frequencies below 100 kHz, use MARKER B OUTPUT to display stopping point on oscilloscope.
- 9. Adjust SAMPLE RATE control for convenient measurement interval

#### NOTE

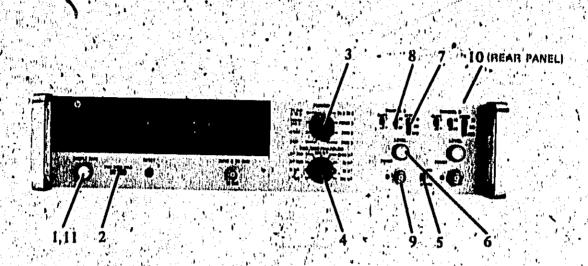
There must be at least 150 ns between the STOP pulse (Channel B trigger) and the next START pulse (Channel A trigger).

#### Time Interval Average

- Sel SAMPLE RATE control slightly clockwise out of OFF.
- 2 Set FAST/NORM/HOLD switch to NORM.
- Sel FUNCTION switch T.L. AVG A.
- 4. Set MULTIPLIER switch to number of time intervals to be averaged.
- 5. If start stop signals are from a common source, connect signal to CHANNEL A input and set CHK-SEP-COM, switch to COM. If start stop signals are from separate sources, connect start signal to CHANNEL A input and stop signal to CHANNEL B input and CHK-SEP-COM switch to SEP.
- b. Set CHANNIEL A SLOPE switch to + for triggering on positive slope of signal or to for triggering on negative slope of signal.
- 7. Set CHANNEL A, LEVEL, and ATTEN to start the measurement at desired voltage level. Select AC or DC coupling. For frequencies below 100 kHz, use MARKER A OUTPUT jack on rear panel to display starting point on oscilloscope.
- 8. Set CHANNEL B, AC-DC, LEVEL, SLOPE, and ATTEN to stop the measurement at desired level. For frequencies, below 100 kHz, use MARKER B OUTPUT to display stopping point on oscilloscope.
- 3. Adjust SAMPLE RATE control for con-

#### NOTE

STOP to START delay must be >150 ns and input rate should not be 10 MHz x M (M and N integers).

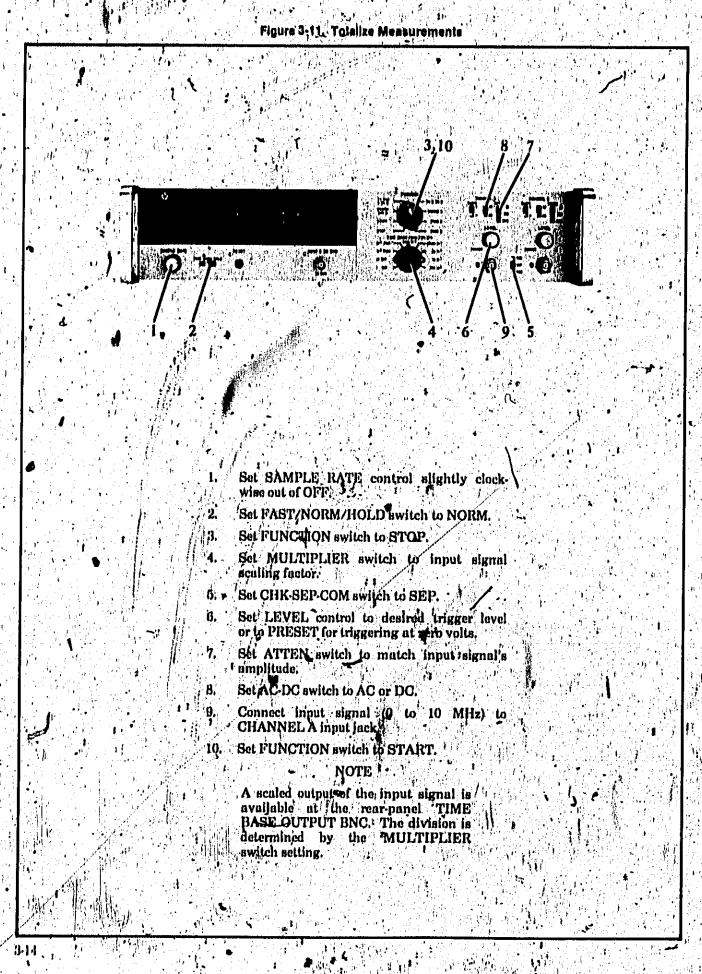


- 1. Set SAMPLE RATE control slightly clockwise out of OFF.
- 2 Set FAST/NORM/HOLD switch to NORM.
- 3. Set FUNCTION switch to FREQ A or FREQ C, direct or prescaled.
- 4. Set MUTLIPLIER switch to desired dividing factor for Pext.
- 5. Set CHR-SEP-COM switch to SEP,
- 6. Set CHANNEL A LEVEL/control to desired trigger level or to PRESET to trigger at zero volts.

- 7. Set ATTEN switch to match input amplitude.
- 8. Set AC-DC switch to AC or DC.
- 9. Connect FA (0 to 50 MHz) to CHANNEL A input Jack or FC to INPUT C.
- 10. Set OSC INT-EXT switch to EXT (rear panel).

  Connect Fext to OSC fack. Fext can be 100

  Hz to 10 MHz 1 V rms (min) to 5 V peak maximum.
- 11. Adjust SAMPLE RATE control for convenient measurement interval.
- 12. Ratio = FA or FC = DISPLAY
  Fext
  units and decimal point.



### BECTION IV

#### THEORY OF OPERATION

### 4-1. INTRODUCTION

4.2: This section discusses the general operating principles of the instrument. Assembly description is covered in more detail in Soction VIII, opposite each schematic diagram. Logic fundamentals are explained in Paragraphs 4-3 through 4-16.

#### 4-3. LOGIC SYMBOLS:

- 4-4. Two states exist in the binary system, 1 and 0, In positive logic, the 1 state is more positive than the 0 state. High (H) and low (L) are used to represent hig 1 and 0 levels, "HIGH ALWAYS REPRESENTS THE MORE POSITIVE LEVEL, WHETHER IT BE POSITIVE OR NEGATIVE LOGIC,
- 4.5. A circle of the input line of a logic symbol indicates that a low activates the function. Pigure 4.1B shows that a low at both inputs produces

a high output. A circle at the output line of a logic symbol indicates a low when activated, as shown in Figure 4-10.

### 4-6. Galley and Logic

4.7. Figure 4.1A represents a basic AND gate, The output is high if all inputs are high. An AND gate may have two or more inputs. Figure 4.1D represents a basic OR gate. The OR gate output is high if one or more of its inputs is high. An OR gate with a circle on the output is called a NOR gate. An AND gate with a circle on the output is called a NOR gate. An AND gate, An BXCLUBIVE NOR (Figure 4.1E) has two inputs; and the output will be low if one, but not both, of the inputs is high. The output will be high if the inputs are both low or both high.

# igure 4-1, Gate Symbols and Logic Comparisons

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## 4-8, INTRODATED CIRCUIT OPERATION

## 4.9. JK Mauler-Blave Filp-Flop

d-10; The JK muster slave flip-flop is bisically abistable multivitrator. With simultaneous high inputs to J and K, before the clock pulse, Q and Q will change stater after the clock pulse, Refer to Pigure 42 and Pable-4-1, This circuit triggers on the trailing clips (negative transition) of the clock pulse, The set (8) and reset (R) inputs operate as follows: when a low is applied to set input, Q goes low and Q goes high; when a low is applied to reset input, Q goes low and Q goes high. Bet or reset can override all other inputs at any time.

Figure 4-2, UK Filp-Flop

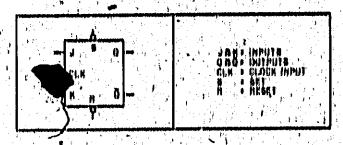


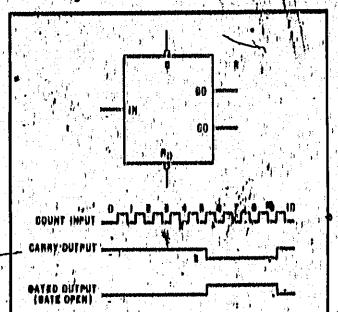
Table 4-1, Truth, Table

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l	3	K'	Q	5	(n + ) = After clock pulse
	1.		911,	ζ,	If J = L and K = L, then Q : and Q will not change from what they were before the clock pulse.
	H	L	B		If J = H and K = L, then Q will be H and Q will be L after the clock pulse.
ı.		11.	1.7 r ·	11	If J = L and K = H, then Q will be L and Q will be H infor a clock pulse;
	H.	-11	<b>a</b> ,	Q <sub>n</sub>	If J = H and K = H before the clock pulse, then after the clock pulse Q and Q will change states.

### 4-11, Time-Buse Decade

4-19. In the reset blate, Carry Output (CO) (see Pigure 4-8) is high and, if the Cate input (C) is low, Unted Output (CO) is low. The pulses on the Cate input produce a negative transition at the Bated Output. If the C input is high, CO is oben-circuited regardless of the count. The Curry Output gives a positive transition after 10 pulses.

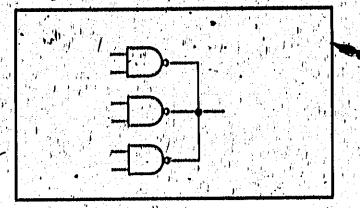
Figure 4-9, Time-Base Decade 1810-0418



### 4-19, Open-Collegior Gate

4-14. The output of an open-collector gate can be paralleled with gates of the same type to perform a wire-OR function, as shown in Figure 4-4. When the outputs are tied to the same line, any one of the gates can pull the line low without damaging itself.

Figure 4-4, Open-Collector Cale 1820-0327



#### 4-15, Logie Levels

4:16. This counter uses three types of logic: TPI-(translator:translator logic), ECI- (smitter-coupledlogic), and IVII- (diode-translator logic), Hee Table, 43 for specific logic levels.

Table 4-2. Logic Levels

Type	H (Min)	(Man)	Princer	Bupply
ROL.	,,,,,,, ·	-1,4 V	1.9 7	-5.0 <b>V</b>
Dari.	9.4 V 9.6 V	04 V 04 V ,	15V 15V	00 Å 20 Å

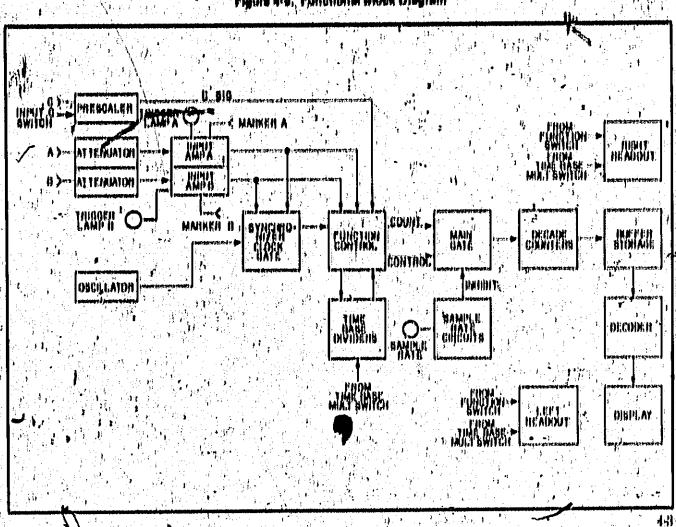
## 4-17, OVERALL COUNTER OPERATION

4:18. The signal connected to CHANNISI. A is conditioned by the front panel switches of the Attenuator Assembly (Pigure 4-6). These switches set the operating conditions for trigger level, coupling, and

the regularly slope. The Input Amplifier converted the signal into narrow pulses for more efficient using throughout the counter. In the 6897A, INPUT I provides an alternate path through the Presenter Assembly, which divides the signal by to ar passes it directly to the Pometron Control Assembly, the path taken is determined by the setting of the front party laken is determined by the setting of the front party in the setting of 
4.10. The Panetipa Control accepts both the input signal and the 10 Mile internal oscillator pulses and routed them in accordance with the mode of operation being used. One of these signals is sent to the Affirms Bake Assembly, which divides the signal as determined by the front panel TIMIS DARIO MILETPLY (it switch, The first and last pulse of the divided signal control the length of time the main sate is other signal as sent directly to the main sate for totalizing by the decade counters and is subsequently displayed. The synchronizer prevents the main sate from opening until an input signal is present.

430). The sample rate circults control the interval between measurements. When the muln gate closes, these circults provide a delay, as controlled by the

Figure 4-8., Functional Block Diagram



from panel BAMPLA RATA controls. When the supple rate period has dispert, a reset pulse is generated to reset the counter and start a new nicosurement.

421. The dynal to be counted, either the internal decillator or input elynal, passes through the main past to the decade counters. The buffer storage registers store the 16D count before it is translated into Acdecimal equivalent and displayed on the front panel are front panel. Also displayed on the front panel are the units of measurement and the decimal point. The left and right readout assemblies contain the unit indicators and the logic spessory to position the decimal point.

## 4: At. Frequency Modes

(199), Proquency is defined as the number of periodic events per unit of time. The counter, therefore, measures in unknown signal (COUNT) for a known length of time (Pigures 40 and 47). The 10 MHs internal oscillator provides the known time and controld the opening of the main gate. The Time lines Assembly divides the oscillator frequency by powers of it to open the main gate from 10 the econds to lit abconds. The longer the gate is open; the more pulses of the unknown frequency are counted and, therefore, the better, the resolution and accuracy.

#### 4-YA, Period Modes

4-29 In the Period Mode, the main gate is open for the period of the input signal (Pigure 4-8), The Time Base dividers scale the 10 MHz sacillator algued by powers of 10 from 1 to 10°, as determined by the MULLIPIABIL switch. This oscillator signal (2011NP) is counted during the gate time (period) by the decade counters and is subsequently displayed.

436. In the Period Average Mode, the MULTPLAINT switch selects the number of periods to be averaged (Pigure 44). The Time Hase dividers count the number of periods selected with the switch and holds the main gate open until this count is complete. The Decade Counter totalises the oscillator pulses while the main gate is open.

## 4:27, Time Interval Modes

A28, In the Time Interval Mode (Pigure 4:10), Channel A signal controls the start of the measurement, while Channel B signal stops the measurement. The two signals control the state of the arming flip flop, which, in turn, enables the Clock Oate to puse oscillator pulses to the Time Base Divider, The oscillator signal is scaled, congruent with the setting of the MULTIPIABL switch, before it is passed through the main gate to the counting assemblies.

A.99. For the Time Interval Average measurements (Figure 4:11), the setting of the MULTIPLIFIT switch determines the number of intervals that eremyeraged. The oblitator signal is counted directly for the duration of each, individual time interval that is being averaged. Once the Time Base Divider totalizes the number of selected intervals, the main gate doses and the measurement is displayed. Hee Page 1:30 for timing diagrams and a technical description.

A.A.

Figure 4:0. Frequency A Mode Flow Diagram

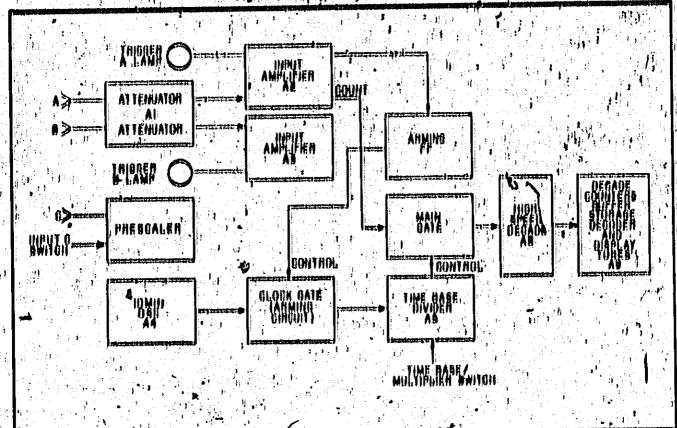
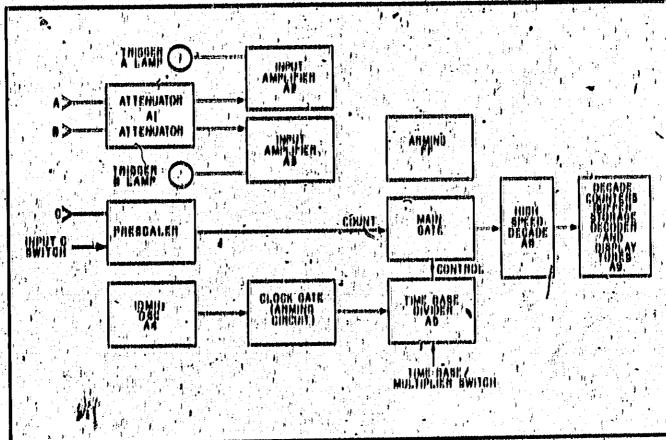


Figure 4-7. Frequency & Mode Flow Diagram



🖰 Figure 4-8; Period Mode Flow Diegram

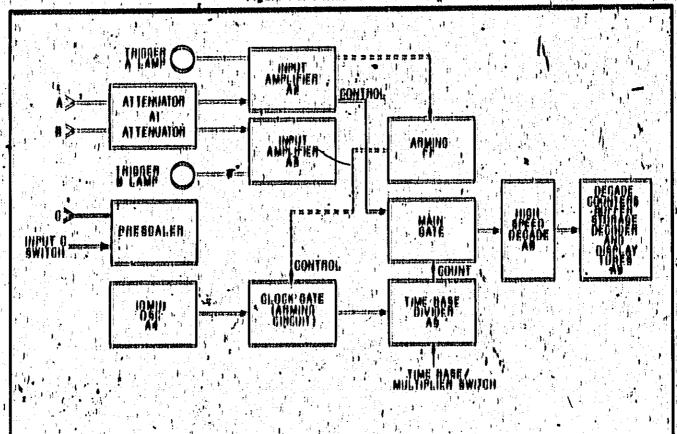
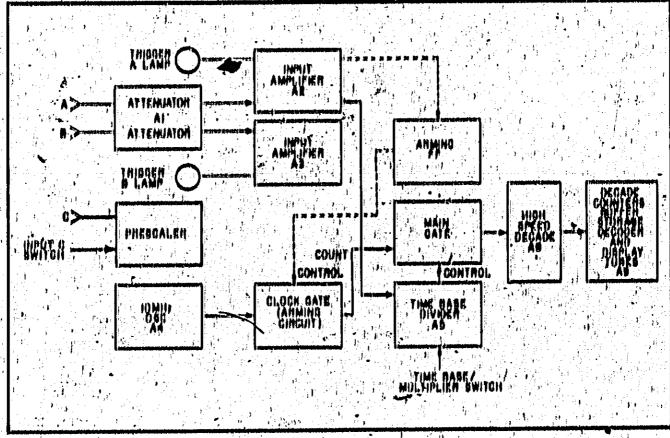


Figure 4-9. Period Average Mode Flow Disgrain:



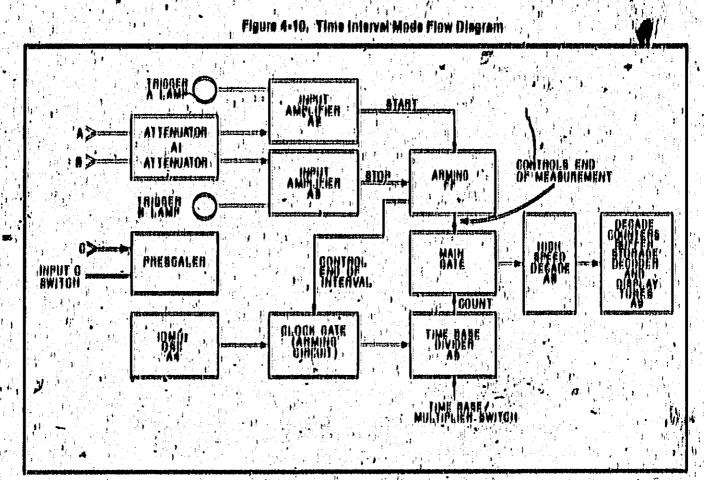
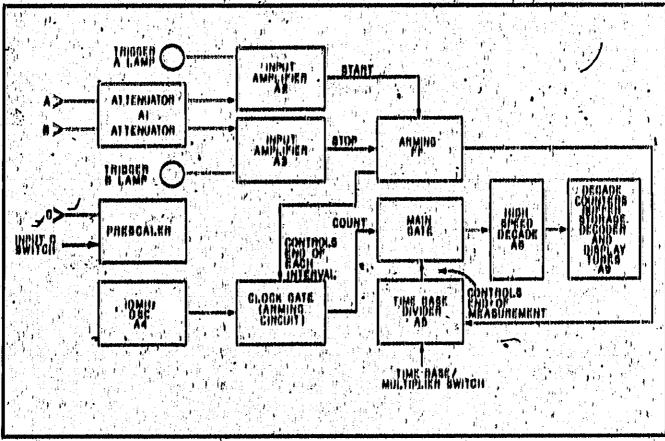


Figure 4-11. Time Interval Average Mode Flow Djagrain.



Fluire 4-18. Timing Diagram

		Figura 4-18. Timing Olagram	
YEL WINT MUNER  WERN ON THE  WENT ON THE  WENT ON THE  WENT ON THE  WENT ON THE  WORLD  WONER			
HAIN GATE HE O	Provide COUNTING SERVICE		auasanis (IO) NTINO
Childr orr	YAPIAN E IN DETARE		
THUM		VANIANIE PROVINCIE TO SE SY PART HOM WILLIAMD BAMPUR HAVE	
THANSPER PULSELY	1 # #HS mercure		
AND OVERLOW		Million of the second	

## BECTION V

#### MAINTENANCE

### 5-1. INTRODUCTION

5-2. This section gives inclutenance and service information. Included is a table of assemblies, reconting monded test equipment in-cabinet performance checks, which may be paid to verify proper counter operations, and adjustments.

### 6-3. ABBEMBLY DESIGNATIONS

54. Table 5-1 lists the designations, name, and Howlett-Packard part number of assemblies used in this instrument.

### 5-5. TEST EQUIPMENT

5-6. Test equipment recommended for maintaining and checking performance is listed in Table 5-2. Test equipment having equivalent characteristics may be substituted for the equipment listed.

Table 5-1. Assembly identification

Assembly	Description	BP Part No.
		hanna annani
Al <sup>2</sup>	Attenuator	05326-60003
Λl	Attenuator (Option 004)	05327-60018
λ2,	Input Amplifier	,05326-60004
`. <b>∧</b> 3;	hiput Amplifier	,05328-60004
* A4	Oscillator	05326-60002
ti Aß	Time Base Control	05326-60005
ΛG	Bample Rate	05326-60013
Λ7	Function Control	05327-60004
AB.	Diaplay Support	05326-60009
A92	Diaplay	05326-60008
AD.	Display (Option 001)	05326-60025
A10	Right Readout	05327-60002
All	Left Rendout	05327-60003
A12	Voltheier Input Amplifie	Not Used
A13	Voltmeter V-I Converter:	
ALA	DVM Logic	Not Uned
A15	Regulator	05327-60020
A16	Interconnect	05327-60026
7 1 1	Interconnect (5327A)	05327-60005
A16		05326-60031
A17	Input C Amp (5326A)	05327-60009 or
≥ \ <b>A</b> 18,	Prescaler (5327A)	05327-60029

# 5-7. ASSEMBLY CONNECTION IDENTIFICATION

5-B. Throughout the manual, connections to printed circuit assemblies are referred to in abbreviated form. For example, connection to A3, pin 10 is A3(10).

### 6-9. IN-CABINET PERFORMANCE CHECK

- 5-10. GENERAL. The performance check (Pable 5-3) and test eard can be used to verify proper operation of all circuits of the counter and may also be used:
- n. As part of an incoming inspection clock of instrument specifications.
- h. Portodically, for instruments used in systems where maximum reliability is important.
- o, As part of a sprocedure to locate defactive
- d. After any repairs or adjustments and before returning instrument to regular service.
- e. As a permanent record of instrument maintenance performed, because the test record pages are perforated and may be removed.
- 5-11. VARIABLE LINE VOLTAGE. During the feat (Table 5-3), the counter should be connected to a variable voltage source, so the line voltage may be parled \$10% from nominal (115 or 230 Vac).

# 5-12. INSTRUMENT COVER REMOVAL

5-13. To remove top or bottom cover, remove the four screws that secure cover to instrument. Slide cover toward rear of instrument and lift off. To replace cover, reverse procedure.

## WARNING

118/230 VAC AND +175 VDC BUPPLY WIRES ARE EXPOSED WHEN EITHER TOP OR BOTTOM COVER IS REMOVED. USE EXTREME CAUTION DURING TROUBLESHOOTING, ADJUSTMENT, OR REPAIR. AVOID DAMAGE TO INSTRUMENT BY REMOVING POWER BEFORE REMOVING OR REPLACING COVERS, ASSEMBLIES, OR COMPONENTS.

#### 5-14. REPAIR

## 5-15. Printed Circuit Component Replacement

A16. Component lead holes in the circuit boards have plated-through walls to ensure good electrical contact between conductors on opposite sides of the board. To prevent damage to the plating and the replacement component, apply heat sparingly, and work carefully.

## 5-17. Replacing integrated Dirculte

6:18. Pollowing are two recommended methods of replacing integrated circuits.

- a, BOLDISK GOBBLISK, This is the best method, Bolder is removed from board by a soldering from with a hollow tip connected to a vaccium wourse,
- b. CLIPAUL. This method should be used as a last resert only. Clip the leads as close to the base in possible. With a soldering from and long nose pliers, carefully remove the wires from each hole. Then elgan the hole.

#### ATMEMBERS OF A

5.20. The adjustments in Table 5.4 are in the order they should be performed but should not be done unless:

- n. A trouble has been repaired which would affect these values.
- political instrument does not most all appolitionations white performing the check in Table 541 (In-Cable Performance Checks).

Table 5-2. Recommended Test Equipment

Instrument Type	Required Characteristics	Recommended Type
Frequency Standard	LMH Output	HP 107AR
Oscilloscopo Verticol Plugdo U Timo Baso Plugdo	50 MHz Bandwidth 50 mV/cm Sensitivity 50 MHz Bandwidth	HP 180A * HP 1801A * HP 1820A
Tent Oscillator (two required)	10 Hz to 10 MHz at 5 volta peak- to-peak	HP 651B
Audio Oscillator	1,2 Hz to 100 kHz at 100 mV rms	11P 2020
HF Signal Generator	50 kHz to 50 MHz at 3.V rms	HP GQIB
VHF Bignal Generator	- 10 MHz-lo 480 MHz	HP GOHP
Prequency Doubler	240 - 550 MHz	HP 1051BA
Pulse Generator	10 MHz repetition rate, 8 ns pulse width, 0,3 volts peak-to-peak output	HP 216A
Electronic Counter	0.1 Hz to 10 MHz Prequency Measurements	HP 5245L
Variable Line Transformer	103 to 127 V rms and 206 to 254 V rms	Electronic Power Stat 3PF116 (115V); 3PF216 (230V)
Digital Recorder	Print Rate: 10 lines/sec.  Data Input: +8421 BCD parallel entry, accepts 1 = +5 V, 0 = +0.25 V.	HP 6086A
	Accepts negative going #5 to 0 V print command	
DC Volumeter	0 to 200 Vdc, 1,% accuracy	HP 412A
AC VTVM	0 to 250 Vac	HP 400F
RF Voltmeter	1 mV 6/3 V	HP 8406A

## Table 8-8. In-Cabinel Performance Check

- TIME HARE STADLETY AND OUTPUT
  - n. Bet counter controls as followers

1	ΝΛ	PI,	IV. 11.	ויויא	Chi.	· .	a vi	11.6	di Si	1.1	MIII)	dina	Ho
- 1	ሆለዘ	ዝረ ኮ	ILQII	M/I	IQI,	J.	1143	19 19 1	1	The s	AfSII	M	,
1	FUN	(7T	ION	34 14		14.4		1 7	4.5	37.	rn n	IJA:	, F)
•	MIL	n n	ŅЩ	/M	VI/	T.	1,110	L.		1,1	$0_{H,\eta}$	11/2	
-	ulyi	ווינן	۸ 🖟	1.1			1/1/20	1110	ş ()	4 6	1 61	1	
• •	YO!			9. a		iji	111	13.4	. ,	$p_i, q_i$	Ų,		
	ani. Ani	-1211	, , ,	7/16 7/16		50. 4	1000	347	第字		D   dan Dinan	rahi.	St.
î	Liev	MI.		****		اور غد الم	i n	$A_{i}$	\ \ \ \ .		933 AC	12 81 197	
: 1	OTH	ΪΛC	3 1C				9 04	N. 6.	1.5	11/1	ואר:		(p)
٠.	OHO				, , , , , , , , , ,	33.5 33.5				ΔÍ	ייות		12.14
١.	3 11 34						67			,,,,,		1 15 25 1 10	

#### NOTE

Allow one-hour warm qui before precedible to stop b.

- b. Connect I Milk frequency strangerd to CHANNEL A Input,
- a.' A counter display of 000, 0000 (1000, 0000 Option 001) indicates that counter time base frequency is exactly f0 Mils. The offset between counter time base and 1 Mils frequency statistical list be determined by subtracting 10 Mils from the indicated equiliator frequency.

M.1.1014	יומונו	INX	· ·	<u> </u>	uchin	WIN	it bit	IMI	ISIAC
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	9970			3		000		1.	
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pop.						000		1	
1, 000,						000			
1:000,						ממע נ			í.
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1 000.						ggg (		• • • •	. 14
1/000,						goo (			
1/000,	uguų		Marie Inc.			900	000	,	

- d. Record frequency offset on test card. For long-term stability, operate the counter continuously for at least one month. Measure, frequency offset at one-month intervals.
- e. To calibrate the counter time base to the frequency standard, perform time-base adjustment in

#### NOTE

Temperature must be held constant or compensation for temperature difference must be made whenever a frequency difference is recorded. Unless a record of the temperature and date of last calibration is available, the frequency offset should not be considered drift or aging rate of the 10 MHz crystal.

- To check time base stability vs. line voltage variations, connect variable transformer to counter power cord. Vary line voltage ±10% and record frequency difference on test card; it should be ≤ 1 part in 107.
- g. To check time base stability vs. temperature, vary counter operating temperature between'0" and 50°C. Record frequency difference on test card; it should be \$42.5 parts in 10°.

# Table 8-3, In-Cabinet Parformance Check (Continued)

- h. Commut equillerappe vertical hipsi to OSC Jack on counter rear panet. Use 10:1 probe at OSC lack.
- 1. Ontllonope should display 10 Milk nominal at > 8,4 volts peak-to-peak smpl(tide. Renord)
- R. DIRPLAY, DECIMAL POINTS, AND DIVIDENS

**MECHAN** 

Propar operation is verified in the Bell-Cheek procedures in Table 6-1. Record on test card,

a, Principling inground and highlitivity

## DILANNISI

- OA of daliwa DCINOA bina at of MACE always, and of a starting remains left ...
- b. Connect a BNO T connector to CHANNICLA input lock. Connect sine wave test escillator out put to T connector. Connect escilloscops vertical input to T connector to monitor input signal amplitude; use a 50-olom feedthrough at escilloscopy BNO.
- o. Adjust test escribator from 20 Hz to 50 MHz, maintaining 100 mVrms input supplitudes. Counter supplied properly display all frequencies in this range. Record on test as Pd.
- d. Bal midle opelitator frequency to 8 11%. Counter should not count. Awitch AC/DC switch to DC.
- 6. Connect a BRO T commutor to Zaxis input of escillescope. Connect counter MARKER A and B
- f. Adjust tent oscillator output for 1000 lis at 8 volts peak-to-peak indication.
- H. Bof CHANNEL A LEVEL to Milister and cheak that challengope marker is at 0 volts.
- h. Bot CHANNEL A BLODE to a Yary CHANNEL A LEVEL control and check that marker is variable over at least -3.0 to 350 volts on the positive slope of waveform.
- 1. Bel CHANNEL A BLOPE to . Vary CHANNEL A LEVEL control and check that marker dot in variable over at least -3.0 to 13.0 volts on the negative slope of waveform. Record on tes
- J. But CHK-Hep-COM switch on COM and repeat marker test for CHANNEL B. Record on test

### INPUT C

- n. Disconnect estillescope and input to CHANNEL A. Remove 5017 feedthrough and connect cable
- b. Hellrungtion selector to FREQ C; Time BABE to is, and input selector to +10 (5327A).
- c. Use the set of frequency generators (Table 5-2) necessary to cover the input frequency from 2/1/k to 550 MHz, while maintaining 100 mVrms input level. Adjust TIME BASE switch as neglessary for best display.
- d. Check for stable count within stability of oscillator. Record on test card.
- a Bet input solector switch to DIRECT.
  - Use the set of frequency generators necessary to cover the input frequency from 1 kHz to 50 MHz, while maintaining 5 mV rms input level. Adjust TIME BASE switch as necessary for best display. On 5326A vary frequency from 0 to 50 MHz.

# Table 5-3. In-Cabinet Performance Check (Conlinued)

g. Check for alable count within alability of carillators trecord on test card, Disconnect selon,

## 4. PULBN OPERATION

a. All counter controls as follows:

FUNCTION	اندا		٠,	1	 1: <b>i</b>	,		آد <b>ۇ</b> چ	•			M	NO A
"I'IMIS JJABI	Υ,	, ,	,	,	,	•	, ,	) (1   (1) (1)		1	į .	1#	7 10 /
, 193 <i>959</i> H . 28 . FY . 3	1 2 2 1	843.	. 13	1 1						9 - 3 : 1	•	₽P	1.20
AQ/DQ (A)	( ) (	1 1	. 1		la II	*	, ,	, 📢	) )		1.	1)()	
ATTEN (A)		1 1			1	1	,	•	<b>1</b> 1 /	a a'i J∵∵		7. ]  }}	legion)
Olk-Hill-	gρ	м	. 3	7. t		1	"	17. <b>#</b> }}   #4.1	7	<b>1</b> (15)	) 3	TH.	ly selection (
MUMURIN,	ωP4	, ,	•	<b>(</b> )		1.	<b>)</b> : 3		, 1		٠ (	DN	
ONO.,,,			,		,	,	, ,	,	). T			IŅĪ	1

- De Connect DNC T connector to cantilinacope vertical input. Connect pulse generator to T. Connect CHANNIL A input to T connector, using COM feedthrough at the counter input.
- o. Adjust pulse generator output for 10 Milk reputition rate, 15 na pulse width at 0, 5 volts peakto-peak indication on oscillogoops,
- d. Chark that counter displays the repetition rate, count light flashes, and trigger A lamp is on. Record on test eard,
- e. Remove input connection from CHANNIII. A input Mak, Remove 500 feedthrough and connect cable to INPUT C jack. Bet FUNCTION acleator to FREQ C. Bet INPUT C switch to DIRECT.
- f. Bet pulse generator happy to 10 MHz reputition rate. These with pulsent at 800 my peak-to-
- B. Chook that counter displays reputition rate and count lamp flushes, Record on test partle
- h. Repent above check for 10 klin.

## 6. PICTION AND PERIOD AVERAGE

- a. Set counter controls as in step is. with FUNCTION to PERIOD A and MULTIPLIER to 195 or an incided, Set audio escillator to 2 Hz at 100 mVrms.
- b. Connect oscillator to CHANNEL A input, using BNC T. Connect oscilloscope to T, using 500 feedthrough at oscilloscope BNC.
- o. Vary audio and test oscillator frequency from 2 Hz to 10 MHz, insintaining 100 mVrms input amplitude. Vary MULTIPLIER as needed to maintain meaningful display with change of frequency. Counter should properly display the period of the frequencies in this range within accuracy appears the instrument. Record on test card.
- d. Bet FUNCTION switch to PERIOD AVG A and repeat step a. Record on test enich
- 6. Time interval and time interval average
  - a. But counter controls as follows:

BAMPL	E RA	rii	) , y		1. 15		. A	Aldeni	sition
- Fabt/)	norm	///	ひんり			, ,	. N	MION	45.75
FUNCT	ION .	1	6.10	··•			'1	'i I, A	to B
MULTI	וטונגניו גי א	<u>د</u> رو		• •	• • •	100			
BLOPE	B						sibr¶* jha i ∰	10	
			1.3	200 800	nell"	Mili i			

### Table 5:5, in Cabinet Performance Check (Continued)

n. Pountar auntral sutlings (contrd):

AC/DC (A and B)
ATTEN (A and B)
LEVEL (A and B)
LEVEL (A and B)
OIK-SEP-COM
OOM

- b. Connect test'espilisher to CHANNIGLA Input. Bet espilister for 1 MHz output at 500 in Visus. Observedisplay for 6 ps at count a trigger error. Record on test card.
- d;""ast rungrigh to T. I. Avo and MULTIPLIER to 101. Bal algorization to 4 & Mila, \* Counter about display one half, the period of the input algorit.

### 7. TOTALIZE

'a, Het counter controls sa follows:

rungtion BTAR MULTIPLIER 1
CHK-REP-COM CONTROL OHK

- b, Check that display totalizes, count light (C) is on and trigger A and B lamps light, Record on tost card,
- a. Using 1011 divider probe, connect escilloscope vertical input to TIME BABIC OUTPUT jack and connect escape.
- d, Check that outlibecope tudicates 10 MHz negative going pulses at least 5 volts peak-to-peak, typically > 50 mag at 50% points. But MULTIPLIER switch to 10 and observe 1 MHz output pulses, typically 100 mag.
- e. Disconnect oscilloscope from TIME BASE OUTPUT jack and connect TIME BASE OUTPUT to 5245L Electronic Counter input. Set 5245L for frequency measurements.
- f. But MULTIPLIER as follows, and check for proper counter display. Record on test card,

MULTI	PLIER.		1, 1,		5245 1	)BPLAY
	i ,	1	3.5	4 4 3	10	Mile
1(	),		i.	$\mathcal{M}_{i,j}$		Mile
	)2 )3				100 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	kiik kiik
i		Aritis.	5			klik
10	)5,				§ 100	lie ,
10	)0`. )7,				. 10	He He
	່ງເຮັ່		, i			Hg \
<b>.</b>	President des	O 15 27 1	3 7 19	法销售物	6.43	1 100

\*\*±1 coun

<sup>\*2</sup> MHz must NOT be exact or display will be ambiguous,

#### U. RATIO

a. Hill counter controls by follows:

PUNOTION
MULTIPLIAN
ACIDO
ATPIEN
CHE-HIP-COM
LICVAL A
OHO (rear panel)

- b. Connect test oscillator to OSC lack, using BNO 7. Consect espillescope to T connector, using 800 feedthrough at escillascope BNO. Set escillator espector for 10 MHs at 1. Yrms.
- 6. Connect BNO T connect accounter's CHANNIL A jack. Confect second test oscillator to T connector. Connect second channel of dual channel oscillators a vertical input to T consideration, using BMI feedthrough at oscillacope BNO. Set variable oscillator for 100 kHz at 100 mV rms display on oscillacope.
- d, Check that counter displays 100. Dispegard units and decimal point. Hecord on test card,
- o. Report that uning 100 He into OBO jack and 100 kHz into CHANNICLA, But MULTPPLICH to 10%. Display should be ratio of two input frequencies X 10% (approximately 10%). Disregard a disclaim point and units. Record on test card.
- υτλη υπίκλε της τυίτης υτχο., τ
  - a. Disconnect setup.
  - b. Hot counter controls as follows:

Function			FILIX
TIME-HABE , .			1 mn
CHK-BER-GOM		 	CHK
FABT/NORM/HO	, כנונ		Fabr :
BAMPLE RATE			max new:

- e. Using 10:1 divider probe, connuct oscilloscope vertical input to CATE outpation observe positive pulses 2.4V with a pulse width of < 100 grs. Record on tool card,
- d, . Blowly rotate BAMPLE RATE clockwise and observe that the pulse width increases.
- o. , Set the TIME DASE switch to 10 ms and rotate the SAMPLE RATE fully clockwise. Observe that the pulse width is > 20 ms., Record on test capt.
- 1. But FART/NORM/HOLD to NORM and turn BAMPKE RATE fully counterclockwise, just out of OFF. Observe the positive pulse width is < 20 ms. Report on test entd.
- g. Blowly rotate the BAMPLE RATE clockwise, observing an increase in the pulse width.
- h. Bet TIME BASE to is and rotate SAMPLE RATE fully clockwise. Verify that the time between finishes of the count (C) lamp is greater than 5 seconds. Hecord on test card.
- 1, But FUNCTION to START and check that gate output is TTL LGW (\* 0.44)
- 1. Bet FUNCTION to BTOP and verify that gate output is TTL ligh (> 2, 4V).

# Table 5-3, In Cabinet Performance Check (Continued)

- 10. DIGITAL RECORDER (Option Will)
  - a. Bet counter controls as follows:

FUNCTION S. FRIED A TIME BARB THE COMPRESSION OF TH

- b. Connect oscilloscops to J0(48). Observe oscilloscops display a print command (drop from >2.4 V to <0.4 V) immediately after the C ismp goes out.
- a: Comment jumper from JO(88) to JO(88).
- d. Check that counter's main gate is inhibited. O light does not finely, and no print command pulses are generated.
- o. Verify proper output by connecting a 1966A printer to Jb. Printed output should agree with counter display. Logic probe or voltmeter may be used to verify that output logic levels agree with informant display. Record on test card,

#### B, OPTION OOF ATTRINUATOR AT ALA YARRUB KUWOL a, Connect counter line cord to variable power transformer. Monitor output voltage with AC VIVM. Adjust transformer for 117 AOZDO HIPZGOM APPION AZD voit indication on VIVM. b. Turn counter HAMPLI HATH control clockwise out of OPP. Using an HP 419A or squivalent, measons of voltage at OHANNIII. A jack. o. Connect VPVM: to A15 Ph 7 and adjust Aibitio for tight V. Adjustable for \$ 1 mV reading. d. Connect VIVM to Ato Pin 6 and addict. Manutre voltage at OHANNIAL D Jack. A101110 for -10.5 V. 1 Adjust RD for \$41 mV readings. RAJRA TOEPING CINA PTIVITIENUE LE Bot A and II attenuators to X100 position. a. Connect a BNO T connector to CHANNEL. Manura voltage at CHANNISI, II Juck. A Input Jack, : Adjust 1832 for \* #1 mV reading, ... b. Connect test encillator output to T connector. Meanure voltage at CHANNISIA jack, o. Connect encillescope vertical input to Temperator, using EST feedthrough at each Adjust 1038 for # #1 mV rending. loacope input IINC. OBUILLATOR A4 d, Connect counter MARKER A bulput to osallosoppe Zanis Input., Connect 1 Milk frequency, standard to CHANNIOL A Inck. e. Adjust test oscillator for 1 kilk output b. Bet counter controls as follows: nt 100 in Virina f. Bet counter controls as follows: PUNOTION ..... PRINT A BAMPLICRATIO ..., allqhtly clockwing ATTEN ..... XI out of OFF ΛΟ:DO ........ e. Remova top cover. d. Using insulated tuning tool, adjust A4CB g. But BLOPR A nwitch to and + positions until display indicates all zeros with cover on. (Wait 10) seconds, between adjustments for s and observe murker position on oscilloscope 'counter to maka manauromant) h. On Input Amplifier board A2, adjust A2R2 BENS pot until + and - marker positions have a symmetrical offset about the zero volt axia For atandard instruments without Option for + and · slope switch positions, · 001, the counter display will overflow; however, all digits are valid, i. Adjust test escillator for 1 kilk output at 200 mV rms. PRISBOALISICATS (\$327A - (\$327480000) i. But counter PUNCTION awitch to 7.1. BENBITIVITY ADJUST FOR PRESGALE A to B. MODE: k. On Input Amplifier, adjust A2R24 TRIG n. Bet counter controls as follows: LEVEL pot until markers are at 0 volts for FUNCTION FIREQ C both + and - SLOPE awitch positions.

I. Repeat procedure for CHANNEL B input

(Amplifier Board All), -

## Table 5:4, Adjustments (Continued)

b. But IIP VIIP Bland Generator and doubler for 550 MIII at 500 mV rms. Measure the output with an IIP 3406A RF Voltaeter using a 500 termination at the probe. Connect signal source to INPUP Gof counter.

arin paringanah

- o. Reduce output level until counter's display becomes unstable. Adjust itl for a stable display. Repeat this procedure until unable to obtain a stable reading. Increase signallevel until display just becomes stable.
- d. Disconnect imput and connect to voltmeter, should read less than 100 mV.

## BENBITIVITY ADJUBT FOR DIRECT MODE

- n. But INPUT O switch to DIRECT.
- b. Combot satup as to step 5b, except use in 11P 600P VIII Signal Generator with the output set to 50 MIs at 50 mV.
- o, Reduce output level until counter's display becomes unstable. Adjust RU for a stable display. Repeat this propedure until unable to obtain a stable reading. Increase signal level until display just becomes stable.
- d, Disconnect input and connect to voltmeler, should read loss than 5 mV,
- 6. 🚼 PRICECIALICIE ATA (BRIZZA OBRIZZ-BRORD)

The 05327-66920 board has an indictional potentiometer, R23; than has the 05327-66000 board. Perform the Step 5 adjustment and, in addition, adjust R23 as follows:

n. Rotalo R28 fully clockwise.

- b. If unable to obtain a stable count at 550 MHz, turn 1928 slightly counterclockwise.
  - o. Theek for a stable counter reading.

## "7. INPUT O AMPLIPARE A17 (6880A)

- a. ' Bet counter controls as follows:

b. Bet HP 600H HP Blynn Cemerator (or equivalent) for 60 MHz at 600 mV rms. Mensyrs the output signal of 600B with an HP 411A 5RP Millivoltmeter, using a 600 termination, Connect signal source to INPUT C of counter,

- b. Reduce output level until counter's display becomes unstable. Adjust RII for a stable display. Repeat this precedure until unable to obtain a stable reading. Increase the signal level dath display just becomes stable.
- d. Disconnect input and connect to voltmater, reading should be less than 5 mV. Check other frequencies within the band,

Table 4-5. D.P. and Annunciator Troubleshooting

Minetion	Multiplier Bwilch		11 /	m	,				Døel	mal	1	1
HWILCH :\\\.	Bwileh	'n					101	101	101	101	10)	100
Period AVG A	10				X						*	X
		X		•	XX		And the second s			,	X	X
		X			X		) N		N.	eganyti Andri Andri		
T.I. AYA A to B	10	e jakili. Politika Politika	X		N N N	heneya.			# 20 C		X	A .
		X X			N N			gunga Pina Pina Pina Pina	-domin	**************************************	X	X
		×			N N N		**	X			)	
T.L.A.w.D	10		<b>J</b>		X	10					, , , , , , , , , , , , , , , , , , ,	<b>X</b> ,
		<b>3</b>		X	N N	,			,		***	X
	10° 10° 10°			19 <sup>6</sup> 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	K	<b>X</b> 3			\$			<b>N</b> ,
Period A	10 10		X,	_	'X' X		1 (1) 1 (1) 1 (1) 1 (1) 1 (1)			•	*******	ĸ
	The second se			X	X, X				, ,	ا <b>د</b> ند. ا	X	X,
	101 101 100 100 101 101	, , ,	**************************************		X	<b>X</b>	, ,	7				X

Table 5-5, D.P. and Annunciator Troubleshboting (Cont'd)

Panelien	Multiplier		,	,			0.0	1	Dool	mal	
Populion Hwitch	Multiplier Bwitch	a	k	M	,i lu	10,	101	1()3	101,	101	104
Pren, A		*		X	×××			33.		X	X
			X	X	***				X	X	, K
			X X	<b>1</b>	X X X			*	*	: B	
Proj. O DHUCOP	10	<b>X</b>		×	×××		4.	\$ 1			
	100	,	X	X	X				×	×	X
			X X X		X	Tariff Tollows		X	X	*	•
Prog. O PREBOALE	100	X		X	i X X X	5		- 1		<b>X</b> 2	×
	10) 101	- <b>/</b> 	X	X X	××			,	<u></u>	) <b>X</b>	×
	10% 10% 10%		X,		×			,	X	**************************************	×.

) 11-12

### PERFORMANCE CHECK TEST CARD

Hewlett-Packard Model 5326A/5327A   Test Performed by Timer/Counter   Date   Date	
	The appropriate the second second
A PROPERTY OF THE PROPERTY OF	CHECK
1. TIME BASE STABILITY AND OUTPUT. Aging Rate: < 5 parts in 107 per month Line Voltage: < 1 part in 107 for 10% line variation Temperature: <±2.5 parts in 104, 0-50°C Output: 10 MHz, > 2.4 volts peak-to-peak	
2. DIBPLAY, DECIMAL POINTS, AND DIVIDERS As per self-check procedures, Table, 3-1	
3, FREQUENCY RESPONSE AND SENSITIVITY  Frequency A Range: 0 to 50 MHz Frequency C Range: 0 to 550 MHz (presculed 5327A)  1 kHz to 50 MHz (direct 5327A)  0 to 50 MHz (5328A)	
Sensitivity, Frequency A and Frequency C (prescaled): 10) mV (5327A)  Frequency C (direct): 5 mV  Channel A Preset: 0 volts  Channel B Preset: 0 volts  Channel B Lovel: 43.0 to -3.0 volts  Channel B Lovel: 43.0 to -3.0 volts	
4. PULSE OPERATION  CHANNEL A: Sensitivity: 0.3 volts peak-to-peak Pulse Width: 15 ns	
INPUT C: Sensitivity: 0.3 volts poak-to-peak Pulse Width: 15 ns	
5. PERIOD AND PERIOD OPERATION Frequency Range: 0 to 10 MHz at 100 mV	
o, TIME INTERVAL AND TIME INTERVAL AVERAGE Time Interval: 0, 0 µs at 300 mV Time Interval Average: 1/2 period of input signal	
7. TOTALIZE  / Range: 0 to 10 MHz  Output: Rear panel TIME BASI BNC  Factor: 1 to 200 in decade steps	

#### SECTION VI

#### REPLACEABLE PARTS

#### 6-1. INTRODUCTION

- 6-2. This section contains information for ordering replacement parts. Table 6-1 lists parts in alphanumerical order of their reference designators and indicates the description and HP Part Number of each part, together with any applicable notes. The table includes the following information.
  - a. Description of part (see abbreviations below).
- b. Typical manufacturer of the part in a fivedigit code; see list of manufacturers in Table 6-2.
  - e. Manufacturer's part number.
- d. Total quantity used in the instrument (TQ column).

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

#### 6-4. ORDERING INFORMATION

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

				REFERENCE DESI	GNATORS				
	a - mibly	F		fuse	MP		mechanical part	U	integrated circuit
	r for		4	filter	P	•	plug	V	vacuum, lube, niss
т		ic		integrated circuit	Q		transistor		hulb, photocell, 11
	capacitor	ິ່ງ		tack	Ŕ		resistor	VR	voltáge regulator
	coupler	ĸ		relay	RT		thermistor	W.	cable
		ï		inductor	5		pwilch	X	nocket
	diode			loud speaker	Ť		transformer	Y	crystal
11.	delay line	M	•	meter	TB		terminal board	Z .	tuned cavity,
8 .	device signaling (lamp)	MK		niterophone	TP		test point	-	network
•	misc electronic part	МК	•	писторнове			trai para		
				ADBREVIAT	IONS				
	amperes	н		hentics	N/O		normally open	RMO	rack mount only
rc	automatte frequency control			hurdware	NOM	-	mompaal	RMS	root-mean square
MPL	amphilier	HEX		hexagonal	NPO		negative positive rero	RWV	reverse sorking
MI. C	2mpiniks	RG.		mercury			(zero temperature		yollage
	beat frequency oscillator			hour(a)			cuefficient)	S-B	nless -bless
			_	hertz	NPN		negative-positive-	SCR	BCTA W
	beryllium copper	116	-				negative	SI.	se leggun
	binder head	1F		intermediate freq	NRFR		not recommended for		arction(a)
)P	bandpass	IMPG	•	impregnated			field replacement	SECT	section(s)
	brass		•		NSR		not penarately	SEMICON	
3W O -	backward wave oscillator	INCD	•	incandeacent	nan	•	replaceable	18	bilicon
		INCL.	٠	include(n)			* **	SIL.	ativer
2CW	counter-clockwise	INS	٠	insulation(rd)	OBD	4	order by description	SI.	allde
CER -	ceramic	INT	•	internal	OH		oval head	SPG	spring
OMC	cabinet mount only	к		ktlo - 1000	OX	v	oxide	5PL	epecial
COUP	coefficient							SST	ataintean atrol
COM .	cummun	LH .	-	icit he d	37	٠	peak	5R -	aplit ring
COMP 4	composition	LIN		linea taper	PC	•	printed circuit	STL .	stort
COMPL	complete	LK WASH	٠	lock wesher	PF		picotarada - 10-12	***	tantalum
ONN		LOG		logarithmic taper			tarads	TA ·	time delas
P .	cadmium plate	LPP		low pann falter	PH BGZ		phospher bronze	TD	
RT (	cathode-ray tube			•	PHL	•	Phillips	TGI	toygh
	rlockwise	M		mitti : 10-3	PIV		peak inverse voltage	THD	thread
- "	T TO THE THE	MEG		ping = 105	PNP		positive-negative-	TI	Manton
DEPC -	deposited carbon	MET FLM		metal (tim			IMMILIAN	TOL	tolerance
	drive	MET OX		sietallie oxida	P'O		part of	TRIM .	
	• • • • • • • • • • • • • • • • • • • •	MFR		nianofacturer	POLY		polyatyzene	TW F	
ELECT	electrolytic	MHZ		mega hertz	PORC		porcelain	u	aucro 10-6
ENCAP	encypulated	MINAT	-	miniature	106		(d)nultiana	Ų	noting to
	external	MOM		momentary	POT		potentiometer	VAR -	
	· farads	MOS	•	metal uzide aubatrate	PP P		peak-to-peak	VDCW	de working volts
r FH	· flat head			metal datas administra	PT	-	point		
	· tillister head	MTG		"mylar"	PWV		peak working vollage	w/	with
	· Hard	MY	•	mytar			harm annual transfer	W	walth
					RECT		rectifica	WIV	working inverse
G	- μικα (10 <sup>9</sup> )	N	•	nano (10 <sup>-9</sup> )		-	radio frequency		voltage
GE	< gcenanium	N/C	•	normally closed	RF			***	wirewound
GL	· Kine	NE	•	กเรเก	RH		round head or	W 0 -	without
GRD	ground(ed)	St PL	٠	nickel plate			. lght hand	W U '	-1110/41

Figure 6-1. Panel Designations

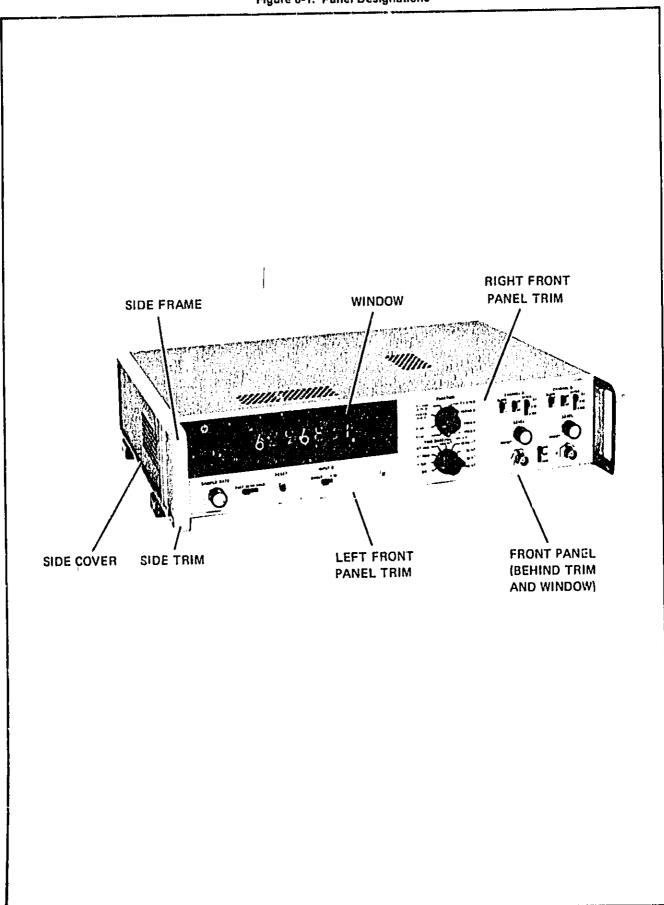


Table 6-1. Replacement Parts, Standard Instrument

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
Al	05724-60047	l.	ATTENUATOR ASSY (SERIES 1274A) (LOADED ON 05376 20047 BLANK BOARD)	26480	a532e-60047
A1C1 A1C2 A1C3 A1C4 A1C5	0160-2244 0160-0939 0160-09376 0160-0161 0160-2140	2 2 15 2	CAPACITUE, FRU. 1914 259F & 500WVDC CAPACITUH, FRU. 430PF *-58 300WVDC CAPACITUE, FRU. 279158 500WVDC CAPACITUE, FRU. 01UF 10W 200WVDC CAPACITUE, FRU. 01UF 10W 200WVDC CAPACITUE, FRU. 470FF +6J-20% 1000WVDC	28480 28480 28480 60280 48480	C160+2244 C160+C934 G160+G978 192P10302 PTS G160+2140
A1C6 A1C7 A1C6 A1C9 A1C10	U180-2930 V160-2167 0160-2148 0160-2930 V16C-2244	5	CAPACITUH,FRC01U/-PD-20% 100HVDC CAPACITUR-FRC. 10PF5% 300HVDC CAPACITH-FRC02UF-800-20% 100HVDC CAPACITH-FRC01UF-800-20% 100HVDC CAPACITUK,FRU. 1PF25PF % 500HVDC	01418 28480 91418 28480	TA C160-21+7 0160-2146 TA U160-2244
A1C11 A1C12 A1C13 A1C14 A1C15	9160-0939 0160-0378 0160-0378 0160-0340 0160-2930		EAPACITUR, FAU, 430PF »-5% 300MVDC CAPACITUR, FAU, ATPF »-5% 300MVDC CAPACITUR, FAU, 430F **IN 200MVTC CAPACITUR, FAU, 470PF **BO-20% 22° 1MVDC CAPACITUR, FAU, 401UF **BO-20% 100MVCC	26446 28446 66280 26486 81418	0160-0533 0160-0338 10010307 PTS 01603-0440 TA
A1U16 A1U17 A1UH1 A1CH2 A1GK3	0160-2146 1910-0016 1910-0016	17	CAPACITOH, FRE, LUPER-TR BOUMBUC CAPACITUP, FRE, JOSEPHEC-207 LOCHBUC UBLODE, SHITLHING, GE, CCV MAR VAN BUMA CIODE, SHITCHING, GE, COV MAR VAN GOMA DIODE, GIN PEP, SI, 35V MAR VAN BUMA	28430 23480 28430 28440 28440	0169-2171 0160-2146 1510-0016 1910-0016 1501-0176
ALCPA ALCPO ALCPO ALCPI ALCRE	1901-0376 1902-0341 1902-0041	•	DIUGI, GIN PRP, SI, 35V MAR VEM 50MA NUT ASSIGNEG IBULE, VREG, 5-11V VZ, -4W MZZ DIJLE, VREG, 5-11V VZ, -4W MAZ NCT ASSIGNEG	2846C 2646C 2846C	1502-0041 1502-0041
AICRY AICRIO AICRII AICRIJ AICRIJ	910-9616  1501-0376  1501-6376		UIODE, SHETCHING, CE, RUY MAX VAM BOMA DEOUE, GEN PAP, SE, 25% MAX VAM BOMA CLUDE, GEN PAP, SE, 35% MAX VAM BOMA NCT ASSIGNED BIOUL, WEEG, S.11V V2, 14% MAX	2848C 2648C 2848C	1910-6016 1501-0376 1501-0376 1502-0641
AICA14 AIG51 AIG52 AIG1 AIG1	1902-0041 2140-0047 2140-0647 1751-0472 1251-0472	2	DIGGE, VPPGS 5-11V VZ. 146 MEA LAMP, GLUG, CULB E-2, LOSV LAMP, GLUG, CULB E-2, 105V CUMBLETUE, PL EUGE, 0-CONT, CEP SOLDER CLARECTUE, PC EUGE, 0-CCNT, DEP SCLOER	28960 742 * 7421 e 71765 71765	1902-6041 Alc Alc 252-96-10-300 272-06-36-36C
Alur Alua Alur Alur Aler	1250 125	2 4	CONNECTOF-COAR, NNC. 57 CHM FEMALE LUNNICTOM-COAR, NO, 50 HHM FEMALE TSTRISE FEET LUAL N-CHANNEL TSTRISE FEET LUAL N-CHANNEL RESESTUM, FRI., 2858 225M CC TUMULAR	28486 28486 17851 17852 01121	1250-1163 1250-1163 0577 05377 CH2235
A187 A184 A185 A186	CCB3-9145 OABJ-1015 O757-0947 O757-0973 U6B3-1055	22 2 4 4	RESISTOR, FRE, 9EURSE 2256 CL TUEULAP PLISSOR, FRE, 100 DHMSE 2256 CC PESISTOR, FRE, 9EERZE 1276 F TUMULAR RESISTOR, FRU, 110RZF 2256 F TUMULAR RESISTOR, FRU, 1858 2256 CC TUPULAR	G1121 G1121 26546 26546 G1121	CHINE CHINE EN-17P-TC-SICE CHINE CHINE
AIK7 AIPB AIRT AIR10 AIR11	07:1-07:3   00:03-22:15   00:03-47:15   00:03-105:5   00:03-105:5	# 7 16	RESISTING FAD, LLUPER LLESS F TUHULAR FRESISTUM, FAD, LEU OHNOT LESS CC FRESISTER, FAD, ATO INNOT LESS CC RESISTUM, FAD, INST LESS CC TUMULAR RESISTUM, FAD, BUST LESS CC TUMULAR	24546 01121 01121 01121 01121	Ch-1/6-10-1102-6 CB2215 CH4715 CH1057 CH3325
A1#12 A1#13 A1#14 A1#15 A1#16	Oph3115   Ctd3115   Ctd3225   Cd3225   Oph3225	15	RESISTUR, FRC, 470 UHMST "25m CC FESISTUR, FRU, 470 UHMST "25m CC PESISTUR, FRU, 470 UHMST "25m CC TUPULAF PESISTUR, FRU, 22mST "25m CC TUBULAR PESISTUR, FRC, 22mST "25m CC TUBULAR	011, 1 C1121 G1121 G1121 G1121	CH4715 CH4715 LPx245 CP2245 CH2235
A1617 A1611 A1619 A1620 A1621	0683-4195 C683-1015 0757-0997 0757-0973 0683-1055		RESISTER, FRE, VICAST 125W CC TUBULAR FESISTER, FRE, ICH GIMBT 125W CC RESISTER, FRE, 91 AZR 1125W F TUBULAR FESISTER, FRE, 114 SZF 1125W F TUBULAR RESISTER, FRE, 1M51 UZSW CC TUBULAR	01121 01127 24541 24546 01121	EMALAS CRISTS CA-178+TC-5101-6 CA-178+TC-8107+6 Ch1655
A1A22 A1R23 A1R24 A1R25 A1R26	0751-0773 0883-2215 2100-3276 0883-1055 2100-3278	2	HESISTOR, FXO, ELONZY LIZON F TURULAR HESISTOR, FRE, 220 CHROY SCON CC BESISTOR, FARE, 10N 20T PC 1951 SH HESISTOR, FARE, 1MSX 1/2W CC TURULAR HESISTOR, VAR, 10N 203 PC SPST SH	24560 01121 28460 01121 28460	CA-176-10-1167-U CH265 2100-3223 CH1655 2103-3228
A1427 A1428 A1429 A1430 A1431	0eb3-4715 Cob3-3325 Ob3-2225 Ob3-2225 Cof3-1005		FESISTIM, FAC, 473 (HMMST ,25m CC TUBULAF FESISTICH, FAC, J.JANST ,25m CC TUBULAF FESISTICH, FAC, Z.JANST ,754 CC TUBULAF FESISTIM, FAC, Z.JANST ,25m CC TUBULAF FESISTIF, FAC, NO LMMST ,25m CC TUBULAF	01151 01151 01151 01151	CP4715 CP3225 CB2225 CB2225 CB2225

Table 6-1. Replacement Parts, Standard Instrument (Cont'd)

Designation		Qty	Description	Code	Mfr Part Number
A1832 A1833 A1834 A161 A182	0x81-10C5 CF83-1005 SxF3-1025 JF01-1313 JF01-1275	}	PESISTOR, PRU, TO HIMBSY "25W CC TUBULAR PESISTOR, PRU, TO HIMBS "75M CC TUBULAR PESISTOR, PRU, TO L #5T "25W CC TUBULAR SWITCH, SU, FORT NS, "5A 125WACZOC SWITCH, SU, EPSI NS, "5A 125WACZOC	01171 G1171 G1171 G1171 JH450 JH470	CH1005 CH1005 CH1005 CH1005 3101-1313 3101-1274
A153 #155 A155 A156 A156	3141-1275 3131-1311 3141-1276 3141-1278 3141-1311	\$	SHITCH, SE, CPST NS, .SA 125VAC/CC SHITCH, SE, CPOT NS, .SA 125VAC/DC SHITCH, SE, UPDT NS, .SA 125VAC/DC SHITCH, SE, UPDT NS, .SA 125VAC/DC SHITCH, SE, UPDT NS, .SA 125VAC/DC	26464 2648C 2646C 2646C 2646C	3101-1279 3101-1311 3101-1278 3101-1278 3101-1371
#17# #17#			Nosobo PART UF RZN Nosobo PART UF RZN		
A./	U5326~6UUJ4	2	IMPUT AMPLIFIER ASSY ISTRIES 072) ILOADED ON 06376-200M BLANK BOARDI	284BC	05126-60004
na	0160 2030		CAPALITICH + FILE + GIUF + EQ = 207 IOUHVCL	91418	TA
A2C2 A2C3 A2C4 A2C5 A2C5	0160-7030 0160-7030 31#6-61#7 0169-61#7 0160-6153	1 8 4	CAPACITOR, F.ED., 01:80-20% 100WVDC LAPACITOR, F.ED., 20,UF #0-20T 10HWVDC CAPACITOR-FRIL, 20,UF F-1CT 20VDC TA LAPACITOR-FRIL, 20,UFF-1CT 20VDC TA LAPACITOR-FRIL, 20,UFF-10T 200WVCC	91418 91418 56265 56269	TA TA \$500225#9020A2 \$500225#9020A2 892P\$0292
A2C7 A2Cn A2C9 A2C1C A2C4]	01 FC+0055 01 F0+0055 0160 2930 0160 2930 1502+00+5	2	CAPACITOHSIA: SIMIN-201 2000VIC CAPACITOHSIADS SIMIN-201 2000VIC CAPACITOHSIADS SIMIN-201 1000VIC CAPACITOSSIAS SIMINAD-201 1000VIC OTOMIC VEROS OSTIV VIS SAN MAR	56285 56285 91418 91418 28580	292814602 292814602 TA TA 1902-0069
A2CH2 A2CH4 A2CH4 A2CH5 A2L1 A2L2 E2L3 A2L4 A2L5 A2L5 A2L5 A2L5 A2L7	1910-C316 1901-0040 1501-0010 1501-0040 8140 0144 9109 2265 9140-0144 9100-2255 9140-6144	20	OTOBE, SETTCHING, GL, BOY NAR VEH EDMA ETOGE, SETTCHING, ST, SOV MAX VEH SOMA DEGCE, SETTCHING, ST, BOY MAX VEH SOMA DEGCE, SETTCHING, ST, BOY MAX VEH SOMA GORL, FXD, RE 4 7UH COIL, FXD, MOLDED BE CHOKE, 47 UH 10% COIL, FXL, MILLIED BE CHOKE, 47 UH 107 COIL, FXL, MILLIED BE CHOKE, 47 TUH 107 COIL, FXL, MILLIED BE CHOKE, 47 TUH 107 COIL, FXL, MILLIED BE CHOKE, 47 TUH 107 COIL, FXC, MILLIED BE CHOKE, 47 TUH 107 COIL, FXC, MILLIED BE CHOKE, 47 TUH 107 COIL, FXT, MILLIED BE CHOKE, 47 TUH 107	20480 28460 27480 24480 24226 24226 24226 24226 24226 24226 24226	1-80-001 1-01-004 1-01-004 1-01-004 0-10-014 10-47 10-47 10-47 10-47 10-47 10-47
A2LB A2L1 A2L1U A2U1 A2U2	9140-0142 4140-0144 4140-0144 1854-0042 1853-0015	4 20	CUIE, FRO. M.EJEU HF CHUKE, 2,20H 192 CUIE, FRO. M.EJEO RF CHUKE, 4,70H 197 C.IE, FRC. M.EJEU FF CHUKE, 4,70H 197 IRANSIST P. PRO SE TRANSIST P. PRO SE	24226 24226 24226 24226 24480 23480	10/221 10/471 10/471 18/4-052 18/3-0015
#201 #204 #205 #205 #201	1053-4415 1854-3345 1854-4345 1853-4015 1853-8015	<b>†</b> 1	TRANSF, FLAG FAP SE TRANSESTER, 200175 NPN SE SAAN ESTER, 200179 NPN SE FRANSESTER, PAP SE TRANSESTER, PAP SE	2848C 04713 04713 28480 28480	1853-0015 285175 285176 1851-0015 1857-0015
A295 A224 A2310 A2311 A2312	1854-007 1853-1015 1852-0015 1853-0015 1853-0015		TRANSISTOR, NPN SI TRANSISTOR, PNP SI TRANSISTOR, PNP SI TRANSISTOR, PNP SI TRANSISTOR, PNP SI	28480 28480 28480 28480 28480 28480	1654-0052 1653-0055 1653-0055 1653-0055 1653-0055
A2011 A2014 A2015 A2010 A2011	1853-0315 1054-0071 1054-0072 1854-0072	::	TRANSISTER, PAP SI TRANSISTER, APA SI TRANSISTER, APA SI TRANSISTER, APA SI TRANSISTER, APA SI	2848C 2848C 2448C 2448C 2448C 2848C	1853~1015 1854~0072 1854~0071 1854~0072 1854~0092
Augl - niggly Augzo Ai(1 Agng	1454-0165 1654-0071 1654-0071 0643-0835 2100-2520	# 3 2	THANSISTER, NPN ST THANSISTER, FON ST THANSISTER, NPM ST FESISTUR, FRG, NEKST JZSWILL TUMULAH RESISTUR, FRG, NEKST JZSWILL TUMULAH RESISTUR, FRG, NEKS, SO UHM ZOFIL	07263 28460 28460 01121 19701	533307 1854-0042 1854-0071 CP685 F75085CC
AJ# 5 #2+4 AZ#5 AJ% AJ#7	0603-2235 Jehl-2405 GBB-3-3625 GUP3-1015 C6U3-3025	2 5	PESISTUR, FRO, ZEO CHRST 225m CC RESISTUR, FRE, 2m CHRST 225m CC TEMULAR PESISTUR, FRE, SENRST 225m CC TEMULAR PESISTUR, FRO, 100 CHRST 225m CC HESISTON, FRE, 3RST 225m CC TUBULAR	01171 01171 01171 01171 01171	CP2215 CH24C5 CH3425 CN4C15 CF3C25
\$250 \$250 \$2510 \$2511 \$2512	0083-1025 0695-3113 3696-3381 0698-3175 0698-3175	13 5 4 6 2	RESISTOR, FAC, IRST "25W CC TURILAR RESISTOR, FAC, IOO OMMST "125W CC RESISTOR, FAC, ISO OMMST "125W CC RESISTOR, FAC, ISO OMMST "125W CC RESISTOR, FAC, OR CRMST "125W CC	01121 01121 01121 01121	CHIC2* HP1015 PP1515 PF3015 HE605

Table 6-1. Replacement Parts, Standard Instrument (Cont'd)

······	, , , , , , , , , , , , , , , , , , , ,	,.,	cement Parts, Standard Instrument (C	1	
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2R13 A2R14 A2R15 A2R16 A2R16	Un78-3375 UC#3-1525 U645-518G U648-5175 U648-3381	)  11  4	HESISTOP, FRG. 13 OHMSE -175M CC HESISTOR, FRG. 1-55VT -25M CC TUBULAH RESISTOR, FRG. 2KST -125M CC TUBULAK RESISTOR, FRG. 160 OHMSE -125E CC HESISTOR, FRG. 150 OHMSE -125M CC	G1121 G1121 G1121 G1121 G1121	681505 CP15/5 BB20/5 BB20/5 BB1515 BB1515
A7F18 A2F17 A2F20 A2F21 A7F22	U683-1025 0698-3113 9683-1015 0683-1025 C683-3675		PESESTOR, PRO, INST 1256 CC TUHULAP RESISTOR, PRO, ECO CHMST 1256 CC MESESTOR, PRO, ECO CHMST 1256 CC PESESTOR, PRO, ECST 1256 CC TUHULAP RESESTOR, PRO, ECOPS 1256 CC TUHULAP	0115; 0115; 0115; 0115;	CH1025 HP1015 CH1025 CH3025
AJP23 AJR24 AJF25 AJF26 AJF21	0843-1015 0863-2225 2100-2521 0863-2225	,	PESISTON, FRD, 20275% 025% CC TUBULAR SESISTOR, FRD, 2025KM 10K C RESISTOR, FRD, 2025KM 225% CC TUBULAR RESISTOR, FRD, 100 UMMST 025% CC RESISTOR, FRL, 100 UMMST 025% CC	01121 01121 01121	CH2275 1 T502202 CH2275 CH1015 CH1015
A7k28 A2R29 A2R30 A2R31 A2R32	0683-6815 Q683-6815 Q683-4725 Q683-1035 Q683-3315	6 21 6	FF315TCR, FRU, NBO JHMST HC RE315TDR, FRU, OBO JHMST .JSM CC FE315TDR, FRU, 42,785T LC TUBULAR FF315TDR, FRU, 1485T CC TUBULAR FE315TDR, FRU, 1385T CC TUBULAR FE315TDR, FRU, 330 UHMST .Z5M CC	01171 01171 01171 01171	CHESTS CHESTS CHESTS CHIOST CHIOSTS
A2R33 A2R34 A2R35 A2R30 A2R37	0603-1035 0683-3315 0683-1035 0683-1015 0683-7735		RESISTOR, FRIL, THEST JON CC TUPULAR RESISTOR, FRIL, 330 0.445T JOSH CC RESISTOR, FRIL, 1085E JON CC THRULAP RESISTOR, FRIL, 100 0.445T JOSH CC RESISTOR, FRIC, 2285T JOSH CC TEMPLER	01121 01121 01121 01121	CB1035 CB3315 CB1035 CB1015 CB235
A2H3H A2H3H A2H4Q A2H41 A3H42	0683-1075 0683-7215 0683-2225 0683-1525 0683-1525		FESISTON, FRC, INST .25W CC TURULAR FESISTON, FRD, 220 OPMST .25W CC RESISTON, FRC, 2-28ST .25W CC TUBULAR RESISTON, FRC, 1-58ST .25W CC TUBULAR MESISTON, FRC, 18ST .25W CC TUBULAR	61151 61151 61151 01151	CH1025 CR2715 CH2227 CH1525 FR1025
A2H43 A2H44 A2H40 A2H40 A2H41	0683-1035 0683-1015 0683-1315 0683-1025 0683-1065	;	RESISTOR, FAL, JORDT "JON CC TUNULAR RESISTOR, FAL, JOD ONNEST "JON CC PESISTOR, FAL, JON ONNEST "JON CC NESISTOR, FAL, KROT "JON CC TUNULAR RESISTOR, FAL, LONGT "JON CC TUNULAR	01121 01121 01121 01121	CH3035 CH3035 CH3035 CH3025 CH3085
AJR48 AZR49 AJR50 AZU3 AZU2	0683-2055 0663-2715 0603-2715 1630-0236 1840 0142	2 5 2 1	RESIDTOR, FRC, 2MST -25M CC TURULAR RESIDTOR, FRU, 270 UNMST -25M CC PFSISTOR, FRU, 270 UNMST -25M CC INTEGRATED CIRCUIT, DOTE, DIE QUAD 2 INTEGRATED CIRCUIT, DOTE, ECC DUAL 4	01173 01121 01121 04713 04713	C#7055 C#2715 C#2715 .101CP #C1004P
A3		ļ	STME AS AZ, USF PREFTR A3.		
An	J5126-80CJ2	1	OSCILLATOR ASSY ISERIES 103.5 ILOADLO ON UC325-20002 BLANK BOARD)	ិត្តអូលិ	64376-60007
AACI	0160-0151	ι	CAPACITUR, FAID, "ALUF+-LOT ZOUMVUC	<b>१८६७</b> ८	297910392
#4C2 #4C3 #4C4 #4C5 #4L1	0180-0197 0121-0059 0160-1264 0160-2030 9100-2276	1 1	CAPALITUS-FRC, 2,20F+-BCT 20VDC TA CAPALITUS, NAR, THES, CIR, 228PF CAPALITUS, FRC, 20FF+-DR 500MVUC CAPALITUS, FRC, 20FF-80-20R 107MVUC CLIL, FRC, MILDED OF CHUKE, 14 JUN 10R	15255 73895 28480 91418 25224	196022589C/QA2 UVIIPERA Glob-22c4 TA 16/10]
A401 A461 A462 A463 A464	1850-0158 0158-50. 0683-1025 0683-3015 0683-3015	1	TRANSISTOR, 202035 PNP GE HESISTOR, FAL. 46.4 OHMIR "125W F HESISTOR, FRO, INST "25W CC TUHULAN HESISTOR, FRO, ING CHMST "25W CC HESISTOR, FRO, ING CHMST "25W CC	C571J 16295 01121 01121 C1121	282635 C4-178-30-4664-F C81025 C83015 C83015
A4U1 A4Y1	1820-6142 3410-0405	ı	INTEGRATED CIRCUIT, CGTL, ECL DUAL 4 CHYSTALIGUARTZ ED MNZ	04713 2848J	HC 1/304P U+10=U+31
A5	ግት ያያል~ልና ህወን	1	TIME BASE CONTROL ASSY (SERIES 872) (LOADED ON 05326-2000 - BLANK BOARD)	284B0	Q5326-60005
A5C1	0180-0197		CAPACITUR-FRO, 2.20F+-10% 20VOL TA	56289	LNG0225#5070#2
A5C2 A5C3 A5C4 A5C5 A5CP1	016C-0127 01E0-0291 0160-2150 0160-2204 1901-0040	2 1 2	CAPACITUR, FXC, 10++-203 25WVIC LAPACITUR-FRE, 10++-103 35VCC TA-SULTD CAPACITUR, FXC, 33PF+-53 300WVIC LAPACITUR, FXC, 100F+-59 300WVIC UICUL, SWITCHING, SI, 3DV MAX VRM 50MA	2546C 56265 2546C 2546C 2546C	01c0-0127 1500105x9015A2 01c0-2150 01c0-2204 1901-0040

Table 6-1. Replacement Parts, Standard Instrument (Cont'd)

	Table 6-1. Replacement Parts, Standard Instrument (Cont'd)							
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number			
A5G1	1854-0072		TEANSISTOR, NPN 51	28480	1854-0092			
ANGS	1954-0092		TRANSISTOR, NPN SI	28480	1854-0092 1854-0071			
A503 A505	1854-0071		THANSISTOR, NPN 51 THANSISTOR, NPN 51	28480	1654-0071			
2707	1854-0071		TRANSESTOR, NPN ST	28480	1854-0071			
A500	1854-0671	•	THANSISTUR, NPN SI	264FC	1854-0071			
ASE I	0683-1015		RESISTOR, FRG. LORST .25% CC TUPULAR	01121	CM1035 CM3035			
A562 A563	0683-1035 0683-5105	4	RESISTUR, FXG, 10PSK "JSW CC TURULAM RESISTOR, FXG, 51 UNMSK "JSW CC TURULAM	01121	(85105			
ASEN	Q683-1325	·	HESISTOR, FRO. J. JEST LISM EL TURULAR	olizi	CR3325			
A5E5	9683-4715		#F51519P, FRC: 470 03M58 .25W CC	21151	CB4715			
A546 A547	0643-1325 0683-1225	2	FLSASTOR, FRO. 1.385T .25W CC TUBULAR Risistor, fro. 1.285% .25W CC Tubular	0M51 0FF5F	C03325 C03325			
		•	FACTORY SELECTED PART					
ASEA	dn# !- 1025		PESISTOR, FRO, INST ,25% CC TUBULAR	01121	CB1025			
45k7	0683-1025		HESTSTOR, EXC. INST .27W CC TUBULAR HESTSTOR, EXC. 220 OBBST .25W CC	01121	CM103' Ch2315			
A5610 A5611	1683-2215 7688-6885		HISISTON, FRO, MAKSE .25W CC TOPULAR	01151	Cho835			
A5F12	3683-3325		RESISTOR, FRO. 3.385% .23W CC TUBULAR	01131	CB3525 CP3325			
ASALI	Je#3-3325		HUSISTUR, FAD, J.JKSR "JÓW CC FUBULAR	01151				
45414 55415	0183-3125 0183-3125		MESISTOR, FREE 3-3PSR -25W CC TUBULAR MESISTOR, FREE 3-3KSR -25W CC TURULAR	01121	C83325 C83325			
ASE LO	Cn83-1025		RESISTOR, FRO, 1K5% ,256 CC TURULAR	01121	C81625			
A6812 25618	0683-1025 0683-2725		RESISTOR, FRO, IRST .25m CC TUBULAR RESISTOR, FRO, 2.2K5% .25m CC TUBULAR	01151	CH1025 CH2225			
				01121	CH2225			
41619 45620	0683+2225 C643-5105		HISISTOR, FRO. 2.285% .25W CC TURULAR HESISTOR, FRC, 51 OHM5% .25W CC TURULAR	01151	CP5105			
A5621	DE#3-5135		RESISTOR, FRU. 51 GHM5% .25W EC TUBULAR	01121	C#5105			
ASUI ASUI	1620-0413	b	INTEGRATED CIRCUIT, NGTE, TTL DECADE INTEGRATED CIRCUIT, DGTE, TTL DECADE	2648C 26480	1620-0413 1620-0413			
Abd3	1620-0413		INTEGRATED CINCUIT, DUTE, TTE DECADE	24480	1820-0413			
8594	1420-0411		INTERNATEL CIRCUIT, OGTE, TTL DECADE	28460	1820-0513			
A5U5 A5U6	1820-0054 1820-0413	•	ENTEGRATE CENCULT, OGTE, TTE QUAD 2 ENTEGRATED ETREDET, OGTE, TTE DECADE	C1295 28480	5674006 11.0-0413			
A597	1820-0-13		INTEGRATED CHREUTT, OGTE, TTL DECADE	24480	1820-0413			
ASHB	1820-0413		ENTEGRATED CENCULT, INSTE. THE BECADE	2848C	1820-0413			
A5010	1820-0413 1820-0174	ı	INTEGRATED CIRCUIT, DGTL, TTL DECADE INTEGRATED CIRCUIT, DGTL, TTL HEX	28480 01295	1820-0413 5674046			
H 2010	1010	•	The state of the s					
Ac	0:376-69013	1	SAMPLE HATE ASSY	26460	05326-60033			
			ILCAGED ON 05376-20013 BLANK HITAFOL.					
Anci	3160-2201	ı	CAPACITUM, FRU, SIPF+ - ST 300WVDE	23480	0160-2201			
AtCZ	0160 0134	i	LAPACTER, FAC. 220 PF+-57 100mVGC	14666	ROM16F22133C			
464.3	0160-022E	3	CAPACITOR-FRG, 220FF-101 15VOC 1A-7110	56284 56284	15002763901582			
1664 4665	0160-0166 0140-0155	l l	CAPACITOH,FRD, "JOHUF+-10% ZOUWYHC CAPACITOH,FRC, HZPF+-5% 300WYHL	15139	9412595010390#A\$C# 5456943A5			
ALCO	0140-0153		CAPACITON, FRE, .0010F10% 200WAUC	56289	252810292			
AnCT NGCT	G19C-3142	2	CALACTION,FRU, 30FF+-5# 30GWYDC PACTIONY STATACTEL PART	26480	0160-2149			
AUCE	0160-0153		CAPACITINGFRE GOIDF*-LOT 200WVDC	56269	252910292			
4114	0170251		CAPACIESH-FXL, SUF+-30% 35VOC TA-50E10	56285	15001053563532			
ACCIO	0160 0161	l t	(APACITOR) FRU - 01UF - 10% 200MVDC CAPACITOR - FRU - 4UF + 75 - 10% 25VDC 71	56289	192P10J92-P15 30D4656C25PAZ			
VCC 15	0189-0114 0130-0114	r.	CAPACITIES FALL SUFFITS 108 25VUL AL	56.85	300405GC25PAZ			
ASCAL	1901-0040		DICHE, SWITCHING SIE BUY MAX VAM SUMA HICHEE SWITCHINGS SIE BOY MAX VAM SUMA	284EC 184EC	1901-0040 1901-0040			
AGC F 2	1501-0360							
ASCH3 ACCH4	1910-0016 1510-0016		STOUL, SWITCHING, GE, COV MAX VAM CUMA DIDE, SWITCHING, GE, COV MAX VAM COMA	26480 26480	1919-0016 1910-0016			
AECHS	1901-0040		DIUGI, SHITCHING, SI, 30V MAX YAM SUMA	28480	1501-0040			
ALCHO ALCH	1501-0060		NUT ANSIGNED DE-ROL, SWEECHING, SE, BOV MAX VRM SOMA	28480	1901-0040			
Acced	1501-3043		utime, switching, St. Joy MAR VER SUMA	28480	1401-0640			
ALC 45	1510-0016		BILDE, SWETCHING, GE, BOY MAR VAM ROMA	2845C	1510-0016			
ACCEIN ALLEIN	1901-0040		DICOL, SHITCHING, SI, 10V MAX VAM SUMA DICOL, SHITCHING, SI, 10V MAX VAM SUMA	284HC 284HC	1901-0040			
A601	1854-0071		THANSSELLE, MPN SI	28480	1854-GUT1			
ALQ2	1654-6071		TRANSESTOR, NPN SE	284BC	1854-0071			
ACU3	1854-0071		TRANSISTURE NPM 51	2848C	1654-0071			
ALU4 ALU5	1654-0009 1654-0071	•	THANSISTICH, INTOO NON SE THANSISTICH, NON ST	28480 28480	1 #54-0009 1 #54-0071			
A6U6	1854-6671		TRANSISTON, NPN SI	28480	1854-0071			
				<u> </u>				

Table 6-1. Replacement Parts, Standard Instrument (Cont'd)

Reference	HP Part Number	<del></del>	Description	Mfr Code	Mfr Part Number
Designation  A607 A608 A609 A6010 A6010	1854-0215 1854-0071 1854-0071 1854-0071 1854-0009	1	TRANSISTON, NPN SI FRANSISTON, NPN SI TRANSISTON, NPN SI TRANSISTON, NPN SI TRANSISTON, NPN SI TRANSISTON, NPN SI	0471 # 28489 28480 28489 28489	SPS 3611 1854-0021 1854-0071 1854-0071 1854-0009
AbQIZ AbQI3 AcP1 AbP2 AbR3	1854-0071 1854-0071 0683-1015 0683-1525 0683-512*	e	FRANSISTOH, NPN 5] TRANSISTOH, NPN 5] HESTSTOR, FXD, 100 AMPST =25M CC RESISTOR, FXD, 1=5MST =25M CC TURULAN RESISTOR, TXD, 5=LRSE =25M CC TURULAN RESISTOR, TXD, 5=LRSE =25M CC TURULAN	2848G 2848C 01121 01121 01121	1834-0071 1854-0071 CH1015 CH1725 CH5125
ACF4 ACF5 ACFC ACFC ACFG	0643-1635 0643-1035 0643-1035 0643-1035 0663-3325		NET ISTOR, PXO, 10K5X -25M CC FUBULAN PESISTUP, PXD, 10K5X -25M CC TUBULA PESISTUP, PXD, 5-LK5X -25M CC TUBULAP PESISTUP, PXD, 10K5X -25M CC TUBULAH PESISTUP, FXC, 1-385X -25M CC TUBULAH	01121 01121 01121 01121 01121	CH1035 CH1035 CH1035 CH1035 CH3325
A6N9 A6F10 A6F11 A6F12 A6R13		ÿ 5	PESISTUM, FRO, 300 CHMST -25M CC AFSISTUM, FRO, 285% -25% CC FUBULAR AFSISTUM, FRO, 27KSR -25M CC TUBULAR AFSISTUM, FRO, 5-185% -25M CC TUBULAR AESISTOM, FRO, 3-385% -25M CC TUBULAR	01121 01121 01121 01121 01121	CH3C15 ER2C25 CR2135 CR5125 CR5125 CR3525
AGRIA AGRID AGRIG AGRIG AGRIG	Ond 3-1035 Ond 3-3325 Ond 3-5125 Ond 3-3325 Cod 3-3325		AESISTOR, FRE, LORDS .25M CC TUPBLAP MESISTOR, FID, 3.1853 .25M CC TUBULAP RESISTOR, FRO, 5.1853 .25M CC TUBULAP MESISTOR, FRO, 3.3853 .25M CC TUBULAR MESISTOR, FRC, 3.3858 .25M CC TUBULAR	01121 01121 01121 01121 01121	CH1035 CH3325 CH3325 CH3325 CH3325
ACF LV A 5K 2U A64 21 A6k 22 A6K 23	0L83-5115 0683-2735 0683-1035 0683-3915 0683-2075	ı	RISISTUR, FRU, SIU UHMST "25M CC RESISTUR, FRD, 27KST "25M CC TUBULAR RESISTUR, FRU, 1900 UHMST "25M CC RESISTUR, FRU, 1900 UHMST "25M CC RESISTUR, FRU, 2K5T "25M CC TUBULAR	01121 01121 01121 01121 01121	CM5115 CB2735 CM1035 CM3915 CM2025
10F24 A0F25 A0F26 A0F27 A0F28	0683-6215 0683-1525 0683-2625 0683-3625 0683-9115	l L	HESISTOR, FRO, 620 CHMSR .25% CC RESISTOR, FRO, LONST .25% CC TUBULAR HESISTOR, FRC, 285% .25% CC TUBULAR HESISTOR, FRO, 385% .25% CC TUBULAR HESISTOR, FRO, 910 CHMSR .25% CC	01121 01121 01121 01121	CH421* CN1525 CH3225 CH3125 CH5115
AGR 29 AGR 30 AGR 31 AGR 32 AGR 33	QBB3-1525 QBB3-2415 QBB3-1035 QBB3-1035 QBB3-2735		RESISTOR, FRE, 1-5KST -25M CC TURULAR HLSISTOR, FRE, 240 UMPST -25M CC HESTSTOR, FRE, LOKST -25M CC TURULAR RESISTOR, FRE, LOKST -25M CC TURULAR HESISTOR, FRE, 27KST -25M CC TURULAR	01121 01121 01121 01121	CN152* CB7415 CH1035 CH1035 CF2735
A 0 H 3 H A 0 H 3 H	0683-2735 0683-1035 0683-1035 0683-2045 0683-2035	l	PESISTOR, FRE, 27KST .25W CC FUBULAR HESISTOR, FRO, 10KST .25W CC TUBULAR HISISTOR, FRO, 200KST .25W CC TUBULAR HESISTOR, FRO, 200KST .25W CC TUBULAR HESISTOR, FRO, 10KST .25W CC TUBULAR	01121 01121 01121 01121 01121	CR2795 CR1035 CR1035 CR2045 CR2045
AB439 AB440 AB441 AB42 AE843	0683-4735 0683-4735 0683-4735 0683-4735	L	PESISTOR, FRO: LUKDE .25m CC TURUL/P RESISTOR, FRO: 42MPE .25m CC TURULAR RESISTOR, FRO: LSKST .25m CC TURULAR RESISTOR, FRO: 100 OMPSE .25m CC RESISTOR, FRO: 47KSE .25m CC TURULAR	01121 01121 01121 01121	CM1035 CB4735 CB1525 CM1015 CM4735
ADH 44 4 601 A 901 A 603 A 604	0683-1015 1620-0654 1620-0272 1620-0068 1620-0054	1	MESIS'UR, FRU, 100 DEMST .25M CC INTEGNATE CERCUIT, OGTE, TTE QUAD ? INTEGNATE CERCUIT, DGTE, ECE TYPE D INTEGNATE CERCUIT, DGTE, TTE THEFRE 3 INTEGNATED CERCUIT, DGTE, FTE QUAD 2	01121 01295 04712 01295 01295	CB101* SNIAUCN MC1022P SNIA1CN SNIAUCN
€100 A 0100 A	1620-0328 1820-0147	<b>!</b>	INTEGRATED CIRCUIT, LGTL, TTL QUAD 2 INTEGRATED CIRCUIT, DGTL, FCL TRIPLE 3	01291 04713	5N7N0/N ME1007P
FT	14004-7 גנכט	1	BOARD ASSY: FUNCTION CONTROL ISERIES 1274A) ILOADED ON 05327-20031 BLANK BOARD,	28480	05327-60031
ATCL	316C-2300	1	CAPACITUR, FXO, 27PF+-5% 300mVot	28480	0160-2306
ATC 2 ATCP1 ATR1 ATR2 ATR3	0150-00+2 1501-0536 0683-1125 0683-1825 0683-1825	1 1 7	CAPACTICS, FRC, 6-FPF+-5T DUDWUC OLDGE, PMR RECT. SI: LUDW MAX VMM LUGA HESISTUR, FRC, 1-185T -25M CC TUBULAH HESISTUR, FRC, 1-885T -25M CC TUBULAR RESISTUR, FRD, 1-685T -25M CC TUBULAR	2048C 0350P 01121 01121	0150-0052 1832658 CE1125 CE1E25 CH1E25
AIRA AIRO AIRO AIRI AIRB	0663~1025 3683-3525 9683-2225 9683-1125 9683-2225	,	RESISTOR, FXG, 1858 .25m CC TUBULAF RESISTOR, FXC, 3.985% .25m CC TUBULAR HESISTOR, FXC, 2.285% .25m CC TUBULAM AESISTOR, FXC, 1.185%	01121 01121 01121 01121	CB1025 CB3925 CB2225 CB1127 CB2225

Table 6-1. Replacement Parts, Standard Instrument (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
AIR9 AIR10 AIR11 AIR12 AIA13	C403-3775 0685-3325 0683-1025 0683-1025 0683-1325		RESISTOR, FRO, 3,31.5R .25M CF TUBULAP RESISTOR, FRC, 3,30-5R .25M CC TURULAH RESISTOR, FRC, 185R .25M CC TURULAH RESISTOR, FRC, 3,38K*R .25M CC TURULAH RESISTOR, FRC, 3,58K*R .25M CC TURULAH RESISTOR, FRC, 1,585R .25M CC TURULAH	01121 01121 01121 01121 01121	CR3325 CR3325 CR1025 CR3325 CR3525
A7+14 A7+15 A7+16 A7+17 A7F [H	0x83-1525 0x83-1015 0x83-5115 0x83-3015 0x83-3015		RESISTOR, FRE, 1.5KSP .25W CC TUHULAP RESISTOR, FRE, 100 CHMST .25W CC RESISTOR, FRE, 510 UMKFF .25W CC RESISTOR, FRE, 300 UMKSR .25W CC RESISTOR, FRE, 300 UMKSR .25W CC	01121 01121 01121 01121	CP15/25 CB1015 CB1165 CP1015 CR3015
# 7% 19 # # 1% 20 # # 7% 2 # # 7% 22 # # # # 23	GER3-1025 ORN 1-1125 ORN 1-1025 ORN 1-1015 URN 1-4715		PLSISEIR, FRU, IRSE .25m CC FUPULAR PLSISTIM, FRO, ILRSE .25m CC TUPULAR PLSISIM, FRO, IRSE .25m CC FUPULAR PLSISIM, FRO, IRSE .25m CC RESISTUM, FRO, 470 DHMSE .25m CC	G1121 71121 71121 71121 61121	CH1025 CH1125 CH1025 CH1015 CH4715
A7#24 A7#25 A7#26 A7#27 A7#27	0083-1515 0683-1025 0683-1025 0683-5115 0683-5115	; 1	NESTST R. FRE, 150 OHMSR .25M CC NESTSTOR, FRS, 240 OHMSR .25M CC NESTSTOR, FRS, 1858 .25M CC TUBULAR NESTSTOR, FRS, 510 OHMSR .25M CC RESISTOR, FRS 510 OHMSR .25M CC	01121 01121 01121 01121	CB1515 CB2415 CB1025 CP5115 CB3115
A7+34 A7+30 A7u1 A7u2 A7u3	0.683-7515 0.683-5115 1820-6162 1820-0484 1266-6474	3 5 2	HESISIUR, FRG90 UNMS# .25% CC BESISTIPE, FRE, SIO UNMS# .25% CC INTEGRATED CIFCUIT, DGTL, ECL J-R FLIP ICIECL SOURIT, ILEC, IC 16-CONT DIP SLOR TERM	01121 01121 04713 24480 06776	CBF515 CB5115 MC1013P 1m20-0489 1CM-143-53
A 703 7.709 A 705 A 705 A 706	1c20-0147 1620-0102 1670-0440 1200-0474 1820-01+7	l	INTEGRATE CERCULT, DGTL, ECL TRIPLE 3 INTEGRATED CINCULT, DGTL, ECL J-R FLIP INTEGRATED CERCULT, DGTL, ECL JUAL R-S SOCKET, ELIG, IC 14-CUNT DIP SLOR TERN INTEGRATED CIRCUIT, DGTL, ECL TRIPLE 3	04713 04713 04713 06776 04712	PC 100 TP MC 101 3P MC 103 4P 1Ch-143-53 MC 100 7F
A Fu F A Tur A Tur A Turo A Turo A Turo	1820-0489 1620-0212 1820-0485 1620-0145 1820-0200	t 1 1	TOTACE  INTEGRATED CINCUIT, DATE, ECK QUAD LINE IGNECL INTEGRATED GIRCUIT, DATE, ECK QUAD 2 INTEGRATED CIRCUIT, DATE, ECK QUAD 2	28480 04713 28480 04713 04717	1820-0489 Mr. 1020P 1820-0489 Ml. 1010P Mc. 1030P
A7U17 A7U13 A7U14 A7U15	620-0464   1820-052   1820-0605   1820-3638	1 1 1	ILITEL INTEGNATE: CIMCUIT, DOTL, ECL CUAL 3- INTEGNATE: CIMCUIT, DOTL, ECL QUAD LINE INTEGNATED CIMCUIT, DOTL, ECL GUAL 3	2848G G4713 G4713 G4713	1820-0483 ML1026P MC10115P MC10111P
1 Å 15	C 5 3 2 6 - 6 0 U Q 9	<b>1</b>	DISPLAY SUPPORT ASSY ESERTES 944) CLUALED ON USBRE-20009 PLANK BUARDE.	2648C	#5326~£00G9
A3C1 AHC2 A8C51 A3C42	0160-2930 - 0160-2199 - 1901-0340 - 1916-0016	1	CAPACITOH,FRC, "OINF+6G-20% LOUWVOC CAPACITUH,FRC, 3GP++-5# 300MVOC DICOR, SHITCHING, SI, 30V MAX VPM 5UMA ULOUE, SHITCHING, GE, 6CV MAX VRM 60MA	91418 28486 28480 26480	7A 9166-2149 1501-0040 1410-0014
AFC#3 ##6#4 ABP1 ABQ1 ##Q2	1914-0016 1901-9040 1751-2035 1854-0092	1	CILLE, SHITCHING, GE, GOV MAX VAM BEMA DITOE, SHITCHING, SI, 30V MAX VAM BOMA CUNNECTOR, PC LUGI, 15-LUNT, OI) SCHOEM SHANSISTUM, NPN SI IMANSISTUM, NPN SI	2840C 2840C 71765 28480 28480	1910-0016 1901-004c 252-15-10-100 1854-0052 1854-0052
# 60 3 # 80 4 # 60 5 # 60 6 # 60 7 # 7 8 7	1054-0365 1654-0365 1654-0365 1654-0365		TRANSISTICE, NPW SI	07263 07261 07263 07263 07263	533107 53-367 533207 533307
ABC8 ABC9 ACJ10 ABG11 ACF1	1654-0365 1854-0052 1654-1052 1654-0052 0683-1125		TRANSISTOR, NPM SI TRANSISTOR, NPM SI TRANSISTOR, NPM SI TRANSISTOR, NPM SI HENSISTOR, FRU, ELIKST ,25m LC TUHULAR	07263 28480 28480 28480 01121	\$33307 1854-0092 1854-0092 1854-0092 CM1825
ASH 2 ASF 3 ASF 4 ASF 5 ASH 6	G6#3-1C45 G6#3-1C45 B##3-1C25 G663-1255 7063-1255	7	FESISTON, FRC, LOOPSE .25M CC TURLLAR FESISTON, FRC, LOOPSE .25M CC TURLLAR FESISTIN, FRC, LKSE .25M CC TURLLAR FESISTON, FRC, L.2MSE .25M CC TURLLAR FESISTON, FRC, L.2MSE .25M CC TURLLAR	01121 01121 01121 01121 01121	CH1045 CB1045 CH1025 CH1275 CH1275
Abril Afir 6 Abril Abril Afir 11	0683-1255 0603-1255 0683-1255 0683-1255 0683-2525	ι	RESISTOR, FRO, 1.2MSE .25m CC TURULAR RESISTOR, FRO, 1.2MSE .25m CC TURULAR PLSISTOR, FRO, 1.2MSE .25m CC TURULAR PLSISTOR, FRO, 1.2MSE .25m CC TURULAR RESISTOR, FRO, 1.2MSE .25m CC TURULAR RESISTOR, FRO, 2.4MSE .25m CC TURULAR	01151 01151 01151 01151	C01255 C01255 C01255 C01255 C01255 C02425

Table 6-1. Replacement Parts, Standard Instrument (Cont'd)

	1		acement Parts, Standard Instrument (	· · · · · · · · · · · · · · · · · · ·	
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
AFF13 ABF13 ABF14 ABF15 ABF16	0683-1025 0683-2715 0683-2715 0683-1025		RESISTOR, FAO, 100 OHMOT "25m CC HESISTOR, FAO, 1858 "25m CC TURULAR RESISTOR, FAO, 270 OHMOT "25m CC RESISTOR, FAO, 4-7858 "25m CC TURULAR GELISTOR, FAO, 1858 "25m CC TURULAR	01121 01121 01121 01121 01121	CH1015 F.01025 CH2715 C04775 C01025
ABH 17 ABL 18 ABE 17 ABE 20 ABE 21	0483-4725 0683-5115 0683-1045 0683-1045 0683-2725	,	RESISTUM, FRO, 4.7K5T .25M CC TUBULAR RESISTUM, FRU, 510 CHM5T .25M CC HESISTOR, FRU, 100K5T .25M CC TUBULAR RESISTOR, FRU, 10CK5T .25M CC TUBULAR RESISTOR, FRU, 2.7K5T .25M CC TUBULAR	01121 01121 01121 01121 01121	CB4725 CB5115 CB1045 CB1045 CB2725
AU422 AU473 AU473 AU475 AU475	0683-5115 0663-1045 0683-2725 0683-1535 0683-2725	4)	PESISTON, FRC, 510 (IMMSE ,25m CC MESISTON, FRD, 100MSE ,25m CC FUPULAR RESISTON, FRO, 2-7MSE ,25m CC TUPULAR PESISTON, FRO, 1555E ,25m CC TURULAR PESISTON, FRO, 2-,MSE ,25m CC TURULAR	01121 01121 01121 01121 01121	CP0115 CR1045 CR2727 CH1515 CH2225
APUL ABUZ ABUS ABUS ABUS	1820-0094 1820-0307 1820-0143 1820-0102	1	INTEGRATED CIPCUIT, DGTL, DTL QUAD 2 INTEGRATED CIRCUIT, DGTL, DTL HEX INTEGRATED CIRCUIT, DGTL, FCL J-K FLIP INTEGRATED CIRCUIT, DGTL, ECL J-K FLIP INTEGRATED CIRCUIT, DGTL, ECL J-K FLIP	04713 07263 04713 04713 04713	MCMAPP UKAPP 1659X MCL027P MCL013P MC1013P
Adus	1820-0102		INTEGRATED CIRCUIT, DOTL, ECL J-K FLIP	94737	MC1013P
A9	C5326-60U08/27	1	OISPLAY A55Y (SEPTES 1224A) (LOADED ON 05326-20008 BLANK BUARD).	28460	05126-6000A/25
A9051 A9051	1570-042 1200-0405	b 6	TUBE, LLCTAN, H5750-5, IND, SCCREE, LLEC, TUBE 14-CCVIT MIRTE PRG	2848C £3761	1570-0042 #15-44
A9052 A9052 A9053 A9053 A9054	1970-0042 1200-0405 1970-0042 1200-0405 1970-0042		TUBE, ELCIAN, B5750-5, IND. SICKET, CLEC, FUME E4-CONT MINIE PKG FUME, ELCTAN, B5750-5, IND, SICKET, ELCC. TUME E4-CONT NIXIE PKG FUBE, FLCTAN, B5750-5, IND.	28460 #3761 28460 63761 28480	E770-0042 F15-44 1970-0042 F15-44 E970-0042
ASDS4 ASDS5 ASDS5 ASDS6 ASDS6	1230-0405 1570-0042 120C-0405 157C-C042 120G-040*		SCCKFT, ELFC, TUPE 14-CONT NIXTE PRG FUBE, ELCTRN, H5750-5, END, SUCRET, ELEC, TUPE 14-CUNT NIXTE PRG TUHE, ELCTRN, R5750-5, IND, SUCRET, ELEC, TUHF 14-CUNT NIXTE PRG	63761 28480 43761 20480 83761	P1564 1970-0042 H1564 1570-0042 R15-44
A9057 A9057 A9058 A9058 A981	1970-0042 1200-0405 1970-0042 1200-0405 0683-1025		TURE, LLCTRA, US750-5, IAD, SICKET, ELEC. TURE LA-CONT NIZIE PRG TURE, ELCTRA, HS750-5, IAD, SUCKET, ELEC, TURE 14-CCAT NIZIE PRG RESISTOR, FRO, IKST ,25W CC TURULAR	28480 53761 28480 53761 ULL21	1570-0042 F15-44 1570-0042 F15-45 CB1025
4947 A943 A944 A945 A946	C658-P#31 O683-1025 O676-8431 C698-8431 U678-8471	ş	# (FXI) LOMP 7500 CHM 5R 1/4W # (FXI) COMP 1000 CHM 5R 1/4W # (FXI) COMP 7500 CHM 5R 1/4W # (FXI) LOMP 7500 CHM 5R 1/4W # (FXI) COMP 7500 CHM 5R 1/4W	284HG D1121 284HC 284BG 284BG	CESH-#53] CB1075 CFTH-#53] USHE-P63] GDSB-P63]
: AYR 7 ASHB ASHS ASRIO ASRII	0498-8431 C698-8431 C688-8431 C683-1065 O678-8431		RIPRO COMP 7500 UHM ST 1/4W RIPRO COMP 7500 UHM ST 1/4W RIPRO COMP 7500 UHM ST 1/4W RESISTORA FRC, 10 OMPSE "25W CC TUBULAR RIFRO COMP 7500 UHM ST 1/4W	26480 28480 28480 01121 28480	unia 1431 desa-pa31 dasa-pa31 casous unsa-pa31 dosa-pa31
A9R\$2 A5U\$ A9U2 A9U3 A9U4	C683-1005 1820-0275 1820-0232 1820-0232 1820-0232	l 6	RESISTOR, FRD. 10 CHMST .25M CC TUHULAR INTEGHATIO CINCUIT, DGTL, ECL-TU-TTL ICITTL INPT, BLANKING DECADE COUNTER ICITTL INPT, BLANKING DECADE COUNTER ICITTL INPT, BLANKING CECADE COUNTER	01121 04713 28480 28480 24480	C81005 PC1035P 1820-0237 1820-0237 1020-0232
4905 A906 A907 A908 A909	1850-0110 1850-0110 1850-0535 1850-0535	l d	ICETTL INPT, BLANKING DECADE CHINTER ICETTL INPT, BLANKING CECADE COUNTER ICETTL INPT, BLANKING CECADE COUNTER INTEGRATED CIRCUIT, DGTL, TIL DECADE INTEGRATED CIRCUIT, DGTL, TIL & 4-BIT	28487 26480 26460 26480 28480	1#20-0227 1#40-0277 1#20-0237 1#20-0115 1#20-0116
A5U10 A5U11 A5U12 A5U13 A9U14	1820-0116 1840-0116 1840-0116 1840-0116		INTEGRATED CIRCUIT, DGTL, TTL® 4-BIT INTEGRATED CIRCUIT, CGTL, TTL® 4-BIT INTEGRATED CIRCUIT, DGTL, TTL® 4-BIT INTEGRATED CIRCUIT, DGTL, TTL® 4-BIT INTEGRATED CIRCUIT, DGTL, TTL® 4-BIT	2848C 2848C 2848C 2848C 2848U	1820-0116 1820-0116 1820-0116 1820-0116
A9015 A9016 A9017 A9019	1820-0116 1820-0116 1620-0729 1623-0092 1620-0092	1 }	INTEGRATED CIR UIT. DGTL, TTL. 4-81T INTEGRATED CIRCUIT, CGTL, TTL. 4-81T INTEGRATED CIRCUIT, DGTL, TTL. 8CD-TO INTEGRATED CIRCUIT, DGTL, TTL. INTEGRATED CIRCUIT, DGTL, TTL.	2148C 2848G 2648C 2448G 2848O	1820-0116 1820-0116 1820-0725 1820-0052 1820-0092

Table 6-1. Replacement Parts, Standard Instrument (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A5U20 A5U21 A5U22 A5U23 A5U2A	1820-0092 1820-0092 1820-0092 1820-0092		INTEGRATED CIRCUIT, DGTL, TIL* INTEGRATED CIRCUIT, DGTL, TTL* INTEGRATED CIRCUIT, DGTL, TTL* INTEGRATED CIRCUIT, DGTL, TTL* INTEGRATED CIRCUIT, DGTL, TTL*	2848G 2848G 2848G 2848C 2848G	1820-0052 1820-0092 1820-0052 1820-0052 1820-0092
v I 10	05127-60002	ı	MEGHT REAROUT ASSY ISEREES BLZOA, MEY. H) ELMADEN EN USSCE-ZOOGZ MEANK HOAKD).	26481)	1527-60002
AIDCRI AIDCR2	05326 00000 05330 40002 05326 80008 05326 80000 05326 80010 1801 0040	2 0 1	BRACKET READOUT ELOCK ANNUNCIATOR INDICATOR MASK IV.N.SI INDICATOR MASK IV.M.HZI INDICATOR MASK IV.M.HZI INDICATOR MASK IV.M.GI DIODE. SILICON JUMA 30WV	78480 28480 28480 28480 28480 28480 07763 07263	05226 00000 05330 40002 05325 20000 05226 80000 05226 80010 FDG 1088 FUG 1088
A 101 51 A 10052 A 10053	#140-0313 2340-0312 2340-0313	14	LAMP, GLUB, FULH T-2, 58Y LAMP, GLUB, FULH T-2, 58Y LAMP, GLUB, FULH T-2, 58Y	28460 98694 98696 98696	C
A10054 A10055 A10056 A10057 A10058	2140-0313 2140-0313 2140-0313 2140-0313 2140-0313		LAMP, GLCW, RULM T-2, SRV LAMP, GLID, HULB T-2, SBV LAMP, GLID, HULB T-2, SBV LAMP, GLID, BULB T-2, SBV LAMP, GLID, PULB T-2, SBV	98808 98876 98898 98898 98898	C.2B C.2B C.2A-B C.2A-R C.2A-F
K 1991 K1002 K1003 K1904	1 #54-CUC'S 1 #54-CUU'S 1 #54-UUO'S 1 #54-U4-74	13	TRANSISTOR, PARCO NPN ST TRANSISTOR, PARCO NPN ST TRANSISTOR, PARCO NPN ST TRANSISTOR, NPN ST TELECT TOERT PASSSIT	28480 28480 28480 28480	1854-0009 1854-0005 1854-0009 1854-0674
a 1005 a 1002 a 1007 a 1004 a 1009	1854-0474 1854-0474 1854-1474 1854-0474 1854-0474		FFANSISTUP, DPN ST. TELECT THENT 2NDDSST FFANSISTUP, NEW RT. LELECT TOENT 2NDDSST TRANSISTUP, NEW ST. TELECT TOENT 2NDDSST TRANSISTUP, NEW ST. TELECT TOENT 2NDDSST TRANSISTER, NEW ST. ELECT TUENT 2NDDSST TRANSISTER, NEW ST. ELECT TUENT 2NDDSST	26480 26480 26480 26480 26480	1854-0474 1854-6474 1854-6474 1854-6474 1854-6474
#10015 #10011 #10010	1854-0474 1654-0474 1854-0474		TRANSISTOR, NOW ST. LERECT TOPMT 2855511 TRANSISTOR, NOW ST. LERECT TOPMT 2855511 TRANSISTOR, NEW ST. LERECT TOPMT 2855511	28480 28480 28480	1054-6414 1054-1474 1853-1474
A 1 3 M 1	1.683-5125		PESISTORS FARS SSENSE S25W CC TURULER	01171	CBSEZE
410 F Z 810 F 3 810 F 4 81° 6	CAR3-7025 CAR3-5125 CAR3-5125 CAR3-5125 CAR3-5125		ACSISTUR, FRU, 5.185% .25M CC TURULAR RESISTUR, FRC, 5.185% .25M CC TURULAR RESISTUR, FRC, 1857 .25M CC TURULAR ATSISTUR, FRC, 285% .25M CC TURULAR RESISTUR, FRC, 285% .25M CC TURULAR	01121 01121 01121 01121 01121	CP5125 CP5125 CP3025 CP2025 CP2025
11047 11048 11043 11001 11002	0683-3075 3683-5135 3683-5135 1823-5276 18,6-0776	, ,	F.SISTUR, FRE, JRSR "25W CC TUMULAN HEI.STER, FRE, 5185E "25W EC TUBULAH R.SISTUR, FRE, 5185E "25W EC TUBULAH R.NIEGATIC CIPCUIT, DETI: DIE QUAD 2 BNIECFATED CIPCUIT, PAGE, UTE QUAD 2	0.121 0.121 01171 04711 04711	CH3025 CR5135 CH5137 MC16GEI MC84GFP
11003 12004 11005 11006 11007	1870-0274 1820-0274 1870-0510 1820-0273 1824-0273	1,	INTEGRATED CIPCOST, DOTE, DTE QUAL 2 INTEGRATOR CIPCOST, DGTE, DTE GUAD 2 INTEGRATOR CIPCOST, DGTE, DTE FRIPLE 3 INTEGRATOR CIPCOST, DGTE, DTE QUAD 2 INTEGRATOR CIRCOST, DGTE, DTE QUAD 2	04713 04713 01295 04713 04713	MC]RCNP MC]BMPP DNIDBEZN MC]NGEP MC]NGEP
111	35371-60005	1	LEFT HEADGUT ASSY ESEFECS 1949A, HEV. A) ELUADED ON 97327-20993 BLANK BIJARU).	28480	05377-60003
	0532e-00005 05330-6002 0532e-80011	ı	SPACRETEPLADIUT PLICATANNENESTUP ENDICATORIMAIN TERT, C. UPT	28485 28485 28485	05326-00009 05330-9002 05326-80011
111/1 111/51 111/52 111/53	0160-2200 2140-0113 2140-0113 2140-0113	L	CAPALITUH, FAC, 43PF+-98 JOSHVOC LAMP, GLCH, HULH T-2, DEV LAMP, GLCH, MULP T-2, SHV LAMP, GLOW, BULB T 2, 58V	28485 08607 08702 08802	01r0-7700 E2A-B E7A-B E2A-B
11101 11102 11103 11104	1#54-0071 1#54-0474 1854-0474 1854-6474		TPANSISTON, NPM ST TRANSISTON, NPM ST TELECT TOURT 2000011 TPANSISTON, NPM ST TELECT TOURT (MODEL) TRANSISTON, NPM ST TELECT TOURT 2000011	28480 28480 28480 28480	1854-2071 1854-0474 1854-0474 1854-0474

Table 6-1. R<sub>F</sub>, 'acement Parts, Standard Instrument (Cont'd)

	Table 0-		icement Parts, Standard Instrument (	Com aj	
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A11#1 A11#4 A11#3 A11#4 A11#5	0263-7035 0463-1035 0463-5125 0483-5135 0483-2025	1	PF515TLR, FND, 20R5% 27% CC TURULAR RE515TCM, FRC, 10R5% 25% CC TURULAR RE515TCM, FRC, 51.K5% 25% CC TURULAR RE515TUR, FRD, 51K5% 25% CC TURULAR RE515TUR, FRD, 2K5% 25% CC TURULAR	01121 01121 01121 01121	CH2035 CH1035 CB3125 CB3135 CF2025
Aliho Alif7 Alif4 Alik9 Alik10	0683-5135 0683-5126 0683-5139 0683-5126 U683-1525		PESISTOR, FAC, SIRSE .25H CC FUBULAR RESISTOR FXD. 51006% 25W CC TUBULAR RESISTOR, FXD. 51606% 25W CC TUBULAR RESISTOR, FXD. 51005% 25W CC TUBULAR PESISTOR, FXD. 3.585 F .25H CC TUBULAR	01121 01121 01121 01121 01121	EP5135 C85126 C85136 C85126 E81525
A11H11	0683-1025		FLSISTOR, FROM LKSE JOSE CC TUBULAR	01151	CB1025
A1101 A1102	1876-0054 1826-0274		INTEGRATED CIRCUIT, DGTL, TTE QUAD 2 INTEGRATED CIRCUIT, DGTL, DTE QUAD 2	01295 04713	\$6740Ch MC1606P
A1103 A1104 A1105 A1106 A1107	1820-0274 1820-0274 1820-0175 1820-0274 1820-0273	1	INTEGRATED CIPCUIT, BGTE, DTE QUAD 2 INTEGRATED CIPCUIT, BGTE, DTE QUAD 2 INTEGRATED CIPCUIT, BGTE, TTL HER INTEGRATED CIRCUIT, BGTE, TTL GUAD 2 INTEGRATED CIRCUIT, BGTE, DTE QUAD 2	04713 04713 01295 04711 04711	NCEBURP NCERUP Sntausa NCEBURP NCEBURP
A11U8 A12 A13 A14	1620-0274		INTEGRATED CIRCUIT, DGTL, DTL QUAD 2 NOT ASSIGNED NOT ASSIGNED NOT ASSIGNED	04713	Mr ingep
Alt	0532c-6002D	1	BOARD ASSY POWER SUPPLY 15EATES 13EZAT 1ERADEU UN U53Z6-200ZO BLANK MRARD).	28480	U5326~6U07G
A15C1	0510-0207 J200-0165 5040-0404 Ctau-016J	1 1	PRESS-EN TRANDUFF, 4-40, "180 LG, "062 SCREW,MACHINE, 4-40 UNC-24 "438 IN PAN SPACERISHIELD CAPACITOR,FRD, "733UF+-LOX 200MVDC	26480 21250 26480 56289	0710-0207 5040-0409 272833357
A15C2 A15C3 A15C4 A15C5 A15C6	018G-0114 018G-0114 018G-0114 018G-0114 016G-1878	26	CAPACITUP-FRC, WUF+75-BGT 25VNS AL CAPACITUR-FRC, MUF+75-BGT 25VGC AL CAPACITUR-FRC, MUF+75-BGT 27VGC AL CAPACITUR-FRC, MUF+75-BGT 27GC AL CAPACITUR-FRC, MOGRUF+20% BGGHVCC	4, 144 5628 56245 56255 24490	3.3040760250A2 3.0040760258A2 3.0040760258A2 4150~3678
A15C7 A15C8 A15C9 A15CH1 A15CP2	016C-387u C16C-3277 - 76C-3277 1587-3007 15-7-0551	) 2 7	CAPACETUM, FRU	28480 28480 28480 28480 28480	0160-3278 - 0160-3277 - 0160-3277 - 1402-3002 - 1402-0551
ALSEKS ALSEKS ALSEKS ALSEKS ALSEKS	1907-0551 85C; -3002 1503-1040 8902-3594 8902-3594	4	DIODE, YMEG, 6-19V VZ, 1W MAX ULCOL, YMIG, 2-37V VZ, -W MAX DIODE, SWITCHING, 51, 10V MAX VAM TOMA OLIGE, VMEG, 5-11V VZ, -W MAX CTGGL, VMEG, 5-11V VZ, -W MAX	28480 28480 28480 28480 28480	150/-0551 190/-130/ 1901-0030 172-3654 1902-3694
A35CHA A35CH3 A35CH10 A35CH11 A35CH17	1501-0048 1502-1994 1502-1059 1502-3154 1502-3425	ļ.	OTICE, SWITCHING, SI, TOV MAR VAM SUMA CHOUL, VAEG, SALLY VZ, AND MAR OTICE, VAEG, SALLY VZ, AND MAR UTICE, VAEG, TOV VZ, AND MAR OTICE, VAEG, TOV VZ, AND MAR	2848G 2848C 2848G 2848C 2848G	1501-cc40 1905-1994 1502-1954 1902-1394 1902-1469
A15CH13 A15CH14 A15CH15 A15CH16 A15CH16	1601 0033 1601 0033 1901-0044 1901-0044 1901-0044	, 4	OLIGE, GEN PRP, 51, EDGY MAR YRM ZUGMA CEGGE, GEN PRP, 51, 100 MAR YRM ZOCHA CIGUE, 5417CHING, 51, 50V MAR YRM CIGUE, 5417CHING, 51, 50V MAR YRM GIGGE, 5417CHING, 51, 50V MAR YRM 50MA	20480 20480 28480 28480 28480	1901-0033 1001-0033 1901-0044 1501-0044
A15CR16 A15F1 A15F1 A15G1 A15G2	1501-0044 2110-0440 1450-0110 1854-0300 1853-0373	1 1 1	DIDDE, SWITCHING, ST, SOV MAR VAM SOMA FUSEE1/32 AMP FU: MELUEN, BIFIN SKT, THU CAP, TA 121V IPAN 151CH, HPN ST THANSISTON, PAP ST	28480 28480 71400 28480 26480	1301-0044 2110-0446 PCOY WITH C-PIN, PAN 1854-0300 1853-0079
A1503 A1504 A1505 A1506 A1507	1854-0034 1651-0012 1654-0792 1853-0020 1854-0071	1 1 2	THANSISTUP, INJOSE NPN SE ERANSESTUR, INISCOR PAP SE EPANSISTUR, NPN SE EPANSISTUR, PAP SE ERANSESTUR, NPN SE	0+712 01245 2648C 2848G 2848G	25105) 282964A 1854-0272 1853-0020 1854-6071
A1508 A1509 E15010 A1561 A1562	1854 0474 1854-0071 1853-0020 0083-7735 0083-1015	ì	TRANSISTUR, NON SI FRANSISTUR, NON SI FRANSISTUR, PAP SI FRANSISTUR, PAP SI AESISTUR, FRO, 2785Y .25H CC TUBULAR RESISTUR, FRO, 100 OMM5Z ,25H CC	284FC 284FC 284BC 01121 01121	1854-0474 1854-0071 1853-1020 CP2735 CP1015

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Table 6-1. Replacement Parts, Standard Instrument (Cont'd)

	Table 6-1. Replacement Parts, Standard Instrument (Contd)						
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number		
A15F3 A15F4 A15F5 A15A0 A15F7	GEB3-1015 GEB3-1925 GEB3-1925 OFB-1105 GBB GBB	ı	HESISTOR, FRO, BOO UNKSE JEW CC HESISTOR, FRO, J.SKSE JEW CC TUBULAR RESISTOR, FRO, J.SKSE JEW CC TUBULAR RESISTOR, FRO, 18 UNKSE JEW CC TUBULAR RESISTOR, FRO, 680 OHM 5% 26W CC TUBULAR	01121 01121 01121 01121 01121	CR1015 CR1075 CR1075 (R1105 CR6816		
A15FB A15FB A15FB A15FB A15FB	0803-6816 CAR3-1325 2100-2073 0AR3-6615 QAR3-6815	2 2	RESISTUR, FAC, 650 CHM 5% 25W CC TUBULAR PESISTOR, 1/PC, 1/APST -/25M CC TUBULAR RESISTUR, VAP, 16PM, 200 CHM 10T CC PESISTUR, FAC, 680 CHM5T -/25M CC PESISTUR, FAC, 680 CHM5T -/25M CC	01121 01121 28480 01171 G1121	CB6815 CB1325 2100-2043 CP6815 CB6815		
A15F13 A15F14 A15F15 A15F16 A15F17	2100-2093 0683-1325 0683-0275 0683-0275	4	PESESTUR, VAR. TRPR, 200 (HHR 30% CC PESESTUR, FRO. 1-185% -/5m CC FUBULAP PESESTUR, FRO. 2-7 (HHS5% -25% CC PESESTUR, FRO. 2-7 (HHS5% -25% CC PESESTUR, FRO. 2-7 (HHS6% -25% CC	2848G G1121 G1121 G1121 O1121	2100-2093 CB1325 CB3765 CB2765 CB2765		
Albeld	dee1-0275		HESISTUR, FAU, 2.7 CHMSR .256 CC	01151	C#2165		
410	05357-6000	i.	BDAPD: ASSYCCOMILETER 15ERITS: 1E32A) (LOADED ON 05327-2007) BLANK BOARD).	76460	05327-60076		
*10C3	0180-2352 0180-2296	k i	CAPACITUR-FRC, 6000UF+75-10% 15VDC AL CAPACITUR-FRC, 4000UF+75-10% 15VDC AL	28440 56780	0160 231.7 390167 DSBISEI		
Aloca Aloco Aloco Aloco Aloco	0180-1962 0180-2382 0180-2382 0140-2244 1916-0016	1 2	CALACITUS-> NO. 150F>50-10% 250VGC AL CAPACITUS-> NO. 1500UF>75-10% 30VDC AL CAPACITUS-> NO. 1500UF>75-10% 30VDC AL CAPACITUS-> NO. 100FF>-57 300VDC UTUBE, SWITCHING, GF, EQV MAR VAN BUMA	56289 56289 56289 28589 28589	350156F25CF35 39D293 0160-2265 1910-0016		
ALCCF7 ALCCF3 ALCCF4 ALCCF5 ALCCF6	1910-0116 1910-0016 1561-0024 1501-0026 1401-0025	2	PEUDE, SWITCHING, GE, BOY MAY VEM COMA DICCE, SWITCHING, GE, COY MAR VEM ROMA DICOL, PWA FECT, SI, ACOY MAR VEM I POMA DICOL, PWA MILT, SI, ACOY MAR VEM ISOMA OTHOR, PWA RECT, SI, BOY MAR VEM ISOMA	2848G 2848C 2848G 2848G 2848G	1910-0010 1410-0010 1-01-0028 1-01-0028 1501-0029		
ALCEP ALOCEG ALOCEG ALOCELG ALOCELL	1501-0024 1501-0024 1501-0025 1501-0415 1501-0415	•	DIDUL, PWF HECT, SI, ACGV MAX VPM TRUMA OIDEE, PWH NECT, SI, ACGV MAX VHM TROMA UICOE, PWH NECT, SI, ACGV MAX VHM TRUMA DIDUL, PWH NECT, SI, SGV MAX VFM I.SA UICOE, PWH NECT, SI, SGV MAX VFM I.SA	7 (644) 28480 28480 28480 28480	1901-0029 1901-0629 1901-0629 1901-0419 1901-0419		
ALOCPIZ ALOCPIS ALOCPIA ALOCPIS ALOCPIS	1901-0415 1501-0415 1910-2016 1510-0016 1501-0460	Į.	OTOOL, PWE FICE, 51, 50V MAX VEM 1.5A DIGOT, PWE RECE, 51, 50V MAX VEM 1.5A UTQUE, 5WITCHING, 61, 60V MAR VEM 6UMA GIVET, 5WITCHING, 61, 60V MAR VEM 6UMA OTOGE, STREESTOR, 51, 15V MAR VEM 15UMA	26486 28486 28486 28486 28486	1901-0415 1901-0415 1910-016 1910-0415 1901-0415		
Alcopi Aloci Aloci Aloci Aloci	1901-6460 1910-0034 1654-605 0612-0021 0812-0021	1 1 1	DIGUE, STARTSTOR, ST. 15V MAX VAM 150MA GIGGE, SALTERING, CE, 30V MAX VAM 80MA TRANSICIUS, 2010M NAN ST RESISTOR, PRI, "47 0MMST 36 F6 TUMULAR RESISTUA, FAG, 47 (MMST 36 PM TUMULAR	26400 26400 26400 2640 91637 91637	1901-0460 1910-0014 1854-0019 68281-1-12-47/100-7 CW281 3 TZ 47 (D) J		
ALOF 3 	CGEC-2G45 CC43-0325 CG43-1725 OF#3-5115 U698-3153	1 1	RESISTEN, FRE, JOURDE SON CE FUNULAN HESISTOR, FRE, NJZ UHASE JON CE HESISTOR, FRE, REE JON CE TUNULAN RESISTOR, FRE, SIGNARE JUON F TUNULAN RESISTOR, FRE, SIGNARE JUON F TUNULAN	10%2 C1151 G1151 C1151	EH2CA5 CR02G5 CR1075 CP5115 C4-178-TO-1831-F		
Alura Aloraz Aloraz Alura	1751-0+39 1820-0176 121-1-1400 1251-1886 1751-1886	i i 6	HESISTON, PRO. CLEINIT LEZEM F TOPOL W INFEGUATED CINCUIT, LEN. VOLTAGE CONNECTOM, PC LOSE, 15-LUNT, DIP SCLUER CUNNECTOR, FC EDGE, 15-CONT, DIP SCLUEP CONNECTOR, PC LOSE, 15-CONT, DIP SCLUER	2454e G7263 71765 71765 71765	Ch-1/6-19-6811-F U/F F7/3353 257-15-30-340 252-15-30-340 252-15-30-340		
ALVAS ALVALA TAKOLA BEKULA PAKOLA	1251-1496 1251-2134 1251-2134 1251-1406 1251-1466	•	CCANFORDS, FO LUGS, 15-LOST, OIP SCLOUP CUMBELTON, FO FORD, 16-COMT, OIP SCLOUP CTANCOTON, FO LUGS, 18-COMT, OIP SCLOUP COMMERCISE, FLOOR, 15-COMT, OIP SCLUUP COMMERCISE, PL EDGE, 15-COMT, OIP SCLUUP	71 765 71765 71765 71765 71785	257-15-30-340 257-16-30-340 257-16-30-340 257-15-30-340 257-15-30-340		
AloxAld AloxAll AloxAl2 AloxAl5 THRU AloxAl6	1251-213- 1251-2134 1251-14cc 1251-1666 1251-1886		CONNECTOR, PC FOGE, 18-CUMT, OIP SCEDEP CENNECTOR, FC EDGE, 18-CUMT, OIP SCEDEP CUMNECTOR, PC EDGE, 15-CUMT, OIP SCEDER CUMNECTOR, PC EDGE, 15-COMT, DIP SCEDEP CONNECTOR, PC EDGE, 15 CONT, DIP SOLDER	71785 71765 71767 71785	252-18-30-340 252-18-30-340 252-15-30-340 252-15-30-340 252-15-30-340		
ALF	05326-10038	t	BCARC ASSYLIAPUL C AMPLIFIER ISERIFS 1136A, AEV C) LLUAUED CN 053.6-20031 BLANK MOARD).	28460	45326-60031		
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Table 6-1. Replacement Parts, Standard Instrument (Cont'd)

	Table 6-1. Replacement Parts, Standard Instrument (Cont'd)							
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number			
A17C1 A17C2 A17C3 A17C4	0180-0157 0180-0157 0180-2049 0180-2055	•	CAPACITUM FRC, Z.2UF+-LOT ZOVEC TA CAPACITUM-FRC, Z.2UF+-LOT ZOVEC TA CAPACITUM-FRC, "GG5UF+RG-ZOT 5GGMVCC CAPACITUM-FRC, "GG5UF+RG-ZOT 5GGMVCC	50285 50285 20460 23450	15001; #5020%; 150027555020%; 0100-2045			
A17C5 A17C6 A17C7 A17C8 A17C5	0160-1878 0180-8106 0166-3878 0186-0106 0190-0055	2	CAPACITOF, FAL, , GOIDF = 2GT IDDWVDC CAPACITOF = FAG, AGUF = 2GT AVEC TA = 5GL IO CAPACITOF + FAG, AGUF = -2GT IOGWVDC CAPACITOF + FAG, AGUF = -2GT AVEC TA = 5GL IO CAPACITOF + FAG, 19PF = -5T 5GTWVGC	28484 56267 28464 56265 28480	0164-3878 15006687000882 0160-3878 3500668300088 0156-6055			
A17C1Q A17C11 A17C12 A17C13 A17CA1	0160-3678 0150-0045 0150-0055 0160-3718 1901-0047	l 2	CAPACITON, FRE, .OCIUF+-201 LUUWVUC CAPACITUN, FRE, . 10 FF+-51 50 GWYGC LAPACITUN, FRE, . 10 FF+-51 50 GWYGC CAPACITUN, FRE, 40 LUF+-201 LIOWWGC DIDE, SWITCHING, 51, 204 MAR YEM 75MA	2848C 2848G 2848G 2848G 2648C	01c0-167e 0150-0055 0,50-0055 0160-187e 1501-1047			
ALICAZ ALICAZ ALICAZ ALICAZ ALICAZ ALICAZ	1901-0047 1912-0009 1230-0836 9100-2259 9146-0142	1 2 1	OTOJE, SWITCHING, SE, ZUV MAK VPM 75NA DICCE-TUNNEL, GERMANIUM CHNECTOM-CCAR, SMC, 50 CHM MALE COIL, FAC, RELDER PF CHCKE, 1MH IOR COIL, FRO, MLEDED RF CHCME, 1ZUM IOR	28480 03507 58291 24274 25274	1901-004/ 1h3712 50-05-4000 10/151 10/2/1			
A17L3 A17L4 A17MP1 A17U1 A17U2	9140-0157 9190-2256 05126-00031 1853-0015 1853-0015	ì	CGIL, FRO. PCLUED OF CHORE, 2,2UH IUR CDIL, FRC. MILDED OF CHORE, .56JM IOR SMIELDINGISE IRRAIJSTCA, IAP SI IFRAISISTCA, FAP SI	24226 24226 26460 28460 28460	10/221 10/560 05/26-00031 1853-6015 1853-6015			
A1703 A1704 A1701 A1702 A1703	1854-0392 1854-0345 0760-0012 0758-0093 0683-1645	i i	THANSISTOM, RPN SI THANSISTOM, TANITY NPN SI PESISTIMM, FAU, TI CHMER IM MC TUBULAN PESISTIMM, FAU, TO CHMER JAM F TUBULAN PESISTUM, FAU, LOOKER JAM CC TUBULAN	28480 04713 28480 24548 01121	1654-6952 200175 0760-6912 C5-174-70-5680-3 C61C55			
A17#4 A17#5 A17#6 A17#8	0663-7715 0683-1515 0683-1515 0683-1825 J683-1625		HISISTUM, FRE, 750 GMMST .25% CC. FESISTUM, FRE, 150 GMMST .25% CC. RESISTUM: FRE, 1.00 GMMST .25% CC TUBULAR RESISTUM: FRE, 1.00% .25% CC TUBULAR RESISTUM: FRE, 1.00% .25% CC TUBULAR	51121 C1121 C1121 01121 01121	CM1515 CM1515 LM1825 CR1825 CR1825			
A1765 A1781G A17411 A17617 A17613	0683-1625 0683-2235 2100-2633 0133-2015 0683-2015	? 2	RESISTON, PRO, L.ERST "25W CC TUBLICAN PESISTON, PRO, 220 OHMST "25W CC RESISTON, PRO, THMP, TRICHM TOX C PESISTON, PRO, 200 OHMST "25W CC RENISTON, PRO, 200 OHMST "25W CC	01121 01121 19701 01121 01121	CH2015 CH2215 CH2215 CH2215			
A17#14 A17#15 A17#16 A17#17 A17#18	0683-1919 0683-9109 0683-7515 0683-1095 0643-1229		RESISTIN, PAC, AND CHMST JEM CC RESISTER, FRU, SE CHMST JESM CC TUBURAR FRISTICH, FRC, FOCUMEST JESM CC RESISTON, FRC, FOCKST JESM CC TUBURAR RESISTON, FRC, LUBUST JESM CC TUBURAR	C1121 C1121 C1121 C1121	C91515 C#5105 C#7515 C#17645 C#1225			
ALTHIG A1762C A1762L A1762L A17622 A17823	0883-3625 0886-3153 3157-0286 0757-0280	<u>.</u>	#F515TCA, FRC, 3.685T ,25M EC FORDLAM NOT #S53GSTO PE515TOR, FRC, 1.63A1T -125M F TUMULAM FE515TOR, FRC, 153 UMM3E .125M F HE515TOR, FRC, 1818 .125M F TUMULAM	01121 10255 24546 24546	CP302* C4-1/a-10-1231-F C4-1/3-10-151-F C5-1/F-TU 1001-F			
A17-24 A17-25 A17-20 A17-01 A17-02	1683-4715 0683-5015 0797-6416 1658-6064 1820-6147	l l l	HESISTOR, FRD, 473 OFMSE .25m CC HESISTOR, FRD, SOO JHMSE .25m GC HESISTOR, FRD, SIL JHMER .825m F INTEGRATED CIRCUIT, LIN, TRANSJETCH INTEGRATED CIRCUIT, COTE, ECL THIPLE 3	01121 01121 24546 2664 04711	CB-715 CB-515 CA-178-10-5110-F CA-3745 HC (COTP			
A16	35327-40033	ı	NCAHO ASSTINION SENSITIVITY PRESCREER ESERTES 1248A ILUAUED EN 05327-20033 BLANK BUARDE.	28486	U-127-68611			
A18C1 A19C2 A18C3	0140-0228 0166-2065 0160-1875	1	CAPACITUM-FRC, 22UFF-10R 15VUC FA-501 tO CAPACITUM-FRC, 20UUFF-60-20T 500HVLC CAPACITUM-FRC, 40UFFF-10R 10UHVUC	56285 28480 28410	15002263403542 0369-2045 0360-3875			
#18C4 #18C5 #18C6 #18C7 #18C8	3160-2364 0160-0226 0160-3674 0160-3676 0360-3676		CAPACTIGH, FRU, #9050F+6G-20T 500NFC CAPACTIGH-FRG, 220F+-10T 159FC TA-50LIL CAPACTIGH-FRC, #010F+-2T 100NFC CAPACTIGH-FRC, #0010F+-2T 100NFC CAPACTIGH-FRO, #0010F+-2T 100NFC	28480 56285 28400 28480 28480	Glec-2044 150022exsc15A7 Glec-3878 Cleo-3878			
A16C9 A16C10 A16C11 A16C12 A16C13	7160-3678 -3160-3878 -0160-3878 -0160-3878 -3160-3678		CAPACITUM, FRDQQIUF+-2QT 1QQWQC CAPACITUM, FRCQQIUF+-2QT 1QQWQC CAPACITUM, FRCQQIUF+-2QT 1QQWQC CAPACITUM, FRQQQIUF+-2QT 1QQWQC CAPACITUM, FRQQQIUF+-2QT 1QQWQC	2545C 2646C 2646C 2646C 2646C	0140-3678 C160-3678 O160-3678 C160-3678 O160-3678			

Table 6-1. Replacement Parts, Standard Instrument (Cont'd)

Reference Designation	HP Part Number	Ωtγ	Description	Mfr Code	Mfr Part Number
A18C14 A18C15 A18C16 A18C17 A18C10	G16U-3876 G16C-3876 G16C-3876 G16C-3878 G16C-3878		CAPACITOF, FRC. , OULUF 20% LOOW DC CAPACITOR, FRC. , OULUF 20% LOOW DC CAPACITOR, FRU. , OULUF 20% LOOW DC CAPACITOR, FRU. , OULUF 20% LOOW DC CAPACITOR, FRU. , OULUF 20% LOOW DC	21/80 28481 26480 28440	0160-3678 0160-3678 0160-3678 0160-3678 G160-3878
A18C19 A18C20 A18C21 A18C22 A18C23	0160-3878 0160-1678 0160-1878 0160-3876 0160-3876		CAFACITUP, FRD003UF+-20% 100MYDC. CAPACITGA, FRD003UF+-20% 100MYDC. CAPACITGA, FRD001UF+-20% 100MYDC. CAPACITOM, FRD001UF+-20% 100MYDC. CAPACITUM, FRD003UF+-20% 100MYDC.	26480 26480 26480 28480 28480	0160-1878 0160-3878 0160-3878 0160-3878 0160-3878
A18C24 A18C25 A18C26 A18C27 A18C28	0160-3878 0160-3878 0160-3878 0160-3879		CAPACITOR, FRD001UP 20T LOUWDC CAPACITOR, FRD001UF 20T LOUWDC CAPACITOR, FRD001" 20T LOUWDC CAPACITOR, FRD001" 20T LOUWDC CAPACITUR, FRD01UP 20T LOUWDC	26450 26450 26450 26450 26450	0) 60-3078 0160-3078 0160-3078 0160-3078 0160-3879
A18C29 A18CR1 A18CR2 A18CR3 A18CR4	0160-3878 1901-0050 1901-0050 1901-0040 1901-0040	2	CAPACITOR, PRO OUTUF 701 LOUNDE DIJOE, SWITCHING, SI, BCY HAY VAM ZOGMA DIJOE, SWITCHING, SI, BCY HAY VAM ZOGMA OUTUFE, SWITCHING, SI, 30V MAX VAM SOMA DIJOE, SWITCHING, SI, 30V MAX VAM SOMA	2648¢ 2648¢ 2648¢ 2448¢ 2848¢	0169-3876 1901-0050 1901-0050 1901-0040 1901-0040
ALBCAD ALACRO ALCTI ALBCZ ALBJI	1501-0040 1701-0040 2110-0436 2110-0436 1250-0836	2	DIDDE, SWITCHING, SI, 10V MAY VAM SOMA DIDDE, SWITCHING, SI, 30V MAX VAM SOMA FUSE, 11A 125V CONNECTOR-COAX, 1MC, 50 DMM MALE	26480 26480 26480 26480 56291	1401-0040 1401-0040 2110-0436 2110-0436 50-053-0000
Aldil Albi2 Albi4 Albi2 Albi2 Albi4	9100-1/68 9100-1788 1854	4	CULLICHURE CULLICHURE TRANSISTUR, 2N-179 NPN 51 TRANSISTUR, NPN 51 RESISTUR, FRU, 1852 -256 CC ludular	02114 02114 04713 28400 01121	YK200-10/4P YK200-10/48 2N9179 1854-0092 C81025
A16F2 A16F3 A16F4 A16F5 A16F6	U098-5976 2100-2033 U083-3925 0698-3378	2	MESISTOR, FRU, 160 OMMSE "125M CC RESISTOR, VAR, THME, LECHE 10% C RESISTOR, FRO, 3-885% "25M CC TUBULAR RESISTOR, FRO, 31 OMMSE "125M CC RESISTOR, FRO, 51 OMMSE "125M C	01121 19701 01121 01121 01121	885615 FT50KtC2 . 19925 Bn '05 6' Nt 5
Ald#7 Ald#8 Ald#9 Ald#10 Ald#11	0698-3111 0683-1025 0683-1015 2100-2413 0698-6283	2 2	RESISTOR, FRO, 30 OHMSE .125m CC RESISTOR, FRO, 185T .25M CC TUBULAH RESISTOR, FRO, 100 OHMSE .25M CC RESISTOR, YAR, TANK, 200 DHN 103 C RESISTOR, FRO, 10 OHMSE .125m CC	01121 01121 01127 1:7701 01121	861009 CB1025 CB1025 CB1005
A18912 A18913 A18614 A18615 A18916	0683-1505 0e98-3374 0e98-5180 0e98-3378	2 1	RESISTUR, FXC, 15 UHMSE "75m CC TUBULAR RESISIGA, FXO, 20 UHMSE "125m CC NOT ASSIGNED FESSION, FXC, 2X5T "125m CC TUBULA. FESSION, FXD, 51 CHMSR "125m CC	01121 01121 01121 01121	CP1505 682005 882025 883025
A18917 A16916 A16819 A16920 A16521	9651-3374 0683-4315 0698-518C 0698-3111 0698-5996	5	RELISTOR, FRC, 20 CHMST .22M CC RESISTOR, FRC, 430 CHMST .25M CC *ESISTOR, FRC, 2K5T .125M CC TUBULAR RESISTOR, FRC, 30 CHMSE .125M CC RESISTOR, FRC, 300 CHMST .125M CC	01121 01121 01121 01121 01121	RM2005 (843):5 #82025 #83005 #83015
A18527 A18523 A18524 A18525 A18526	0698-4131 0698-4131 7698-3111 0683-1025 0683-1015	•	RESISTUM, FRC, 30 CHMST .125W CC PESISTUM, FRC, 30 CHMST .125W CC RESISTUM, FAC, 30 CHMST .125W CC RESISTOF, FAD, 1KST .25W CC TUBULAR RESISTCA, FRD, 100 CHMST .25W CC	01121 01121 01121 01121	883605 885605 883605 Câl025 CAl025
A16+27 A16+20 A16+29 A16+10 A16+31	2100-2415 0654-6283 0698-5103 0698-5103 6683-1505	2	RESISTUR, JAP, TRMM, 200 CHM 107 C RESISTUR, FAD, 10 CHMST .125W CC RESISTUR, FAD, 430 CHMST .125M CC RESISTUR, FAD, 430 CHMST .125M CC RESISTOR, FAD, 15 CHMST .25W CC TUBULAR	19701 01121 01121 01121	F150X20L BP1005 HP4515 BR4515 CB1505
A18F32 A16F33 A16F34 A18F35 A18F30	Cc98-5374 G698-5175 U698-3376 G698-3111	1	NOT ASSIGNED  PESISTEN, FYU, 20 DH#ST .125W CC  RESISTOR, FAD, 1.0KST .125W CC TUBULAR  PESISTOR, FAD, 51 UMPST .125W CC  KESISTOR, FAU, 30 GHMST .125W CC	01121 01121 01121 01121	BR2005 BB1825 BB5105 BB3005
A10+37 A10H3A A10H3A A10H4O A10H4O	0657-3378 0698-3374 0683-4315 0698-4131 0698-3563	ı	HESISTUR, FAC: 51 GHMSR :125W CC HESISTOR: FAC: 20 GHMSR :125W CC RESISTOR: FAC: 430 GHMSR :25W CC FESISTOR: FAC: 52 GHMSR :125W CC RESISTOR: FAC: 18C GHMSR :125W CC	01121 01121 01121 01.21	## 105 ## 2005 C# 315 E B 5605 ## 1815
Aldhaz Aldha3 Aldra- Aluha5 Aldra-	J698-4131 - (698-3111 - G628-3113 - G683-1025		RESISTER, PXC, 56 CHMST -1256 CC RESISTOR, FAC, JO CHMST -1258 CC FESISTOR, FAD, 100 CHMST -1258 CC NOT ASSIGNED RESISTUR, FAO, 185% -258 CC TUBULAR	01121 C1121 01121	F#3605 R#3C05 &B1015 C#1025

Table 6-1. Replacement Parts, Standard Instrument (Cont'd

Table 6-1. Replacement Parts, Standard Instrument (Cont.)						
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number	
A18447 A13848 A18849 A18850 A18851	0683-3905 0483-8215 0683-1025 0683-4315 0683-4315	1	HESISTOR, PXO, 37 OHNST .25M CC TUBULAR RESISTOR, FXC, 820 OHNST .25M CC RESISTOR, FXO, IRST .25M CC TUBULAR PESISTOR, FXD, 430 OHNST .25M CC RESISTOR, FXC, 430 OHNST .25M CC	01121 01121 01121 01121 01121	CB3905 CB215 CB1025 CB4315 CB4315	
ALBR52 ALBU1 ALBU2 ALBU3 ALBU4	0683-4315 5088-7002 1826-0084 1826-0085 1820-0736 OR	1 1 1	RESISTOR, FPD, 430 OHPSE .25m CC ICCLIMITER INTEGRATED CIRCUIT, LIN, WIDE BAND INTEGRATED CLACUIT, LIN, WIDE BAND ICCOLOGITAL	01121 25450 26450 26460 26460 28460	C44315 5086-7002 1026-6084 1826-6085 1820-0736	
OR A1894 A1895 A1896 A1997 A1898	1820-0528 1820-0714 1820-0469 1821-0001	1 1 2	ICTOU-L-BINARY ICTOIGITAL QUINARY DIVIDER ICTECL INTEGRATED CIRCUIT, LIN, TRANSISTOR INTEGRATED CIRCUIT, LIN, TRANSISTOR	2848C 2848C 2848C 02735 02735	1820-C558 1820-C714 1820-C489 CA3046 CA3046	
ALEU9	1820-0402	ı	INTEGRATED CIRCUIT, OGTL, ECL QUAD 2	04713	MCBOBGZP	
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Table 6-1. Replacement Parts, Standard Instrument (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			INTERNAL & CTMER PARTS		
	03FC-0104	9	KNUHSELK BAR W/ARROW 1/4" SHAFT	28460	0370-0104
	01921-67401	2	(FIME BASE/FUNCTION)  KNGBITRIGGER LEVEL  (LEVNL)	28460	01821-67401
	00180-67403	6	KNUM ASSY (SAMPLE PATE)	28460	00180-67403
	50+0-0170 5060-0109	3	GUIDE PEUG-IN PC BOARD CONNECTOREES CONTACTS	29480 25480	5040-0170 5060-0109
	05326-00010 05326-00016 05326-20046	1 1 1	' SM'ELDENIXIE CHASSIS HOAFDEREAR PANEL CONNECTUR	21480 21480 28480	05326-00010 05326-00018 05326-20046
	05326-60032 05327 60037 6120-1378	k 1 1	CABLE ASSYLPCHER CABLE ASSYLPCHESCALED CABLE, UNSHLD 3-CUND LRANG	28430 26483 70902	05326-60032 05327-60027 KH-7081
			PAINTED CABINET PARTS		
	05325-0000Y 05326-00006	1	CCVERIBUTTCMICPT 2452 RIGHT PRONT PANEL TRIM	28480 28460	05325-00004 0537 <b>6-</b> 00006
	C5326-00003	l.	LEFT FRONT PANEL TREM, OPT A05/XY5 FCULOR OPTION A05/XY5)	26480	05326~00003
	05326-0007L 05326-00022 05326-60029	2 1 2	STUE COVER TOP COVERTORT XYS) ATTIFACK HOUNTTORT ABS/X93)	28480 28480 28480	05326-00021 05326-00022 05326-60029
	2370-0012 2510-0047 5620-0106 5020-0107	3 4 1	CUNSISTING CF:  5C#Em,MACHINE, 6-32 UNC-24 .25 IN 10U 5C#Em,#ACHINE, 8-32 UNC-24 .4.8 IN MAN BFACPFT:ELEFT BFACRET:FIGHT	90123 78901 28480 28480	5020-0706 5020-0707
	05326-41.002	1	STRIPIFILLER CHAY	28+60	05326-40002
			OTHER CABINET PARTS		
	04c0-U114	12	TAPE POLYURETHANE 1-1/4 IN WIDE (FOR TUP COVER)	85471	TESAMOLL-2
	149C-0030 500C-0050	2	MIRÉPORM TRIMISLOES	28480	1490-0030 5000-0050
	5060-0729 5060-0767 05126-00001 05126-00032 05326-00008	2 5 1 1	FRAME ASSYED X LLESIDED FCCT ASSYEM PANELIFRANT PANELIFEAR INSULATOR	28480 28480 28480 28480 28480	5060-0724 5060-0767 05326-00001 05327-00032 05326-00008
	05178-00011 05320-20012 05327-20010 712C-1254 05322-09033	1 1	PLATE CONNECTOR, LONG WINDOW (5326A) WINDOW (5327A) PLATE, INFC, HP LOGO; ABS BASE ADAP & RECONNECTORE OPT 0021	78450 25480 25480 28480 28480	05326-00011 05326-20012 05327-20010 7120-1254 05326-00033
	05376-00020 05376-00023 05376-00024 0537-00032	1 1 1	PANELIFRONT TRIM, OPT A85/X4515326A ONLY PANELIFRONT TRIM, STO PANELIFRONT EXTRU, STO CULOH(5326A ONLY PANELIFRONT EXTRU, OPT A85/X45(3)27A) KITERACK MOUNT(OPT A85/X45)	28180 28: 0 25:460 26480 28480	05326-00020 05326-00023 05326-00074 05327-00002 05326-00079
	05320-66346 05327-00039	1	MITIRACH MOUNT, STO COLOR PANELIFFONT EXTRU, STO COLOR(5377A)	28480 28480	05326-60046 05327-00004
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Table 6-1. Repincement Parts, Standard Instrument (Cont'd)

					Model 5326/27 Replacement Par
Reference	Table 6-		ncement Parts, Standard Instrument (C	Mfr	Mfr Part Number
Designation	i i i aj t i valinaci			Code	
			C 7 1ES PARTS		
ei	3140-0030 1150-0035	ļ	MOTOR, ELEG, INDUCTION 115VAC 30CO RPM FILTER, EXPANDED ALUMINUM	284BC 284BC	3140-CC36 3150-CC39
61	31:0-0:35 1 521.4-128	1	FAN-ELADE, ARL, 2.25 DC -1250 BRACHETIFAN	0486E   28480	3160-0075 5212A-12H
B1 C1 F1	G16C-7343 2110 0020	i	CAPACITOR, FRC, .octub/.cotub-207 FUSE 08A 250V SLO BLO	284EC 76016	0140-1643 3138305
51	2110 0304	1	FUSE, 1 BA 250V SLO-BLO NUT ASSIGNED	71400 26460	MDX 1-1/2A 1250~1253
92 93	1250-1253 1250-1253	5	CONNECTOR-CCAX, BNC, 50 CHM FFMALE CONNECTOR-CCAX, BNC, 50 CHM FCMALE CONNECTOR-CCAX, BNC, 50 CHM FEMALE	28460 28460	1250-1253
J4 J5	1250-1253		CONNECTOR-COAX, BNC, 50 UNM FEMALE	28480	1250-125
J6 J7	1250-1253		CENNELTUR-COAK, PNE, 50 DHM FEMALE PART OF 35327-60033 PRESCALER ASSY	ZBABC	1250-1271
19	1251-2357	1	CONNECTOR, AC PHP, HP-9 MALE FLANGE NOT ASSIGNED	H2385	FAC 101
J10	1250-0212	ı	ACT ASSIGNED CUNNECTOR-COR, BAC, SO DIM FEMALE	9571:	, 30409-1
J11 P1 Q1	5060-0109 1653-0233	; 1	CCHNECTURE15 CONTACTS TRANSISTUR, PHP SI	2848C 28480	5000-0104 1853-0233
ŭi	05327-20024	2	HEAT SENK FOR GE AND UZ	26480	05377-20074 974-307
01 01	1200-0081	2	INSULATION BSHG,FLG .LLS ID INSULATION XSTA = GCZ THK	26365 28480 28480	0340+0765 1854-0420
02	1854-0420 05327-20024 1200-0081	1	TEANSISTON, NPN ST HLAT SINK FOR OI AND OZ ENSULATOR, BSHOFLE, -ELD ID	28480 26165	05327-20024 974-307
92	0340-0765		INSULATUR, X"TH, .COZ THR	28486	0340-0765
02 FL	7124-2195 2100-2961	1 1	EABLE FOR HEAT SINK BESISTOR, WARE IN 20% SPST SW	28480 28480	7124-7195 2100-2961
\$1 \$2	3101-1327	1	PART OF HI SWITCH, SL, DPST NS, BA 126VACH ? FAST-NORM-HOUD!	28480	101-1327
53	3101-1216	1	SWITCH, PB 1 STA LITTEL SPST IRESETI	284MC	3101-1716
54	3101-1311	•	SWITCH, SE, EPDT NS, 154 125VAC/PC	2848C	3161-1311
			(INPUT C)	284BC	05326-6001h
55 56	0537e-60016 0537e-60019	1	SHITCH ASSYSTIME HADECHINED SHITCH ASSYSTUNCTION SHITCH ASSYSTUNCTION SHITCH STATEMENT SHITCH ASSYSTACTOR	2848C 2848G	05326-60019 3101-1311
57	3101-1311		EDSC-INT/EXT) SWITCH, SL, DEDT NS, SA 125VAC/DC (STORAGE)	28480	3161-1311
, , ,	"""			*****	1161-1116
59	3101-1234		SWITCH, SL, DPDT PS, 6A 250VAC ISELECTOR 115:230V)	PHABC Phabc	3101-1234 9100-3020
11	9100-3020	1	(5326A/5327A)		
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Table 6-2. Replacement Parts, Options

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Reference	<u> </u>		Dascription	Mfr	Mfr Part Number
Reference Designation	HP Part Number	Qty	Dascription	Corle	in i a c (4011110)
.,	C5326-60025	38	COPTICH GOL - 8 DIGIT DISPLAY) UFLETE A9 05326-60008 AND PEPLACE WITH A9 05326-60025- 0159LAY ASSY ISERIES 1032A)	2648C	05376-60025
			ELCADED EN 05326-2000E BLANK BCARDI		
A5051 A 2051	1970~0042 1200~0~05	B 6	TUBE, ELCTRN, 85750-5, IND, SCCKLT, EEFC, TUBE L4-CONT NIFIE PKG	2848G 83761	1970-0042 #15-44
89952 85052 85053	1516-0042 1703-0455 1510-0047 1210-045		TUME, ELCIFN, H9750-S, IND, SCENET, THEC, TUME 14-CONT MERIE PRO TUME, ELCIRN, B5750-S, IND, SPERET, FLEC, TUME 14-CONT NEXTE PRO	2646C 63761 2646C 63781	1970-004/ R15-44 1970-0042 R15-44 1970-0042
49053 A9054 A9055 A9055 A9056 A9056	1201-04/5 1370-04/5 1370-04/2 1204-04/5 1470-04/2 1204-04/5		TUBE, ELCTRN, B5750-5, IND,  SCCRET, ILEC, PUBE 14-CENT NERTE PRG TUBE, ELCTRN, B5750-5, IND, SOCKET, ELEC, TUBE L4-CENT NERTE PRG TUBE, ELCTRN, B5750-5, IND, SOCKET, FLEC, TUBE L4-CENT NERTE PRG	83761 2648C 83761 2648C 83761 2648O 83761	RIS-44 1970-0042 RI-44 1970-0042 EIS-44
k 105 f A5035 f A503B R5Catt	1970+0542 1200-0405 1570-042 1200-0405 0883-1025	2	TUBL, ELCIPN, N5750-5, IND, SICKET, FLEC, TUBE 14-CONT WEXTE PRG FUBE, ELCIRN, N5750-5, IND, SICKET, FLEC, TUBE 14-CONT NEXTE PRG HSSISTON, FRO, 185% 225% CC TUBULAR	2848C 83781 2848C 83781 01121	1570-0042 ET5-44 1970-0042 HT5-44 CN1025
AVI 2 AVI 3 AVI 4 AVI 5	UC 83-7525 Ore 3-1025 Ores-7525 Ores-7525 Ores-7575	6	PESISTER, PRO. 7.585% .25M CC TURULAN RESISTER, PRO. IK5% .25M CC TURULAR RESISTER, FRO. 7.585% .25M CC TURULAR	01121 01121 01121 01121 01121	CB7525 CB5025 CB7525 CB7525 CB7525
A986 A988 A988 A984 A981U A9811	08.03-772* CER3-7525 ORB3-7525 CB3-1005	ı	FESISTON, PAD. 7.585% JOW CC TURULAR RESISTOR, FRO, 7.585% JOW CC TURULAR RESISTOR, PAO. 7.586% JOW CC TURULAR RESISTOR, PAO. 10 UMMST JOW CC TURULAR FESISTOR, FRO, 7.586% JOW CC TURULAR	01121 01121 01121 01121	CA7925 CH7925 CH7925 CA1005 CH7925
4501 4502 4533 A-U4 4505	1820-0275 1020-0115 1020-0115 1020-0115 1020-0119	1 7	INTEGRATED CIRCUIT, OGTL, FCL-10-TTL INTEGRATED CIRCUIT, LGTL, TTL DECADE INTEGRATED CIRCUIT, DGTL, TTL DECADE INTEGRATED CIRCUIT, LGTL, TTL GECADE INTEGRATED CIRCUIT, LGTL, TTL UECADE	04713 26450 26450 26460 26460	M: 1034P 1820-0115 1020-0119 1820-0119 1820-0115
ASUB ASUB ASUB ASU ASUB ASUB	1821-0117 1820-0117 1820-0117 1820-0116 1820-0116	ė	INTEGRATED CIRCUIT, EGIL, TIL GECADE INTEGRATED CIRCUIT, EGIL, TIL DECADE INTEGRATED CIRCUIT, EGIL, TIL 0-CADE INTEGRATED CIRCUIT, EGIL, TIL 4-BIT INTEGRATED CIRCUIT, EGIL, TIL 4-BIT	28485 28480 28460 28480 28480	1620-0119 1620-0119 1620-0119 1620-0116 1620-0116
ANULT FAULT ANULT ANULT ANULT	1870-0116 1820-0116 1820-0116 1820-0116		INTEGRATED CIRCUIT, UGTL, TTL+ 4-BIT INTEGRATED CIRCUIT, UGTL, TTL+ 4-BIT INTEGRATED CIRCUIT, UGTL, TTL+ 4-BIT INTEGRATED CIRCUIT, UGTL, TTL+ 4-BIT INTEGRATED CIRCUIT, UGTL, TTL+ 4-BIT INTEGRATED CIRCUIT, UGTL, TTL+ 4-BIT	28480 28480 28480 28480 28480	1820-0116 1820-0116 1820-0116 1820-0116
20016 49017 A9018 20019 A9020	1624-0116 1620-0052 1620-0052 1620-0052 1620-0052	l P	INTEGRATED CIRCUIT, DGIL, TILA 4-PIT INTEGRATED CIRCUIT, DGIL, TILA INTEGRATED CIRCUIT, DGIL, TILA INTEGRATED CIRCUIT, DGIL, TILA INTEGRATED CIRCUIT, DGIL, TILA INTEGRATED CIRCUIT, DGIL, TILA	28480 28480 28480 28480 28480	1820-0116 1820-0092 1820-0092 1820-0092 1820-9092
A7021 A7022 A7023 A7024	1#20~00#2 1#20~00#2 1#20~00#2		INTEGRATED CENCULT, DGIL, TILO INTEGRATED CINCULT, DGIL, TILO INTEGRATED CINCULT, DGIL, TILO INTEGRATED CINCULT, DGIL, TILO	28480 28480 28480 28480	1 # 10 - 0.0 ¥2 - 0.0 ½ - 0.0 ¥2 - 0.0 ¥2
			OPTION DOZ THEMOTE PROGRAMMINGS OTE TE SUBO-OLOG - 15 CONTACT CONVECTOR AND AUG UD327-00013 CABLE A55Y.		
	05327-63013	1	CALLE ASSYLPHINGFAMMING CLASSISTING OF STATE OF	28480	05327-80013
J10 W2P1 W2P2	1751-0065 5060-0113 1200-0063		CONNECTOR, 36 C., NT, FEM, MICRO RIBBON CONNECTOR 45 CONTACT LUG CRIMP	28×80 28×80	5060 0113 1200 0061
			PITTER OUS - CHELTAL DUTPUT.		
.19 W.P.I W.IP2	1261 0087 1261 2262 1261 2262	1 2	CONNECTOR, 50 CONT, FEM. MICRO RIBBON CONNECTOH, PC EDGE, 10 CONT, SOLDER EYE LUNNECTOR, PC EDGE, 10 CONT, SOLDER EYE	71785 71785 71 45	57 40500 175 251 10 30 400 251 10 30 400

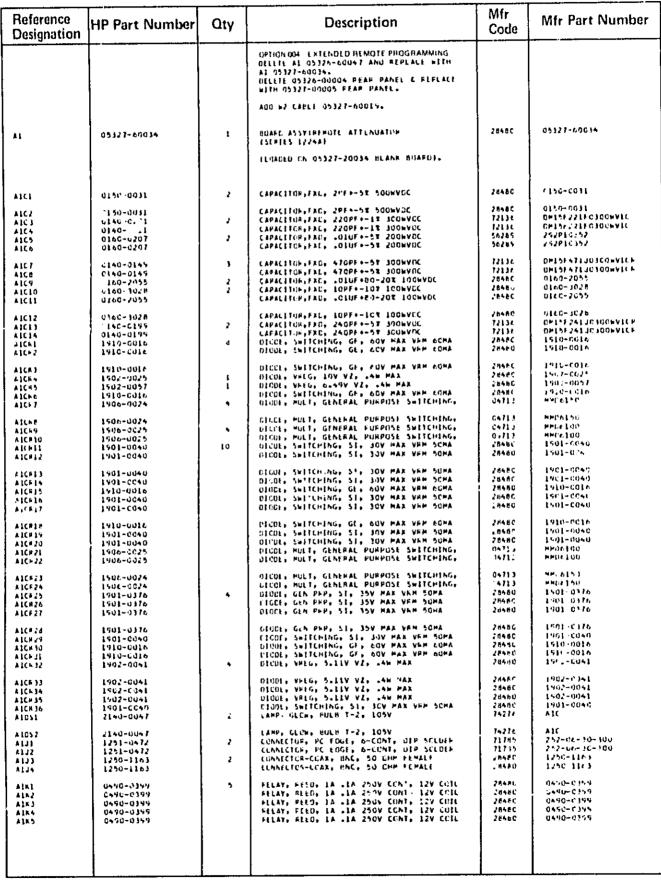
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See introduction to this section for ordering information

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 $\|\mathbf{I}_{\mathbf{i}}(\mathbf{r})\|_{L^{2}(\Omega)} \leq \|\mathbf{I}_{\mathbf{i}}(\mathbf{r})\|_{L^{2}(\Omega)} \leq \|\mathbf{I}_{\mathbf{i}}(\mathbf{r})\|_{L^{2}(\Omega)}$ 

Table 6-2. Replacement Parts, Options (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A101 A102 A103 A104 A105	1854-0639 1853-0401 1854-0715 1854-0215 1853-0036	1 1 5	TRANSISTUH, 2M3US3 NPN SI THANSISTON, PNP SI TPANSISTON, NPN SI TRANSISTON, NPN SI TRANSISTON, PNP SI	04712 28460 04713 04713 28480	263052 1653-CGQ1 5P5 3611 5F5 3611 1853-GGJ6
A106 A107 A106 A107 A1010	1853-0036 1854-0215 1854-0215 1853-0036 1853-0036		FRANSISION, PNP SI TRANSISIOF, NPN SI TRANSISIOF, NPN SI TRANSISIOF, PNP SI TRANSISIOF, PNP SI	28480 C4713 O4713 26480 28480	1853-0032 5P5 3611 5P5 3611 1853-0036
Alcii Alui? Alui4 Alui4 Alui	1854~0215 1854~0215 1855~0334 1855~0334 0.46~6123	2	TEANSISTUR, NPN 51 TEANSISTUR, NPN 51 TSTRIST FET CUAL N-CHANNEL TSTRIST FET CUAL N-CHANNEL RESISTUR, FRD, 2085T .125W CC TUNULAP	0471.3 0471.3 17856 17856 011.21	5P5 3611 5P5 3611 1877 Uh377 HP2035
A152 A163 A164 A165 A166	0658-6123 CLSE-5565 CLSE-5565 ULB6-1515 CLEC-1815	6 1 1	HESISTOR, FRD, JORDS .125M CC TURULAR PLOTOTOR, FAC, 2.3KDS .125M CC TURULAR RESISTOR, FAU, 2.3KDS .125M CC TURULAR PISTOR, FAD, 150 OMMDS .5M CC TURULAR RESISTOR, FAD, 160 OMMDS .5M CC TURULAR	01171 01121 01121 01121 01121	NR2035 8P2225 RP2225 E-1515 Fel815
rint Alba Alba Albi Albid Albid	0494-3141 0456-3381 2100-2633 0676-5103	\$ 2	FLSISIUM, FRU, 150 OMPST .125W CC RESISIUM, FRU, 150 OMPST .125W CC PLSISIUM, VAR, IMMR, IRCHM 10T C HESISIUM, FRU, 430 UMMST .125W CC RESISIUM, FRU, 430 UMMST .125W CC	01121 01121 19701 01121 01121	#P1015 PP1015 EMPORIGE HMA315 PP4015
A1612 A1613 A1714 A1715 A1618	0698+1945 0698-1946 0698-1966 0698-1965 9157-0461	2	FESISTOR, FRU, 330KSE .125M CC TUBULAR FESISTOR, FRU, 660KSE .125M CC TUBULAR FESISTOR, FRU, 680KSE .125M CC TUBULAR FESISTOR, FRU, 330K57 .125M CC TUBULAR FESISTOR, FRU, 121KLE .125M F TUBULAR	2848G 01171 01123 284FC 24546	0678-7565 Rec645 REC645 C656-7965 C4-178-10-1713-F
A1#17 A1#16 A1#19 A1#20 A1#21	0757-4467 0446-3581 4683-3015 7648-3381 J683-3615	,	HESISTUR, FRD, LZBRIT 125% F TUPULAR FILISTUR, FRU, 150 GHM5T 122% CC HESISTUR, FRU, 300 UHM5T 125% CC HESISTUR, FRU, 150 GHM5T 122% CC HESISTUR, FRU, 150 GHM5T 125% CC	24546 01121 01121 01121 01121	C4-1/0-F0-1213-F #85515 CA4Q15 #81515 C#4015
A1H.2 #1+23 #1H24 #1H25 #1F26	COUN-550N 0052-0244 0058-550N 9815-0244 0483-111	2 4	#ESISTON, FAG, TARBE LIZBE CC TUBULAR NESISTON, FAG, 1-ABBE -12BE CC TUBULAR FESISTON, FAG, JAKBE -12BE CL TUBULAR MESISTON, FAL, 3-ABBE -12BE CC TUBULAR RESISTON, FAL, 3-ABBE -12BE CC TUBULAR RESISTON, FAL, 3-ABBE -12BE CC	01121 01121 01121 01121	##1615 ##125 ##1625 ##1625 CHESES
#1627 *1626 *1629 *1430 #1631	0603-1515 1850-6381 0658-6381 0658-7057 0648-717	,	HEDISTOR, FRD, 153 CHM5T, 25W EC FEDISTOR, FRD, 155% FL25W CC TURULAH RESISTOR, FRD, 1185% FL25W CC TURULAH RESIST-H, FRC, 185% FL25W CC TURULAH RESISTOR, FRD, 185% FL25W EC TURULAH RESISTOR, FRD, 185% FL25W EC TURULAH	01151 01151 01151 01151	Chibib halisb nalisb nalobb balobb
51-32 618-3 618-3 618-3 618-3 618-14	7100-2574 2100-2574 0658-7964 3696-7564 3696-5381	2	RESISTOR, VAR, TAME, SOO DIE LOT C FESTSDER, VAR, TAME, SOC DEM TOT C HISTSTER, FRU, LOOKER LESSE CC TURULAR HESTSTUR, FRU, LOOKER LESSE CC TURULAR HESTSTUR, FRU, LOOKER LESSE CC	CELST 58480 58480 12401	F Thursoll Eliscisholl Cepts Press Costs Tress Priblis
A1737 A1838 A1839 A1840 A1841	0298-3181 9658-5174 3695-5174 0298-6534 0658-6536	,	#EDISTIF, FRO, 100 UMM5# .125m CC #EDISTIF, FAC, 200 (AMM5# .125m CC #EDISTICA, FAC, 203 UMM5# .125m CC #EDISTICA, FAC, 470 UMM5# .125m CC #EDISTICA, FAC, 476 UMM5# .125m CC	01151 01151 01151 01151 01151	##1515 ##2615 ##2015 ##4715 ##4715
8[642 1]64] Al646 Al666 El440	GBY8-7CS7 CO58-7SY7 JEYR-6244 CU58-6244 CO58-6561	2	NCSISTIE, FAL, IMST 1125m CC TUMULAR MESICTUM, FRE, IMST 1125m CC TUMULAM MESISTUM, FAL, 3-355% 125m CC TUMULAR RESISTUM, FAL, 3-365% 125m CC TUMULAR SISTUM, FAL, 3-365% 125m CC TUMULAR SISTUM, FAL, 6-6 CHMST 1125m CC	01121 01121 01121 01121	PE1055 PE1055 HP3325 BH3325 BH6545
11+47 Alford Alford Alford	0658-5561 0653-5174 2100-2595 2656-5174 2100-2595	2	FLSISTUR, EXO, 648 GHP5% 1256 CC FESISTUR, FAO, 200 UHP5% 1256 CC FESISTUR, FAO, GH 10% LIP FESISTUR, FAO, 200 UHP5% 11256 CC REVAR CEPHER 10% UPH 10% LIP	C1121 C1121 2846C C1121 2848C	BPEEGF BEFGEF 2100-2905 BP2CL5 2100-2905
A1452 A1453 A1454 A1455 A3456	2694-5565 - 0668-5565 - 3698-5565 - Cube-5565 - 2100-2633		HISISTON, FRU, 2-2857 -125M CC TUBULAR RESILTOR, FRC, 2-2877 -125M CC TUBULAR RESILTOR, FRO, 2-2857 -125M CC TUBULAR RESILTOR, FRD, 2-2857 -125M CC TUBULAR FISISTOR, VAN, TAMB, TROWN TOT C	01121 91121 91121 (1121 15701	882225 882225 882225 882225 63508202
A151 A15, A153 A156 A155	1101-1113 1101-1313 1101-1313 3101-1311 3101-1341	,	SHITCH, SL, LP3T NS, .SA 125VAC/CL SHITCH, SL, DP3T NS, .SA 125VAC/DC SHITCH, SL, DP3T NS, .SA 125VAC/CC SHITCH, SL, DP0T NS, .SA 125VAC/DC SHITCH, SL, DP0T NS, .SA 125VAC/DC	28466 28480 28480 28480 	3101-1 13 3101 3101- 31 3101-314

# Table 6-2. Replacement Parts, Options (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
#157 #157 #156 #157 #161	3101+1311 3191+1311 1874-0774	1	PART CE NAME,  PART OF MAIL,  SWITCH, SE, EPOT NAME, SA EZAMACZEC  (NICCH, SE, EPOT NAME, SA EZAMACZEC  (NICCH, SE, EPOT NAME, STE QUZD Z	2840C 7840O 04711	3[0]-13]] 3[0]-13]] *(10FP
A1-12 A1-12 A1-12 A1-12		í	INTEGRATES CIRCUIT, COTE, HTC GCAC 2 INTEGRATES CIRCUIT, COTE, HTC TRIPLE ENTIGRATES CIRCUIT, COTE, HTC GUAG 2	05713 05713 05713	MC 6728 MC 6728 MC 6724
W2 W2P1 W2P2 J10	05327 60010 6060 0113 1200 0063 1261 0087	1	CABLE ASSY CONNICTOR PRESSURE 45 CONTACT LUG CRIMP CONNECTOR FEMALE 6) PIN MINIATURE	28480 28480 28480 28480 28480	05327 60010 6060 0113 1200 0063 1761 0087
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Yable 6-3. Manufacturers Code List

HER			210
NO.	MANUFACTURER NAME	ADDRESS	CODE
01121	ALLEN MRADLEY CO.	MILWAUKEE, WIS.	53204
01295	TEXAS INSTRUMENTS INC. SEMICONDUCTOR COMPONENTS DIV.		75231
02114	FERROXCUNE CORP.	SAUGERTIES, N.Y.	12477
02735	RCA SOLIO STATE & PECEIVING TURE DIV.	SCHERVILLE. N.J.	08876
03508	G.E. CO. SEMICONDUCTOR PROC. DEPT.	SYRACUSE, N.Y.	13201
04713	HOTOFOLA SEMICONOUCTOR PROD.INC.	PHOENIX, ARIZ.	85008
<b>J4868</b>	HEINZ HUELLER ENGINEERING CO INC	FOREST PARK IL	60130
06776	POBINSON NUGENT INC	NEW ALBANY IN	47150
07263	FAIRCHILD CAMERA & INST. LORP. SEMICONDUCTOR DIV.	MOUNTAIN VIEW, CALIF.	94040
08806	G.E. CO. MINIATURE LAMP DEPT.	CLEVELAND, OHIO	44112
16299	COPNING GLASS WORKS ELECTRIVIC CIMPONENTS DIVISION	RALEIGH NC	27604
17856	S'LICCNIX INC.	SUNNYVALE, CALIF.	94086
19701	ELECTRA/MIDLAND CORP.	MINERAL WELLS, TEX.	76067
24226	GUWANDA ELECTRONICS CORP	GOWANDA NY	14070
2454+			
20365	GFIES REPRODUCEP CORP.	NEW POCHELLE, N.Y.	10802
28489	HEWLETT-PACKARD (O. CORPORATE HQ	YOUR NEAPEST HP OFFICE	
56289	SPRAGUE ELECTRIC CO.	N. ADAMS, MASS.	01247
78901			
70903	HELDEN CORP.	CHICAGO, ILL.	60544
71400	BUSSMANN MFL. CIV. MC GRAW-EDISON CO.	ST. LOUIS, MU.	63017
71785	CINCH MEG. CT. DIV TRW INC.	ELK GPOVE VILLAGE, ILL.	
72136	ELECTRO MOTT 'E MEG. CO. INC.	WILLIMANTIC, CONN.	96224
73899	JED ELECTRONICS CORP.	BFUUKLYN, N.Y.	11215
74276	SIGNALITE INC	NEPTUNE, N.J.	07753
77250	PHEOLE MEG. CI. DIV. ALLTED PROD. COPP.	CHICAGO, ILL.	60650
02389	SWITCHCRAFT INC.	CHICAGO, ILL.	60630
83781	NATIONAL ELECTRONICS INC	GENEVA IL	601 34
85471	80YD A.B. CC.	SAR FRANCISCO, CALIF.	94103
86684	RCA ELECTRONIC COMPONENTS	HARPISON, N.J.	07029
90123	HAPPER H H CO THE	NORTON GROVE IL	60053
91637	LALE ELECTRONICS INC.	COLUMBUS, NEB.	10086
95712	BENOLX COPP. THE MICROWAVE DEVICE DIV.	FPANKLIN, IND.	46131
98291	SEALECTRO CORP.	MAMARONECK, N.Y.	10544

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# SECTION VII

I I I I MI PANET I

# MANUAL CHANGES AND OPTIONS

# 7-1. INTRODUCTION

7-2. This section contains information necessary to adapt this manual to older instruments. Also included is the operating and installation information for available options. Refer to Section II for remote programming requirements.

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## 7-3. OPTION3

7-4. Options 001 through 004 are available for 5326A and 5327A models. The following paragraphs describe each option's purpose and operation.

# 7-5. Option 001, 8-Digit Display

7-6. Option (0)1 is the addition of an eighth digit to the display assembly. This addition becomes the most significant digit and extends the counter's resolution at higher frequencies. The digit is always blanked if the reading is "0". Option 001 consists of A9 Display Assembly 05326-60025 in place of 05326-60008.

#### 7-7. Option 002, Remote Programming

7-8. Option 302 allows the counter to be computer controlled from a 36-pin connector on the counter's rear panel. Programming instructions are given in Section II. A schematic diagram is included in Section VIII.

# 7-9. Option 003, Digital Recorder Output

7-10. The data displayed on the counter's front panel can be permanently recorded by connecting a printer to the counter via Option 003. The necessary signals are coupled from A9 Display Assembly to an HP 5055A or 5050B Digital Recorder through J9 on the counter's rear panel (also, see Table 1-3 for specifications and Section VIII for pin references).

# 7-11. Option 004, Extended Remote Programming

7-12. This option is similar to Option 002 except it includes the remote programming of the AC/DC, SEP-COM-CHK, FAST/NORM, and ATTEN switches. Remote programming of the attenuator board is achieved by connecting the DTL input lines in parallel with the front panel switches (connected at cable points 1 through 8). When the counter is being externally controlled, the A COM line goes high. This high turns off diodes A1CR6, 18, 2, 3, 15, 30, 31, and 1, and disables the front panel switches.

# 7-13. Option 010 Temperature Compensated Oscillator

7-14. Option 010 consists of a Temperature Compensated Crystal Oscillator (TCXO) (05327-60036) in place of Oscillator Assembly A4 (05326-60002). This option is available for 53:26A instruments with Serial Prefix 1032A and above or for all 5327B instruments. The TCXO is not field repairable.

# 7-15. Option 011 Oven Oscillator

7-16. Option 011 consists of an HP Oven Oscillator (10544-60011) in place of Oscillator Assembly A4 (05326-60002). This option is available for 5326A instruments with Serial Prefix 1240A and above or for 5327A instruments with Serial Prefix 1236A and above. The oven oscillator is not field repairable; for replacement or repair, order rebuilt assembly 10544-60511.

# 7-17. FIELD .NSTALLATION OF OPTIONS

# 7-18. Installation of Option 001, 8th Digit

7-19. Parts required to install this option are:

1820-0119 Decode — unter U8 1F20-0116 Buffer Storage U16 18/0-0092 Decoder Driver U24 1970-0042 Display Tube DS8

- n. Remove right and left rendout boards, A10 and A11.
- Remove two screws holding display tube shield and remove shield.
- c. Remove display board Ab and display support board A8 from the counter by pulling up on the display support board A8. Separate A8 from A9.
- d. Install parts on A9 as shown in the component location photo on Figure 8-13 of this manual,
- e. Remove R10 to prevent overflow information from U7. R12 carries the overflow when Option 001 is installed. Replace boards in instrument.
- f. Perform Self-Check in Table 3-1, Especially note that the OF (overflow) lamp lights when the left-most digit changes from 9 to 0.

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# 7-20. Installation of Option 002, Remote Programming

- 7-21. To install remote programming capability in units not so equipped, order remote cable assembly HP Part No. 05327-60013, two 4-40 x 1/4-inch machine screws, and one 6-32 x 3/4-inch machine screw with hex nut.
- a. Remove the plate covering the lower opening in the rear panel for Option 002.
- b. The rear-panel interconnect board containing the wiring from the rear-panel BNC's and switches must be removed. To accomplish this, remove the nuts holding the rear-panel BNC's.
- e. Remove two screws holding PIA (the 1%-inch, black, pressure connector) to the interconnect A16.
- d. Remove side covers and six screws holding rear panel. Loosen one side frame, Pull rear panel away from the instrument.
- e. Remove the rear-panel interconnect board from the instrument and separate it from P1A by removing two screws.
- f. Feed the pressure connector through hole in rear-panel and mount rear-panel connector J10, with screws removed earlier. Position J10 with pin 1 near the side frame.
- g. Assemble the rear-panel interconnect board and the new 5-inch long pressure connector P1 with three 6-32 x 35-inch screws and hex nuts. Be certain that proper contact is made between interconnect board and P1.
- h. Attach P1 to the motherboard using four 4-40 x 4-inch screws. Do not tighten screws. Route cable as shown in the top internal photo of instrument, Figure 8-4.

#### CAUTION

# SCREWS LONGER THAN 14-INCH WILL DAMAGE P1.

- i. Gently reintstall rear panel, Install BNC lock nuts so that the board is still movable.
- j. Observe the alignment of the connector in the motherboard. Tighten the four screws holding 121 to the motherboard, making sure to maintain proper contact.
- k. Check contact alignment of P1 with motherboard and with the rear-panel interconnect board. If necessary, loosen the screws in P1 and shift slightly to obtain proper terminal contact.

- . Tighten BNC lock nuts and reassemble instrument.
- m. Run a complete performance check on the unit to verify that remote programming is working properly.

# 7-22. Installation of Option 003, Digital Recorder Output

- 7-23. Order digital recorder cable assembly HP Part No. 05326-60012.
- a. Remove the plate covering the upper opening in the rear panel.
- b. Remove right and left readout boards A10 and A11. Remove two screws holding the display tube shield and remove shield, Remove display support board A8 and the display board A9 by pulling up on A8.
- c. Feed the two pressure connectors of the recorder cable through the rear panel and mount J9 on the rear panel, using the screws previously removed. Position J9 so pin 1 is near the side frame.
- d. Slide the connectors on the A9 board, shown in the photo on Figure 8-4. The connector with the long wires attaches to J1 and is positioned so that pin 1 is toward the front of the instrument. The other connector attaches to J2, and pin 1 is toward the rear of the instrument.
- e. Position the PI cable so it passes between A8 and A11, completely clearing A8. Reinstall A8 and A9.
- f. Route the cable around TI and in front of A8 assembly.
- g. Reassemble unit and run a proof-ofperformance check of the digital output to verify that the option is installed properly.

# 1-24. Installation of Option 004, Extended Remote Programming

7-25. Field installation of Option 004 is not available.

# 7-26. Installation of Option 010 and 011, Oscillator Assemblies

7-27. Remove the standard oscillator A4 and insert the option into XA4 connector. The Option 011 assembly must be mounted to the interconnect hoard with 6 x 32, 44" screws, Place the fiber washers on the underside of the board.

#### 7-28. MANUAL CHANGES

7-29. This manual applies directly to Model 5326A and 5327A with serial prefix 1312A. Refer to paragraph 1-4 for a description of serial prefixes.

#### 7-30. Newer Instruments

7-31. As changes are made, newer instruments may have serial prefixes that are not listed in this manual. The manuals for these instruments are supplied with a manual change sheet, containing the required information. Contact the nearest Hewlett-Packard Sales and Service Offices if the change sheet is missing.

#### 7-32. Older Instruments

7-33. To adapt this manual to instruments with serial prefixes prior to 1312A, make the backdating changes that apply to your instrument, as listed in the table below.

#### **IMPORTANT**

For Model 5326A instruments with serial prefix 1044A or below, a separate manual is required. Older Model 5326A/B 50 MHz Timer/Counter/DVM Operating and Service Manual.

Table 6-1 and Figure 8-14 (A10 schematic): Delete A10CRI and CR2. Change board series number to 1040A.

#### **CHANGE 2**

Figure 8-17, A17 schematic:

Replace Figure 8-17 schematic with Figure 7-1. Replace Figure 8-17 component locator with Figure 7-2.

#### Table 6-1:

Delete A17C13 CF .001 $\mu$ F 75V 0160-0975. Delete A17R25, R26 R:FXD 560 OHM .25W 0683-5615.

Change A17R22 to 120 OHM .25W 0683-1215. Change A17R23 to 1200 OHM .25W 0683-1225. Ado A17R20 270 OHM .25W 0683-2715. Change A17 board series to read 1116A Rev A.

## **CHANGE 3**

Table 6-1:

Under chassis parts, change part number of T1 to 9100-2888. (The 9100-3020 has additional current capabilities for special high-stability oscillators.) For replacement, order 9100-3020.

Table 7-1. Manual Backdating Changes

#### 5326A BACKDATING

#### 5327A BACKDATING

If your 5326A has serial prefix	Make the following changes to your manual	If your 5327A has serial prefix	Make the following changes to your manual
1240A	14	1248A	14
1224A	14, 11	1236A	14, 13
1144A	14, 11, 10	1224A	14, 13, 12, 11
1136 <b>A</b>	14, 11, 10, 7, 8	1220A	14, 13, 12, 11, 10
1132A	14, 11, 10, 7, 8, 3	1120A	14, 13, 12, 11, 10, 9-4
1116A	14, 11, 10, 7, 8, 3, 2	1040∧	14-4, 11

#### **CHANGE 1**

To the little of the second of

Table 6-1:

Change part numbers to:

COVER: SIDE 3X11 ... 5000-0729 2 en. COVER: TOP ...... 05325-00008 1 en. INSULATOR (Q1 & Q2) ... 0340-0162 2 ea.

#### NOTE

If replacement of above parts are required, replace with new parts listed in Table 6-1.

Table 6-1 and Figure 8-16:

Change part number of A16 Interconnect Board to 05327-60005, series 1040A. (The 05327-60026 board accepts special high stability time base assemblies.)

#### **CHANGE 4**

- Table 6-1:

Change A6R19 to C683-2025 R:FXD 2000 OHM 5% 1/4W 01121 CB2025.

Change A6 board series to 1036A.

## CHANGE 4 (Cont'd)

Table 7-2:

Change A7C2 to 0160-0333 C:FXD MICA 15PF 3000VDCW,00853, RDM 15C150D; C.

Figure 8 10, A6 schematic: Change A6R19 to 2000 OHM.

Figure 7-3, A7 schematic: Change A7C2 to 15PF.

#### CHANGE 5

Table 6-1:

Change A15CR15-18 to 1901-0040

Change A15R17, R18 to 0683-0395 R:FXD COMP 3.9 OHM 5% 174W.

Change board series to 1104A.

rigure 8-16, A15 schemetic:

Change A15R17, R15 to 3.9 OHM

#### Table 6-1:

Under chassis parts, 4dd T1 9100-2888

TRANSFORMER: POWER (5327A). For T1 (9100-3020) change descritpion to indicate use for 5326A only.

#### **CHANGE 6**

Table 6-1:

Change A17CR3 to 1912/0007.

Change A17Q4 to 1854-0092.

Change A17R21 to 0683-2525 R:FXD COMP 3600 OHM 5% 174W 01121 CB 3625.

Change A17R22 to 0683-1515 R:FXD COMP 150 OHM 5% 1/4W 01121 CB 1515.

Change A17R23 to 0683-1025 R:FXD COMP 1000 OHM 5% 174W 01121 CB 1025.

Change A17R26 to 0683-5615 K.FXD COMP 560 OHM 5% 174W 01121 CB 5615.

Change board series number to 1128A.

#### Figure 8-17:

Change A17R21 to 3600 OHM.

Change A17R26 to 560 OHM.

In table of active elements, change part number of A17CR3 to 1912-0007. Change A7Q4 to 1854-0092.

At top of A17 schematic, change series number to 1128A.

#### **CHANGE 7**

This change is concerned with the older cabinet colors. 5326A instruments with serial prefixes below 1144A and 5327A instruments with serial prefixes below 1220A had standard colors of light gray panels and blue textured cabinets. For replacement, order parts identified as option X95.

#### CHANGE 8

Table 6-1:

Delete A15C8 and description.

Figure 8-16, A15 schematic diagram:

Delete A15C8,

Change board series number 1104A.

#### **CHANGE 9**

Table 7-3 and Figures 7-6 and 7-7:

Delete the following: A19 05327-60032 Protection Board and all A19 parts. Also delete A19 component locator.

# Table 1-2, Table 1-3:

Under specifications for INPUT CHANNEL C, change maximum input to 5 volts rms, 7.5 volts peak.

#### **CHANGE 10**

Table 6-1:

Change part number of A1 to 05326-60003 series 944 (loaded on 05326-20003 blank board). Change part numbers of A1R24 and A1R26 to 2100-2905.

Under other cabinet parts, change 05326-00032 to 05326-00004.

Delete: 05326-00011, 05326-00033, and 05326-20046.

Add 05326-00012 plate: Connector, short J10 cover.

Add 05326-20028 Board: Blank (Rear Panel Interconnect).

Add 05327-00005 Panel: Rear (Option 004),

#### Figure 8-6, A1 schematic:

Change assembly part number at top of schematic to 05326-60003 series 944A.

# **CHANGE 11**

Paragraph 7-18:

Add following parts to parts required to install Option 001: 0683-7525 7.5KO 1/4W resistor R11, 1200-0405 Display Tube Socket

Paragraph 7-18, step e.

Delete step e and replace with the following: R10 carries the overflow information from the decades and can be placed one of two locations. Move R10 to the location shown in Figure 7-9. In this location, R10 connects to pin 8 of US.

# Figure 8-13:

Replace schematic and componet locator for A9 with Figures 7-8 and 7-9.

Table 6-1:

Delete A6R44 and description.

Figure 8-10, A6 schematic diagram:

Delete A6R44. Draw a straight-through connection from A6C10 to pin 2.

## CHANGE 11 (Conl'd)

#### Table 6-1:

Change A9 part number to "05326-60008", Delete the following parts and descriptions: A9R11, A9R12, A9U8, A9U16, A9U24, A9DS5, A9XDS8, and A9XU8.

Delete the following parts and descriptions: A16C6, A16CR18, A16Q1, A16R4, A16R5, A16R6, A16R7, A16R8, and A16U1.

Figure 8-22, A16 schematic diagram:
Delete schematic diagram for this portion of A16.

#### Table 6-1:

Replace parts lim for A7 (05327-60031) with Table 7-2 (parts list for 05327-60004).

Figure 8-11, A7 schematic diagram:

Replace schematic diagram with Figure 7-3 (schematic for 05327-60004).

Replace component locator with Figure 7-4.

#### CHANGE 12

Page 3-5, Figures 3-4 and 3-5;

Indicate that instruments with serial prefixes below 1236A have the INPUT C connector on the front panel.

#### Table 6-1;

Change A9R2, R4 through R9, and R11 to "0683-7525 R:FXD COMP 7500 OHM 5% 1/W 01121 CB 7525".

Change A9U17 to "1820-0092",

Under internal and other parts, change 05327-60037 to "05327-60011". Also delete "05327-00009 Panel: Front Extru standard color (5327A only)".

#### **CHANGE 13**

## Table 6-1:

Delete parts list for A18 and replace with Table 7-3.

Figure 8-18, A18 schematic and component Locator:

Delete component locator and replace with Figure 7-5.

Replace schematic diagram with Figures 7-6 and 7-7.

#### CHANGE 14

Table 6-1:

Change A9R2, R4-9, and R11 to "0757-0440 R:FXD MET FLM 7500 OHM 5% 1/4W 01121 CB 7525".

Change A15R1 to "0683-2035 R:FXD COMP 20K OHM 5% 1/4W 01121 CB 2035".

Change A15R6 to "0683-1505 to R:FXD COMP 15 OHM 5% 1/2W 01121 EB 1505".

Delete A15F1, A15XF1 and descriptions.

Change board series to 1136A.

Figure 8-16, A15 schematic:

Change A15R1 to 29R.

Change A15R6 to 15 OHM.

Delete A15F1 and draw a straight through connection to pins 1 and A.

Change board series number to 1136A

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	Table	7-2. A7	(05327-60004 Series 1132A) Replaced	ble Parts	
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
H	05121-00004	ı	BOAFD ASSYCFUNCTION CONTROL (SERIES CLOVA) (CDADED ON OSS27-ZOOON BLANK BOARD)	28480	U1177~80UU4
87L) 87L) 87C3 81C4	0140-0201 0160-2327 0160-2327	l S	NOT ASSIGNED  O'FALEMICA 12 PF  CIFED CER 2000 PF 20% 100YDCW  CIFED CER 1000 PF 30% 100YDCW	/MIMI 96733 96733	0140-0201 83048#302# 83048#302#
#165 #166 #161 #101	0160-2327 0160-2327 0160-2327 1854-0215		CIFED CER 1000 PF 20% 100VOCM CIFED CER 1000 PF 20% 100VOCM CIFED CER 1000 PF 20% 100VOCM TSTRISE NPA	96733 96733 96733 60131	810482102M 810482102M 810482102M 2N1904
207 2013 2014 2014 1414	1854-0215 1854-0009 1854-0009 1854-0009 0683-1125	,	TSTRISE NEW TSTRISE NEW TSTRISE NEW TSTRISE NEW RIFAD COMP SEGO OHM SK EVAW	60131 60131 60131 60131 01171	JN3904 JN709 JN709 JN709 CR 1125
21#2 21#3 21#4 21#5 21#6	On #3-1 #25 On #3-1 #25 Un #3-1525 On #3-3925 Un #3-2225	<b>1</b> 0	REFRU COMP 1800 OHN ST 17AW REFRU COMP 1800 OHN ST 17AW REFRU COMP 1500 OHN ST 17AW REFRU COMP 1900 OHN ST 17AW REFRU COMP 7.7K OHN ST 17AW	01171 01171 01171 01171 01171	CB 1625 CB 1425 CB 1525 CB 3925 CB 2925
ainti airi aira airi airi	On 3-11/5 Ob 83-2275 Ob 83-1375 Ob 83-1375 Ob 83-1575		RIFID COMP ILOD DAM SE IZAM RIFID COMP JIJO DAM SE IZAM RIFID COMP JIJOD DAM SE IZAM RIFID COMP JIJOD DAM SE IZAM RIFID COMP ISOD DAM SE IZAM	01121 01121 01121 01121 01121	CH 11/5 CH 22/5 CH 33/5 CH 33/5 CH 15/5
1611 1611 1611 1611 1611 1611	Con3-33/5 Con3-15/5 Con3-15/5 Con3-1015 Con3-5115	•	HIFAD COMP 3300 OHM 5% 174W REFYD COMP 1500 OHM 5% 174W REFAD COMP 1500 OHM 5% 174W REFXD COMP 100 OHM 5% 174W REFXD COMP 100 OHM 5% 174W	01171 01171 01171 01171 01171	CR 3375 CR 1525 CR 1525 CR 1015 CR 5115
11414 1414 1414 1414 1414 1414	Gos1-1415 Gos3-3015 Gos3-2015 Gos3-2725 Gos3-2725	5 3 1	RIFED COMP 300 OHN 5% 1/4w RIFED COMP 300 OHN 5% 1/4w RIFED COMP 200 OHN 5% 1/4w RIFED COMP 2700 OHN 5% 1/4w RIFED COMP 750 OHN 5% 1/4w	01121 01121 01121 01121 01121	CR 3035 CR 3035 CR 2015 CB 2725 CR 7515
97477 47873 97474 43675 47675	QAB1-4715 QBB1-1125 QBB3-4725 QBB3-1125 QBB3-1125		RIFAD COMP 4FO DHM 5% 1/4W RIFAD COMP 1100 DHM 5% 1/4W RIFAD COMP 1100 DHM 5% 1/4W RIFAD COMP 1100 DHM 5% 1/4W RIFAD COMP 1100 DHM 5% 1/4W	01171 01171 01171 01171 01171	CR 4715 CR 1125 CB 4725 CR 1125 CR 1125
A1=21 81=20 A1=20 A1=01 A1=01	0643-4715 0645-1015 0645-1125 1620 102 1620-0489	<b>4</b> 5	PIEAD COMP 470 CHM 5% 1/44  PIEAD COMP 100 OHM 5% 1/4M  ENTEGRATIO CTRCUITIJ-K PLIP FLOP  [CITCL	01171 01171 01171 04713 78480	CB 4715 CB 1015 CB 1175 MC1013P 1870-0484
etus etus etus etus etus	1870-01-7 1870-0-6 1870-01-7 1870-0489 1870-0717	,	ICTECL TEPOLT 1-1MPT MOR GATE ICTECL 19JAL #5 1/F ICTECL TRIPLE 3-1MPT MOR GATE ICTECL ICTECL QUAD LINE PECELYER	04713 04713 04711 28480 04711	MC 101 P MC 101 P MC 100 P 1 #70-04 N Y MC 107 UP
# fom # foly # folio # folio # folio # folio	1670-0469 1870-0145 1870-0469 1870-0757 1870-0700	<b>,</b> 1	ICTECL ICTOIGITAL QUAD 2-INPT NOR GATE ICTECL ICTECL QUAL 3-4 INPT OR/NOR GATE ICTECL QUAD EXCL. OR GATE	28480 28480 94713 94713	1930-0484   1830-0144   1870-0484   MC 1030P   MC 1030P
		:			
	<u> </u>				

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Table 7-3. A18 (05327-60029 Series 1116A) Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
Alm	01.60-0197	ı	IOARD ASSY PRESCALER SERRES (1984) (1981): BON 0637 2029 BLANK BOARD	25450)	06-127 649129 1500:2253:902:082 -6.45
#1 HC 2	0140-0104		CIFAN ILECT 2.2 UF LOR ZOVOCH	12974	55M-1001-78
AINES AINES AINES AINES AINE I	0180-0975 0180-0108 0180-0175 0180-0975		CIPRD ELECT 60 UF 20% 6VDCM CIPRD CFR 0.001 UF 20% FSVDCM CIPRD CFR 60 UF 20% 6VDCM CIPRD CFR 0.001 UF 20% FSVDCM CIPRD CFR 0.007 UF 20% FSVDCM	76480 12574 28480 12574	0180-0106 55m-,001-78 0180-0106 55m-,001-78 55m-,001-78
#18C8 #18C9 #18C10 #18C12 #18C12	0140-0775 0160-0975 0160-0975 0180-0197 0180-0197	ì	CIFIO MICA 300 PF LT CIFIO CER 0.001 UF 20% 75VDCM CIFIO CER 0.001 UF 20% 75VDCM CIFIO ELECT 2.2 UF 10% 20VDCM CIFIO ELECT 2.2 UF 10% 20VDCM	28480 12574 12574 56289 56289	0140-0225 \$5M-,001-98 \$5M-,001-98 1500225X9020A2-0Y5 1500225X9020A2-0Y5
AIRCII AIRCII AIRCRI AIRCRI AIRCRI	0160-2049 160-2049 1902-1002 1912-1007 1902-2048	<b>,</b>	CIFRO CER FEED-THRU 5000 PF +80-20% CIFRO CER FEED-THRU 5000 PF +80-30% UTODE HRFARDOWNIZ-37V 5% DIODE HRFARDOWNIZ-37V 5% OTODE HREAKOOWNISTLICON 3-48V 5%	28480 28480 28480 03508 28480	0160-2049 0160-2049 1402-1002 143714 SPEC 1402-1048
AINUI AINUI AINUI AINUI AINUS	1250-0816 () (04)64 -100-2751 (851-0015 1854-0345 (854-0092	ŧ	CONNECTORIRE SUB-MINIATURE FORLERO RE 0.22 VH 10% FOREST PRO FOREST PRO FOREST NON TOTREST NON	98291 (PMp) 28480 80131 80131 80131	50+053+0000 102531 9100+2251 201540 201119 203563
3)MEL ALME? ALME1 31RRA ALME5	2100-263 5 2100-2521 0693-5105 0683-105	1	PIVAR CERMET IP. UNN 10% EIN 1/2W REVAR FLM 2000 UNN 10% LIN 1/2M REFAD COMP 51 UNM 5% J/AM REFAD COMP 51 UNM 5% 1/AM REFAD COMP 100K OHNS 5% 1/AM	7480 21480 01171 01121 01121	2100-2633 2100-2521 CB 5105 CB 5105 CB 1045
AIMED AIME? AIMEM AIMEM AIMEIU	0683-1025 0685-3328 0681-1815 0683-1825 0683-2215	} 1	RIFAD COMP JOOD OHM SE 1/ W RIFAD CARBON SI OHM SE 1/AW RIFAD COMP JEO OHM SE 1/AW RIFAD COMP JEO OHM SE 1/AW RIFAD COMP 270 OHM SE 1/AW	01121 28480 01121 01121	CM 1079 CM 98-1178 CB 1415 CB 1475 CB 2715
#1MH12 #1MH12 #1MH13 #1MH10 #1MH10	Un # 1-1825 Un # 3-1 #25 Un # 3-1 #25 Un # 3-2015 Un # 1-2015		RIPKO COMP 1800 CHM SE 174M RIFKO COMP 1800 CHM SE 174M RIFKO COMP 1800 CHM SE 174M RIFKO COMP 200 CHM SE 174M RIFKO COMP 200 CHM SE 174M	01121 01121 01121 01121	, 35 2015 Сн 2015
#186 # #186 # #186 # #186 # #186 #19	U6#1-1425 U6#1-1515 U6#1-4115 U6#1-5115 U6#1-8205	) 	HIFRO COMP EDOD OMN SE 1/AM RIFRO COMP 150 OMN SE 1/AM RIFRO COMP 450 OMN SE 1/AM RIFRO COMP 510 OMN SE 1/AM RIFRO COMP 82 OMN SE 1/AM	01121 01121 01121 01121	CR 1027 CR 1515 CR 4315 CR 5115 CR 8205
#18671 #18672 #18673 #18675 #18675	0683-1015 0683-2025 0683-215 0683-2405 0698-3:74	ı	REFAD COMP 100 UMM 5% 1/4M REFAU COMP 2000 OMM 5% 1/4M REFAU COMP 240 OMM 5% 1/4M REFAD COMP 24 UMM 5% 1/4M REFAD CARBON 20 OMM 5% 1/4M	01121 01121 01121 01121 28480	CO 10 ) CO 2/27 CO 3/17 CO 2/07 CO 3/17
#18470 #1847# #1847# #1844 #1844	0683-3635 0683-2715 2100-2670 5088-7002 5088-7001	1 1 1	RIFED COMP 360 OHM 5% 1/4W RIFED COMP 270 OHM 5% 1/4W RIVAP CEMET 20 OHM 30% LTN 3/2W ECILMITER ICIAMP AND TRIG	01121 01121 26480 28480 28480	CD 1617 CB 2717 2100-2670 1088-7002 1088-7001
Albus Pimus Penus Pimus Albus Albus	1870-0116 1870-0184 1870-0187 1870-0141 1898-0004	1	ICIDIGITAL ICININARY-QUINARY ICITEL ICITEL ICITEL INIPER 3-INPT NUR GATE ISTR ARREVISI NPN DUAL DIFF, AMPL.	28480 28480 28480 04713 28480	1 #20-0 F16 1 #20-0 F#4 1 #20-0 4 #4 MC 100 FP 1 #5 #-0004
Almaia; Almaia; Almaia Almaia Almaia Almaia	1820-0790 1731-1336 1731-1336 1703-0741 1703-0744	)   	ICIDIGITAL CUMMICTURISINGLE CUMTACT LUMMICTURISINGLE COMTACT HEAT DISSIPATOR PETAINIE	28480 00779 00779 28480 28480	1870-0744 2-330808-8 2-330808-8 3203-0243 3205-0244
/18904 #18904	0520-0129 0610-0001 3050-0062 1050-0079	, , ,	SCREWIPAN HD POZI DR 2-56 R 0.3124 LG NUTIHER 2-56 A 0.3884 MASHEFIFAT, HARCLETE WASHERINVERN U.18754 DD	90000 90000 90000	08D 08D 08D 08D

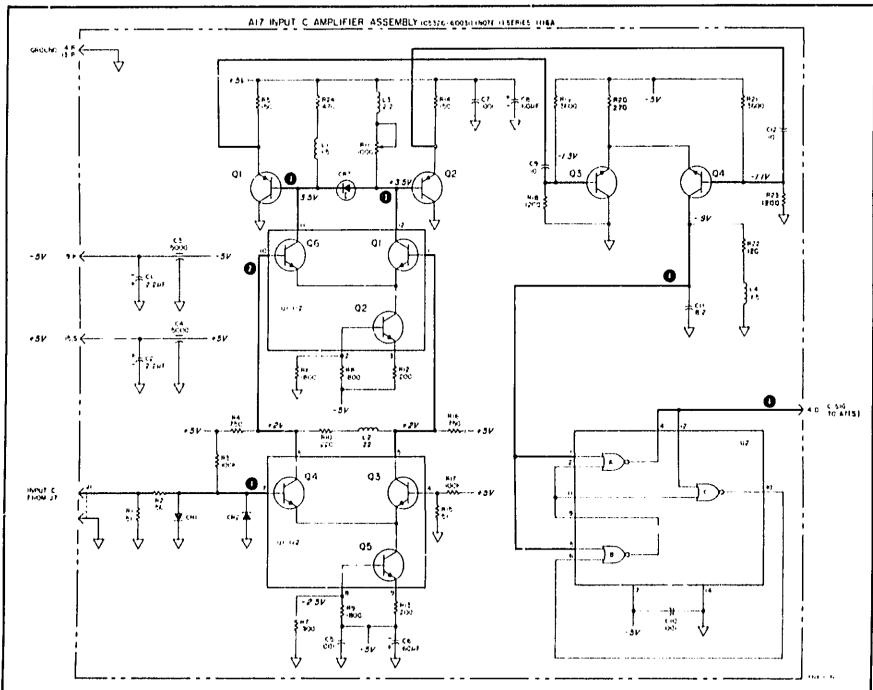
Table 7-4. A18 (05327-60009 Series 1040A) Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1 9	Q5 37 7 - KDQQ Y	l	PRESCALEE ASSY ISEERS TOAMAL BLOADEN ON OSSEE-20009 ELANK BOAFDI	28480	05 \$7 E-84005
Alaci	1050-0062 01#6-0197	,	WASHI PEFLAT, BANELITE CETED FLECT 2-7 HF LOR ZOVDCW	00000 667 HS	000 [*00275>4024A2+0Y5
A1462 A1463 A1464 A1465 A1467	0160-0975 0160-0106 0160-0975 0160-0106 0160-0975		CIFRU CER D.GOT UF FOR FSVOCM CIFRU ELECT ON UF FOR SYDCM CIFRU CER D.GOT UF FOR FSVOCM CIFRU ELECT ON UF FOR FSVOCM CIFRU CER U.GOT UF FOR FSVOCM	17574 76580 17575 28580 17574	\$5M-,001+4P 0180-0106 \$5M-,001-4# 0180-0106 \$5M-,001-48
A1 6C 6 A1 6C 9 A1 6C 10 A1 6C 12 A1 6C 12	0140-0225 0160-0375 0160-0375 0160-0197	•	CIPRO MICA 100 PP LE CIPRO CER 0.001 UF JOR PSYDEM CIPRO CER 0.001 UF ZOR PSYDEM CIPRO FLET: 2-2 UF 10R ZOYDEM CIPRO ELECT 2.3 UF 10R ZOYDEM	284 ED 125 / 4 125 / 4 125 / 4 126 / 8 126 / 8 126 / 8	0140-0225 558-4001-98 558-4001-98 150022545902082-075 150022545902082-075
ALSCIS ALSCIS ALSCHI ALSCHI ALSCHIS	0160-7049 0160-7049 1907-1007 1917-6007 1917-8048	,	CLEXO CLE PERO-THRU 4000 PF + HU-FOR CLEAD CEN FERO-THRU 5000 PF + HU-FOR HEDDE SHEAR-UDWN-22-37V 58 DEODE THE CLEAT TYPE 1 15-3714 OLUDE HALFADUWN-1514 ICON 35-8V 58	784PU 284PU 284PU 284PU 035UB 284PU	0160-2049 0160-2049 1902-1002 1911-591C 1902-1068
VINOS VINOS VINOS VINOS VINOS	1750-0836 9100-2751 1851-0015 1854-0097 1854-0097	<i>:</i>	CONNECTIBLES SOM-MENTATURE COLLETED BE 0.22 UK 10% TSTRIST PAP TSTRIST NPN TSTRIST NPN	56,9) 764,60 80,31 80,31 80,31	50-053-0000 98:00-2258 748660 243563 241563
41 25 4 A 1 22 2 A 1 24 4 A 1 24 4 1 24 5 5	2100-2533 7100-2521 0581-5105 0581-5105 0581-105		RIVAN CERMET IN DHM 10% LIN 1/2W RIVAR FAN 7000 DHM 10% LIV 1/2W REFAD COMP 51 DHM 5% 1/4W RIFRU COMP 100R DHM5 5% 1/4W RIFRU COMP 100R DHM5 5% 1/4W	76480 78480 01671 01171 01171	2100-2673 2100-2521 CH 5105 CB 5105 C3 1045
A1446 A1647 A16 P A1649 A1641U	OBB3-1075 ON58-11815 OBB3-1815 OBB3-1625 OBB3-2215		RIERD COMP 1000 SIM 5% 1/4M RIERD CARRON 51 OHM 5% 1/2W RIERD COMP 1800 CHM 5% 1/4M RIERD COMP 1800 CHM 5% 3/4M RIERD COMP 7/0 CHM 5% 1/4M	01121 28480 01121 01121	CM 1025 1044-3116 CM 1815 CM 1825 CM 2215
Aleki; Ald4 2 Ald4 3 Ald4 5 Al6= 5	00d3-1825 06#1-1825 06#1-1825 06#1-2015 06#1-2015		REFED EDMP 1800 DMM PE 174W REFED COMP 1800 DMM PE 174W (1880) COMP 1800 DMM PE 174W REFED COMP 200 DMM PE 174W REFED COMP 200 DMM PE 174W	01171 01171 01171 01171 01171	EM 1875 EM 1875 EM 1875 EM 7015 EM 7015
Almhib Aldhir Aldhiu Aleriy Aluhro	Ub#1-1075 Ub#1-1515 GBB3-5315 GBB3-1115 GBB3-8705	,	RIPPO COMP 3000 OHM AK 174W RIPPO COMP 150 OHM SK 174W RIPPO COMP 430 OHM SK 174W RIPPO COMP 430 OHM SK 174W RIPPO COMP 82 OHM SK 174W	01171 01171 01171 01171 01171	EN 1025 EN 1515 EN 6315 EN 3315 EN 8245
A18471 A18427 A18473 A18474 A1841	USE 1-1017 UNP3-7025 UNP3-7315 UNP3-7405 5088-7002		BLEFD COMP 100 OHM 58 174W FEFRD COMP 2000 OHM 58 174W REFRD COMP 310 OHM 58 174W REFRD COMP 24 OHM 58 174W ICEL MITTER	01171 01171 61171 91171 24440	CB 1015 CB 2025 CB 1815 CB 2405 FURB-2002
Albu? Albuh Albuh Albuh	50 FF-7 CO) 1820-073n 1820-0714 1820-0489 1820-0147	l	CLIAMP AND TRIG ICLOSGITAL ICLOSGITAL QUINARY DEVIDER ICLICAL ICLICAL TRIPLE 3-INPT NOR GATE	2 84 80 284 80 284 80 284 80 04 78 3	5986-7001 1820-0736 1870-0716 1870-0716 MC1007P
1001A Suabea	1858-000A 1751-1556	47	TSTR ARRAYES! NPN DIAL DIFF, AMPL. COMMECTOR+SINGLE COMTACT	784 RO 00779	1858-0004 2-310808-8
A10 A10 A10CT A10CT A10CR2 A10F A10AI A10AI A10XF1A A10XF1B	08.627-600.02 08.027-39.0.12 0180-0228- 0180-0228- 1001-0080- 1001-0080- 2110-0436- 1250-1408- 1250-0805- 1251-3216- 1251-3216-		PROTECTION BOARD BLANK BOARD C FXD TANT 22UF 10% 15V C FXD TANT 22UF 10% 15V BLODE SILICON BLODE SILICON FUSE OLAMP CONNECTOR SUBMIN CONNICTOR SUBMIN SOCKET MINIATURE SOCKET MINIATURE	5440 5440 5440 5440 5440 5440 5440 5440	05.127 - 6.06.17 05.127 - 9.66.12 01.80 - 07.28 01.80 - 07.28 10.01 - 08.20 10.01 - 08.20 21.03 - 04.08 12.20 - 0.86.5 12.51 - 07.05 12.51 - 07.05

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Figure 7-1. A17 input C Amplifier Assembly Series 1116A (5326A Only)



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Figure 7-2. A17 Series 1116A Component Locator

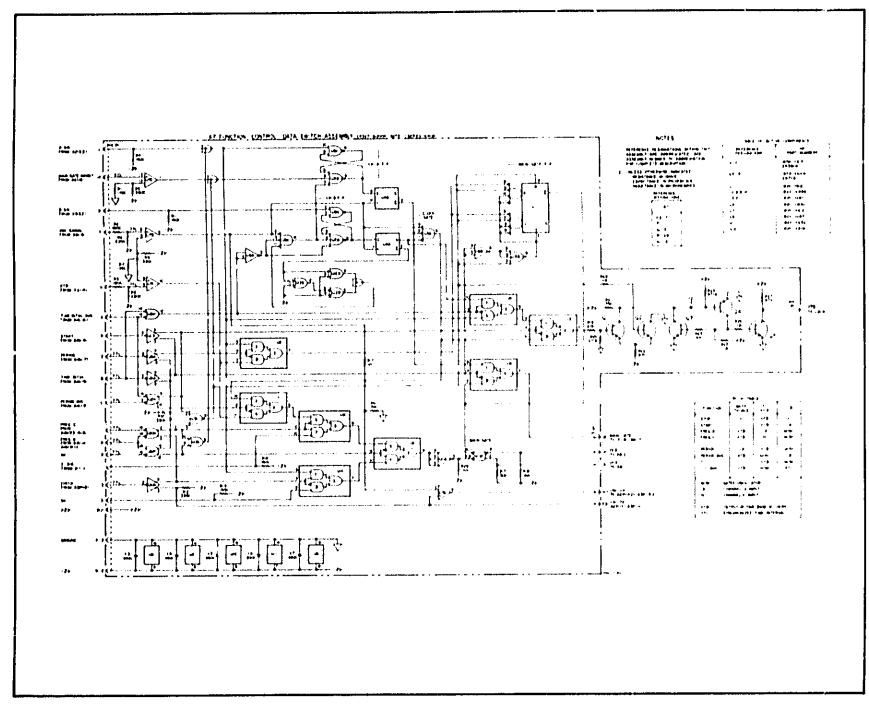


Figure 7-3. A7 Function Control Assembly, Series 1040A

Figure 7-4. A7 Component Locator, Serie. 1040A

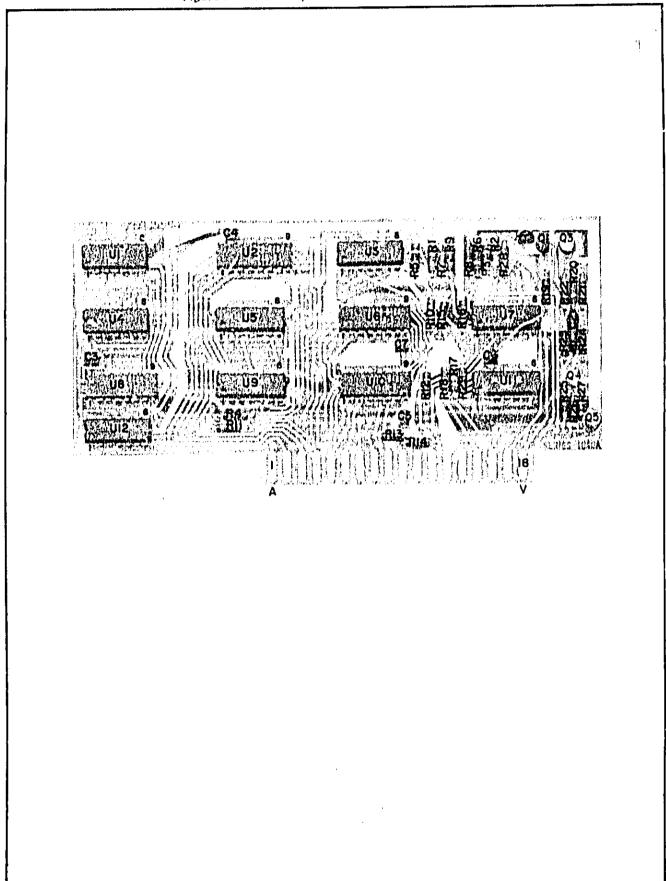
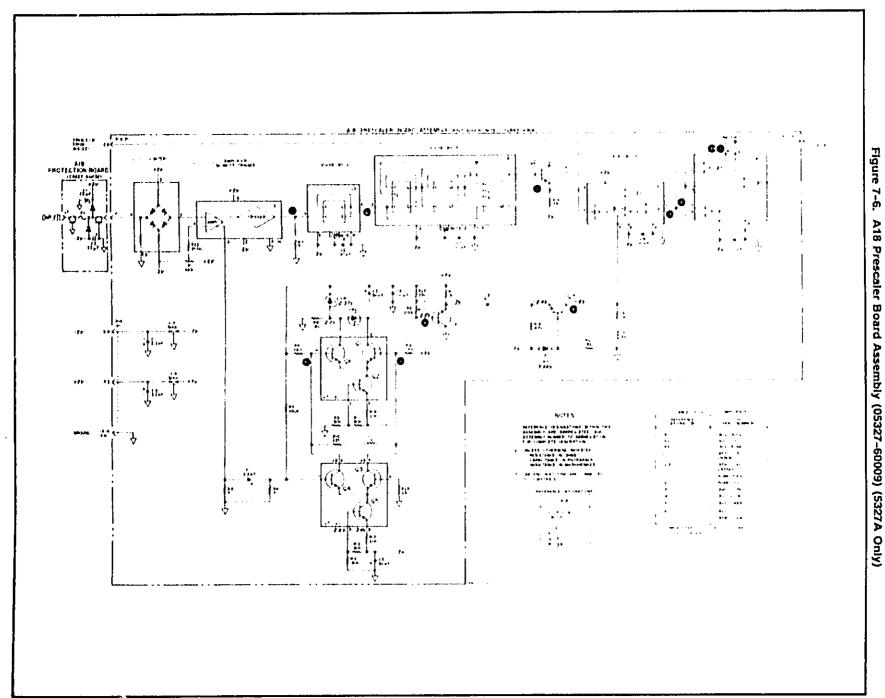


Figure 7-5. A18 and A19 Component Locators The 5327A model may be supplied with either A18 Prescaler Assembly. Both assemblies perform the same function. Note that separate schematics, component locators, and parts lists are supplied for each assembly. 81A gepted weath A18 (05327-60009) ∧19 **PHOTECTION BOARD** 

A18 (05327-60029)



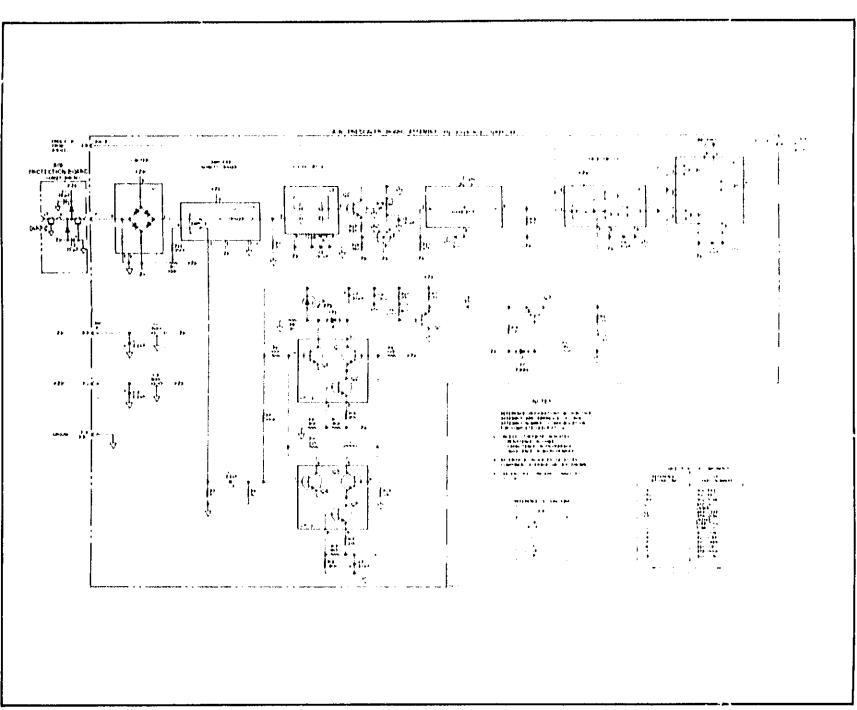


Figure 7-7. A18 Prescaler Board Assembly (05327-60029) (5327A Only)

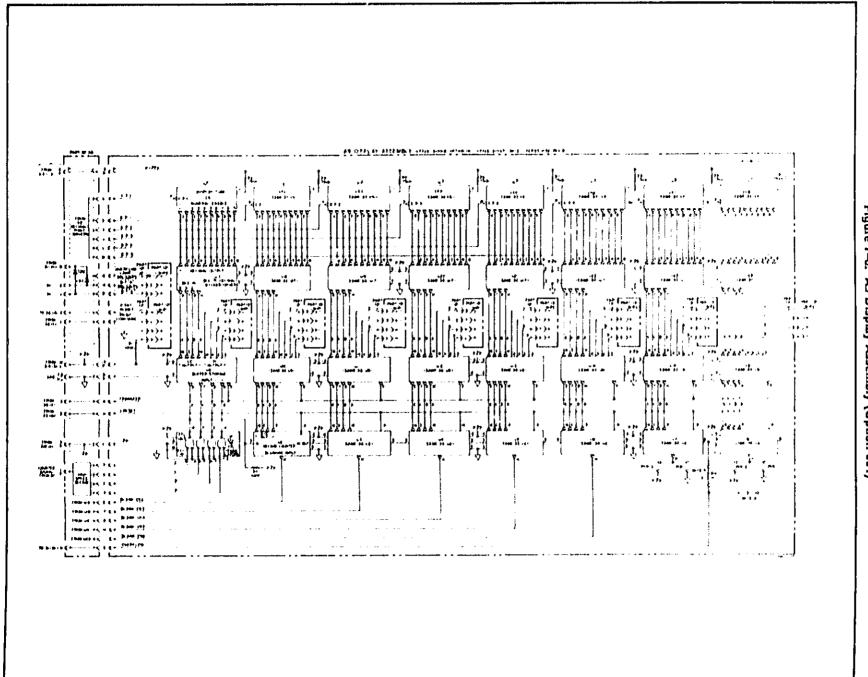


Figure 7-8 A9 Display Assembly (Option 001)

OPT OOI POSITION in The State of th POSÍTION NO. 2 BLANKING DEFEATISEE POSITION B (NOTE 3)

Figure 7-9. A9 Display Assembly (Option 301), Component Locator

### NOTES

- I REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION
- 2 UNLESS OTHERWISE INDICATED RESISTANCE IN OHMS.
- 3 RIG IS WIRED TO B FOR OPTION GOL

REFERENCE DESIGNATIONS

NO PREFIX	Ab	A9
	CR2.3	051-6
	JI Pl	JI, 2
		R1-11 UI-24
WIPI,P2		

TABLE OF ACTIVE COMPONENTS

SECTION II)

PEFERENCE DESIGNATIONS	HP ARTONUM TRAT	
AB		
C#2,3	1910 वर्गक	
An		
UI	1820 - G275	
	NCIO 19P	
u2 - B	1820 - 0119	
U9 +16	1820 - 0116	
U17 - //4	1820 - 0092	

### SECTION VIII

### **SCHEMATIC DIAGRAMS**

This section contains the following:

- a. Schematic diagram notes.
- b. Schematics.
- c. Component locators.
- d. IC outline drawings.
- e. Waveforms.
- f. Simplified block diagrams.
- g. Theory of operation.
- h. Troubleshooting.

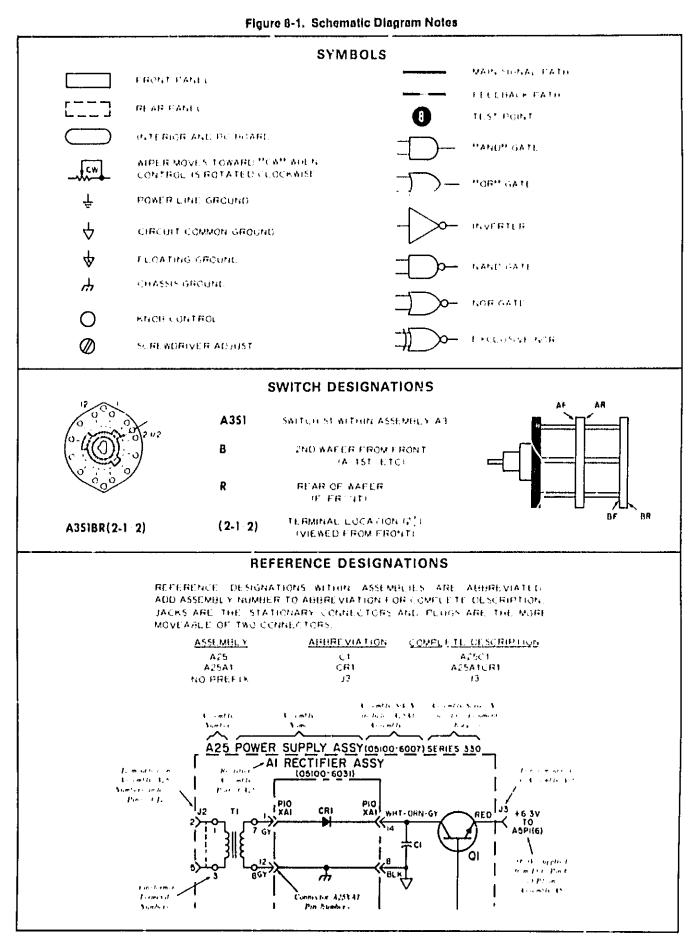
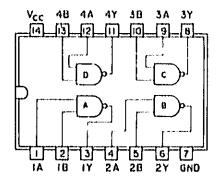


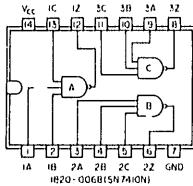
Figure 8-2. Integrated Circuit Diagrams

### 1820-0054



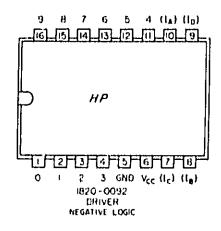
1820-0054(SN7400N)
QUADRUPLE 2-INPUT POSITIVE NAND GATE
NOTE: POSITIVE LOGIC Y= AB

### 1820-006B



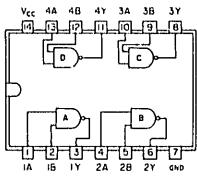
TRIPLE 3-INPUT POSITIVE NAND GATE POSITIVE LOGIC Y+ ABC

### 1820-0092



(11 <sub>A</sub> 1	18(5)	1 <sub>C</sub> (4)	i <sub>D</sub> ខេរ	"חט" דעיונעט
11	H	Н	[ н ]	0
L	Н	Н	H	1
Н	L,	Н	H	2
L	L	11	H	3
Н	H	l.	H	4
L.	Н	L	+1	5
Н	L	L	Н	6
Ļ	L	L	Н	7
н	н	н	L	н
L	H	11	L	9
BO	D 10		NONE	

### 1820-0094



1820-0094(MC846P)

QUADRUPLE 2 INPUT POSITIVE NAND GATE

NOTE: POSITIVE LOGIC Y AB

Figure 8-2. Integrated Circuit Diagrams (Continued)

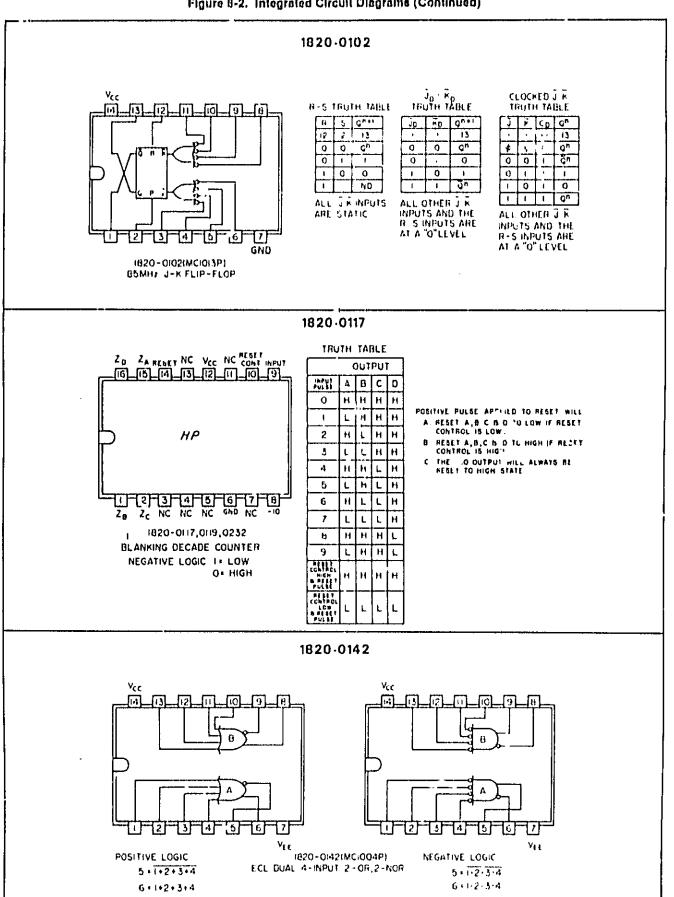
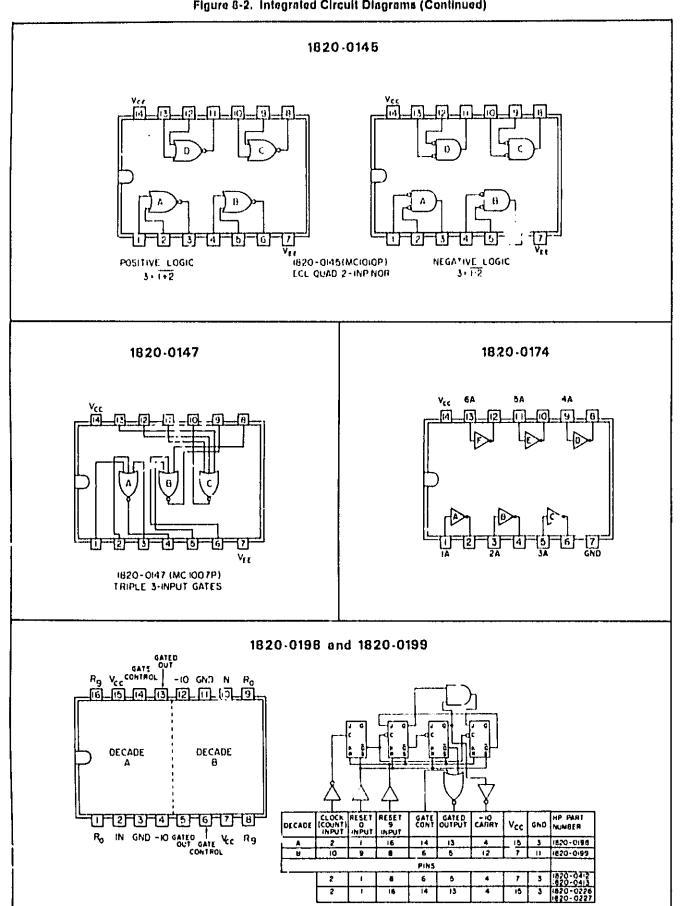


Figure 8-2. Integrated Circuit Diagrams (Continued)



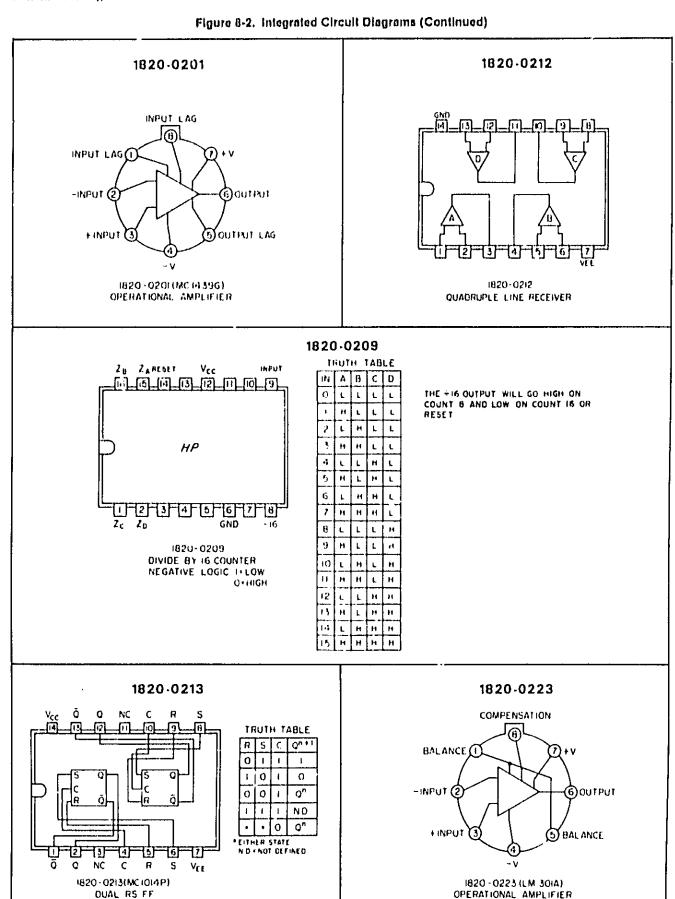
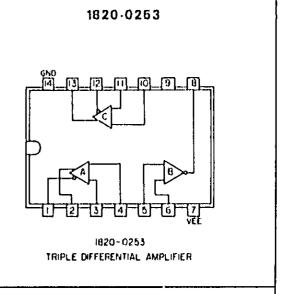
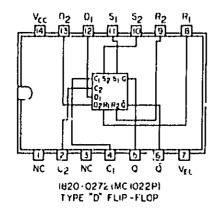


Figure 6-2, integrated Circuit Diagrams (Continued)

# 1820-0238 VCC M S P C D GNO IB20-0238 (MC IBIOP) QUAD 2-INPUT NOR GATES



### 1820-0272



### CLOCKED TRUTH TABLE C Qn + 1 <u>ān+i</u> PIN No. 12 cm 13 2 OR 4 6 o" Ŏ" O 0 ٥° 0 Q<sup>n</sup> 1. 0 0

"A" OR CLOCK INPUT IS DEFINED FOR THIS FLIP-FLOP AS A CHANGE IN LEVEL FROM A LOW INPUT TO A HIGH INPUT.

0

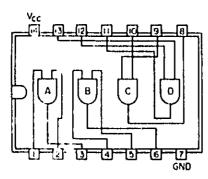
t\*

R-S TRUTH TABLE

	R	5	Qn+1	Qn+1
PIN No	8 on 4	10 on 11	5	6
	0	O	Q <sup>n</sup>	٥'n
	0		1	С
	Ī	0	υ	l
	ı	-	ND	ND

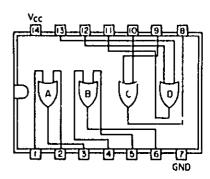
NO INOT DEFINED

### 1820-0273



IB20-0273 (MCIB06P)
QUAD 2-INPUT AND GATES

### 1820-0274



1820-0274 (MC 1808P) QUAD 2-INPUT OR GATES

Figure 8-2. Integrated Circuit Diagrams (Continued)

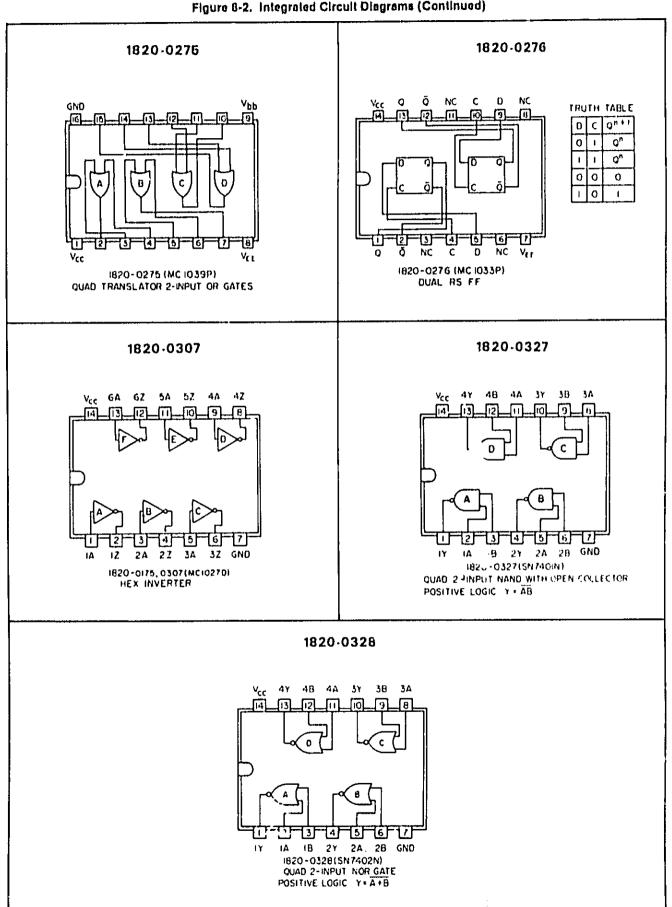
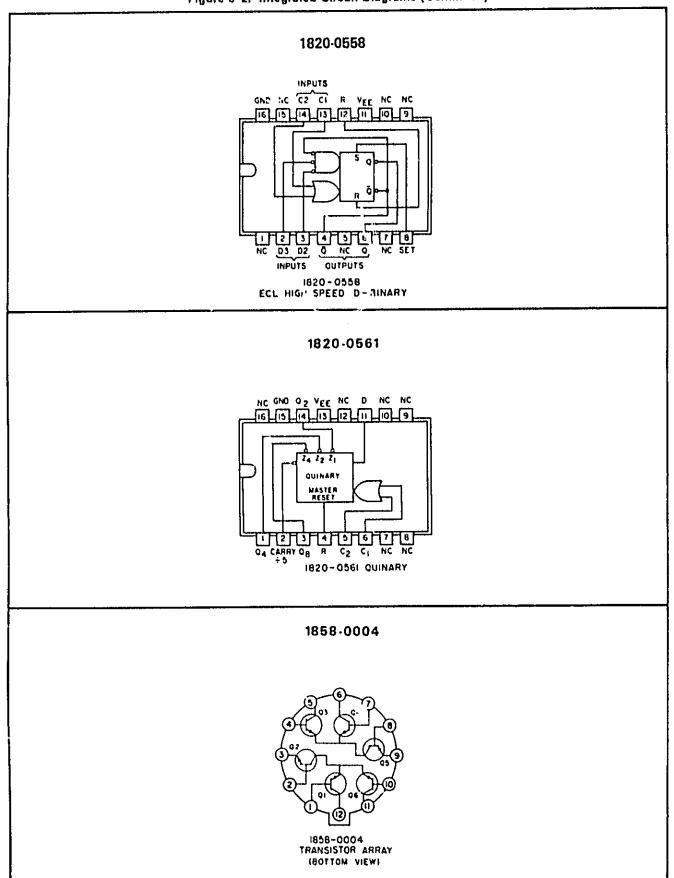


Figure 8-2. Integrated Circuit Diagrams (Continued)



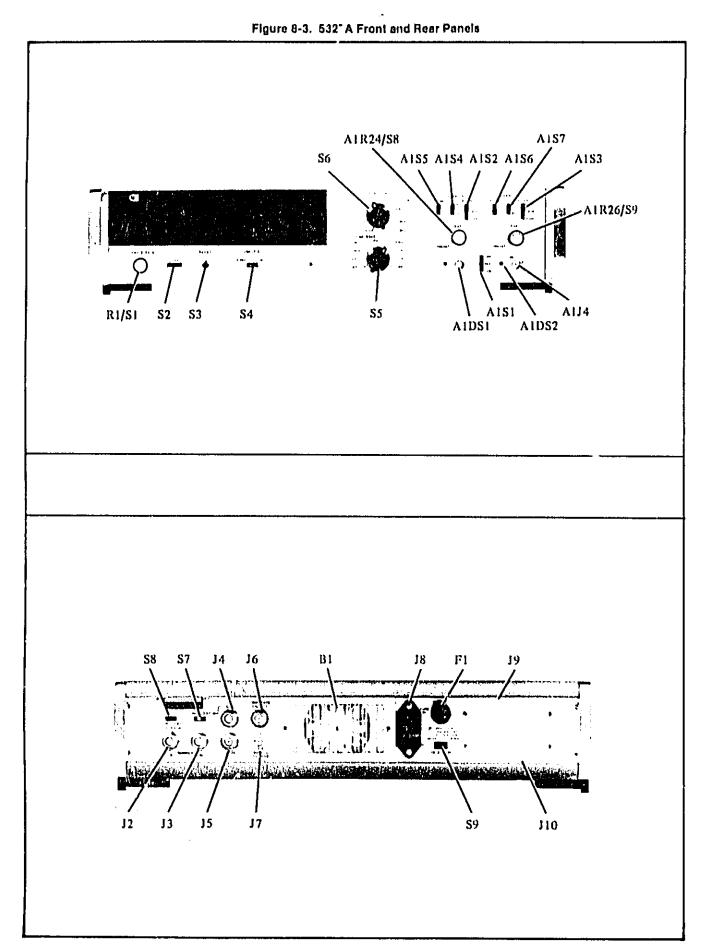
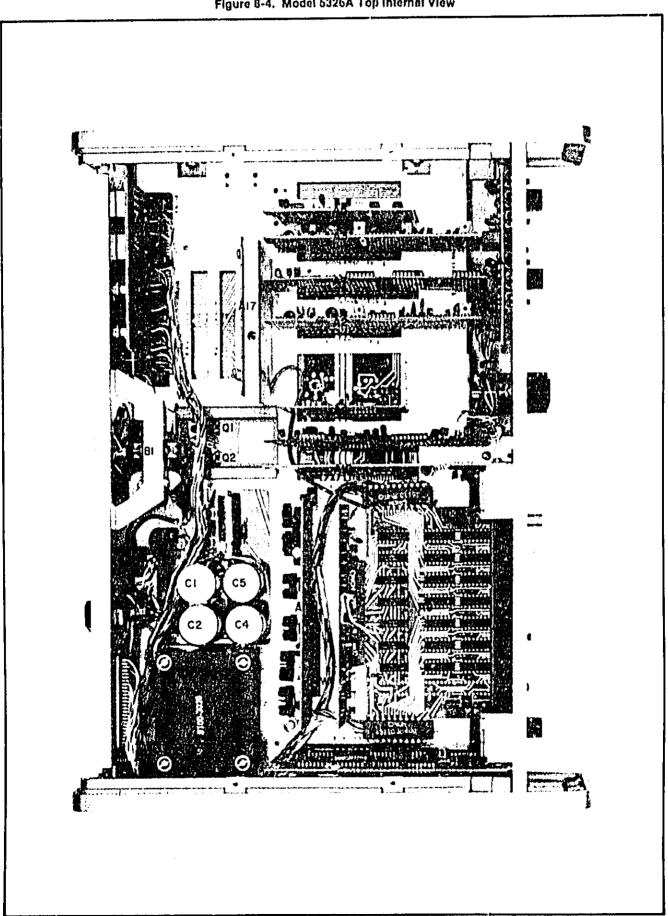


Figure B-4. Model 5326A Top Internal View



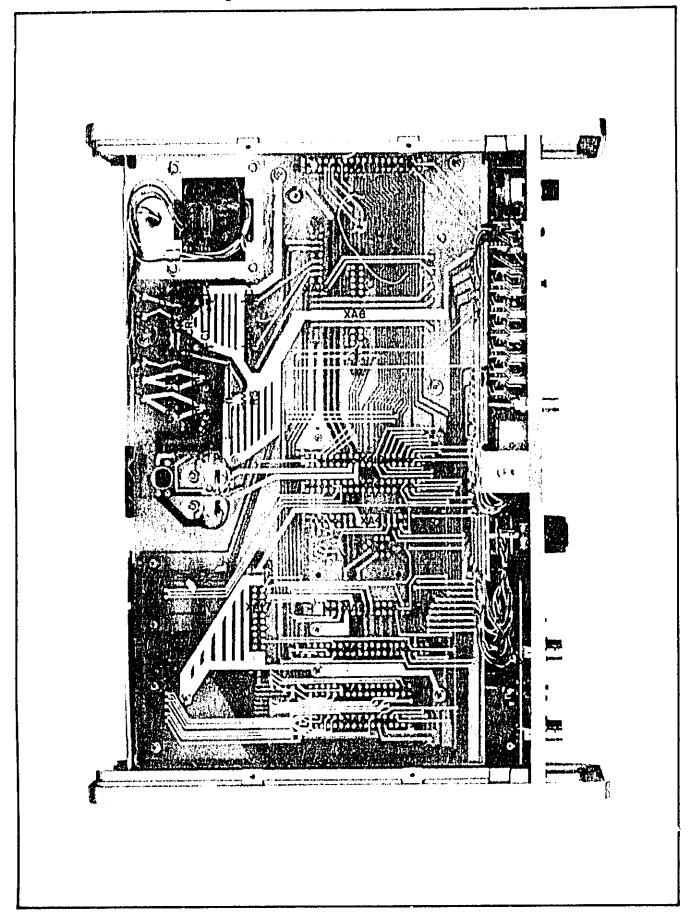


Figure 8-5, Model 5326A Bottom Internal View

### A1 ATTENUATOR OPERATION

Attenuator Assembly A4 consists of two input attenuator channels. Since the channels are identical, only Channel A will be described Channel A input signals are routed through J3 to the attenuator network. When ATTEN switch S2 is set to X4, the fell input signal is fed to the gate of Q1A. With the ATTEN switch in X10, R2, R5, C1, and C3 serve as a 10:1 voltage divider. In the X100 position, the 1604 divider consists of R2, R4, C1, and C2. R3 provides damping.

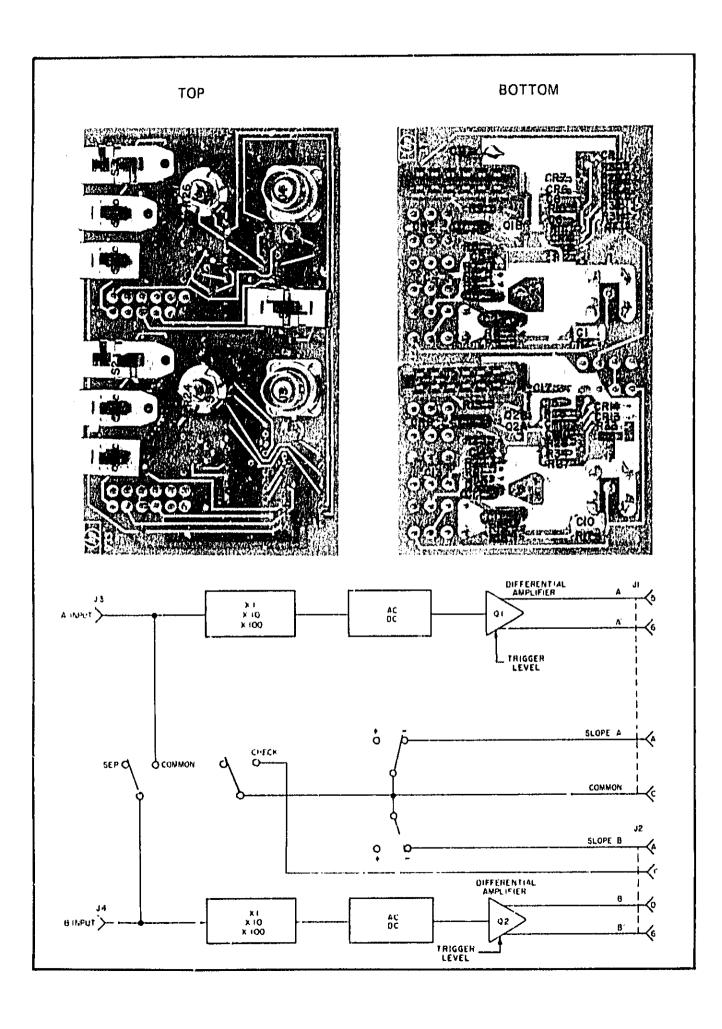
When AC DC switch S4 is set to AC, C4 is in series with the signal path. CR3 and CR4 limit the input amplitude to Q1A to approximately 45.8 volts. R7 and R8 provide current limiting. C5 compensates Q1A input capacitance.

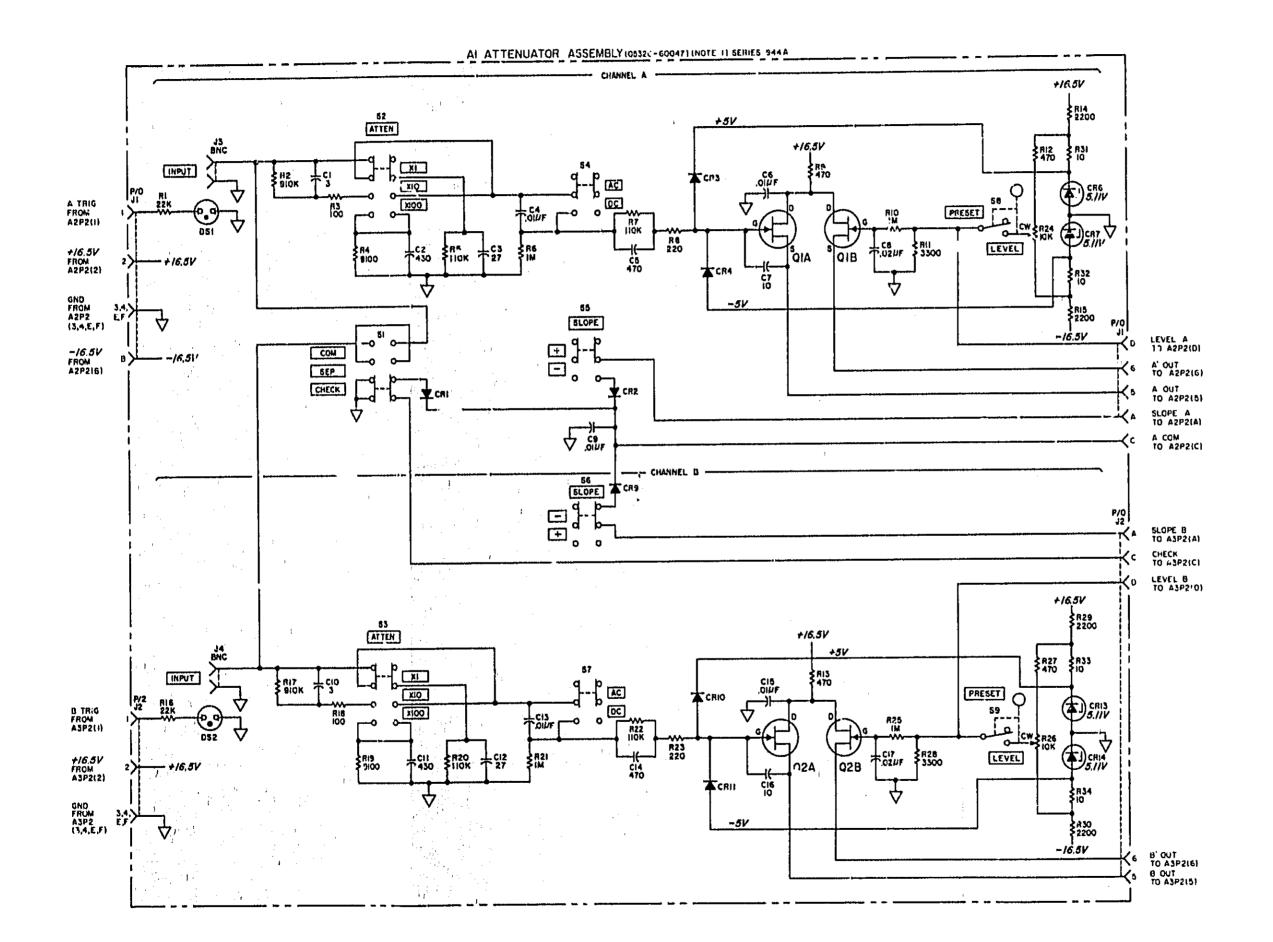
Q1A and Q1B form a differential amplifier connected as source followers. The outputs are fed to A2 via pins 5 and 6 of J1. LEVE1, potentiometer R24 determines the trigger level on Q1B gate. The trigger level can be preset to zero volts or varied from 3 to 3 volts, or with the LEVEL control set to PRESET, an external trigger level can be applied at J10 to A1J1(D) for remote programming. Diodes CR6 and CR7 develop 5 volts for the input protection and level pots. R12 adds symmetry to the voltage range of R24, R11 lowers the impedance of Q1B gate circuit to limit stray charges and false triggering. R10 and C8 form a filter to pre-ent noise from triggering the differential amplifier.

When SLOFE switch S5 is set to 5, a ground is supplied via CR2 to 41 pin A. This sets amplifier trigger A2 to trigger on the negative slope of the input signal. When remote programming is used, 41(C) is held high to disable the SLOPE switches and the CHK switch.

COM-SEP-CHK switch S1 connects inputs A and B in parallel when set to COM and grounds J2C) via CR1 for the check mode.

Al contains trigger lights DS1 and DS2 and current limiters R1 and R2.—CR1, CR2, and CR9 eliminate interaction of the remote programming signals.





### NOTES

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

## REFERENCE DESIGNATIONS C1 - 17 CI-17 CRI-4,6,7, 9-11,13,14 OS1,2 JI-4 OI,2 RI-34 SI-9

### TABLE OF ACTIVE COMPONENTS

REFERENCE DESIGNATIONS	HP PART NUMBERS		
CR1,2,9	1910 - 0016		
CR 3,4,10,11	1901-0376		
CR6,7,13,14			
01.2	1655-0334		

COMPLETE PARTS LIST FOR THE THIS ASSEMBLY IS LOCATED ON PAGE 6.3

Figure 8-6. A1 Attenuator Assembly

### A2, A3 AMPLIFIER/TRIGGER OPERATION

Two input amplifier assemblies are provided: A2 for Channel A and A3 for Channel B. Since the assemblies are identical, only one will be described. The input signal and the trigger level are received from A1 via P2O) and P2O respectively. Potentiometer R2 is adjusted to cancel out offset voltages due to imbalances in the circuit.

The differential amplifier (Q1 and Q8) serves to clip a small window out of the input signal waveform. The outputs of Q1 and Q8 drive another differential amplifier Q2 and Q6. Q2 and Q6 inject a current drive input to differential Schmitt trigger Q3, Q4, Q5, and Q7.

Q3 and Q7 are common base amplifiers, which present a low input impedance and high output impedance to Q4 and Q5. This arrangement allows for greater high-speed operation of Q4 and Q5. C2 and R15 reduce the hysteresis of the Schmitt trigger to give greater reliability at the high frequencies. Two out-of-phase signals from this circuit are routed to Q9 and Q10. The output levels shift from approximately +0.8 to +0.5 volts.

The SLOPE switch on A1 drives U(1D(11) low for a \*slope selection and U(1A(3)) low for a \*slope selection. This allows either the in-phase signal or the out-of-phase signal to be switched to Q(13) via Q(10) and Q(12) for \*slope or via Q(9) and Q(11) for \*slope.

The differentiator circuit consists of Q13 and feedback network L8 and R32. The circuit develops 10 ns pulses at the collector of Q13. CR3 and CR4 bias Q13 so that the collector circuit is compatible with ECL output driver U2B.

U2A(6) drives trigger-lamp driver Q16, Q17, Q18, Q19, and Q20. The circuit consists of RS FF Q16-Q17 and one-shot Q19-Q20. When U2A(6) is low, Q16 turns off and Q17 turns on. With Q17 on, Q18 cuts off to drive P1(1) high, which will light the trigger lamp DS1 on A1. As C8 charges, Q20 base goes positive. When Q20 base is approximately ground potential, the one-shot fires to turn off Q19 and Q17.

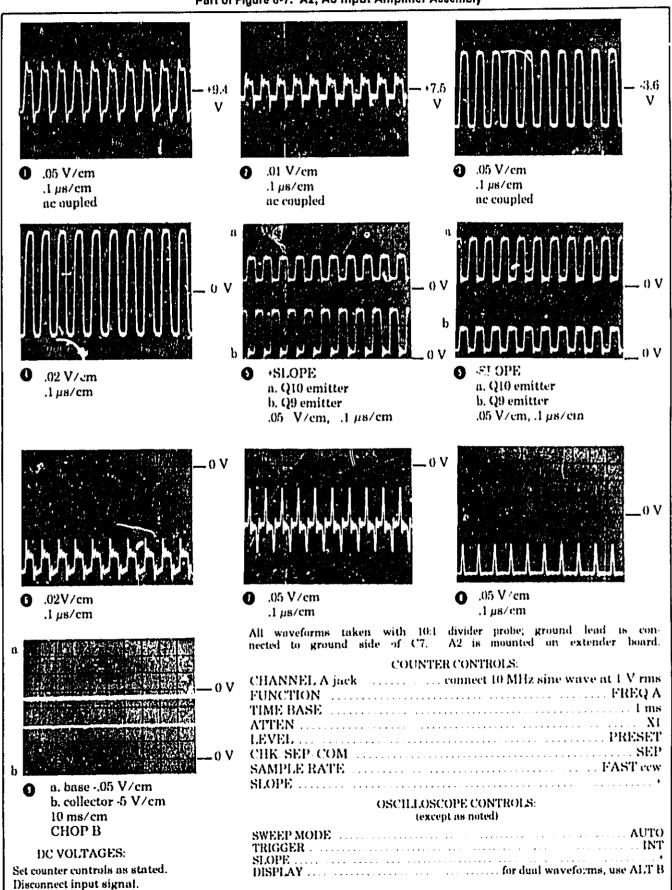
The marker circuit, Q15 and Q14, is a pulse stretcher that provides a low marker output at P1(12, N). When the input amplifies circuits trigger, U2B(8) provides a positive spike to Q14 base to drive Q14 collector below ground and allow CR5 to conduct. This makes the charge on C6 more positive. When U2B(8) returns to logical zero (approximately 4.6 V), Q14 is back biased and turns off, allowing Q15 to turn on to drive the marker output line low. After C6 has discharged through R36, Q14 turns on again, Q15 turns off, and the marker output returns to the high state.

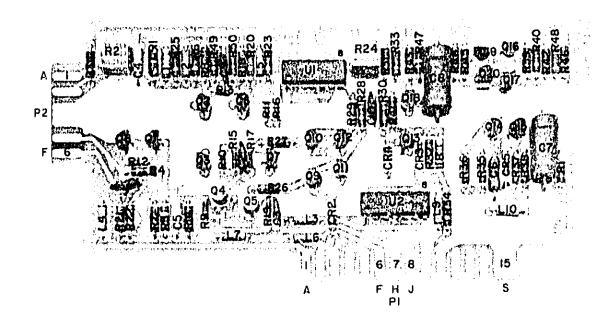
During the check mode, A1P1(C) is held high to disable U2B and enable U2A. With U2B disabled, the marker pulses are inhibited. With U2A enabled, the 10 MHz check signal at P1(4,D) connects to the amplifier output line P1(5,E).

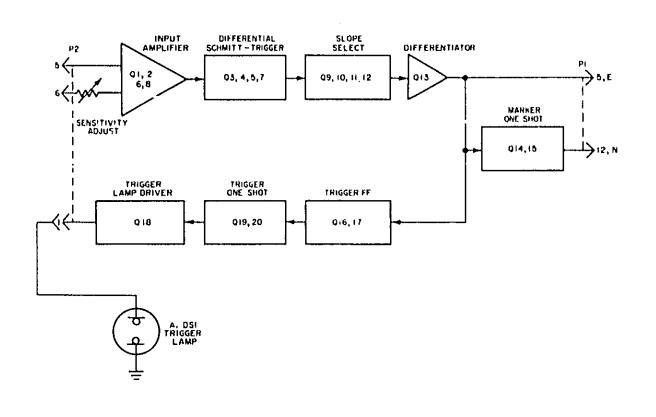
### A2 INCUBLESHOOTING

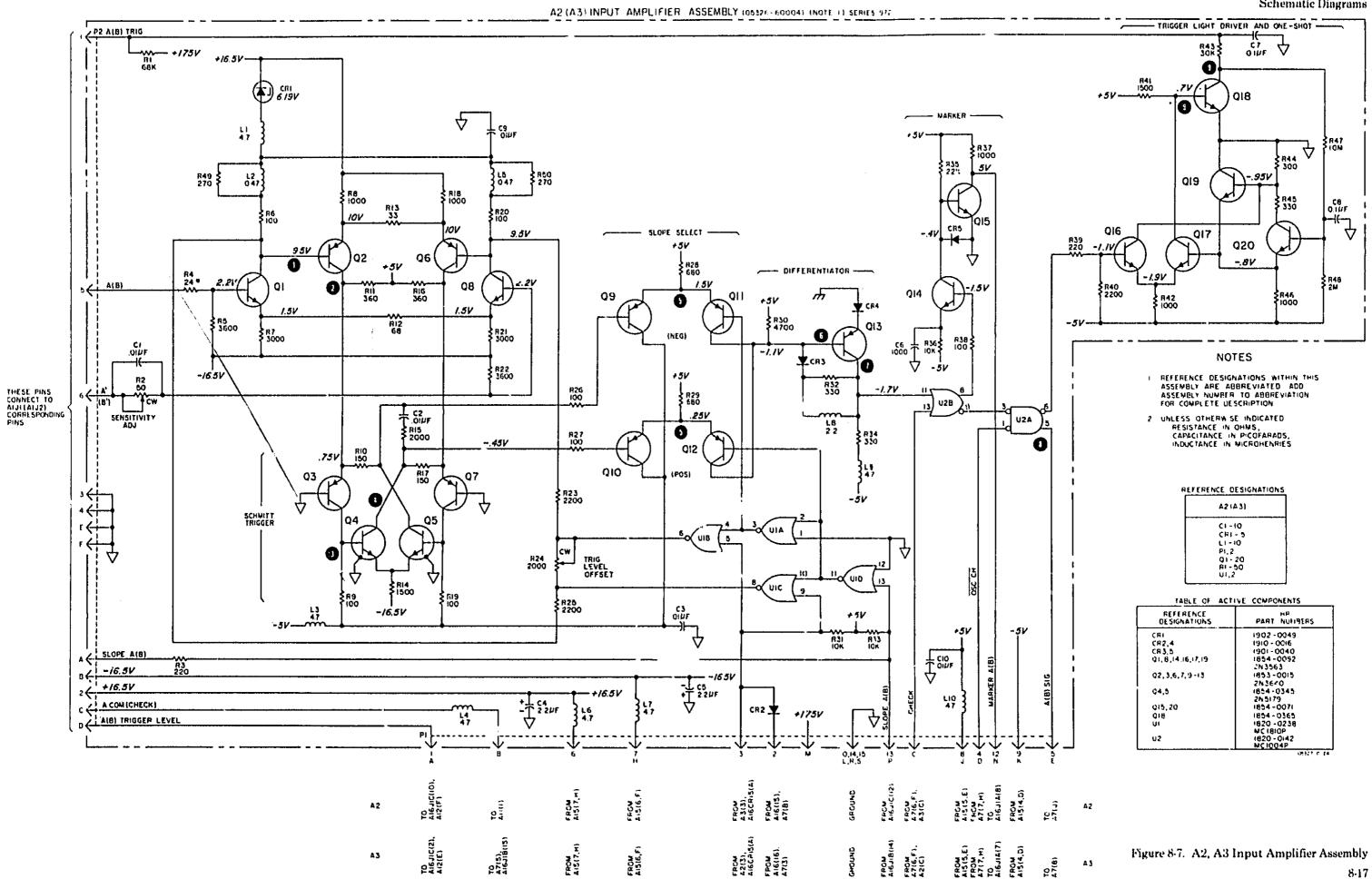
When tracing the signal through the amplifier assembly, a good starting point is the collector of Q4, test point 4. With a sine wave input and the LEV II control set to zero, this waveform should always resemble a square wave, due to the action of the Schmitt Trigger. A second check would be test point 6. If no signal is available there, check the slope gates of U! and transistors Q9-Q12. Make use of the waveforms that are provided on this page. Once the problem is confined to a general urea, us de voitage checks to pinpoint the trouble.

### Part of Figure 8-7. A2, A3 Input Amplifier Assembly









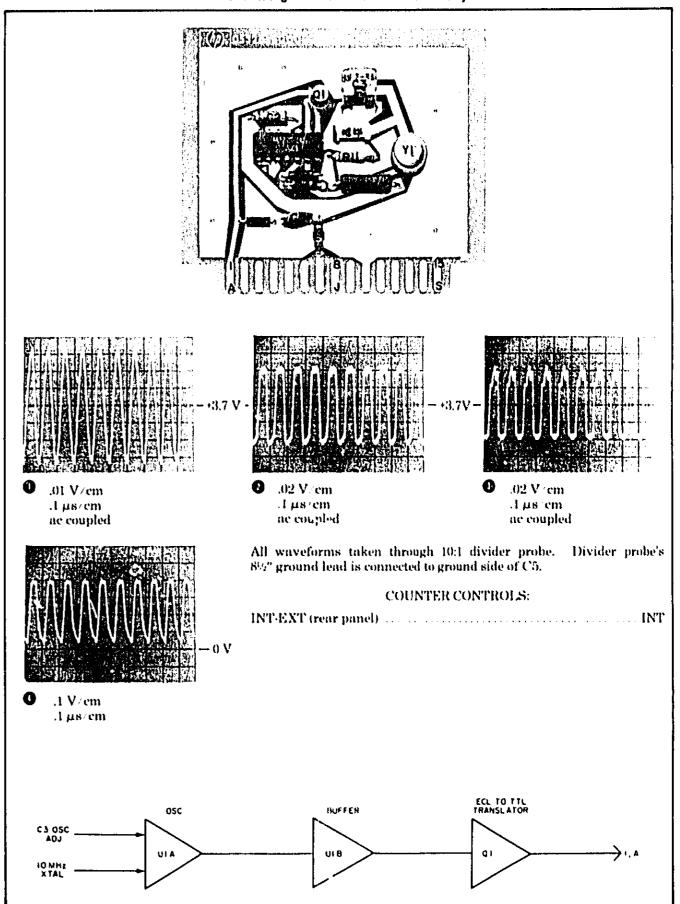
### **A4 OSCILLATOR OPERATION**

The 10 MHz oscillator assembly consists of oscillator U1A, buffer U1B, and level shifter Q1. U1A operates like an amplifier with positive feedback. The positive feedback path is from the noninverted output of U1A(6) through 10 MHz crystal Y1, trimmer capacitor C3, and C4 to U1A(4). Negative feedback is used to establish the input bias for U1A. The negative feedback path consists of R1 and R2. The inverted output of U1A(5) connects to buffer U1B(10). The buffer provides isolation between the oscillator and the output. The outputs of U1B(8) and (9) switch from approximately 3.5 to 4.25 volts. When one output is 3.5 volts, the other output is 4.25 volts. Level shifter Q1 converts the output of U1B to an approximate square wave of 0 to +4 volts.

Figure 8-7
A2, A3 INPUT AMPLIFIER ASSEMBLY
(See Page 8-17)

Model 5326/27A Schematic Diagrams

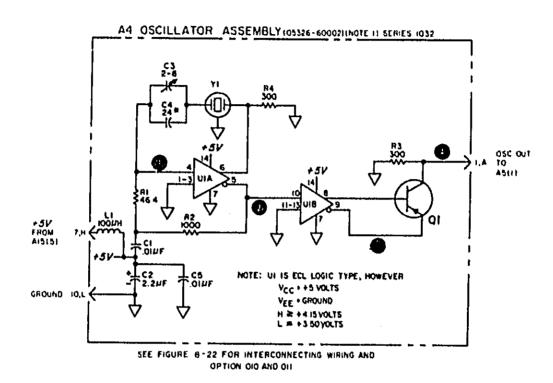
Part of Figure 6-8. A4 Oscillator Assembly



8-18

MORE DATA UNDER THIS FOLD

Figure 8-8. A4 Oscillator Assembly



### **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; INDUCTANCE IN MICROHEMRIES
- 3 ASTERISK (\*) INDICATES SELECTED COMPONENT, AVERAGE VALUES SHOWN

REFERENCE DESIGNATIONS				
A4				
C1-5 L1 Q1 R1-4 U1				

REFERENCE DESIGNATIONS	HP FART NUMBERS
<b>3</b> 1	1650 - 0/56
	2N2635
J1	1820-0142
ri	0410-0405

===<u>:</u> 1100

**3**| | | |

### A5 TIME BASE OPERATION

1 10 1 1

This assembly contains 8 decade dividers, which are controlled by TIME BASE switch S5. The input signal is 10 MHz for the frequency mode. For the totalize and period average modes, the decade dividers receive CHANNEL A signals.

When a particular decade receives a gate-enable signal the corresponding gated output line is enabled. For example, if S5 is set to .1 second U1(6) is grounded. This gates the divided signal out on U1(5). The gated outputs are connected together on a common line to C5. C5 differentiates the high to low transitions into approximately 100 ns pulses at U5C(8). When S5 is set to .1 µs, the input signal bypasses the decade dividers and passes through U10D and U5D. The output of U5C feeds through U10C to A7 and also through U10E to the rear-panel TIME BASE OUTPUT jack J6.

Q1 and Q2 form an ECL to TTL translator. When the main gate opens flow is main-gate enable), Q2 turns on the start one-shot Q3/Q4. During short gate-length times, this holds the gate lamp enable line low for approximately 50 ms to extend the time the gate lamp is on. When Q1 collector goes high, a low is developed

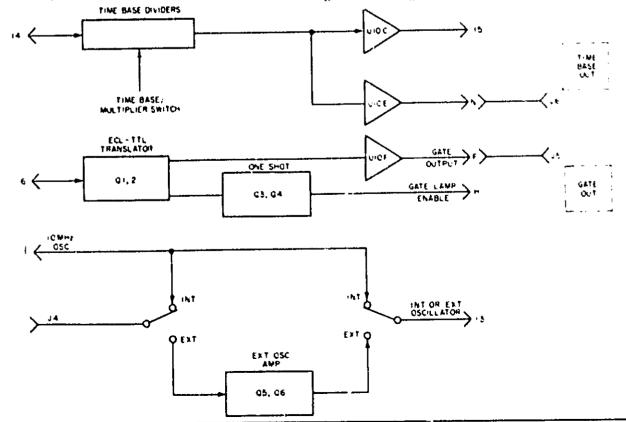
at U10F(12) and routed to the GATE OUT jack J5.

U5A and U5B select either the internal or external oscillator signal. When S7 is set to EXT, the internal oscillator signal is inhibited and the external oscillator signal passes through Schmitt trigger Q5 and Q6 to U5B and XA5(13).

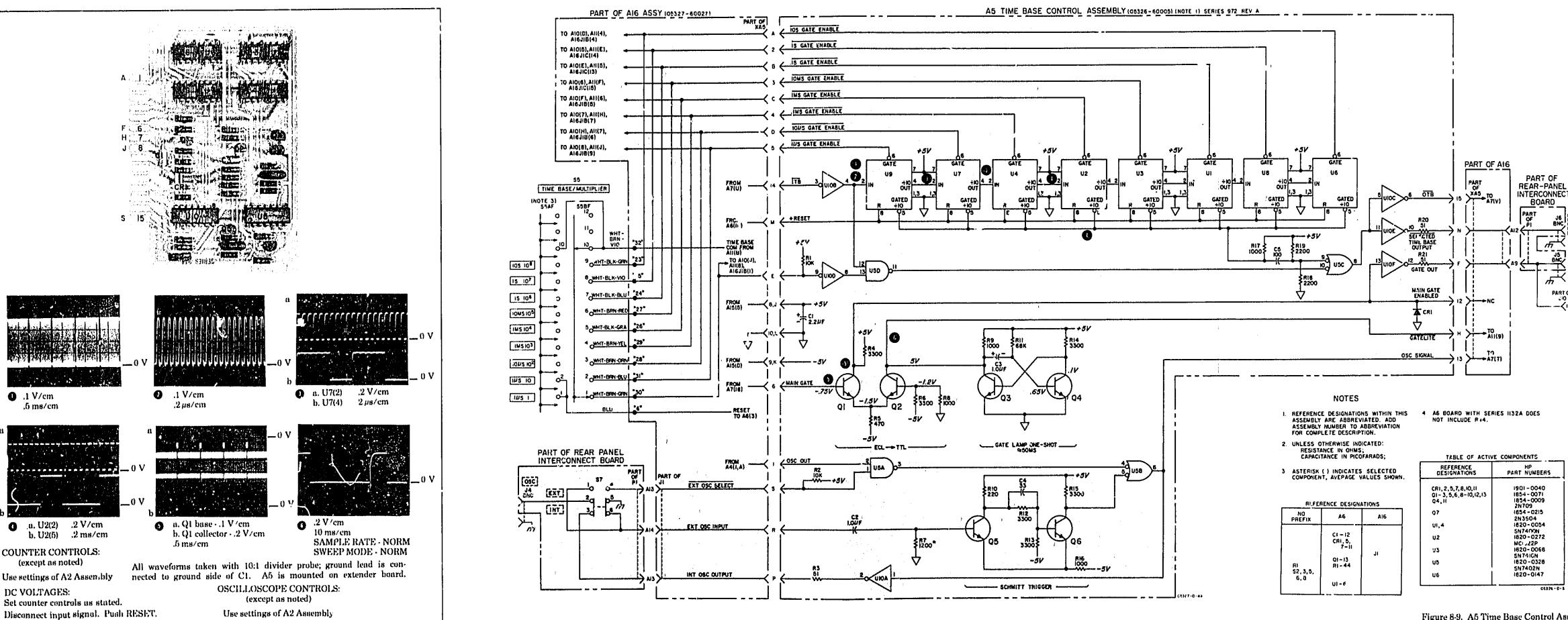
### Ab TROUBLESHOOTING

When troubleshooting the Time Base Dividers, place the FUNCTION switch to START and SEP/COM/CHK to CHK, Step the TIME BASE switch through each position and note the When the counter stops counter's display. totalizing, check for a low on pin 6 of the If the counter does not selected decade. totalize for any position of the TIME BASE switch, the problem is in the circuitry of U10B, Before the gated output is U10C, or U5C. sent to the A7 Function Control, it is dif-Grentiated by C5 and R18. This produces extremely sharp pulses, which are best observed when the gate time is 0.1 µs (TIME BASE switch).

To check the operation of the Gate Lamp oneshot, check for waveform 5 and 6 with SAMPLE RATE switch to NORM. The Collector of Q3 should be Low for about 50 ms, regardless of the gate time.



PART OF



...

\_

### A6 SAMPLE RATE OPERATION

The sample-rate circuits determine interrogation rates for the input signal and provide several functions for the various operating modes. These functions include generating reset, transfer, print command, and main-gate inhibit signals. In addition, the circuits receive computer inhibit, printer inhibit, and manual reset signals. The circuits also serve to control storage and display-hold functions.

As an example of operation, assume the following operating conditions: STORAGE to ON, SAMPLE RATE to FAST, no printer inhibit, no computer inhibit, no manual reset, and main gate open. At the end of the gate time, Pin 17 goes high, which sets inhibit flip-flop U2. This sends a signal to U6C to gene ate a high inhibit at U6B(9). In addition, a low is generated at Q4 collector to trigger the sample raw one-shot if no printer inhibit is present at U5B(6). The display time starts at this point, and the high at U5C(10) generates a low at U1D(11). The resulting high on U1C(8) turns on Q6, giving a low at the collector, which is the print command. Also at this time, the low on U1B(6) activates U4C through differentiator C5 to generate the positive and negative transfer signals at pins T and K, respectively.

When the sample rate one-shot is set, U1B(6) goes low to turn off Q7, allowing the \*5 V supply and R41 - R1 to charge C4 for the display time. C3 is also connected for the NORM position. R1 varies the display time by varying the time required to bring Q8 base to a sufficient plus value to trigger Schmitt Trigger Q8 through Q10. This gives a high at U1A(1). The reset will be delayed until there is no print inhibit. U1A(3) will go low, generating a high at U3B(6), which is fed out at A6(46). The negative reset at U3C(8) is fed out at pin 9 in addition to being used to reset the sample rate one-shot.

The positive reset is used on A6 after passing through level shifter CR7 and CR8. The positive reset turns on Q1 and applies an ECL high to clear U2 and also turns on Q2, which maintains inhibit approximately 200 ns after the end of the reset pulse. At this time, the inhibit goes low and the main-gate circuits are free to function.

Q11 circuitry is a reset one-shot that ensures a sufficiently long reset pulse. The reset pulse width is approximately 40  $\mu$ s or 400  $\mu$ s, as determined by the FAST/NORM switch. For NORM sample rates. S2 switches C10 in parallel with C8. The sample rate disable line (ans 10, L) is low during START mode and maintains continuous transfer through CR3 and prohibits main-gate inhibit through U4B in addition to holding down Q8 base through CR2. This prevents the reset from being generated.

When STORAGE is OFF, U5A is activated to maintain transfer through CR4. The manual reset (pin 3) holds the reset one-shot in the ON state as long as the RESET button is depressed treset low). It also maintains the transfer during the same time to clear the display. In addition, it turns on the main-gate inhibit, even if the main gate is open. The manual reset signal is low if the RESET button is depressed or if the TIME BASE or FUNCTION switch is between positions. (No reset is generated between start and stop positions.)

### A6 PROUBLESHOOTING

Troubleshooting the Sample Rate board is best accomplished when the board is in a static state. The procedure given below examines each section separately when the circuit is in a working, but static, condition. Perform the tests in order listed. The schematic shows the circuit levels after RESET is pushed. These levels should be used as a reference.

### NOTE

Do not use an input signal when performing the tests below.

MAIN GATE INHIBIT, PRINT COMMAND DRIVER, and SAMPLE RATE ONE-SHOT. Before troubleshooting, perform the procedure below.

FUNCTION switch	FREQ A
TIME BASE switch	1 s
SAMPLE RATE switch	. HOLD
SLOPE switch	
CHK/SEP/COM	SEF
STORAGE switch	ON
LEVEL control	full ew
Push RESET	
LEVEL	
(Note that trigger lam	ip fires)

The purpose of this procedure is to set these circuits to the point immediately after the main gate closes. Varying the LEVEL control triggers a pulse to open the main gate for 1 second, and pin 17 goes Low during the gate time. U2 sets when the gate closes (positive transition) and remains set with the SAMPLE RATE twitch set to HOLD. Once U2 sets, check for a Low on U5C(8). This generates a High on U1C(8) and a Low on U1D(6). Check that U4C(8) pulses High and Q6 collector sets Low. The main gate inhibit line at U6B(9) should now be High. The collector of Q7 is not now affected.

SAMPLE RATE INHIBIT. The sample rate inhibit gates are controlled by the FUNCTION and STORAGE switches and by a print inhibit signal. With the controls set as above, check for the levels shown on the schematic.

SCHMITT TRIGGER. The Schmitt Trigger and Q7 should be checked by using an input signal. Set the counter controls as listed under the waveforms. In waveform five, the repetition rate of the pulses changes with gate time, but pulse width remains the time. Pulse width changes with the SAMPLE RATE controls, but not spacing.

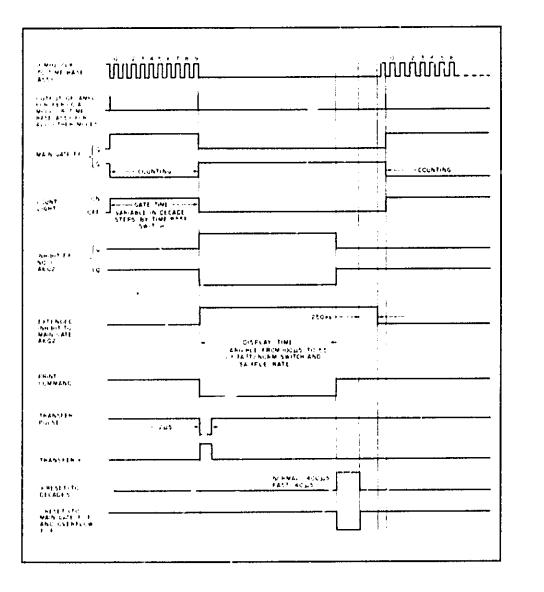
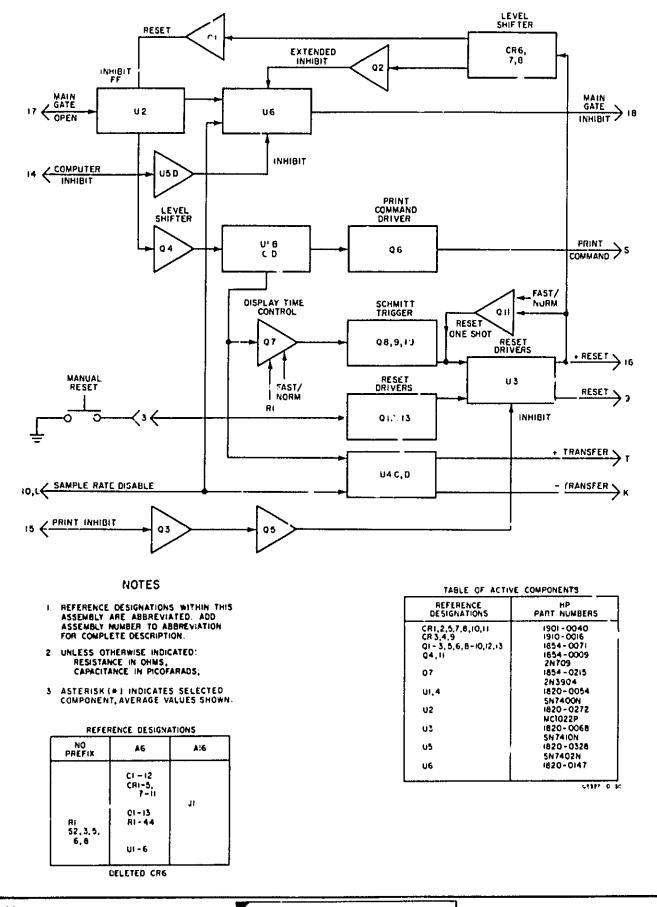


Figure 8-9
A5 TIME BASE CONTROL ASSEMBLY
(See Page 8-21)

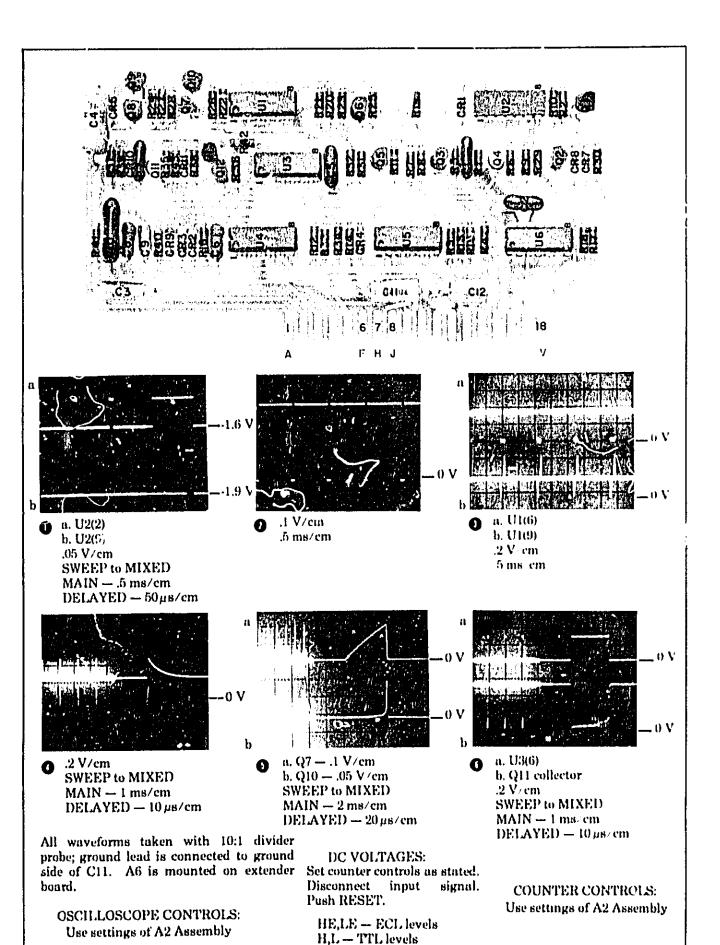
Model 5326/27A Schematic Diagrams

### Part of Figure 8-10. A6 Sample Rate Assembly



8.22

MORE DATA UNDER THIS FOLD



PRINT COMMAND NEGATIVE RESET (TTL) 9 TO AILINI --- RESET ONE SHOT-MAIN GATE INHIBIT (HIGH . ) (1)7A OT 51 CONNECTOR PART OF AIG CONNECTOR BOARD PRINT COMMA DRIVER --m C3 22µF SAMPLE PATE (-.7 · OFF)
POSITIVE RESET (OV · RESET) POSITIVE RESET (TTL) FUNCTION 100 SAM (510P) ₩ 190 U5C )10 4 [37km] POSITIVE RESET TO AS(M), ASPI(B), ASPI(H) FROM ANGE FRE(AF 163 ( 52) 5 U5B) SAMPLE RATE ONE SHOT FROM 2(0134) P/O 55 HASE STORAGE ON C9 1,0µF FROM ABIDT FROM AISIS, ET FROM A1512, 3, B, C1 FROM AI5(4,0) MANUAL RESET

A6 SAMPLE RATE BOARD ASSEMBLY 105326-600131 (NOTE 1) SERIES 10364

SAMPLE PATE HOLD

Figure 8-10. A6 Sample Rate Assembly

### A7 FUNCTION CONTROL OPERATION

This assembly contains the gating, flip-flops, one-shots, and translators necessary to interconnect the oscillator, time base, and input channel signals to the time base and decade counting assemblies. Table I lists the functional interconnections for each function of the counter.

An example of the operation in the FREQ A mode will explain the typical circuit operation. This wi' be expanded to the other functions. Assuming the start of a new mea. Sement, main gate inhibit (pin 17) has just gone low (at the end of the play time). Upon the arrival of the first subsequent change! A input annel A flip-flop sets, making U5B(9) High. Upon the acres to using each of the oscillator signal (pin T. TTL levels; U8B(4) Et ! levels), U5B sets and arms the oscillator gate U3A. The gated oscillator signal is then connected to the time base input one-shot U4, why therates 50 ns, negative-going pulses to time base input (pin U).

The time base will return a puise upon receipt of the 1st and Nth pulse delivered from pin U (N = multiplier setting on front panel). The 1st pulse arriving at pin V is translated from TTL to ECL by U8 and then goes on to toggle (set) main gate flip-flop U1. This opens the main gate (U13B), and the decade counting assembly counts the signal (in this case, input A - see Table I). Upon the arrival of the 2nd time base output pulse, U1 toggles closed, shutting main gate U13B and signaling A6 to start the display cycle (pin 18). A6 returns a High MINH (pin 17) and the main gate flip-flop U1, synchronizer U5, and ITB one-shot U4 are locked closed at the end of the display. MINH goes low and the cycle repeats.

Continued

In the period mode, the main gate F-F U1 is toggled by the input A signal so that it is set for exactly one period of A. The counted signal is the oscillator dicided by the MULTIPLIER switch setting.

In period average, the input A signal goes to the time base, which generates a pulse on the 1st and Nth pulse. These pulses toggle the main gate, and the oscillator is counted during N periods of A.

In START, the main gate is held open and the input signal, which is scaled by the time base, is counted. The FREQ C operation is the same as FREQ A, except that the input synchronizer U5B is held on by U10. IC's U2, 3, 7, 8, 9, 10, and 12 are combination TTL/ECL translators and data switches. The function inputs (FREQ A, FREQ C, etc.) are TTL low true and are pulled up by internal 10k-ohm pullups on the translators. U8(3) is the check signal to Amplifier A2 and A3. In normal it is low; while in check, it is high with negative 10 ns pulses

In time interval, the operation is similar to period, but U1 is set centinuously. MGATE OUT (pin 18) is now controlled by the output of U5B. The following explanation describes how the synchronizer U5A and B works in a time interval mode.

Assuming a display cycle has just been completed, the flip-flops formed by U11 and U6 and U5 sections have been reset. Two conditions can occur.

First — If a channel A signal occurs before a B signal, the A signal will set the channel A flip-flop before the B sets the B flip-flop (see Timing Dingram). When the first leading edge of the oscillator occurs after the A.F.F is set, U5B is set, opening the clock gate and instructing A6 that the measurement has started (pin 18). The oscillator signal goes to the time base and is divided, returns, and is sent out through the main gate to A8 for subsequent display. When the B signal occurs, the leading edge of the next clock pulse sets U5A, closing the clock gate.

The U5A  $\overline{Q}$  low signal goes back to U6(11) and waits about 50 ns for the falling edge of the oscillator. At this point, U6(10) goes high, resetting the A and B flip-flops, putting lows at the D input of U5A and B. When the clock pulse again rises positive, U6(10) goes low (about the 10 ns after the clock edge) and U5A and B are closed to the "cleared" state.

Second — If a B signal occurs before an A, U5A would be set first, and no counting would occur. Also, it would take about 150 ns for U5A to complete the resetting described above; so if an A signal occurred during this time, it would be ignored. If the B-to-A delay is >150 ns, the A signal would start the interval as described above.

With time interval averaging, the input synchronizers work the same way, but the oscillator (not divided) is counted for the duration of each individual time interval that is being averaged. The first input A signal sets flip-flop U5B, which enables U3A to gate an oscillator pulse to the time base dividers. The dividers are now set to zero, from their previous reset-to-nine state. During this time, a channel B signal was received to complete the first time interval; but this first interval is not counted, since the main gate was closed. The time base output pulse enables the main gate to pass clock pulses for the duration of the time interval. After N intervals, the time base returns a pulse to close the main gate.

Table I. Functional Interconnections

FUNCTION	MGFF TOGGLE	TO DCA	ITB
stop	()	отв	0
START	1	OTB	IA
FREQ A	отв	IA	GOSC
FREQ C	отв	IC	GOSC
DVM+RA+RB	отв	IV	GOSC
PERIOD	IA	отв	GOSC
PERIOD AVG.	ОТВ	GOSC	1A
T. I.	1	отв	GOSC
T. I. AVG.	отв	GOSC	sti

DCA - Decade Counting Assembly

GOSC - Gated Oscillator

IA - Input A Signal

IC - Input C Signal

ITB - Input to Time Base

IV - DVM V-F Converter Output

OTB - Output of Time Base

STI - Synchronized Time Interval

Model 5326/27A Schematic Diagrams

### Timing Diagram for Time Interval Measurements

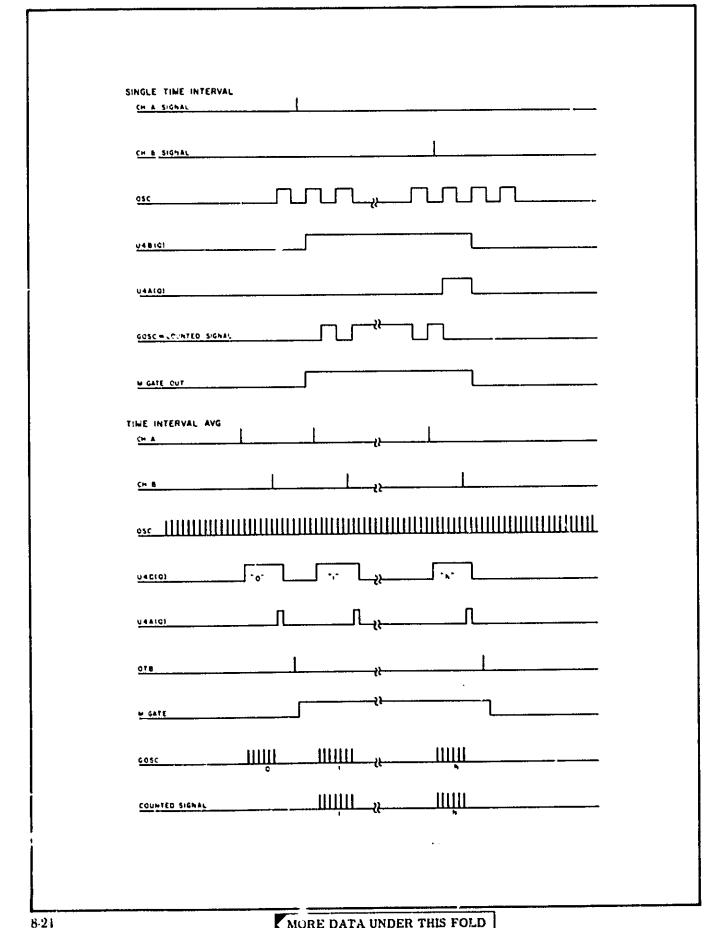
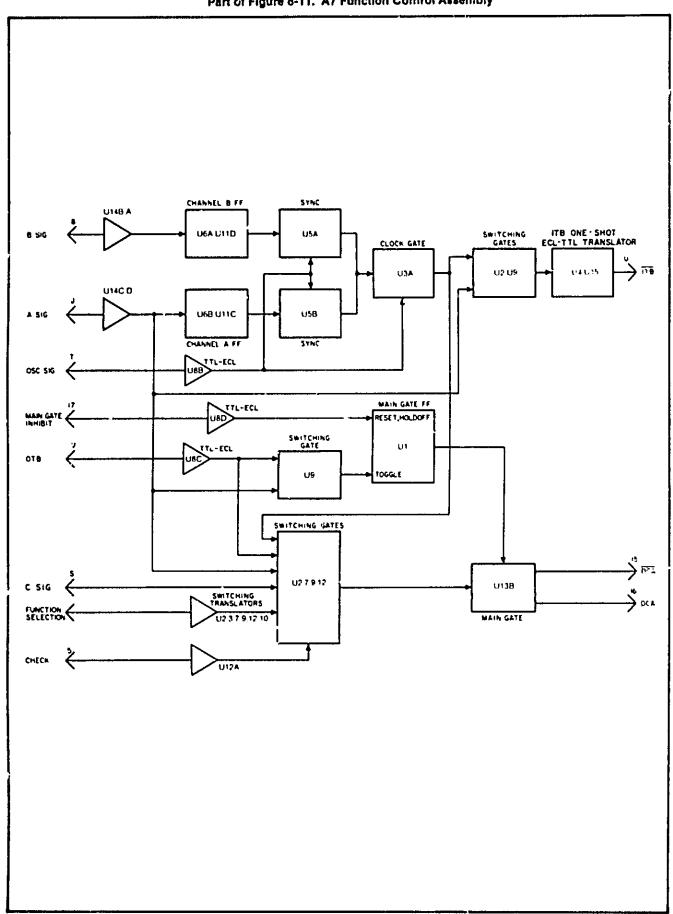


Figure 8-10 A6 SAMPLE RATE ASSEMBLY

(See Page 8-23)

MORE DATA UNDER THIS FOLD

Part of Figure 8-11. A7 Function Control Assembly



# SECTION VI

### 6-1! INTRODUCTION

- 6-2. This section contains information for ordering replacement parts. Table 6-1 lists parts in alphanumerical order of their reference designators and indicates the description and HP Part Number of each part together with any applicable notes. The table includes the following information.
  - a. Description of part (see abbreviations below).
- b.. Typical manufacturer of the part in a fivedigit code; see list of manufacturers in Table 6-2.
  - c. Manufacturer's part number.
- d. Total quantity used in the instrument (TQ, column).

6.3. Miscellaneous parts are listed at the end of

### 6-4. ORDERING INFORMATION

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

		. 我就会 * 2011 (2012) - 20	A Company	r sa again again sa sa sa sa sa sa sa sa sa sa sa sa sa				11111
1	ri e			REPERENCE DE				
	A	assembly	. <b>j</b>	fune filler	MP .	mechanical part	1 <b>1</b> 9 1	integrated elecution
١,	BT	motor battery	ic.	integrated circuit	Ö	translatur		bulli, phylocell, etc.,
'	' č' 's	tapacitor	. j	lack	ÎÎ.	resistor .	Vn,⊃, ± №	voltagi yiyotator 👑 🔻
	CP	coupler	K	relay Inductor	RT	thermidbr <sup>2</sup>	W ' '	cable aucled
	· Cir · S	diode delay line	i.s	loud speaker	- F	transformer	ti <b>v</b> î (: ∫î	crystal + 181
1		device signaling (lamp)	M	meler	TB *	terminal laurd 1	2	funed cavity.
1	E .	mise elegaronic part	MK (1867) 14	microphone >	, TP . •	lest point		network
L			, , , , , , , , , , , , , , , , , , ,	ABBREVIA	TIONS			
1.								
ď	A men / le	amperes automatic frequency control	HDW .	henries hardware	NOM *	normally open y	RMO	rack mount only
Ί.	APC *	amplifier	REX .	hermonal	סינא -	negative positive sero	RWV	reverse working
ŀ,			HG *	mercury 1		teero temperature	•	miliage .
	nro :	beat frequency oscillator	BR '	hour(a)	พ่าห	coefficient)	B-11	klow-blow
1	BE CU *	beryllium copper	NZ ·	shëria :	PILO.	hegative positive	BCR -	screw
۱.	DP .	banduans	17 - +	Mermediale freq	NRFR -	not recommended for .	SE BECT	sedenium" sectionis
1.	nius =	brass backward wave oscillator	IMPG /	Impregnated	1	field replacement	BEMICON .	semigonductor*
1	IIMO	backward wave oscillator	INCD .	Incandescent include(s)	NSR •	rod acparately replacement	81	allicon
١.	CCW .	imenter-clockwise	INS .	insulation(cd)	ono s	order by description	6iL i∗.	aliver
١,	CER	ceramic,	INT	internal	י ווט	urger by acacripsion .	SPG -	euring
Ŀ	CMO	cabinet issual only coefficient	, k	. kUia, = 1000	OX .	oxide .	bpt.	apecial
V	COM	contine	ui .	left hand	. p	peak	SST BR	stainless steel
l:	COMP	composition	LIN	linear lagier	PC 3	printed circuit	BTL	ates
K	COMPLY	complete	LIK WASII* +	lock washer logsrithmic taper	PF ' ' "	picularada 10-12	TA	tantalum
٦	CONN	cadmium plate.	LPF	low has filter	PH DRZ -	phosphor bronzes	11)	time delay
١.	citi	cathode-ray tube	. 71 - 44 9		PIL,	Phillips	roi	toggle ,
ľ	CW •	clockwing	MEG	milli = 10-3 meu = 106	PRP	peak inverse voltage positive-negative-	THID : *	thread (Hablum
*	DE	deposited carton	MET PLACE	med a lilm	P. 9. P.	invertifie	าวเ	Interance
١.	DRV:	drive	MET OX	्राष्ट्रकेश्वीद oxide 📜 🗓	P/O <sub>L</sub>	part of	TRUM	trimmer, i
2	ELECT	electrolytic / / /	) MFR 💥 🖓	manufacturer	POLY	polystyrene.	י דאור י	traveling wave tube
1	ENCAP A	encapablated	MHZ* MINAT	mega herta	POS	postion(s)	n n	emicro10°
	EXT	external.	MOM	nsomentary	POT	gotentiameter. 😘 🔥	VAR -	variable.
1,.	* /i	farada (1974)	MOS .	metal ozide substrate	i pp	peak-to-prat 4	VDCW **	da working volta
	FILH *	fillighter filendy	MY	mounting mylasi	PWV	point the policy of age	w	with
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3	G S	ulga (109) 11 States at 12 2	* N 111	nami (10-9)	RECT	rectifler	WIV	working inverse
<b>!</b>		germantum		normally closed 🧰	ix ne 👫	radio frequency round head or	uw /	voltage historiad
$i_1$	OL	glass ground(ed)		neon nickél plate	i in	right hand	W 10	without 5
4			314	Manage Breat	3 - 1 - 1 H	3		
.0	0(104-14							
1		1.特人所以"阿尔特斯"的"特"	A	建原物 医多生性	, P	7.1.2 产品((生物))指示。	Quality 1	38.75 J 275 J 3 435

Table 6-1, Replaceable Parts

ILOADED ON 05526-20003 RLSHK SQARD1   ILOADED ON 05526-20003 RLSHK SQARD1   ILOADED ON 05526-20003 RLSHK SQARD1   28450 O160   28450	ra-hoùos 
AICP 0160-0939 1 2 CI FND MICA 930 PF SE 300 VDCW 24480 0160	1-2244
AIC4	0-0919 15E270J55
ALCA GIAG-2144 CIFRO CEPRO CER OLUZ UF +80-208 LOOVOCH 91410 FA	110392-015
ALCIS OLOG-0378 CE FRO NICA 27PF SE DOU VINCH 28480 TALISA PONI	)-2244 1-0939 1-56210355 #
AICLA 0140-2140 CIFKO CER 470 PF *80-20E 1000VDCM 91418 74 1016 0140-2990 CEFRO CER 0.01 UF *80-20E 100VDCM 91418 74 1016 0140-2140 CEFRO HICA 10 PF 3E NO VINCW 72136 PONL 7117 0140-2140 CEFRO CER 0.02 UF *80-20E 100VDCM 91418 74 1016 0140-2140 CEFRO CERMANIUM 100MA/0.659.60P(V 93332 D236	schoolse
MCR6 1902-0041 4 0100E:BREAKDONN 5-11V 5R 28480 04713 5210	1 -0374 -0374 -0374
AICH13 1902-0041 0100E1BREAKDOWN 5-11V St	; -0374 -0374 -0374 939-98 939-98
ALTE . 1251-0472   E. CONNECTORIPC 12 CONTACTS   71783   252-	06-10-100 06-10-100 -1161
#134   1250-1163   COMMECTORERF BNC INPUT   28480   1250-1163   1895-0334   2   TSTRIST FET DUAL N-CHANNEL   17856   0037	2)5
#### #################################	125 -3576 055
AIRB 0683-225 % 9 REFRD COMP 220 DEM MCARAN 0121 CR 22 AIRB 0685-6719 9 REFRD COMP 470 DEM CARAN 0121 CB 47 AIRB 0685-6719 9 REFRD COMP 470 DEM CARAN 0121 CB 47 AIRB 0685-8325 29 REFRD COMP 3100 DEM SE 1/AM 01121 CB 31 AIRB 0685-6715 3 REFRD COMP 370 DEM	715 055 125
######################################	225 225 235
Alara	015 125 -3576 955
######################################	21 5 - 2 105 05 5 - 2 105
######################################	125 125 125

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Table 6-1. Replaceable Parts (Continued)

Referènce Désignation	HP Part/Number	· aty d	Description	Mfr. Code	Mfr Part Number
AIRSA 1 AIRSA AISA 14 AIS2 47 AIS31 14	0683-1005 0683-1005 1101-1313 3301-1279 3101-1279		NIFED COMP TO DIM SE 1/AW "NIFED COMP TO DIM SE 1/AW SWITCHISLIDE DPS 7 J. DA 125V AC/DC SWITCHISLIDE DP 3 POSTTOMS BMITCHISLIDE DP 3 POSTTOMS	01121 01121 79727 79727 79727	Callons Callon Callons Callons Callons Callons Callons Callons Callons Callons
	3101-1311 3101-1378 3101-1378 3101-1311		SWITCHESLIDE DPDT 0.5A 125V AC/OC SWITCHESLIDE DPDT 5WITCHISLIDE DPDT 5WITCHISLIDE DPDT 0.5A,225V AC/OC PART OF R24	19727 19727 79727 79727	G12A-0020 O-12A-0007 G-12A-0007 G12A-0020
Alay	084286-00004		PARE OF REAL INPUT METHOD TO THE INPUT METHOD	29480	HANGE BEEST
AIGI AIGI	0160-2930 0160-2930 0160-2930		(HERIES 87B) (LI)ADED ON OSIZE 2004 BLANK BOARD)  ĈIFRO CER G.OL UF -80-208, LOSYOCH CIFRO CER O.OL UF -80-208, LOSYOCH CIFRO CER O.OL UF -80-208, LOSYOCH	91418 91418 91418	
APEN APEN APEN APEN APEN	0180-0197 0180-0197 0160-0193 0170-0095 0170-0055	*	CIFRO ELECT R.2 UF SOE ROVOCM CIFRO NY 0.001 UF LOE ROVOCM CIFRO NY 0.101 208 200VDCM CIFRO NY 0.101 208 200VDCM	56289 56289 56289 56289 56289	1500225K9020A2-DYS 1500225K9020A2-DYS 192P10292-PTS ' 192P10402 192P10402
A2C9 E2C10 A7OUL 1 A2CAU A2CAU A2CAU	0160-2910 1 0160-2910 1902-0049 1910-0016 1901-0040		CIPED CER 0.01; UF +80-208 100YDCN CIPED CER 0.01; UF +80-208 100YDCN DIODESBREARDONN 0.194 38' DIODESBREARDONN 100MA/0.884 40PIV 1 DIODESBRILLICON 30MA 3DMV	91418 91418 04713 93332 07243/	TA TA 5210939-122 02361 FOGIONA
HIZURA BICKO BILL BILL BILL	- 1910-0014 1901-0040 9140-0144 9100-2255 9140-0144		DIQUEIGERMANIUM LUOMA/D.BSV ADPIV DIDDELEILICUM BUMA BONV COILIFFID RF 4.7 UM A CUIL/CHURE G.47 UM 10E	93332 07263 28480 28480 28480	02361' FDG1088 ; 9140-0144 9100-2255 9140-0144
A2L4 A2L5 A2L6 A2L7 <sup>2</sup> A2L8	9140-0144 9100-2255 9140-0144 9140-0144		COLLIFÃO RF 4.7 UH COLLICIDAE 0.47 UH 10E COLLIFÃO RF 4.7 UH COLLIFÃO RF 4.7 UH COLLIFÃO RF 2.20 UH 10E	28480 - 28480 28480 28480 82142	9140-0144 9100-2295 9140-0144 9140-0144 09-4436-4K
A7L9. A7L10 A2Q1 A2Q2 A2Q3	9140-0144 9140-0144 1854-0098 1853-0015	**	COLLIFAD RF 4.7 UH COLLIFED RF 4.7 UH TSTRISE RPH TSTRISE PHP TSTRISE PHP	28480 28480 90131 80131	9140-0144 9140-0144 2N3563 2N360 2N360
A7Q4 A2Q5 AZQ6 A2Q7 A2Q1	1854-0345 1854-0345 1853-0015 1853-0015 1854-0092		TSTRISE NPN TETRISE NPN ESTRISE PAP TETRISE PAP TETRISE PAP	1740131 60131 60131 60131	2M51797 2M5179 2M5140 2M5440 2M5440
A209 A2010 A2011 A2012 A2012	1893-0015 1859-0015 1853-0015 1853-0015 1893-0015		TETRISE PNP TETRISE PNP TETRISE PNP TETRISE PNP TETRISE PNP	#0131 #0131 #0131	2N3640 2N3640 2N3640 2N3640 2N3640
#2014 #2015 #2016 #2017 #2017	1854-0092 1854-0071 1854-0092 1854-0092	<b>11</b>	TETRIET NPH TETRIES NPH BELECT (Q - RON TENSTON) TOTRIES NPH TETRIES NPH TETRIES NPH	#0131 #0131 #0131 #0131	203503   1854-0011   203503   203503   204510
A2019 A2020 A2R2 A2R2 A2R3	1854-0072 1854-0071 0683-0835 2100-2520 0683-2215		TETRISE NON SELECTED FADN 2N3704h RIFKD COMP JOSK OHN SE 1/AM RIFKD COMP JOS OHN SE 1/AM RIFKD COMP 220 OHN BE 1/AM	#0131 #4480 01121 #4480	203563 1854-0071 CB 6835 2100-2520 CB 2215
4744 Alro Alro Alro 1287 4288	0483-2403 0483-3628 0483-1019 0483-2025 0483-1025		REFED COMP 24 DHM SE 1/4W REFED COMP 3600 DHM SE 1/4W REFED COMP 3000 DHM SE 1/4W REFED COMP 3000 DHM SE 1/4W	01121 01121 01121	Ca 2405 Ca 3025 Ca 3025 Ca 3025 Ca 1025
# # # # # # # # # # # # # # # # # # #	0678-3113 0678-3361 0678-3377 0678-3377 0678-3375		REFAD CARBON LOO CHM SE 1/EM, REFAD COMP 150 CHM SE 1/EM REFAD COMP 340 CHM SE 1/EM REFAD COMP 48 CHM SE 1/EM REFAD COMP 33 CHM SE 1/EM	24480 24480 24480	0498-3113 0498-3381 0498-5175 0498-3379 0498-3379

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Table 6-1. Replaceable Parts (Continued)

Reference   Designation	HP Part Number	Qty.	Description	Mfr. Code	Mfr Part Number
		•	A Sangariangue		
APRIA APRIA APRIA APRIA APRIA	0683-1525 0694-5180 0698-5175 0698-3381 0683-1025		ATEXD COMP 1500 OHN 5E LAWN REFND COMP 2K OHN 5E LAWN REFND COMP 360 OHN 5E 1/AN REFND COMP 150 OHN 5E 1/AN REFND COMP 1000 OHN 5E 1/AN REFND COMP 1000 OHN 5E 1/AN	01121 28480 28480 28480 201121	Cn 1525 0698-5180 0698-5185 0698-3381 Cn 1025
A2N1Y	0494-9113 3 3 1 0483-1019 3 3 1 0483-3078 1 0483-3475 1 0483-225		RIFKD CARBON 100 DHM 58 1/40 RIFKD COMP 100 DHM 58 1/40 RIFKD COMP 3000 DHM 58 1/40 RIFKD COMP 3000 DHM 58 1/40 RIFKD COMP 222K DHM 58 1/40	20440 01121 01121 01121	O694-3113 CB 1015 CB 3025 CB 3025 CB 3225
A2R24 A2R25 A2R26 A2R26 A2R27 A2R28	2100-2521 0683-2225 0683-1015 0683-1015 0683-6815		RIVAR ELM 2000 DHB 10% LIN 1/2W RIFRD COMP 22/K CHM SW 1/4W RIFRD COMP 100 CHM SW 1/4W RIFRD COMP 100 CHM SW 1/4W RIFRD COMP 600 CHM SW 1/4W	28480 01121 01121 01121 01121	2100-2321 CB 2225 CB 1015 CB 1015 CB 4015
(A2829 (A2830 (A283) (A283) (A2833 (A2833	0683-6619 0683-4725 - 0683-1035 - 0683-1035 - 0683-1035	22.7	REFED COMP AND DIM SE L/AM REFED COMP ATOD DIM SE L/AM REFED COMP LOK DIM SE L/AM REFED COMP LOK DIM SE L/AM REFED COMP LOK DIM SE L/AM	01121 01121 01121 01121 01121	CR 4015 CB 4725 CB 1035 CB 1035 CB 1035
AZR36 AZR35 AZR36 AZR37 AZR38	0483-3315 0483-1035 0483-1015 0483-2235 0483-1025		RIFKO COMP 330 OHM SE L/AW RIFKO COMP 100 OHM SE 1/AW RIFKO COMP 100 OHM SE 1/AW RIFKO COMP 22K OHM SE 1/AW RIFKO COMP 1000 OHM SE 1/AW	01121 01121 01121 01121 01121	CB 3319 CB 1035 CB 1015 CB 2235 CB 1025
#2839 #2840 #2841 #2842 #2843	0443-2215 , 0483-2225 , 0483-1525 , 0483-1525 , 0483-3035		REFERD COMP 220 OHN BE 1/44 REFERD COMP 2.5K DIM SE 1/4M REFERD COMP 1500 DHM SE 1/4M REFERD COMP 1000 DHM SE 1/4M REFERD COMP 30K OHM SE 1/4M	01121 01121 01121 01121	CB 2215 CB 2228, CB 1525 CB 1025 CB 1025
#2844 #2845 #2846 #2847 #2848	1 0483-3015 0483-3315 0483-1025 ± 0483-1045 0483-2055		RIFKD COMP 300 DHM SE 1/AM RIFKD COMP 350 DHM SE 1/AM RIFKD COMP 1000 DHM SE 1/AM RIFKD COMP 10M OHM SE 1/AM RIFKD COMP 2 MEGUMN SE 1/AM	01121 01121 01121 01121 01121	CB 3015 CB 3315 CB 1025 CB 1065
AZUZ AZUZ AZUZ AZUZ	- 0483-2715 0443-2715 1420-0238 1820-0142	2	RIFNO COMP 270 OHM SE 1744 / RIFNO COMP 270 OHM SE 1744 / INTEGRATED CIRCUITIOTL 2 INPUT NOR GATE INTEGRATED CIRCUITIATINPUT, 2-DR/NOR	01121 01121 04713 04713	CB 2715 'CB 2715 AC 1410P ' MC1004P
A1 <sup>1</sup> ,			HAME AS A2 USE PREFIX A3		
	- 03358-80005	1	OSCILLATOR ASSY	28480	05326-60002
			ELDADED ON 05324-20002 BLANK BOARD)		$\hat{X}'$
84C1 84C2	0160-0161 0140-0197		CIFAD MY O OL UF 108 2004DCM	54289 76289	192P10192-P15 1500225X9020A2-DY5
44C3 54C4 44C5 44C1 44D1	0121-0059 , 0160-2264 , 0160-2276 , 1650-0158		CIVAR CER 2-8 PF 300VDCH CIFRO CER 2D PF 3B 300VDCH CIFRO CER 0.01 UF 180-208 100VDCH CDIL/CHOKE 100 UH 108 TSTRIGE PHP	28480 72482 91418 28480 80131	0121-0054 301-000-C0C0-200J TA. 4100-2276 2026-2054
AARI AARE AARI AARI	0498-4037 0483-1025 0483-7015 0483-7015 1820-0142		REFXD MET FLM 44.4 DHM 18 1/8W REFXD COMP 1000 DHM 58 1/4W REFXD COMP 300 DHM 58 1/4W REFXD COMP 300 DHM 58 1/4W INTEGRATED CIRCULTESINPUT, 2-DR/MOR	284 80 G1121 G1121 G1121 G1121	0698-4037 CB 1025 CB 3015 CB 3015 MC1004P
AAVI	04 10-0405		CRYSTAL JOUARTZ 10 MHZ	'204BD .	0410-0405
	05326-60005		TIME BASE CONTROL ASSY	, 28480	U5326-60005
1			TENSES DES DE DESENS BLANK BIANDS &		
foci /	0160-0197		CIPRO ELECT 2.2 UF, 100 ZOVDCH	56284	Langsanagons-par.
ASC2 ASC3 ASC4 ASC5	0140-0127 6180-0291 0140-2150 0140-2204		CIFRO CER L.D UF 20% 25VOCW CIFRO ELECT L.O UF 10% 35VOCW CIFRO MICA 33 PF 5% CIFRO MICA 100PF 5%	56289 56289 28480 72136	5C13C5-CML 1500105X4035A2-DY5 01AU-2150 FDM15F1D1J3C

See introduction to this section for ordering information

Table 6-1, Replaceable Parts (Continued)

Reference HP Par Numbe	Qty	Description	Mfr Code	Mfr Part Number
			Specific School	
A903 1894-0092 A903 1894-0092 A904 1894-0071 A909 1894-0071		TETRIES NPM TETRIES NPM TETRIES NPMISELECTED FROM 2N3TO4) TETRIES NPMISELECTED FROM 2N3TO4) TETRIES NPMISELECTED FROM 2N3TO4) TETRIES NPMISELECTED FROM 2N3TO4)	40131 80131 20440 28440 28480	283563 283563 1854-0071 1854-0071 1854-0071
ASUB 1854-0071 ASR1 0483-1035 ASR3 0483-1035 ASR3 0483-5105 ASR4 0483-2325		TSTRIST HPHISELECTED FROM 2N3TO4) RIFRO COMP LOK CHIN SE 1/4W RIFRO COMP DL CHIN SE 1/4W RIFRO COMP DL CHASE 1/4W RIFRO COMP 3300 CHIN SE 1/4W	28480 01121 01121 01121	1856-0071 CB 1035 CB 1035 CB 5105 CB 3325
Anno 0683-4715 0683-3375 0683-3375 0683-1025 0683-1025 0683-1025		RIFRO COMP ATO DHN SE 1/AW RIFRO COMP BEDD OHN SE 1/AW RIFRO COMP 1000 OHN SE 1/AW RIFRO COMP 1000 OHN SE 1/AW RIFRO COMP 1000 OHN SE 1/AW	01121 01121 01121 01121	CB 4715 CB 3325 CB 1025 CB 1025 CB 1025
ASRIO 0683-2215 0683-6835 35812 0683-825 45813 0683-3225 45814 0683-3325		RIPAD COMP 220 OHN SE 1/4W RIPAD COMP SEC OHN SE 1/4W RIPAD COMP 3300 OHN SE 1/4W RIPAD COMP 3300 OHN SE 1/4W RIPAD COMP 3300 OHN SE 1/4W	01121 01121 01121 01121	CB 2215 CB 60351 CB 3325 CB 3325 CB 3325
ADRIS 0-83-3275 0-83-1025 0-83-1025 0-83-1025 0-83-1025 0-83-1025 0-83-1025 0-83-2225		REFAU COMP 3300 OHM SE 1/4M REFAU COMP 1000 OHM SE 1/4M REFAU COMP 1000 OHM SE 1/4M REFAU COMP 202R OHM SE 1/4M REFAU COMP 202R OHM SE 1/4M	01121 01121 01121 01121 01121	C6 2225 C6 1025 C6 1025 C6 2225 C6 2225
ASH20 0683-5105 ASH21 0683-5105 ASU1 1820-0412 ASU3 1820-0412 ASU3 1820-0412		REPAID COMP SE DAM SE LAN REPAID COMP SE DAM SE LAN INTEGRATED CERCULTEDECADE DIVIDER INTEGRATED CIRCULTEDECADE DIVIDER INTEGRATED CIRCULTEDECADE DIVIDER	01121 01121 28480 28480 28480	CB 5105 CB 5105 1820-0412 1820-0412 1820-0412
A504   1820-0412   1820-054   1820-054   1820-0412   1		INTEGRATED CIRCUIT DECADE DIVIDER LINTEGRATED CIRCUIT DECADE DIVIDER LINTEGRATED CIRCUIT DECADE DIVIDER LINTEGRATED CIRCUIT DECADE DIVIDER LINTEGRATED CIRCUIT DECADE DIVIDER	28480 28480 28480 28480	1420-0412 5H7400H 1820-0412 1820-0412 1820-0412
A5119 71870-0413 A5U10 1870-0174		ICETTL DECADE DIVIDER LESS MIE MIN.	28480 V	1820-0413 SNF404N
A6 05926-60013	, ,	SAMPLE MATE ASSY.	28480	05324-60013
ACC1 0160-22015		, ILUADED ON 05326-20013 BLANK BOARD) CERRO HECA SE PE SE CERRO HECA 220PF SE 300VOCH	72136 14455	ADMISESTORIC NOMISESTORIC
ACC)		CIFNO ELECT 22 UF 102 15VDCM CIFNO NY 0.048 UF 102 200VDCW CIFNO NY 0.001 UF 102 200VDCW CIFNO NY 0.001 UF 102 200VDCW CIFNO NY 0.001 UF 102 200VDCW	56289 56289 28480 56289 28480	1500224X901562-DYS 192248392-PTS 0140-0145 192210292-PTS 0140-2199
AACI 0160-0153 AACI 0160-0291 AACI 0160-0161 AACI 0160-0114 AACI 0160-0114		CIENO EFECT 4"O NE +100-108 SEADCH CIENO EFECT 4"O NE +100-108 SEADCH CIENO NA 0"OST NE TOR SOADCH CIENO NA 0"OST NE TOR SOADCH	54289 54289 54289 28480 28480	192P10292-PTS //1900103X9035A2-DVS 192P10392-PTS 0180-0114 0180-0114
AACA1 1903-0040 AACA2 1901-0040 AACA3 1910-0018 AACA3 1910-0040		O DOCESTLICON SONA SONY DIDDESSILICON SONA: SONY DIDDESGERNANIUM LOGMA/O.85Y &OPIY OTIDESGERNANIUM LOGMA/O.85Y &OPIY OTIDESSILICON SONA SONY	07243 07243 93332 93332 07243	FDG1088 FDG1048 D2361 D2361 FDG1088
A6CR7   1901-0040 A6CR8   1901-0040 A6CR10   1910-0016 A6CR10   1901-0040	And the second s	DIDDETSILICON 30MA 30MY DIDDETSILICON 30MA 30MY DIDDETSILICON 30MA 30MY DIDDETSILICON 30MA 30MY DIDDETSILICON 30MA 30MY	07263 07263 93332 07263 07263	FDGLGSS. D23615 FDGCGSS>FDGLGSS>FDGLGSS.
ANDI 1854-0071 ANDI 1854-0071 ANDI 1854-0071 ANDI 1854-0009 ANDI 1854-0071		TSTRISI NPNISELECTED FROM 2NSTOAL VSTAISI NPNISELECTED FROM 2NSTOAL TSTRISI NPNISELECTED FROM 2NSTOAL TSTRISI NPN TSTRISI NPNISELECTED FROM 2NSTOAL	28480 28480 28480 80131 28480	1854-0071 1854-0071 1854-0071 20709 1854-0071
AAUA 1854-0071 AAUR 1894-0215 AAUR 1894-0071 AAUJ 1894-0071		TETAISI NPHISELECTED FROM 2N3704) TSTRIST NPHISELECTED FROM 2N3704) TSTRIST NPHISELECTED FROM 2N3704) TSTRIST NPHISELECTED FROM 2N3704) TSTRIST NPHISELECTED FROM 2N3704)	28480 80131 28480 28480 28480	1894-0071 283904 1454-0071 1894-0071

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Table 6-1. Replaceable Parts (Continued

Reference Designation	HP Part Number		Description	Mfr. Code	Mfr Part Number
		erri e. Marijan		Harasana Ayrasa	
ADDIA ADDIA ADDIA ADDIA	1854-0009 1854-0071 1854-0071 0483-1015		TSTRESE NPH TETRISE NPH BELEGTED FROM PHETOAS TETRISE NPH SELECTED FROM PHETOAS RIPKO COMP, LOO DHM SE L/AN	80131 28480 26480 DLL21	.Brfg9   1454-0071   1654-007177   CB 1015
folia.	0483-1925 0483-5128 0483-1035		REFER COMP. SLOD DAM SE 1/4W	01121 01121 01121	CB 1525 CB 5125 CB 1035
AARS AARA PART	0483-1032 0483-1032 0483-1032		RIPAD COMPLICATION OF SELVAN RIPAD COMPLICATION OF SELVAN RIPAD COMPLICATION OF SELVAN	01121 01121 01121	CB 1035 CB 5125 CB 1035
AART AARIO AARIO	0483-3325 0483-3015 0483-2025 0483-2735		RIFKD COMP 3300 ON SE L/AM RIFKD COMP 300 ON SE L/AM RIFKD COMP 2000 DW SE L/AM RIFKD COMP 27K OW SE L/AM RIFKD COMP 5100 ON SE L/AM	01121 01121 01121 01121	CB 3325 CB 3019 CB 2025 CB 2735
AARIS AARIS	0683-3225 0683-1035		RIFKD COMP 3300 DHM SE 1/AN	01121 :01121 :01121	CB 3325 CB 1035
AGRIG AGRIG	0483-3328 0483-8128 0483-3328		RIFNO COMP 3200 OHN SE 1/4W RIFNO COMP 3200 OHN SE 1/4W RIFNO COMP 3200 OHN SE 1/4W	01121 01121 01121	CB 5129 CB 5129
AGRIG AGRIG AGRIG AGRIG	0483-3325 0483-2025 0483-2735 0483-1035		RIFRO COMP 3300 DIN SE 1/4M RIFRO COMP 2000 DIN SE 1/4M RIFRO COMP 27% DIN SE 1/4M RIFRO COMP 10K DIN SE 1/4M	01151 01151 01151	CB 2015 CB 2735 CB 1035
AAR23 AAR23			RIFKD COMP 2000 OHM SE 2/4M E RIFKD COMP 2000 OHM SE 2/4M RIFKD COMP 620 OHM SE 2/4M	01121 01121 01121	CB 2029 4
A68.25 A68.21	0683-1525 0483-2025 0483-3025		R REFAD COMP 2000 OHM. SE 1/4W REFAD COMP 420 OHM SE 1/4W REFAD COMP 1500 OHM SE 1/4W REFAD COMP 2000 OHM SE 1/4W REFAD COMP, 3000 OHM SE 1/4W	01121	CB 4215 CB 1525 CB 2025 CB 3025
#6829 #6829 #6835 #6833	0483-7115 0483-1525 0483-3418 0483-4185 0483-1035		RIFKD COMP 910 OHM SE 1/AM RIFKD COMP 3500 OHM SE 1/AM RIFKD COMP 260 OHM SE 1/AM RIFKD COMP 10K OHM SE 1/AM RIFKD COMP 10K OHM SE 1/AM	01121 01121 01121	C8 1035
AAR) 3 AAR) 4 AAR) 5	0443-2),5 0443-273,5 0443-273,5 0443-1035		RIFED COMP 27K ONE SE 1/4W RIFED COMP 27K ONE SE 1/4W RIFED COMP 10K ONE SE 1/4W RIFED COMP 10K ONE SE 1/4W RIFED COMP 10K ONE SE 1/4W	01121 01121 01121 01121	CB 2735 CB 2735 CB 2735 CB 1035
AGREC AGRET AGRET	NEWS TORK		RIPED COMP INC OWN SELIZANI	01121	C8 1035 () () () () () () () () () () () () ()
A6R39 A6R4Q A6R41 A6R42	DA03-1035		RIFED COMP LOW DIN SELL/AND RIFED COMP 47K DUN SELL/AND RIFED COMP 150 COMP 150 HIN SELL/AND RIFED COMP/100 COMP SELL/AND RIFED COMP/100 COMP SELL/AND RIFED COMP/100 COMP SELL/AND RIFED COMP/100 COMP SELL/AND RIFED COMP/100 COMP SELL/AND RIFED COMP/100 COMP SELL/AND RIFED COMP/100 COMP		CB 1035 CB 4735 CB 1925 CB 1015 1
#4843 #601 #602	0683-4715 [820-0054		REFER COMP 47K DHM/SK 1/4W   TCFFTL QUAD 2-INFT MAMO GATE   ICEGL TYPE D F/F	01121 01295 04713	EN 4735 SN7400H
#649 #444	1820-0054 1820-0054	71 3.7	CITTL TRIPLE 3-INPUT POS NAMO GATE  (CITTL GUID 2-INPT MAND GATE)  (CITTL GUID 2-INPT MOR GATE)	12040 01295 04733	SN74LON SN74OOK! SN74O2N
Abub	1020-0147		CHECK TREPLE 3-INNT HOR GAYE	84713	WC1003E
	05927-40004	er.	BOARD ASSYSFUNCTION CONTROL SERSES (040A) REV. C.	20400	05327-40004
				<b>W</b>	
ATCS ATCS	0140-0333 0140-2327	•	NOT ESTICHED CONTROL OF SOUTH	04853 96733	ROMLSC15003C
47C4 47C9 47C6	0160-2327 0160-2327 0160-2327		CTFND CER 1000 PF 20% 100VDCW CTFND CER 1000 PF 20% 100VDCW CTFND CER 1000 PF 20% 100VDCW	94733 94733 94733	81048X102M 81048X102M 81048X102M
A701 A701	0160-2327 1854-0215		CIPID CER 1000 PF 208 100VDCW TETRISE NPN TETRISE NPN	#0131 #0131	81048#102# 2N3904 : EN3904 :
A703 A704 A705 A7RL #	1854-0009 1854-0009 1854-0009 0483-1125	•	TETREEL NPM TETREST NPM TETREST NPM REFAD COMP BE E/AM	01121 00131 00131	2N709 2N709
	ATT BEST HOLD TO				

<sup>8</sup> See introduction to this section for ordering information

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Table 6-1. Replaceable Parts (Continued)

				Mfg	
Reference Designation	HP Rart Number	Qty :	Description	Code	Mfr Part Number
	10683-1825	10	REEKO COMP 1800 DHM 58 1/4M	01121	CB 1825 CB 1825
	1 0643-1525 1 0643-1925		REFRO COMP 1800 OHR SE 1/4M REFRO COMP 1500 OHR SE 1/4M REFRO COMP 3500 OHR SE 1/4M REFRO COMP 2-2K OHR SE 1/4M	01121	CO 1825
ATRA	0683-2225		RIFKO COMP 1100 DHM ST 1/4W RIFKO COMP 2-2K CHM ST 1/4W	01121 01121	CB 1125 CB 2229
APRILL	QAW1-2225 DAW1-3325 DAW1-3325	r i	RIFKO COMP. 3300 DIM SE 1/40 RIFKO COMP 3300 DIM 48 1/40 RIFKO COMP 1500 DIM 58 1/40	01121 01121 01121	CB 3325 CB 3325 CB 1525
ATRI DE SANTE	(pana-1929 (pana-1929		REFNO COMP 3300 OHN SE 1/4M REFNO COMP 1500 OHN SE 1/4M	01121	CO 3325 CO 1925
	0683-1525 0683-1525 0683-1015		RIFRO COMP 1500 ONN 58 1/4W RIFRO COMP 100 ONN 58 1/4W RIFRO COMP 5101 ONN 58 1/4W	01121	CB 1925 CB 1015 CB 5119
A7816: (1) : (4) :	0683-3015 0683-3015		RIFED COMP 300 OHN SE 1/4M RIFED COMP 300 OHN SE 1/4M	01121	CB 3015
A7819 A7820 A7821	0683-2015 0683-2725 0643-7515	1 3	RIFRO COMP 200 OHM SE 1/4M RIFRO COMP 2700 OHM SE 1/4M RIFRO COMP 750 OHM SE 1/4M	01151 01151 01151	CB 7515
ATRES	D683-4715 D683-1123	2	BIFRO COMP 470 OHM SE 1/4W	01121 01121	C0 4715
A7824 A7824 A7626	0683-4725 0683-1125 0683-1125		RIPAD COMP 4700 OHN 58 L/AM RIPAD COMP 1100 OHN 58 L/AM RIPAD COMP 1100 OHM 58 L/AM	01121 01121 01121	CB 4725 CB 1125 TCB 1125
ATH P F	DAR3-4715 DAR3-1015		RIFID COMP 470 OHM 58 1/4W RIFID COMP LOO OHM 58 1/4W	01121 - 01121	CB 4715 A
ATRIN ? APU1 APU2	0683-1125 1820-0102 1820-0489	•	RIFAD COMP 1100 OHM SE 1/4M INTEGRATED CIRCUITIJ-K' FLIP FLOP	01121 04713 28480	1950-0784 WC10115 CB 1152
Arus i	1820-0147 1820-0440	. 1.,	ICIECL TRIPLE A-INPT HOR GATE	04713 04713 04713	MC1007P MC1014P MC1007P
Alus Alus	1820-0147 1820-0489 , 1820-0212	2 ) · · · · · · · · · · · · · · · · · ·	ICIECL TAIPLE 3-INPT HOR GATE ICIECL OUAD LINE RECEIVER	28400 047137E	1 1820-0489
Arus Arus	1820-0489 1820-0145	į	IC.ECL IC.DIGITAL DUAD 2-INPT NOR GATE	28480 28480 28480	1820-0489 1820-0145 1820-0489
A709 6 6 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1820-0489 1820-0252 1820-0200	1 1	ICIECL DUAL 3-4 INPT DRINDR GATE ICIECL QUAD EXCL. DR GATE	04713 04713	MC1026P
	05126180009		DISPLAY SUPPORT ASSY	25180	05326-60008
			(EOADED ON 18528-20008 BLANK BOARD)		
anca:	0160-2910		CIFED GER 0.01 UF +80-20E 100VDCW CIFED NICA 30 PF SE 300VDCW DIDDEISILICON 3DMA 3DWV	91418 28480 707263	TA D140-2199 FDG1008
ANCHA!	1910-0040 1910-0016 1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	02361
ANCAN ANJA ANGAN	1901-0040 1251-2015 \$356-0092	1 1	DIODEISILICON 30NA 30NY COMMECTORIPE EDGE 12 X 151 30 COMTACT	07243 71785 80131	FDGL048 252-15-10-300 2H3543
ABO2 17	1854-0345		I bernari MBM	, BOL31	203563 206610
4804 4805 4806	1854-0365 1854-0365 1854-0365		- TETRISE NPN TETRISE NPN TETRISE NPN TETRISE NPN TETRISE NPN TETRISE NPN TETRISE NPN	#0131 #0131	204410 204410 204410
4807 4808	1854-0365		TETRISI NPN TETRISI NPN TSTRISI NPN TSTRISI NPN	90131	2N4410 A
20010 20010	185968092 1854-0092 1854-0092	, , ,	ESTRES NPN	40131 80131 80131	2N3563
ANN 1	0643-1125 0643-1045		RIFAD COMP 1000 OHM SE 174W	01121	CO 1125 CO 1045
ATRA	0683-1025		I RIFED COMP 1.2 REGOING ST 1/4W	01121 01121 01121	
MAT : N	0683-1275		RIPAU COMP. LOS MESONN DE SPEN	) 0115F (	CB 1255
2059 2059	0683-1205 0683-1255 0683-1257		RIFED COMP 1.2 MEGONS SE 1/4M RIFED COMP 1.2 MEGONS SE 1/4M RIFED COMP 1.2 MEGONS SE 1/4M RIFED COMP 2400 OHM SE 1/4M	01121	CB 1255 CB 1255 CB 1255 CB 2425
ARRIT ARRIVA	- 0683-2425 0683-1015		MIND COM TOO OWN SE 1544	Olizi.	CB 1015
1 MH . 1	₩ 「特別」	1 ,		18.00	d and the second

See introduction to this section for ordering information

Table 6-1, Replaceable Parts (Continued)

Reference Designation	HP Part Number	Oty	Description	Mfr Code	Mfr Part Number
				1.3/	
ABRIS ABRIS ABRIS ABRIS	0483-1085 0483-276 0483-4765 0483-1085 24 0483-4723785		RIFAD COMP 1000 DHM SE 1/4W RIFAD COMP 270 DHM SE 1/4W RIFAD COMP 4700 DHM SE 1/4W RIFAD COMP 1000 DHM SE 1/4W RIFAD COMP 4700 DHM SE 1/4W	01121 01121 '01121 '01121	C0 1029 C0 2719 C0 4725 C0 1025 C0 4725
ABRIO ABRIO ABRIO ABRIL Walker	0483-5115 0483-1145 0483-1145 0483-2266 0483-5118		RIFRO COMP SIO OHM SE I/AM RIFRO COMP LOOK CHAIS SE I/AM RIFRO COMP RIOD CHAIS SE I/AM RIFRO COMP RIOD OHM SE I/AM RIFRO COMP SIO CHAISE I/AM	01121 01121 01121 01121 01121	CR SILB CA 1045 CB 1045 CB 2725 CR 5115
ABR23 ABR24 ABR25 ABR26 ABUL	0683-1855 0683-2725 0683-2225 1920-0094		REFERD COMP 100K CHMS SE 1/4M REFERD COMP 2700 CHM SE 1/4M REFERD COMP 15K CHM SE 1/4M REFERD COMP 2.2K CHM SE 1/4M ICIDTL CHAD 2-5MPUT GATE.	01121 01121 01121 01121 04713	CB 1045 CB 2725 CB 1835 CB 2225 SC4903PK
ABUS ABUS ABUS ABUS ABUS	1620-0307 1620-0143 1620-0102 1620-0102 1620-0102		ICIDIGITAL DTL HER IMPERTER INTEGRATED CIRCUITIAC COUPLED AK P/F INTEGRATED CIRCUITIA-R FLIP PLOP INTEGRATED CIRCUITIA-R FLIP PLOP INTEGRATED CIRCUITIA-R FLIP FLOP INTEGRATED CIRCUITIA-R FLIP FLOP	04713 04713 04713 04713	MC102FP MC1013P MC1013P
19	05 324-6000 <b>0</b>		DISPLAY ASSY SEPIES 1032AL	28480	OSSZ6-ACODB
APOSI APOSI	1970-0042, 1200-0405		ALDADED ON 05328-20008 BLANK BOARD)  AET NUMERICAL! INDICATOR RETITUBE FOR 5700 BERTES	#3594 #3594	#-5750-\$ 5K 207
A9052 A9052 A9053 A9053 A9054	1970-0042 1200-0405 1970-0042 1200-0405 1970-0042		TUBEINUMERICAL INDICATOR SOCRETITUSE FOR STOO SERIES TUSEINUMERICAL INDICATOR SOCRETITUSE FOR STOO SERIES TUSEINUMERICAL INDICATOR	83594 83594 83594 83594 83594	8-5750-5 5K 207' 8-5750-5 5K 207 8-5750-5
#90\$4 #90\$5 #90\$5 #90\$6 #90\$4	1200-0405, 1970-0042 1200-0405 1970-0042 1200-0405		SOCRETATURE FOR BYOG SERIES TUREINUMERICAL INDICATOR SOCRETATURE FOR BYOG SERIES TUREINUMERICAL INDICATOR BOCKETYTURE FOR BYOG SERIES	63594 63594 63594 63594 63594	SK 207 8-5750-8 5K 207 8-5750-5 5K 207
A905? A905? A981 A982 A983	1970-0042 1200-0405 0481-1025 0481-7525 0481-1025		TUSEINUMERICAL INDICATOR SOCRETITUSE FOR STOD SERIES, RIFAD COMP 1000 OHM 58 1/4M AIFAD COMP 7500 OHM 58 1/4M RIFAD COMP 1000 OHM 58 1/4M	03594 03594 01121 01121 01121	8-5750-5 SK 207 CB 1025 CB 7525 CB 1025
4984 4985 4986 4987 4988	D483-7525 D483-7525 D483-7525 D483-7525 D483-7525		RIFKO COMP 7500 CHM \$2 1/4W RIFKO COMP 7500 CHM 52 1/4W RIFKO COMP 7500 CHM 52 1/4W RIFKO COMP 7500 CHM 52 1/4W RIFKO COMP 7500 CHM 52 1/4W	01121 01121 01121 01121	CB 7525 CB 7525 CB 7525 CB 7525 CB 7525
9403 9405 94010 94810	0483-7525 0483-1005 1820-0275 1820-0119 1820-0119		REFXD COMP 7500 DMM 58 1/4W REFXD COMP to DMM 58 1/4W CORECL TO TTL QUAD 2-1MPT DR TRANS. ICESTL BLANKING DECADE COUNTER ICESTL BLANKING DECADE COUNTER		CB 7925 CB 1005 MC1039P 1 1820-0119, 1820-0119,
4909 4905 4904 4907 4909	1820-0119 1820-0119 1820-0119 1820-0119		ICITTL BLANKING DECADE COUNTER ICITTL BLANKING DECADE COUNTER ICITTL BLANKING DECADE COUNTER ICITTL BLANKING DECADE COUNTER ICITC BLANKING DECADE COUNTER ICITC BLANKING DECADE COUNTER ICITC BLANKING DECADE COUNTER ICITC BLANKING	28480 28480 28480 28480 28480	1820-0119 6820-0119 1820-0119 1820-0119
A9010 A9012 A9013 A9014	870-01 6  1800-01 6  1820-01 6  820-01 6		IC:4-BIT BUFF STORE GATED OUTS IC:4-BIT BUFF STORE GATED OUTS IC:4-BIT BUFF STORE GATED OUTS IC:4-BIT BUFF STORE GATED OUTS IC:4-BIT BUFF STORE GATED OUTS	78480 28480 28480 28480 28480	1620-0116 1820-0116 1820-0116 1820-0116 1620-0116
A9019	1870-00116 1870-0097 1870-0097 1870-0097		ICIA-BIT BUFF STORE GATED OUTS INTEGRATED CIRCUITIDECDOER-OLVIDER INTEGRATED CIRCUITIDECDOER-OLVIDER INTEGRATED CIRCUITIDECDOER-DIVIDER INTEGRATED CIRCUITIDECDOER-DIVIDER	28480 : 28480 : 28480 28480	1420-0116 1420-0042 1420-0042
49U23 14 49U23	1020-0092 1020-0092 1020-0092		INTEGRATED CIRCUITIDECODER-DIVIDER INTEGRATED CIRCUITIDECODER-DIVIDER INTEGRATED CIRCUITIDECODER-DIVIDER	28480 28480 28480	1020-0092 1020-0092 1020-0092
49023 49023 49023	1820-0012 1820-0092 1820-0092		INTEGRATED CIRCUITIDECODER-DIVIDER	28480 28480 28480	1420-0092

See introduction to this section for ordering information

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. Table 6-1, Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty .	Description	Mfr Code	Mfr Part Number
A10	0852740002		RIGHT BEADOUT ASSY ISERIES 1120A. REV. 8) ELDADED DN (05227-20002 BLANK BOARD)	24400	08327450(0)2
	05328-00009 05326-80008 05328-80009		BRACKET: READOUT INDICATOR HASK (U.N. 5.) INDICATOR HASK (M.N. H.)	28480 28480 28480	05324-00009 05324-00008 05324-00009
ABUCA1 ABUCA2 ABUCA2	05326-80010 05330-40002 1901-0040 1901-0040 2140-0313		INDICATORINASK (**,K,G). BLOCKIANNUNCLATOR DIODEISELIGON JOHA JOHY DIODEISELICON JOHA JOHY LAMPINEON GLOW PROSTED 1.** MILLIAMPS	20480 26480 07263 07263	05326-8001D 05330-40002 FDG1088 FDG1088 CZA-B
A10032 A10033 A10034 A10035) A10035	2140-0313 2140-0313 2140-0313 2140-0313 2140-0313		- LAMPINEON GLOW PROSTED 1.9 MILLIAMPS LAMPINEON GLOW PROSTED 1.9 MILLIAMPS LAMPINEON GLOW PROSTED 1.9 MILLIAMPS LAMPINEON GLOW PROSTED 1.9 MILLIAMPS LAMPINEON GLOW PROSTED 1.9 MILLIAMPS	08804 08804 08804 08804 08804	CZA-B CZA-B CZA-B CZA-B
Alops7	7140-0313 2140-0313 1854-0009	)	LAMPINEON GLOW PROSTED 1.9 MILLIAMPS LAMPINEON GLOW PROSTED 1.9 MILLIAMPS TSTRIBE: NPM	08804 08806 80131	CZA-B CZA-B
A1002 A1003 A1004 A1005 A1006 A1007	183-0009   183-0009   183-0474   183-0474   183-0474	113	TSTRISE NPM TSTRISE NPM TSTRISE NPM TSTRISE NPM TSTRISE NPM TSTRISE NPM TSTRISE NPM	60131 20131 20480 20480 20480 20480	2H709 2H709 1854-0474 1854-0474 1854-0474
10012 10010 10011 10011	1854-0474 1854-0474 1854-0474 1854-0474 1854-0474		TSTRIST MPN TSTRIST MPN TSTRIST MPN TSTRIST MPN TSTRIST MPN TSTRIST MPN TSTRIST MPN	28480 28480 28480 28480 28480	1834-0474 1834-0474 1854-0474 1834-0474
#10#1 #10#2 #10#4	0403-5125 0403-5125 0403-5125 0403-5125		RIFKO COMP 3100 OHM 58 1/4W RIFKO COMP 3100 OHM 58 1/4W RIFKO COMP 3100 OHM 58 1/4W RIFKO COMP 3000 OHM 58 1/4W	01121 01121 01124 01121	CB 5125 CB 5125 CB 6125 CB 3025
Aturs' Ature Ature Ature Ature	0483-2025 -0683-2025 -0683-3025 -0483-5135 -0483-5135	<b>. . . . . . . . . .</b>	RIFXO COMP 2000 CHM 5% 1/4M RIFXD COMP 2000 CHM 5% 1/4M RIFXD COMP 3000 CHM 5% 1/4M RIFXD COMP 51% CHM 5% 1/4M RIFXD COMP 51% CHM 5% 1/4M	01121 01121 01121 01121 01121	CB 2029 CB 2025 CB 3025 CB 5125 CB 5125
Atuut 41002 A1013 A1014 A1005	1820-0274 1820-0274 1820-0274 1820-0274 1820-0310	12	ICIOTL QUAD 2-IMPT OR GATE ICIOTL QUAD 2-IMPT OR GATE ICIOTL QUAD 2-IMPT OR GATE ICIOTL QUAD 2-IMPT OR GATE ICIOTL JIATIPLE 3-IMPUT NAMO GATE	28460 28480 28480 28480 28480	1020-0274 1020-0274 1020-0274 1020-0274 5C0-0274
A1006 -A1007	3020-0213 1470-0273		ICIDTL QUAD 2-INPT AND GATE ICIDTL QUAD 2-INPT, AND GATE	28480 28480	1820-0273
	08327-600037		LEFT READOUT ASSY SERIES: 1040A+ REV. AI ELGADED ON 06327-20003 BLANK BOARD)	28460	08327-80003
	05326-00007 05326-80011 05310-40002		BRACKETIREADOUT INDICATOREMASK CERT. C. OF) BLOCKENHAMMCEATOR	28480 28480 28480	09326-00009 05926-80011 05930-40002
A11C1 A110S1 A110S2 A110S1	0140-2200 2140-0313 2140-0313 2140-0313		CIFED MICA 41 PF SE 300 VINW LAMPINEON GLOW FROSTED 1.9 MILLIAMPS LAMPINEON GLOW FROSTED 1.9 MILLIAMPS LAMPINEON GLOW FROSTED 1.9 MILLIAMPS	72136 08604 08806 08806	RONLSEARDISC CZA-B CZA-B
Attut Attut Attus Attus Attus	1854-8071 1854-8674 1854-8474 1854-8474		TSTRESS NONESELECTED FROM 2N3704) TSTRESS NON TSTRESS NON TSTRESS NON	26480 26480 26480 (28580	1834-0071 1834-0474 1834-0474 1834-0474

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Table 5-1, Replaceable Parts (Continued)

a the late, The	• • Secretary • Control	, 55,00			Market Company of the	٦.
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr.Part Number	
						\ \
			RIPHO COMP 20K DHM 88 1/4M	one.	co zósy n	, 
ALINA ALINA ALINA	0483-2035 0483-1035 0483-5125	an a m	RIFED COMP LOK OWN SE 1/4M SIFED COMP STOO OHM SE 1/4M	Olisi	CO 1035	,
ALLRA ALLRS ALLRA	0483-5135 0483-2025 0483-5135		REFAU COMP SIK OHM SE 1/4M REFAU COMP 2000 CHM SE 1/4M REFAU COMP SIK CHM BE 1/4M	01121	CB 5135 CB 2025 CB 5135 CB 9125	7] 24
ALIRO ALIRO	0463-5135 P 0463-5135	Salahi Maratan	REPRO COMP SEGO CHM SE 1/4M REPRO COMP SER CHM SE 1/4M REPRO COMP SEGO CHM SE 1/4M	01121	CB 5135	
Aliaio Aliaio	0483-1052 0483-1856		RIFED COMP 1000 DHM SE 1/4W RIFED COMP 1000 DHM SE 1/4W	01121	CB 1625 CB 1025	,
viint 1	1870-0034		ICITTE QUAD R-IMPT MAND GATE	01295	EN7400N L#20=0274	
A11U2 A11U4 A11U4 A11U5	1820-0274 1820-0274 1820-0274 1820-0175		ICEDTE QUAD 2-1MF OR GATE ICEDTE QUAD 2-1MF OR GATE ICEDTE QUAD 2-1MF OR GATE ICEDTE QUAD 2-1MF OR GATE ICETTE INEK INVERTERIA	28480 28480 01235	1820-0274 1820-0274 BNB260	1
A1104 A1107	1820-0274		ICIDTL DUAD 2-IMPT, DR GATE ICIDTL DUAD 2-IMPT AND GATE ICIDTL DWAD 2-IMPT, OR GATE	26480 26480 26490	1020-0274 1020-0273 1020-0274	
ALLUN CONTRACTOR	1020-0274		(CIDIL OND 2-1MT OR GATE AT THE	1		3
415	05327-60020		BOARD ASSTIPONER SUPPLY	20100	05327~60020	,
			(LOADED COLDENTAL - 20020 BLANK BUARD)	-		
	0510-0201 2200-0145		NUTICAPTIVE 4-40 K O.LES LG SCREWIGAN HO POLL DR 4-40 K O.438	284 80 00000	0510-0207 080	
A15C1	9040-0409.		SPACER: SHIELD	28480 ·	1 5040-0407 192733392-815 0160-0114	
Alses /, 10	0180-0114 0180-0114 0180-0114	,	CIPRO ELECT 4.0 UF *100-10E 25YDCH CIPRO ELECT 4.0 UF *100-10E 25YDCH CIPRO ELECT 4.0 UF *100-10E 25YDCH CIPRO ELECT 4.0 UF *100-10E 25YDCH	28480 26480 26480 28480	0180-0114 0160-0114 0160-0114	1
(1136.5	0100-0114				.ESH00]-98	
ALSCA VISCT ATSCAL	0140-0975 0140-0975 1902-3002	12	COFRO CER 0.001 UF 20% TSVOCH CIFRO CER 0.001 UF 20% TSVOCH DIODE BREAKDOWNIZ-37Y 5% DIODE BREAKDOWNIZ-19Y 5%	12574 12574 28480 28480	55M-001-98 1902-3002 1902-0551	
AISCR3	1902-0551 1902-0551		DIGDE BREAKDOWNIG. LTV 5%	24460	1902-0551	•
ALSCAS ALSCA6 ALSCA7	1901-0040 [902-3094 1902-3094	•••	- DIODE BREWDOWN:2-114 58 DIODE BREWDOWN:2-114 58 DIODE:21FICON 30M 30MA	. 072A3 28480 28480 072A3	F0G1088 1902-3094 1902-3094 FDG1088	
ALSCRO	1902-3094 1902-3094		DIODE SILICON BONA SOLV DIODE BREAKDOWNIS-LLV ZE DIODE BREAKDOWNIS-LLV ZE	26460 26480	1902-1044 1902-1094	
AISCRID AISCRIZ AISCRIZ	1902-3394 1902-3429 1901-0033	1:61	DIDDE BREAKDOWN:75 Y 2E DIDDE: SILICON TOOM TROWY	26480 26480 07263	1902-3394 1902-3429 FD3349	
ALSCRIA .	1901-0033		DIDDESSILICON LOOMA LOOMY DIDDESSILICON SOMA SOMY DIDDESSILICON SOMA SOMY	07263 07263 07263	FDG1088 FDG1088	
AISCRIA AISCRIA AISCRIA	1901-0040 1901-0040		DIDDEREILICON BOMA BONY	07263	FOGLORS	,
A1501. A1501 , A1502	1854-0300 1205-0014 1851-0073	1 2 46 1 2 1	TETRIES NOW HEAT SINCESENICONDUCTOR TETRIES PAR	28480 05820 28480 05820	1854-0300 203-08 1853-0073 203-08	
A1502 A1503	1205-0018 1854-0039	1,7	HEAT SENKISENICONDUCTOR TSTALEL HON	80131	2M1051	
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See introduction to this section for ordering information

Table 6-1, Replaceable Parts (Continued)

Referençe	HP Part Number	City	Description	Mfr Code	Mfr Part Number
Designation				, Lode	
A1503 A1504 A1504 A1505 A1505	1205-0013 1683-0012 1205-0013 1654-0132 1205-0041		HEAT SINKISEMICONDUCTOR TETRISI PHP HEAT SINKISEMICONDUCTOR TETRISE NPHISELECTED FROM 2H3440) HEAT SINKISEMICONDUCTOR	05820 80131 05820 24480 05820	207-C8 2N2-904A 207-C8 1189-0232 209-C8
#150# #150# #150# #1509 #15050	1893-0020 1894-007L 1894-0474 1894-007L 1893-0020		TETRIES PHPISELECTED FACH 2H3TO2) TETRIES HPMISELECTED FACH 2H3TO4) TETRIES HPMISELECTED FACH 2H3TO4) TETRIES HPMISELECTED FACH 2H3TO4) TETRIES PHPISELECTED FACH 2H3TO23	20400 20400 20400 20400 20400 20400	1833-0020 1834-0071 1834-0474 1834-0071 1833-0020
ALSAL ALSAL ALSAL ALSAL ALSAL ALSAL	0483-2038 0483-2018 0483-1018 0483-3725 0483-3728		RIFKD COMP ZOR OHN 58 1/4M RIFKD COMP LOO DHN 58 1/4M RIFKD COMP LOO DHN 58 1/4M RIFKD COMP 3900 DHN 38 1/4M RIFKD GOMP 3900 DHN 58 1/4M	01121 01121 01121 01121	CB, 2035 CB 1015 CB 1016 CB, 305 CB, 3
ALSR6 ALSR8 ALSR8 ALSR10	0685-1505 0683-6615 0683-1325 2100-2093	2	RIFRO COMP 18 DHE SE 2/2M RIFRO COMP 460 DHE SE 1/4M RIFRO COMP 460 DHE SE 1/4M RIFRO COMP 1300 DHE SE 1/4M RIFRO COMP 200 DHE 308 1/4M	01121 01121 01121 01121 20680	EB 1905 CB 6015 CB 6015 CB 1825 2100-2093
#15#11 #15#12 #15#13 #15#14 #15#15	0683-6815 2100-2093 0683-1323 0683-0775		RIFED COMP 480 DHM SE 1/4W RIFED COMP 480 DHM SE 1/4W RIFED COMP 200 DHM 308 LIM. 1/8W RIFED COMP 207 DHM SE 1/4W RIFED COMP 207 DHM SE 1/4W	01121 01121 20400 01121	CB 4815 CB 6815 2100-2093 CB 1325 U CB 2765
A15816 A15817 A15810	0683-0275 0683-0395 0483-0395		RIFKD COMP 3.9 DIM ST 1/4M RIFKD COMP 3.9 DIM ST 1/4M RIFKD COMP 3.9 DIM ST 1/4M	01121 01121 01121	CB 27G5 CB 39G5 CB 38G5
					And the second s
Als	05327 60006		POARD ABSY-CONNECTOR (BERIES 1040A) (LOADED ON 05327-60006 BLANK BOARD) UBES BAME PARTS AS A16 05327-60026 BOARD ASSYLCOANECTOR	28480 4	05527-60005 05527-60026
nide.	0100-2352		(SERIES 1132A) (LOADEO, ON 05327-20027 BLANK BOARD)  "CIPRO ELECT 6000 UF +75-108 19VOCM	28480	0180-2352
#16C2 #16C3	0180-1962 0180-1962		CIFRO ELECT 4000 UF +75-LOR 15VOCH CIFRO AL ELECT 15 UF +50-108 250VDCH CIFRO AL ELECT 1500 UF +75-108 AQVOCH	54289 54289 54289	390167-05818E) 390136F250E34-058 390293
Alacs Alacki Alacki Alacki Alacki	1910-001A 1910-001A 1910-001A		CIFRO AL ELECT 1900 UF 175-108 BOVDCH DIDDEIGERMANIUM 100MA/0.85% AOPIV DIDDEIGERMANIUM 100MA/0.85% AOPIV DIDDEIGERMANIUM 100MA/0.85% AOPIV	96289 93132 93132 93332	390243 02361 02361
ALOCAO ALOCAO ALOCAO ALOCAO ALOCAO	1901-0045 1901-0045 1901-0029 1901-0029	14	DIODEISILICÓN 0.75A 100RIV DIODEISILICON 0.75A 100RIV DIODEISILICON 600 PIV DIODEISILICON 600 PIV	04713 04713 28480 28480 28480	\$8 350-7" \$8 350-7" ! 90!-0029 ! 90!-0029 ! 190!-0029
Alechio Alechio Alechio Alechio Alechio	1901-0029 1901-0415 1901-0415 /1901-0415		DIDDERSTLEON GOO PIV JA DIDDERSTLEON SO PIV J	28480 28480 28480 28480 28480	1901-0415 1901-0415 1901-0415 1901-0415
Alacala Alacala Alacala Alacala Alacala	1910-0016 1910-0016 1901-0460 0812-0021	2	OIDDE:GERMANIUM LOGHAYO.85V ADPIV OIDDE:GERMANIUM LOGHAYO.85V ADPIV DIODE:SILICON 3-JUNCTION STARISTON OIDDE:SILICON 3-JUNCTION STARISTON RIFKD MM 0,47 DHM 58 3M	73332 73332 03508 03508	02341 02341 578523 578523 0812-00214
Alanz Alanz Alazyi Alazyi Alayaz	0612-0021 0686-2045 1291-1886 1291-1886	i	AFFRO WH 0.47 OHM SE 3M RIFED COMP 200K OHM SE 5M NOT ASSIGNED CONNIFC 30-CONTACT (2X15) CONNIFC 30-CONTACT (2X15)	28480 01121 71785 75785	0f12-0021 EB 2045 -252-15-30-340 252-15-30-340

Table 6-1. Replaceable Parts (Continued)

Reference Designation	HP Part Number	aty	Description	Mfr Code	Mir Part Number
Alexan Alexan Alexan Alexan Alexan	1251-1816   1251		CONNERCISO-CONFACT FREE CONNERCIONES CONTACT FREE CONTACT	71703 71703 71703 71703 71703 71703	202-35-10-340 . 202-35-10-340 . 202-36-30-300-300-32-3-3-3-30-300-300-300-300-
PARAIN DIANAIN ALAKAIN TINGAN TINGAN	1261-1006 1251-2134 1251-2134 1251-1006 1251-1006		CONHIPC 30-CONTACT 12x18) CONNECTORIPC 12x18136 CONTACTS CONNECTORIPC 12x18136 CONTACTS CONNIPC 30-CONTACT 12x181 CONNIPC 30-CONTACT 12x181 CONNIPC 30-CONTACT 12x181	11700 71700 71700 71700 71700	### 19-10-100 2021 9-10-100 2021 9-10-100 202-15-20-100 202-15-20-100 202-16-10-160
Aloxals Valoxals Valoxals Caloxals	1291 - 1 aaa		CONNIPC 36-CONTACT (2X13) NOT ASSIGNED. NOT ASSIGNED. CONNIPC 36-CONTACT (2X13)		10 10 10 10 10 10 10 10 10 10 10 10 10 1
Alty (	wisemi		BOARD ASSY, INPUT C AMPLIFIER (BERURA 1128A) 5328A ONLY		(Mases emas)
ALTCI ALTCI ALTCS ALTCS ALTCS	0[bb-0]97 0180-0197 0180-0197 0160-2049		CIFAD ELECT 2.2 UF 100 20VOCW CIFAD ELECT 2.2 UF 100 20VOCW CIFAD ELECT 2.2 UF 100 20VOCW CIFAD ELECT 2.2 UF 100 20VOCW CIFAD CER FEED-TINU SOOD PF 80-200 CIFAD CER FEED-TINU SOOD PF 80-200 CIFAD CER FEED-TINU SOOD PF 80-200	56289 % 56269 % 28480 28480	1 900223 H020A2-DYS 1900235 H02HA2-DYS 0160-2044 0160-2044 55H00173#
Alica Alica Alica Alica Alica Alica Alica Alica	0180-0106 0180-0775 0180-0106 0150-0055 0150-0045 0150-0055		CIFRO ELECT.AO UF ROT AVDCH CIFRO CER Q.ODI UF 201 79VOW CIFRO ELECT AO UF 201 79VOW CIFRO TI DIOXIDE 10 PF 58 300VDCH CIFRO TI 12 1N 58 300VOCH CIFRO TI DIOXIGE 18 PF 58 300VDCH CIFRO TI DIOXIGE 18 PF 58 300VDCH CIFRO TI DIOXIGE 18 PF 58 300VDCH	28480 12974 28480 78488 12574 74488 12974	0190-0104 \$\$M-,D01-98 0180-0104, YVE GA .\$\$M-,D0\$/,98 TYPE GA, PE
AITCAL AITCAL AITCAL AITCAL AITLA AITLA	0140-0979 1901-0047 1912-0007 Y 1250-0834 11 9100-2259 9140-0142		DIODE JUNCTIONISTICON ZOPIV  DIODE JUNCTIONISTICON ZOPIV  DIODE TUNNEL LI TIPE INSTIC CONNECTORINE SO-NIVITATURE COLL/CHORE 1.50 UN TOR	264 8D 03908 982 91 998 00 621 42	\$\$M-001748 L401-0047 L401-0047 198714 \$PFC 80-051-0000 1025-14 U4-9418-48
AIPLI AIPLA AIPLA AIPO2 AIPO3 AIPA	91.40-0127 91.00-2256 1893-0019 1893-0019 1894-0092 70740-0012		COSLIPKO AF 2.20, UH 10% COSLIPCHORE 0.56 UH 10% TSTRESS PNP TSTRESS PNP TSTRESS NPN FSTRESS NPN 1 A AFFRO MET OR 31 OHM 28 (W	#2142 13039 19231 #0131 #0131 #0131	Dymanjamak Oymanjamak Rajano Rajano Rajana Rajana Rajana Rajana
ALTAS ALTAS ALTAS ALTAS ALTAS ALTAS ALTAS	0691-1019 0691-1		RIFRD MET DR 56 CHM SE F/AM REFRO COMP 1000 CHM SE 1/AM AFFRO COMP 750 CHM SE 1/AM REFRO COMP 150 CHM SE 1/AM REFRO COMP 1800 CHM SE 1/AM REFRO COMP 1800 CHM SE 1/AM REFRO COMP 1800 CHM SE 1/AM	20480 201121 201121 201121 201121 201121	0756-0049 CB 1065 CB 1515 Ca 1515 CA 1825 CB 1825 CB 1825
AITRO AITRIO AITRIO AITRIO AITRIO AITRIO AITRIO AITRIO	OM3-1825 OM3-2215 2100-2433 OM81-2015 DM81-2015 OM81-515 OM81-5105 OM81-5105		RIFKD COMP 1800 DHN SE 1/AW RIFKD COMP 220 DHN SE 1/AW RIFKD COMP 200 DHN SE 1/AW RIFKD COMP 200 DHN SE 1/AW RIFKD COMP 150 DHN SE 1/AW RIFKD COMP 150 DHN SE 1/AW RIFKD COMP 51 DHN SE 1/AW RIFKD COMP 51 DHN SE 1/AW	01121 24940 01121 01121 01121 01121	CR 1829 CR 2215 2100-2415 CR 2015 CR 2015 CR 1515 CR 9105 CR 9105
417417 417418 417418 6 7 7 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8	0683-1045 9683-1225 9683-3625 9683-3625 9683-3625 9683-1515 9683-1085 9683-4715		RIFKD COMP 100K DINS 88 1/4M PRIFKD COMP 1200 DIN 58 1/4M RIFKD COMP 3600 DIN 58 1/4M RIFKD COMP 3600 DIN 58 1/4M RIFKD COMP 150' DIN 58 1/4M RIFKD COMP 100D DIN 58 1/4M RIFKD COMP 100D DIN 58 1/4M	01121 01121 01121 01121 01121	CB 1045 CB 1225 CB 1325 CB 1325 CB 1315 CB 1025 CB 1075
A17625 A1702 A1701 A1702	0683-5615 0683-5615 1858-0004 1820-0147		RIFAD COMP SEO CHM SE 1/AM RIFAD COMP SEO CHM SE 1/AM TETE ARRAYES MPN DUAL DIFF. AMPL. SCIECL TRIPLESS-IMPT NOR GATE	0)121 01121 2480 00713,	CR 5615 1456-0004 MC100 MP

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Model 5:121927A Replacquide Party

Table 6-1, Replaceable Paris (Continued)

	arence ignátion	HP Part Numbe	r s'diy	Discriptio	n Mir Code	Mfr Part Number
		ps 12 1 - 6000 \$		PRESCALER ASSY)	Pasto	OVJET-AUDOV
		hain-aoks ni w-ni v		SLUADED DN.05327-20009 BLA WASHERSPLAT, BARELTE COFFO CLECT 2/2 UF 10% 20V COFED CER 0.001 UF 20% 35V	DCU 00000	000 190022844070A2-DV6 558-,001-VA
A DE		41 NO-01 D6 01 60-01 75 01 NO-01 D6 01 60-01 75		CIFRO CER D. ON UF 20% AND CIFRO CER D. ON UF 20% AND CIFRO CER D. ONE UF 20% TOY CIFRO CER D. ONE UF 20% TOY	DCN 11 12974 DCN 12974	0180-0106 65H-0010-98 0180-0106 145H-1001-98
AL SE	PI CONTRACTOR	0140-0775 0140-0975 0140-0975 0140-0197		CIFRO MICA 300 PF 38 CIFRO CER 0.001 UF 208 75V CIFRO CER 0.001 UF 208 75V CIFRO ELECT 2.2 UF 108 20V CIFRO ELECT 2.2 UF 108 20V	DCH A6289	55M-001-98 • 55M-001-98 • 55M-001-99 150022547070AP-DYS 15007587070AP-DYS
ALOC ALOC ALOC ALOC ALOC		0140-2049 0140-2049 1902-3002 1912-0007 1902-5048		CIPRO CEN FEED-THAN 1000 P CIPRO CEN FEED-THAN 1000 P OLODE MERANDONIES BY SE OJODESTUNMEL ELA JYPE INST DEODE: BREARDOWNES BLICON S.	F -80-208	0140-2044 0140-2042 1497-2002 149714-5PEC 1402-1448
A   A   A   A   A   A   A   A   A   A	MILL			CONNECTOR OF SUB-PRINTATIONS COLLIFED BY G. 22 UH 108 TETREST PPP TETREST PPP TETREST PPP TETREST PPP	98011 (\$2846 80131 80131 90131	\$0-033-0000 \$100-223 L 283840 283840 283843 213
		7100-2533 7100-2531 0657-5104 0683-5104		PATYAN CERNET IN CHM LOR LI RIYAR FLW RODO DIM 108 LIM RIFKO COMP 51 CHM 38 1746 RIFKO COMP 51 CHM 88 1746 RIFKO COMP 104K CHMS, 88 18	1/20 24480 Oliel	2100-2033 -2100-2521 -
		0483-1025 0490-1919 0481-1819 0481-1828 0481-2218		SHIPRO COMP 1000 CHM SE FA RIPRO CARBON SI CHM SE FA RIPRO COMP 180 CHM SE FA RIPRO COMP 1800 CHM SE FA RIPRO COMP 220 CHM SE FAM	#	CR 1028 0498-3178 CR 1815 CR 1825 CR 8215
A   81 A   61 A   61 A   63 A   64		0003-1029 0003-1029 0003-1029		RIFAD COMP 1800 DIM SE 1/4 RIFAD COMP 1800 DIM SE 1/4 PEFAD COMP 1800 DIM SE 1/4 RIFAD COMP 200 DIM SE 1/4M RIFAD COMP 200 DIM SE 1/4M	W - 1 2 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	co teab . co teab . co teab . co teab . co teab
A   0 h A   0 h A   0 h A   0 h	19: 5 16:	One14] D25 0691-1315 0491-4315 0493-3315 0663-8205		RIFED COMP SOUD DAM SE 1/4 RIFED COMP 180 CHM SE 1/4M RIFED COMP 430 CHM SE 1/4M RIFED COMP 300 CHM SE 1/4M RIFED COMP 82 CHM SE 1/4M		Co 1025 Co 1915 Co 1915 Co 1915 Co 1915 Co 1915
A) 84 A) 84 A) 88 A) 88 U 0 1 A		0683-1039 0693-5029 0693-5339 0643-5405 5888-7006		RIFED COMP 100 OHN SE 1/AM RIFED COMP 2000 DHM SE 1/A RIFED COMP 330 OHN SE 1/AM RIFED COMP 24 OHN SE 1/AM ECOLOMITES		Ca this Ca 2025 6 8 Ca 3015 Ca 2605 Suaa-7002
V 101		**************************************		ICIAH AND IRIG ICIDISTAL ICIDISTAL QUINAN DINIDIA ICIECL TRIPLE 3-1401 NOR G	2 2480 2 2480 2 2480 2 2480 2 2480 2 2880 2 2880 2 2880	1 3008-7001 1 820-0736 1 1820-0716 1 1820-0487 NC1007P
Sign.		11112198	-15	TATE ARRAYES HPH DIAL DIF	A APPL A STATE OF THE STATE OF	1858-0004 2-33 gaça-a
			3.11		1、水温等加坡。1000年(巴罗)。1955年 四海(在1876年)。1956年(日本1886年)	Walley James Like

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Table 6-1. Replaceable Parts (Continued)

Reference Designation	HP Part Number	a zateli. Paradata	Description	Mfr Code	Mfr Part Number
Alian (	(Icon) aprima		BOARD ARSY PRESCALER (SERIES ITIGA) (LIANGE THE COLOR TENDER (MARIE)	)20 AMC) <sup>1</sup>	ORCOUR TRICAG
Almedi Alata Alata Alaca	0180-0197 0140-01975 0180-0108 0180-0175		CIPAD ELECT 2.2 UP 108 20VDCH CIPAD CER 0, QOI UP 208 75VDCH CEPAD ELECT 60 UP 208 6VDCH CIPAD CER 0.001 UF 208 75VDCH	86289 12874 28480 12874	190022919020A2-075 65A-0001-98 0180-0104 45A-0001-98
Ajacs	0140-0104 0140-0174 0140-0179		CINNO CER O'DOT THE SOR SPACEN CINNO CER O'DOT THE SOR SPACEN CINNO EFECT OF THE SOR PADEN	12474 12574 12574	\$5M-00h; 48 0180-010- 55M-001-48 55M-001-48 0140-0225
Alacio Alacio Alacio Alacio	0160-0978 0160-0978 0180-0197 0180-0197		CIPRO MICA 300 PF BE CIPRO CER 0.001, UF 20E PSYDCH CIPRO CER 0.001 UF 20E PSYDCH CIPRO ELECT 2.2 UF 10E 20YDCH CIPRO ELECT 2.2 UF 10E 20YDCH	12574 12574 56287 56287	######################################
Alacia Alacia Alacas Alacas	0140-2049 0140-2049 1402-3002 1412-0007		CIPRO CER PEED-THAU 5000 PP + 80-201 CIPRO CER PEED-THAU 5000 PF + 80-201 DIODE BREAKDOMIE 37V 5E DIODE TUNNEL EIG TYPE LH3714 DIODE THEAKDOMIES IL CON 3.48V 5E	28480 28480 28480 03508	0160-2049 0160-2049 1402-1002 1407-16 BPEC 1408-1048
Alegi Aleia Alegi Alegi	12 90 -0 3 4 014041 3 8 9100 - 2 2 9 1 1493 - 0 0 1 9		DIDDE BREAKDOMMESILECON 3-ANY BE  TECHNECIDM SP SUB-HINIATURE  SUBSECTION OF 0-22 UH 108  TESMEET PHP	98291-3 99930 28480 80131	\$50-055-0000 100-100 1000-1251 2000-1251
A1802 A1803 A1884 A1882	1854-0345 1854-0098 2100-2433 2100-2521		TETRIES NON TETRIS	#0131 #0131 28440 28440	2100-2693 2100-2693
Alana Alana Alana	0483-5105 0483-5105 0483-1045 0483-1025		REFER COMP SE DIM SE 1/4M REFER COMP SE DIM SE 1/4M REFER COMP 100R CHRS SE 1/4M REFER COMP 100D CHM SE 1/4M	01151	CB \$105 CB \$1045 CB \$1045
ASAR ASAR ASAR ASARSO	0646-3378 0643-1415 0643-1825 0643-2215 0643-1825		REFAD CARBON ST DHM SE 1/89 REFAD COMP 1800 DHM SE 1/40 REFAD COMP 1800 DHM SE 1/40 REFAD COMP 220 DHM SE 1/40	20400 0)121 0)121 mpligh	DA98-3378 CD 1815 CD 1829 CD 2215
A10811 * A10812 * A10813 * A10814 * A10819 *	0683-1828 0683-2015 0683-2015		RIFAD COMP 1800 ONN 58 1/4W   W 1/4 RIFAD COMP 1800 ONN 58 1/4W   W 2/4 RIFAD COMP 200	1 0 1 2 1 0 1 2 1 0 1 2 1 0 1 2 1 0 1 3 1	1/ch fazs, Cn 1azs, da 1azs, cn 2010 / 1 / co 2010 /
ALMALA ALMALA ALMALA ALMALA ALMALA	0483-1025 0483-1315 0483-4315 0483-8115		RIFAD COMP 1000 OHM SE 1/4W RIFAD COMP 150 OHM SE 1/4W RIFAD COMP 430 OHM SE 1/4W RIFAD COMP 810 OHM SE 1/4W RIFAD COMP 82 OHM SE 1/4W	01121 01121 01121 01121	Ca 1025 Ca 1515 Ca 4515 Ca 5115
A1MX21 A1MX21 A1MA22 A1MA23	0683-1018 0683-2028 0683-2318 0683-2405		RIFKD COMP 100 OHN SE 1/44 RIFKD COMP 2000 OHN SE 1/44 RIFKD COMP 330 OHN SE 1/44 RIFKD COMP 24 DHN SE 1/44	01121 01121 01121 01121	C8 1015 C8 2025 C8 3318 C8 2405
A10924 A10924 A10924 A10924	0498-3374- 0483-3415 0483-2315 2100-2470		REPAD COMP 340 DM SE 1/8M  REFAD COMP 340 DM SE 1/4M  REFAD COMP 270 DM SE 1/4M  REFAD COMP 270 DM SE 1/4M	28480 01121 01121 28480	0498-3374 CB 3615 CB 2714 2100-2470
ATRUS ATRUS ATRUS	\$088-7002 \$088-7001 1820-0734 1820-0784		ICOLINITER ICOAMP AND TRIG ICODISTAL ICOBINARY-QUINARY	28480 28480 28480	9089-7002 18088-7001 91 1820-073A 1820-0784
A18U5 A18U6 A18U7	\1820-0489 \1820-0147 \856-0004		ECTECL TRIPLE 3-IMPT MOR GAYE TETR ARRAYSES APPL DUAL DIFF. AMPL.	20480 04713 20480	1870-0489 MC1007P 1858-0004
Alaue Alauz Alauz Alaue Alaue	120-070 121-1556 121-1556 1205-027		ICIDIBITAL CONNECTORISINGLE CONTACT CONNECTORISINGLE CONTACT HEAT DISSIPATOR: RETAINER	28480 00779 28480 28480	2-310808-8 2-310808-8 2-310808-8 1205-0243 1203-0244
#10 PUT	0570-0119 0510-0001 2050-0062 2050-0079		SCREWIPAN HOPDEL OR 2-94 K 0,312" LG MUTINER 2-54 K 0.188" MASHERIPLAT, GARELITE WASHERINYLON 0,1675" DD	00000 00000 00000	CAD (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)

See introduction to this section for ordering information

Table 6-1, Replaceable Parts (Continued

Reference ! Designation	HP Part Number	" Oty	Description	Mfr. Cod	Mfr Part Number
		ووفر			
	3190-0019 3190-0010		PELTERIAIN MOTORISHADED POLE	2040D	9190-0099 9140-0090
	3[60-0039 571/A-178 0160-1043 21 (8-0020		PANTIMPELLER AREAL 2-2/4 DEAM COFAD CER & R 0.000 UF 200 25DVAC FUSE 0.00 AREAL 2-2/4 DEAM COFAD CER AREAL 2-2/4 DEAM COFAD CER AREAL 2-2/4 DEAM COFAD CER AREAL 2-2/4 DEAM COFAD CERTAIN COFAD CERTAI	04874 78480 88789 78918	#   / A   HIP   129   5   5#   2#   128     # C   9   7   128     # C   9   128   12
. <b> </b>	1480-1583 3110-0304		PURE CARTRIDGE L.S. AND 250V BLOW-BLOW CONNECTORING BIG MOUNT JACK	71400 60674 90674 74731	MOX-1-1/2A OF 21AC OF 21 MADOM 2010/104-1 2011/44-1
	1290-1293 1290-1293 1290-1293 1290-1293		CONNECTORIAP BMC MOUNT JACK CONNECTORIAR BMC MOUNT JACK CONNECTORIAR BMC MOUNT JACK CONNECTORIAR BMC MOUNT JACK	24431 24431 24431 24431	2018   44-1 2018   74-1 2018   74-1
	130-0318 1301-339,1		PART OPINISTABILL PRESCALER ABRY BOCKET & S-PIN HALE PINER RECEPTACLE CONHECTOR JACK CHARGES BMC	#9389 #9312	EAC-30) 19409-1
d A	8040-0104 1893-0233 3894-0429 09327-20024 7124-2105		CONNECTORALS CONTACTS TETRES PMP ESTRES MAN HEAT SHALLON OJ AND OR LAUSCL PUNITSEATHINK	2000 01290 2000 2000	5040-0104 11P, 32 1864-040 05327-20034 7104-0105
	3103-1381 8100-844) 1134-310-3		PART OF A1 BALTON DEST 0.98 1239 AC/OC	19727	Allean-gane
	3101-1214 3101-1311	<u>, , , , , , , , , , , , , , , , , , , </u>	SWITCHIPUSHMUTTON SPST SWITCHIPUSHMUTTON SPST SWITCHIGLIBE DINTT OFFA, 1284 AT/DC	82389 19727	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)
	()		SANIACH VERANIME BYESINISED!	20000	05326-60038 -
	101-111		, but tan alde oppiso. Da 1884 ar/oc	IVZAY	Maponen
10 10 10 10	3101-1311		STITEMENT OF THE STITEM		0150-0010
	8100 2030 8100 -8888		THANHORMAN CABINET PARTS  THANHORMAN CABINET PARTS  OTHER CABINET PARTS	40	8100'9030 8100'9030
	##0-0114 1490-0030 * \$000-0030 \$040-0729	12	TAPETPIN VINETIMME 1-1/4 (M MIDE 1-1/1/17)/ STANDITELT TAINIBLUES PRANE ASSVID N 11-1810E)	; 3%	1480-0030 9000-0030 9000-0030
	5040-0147 05324-00001 05324-00004 06327(00000		PANEL PROMIT PANEL PROMIT PANEL MEAR (OPT OH) PANEL MEAR (OPT OH) PANEL MEAR (OPT OH)	7 6 6 0 2 6 6 0 2 6 6 0	5000-0)a7 
	05326+00011 05326+00012 05325-20012 05327-20010		PLATE ECOMPECTOR, LONG (JRED)VKR) PLATE COMPECTOR, SINGET (JULDIVKR) PLATE (COMPECTOR, SINGET (JULDIVKR) WANDAW (BJ27A)	#8480 #8480 #8480 #8480	05376-0005 05385-0005 05387-00018
	05329-00009		TRADEMARK (IIP (ANNI)).  PAÉNTED CAPINET PARTS  COVERS MATTIM	Serap I	0)113-00000
	05326-00006 05326-00003 05326-00021 05326-00023		BIGHT FRONT PANEL TRIM LEFT FRONT PANEL TRIM SIDE COVER THE COVER	/8480 /8480 /8480 /8480	ON SPA-HOODUS INCHINISHINIS IN SPA-HOODEL IN SPA-HOODER

New introduction to this section for ordering information

Table 6-1, Replaceable Parts (Continued)

Reference Designation	HP Part Number	Oty	Description	Mfr Code	Mir Parc Number
	#970-0014 #810-0047 9030-0704 9030-0707		SCREWERST PLAT HD PIN. IN. 6-35 H 5/A SCREWERSM HD PIZE DN 8-32 H G. VSRV LG BRACKET SLEFT BRACKET SQ I BIST STRIPSFILLER CRAY	78480 00000 76480 78480 78480	2410-0012 040 070-0704 0040-0701 0040-0701
	0170-0104 0192-0004 0192-0001 0100-0100 0100-0100 0000-0100 0000-0100 0000-0100		ENTERNAL AND COMER PARTS  RICHARDS BLE BAR (THRESTARD)  RICHARDS BLE BAR (FUNCTION)  RICHARDS BLE BATTO  RICHARDS BESTITATION  RICHARDS BESTITUTE  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITUTE  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITUTE  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITUTE  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITUTE  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITUTE  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITUTE  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITUTE  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITUTE  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITUTE  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITUTE  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITUTE  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITUTE  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITUTE  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BESTITATION  RICHARDS BE	PRARO PRARO PARO PARO PARO PARO PARO PAR	OSTO-DEGA OSTO-DEGA DESPI-STADE UNITEDA DEGISTO ADMODILE DASSEDALIA DASSESSALIA
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Bataranca	HP Part Number	Qty	O Description	Mir	Mfr Part Number
Dalignation		不		Code	
4			IDPION OOL EN DIGIT DIAPLAY) ORLETE AN ONNA-AOODN AND APPLACE		
	**************************************	74	NIII AT OSDA-BODES. BISPLAY ASBY (ARAIPS 1038A)	78480	00376-60079
		E	CHARLO, DA DASSO-SODOR MI WAN MINED!	ļar ∱a <sub>p</sub> Lite	
AND ST.	1970-0007	•	THER MINISTERS THE STATES TO SERVER THE STATES	83394 43394	N-978D-B
49067 49069 49063	470-0047   700-0405   470-0047   1700-0405		TUBE MUMERICAL INDICATOR SOCRETS DURE FOR SEUD SERIES SUREINMERICAL EMDICATOR SUCKETIJURE FOR SERIES	83596 83596 83596 83596	EM 207 0-5750-8 30 207 5-5750-8 58 207
29056 49056 29066	1970-0047 1400-0406 1470-0047		TUBET MUMERTCAL EMPLOATER ADCARTATURE FOR STOO SERIES TUBET MUMERICAL INDICATOR	83544 83544 83544	/6-3750-5 68 707 8-3750-5
PULS	1701-0403 1970-0043		Speakeling ton Fon Arasis ture mmentum. Indicator	13374	\$8.6760-6
, 49866 49067 49067	1700-0405 1778-0047 1700-0405		ADCRETATURE FOR STOO SERIES' TUBERNIMERICAL EMULCATUR TUBERNIMERICAL EMULCATUR	# # # # # # # # # # # # # # # # # # #	84 207 0-9700-5 54 207 0-9780-6
A4044 A444 A444	1700-0405 0483-1075 0483-7575		APPAD COMP TOOD ON BE LIVE REPUT COMP TOOD ON BE LIVE REPUT COMP TOOD ON BE 1/44	03574 01123 01121	CB 1029
4444 4444 4444	0483-1075 20483-7676 0483-7835	μ, ι	RIFAD COMP 1500 CHM SE 174W RIFAD COMP 1500 CHM SE 174W RIFAD COMP 1500 CHM SE 174W		CO 1016 CO 1016 CO 1016
4986 4987 4988 4989 4989	0489-7974 0483-7975 0483-7975 0483-1475 0483-1403		REPAD COMP 7500 CHM 98 1/4H REPAD COMP 7500 CHM 58 1/4H REPAD COMP 7500 CHM 58 1/4H REPAD COMP 7500 CHM 58 1/4H REPAD COMP 10 CHM 58 1/4M	0000	CB 1978 CB-1978 CB 1978 CB 1978 CB 1903
390   4 390   390   390	0A83-7678 1870-0114 1870-0114		RIPHO COMP 3800 OHM SE 2/4H [FIECE TO TPE QUAD-P-IMP OR YEARS: [FIFT, BLANKING DECADE COUNTER [FIFT], BLANKING DECADE COUNTER [FIFT], BLANKING DECADE COUNTER [FIFT], BLANKING DECADE COUNTER	01191 04715 94140 28640	CB 1928 NC1030P 1820-0119 1820-0119 1820-0119
	. 1870-0519 1870-0319 1870-0317 1870-0319		CITTL BLANKING DECADE, CHUNTER CITTL BLANKING DECADE CHUNTER CITTL BLANKING DECADE CHUNTER	20,00 20,00 20,00 20,00	
3911 3911	1970-0114 1970-0116		ICITE PLANTING DECADE COUNTER	) #488 2 #488	1020-0  0   1020-0  0
AVI I O AVI I I AVI I A AVI I A AVI I A	AFN-0  A   AFN-0  A   AFN-0  A   AFN-0  A	ng <b>l</b> ing Tagada	Cisebit burr binem gated buts Cisebit burr binem gated buts Cisebit burr binem gated buts Cisebit burr binem gated buts ICisebit burr binem gated buts	78480 78480 78480 78480	18/0-0  6   18/0-0  6   18/0-0  16   18/0-0  16
A9019 A9010 A9017 A9017	870-0    6   870-0    6   870-0077	• . <b>.</b>	ICIA-BIT BUPP STORE GATED DUTS INTEGRATED CIDEN STORE GATED DUTS INTEGRATED CIDCUITIONE GATED DUTS INTEGRATED CIDCUITIONE GATED DUTS	/8480 /8480 /8480 /8480	1870-0116 1870-0116 1870-0017
ANITA ANITA ANITA	1970-0097, 1970-0097 1970-0097		INTERNATED CINCUITIDECUDEN-UIVIDEN	/0490 / /0490	1470-0091 1470-0097 1470-0097
44177 144174 144174	1820-0093 1820-0093		MIESRATED E REUIT DECIMENTO VIDER INTERNATED E REUIT DECIMENTO VIDER INTERNATED EIRCHIT DECEMENTO VIDER INTERNATED EIRCHITADECOMENTO VEDER	) 1 ( 10 ) 1 ( 10 ) 1 ( 10 ) 1 ( 10	1910-0011   910-0011   910-0011
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	Elano ficent		TAMA AME PROMING AMAING AMAING STANDARD TO THE STANDARD S	pilijan Pilijan	(AMAI A0018)
Complete Com	Ances (all 1 First count   First count		еринистин тима и ин ин ин и и и и и и и и и и и и и и	Market Market Market	100   40000   \$100 0     \$1   \$100 0000\$
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	; (30) 4000) (10) 4000) (10) 4000		TANIM'NI DAKIAKIN KITUKINKE RTIATHELIMINI ELIPEKIN KITUKIN RTIATHELIMINI ELIPEKIN KITUKIN	76440 76440 76440	1) In 1 (10) 7 (A) 10 au 460 (A) 17 au 470

Table 6-1: Replaceable Parts (Continued)

	Qty	Description	Code	Mid Part Number
	}oiota	ORTION 604-EXTENDED NAME OF PROGRAMMING Divide At 19528 (1983 and profuse with At 19527 (1918), 19526 (1984) per panel and replace with 19527 (1918) transfer at 19526 (1918).	and	
09997~4001#		states in objes-soom arana mako	20400	Objet-sames
0  60-0031 0  60-0031		CIPAD TI & PR BE SDOVICH	78488 78488	TYPE GA
0)40-077} 0 40-0707 0 40-0707		Ceran wich 220 AM LD	78480 78480 78480	Olso-oppl Olso-oppl Olso-oppl Oss-oppl Onites!135
0)40-2011 0 40-2018 0 40-2018		CIPAN CER'N. AL IN GRA-POR INSUNCE	14787	CO23F103F103F377-CHH H1N-C-10-K CO33F103F103F377-CHH H1N-C-10-K B140-B149
0]60-0]99  9]0-0]99  9]0-0]9		CIPAD MICA JAD BY BE DIDDESDEAMANION IDDMA/D, BEV ADPIV DIDDESGEMANION COMA/D, BEV ADPIV	23140 23111 231111	DIAD-DIAV DIAD-DIA DIAD- DIAD- DIAD-DIAD- LAD-DIAD-
403-0057   416-0056   416-0056   416-0056			28440, 43332 28480 24480	1902-0024 07361 1906-0024 1906-0024
1404-0074 1401-0040 1401-0040 1401-0040	10	DIDDE ABSYSSE UIDDESSISSON SONA SONV DIDDESSISSON SONA SONV	24130 07743 07743	1906-0029- FOGLORA FOGLORA FRUIDRA FUGLORA
		Dindestananeum 100ma/0,859 a0P29 Dindessilich 30ma 30my Dindessilich 30ma 30my Dindestananeum 100ma/0,859 a0P19	41332 07763 07763 97833	tisja: / routona / roalona / praid / poutona
1901-0040 1904-0075 1904-0075 1904-0074		DIDDRESTLICUM DOMA ROMY DIDDR ASSYSSI DIDDR ASSYSSI DIDDR ASSYSSI DIDDR ASSYSSI DIDDR ASSYSSI	07/63 70400 76400 76400	FDG 088 1806-0078 1906-0078 1906-0074 1906-0074
170 -0174 190 -0174 190 -0174 190 -0174 190 -0000		ntimesti i irma sev	Phonb (	1 1 901 = 01 7 A 1 901 = 01 7 A 1 901 = 02 7 A 1 901 = 02 7 B 7 D D D D D D D D D D D D D D D D D D D
1916-0016 1916-0016 1907-0061 1907-0061		Biddesuseramium idomaju, asy adety Didyeseramium idomaju, ssy adety Didyeseramium i idomaju, ssy adety Didyeseramium i ity ss Didyeseramium s, ity ss		DP363 DP363 \$10939-98 \$10939-98 \$10939-98
407-006    901-0060   9140-0067   140-0067		SOLDDERBERADOWN B. BLV BE	# 113   # 1	* 110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
		CONNECTORIPÉ LA CUNTACTE CONNECTORIPE BNC INFUI CONNECTORIPE BNC INFUIT.	31785 20000 2000	10   10   10   10   10   10   10   10
64 90-6379 64 90-6379 64 90-6379		ATLATIATED ALLY, 1200 DIM 12VDC ATLATIATED ALLY, 1200 DIM 12VDC BLATIATED ALLY, 1200 DIM 12VDC RELATIATED ALLY, 1200 DIM 12VDC	##4#0 . 7/#4#0 ##4#0 ##4#0	\$M8888 \$440-8848 \$440-8848 \$440-8848 \$1440-8848
101-000 104-0715 104-0715 101-0014		TATALL PROCESSES PART AND SAFE	70.00 00103 00103 00103	
	C  40-003  C  40-003  C  40-003  C  40-077  C  40-077  C  40-077  C  40-077  C  40-077  C  40-077  C  40-077  C  40-077  C  40-077  C  40-077  C  40-077  C  40-0077  C  40-00	09377-40018  0190-0031 030-0031 03	District Al (10374 CORNA)  District Control for promoting and implicate with Al (10374 AND) from a control for the control for	Deleta Al Octational and replace with Al Octational Deleta All Octational All Octational All Octational All Octational All Octational All Octational All Octational All Octational All Octational All Octational All Octational All Octational All Octational All Octational Octational All Octational Octational All Octational

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Table 6-1. Repigcable Parts (Continued)

	Reference Designation	HP Part Number	QIY		Description	Mfr. Code	Mir Part Number
				1			
. i 1		1884-0718 (484-0718 (488-0036 (483-0036 (483-0076		767816) 7678161 7678161 7678161	PAP 1	#0131 #0131 #0131	2M3904 2M3904 2M3904 2M3904
		1894-0216 1891-0394 1893-0394 0498-4163 0498-4163		TATALAS TATALAS TATALAS TATALAS ASPADISA ASPADISA	PM. DUAL N-CHANNEL SET DUAL N-CHANNEL SET DUAL N-CHANNEL NA JOAN 10 10 10 10 10 10 10 10 10 10 10 10 10	00131 00131 17036 17036 20400	203904 00317 00317 04394 04494 04494 04494 04494 04494 04494 04494
	Ajna Ajna Ajna Ajna Ajna	1144-9565 11445-9565 11646-1915 1144-9562 1144-9562		AIPAD CA RIPAD CA RIPAD CA RIPAD CA	RBON 2.7K CHN BE 1/AN RBON 2.2K CHM BE 1/AN MP 18D CHM BE 1/AN RBON 18D CHM BE 1/AN MP 18D CHM BE 1/AN	26480 26480 01121 26480 26480	0448-4565 0448-5565 EN 19196 0448-5563 0448-3383
		0498-3344 F100-7633 0498-3103 0498-3103 0498-7943		RIVAR CE RIPLO CO RIPLO CO	HP 180 DHM 86 1/8W AMET IN IMM FOR LIN 1/2W MP A30 DHM 88 1/8W MP A30 DHM 88 1/8W MP 330M DHM 88 8/8W	20400 20400 20400 20400 20400	, 0498-3381 2100-2633 0498-8103 0498-8103 08-3349
	1313 	DANH-THAA DANH-THAA DANH-THAB DTAT-DAAT DTAT-DAAT		L KIFAO CO	MP ASDR CHM SR 1/AW MP ASDR CHM SR 1/AW MP SSDR CHM SR 1/AW T PLM 121R CHM 18 1/AW T PLM 121R CHM 18 1/AW	01121 01121 01121 20100 20100	#8 6845 #8 6845 #8 3345 #877-0467
		OA48-1941 OA83-1018 OA48-2381 DA88-49A8		RIPRO CO RIPRO CO RIPRO CO RIPRO CO	MP 150 INM SE 1/AM MP 300 INM SE 1/AM MP 300 INM SE 1/AM MP 300 INM SE 1/AM RBON SAK INM SE 1/AM	2000 01121 2000 01121 2000	0498-5381 C8 2015 0498-3381 C8 2015
	ines ines ines ines ines	0448-4744 0448-5348 0448-6744 0483-1813 0443-1813		RIPAD CAI RIPAD COI RIPAD COI	P S.BK CHN BE 3/RM BOM BAR CHN BE 1/RM P 3-5K CHN BE 1/RM P 150 CHN BE 1/AM P 150 CHN BE 1/AM	01121 20100 0121 0121	88 3328 0498-5548 88 3328 CB 1515 CB 1515
	ingh igga ingo ingi ingo	0446-4381 0448-4381 0448-7097 0448-7097 2100-2374		AIPED COM AIPED COM AIPED COM		08485 08485 15110 15110 08485	0448-6381    0498-6381 88 1058 88 1058 88 1058
1	1833 1836 1838 1838	2100-2874 0444-7444 0444-7444 0448-3382 0448-3382		RIFAD CON	HET BOD OHM LOT LIN 1/24  P LOOK CHM BE 1/84  P LOOK CHM BE 1/84  P 180 CHM BE 1/84  P 180 CHM BE 1/84	211400 01171 01121 20100 20100	2100-2074 88-1045 88-1045 040-3381 0400-3381
\$	RJA  RJO  R40  R42  R42	DAYB-B17A DAYB-B17A DAYB-BYBA DAYB-BYBA DAYB-TOYT		AIFED COM AIFED COM AIFED COM	P 200 CHM SE 1/AM P 200 CHM SE 1/AM P 270 CHM SE 1/AM P 270 CHM SE 1/AM P 170 CHM SE 1/AM P 1 MEGCHM SE 1/AM	28480 28480 28480 28480 01121	0678-5175 0678-5174 0678-6786 0678-6786 0678-6788
1 1		De 98-6 244 De 98-2 244 De 98-3 261 De 98-3 261		AIFAD COM AIFAD COM AIFAD COM	P. L. NEGOWN ST 1/AN P. 3.3K CHM SE L/AN P. 3.3K CHM SE 1/AN P. 6.6 CHM SE 1/AN P. 6.6 CHM SE 1/AN	01131 01131 01131 20100	88 1055 88 3328 88 3328 0698-5361 0698-5361
	RAA* BAY BBI BBI	0648-8174 2100-2408 0648-9114 2100-2408 0648-848		RIPAD COM RIVAR CEN RIPAD COM RIVAR CEN	P POG CHM BY 3/AN' MET TOK CHM TOR LEN P POG CHM BR 1/AN' MET TOK CHM LOR LIN BON A.P.K CHM BR 1/AN	294 BO / 244	0498-8]74 2100-2905 0498-8]74 2100-2905 0498-8948
	# 6 5 # 6 6 # 6 6 # 6 6 # 6 7	De 98-5565 DE 98-5565 DE 98-5565 JIDO-7622 JIDI+1113		AIPAD CAR AIPAD CAR AIPAD CAR RIVAR CRA	NON de 24 CHM SE S/AN SON de 24 CHM SE S/AN SON DE 24 CHM SE S/AN SET SA CHM SEE S/AN SET SA CHM SEE S/AN SEE PROTOSA SESS AC/OC	المنما	70479-8948 0498-8948 0498-8948 2100-228 2100-228
1		3101-1313 3101-1313 3101-1311 3101-1311		SWITCHISL SWITCHISL SWITCHISL	IDE DPSY 0.9A 125V AC/DC IDE DPSY 0.9A 125V AC/DC IDE DPSY 0.9A 125V AC/DC IDE DPSY 0.9A 125V AC/DC	19727 19727 19727 19727	G1285-0004 G1285-0004 G1285-0020 G128-0020
	WL I	3 0 - 3   3 0 - 3   3 0 - 3   3 0 -0 14  0 0 -0 14		PART OF RI SWITCHISL SWITCHISL		1 00000 17	4174-0070 6174-0010 1840-0174 1840-0187

Bee introduction to this section for ordering information

Table 6-1: Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description	Mir Code	Mir Part Number
	1820-0834 1820-0887		ICONTE INIPER LEVEL TRANSLATOR (TEL-18TE) ICODOCTÁL QUAD 2-INPT HAND GATE		MCGAAP 1600-OPRI
NIK Warta Warta Ilio	nastranja instraci instraci instraci		Canderaby' Canderaby Pershire a Contact Connector Pershire as Contact Tanner Torreshold by Tanner Torreshold Tanner Torreshold by Tanner Torreshold Tanner T	(MAN) (MAN) (MAN) (MAN)	(1827/851)  8 
		24 4			
				6. 6.	
				Silver Cale	
1 m					
<b>9</b>		$Y_{g,i}$			
		-			

Table 6-2, Manufacturers Code List

MFK NO.	MANUFACTURER NAME	ADDRESS	Z.I P
1, 14	こうれい とんこ 強力性 しゅうさい システィック しん 名物 かいちゅうしょ しょしょ	"我们,我们们,我没有什么,我想到你的人的我们的,我们也没有了。"	The state of the s
rnan : II	ISSA. CJMON  AP INC. (ALKCPAFT MARINE PROD.)  ANGANO ELECTRIC GO.PICKENS DIV.  LLEN BRADLEY CO.  EXAS. INSTRUMENTS INC. SEMICONDUCTOR CON  L. CO. SEMICONDUCTOR PROD. DEPT.  OTOROMA SEMICONDUCTOR PROD.INC.  M MOTOR CO.  AKEFIELD ENGINEERING INC.  AIRCHILD CAMERA C INST. CORP. SEMICONDU	ENV SUDDITER OF U.S.	
( ) 14 A	MP INC. (ALKOPAFT MARINE PROD.)	HARRISBURG, PA.	17101
CHOL: S	ANJAND ELECTRIC CO.PICKENS DIV.	PICKENS, S.C.	27671 53204
1295	EXAS THETRUMENTS INC . SENTONOUCTOR COM	PUNENTS DIV. DALLAS, TEX.	7523
3500 U.G 4713 - M	otorola seniconductor prod. Dept.	SYRACUSE, N.Y.	13201
4870 > P	A HOTOR CO.	WESTCHESTER, ILL.	60150
5820 M 1201F	APPCHILO CAMERA G'INST. CORP. SENICONDU	CTOR DIV. MOUNTAIN VIEW, CALIF	, 94040
Ellino D	ATTOMAL SEMICONDUCTUP CORP.  ATTOMAL SEMICONDUCTUP CORP.  ULTON TNO. INC. DATA SYSTEM DIV.  IRCO SUPPLY CO. INC.  OHNELL DUBLIER ELECT. DIV.FEDERAL PACIF	CLEVELAND, OHID	4411
2040 N 2574 D	ULTON IND. INC. DATA SYSTEM OLV.	ALBUQUERQUE, N.M.	8710
1019 A	IRCO SUPPLY CO. INC.	MITCHITA, KANS.	6721
4099 C 7856 S	ILICONIX INC.	SUNNYVALE, CALIF	9408
570'L E	LECTRA/HIDLAND CORP.	MINERAL HELLS, TEX.	7606
6480 H	PECTALITY CONNECTOR CO. INC. ENLETT-PACKARD COMPANY	PALQ ALTO, CALIF.	9430
6289 5	PRAGUE ELECTRIC CO.	N. ADAMS. MASS.	0124
£474 5 1400 B	UPERIOR ELECTRIC CO. TR USSNANN MFJ. DIV. NC WAW-EDISON CO	BRISTOLICONN.	6301
1705 6	INCH MEG. CO. DIV TRW INC.	ELR GROVE VILLAGE, I	LL.
2136 E 2082 E	LECTRO MOTIVE MFGS CO. INC.	WILLIMANTIC, CONN.	. 0622 . 1651
5915 L	ITTELPUSE INC.	DES PLAINES, MLL.	6001
648B	TACKPOLE CARBON CO.	ST. MARYS, PA.	1585
Olil ·E	LECTAONIC INDUSTRIES ASSOCIATION	WASHINGTON D.C.	2000
2142 A	IRCO SPEER ELECT. COMP.	DU BUIS. PA.	1580
2597 5 3594 B	LAROUGHS CORP. ELECT. COMP. DIV.	PLAINSFIELD, N.J.	0706
5471 B	CYD A.B. CC.	SAN FRANCISCO, CALIF.	9410
7135 2	YLVANIA ELECTRIC PROD. INC. SEMICOMOUCT	UR DIV. WOBURN, MASS.	0180
5712 0	ENDIX CORP. THE MICROWAVE DEVICE DIV.	FRANKLIN, IND.	4613
£733' 5 E291 5	IRGS SUPPLY CO. INC. OHNELL DUBLIER ELECT. DIV.FEDERAL PACIF ILIGENIX INC. LECTRA/HIDLAND CORP. PECIALTY CONNECTOR CO. INC. EMLETT-PACKARD COMPANY PRAGUE ELECTRIC CO. UPERIOR ELECTRIC CO. THE USSNANN MFJ. DIV. MC MAW-EDISON CO. INCH MFG. CO. DIV TRW INC. INCH MFG. CO. DIV TRW INC. INCH MFG. CO. DIV TRW INC. ITTELPUSE INC. ITTELPUSE INC. CNTINENTAL-WIRT ELECTRONICS CORP. LECTRONIC INDUSTRIES ASSOCIATION IRCO SPEER ELECT. COMP. WITCHCRAFT INC. UARDUGHS CORP. ELECT. COMP. DIV. CYD A.B. CC. ADIO MATERIALS CO. YUVANIA ELECTRIC PROD. INC. SEMICUMDUCT ENDIX CORP. THE MICROMAVE DEVICE DIV. AN FERNANDO ELECT. MFG. CO. EALECTRO CORP. ELEVAN ELECTRONICS CORP.	NAMARONECK, N.Y.	1054
5000 D	ELEVAN ELECTRONICS CORP.	E. AUROPA, N.Y.	1405
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### **BECTION VII**

## MANUAL CHANGES AND OPTIONS

## 7-1. INTRODUCTION

7-2. This section contains information necessary to adapt this manual to bigger instruments. Also included is the operating and installation information for available options. Refer to Section II for remote programming requirements.

## 7-1, MANUAL CHANGES

7-4. This manual applies directly to Models 5326A with serial prefix 1136A and 5327A with serial prefix 1120A (refer to Paragraph 1-4).

### 7-5. New Instruments.

7-6. As changes are made, newer instruments may have serial prefixed that are not listed in this manual. The manuals for these instruments are supplied with a manual change sheet, containing the required information. Contact the nearest Hewlett-Packard Sales and Service Office if this sheet is missing.

## 7-7. Older Instruments

7-8. To adapt this manual to instruments having a serial prefix prior to 1136A for the 5326A or 1120A for the 5327A, perform the backdating that applies to your instrument serial prefix, as listed in the table below.

#### **IMPORTANT**

For Model 5326A with serial prefix 1044A or below, a separate manual is required. Order "Model 5326A/B 50 MHz Timer/Counter/DVM Operating and Service Manual."

Serial P	Perform Change		
5326A	5327A		
1132A 1116A	10404	1,2 73	

#### " CHANGE I

- a. In Table 6-fi, change part number of The Power Transformer to 9100-2888. (The 9100-3020 has additional current capabilities for special high-stability oscillators.). For replacement, order 9100-3020.
- b. In Tables 5-1 and 6-1 and Figure 8-16, change part number of A16 Interconnect Board to 05327-60005, series 1040A (the 05327-60026 board accepts special high-stability time base assemblies.)

#### CHANGE

- n. Replace A17 Input C Amplifier Assembly schematic with Figure 7-1,
- b. Replace A17 Input C Amplifier Assembly component locator with Figure 7-2.
- c. In Table 6-1:

Delete: A17C13 CF .001 µF 75V 0160-0975

A17R25, A17R26 RF 560Ω .25W 0683-5615 2 ca.

Change A17R22 to Fend; 1200, 25W 0683-

Change A17R23 to read: 12000 .25W 0583-

Add: A17R20 2700 25W: 0683-2715 1 en. Change board series number to read 1116A, Rev. A.

## CHANGE

#### NOTE

If replacement of any of the above parts is required, replace with new parts listed in Table 6-1.

b. In Table 6-1 and on \$10 schematic (Section VIII), Delete: A10CR1 and A10CR2. Change board series number to 1040A.

#### 7-0, OPTIONS

7-10. Options 001 through 004 are available for 5930A and 5927A modula, "The following paragraphs describe each options purpose and operation.".

### 7-11. Option 001, #Digit Display

7-12. Option (9) is the addition of an eighth digit to the display assembly. This addition becomes the most significant digit, and extends the counter's resolution at higher frequencies. The digit is always blanked if the reading is 70". Option 001 consists of A9 Display Assembly 05320-60025 in place of 05326-60008.

### 7-13. Option 002, Remote Programming

7-14. Option 002 allows the counter to be computer controlled from a 36-pln connector of the counter's rear panel. Programming instructions are given in Bectlow II. A schematic diagram is included in Bectlon VIII.

## 7-15, Option 0032 Digital Recorder Output

7-16. The data displayed on the counter's front panel can be perminently recorded by connecting a printer to the counter via Option 003. The necessary signals are coupled from A0 Display Assembly to an HP 5055A or 5050B Digital Recorder through J0 on the counter's rear panel (also, see Table 1-3 for specifications and Section VIII for pin references).

## 7,17. Option 004, Extended Remote Programming

7-18. This option is similar to Option 102 except it includes the remote programming of the AC/DO, SEP-COM-OHK, FABT/NOISM, and ATTEN switches. Remote programming of the attenuator board is achieved by connecting the ITE input lines in parallel with the front panel switches (connected at cable points I through 8). When the counter is bling externally controlled, the A COM line goes high. This high turns off diodes A1016, 18, 2, 3, 15, 30, 31, and 1, and disables the front panel switches.

### 7-19, FIELD INSTALLATION OF OPTIONS

## 7-20. Installation of Option 001, 8th Digit

7-21. Parts required to install this option and

1820-0119 Decade Counter US 1820-0116 Buffer Storage U10 1820-0092 Decoder Driver U24, 0883-7525 7.5 kO; W watt resister R11 1200-0405 Display Tube Bocket 1970-0042 Display Tube DBS

a. Remove right and left rendout bourds, A10 %, and A11.

- b. Remove two serews helding display, tabs
- o. Remove display board A9; and display support board A8 from the counter by pulling up on the display support board A8, Reparate A8 from A8.
- d. Install parts on A9 as shown in the component location photo on Pigura 8-18 of this manual, and solder in place.
- e. 1810 carries the overflow information from the decales and can be placed in one of two locations. Move 1810 to the location shown in the photo. In this location, 1810 compets to pink of Uh.
- f. Perform Belf-Check in Table 8-1, Isopecially note that the OF (overflow) lamp lights when the left; most digit changes from 8 to 0.

### 7-22, Installation of Option 002, Remote Programining

- 7-23. To install remote programming capability in units not so equipped, order remote cable assembly HP Part No. 05/127-35010, two 4-40 x Minch machine screw with hex but
- n. Remove the plute covering the lower opening in the rear panel for Option 1002;
- b. The rear panish interconnect board containing the wiring from the rear panel BNC's and switches must be removed. To accomplish this, remove the nuts holding the rear panel BNC's
- c. Remove two screws holding PIA (the Bilach, black, pressure competer) to the interconnect A16.
- d. Remove alde overs and alx screws holding rear panel. Lenson one side frame. Pull rear panel nway from the instrument.
- , a, Itemove the regrammed interpendent board from the instrument and separate it from 171A by removing two screws.
- f. Paul the pressure connector through hole in rear panel and mount rear panel connector J10, with screws removed earlier. Position J10 with pin 1 near the side frame.
- g. Assemble the rear panel interconnect beard and the new 6-inch long pressure connector. Pt with three 6-12 x %-inch serses and hex nuts. Be certain that proper contact is made between interconnect board and Pt.
- h, Attach PI to the motherhoard uning four 440 x-M-inch acrows. Do not tighten acrows. Routs cable as shown in the top internal photo of instrument, Figure 8-4.

#### CAUTION

### BOREWS LONGER THAN WINDH WILL DAMAGE PI.

- t, Geber initiatal war panel. Install BNO look muta ao that the highest is allumovable.
- I. Observe the all imment of the connector in the motherboard. Thirliten the four sorews holding P1 to the motherboard making sure to maintain proper contact.
- k. Check contact alignment of PI with mother board and with the rear-panel interconnect board. If necessary, lossen the screws in PI and ship slightly to obtain proper terminal contact.
- 1. Tighten BNO lock mute and researable
- in. Tun a complete performance check on the unit to verify that remote programming is working properly.

7-24, Installation of Option 00% Digital Neborder Cultivi

- 7-25. Order digital recorder cable assembly HP Part No. 00193 (0012)
- in. Remove the plate covering the upper opening in the rear panel.

- b. Utemove right and left readout boards A10 and A11.3 Itemove two serews holding the display tibe shield and remove shield. Remove display support board A6 and the display board A6 by pulling up on A6.
- o. Peed the two pressure connectors of the recorder cable through the rear panel and mount JD on the rear panel, using the acrews previously represent Position JD so pin I is near the side frame.
- d. Alide the connectors on the AP board, shown in the photo on Pigure it 4. The connector with the long wires attaches to JI and importioned so that plus I is toward the front of the instrument. The other connector attaches to JR, and plus I is toward the rear of the instrument.
- e. Position the P1 cable so Repasses between As. and A11, completely clearing A5. Relactely A6 and A9.
- f. Route the cable around The and to front of All nesembly.
- y. Resusemble unit 'sid run a' probable performance check of the digital output to verify that the option is installed properly.

7-26 Installation of Option 604, Extended flemple Polyramming

7-27. Plaid installation of Option (9)4 is not available.

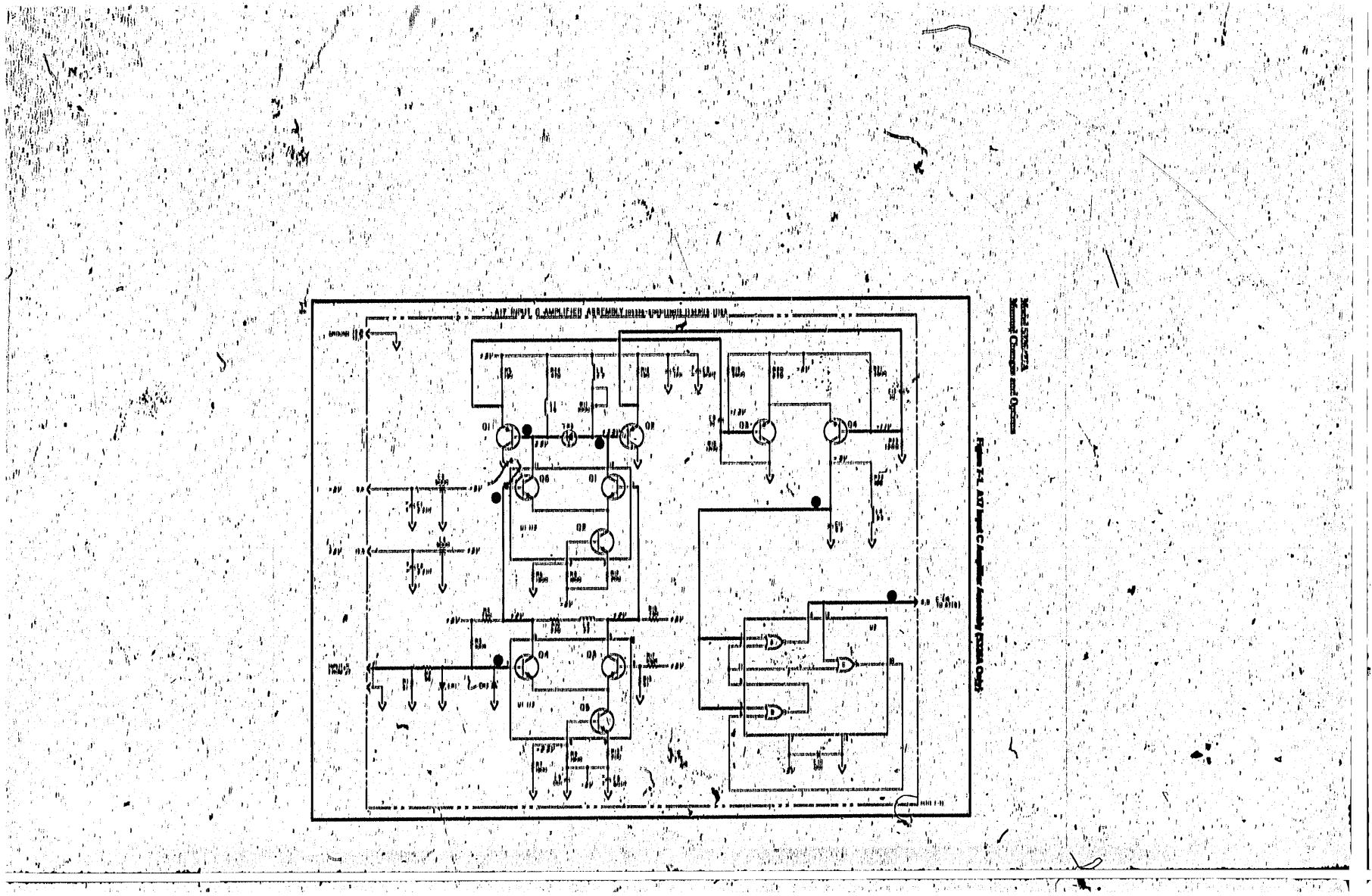
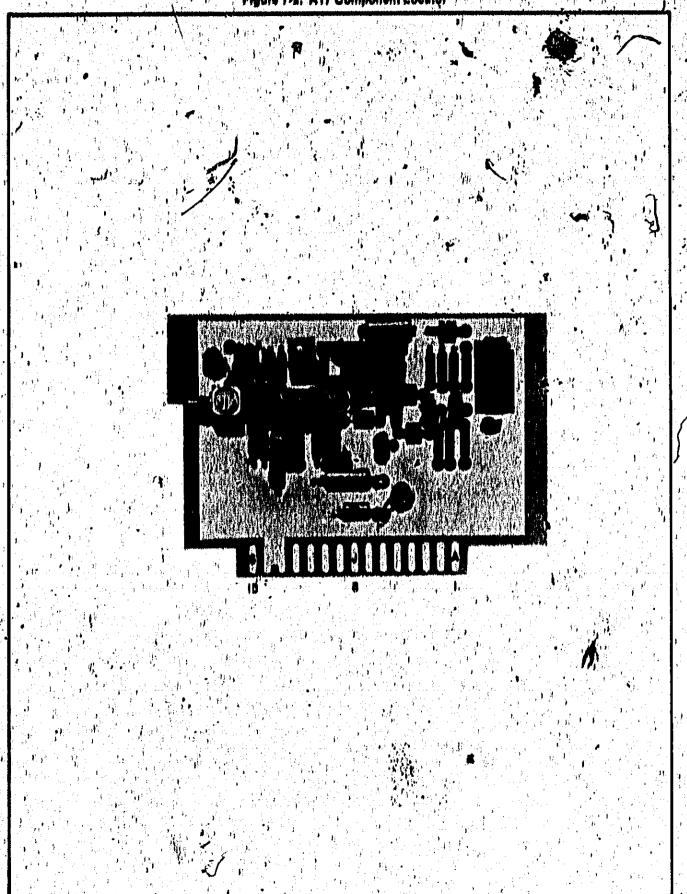
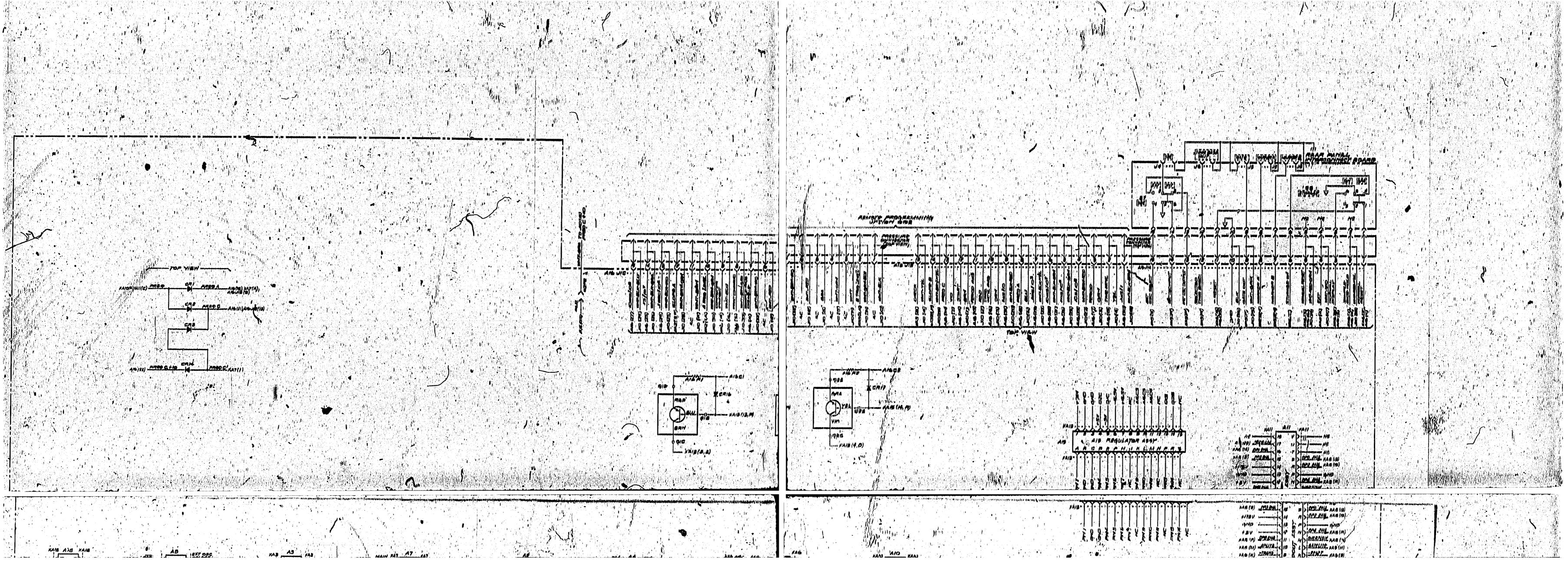
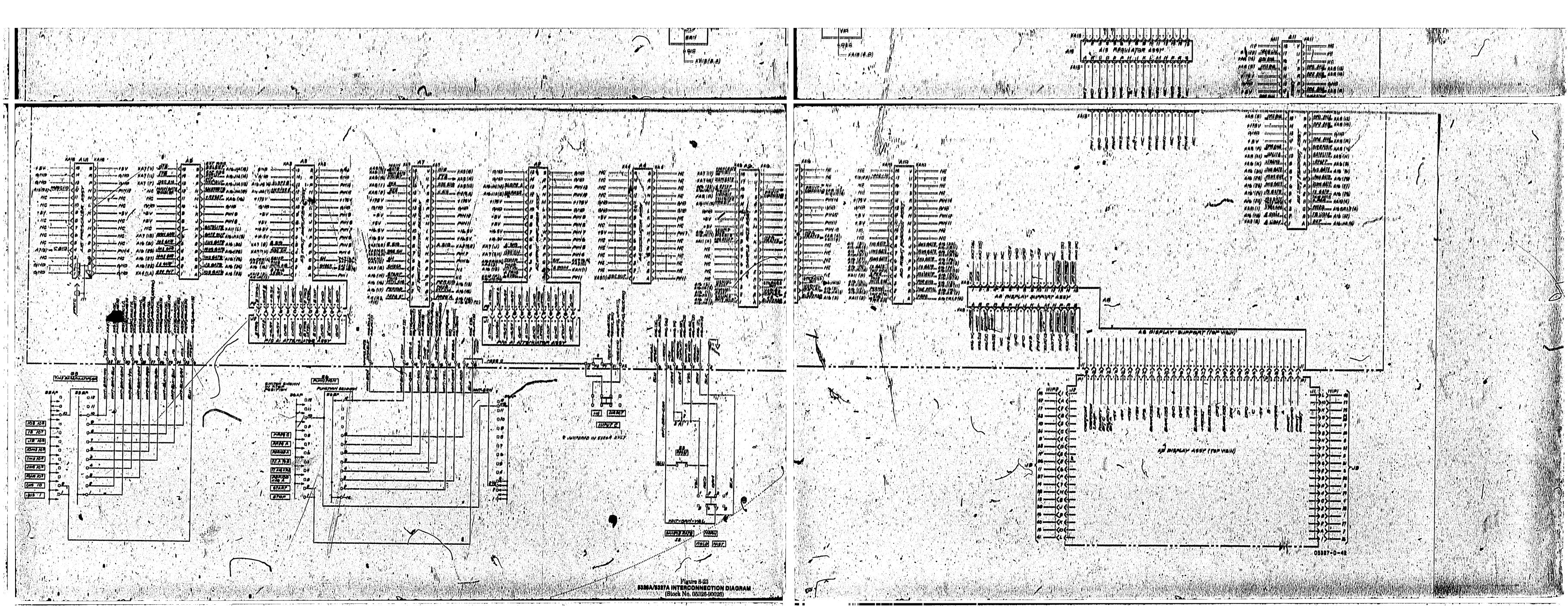


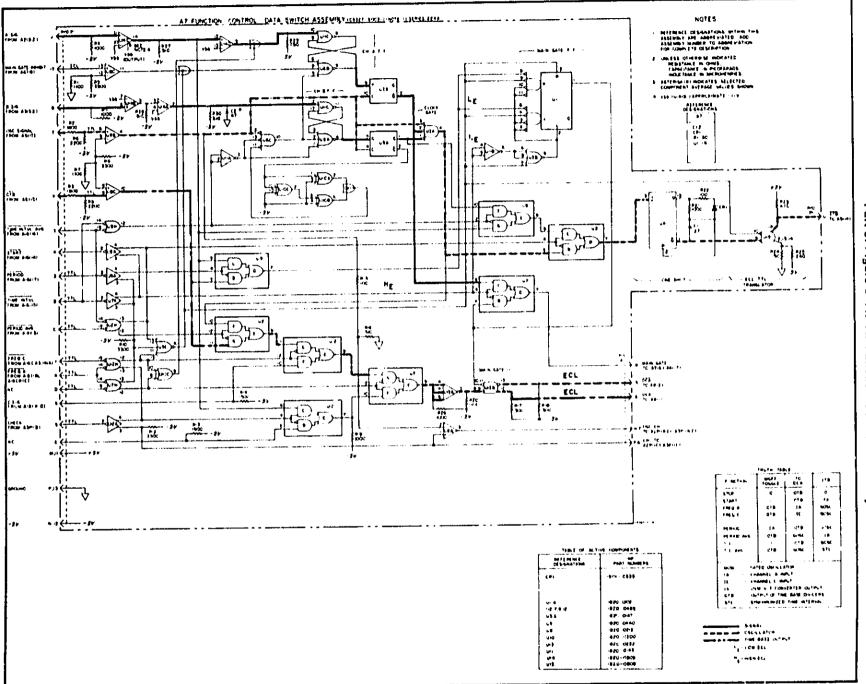
Figure 7-2. A17 Component Localor



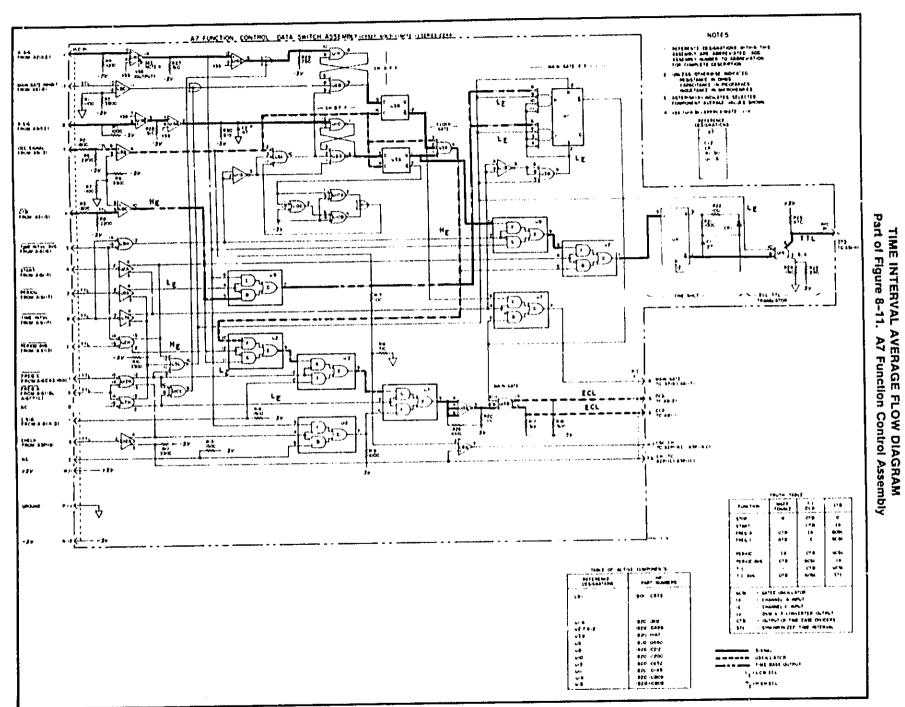


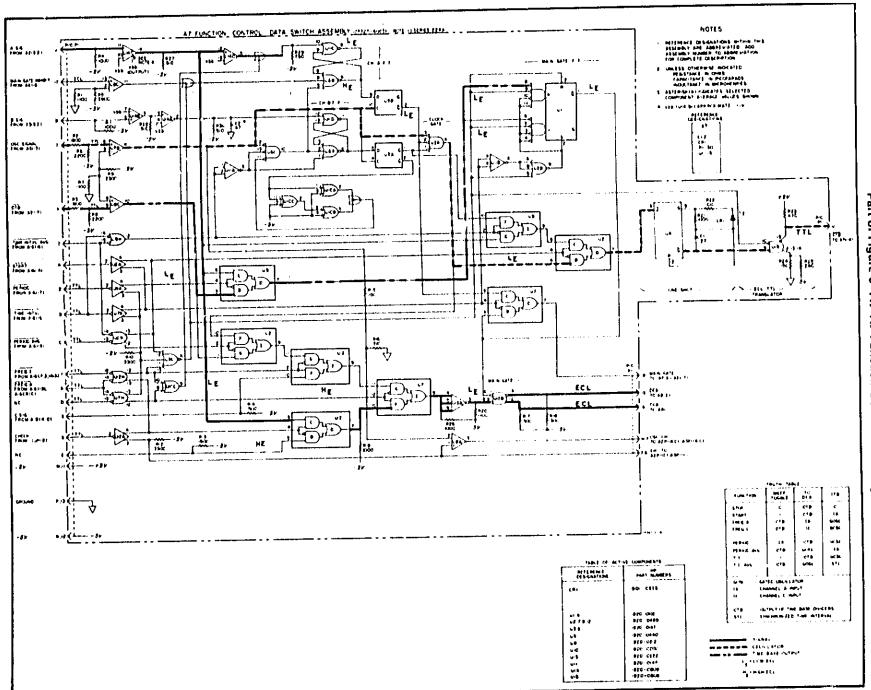




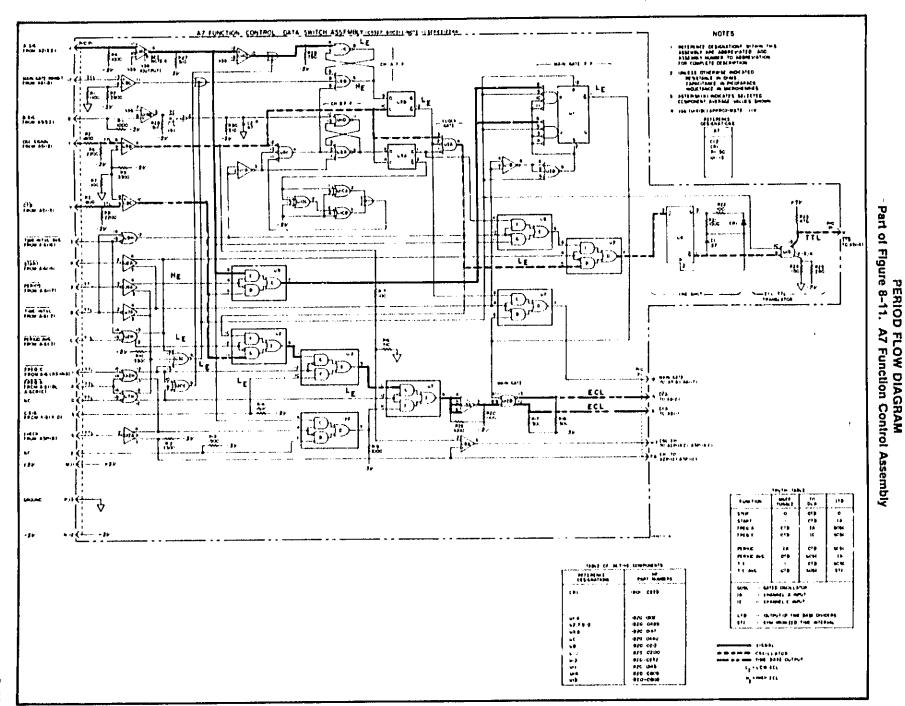


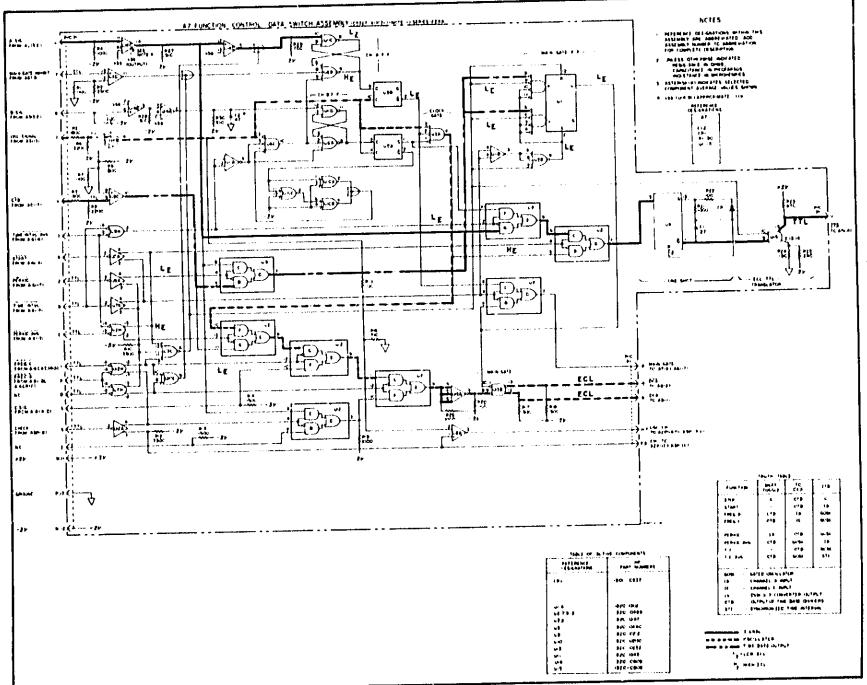
8-26



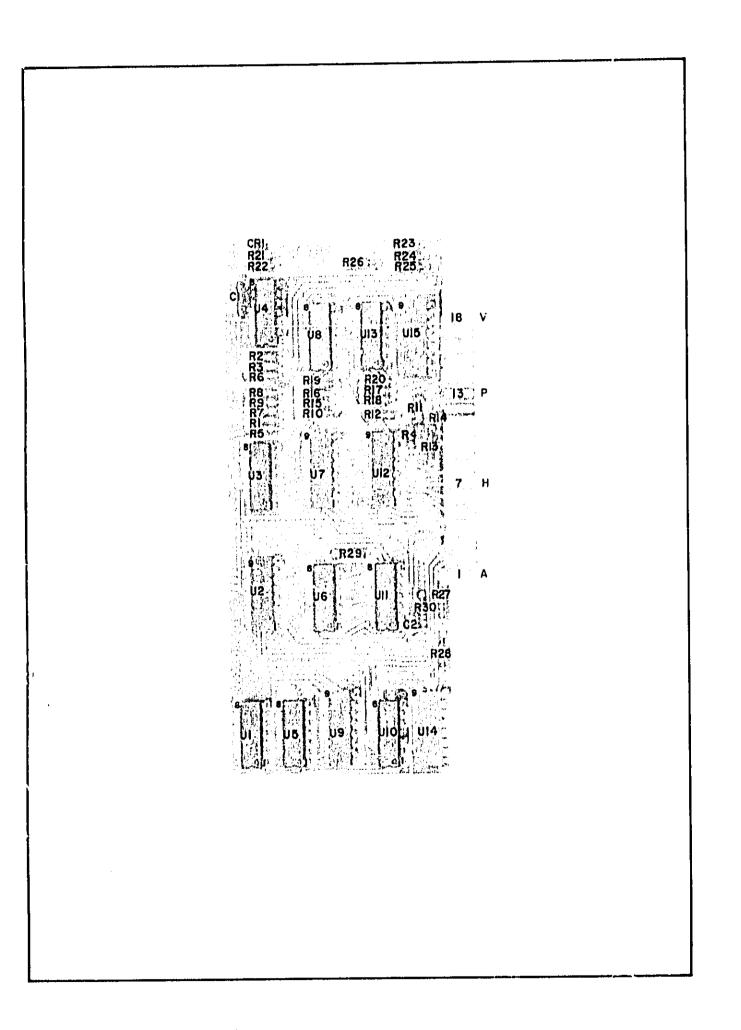


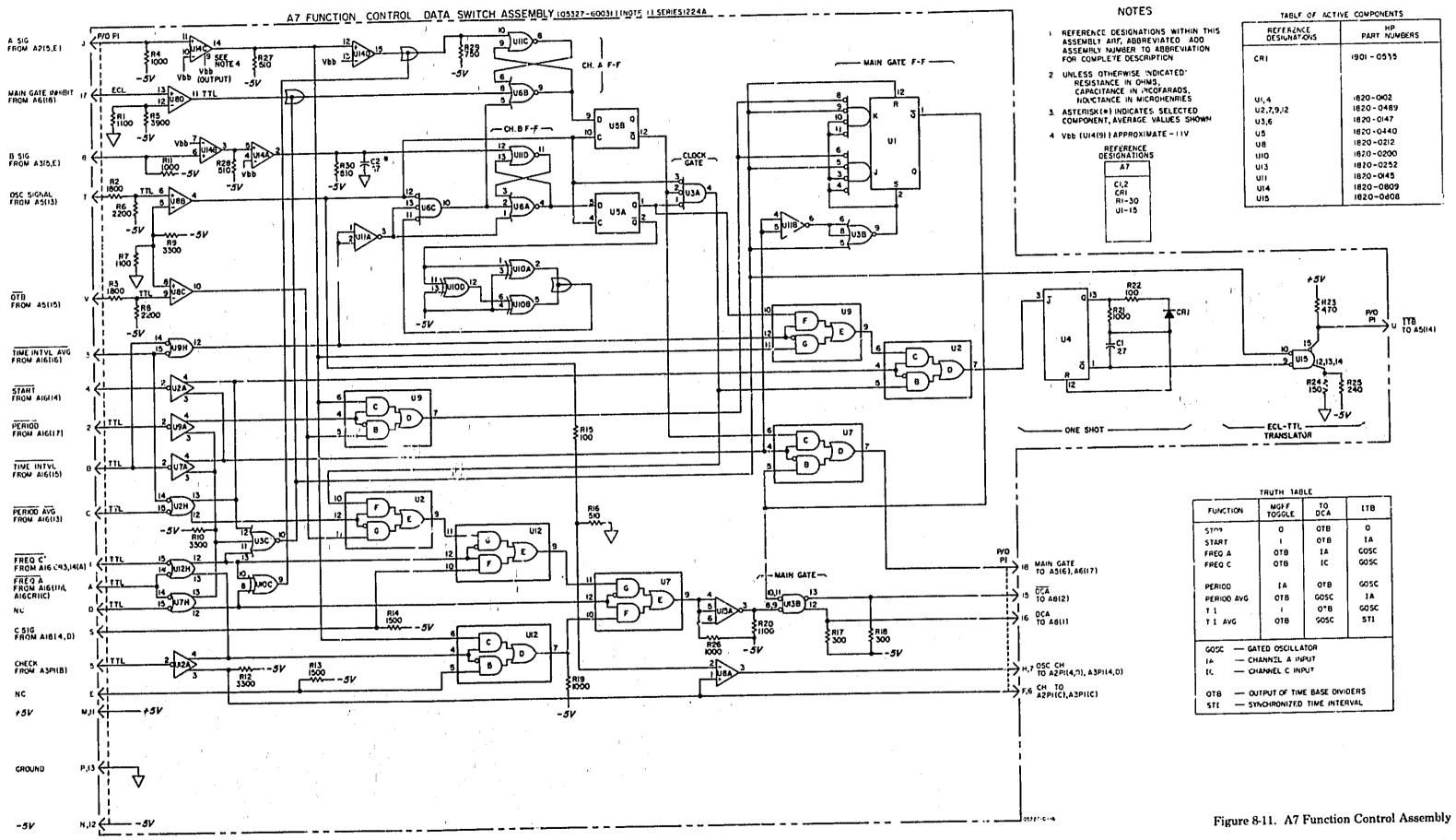
8-28





FREQ A FLOW DIAGRAM
Part of Figure 8-11. A7 Function Control Assembly





# AS DISPLAY SUPPORT OPERATION

The display support assembly A8 serves to interconnect the display assembly A9 with the interconnect assembly A16. In addition, A8 contains a high-speed decade counter, decimal point drivers, and blanking (logic) circuits.

The nigh-speed decade consists of four JK flip-flops Un through U6. The line receiver, Q2 and Q9, serves to reduce noise levels on the signal from A7 prior to driving U3(6, 9). U3 divides by two and the combination of U4 through U6 divides by five. The decade supplies BCD outputs to A9 via J1(5, 4, 2, 3) for the 10° display tube. The D output is also used as the carry output to the next decade counter on A9. Q1 translates the positive TPL reset signal to ECL levels to reset the high-speed decade to zero.

Decimal point drivers Q3 through Q8 work in conjunction with logic circuits on A11 to light the proper decimal points. R15 and R17 provide operating bins for Q3 through Q8. R19, R20, and R23 are current limiters. R2 and R3 provide 87.5 volts pre-bins for the OFF decimal points. R5 through R10 connect the off decimals to the pre-bins voltage to eliminate background glow.

As an example of operation, when a ground is received at P1(S) from A11, Q5 conducts. With Q5 on, decimal point enable tine 3 (DP3) is pulled to ground to light the decimal point on ^9(DS4(10°) Also with P1(S) low, U1D(11) is high to unblank A9 U1. When U1D(11) goes high, U1B(6) and U1A(3) are also high to unbtank A9U3 and U2. This unblanks A9DS4, DS3, and DS2. DS5 and DS6 remain blanked. DS1 is never blanked, and DS7 and DS8 (Option 001) will always be blanked.

CR2 and CR3 are included for use with the digital recorder Option 503. When overflow occurs, P1(M) and J1(15) go low. CR2 and CR3 cause J1(14 and R) to also go low. When J1(15, 14, R) are low, the recorder will print a zero on the annunciator line. R21 and R24 are pull-up resistors.

#### AS TROUBLESHOOTING

## High Speed Decade

If a problem is the High-Speed Decade is not readily apparent when checking for the correct waveforms, a step-through method may be preferable. Set the counter as follows:

- 1. MULTIPLIER switch to 10
- 2. CHK/SEP/COM switch to CHK
- 3. FUNCTION switch to START
- 4. Press RESET.

The High-Speed Decade has four output lines that are binary weighted DCBA. Release the RESET button and note the counter's display. A typical problem is as follows: The display counts 1...2...3...0....1...2...3...0. When the display reads "0," set the FUNCTION switch to STOP and check the C line for a Low trefer to the table below? Check the input lines of the IC, since their levels depend on the state of other IC's in the circuit (note U4 pin 3 and U6 pin 13). The levels given below at ECL.

	Α	В	C	1)
DISPLAY	th(i3)	U4(1)	U5(1)	U6(1)
1	1.	11	11	н
2	н	1.	н	н
3	1.	l,	Н	11
4	H	Н	1.	н
<i>t</i> ;	1	Н	1.	Н
6	Н	1.	1.	н
7	ı.	1.		Н
н	Н	11	н	1.
9	1.	H	Н	I.
10	11	Н	н	11
11		RE	PEATS	

## Decimal Point and Blanking

Before testing the decimal point and blanking circuitry, set the CHK SEP COM switch to SEP and disconnect the input signal.

DECIMAL POINT. To check the decimal point circuitry, set FUNCTION switch to PERIOD AVG and position the TIME BASE switch to pull the required D.P. line Low.

LINE	MULTIPLIER POSITION	DRIVER
D.P.0	1	Q8
D.P.1	10	Q7
D.P.2	10	Q6
D P.3	10*	Q5
D.P.4	10 <sup>7</sup>	Q4
D.P.5	10*	Q3

BLANKING. To check the blanking circuitry, set the FUNCTION switch to PERIOD AVG and MULTIPLIER switch to 1. All digits, except the first one, should now be blanked. If another digit is lit, check that line at A8J1 for a High level, which indicates a problem on that line.

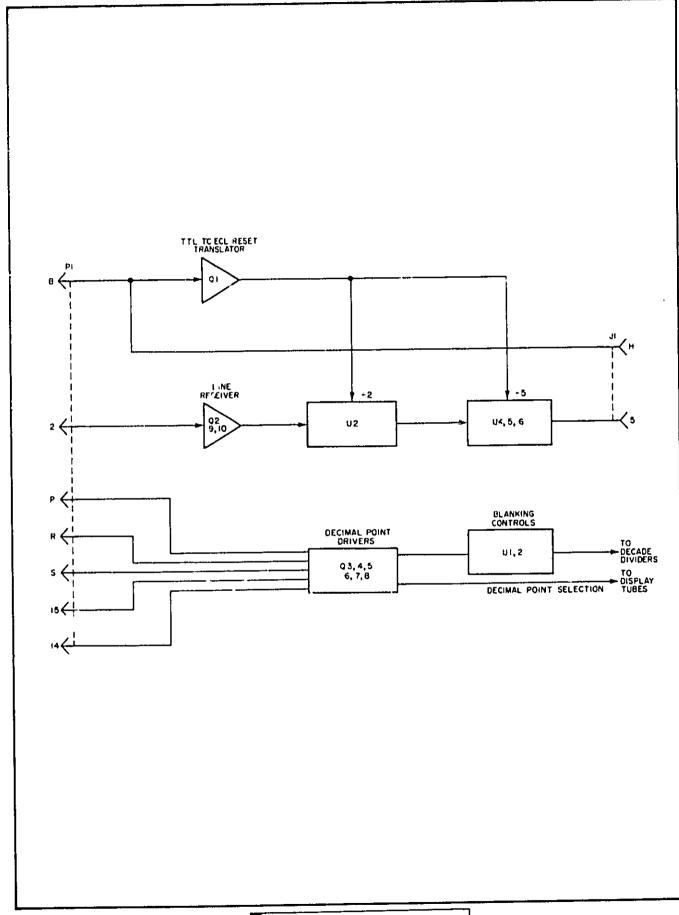
Figure 8-11
A7 FUNCTION CONTROL ASSEMBLY

(See Page 8-31)

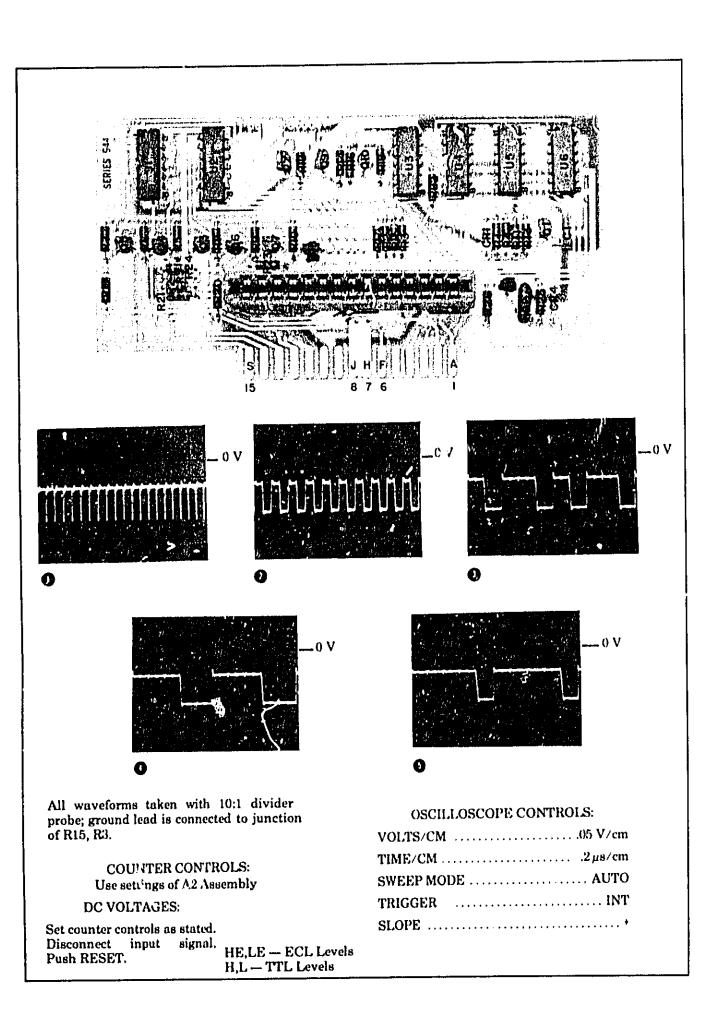
8-32

Model 5326/27A Schematic Diagrams

Part of Figure 8-12. A8 Display Support Assembly



MORE DATA UNDER THIS FOLD



Model 5326/27A Schematic Diagrams

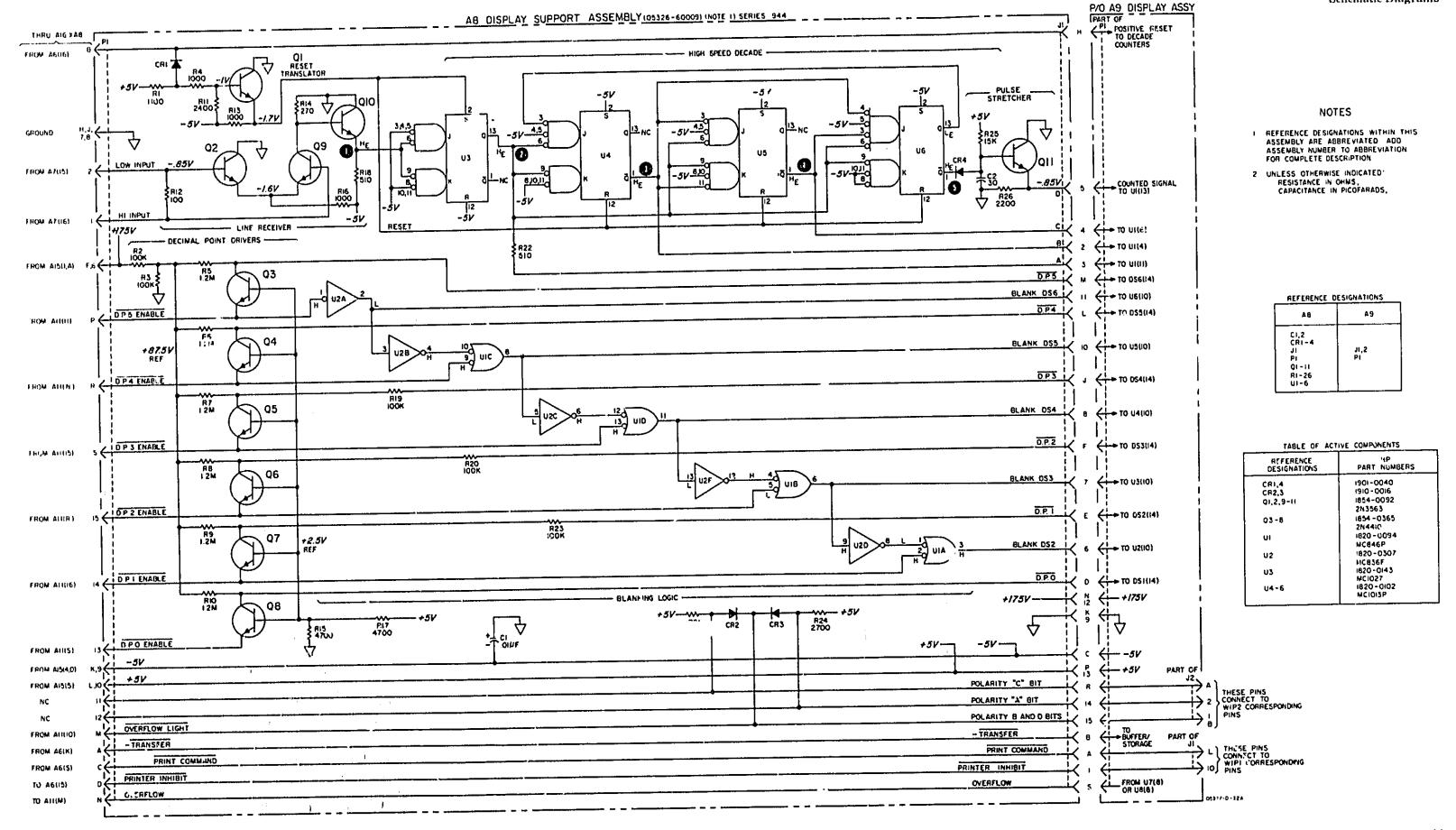


Figure 8-12. A8 Display Support Assembly

8-33

## A9 DISPLAY ASSEMBLY OPERATION

Display assembly A9 contains decade counters U2 through U7, buffer storage units U9 through U15. BCD to decimal converters U17 through U23, and display tubes USI though DS7.

U1 translates the ECL data from A8 into TTL levels for use by circuits on A9. Each translator of U1 is noninverting. The D output at U1(15) is the counted signal divided by 10 and is used as the input to 10<sup>3</sup> decade U2.

Decade counters U2 through U7 count the number of input pulses while the main gate is open. Each decade provides a -8421 BCD output to the corresponding baffer storage unit. When pin 14 (reset) goes High, the decades reset to zero if pin 10 is High; the decades reset to 15 (blank) if pin 10 is Low. The ECL decade on A8 never blanks. U7 and U8 (Option 001) always blank. The last decade supplies an overflow output at pin 8 when the count exceeds the capacity.

Buffer storage units U9 through U15 receive the BCD outputs of the decades. When the counter operates in the storage-on mode, data is transferred when a low transfer pulse arrives at , 1.5 of the buffers. When the transfer line is high, the buffers will store the data to allow a continuous display while a new measurement is being made. During storage-off or totalize mode, BCD data is continuously fed from the buffers to the decoders. The buffers also supply \*8421 BCD outputs to A9 J1 and J2 for further distribution to J9 when Option 003 is included.

Decoder drivers U17 through U23 receive the -8421 BCD data and provide a decoded decimal output to light the corresponding numeral on the display tube. The terminal for an illuminated numeral will be approximately +2 volts whereas an extinguished numeral is typically +100 volts. The decimal point terminal (14) of the display tube is +5 volts when lit and about 87.5 volts when extinguished.

### A9 TROUBLESHOOTING

The Att Display Assembly may be set up for troubleshooting with either of two methods. A highly accurate oscillator may be used for a front-canel input signal. Any difference in count from the input signal is then immediately obvious on the display. Check for the proper signal division of the decade counter in previous column. As an alternate method, place the CHK-SEP/COM switch in CHK and the FUNCTION switch in START. Allow the count to totalize until the problem occurs; then, set the FUNCTION switch to STOP. Use the TIME BASE switch to adjust the rate of counting. When the problem appears, check the circuitry of that column.

Start by checking the Buffer-Storage outputs (U9-U15) for the BCD code of the number that should be displayed, rather than what is displayed (see Table 1). Check that the Buffer-Storage code pulls the proper decimal line low on the BCD-to-Decimal Decoder.

Table 1

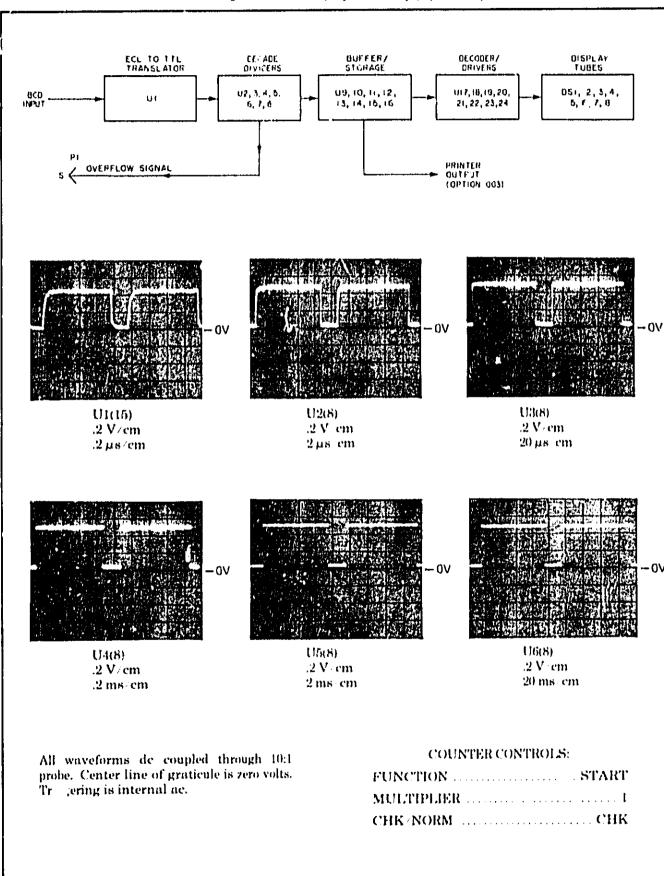
DISPLAYED DIGIT	BUFFER STORAGE BCD (TTL)				
	н	-1	2	1	
0	11	Н	11	Н	
i i	H	н	н	1.	
2	н	н	L	Н	
3	H	H	ı.	t.	
4	H	i.	н	H	
5	Н	L	H	l,	
6	H	L.	l.	Н	
7	Н	I.	i.	.1	
8	l.	н	11	Н	
9	ı.	H	H	l.	
Blank	l.	1.	1.	1.	

Figure 8-12
A8 DISPLAY SUPPORT ASSEMBLY

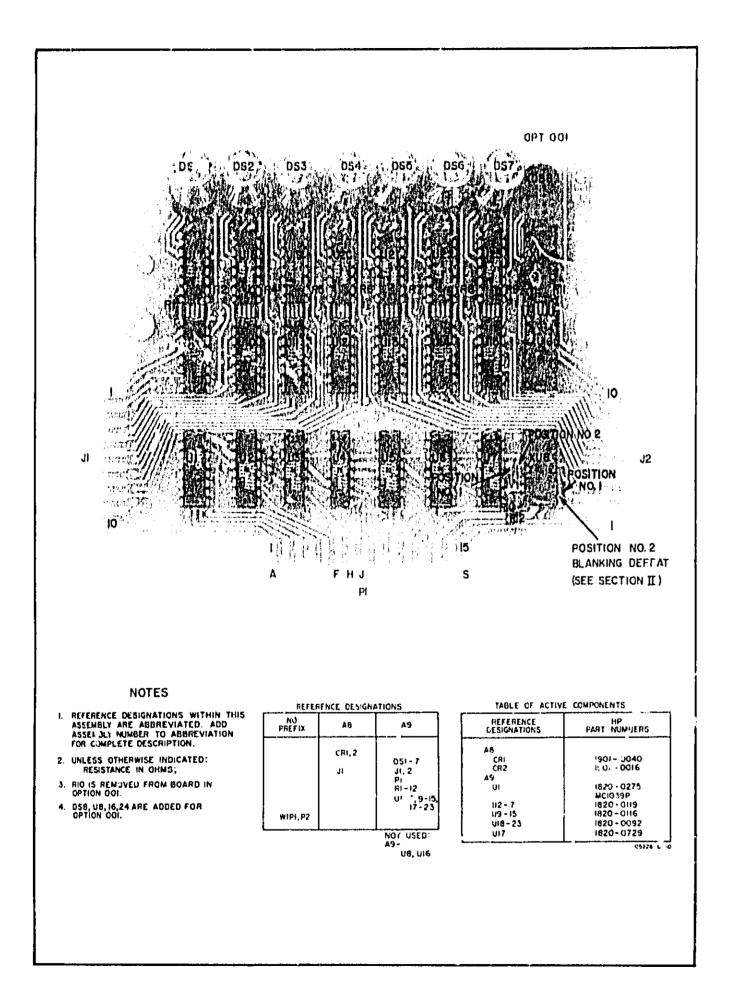
(See Page 8-33)

### Model 5326/27A Schematic Diagrams

Part of Figure 8-13. A9 Display Assembly (Option 001)



MORE DATA UNDER THIS FOLD



Model 5326/27A Schematic Diagrams

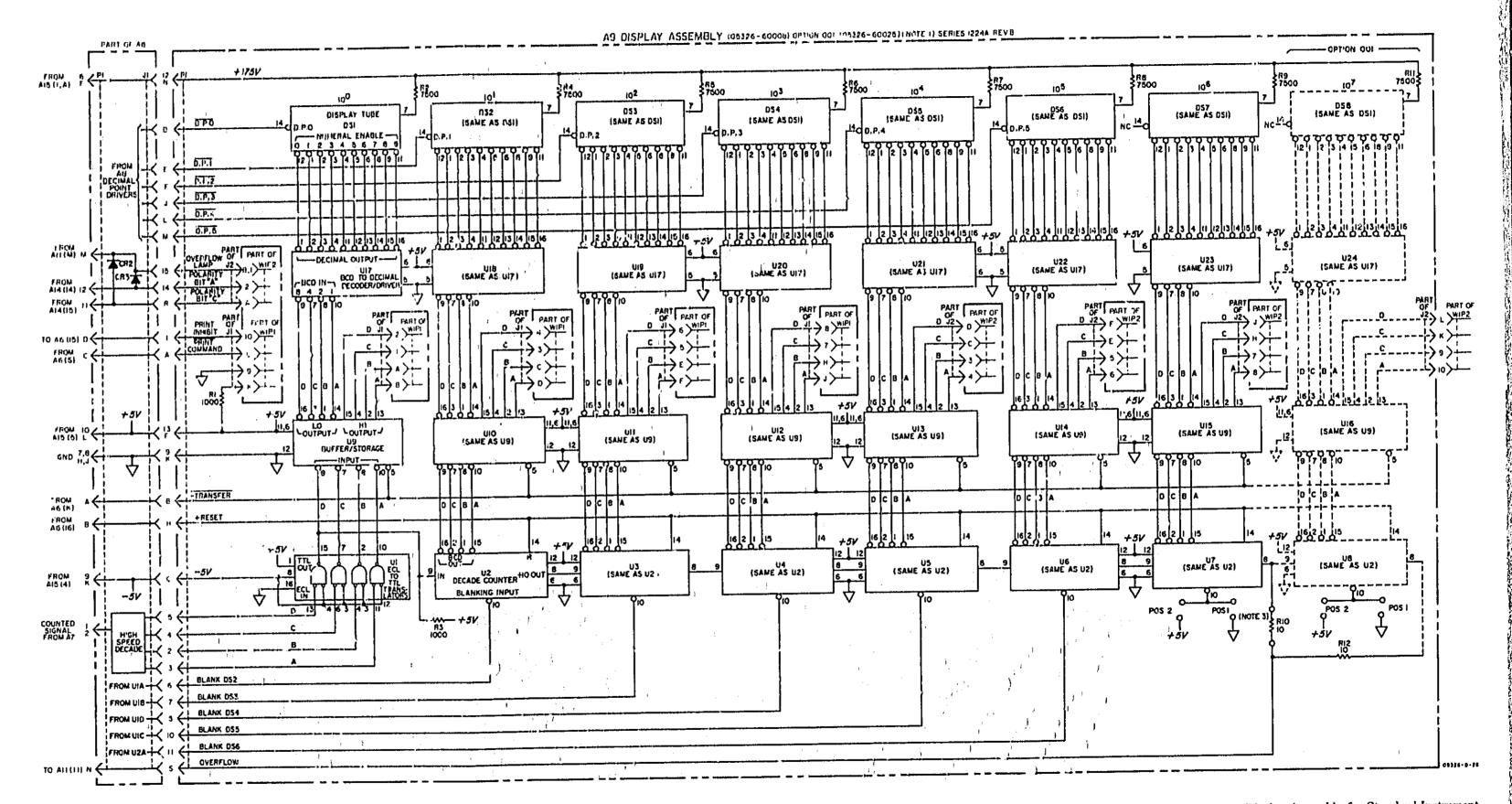


Figure 8-13. A9 Display Assembly for Standard Instrument and Option 001

8-35

## A10 RIGHT READOUT OPERATION

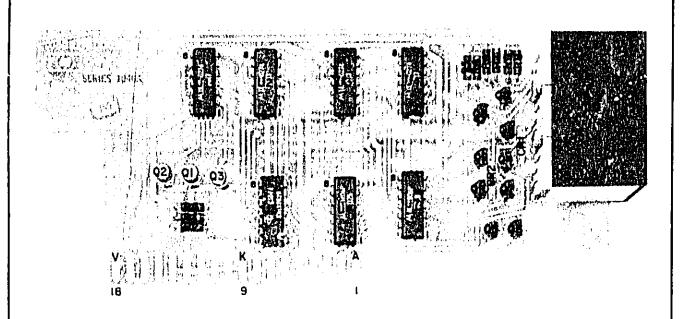
The right rendout contains DTL logic to provide the proper measurement units for a given setting of the front-panel controls. A10 logic is negative true, and a low (<0.8 volts) to the emitter of any driver transistor will light the given neon. When a DTL high is applied on the emitters, the transistor is reverse biased to turn off the neon lamps. The voltage dividers provide a reference of 2 V (nominal) to the bases of the drivers, when no annunciators are on.

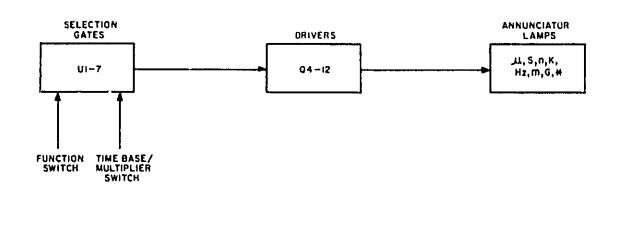
Selecting a function mode and time base pulls a pair of these lines low, activating a gate. This low on the gate output will forward bins the driver transistor  $\omega$  turn on the annunciator lamp. For example, selection of frequency and 1 ms makes the output of U4D(11) low, turning on Q9 to light DS5. Q10 also turns on, lighting DS6.

The asterisk (\*) annunciator (DS8) is activated when the counter is in the time interval or period mode and the time base is 10s. An asterisk indicates the proper units are not displayed.

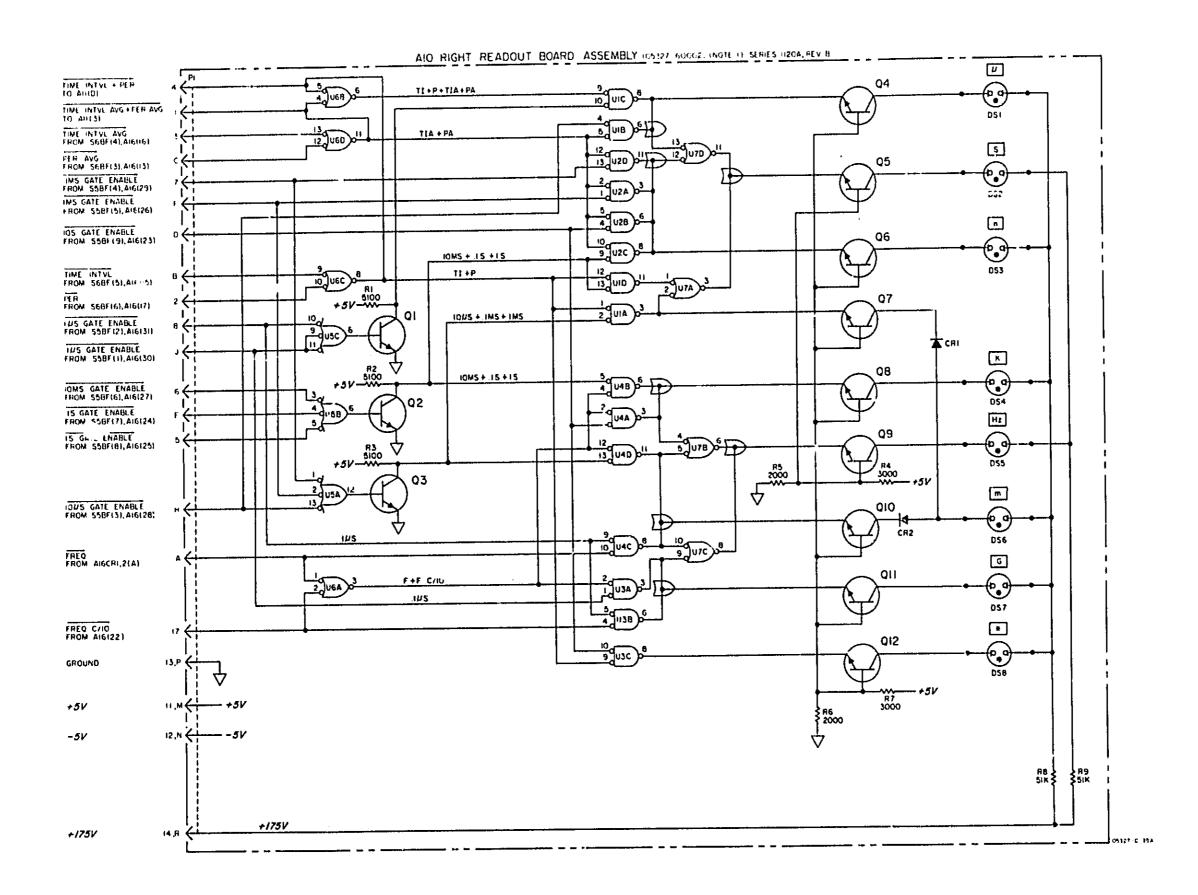
## A10 TROUBLESHOOTING

Select the specific function mode and time base combination that is faulty. Check the gate that is common to the two lines. For instance, when using frequency and a 1 ms gate time, check U4D; when using .1 µs, U3A becomes the common gate. Refer to Table 5-5 for the proper annunciator lighting conditions





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NOTES

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

REFERENCE DESIGNATIONS AIQ CRI, 2 OSI-B PI QI-12 RI-9 UI-7

TABLE OF ACTIVE COMPONENTS

REFERENCE DESIGNATIONS	HP PART NUMBERS
CFI,2	1901-0040
C1-3	854 -0009 2N709
G4-12	1854 - 0474 2N5551
U1 - 4	1820 - 0274 MC 1808
US	1820 - 03:0 MC 662
, 1 06,7	1820-0273

Model 5326/27A Schematic Diagrams

#### **A11 LEFT READOUT OPERATION**

The left readout contains DTL logic to select the proper decimal point corresponding to the TIME BASE SETTING. It also contains the switch common drivers for the time base, function, and amplifier common lines (for remote programming), a storage circuit and lamp for the overflow signal, the gate light, and the EXT light.

The overflow signal from the + 10 output of A9U7 (U8, Option 001) enters through pin M and is differentiated by C2 and R1. Q1 turns on momentarily to set flip-flop U1A&D. During the transfer pulse, the information at U1A&D is transferred to the overflow storage flip-flop U1B&C. The overflow condition drives U1C(8) low to turn Q2 on and light overflow lamp DS1. The next reset pulse clears flip-flop U1A&D; however, U1B&C are not reset until the transfer pulse arrives. With storag off, transfer is on continuously.

A low at pin L turns on Q3 to aght the count lamp, D32. Similarly, a low at pin A lights the EXT lamp and opens the common lines for the TIME BASE, FUNCTION, and SLOPE switches. This disables these controls to allow remote programming of the unit.

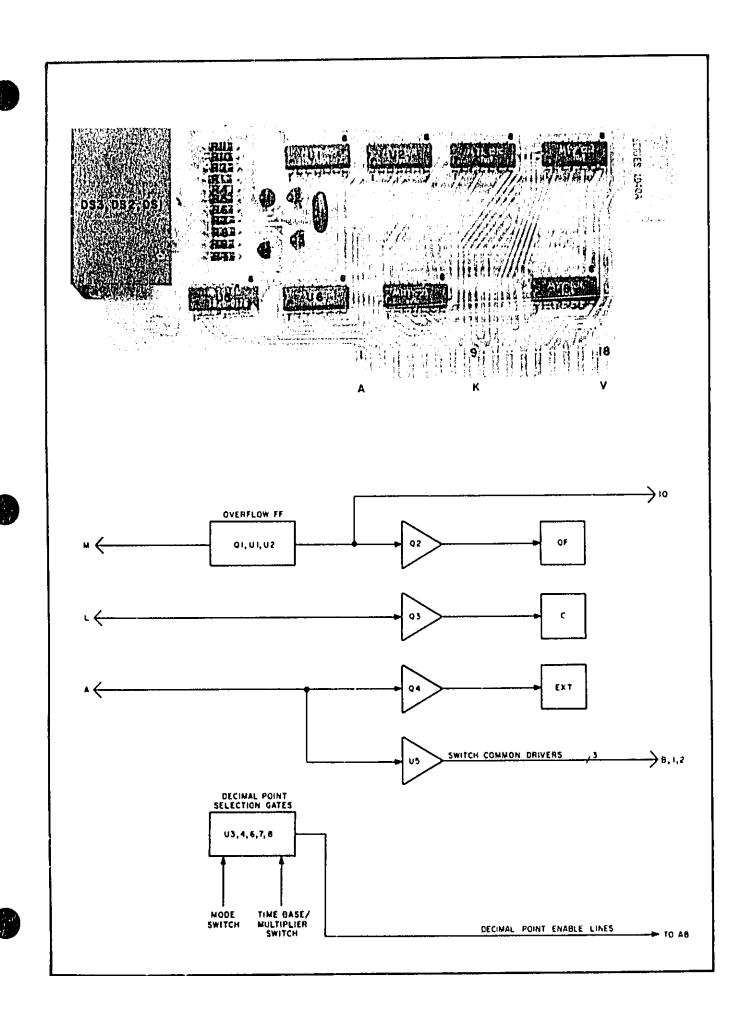
Decimal selection and resultant blanking are accomplished by the negative logic AND gates. For any pair of low inputs, a specific decimal point line is held low, lighting the decimal point. There are a number of combinations for each decimal; therefore, the output of each AND gate is paralleled to give a wired OR configuration (any output low = all low).

#### A11 TROUBLESHOOTING

Select the specific function mode and time base combination that is faulty. Check the gate that is common to the two lines. Refer to Table 5-5 for the proper annunciator lighting conditions.

To check the overflow circuits, set the FUNCTION switch to START and select a fast gate time. When the most significant digit on the counter's display changes from 9 to 0, both flip-flops in the overflow circuit should set. As an initial test, check U2 for a High on pin 13. The second flip-flop (U1B and U  $_{\rm C}$ ) should have a Low on pin 8 and a High on pin 6.

In any mode other than START, the TRANSFER line pulses Low, rather than being held Low. If the OF light does not turn off at the end of the display time, check that the RESET pulse clears flip-flop U1A&D.



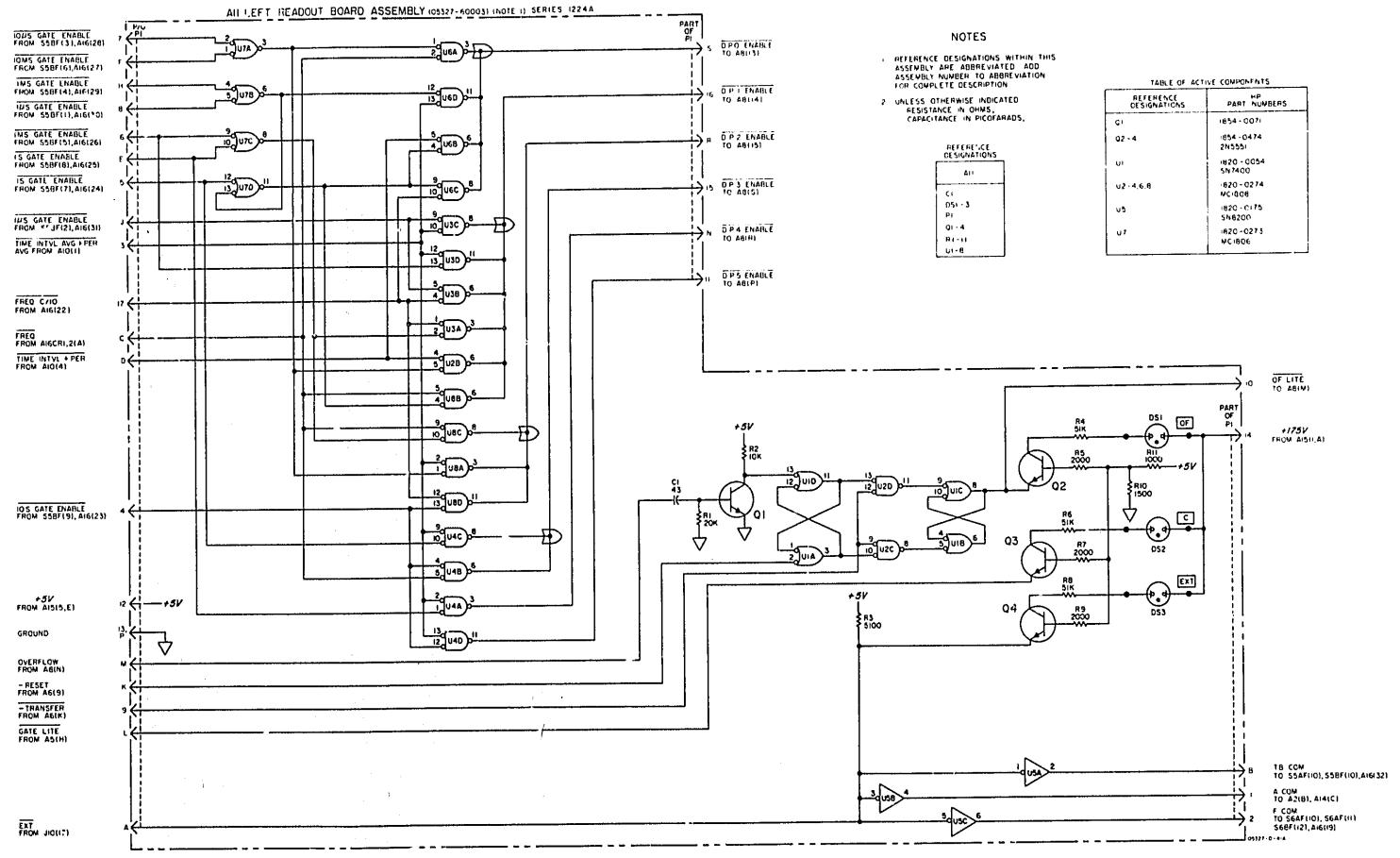


Figure 8-15. All Left Rendout Assembly

### A15-A16 POWER SUPPLY OPERATION

The power supply provides +175, +16.5 V and +5 V. Transformer TI has a 115-220 primary and secondaries with open circuit ve tages of 181 V at the red leads, 21 V at the orange, and 18.6 V between the green leads, with the winding center tapped to ground.

A15 CR69 comprise a full-wave bridge whose output is fed to filter C3 and bleeder R3. Q5 is a series pass regulator. A constant reference voltage is developed across CR11 and CR12 through resistor R1. When the output voltage at XA15(1, A) decreases, Q5 increases unduction to increase the output voltage. Q8 is a current limiter that senses the voltage drop across R6. Output current above approximately 60 mA turns on Qr and shunts base current from Q5, tending to turn Q5 off and limit the current. C1 adds oscillation stability to the regulator.

For the \*16.5 V supplies, the orange leads of TI connect to half wave rectifier CR4 and filter C4. Q1 is a series pass regulator and Q9 performs the same function as CM1&CR12 in the 175 V supply except that R10 provides a means to adjust the output. Assume that a Q1 base current is flowing through R2 and Q6. The resulting Q1 collector current establishes a voltage at the output, which is divided across R9, R10, and R1 - if the voltage at the wiper of R10 is greater than that across CR9, Q9 will be turned on, shunting base current from Q1. This will tend to turn off Q1 and lower the regulated voltage. Thus, varying R10 establishes the largest output voltage that can exist before Q9 turns on to cut back Q1. Resistor: R17, R18, and diodes CR15-18 provide current limit action at 180 mA similar to the +175 V supply.

Q6 is a prere - to that gives the circuit better line regulation and lower rithan the Zener diodes of the 175 V supply. With CRI as a reference, Q6 is a constant current circuit that maintains a QI base current independent of variations of the input tline voltage changes and ripple). R4 is needed to establish the current through CRL. The 46.5 V supply is complementery. The 5 V supplies are also complementary and only the + will be discussed.

The output from the T1 green leads is fed through full wave rectifier CRIO and CRII into filter C1. It then passes through overload current limiter RI and into the series pass regulator QI, to the 5 V output at QIC. Q3 is a driver for Q1 and has approximately 5.75 V on its base, developed across CR6 and CR5 by the current from the 16.5 V supply through R7. If the voltage at the emitter 5.1 V, Q3 is turned on providing base current to turn on Q1, raising the output voltage. Q3 turns off when its emitter gets above 5.1 V. C2 is the output filter to maintain a low output impedance at high frequencies.

CR2 clamps the output at 6 V to provide protection for the IC's in case the 16.5 V or 175 V line should momentarily short to the 5 V line. CR5 provides thermal compensation for Q3.

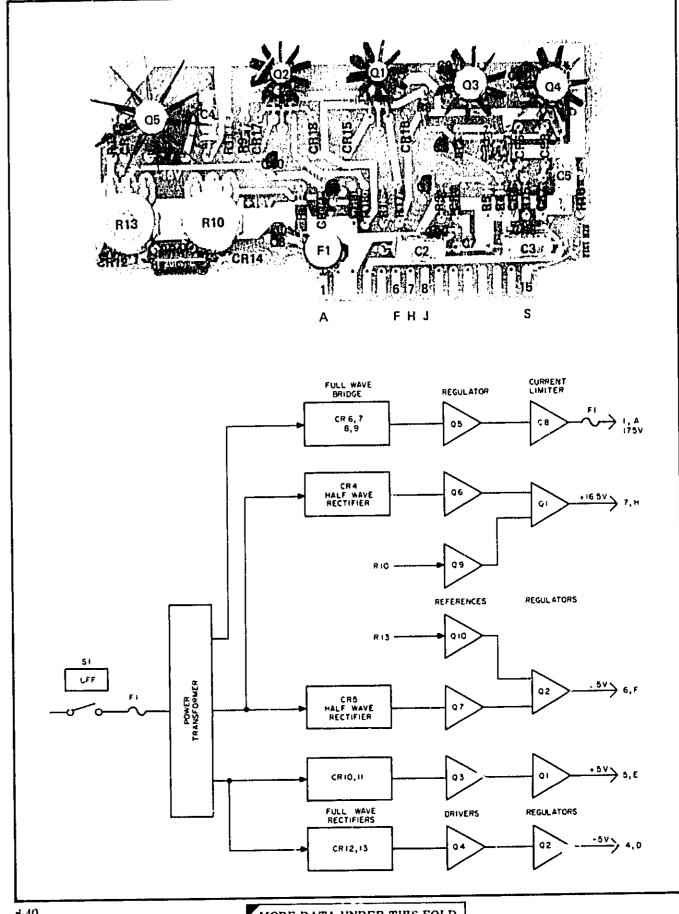
Note that the 16.5 V supply is needed for operation of the 5 V supply. If the + or - 16.5 7 supply fails, the corresponding 5 V supply will be inoperative.

> Figure 8-15 A11 LEFT READOUT ASSEMBLY

> > (See Page 8-39)

Model 5326/27A Schematic Diagrams

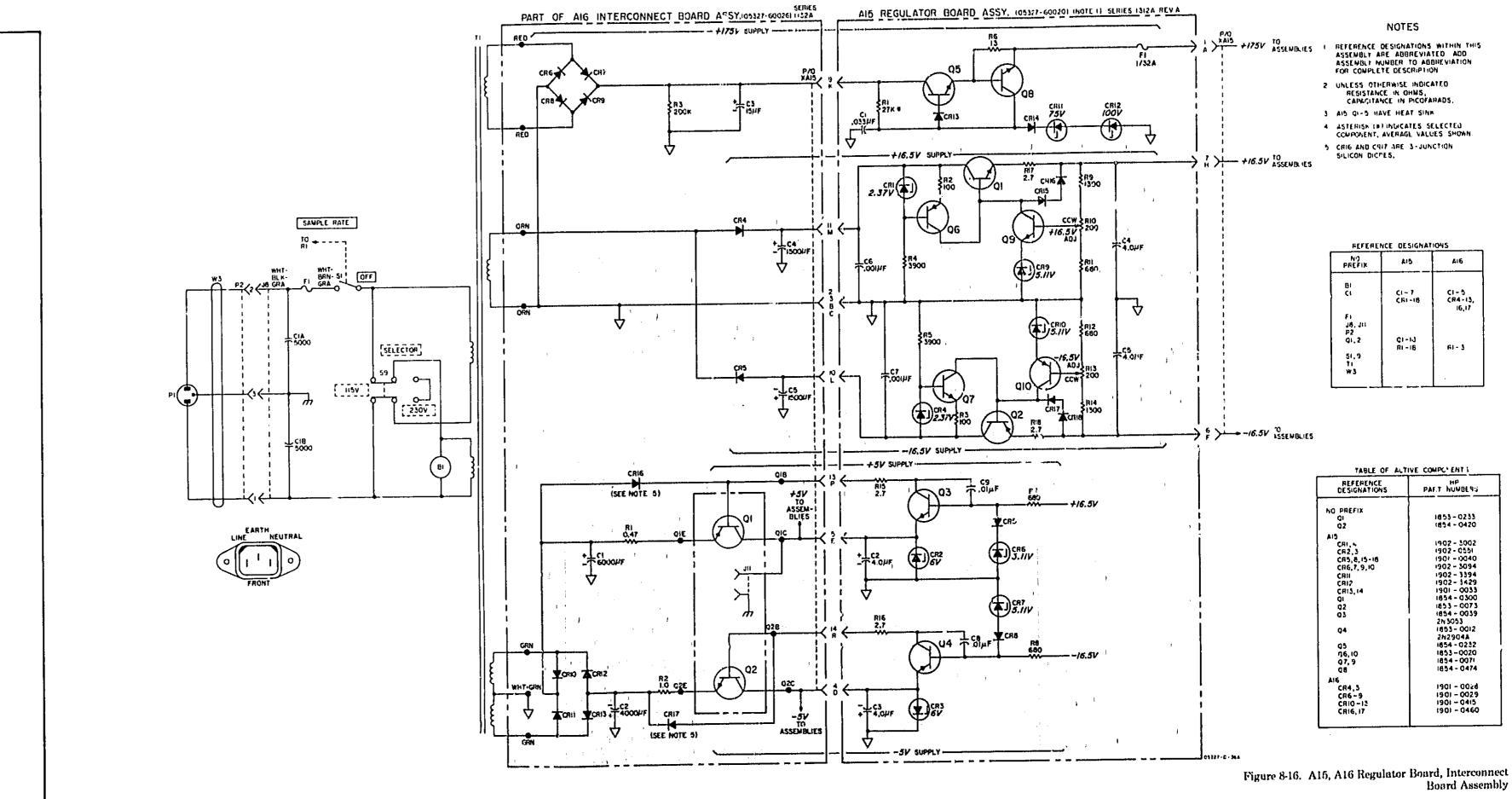
Part of Figure 8-1 i. A15, A16 Regulator Board, Interconnect Board Assembly



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- SEE FIGURE 8-22

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#### A17 INPUT C AMPLIFIER OPERATION

The input amplifier performs two functions: it provides a channel for increased sensitivity and it produces narrow pulses for efficient usage by other counter circuits. The amplifier is not controlled by any front-panel switches.

The input signal is de coupled into a 50 ohm input impedance (R1) and is fed into the input amplifier, which is protected by R2, CR1, and CR2. Current source U1Q5 feeds the balanced differential amplifier U1Q3, Q4. The twin outputs are londed by R10 and peaking coil L2. The signal flows to another amplifier circuit, whose outputs control the triggering of the tunnel diode, CR3. The di.de is biased for maximum sensitivity with R11. When the diode fires, it produces fast rise and fall times on the input signal.

High-impedance emitter followers (Q1, Q2) ac couple the signal to the single-ended differential amplifier of Q3 and Q4. The short time constants of C9, R18, and C12, R23 differentiate the signal into narrow spikes of about 15 ns. The output circuit of C11, R22, and L4 approaches resonance at high frequencies for improved gair...

The signal is then fed to the one-shot multivibrator U2. The one-shot output goes High (U2, pin 4) when the input goes low. The output goes Low again after about 12 ns, when the level changes have propagated through the gates in a dowing effect.

#### SENSITIVITY ADJUSTMENT

a. Set counter controls as follows:

UNCTION	٠.			٠						•		,		٠		ŀ	ŀ	U	(Q	(	.,
IME BASE								,											0.1	;	S

b. Set HP 606B HF Signal Generator (or equivalent) for 50 MHz at 500 mV rms. Measure the output signal of 606B with an HP 411A RF Millivoltmeter, using a 500 termination. Connect signal source to INPUT C of counter.

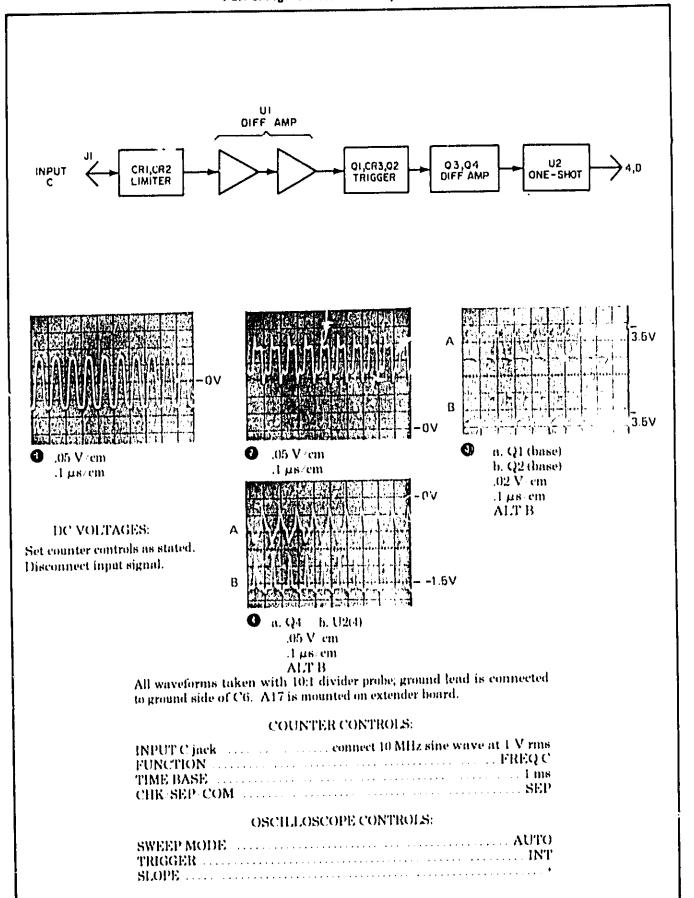
- c. Reduce output level until counter's display becomes unstable. Adjust R11 for a stable display. Repeat this procedure until unable to obtain a stable reading. Increase the signal level until display just becomes stable.
- d. Disconnect input and connect to voltmeter, reading should be less than 5 mV. Check other frequencies within the band.

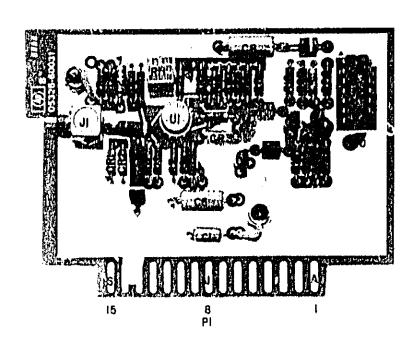
Figure 8-16 A16, A16 REGULATOR BOARD, INTERCONNECT BOARD ASSEMBLY

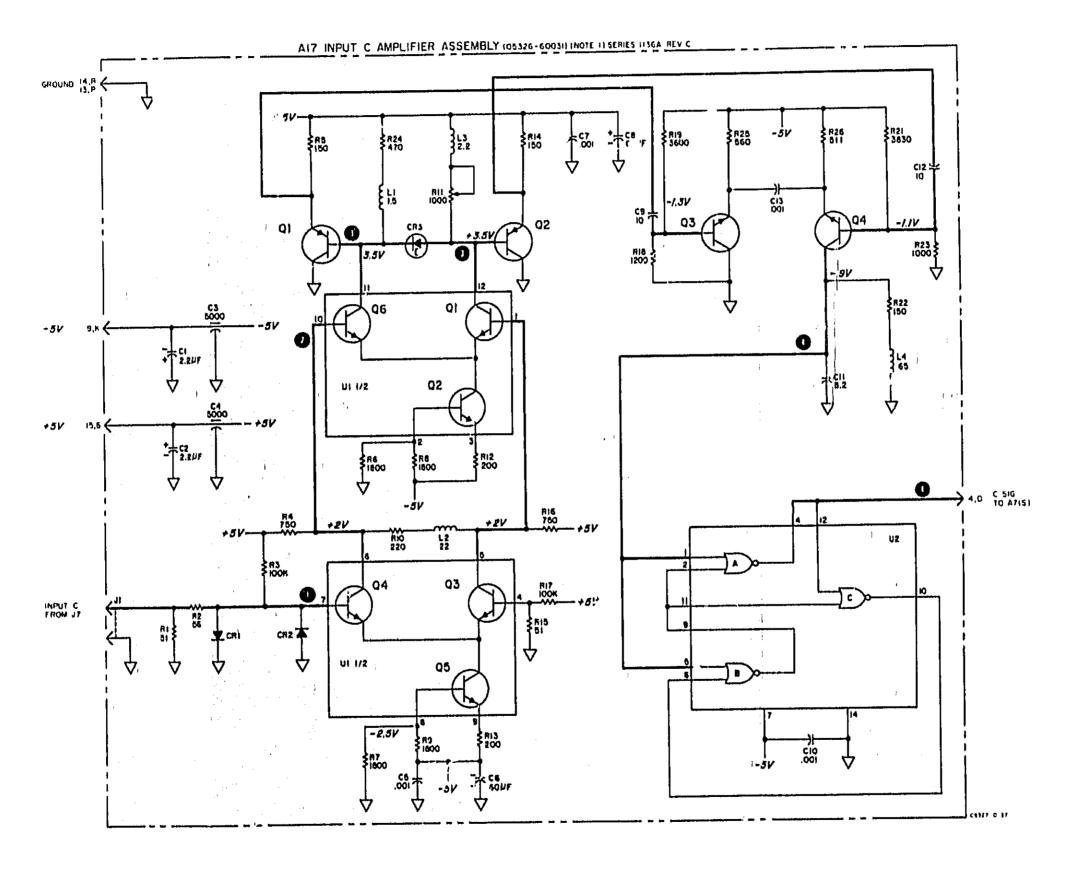
(See Page 8-41)

Model 5326/27A Schematic Diagrams

Part of Figur # 8-17. A17 Component Locator







NOTES

- I REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION
- 2 UNILESS OTHERWISE INDICATED.
  RESISTANCE IN OHMS,
  CAPACITANCE IN PICOFARADS,
  INDUCTANCE IN MICROHENRIES

TABLE OF ACTIVE COMPONENTS

REFERENCE DESIGNATIONS	PART HUMBURS
CRI,2	1901-0047
CR3	1912-0009
O1,2	1853-0015
C3	1854-07-92
Q4	1854-7,345
U1	1858-0004
U2	1857-0345

DESIGNATION

At

C1-15

CR1-5

L1-4

Q1-4

R1-19,
21-25

U1,2

Figure 8-17. A17 Input C Amplifier Assembly (5326A Only)

#### A18 PRESCALER OPERATION

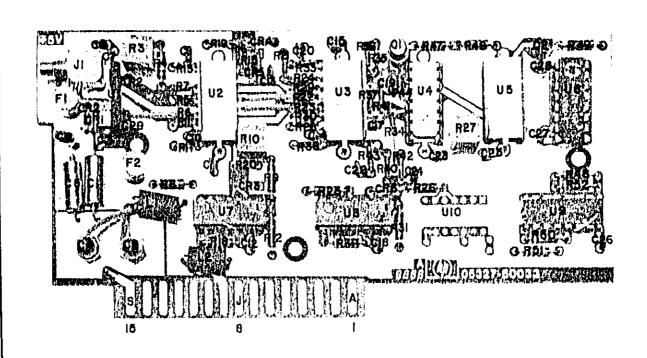
The prescaler hoard serves a direct amplifier-trigger or as a divideby-ten amplifier-trigger, with the function controlled by the front-panel input selector switch. With the switch in the PRESCALE position, the circuit performs as follows:

The signal is fed into the 500 input of J1. CR1, CR2, and U1 provide protection above 3.5 V rms or 5 V peak. There is about 2 dB loss through U1. The signal is passed to U2 amplifier, which is biased for sensitivity by R3. U3 amplifies the differential input and shapes the signal into a square wave. U4 and U5 combine to divide the signal by ten and Q2 translates the signal from EECL to ECL levels before presenting it to the data switch.

The airect signal, also from U3(13), bypasses the divider network and is sent to the data switch through the level translator Q1. The setting of the INPUT C switch determines whether the data switch will accept the direct or prescaled signal. Pin  $\angle$  of U6 is High for direct and Low for prescaled. U9 shapes the positive, square-shaped pules into narrow spikes before sending the signal to A7 Function board. U7, U8, and U10 (a production option) are constant-current sources for the amplifier circuits.

#### A18 TROUBLESHOOTING

Before troubleshooting the circuits, check the input protection fuse. If problem is in direct mode only, check Q1 and U6. If problem is in prescale mode only, check U4, U5, U6, and Q2. If aproblem is found in the amplitiers (U2 and U3), remove the input signal and check the devoltages supplied by the constant-current sources U7 and U8.



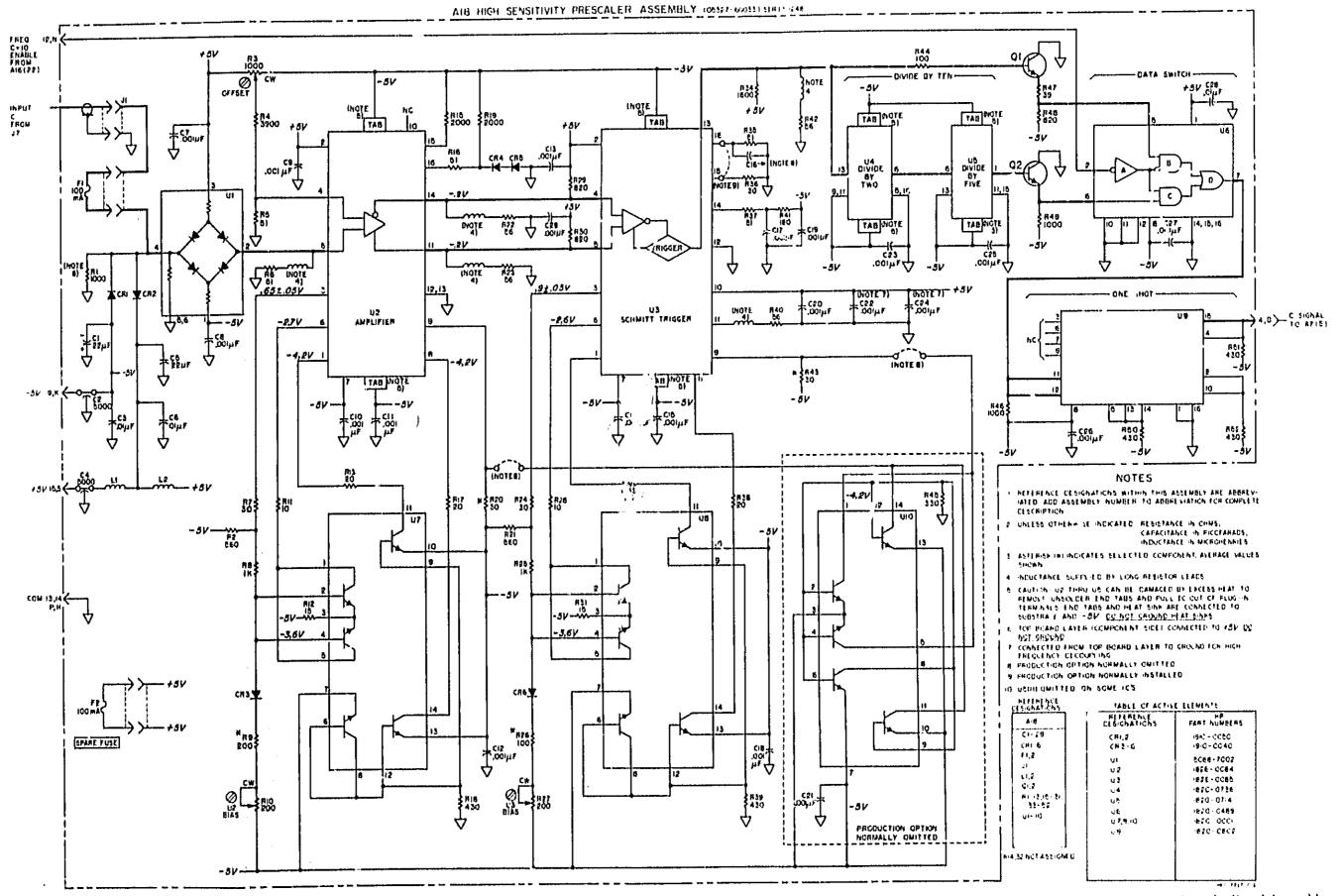


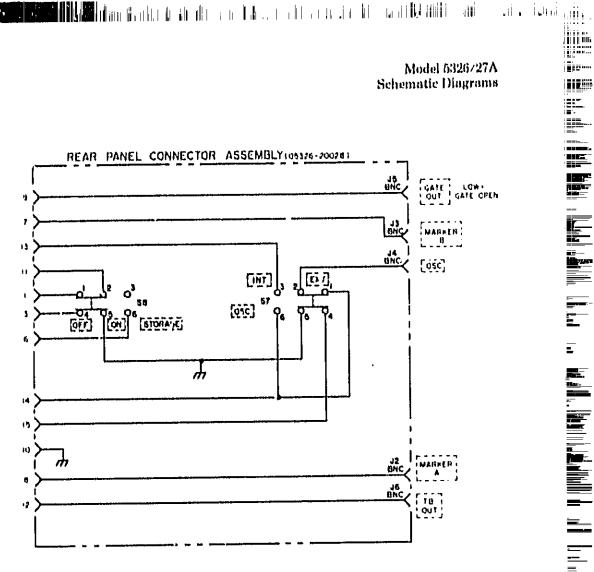
Figure 8-18. A18 Prescaler Board Assembly (5327A Only)

# OPTION 002 REMOTE PROGRAMMING

See Section II for programming information.

Start Period Avg A Time Intvl Avg Time Intvl Period Freq A Freq C	1 2 3 4 5	Brn Red Orn Yel	B12 B11	A16(14) A16(13)	1, - Start Open - Stop
Period Avg A Time Intvl Avg Time Intvl Period Freq A Freq C	2 3 4	Red Orn		A16(13)	1 - Mandala
Time Intvl Avg Time Intvl Period Freq A Freq C	3 4	Orn			1 Enable
Time Intvl Period Freq A Freq C	4	1	B10	A16(16)	<b>†</b>
Period Freq A Freq C	•	1 1/1	132	A16(15)	
Freq A Freq C	**	Grn	B3	A16(17)	
Freq C	ß	Blu	138	A16(18)	
· · · · · · · · · · · · · · · · · · ·	7	Vio	B131	A10(21)	L = Enable
No connection	8	Gra	CP	'	
No connection	9	Wht	C3		
No connection	10	Wht-Blk	C1		
No connection	11	Wht-Brn	CH		
No connection	12	Wht-Red	C6		
No connection	13	Wht-Orn	CI		
Check	14	Wht-Yel	B15	XA3(B)	1, : Cheek
Gate Out	16	Wht-Grn	A9	(A5(F)	Gate Closed         Gate Open
Computer Inhibit	16	Wht-Blu	C9	XA604)	), = Inhibit
Ext	17	Wht-Vio	Ail	XATI(A)	
Freq C + 10	18	Wht-Gra	(W2P2)	A10(22)	L = Enable
.1 µո/1	10	Wht-Blk-Brn	B1	A1660)	
1 μs/10 <sup>1</sup>	20	Wht-Blk-Red	139	A16611)	
10 μs/10 <sup>7</sup>	21	Wht-Blk-Orn	136	Atheb	
.1 ms/104	22	Wht-Blk-Yel	137	A16(20)	
l ms/10 <sup>1</sup>	23	Wht-Blk-Grn	B5	A16(26)	
10 ms/10°	24	Wht-Blk-Blu	C15	A16(27)	
.1 s/10 <sup>6</sup>	25	Wht-Blk-Vio	C13	A16(24)	
1 8/10:	26	Wht-Blk-Gra	C14	A16(25)	<b>\</b>
10 8/10"	27	Wht-Blk-Red	134	A16(23)	L : Enable
Slope A	28	Wht-Brn-Orn	C12	XA2(13,P)	1, - Minus Open - Plus
Stope B	20	Wht-Brn-Yel	B14	XA3G3,P)	

Function	J10 Pin No.	Wire Color	W2P1 Pin No.	Circuit Board Terminals	Level
A Trig Level	30	Wht-Brn-Grn	Gto	XA2(1,A)	+3 V to -3 V
B Trig Level	31	Wht-Brn-Blu	C2	XA3(1,A)	3 V to 3 V
Sample Rate Disable	32	Wht-Brn-Vio	C7	A16(11)	1, = Disable
Print Command	33	Wht-Brn-Gra	C8	XA6(S)	L - Causes Print
Manual Reset	34	Wht-Red-Orn	<b>A</b> 5	A16(6)	1, = Reset
Sample Rate Hold	36	Wht-Red-Yel	Α2	A16(d)	1 Maintain Display
Ground	36	Blk	A10	Ground	



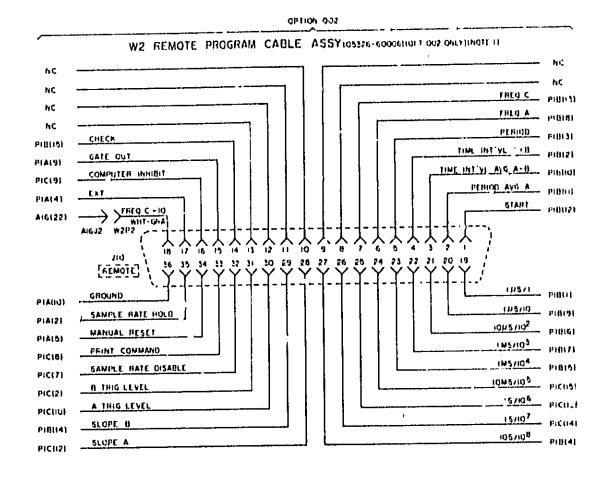
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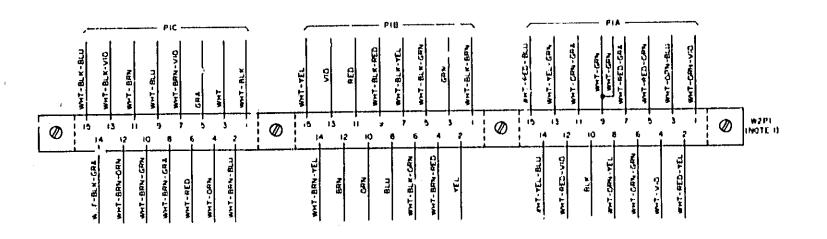
NOTES I IN STANDARD INSTRUMENT, ONLY WORLA

Figure 8-19. Option 002 Remote Programming Cable Assembly and Rear Panel Connector Assembly

CHIP C 10

8-17





# OPTION C13, DIGITAL RECORDER OUTPUT

Option 003 includes cable assembly W1 and rear panel connector J9. The counter (A9 Display Assembly provides \*8421 BCD and control line inputs and outputs for use with a printer or other data storage devices.

The annunciator lines 64947, 48, 42, and 43) supply overflow, plus, and minus outputs as follows:

FUNCTION	BCD
	8 4 2 1
Overflow	1. 1. 1. 1.
All Other Times	нини

When the print command line at J9(48) goes low, it indicates that the counter has completed a measurement and the data output may be interrogated. When the inhibit line is held High, the data output is maintained. The line must go high less than 30  $\mu s$  after the print command goes low. The 45 V reference line (J9-25) has a 1K source impedance and is used for data level references. The 0 volt or ground reference connects to J9(24, 50).

# **OPTION 004, EXTENDED REMOTE PROGRAMMING**

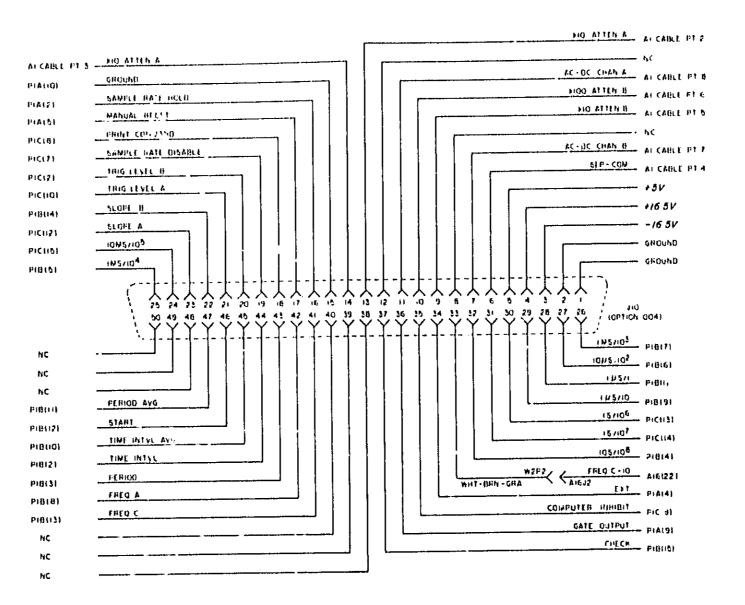
See Section  $\Pi$  for remote programming information.

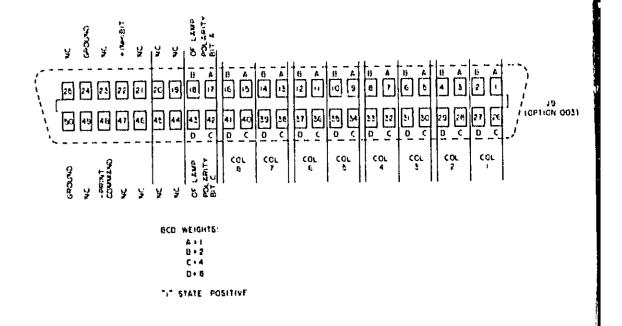
#### **Option 004 Pin Connections**

Function	J10 Pin No.	Wire Color	W2P1 Pin No.	Circuit Board Terminals	Level
Ground	1	Blk			
Ground	2	Blk			
-16,5 V Output	з [	Orn			İ
•16,5 V Output	4	Yel			
•5 V Output	5	Gri.			
Sep-Com	6	Blu		A1 Cable Point 4	I, = Com
AcDe Chan B	7	Vio		A1 Cable Point 7	L = De
No connection	8	Gra			H = Ac
X10 Atten B	9	Wht		A1 Cable Point 5	   See Section II
X100 Atten B	10	Wht-Blk		A1 Cable Point 6	
Ac-De Chan A	11	Wht-Brn		A1 Cable Point 8	L = De
No connection	12	Wht-Red			H = Ac
X10 Acten A	13	Wht-Orn		A1 Cable Point 2	See Section II
X100 Atten A	14	Wht-Ye <sup>1</sup>		At Cable Point 3	

Sample Rate Hold         16         Wht-Blu         A2         A16(4)         L = Maintain Disah           Manual Reset         17         Wht-Vio         A5         A16(6)         L = Reset           Print Command         18         Wht-Gra         C8         XA6(S)         L = Causes Print           Sample Rate Disable         19         Wht-Blk-Brn         C7         A16(11)         L = Disable           Trig Level B         20         Wht-Blk-Red         C2         XA3(1, A)         +3 V to -3 V           Trig Level A         21         Wht-Blk-Orn         C10         XA2(1, A)         +3 V to -3 V           Slope B         22         Wht-Blk-Yel         B14         XA3(13, P)         L = Minus           Open = Plus           L = Minus         Description         Description         Description	Function	J10 Pin No.	Wire Color	W2P1 Pin No.	Circuit Board Terminals	Leve <sup>1</sup>				
Manual Reset	Ground	15	Blk	A10						
Manual Reset         17         Wht-Vio         A5         A16(6)         L. = Reset           Print Command         18         Wht-Bik-Brn         C8         XA6(8)         L. = Causes Print           Sample Rate Disable         19         Wht-Bik-Brn         C7         A16(11)         L. = Disable           Trig Level A         21         Wht-Bik-Orn         C10         XA2(1, A)         -3 V to -3 V           Slope B         22         Wht-Bik-Orn         C10         XA2(1, A)         -3 V to -3 V           Slope B         22         Wht-Bik-Orn         C12         XA2(1, A)         -3 V to -3 V           Slope A         23         Wht-Bik-Gra         C12         XA2(1, A)         -3 V to -3 V           Jam/10°         24         Wht-Bik-Gra         C15         A16(27)         L = Minus Open = Plus           Jam/10°         25         Wht-Bik-Gra         B5         A16(29)         L = Enable           Jam/10°         26         Wht-Birn-Red         B6         A16(29)         L = Enable           Jam/10°         27         Wht-Birn-Vel         B9         A 46(31)         L = Enable           Jam/10°         30         Wht-Bra-Gra         C13         A16(29)         L = Enable	Sample Rate Hold	16	Wht-Blu	A2	A16(4)	1, = Maintain Disable				
Sample Rate Disable  Trig Level B  20 Wht-Blk-Brn  C1 XA3(1, A)  Slope B  22 Wht-Blk-Yel  B14 XA3(13, P)  XA2(1, A)  XA2	Manual Reset	17	Wht-Vio	Aħ	A16(6)					
20	Print Command	l 1 18	Wht-Gra	Св	XA6(S)	L = Causes Print				
Trig Level A   21	Sample Rate Disable	19	Wht-Blk-Brn	C7	AIG(11)	L = Disable				
Slope B   22	Trig Level B	20	Wht-Blk-Red	C2	XA3(1, A)	+3 V to -3 V				
Slope A   23	Trig Level A	21	Wht-Blk-Orn	C10	XA2(1, A)	+3 V to -3 V				
Slope A   23	Slope B	22	Wht-Blk-Yel	B14	XA3(13, P)					
	Slope A	23	Wht-Blk-Grn	Wht-Blk-Grn C12 XA2(13, P)						
1 ms/10   26	10 ms/105	24	Wht-Blk-Blu	C15	A16(27)	L = Enable				
10	1 ms/104	25	Wht-Blk-Vio	B5	A16(26)	l †				
Description   Description	.1 ms/10°	26	Wht-Blk-Gra	B7	A16(29)					
1	10 μs/10 <sup>2</sup>	27	Wht-Brn-Red	B6	A16(28)					
18/10°   30   Wht-Brn-Grn   C13   A16C4)     18/10°   31   Wht-Brn-Blu   C14   A16C25)     10 8/10°   32   Wht-Brn-Vio   B4   A16C23)     Freq C + 10   33   Wht-Br ra   W2P2   A16C22)     Ext   34   Wht-Red-Orn   A4   XA11(A)     Ext   35   Wht-Red-Grn   A9   XA5(F)     Computer Inhibit   36   Wht-Red-Grn   A9   XA5(F)     Check   37   Wht-Red-Blu   B15   XA3(B)     Check   37   Wht-Red-Blu   B15   XA3(B)     Check   37   Wht-Red-Grn   C4     No connection   38   Wht-Red-Grn   C6     No connection   39   Wht-Red-Grn   C6     No connection   40   Wht-Orn-Yel   C11     Freq C   41   Wht-Orn-Grn   B13   A16C1)     Freq A   42   Wht-Orn-Blu   B8   A16C18     Period   43   Wht-Orn-Crn   B2   A16C15     Time Intvl   44   Wht-Orn-Grn   B10   A16C16     Start   46   Wht-Yel-Grn   B10   A16C16     Start   46   Wht-Yel-Blu   B12   A16C13     Ca   Ca     Ca   Ca     Ca   Ca     Ca   Ca	.l µв/I	28	Wht-Brn-Orn							
1 s/10 <sup>7</sup>   31    Wht-Brn-Blu	1 με/10	29	Wht-Brn-Yel							
10 s/10^   32	.1 s/10 <sup>n</sup>	30	Wht-Brn-Grn	C13	A16C4)					
Freq C + 10         33         Wht-Br va         W2P2         A16(22)         L = Enable           Ext         34         Wht-Red-Orn         A4         XA1(A)         H = Int         L = Ext           Computer Inhibit         35         Wht-Red-Yel         C9         XA6(4)         L = Inhibit           Gate Output         36         Wht-Red-Gra         A9         XA5(F)         H = Gate Closed           Check         37         Wht-Red-Blu         B15         XA3(B)         L = Check           No connection         38         Wht-Red-Gra         C6         C4           No connection         39         Wht-Red-Gra         C6           No connection         40         Wht-Orn-Yel         C11           Freq C         41         Wht-Orn-Grn         B13         A16(21)         L = Enable           Freq A         42         Wht-Orn-Blu         B8         A16(18)         A16(18)           Period         43         Wht-Orn-Gra         B2         A16(15)         L = Enable           Time Intvl Avg         45         Wht-Yel-Gra         B1         A16(14)         L = Start           Open = Stop           Period Avg         47         Wht-Yel-Gra	1 s/10 <sup>7</sup>	31	Wht-Brn-Blu	C14	A16(25)					
Ext	10 s/10*	32	Wht-Brn-Vio	B4	A16(23)	}				
Computer Inhibit   35	Freq C + 10	33	Wht-Br ra	W2P2	A16(22)	L = Enable				
Gate Output         36         Wht-Red-Grn         A9         XA5(F)         H = Gate Closed L = Gate Open           Check         37         Wht-Red-Blu         B15         XA3(B)         L = Check           No connection         38         Wht-Red-Vio         C4         L = Check           No connection         39         Wht-Red-Gra         C6         C6           No connection         40         Wht-Orn-Yel         C11         L = Enable           Freq C         41         Wht-Orn-Gra         B13         A16(21)         L = Enable           Freq A         42         Wht-Orn-Blu         B8         A16(18)         A16(18)           Period         43         Wht-Orn-Gra         B2         A16(15)         L = Enable           Time Intvl Avg         45         Wht-Yel-Gra         B10         A16(16)         L = Enable           Start         46         Wht-Yel-Blu         B12         A16(14)         L = Enable           Period Avg         47         Wht-Yel-Orn         B1         A16(13)         L = Enable           No connection         48         Wht-Grn-Blu         C3         C3         C3	Ext	34	Wht-Red-Orn	A4	XA11(A)					
Check   37	Computer Inhibit	35	Wht-Red-Yel	C9	XA6(4)	L = Inhibit				
No connection         38         Wht-Red-Vio         C4           No connection         39         Wht-Red-Gra         C6           No connection         40         Wht-Orn-Yel         C11           Freq C         41         Wht-Orn-Grn         B13         A16(21)           Freq A         42         Wht-Orn-Blu         B8         A16(18)           Period         43         Wht-Orn-Vio         B3         A16(17)           Time Intvl         44         Wht-Orn-Gra         B2         A16(15)           Time Intvl Avg         45         Wht-Yel-Grn         B10         A16(16)         L = Enable           Start         46         Wht-Yel-Blu         B12         A16(14)         L = Start Open = Stop           Period Avg         47         Wht-Yel-Vio         B11         A16(13)         L = Enable           No connection         48         Wht-Yel-Gra         C5         C5           No connection         49         Wht-Grn-Blu         C3         C3	Gate Output	36	Wht-Red-Grn	A9	XA5(F)					
No connection         39         Wht-Red-Gra         C6           No connection         40         Wht-Orn-Yel         C11           Freq C         41         Wht-Orn-Grn         B13         A16(21)         L = Enable           Freq A         42         Wht-Orn-Blu         B8         A16(18)         A16(18)           Period         43         Wht-Orn-Vio         B3         A16(17)         A16(17)           Time Intvl         44         Wht-Orn-Gra         B2         A16(15)         L = Enable           Start         45         Wht-Yel-Grn         B10         A16(16)         L = Enable           Start         46         Wht-Yel-Blu         B12         A16(14)         L = Enable           Period Avg         47         Wht-Yel-Vio         B11         A16(13)         L = Enable           No connection         48         Wht-Yel-Gra         C5         C5           No connection         49         Wht-Grn-Blu         C3         C3	Check	37	Wht-Red-Blu	B15	XA3(B)	L = Check				
No connection         40         Wht-Orn-Yel         C11           Freq C         41         Wht-Orn-Grn         B13         A16(21)         L = Enable           Freq A         42         Wht-Orn-Blu         B8         A16(18)         Time Int(18)         A16(17)         A16(17)         A16(17)         Time Intvl         A16(17)         A16(15)         L = Enable         L = Ena	No connection	38	Wht-Red-Vio	C4						
Freq C         41         Wht-Orn-Grn         B13         A16(21)         L = Enable           Freq A         42         Wht-Orn-Blu         B8         A16(18)         A16(18)           Period         43         Wht-Orn-Vio         B3         A16(17)           Time Intvl         44         Wht-Orn-Gra         B2         A16(15)           Time Intvl Avg         45         Wht-Yel-Grn         B10         A16(16)         L = Enable           Start         46         Wht-Yel-Blu         B12         A16(14)         L = Start Open = Stop           Period Avg         47         Wht-Yel-Vio         B11         A16(13)         L = Enable           No connection         48         Wht-Yel-Gra         C5         C5           No connection         49         Wht-Grn-Blu         C3         C3	No connection	39	Wht-Red-Gra	C6						
Freq A         42         Wht-Orn-Blu         B8         A16(18)           Period         43         Wht-Orn-Vio         B3         A16(17)           Time Intvl         44         Wht-Orn-Gra         B2         A16(15)           Time Intvl Avg         45         Wht-Yel-Grn         B10         A16(16)         L = Enable           Start         46         Wht-Yel-Blu         B12         A16(14)         L = Start Open = Stop           Period Avg         47         Wht-Yel-Vio         B11         A16(13)         L = Enable           No connection         48         Wht-Yel-Gra         C5         C5           No connection         49         Wht-Grn-Blu         C3         C3	No connection	1 40	Wht-Orn-Yel	CII						
Period         43         Wht-Orn-Vio         B3         A16(17)           Time Intvl         44         Wht-Orn-Gra         B2         A16(15)           Time Intvl Avg         45         Wht-Yel-Grn         B10         A16(16)         L = Enable           Start         46         Wht-Yel-Blu         B12         A16(14)         L = Start Open = Stop           Period Avg         47         Wht-Yel-Vio         B11         A16(13)         L = Enable           No connection         48         Wht-Yel-Gra         C5         C5           No connection         49         Wht-Grn-Blu         C3         C3	Freg C	41	Wht-Orn-Grn	B13	A16(21)	L = Enable				
Time Intvl         44         Wht-Orn-Gra         B2         A16(15)         ↓           Time Intvl Avg         45         Wht-Yel-Grn         B10         A16(16)         L = Enable           Start         46         Wht-Yel-Blu         B12         A16(14)         L = Start Open = Stop           Period Avg         47         Wht-Yel-Vio         B11         A16(13)         L = Enable           No connection         48         Wht-Yel-Gra         C5         C5           No connection         49         Wht-Grn-Blu         C3         C3	Freq A	42	Wht-Orn-Blu	B8	A16(18)	1				
Time Intvl Avg         45         Wht-Yel-Grn         B10         A16(16)         L = Enable           Start         46         Wht-Yel-Blu         B12         A16(14)         L = Start Open = Stop           Period Avg         47         Wht-Yel-Vio         B11         A16(13)         L = Enable           No connection         48         Wht-Yel-Gra         C5         C5           No connection         49         Wht-Grn-Blu         C3         C3	Period	43	Wht-Orn-Vio	В3	A16(17)					
Start         46         Wht-Yel-Blu         B12         A16(14)         L = Start Open = Stop           Period Avg         47         Wht-Yel-Vio         B11         A16(13)         L = Enable           No connection         48         Wht-Yel-Gra         C5         C5           No connection         49         Wht-Grn-Blu         C3         C3	Time Intvl	44	Wht-Orn-Gra	B2	A16(15)	↓				
Period Avg 47 Wht-Yel-Vio Bt1 A16(13) L = Enable  No connection 48 Wht-Yel-Gra C5  No connection 49 Wht-Grn-Blu C3	Time Intvl Avg	45	Wht-Yel-Grn	B10	A16(16)	L = Enable				
No connection 48 Wht-Yel-Gra C5 No connection 49 Wht-Grn-Blu C3	Start	46	Wht-Yel-Blu	B12	A16(14)					
No connection 49 Wht-Grn-Blu C3	Period Avg	47	Wht-Yel-Vio	Bt1	A16(13)	L = Enable				
	No connection	48	Wht-Yel-Gra	C5						
No connection 50 Wht-Grn-Vio C1	No connection	49	Wht-Grn-Blu	C3						
	No connection	50	Wht-Grn-Vio	Cı						

Model 5326/27A Schematic Diagrams





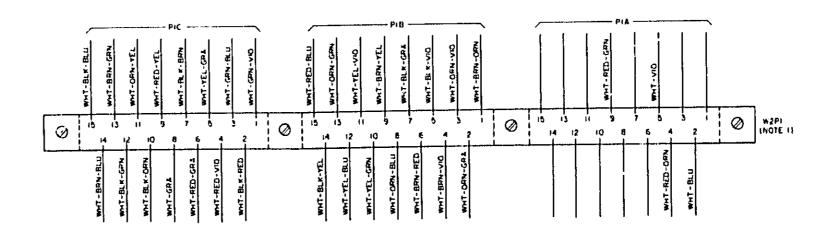
NOTES

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cets+ c 16

Figure 8-20. Option 004, Remote Programming Cable Assembly and J10 Option 003, Digital Recorder Cable Assembly

8-49



## A1 OPTION 004 OPERATION

The remote programmable attenuator board attenuates the input signal and routes it to the amplifier boards. The signals from inputs A and B are routed through identical paths.

In the X1 position K2 is closed and the signal is routed d'rectly to K4, which is open with ac coupling and closed with dc. R30 provides the 1 M0 input impedance. R34, R38, and C7 compensate for high frequency roll-off and also limit the input current to Q1A. Diodes CR25 and CR27 limit the voltage at the input of Q13A to 45.8 V. Q13A operates as a source follower with a high input impedance and a low output impedance to the amplifier boards. Q1B operates as a source—lower, supplying the amplifiers with the dc trigger-level voltage generated either by R49, CR32, and CR33, or from an external analog input (J19). R46, 44, 42, and C13 filter the trigger-level voltage.

In the X1 position, K2 and K4 are closed providing a direct path for the input signal to the gate of Q13A. In the X10 position, K2 is open and diodes CR7 and CR9 are turned on, shorting R16 to ground. R12, R14, and R16 form the dc attenuator. The ac (high frequency) attenuator is formed by C1 and stray capacitance in the circuit.

In the X100 postaion, K2 is open, CR7 and CR9 are off, and CR21 and CR23 are turned on. C3 and R28 are thus connected to ground. R12, R14, and R28 form the dc portion of the attenuator, while C1, C3, and stray capacitance form the high frequency portion of the attenuator.

The circuitry to drive AC/DC relay K4, and SEP/COM relay K1 is provided by U3 A&C. U3's citput is at HTL levels (+12 V, +1.5 V) and thus is sufficient to delive the relays directly. U3's input is at DTL levels and is compatible with remote programming levels. K2 is driven by Q7 and is open when CR7 and CR9 or CR21 and CR23 are on.

Diode pairs CR7 and CR9 are driven by emitter followers Q3 and Q6, which, in turn, are driven by HTL gates U2D AND U2C. U2's power supply, consisting of Q1 and Q2, is +8.9 V and -5.6 V rather than the usual +15 V and 0 V. This special bias moves the HTL input threshold to +1.9 V, rather than the normal +7.5 V. U2D can now be driven by DTL gate U1B. The output swing of U2D is +9 V to -4 V, providing the diode quad CR7 and CR9 with positive turn-on and turn-off aignals. R9 is adjusted to minimize the offset voltage of the quad.

Figure 8-20
OPTION 004, REMOTE PROGRAMMING CABLE ASSEMBLY AND
J10 OPTION 003, DIGITAL RECORDER CABLE ASSEMBLY

(See Page 8-49)

Model 5326/27A Schematic Diagrams

#### **ADJUSTMENTS**

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TIME BASE																					, ,	,		,		(	١. ا	H	Ľ	2,
AC/DC	•	• •	•	•	•	•		ľ	•	Ċ																		. 1	)(	С
SEP/COM .	٠.	•	•		•		٠	٠	•	•	•				ĺ											.,		S	E	Į)
ATTEN A/B	٠,	٠	•	•		•	•	٠	•	•	• '		•	•	•	·		•		Ċ			٠.		٠.			. )	(I	()
- WEIRN WO	٠		• •	٠	٠	٠	•	٠ 1	•	•	•	٠	٠	٠	٠	•	٠.	•	•	•	•	•								

- Using an HP 412A or equivalent, measure voltage at CHANNEL. A jack.
- 2. Adjust R50 for <+1 mV rending.
- 3. Mensure voltage at CHANNEL B jack.
- 4. Adjust R0 for <+1 my reading.
- 5. Set A and B attenuators to X100 position.
- 6. Mensure voltage at CHANNEL B jack.
- 7. Adjust R32 for <+1 mV reading.
- 8. Mensure voltage at CHANNEL A jack.
- 9. Adjust R33 for <+1 mV rending.

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; INDUCTANCE IN MICROHENRIES A1,0PT.00-2 C1-14 CR1-36 D51,2 J1-4 K1-5

Q1-14 R1-56

51-9 U1-4

TABLE OF ACTIVE COMPONENTS

DESIGNATIONS	PART NUMBERS
CRI-3,6,15,18,30,31	1910 - 0016
CR4	1902 - 0025
CR5	190,7-44057
CR7,8,23,24	1906 -L 024
CR9,10,21,22	1806-7025
CRIS-14,16,17.	
19, 20, 29, 36	1901-0040
CR25-28	1901-0376
CR32-35	1902 - 3041
Q i	1854-0039
Q2	1853-0001
03,4,7,8,11,12	1654 - 0215
95,6,9,10	1853-0036
013,14	1855-0354
UI	1820-0274
U2.4	1620-0267
u3	1820-0625

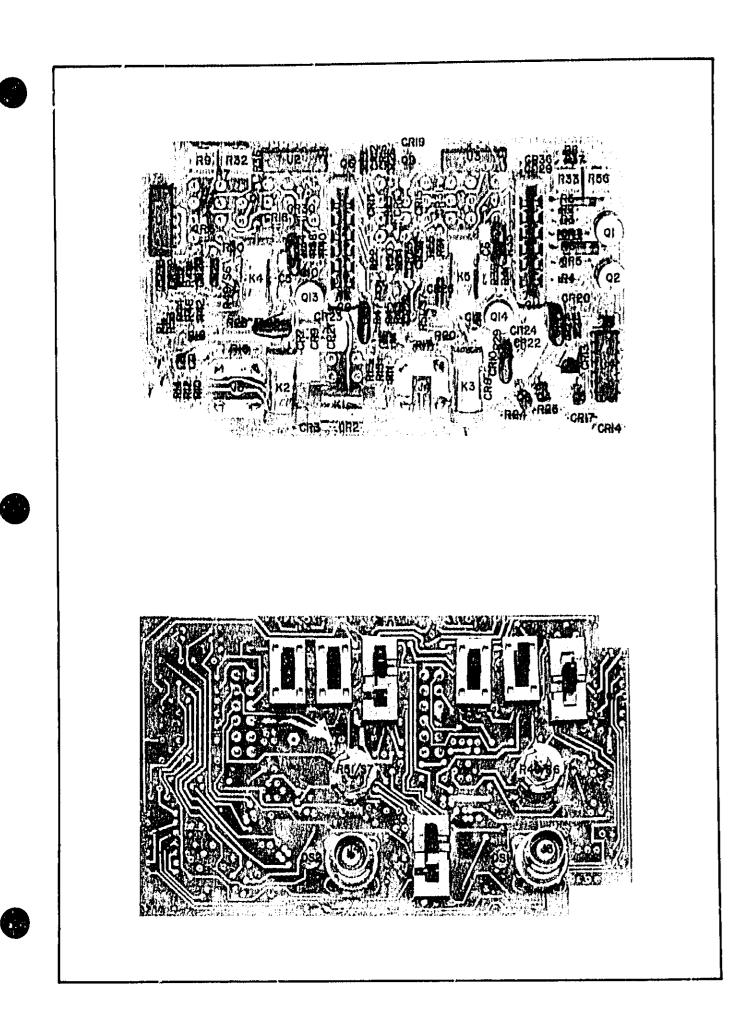
CABLE POINT	COLOR	DESTINATION
<u> </u>	GRK	+67
2	WHT-ORN	110 (13)
3	WHT-YEL	310(14)
4	BLO	110(6)
6	WHT	110(9)
6	WHT-BLK	JIO(IO)
7	VIO	JI017)
6	WHT -BRN	310(13)

COMPLETE PARTS LIST FOR THIS ASSENBLY IS LOCATED ON PAGE 618

MORE DATA UNDER THIS FOLD

8-50

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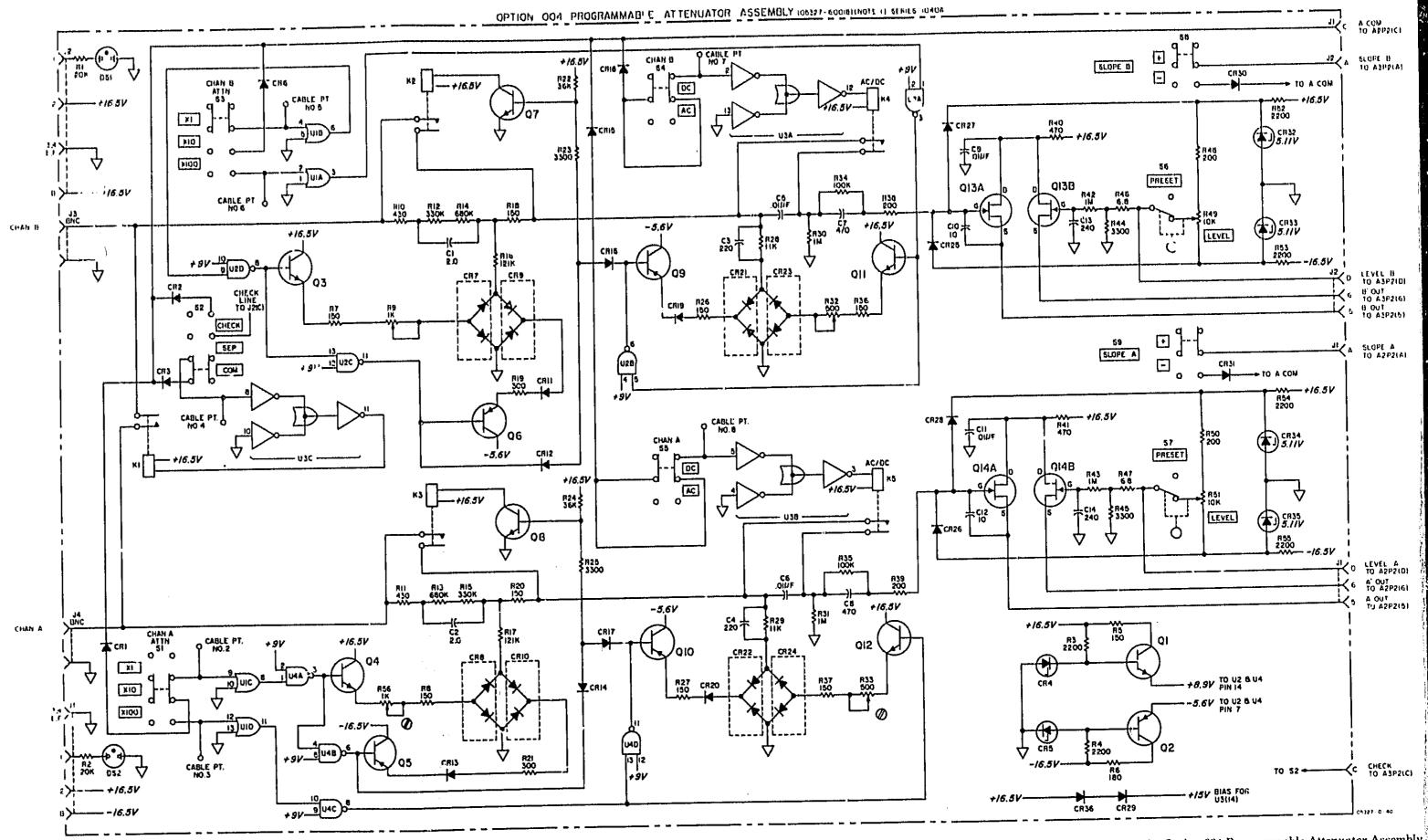
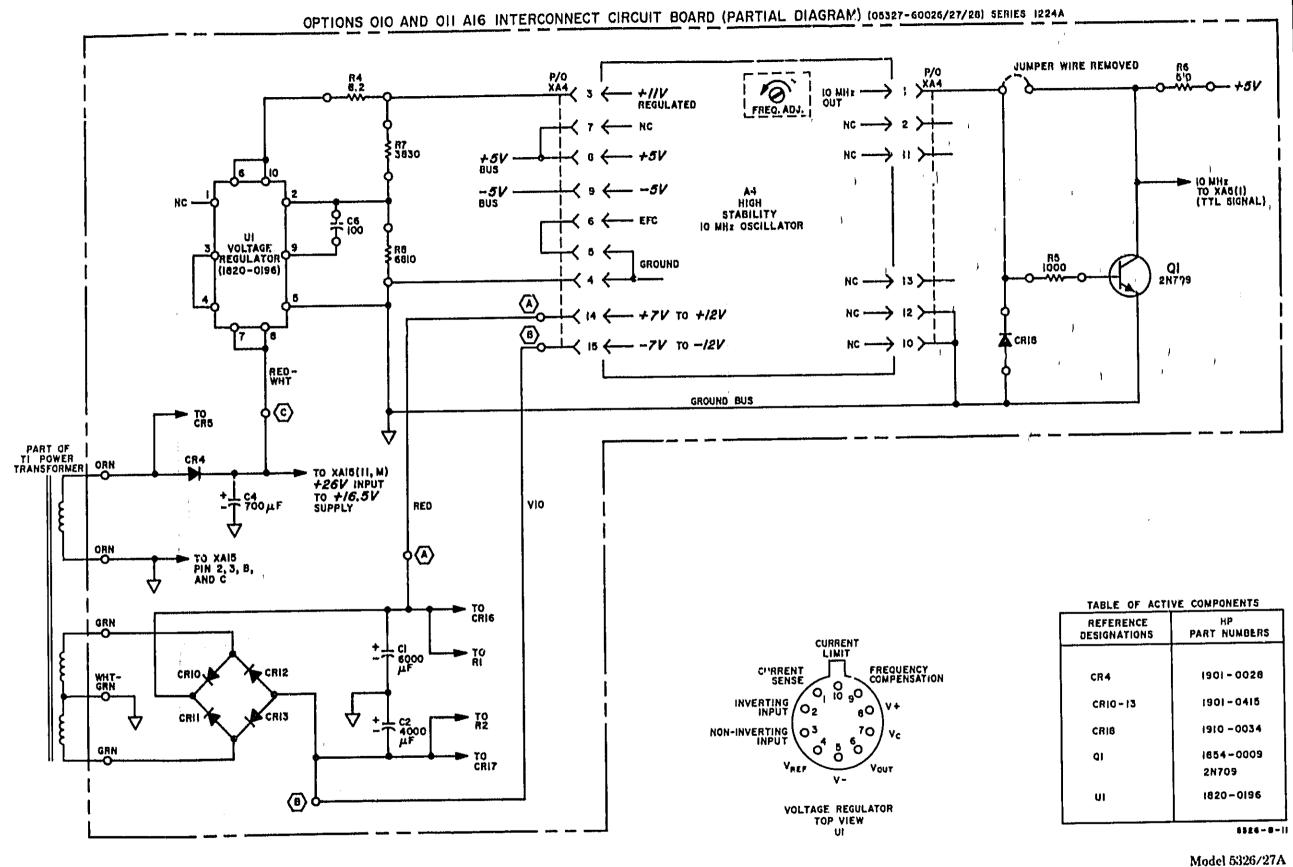


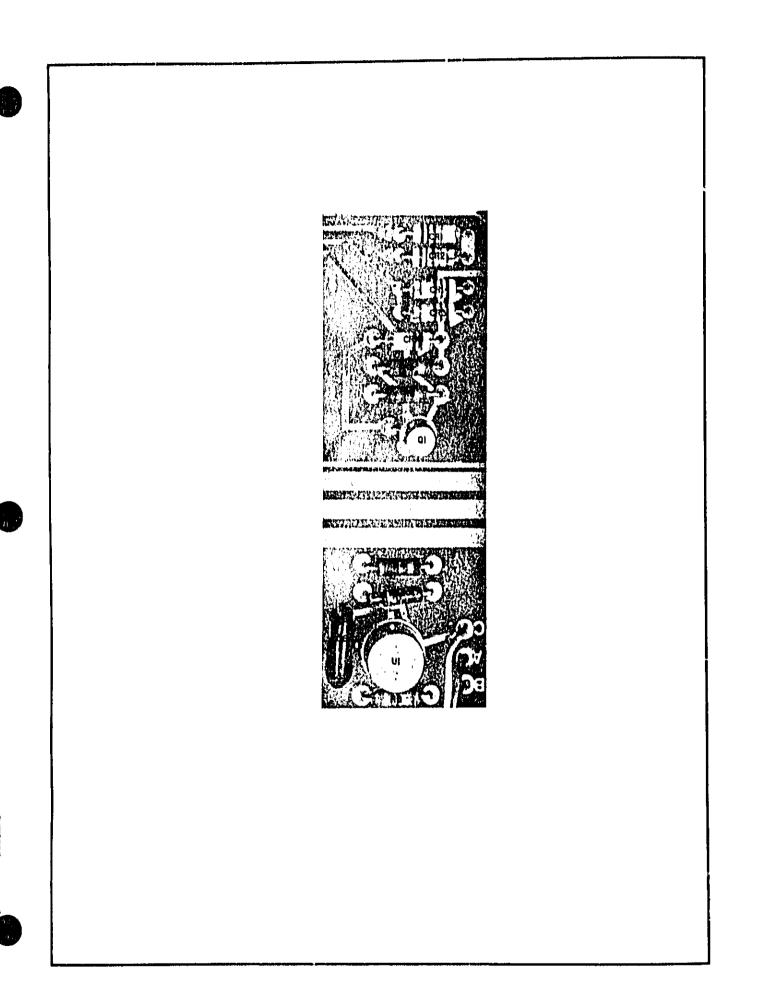
Figure 8-21. A1 Option 004 Programmable Attenuator Assembly

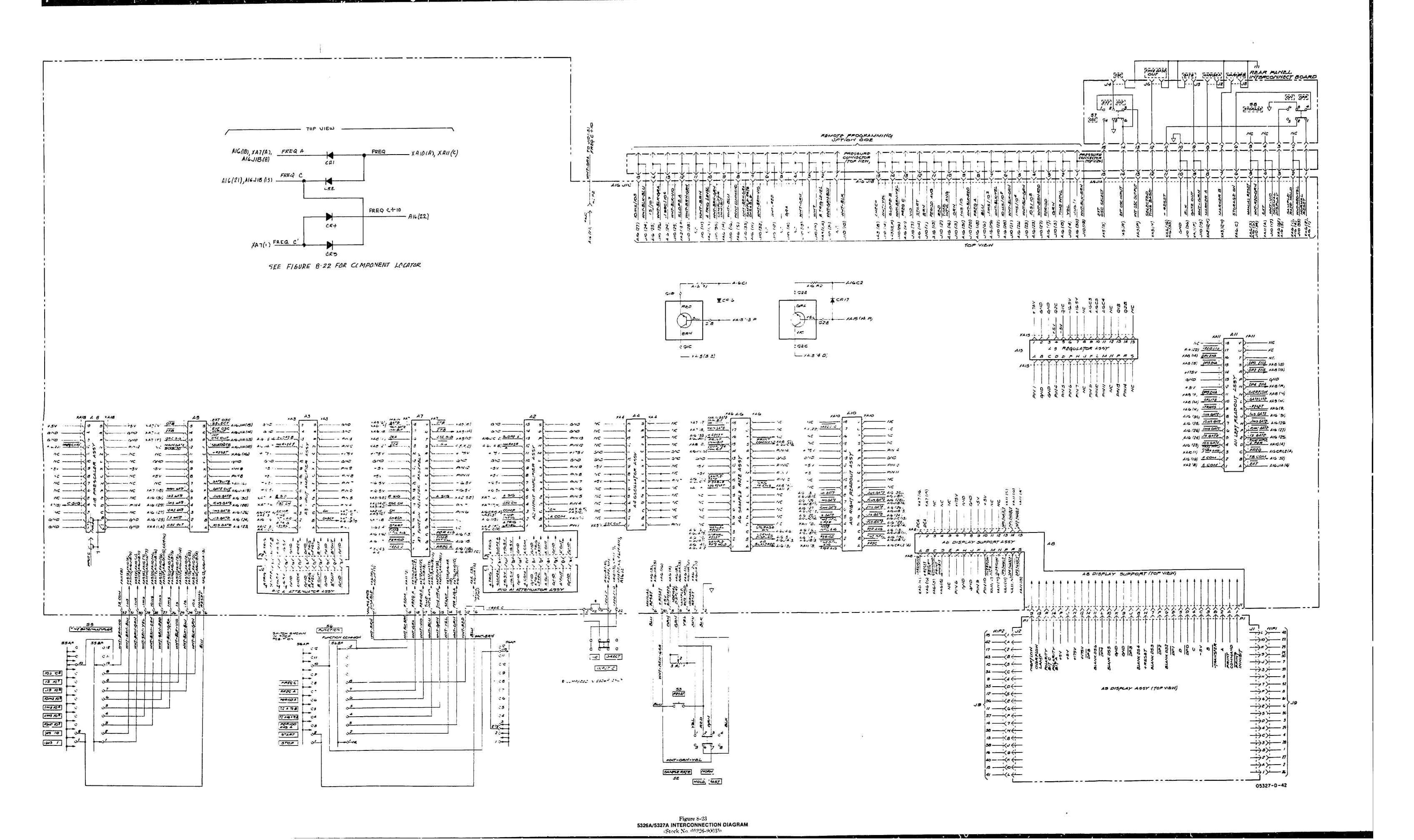


Schematic Diagrams

Figure 8-22. Options 010 and 011 and 016 Interconnect Circuit Board

8-53





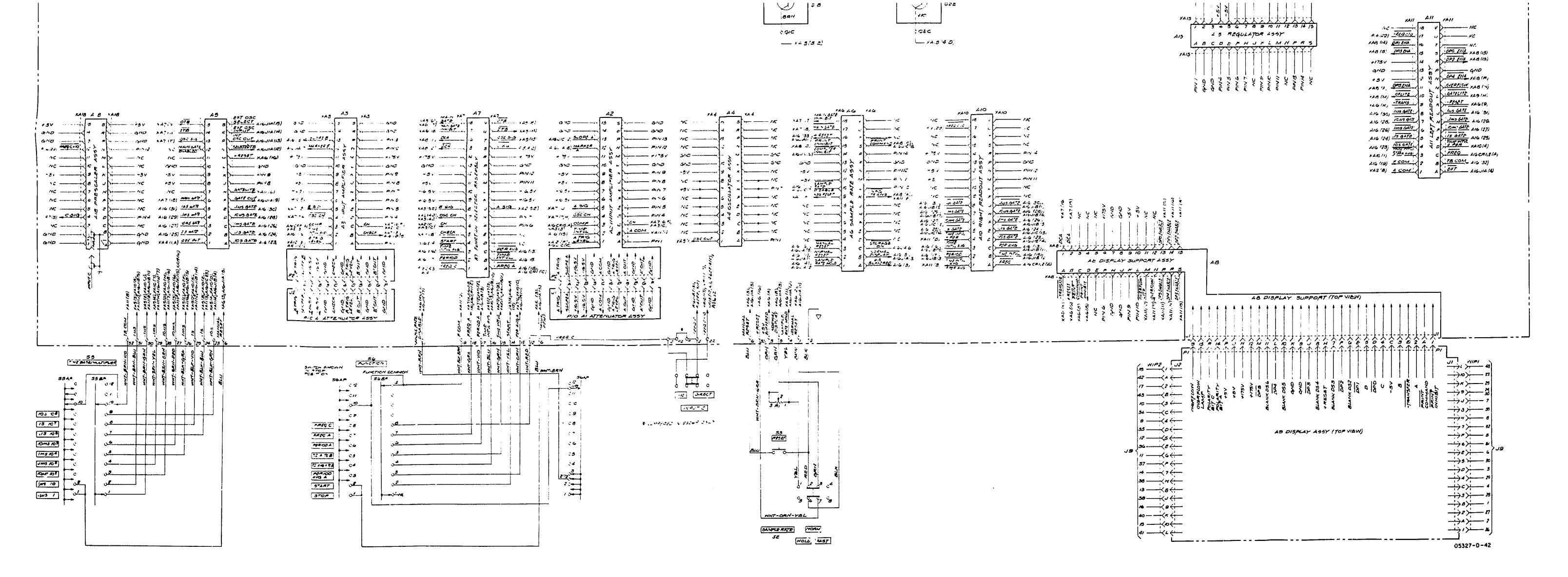


Figure 8-23
5326A/5327A INTERCONNECTION DIAGRAM
(Stock No. 05/226-94035)

# SECTION VIII

This section contains the following:

- a. Schematic diagram notes.
- b. Schematics.
- c. Component locators.
- d. IC outline drawings.
- e. Waveforms.
- f. Simplified block diagrams,
- g. Theory of operation.
- h. Troubleshooting.

Figure 8-1. Schematic Diagram Notes SYMBOLS MAIN SIGNAL PATI FRONT PANEL FEEDBACK PATH BEAR PANEL TEST POINT INTERIOR AND PC ROARDS "AND" GATE WIPER MOVES TOWARD "CW" WHEN CW POR" GATE POWER LINE GROUND INVERTER CIRCUIT COMMON GROUND FLOATING GROUND NAND GATE CHASSIS, GROUND NOR GATE KNOB CONTROL EXCLUSIVE NOR · SCREWORIVER ADJUST, SWITCH DESIGNATIONS SWITCH ST WITHIN ASSEMBLY AS 2ND WAFER FROM FRONT REAR OF WAFER TERMINAL LOCATION (2) (2-1/2)A351BR(2-1/2) IVIEWED FROM FRONT REFERENCE DESIGNATIONS: REFERENCE DESIGNATIONS WITHIN ASSEMBLIES ARE ABBREVIATED, ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
JACKS ARE THE STATIONARY CONNECTORS AND PLUGS ARE THE MORE MOVEABLE OF TWO CONNECTORS. ASSEMBLY ABBREVIATION COMPLETE DESCRIPION NO PREFIX A25 POWER SUPPLY ASSY (05:00) SODY) SERIES RECTIFIER ASS an illian

Figure 8-2. Integrated Circuit Diagrams

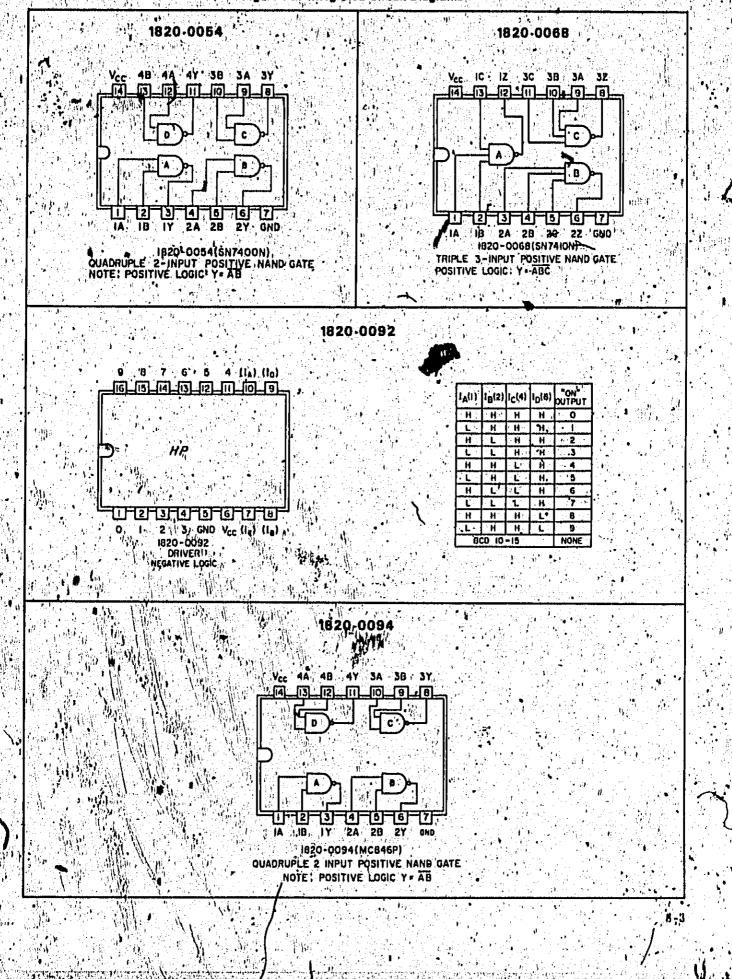


Figure 8-2, Integrated Circuit Diagrams (Continued)

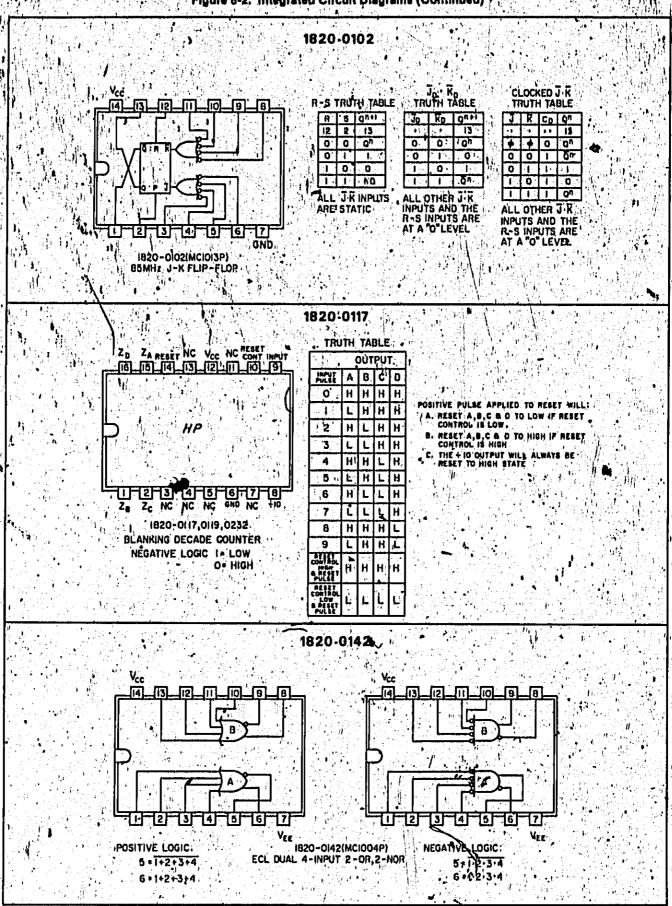
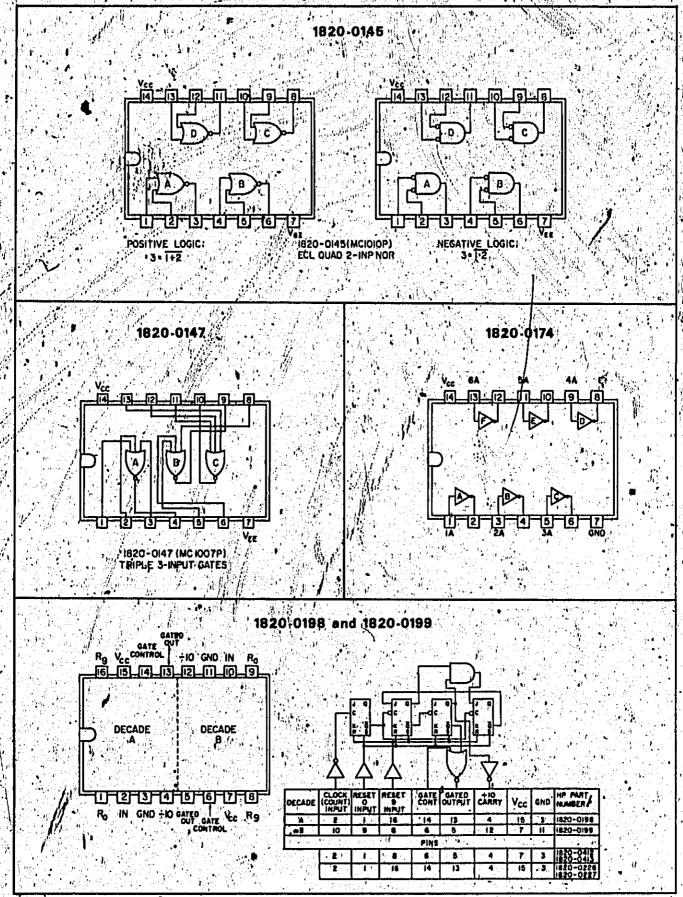
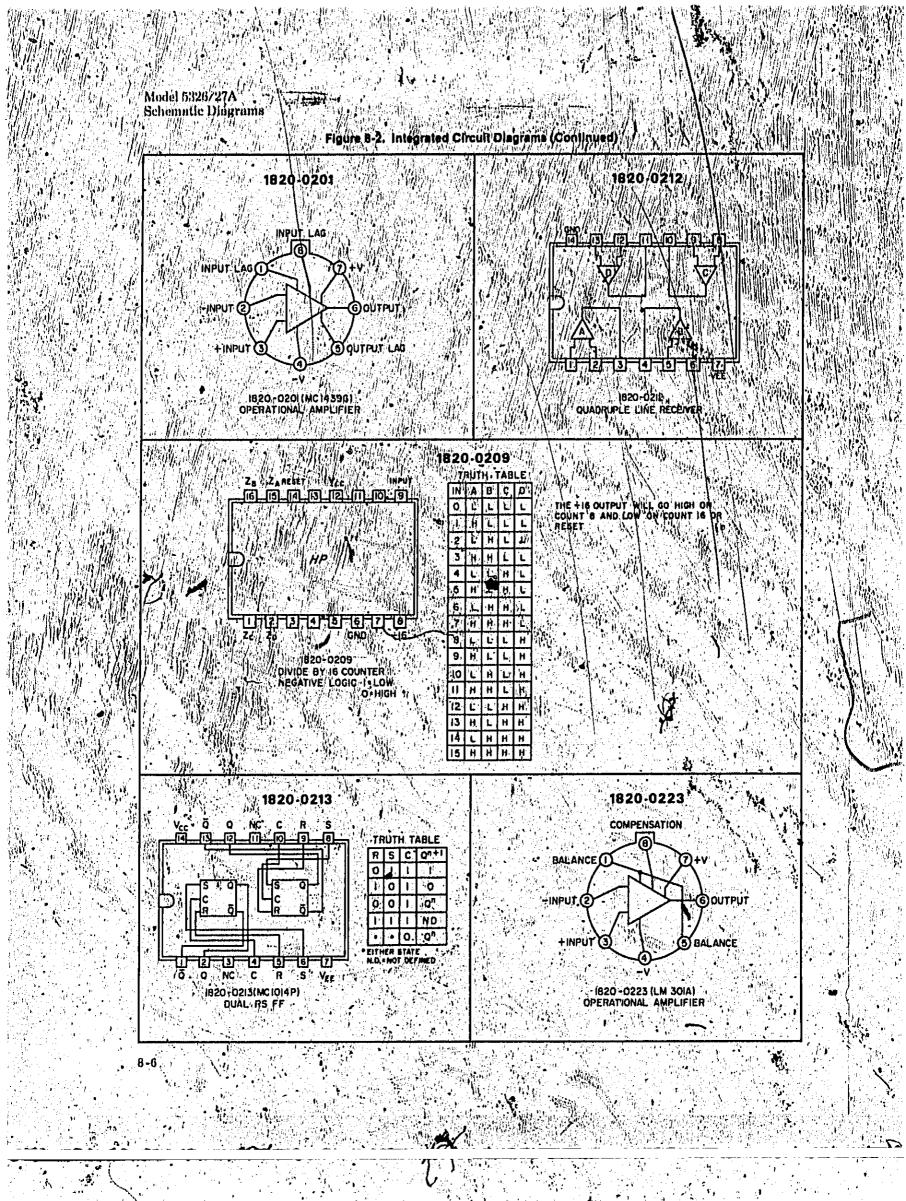


Figure 8-2, Integrated Circuit Diagrams (Continued)





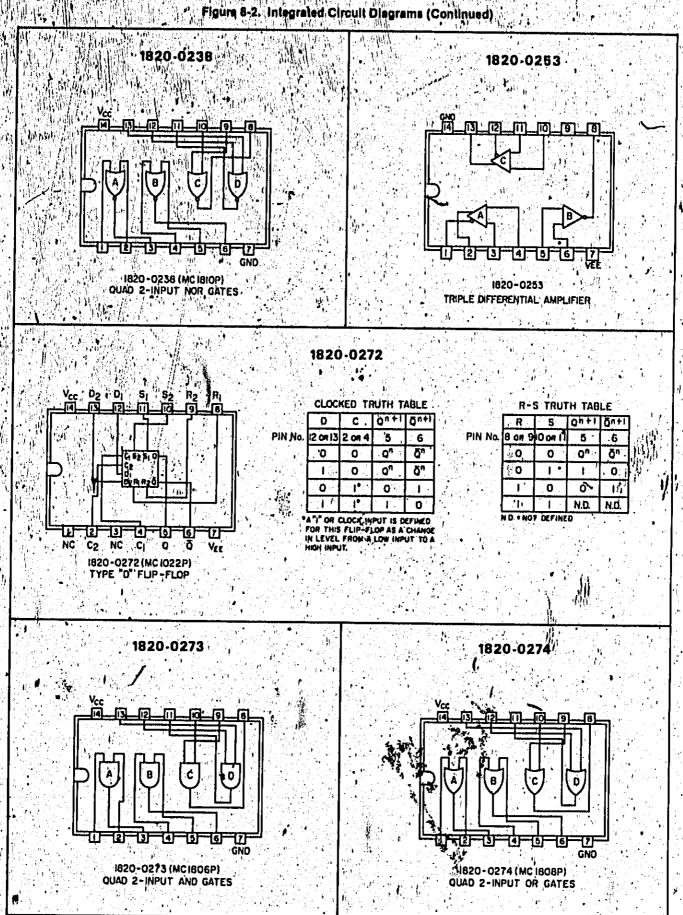
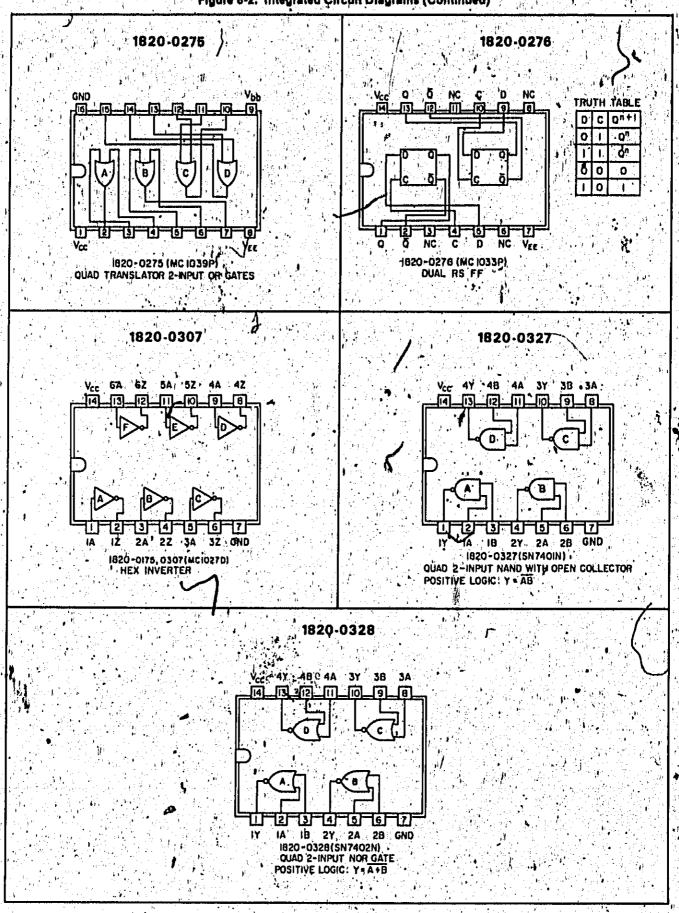
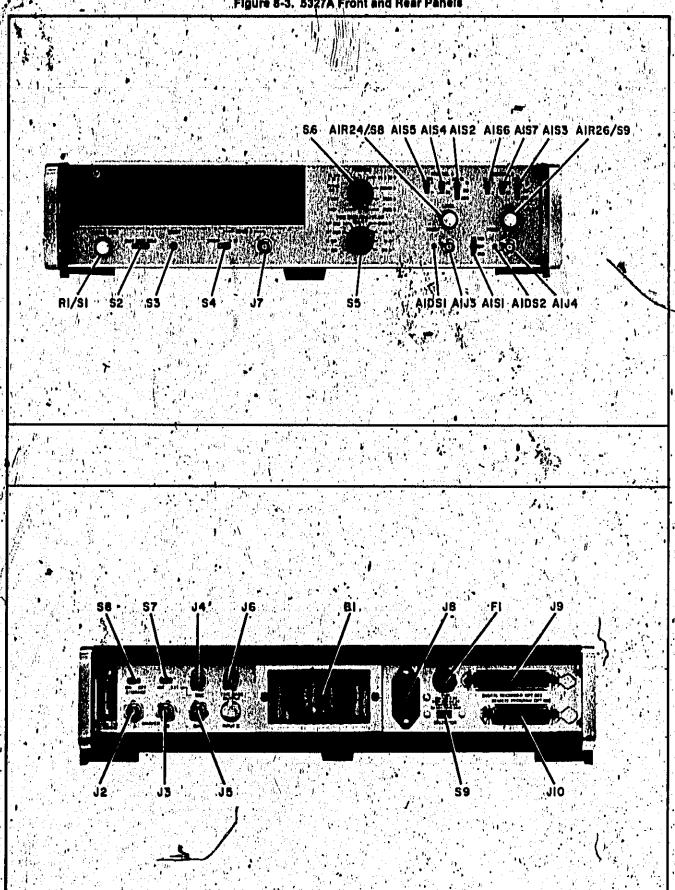


Figure 8-2. Integrated Circuit Diagrams (Continued)



B - B





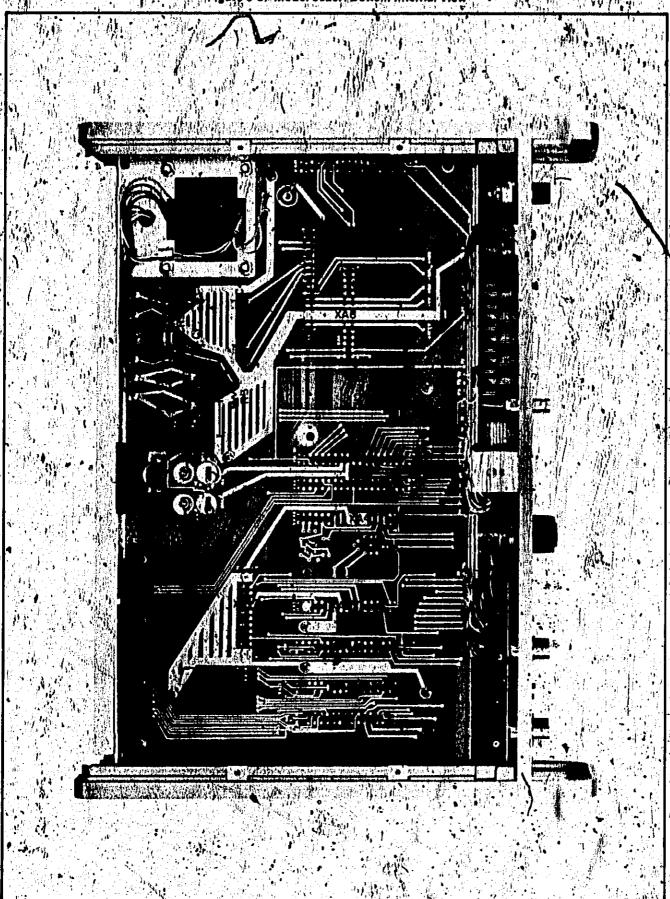


Figure 8-5. Model 5326A Bottom Internal View

#### AT ATTENUATOR OPERATION

Attenuator Assembly, A1 consists of two input attenuator channels. Since the channels are plentical only Channel A will be described. Channel A input signals are round through 33 to the attenuator network. When ATTEN switch S2 is set to X1, the full input signal is fed to the gate of Q1A. Will the ATTEN switch in X10, R2, R5, C1, and Q1 serve, hs a 10 hydrige divider in the X100 position, the 100:1 divider consists of R2, R4, G1, and C2. R3 provides damping.

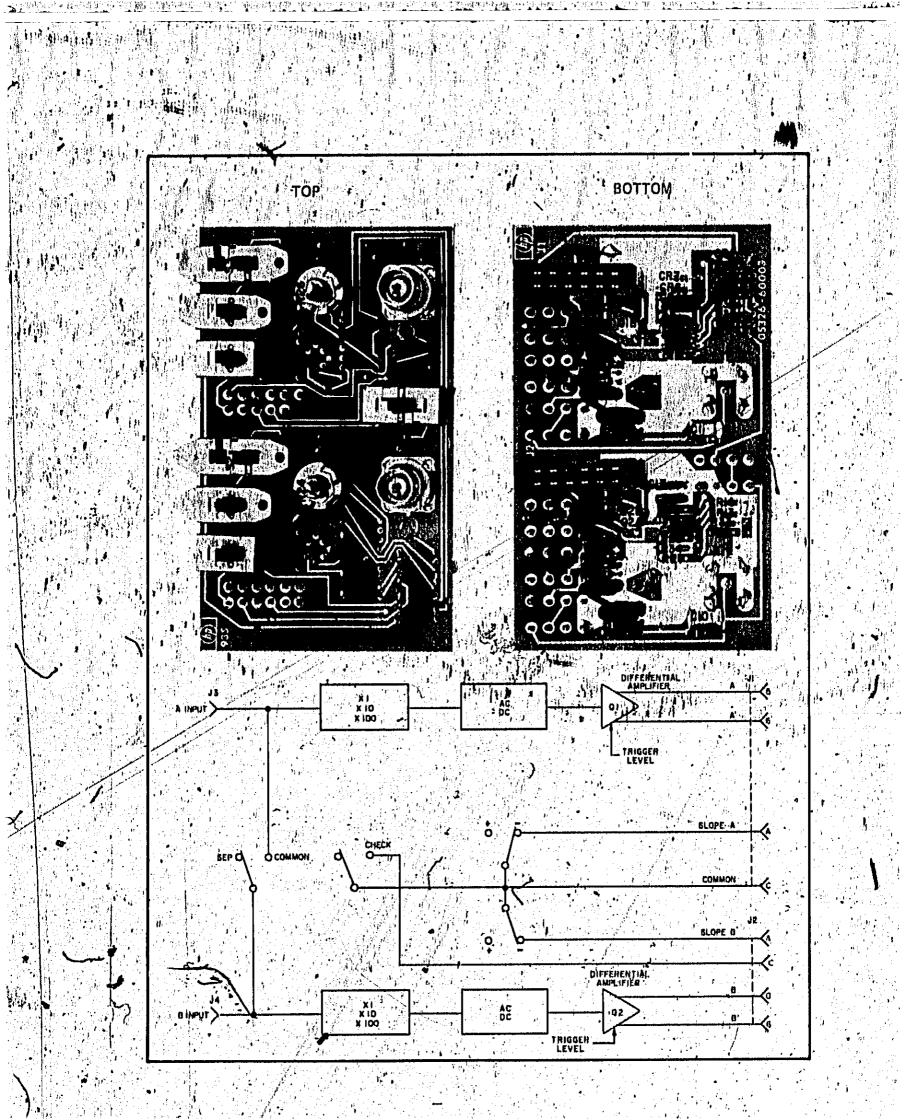
When AC/DC switch S4 is set to AC, C4 is in series with the signal path: CR3 and CR4 limit the input amplitude to Q1A to approximately 15.8 volts: R7 and R6 provide current limiting. C5 compensates Q1A input capacitance.

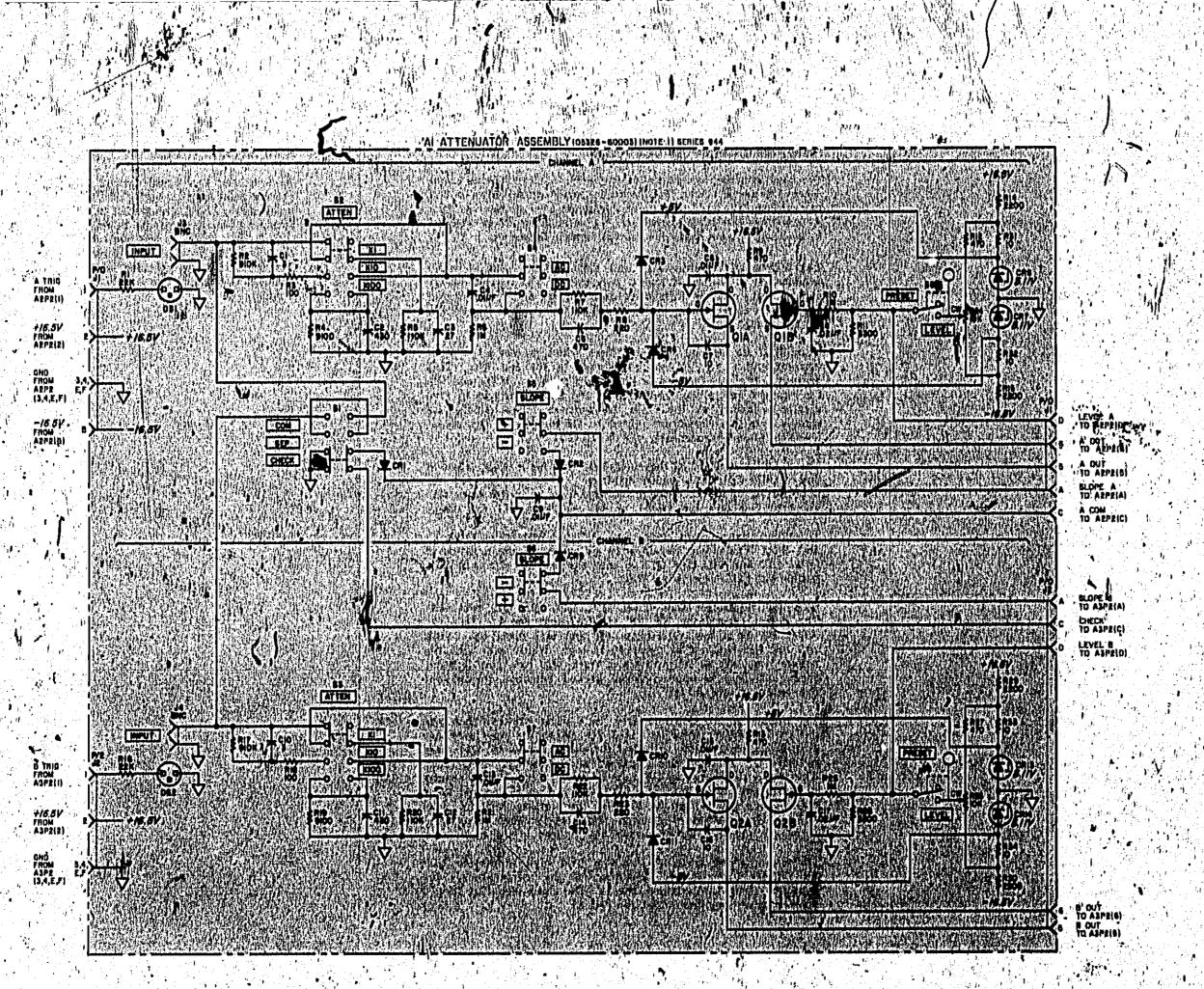
QIA and QIB form a differential amplifier connected as source followers. The outputs are fed to A2 via pins 5 and 6 o(J1. LEVE] potentilmeter. R24 determines the trigger level on Q1B gate. The trigger level can be preset to zero volts or varied from 3 to 63 volts; or with the LEVEL control set to PRESET, an external trigger level can be applied at J10 to A1J1(D) for remote programming. Dlodes CR6 and CR7 develop 5 volts for the input protection and level pots. R12 adds symmetry to the voltage range of R24, R11 lowers the impedance of Q1B gate circuit to limit stray charges will false triggering. R10 and C8 form a filter to prevent noise from triggering the differential amplifier.

When SLOPE switch 85 is set to , a ground is supplied via GR2 to J1 pig. A., This sets amplifier trigger, A2 to trigger on the negative slope of the japut signal. When remote programming is used, J1(C) is held high to disable the SLOPE switches and the CHK switch.

COM-SEP-CHK switch SI connects Inputs A and B in parallel when set to COM and grounds 120 via CR1 for the check mode.

Al contains trigger lights DSI and DSR and current limiters R1 and R2. CR1, CR2 and CR9 eliminate interaction of the remote programming signals.





Model 5326/27A Behamatic Diagrams

I HEFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED, ADD ABBREVIATION FOR COMPLETE DESCRIPTION.

E. UNLESS OTHERWISE INDICATED;
RESISTANCE IN OIMS;
CANCITANCE IN PICOFARADS;

HEFERENCE DEBIGNATIONS

C1-17 CH1-4.8.7, D-15,13,14, DB1,R JI-8 H1-84 B1-8

TABLE OF ACTIVE COMPONENTS

	REFERENCE DESIGNATIONS	мант намисли
	CH1, 8 4 CH3, 4, 10, 11 CH6, 7, 13, 14 2 O1, 8	1910 - 0016 1901 - 0376 1902 - 0041 1850 - 0334
٠. '	<del></del>	2

COMPLETE PARTS LIST FOR THE THIS ASSEMBLY

#### A2, A3 AMPLIFIER/TRIGGER OPERATION

Two input amplifier assemblies are provided: A2 for Channel A and A3 for Channel B. Bince the assemblies are identical, only one will be described. The input signal and the trigger level are received from A1 via P2(5) and P2(6) respectively. Potentiameter R2 is adjusted to cancel but offset voltages due to imbulances in the circuit.

The differential amplifier (Q1 and Q8) serves to clip a small window, out of the input signal waveform. The outputs of Q1 and Q8 drive another differential amplifier Q2 and Q6. Q2 and Q6 inject is current drive input to differential Schmitt trigger Q3, Q4, Q5, and Q7.

Q3 and Q7 are common base amplifiers, which present a low input impedance and high output impedance to Q4 and Q5. This arrangement allows for greater high-speed operation of Q4 and Q5. C2 and Q5 reduce the hysteresis of the Schmitt trigger to give greater reliability at the high frequencies. Two out-of-phase signals from this circuit are routed to Q9 and Q10. The output levels shift from approximately 10.8 to 10.5 volts.

The SLOPE switch on A1 drives U1D(11) low for a \*\*slope selection and U1A(3) low for a \*\*slope selection. This allows either the in-phase signal or the out-of-phase signal to be switched to, Q13 via Q10 and Q12 for \*\*slope or via Q9 and Q11 for \*\*slope.

The differentiator circuit consists of Q13 and feedback network L8 and R32. The circuit develops 10 as pulses at the collector of Q13. CR3 and CR4 bias Q13 so that the collector circuit is compatible with ECL output driver U2B.

U2A(6) drives trigger-lamp driver Q16, Q17, Q18, Q19, and Q20, The circuit consists of RS FF Q16-Q17 and one-shot Q19-Q20, When U2A(6) is low, Q16 turns off and Q17 turns on. With Q17 on Q18 cuts off to drive P1(1) high, which will light the trigger, lamp DS1 on A1. As C8 charges, Q20 base goes positive. When Q20 base is approximately ground potential, the one-shot fires to turn of Q19 and Q17.

The marker circuit, Q16 aph Q14, is a pulse stretcher that provides a low marker output at P1(12, N). When the input amplifier circuits trigger, U2B(8) provides a positive spike to Q14 base to drive Q14 collector below ground and allow CR5 to conduct. This makes the charge on C6 more positive. When U2B(8) returns to logical zero (approximately 1.6 V), Q14 is back biased and turns off, allowing Q15 to turn on to drive the marker output line low. After C6 has discharged through R36, Q14 turns on again, Q15 turns off, and the marker output, line returns to the high state.

During the check mode, A1P1(C) is held high to disable U2B and enable U2A. With U2B disabled, the marker pulses are inhibited. With U2A enabled, the 10 MHz check signal at P1(4,D) connects to the amplifier output line P1(5,E).

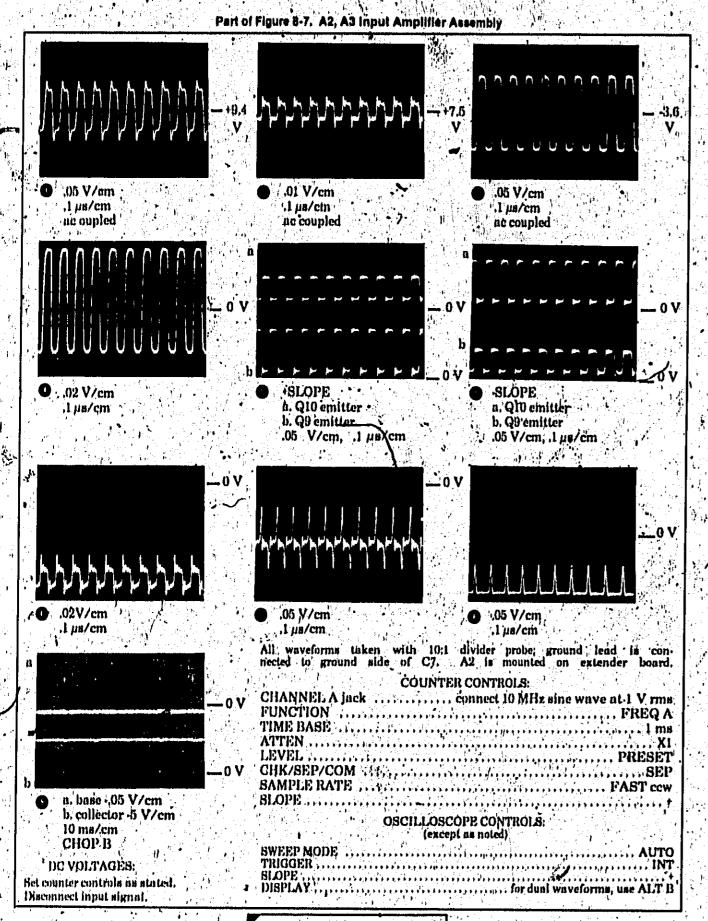
#### A2 TROUBLESHOOTING

When tracing the signal through the amplifier assembly, a good starting point is the collector of Q4, test point 4. With a sine wave input and the LEVEL control set to zero, this waveform should always resemble a square wave, due to the action of the Schmitt Trigger. As second check would be test point 6. If no signal is available there, thack the slope gates of U1 and translators Q9,Q12. Make use of the waveforms that are provided on this page. Once the problem is confined to a general area, use de voltage checks to pinpoint the trouble.

Sigure 8-6

(See Page 8-15)

Model 5326/27A



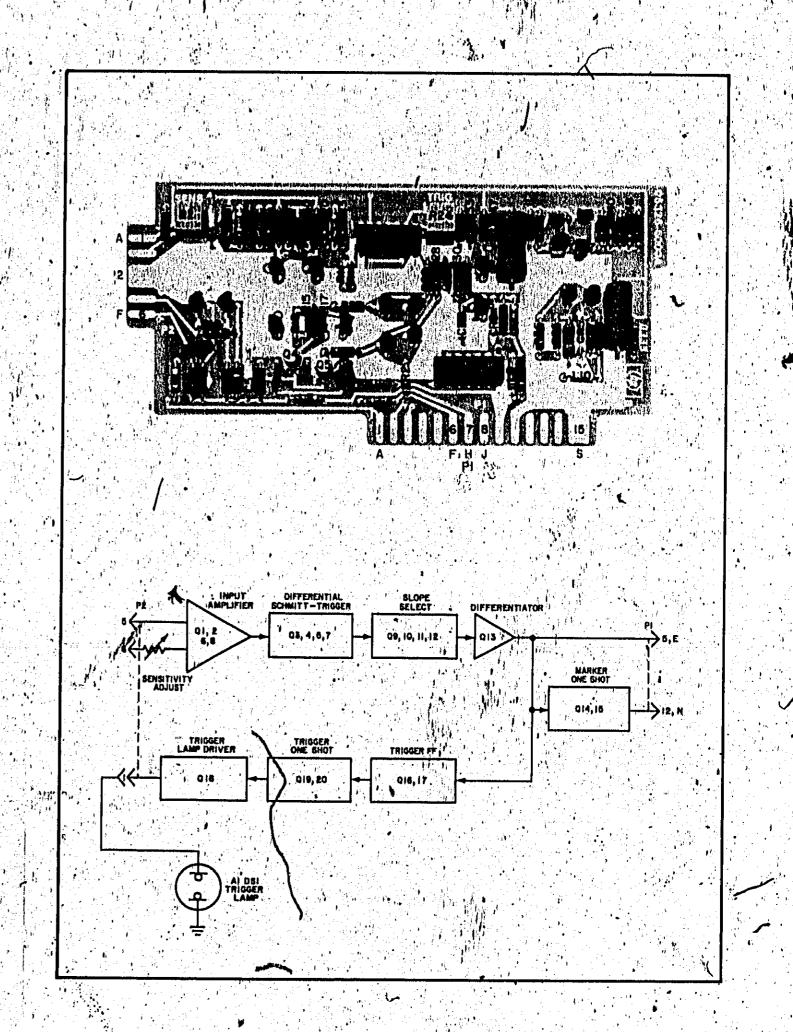
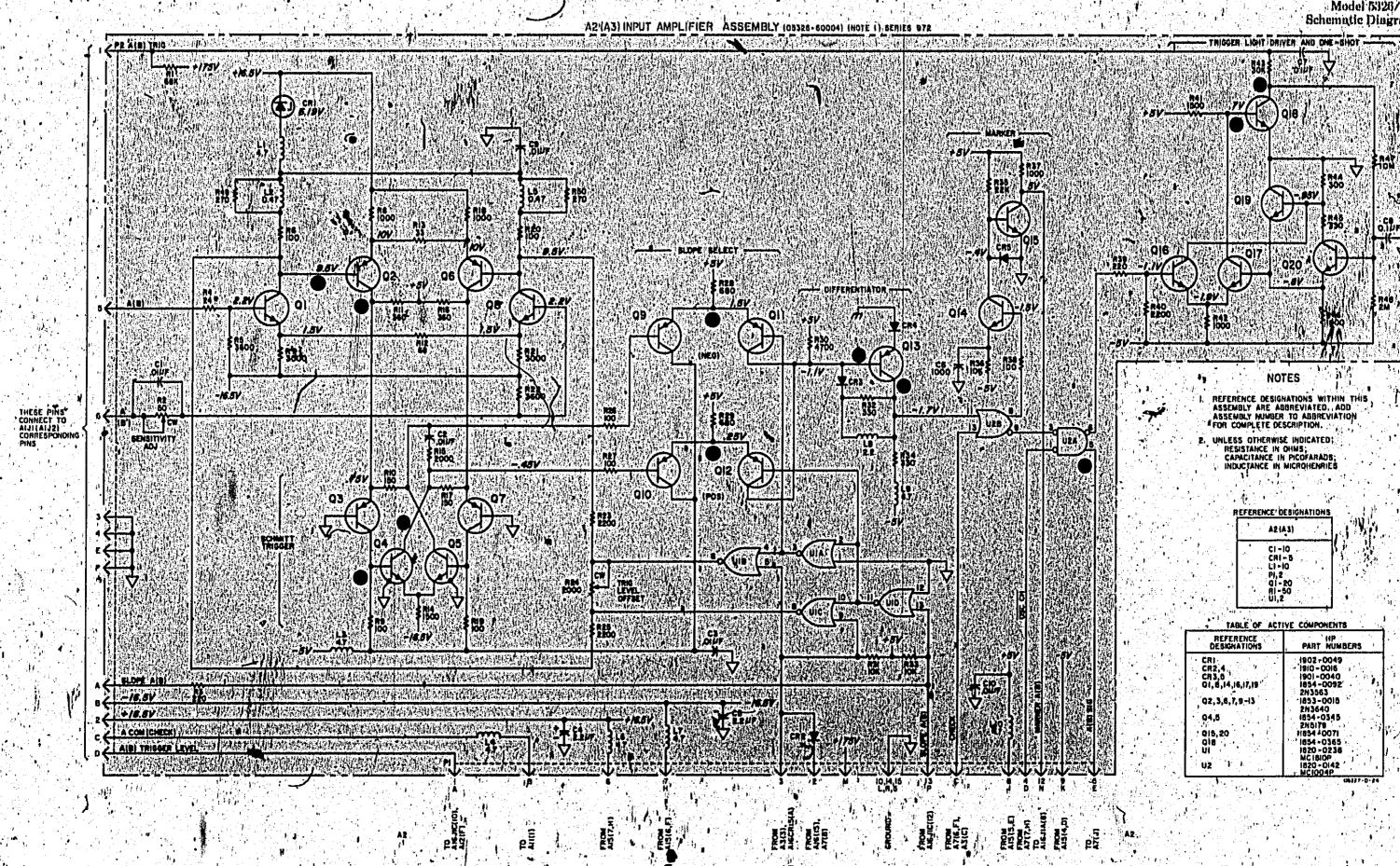


Figure 8-7. A2, A3 Input Amplifier Assembly,



### A4 OSCILLATOR OPERATION

The 10 MHz oscillator assembly consists of oscillator U1A, buffer U1B, and level shifter Q1.—U1A operates like an amplifier with, positive feedback. The positive ceedback path is from the noninverted output of U1A(6) through 10 MHz crystal Y1, trimmer capacitor G3, and C4 to U1A(4) Negative feedback is used to citablish the input bias for U1A. The negative feedback path consists of R1 and R2: The inverted output of U1A(5) connects to buffer U1B(10). The buffer provides isolation between the oscillator and the output The outputs of U1B(8) and (9) switch from approximately 3.5 to 4.25 volts. When one output is 3.5 volts, the other output is 3.5 volts, the other output is 4.25 volts. Level shifter Q1 converts the output of U1B to an approximate square wave of 0 to +4 volts.

.02 V/cm .02 V/cm 1 µs/cm .1 µ8/cm i μa/cm ac coupled : ne coupled All waveforms taken through 10:1 divider probe. Divider probe's 8%" ground lend is connected to ground side of C5. COUNTER CONTROLS: INT-EXT (rear panel) l V/cm ECL TO TTL.

Part of Figure 8-8. A4 Oscillator Assembly

A2, A3 INPUT AMPLIFIER ASSEMBLY

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Salar Barrier

H-20

# AS TIME BASE OPERATION

This assembly contains 8 decade dividers, which are controlled by TIME BASE switch 85/ The input signal is 10 MHz for the frequency mode. For the totalize and period-nyerage modes, the decade dividers receive CHANNEL A signals.

When a particular decade receives a gate-enable signal the corresponding gated output line is enabled. For example, if S5 is set to 1 second U1(6) is grounded. This gates the divided signal out on U1(5), The gated outputs are connected together on a common line to C5. C5 differentiates the high to low transitions into approximately 100 ins pulses at U5C(8). When S5 is set to 1 µs, the input signal by passes the decade dividers and passes through U10D and U5D. The output of U5C feeds through U10C to A7 and also through U10E to he rear-panel TIME BASE OUTPUT jack J6.

Q1 and Q2 form an ECL to TTL translator. When the main gate opens flow is main gate enable, Q2 turns on the start one shot Q3/Q4. During short gate length times, this holds the gate lamp enable line low for approximately 50 ms to extend the time the gate lamp is on. When Q1 collector goes high, a low is developed

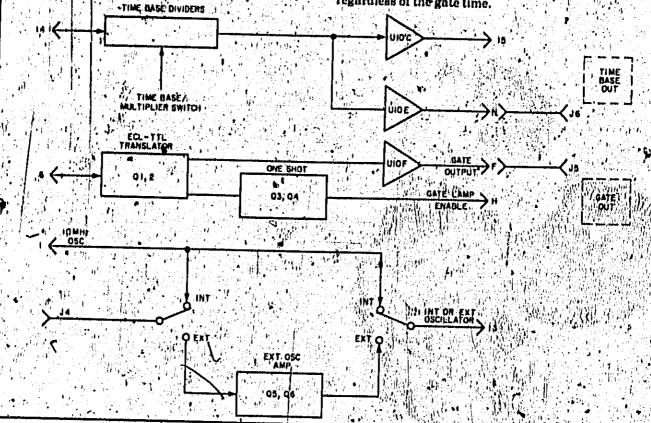
at Utility) and routed to the GATE Our

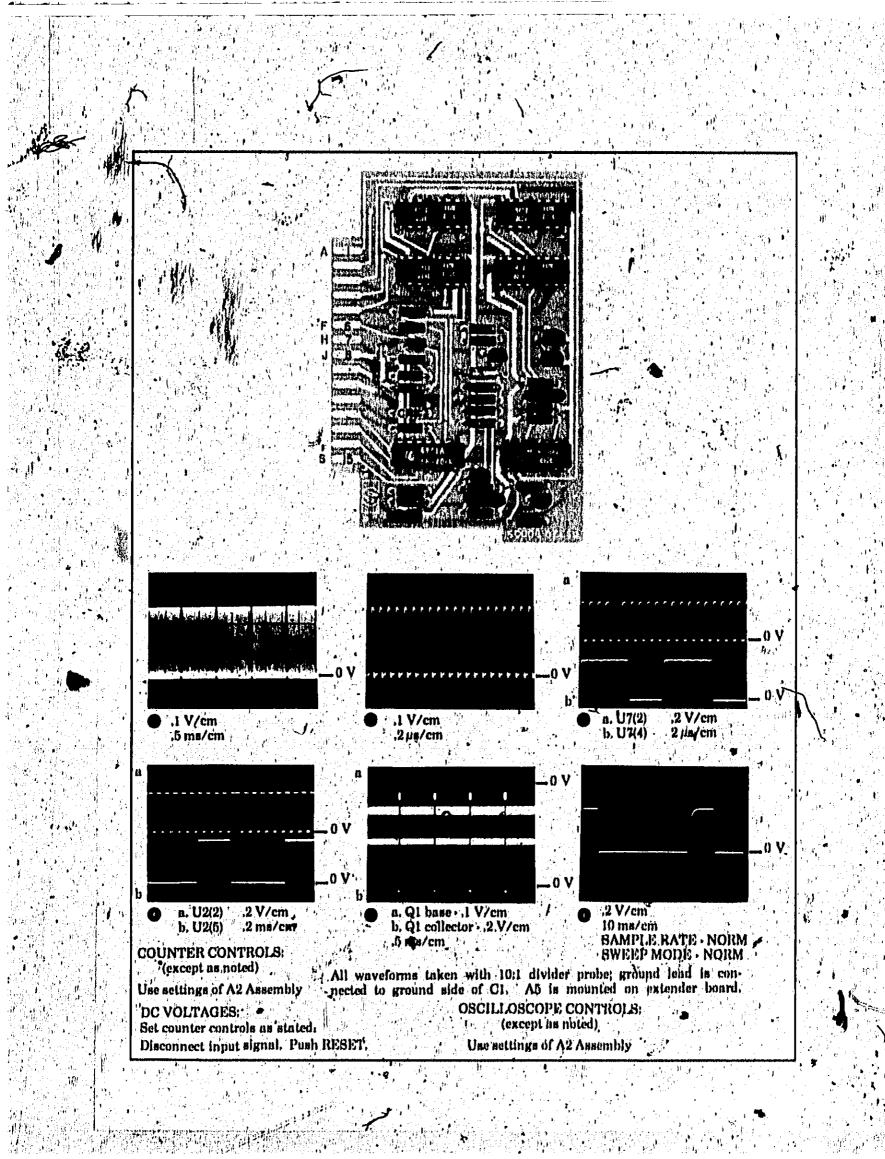
U5A and U5B select either the internal or external oscillator signal. When S7 is set to EXT, the internal oscillator signal is, inhibited and the external oscillator signal passis through Schmitt trigger Q5 and Q6 to U5B and A5(16).

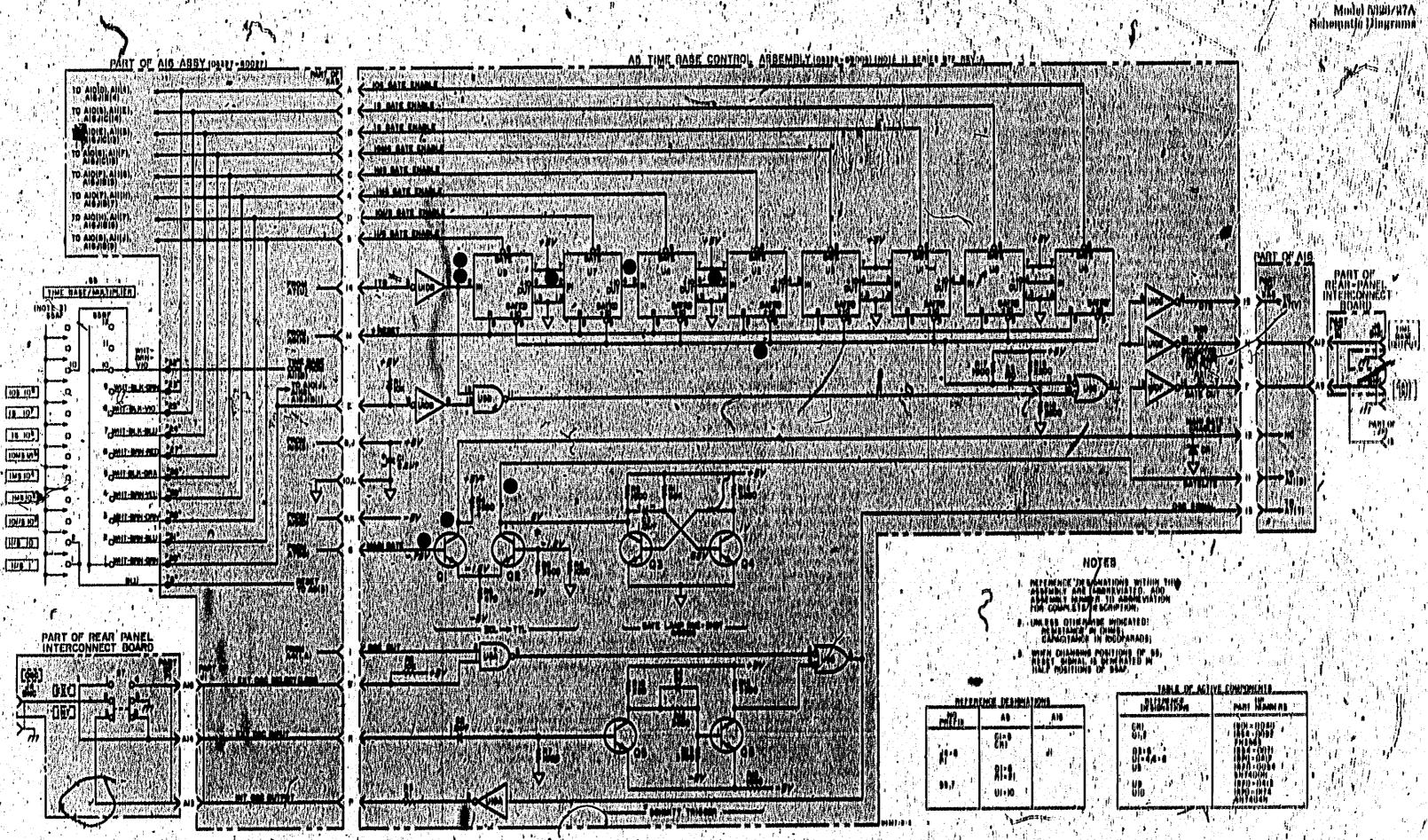
# AS PROPRIESHOOTING

When troubleshooting the Time Base Dividers, place the FUNCTION switch to START and SEP/COM/CHK to CHK. Step the TIME BASE switch through each position and note the counter's display. When the counter stops totalizing, check for a low on pin 6 of the selected decade. If the counter does not totalize for any position of the TIME BASE switch, the problem is in the circuitry of U10B, U10G, or U5C. Before the gated output is sent to the A7 Function Control, it is differentiated by C5 and R18. This produces extremsly sharp pulses, which are best observed when the gate time is 0.1 jrs (TIME BASE switch).

To check the operation of the Gate Lamp oneshot, check for waveform 5 and 6 with SAMPLE RATE switch to NORM. The Collector of Q3 should be Low for about 50 mg, regardless of the gate time.







Phing (19, At Time Dane Control Assembly

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#### ARBAMPLE RATE OPERATION

The sample rate circulta, determine interrogation rates for the imputsignal and provide several functions for the various operating modes. These functions include generating reset, transfer, print commonnt, and main-gate inhibit signals, and manual reset signals, receive propositer inhibit, printer inhibit, and aroman reset signals, The circuits also serve to control storage and displaybable functions.

As an example of operation, assume the following operating conditions: RIOIAGIS to ON, BAMPLIS IATIS to IARI, no printer inhibit, no computer inhibit, no multiplices, and main gate open. At the end of the gate time, Pin 17 goes high, which sets inhibit (lip flop US. This sends a signal to UtiC to generate a high inhibit at this greatest at the point, and the present to trigger the sample rate one-shot if no printer inhibit is present at UbiAth. The display time starts at this point, and the high at UbiAth. The display time starts at this point, and the high at UbiAth. The display time starts at this point, and the high at UbiAth. The resulting high on U1C(8) generates a low at U11X11). The resulting high on U1C(8) terms on Qi, giving a low at the collector, which is the print command. They at this time, the low on U1I(6) activates U4C through differentiator C5 to generate the positive and negative transfer signals at pins T and K, respectively.

When the sample rate one shot is set, U11(d) shee low to turn of Q7, allowing the 45 V supply and R41 R1 to charge C4 for the display time. C0 is gleo connected for the NCRM position. R1, varies the display time by varying the time required to bring Q8 base to a sufficient plus value to trigger Schmitt Trigger Q8 through Q10; This gives a high at U1A(1). The reset will be delayed until there is no print inhibit. U1A(0) will go low, governing a high at U3R(6), which is fed out at AR1(6). The negative reset at U3C(8) is fed out at pin 0 in addition to being used to reset the sample rate one shot,

The positive reset is used on At after passing through level shifter CR7 and CRB, The positive reset turns on Q1 and applies on 1915, high to clear UR and also turns on Q2, which maintains inhibit approximately RRI as after the end of the reset palse, A1, this time, the inhibit goes low and the main gate circuits are free to function.

Q11 circuitry in a reset one shot that ensures a sufficiently long reset pulse. The reset pulse width is approximately 40 ps or 400 ps, as determined by the PART/NORM switch. For NORM sample rate disable line (pins 10, L) is low-during RTART mode and maintains continuous transfer through CR3 and probable main-gate inhibit through U4B in addition to holding down Q8 biss through CR3. This prevents the reset from being generated.

When BTORAGE is OFF, that is activated to make transfer through CR4. The mapual reset (in 1) holds the reset one shot in the ON state as long as the RESIST button is depressed (reset low). It also maintains the transfer during the same time to clear the display. In addition, it turns on the maintaine the low if the order is maintained to low if the title main gate is open. The manual reset signal is low if the RESIST button is depressed only the TIME HARR or FUNCTION switch is between positions. (No reset is generated between start and stop positions.)

### - ACTROUBLESHOOTING

Troubleshooding the Hample Roya board is best accomplished when the depart is in a static state. The procedure given below accombine each section separately when the drest is in a working, but state, condition. Perform the tests in order listed. The schematic shows the circuit levels after RESET is pushed. These levels should be used that reference.

### ·> ∴ NOTR

Do not use an input signal when performing the tests below.

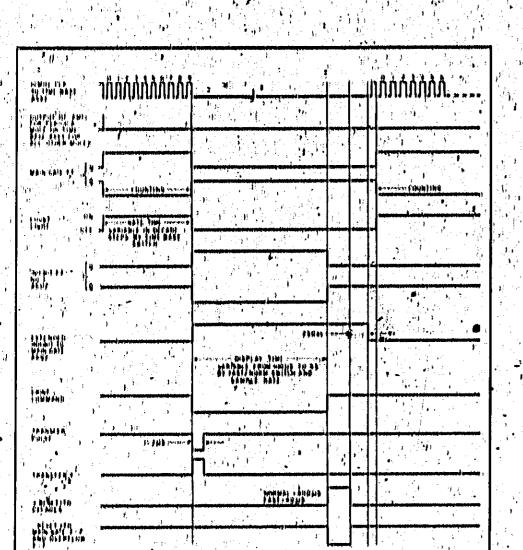
MAIN CATE INHIBIT, PRINT COMMAND DRIVER, and BAMPLE RATE ONE-BIOT, Before troubleshooting, perform the procedure below.

PUNCTION witch	San this A
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CHK/NP/COM Simonim	
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LRVKL control	
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LICVICLE IN that trigger land	ssees full prw a Nicola

The purpose of this providere is to set these circuits to the point immediately after the main pote closes. Varying the LEVEL control trippers a pulse to open the main wate for Legend, and pin 17 gres Low during the gate time. Of sets when the gate closes (positive transition) and remains set with the SAMPLE RATE switch set to IRILD. Once the sets, check for a Low on Uncell), This generates a High on UIC(8), and a Low on UID(6). Check that U4C(8) pulses ligh and Q6 collector sets Low. The main gate inhibit ling at UBB(6), should now be High. The collector of Q7 is not now affected.

NAMPLIS RATIS DMITHIT. The sample rate inhibit gates are controlled by the FUNCTION and STORAGIS switches and by a print inhibit signal. With the controls set as above, check for the levels shown on the schematic.

BCHMITP TRICKISK. The Belonitt Trigger and Q7, should be checked by using an input signal. But the counter controls as listed under the waveforms, in waveform flyp, the reputition rate of the pulses changes with gate time, but pulse width remains the same, Pulse width changes with the BAMPLIS, BATES controls, but not spacing,



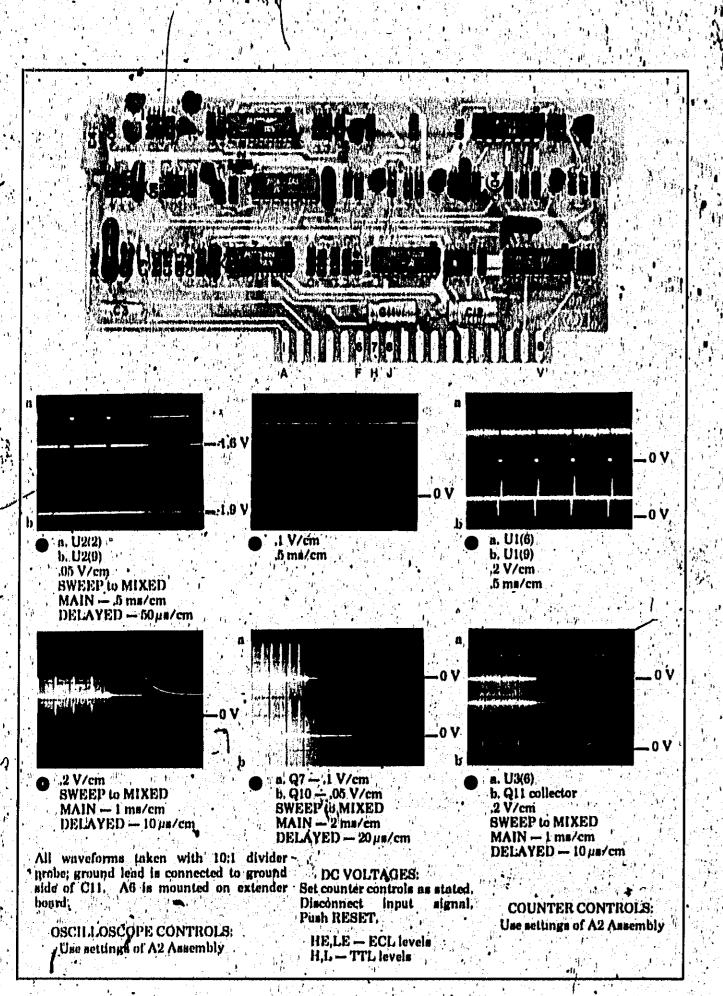
Part of Figure 8-10, At Sample Rate Assembly CHYEL . CMS, ur. , US HHIRIT H COMMITTEE USD COMMAND DRIVER UI A C<sub>1</sub>0 9 DIME AY TIME PCHMITT OHE DIOT 00,0,10 · MESEL > II DAVIO UB ; PART/ NORM RI QIR, IB INHIBIT 1 + THANSPER U40,0 - TRANSTER S ID CHINT IMMINIT TABLE OF ACTIVE COMPONENTS DE SIGNATIONS PART MANGERS NOTES (90)-0040 (90-004 (910-004 (944-007) (944-007) (944-007) (944-007) (944-007) (940-004 (940-004) (940-004) (940-004) (940-004) (940-004) (940-004) (940-004) (940-004) CHI.R.A.7,8,10,11 CHI.A.4,8 GI.-B. 5,6,8-10,12,13 G4,11 REFERENCE DESIGNATIONS WITHIN THE ASSEMBLY AND ASSEMBLY AND ASSEMBLY NUMBER TO ASSEMBLY ATION FOR CUMPLETS DESCRIPTION. UNLESS OTHERWISE MOICATED! REDISTANCE IN OHMS!: CAPACITANCE IN PICOTARADS! HEFERENCE DESIGNATIONS MEFIX 82, 3, 5, 6, 8 U) - 6 DELETED: CHE

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AS TIME BASE CONTROL ASSEMBLY
USED Page (4-21)

8.22

MORE DATA UNDER THIS FOLD



A6 SAMPLE RATE BOARD ABSEMBLY (08384-60013) (NOTE 1) SERIES 1034 LANGE OF THE PROPERTY ACRES FOR THE PARTY OF PART OF AIG CONNECTOR BOARD SAMPLE HATE FUNCTION BIANT FROM AILES MANNE MATES FROM \$18(4,D)

Model 5326/27A Schematic Diagrams

Figure 8-10, A6 Sample Rate Assembly

### AT FUNCTION CONTROL OPERATION

This assembly contains the goting flip dops, one shots, and translators necessary to interconnect the oscillator, time base, and input channel signals to the time base and decade counting assembles. Table I lists the functional interconnections for each function of the counter.

An example of the operation in the FREQ A mode will explain the typical circuit operation. This will be expanded to the other functions. Assuming the start of a new measurement, main gate inhibit (pin 17) has just gone low (at the end of the display time). Upon the arrival of the first subsequent channel A input, channel A flip-flop sets, making U4B(9) High. Upon the fext leading edge of the oscillator signal (pin T, TTL levels; U7(4) ECL levels). U4B sets and arms the oscillator gate U3A. The gated oscillator signal is then connected to the time base input one-shot Q1-Q5, which generates 50 ns, negative going pulses to the time base input one-shot Q1-Q5, which generates 50 ns, negative

The time base will return a pulse upon receipt of the 1st and Nth pulse delivered from pin U (N \* multiplier setting on front panel). The 1st pulse arriving at pin V is translated from TTL to ECL by U7 and then goes on to toggle (set) main gate flip flop U1. This opens the main gate (U11B), and the decade counting assembly counts the signal (in this case, input A + see Table I). Upon the arrival of the 2nd time base output pulse, U1 toggles closed, shutting main gate U11B and signaling A6 to start the display cycle (pin 18). A6 returns a High MINH (pin 17) and the main gate flip flop U1, synchronizer U4, and ITB one-shot Q1-5 are locked closed at the end of the display. MINH goes low and the cycle repeats.

In the period mode, the main gate F-F U1 is toggled by the input A signal so that it is set for exactly one period of A. The counted signal is the oscillator divided by the MUETIPLIER switch setting.

In period average, the input A signal goes to the time base, which generates a pulse on the 1st and Nilspulse. Those pulses toggle the main gote, and the oscillator is counted during N periods of A.

In START, the main gate is held open and the input signal, which is scaled by the time base, is counted. The Freq C operation is the same as Freq A, except that the input synchronizer U4B is held on by U12, IC's U2, 6, 6, and 10 are combination TTL/ECL translators and data switches. The function inputs (Freq A, Freq C, etc.) are TTL low true and are pulled up by internal 10k-ohm pullups on the translators. U7(3) is the check signal to Amplifier A2 and A3. In normalities low, while in check, it is high with negative 10 as pulses at 10 MHz. C2 and R13/R14 generate the 10 as pulses from the edge of the oscillator signal.

In time interval, the operation is similar to period, but U1 is set continuously. MGATE OUT (pin 18) is now controlled by the output of U4B. The following explanation describes how the syncrhonizer U4A and B work in a time interval mode.

Assuming a display/cycle has just been completed, the flip-flops formed by UF and U5 and the U/ sections have been reset. Two conditions can occur:

First-If a channel A signal occurs before a B signal, the A signal will set the channel A flip-flop before the B sets the B flip-flop (see Figure I). When the first leading edge of the oscillator occurs after the A F-F is set, U4B is set, opening the clock gate and instructing

At that the measurement has started (pln 18). The oscillator algority goes to the time base and is allyided, returns, and is sent out through the main guts to As for volvestions, displays. When the Basignal according to leading edge of the next clock pulse sets 1/4A, closing the clock gate.

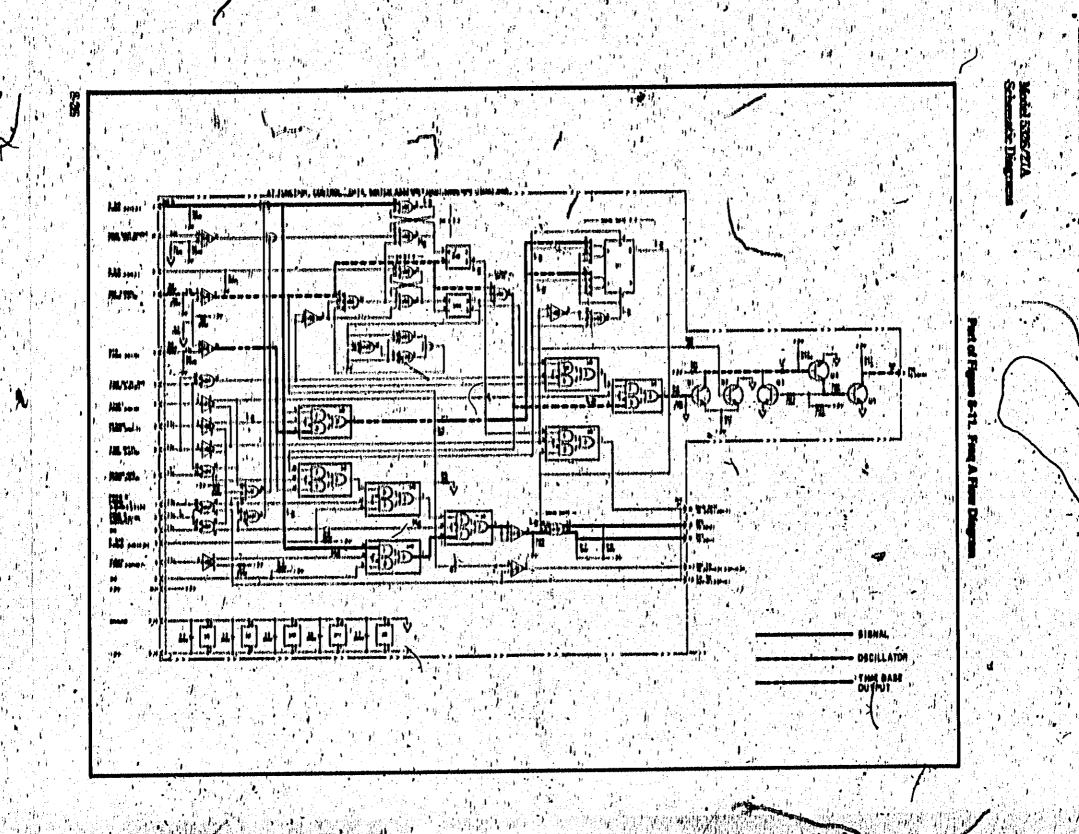
The U4A Q low signal goes back to UK(1) and waits about 59 ns Apt the falling edge of the oscillator. At this point, UK(Q) goes bight resetting the A and B flip flops, putting lows at the D'shput of U4A and B. When the clock pulse again rises positive, UK(10) goes low (about 10 ns after the clock edge) and U4A and B are chisely to the "closed" state.

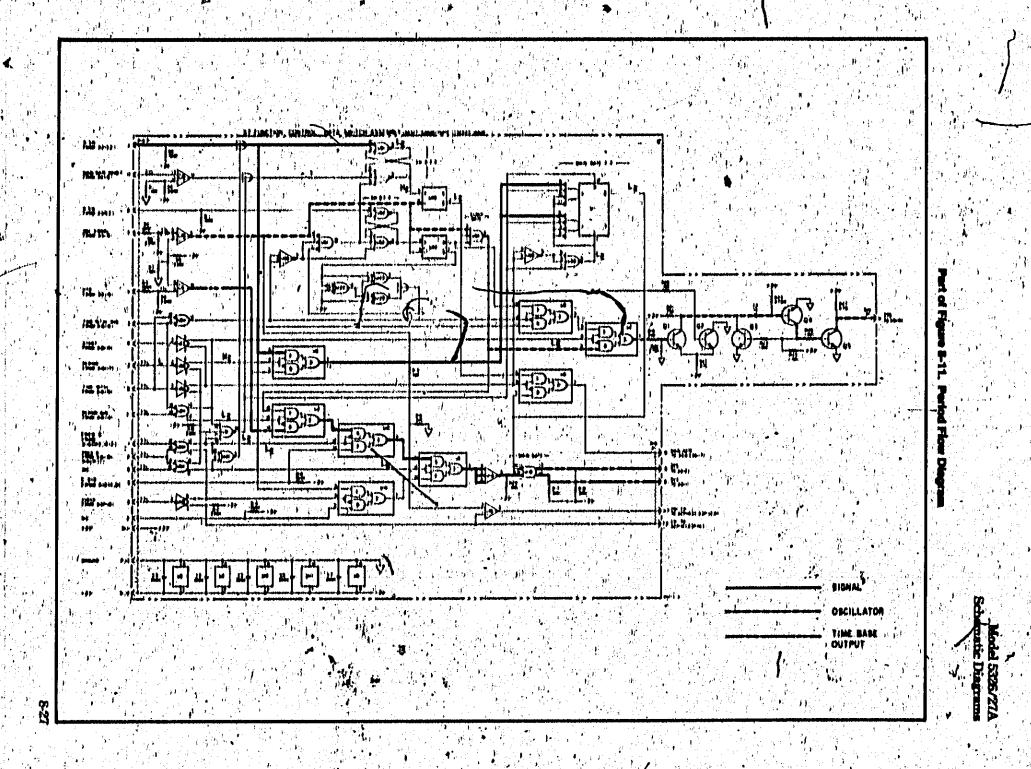
Becond If a Balgnal occurs before an A. U4A would be set light, in the no. counting would occur. Also, it would take about 18) he for U4A to complete the resetting described above; so if an A signal occurred during this time, it would be ignored. If the B-to-A delay is 1500-ps, the A signal would start the interval as described above.

With time interval averaging, the input synchronizer work the same way, but the oscillator (not dividual) is counted for the duration of each, individual time interval that is being averaged. The first input A signal sets file flop U413, which enables U3A to gate an oscillator pulse to the time base divers. The dividers or order to to zono, from their previous reset to him state. During this time, a channel it signal was reserved to complete the first time interval; but this first interval is not counted, since the main gate was closed. The time base output pulse enables the main gate to pass clock pulses for the duration of the time interval. After N intervals, the time hase returns a pulse to close the main gate to close the main gate.

		bio i, Functional in	lerounnealions		Model follow/17A Behanatle t Neurona Pigus I, Timing Diagram for Time Interval Measurements
	FUNCTION	MODULE TOUGHT	TO	Print S.	
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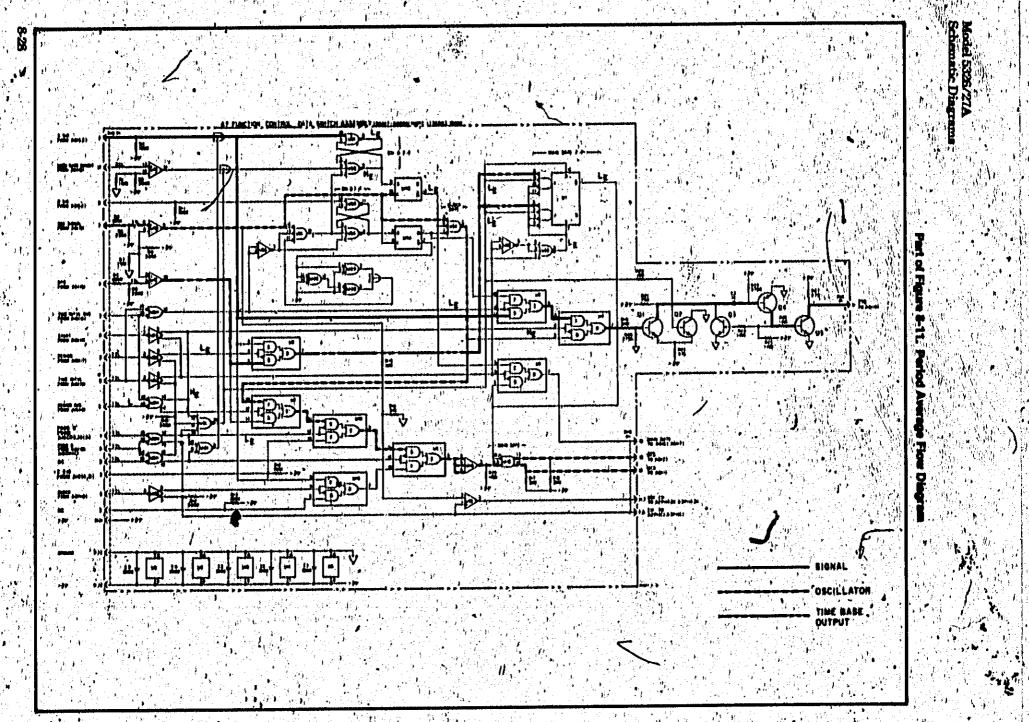
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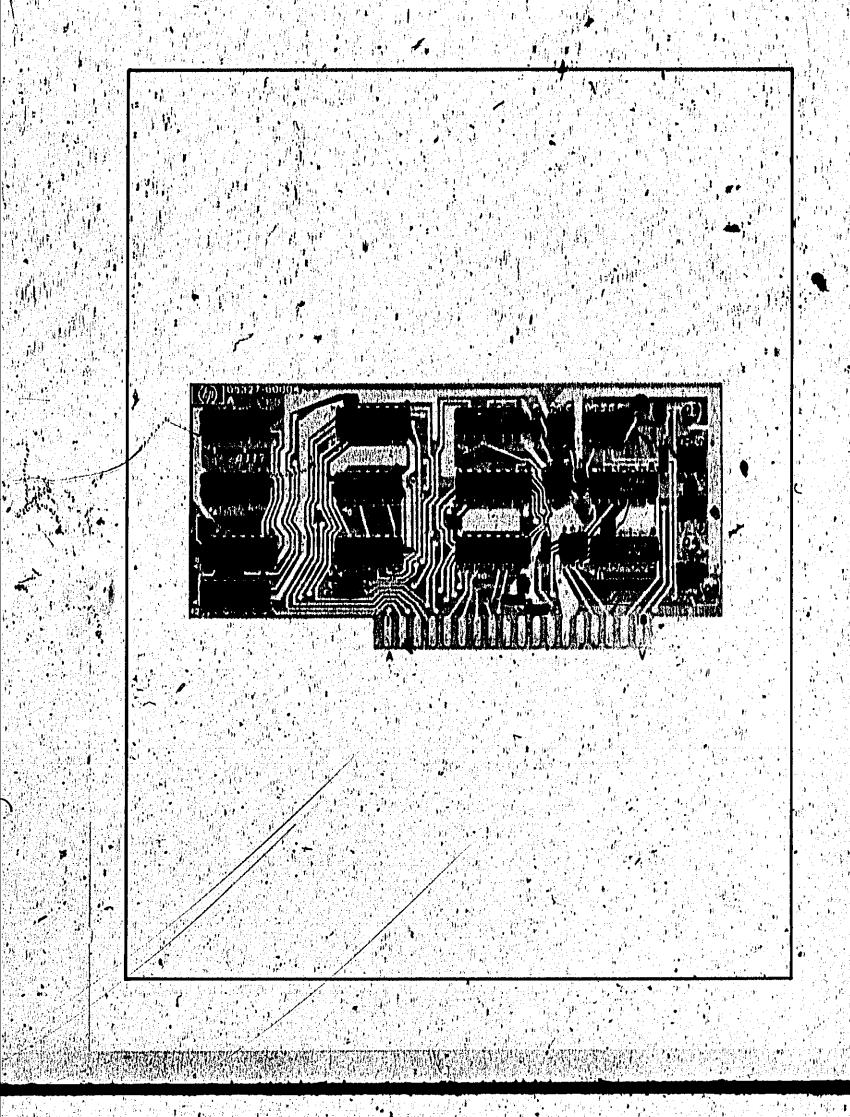


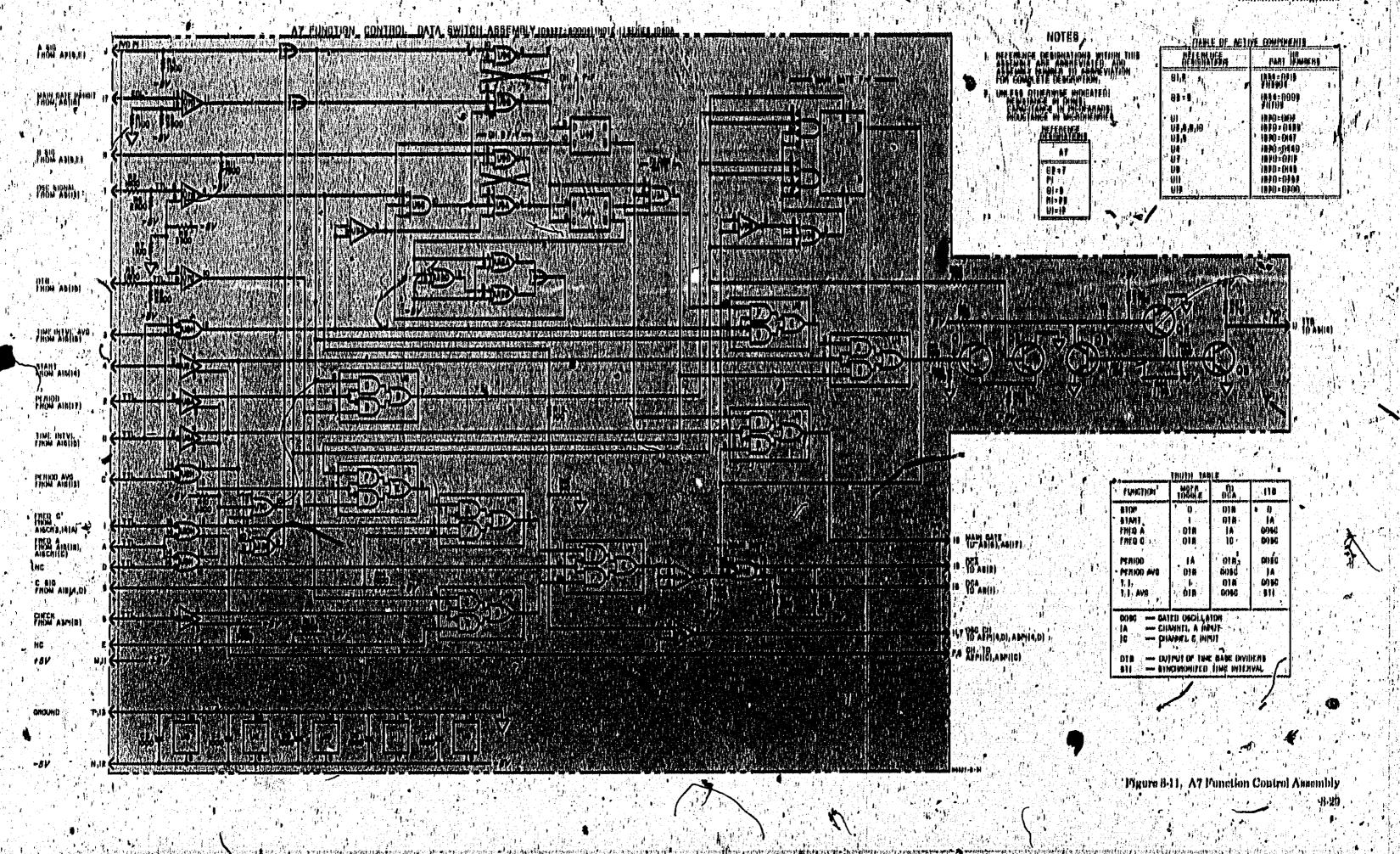


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And Burning France







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## AN DIBPLAY BUPPORT OPRIATION

The display apport assembly All serves to interconnect the display assembly All. In addition, All contains a high-speed decade counter, decimal point drivers, and blanking (logic) circuits.

The ligh-speed decade consists of four JK flip flops 1/4 through 1/8, The line receiver, QL and Qb, serves to reduce noise levels on the signal from A7 prior to driving 1/3(6, 0). US divides by two and the combination of U4, through U6 divides by five. The decade supplies 1(D) outputs to A6, via J1(6, 4, 2, 0) for the 10% display tube. The D output is also used as the carry output to the next decade counter on A6, Q1 translates the positive TPL reset signal to EQL. levels to reset the pight peed decade to zero.

Decimal point drivers QII through QB work in conjunction with logic circuits on. All to light the proper decimal points. R15 and R17 provide operating bins for QB through QB. R10, R20, and R25 are current limiters. R8 and R8 provide 875, volts pre-bins for the OPP decimal points. R5 through R10 connect the off decimals to the pre-bins volts pre-bins for the pre-bins voltage to eliminate having ound glow.

As an example of operation, when a ground is received at P1(8) from A11, Qb conducts. With Qb on, decimal point on A1D84(104), (DP3) is pulled to ground to light the decimal point on A1D84(104), (Also with P1(8) low, U1D(11) is high to unblank A9 U4. Whist (U1D(11)) goes high; U1B(6) and U1A(8) are also high to unblank A988 and U8. This unblanks A9D84, D83, and D88. D80 sind D86 remain blanked, D81 is never blanked, and D88. D80 and D88.

CRR and CRI are included for the with the digital recorder Option 603. When overflow, occurs, PI(M) and JI(16) go low. Cits and CRI cause JI(14 and R) to also go low. When JI(16, 14, R) are low, the recorder will print a stro, on the anymeintor, line, RRI and RR4 are pull-up resistors.

## ARTROUBLEBHOOTING

## High Hoead Decade

If a problem in the High-Speed Decade is not readily apparent when checking for the correct waveforms, a step-through method may be proferable. But the counter mitollows:

- 1. MIMATIPLIER awitch to 10%,
- 2. GHR/BRP/COM nwitch to CHK.
- th, PUNCTION switch to BYART.
- 4. Promi Richic'i.

The High Append Docade has four output lines that are binary weighted DOBA. Belease the Highl? button and note the counter's display. A (ypical problem is as follows: The display counts how his lands had a "b," set the lands had related by switch to ATOP and scheck, the G line for a low (refer to the table below). Obeck the input lines of the 1G since their levels depend on the state of other 1C's in the circuit (note 14 pin 12 and 16 pin 18; The levels given below are ECL.

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10,0	H			11:
		) Jakir	RIVAS	

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# Deelmal Phint and Dianking (

Holino testing the desimal boint and blanking elecultry, not the CHR/BRP/COM awitch to BRP and disconnect the input signals

DISCIMAL POINT. To clieck the decimal point circultry, set trunctrion awitch to PISRIOD AVO and position the TIMB BARR, switch to pull the required D.P. Hus Law.

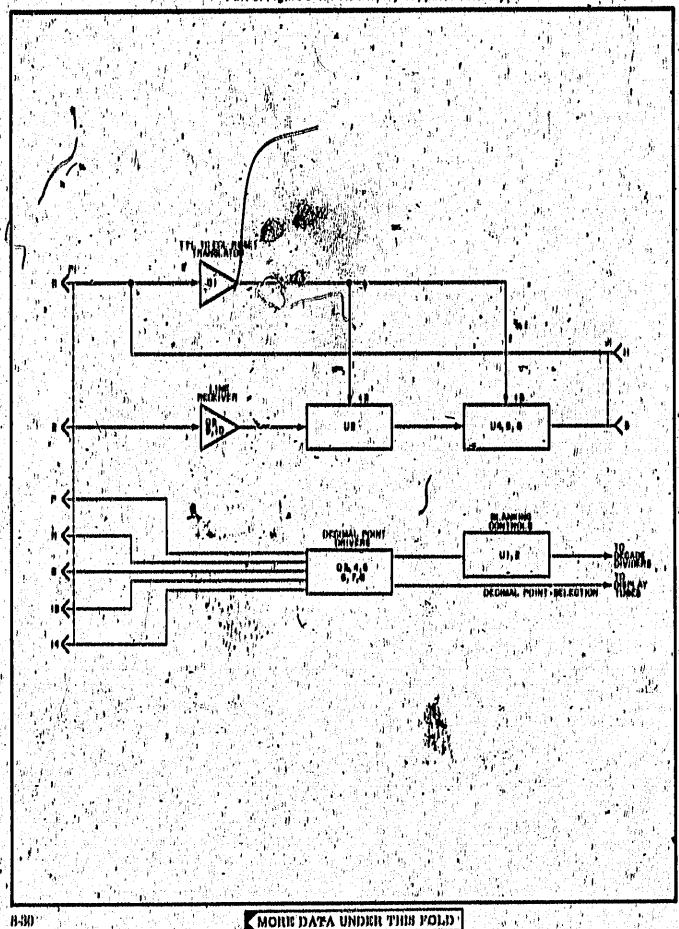
LINI	мордения роягром	priver
D.P.0 D.P.1 D.P.8	10	G G
D.P.H D.P.H	100	3. S. S. S. S. S. S. S. S. S. S. S. S. S.

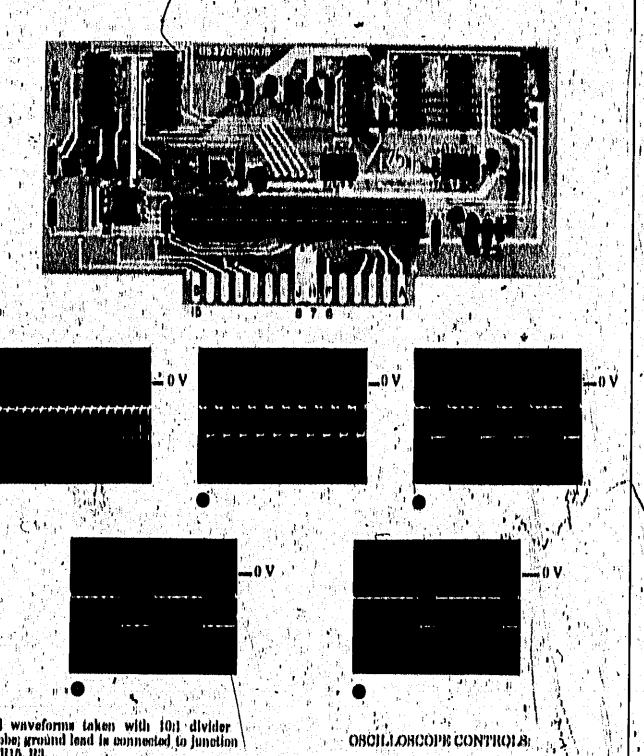
BLANKING. To check the blanking circultry, set the FUNCTION switch to PERIOD AVO and MULTIPLIBIT switch to 1. All digits, except the first one, should now be blanked. If another digit is it, check that line at ABJ, for a High level, which indicates a quablem in that line.



Model Mikh/N7A Behenjada Dingrama

# Part of Figure 8-18. At Display Support Assembly.





All waveforms taken with 10:1 divider probes ground lead is connected to junction of R16, R1,

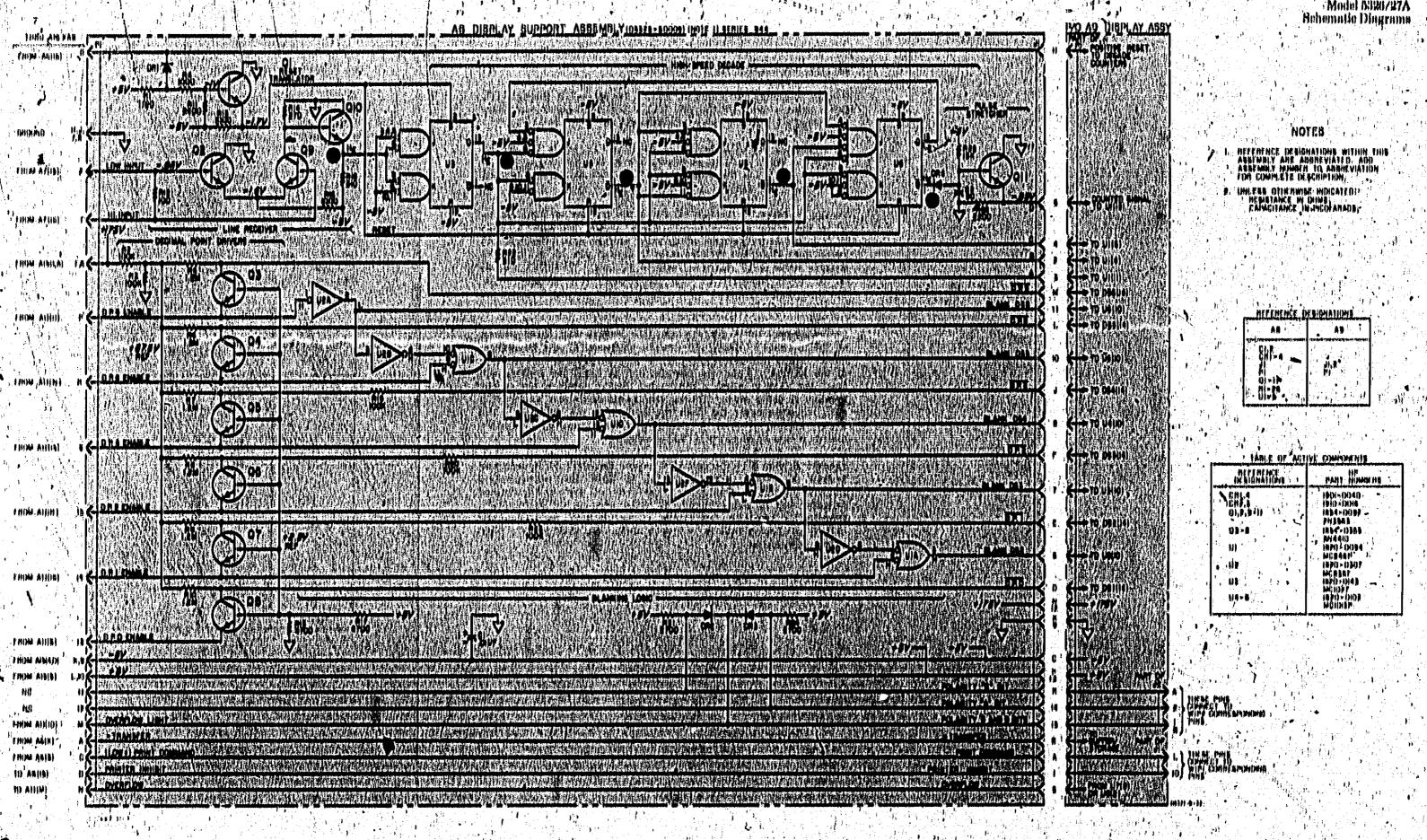
COUNTER CONTROLS: Una nattings of A2 Assembly DO VOLTAGEBI

Bet counter controls as stated, Discommet input signal, Push RRBET,

HR,LR — ROLLavele H,L — TPL Lavele

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Mgura 6-12. As Display Bupport Assembly

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Marine?

# ADDISPLAY ASSEMBLY OPERATION

Display assembly An contains decade counters U2, through U7, buffer storage units U9 through U15, BOD to decimal convertors U17 through U2), and display tubes DSI though DS7.

Ut translates the ECL dath from A8 into TTL levels for use by circuits on A9. Each translator of U1 is noninverting. The D output at U1(15) is the counted signal divided by 10 and is used as the input to 10 decade U2.

Decade counters U2 through U7 count the number of input pulsar while the main gate is open. Each decade provides a \$421 BCD output to the corresponding stuffer storage unit. When pin 14 (reset) goes High, the decades reset to zero if pin 10 is High; the decades reset to 15 (blank), if pin 10 is Low. The ECL decade pin AB never blanks. U7 and U8 (Option 001) always blank. The last decade supplies an overflow output at pin 8 when the count exceeds the capacity.

Buffer storage units UP through U15 receive the BCD outputs of the decades. When the counter operates in the storage on mode, data is transferred when a low transfer pulse arrives at pin 5 of the buffers. When the transfer line is high, the buffers will store the data to allow a continuous display, while a new measurement is being made. During storage off or totalize mode, BCD data is continuously fed from the buffers to the decoders. The buffers also supply \$421 BCD outputs to A9 J1 and J2 for further distribution to J9 when Option 003 is included:

Decoder drivers U17 through U23 receive the -8421 BCD data and provide a decoded decimal putput to light the corresponding numeral on the display tube. The terminal for an illuminated numeral will be approximately +2 volts whereas an extinguished numeral is typically +190 volts. The decimal point terminal (14) of the display tube is <5 volts when lit and about 87,5 volts when extinguished.

### A9 TROUBLESHOOTING

The A9 Display Assembly may be set up for troub chooting with either of two methods. A highly accurate oscillator may be used for a front-panel input signal. Any difference in count from the input signal is then immediately obvious on the display. Check for the proper signal division of the decade counter in previous column. As an elternate method, place the CHK/BEP/COM switch in Clik and his FUNCTION switch in START. Allow the count to totalize until the problem occurs; then, set the FUNCTION switch to STOP. Use the TIME BASE switch to adjust the rate of counting. When the problem appears, check the circuitry of that column.

Stort by checking the Buffer-Storage outputs (UD-U15) for the BCD code of the number that should be displayed, rather than what is displayed (see Table 1). Check that the Buffer-Storage code pulls the proper decimal line low on the BCD to Decimal Decisier.

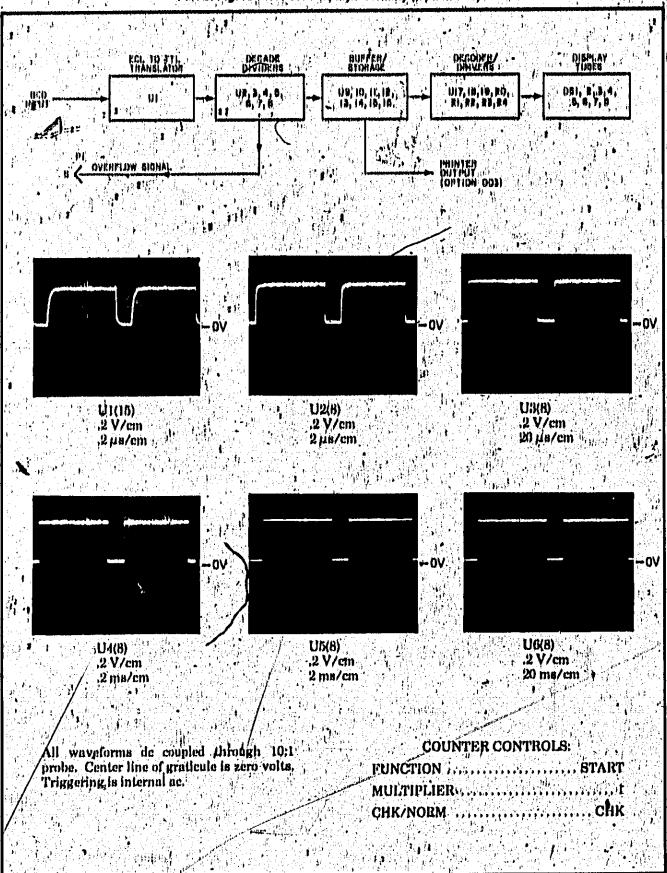
Table 1

1	Aspendig	
	DISPLAYED DIGIT	BUFFER STORAGE BCD (1711.)
	0 2 3 6 7 8 8	

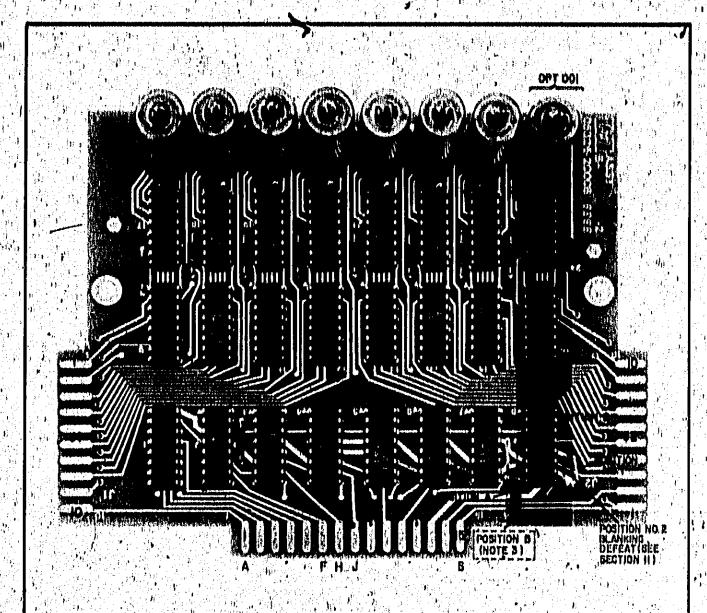
Figure 8-12 8 DISPLAY SUPPORT ASSEMBLY

(See Page 8-31)

# Part of Figure 8-13, A9 Display Assembly (Option 901)



MORE DATA UNDER THIS FOLD



# NOTES

I REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED, ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.

P. UNLESS OTHERWISE INDICATED!

3. NO IS WINED, TO & FOR OFTION DOL.

### REFERENCE DESIGNATIONS

PREFIX	) AN	Α,
WP. P4		DBI+0 JI,2 PI NI-U U)+24

#### TABLE OF ACTIVE COMPONENTS

	DESIGNATIONS	PART NUMBERS
	AB CHR,B,	สเด็ต+อดีเล
	A)	1820 - 0275 MC1039P
i a	U7-8 U9-16 U17-84	1820 - 01)6 1820 - 01)6 1820 - 0092

COMPLETE PARTS 1.161, FUR 05276 60330, 15 1.0047ED ON PAGE 8 0. SEE PAGE 8 18 FOR 05276 60076 TOPTION OUT) PARTS LIST.

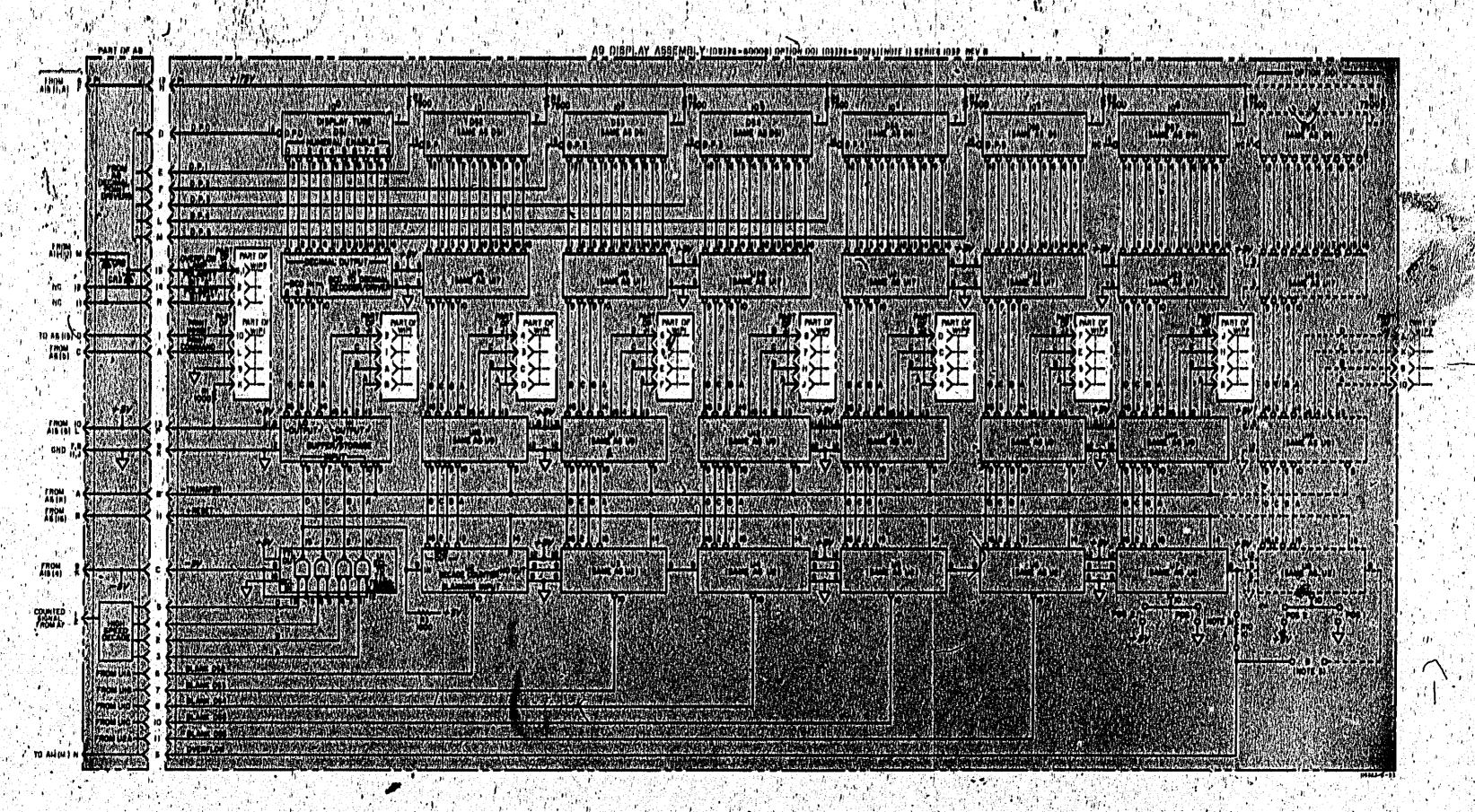


Figure 8-13. All Display Assembly (Option 001)

### A10 RIGHT READOUT OPERATION

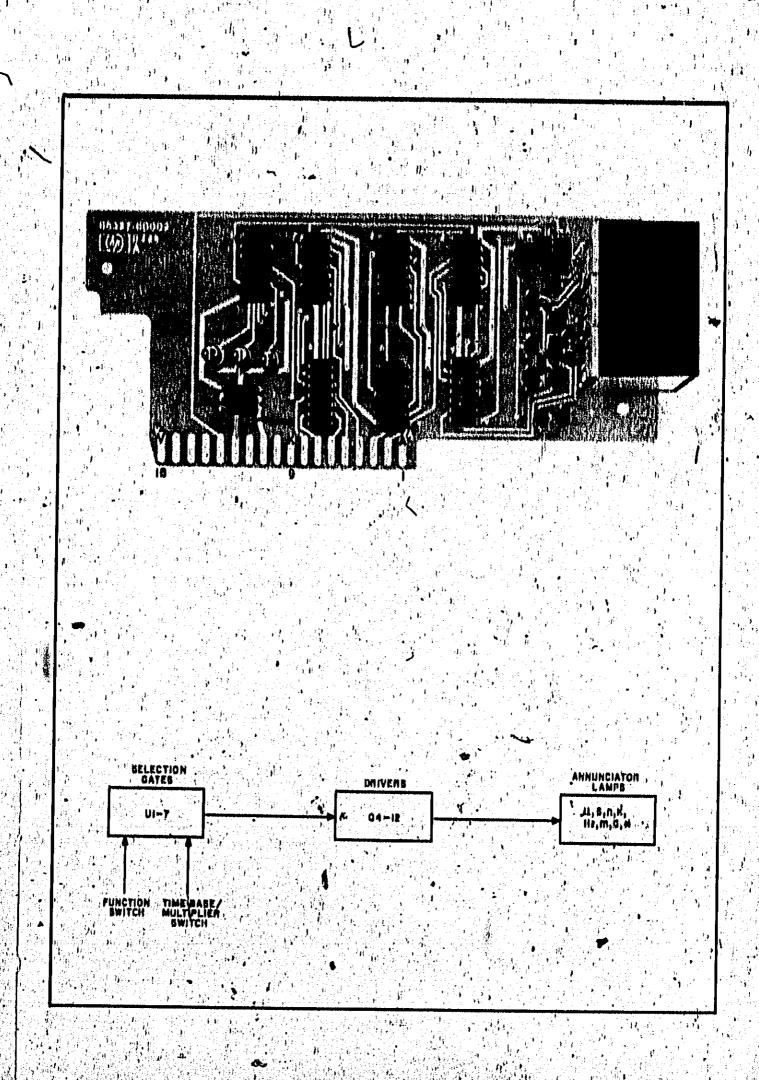
The right rendoit contains DTL logic to provide the proper measurement units for a given setting of the front-panel controls. Atthe logic is negative true, and a low (\*0.8 volts) to the emitter of my driver translator will light the given hear. When a DTL high is applied on the emitters, the translator is reverse, biased to turn of the neon lamps. The voltage dividers provide a reference of 3 V (nominal) to the bases of the drivers, when no annumentains are on.

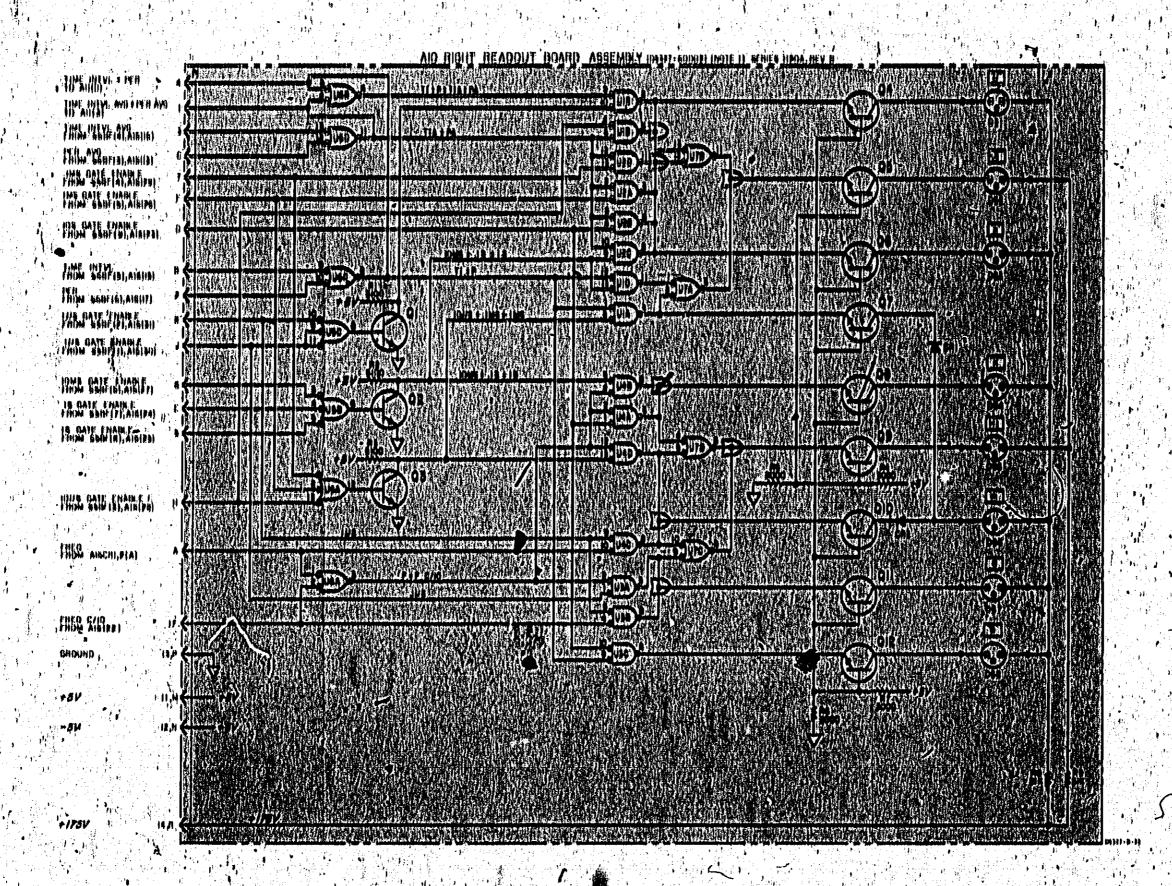
Belecting a function mode and time, base pulls a pair of these lines low, activating a gala. This low on the gate output will forward blue the driver translator to turn on the annunciator lump. For example, selection of frequency and 1 ms 'makes the autput of U417(1) low, turning on Q0 to light D86. Q10 also turns on, lighting D86.

The asterisk (\*) annunciator (DBB) is activated when the counter is in the time interval or period mode and the time base is 10s. An asterisk indicates the proper units are not displayed.

# A10 TROUBLESHOOTING

Helect the specific function mode and time base combination that is faulty. Check the gate that is common to the two lines. For instance, when using frequency and a 1 ms gate time, check U4D; when using 1 µs, U3A becomes the common gate. Refer to Table 5-5 for the proper annuclator lighting conditions.





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ž	UNIT	INPID-ORFA

### A11 LEFT READOUT OPERATION

The left reddent contains DTL logic to select the proper decimal point corresponding to the TIME BASIS SETTING: It also contains the switch common drivers for the time base, function, and amplifor common lines (for remote programming), a storage direct and lamp for the eyerflow signal, the gate light, and the EXT light,

The overflow signal from the ±10 output of AdU7 (US, Option 601) enters through plu M and is differentiated by CR and R1. Q1 turns on momentarily to set flip-flop U1A&D. During the transfer pulse, the information at "U1A&D" is transferred to the overflow storage flip-flop U1B&Q. The overflow condition drives U1C(8) low to turn QR on and light overflow lump DS1. The next reset pulse clears flip-flop U1A&D; however, U1B&Q are not reset built the transfer pulse arrives. With storage off, transfer is an continuously.

A low at pin Leturns on Q3 to light the count lump, D82. Bindarly, a low at pin A lights the fext lump and opens the common lines for the TIME BASIS, FUNCTION, and BLOPE switches. This disables these controls to allow remote programming of the unit.

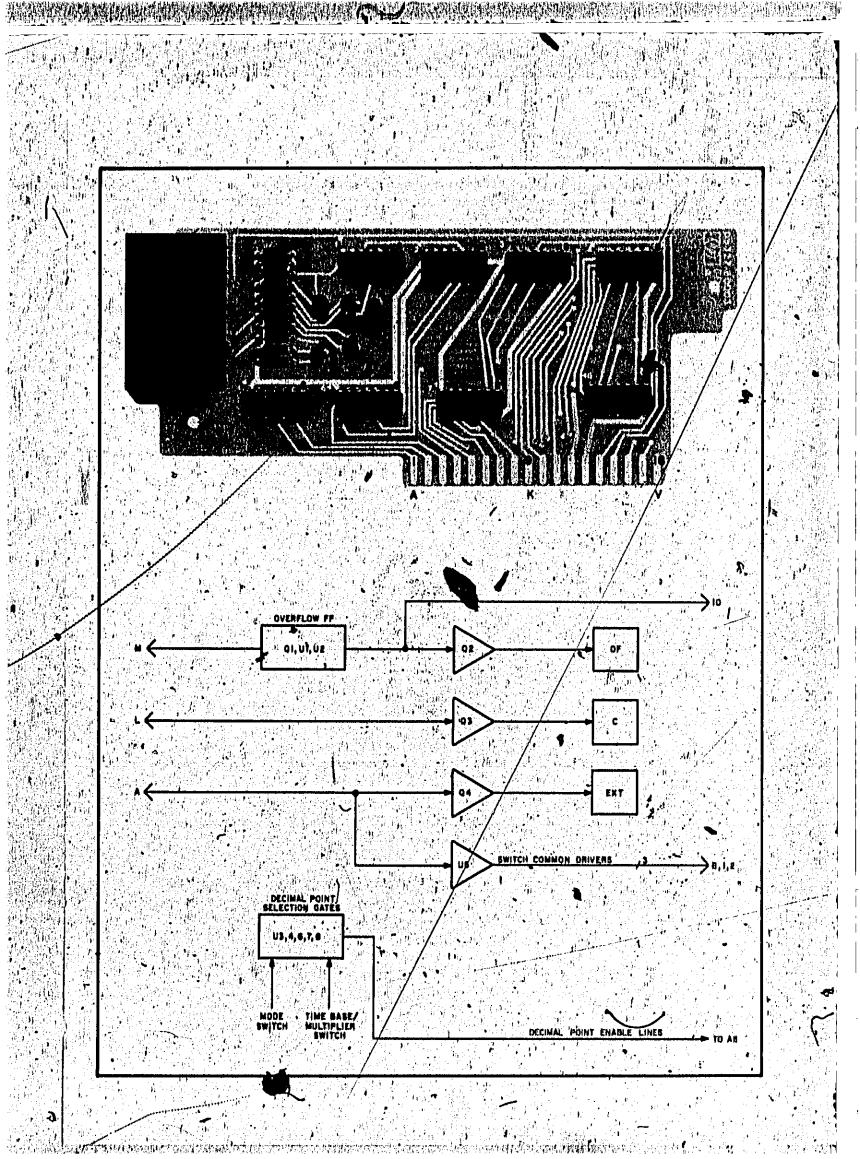
Decimal selection and resultant blanking are accomplished by the negative logic AND gates. For any pair of low lipiuts, a specific decimal point line is held low, lighting the decimal point. There are a number of combinations for each decimal therefore, the officult of each AND gate is paralleled to give a wired OR configuration (any output low a all low).

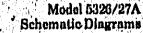
### A11 TROUBLEBILOOTING

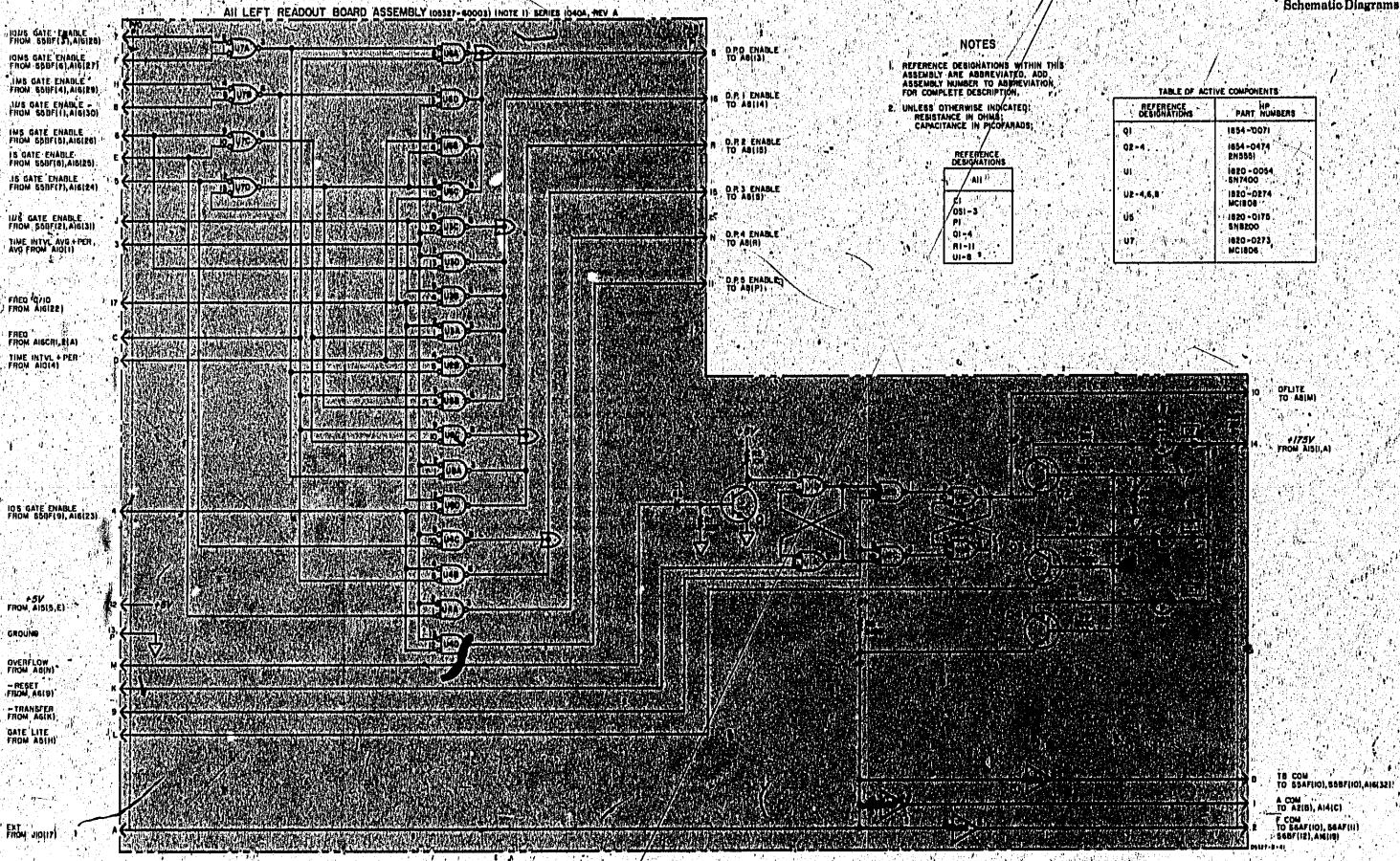
Beliet the specific function mode and time base combination that is faulty. Check the gate that is common to the two lines, Refer to Table 5-5 for the proper annunglator lighting conditions.

To cleek the overflow circuits, set the FUNCTION switch to STARY and select a fast gate time. When the most significant digit on the conner's display changes from 0 to 0, both flip flops in the overflow circuit should set. As an initial test, check U2 for a High on pln 18, The second flip flop (U1B and U1C) should have a Low on pln 8 and a High on pln 6.

In any mode other than BTART, the TRANSFER line pulses Low, rather than being held Low, If the OF light does not turn off at the end of the display time, check that the RESET pulse clears flip flop UIA&D.







### A15-A16 POWER SUPPLY OPERATION

The power supply provides +175, +16,5 V and +5 V. Transformer TI has a 115/220 primary and secondaries with open circuit voltages of 181 V at the red leads, 21 V at the orange, and 18.6 V between the green leads, with the winding center tapped to ground.

A15 CR6-9 comprise a full-wave bridge whose output is fed to filter CB and bleeder R3. Q5 is a scries pass regulator. A constant reference voltage is developed across CR11 and CR12 through resistor R1. When the output voltage at XA15(1, 'A) decreases, Q5 increases conduction to increase the output voltage. Q8 is a current limiter that senses the voltage drop across R6. Quiput current above approximately 60 mA turns on Q8 and shunts base current from Q5, tending to turn Q5 off and limit the current. C1 adds oscillation stability to the regulator.

For the +16.5 V supplies, the orange leads of T1 connect to half wave rectifier CR4 and filter C4. Q1 is a series pass regulator and Q9 performs the same function as CR11&CR12 in the 175. V supply except that R10 provides a means to adjust the output, Assume that a Q1 base current is flowing through R2 and Q6. The resulting Q1 collector current establishes a voltage at the output, which is divided across R9, R10, and R11. If the voltage at the wiper of R10 is greater than that across CR9, Q9 will be turned on, shunting base current from Q4. This will tend to turn off Q1 and lower the regulated voltage. Thus, varying R10 establishes the largest output voltage that can exist before Q9 turns on to cut back Q1. Resistors R17, R18, and diodes CR15-18 provide current limit action at 180 mA similar to the +175 V supply.

Q6 is a preregulator that gives the circuit better line regulation and lower ripple than the Zener diodes of the 175 V supply. With CRI as a reference, Q6 is a constant current circuit that maintains a Q1 base current independent of variations of the input (line voltage changes and ripple). R4 is needed to establish the current through CRI. The 16.5 V supply is complementary. The 5 V supplies are also complementary and only the will be discussed.

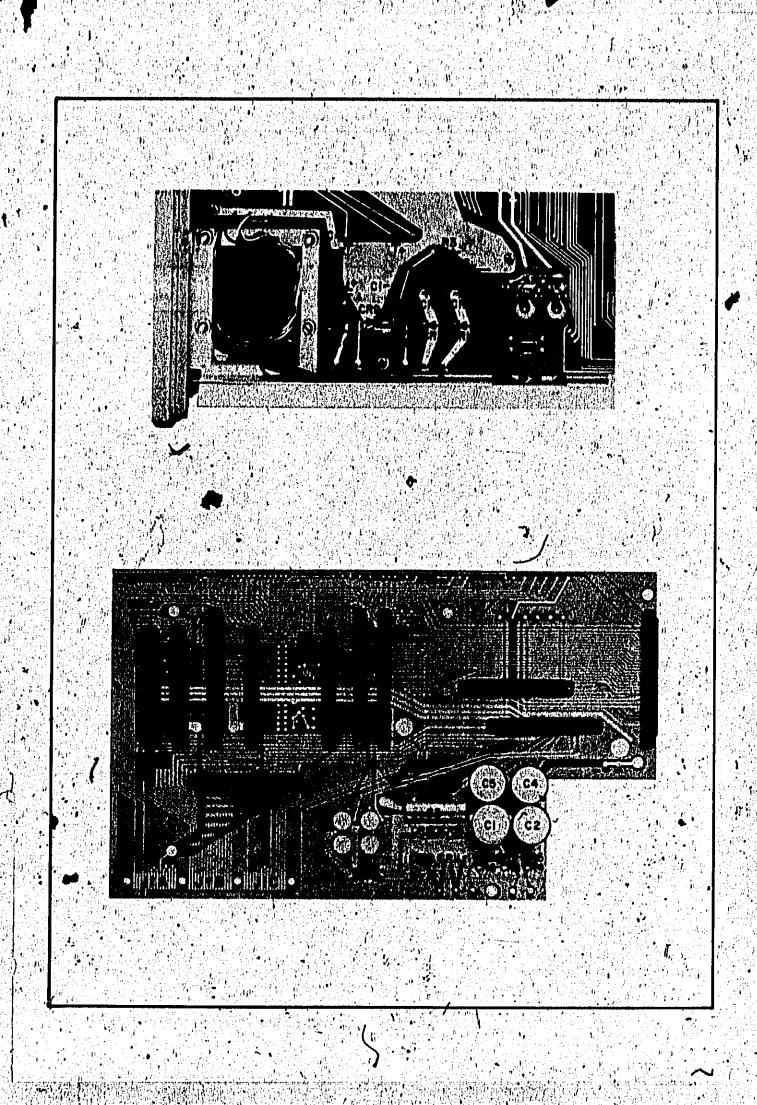
The output from the TI green leads is fed through full wave rectifier CR10 and CR11 into filter CI. It then passes through overload current limiter RI and into the series pass regulator QI, to the 5 V output at QIC. QI is a driver for QI and his approximately 5.75 V on its base, developed across CR6 and CR5 by the current from the 18.5 V supply through R7. If the voltage at the emitter 5.1 V, Q3 is turned on providing base current to turn on QI; raising the output voltage. Q3 turns off when its emitter gets above 5.1 V, C2 is the output filter to maintain a low output impedance at high frequencies.

OR2 clamps the nutput at B, V to provide protection for the IC's in case the 16.5 V or 175 V line should momentarily short to the 5 V line, CR5 provides therms compensation for Q3,

Note that the 16.5 V supply is needed for operation of the 5 V supply. If the tor 16.5 V supply fails, the corresponding 5 V supply will be inoperative.

Pigure 8-10 A11 LEFT READOUT ASSEMBLY

(See Page 8-37)



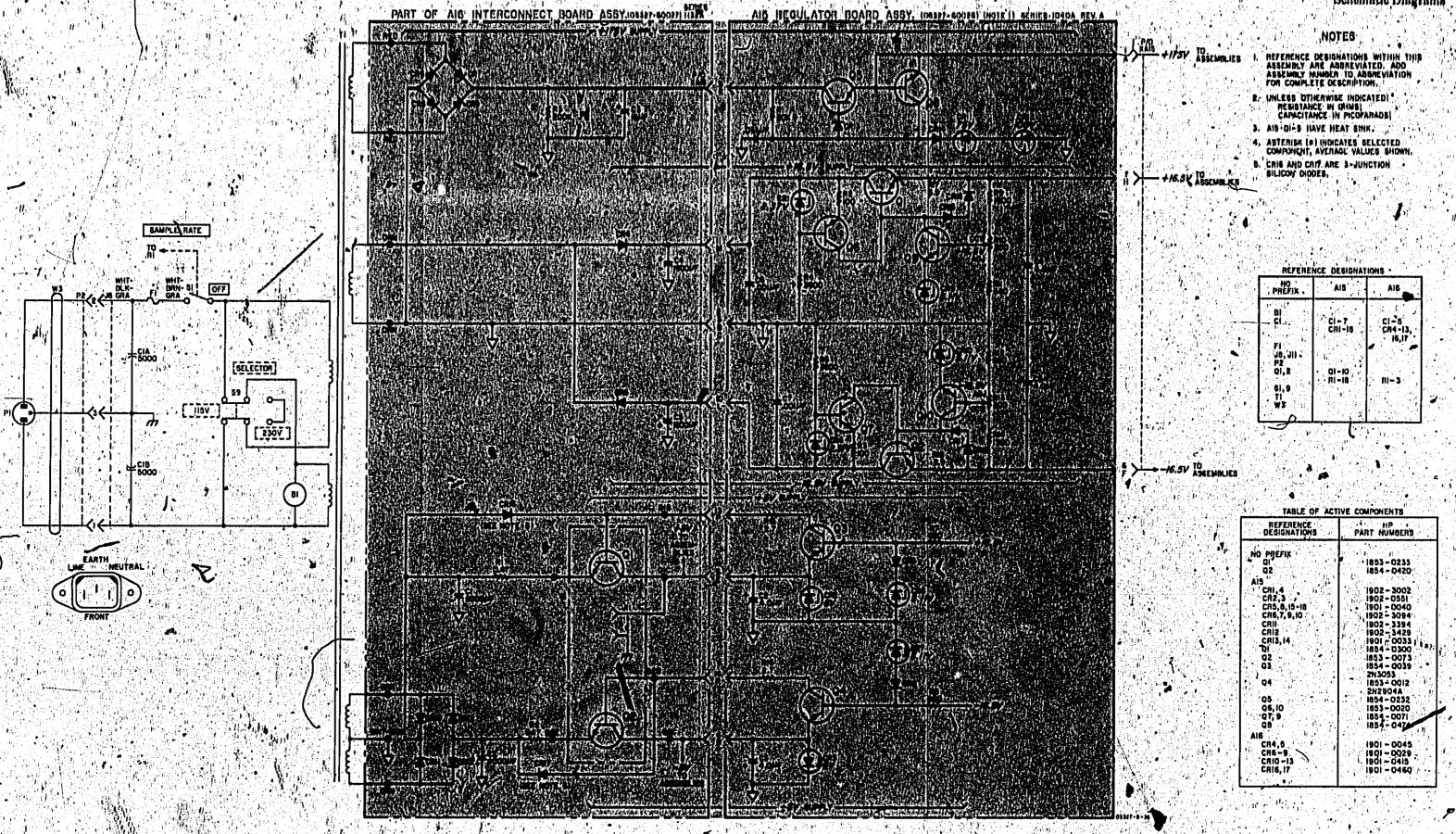


Figure 8-16. A15, A16 Regulator Board, Interconnect Board Assembly

9.30

## A17 INPUT C AMPLIFIER OPERATION

The input amplifier performs two functions: It provides it channel for increased sensitivity and it produces marrow pulses for efficient usage by other counter circuits. The amplifier is not controlled by any front-pinel switches.

The input signal is do coupled into a 50 ohm toput impedance (R1) and is fed into the input amplifier, which is protected by R2, CR1, and CR2. Current source UIQ5 feeds the bulanced differential amplifier UIQ3, Q4. The twin outputs are loaded by R10 and peaking coil L2. The signal flows to another amplifier circuit, whose outputs control the triggering of the tunnel diode, CR3. The diode is blased for maximum sensitivity with R11. When the diode fires, it produces fast rise and fall times on the input signal.

High-impedance emitter floowers (Q1, Q2) ac couple the signal to the single-ended differential amplifier of Q3 and Q4. The short time constants of C9, R18, and C12, R23 differentiate the signal into narrow spikes of about 15 ns. The output circuit of C11, R22, and [4] approaches resonance at high frequencies for improved gain.

The signal is then fed to the one-shot multivibrator U2. The one-shot output goes High (U2, pin 4) when the input goes low. The output goes Low again after about 12 ns, when the level changes have propagated through the gates in a domino effect.

# SENSITIVITY ADJUSTMENT

n. Set counter controls as follows:

Function Freq C Time Base 0.1

- b. Set HP 606B HF Signal Generator (or equivalent) for 50 MHz at 500 mV rms. Measure the output signal of 606B with an HP 411A RF Millivoltmeter, using a 500 termination. Connect signal source to INPUT C of counter.
- c. Reduce output level until counter's display becomes unstable.

  Adjust R11 for a stable display. Repeat this procedure until unable to obtain a stable reading. Increase the signal level until display just becomes stable.
- d. Disconnect input and connect to voltmeter, reading should be less than 5 mV.; Check other frequencies within the band.

Figure 8-16
A15, A16 REGULATOR BOARD,
INTERCONNECT BOARD ASSEMBLY
(See Page 8-39)

Model 5326/27A Schematic Diagrami

Part of Figure 8-17 A17 Component Locator .05 V/cm n. Q1 (base) ,05 V/cm Q2 (base) .1 μs/cm .02 V/cm DC VOLTAGES: Set counter controls as stated. Disconnect input signal. 1 µ8/cm ALT B All waveforms taken with 10:1 divider probe; ground lead is connected" to ground side of C6, A17 is mounted of extender board. COUNTER CONTROLS: FUNCTION .... FREQ C CHK/SEP/COM ...... SEP OSCILLOSCOPE CONTROLS:

MORE DATA UNDER THIS FOLD

# MANUAL CHANGES

### MANUAL DESCRIPTION

INSTRUMENT:

5326A/5327A Timer-Counter

Operating and Service Manual

SERIAL PREFIX:

5326A/5327A---1312A

DATE PRINTED: HP PART NO:

**SEP 1973** 05326-90035

MICROFICHE NO:

05326-90040

CHANGE DATE: May 6, 1980

(This change supersedes all earlier dated changes)

- Make all changes listed as ERRATA.
- Check the following table for your instrument's serial prefix or serial number and make listed change(s) to manual.

IF YOUR INSTRUMENT HAS SERIAL PREFIX OF SERIAL NUMBER	MAKE THE FOLLOWING CHANGES TO YOU'S MANUAL	IF YOUR INSTRUMENT HAS SERIAL PREFIX OR SERIAL NUMBER	MAKE THE FOLLOWING CHANGES TO YOUR MANUAL				
1428A	. 1	1620A04016 & Up (5328A) 1620A00796 & Up (5327A)	1,2,3,4,5,6				
)o40A (E327A Only)	1,2	1820A	1,2,3,4,5,6,7				
1544A (5326A Only)	1,3	1844 (5326A Only)	1,2,3,4,5,6,7,8				
1604A (5327A Only)	1,2,3,4	1936A (53.26A Only)	1,2,3,4,5,6,7,8,9				
1620A	1,2,3,4,5	■ 2012A (53?6A Only)	1 through 10				

# **M** NEW OR REVISED ITEM

### ERRATA

Page 1-1, Table 1-1:

Change Rack Mouting Kit from 05326-60029 to 05326-60046.

Page 5-10, Table 5-4, Steps 5c and d:

Change 0.65 to  $0.9 \pm .05V$  at A18U2(3).

Change 0.90 to 0.8 ±.05V at A18U3(3).

Pages 6-7/8 Table 6-1, Replaceable Parts:

Add A7C3 0160-2150 CAPACITOR :FXD 33PF 5% 300V FACTORY SELECTED; 28480; 0160-2150; QT 1. Add A7XU14 1200-0473 SOCKET:IC 16 PIN; 28480; 1200-0473. With this change A7 05327-60031 is SERIES 1312.

Page 6-8, Table 6-1, Replaceable Parts:

Change A7U10 reference designator only to A7U11.

Change A7U11 reference designator only to A7U10.

Pages 6-14 and 6-15, Table 6-1, Replaceable Parts:

Add "FACTORY SELECT" after description for A18R34 and A18R42. Change A18U3 from 1826-0085 to "1826-0085 or 1826-0151" in HP and Mfr Part Number columns.

Page 6-22, Table 6-3, Manufacturers Code List:

Ādd 00779 AMP, INC. P.O. Box 3608, Harrisburg, PA 17105.

Page 8-31, Figure 8-11, A7 Schematic Diagram:

Add A7C3\* 33PF; connected from XU14C(11) to XU14C(16) (ground).

Change REFERENCE DESIGNATION table from "C1,2" to "C1-3".

Page 8-40, Part of Figure 8-16:

Replace A15 Component Locator photo with attached Figure 1.

Page 8-45, Figure 8-15, Schematic Diagram:

Add asterisk (\*) by A18R34 and A18R42.

In TABLE OF ACTIVE ELEMENTS show 1826-0085 or 1826-0151 for A18U3 and 1820-0736 or 1820-0558 for A18U4. Change dc voltage at A18U2(3) from .65  $\pm$ .05V to .9  $\pm$ .05V and voltage at A18U3(3) from .9  $\pm$ .05V to .8  $\pm$ .05V.

Page 6-9, Table 6-1, Replaceable Parts:

Change A9U2 through U7 from 1820-0232 to 1820-0119 in "HP Part Number" and "Mfr Part Number" columns.

Page 7-2, Paragraph 7-21:

Add the following sentence:

"An HP Part No. 05326-00033 adaper plate will also be required four mounting 36-pin remote programming connector J10".



# MANUAL CHANGES MODEL 6326A/6327A PAGE 2

# ERRATA (Cont'd)

Page 6-17, Table 6-1, Replaceable CHASSIS PARTS:

Change Q1 from 1853-0233 to 1853-0356 in "HP" and "Mfr" part number columns,

Change Q2 from 1854-0420 to 1654-0625 in "HP" and "Mfr" part number columns.

NOTE - THE ABOVE TRANSISTORS FOR Q1 AND Q2 ARE RECOMMENDED FOR REPLACE-MENT IN ALL INSTRUMENTS. THE HIGHER WATTAGE RATING OF THESE TRAN-SISTORS WILL IMPROVE INSTRUMENT RELIABILITY.

Page 8-41, Figure 8-16, TABLE OF ACTIVE ELEMENTS:

Change Q1 from 1853-0233 to 1853-0356 and Q2 from 1854-0420 to 1854-0625.

Page 6-15, Table 6-1, A16 (05327-60027) Replaceable Parts:

Change A16XA2 thru XA5, XA8, XA15, and XA18 from 1251-1886 to 1251-2035; Mfr Code to 28480; Mfr Part Number 1251-2035.

Change A16XA8, XA7, XA10, and XA11 from 1251-2134 to 1251-2026; Mfr Code 28480; Mfr Part Number 1251-2026.

Page 6-19, Table 6-2, Replacement Parts, Options:

Change A1C7 and C8 from HP Part Number 0140-0149 to 0160-3533; Mfr Code to 28480;

Mfr Part Number to 0160-3533.

Page 1-5, Table 1-3, Specifications:

Change Option 011 Short Term Fluctuation (1 sec avg) to  $< 1 \times 10^{-10}$  rms.

Page 8-51, Figure 8-21, A1 (Option 604) Schematic Diagram:

Change circuit board part number from 05327-60018 to 05327-60034 and "SERIES 1040A" to SERIES 1224.

### **CHANGE 1 (1428A)**

Page 6-11/12, Table 6-1:

Change A15F1 from 2110-0460 to 2110-0487 1/20 Amp.

Change A15R6 from 0686-1305 to 0698-5479 8.2 OHM; 01121; EB82G5.

Delete A15F1 Part No. 1400-0110 FUSEHOLDER.

Add A15XF1 1251-3205; 2; SOCKET, MINIATURE SINGLE PIN; 00779; 2-33\*272-7.

With these changes A15 assembly 05327-60020 is "SERIES 1428". Component locator in attached Figure 1 is applicable for A15 with SERIES 1312 and 1428.

Page 6-14, Table 6-1:

Add A18L3; 05303-80001, 1, COIL, FXD, RF PEAKING, 28480, 05303-80001.

Add "FACTORY SELECTED" to A18R34 and A18R42 "Description".

With these changes A18 assembly 05327-60033 is "SERIES 1428".

Page 8-41, Figure 8-16, A15 Schematic Diagram:

Change A15F1 value from 1/32A to 1/20A.

Change A15R6 value from 12 to 8.2 OHM.

Change "SERIES 1312A REV. A" at top of A15 schematic to "SERIES 1428".

Page 8-45. Figure 8-18, A18 Schematic Diagram:

Add A18L3 in series with A18U3(13) output line. Output circuit trace is cut and one end of A18L3 is connected to the junction of A18U3(13) and A18R34. The other end of A18L3 is connected to the junction of A8R44 and the coil from A18R42.

Change series number at top of A18 schematic diagram to "SERIES 1428".

Page 6-12, Table 6-1:

Change A16R7 from 0698-3153 (3830 ohm) to 0698-3155, 4630 ohms.

Page 8-53, Figure 8-22, Schematic:

Change A16R7 from 3830 to 4630 ohms.

Change SERIES number of A18 circuit board to 1428 on various pages where portions of A16 appear in this manual. This includes the Table of Replaceable Parts.

Page 6-14, Table 6-1:

Change A 16R 29, A 18R 30 from 0698-5177 (820 OHM) to 0698-5103 430 OHM. Add "FACTORY SELECTED VALUE" to description.

Page 8-45, Figure 8-18, A18 Schematic:

Add asterisk (\*) adjacent to A18R22, A18R23, A18R29, A18R30, and A16R40.

In Table 6-1 for these resistors add "FACTORY SELECTED VALUE" to description.

Page 1-3, Table 1-3, Specifications:

Delete paragraph ; sining to "Short-Term Fluctuation" under "TIME BASE" heading.

### MANUAL CHANGES MODEL 5326A/5327A PAGE 3

### CHANGE 2 (1540A) (5327A ONLY)

Page 5-19, TAble 5-4, Paragraph 5 Prescaler ∧ djustments:

Change paragraph 5-g to read as follows:

"Reduce output level until counter's display becomes unstable. Alternately adjust A18R3 and A18R53 for a stable display. Repeat procedure until unable to obtain a stable display. Increase signal level until display just becomes stable and make any final adjustments of A18R3 and A18R53".

Page 6-13, Table 6-1, A18 Replaceable Parts (SERIES 1540):

Ādd A18C30; 0160-3879; CAPACITOR-FXD 0.01 µF 20% 100VDCW CER; 28480; 0160-3879.

Change A18R22 and A18R23 from 0698-4131 (56 ohms) to 0698-3111; RESISTOR-FXD 30 OHM 5% .125W CC; 01121; BB3005.

Change A18R29 and A18R30 from 0698-5703 (430 ohms) to 0698-5177; RESISTOR-FXD 820 OHM 5% .125W CC; 01121; BB8215.

Change A18R34 from 0698-8073 (1600 ohms) to 0698-5178; RESISTOR-FXD 1500 OHM 5% .125W CC; 01121; BB1525.

Add A18R53; 2100-2633; RESISTOR VAR 1000 OHMS 10% COMP SIDE ADJ; 30983; ET50X102.

Add 18R54 and A18R55; 0698-3374; RESISTOR-FXD 20 OHM 5% .125W CC; 01121; BB2005.

Add A18R56; 0698-6283; RESISTOR-FXD 10 OHMS 5%; .125W CC; 01121; BB1005.

Page 8-45, Figure 8-18, A18 Prescalor Assembly Schematic:

Add A18C30 (.01 µF) between common and the "+5V" end of A18R34.

Add A18R53 (1000 ohms) variable resistor between +5.2V and -5.2V. Connect junction of A18C30 and A18R34 to arm of A18R53 in place of "+5V" as shown on schematic diagram.

Change value of A18R34 from 1600 to 1500 ohms.

Change A18R22 and A18R23 from 56 to 30 ohms.

Change A18R29 and A18R30 from 430 to 820 ohms.

Add A18R54 (20 ohnis) in series between A18U2 pin 11 and the junction of A18R23, A18R30, and A18U3 pin 5.

Add A18R55 (20 ohms) in series between A18U2 pin 14 and the junction of A18R22, A18R29, and A18U3 pin 4.

Add an asterisk (\*) adjacent to A18R54 and A18R55.

Add A18R56 (10 ohms) in series between A18U1 pin 2 and the junction of A18U2 pin 5 and A18R56.

Change "SERIES" number at top of schematic to "1540".

### **CHANGE 3 (1544A)**

Page 1-4, Table 1-3, Specifications for OPTIONS:

Add to Option 001: 8-digit display. "Part of standard ins rument; discontinued as an Option".

Add to Option 603: Digital Output (for numerals and polarity only). "Discontinued as an Option and included as part of the standard instrument".

Page 1-5, Table 1-3, Specifications for OPTIONS:

Delete Option 010 Temperature Compensated Oscillator. This Option is discontinued and is no longer available.

Page 7-1, Options and Manual Changes:

Paragraph 7-14, Delete second sentence.

Paragraph 7-18, Add — "Part of Standard Instrument; Discontinued as an Option".

Paragraph 7-22, Add - ". art of Standard Instrument; Discontinued as an Option".

Page 6-9, Table 6-1, A9 Replaceable Parts:

Replace A9 table for 05326-60008 with table for 05326-60025 A9 on Page 6-18 of Table 6-2.

Page 6-18, Table 6-2:

Add parts for Option 003 as part of standard instrument.

The 5326A/5327A Timer/Counters are furnished less the RACK MOUNTING KIT described in this manual. If ordered at the same time as the instrument, the RACK MOUNTING KIT described in the manual is available as Option 908 at additional cost. If not ordered with an instrument, the RACK MOUNTING KIT is available under HP Part No. 05326-60046. Disregard any manual references stating the instrument is supplied with a rack mounting kit.

Page 6-17, Table 6-1, Chassis Replaceable Parts:

Change XF1 (useholder from 1400-0084 to the following recommended replacement for all instruments,

Add the following parts on Page 6-17 under CHASSIS PARTS:

XF1; 2100-0465; FUSEHOLDER BAYONET CAP; 75915; 345003-020

XF1; 2310-0470; FUSEHOLDER BODY UL/IEC; 75915; 3450003-010

XF1; 2950-0054; NUT FUSEHOLDER MTG 1/2-28; 28480; 2950-0054

### CHANGE 4 (1504A for 5327A)

Page 6-13 and 6-15, Table 6-1, A18 (05327-60033) Replaceable Parts:

Change A18 from SERIES 1540 to 1604,

Add A18R57; 0698-3113; RESISTOR FXD 100 OHM 5% .125W CC; 01121; BB1015.

Page 8-45, Figure 8-18, A18 Schematic Diagram:

Change SERIES 1540 at top of schematic to 1604.

Add 100 ohin resistor R57 in series with +5V input to pin 10 of SCHMITT TRIGGER A18U3.

# MANUAL CHANGES MODEL 5326A/5327A PAGE 4

### CHANGE 4 (1604A for 6327A) (Cont'd)

Page 6-17, Table 6-1, Replaceable CHASSIS PARTS:

Change Q1 from 1853-0233 to 1853-0356 in "HP" and "Mir" part number columns.
Change Q2 from 1854-0420 to 1854-0425 in "HP" and "Mir" part number columns.
NOTE — THE ABOVE TRANSISTORS FOR Q1 AND Q2 ARE RECOMMENDED FOR HEPLACEMENT IN
ALL INSTRUMENTS. THE HIGHER WATTAGE RATING OF THESE TRANSISTORS WILL
IMPROVE INSTRUMENT RELIABILITY.

Page 8-41, Figure 8-16, TABLE OF ACTIVE ELEMENTS: Change Q1 irom 1853-0233 to 1853-0356 and Q2 from 1854-0420 to 1854-0625.

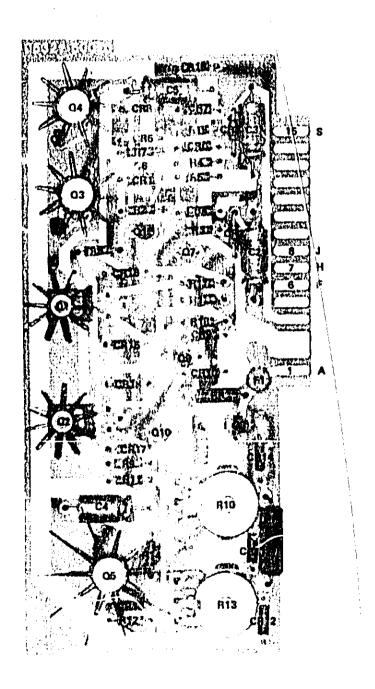


Figure 1. A15 Regulator Board Assembly Component Locator 05327-60020 Series 1312 or 1428

### MANUAL CHANGES MODEL 5328A/5327A PAGE 5

### **CHANGE 5 (1620A)**

Page 6-6, Table 6-1, A6 (05326-60013) Replaceable Parts:

Change A6 series number to 1620,

Change A6C8 from 0160-0153 (.001 UF) to 0160-0299; CAPACITOR, FXD, 1800 PF 10% 200WVDC POLYE; 56289; 292P12292. Add A6C13: 0180-1735; CAPACITOR-FXD .22 UF 10% 35WVDC TANT; 56289; 150D224X9035A2.

### Page 8-23, Figure 8-10, A6 (05326-60013) Schematic Diagram:

Change series number, at top of diagram, from 1036A to 1620.

Change A6C8 from 1000 to 1800 PF.

Add A6C13 capacitor (.22 UF) between circuit board common and junction of A6R12, A7U4B(5), A6CR2, and A6CR3.

The positive side of the capacitor goes to the SAMPLE RATE DISABLE line from connector pins 10L and the negative side to circuit board common.

Add A6C13 in REFERENCE DESIGNATION tables.

### Page 6-7 and 6-8, Table 6-1, A7 (05327-60031) Replaceable Parts:

Change A7 series number from 1312A to 1620.

Change A7R15 from 0683-1015 (1001) to 0683-3915; RESISTOR, FXD, 390 OHM 5%, .25W CC; 01121; CB3915. Change A7R16 from 0683-5115 (5101) to 0683-1525; RESISTOR, FXD, 1500 OHM 5%, .25W CC; 01121; CB5115.

### Page 8-31, Figure 8-11, A7 (05327-60031) Schematic Diagram:

Change series number, at top of schematic, from 1312A to 1620.

Charge A7R15 from 100 to 390 ohms.

Change A7R16 from 510 to 1500 ohms.

### Page 6-12, Table 6-1, A16 (05327-60026) Replaceable Parts:

Change series number from 1132A to 1620.

Change A16R2 from 0811-1732 (11) to 0812-0021 (0.47 OHMS) with same description as A6R1.

Some manuals already have this change.

### Page 8-41, Figure 8-16, A16 (05327-60026) Schematic Diagram:

Change A16 series number, at top of diagram, from 1132A to 1620.

Change A16R2 from 1.0 to 0.47 ohm.

### Pages 6-12 and 6-13, Table 6-1, A17 (05326-60031) Replaceable Parts:

NOTE: — Some instruments with serial prefix 1136A also have the following change on circuit boards marked "SERIES 1136".

Change A17 from series "1136A, REV C" to series "1620".

Change A17R21 from 0698-3153 (38301)) to 0757-0933; RESISTOR, FXD, 2400 OHM 2% ,125W F F TUBULAR; 24546; C4-1/8-TO-2401-G. \*FACTORY SELECTED VALUE.

### Page 8-43, Figure 8-17, A17 (05326-60031) Schematic Diagram:

Change series number, at top of schematic from "1136" to "1620".

Change A17R21 from 3830 to 2400 ohms.

Add asterisk (\*) and "NOTE 3" adjacent to A17R21 in schematic.

Add following note to table of "NOTES":

3. RESISTOR A17R21 SELECTED TO SET DC LEVEL OF A17Q4 COLLECTOR BETWEEN -.80V and -.85V. MINIMUM VALUE FOR A17R21 is 2000 OHMS.

# CHANGE 6 (5326A Serial No. 1620A04016 or higher) (5327A Serial No. 1620A00796 or higher)

NOTE — NOT ALL INSTRUMENTS WITH THE ABOVE SERIAL NUMBERS THAT HAVE OPTION 004 EXTENDED REMOTE PROGRAMMING WILL HAVE A SCRIES 1620 CIRCUIT BOARD FOR A1.

Page 6-19, Table 6-2, Replaceable Parts for Option 004:

Change A1 (05327-60034) series number from 1224A to 1620,

Add capacitor A1C15, A1C16; 0160-3878; CAPACITOR-FXD 1000 PF 20% 100VDC CER; 28480; 0160-3878.

# ▶Page 8-51, Figure 8-21, A1 (95327-60034) Schematic Diagram:

Change series number, at top of diagram, to 1620.

Add A1C15 and A1C16 capacitors (1000 pF) to A1 diagram. Connect both capacitors between the A COM line from A1J1(C), in upper right corner, and circuit board cornmon.

# Page 8-50, At REFERENCE DESIGNATIONS TABLE:

Change capacitor listing from C1:14 to C1-16.

### **CHANGE 7**

Instrument serial profix number does not change and remains 1620A with this change,

# Page 6-18, Table 6-1/ Chassis Replaceable Parts:

Add the following under CHASSIS PARTS:

XF1; 2110-0564; FUSEHOLDER BODY; 28480; 2110-0564.

XF1; 2110-0565; FUSEHOLDER CAP; 28480; 2110-0565.

XF1; 2110-0569; NUT FUSEHOLDER MTG, PLASTIC HEX; 28480; 2110-0569.

Delete 2110 0465, Firseholder Cap; 2110-0470, Fuseholder Body; and 2950-0054, Fuseholder Mtg. Deleting these three parts negates part of Change 3.

# MANUAL CHANGES MODEL 5326A/5327A PAGE 6

### CHANGE 8 (1844A) (5326A ONLY)

Page 6-5, Table 6-1, A4 OSCILLATOR ASSY REPLACEABLE PARTS: Change A4 from 05326-60002 to 05326-60052; OSCILLATOR ASSY (SERIES 1844); 28480; 05326-60052.

Change A4 components to those given in attached Table 1.

Page 8-18, Part of Figure 8-8, Component Locator:

Change A4 component locator illustration to the new illustration shown in attached Figure 2.

Page 8-19, Figure 6-8, A4 Schematic Diagram:

Change A4 schematic diagram to the new diagram in attached Figure 3.

Serial Prefix Numbers of 5326A Counters shipped from the factory with the 05326-60052 oscillator change to 1844A. The 05326-60052 Oscillator Assembly is the recommended replacement for A4 in all 5326A/5327A instruments.

TABLE 1. A4 REPLACEABLE PARTS
A4 OSCILLATOR ASSEMBLY 05326-60052 (SERIES 1844)

REF. DESIG.	HP PART NO.	DESCRIPTION
A4C1	0121-0059	CAPACITOR-VAR 2-8 PF 350VDCW
A4C2	0160-2257	CAPACITOR-FXD CER 10PF 5% 500VDCW
A4C3	0160-3878	CAPACITOR-FXD CER 1000PF 20% 100VDCW
A4C4	0121-0061	CAPACITOR-VAR CER 5.5-18 PF 350VDCW
A4C5	0160-3879	CAPACITOR-FXD CER 0.01 UF 20% 100VDCW
A4C6	0180-0197	CAPACITOR FXD TANT 2.2UF 10% 20VDCW
A4C7	0160-G161	CAPACITOR-FXD POLYE 0.01UF 10% 200VDCW
A4L1	9100-2276	COIL-MLD 100UH 10% Q=50
A4Q1	1853-0015	TRANSISTOR-SI PNP FT=500 MHz 200MW
A4Q2	1853-0015	TRANSISTOR-SI PNP FT=500 MHz 200MW
A4R1	0683-3015	RESISTUR-FXD FC 300Ω 5% .25W
A4R2	0683-1526	RESISTOR-FXD FC 1500Ω 6% .25W
A4R3	0683-2715	RESISTOR·FXD FC 270Ω 5% .25W
A4R4	0683-1525	RESISTOR-FXD FC 1600Ω 6% .25W
A4R5	0683-3905	RESISTOR-FXD FC 39 5% .25W
A4R6	0683-1525	RESISTOR·FXD FC 150CΩ 5% .25W
A4R7	0683-5105	RESISTOR·FXD FC 51Ω 5% .25W
A4U1	1820-1224	IC ECL TRIPLE 2-INPUT LINE RCVR MC 10216P
A4Y1	0140-0405	CRYSTAL 10 MHz

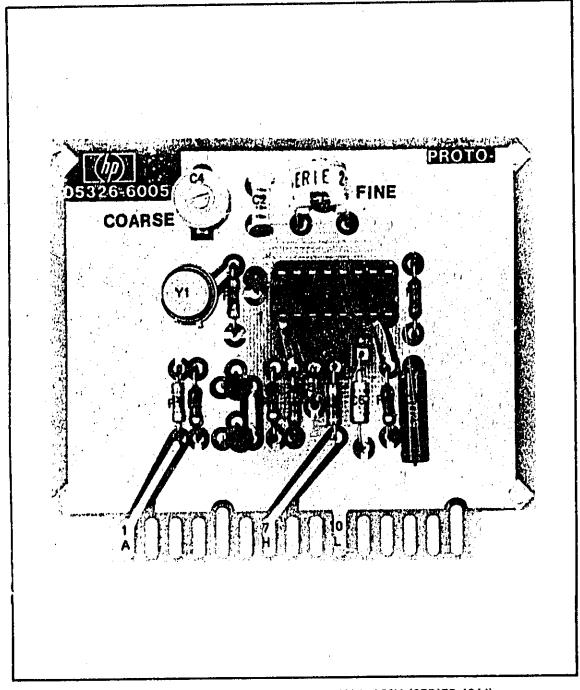
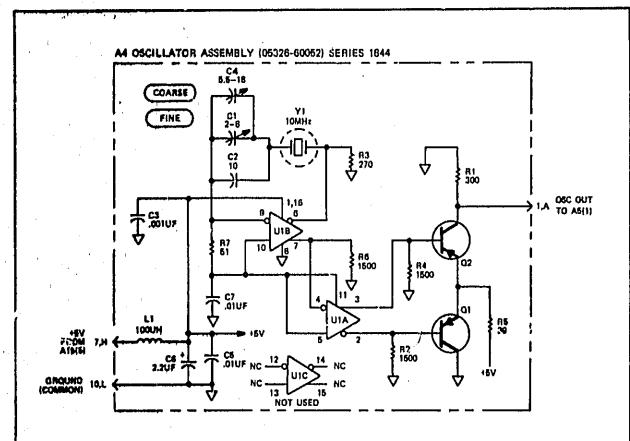


FIGURE 2. 05326-6005 10 MHz OSCILLATOR ASSY (SERIES 1844)



### **NOTES**

- 1. 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; INDUCTANCE IN MICROHENRIES
- 3. ASTERISK (\*) INDICATES SELECTED COMPONENT, AVERAGE VALUES SHOWN

### REFERENCE DESIGNATIONS

A4							
C1-7							
L1							
01,02							
R1-7							
וט							
Y1							

### TABLE OF ACTIVE COMPONENTS

REFERENCE DESIGNATIONS	HP PART NO.
Q1, Q2	1853-0015
	2N3640
UI	1820-0142
	MC10216P
YI	0410-0406

# MANUAL CHANGES MODEL 6328A/6327A PAGE 10

**CHANGE 9 (1936A)** 

Page 6-3, Table 6-1, Replaceable Parts:

Change A1 (05326-60047) series number from 1224A to 1936.

Change A151 from 3101-1598 to 3101-2383; SWITCH-SL DP3T MINTR 0.5A 125VAC FC; 28480; 3101-2383. Change A154 through 57 from 3101-1596 to 3101-2334; SWITCH-SL DPDT MINTR 0.5A 125VAC PC; 28480; 3101-2334.

Page 6-21, Table 6-2, Replaceable Parts (Option 004): Change A1 (05327-60034) series number from 1620 to 1936.

Change A151 through 53 from 3101-1598 to 3101-2383; SWITCH-SL DP3T MINTR 0.5A 125VAC PC; 28480; 3101-2383. Change A154, 55, 58, and 59 from 3101-1596 to 3101-2334; SWITCH-SL DPDT MINTR 0.5A 125VAC PC; 28480; 3101-2334.

Page 8-15, Figure 8-6, A1 (05326-60047) Schematic Diagram:

Change AT series number from 1224 to 1936.

Page 8-51, Figure 8-21, A1 (05327-60034) Schematic Diagram:

Change A1 series number from 1620 to 1936.

NOTE — The above switches are recommended replacements in all 5326A and 5327A counters.

E CHANGE 10

Page 1-3, and Page 3-4: Under "PERIOD AVERAGE" add:

Measurement errors as large as one period may occur due to coherence between the measured signal and the time base. The error can be reduced by averaging over larger samples.

### HP MANUAL CHANGES

MAKE ALL CORRECTIONS IN YOUR MANUAL ACCORDING TO ERRATA.

Check the following table for your instrument serial profix and make any indicated charges to the manual:

\*New or revised Item.

MANUAL TITLE: 5326A/27A

MANUAL PRINTEDSeptember 1973

MANUAL PART NO: 05326-90035

CHANGE DATE: 28 September 1976.

SERIAL PREFIX	. MAKE CHANGE	SERIAL PREFIX	MAKE CHANGE	SERIAL PREFIX	MAXE CHANGE
1446U	1	15440-00494	1-5		
15190	1-2	1641(5327 only)	1-6	<u> </u>	
1537U	1-3				
1544U	1-4				<u></u>

The 5326A/27A is furnished less the RACK MOUNTING KIT described in the manual. If ordered at the same time as the instrument, the RACK MOUNTING KIT described in the manual is available as Option 908 at additional cost. If not ordered with an instrument, the RACK MCUNTING KIT is available under HP Part No. 05326-60046. Disregard any manual references stating the instrument is supplied with a rack mount kit.

### **ERRATA**

Page 1-1, Table 1-1 Change Rack Mtg. Kit from 05326-60029 to 05326-60046

Page 5-5, 4. PULSE OPERATION:
In step a. set LEVEL (A) to "SLIGHTLY +" in place of PRESET

Change step c to read "Adjust pulse generator for positive output for 10 MHz repetition rate, 15ms pulse width for o.3 volts peak-to-peak indication on oscilloscope".

Change step d to read "Adjust counter LEVEL A control until counter triggers and counts. Check that counter displays the repetition rate, count light flashes, and trigger A lamp is ON. Record on test card."

Page 5-10, Table 5-4, Steps 5c and 5d: Change 0.65 to 0.9 ± .05V at A18U2(3). Change 0.90 to 0.8 ± .05V at A18U3(3).

Fage 6-4

Change AlS5,6 to part no. 3101-1594 Sw. Slide

Page 6-7/8, Table 6-1
Add A7C3 0160-2150 CAPACITOR: FXD 33pF 5% 300V FACTORY SELECTED
Add A7XU14 1200-0473 SOCKET: IC 16 Pin; with this change A7 05327-60031 is
REV B SERIES 1312A.

Page 5-8, Table 6-1
Change A7010 reference designator only to A7011
Change A7011 reference designator only to A7010.

Page 6-9, Table 6-1

Add to A9 Assy part no. 1200-0473 Socket I.C.

Change A9U2-U7 from 1820-0232 to 1820-0119 in "HP Part Number" and "Mfr Part Ho" columns.

Page 6-12, Table 6-1

Change A16CR4/5 to part no. 1901-0050 Di Si

Change A9R2, 4 9, 11 to part no. 0757-0440 R FXD 7.5K ohm 1% 1W

Page 6-13, Table 6-1 ChangeA17, L2 to part no. 9100-2260 Ind Fxd 1.8.H

Page 6-14 and 6-15, Table 6-1
Add "FACTORY SELECT" after description for A18R34 and A18R42.
Change A18U3 from 1826-0085 to 1826-0085 or 1826-0151 in HP and Mfr.
Part no. columns.

Page 7-2, Paragraph 7-21

Add the following sentence: "An HP Part No 05326-00033 adapter plate will also be required for mounting 36-pin remote programming connector J10."

Page 8-31, Figure 8-11, A7 schematic:
Add A7C3\* 33pF connected from XU14C(11) to XU14C(16) (ground).
Change REFERENCE DESIGNATION table from "C1,2" to "C1-3".

Page 8-40, Part of Figure 8-16
Replace Al5 component locator photo with attached Figure 1.

Page 8-45, Figure 8-18, Schematic Diagram Add Asterisk (\*) by A18R34 and A18R42. In TABLE OF ACTIVE ELEMENTS show 1826-0085 or 1826-0151 for A18U3 and 1820-0736 or 1820-0558 for A18U4. Change dc voltage at A18U2(3) from .65  $\pm$  .05V to .9  $\pm$  .05V and voltage at A18U3(3) from .9  $\pm$ .05V to .8  $\pm$  .05V.

# CHANGE 1

Page 6-11/12, Table 6-1 Change A15R6 to part no. 0698-5479 R FXD 8.20 5% Change A15XF1 to part no. 1251-3205 Cont Skt. (2 regd) Change A15F1 to part no. 2110-0487 Fuse 1/20A (Board blank to Rev D 05326-20020).

Page 6-16, Table 6-1 Change Part No. 05326-00032 Rear Panel to 05326-60049 Item 5050-0160 now total quantity 2.

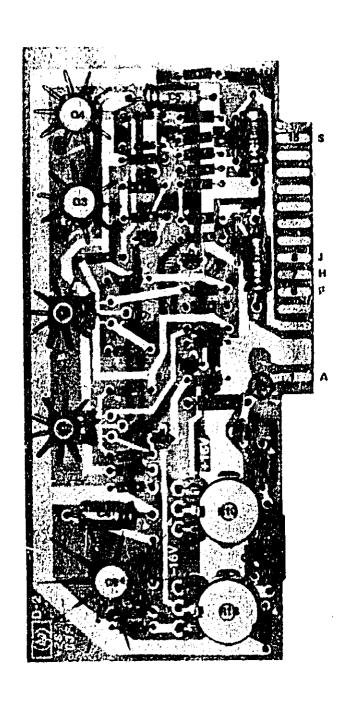


Figure 1. A15 Regulator Board Assembly Component Locator 05327-60020 Series 1312A or 1428A

# CHANGE 2

Page 6-13, Table 6-1 Change A18R29, 30 to Part no. 0698-5103 R FXD 430n 5% 3W (Add asterisk \* to indicate select on test) Add to A18R22, 23, 40 asterisk (\*) to indicate select on test.

# CHANGE 3

Page 6-7, Table 6-1 Add A703\* part no. 0160-2150 C FXD 33pF.

Page 8-31, Fig. 8-11, A7 Function control assy.
Add C3\* connected pin 11 U14 2 gnd.

# CHANGE 4

Page 1-4, Table 1-3 Specifications for OPTIONS
Add to Option OO1: § digit display. "Part of standard instrumentdiscontinued as an Option."
Add to Option OO3: Digital Output (for numerals and polarity only).
"Discontinued as an Option and included as part of the standard instrument."

Page 1-5, Table 1-3, Specifications for OPTIONS
Delete Option 010 Temperature Compensated Oscillator. This Option is discontinued and is no longer available.

Page 7-1, Options and Manual Changes, Paragraph 7-14
Delete second sentence.
Paragraph 7-18
Add "Part of Standard Instrument - Discontinued as an Option".
Paragraph 7-22
Add "Part of Standard Instrument - Discontinued as an Option".

Page 6-9, Table 6-1, A9 Replaceable Parts
Replace Λ9 table for 05326-60008 with table for 05326-60025 A9 on
Page 6-18 of Table 6-2.

Page 6-18, Table 6-2
Add parts for Option 003 as part of standard instrument.

# \*\* CHANGE 5 \*\*

Page 6-19 Table 6-2 Add A1C15 part no. 0160-3878 C Fxd .001µF 100VDC

Page 6-17 Table 6-1
Add XF1 part no. 2110-0465 Fuse Pose CAP
Add XF1 part no. 2110-0470 Fuse Post (Replaces 1400-0084 Fuse Holder Extr Post).

# CHANGE 6 (5327A only)

Page 5-10, Table 5-4, Paragraph 5 Prescaler Adjustments
Change paragraph 5-g to read as follows: "Reduce output lever until
counter's display becomes unstable. Alternately adjust Alara Alara for
a stable display. Repeat procedure until unable to obtain a stable display.
Increase signal level until display just becomes stable and make any final
adjustments of Alara and Alara."

Page 6-13, Table 6-1, A18 Replaceable Parts
Add A18C30; 0160-3879; CAPACITOR-FXD 0.01 iF 20% 100 VDCW OER
Change A18R22 and A18R23 from 0698-4131 (56 ohms) to 0698-3111; R FXD 30 OHM
5% .125W CC
Change A18R29 and A18R30 from 0698-5103(420 ohms) to 0698-5177; R FXD
820 OHM 5% .125W CC

Change A18R34 from 0698-8073 (1600 ohms) to 0698-5178; R FXD 1500 OHMS 5% .125W CC Add A18R53; 2100-2633; R VAR 1000 OHMS 10% COMP SIDE ADJ; Add A18R54 and A18R55; 0698-3374; R FXD 20 OHM 5% .125W CC

Add A18R56; 0698-6283; R FXN 10 OHMS 5%; .125W CC

Page 6-13 and 6-15, Table 6-1, A18(05327-60033) Replaceable Parts: Change A18 from SERIES 1544 to 1645
Add A18R57; 0698-3133; RESISTOR FXD 100 OHM 5% .125W CC

Page 6-14, Table 6-1
Add A18L3; 05303-80001, 1, COIL, FXD, RF PEAKING
Add "FACTORY SELECTED" to A18R34 and A18R42 "Description".

Page 8-45, Figure 8-18, A18 Prescaler Assembly Schematic.

Add A18C30 (.01 F) between common and the "+5V" end of A18R34.

Add A18R53 (1000 ohms) variable resistor between +5.2V and -5.2V. Connect junction of A18C30 and A18R34 to arm of A18R53 in place of "+5V" as shown on schematic diagram.

Change value of Al8R34 from 1600 to 1500 ohms. Change Al8R22 and Al8R23 from 55 to 30 ohms. Change Al8R29 and Al8R30 from 430 to 820 ohms.

Add A18R54 (20 ohms) in series between A18U2 pin 11 and the junction of A18R23. A18R30 and A18U3 pin 5.

Add A18R55 (20 ohms) in series between A18U2 pin 14 and the junction of A18R22, A18R29, and A18U3 pin 4.

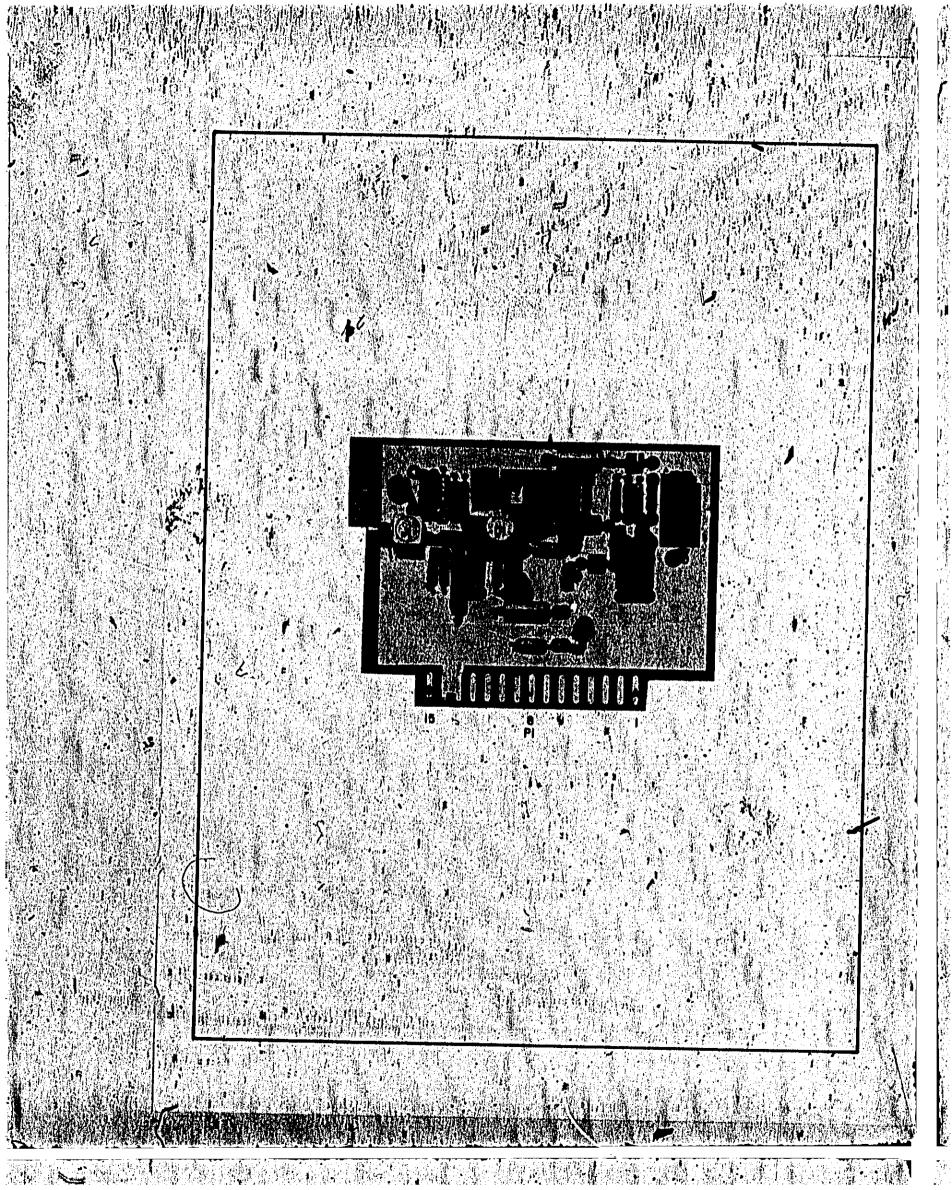
Add an asterisk (\*) adjacent to A18R54 and A18R55.

Add Al8R56 (10 ohms) in series between Al8Ul pin 2 and the junction of Al8U2 pin 5 and Al8R56.

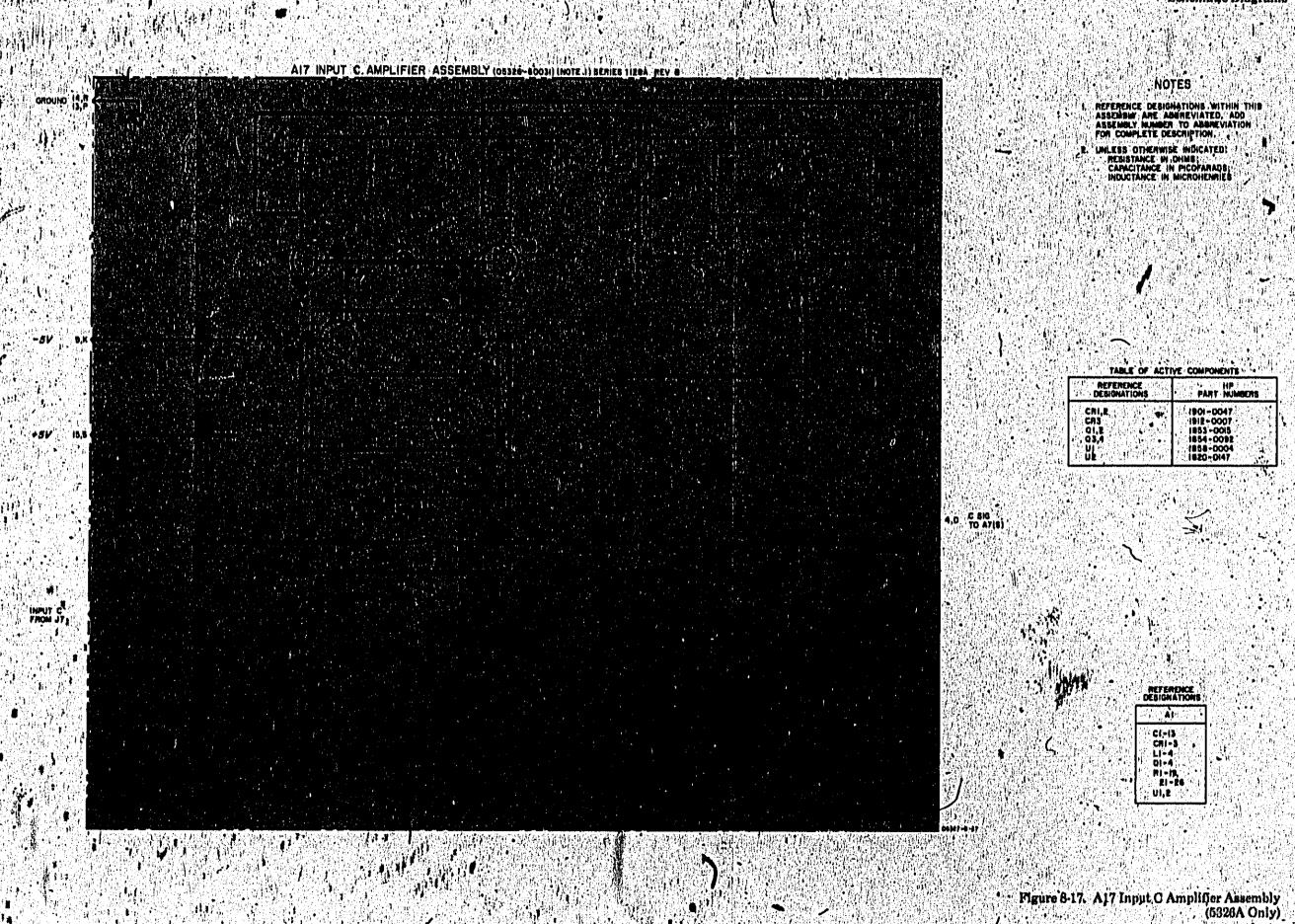
Change SERIES 1544 at top of schematic to 1645.

Add 100 ohm resistor R57 in series with +5V input to pin 10 of SCHMITT TRIGGER A18U3.

Add A18L3 in series with A18U3 (13) output line. Output circuit trace is cut and one end of A18L3 is connected to the junction of A18U3(13) and A18R34. The other end of A18L3 is connected to the junction of A8R44 and the coil from A18R42. Add asterisk (\*) adjacent to A18R22, A18R23, A18R29, A18R30 and A18R40. In Table 6-1 for these resistors add "FACTORY SELECTED VALUE" to description.



8-41



### A18 PRESCALER OPERATION

The prescaler board serves as a direct amplifier trigger or as a divideby-ten amplifier trigger, with the function controlled by the frontpanel input selector switch. With the switch in the PRESCALE position, the circuit performs as follows:

The signal is fed into the 500 input of J1, 1U1 limits the input level to about ±1 V and provides protection up to 5 V rms. There is about 2 dB loss through U1. The signal is passed to U2 amplifier Schmitt trigger, which is biased for sensitivity by K1. The Schmitt trigger threshold is about 70 mV and triggers independently of frequency. The square wave from U2(11) is divided by two and again by five in U3 and U4, respectively. Q2 translates the signal to ECL levels, before presenting it to the data switch.

At the same time, U2 amplifier is supplying the direct triggering network with the input signal. Of accouples the signal and eliminates the effect of U2 amplifier drift. U7 consists of a dual-differential amplifier, which converts the input voltage to an output current which is driven through tunnel diode CR2. The diode performs a Schmitt trigger function and squares the output. R2 is used to vary the bias current through CR2 to control the sensitivity, Q1, Q3, C8, and R18 differentiate the signal and pass the negative pulses at an ECL level to U5 data swich.

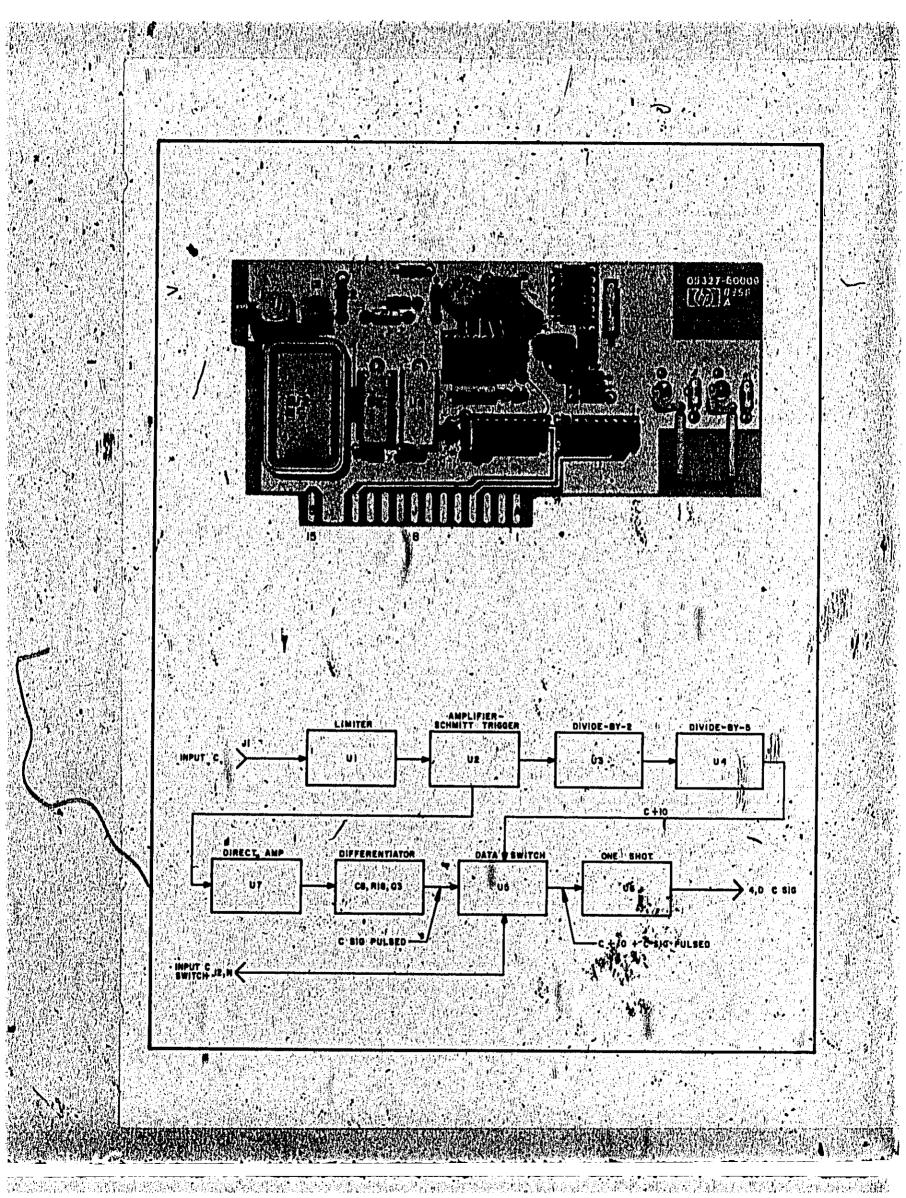
The data switch is controlled by the input selector switch (TTL high at U5(2) \* Direct; (TTL low at U5(2) \* Prescale) and connects either the direct or prescaler signal to A7. Function Control by way of the one-shot, U6. The one-shot output goes high (U6(4)) when the input goes low. The output goes low again after about 12 ns when the level changes have propagated through the gates in a domino effect.

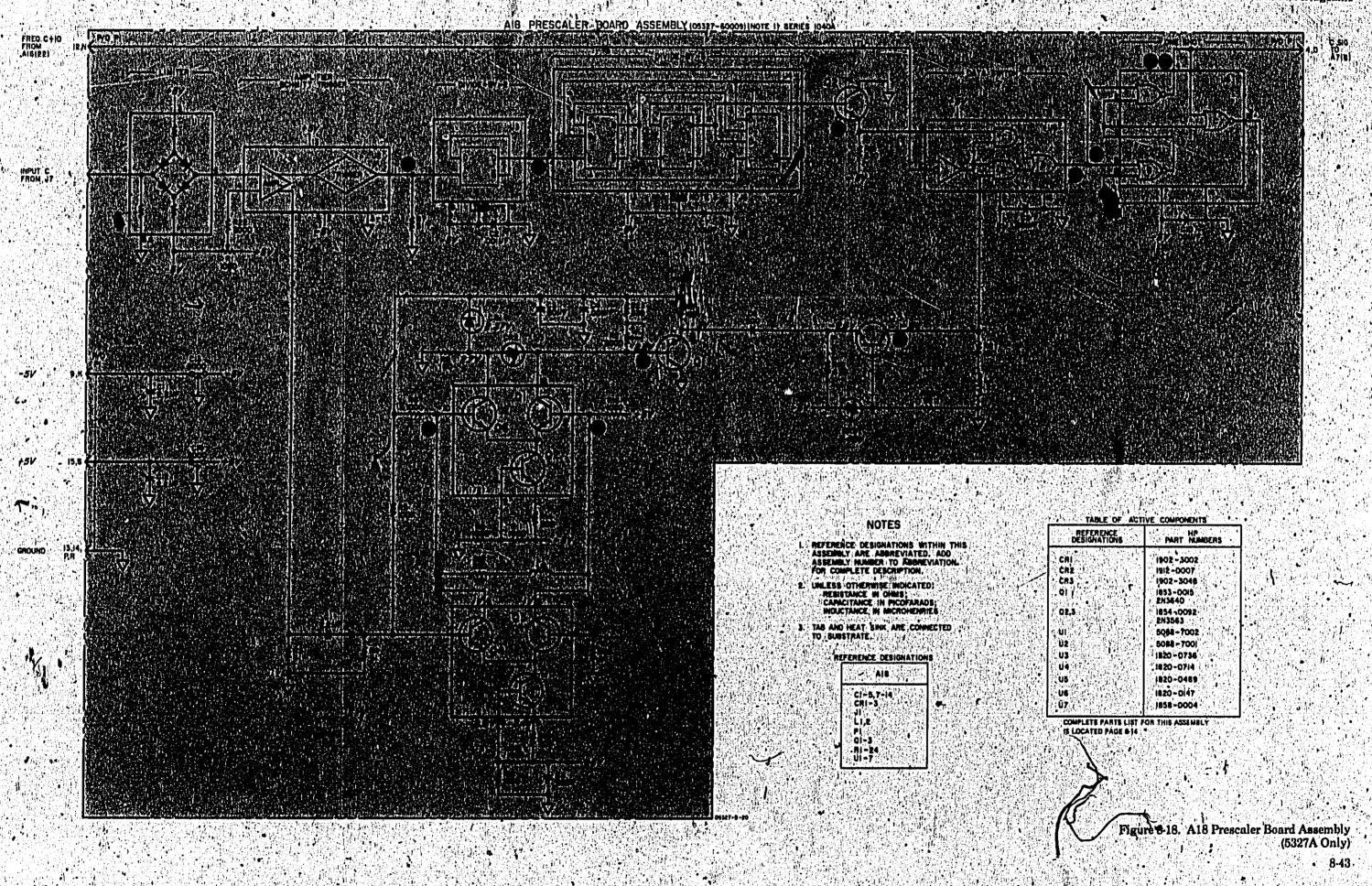
# ALE TROUBLESHOOTING

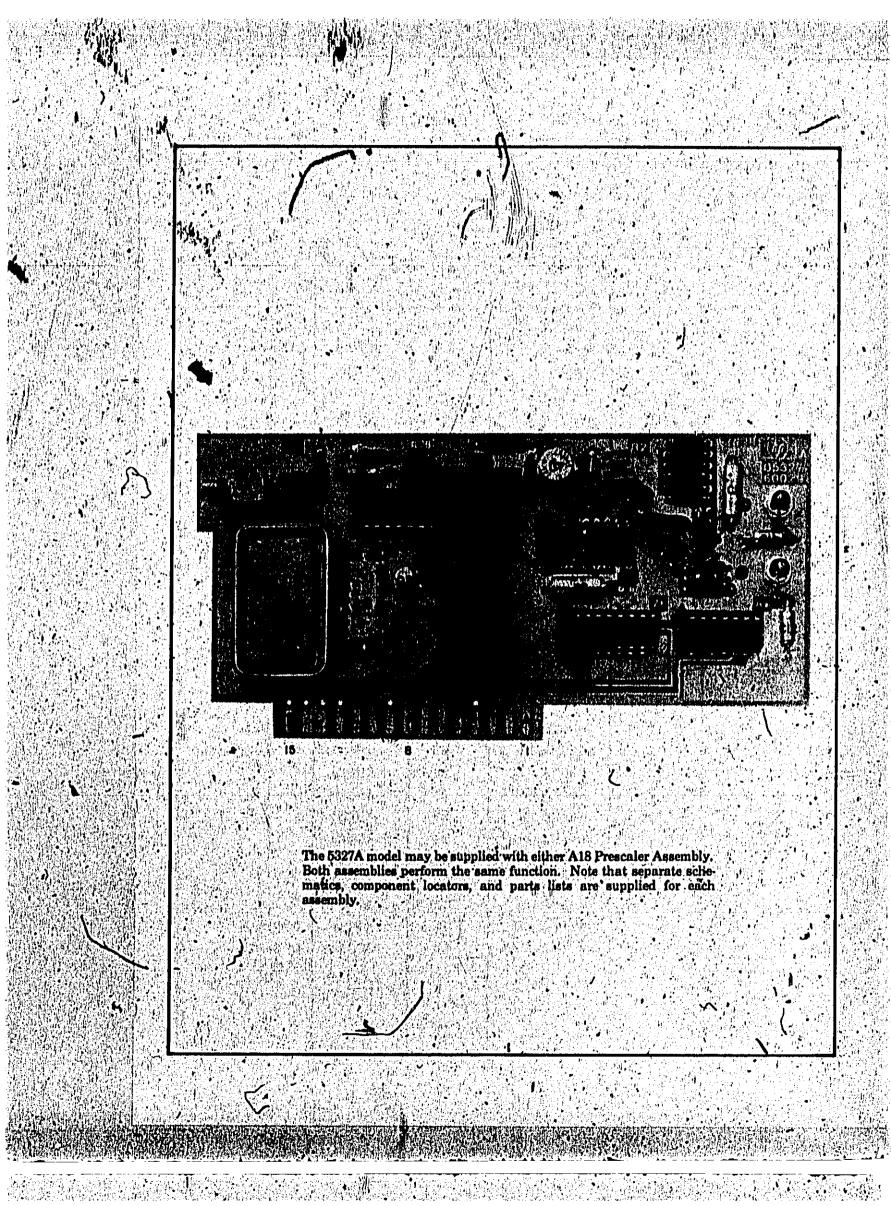
Check for operation by placing the input selector switch in both direct and prescale positions. If the counter does not work with the switch in either position, the trouble is probably in U1, U2, U5, or U6. In the direct mode, start by checking in the tunnel diode (CR2) area; check for proper waveforms of 5 and 6. For the prescale mode, start by checking the output of divided by two circuit, U3(6).

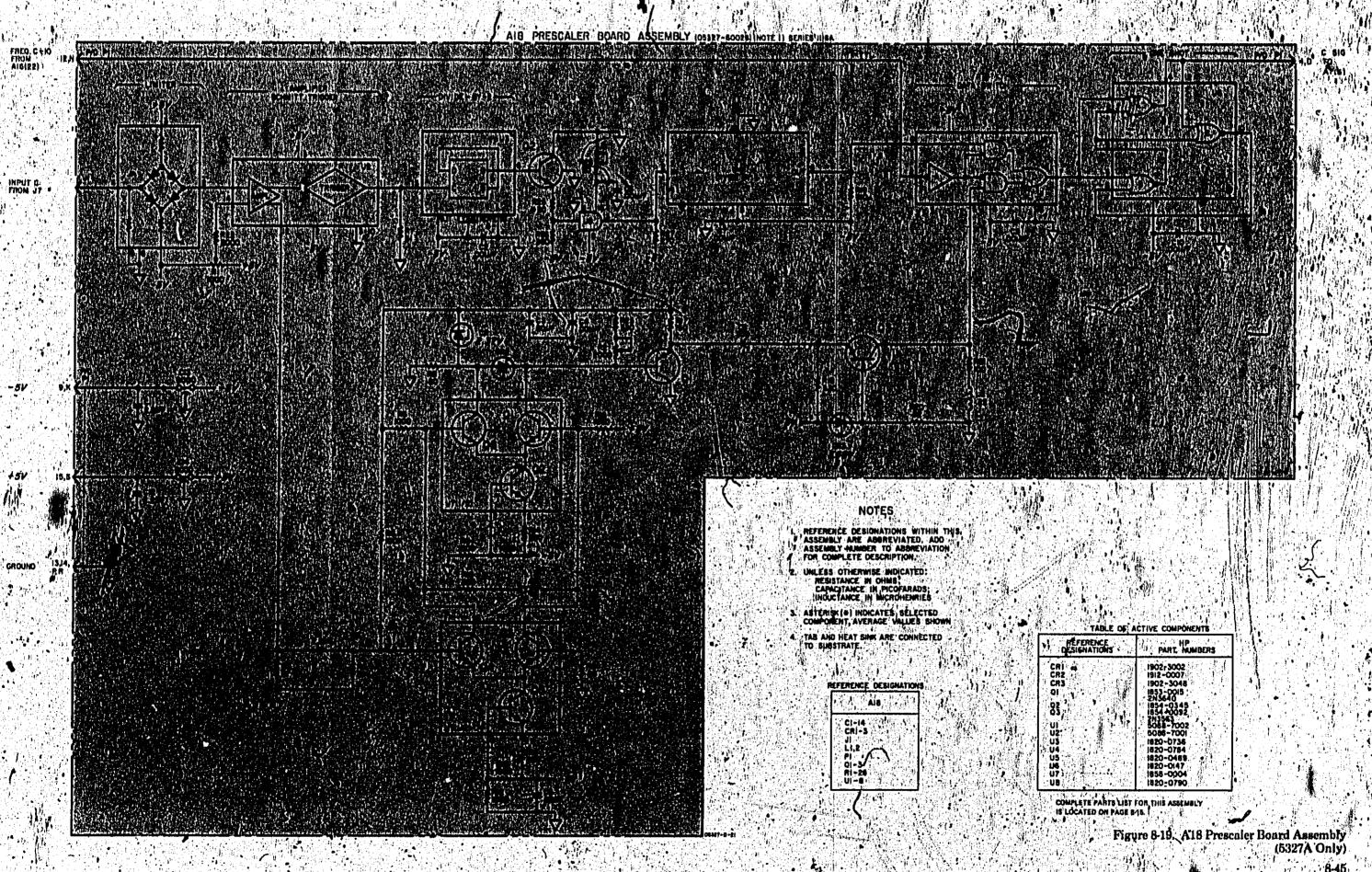
Figure 8-17 117 INPUT C AMPAIFIER ASSEMBLY (5325A ONLY)

(See Page 8-41)



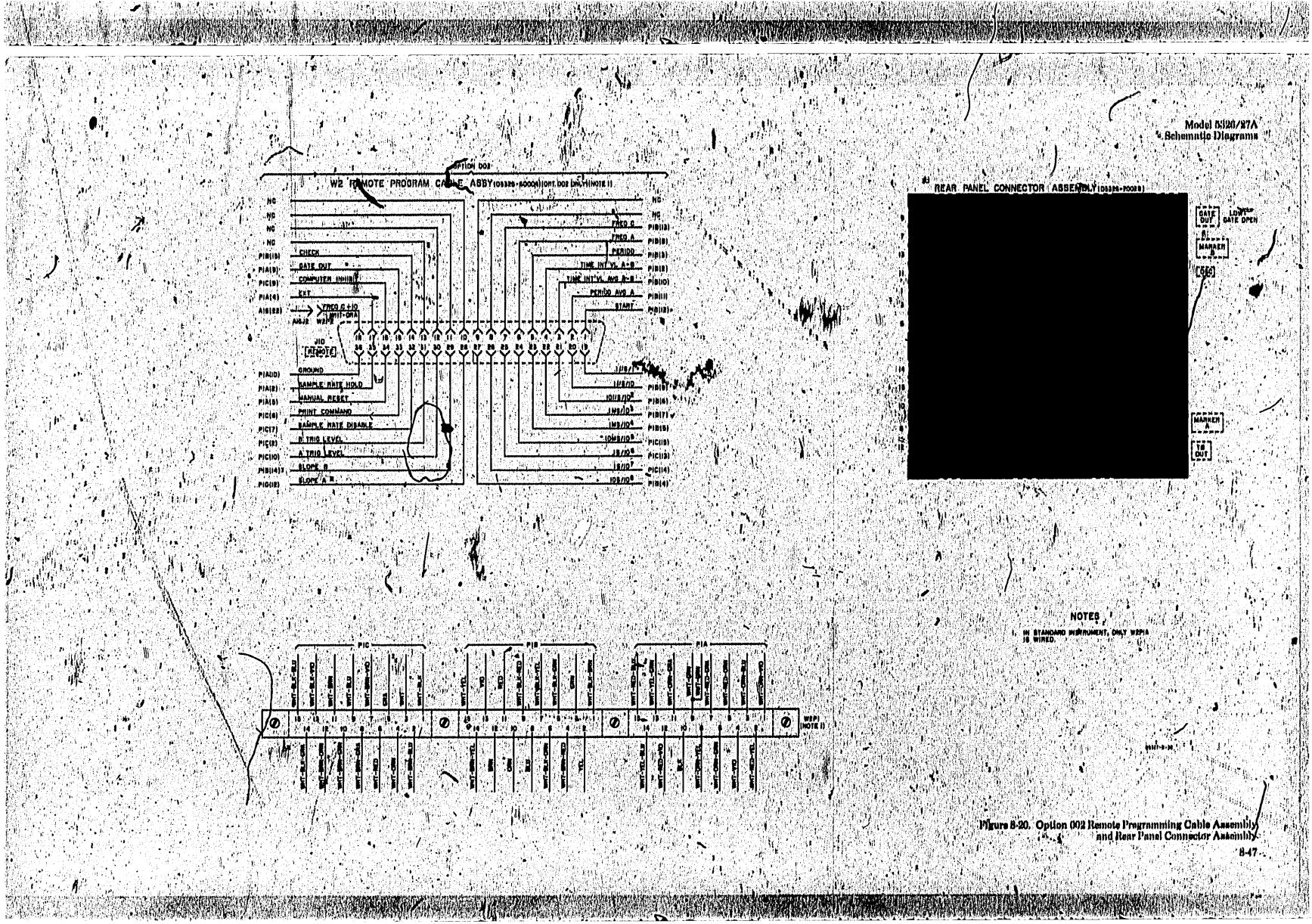






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o connection 0 Whitelik C1 o connection 10 Whitelik C1 o connection 11 Whitelia C1 o connection 12 Whitelia C2 o connection 13 Whitelia C3 o connection 13 Whitelia C4 o connection 13 Whitelia C4 o connection 13 Whitelia C4 o case C4 o c		D- Rpaul	A10(21)	363 A 4 A 4 A 4 A 4 A 4 A 4 A 4 A 4 A 4 A	<b>从有事。在除版教育,就是以下</b>		医痛性尿炎 医无视眼外
o connection 11 Wht-Brit C0				<b>就是一种飞机</b>	[26] 推翻 中部海绵 医甲基基酚		C. 多新 6数 性 No.3 2 数 数 数 数 数 1
Commission				· 温泉305.特殊11/3	30公共2006年3月2日(前日安治16月26)	)) / <b>(10</b>	
White   Bis   XA3(B)   L = Check   Sis   Out				建第二体位键 【数	初始6.48.68.68.69. <b>通过</b> 社 从示法!		n ontraction
The content of the				连续联系 说话 医耳样	<b>,可以是一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个</b>		6.74.74.15.15.15.15.15.15.15.16.16.16.16.16.16.16.16.16.16.16.16.16.
Total   Tota	3 ¥ 5 T N	数位 13数40 年16.0元	的。新1976年到新5日22日多	智慧的现象 贫	<b>新教育的机器可用的代数程序的</b>	// This ?	"多思图的" 医红色流 海绵的复数形
	7M (1387)	લંક હોંગ માટેલ લાગે		Co	WhtBlu		mputer Inhibit
##/10   Whi-Bik-Brn   B)   A16(30)		H • Int	双重运动 医双甲基酚酚 医二甲酚		. WhiNip		
		L = Enable	A16(22)	(W21°3)	<b>与专业等的经济关键</b> 与网络系统经济设计	18	uq.13 + 10
May 10			BONG BARRASAN BURGARAN AND AND AND AND AND AND AND AND AND A		医皮肤性 医乳腺性 医多种 医多种 医多种 医多种 医多种 医多种 医多种 医多种 医多种 医多种	20 10 10 10 10 10 10 10 10 10 10 10 10 10	
##/10)	<b>*</b>		: 전환경 및 선생님은 10명 (1988) - 10명 (1988) - 10명 (1988) - 10명 (1988) - 10명 (1988) - 10명 (1988) - 10명 (1988) - 10명 (19	100	<ul><li>ないかかには、1000日まじたは、1200年6月2日</li></ul>	21	44/10
ms/10 24 Wht-Blk-Blu C15 A16(27)  1/10 25 Wht-Blk-Vio C18 A16(24)  1/10 20 Wht-Blk-Gra C14 A16(25)  1/10 27 Wht-Blk-Red B4 A16(21) L=Engblk  1/10 28 Wht-Bra-Orn C12 XA2(13,P) L=Minus			<b>发帝国共和国的国际工事中国的工程。但于17</b>	经现在分词 经制制 [6]	化异戊基苯甲酚基 医动物毒类菌类		
/10   20   Wht-Blk-Gra   C14   A16(25)   1   27   Wht-Blk-Red   B4   A16(21)   L = Enable   28   Wht-Bra-Orn   C12   XA2(13,P)   L = Minus			作的转动数据 经营品数据支票法 医科	Tigata Addadd Laa	新食品的 经市场运动 (1800年)   11	医多种动物 医多种性皮肤 医骨盆	
Whe Blic Red   B4   A16(23)   L = Encols			的复数形式 医甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基	经保险 医溶液 医溶液	(有)医疗性强症度 法持续强强 解除法。 [[5	(4) 的 医克勒特氏 医自己性结合 医	(3) おけば間 1またい信息 ■
Pp A C12 XA2(18,P) L = Minus	创	L=Engole	高级数据高级增强人 (1984)	<b>种的特别性的人</b>	"你说:"我这么好看到这么好像我的人会我们们看他们看到	图集中系统 电辐射 ■6	
		L = Minus	XA2(18.P)	1. <b>化</b> 电子数据 1. 数k 1. 数k	addin 2018年的1888年11月月20日本公司589月7月2日日		nno A
pe B XA3(13/P) L = Minus Open = Plus		L - Minus	XA3(13,P)	BU	Wht Brn Yal	12. /20	pe IS \\ \\

	植物解析特殊的原本的	a Portalis ir tigle said piediesis i	计分别 机高温器	一点点 40年 1947年	
, illunction	J10 Pin No.	Wire Color	W2P1 Pin No.	Circuit Board Terminals	Lavel •
A Trig Loyel D-Trig Loyel	300	Whi-Bm-Om Wht-Bm-Blu	Ö10 •	XAB(I,A)	73 V 16-31 V
Bample Rate Disable Print Cominand	)12 (*) (33	Wht Brn-Vio Wht Brn-Gra	07 CB	A16(11) XA6(8)	+3 V, to -3 V L = Diamble L = Causes Print
Manual Reset Sample Rate Held Ground	95 30 4	-Whi-Red-Orn (Whi-Red-Yal & Blk	. A2	A16(6) A16(4)	L = Reset L = Maintain Display
	<b>北京集合制第二章</b>	4 +0.8 V (Output) 'H	A10     24V, L54	Ground .	



Model 5820/27A Beliematie Diegrams

### OPTION 003, DIGITAL NECORDER OUTPUT

Option 003 includes cable passimbly W1, and rase panel connector-JD. The counter (A9 Display Assembly) provides #8421 BOD and control line injute and outputs for use with a printer or other data storage devices.

The anglinomior lines (39-17) 18, 42, and 43) supply overflow, plus, and minus putputs as follows:

UNCTION	ВОП	1.
Overflow All Other Timos	H.H.H.H	

When the print command line at JB(48) goes low, it indicates that the counter line completed a measurement and the data output may be interrogated. When the inhibit line is held High, the data output is maintained. The line must go high less than 30 us after the print command goes low. The to V reference line (J9-25) has a 1K source impedance and is used for data level references. The 0 volt or ground reference connects to JB(24, 50).

# PPTION 004, EXTENDED REMOTE PROGRAMMING

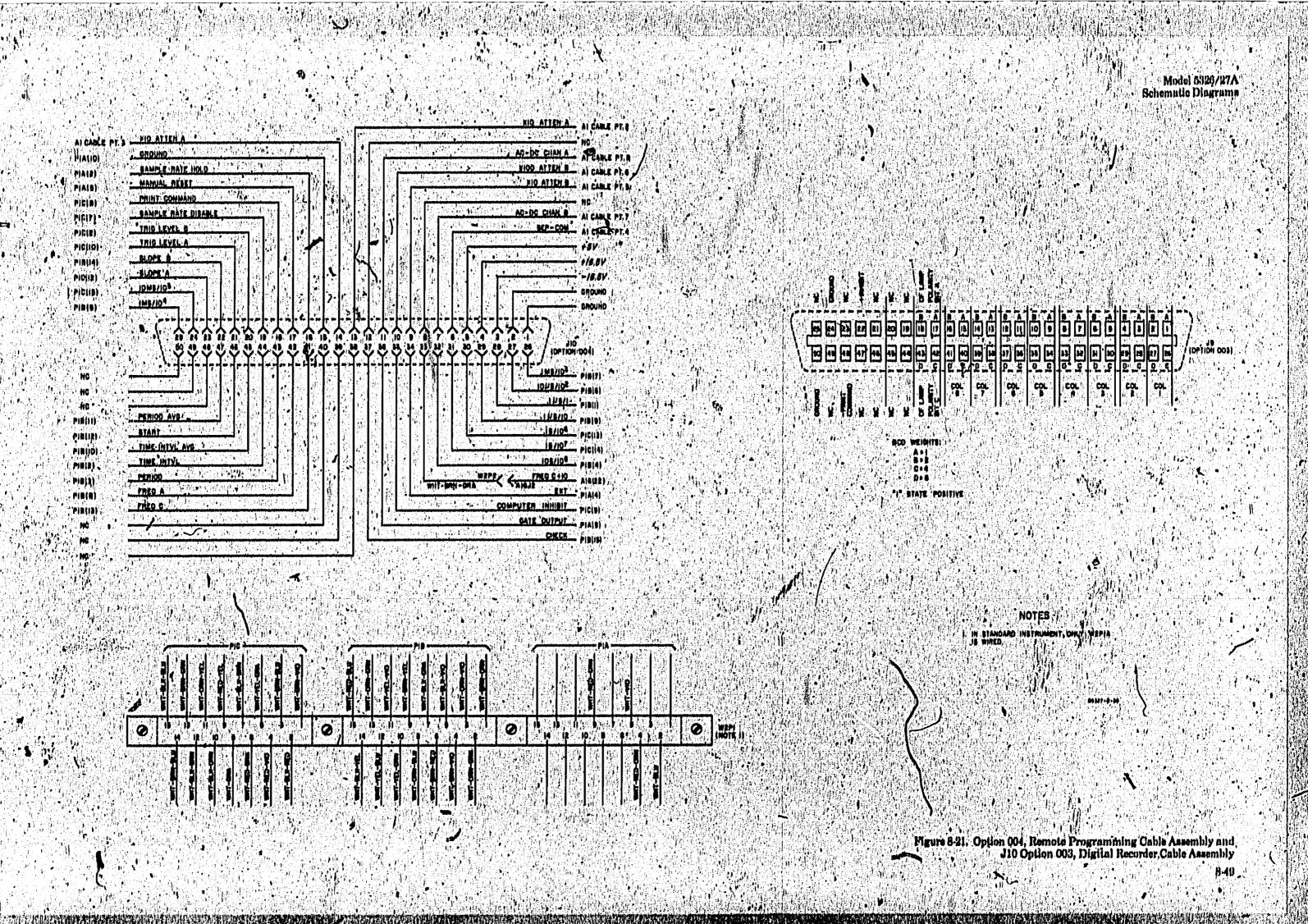
See Section II for remote programming information.

# Oplion 004 Pin Connections

Function	JIO Pin No.	With Color	W2P1 Pin No.	Circuit Board. Terminale	Level
Oround ,					
<b>Oround</b>		BIK			
In,5 V Output		, Om			
+16.6 V Output		Yel			
18 V Output		, Om			
Sep Com		Blu		Al Cable Point 4	L*Com
Ac-Dp Glian B		# Pay VIO Constraint of the Co	· 1000年1月1日	At Cable Point?	L=Do
No connection XIO Attanta		Ora		Al Cable Point 6	H Ao
K)00 Allen B	10 ·	Wheble		AL Cable Point 6	Bee Bection_II
Ac-De Chan A		White		A1 Cable Point 8	L. Do
No compaction.	12.	WhtRed			li • Ao
XII) Atlen A		Whlom		Al Cable Point B	
X 100 Atten A	14	Whtevel		Al Cable Point !	Bee Bection II
	1111				

Punction	Jio Pin No	Wire Color	WaPi Pin No.	Circuit Bonrd Terminata	Lavel
<b>Dround</b>	118	DIK WE TO	A10		
lample Rate Hold Junual Reset	10.10	Wht Blu Wht Vio	<b>A2</b>	A10(4)	14 Maintain Diach
rint Command	1) 18	WhtGra	CB	(8)01A (8)0AX	L = Reset L = Causes Print
ampie Rate Djaable	10	Wht Blk Brn	<b>≁</b> Ci	Alg(II)	1. + Dianbia
rig Laval 13	20	Whi Blk Rad	O2	XAIKI, A)	13 V to 3 V
rik Lovel A		Wht Blk Om	Olo .	XAXI, A)	13 V to 3 V
Inpe B	222	Wht Blk Yel	Bly	XA3(18, P)	L * Minus
lope A	21	Wiii-Bik-Gm	Oia	(q, BISKAX s	Open * Plus !!!
					Open * Plus
) ma/10°	24	Whi Dik Bid;	CIB	A10(27)	L. Enuble
m=/10!	25 //	Whi lik Vio	lun's	A) ((26)	
ma/10 <sup>1</sup>	26	- Whilblik Grn	, D7, 10,	A16(20)	
144/10	• 27	Whl Brn Red	130	A10(2H)	American State (State )
μο/1,	24	Wht-Jim-Om	BI	V10(00) 4	
ub/10	20	Whillen Yal	10	A10(81)	
a/10°	.30	Wht Brn Om	OIR	A10(24)	
N/10"		Wht-Brn-Blu	. 014	A10(26)	
reg C+10	82 83	Wht Brn Vio	134	A16(23)	<b>V</b>
	<b>M</b>	Whi Drn-Ora	W2P2	A10(22)	De Enable
		Withlad-Om		XAII(A)	III + Int
omputer Inhib	135	Wht-Red-Yel	Cl	XAG(4)	L' Inhibit
nte Output	30	'Whi-Rad-Gri	N N	XAMP) V	H . Onto Cloned.
lock					L # Guta Open
o connection	10.11	Whi Rid Blue	(5.5 B) 15.40	XAB(D)	L = Check
o connection	89 and	WhitRad-Vio WhitRad-Gra	C4		
o connection	40	Witt-Orn-Yel	Col.		
wi C	1	WKLOm-Omi	Bis	AINON	La Enable
	42	Wht Om Blu	138	A10(21) A10(18)	4
rjod .	30	Wht Om Vh	10	A16(17)	
ma Intvl	44	Wht-Om-Gra	132;	A10(15)	
me Intel Avg	45 (	WhuYel:Orn	310.7	A16(16)	Li= Knable
(* 16. júnos) (* 16. júnos) 40. júnos (* 16. júnos)	40 1	Whi Yal Blu	312	A10(14)	L'a Blart
					Open - Stop
riod Ave	47	Wht-Yel-Vio	Bit	- <b>Alo(13)</b>	L'e Comble
p connection		Whit Yol-Ora	On .		
o connection	40	Whi Om Blu	( Oii:		
lo connection	1	Whit amylo	OI .		

i inter



### A1 OPTION 004 OPERATION

The remote programmable attenuator, board attenuates the input signal and routes it to; the amplifier boards. The signals from inputs A and B are routed through identical paths.

In the X1 position Ki is closed and the signal is routed directly to K4, which is open with ac coupling and closed with dc. R30 provides the 1 M0 input impedance. R34, R35 and O7 compensate for high frequency roll-off and also limit the input current to Q1A. Diodes CR25 and CR27 limit the voltage at the input of Q13A to \$5.8 V. Q13A operates as a source follower with a high input impedance and a low output impedance to the amplifier boards. Q1B operates as a source follower, supplying the amplifiers with the dc trigger-level voltage generated either by R49, (1832; and CR33, or from an external analog input [J10]. R46, 44, 42, and C13 filter the trigger-level voltage.

In the X1 position, K2 and K4 are closed groviding a direct path for the input signal to the gate of Q13A [In the X10 position, K2 is open and diodes CR7 and CR9 are turnled on, shorting R16 to ground. R12, R14, and R16 form the do attenuator. The sc (high frequency) attenuator is formed by C1 and stray capacitance in the circuit.

In the X100 position, K2 is open, CR7 and CR9 are off, and CR21 and CR23 are turned on. C3 and R28 are thus connected to ground, R12, R14, and R28 form the do portion of the attenuator, while C1, C3, and stray capacitance form the high frequency portion of the attenuator.

The circuitry to drive AC/DC relay K4, and SEP/COM relay K1 is provided by U3 A&C. U3's output is at HTL levels (+12 V, +1.5 V) and thus is sufficient to drive the relays directly. U3's input is at DTL levels and is compatible with remote programming levels. K2 is driven by Q7 and is open when CR7 and CR9 or CR21 and CR23 are on.

Diode pairs CR7 and CR9 are driven by emitter followers Q3 and Q6, which, in turn, are driven by HTL gates U2D AND, U2C, U2's power supply, consisting of Q1 and Q2, is 18,9 V and 5.6 V rather than the usual +15 V and 0 V. This special bias moves the HTL input three-bold to +1,9 V, rather than the normal +7.5 V. U2D can now be driven by DTL gate U1B. The output swing of U2D is 19-V to -4 V, providing the diode quad CR7 and CR9 with positive turn-on and turn-off signals. R9 is adjusted to minimize the offset voltage of the quad.

Schematic Diagrams

Model 5328/27A

### ADJUSTMENTS

1	Sel	1,	۽ آي <sup>ا</sup>	1,31	٧,			ŹУ				ú.	, ,	11	41	()	3)	ា		1		,A	311		3	'n,	14	. (	in.	Ì
15 h	4	į,	1	•	T	ΊN	E	B	Á١	310	3	í		,		1	11	Y	1	Ų.	3,1	ψį		Ġ	11	ı,	١,	0.	ľ	i
. 75	):	1	i į	- 7	A	n	'n	O'	į,	7	7					ì	1	r	়া	9	'n.	4,	ď,	1	ď.	<b>{</b> }	ų,	4	>	Ì
	$L^{1q}$		1	Ì,	R	ΝÌ	771	วัก	'n.	al.	bi)	ŧ,	•	្នា	, (	ļ,					΄.	Į,	1	ď		<u>'</u>	17	8	'n	í

1. Using an HP 412A or equivalent, measure voltage at CHANNEL A lack.

ATTEN A/B

- 2. Adjust Rise for sel mV reading.
- 3. Mensure voltage at OHANNEL Black.
- 4. Adjust R0 for stl mV reading.
- 5. Set'A and B attenuators to X100 position.
- 6. Menauro voltage at CHANNEL B juck.
- 7. Adjust R32 for <11 my reading.
- B. Mensure voltage at CHANNEL A Jack
- 9. Adjust Rill for <\*1 mV meading.

# NOTES

I, REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ASSEMBLY AND ASSEMBLY MARKET TO ASSESSED FOR COMPLETE DESCRIPTION.

R. LIMILES CTHENWISE MOICHTED

# TABLE OF ACTIVE COMPONENTS

		PART NAMES
2	cm) -3,6,15,10,20,31	1910-0016
	CR4 CR5 CR7,0,16,64	1902-0025 1902-0067 1906-0024
	CR19,10,R1,R2	1904-0085
ď	19, 20, 29, 34, CR25-20	1901-0040 1901-0378
	O)	1894-0039
i.	034,74,11,12	1883-000 1864-0215 1863-0006
1	95.0	1655-0334 1880-0874
3		1920-0497

COLON CESTINATION

GIN + BV

B WHT-DRN JID(13)

WHT-PEL JID(14)

WHT-PEL JID(16)

WHT-PELS JID(16)

WHT-PELS JID(17)

WHT-PELS JID(17)

WHT-PESS JID(17)

WHT-PESS JID(17)

A1,0PT,004

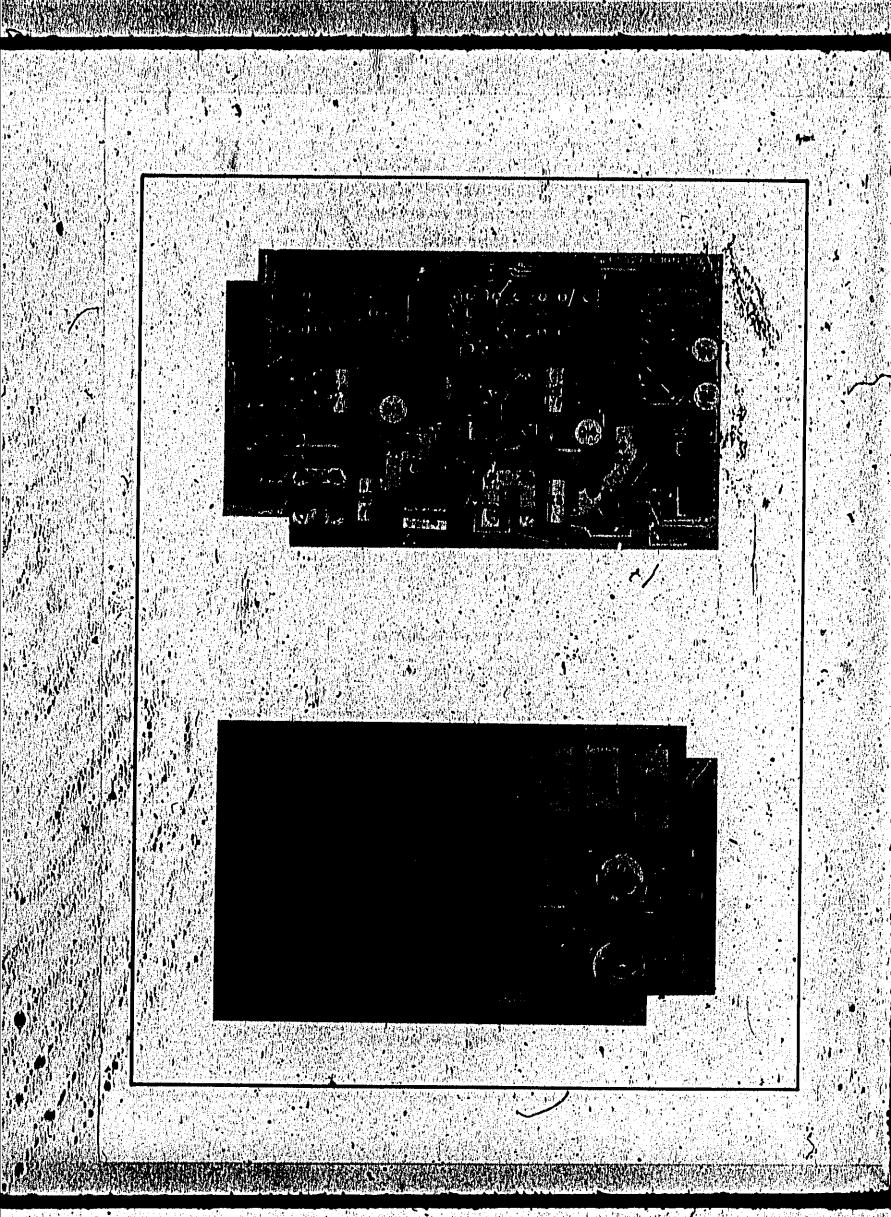
Bié Bi

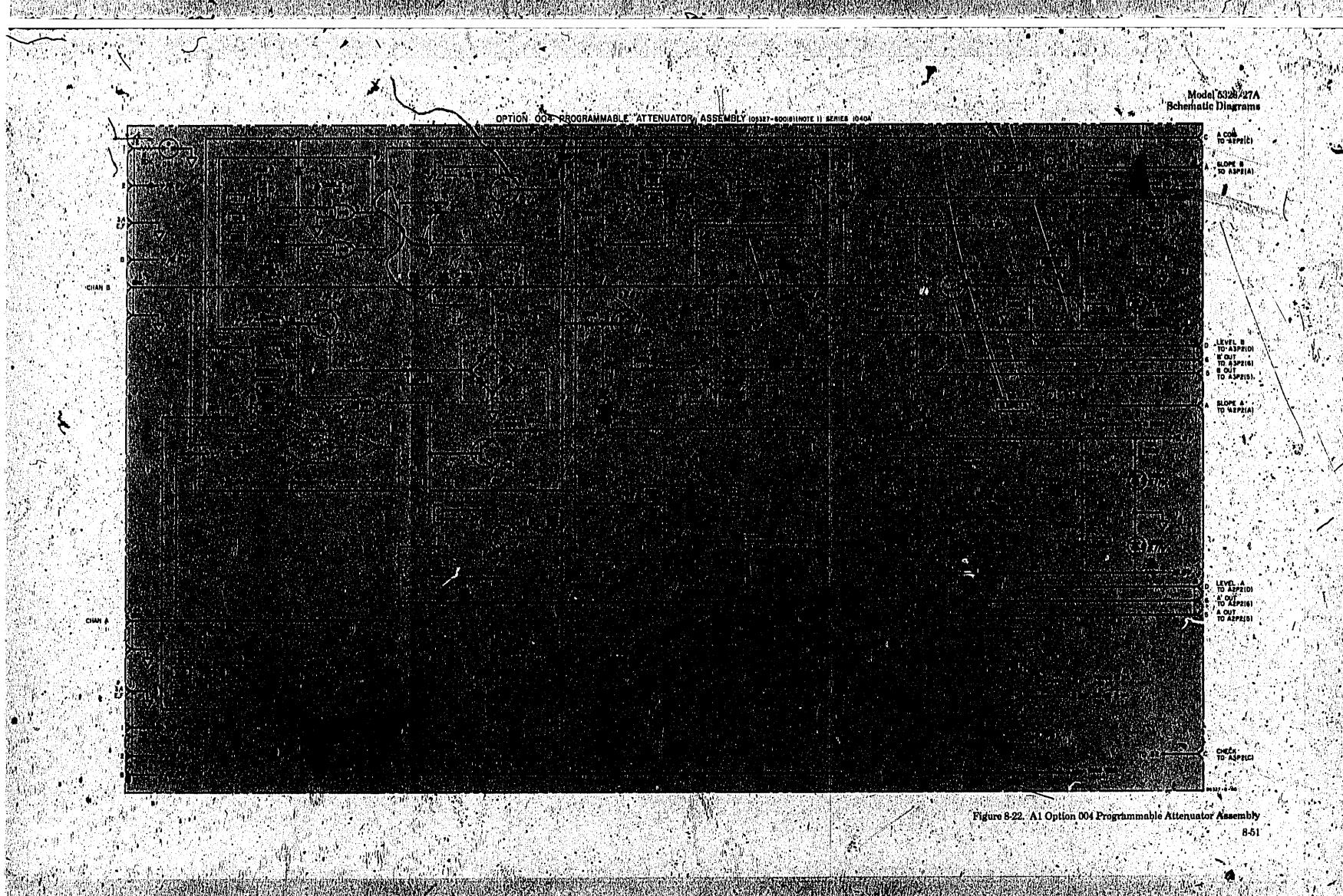
COMPLETE PARTS LIST FOR THIS ASSEMBLY IN LOCATED ON PAGE IS IS.

Pigure 8-21 OPTION 004, REMOTE PROGRAMMING CASLE ASSEMBLY AND J10 OPTION 003, DIGITAL RECORDER CABLE ASSEMBLY

(See Page 6-49)

MORE DATA UNDER THIS FOLD







MANUAL DESCRIPTION

INSTRUMENT: 5325A/5327A Timer Counter

BERIAL PHEFIX: 5326A (1136A) 5327A (1120A) DATE PRUNTEDI MAR 1972

01226 90026

CHANGE DATE: May 7, 1973

(This change supersades all earlier dated changes)

- P Make all changes listed as ERRATA.
- Check the following table for your instrument's serial prefix or serial number and make listed change (s) to manual, y

KATATAN KANCALAN MENGANISAN

1	is not be result as second tables. If it is not a second to the second table is the second		
	IR YOUR INSTRUMENT HAS BERIAL PRIEFIX FOR BERIAL MARKET	MAKE THE FOLLOWING CHANGES TO YOUR MANUAL	
; ;	OR BENIAL NUMBER	TO YOUR MANUAL	
1	1136A (6326A)	到(2,3%)()()()()	
	1144A (6326A)	1, 2, 3, 4, 6	
	1220A (8327A)	1, 2, 4, 4, 6	
	1224A (B326A)		

NEW OR REVISED ITEM

	IP YOUR INSTRUMENT HAS BERIAL PREFIX ON BERIAL HUMBER	POLLOWING CHANGES TO YOUR MANUAL
•	1224A (6327A)	1,24,8,8,7
	1240A (6326A)	21-8/7/0 (A) (A)
	1238A (6327A)	1, 2, 4-0
	1248A (6327A)	1, 2, 4-10
,	>1312A (6927A)	
	1312A (6326A)	1-4, 7, 0, 11

ERRATA

Page 8-49/50, Figure 8-21

Change title of Figure from "710:OPTION 003" to "79 OPTION 003"

Change illustration of 19 (OPTION 003) at pin 25 from "NC" to "+5 V (1K bhm source)" also correct title in List of Pigures.

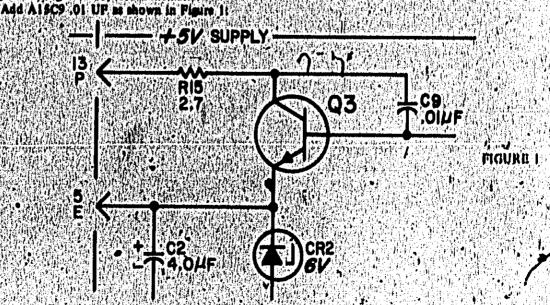
Page 1-3, Table 1-3, TIME BASE, Time Base Output;
Change 2nd sentence to read "In START, output frequency is INPUT: A divided by TIME BASE/MULTIPLIER switch selting."

Page 6-3, Table 6-11 Change A1R24, 26 to 2100-3228

Page 6-11, Table 6-1

A44 A15C9 0160-3277 C:FXD CER :01 UF SOVDCW.-Board assemblies with A15CS and C9 are SERIES 1104A.

Page 8-39, Pigure 8-16, A15 Schematic



# MANUAL CHANGES MODEL 5326A/6327A Page | HRNATA (Cont'd) Page 1-27-Cable 1-3, Dynamic Input Vyither Rainer Add period (i) after less word of first line, making it read "attenuesor setting." Page 2-4, Paragraph 2-41hi Change lest pentence to read "Ground is available at #10(1) 2)." Page 6-6, Table 5-11 Change A5R7 to 0003-1225 1200 OHM FACTORY SELECT VALUE h 6-6, Table 6-1: TAdd to A607 description "FACTORY BELECT VALUE" Page B-11, Takke B-11 Change A1606, 7 to 0160-3678 1000pf Page 6-12, Table 6-11 Change 05327-60026 BLANK BOARD P/N to 05327/20026 Page 6-12, Table 6-1, A16 (05327-60006) and (05327-60026) Change A16CR4, 5 to 1801-0028 400PIV: MFR PART NUM Page 6-13, Table 6-1 Change A1705, 7, 10, 13 to 0180-3878 1000pf Page 6-14, Table 8-1: Change A18C2, 4, 7/9, 10 to 0180-3878 1000pf Page 6-15, Table 6-11 Change A18C2, 4, 6, 7, 9, 10 to 0180-3878 1000eF Also make appropriate changes corresponding to four previous items in Page 6-19, Table 6-1, OPTION 0041 Change 06327-80018 board (A1) to 08327-80034 SERIEE 1224A. Page 6-19, Takin 6-1, OPTION 004-EXTENDED REMOTE PROGRAMMING Delete line starting "Delete A1 05826-80003..." and replace with "Delete A1 Q5328-50047 and replace with A1 05327-60034" Delete following line also. Change A1 to 05327/80034 SERIES 1224A Change blank board to 06327-20034 Page 8-21. Flaure 8-9: Change A5R7 to 1200 Add to NOTES! 2'4. Arthrisk (\*) indigates component, average Page 6-23, Figure 8-10, A6 schematics Add to ABC7 an atteriok (a) Add NOTE 3 as follows: "ABTERISKA») INDICATES SEL Puge 8-30, Figure 8-16, A16 echemetics Change board P/N to (06327-80026) Page 8-36, Figure 8-16, P/O A16 schemetics Change (06327-60027) to (06327-60026 Change (06327-60027) to (06327-60026 Change A1672 to "0.47" to "1.4 OHM" Page 0-30, Figure 0:16, TABLE OF ACTIVE COMPONEN Change A16 CR4/6 to 1801-0028 Popo \$40, A17 INPUT C AMPLIFIER OPERATION: Change first line, third persurate to read: thigh-impedence emitter followers (Q1, Q2)..." Page 8-40/50, Figure 8-21 titles both pages: Change "UTO OPTION 003" to "UE OPTION 003"

PXD COMP 180 OHM 8% 1/8

Page 6-20, Table 6-11

Change A1 R6 from 0000-5563 to 0006-1

# MANUAL CHANGES MODEL 5398A/5327A Page 3A BRRATA (Cont/d) Prace 14, 18 (of this alpplement)) Change A18836, 70 from 0498-1103 to 0498-117 820 OHM Change A18836 from 0498-179 to 0498-1013 200 OHM; and to seekinglight "FACTORY BILLECT COMPONINT") Add to A18836 deetingles (MACTORY BELECT COMPONINT") Prace 17 (of this supplement) A18 (03327-0033) information Change A18834 (o) (800 OHM) Change A18834 (o) (800 OHM) Change A18834 (o) (800 OHM) Change A18834 (o) (800 OHM) Change A18836 (o) (800 OHM) Change A18836 (o) (800 OHM) Change A18836 (o) (800 OHM) Change A18836 (o) (800 OHM) Change A18836 (o) (800 OHM) Change A18836 (o) (800 OHM) Prace 6-9, Table 6-1 Change A19237, (if Pract No. to 18200) 19 out 820-0223

# MANUAL CHANGES MODEL 5386A/6387A Poor

### CHANGE 1

Page 6-7, Table 6-11:
Change AdR19 0088-2020 to 0088-6115 5/0 CHM
With this change part 0529-60015 is BERING 1182A
Change A7CE 0160-0888 to 0140-0201 IE PF 5M 500V
With this change board 05827-80004 is BERING 1182A
Page 8-28, Pigure 8-10, Ad schematic;
Change A6R19 to 510 OHM
Page 8-29, Pigure 8-11, A7 schematic;
Change A7CE to 12 PF

### CHANGE I

Rage #11, Table #11 Change #16CRIB-18 1901-0040 to 1901-0044 Change #16R17, R18 0883-0898 to 0883-0878 8.7 OHM With this change beard 05887-80080 is BERIER 1188#

Page 8-80, Plaure 8-18, A16 behematic Change A16R17, H16 to 2.7 OHM

Page (I-IA). Table 6-11 Thelete T1 9100-8666 Change T1 9100-8080 description to (5886A/87A)

### CHANGE I

Page 6-18, Table 6-1; Change A17CR8-1018-0007 to 1918-0009 Change A17CR1-10688-8688 to 0008-8158-8680 OHM 14-14W Change A17R82-0068-1618 to 0787-0864-180-014M-AW Change A17R88-0068-1618 to 0787-0860-1000 OHM AW Change A17R86-0068-8618 to 0787-0418-811-014M-AW Add 06886-00081-818181J);AMPLIFTER With this change board 06886-80081-16-88R1K8-1186A-R8V-C

Page 8-41, Player A-17/ Change A-17/20 to 8680 CHM Change A-17/20 to 8-11 CHM Change A-17/20 to 1919-0009 in TABLE OF ACTIVE COMPONENTS Change A-17/20 to 1964-0848 in TABLE OF ACTIVE COMPONENTS At top of schematic change to SERIES 1106A Rev C

### CHANGE 4

NOTE: This change provides for the norgatandard antisptional instrument delors.
Option: Add designator use of light gray panel with alive gray cabinet. Option XSS designates was of light gray panel and blue tentered cabinet. Blandard colors are mint gray panel and olive gray cabinet.

Page 6-16, 17, Table 6/1

Change 8180-1848 to 8180-1878

OBSEC-00008 Add to decembrate "COLCIR OPTION ASS/X86"

Add OBSEC-00008 PANEL, PRONT TRUM COLCIR OPTION ASS/X86 (\$86A ONLY)

Add OBSEC-00008 PANEL, PRONT STANDARD COLCIR (\$86A ONLY)

Add OBSEC-00008 PANEL, PRONT EXTRU STANDARD COLCIR (\$86A ONLY)

Add OBSEC-00008 PANEL, PRONT EXTRU STANDARD COLCIR (\$86A ONLY)

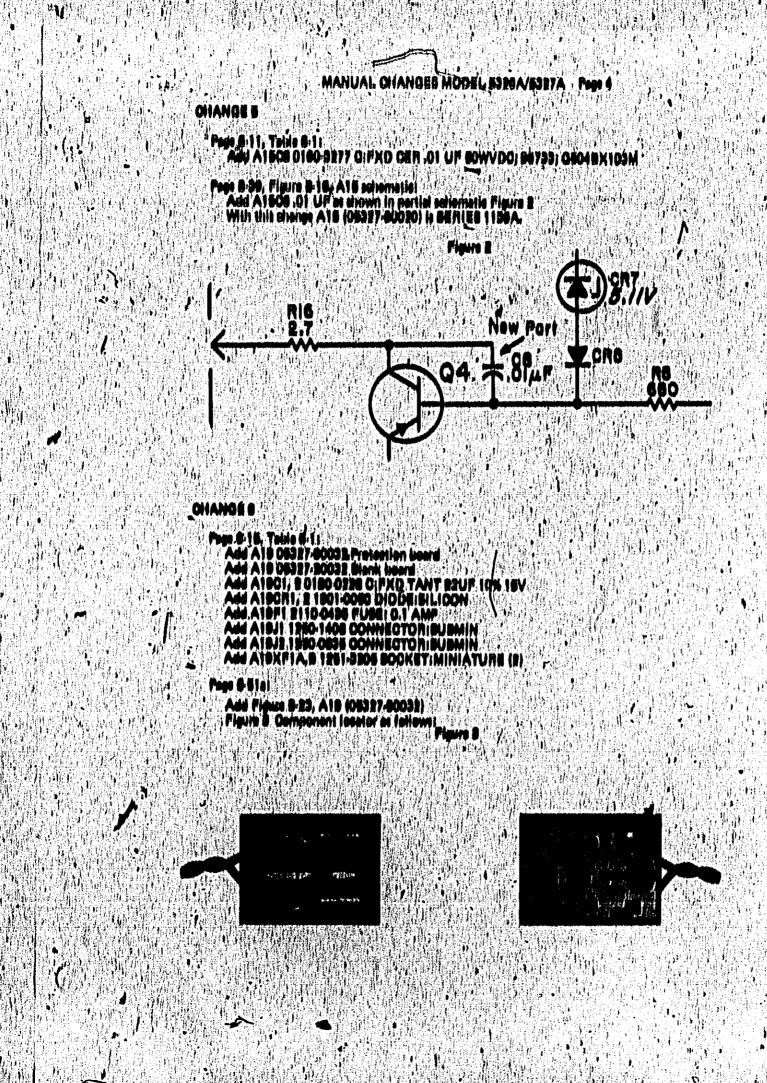
Add OBSEC-00008 PANEL, PRONT EXTRU COLCIR OPTION ASS/X86 (\$887A ONLY)

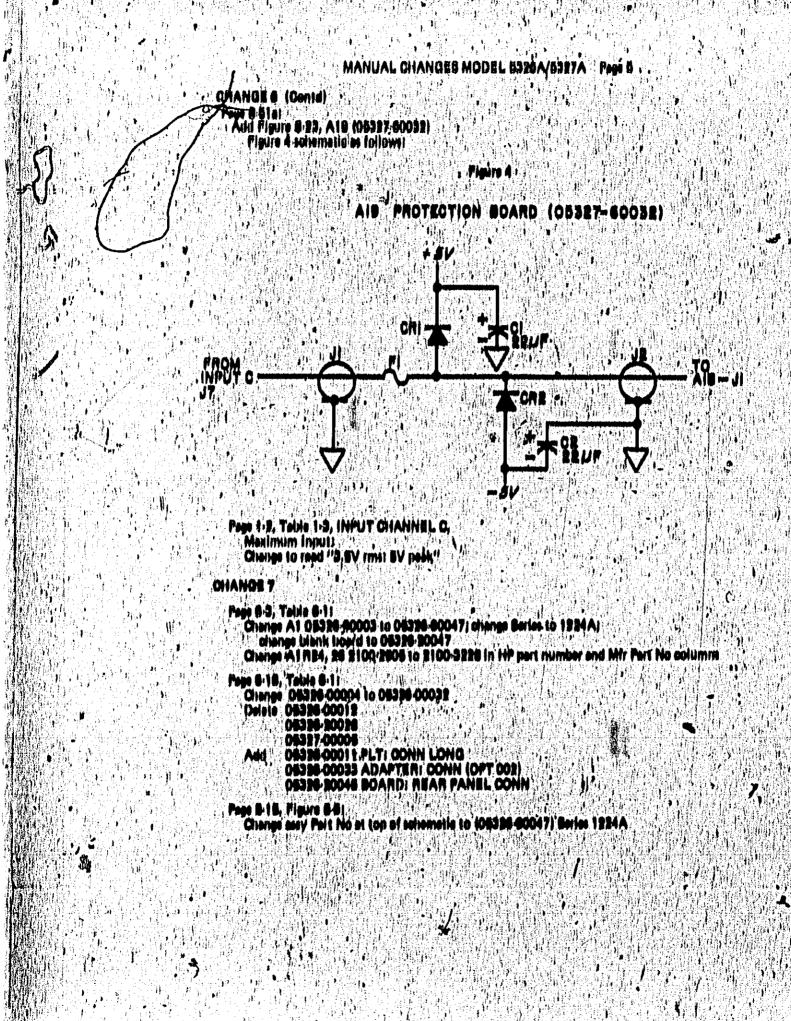
Add OBSEC-00008 PANEL, PRONT EXTRU COLCIR OPTION ASS/X86

Add OBSEC-00008 PANEL, PRONT EXTRU COLCIR OPTION ASS/X86

Add OBSEC-00008 PANEL, PRONT EXTRU COLCIR OPTION ASS/X86

Delete 8100-8486





#### CHANGE

Arid after Perseraph 7-18, the ballowing 7-18e. Options 010 and 011, filigh Brability Oscillators

Option 010, Conflictor Antimoly A4 (05388-60002) is replaced with 7.100.

TDXO Coellisto: Assembly (0032740036)

Option 011, Coellistor Assembly A4 (06326-00002) is septemble with Coellistor Assembly A4 (06326-00002) is septemble with Coellistor (10844-00011). Options 010 and 011 are systliable by instruments with 7-18c.

for \$326A and 1236A for &

Page 4-7, Table 4-11

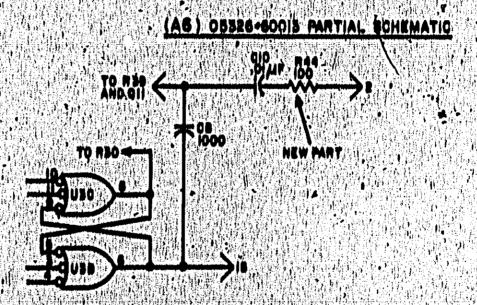
Add ABR44 0003-1015 Rt FXD COMP JOD BN 1/4W With this change AS (05326-80018) is SERVER 1924A

Proc 8-22. Floure 8-10 REFERENCE DESIGNATIONS wille

Change As column to read !! 144!

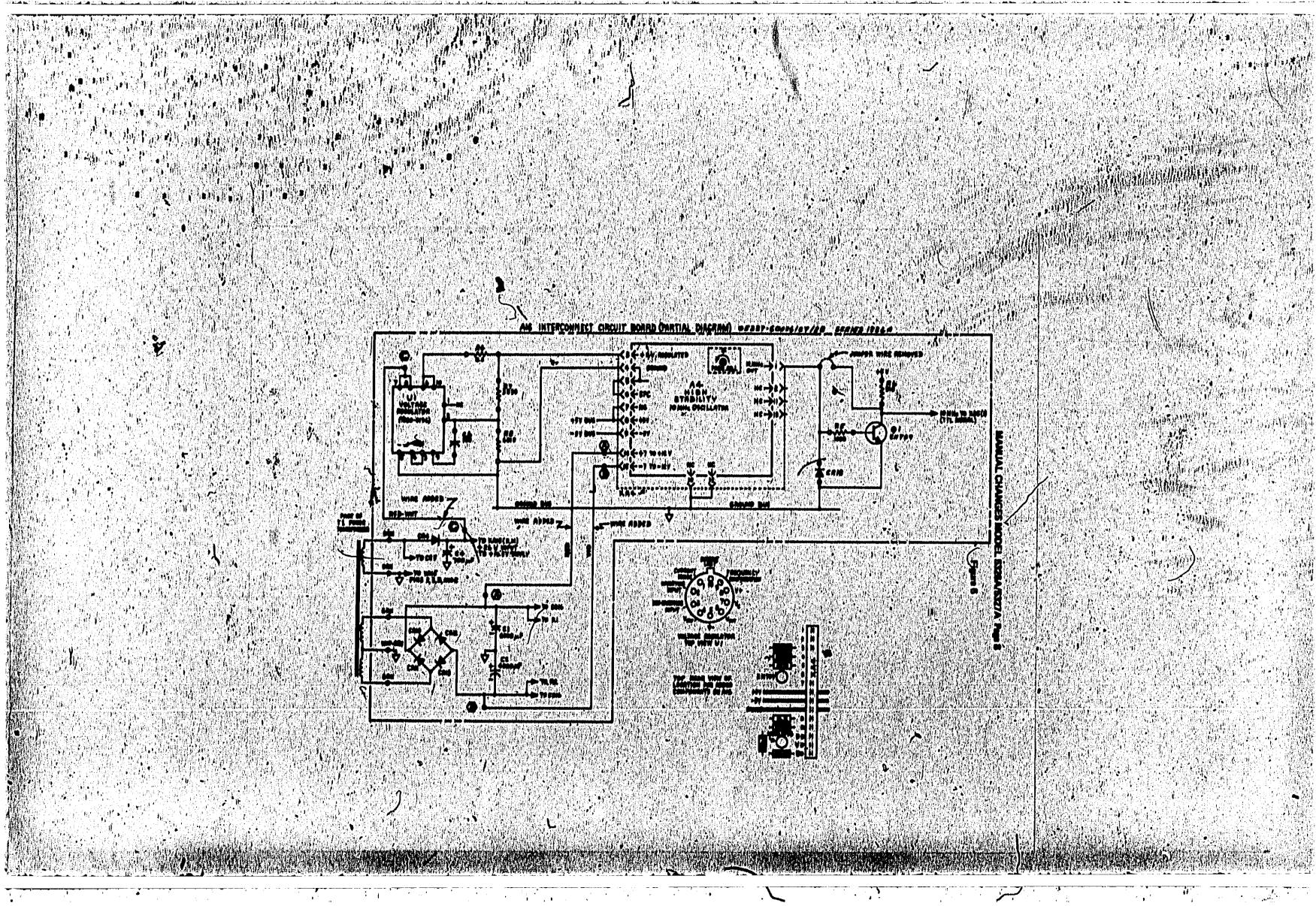
Prov 8:23, Figure 8:10 Althornation Add A8R44 100 OHM as shown in Flaure & attached

Flaure I



Page 64, Table 6-1: Change AD to 09535-\$0000/25 SERIES 1224A AND ANTI COCHTERE RIFXD COMP. 7800 CHM SN 1/AW AL ABRIE 0003-1000 R. FXD COMP. ID CHM SK 1/4W. add abuil 1820-0118 ici a-bit buff store gated outs add agusa 1820-0002 ici Decoder-Divider AM ABOR 1870-0042 TUBE NUMERICAL INDICATOR Add Added 1200-0408 BOOKET TUBE FOR \$700 BERIES Add AdXUE 18, 84 1200-0477 SOCKET IC

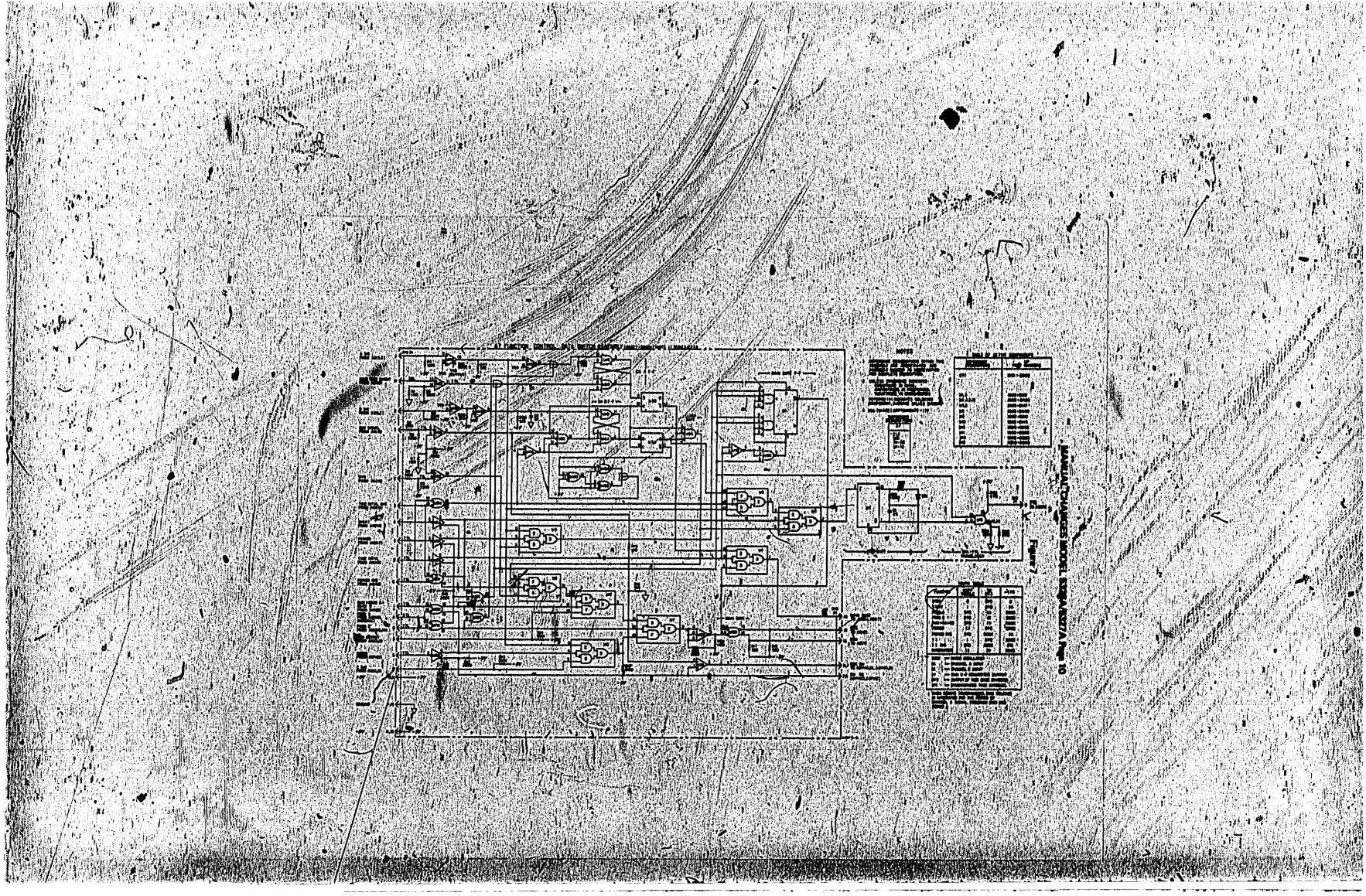
```
MANUAL CHANGES MODEL 5320A/5327A Page 7
   CHANGE 8 (Cont'd)
           Page 8-99, Figure 6-191
              Change NOTES, #5 joyeed "R12 Is, wheel to B for Option 001"
           Page 6-11, Table 6-1;
              Alii A1606 0160 2204 CEFXD 100 PF
             Add A160718 1910-0034 DIODE: 087
             Add A1601 1864-0009 TRANSISTORI SIL NPN 2N706
              Add A18R4 0003-0026 R: FXD 8:2 OHM 1/4W
              Add A1686 0663/1026 N1 PXD 1000 OHM 1/4W
             Add A1976 0003-5115 N: FXD 510 OHM 1/4W
             Add A1477 0000-3163 RI PXD 3630 OHM 1% 1/9W
             Aid A1978 0757-0439 Rt FXD 6610 OHM 1% 1/8W
              AM A16UI 1880-0186 IC: VOLTAGE REGULATÓN
             Above parts are added at shown in attached Figure 8
          Page 6-7/8, Talyle 6-1
             Change A7 06327-80004 to 06327-8003
             The attached perty list is on page 9.
          Page 8:29, Figure 8-11, A7 Function Control Assembly:
             Maplace A7 schematic (05327,60004) with attenhed schematic.
             The A7 schematic (06327-60031 - Figure 7) is shown on page 10.
             Replace A7 component locator photo (05327-60004) with Figure 8 photo (05327-60031) page 11.
          Pro 8-24, A7 FUNCTION CONTROL OPERATION
            Flephace text under this heading with following (see page 12).
           hose 3.5, Flaure 3.4, Item 5:
             "Add to first paragraph) "On indiruments with Berial Prefix 1236A and above INPUT C connector
             is located on reer panel,"
           Page 6-9, Toble 6-11
             Change ABRR, 4-9, 11 from 0663-7528 to 0787-0440 Mi FXD MRT FLM 7800 OHM IN 1/8W
             Change ABU17 from 1820-0092 to 1820-0729
          Page 8-17, Table 8-11
             Change 05327-60011 to 05327-60037
             Add 06327-00000 PANEL! FRONT EXTRU STANDARD COLON: (6327A ONLY)
CHANGE 10
          Page 6-14/18, Table 6-11
             Change A18 06327-60000 and 06327-60020 to 06327-60033
                          06327-20006 and 06327-20028 to 06327-20033
             Delete all components profixed A18 and replace with attached parts list for A18 High Benefitivity
             Projector Americaly (06327-00033) SERIES 1248A, see Page 14 and 15.
             Component locator for this new assembly is on Page 18, Schematic diagram for this new seembly is in Page 17.
►CHANGE
             Page 60, Table 61
                Change ABR2, 4-0, 11 from 0003-7525 to 9
                                                           999-8431 7900 OHM
             Page, 6-11/12, Table 4-14
                Change A16R1 from 0003-2036 to 0003-2736 27K
               Change A15R6 from 0000-1805 to 0000-1906 19 OHM
Add A15F1 2110-0400 FUSE 1/32 AMP
Add 1400-0110 FUSEHOLDER
                  With this change board 05327-00020-A
             Page 8-30, Pigure 8-16, A18 achemetics
Change A18R1 to R7K
Change A18R8 to 13 OHM
              Add A16F1 1/92A fuse between A16(1) and junction of R6 and C8(E),
```

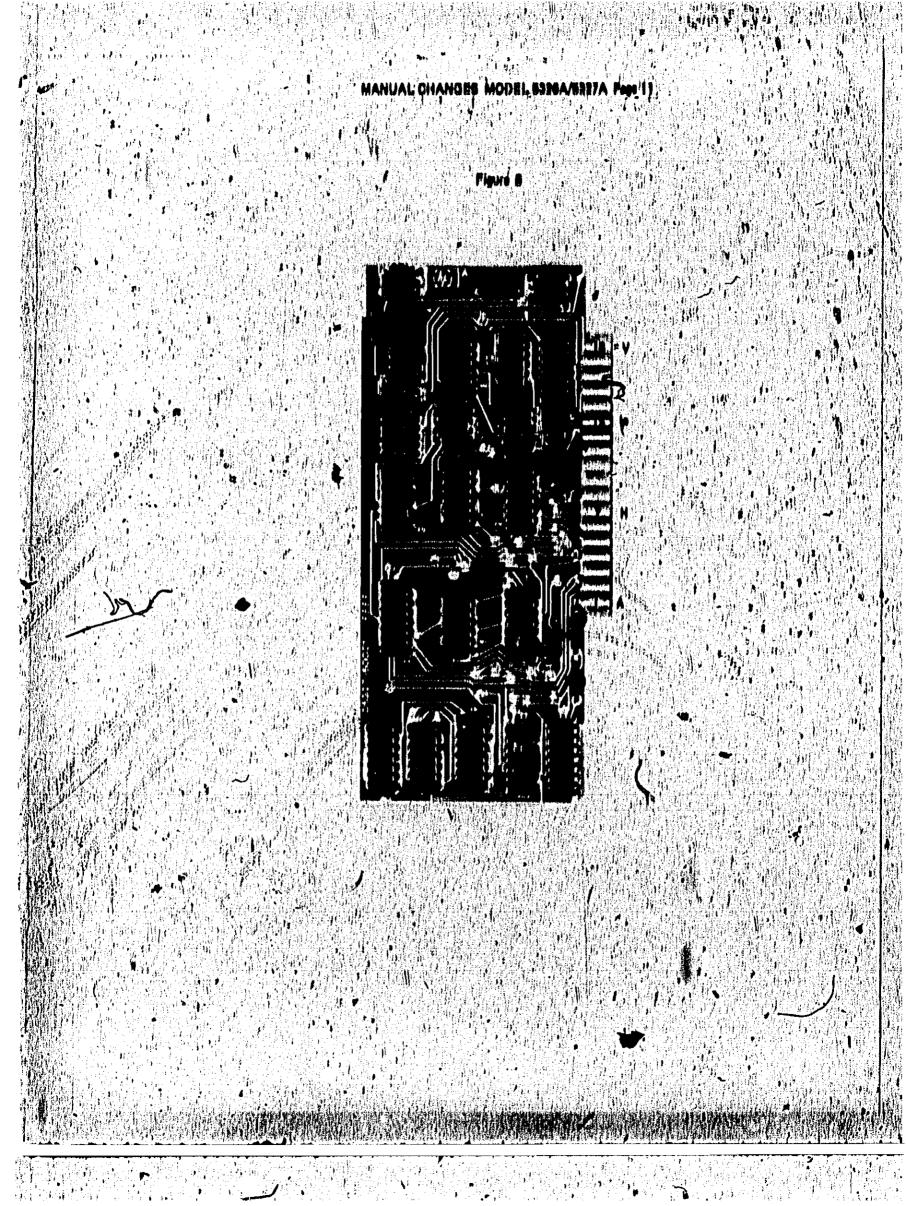


#### MANUAL CHANGES MODEL 5326A/5327A Page 9

PEF DEBIG.	DESCRIPTION	PART NUMBE
47.1	BOARD: FUNCTION CONTROL	06327-60031
A/QI	C: PXD, 27 PF, 300V	0160-2308
A7C2	C: FXD:4.7 PF: 500V	0150-0042
A7CR1	DIODE: HOT CARRIER	1901-0536
AYRI	R, FXQ, 1.1K, 6%, 0.280W	0883-1125.
A7R2 A7R3	R: FXD, 1.8K, 0.250W R: FXD, 1.8K, 5% 0:250W	0683,1825
A7R4	R: FXD, 1K, 5%, 0.250W	0683-1825 0683-1025
ATRE	Ri FXD, 3.9K, 6%, 0.260W	0683-3925
A7R6	R: FXD, 2.2K, 0.250W	0682-2225
A7R7	R FXD, 1.1K, 5%, 0.250W	[2] A. A. A. C. (1985) 1987 1989 1989 1989 1989 1989 1989 1989
ATRO	R FXD, 3.3K, 6%, 0.250W	0683-2226 0683-3326
<b>₹</b> 7810	R; FXD, 3.3K, 5%, 0.250W	0883-3328
AZRIT	RI FXD, 1K, 5%, 0.250W	0883-1025
A7R12 A7R13	RI FXD, 3.3K, 5%, 0.250W RI FXD, 1.5K, 5%, 0.250W	068 <b>3 4325</b> 0683-1625
A7R14	RI FXD 1.6K, 5%, 0.250W	0683-1525
A7R16	; R: FXD, 100 DHM; 0.250W	<b>08</b> β3-1018∙
A7R16	RI FXD, B10 OHMX 250W	0683-5115
A7R17 A7R18	RI FXD, 300 OHM, 8.250W	. 0683-3015 0683-3015
A7R10	R: FXD, 1K, 8%, 0.250W	0683-1025
A7R20	R: FXO 1.1K, 6%, 0.250W	0683-1125
A7R21	R: FXD, 1K, 596, 0,250W	. 0683-1026
A7R22 A7R23	R: FXD, 100 OHM, 0.250W R: FXD, 470 OHM, 0.250W	0683-1015 0683-4715
J A7R24	R: FXD, 160 OHM, 0,250W	0683-1515
A7R25	R: FXD, 240 OHM, 0.250W	
A7 R28	R: FXD, 1K, 5%, 0.250W	0683-1025
A7R27 A7R28	R; FXD, 510 OHM, 0.250W R: FXD, 510 OHM, 0.250W	0683-5115
A7R29	R: FXD, 780 OHM, 0:250W	0683-5115 0683-7515
A7 R30	/ R: FXD, 510 OHM, 0.250W	0683-5115
A7U1	INTEGRATED CIRCUIT	1820-0102
A7U2	INTEGRATED CIRCUIT: ECL DAT 5W INTEGRATED CIRCUIT	1820-0489 1820-0147
A7U4	INTEGRATED CIRCUIT	1820-0102
A7U5	INTEGRATED CIRCUIT: DIGITAL	1820-0440
4 A7U6 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	INTEGRATED CIRCUIT	1820-0147
A7U7 A7V8	INTEGRATED CIRCUIT INTEGRATED CIRCUIT: 55	1820-0486 1 1820-0212
A7U9 💛	INTEGRATED CIRCUIT: ECL DAT SW/	1820-0 <b>469</b>
A7U10	INTEGRATED CIRCUIT	1820-0148
A7UIT	INTEGRATED CIRCUIT	1820-0200
A7U12 A7U13	INTEGRATED CIRCUIT: ECL DAT SWITCH INTEGRATED CIRCUIT: ECL CLOCK DR	1820-0489 1820-0252
A7U14	INTEGRATED.CIRCUIT	1820-0809
A7U15	INTEGRATED CIRCUIT: DIGITAL	1820-0808
	BD-BLANK	06327-20031

Ľ.





### MANUAL CHANGES MODEL BORGA/5027A. Page 12

### AT FUNCTION CONTROL OPERATION

This passembly contains the gating, flip flope, one shots and translators necessary to interconnect the decillator, time base, and input channel signals to the time base and decade coloting assembles. Table I lists the functional interconnections for each function of the counter.

An example of the operation in the PRING A mode will explain the willow directly operation. This will be expanded to the other functions. Assuming the start of a new minarcrement, main gate inhibit (sin 17) has just gone low (at the end of the display time). Upon the arrival of the first subsequent channel A input; channel, A fip-flop sets, making Unit(s) itim. Upon the best lending some of the sectiator signal (pin T. TTI, levels) USB(4) RUL, levels), USB sets and arms the section of the time base input one shot Us, which generates 50 hs, negative georgepulate to the time base input (pin U).

The time base will return a pulse tuben receipt of the let and Nile pulse delivered from pin U (N a multipler setting on front panel). The let pulse arriving at pin V is translated from TTV to MCL by U8 and then goes an to toggie (set) main gate flip-flop U!. This opens the main gate (UBB), and the decade sounding assembly counts the signal in this case, input A = see Table I). Upon the arrival of the and time base output pulse, U! asgales closed, situiting main gate UBB and summating A6 to start the display of the (pin 18). A6 returns a light MINIT (pin 17) and the main gate flip-flop UI, synchroniser U/, and TTB provaled U4 are locked shood at the and-of the display, MINIT gree low and the cycle repeats.

In the period mode, the main male P.P UI to tourled by the input A signal so that it is set for exactly one period of Arritic counted signal in, the oscillator divided by the MUI/TIPLIBR switch setting.

In period average, the input A signal gree to the time base, which generates a pulm on the let and hit pulse. These pulms toggis the main gate, and the oscillates is consisted during N periods of A.

In START, the main gate is held open and the input aignal, which is seeled by the time base, is purised. The Even C operation is the bame as Free A, except that the input synchronizer UDB to held an by U10, IC's UR, B, 7, 8, 9, to and 18 are combination TTC/ECL translators and data switches. The function inputs (Free A, Free C, etc.) are TTL low true and are pulled up by internal 10k-olum pullage on the translators. UR(8) is the check signal to Amplifier AB and AB. In normal tis low; while in check, it is high with negative 10 ns pulses at 10 Mile.

In time interval, the operation is similar to period, but UI is set continuously, MOATE OUT (pin 18) is now controlled by the output of UBB; The following explanation describes how the synchronizer UBA and B work in a time interval mode.

Assuming a display train has Just been completed, the flip flope flowed by UII and U6 and U6 mollone have been resel. Two could!

Mret — If a channel A signal occurs before a B signal, the A signal will set the channel A flip flop before the B sets the B flip flop (see Maure I). When the first leading edge of the cacillator occurs after the A P F is set, USB is set, opening the clock gate and instructing An that

### MANUAL GIANGES MODEL BARGA/SB27A Page 1

Table I. Functional Interconnections

Mindley	word rocala	· PA	
ATOP ATART PIIKQ O PUKQ O IVM • HA•RB PHRIOD AVO. TH.	OTA OTA OTA OTA OTB	OTTB OTTB IA IC IV OTTB GCBO OTTB	0 IA IOBC IOBC IOBC IIA IOBC

DGA : Decade Counting Assembly

GOBG: Galed Carellager

IA . Input A Bland

10 - Inpul O Humal

1773 . Input to Time Hase

IV , DVM V.P Converter Output

OTH Output of Time Base

BTI . Bynchronized Time Interval

the measurement has started (pin' 18). The secillator signal goes to piles time hase and is divided, returns, and is sent out through the main gate to All for subsequent display. When the B signal secure, the leading edge of the next clock pulse sets USA, glosing the clock gate,

The USA Q low signal goes back to US(1) and walts about 50 he for the falling sage of the cacillator. At this point, US(10) goes high, resetting the A and B filp-flops, putting town at the D input of USA and B. When the mack pulse again rises positive, US(10) goes low (about the 10 he after the clock edge) and USA and B are closed to the released state.

Becond and If a B signal occurs before an A. USA would be set first, and no counting would occur. Also, it would take about 160 ns for USA to complete the receiting described above so If art A signal occurred during this time, it would be ignored. If the B-lo-A delay is 2100 no, the A signal would start the interval as described above.

With time interval averaging, the input synchronisers work the same way het the oscillator (not divided) to counted for the duration of sact; individual time interval that to being averaged. The first input A pigmal age flip flop USB, which enables USA to sate an positiator make to the time base dividers. The dividers are now set to zero, from their previous resolvents nice state, During this time, a channel hadron was received to complete the first time interval; but this first interval is not counted, since the main gate was glossed. The time base pulse is passe close pulsets for the duration of the time interval. After N intervals, the time base returns a pulse to close the main gate.

### MANUAL GHANGES MODEL \$326A/\$327A Page 14

### ATE HIGH SENSITIVITY PRESCALER ASSEMBLY (05327-60055) SERIES 1248A

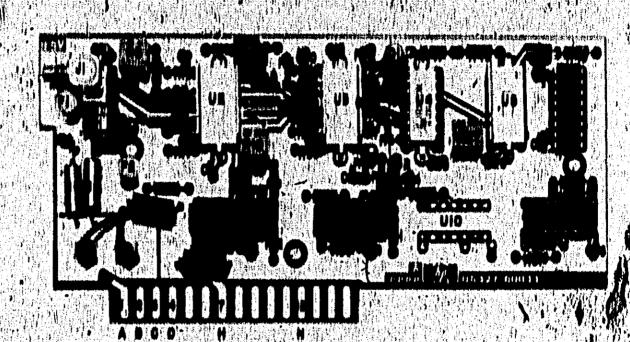
ABA Debigi		PART MUMBER			DESCRIPTION
A10		96827-60028 96827-20038 9180-9229		Board Abeyi Hush Board: Blank C: FXD TANT 21 UF	BENDITIVITY PA
A1909 A1903 M1804		0180-1044 0180-1070 0180-1046		CI FXD GEN 1000 PP CI FXD GEN D.O1 UP CI FXD GEN 5000 PP	100 - 20% ROW I DOVIDON
A1000		01000776 0100-8070		gi fad <mark>tant bl</mark> uf . Gi fad gen o <sub>e</sub> gi uf	ON INVOOR
A1807 IN A18027 A18026		) 100-3070 ) 100-3070		di FXD gen 1000 pp Gi FXD gen 0.01 Up	NOW 100V DOW
AIBON AIBONI - AIBONE		) 180-3078   901-0080   901-0080		g: PXD gen 1000 pp Diode: Bil 76V	RON TOOYDON
Albend (	Inv CAG i	901-0040 1110-0406		Diodei Bil 76V Diodei Sil Bov Fubei 1/10 Amp 126	
AINI		1004M		Fuber 1/10 Amp 126 Jacki Megeht Po Bo	
AIBLE AIBLE AIBLE		100-1760 100-1760 100-1760	VV trans	ooili ar Boili ar Taansistoni sil ni	
AIBOI		100-0001 1000-1021		TAANNISTONI BIL NI Ri PXD GOMP 1000 C	
AIBRE AIBRE AIBRE				ni PND COMP 880 OI Ni VAR 1000 OHM LI Ni PNO COMP 8800 C	IM BN 1/8W N 10% 1/8W
AIDRO		100-3176 100-3076		ni fxd comp 81 ohi Ni fxd comp 81 ohi	
AIBRI AIBRO AIBRO		2004111 20041026 20081018		1) FXD COMP 80 CH) 1) FXD COMP 1000 C 1) FXD COMP 100, CH	IIM BY I/AW IM BY I/AW
Alenio Alenio Alenio	A 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			11 YAR ROO OHM LIN 11 PXD OOMP 10 OHM 11 PXD OOMP 18 OHM	4 6% 1/6W
AIDHID AIDHID AIDHID		105   105 104   37 / 105   51   50		II FXD COMP 20'CIM VA	A BX (/pv
ALENIO Aleni7				II FXD COMP 2000 O II PXD COMP 21 OHA II FXD COMP 20 OHA	6 6 1/8W
Alenio Alenio Alenio		664-557.4 665-1816 664-5160 664-3111	V	II FXO COMP 480 OH II FXO COMP 8000 OH II FXD COMP 80 OHN	M 6% 1/4W IM 6% 1/69
Alenti Alenti Alenti				I KKU WANG KAN ANI	LA RN. IVALII
Alone4 Alone6		0064181 0464111 045-1886		PXD DOMP 86 OHM PXD DOMP 86 OHM PXD DOMP 80 OHM PXD DOMP 1000 OH	BN 1/AW IM BN 1/AW
45 * 1265 (基 6) (初) (4	\$\$\$\$ \$\$\$\$ \$\$\$\$\$ \$	14.1 其所提出20年代的扩展中国有关部	50.1876年代和14.18万万万年	福的公共。1965年第3位,但不是自己的《大学》。	はつはな 野 人の難診な 二間にし

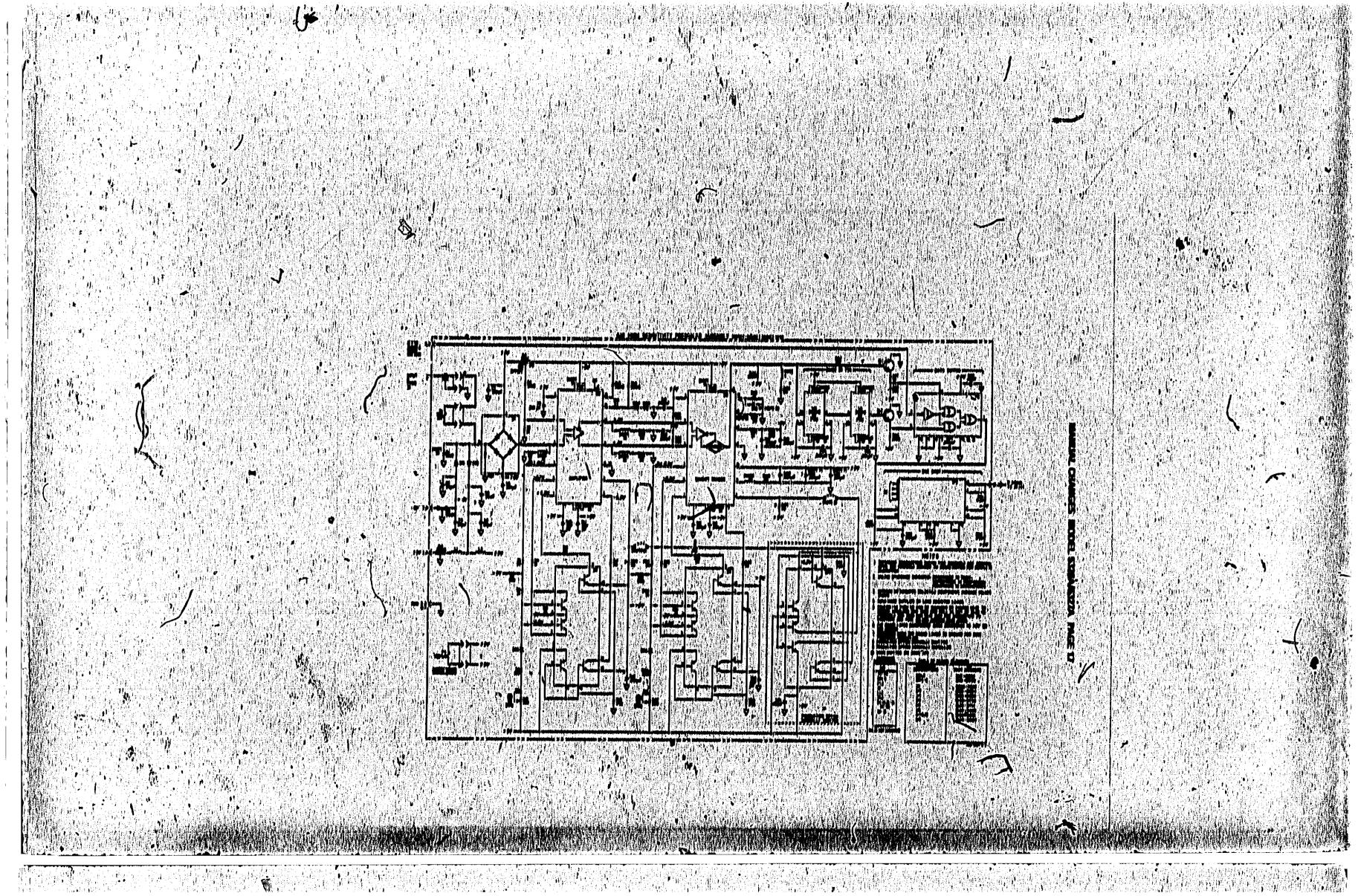
### MANUAL CHANGES MODEL 6326A/5327A Page 16

### A18 HIGH SENSITIVITY PRESCALER ASSEMBLY (05327-60056) SERIES 1248A (Cont's)

HEP DEBIG	' IN PART NUMBER	DESCRIPTION
Alenge Alengy Alenge Alenge Alenge Alenge	0903-1018 2100-2418 0090-6193 0090-6103 0090-6103	RI FXD GOMP 180 OHM SN 1/4W RI VAR 200 OHM LIN 10N 1/2W RI FXD COMP 10 OHM SN 1/2W RI FXD COMP 480 OHM SN 1/2W RI FXD COMP 480 OHM SN 1/2W RI FXD COMP 480 OHM SN 1/2W
A18RB9 A18RB4 A18RB8 A18RB8 A18RB9 A18RB9 A18RB9	C000-9074 C000-9170 C000-9170 C000-9111 C000-9178 C000-9174	N/A RI PXD COMP BO OHM SK 1/BW RI PXD COMP 1800 OHM SK 1/BW RI PXD COMP SI OHM SK 1/BW RI PXD COMP SO OHM SK 1/BW RI PXD COMP SI OHM SK 1/BW
A18R99 A18R40 A18R41 A18R48 A18R48 A18R44	Dee3 4218 Dee6 4181 Cee6 4181 Cee6 4181 Dee6 3111 Dee6 3111	RI FXD COMP BI OHM SN 1/8W RI FXD COMP SO OHM SN 1/8W RI FXD COMP SO OHM SN 1/8W RI FXD COMP SO OHM SN 1/8W RI FXD COMP SO OHM SN 1/8W RI FXD COMP SO OHM SN 1/8W RI FXD COMP SO OHM SN 1/8W
A18748 A18747 'A18748 A18749 A18780	Cess-1028 Cess-2006 Cess-2016 Cess-1028 Cess-4016	N/A  PI FXD COMP 1000 OHM SN 1/4W  PI FXD COMP SO OHM SN 1/4W  PI FXD COMP SID OHM SN 1/4W  PI FXD COMP 1000 OHM SN 1/4W  PI FXD COMP 400 OHM SN 1/4W
ATBRES AT	0000-4918 0000-7008 1000-7008 1920-0006 1920-0006 1920-0006	RI PXD COMP 480 OHM SN 1/4W RI PXD COMR 480 OHM SN 1/4W N/A CIRCUIT! INTEGRATED LIMITER CIRCUIT! INTEGRATED LIMEAR CIRCUIT! INTEGRATED LIMEAR CIRCUIT! INTEGRATED LIMEAR
A18U8 Á18U8 Á18U7- Á18U8 Á18U8	1810-0666 PT 1810-0714 1810-0488 1821-0001 1821-0001 1820-0602	CIRCUIT: INTEGRATED DIGITAL GIRCUIT: INTEGRATED EGL DATA BW GIRCUIT: INTEGRATED TRAMISTON ARRAY GIRCUIT: INTEGRATED TRAMISTON ARRAY GIRCUIT: INTEGRATED MG 101021.

MANUAL CHANGES MODEL SOMA/BORYA Page 10





### SERVICE'NOTE

None

5326/5327

Listing of PC Boards
All Sorials

This Service Note lists the commonality of plug-in boards between all the models of the 5326/27 family of counters. Such information may be useful in shortening repair times by borrowing a board from a good instrument to confirm a diagnosis.

The 5326/27 family use several basic building blocks which are combined to provide the various capabilities. These are summarized below:

53260 - 50 MNz Frequency Period Average, Totalize

5326A - Add Time Interval to 5326C

5326B - Add DVM function to 5326A

5327A/B/C,- Same as corresponding 5326, except 550 Mile prestaler is added.

See other side for tabulation of pc boards used in the instruments

REG/sg/WO

4/72-02



Por more Information, call your local HP, Bolos Office, or Bost (101) 268-2600; c Midwest (212) 647-0400 r South (484) 436-660 Work (112) 877-1282; Or witnes Howlest Packard, 1887 Page Mill Road, Palo Alla; California 7430; h. Europa, 1217 Mayrin Genev,

	NÀME	D526A profix 1044A 4 below	5526A prefix 1110 <b>A</b> 4 above	6327Å	BBROR Prefix 1124A & below	5886B prefix 1188A & above	58A7D	888G	RBB7C
<b>1</b> 1	Atten		0,0000-6	0000				05886	00080
<b>A1</b> ~	Opt 004		00027-0	0010		05887-0	M018		
<b>A</b> 8	linput'Amp	1			,00880=0	0004			
72	Input Amp		05580-0	0004					
14	080				04020-0	0001			
A.B	Time Base		· 人的复数分别		00020-0	0005			
AO.	Sample Rate				05320-0	0018			
۸7	Function	05386- 60007/ 24	05887-0	0004	05326- 60007/ 84	05887-0	10004	odaro.	60045
AO	Display Support)				05326-0	0000			
A0	Diaplay		06380-0	0008 (0	dens Opti	on 01)			外的
A10	Right Readout	05320- 00011	00027-0	0002	06320-1 60025	05527-0	10000	OBBAG	-0000 d
All	Left Readout	05320- 60010	00387-0	0003	00320-	05397-0	0007	OBBAO	6000B
A12	DVMAtton					-00320-0	10010		2000年 (1900年) 2000年 (1900年) 2000年 (1900年)
A13	DVMV-N		an Argingitukok Arginar di Kesalu			00920-0	0017		
<b>Å14</b>	DYM Logic					00820-0	0015	<b>国新植材制商</b>	<b>第二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十</b>
A18	Power Suppl Regulator				00326-0	0001 or	08827-6		
A17	Direct Amp		05326- 60031		-L-33	05326- 60031			
AIB	Proscalor			00327- 00000 or 0002			05327 00000 or 000	14 对为为	05327- 00000 or 00029/

### SHRVICH NOTE

(M 1180A and below (K 1140A and below (K 1144A and below MIPINPUT OVERLOAD PROTECTION MODIFICATION

A protection Loard (NP Part No., 05837=60038) can be installed on the 05837=60000 or 05837=60039 presenter board assemblies in all 5287A, 5387B, 5337G Counters to protect the amplifier and Behmitt trigrer circuit from transferie on the input and overly large input voltages and currents. Installation is the same for 06537=60000 and 06537=60 in this note these boards will by called "AJAHT."

The hoard, which contains a furt and additional limiting circuits, in complete installation requires only small hand tools and a notificing tron.

### HOTALLATION

- Disconnect the AC power line and remove too
- Remove Ald and detach the RF laput calle from the 550 MMM Japut BND.
- - Attach the female RP connector on the board to the male RP connector on A18 males of our other than the face and male RP connector on the board are to the component side of A18.
  - p. Birket the red and black wines retained to the non-commontal side of ATT and solder the red wire (48) in the pinted through hole of the 44Y from pla through \$1 (pin 18)
  - holder the bines vire (-5) to the plated brough hole of the -17 kept pin on A18P1 pin 6):
  - d. Till the protection already above (lowered the gold equinote on AlS) and plug AlS page light the last runner.

of Till the HP perfector and cathe so that they clear other components and tigujen the

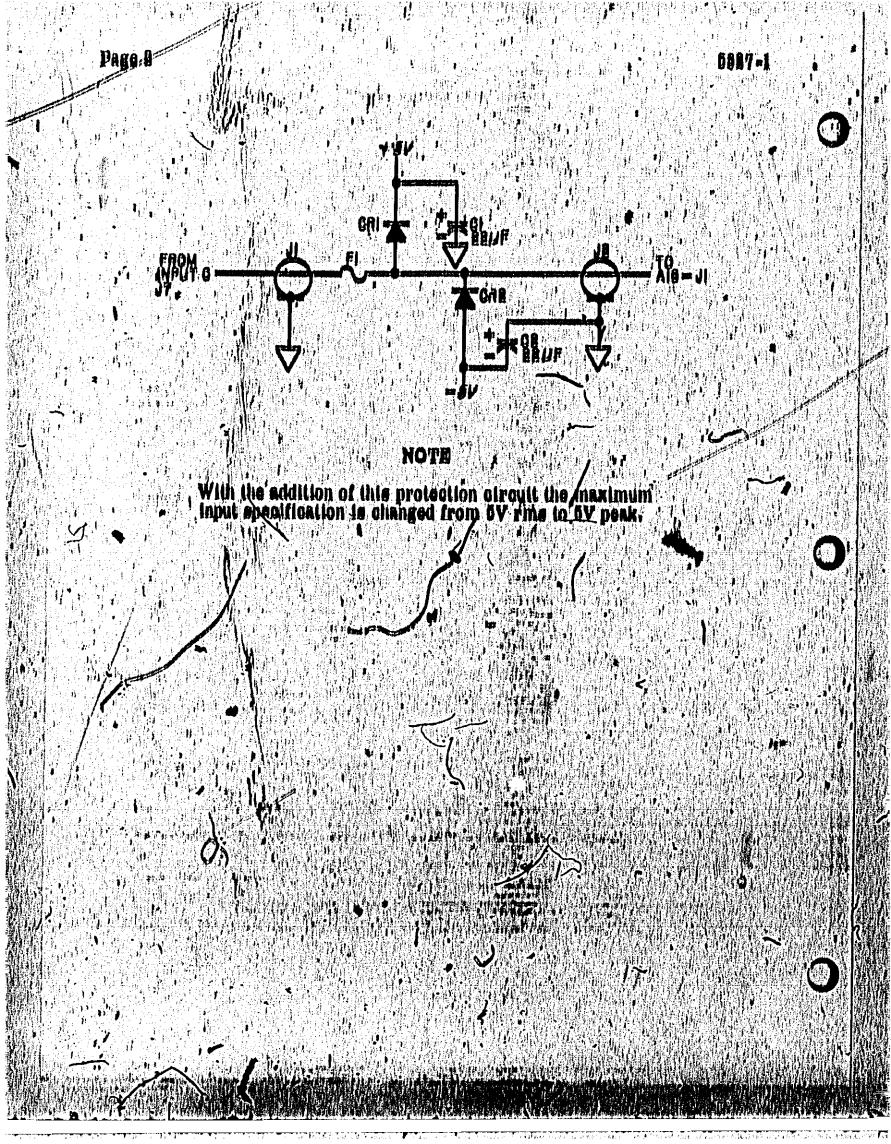
- ITA and \$1170 Installation
  Attach the female it is connector on the board
  to the male it is connector on Alt. Make
  sure the feet and it is connector on the board
  are to the non-component side of Alt.
- b) Bring the red and black wires to the non-component side of Ale and solder the red wire (18) in the plated through hole of the 19 volt input plu on Alepi (pin 19),
- Bolder the black wire to to the plated through hole of the stroit input pin on Alb PI (pin 0),
- Install A16 with the Altached board back into the instrument. Altack the RP con-pector to the majo HP symmetor on the
- by Reconnect the AC power line and adjust AN accountined in the mathtenance rection of the manual under adjust pickles.
- Regimen the top cover.

Parts LIAL

Protestion Board HP Parl No. Mark Board PXD TANT BKILL **05117**-110081 OT OU-ONER 001 =0081 110 = 0481 Dioder Billeon Puse: 0,1 Amp Connector: RP subminiture 1850-0685 Connector: RP subminiture 1850-1406 Bosset: T pin; subminiture 1851-8805

HEWLETT (hp) PACKARD

LM/ML/WA



**SUPPLIED** 

None

### 5326/5327 Input Attenuator Noise Solution

In the past some problems have been encountered in the field with jumpy marker outputs and/or unexplainable noise on the A and B inputs. This note is to document the solutions available for these problems.

The cause of these problems has been traced to a single source, notey neon trigger level lights. Some small percentage of the neon bulbs used as a trigger level indicators get notey with age. This notes is coupled back to the markers and channels. A and B causing the symptoms.

To solve this problem change the notey lamp to one that lan't notey. The lamps involved are Al DSI and/or Al DSI IIP P/N \$140-0047. These are shown in the 6886/5887 manuals on the Al schematics and component locators.

This repair may be charged to warranty only if the instrument is in warranty.

LW/se/Wo

12/72-02

HEWLETT (I) PACKARD

Polimora Hlaymallani, sall'yaur local lib dally dyllor ar ball'i [30]) Idisabb (a. Midwall (314), 677,019) / Basik (400) (114), 678,019 / Basik (400) (114), 677,019) / Basik (400) (114), 677,019) / Basik (400) (114), 677,019) / Basik (400) (114), 677,019) / Basik (400) (114), 677,019) / Basik (400) (114), 677,019) / Basik (400) (114), 677,019) / Basik (400) (114), 677,019) / Basik (400) (114), 677,019) / Basik (400) (114), 677,019) / Basik (400) (114), 677,019) / Basik (400) (114), 677,019) / Basik (400)

Superpodes:

None

. 5316/6617 all models and serial numbers Batra Insulation for the s and a 5 volt requisiors

Here is a appution for a problem we have experiented in 500 and 500 Universal Counters. The 40 volt and 40 volt regulators (QI and QV) in these counters have shown inprefor a tendency to fail than other components in the counter, but no more Here are the parts and instructions necessary to cure this problem in the field.

PARTS LIST.

Casulatori Teplon II ea 0040-0781 Vatner de else II ea 9050-0001 Pubblica II ea 1800-0061 Maat Blak Compound II ea 8500-0188

#### INSTRUCTIONS:

- Unplug instrument and remove top and bottom govers.
- I. Hemove one screw, one mil! and one solder lug holding QI, and the heat sink to chastis.
- 9. Apply liberal amounts of heat/sink compound (HP Part No. \$500-0169) to Moin sides of insulator (HP Part No. 0340-0765). (The QI up and side insulator intuen QI and heat sink lining up hole in insulator/with mounting hole in QI and hole in heat sink
- 4. Secure Q1 to phassis and heat sink by inserting serow first through Q1; then the miss. Insulator, then the heat sinking sure that shasis. Tighten assembly, making sure that Q1 hose sot joubs the side of the heat sinking from the bottom of the lastrument put \$8 washer and bushing on the screw, then the solder jug, then the not. See Figures 1 and 3

MATERIAL STATES OF THE STATES

Flavre 1. Embloded View

- 5, Repeat stops 2, 3 and 4 for GB.
- 6.1 Cheek 45 volt and +6 volt regulation at high hand low line voltage. Bhake instrument to low insure QL and QL are properly secured.
- The Replace top and bottom covered

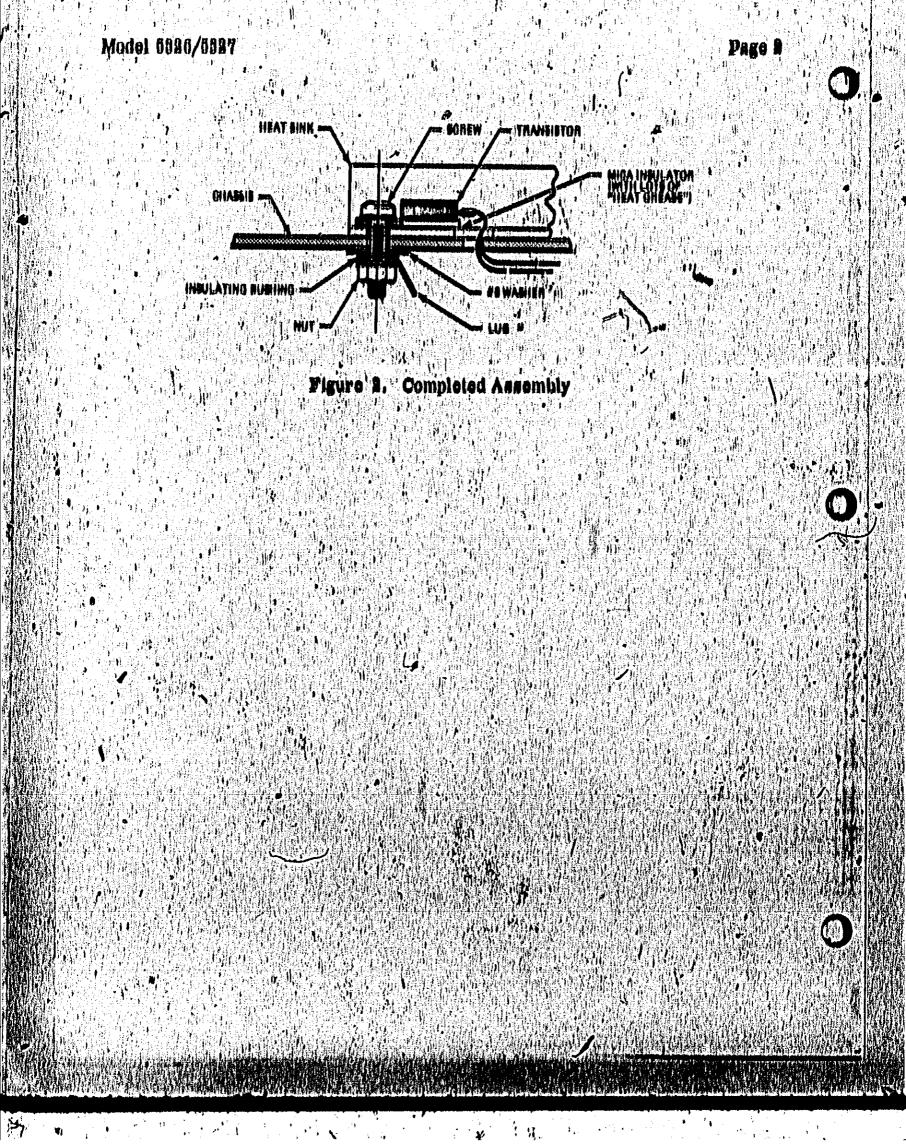
LM/m/WO

7/11-01

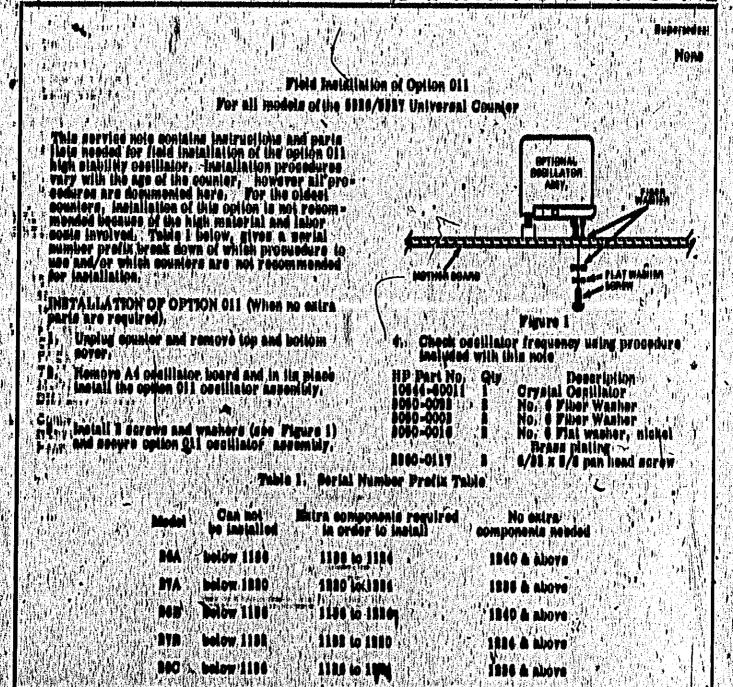
HEWLETT (1) PACKARD

Por Inter Intermellen, and year hand AP Entre Office of Past (808 2008 C Midwest (812) 877-0400 C South (404) APE-8181 C West (818) Cr (willte) I thought the wid (801 Page All Head) Pole Allo, Colligen is 84904 (in Europe, Past Office Hax 65, Cit-1217 May in 2, Canava, Environment, in Jugan, Venegous Ferriot (Past are, 148 ); Yeyobi, Shipanya (6) Talyo, 181)

Printed in U.S.A.



### BERVICENOTE





AUGYE

Per mers information, sell your teste lift Sales Office or Wast (201), 200-0000 " Midwest (212), 677-0400 " Bouth (404) 426-4181 " Wast (212) 277-1201; Or, writes Howlers Fackers, 1801 Pape Will Head, Polo Alie, Ballerinis 84304, In Europe, Past Office Box 26; 011-1217 Meyrinis, Canava, Deliver Lond, Johnson, Yakegama Howlest Fackers, 148-1, Yayegi, Shibuya Ku, Takya, 181.

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7/12-01

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LWMWN

INSTALLATION OF OPTION OIL (When no extra components must be added);

- 1. Unplug counter and comove top and bottom povers.
- B. Remove A4 civelat assembly and install components using Figure S. 4: 8 and parts list in Table S as reference.
- Instalt option 011 crystal assembly in place of the A4 assembly and secure in place with 8 screws\_sace Figure 3.
- 4. Check Option 011 Trequency as cultimed in pro-

Principal Adjustment Procedure Por Option 011 Oscillator

#### MOT

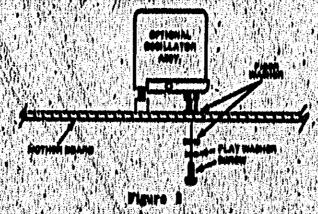
The counter must have primary power applied for at least 14 hours to allow the occillator temperature to stabilize.

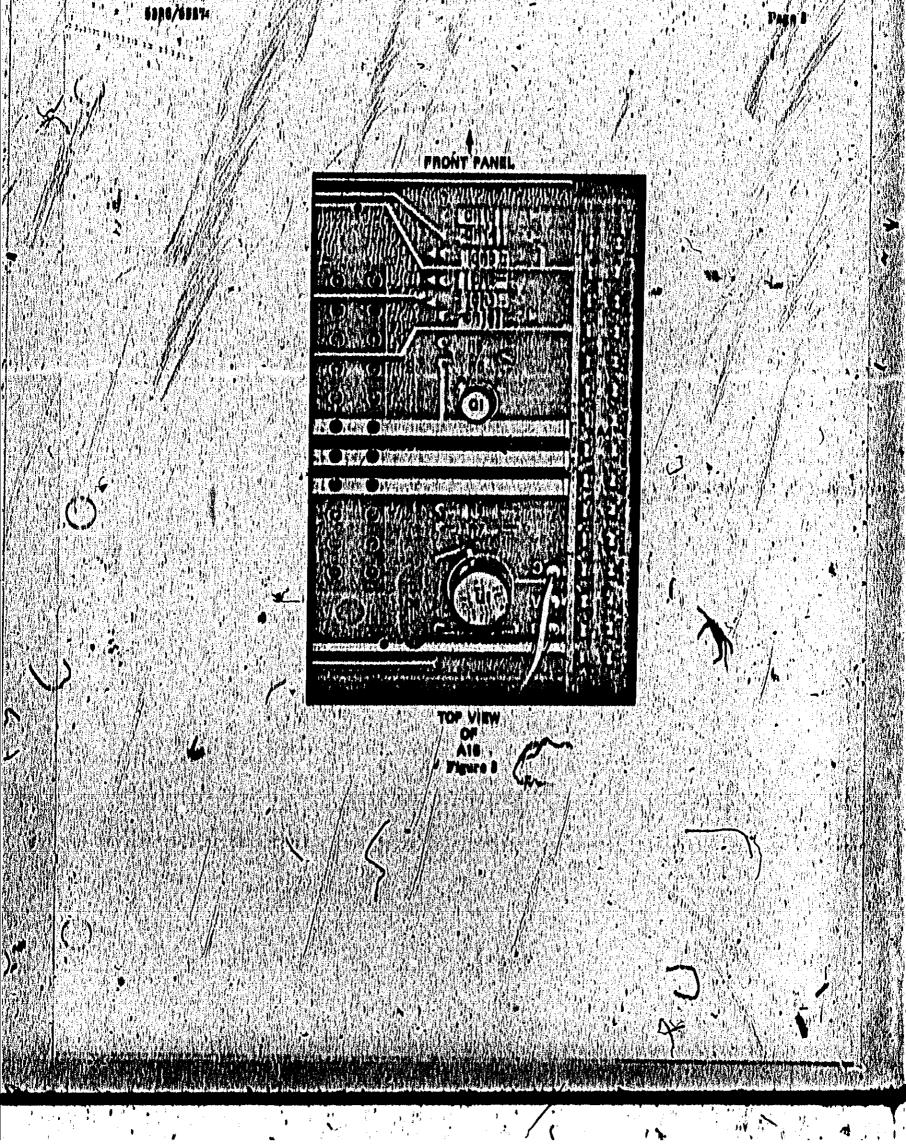
- 1. Set controls on oscillosance as follows:
  CHANNEL A 0.8 Y/em; DC coupled; + up:
  SWEND 0.05 | Hesc/cm/
  TRICORT: MKT, + slove, ACF
  MODE to NORM
  PRIFLAY to CHANNEL A
- P. Connect a suitable 1 MHs. 8 MHs or 10 MHs frequency standard (such as an RP Cestum Beam) to the NKT laput on oscilloscope/

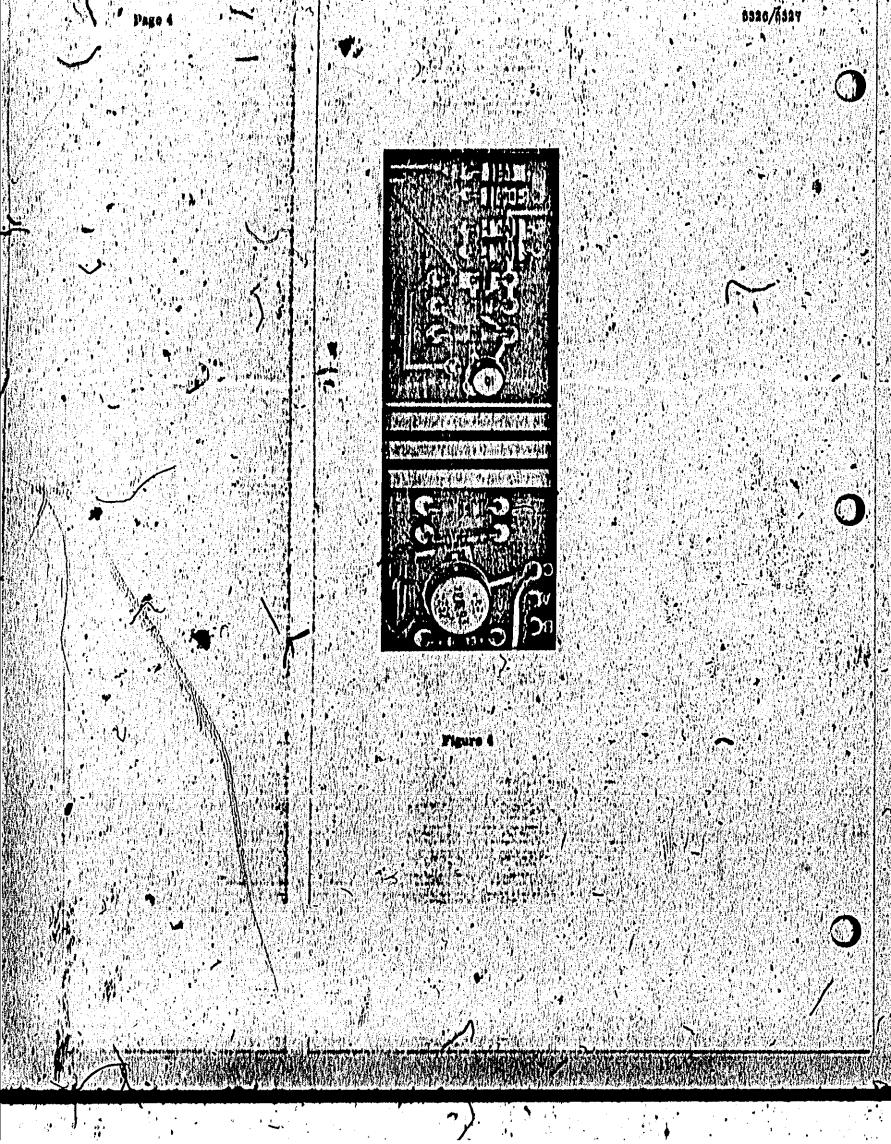
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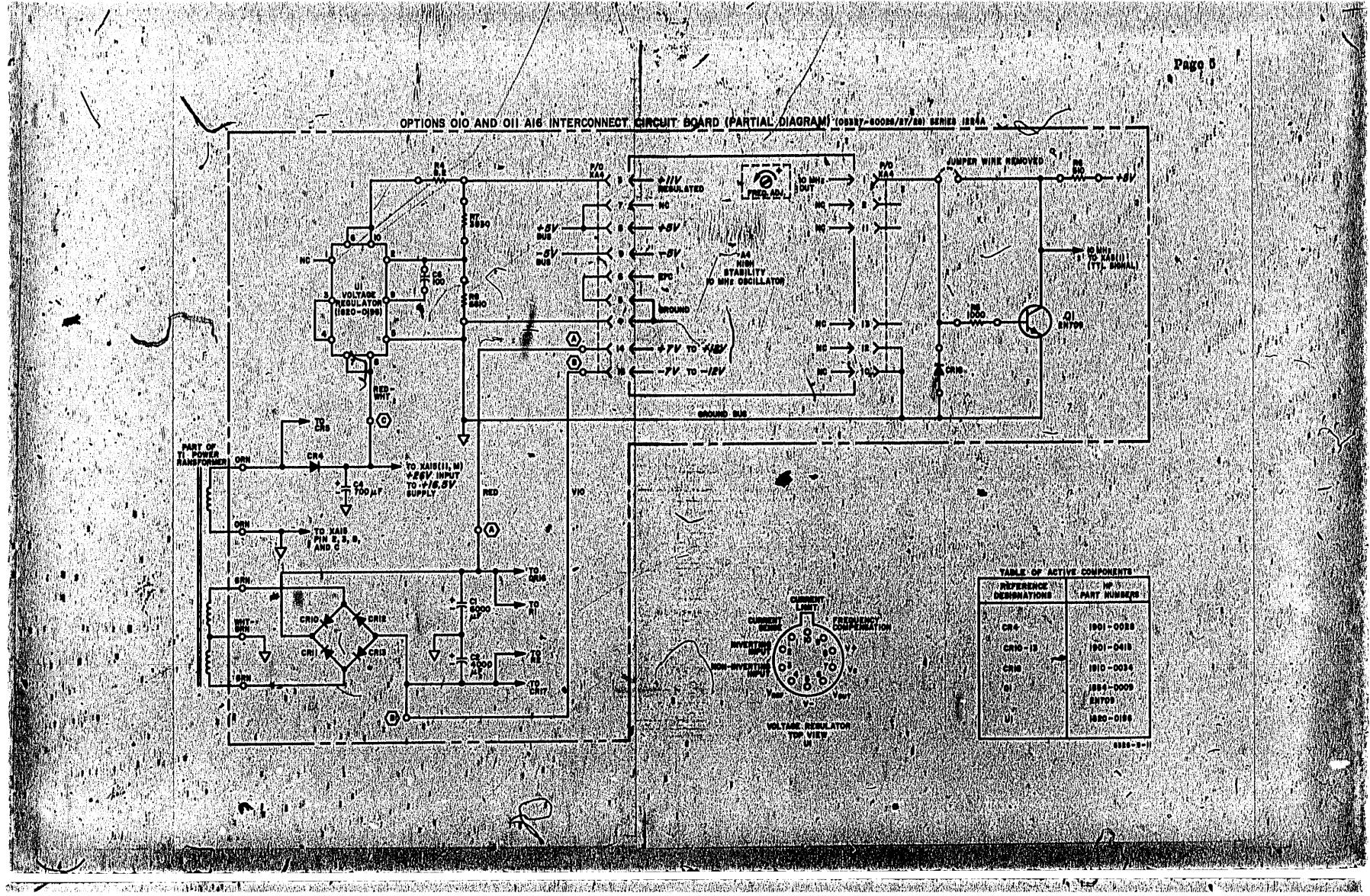
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- 8. Connect Ossillossope Channel A to OSC, BMC available on counter bear panel.
- 4. Adjust ossilialor PREQUENCY ADJ for mixtmam sideways movement of the ossilialor signal.









BERVICE

0380/27DF0 0320/27D-0 0320/27D-0

Hebrieber

None

Field Installation of Option 010 Model 5926/27 Counters
| Borisl number profix 1032 and above.

This service note contains installation instructions needed for field installation of the option 010 Temperature Compensated Crystal Oscillator (TCXO) HP Part No. 05327-69036. This option may be installed in any 5326/27 counter with serial number prefix 1032 and above.

Installation Instructions:

- 1. Unplug counter and remove top cover
- 2. Remove the A4 oscillator assembly and install the TCKO in its place.
- 3. Adjust the frequency of the TOXO using the following procedure.

Frequency Adjustment procedure:

NOTE: This procedure should be performed with the instrument open and the TCXO as near 25°C (approximately room temperature) as possible.

- 1. Connect a 5245L (or equivalent) to OSC BNC on back of counter.
- 2. Set 5245L to frequency and 1 second time base,
- 3. Adjust screw on top of TCXO assembly until 5245L read-out matches the frequency stamped on TCXO.

LM/ag/WN

7/73-02

HEWLET!



For more information, sall year lead IP Edes Office or East (201) 368-5200 @ Mid-Wei (212) 877-0400 @ South (404) 436-5181 @ West (212) 877-1281. Or, write: HewlettPathers, 1801 Page Mill Road, Pole Alto, California 84304 in Europe/Poli Office Box 95, CH-1217 Meyrin 2, Genera, Spritzerland, In Japan, Yokopero Hewlett Pages 2, 1-59-1; Yoyost, Ehitotyo-Ku, Takyo, (8), 331

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## SURVECE NOTE

Buplaced set

Added protection for the 1175 Valt power supply in GRECOMY Universal Counters

Failures that abort the +175 Thit phwer supply to ground can gause extensive damage inside a counter.

To project the 5886 and the 5887 model univered counters from these failures, the 175 volt supply is current limited. To provide aided protection in applications where it might be needed, this service note contains instructions and parts list for adding a Tues in the 175 volt line.

ingirusilong: (Por ingirumenta with serial profix 1918 & above))

- ). Turn off instrument, disconnect power sord
- Remove and axamine AlS power supply board.

  It is fuse to present on the board the 175 volt supply is already fused and so further protection is needed. If no fuse is present specially to step 5.
- B. Remore the jumper soldered between the two plated-through holes in trace connected to A10 pin 17
- 4. Bolder Pass helger (P/N 1400-0110) in platedthrough holes, finefall fues.
- lastall AIS power supply in counter, replace top cover and check hadrument for proper operation.

Berial Prais below 1919

- I ... Qura alt Instrument, dischinect power cord
- I. Hempye A15 power Bughly-board from instrument. Howeve A15116 and alean pikted-through Notes
- 9. Using a Pakor Made, carefully remove approxmately 1/8% of the trace between A15 pin 1 and the plate-through hole for A15RS that the traceconnects to
- 4. Install the ISD resistor (P/N 0008-1809) in place of A18R8.
- Bend the pine on the has holder (P/N 1400) 0110) out at right angles and solder holder to either side of out trace on A152 Install fuse.

Note

the nume that the tune holder is necurally held to board by the solder and that no solder bridges the out in the trace.

9. Install A15 in counter, replace top cover, and check instrument for proper operation.

Paris List

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7/73-02

HEWLETT (ID PACKARD

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BURVICE

None

# NIXIE DRIVER WARNING For all models of 5986/87 Universal Counters

Datch number 2075 of the nixte driver pircuits (P/N 1020-0002) in these counters have been failing at a rate higher than we like. Even though only a small number of the circuits in this batch are weak, all of them have been pulled from the stocking bins. There are, however, some nixte drivers from this batch presently in use in instruments. If they have not failed DO NOT replace them. If they do fail replace them with an 1820-0002 with a batch number other than 2075.

LM/ka/WO

05-74-2

HEWLETT UD PAGKARD

ra) mare intermetion, call your local HP, Sales Cilicolor Cast (101) 155.5000 / Midwest (111) 177.6400 P. Doolb (401) 154.650 Wast (211) 177.7201. Or, willia: Yagiatti Pictold, 1801 Page Mill Roba, Palo Alfo, Califold 71000, Is Corano, 1817 Moyrin: Sondy

### BRVICE

. / Bupersed vs AGO, G, AURED 1317A,0,0.0A

### IM MODEL BIZZ/SIZY PREQUENCY COUNTERS

Sorial Numbers

5326A - 1312A-01906 to 1312A-02900 53268 - 1912A-02141 16 1912A-03015

53260 - 1312A-00451 W 1312A-00675 5327A - 1312A-00366 W 1312A-00660 53278 - 1312A-00646 W 1312A-00666 53270 - 1312A-00646 W 1312A-00666

### ADDED PROTECTION TO PREVENT THE 4175 VOLT FUSE FROM BLOWING

In order to prevent the 4175 volt power supply fuse from blowing a new limiting resistor (No.HP/PN 0508-6479); fuse (HP/PN 2110-0487) and fuse adapters (HP/PN 1251-3205) must be: added to Regulator Roard Assy (A15).

If the 4176V fue is blowing, first check to see If the problem is not caused by short circuits in the **Instrument, then perform this modification.** 

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#### INSTALLATION PROCEDURE

- 1 Remove A15 Regulator Asey (HP/PN 05327-00020) from Instrument
- Remove A15R6 (13Ω) and Install new value of R6 (6.2Ω 5%).
- Insert Mini-Sockets Into existing fuse holder socket.
- Insert new 50 mA fuse into modified fuse holder socket.
- Return Instrument to original configuration and ensure +175V supply fuse ticesn't fall.
- Check Instrument for proper operation

TMAKAWA 7/74-02

HEWLETT (h) PACKARD

### BERVICE NOTE

BUMEN DEDEN None

#### 00117-60010 Presenter Board

The CORRY-600KB SSC Mils prescalor board may be substituted for the CDBRT-60008 board on the SBRTA, CRRYB, or SBRTQ, William C.

Kilker board may have been installed in the counter when shipped from the factory.

If a 5317-50039 board in used to realage a 5337r 60009 board in a 5337c with senial number 1040A00230 and below, it will believessary to add a 1.5K V/4(watt resistor (P/N-9685-1535) to the A7 board (P/N-96828-60045) as shown in the diagram below.

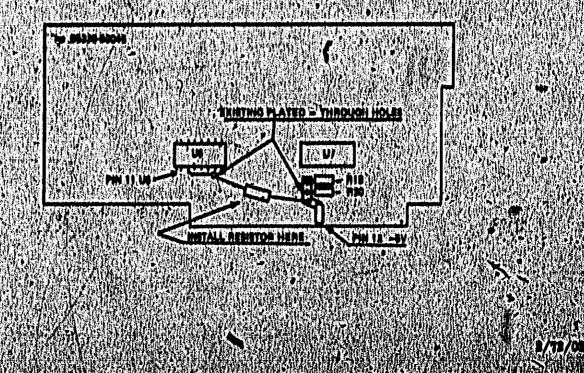
Using insulating spagnetti on the leads install the resistor in the existing plated-through-soles between pin 11 of US and the jundition of 118 and

The main difference in the two boards is in U4, the divide-by-5 circuit. In 05847-50088, hoard, Q2 shifts the BECL below of U8 (07 to -0.67) to standard ECL jevels (-0.87 to -1.87). U8 is an ECL gate that provides buildring. The bulgut of U4 io Jiahdard Ecc.

The remaining directory is identical to that on the ... 05327-60009 heard. Refer to the description is the Operating and Berylon Manual:

The adjustment procedure for RI and RA are identical on the two boards. The 05387-60089 has an additional potentimeter, RRS, which is adjusted as follows:

- 1. Rolaie RBB (ully clockwise) 2. If unable to obtain a stable count at 550 MHs
- turn RES slightly counterclockwise. Check for a stable counter reading.





NG/ME/WO