Errata

Title & Document Type: **5248L/M Electronic Counter Operating and Service Manual**

Manual Part Number: **05248-90001**

Revision Date: **October 1971**

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HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, life sciences, and chemical analysis businesses are now part of Agilent Technologies. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A. We have made no changes to this manual copy.

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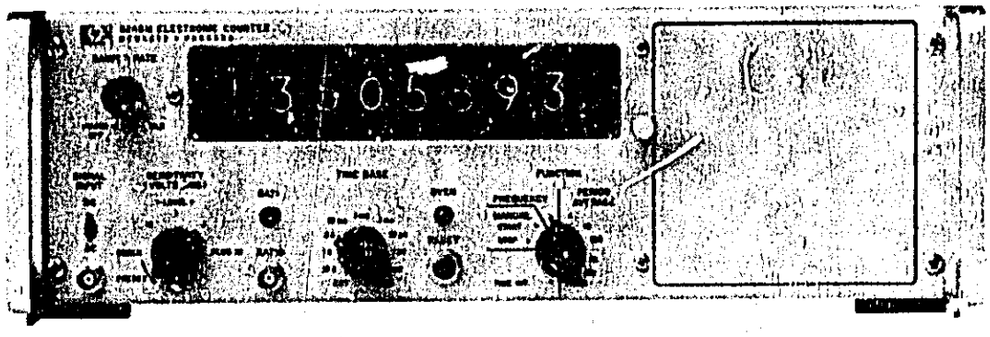
OPERATING AND SERVICE MANUAL

ELECTRONIC COUNTER

5248L/M



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CERTIFICATION

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

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ELECTRONIC COUNTER
5248L/M

SERIAL PREFIX: 1124A

This manual applies directly to HP Model 5248L and 5248M Electronic Counters having serial prefix 1124A.

SERIAL PREFIXES NOT LISTED

For newer instruments with serial prefix above 1124A, a "Manual Changes" sheet is included with this manual. For older instruments with serial prefix below 1124A, changes required to backdate this manual can be found in Section VII.

OPTIONS

For instruments having Option 002 or Option 003, refer to Section VII.

5301 STEVENS CREEK BLVD., SANTA CLARA, CALIF. 95050

Printed: OCT 1971

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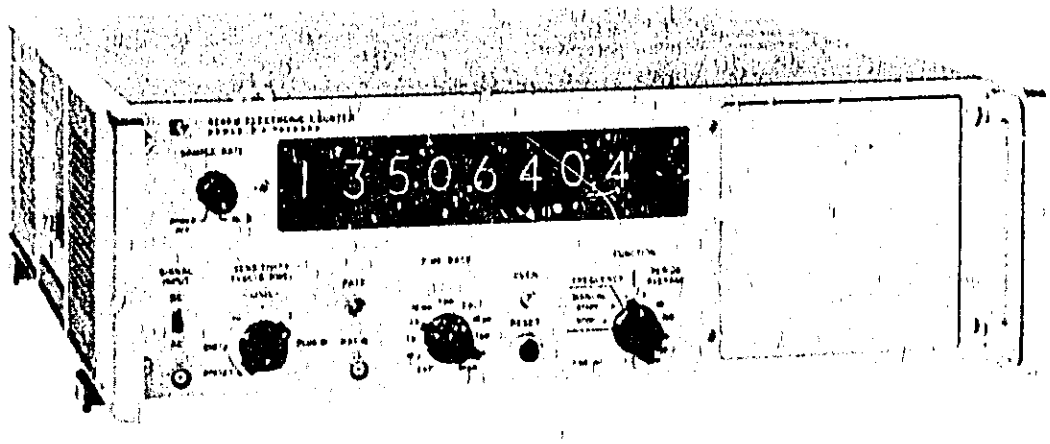
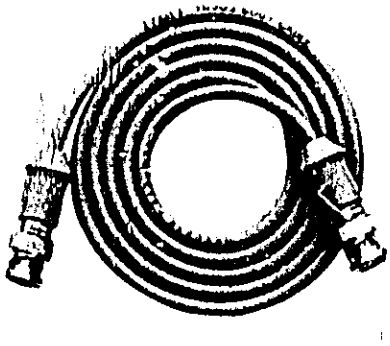
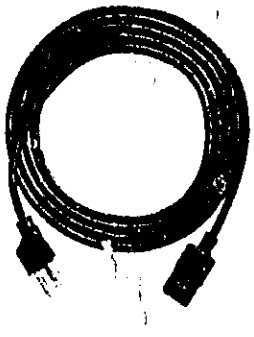
MODEL 5248L/M



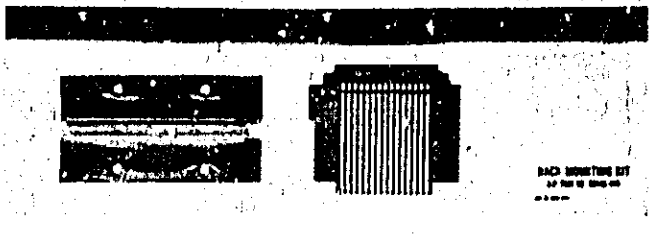
BNC TO BNC CABLE



POWER CABLE



RACK ADAPTER KIT



SECTION I

GENERAL INFORMATION

1-1. DESCRIPTION

1-2. The 5248L and 5248M are high-frequency, general-purpose electronic counters capable of:

a. Frequency measurements from 0 to 150 MHz.

b. Period measurements from .01 μsec to 10 seconds.

c. Period averages from 10 to 100,000 periods.

d. Ratio measurements.

e. Multiplied ratio measurements.

f. Scaling (dividing) frequencies from 0 to 150 MHz by decades up to 10^9.

g. Pulse measurements, counting positive or negative pulses.

h. Providing standard output frequencies from .1 Hz to 100 MHz in decade steps.

i. 5 MHz OUTPUT, 1 V rms into 50 ohms usable as a secondary frequency standard (Model 5248M only).

j. Four-line BCD 8421 output for digital recorder, analog converter, or data processing equipment.

1-3. The basic difference between Model 5248L and 5248M is the time base oscillator. Time base frequency of the 5248L is 1 MHz with an aging rate of less than 3 parts in 10^9 per day and short term stability of less than 3 parts in 10^{10}. The 5248M time base frequency is 5 MHz with an aging rate of less than 5 parts in 10^{10} per day, and short term stability of less than 5 parts in 10^{11}.

1-4. The counters feature solid state design, low power consumption, small size (5-1/4 inch panel height), light weight (31 lbs), easy conversion for rack mounting, and modular plug-in circuit boards for simplified maintenance.

1-5. IDENTIFICATION

1-6. Hewlett-Packard uses a two-section serial number mounted on the rear panel. Earlier instruments use an eight-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 nine-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 on your instrument does not appear on the title page of this manual, there may be differences between the manual and your instrument. If there are differences, they will be described in a change sheet included with the manual.

1-7. All instruments with the same serial prefix are the same. The group of instruments to which this manual applies directly is identified on the title page. For older instruments (lower serial numbers), make manual changes listed in Section VII. For newer instruments, having serial numbers higher than those listed on the title page, Manual Change sheets are included, describing the required changes. The manual for an instrument having special electrical modifications will include an insert sheet describing that modification. If a change sheet or special information sheet is missing, the information sheet can be supplied by any Hewlett-Packard Sales and Service office listed at the back of this manual.

1-8. INSTALLATION AND OPERATION

1-9. Installation and operation procedures are covered in Sections II and III of this manual. An explanation of controls and connectors and a self-check procedure are included in Section III (Figures 3-3 through 3-5).

1-10. TERMINOLOGY

1-11. The definitions of the following terms apply to these terms as used throughout this manual.

1-12. Scaling

1-13. A feature to divide an input frequency (0 to 135 MHz) by decades up to 10^9. See Figure 3-10 for proper control settings.

1-14. Truth Table

1-15. Table which lists the high or low states of a binary system for each decimal digit to be represented. These states are listed in an order which presents the most significant digit first. Example: In a 1248 code, binaries D, C, B, A are assigned decimal weights of 8, 4, 2, and 1 respectively. The decimal numeral 5 is represented by state 0101 and weights of 4 and 1 are present. The allowable combination (0101) is listed in the truth table Table 1-1.

Table 1-1. Truth Table

Digit	Standard 1 = High, 0 = Low Option 003 1 = Low, 0 = High			
	D = 8	C = 4	B = 2	A = 1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
Low = -8 V		High = +18 V		

Table 1-2. Specifications

FREQUENCY MEASUREMENT

Range: 0 to 150 MHz (dc input), typical response < ±1 dB, 25 Hz to 150 MHz (ac coupled).

Gate Time: 1 μs to 10 seconds in decade steps.

Accuracy: ± 1 count ± time base accuracy.

Readout: kHz or MHz with positioned decimal point; units annunciator in line with digital display.

Self-Check: Counts 100 MHz for the gate time chosen.

PERIOD AVERAGE MEASUREMENTS

Range: Single Period 0 to 1 MHz
Multiple Period 0 to 300 kHz

Periods Averaged: 1 period to 10^5 periods in decade steps.

Frequency Counted: (in decade steps)

1 and 10 Period	1 Hz to 100 MHz
100 Period	10 Hz to 100 MHz
1,000 Period	100 Hz to 100 MHz
10,000 Period	1 kHz to 100 MHz
100,000 Period	10 kHz to 100 MHz

Accuracy: ± 1 count ± time base accuracy ± trigger error * .

Readout: Sec, ms, μs, with positioned decimal point; units annunciator in line with digital display.

Self-Check: Checks operation from 1 period to 10^5 periods.

RATIO MEASUREMENTS

Displays: (f_1/f_2) times period multiplier; multiplier: 1 to 10^5.

Range: f_1: 0 to 150 MHz. f_2: 0 to 1 MHz in single ratio, 0 to 300 kHz in multiple ratio; ratios averaged 1 to 10^5 in decade steps.

Sensitivity: 0.1 V rms, each input (max).

Accuracy: ±1 count of f_1 ± trigger error * of f_2. f_2 is applied to the decade dividers (enters ratio jack on front panel), f_1 is frequency applied to decimal counters (enters signal input jack).

Readout: Dimensionless; positioned decimal point for number of periods averaged.

Self-Check: Period Average Self-Check applies.

* 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; error decreases as signal-to-noise ratio and input level increase.

SCALING

Frequency Range: 0 to 150 MHz

Factor: By decades up to 10^9, switch selected on rear panel; 50 MHz max. for ÷ 10 step. For ÷ 2, ÷ 4, ÷ 8, add HP 5252A Prescaler.

Input: Front panel, Signal Input.

Output: In place of time base output frequencies.

GENERAL

Display: 8 digits in-line with rectangular Nixie® tubes; 99,999,999 max. display; total width of display including units annunciator and auto-positioned decimal point indication does not exceed 7 inches.

Display Storage: Holds reading between samples; rear panel switch overrides storage.

Sample Rate: Time following a gate closing during which the gate may not be reopened is variable from less than 50 ms to 2 s in Frequency mode, independent of gate time; display can be held indefinitely.

Signal Input:

Maximum Sensitivity: 100 mV rms

Coupling: ac or dc, selected by front panel switch. AC coupling has 600 V dc, 0.022 μF capacitor (-3 dB at approx. 7 Hz).

Impedance: 1 meg parallel with approx. 25 pF, all ranges.

Attenuation: Step attenuator (SENSITIVITY switch) provides nominal sensitivities of 0.1, 1, and 10 V rms.

Trigger Level Adjustment (min): Front panel control has ±0.3 V trigger level range on 0.1 V position, ±3 V range on 1 V position, ±30 V range on 10 V position. A PRESET position automatically centers trigger level at 0 V.

Overload Protection: Diodes protect input circuit for up to 120 V rms < 1 kHz on 0.1 V range, 250 V rms on 1 V range, 500 V rms on 10 V range. Input resistance for overload conditions (input amplitude > ten times SENSITIVITY) is 100 kΩ on 0.1 V range, and is approximately 1 MΩ on other ranges.

Pulse Measurements: Front panel TRIGGER LEVEL adjustment allows counting positive or negative pulses.

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Table 1-2. Specifications (Cont'd)

GENERAL Cont'd.

Time Base External Input (front panel):

Maximum Sensitivity: 100 mV rms

Impedance: 1 MΩ, approx. 20 pF, dc coupled.

Overload: Diodes protect input circuit up to 120 V rms.

Digital Output: 4-line BCD 8421, "1" state positive; includes decimal point and measurement unit.
"1" State Level: +18 V
"0" State Level: -8 V
For 4221 "1" state positive: order Option 02
For 8421 "1" state negative: order Option 03

Impedance: 100 kΩ, each line.

BCD Reference Levels: approximately +10 V, 350Ω source; approx. -1 V, 1000Ω source.

Print Command: +13 V to 0 V step. DC-coupled.

Hold-off Requirement: +15 V min., +25 V max. from chassis ground (1000Ω source).

Cable Connector: Amphenol 50-pin 57-30500-375, HP Part No. 1251-0069, 1 required.

Operating Temperature Range: -20°C to +65°C

Altitude: 25,000 feet

Power Supply: 115 or 230 volts ±10%, 50 to 60 Hz; 125 watts ±10%. (50 to 1000 Hz operation, price on request.)

Weight: Net, 31 lb (14 kg) with blank plug-in panel. Shipping, 37 lb (17 kg).

Connectors: BNC (except remote program and BCD out).

Accessories Furnished: 10503A Cable, 4 ft (120 cm) long, male BNC connectors. Detachable power cord, 7-1/2 ft (200 cm) long, NEMA plug. Circuit Board Extender, rack mount conversion kit.

Dimensions: 5-7/32" high x 16-3/4" wide x 16-3/8" deep.

Optional and Special Features (at added cost):

Option 002: 4-line BCD 4221 "1" state positive.

Option 003: 4-line BCD 8421 "1" state negative.

Special: Remote Control of timebase and function.

MODEL 5248L TIME BASE

Crystal Frequency (internal): 5 MHz

Stability:

Aging Rate: < 3 parts in 10^9 per 24 hours *.

Short Term: < 2 parts in 10^{10} rms with measurement averaging time of one second under constant environment and line voltage conditions.

Temperature: < 2 parts in 10^{10} per °C from -20° to +55°C.

Line Voltage: < ±5 parts in 10^{10} for 10% change in line voltage from 115 V or 230 V rms.

Adjustment: Fine frequency adjustment (range approx. 4×10^{-8}) and medium frequency adjustment (range approx. 1×10^{-6}) are available from the front panel through the plug-in hole. Coarse frequency adjustment (range approx. 1×10^{-5}) is available at the rear of the instrument.

Output Frequencies:
At Rear Panel: 0.1 Hz to 10 MHz in decade steps, switch selected on rear panel. All frequencies available in manual function without interruption at reset except 100 Hz, 10 Hz, 1 Hz, and 0.1 Hz which are interrupted by manual reset; 10 kHz to 10 MHz available continuously in all functions; 1 kHz available continuously for all functions except 10^5 period average; stability same as internal time base. Output is: 5 volts p-p rectangular wave with 1000Ω source impedance at 1 MHz and lower; 1 V rms sine wave with 1000Ω source impedance only at 10 MHz. Separate BNC gives 100 MHz sine wave, 100Ω source.

External Standard Frequency: 1 MHz, 1 V rms into 1000Ω can be substituted for internal time base via rear panel EXT STD FREQ connector.

* After 72 hours continuous operation.

Table 1-2. Specifications (Cont'd)

MODEL 5248M TIME BASE

Crystal Frequency (Internal): 5 MHz

Stability:
- Aging Rate: < 5 parts in 10^{10} per 24 hours after warmup *
- Short Term (RMS fractional frequency deviation): Better than 5 parts in 10^{11} for 1 second averaging time.
- Temperature: < 5 parts in 10^{11} per °C from 0° to 50°C (< 2.5 parts in 10^{9} within the entire span of 0° to 50°C).
- Line Voltage: < ±1 part in 10^{10} for 10% change in line voltage from 115 V or 230 V rms.
- Load Stability: Typically < ±2 parts in 10^{11} for any of the following loads: open, short, 50Ω resistive, 50Ω inductive, 50Ω capacitive.

Warmup: For "off" periods up to approx. 24 hours: 1 hour typical to reach 5 parts in 10^{9} of the frequency that existed when turned off. The 5 MHz crystal oscillator operates whenever the power cord is connected.

Adjustment: Fine frequency adjustment, range approx. 5×10^{-8}, 15-turn control accessible through plug-in accessory compartment in front panel. Coarse frequency adjustment, range approx. 1×10^{-6}, 20-turn control at rear panel.

Output Frequencies:
1. Rear Panel: 5 MHz sine wave, 1 V rms into 50Ω. Available at all times whenever power cord is energized, whether front panel power switch is ON or OFF. Stability is defined above. Signal-to-noise ratio typically >87 dB below rated output. Harmonic distortion typically >40 dB below rated output. Non-harmonic components typically >80 dB below rated output.
2. Rear Panel: 0.1 Hz to 10 MHz in decade steps; switch selected on rear panel; all frequencies available in manual function without interruption at reset except 100 Hz, 10 Hz, 1 Hz, and 0.1 Hz which are interrupted by manual reset; 10 kHz to 10 MHz available continuously in all functions; 1 kHz available continuously for all functions except 10^{5} period average; stability same as internal time base; 5 V p-p rectangular wave with 1000Ω source impedance at 1 MHz and lower; 1 V rms sine wave with 1000 Ω source impedance only at 10 MHz. Separate BNC gives 100 MHz sine wave, 100Ω source.

External Standard Frequency: 5 or 10 MHz, 1 V rms into 1000Ω can be substituted for internal time base via rear panel EXT STD (EQ connector.

* Up to 72 hours continuous operation may be required to reach this aging rate after transportation or lengthy "off" periods.

1-16. Aging Rate

1-17. Refers to the average slope of the fractional frequency change of an oscillator plotted against time as seen in Figure 1-2. Example: An oscillator has an aging rate of ±5 parts in 10^{10} per day and its base frequency is 5 MHz. In one week the maximum allowable frequency deviation would be 7 x 5 parts in 10^{10} or 35 parts in 10^{10} or ±3.5 parts in 10^{9}. This means that the base frequency will fall between 5,000,000.0035 Hz and 4,999,999.9965 Hz.

1-18. AVAILABLE PLUG-IN UNITS

Figure 1-3

1-19. Model 5252A Prescaler

1-20. HP Model 5252A Prescaler Plug-in unit extends the counter's range to 350 MHz. Prescaling is accomplished without tuning by binary dividers over a frequency range of 0 to 350 MHz. Multiple scaling factors (2, 4, or 8) shorten scaling time at lower frequencies.

1-21. Model 5253B Frequency Converter

1-22. HP Model 5253B Frequency Converter extends the counter's frequency range to 512 MHz. The stability and basic accuracy are retained by multiplying a 10 MHz signal, from the counter's time base, to a known harmonic frequency. When this harmonic frequency is selected and mixed with the input signal frequency, the difference frequency produced is within the range of the basic counter and is displayed by the counter.

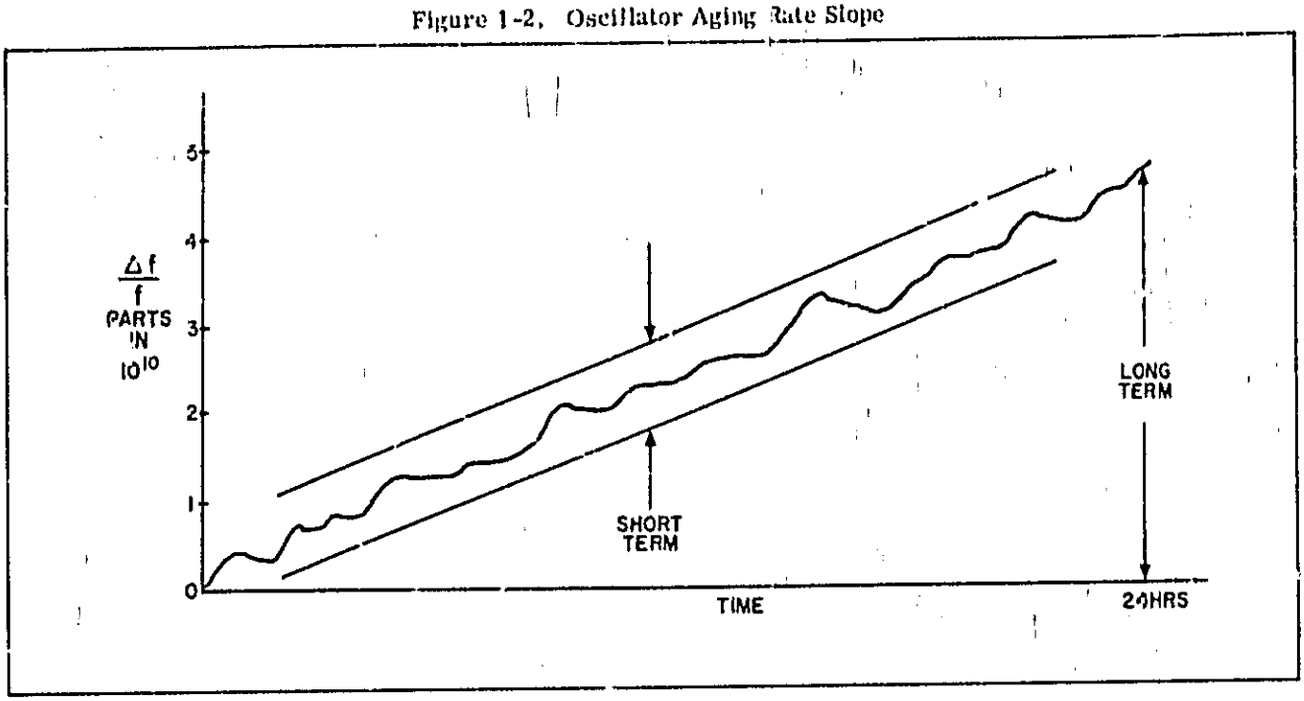
1-23. Model 5254C Frequency Converter

1-24. HP Model 5254C Frequency Converter provides the counter with a frequency range from 200 MHz to 3 GHz. The stability and accuracy of the basic counter are retained by using 10 MHz from the counter and multiplying it to 50 MHz to beat with the frequency being measured. The difference produced is within the range of the basic counter and is displayed by the counter. The converter has an indicator which aids in frequency selection and indicates the output level to the counter.

1-25. Model 5255A Frequency Converter

1-26. HP Model 5255A Frequency Converter provides the counter with a frequency range from 3 to 12.4 GHz. The stability and accuracy of the counter is retained by using a heterodyne signal frequency (a selected harmonic from a 200 MHz comb spectrum) which is

Figure 1-2. Oscillator Aging Rate Slope



derived from the 5248 time base. The 5248 displays the converter's difference frequency to the nearest cycle with the counter TIME BASE switch set to 1 sec. Adding this reading to the 5255A dial reading (3 to 12.4 GHz) gives the input frequency with resolution to 1 Hz.

1-27. Model 5256A Frequency Converter

1-28. HP Model 5256A Frequency Converter provides the counter with a frequency range from 8 to 18 GHz. The stability and accuracy of the counter are retained by the use of a heterodyne signal frequency (a selected harmonic from a 200 MHz comb spectrum) which is derived from the 5248 time base. The 5248 displays the converter's difference frequency to the nearest cycle with the counter GATE TIME switch set to 1 sec. Adding this reading to the 5256A dial reading (8 to 18 GHz) gives the input frequency with resolution to 1 Hz.

1-29. Model 5258A Sensitive Prescaler

1-30. HP Model 5258A Sensitive Prescaler Unit extends the counter's frequency range to 200 MHz. It extends the input sensitivity in the 1 MHz to 200 MHz range to 1 mV rms and can be used as a video amplifier. Input frequency prescaling (dividing) is done without tuning by binary dividers operating from 1 MHz to 200 MHz. At the same time, the prescaler adjusts the counter's time base an equal amount to provide direct readout in frequency.

1-31. Model 5261A Video Amplifier

1-32. HP Model 5261A Video Amplifier extends the counter's sensitivity to 1.0 mV over the frequency range of 10 Hz to 50 MHz. Input impedance is increased to 1 Megohm and can be increased to 10 Megohms by using an accessory 10:1 divider probe (HP 10003A) for signals greater than 10 mV. A 50 ohm output is provided for oscilloscope monitoring of the amplified signal.

1-33. Model 5257A Transfer Oscillator

1-34. HP Model 5257A Transfer Oscillator enables the counter to measure CW, FM, or pulsed signals, from 50 MHz to 18 GHz. Wide phase lock range of ±0.2% and wide capture range simplify tuning and permit measuring signals with large FM content. Direct readout on counter after harmonic number is set into thumbwheels.

1-35. Model 5262A Time Interval Unit

1-36. HP Model 5262A Time Interval Unit provides start and stop pulses, initiated by electrical inputs, to the main count gate in the Model 5248 enabling it to make time interval measurements. Time intervals from 1 microsecond to 10^8 seconds are measured with a resolution of 0.1 microsecond. Basic counter accuracy is retained when the signal counted is derived from the internal oscillator.

1-37. Model 5267A Time Interval Unit

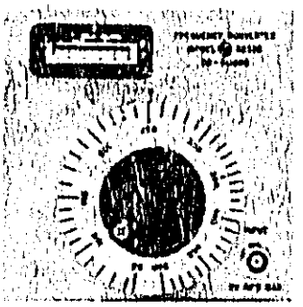
1-38. HP Model 5267A Time Interval Unit provides start and stop to the counter enabling it to make time interval measurements. Time intervals from 100 nanoseconds to 10^8 seconds are measured with a resolution of 10 nanoseconds. Basic counter accuracy is retained when the signal counted is derived from the internal oscillator.

1-39. Model 5264A Preset Unit

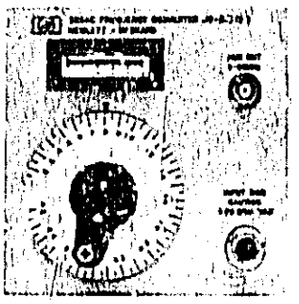
1-40. HP Model 5264A Preset Unit converts the counter to a preset time base counter while retaining

Figure 1-3. Plug-ins

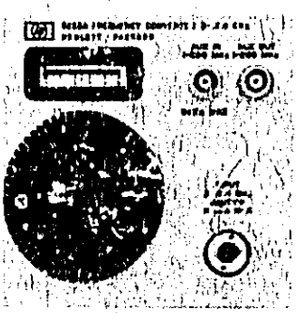
52?2A Prescaler



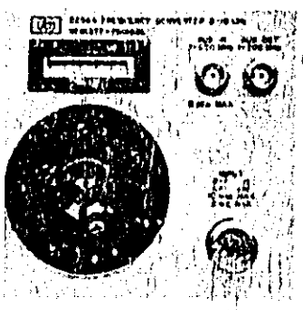
5253B Converter



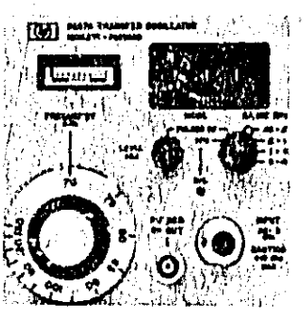
5254C Converter



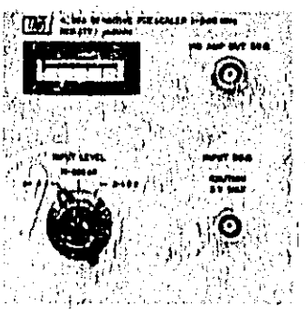
5255A Converter



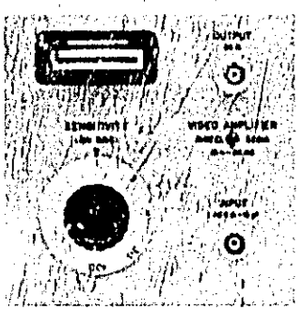
5256A Converter



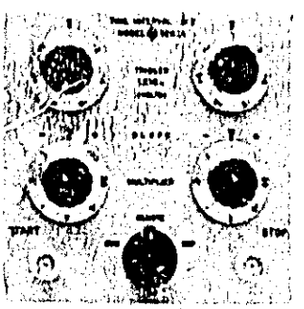
5257A Transfer Oscillator



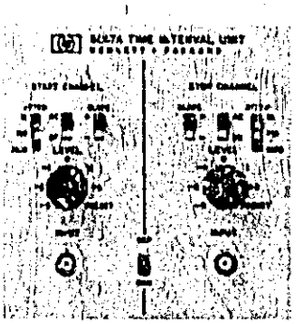
52?8A Sensitive Prescaler



5261A Video Amplifier

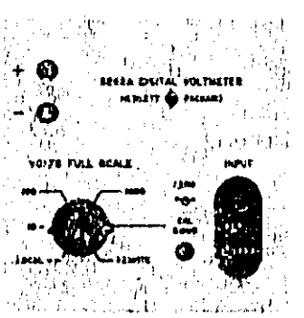


5262A Time Interval Unit



5267A Time Interval Unit

5264A Preset Unit



5265A Digital Voltmeter

its basic measurement functions and range. HP 5264A permits the counter to:

Measure normalized frequency rate
Measure normalized ratio
Measure normalized period
Count N events
Divide an input frequency by N.

In these measurements, N may be any integer from 1 to 100,000 (N = 100,000 when all N switches are set to 0).

1-41. Model 5265A Digital Voltmeter

1-42. HP Model 5265A Digital Voltmeter converts the counter to an accurate DC digital voltmeter. DC voltages as high as 1000 volts can be measured with six-digit presentation. Accuracy of the Digital Voltmeter is ±0.1% of the displayed reading or 0.01% of the full-range value for operating temperatures between +15°C and +40°C. Accuracy is maintained for over-range voltages of 5% on all ranges. Polarity of the input dc voltage is automatically sensed and displayed. The .01 μs time base is not useable.

1-43. APPLICATIONS

1-44. The counter can measure frequencies from 0 to 150 MHz directly, and to 18 GHz when used with available plug-in units. It can measure speed, rpm, acceleration, vibration, and other phenomena when they are converted to sine waves or pulses. It can simplify the design, test, and calibration of filters, oscillators, scalers and other devices which require critical frequency or time interval measurements in their manufacture or maintenance. The BCD (rear panel) output permits hard copy records automatically.

1-45. High Resolution Analog Plot

1-46. The counter can be used in standards labs to measure, monitor, and record frequency standards. Standard frequencies to 18 GHz (using applicable plug-in unit) can be measured while providing a 4 level BCD code output to a Digital to Analog Converter (HP Model 581A), whose analog output goes to a strip chart recorder (HP Model 7128A), giving a hard copy permanent record of frequency stability.

1-47. DC to 40 GHz Measuring System

1-48. The counter, when used with HP Model 8690A Sweeper, HP Model 8709A Synchronizer, HP Model 797D 20 dB Coupler, HP Model 5257A Transfer Oscillator (plug-in), and HP Model 11517 Mixer will measure frequencies to 40 GHz (Figure 1-4). Sensitivity using this system is better than -30 dBm at 12 GHz, -20 dBm at 40 GHz.

1-49. OPTIONAL BCD OUTPUTS

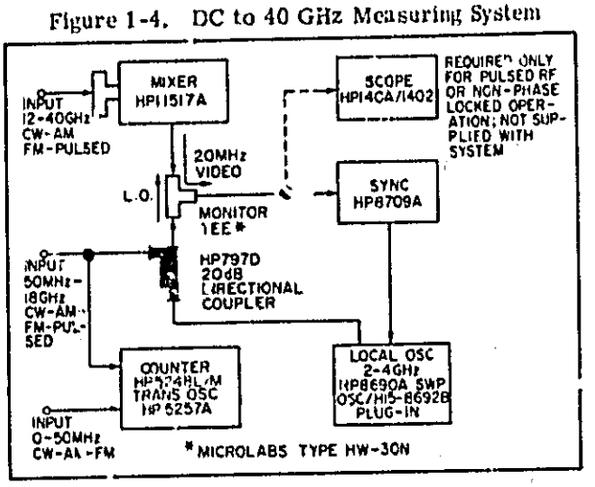
1-50. Option 002

1-51. The Counter is available with +1224 "1" state positive BCD output (Table 1-2). Option 002 assemblies with +1224 "1" state positive have been substituted for A8, A9, A10 through A14, A15, A16, A18. These substitutions are listed in Section VII with corresponding part numbers.

1-52. Option 003

1-53. The Counter is available with -1248 "1" state negative BCD output (Table 1-2). Option 003 assemblies with "1" state negative have been substituted for the standard assemblies. The substitutions have been made to A8, A9, A10 through A14, A15, A16, A18. These substitutions are listed in Section VII with corresponding part numbers. The Counter operation with Option 03 is identical in all respects to the standard counter except for the "1" state.

Figure 1-4. DC to 40 GHz Measuring System



1-54. EQUIPMENT SUPPLIED AND AVAILABLE

1-55. Equipment supplied with Model 5248 Electronic Counters is listed in Table 1-3.

Table 1-3. Equipment Supplied

Description	HP Part No.
Detachable power cord 7-1/2 feet (231 cm) long	8120-1348
Cable 4-feet (122 cm) long male BNC connectors	10503A
Rack mount kit	5243A-44A
Kit includes:	
1 Right-hand bracket	5020-0709
1 Left-hand bracket	5020-0708
1 Strip filler (gray)	05243-4001
1 Label	05243-9004
1 Circuit-board extender	05243-6022

SECTION II

INSTALLATION

2-1. INTRODUCTION

2-2. This section contains information on unpacking, inspection, repacking, storage, and installation.

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 Procedure, Figure 3-5), notify the carrier and the nearest Hewlett-Packard Sales and Service office immediately (offices are listed at the back of this manual). Retain the shipping carton and the padding material for the carrier's inspection. The Sales and Service office will arrange for the repair or replacement of your instrument without 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 instrument with protective wrapping paper. Pack instrument in strong corrugated container (350 lb/sq in. bursting test) with a layer of excelsior about 6 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 for rack installation, refer to Figure 2-1 and proceed as follows:

a. Remove tilt stand.

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.

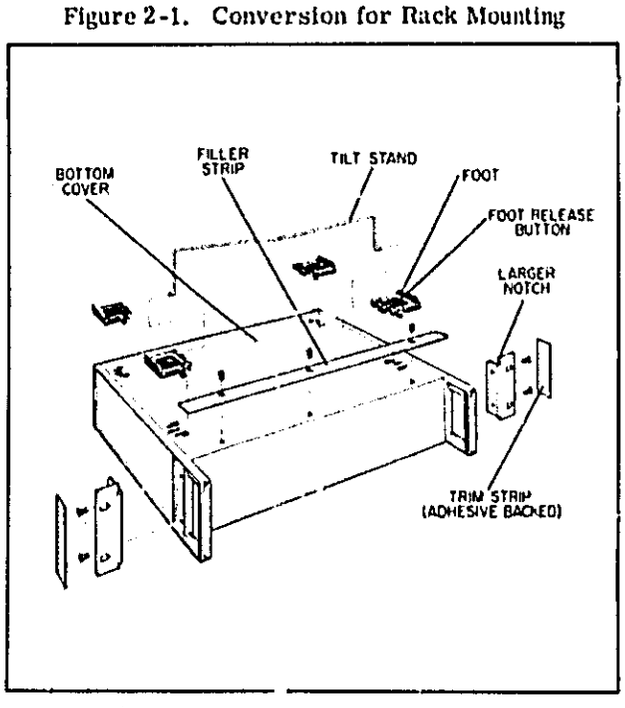
d. Attach filler strip along bottom edge of front panel.

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 a maximum of 131°F (55°C). Be sure instrument position in rack permits air circulation to intake in center area of rear panel and that nearby instruments do not discharge hot air near intake.

Figure 2-1. Conversion for Rack Mounting



2-10. POWER CONNECTION

2-11. LINE VOLTAGE. The Counter may be operated from either 115 or 230 volt (±10%) power lines. A slide switch on the rear panel permits quick conversion for operation from either voltage. Insert a narrow-blade screwdriver in the switch slot and 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 115 volt fuse; be sure to replace this fuse for 230 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

Conversion	115 Volt	230 Volt
Slide Switch	Left (115)	Right (230)
AC Line Fuse	2 Ampere Slow-Blow (HP 2110-0303)	1 Ampere Slow-Blow (HP 2110-0312)

2-12. POWER CABLE. The Counter is equipped with a detachable 3-wire power cable. Proceed as follows for installation.

a. Connect flat 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. COOLING

2-14. The Counter uses forced air cooling. The air intake and filter are located on the rear panel of instrument. Inspect the filter regularly; clean the filter before it becomes dirty enough to restrict air flow.

Note

Do not apply coating compounds to non-metal filters.

2-15. PLUG-IN INSTALLATION

2-16. Plug-in units are installed into the rectangular compartment at the right hand side of the counter's front panel. To install plug-in unit, turn counter OFF and remove blank panel by turning the retaining latch knob counterclockwise. Insert plug-in unit and push firmly into compartment until front panel of plug-in is flush with the front panel of the counter. Turn the retaining latch knob clockwise until tight.

2-17. To remove unit, turn counter OFF and turn the retaining latch knob counterclockwise to its stop. Grasp knob or connector and pull from counter. If any difficulty is encountered with installation or removal, check that the retaining latch is fully counterclockwise.

OPERATION

SECTION III

OPERATION

3-1. INTRODUCTION

3-2. The Counter measures frequency, period average, ratio of two frequencies, and total events. The FUNCTION switch selects MANUAL START/STOP, FREQUENCY, PERIOD, or TIME INT. Gate time selection is by the TIME BASE switch. The SAMPLE RATE control varies the sampling rate, and a SENSITIVITY control adjusts the input sensitivity. Figures 3-3 and 3-4 describe the front and rear panel operating controls. Figures 3-5 through 3-8 provide step-by-step operating procedures for self-check, frequency measurements, period measurements, and ratio measurements. Figures 3-9 and 3-10 provide operating procedures for totalizing and scaler operation.

3-3. INTERPRETING DISPLAY

3-4. Direct readout is provided in both PERIOD and FREQUENCY functions with measurement units displayed and the decimal point automatically positioned. In the MANUAL function the display is read directly and the decimal point is not lighted. Note that the only difference between ratio and period measurements is the use of an external counted frequency instead of one of the internal standard frequencies.

3-5. ACCURACY 5248L

3-6. FREQUENCY MEASUREMENTS. Accuracy is determined by two factors; the aging rate of the 1 MHz crystal standard in the time base, which is less than 2 parts in 10^3 per week, and the inherent error of ±1 count present in all counters of this type. This error is due to phasing between the timing pulse that operates the electronic gate and pulses that pass through the gate to the counters. The chart in Figure 3-1 shows the error possible for frequency measurements (assuming oscillator calibration once a week).

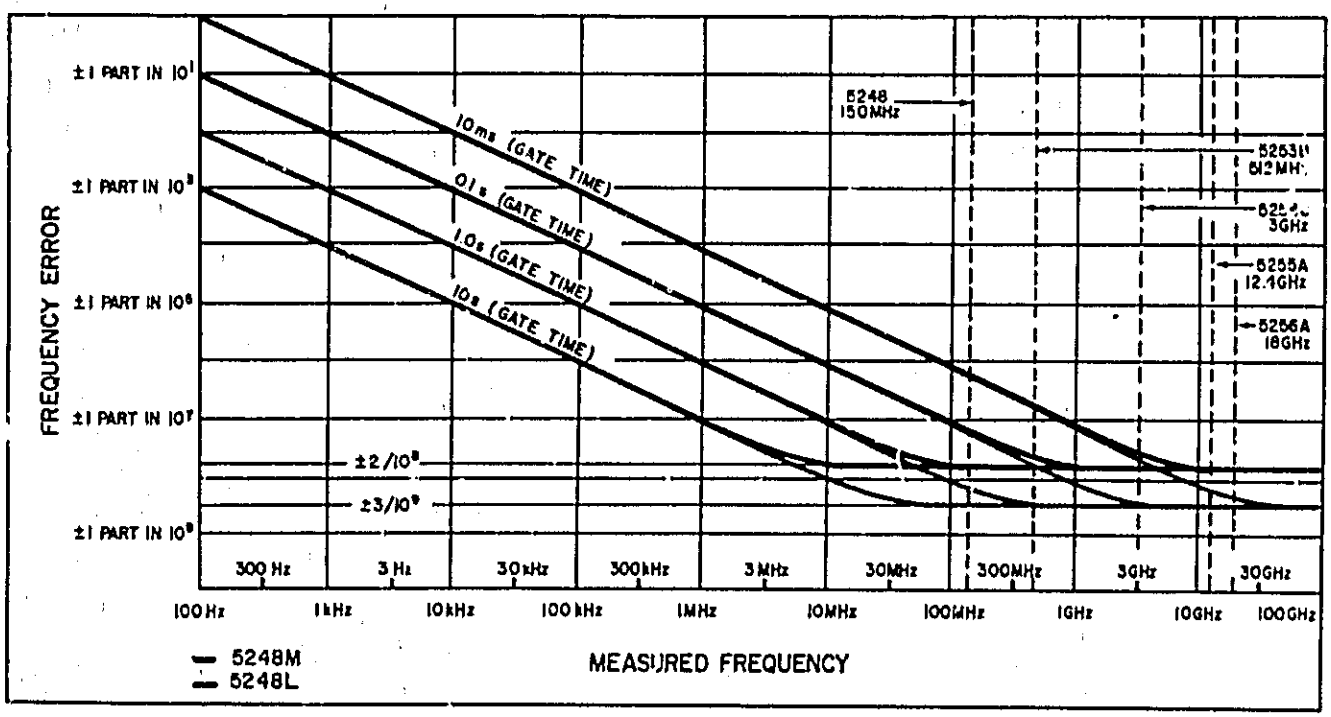
3-7. PERIOD MEASUREMENTS. The three factors contributing to the accuracy of period measurements are:

a. The aging rate of the 1 MHz standard, which is less than 2 parts in 10^8 per week.

b. The ±1 count ambiguity.

c. The ± trigger error (for one period, assuming signal to noise ratio of 40 dB, this trigger error is 0.3% at rated sensitivity).

Figure 3-1. Frequency Error



3-8. ACCURACY 5248M

3-9. FREQUENCY MEASUREMENTS. Accuracy is determined by two factors; the aging rate of the 5 MHz crystal standard in the time base, which is less than 5 parts in 10^{10} per day, and the inherent error ±1 count present in all counters of this type. This error is due to phasing between the timing pulse that operates the electronic gate and pulses that pass through the gate to the counters. The chart in Figure 3-1 shows the error possible for frequency measurements (assuming oscillator is calibrated once a week).

3-10. PERIOD MEASUREMENTS. The three factors contributing to the accuracy of period measurements are:

a. Aging rate of the 5 MHz standard, which is less than 5 parts in 10^{10} per week.

b. The ±1 count ambiguity, of counted frequency.

c. The ±trigger error (for one period, assuming signal to noise ratio of 40 dB, this trigger error is 0.3% at rated sensitivity).

3-11. ACCURACY/ERROR CALCULATION

3-12. The formula for determining the actual FREQUENCY ERROR is given as follows: (this formula applies to the 5248L and 5248M, with the only different variable being (E), time base accuracy).

$$\text{error} = \pm \left(\frac{1}{(f_1)(f_2)}\right) \pm E$$

Note: The expression $\frac{1}{(f_1)(f_2)}$ equals the ±1 count ambiguity where f_1 equals measured frequency (Hz) f_2 equals time base frequency selected or 1/gate time selected.

E equals TIME BASE accuracy (daily aging rate times days since standardization ± temperature effects ± line voltage effects).

3-13. An example of FREQUENCY ERROR calculation of oscillator is calibrated once a week is as follows:

f_1 = 20 MHz ($.02 \times 10^8$ Hz)
f_2 = 1 Hz (1 sec gate)
E = 5 parts in 10^{10} per day times seven days = 35 parts in 10^{10} or 3.5 parts in 10^9 per week (this equation uses 5248M time base accuracy for Example only).

$$\text{Error equals } \left(\frac{1}{10.2 \times 10^8 (1)}\right) \pm \frac{3.5}{10^9} = 5.35 \text{ parts in } 10^8$$

The maximum error that can be expected for FREQUENCY MEASUREMENTs (with oscillator calibrated weekly) is shown in Figure 3-1.

3-14. A general formula for finding error of PERIOD MEASUREMENTs to be expected under various conditions is as follows: (this formula applies to the 5248L and 5248M with the only different variable being (E), TIME BASE accuracy).

$$\text{error equals } \left(\frac{f_2}{nf_1}\right) \pm \left(\frac{e}{n}\right) \pm E, \text{ where:}$$

f_1 = TIME BASE counter frequency (Hz)
f_2 = frequency whose period is being measured (Hz)
$e = 3 \times 10^{-3}$ (trigger error for one period, 40 dB S/N)
n = number of PERIODs being averaged
E = TIME BASE accuracy (daily aging rate times number of days since calibration ± temperature effects ± line voltage variations.

Note: The expression $\frac{f_2}{nf_1}$ equals the ±1 count ambiguity.

3-15. An example of a PERIOD MEASUREMENT error calculation is as follows:

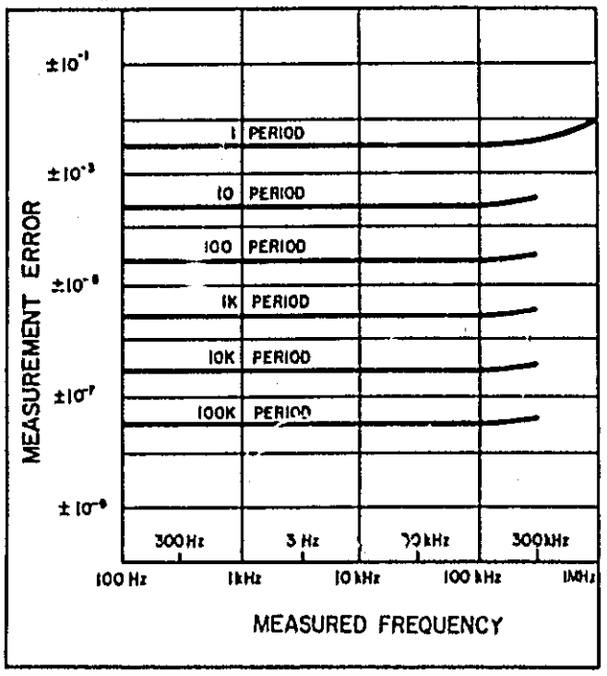
$f_1 = 1 \times 10^{-6}$ (TIME BASE set to 1 μs) for 1 MHz
f_2 = 200 Hz (signal whose period is being measured)
$e = 3 \times 10^{-3}$ (trigger error)
n = 100,000 (numbers of PERIODs being averaged)
E = 5 parts in 10^{10} per day times days equals 3.5 parts in 10^9 per week. (This equation uses the 5248M TIME BASE accuracy for example only.)

$$\text{error} = \left(\frac{2 \times 10^2}{(10^5)(10^6)}\right) \pm \left(\frac{3 \times 10^{-3}}{10^5}\right) \pm \left(\frac{3.5}{10^9}\right)$$

$$\text{error} = \left(\frac{2}{10^9}\right) \pm \left(\frac{30}{10^9}\right) \pm \left(\frac{3.5}{10^9}\right) = 35.5 \text{ parts in } 10^9$$

A plot of this formula is shown in Figure 3-2 using 100 MHz (f_1): for each different (f_1) used, a new family of curves will be created.

Figure 3-2. Period Measurement Error



3-16. STANDARD FREQUENCY OUTPUT

3-17. REAR PANEL. 5 MHz OUTPUT is 1 volt rms across 50 ohms, usable as a secondary frequency standard (5248M). Frequencies of 0.1 Hz through 10 MHz are available in decade steps at the rear-panel OUTPUT connector as selected by the rear-panel OUTPUT switch. This output is subject to the restrictions listed in Paragraph 3-18.

3-18. RESTRICTIONS. All frequencies are available one at a time in the MANUAL function without interruption; 1 kHz is continuously available for all functions except 100K PERIOD AVERAGE; 10 kHz to 10 MHz continuously available in all functions. 100 MHz is available through its own connector (rear panel) and is independent of switch settings.

Note

Accuracy and stability of these outputs are the same as that of the time base oscillator.

3-19. DIGITAL RECORDER OUTPUT

3-20. To supply counter display information (including all digits, decimal point position, and measurement unit) to the HP Model 5050A Digital Recorder or HP Model 580A/581A Digital to Analog Converter, connect 50 wire cable (HP Part No. 562A-16C) between rear panel DIGITAL RECORDER jack on counter and input connector of Recorder or D to A Converter. Cable can be fabricated for connection to other equipment using an Amphenol 57-30500 connector to mate with the counter DIGITAL RECORDER jack. Output information for decimal point and measurement units is provided in Tables 3-1 and 3-2. Signals available and external signals required are shown in Table 3-3. Levels shown in these tables show +1248 code; for Option 003 (-1248) logic levels would be reversed. Option 002 Digital Recorder Output Jack (J11) connections are shown in Section VIII.

Table 3-1. Decimal Point BCD Output

Display	J11 Output			
	Pin 45	Pin 44	Pin 20	Pin 19
0 0 0 0 0 0 0 0	0	0	0	0
0 0 0 0 0 0 0 0 .	0	0	0	0
0 0 0 0 0 0 0 . 0	0	0	0	1
0 0 0 0 0 0 . 0 0	0	0	1	0
0 0 0 0 0 . 0 0 0	0	0	1	1
0 0 0 0 . 0 0 0 0	0	1	0	0
0 0 0 . 0 0 0 0 0	0	1	0	1
0 0 . 0 0 0 0 0 0	0	1	1	0
0 . 0 0 0 0 0 0 0	0	1	1	1
0 = -8 V 1 = +18V				

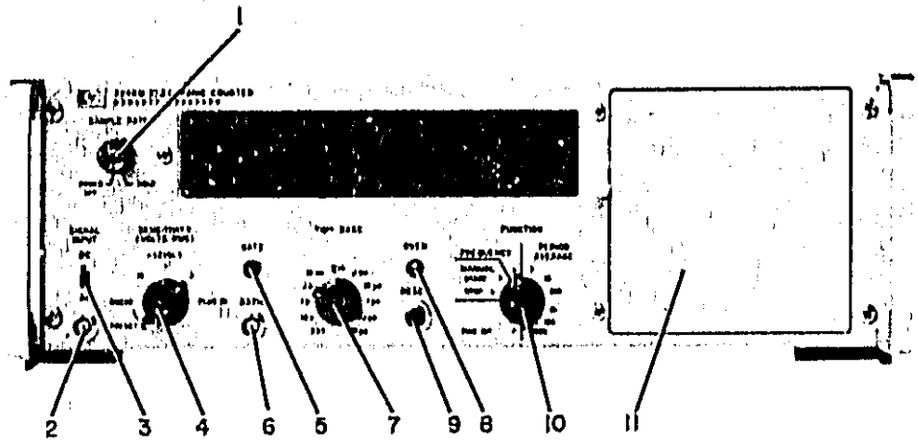
Table 3-2. Measurement Units BCD Output

Display	J11 Output			
	Pin 43	Pin 42	Pin 18	Pin 17
*	0	0	0	0
MHz	0	0	0	1
kHz	0	0	1	0
sec	0	0	1	1
ms	0	1	0	0
μs	0	1	0	1
0 = -8 V 1 = +18 V				

Table 3-3. Digital Recorder Jack Pin Functions

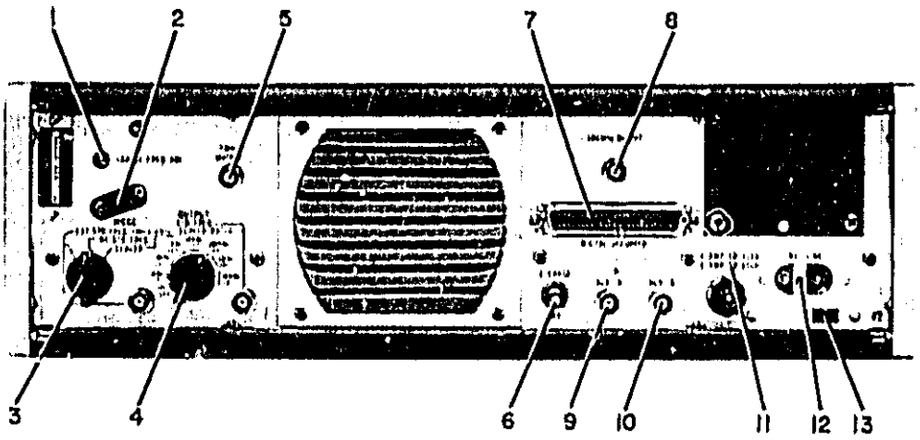
Display	Weight			
	8	4	2	1
	J11 Pin No.			
0 0 0 0 0 0 0 ⓪ .* Units 10^0	27	26	2	1
0 0 0 0 0 0 ⓪ 0 .* Tens 10^1	29	28	4	3
0 0 0 0 0 ⓪ 0 0 .* Hundreds 10^2	31	30	6	5
0 0 0 0 ⓪ 0 0 0 .* Thousands 10^3	33	32	8	7
0 0 0 ⓪ 0 0 0 0 .* Ten Thousands 10^4	35	34	10	9
0 0 ⓪ 0 0 0 0 0 .* Hundred Thousands 10^5	37	36	12	11
0 ⓪ 0 0 0 0 0 0 .* Millions 10^6	39	38	14	13
⓪ 0 0 0 0 0 0 0 .* Ten Millions 10^7	41	40	16	15
0 0 0 0 0 0 0 0 ⊙ Measurement Units	43	42	18	17
0 0 0 0 0 0 0 0 ⊙* Decimal Point	45	44	20	19
Inhibit signal input +15V min, +25V max.	Pin 22			
Print command output +13V to 0V step	Pin 48			
Negative reference output, about 6.5V dc indicates "0" level for BCD output	Pin 24			
Positive reference output, about +17V dc indicates "1" level for BCD output	Pin 25			
Ground	Pin 50			
No connection	Pins 21, 23, 46, 47, and 49			

Figure 3-3. Front Operating Controls



1. SAMPLE RATE:
   a. Controls power to all circuits except crystal oven heater; max ccw turns POWER OFF.
   b. Controls time between measurements from 50 ms to 2 seconds.
   c. Causes display to HOLD indefinitely when maximum cw.
2. SIGNAL INPUT, DC to 150 MHz.
3. AC-DC, provides coupling to internal amplifier through .022 μf (600 Vdc) (AC), or directly (DC).
4. SENSITIVITY and LEVEL controls:
   a. Controls input attenuator; set to highest position which includes signal amplitude (max. overload; 120 V rms in position 0.1, 350 V rms in position 1, 500 V rms in position 10).
   b. Maximum ccw (CHECK position) gives internal self check; counts 100 MHz with selected TIME-BASE gate for FREQUENCY; 100 kHz (.01 μs to 10 sec) for PERIOD AVERAGE (100K position); counts continuously at selected TIME BASE frequency (.1 Hz to 100 MHz) for MANUAL START.
   c. Maximum cw (PLUG-IN position) connects output of some plug-in units directly to input amplifier (see plug-in operating/service manual).
   d. LEVEL control adjusts input trigger level from -0.3V dc to +0.3V dc when attenuator is set at 0.1V; -3.0V dc to +3.0V dc when set at 1V; and -30V dc to +30V dc when set at 10V.
   e. Maximum ccw position (PRESET) set trigger level to zero volts.
5. GATE lamp glows during counting (main gate open).
6. RATIO input connector accepts lower frequency in ratio measurement (higher frequency to SIGNAL INPUT) when TIME BASE set to EXT.
7. TIME BASE selects either time that main gate is on for frequency or time unit per count for period measurement.
8. OVEN lamp glows when unit has power applied even though SAMPLE RATE has power turned off. When oven unit has reached operating temperature, the lamp will dim.
9. RESET pushbutton returns both displayed and internal count to zero.
10. FUNCTION:
    a. Permits totalizing of pulses applied to SIGNAL INPUT when set to MANUAL START; holds accumulated count when switched to MANUAL STOP.
    b. Permits measurement of frequency applied to SIGNAL INPUT during interval selected by TIME-BASE switch when in FREQUENCY.
    c. Permits period measurement of signals applied to SIGNAL INPUT, averaged over 1 to 100,000 periods when set to PERIOD AVERAGE.
    d. Permits time interval measurement with plug-in units when set to TIME INT position.
11. Plug-in Compartment:
    a. Receives plug-in to extend counter capabilities. To install unit, turn power off, loosen knurled screw, remove blank panel or plug-in, slide plug-in into place and tighten screw.
    b. 5248L: permits access to oscillator medium and fine frequency adjustments.
    c. 5248M: permits access to oscillator fine frequency adjustment.

Figure 3-4. Rear Operating Controls



1. COARSE FREQ ADJ:

   a. 5248L: permits adjustment of oscillator over a range of about 1 part in 10^5.

   b. 5248M: permits adjustment of oscillator over a range of about 1 part in 10^6.

2. 5248M: 5 MHz filter adjustment should be tuned only is 5 MHz output is below 0.0V rms.

3. MODE switch:

   a. Permits use of external 1 MHz (5248L); 5 MHz or 10 MHz (5248M), frequency standard for time-base control when set to EXT STD FREQ.

   b. Permits normal operation of counter using internal oscillator when set to INT STD FREQ.

   c. Permits scaling (dividing) of input signals by factors of 10 when set to SCALER.

4. OUTPUT switch:

   a. Selects output frequency when MODE is set to INT STD FREQ or EXT STD FREQ.

   b. Selects scaled output frequency when MODE is set to SCALER.

5. 5248M: 5 MHz OUTPUT provides 5 MHz, 1 V rms across 50 ohms; available as a secondary frequency standard.

6. STORAGE switch provides display storage when up, continuous display of internal count when OFF (down).

7. DIGITAL RECORDER connector supplies BCD information to recorder, analog converter, or data processing equipment.

8. 100 MHz output.

9. AUX A: Auxiliary start/stop outputs for time interval measurements. See appropriate plug-in manual.

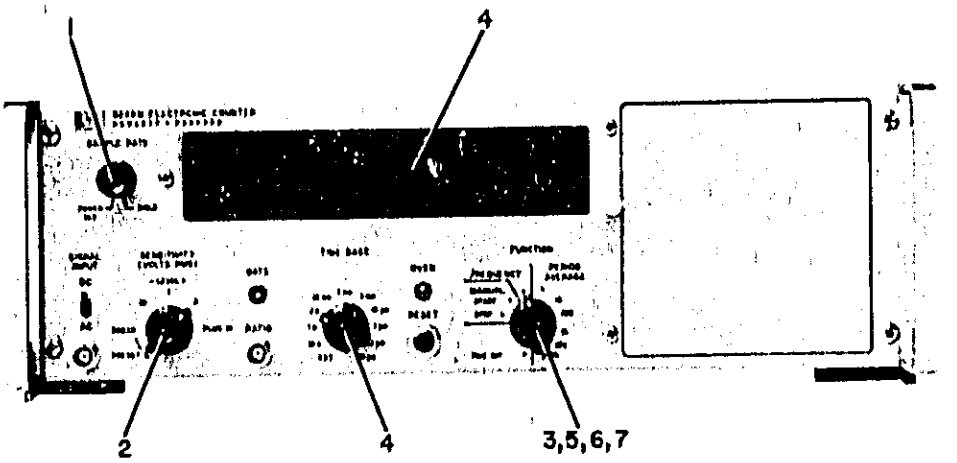
10. AUX B: Auxiliary start/stop outputs for time interval measurements. See appropriate plug-in manual.

11. Fuse provides overload protection, should be 2 ampere slow-blow for 115V operation, 1 ampere slow-blow for 230V operation.

12. AC LINE connector connects to flat plug on the power cable.

13. LINE-VOLTAGE switch permits selection of either 115V or 230V ac line; insert narrow blade screwdriver and slide to left for 115 volt operation, slide to right for 230 volt operation.

Figure 3-5. Self Check



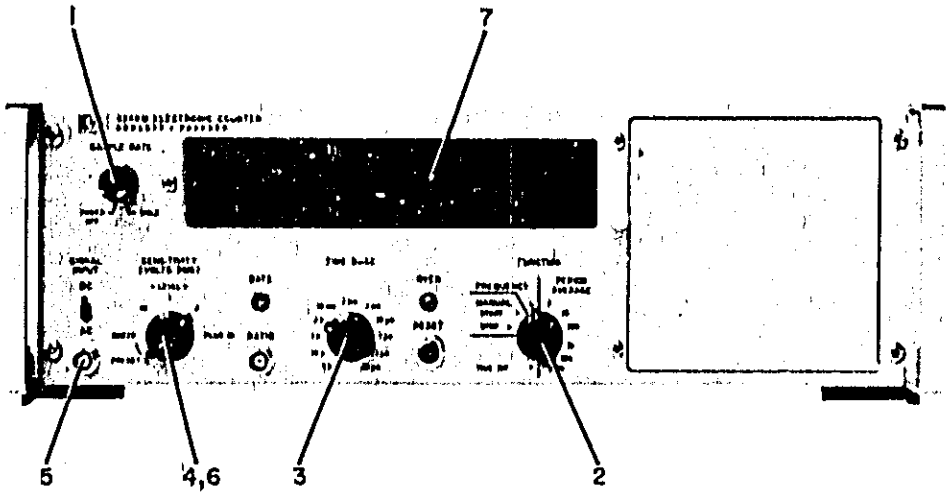
1. Turn SAMPLE RATE control clockwise from POWER OFF position to turn counter on.
2. Set SENSITIVITY switch to CHECK.
3. Set FUNCTION switch to FREQUENCY.
4. See table below for proper display (±1 count) for each position of TIME BASE switch.

TIME BASE	DISPLAY
1 μs	00000100. MHz
10 μs	0000100.0 MHz
.1 ms	000100.00 MHz
1 ms	00100000. kHz
10 ms	010J000.0 kHz
.1 sec	100000.00 kHz
1 sec	00000.000 kHz
10 sec	0000.0000 kHz

5. Set FUNCTION switch to MANUAL START. Counter should count continuously at frequency selected on TIME BASE switch.
6. Set FUNCTION switch to 1 PERIOD AVERAGE.
7. See table below for proper display (±1 count) for each PERIOD AVERAGE position of the FUNCTION switch.

PERIOD AVERAGE	DISPLAY
1	00000001
10	00000010
100	00000100
1K	00001000
10K	00010000
100K	00100000

Figure 3-6. Frequency Measurements



1. Turn SAMPLE RATE control clockwise from POWER OFF to turn counter on.

2. Set FUNCTION switch to FREQUENCY.

3. Set TIME BASE switch for desired resolution (gate time).

Note

Asterisk (*) will light at right end of display for switch positions which do not permit valid measurement (EXT, .1 μs, .01 μs).

4. Set SENSITIVITY switch to CHECK to verify proper counter operation (see Figure 3-5).

5. Connect unknown signal to SIGNAL INPUT jack.

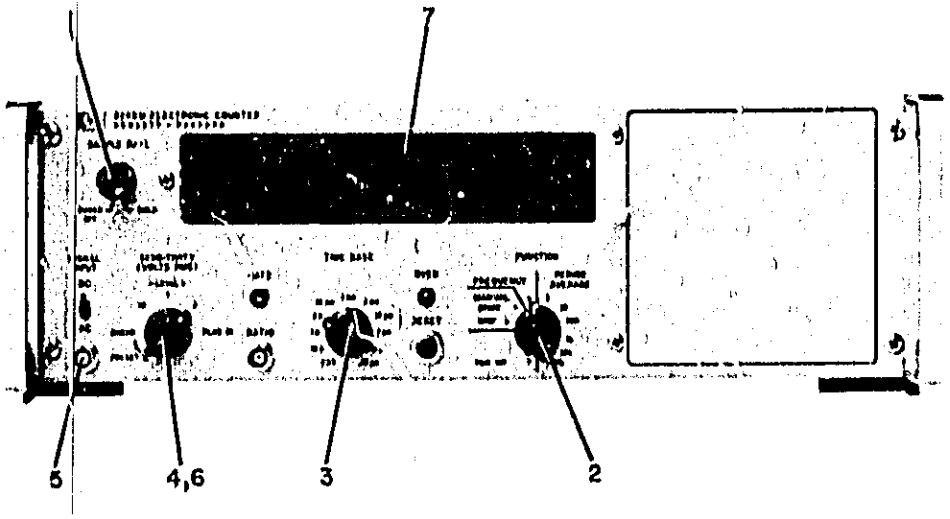
6. Charge SENSITIVITY switch to "10". If there is no count, or if count is uncertain, switch SENSITIVITY to lower ranges.

CAUTION

Maximum overload is 120V rms in position 0.1, 250V rms in position 1, 500V rms in position 10. Maximum input level for correct count is 2 volts in position 0.1, 20 volts in position 1, 200 volts in position 10.

7. Read frequency from display. Decimal point is correctly positioned and correct measurement unit (kHz or MHz) is displayed.

Figure 3-7. Period Measurement



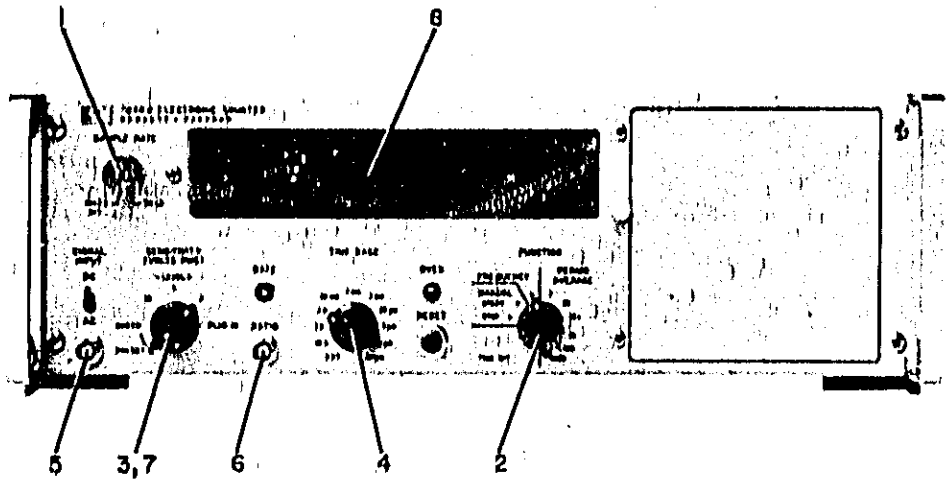
1. Turn counter on with SAMPLE RATE control.
2. Set FUNCTION switch to desired PERIOD AVERAGE position.
3. Set TIME BASE switch to desired time unit per count.

Note

Asterisk (*) will light at right end of display for switch positions which do not permit valid measurement (any position between 1 millisecond and 10 seconds, depending on number of periods averaged as selected on FUNCTION switch).

4. Set SENSITIVITY switch to CHECK to verify proper counter operation (see Figure 3-5).
5. Connect unknown signal to SIGNAL INPUT jack.
6. Turn SENSITIVITY switch clockwise to first position which gives steady count. (See CAUTION Figure 3-6.)
7. Read period from display. Decimal point is correctly positioned and measurement unit (μs, ms, sec) is displayed.

Figure 3-8. Ratio Measurement



For ratio measurements (f_1/f_2), higher frequency f_1 should be 0 to 150 MHz. Lower frequency f_2 0 to 1 MHz for single period or 0 to 300 kHz for multiple period.

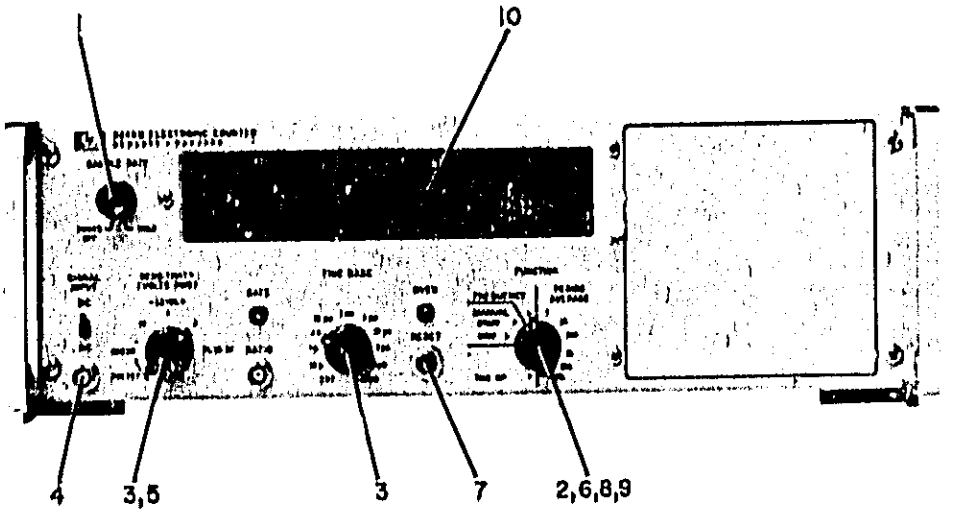
1. Turn counter on with SAMPLE RATE control.
2. Set FUNCTION switch to desired PERIOD AVERAGE position.
3. Set SENSITIVITY switch to CHECK to verify proper counter operation (see Figure 3-6).
4. Set TIME BASE switch to EXT.
5. Connect f_1 (higher frequency) to SIGNAL INPUT jack.
6. Connect f_2 (lower frequency) to RATIO input jack.

CAUTION

Input f_2 must not exceed 2 V rms for correct count. Maximum input 120 V rms. Use external blocking capacitor if a dc component is present.

7. Turn SENSITIVITY switch clockwise to first position which gives steady count (see CAUTION, Figure 3-6).
8. Read ratio f_1/f_2 from display. Decimal point is correctly positioned; no measurement unit is displayed since ratio is dimensionless.

Figure 3-9. Totalizing Operation



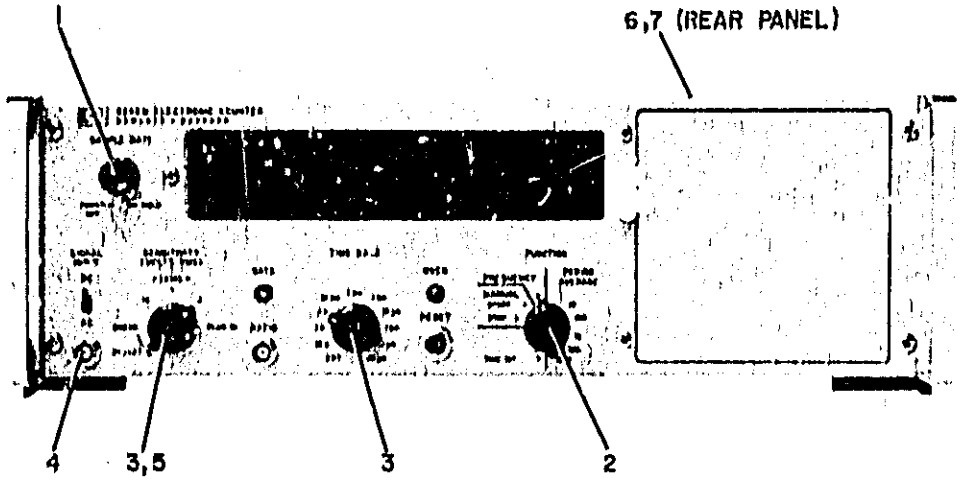
1. Turn counter on with SAMPLE RATE control.
2. Set FUNCTION switch to MANUAL START.
3. Set SENSITIVITY switch to CHECK to verify correct counter operation. Counter should count continuously at frequency selected on TIME BASE switch.
4. Connect signal to SIGNAL INPUT jack.
5. Change SENSITIVITY switch to "10". If there is no count, or if the count is uncertain, switch SENSITIVITY to lower ranges (see CAUTION, Figure 3-6).
6. Set FUNCTION switch to MANUAL STOP.
7. Press RESET button.
8. At desired time to begin count, set FUNCTION switch to MANUAL START.
9. At desired time to end count, set FUNCTION switch to MANUAL STOP.
10. Read accumulated count from display.

NOTE

FOR REMOTE TOTALIZING

a. STORAGE switch in OFF position.
b. Plug-in unit must be removed.

Figure 3-10. Scaler Operation



Any signal from 0 to 150 MHz can be scaled (divided) by decade factors from 10^2 to 10^9 (0 to 50 MHz in 10 position only).

1. Turn counter on with SAMPLE RATE control.
2. Set FUNCTION switch to MANUAL START.
3. Set SENSITIVITY switch to CHECK. Counter should count continuously at frequency selected on TIME BASE switch.
4. Connect signal to SIGNAL INPUT jack.
5. Turn SENSITIVITY switch clockwise to first position which gives steady count (see CAUTION, Figure 3-6).
6. Set OUTPUT switch (rear panel) to desired scaler ratio (10 to 10^9).
7. Take scaled output from OUTPUT connector (rear panel), located below the OUTPUT switch.

THEORY

SECTION IV

THEORY OF OPERATION

4-1. This section discusses counter operation in different modes, using counter logic diagrams for explanation and signal path descriptions.

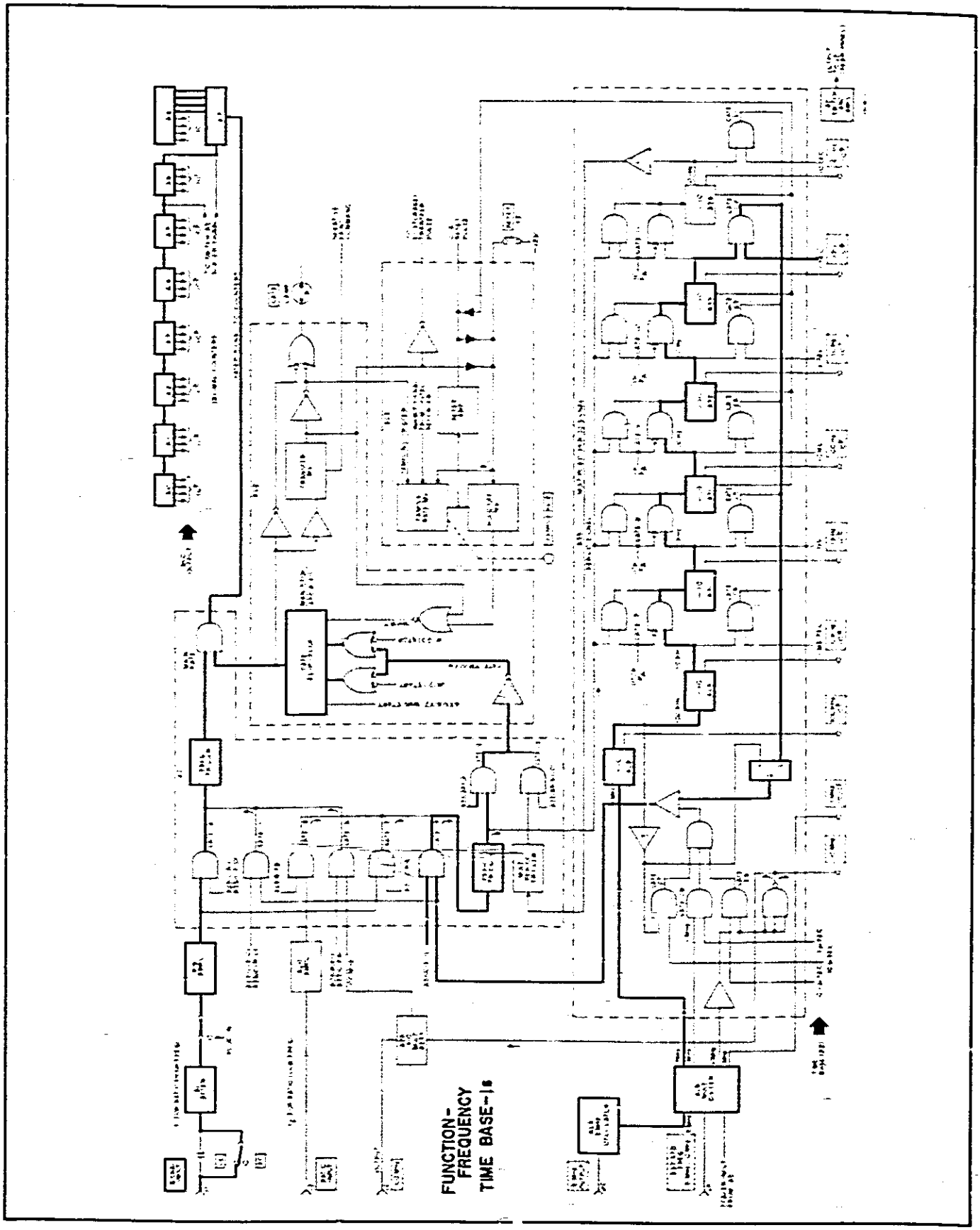
4-2. Detailed theory for each counter circuit is discussed in section VIII, with applicable schematic and troubleshooting information.

4-3. The Block Diagram used in this section is the 5248M, however, 5248L logic is identical. The only difference between the two counters is the time base; overall counter operation is the same.

FREQUENCY MEASUREMENTS

Frequency is defined as the number of cycles in a specific time. Figure 4-1 shows the logic diagram for the FREQUENCY mode. Two signals that need to be traced are: the input signal to be measured; and the gating signal, which determines the length of time during which the DCA's (Decimal Counter Assemblies) accumulate pulses. The input signal goes through gate 2 (enabled by the FUNCTION switch in FREQUENCY) to a Schmitt trigger waveshaping network. The main gate signal from gate 2 is a series of pulses at a rate equal to the input frequency. The 1 MHz time base output is shaped so positive spikes, 1 microsecond apart, are fed through the number of DDA's (Decade Divider Assemblies) required to provide the selected gate time. In Figure 4-1, six DDA's are used for a 1 second gate. The first output pulse goes through gate 22 (enabled by TIME BASE in 1 s), through gate 3 (enabled by the FUNCTION switch in FREQUENCY), through a Schmitt trigger and gate 12 (enabled by the FUNCTION switch in FREQUENCY) to the gate flip-flop. The gate flip-flop will be set by this pulse to enable the main gate and allow pulses (input signal) to enter the DCA's and be totalized. This continues until the second pulse resets the gate flip-flop to inhibit the main gate and stop pulses to the DCA's. The DCA's are now in a state which corresponds to the number of input pulses received during a precise time interval determined by the time base. This BCD state is then analyzed by a decoding matrix, converted to decimal information, and fed to the display and BCD output jack J11.

Figure 4-1. Frequency Measurements



SINGLE PERIOD MEASUREMENTS

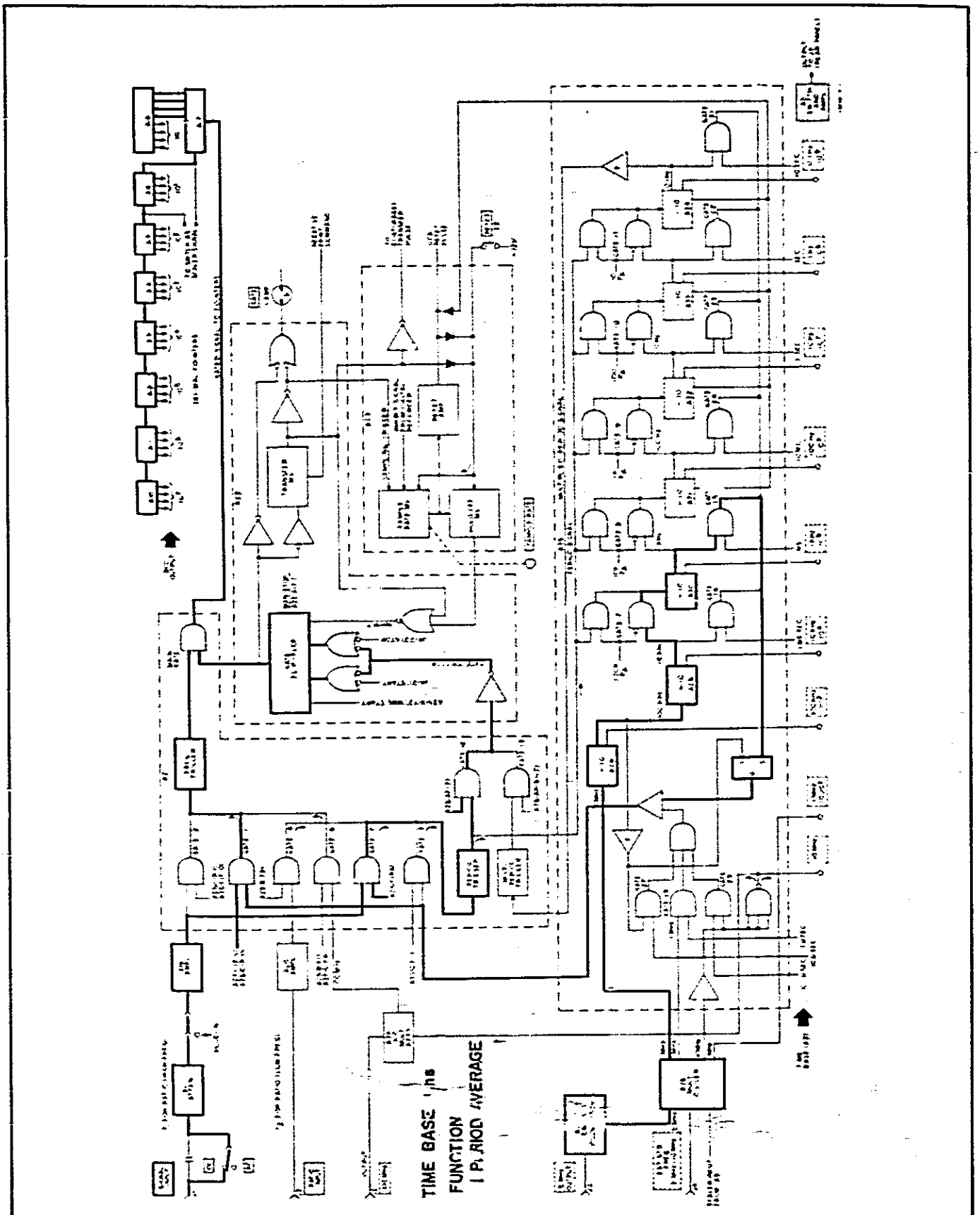
Period is defined as the time required for one complete cycle -- the reciprocal of frequency. In the FREQUENCY mode a known time interval was used to measure an unknown frequency. The reverse will be used to determine time; the known time base frequency will be measured by an unknown time base (based on the input signal period). Figure 4-2 shows the signal paths used with the FUNCTION switch in 1 PERIOD AVERAGE and TIME BASE in 1 ms.

The 1 Mllz time base signal from A26 is fed through 3 DDA's to provide a 1 kllz signal through gate 26 (enabled by TIME BASE in 1 ms), through gate 1 (enabled by FUNCTION in PERIOD AVERAGE), through the Frequency trigger waveshaping circuit to the main gate. The Main Gate will be enabled for a time equal to the input period and allow pulses to the DCA's for totalizing.

The input signal goes through ATTENUATOR A1, INPUT AMPLIFIER A19, to gate 5 (enabled by the FUNCTION switch in PERIOD AVERAGE), through the period trigger circuit to gate 12 (enabled by the FUNCTION switch in 1 PERIOD AVERAGE) to set the gate flip-flop which enables the main gate. At the end of one input cycle, the gate flip-flop is reset and inhibits the main gate. Pulses accumulated in the DCA's will be decoded and displayed. An example is discussed below.

Single period example with a period of 100 ms, the main gate is open for this time allowing the DCA's to count the 1 kllz selected time base for 100 ms, or 100 counts.

Figure 4-2. Single Period Measurements

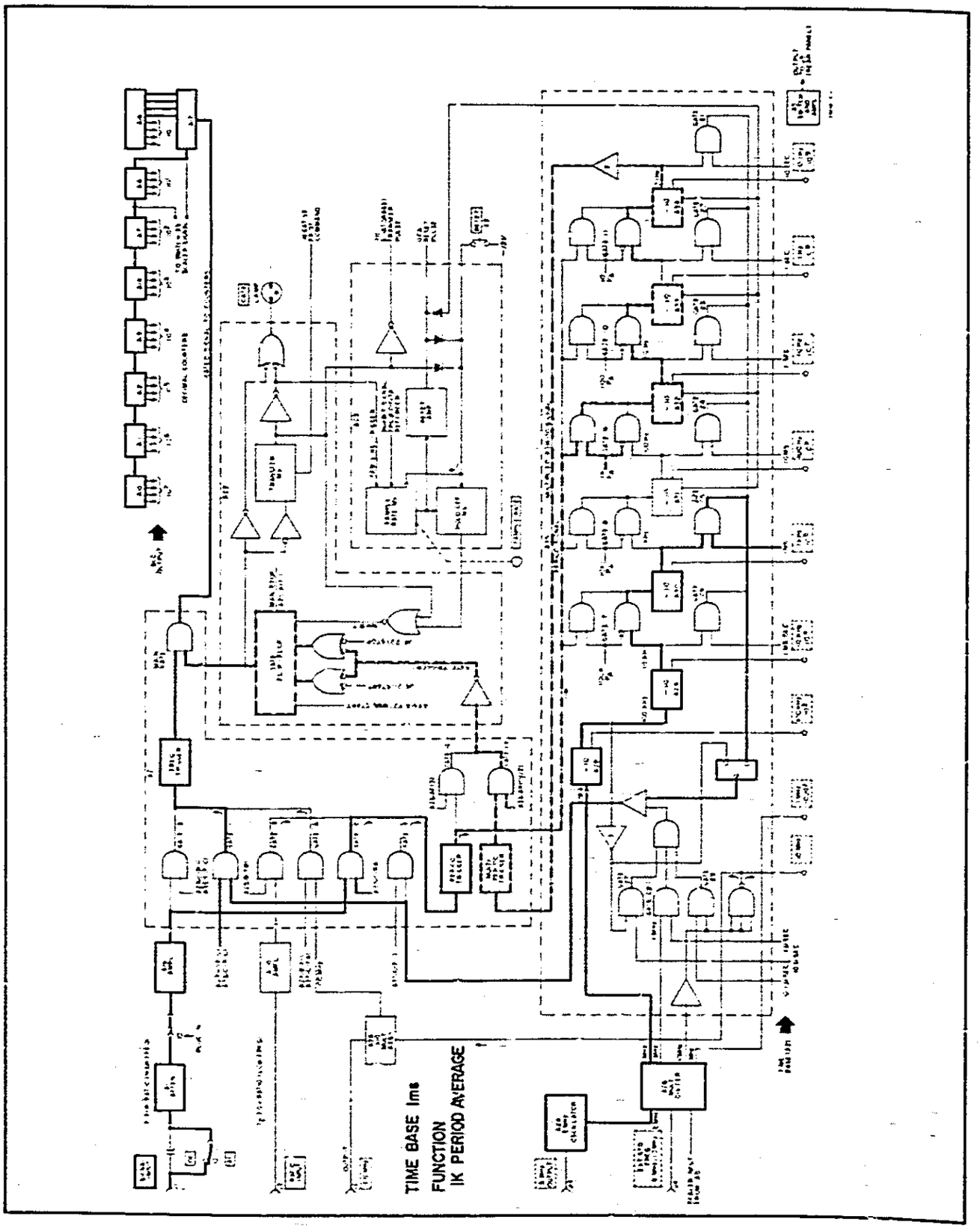


MULTIPLE PERIOD AVERAGE MEASUREMENTS

Counter operation for multiple period average measurements is similar to single period operation. A selected time base frequency is counted for the duration of an unknown period (input signal). The difference between single and multiple period averages is that multiple period measurements use more than one period to count the selected time base frequency (10 through 100K).

Figure 4-3 shows signal paths with the FUNCTION switch in 1K PERIOD AVERAGE, TIME BASE switch in 1 ms. Signal paths for the time base signal is the same as single period measurements (Figure 4-2). Input signal path is also the same up to the output of the period trigger. The signal is now applied to gates 7 through 11, (the only gate enabled by the FUNCTION switch is gate 0) signal goes through three DDA's and to the multi-period trigger waveshaping network. The signal period at this point is 1000 times longer than the input since the input frequency has been divided by three decades. Signal passes through gate 13 (enabled by FUNCTION in 1K PERIOD AVERAGE) to set the gate flip-flop which will enable the main gate, allowing selected time base pulses through to the DCA's to be totalized. After 1000 cycles of the input or 1K periods, a second pulse will reset the gate flip-flop to inhibit the main gate. Using the example for single period measurements, the 100 ms period will become 100 seconds allowing the DCA's to count 100K cycles of the 1K selected time base frequency. The counter display will be 00100.000 ms which is three times the resolution of a single period measurement.

Figure 4-3. Multiple Period Average Measurements

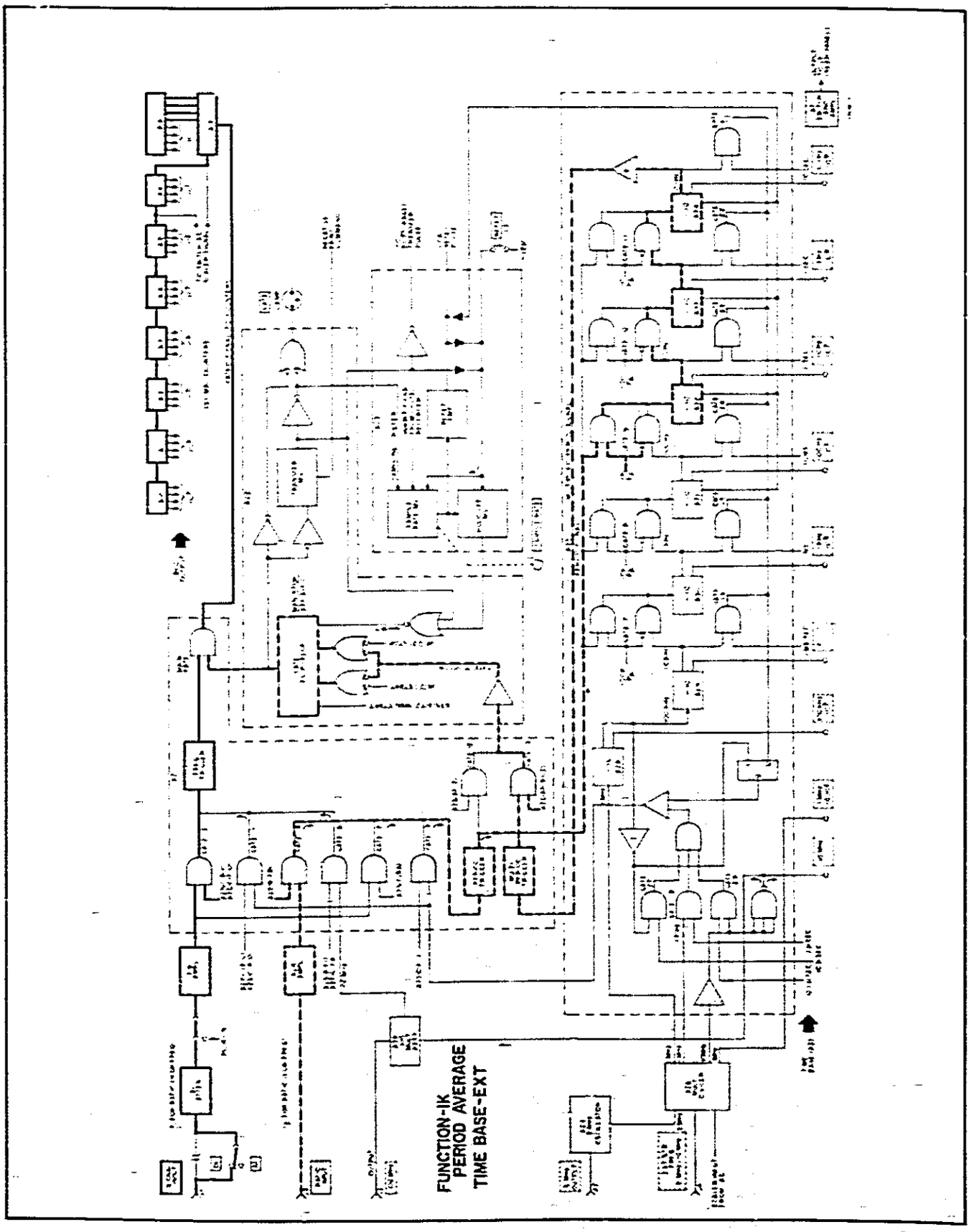


RATIO AND MULTIPLE RATIO MEASUREMENTS

A ratio measurement is a period measurement with the lower of the two frequencies (f2) used as the gating signal. Higher frequency (f1) will be counted by the DCA's in place of the selected time base, discussed in PERIOD MEASUREMENT.

For example: (Figure 4-4) F1 = 100 kHz, F2 = 1 kHz, the ratio of F1/F2 is 100. With FUNCTION switch in 1K PERIOD AVERAGE, multiple ratio measurements are performed. F1 follows the same path as for any frequency measurement. F2 follows the path for multiple period measurement, through gate 4 (enabled by TIME BASE in EXT), through period trigger, gate 9 (enabled by FUNCTION in 1K PERIOD AVERAGE), 3 DDA's, multiple period trigger, and to the gate flip-flop. A ratio of 100 kHz to 1 kHz would be displayed as 00100.000 with 6-digit resolution.

Figure 4-4. Ratio and Multiple Ratio Measurements



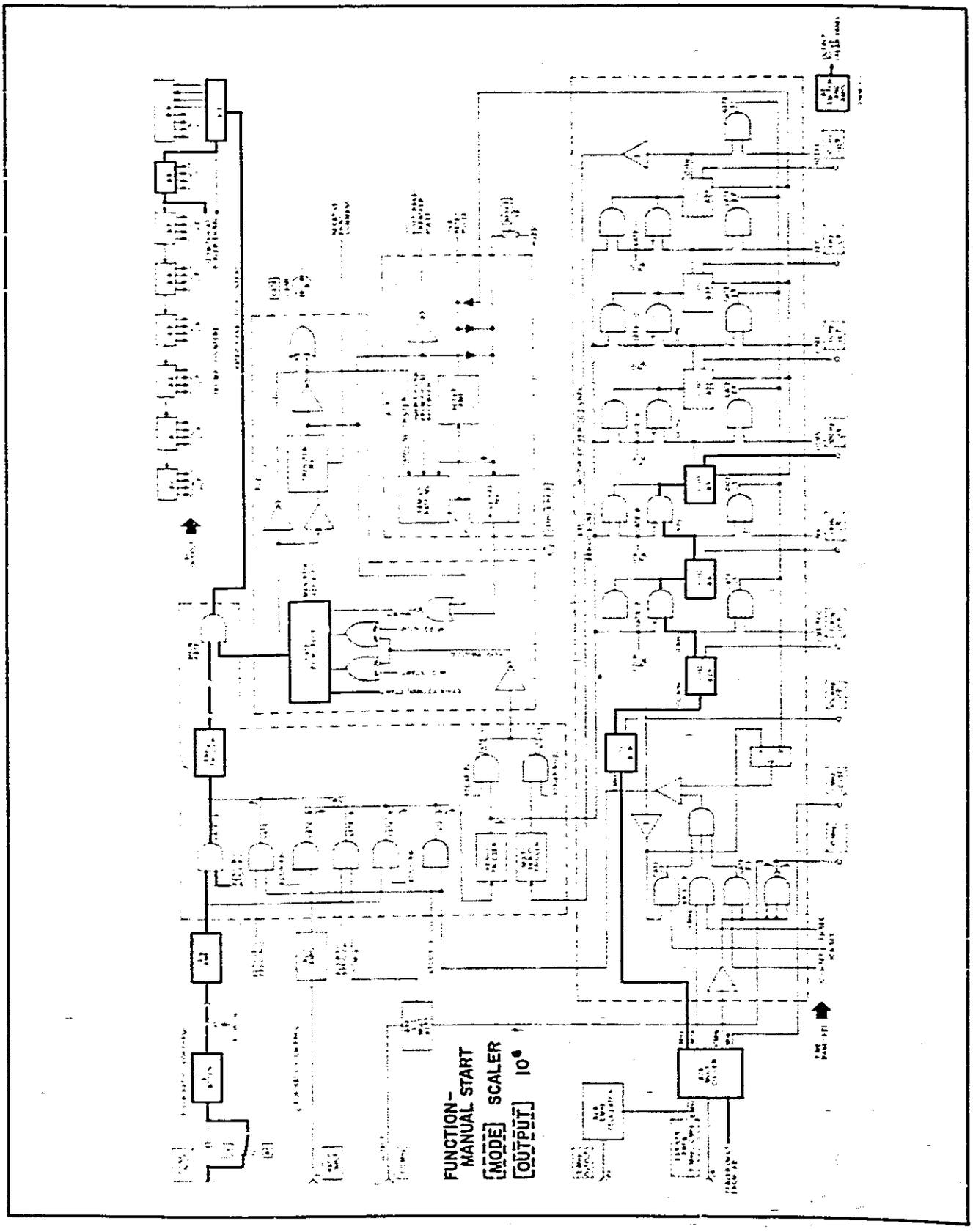
SCALING (DIVIDING)

Counter circuits may be used to divide external signals from 0 to 135 MHz by 10^2 through 10^9, and 0 to 50 MHz by 10.

Figure 4-5 shows that the input signal follows the same path as frequency measurements except the main gate is kept open by the FUNCTION switch in MANUAL START. The first decade division is done by A17, and if the OUTPUT switch (rear panel) is in 10 position, the signal from A17 will be fed directly to A5 and the output jack. If the OUTPUT switch is in 10^2 position the signal from A17 will be fed to A16 and again be divided by 10, then fed to the output. Any other position (10^3 through 10^9) of the OUTPUT switch, the signal will be fed through the DDA's for the selected scaling factor.

Figure 4-5 shows the signal path from the main gate, with Counter controls set to: FUNCTION to MANUAL START; MODE (rear panel) to SCALER; OUTPUT (rear panel) to 10^6. Signal goes through A17, A16, A5, A26, DDA's A28 through A31, and to the output. The first two stages (A17 and A16) divide by 10^2 and A28 through A31 divide by 10^4, resulting in a total division of 10^6.

Figure 4-5. Scaling (Dividing)



MAINTENANCE

SECTION V

MAINTENANCE

5-1. INTRODUCTION

5-2. This section gives maintenance and service information. Included is a table of recommended test equipment, disassembly and repair procedures, an in-cabinet performance check which may be used to verify proper operation of the Counter, troubleshooting and adjustments. Theory of operation is located in Section VIII, opposite each schematic diagram.

5-3. ASSEMBLY DESIGNATIONS

5-4. Table 5-1 lists the designations, name, and HP 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

Assy	Name	HP Part No.
A1	Input Switch (Sensitivity)	05248-60010
A2	Time Base Switch	3100-2403
A3	Function Switch	3100-2402
A4	Mode Switch (5248L)	05248-60020
A4	Mode Switch (5248M)	5245L-6028
A5	Output Switch	05248-60015
A6	Rectifier	5243A-65L
A7	Regulator	5243A-65H
A8	Decimal Point	05248-60007
A9	Measurement Units	05248-60008
A10-14	Decimal Counter	05212-6002
A15	5 MHz Decimal Counter	05232-6014
A16	Intermediate Freq. Dec.	05247-6001
A17	High Frequency Decimal	05247-60021
A18	Readout	05247-6008
A19	High Freq. Input Amplifier	05248-60022
A20	Low Freq. Input Amplifier	05245-6014
A21	Function Control	05248-60023
A22	Gate Control	05248-60013
A23	Sampling Control	05247-6010
A24	Crystal Oven (5248L)	05243A-69A
A24	5 MHz Oscillator (5248M)	00105-6013
A25	Oven Control (5248L)	5243A-65T
A25	Osc. Power Supply (5248M)	05245-6024
A26	1 MHz Oscillator (5248L)	05248-60019
A26	Multiplier Divider (5248M)	05245-60019
A27	1 to 10 MHz Mult. (5248L)	5243A-65C
A28	High Freq. Decade Divider	05232-6009
A29-34	Decade Divider	5212?-65C
A35	Time Base Control	05248-60004
A36	10 MHz to 100 MHz Mult.	05248-60002

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 A5 pin 6 is A5(6).

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 in the Counter and also may 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, before returning instrument to regular service, and

e. As a permanent record of instrument maintenance performed since the test record pages are perforated and may be removed.

5-11. VARIABLE LINE VOLTAGE. During the following tests (Table 5-3), Counter should be connected through a variable voltage source so that line voltage may be varied ±10% from nominal (115 or 230 Vac) to assure proper operation under test supply conditions.

5-12. INSTRUMENT COVER REMOVAL

5-13. To remove top or bottom cover, unlock two quarter turn fasteners which secure cover to instrument. Then slide cover toward rear of instrument and lift off. To replace cover, reverse procedure.

WARNING

115/230V AC AND +170V DC 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. ASSEMBLY LOCATION

5-15. Top and bottom internal views of the Counter are shown in Figures 5-1 through 5-4. These figures show the location of the assemblies, connectors, and chassis parts.

Table 5-2. Recommended Test Equipment

Instrument Type	Required Characteristics	Recommended Type
Oscilloscope Vertical plug-in Time Base plug-in Sampling Vertical plug-in Sampling Time Base plug-in	20 MHz Bandwidth, plug-in capabilities 5 mV/cm Sensitivity 20 MHz Bandwidth, .2 μs/cm DC to 1 GHz 10 ps/cm to 500 μs/cm	HP Model 140A HP Model 1402A HP Model 1423A HP Model 1410A HP Model 1424A
Low Frequency Generator	.008 Hz to 1.2 kHz, 10 V rms	HP Model 202A
Test Oscillator	10 Hz to 10 MHz, 100 mV rms	HP Model 652A
Frequency Synthesizer	100 kHz to 500 MHz, 100 mV rms	HP Model 5105A
Synthesizer Driver	Compatible with Synthesizer used	HP Model 5110B
VHF Attenuator	12 dB in 1 dB steps	HP Model 355C
Pulse Generator	±50 ns, 0.3 V, 100 kHz	HP Model 222A
DC VTVM	0 to ±300 V, ±1%, 200 megohm impedance	HP Model 412A
AC VTVM	1 mV to 300 V, 10 Hz to 10 MHz, ±5%	HP Model 3400A
Strip Chart Recorder	1 div/hr to 8 div/min, 5 mV to 100 V full scale	HP Model 680A
Frequency Standard	1 MHz, 5 MHz, stability less than 2 parts in 10^{11} per month	HP Model 5065A HP Model 5061A
Linear Phase Detector	1 MHz, 5 MHz, DC output level proportional to phase shift	HP Model K05-5060A
Electronic Counter	0 to 160 MHz, plug-in capabilities	HP Model 5248M
Var. Line Voltage Source	Variable from 103 to 127 V ac (207 to 253 V ac)	
Divider Probe	10:1, 10 pF, dc to 40 MHz	HP Model 10003A
50Ω Feedthru Termination	Male to Female BNC	HP Model 10100A
BNC "T" Connector		HP Part 1250-0781
RF Millivoltmeter	1 mV to 3 V, 10 kHz to 2 GHz, ±5%	HP Model 411A

5-16. REMOVAL OF PRINTED CIRCUIT BOARDS

5-17. MEASUREMENT UNITS BOARD (A9). To remove this board:

a. Remove top cover (see paragraph 5-12).

b. Remove printed circuit boards A16 and A17.

c. Remove the two screws that secure board to chassis.

d. Move board to rear of instrument until all neons are out of the Units Readout Assembly.

e. Unsolder connections to board and remove board from unit.

5-18. DECIMAL POINT BOARD (A8). To remove this board:

a. Perform steps a, b, c, and d (see paragraph 5-16).

b. Remove printed circuit boards A10 through A17, A22, and A23.

c. Remove screw going through front panel (just left of amber lens, in front of Readout Assembly) into Readout Support.

d. Loosen two allen screws holding Units Readout Assembly so assembly is free.

e. Fold Assembly towards rear of unit to expose A8.

CAUTION

Take care not to put a strain on connecting wires or bend them too many times. This will cause the connecting wires to break or become weakened.

f. Unsolder wires and remove two screws holding A8.

g. Gently push out the neons from the Decimal Holder Assembly.

h. Replace board by reversing procedure.

Note

When replacing boards with soldered wires, be sure wires are connected correctly by observing color codes.

5-19. PRINTED CIRCUIT COMPONENT REPLACEMENT

5-20. Component lead-holes in the circuit boards have plated thru walls to ensure good electrical contact between conductors on opposite sides of the board. To prevent damage to this plating and the replacement component, apply heat sparingly, and work carefully.

5-21. ADJUSTMENTS

5-22. 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 these values.

b. The instrument does not meet all specifications while performing the checks in Table 5-3 (in-cabinet performance checks).

NOTE: Troubleshooting information (paragraphs 5-23 through 5-33) follows Adjustment Table 5-4.

Table 5-3. In-Cabinet Performance Check

FREQUENCY MEASUREMENTS

1. RANGE: DC coupled: 0 to 150 MHz
AC coupled: 25 Hz to 150 MHz

DC INPUT (AC-DC switch in DC)

a. Set Counter controls as follows:

SENSITIVITY	.1 VOLT
SAMPLE RATE	slightly cw out of POWER OFF
TIME BASE	.1 second
FUNCTION	FREQUENCY
-LEVEL+	PRESET

b. Connect Frequency Synthesizer output to Counter SIGNAL INPUT with 50 ohm termination and to Oscilloscope input with 1 NC "T" connector.

c. Vary Synthesizer output from 0 to 150 MHz, maintaining 0.1V rms (0.28V peak-to-peak) level, record on test card.

d. To check for pulse operation, connect Pulse Generator to Counter SIGNAL INPUT. Set Pulse Generator output for 1 μsec, ±1 volt pulse, with a repetition rate of 500 pps.

AC INPUT (AC-DC switch in AC)

a. Repeat the procedure given for DC INPUT, steps a, b, and d.

b. Vary Synthesizer output from 25 Hz to 150 MHz.

c. Record on test card.

2. GATE TIME: Selectable from 1 microsecond to 10 seconds.

a. Set Counter controls as follows:

SENSITIVITY	.1 VOLT
SAMPLE RATE	slightly cw out of POWER OFF
TIME BASE	1 μs
FUNCTION	FREQUENCY
-LEVEL+	PRESET
AC-DC Switch	DC

b. Connect Synthesizer output to Counter SIGNAL INPUT.

c. Set Synthesizer output for 10 MHz, 0.1 V rms.

d. Rotate TIME BASE switch counterclockwise through all positions and observe counter reading. Record results on test card.

Table 5-3, In-Cabinet Performance Check Cont'd.

FREQUENCY MEASUREMENTS Cont'd.

3. ACCURACY: ±1 count, ± time base accuracy ± source accuracy

   a. Set Counter controls as follows:

SENSITIVITY	.1 VOLT
SAMPLE RATE	slightly cw out of POWER OFF
TIME BASE	1 μs
FUNCTION	FREQUENCY
-LEVEL+	PRESET
AC-DC Switch	DC

   b. Allow counter to warm up for 72 hours. Internal crystal should be stabilized.

   c. Connect Synthesizer output to Counter SIGNAL INPUT.

   d. Set Synthesizer for 150 MHz at 0.1 V rms; Counter should read 150 MHz ±1 count. Record accuracy on test card.

   e. Change TIME BASE to 10 s, Counter should read 150 MHz ±7 counts for 5248L, ±5 counts for 5248M. Record accuracy on test card.

4. OUTPUT DISPLAY: 8 significant figures with decimal point automatically positioned and measurement units properly displayed.

   SELF CHECK: Counts 100 MHz for the gate time selected on the TIME BASE switch.

   a. Use Self Check procedure; see Figure 3-5.

   b. Record results on test card.

SCALING

1. RANGE: (Divide by 10, 0 to 50 MHz)
   (10^2 through 10^9 positions 0 to 150 MHz)

   a. Set Counter controls as follows:

SENSITIVITY	.1 VOLT
SAMPLE RATE	slightly cw out of POWER OFF
TIME BASE	10 s
FUNCTION	MANUAL START
-LEVEL+	PRESET
MODE (rear panel)	SCALER
OUTPUT (rear panel)	SCALER RATIO 10
AC-DC switch	DC

   b. Connect output from rear panel SCALER RATIO OUTPUT jack to an Oscilloscope or another 5248.

   c. Connect Synthesizer output to Counter SIGNAL INPUT.

   d. Set Synthesizer output for 50 MHz, 0.1 V rms. The scaled output should be 5 MHz. Record results on test card.

2. FACTOR: By decade selections from 10^2 to 10^9.

   a. Set Counter controls as follows:

SENSITIVITY	.1 VOLT
SAMPLE RATE	slightly cw out of POWER OFF
TIME BASE	10 s
FUNCTION	MANUAL START
-LEVEL+	PRESET
MODE (rear panel)	SCALER
OUTPUT (rear panel)	SCALER RATIO 10^2
AC-DC switch	DC

Table 5-3. In-Cabinet Performance Check Cont'd.

SCALING Cont'd.

b. Connect rear panel SCALER RATIO OUTPUT to an Oscilloscope or another 5248.

c. Connect the Synthesizer output to Counter SIGNAL INPUT.

d. Set Synthesizer output for 150 MHz, 0.1 V rms.

e. Rotate rear panel OUTPUT switch clockwise through SCALER RATIO positions 10^2 through 10^0. OUTPUT frequency should decrease by factors of 10 as the switch is advanced. Record results on test card.

PERIOD MEASUREMENTS AND PERIOD MEASUREMENT ACCURACY

1. SINGLE PERIOD (frequency range 0 to 1 MHz)

a. Set Counter controls as follows:

SENSITIVITY	.1 VOLT
SAMPLE RATE	slightly cw out of POWER OFF
TIME BASE	.01 μs
FUNCTION	1 PERIOD AVERAGE
-LEVEL+	PRESET
AC-DC switch	DC

b. Connect Synthesizer output to Counter SIGNAL INPUT.

c. Set Synthesizer output for 1 MHz, 0.1 V rms.

d. Counter should display 1.00 μs ±1 count, with the decimal point positioned and measurement unit displayed. Record results on test card.

2. MULTIPLE PERIOD (frequency range 0 to 300 kHz)

a. Set Counter controls as follows:

SENSITIVITY	.1 VOLT
SAMPLE RATE	slightly cw out of POWER OFF
TIME BASE	.01 μs
FUNCTION	10 PERIOD AVERAGE
-LEVEL+	PRESET
AC-DC switch	DC

b. Connect Synthesizer output to Counter SIGNAL INPUT.

c. Set Synthesizer output for 300 kHz, .1 V rms.

d. Rotate TIME BASE switch ccw from .01 μs through 10 s. Record results on test card.

e. Change FUNCTION to 100 PERIOD AVERAGE, and rotate TIME BASE switch from .01 μs through .1 s. Change FUNCTION switch to 1K, 10K, and 100K PERIOD AVERAGE positions and rotate the TIME BASE switch to observe all valid readings (without asterisk). Record results on test card.

FREQUENCY RATIO MEASUREMENTS

1. SINGLE PERIOD:

NOTE: F_1, the higher of the two frequencies to be compared, applied to Counter SIGNAL INPUT jack (0 to 150 MHz). F_2, the lower of the two frequencies to be compared, applied to Counter RATIO jack (0 to 1 MHz).

a. Set Counter controls as follows:

SENSITIVITY	.1 VOLT
SAMPLE RATE	slightly cw out of POWER OFF
TIME BASE	EXT

Table 5-3. In-Cabinet Performance Check Cont'd.

FREQUENCY RATIO MEASUREMENTS Cont'd.

1. SINGLE PERIOD:
   a. Set Counter controls as follows (Cont'd):

FUNCTION	1 PERIOD AVERAGE
-LEVEL+	PRESET
AC-DC switch	DC

   b. Connect Synthesizer to Counter SIGNAL INPUT and set output to 150 MHz, .1 V rms.
   c. Connect 5248, 100 Hz OUTPUT STD FREQ (rear panel) to Counter RATIO jack.
   d. Observe ratio of F_1/F_2 by selecting F_1 on the Synthesizer as shown in the table. Record readings.

	F1	F2	Ratio F1/F2 (Readout)
(1)	150 MHz	100 Hz	01500000.
(2)	50 MHz	100 Hz	00500000.
(3)	10 MHz	100 Hz	00100000.
(4)	1 MHz	100 Hz	00010000.
(5)	100 kHz	100 Hz	00001000.
(6)	10 kHz	100 Hz	00000100.
(7)	1 kHz	100 Hz	00000010.
(8)	500 Hz	100 Hz	00000005.
(9)	100 Hz	100 Hz	00000001.

2. MULTIPLE PERIODS
   a. Set Counter controls as follows:

SENSITIVITY	.1 VOLT
SAMPLE RATE	slightly cw out of POWER OFF
TIME BASE	EXT
FUNCTION	10 PERIOD AVERAGE
-LEVEL+	PRESET
AC-DC switch	DC

   b. Connect Synthesizer to Counter SIGNAL INPUT and set output for 150 MHz, .1 V rms.
   c. Connect Test Oscillator to Ratio input connector and set for 100 kHz, .1 V rms.
   d. Counter should display 0001500.0, by moving the FUNCTION to 1 PERIOD AVERAGE, the reading should be 00001500.
   e. Observe ratio of F1/F2 by selecting F1 and F2 as described in the table. Record readings.

	F1	F2	FUNCTION	Ratio F1/F2 (Readout)
(1)	150 MHz	100 kHz	10 PERIOD AVERAGE	0001500.0
(2)	100 MHz	100 kHz	100 PERIOD AVERAGE	001000.00
(3)	50 MHz	100 kHz	10K PERIOD AVERAGE	0500.0000
(4)	100 kHz	100 kHz	100K PERIOD AVERAGE	001.00000
(5)	100 kHz	50 kHz	10K PERIOD AVERAGE	0002.0000
(6)	150 kHz	10 kHz	100K PERIOD AVERAGE	015.00000
(7)	150 Hz	10 Hz	10 PERIOD AVERAGE	0000015.0

Table 5-3. In-Cabinet Performance Check Cont'd.

TIME BASE: FREQUENCY (INTERNAL) 5 MHz (5248M only)

Before measuring Counter time base frequency stability, the measurement system must be calibrated as follows:

a. Connect Rubidium Vapor Frequency Standard 5 MHz output to Linear Phase Detector INPUT 1 and INPUT 2.

b. Set Phase Detector front panel selector switch to 5 MHz.

c. Connect Phase Detector rear panel OUTPUT jack to Strip Chart Recorder INPUT jack.

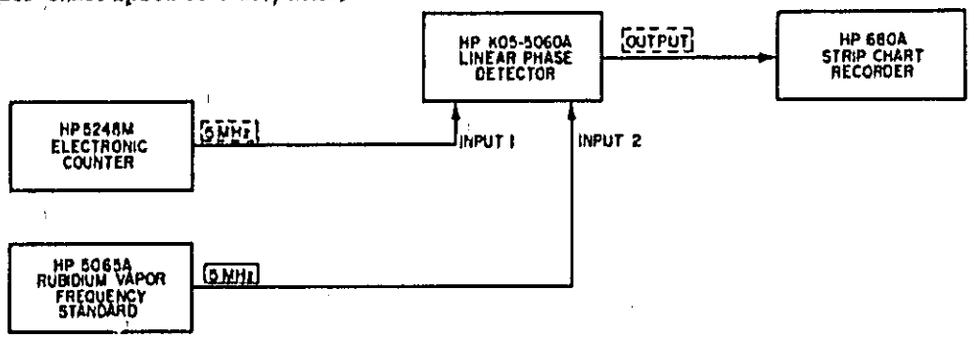
d. Set Recorder controls as follows:

RANGE switch	1 V
PEN switch	DOWN
Chart Time switch	N

e. Depress and hold Phase Detector ZERO ADJ pushbutton and adjust associated control for a left edge pen reference on Recorder chart paper (it may be necessary to adjust Recorder ZERO control). Release pushbutton.

f. Depress and hold Phase Detector FULL SCALE ADJ pushbutton and adjust associated control for a right edge pen reference on Recorder chart paper.

The measurement system is now calibrated. There should be no pen deflection on the Strip Chart Recorder. To measure 5248M Time Base Stability, connect equipment as shown in figure below and set Recorder Chart Speed to 4 div/MIN.



Full scale deflection is calibrated for .2 μsec. To calculate the drift between Standard and Counter, use the formula and examples below.

$$\frac{\Delta t}{t} = \frac{\Delta f}{f} = \text{Rate of Oscillator drift}$$

Δt = Phase change in time from starting point in seconds
t = total sample time in seconds

EXAMPLE 1: With a 5 minute sample, the chart indicates 1 full scale deflection plus 2-1/2 major divisions; therefore $\Delta t = .2\ \mu s + .1\ \mu s$ or $.3\ \mu s$ over 5 minutes or 300 seconds.

$$\therefore \frac{\Delta t}{t} = \frac{.3 \times 10^{-6}}{3 \times 10^{2}} = \frac{3 \times 10^{-7}}{3 \times 10^{2}} = 1 \times 10^{-9} \text{ or 1 part in } 10^{9}$$

EXAMPLE 2: If the deflection had been 1/2 full scale, the drift rate would be:

$$\frac{\Delta t}{t} = \frac{.5 \times (.2 \times 10^{-6})}{3 \times 10^{2}} = \frac{.1 \times 10^{-6}}{3 \times 10^{2}} = \frac{1 \times 10^{-7}}{3 \times 10^{2}} = .33 \times 10^{-9} \text{ or } 3.3 \text{ parts in } 10^{10}$$

1. STABILITY: Aging Rate: Less than 6 parts in 10^{10} per 24 hours (after 72 hour warm up)
As a function of line voltage: less than 1 part in 10^{10} for changes of ±10%
As a function of ambient temperature: Less than 5 parts in 10^{11} per °C from -20°C to +55°C

Measure the stability of the TIME BASE using the test setup shown above and the procedure described above. Record results.

Table 5-3. In-Cabinet Performance Check Cont'd.

TIME BASE: FREQUENCY (INTERNAL) 5 MHz (5248M only) Cont'd.

1. STABILITY Cont'd.

   TEMPERATURE

   a. Place Counter only in a temperature controlled environment.

   b. Make a 30 minute reference plot with Counter at room temperature. Lower the temperature of the Counter to -20°C and allow 3 hours to reach thermal equilibrium. Make a plot of the drift, calculate amount, and record on test card. Remember to substract the aging rate for an accurate measurement.

   c. Repeat procedure in step (b) except have counter at a temperature of +55°C.

   LINE VOLTAGE: Connect the Counter to a variable voltage ac power source. Using the setup for temperature check, make a plot with the line voltage set to 115V rms. Lower the voltage to 103V rms (10% low), and make a second plot. Raise the voltage to 127V rms (10% high), and make a third plot. Calculate the drift change using the procedure described in Temperature check, and record on test card.

   LONG TERM STABILITY: The Counter should be in a constant temperature environment (25°C). Allow 72 hours continuous operation for stabilization. Make a reference plot and record temperature and line voltage on the test card. Repeat the check in 24 hours and record any change in frequency. Temperature and line voltage must be the same as the first check or compensations for differences must be made.

2. TIME BASE OUTPUT (rear panel): 0.1 Hz to 10 MHz in decade steps
   5V p-p rectangular wave with 1000 ohm source
   100 MHz sine wave with 100 ohm source
   5 MHz sine wave with 50 ohm source

   a. Set Counter controls as follows:

SAMPLE RATE	slightly cw out of POWER OFF
MODE (rear panel)	INT FREQ STD
OUTPUT (rear panel)	10 MHz

   b. Connect Oscilloscope to the OUTPUT connector; signal should be 10 MHz, 5V peak-to-peak. Record on test card.

   c. Set OUTPUT switch to each position, the displayed signal frequency should decrease by factor of 10 at each position. Record results.

   d. Connect oscilloscope to rear 100 MHz output jack; signal should be more than 1.3 V peak-to-peak sine wave.

TIME BASE: FREQUENCY (INTERNAL) 1 MHz (5248L only)

1. STABILITY: Aging Rate: less than 3 parts in 10^9 per 24 hours
   As a function of line voltage: less than 5 parts in 10^{10} for changes of ±10%
   As a function of ambient temperature: less than 2 parts in 10^{10} per °C from -20°C to +55°C

   Measure the stability using the setup and procedure described for the 5248M, with the following exceptions:

   a. Set Phase Detector switch to 1 MHz.

   b. Use the Frequency Standard 1 MHz output.

   c. Set Counter controls as follows:

SAMPLE RATE	slightly cw out of POWER OFF
TIME BASE	.1 μs
FUNCTION	MANUAL START
MODE (rear panel)	INT FREQ STD
OUTPUT (rear panel)	1 MHz

Table 5-3. In-Cabinet Performance Check Cont'd.

TIME BASE: FREQUENCY (INTERNAL) 1 MHz (5246L only) Cont'd.

1. STABILITY Cont'd.

   d. Connect 5248 OUTPUT (1 MHz) signal to Phase Detector INPUT 1 jack.

   e. Record results on test card.

   TEMPERATURE: Repeat the procedure used for the 5248M. Record results.

   LINE VOLTAGE: Repeat the procedure used for the 5248M. Record results.

2. TIME BASE OUTPUT (rear panel): 0.1 Hz to 10 MHz in decade steps
   5 V p-p rectangular wave with 1000 ohm source
   100 MHz sine wave with 100 ohm source

   Repeat procedure used for the 5248M. Record results on test card.

PERFORMANCE CHECK TEST CARD

Hewlett-Packard Model 5248L/M
Electronic Counter

Serial No. ___ - _____

Tests Performed by _____

Date _____

Description		Check	
FREQUENCY MEASUREMENTS			
1. RANGE			
DC Coupled 0-150 MHz		_____	0 to 150 MHz
AC Coupled 25-150 MHz		_____	25 to 150 MHz
2. GATE TIME			
TIME BASE switch 1 μs through 10 s	1 μs	_____	00000010. MHz ±1 Count
	10 μs	_____	0000010.0 MHz ±1 Count
	.1 ms	_____	000010.00 MHz ±1 Count
	1 ms	_____	00010000. kHz ±1 Count
	10 ms	_____	0010000.0 kHz ±1 Count
	.1 s	_____	010000.00 kHz ±1 Count
	1 s	_____	10000.000 kHz ±1 Count
	10 s	_____	0000.0000 kHz ±1 Count
3. ACCURACY			
Gate time 1 μs		_____	00000150. MHz ±1 Count
Gate time 10 s	5248L	_____	5000.0000 kHz ±7 Counts
	5248M	_____	5000.0000 kHz ±6 Counts
4. OUTPUT DISPLAY			
Time base 1 μs		_____	00000100. MHz ±1 Count
Time base 1 ms		_____	00100000. kHz ±1 Count
SCALING (DIVIDING)			
1. RANGE (divide by 10, 0 to 50 MHz)			
Divide by 10, 50 MHz		_____	5 MHz
2. FACTOR 10^2 through 10^9 (0 to 150 MHz)		SCALER RATIO OUTPUT	
Scaler ratio positions 10^2 through 10^9	10^2	_____	1.50 MHz
	10^3	_____	150 kHz
	10^4	_____	15.0 kHz
	10^5	_____	1.50 kHz
	10^6	_____	150 Hz
	10^7	_____	15.0 Hz
	10^8	_____	1.50 Hz
	10^9	_____	.150 Hz

PERFORMANCE CHECK TEST CARD

Description		Check	
PERIOD MEASUREMENTS AND PERIOD MEASUREMENT ACCURACY			
1. SINGLE PERIOD (FREQUENCY RANGE 0 to 1 MHz)		_____	000001.00 μs ±1 Count
2. MULTIPLE PERIOD (FREQUENCY RANGE 0 to 300 kHz)			
Change TIME BASE and FUNCTION to positions shown below.		10 PERIOD AVERAGE	
	10 s	_____	*
	1 s	_____	0000000.0 sec ±1 Count
	.1 s	_____	000000.00 sec ±1 Count
Note	10 ms	_____	00000000. ms ±1 Count
Be sure to integrate ±0.3% trigger error with ±1 Count error.	1 ms	_____	0000000.0 ms ±1 Count
	.1 ms	_____	000000.00 ms ±1 Count
	10 μs	_____	00000003. μs ±1 Count
	1 μs	_____	0000003. μs ±1 Count
	.1 μs	_____	000003.33 μs ±1 Count
	.01 μs	_____	00003.333 μs ±1 Count
		100 PERIOD AVERAGE	
	10 s	_____	*
	1 s	_____	*
	.1 s	_____	00000000. ms ±1 Count
	10 ms	_____	0000000.0 ms ±1 Count
	1 ms	_____	000000.00 ms ±1 Count
	.1 ms	_____	00000003. μs ±1 Count
	10 μs	_____	0000003.3 μs ±1 Count
	1 μs	_____	000003.33 μs ±1 Count
	.1 μs	_____	00003.333 μs ±1 Count
	.01 μs	_____	0003.3333 μs ±1 Count
		1K PERIOD AVERAGE	
	10 s	_____	*
	1 s	_____	*
	.1 s	_____	*
	10 ms	_____	000000.00 ms ±1 Count
	1 ms	_____	00000003. ms ±1 Count
	.1 ms	_____	0000003.3 μs ±1 Count
	10 μs	_____	000003.33 μs ±1 Count
	1 μs	_____	00003.333 μs ±1 Count
	.1 μs	_____	0003.3333 μs ±1 Count
	.01 μs	_____	003.33333 μs ±1 Count
		10K PERIOD AVERAGE	
	10 s	_____	*
	1 s	_____	*
	.1 s	_____	*
	10 ms	_____	*
	1 ms	_____	0000003.3 μs ±1 Count
	.1 ms	_____	000003.33 μs ±1 Count
	10 μs	_____	00003.333 μs ±1 Count
	1 μs	_____	0003.3333 μs ±1 Count
	.1 μs	_____	003.33333 μs ±1 Count
	.01 μs	_____	03.333333 μs ±1 Count

* Switch positions do not permit valid measurement.

PERFORMANCE CHECK TEST CARD

Description		Check	
PERIOD MEASUREMENTS AND PERIOD MEASUREMENT ACCURACY Cont'd.			
2. MULTIPLE PERIOD Cont'd.		100K PERIOD AVERAGE	
	10 s	_____	*
	1 s	_____	*
	.1 s	_____	*
	10 ms	_____	*
	1 ms	_____	*
	.1 ms	_____	00003.333 μs ±1 Count
	10 μs	_____	0003.3333 μs ±1 Count
	1 μs	_____	003.33333 μs ±1 Count
	.1 μs	_____	03.333333 μs ±1 Count
	.01 μs	_____	3.3333333 μs ±1 Count
FREQUENCY RATIO MEASUREMENTS			
1. SINGLE PERIOD			
f1/f2	150 MHz/100 Hz	_____	01500000. ±trigger error
	50 MHz/100 Hz	_____	00500000. ±trigger error
	10 MHz/100 Hz	_____	00100000. ±trigger error
	1 MHz/100 Hz	_____	00010000. ±trigger error
	100 kHz/100 Hz	_____	00001000. ±trigger error
	10 kHz/100 Hz	_____	00000100. ±trigger error
	1 kHz/100 Hz	_____	00000010. ±trigger error
	500 Hz/100 Hz	_____	00000005. ±trigger error
	100 Hz/100 Hz	_____	00000001. ±trigger error
2. MULTIPLE PERIODS			
f1/f2 x PERIOD AVERAGE			
	150 MHz/100 kHz x 10	_____	0001500.0 ±trigger error
	100 MHz/100 kHz x 100	_____	001000.00 ±trigger error
	50 MHz/100 kHz x 10K	_____	0500.0000 ±trigger error
	100 kHz/100 kHz x 10K	_____	001.00000 ±trigger error
	100 kHz/50 kHz x 10K	_____	0002.0000 ±trigger error
	150 kHz/10 kHz x 100K	_____	015.00000 ±trigger error
	150 kHz/10 Hz x 10	_____	0000015.0 ±trigger error
TIME BASE: FREQUENCY (INTERNAL) 5 MHz (5248M only)			
1. STABILITY		_____	Maximum ±5 parts in $10^{10}/2^{\Delta}$ hr
TEMPERATURE			
	Reference Plot	_____	Maximum ±5 parts in 10^{10}
	-20°C Plot	_____	Max. 2.25 parts in 10^{10}
	+55°C Plot	_____	Max. 1.5 parts in 10^{9}

* Switch positions do not permit valid measurement.

PERFORMANCE CHECK TEST CARD

Description	Check	
TIME BASE: FREQUENCY (INTERNAL) 5 MHz (5248M only) Cont'd.		
1. STABILITY Cont'd.		
LINE VOLTAGE		
103V (10% low)	_____	Maximum ±1 part in 10^{10}
127V (10% high)	_____	Maximum ±1 part in 10^{10}
LONG TERM STABILITY	_____	Maximum ±5 parts in 10^{10}
2. TIME BASE OUTPUT (rear panel)		
10 MHz (rectangular wave)	_____	10 MHz 5V peak-to-peak
.1 to 1 MHz (rectangular wave)	_____	1 MHz 5V peak-to-peak
	_____	100 kHz 5V peak-to-peak
	_____	10 kHz 5V peak-to-peak
	_____	1 kHz 5V peak-to-peak
	_____	100 Hz 5V peak-to-peak
	_____	10 Hz 5V peak-to-peak
	_____	1 Hz 5V peak-to-peak
	_____	.1 Hz 5V peak-to-peak
100 MHz	_____	100 MHz (min.) 1.3V p-p
TIME BASE: FREQUENCY (INTERNAL) 1 MHz (6248L only)		
1. STABILITY	_____	Maximum 3 parts in 10^{9}
TEMPERATURE		
Reference Plot	_____	Maximum ±3 parts in 10^{9}
-20°C Plot	_____	Maximum ±9 parts in 10^{9}
+55°C Plot	_____	Maximum ±6 parts in 10^{9}
LINE VOLTAGE		
103V (10% low)	_____	Maximum ±5 parts in 10^{10}
127V (10% high)	_____	Maximum ±5 parts in 10^{10}
2. TIME BASE OUTPUT (rear panel)		
10 MHz (rectangular wave)	_____	10 MHz 5V peak-to-peak
.1 to 1 MHz (rectangular wave)	_____	1 MHz 5V peak-to-peak
	_____	100 kHz 5V peak-to-peak
	_____	10 kHz 5V peak-to-peak
	_____	1 kHz 5V peak-to-peak
	_____	100 Hz 5V peak-to-peak
	_____	10 Hz 5V peak-to-peak
	_____	1 Hz 5V peak-to-peak
	_____	.1 Hz 5V peak-to-peak

Table 5-4. Adjustments

NOTE: All voltage measurements taken with respect to chassis.

1. REGULATOR ASSEMBLY A7

CAUTION: When troubleshooting or adjusting the power supply, do not short supplies to ground or to each other. This will damage the diodes and transistors.

a. Set line voltage to normal value (115 or 230 V ac).

b. Connect dc voltmeter to -15 V dc line between A7 (13) and chassis.

c. Voltmeter should read -15 V dc ±0.5 V dc. If voltage is outside this range, adjust A7R5.

d. Vary line voltage from 103 to 127 V ac (207 to 255 V ac). The -15 V dc supply should not vary more than 0.5 V dc.

e. Check all supply voltages at locations, and under conditions shown in Table 5-5.

NOTE: Input sensitivity levels must be rechecked if power supply voltages are adjusted.

2. INPUT AMPLIFIER A19

The following procedure sets the output level and checks the gain, frequency response, and sensitivity of the input amplifier.

a. Turn counter on and set LEVEL to PRESET, SENSITIVITY to 0.1V, and AC-DC to DC.

b. Connect Test Oscillator output to Counter INPUT jack with 50-ohm termination at Counter.

c. Set Test Oscillator output to 10 MHz, 100 mV rms.

d. Output at A19(6) should be 1.0V peak-to-peak minimum.

e. Increase output of Test Oscillator to 3 V rms. The output at A19(6) should be a symmetrically clipped waveform <2V peak-to-peak.

f. Set SENSITIVITY to .1 V, TIME BASE to .1 μs, and FUNCTION to 1 PERIOD AVERAGE.

g. Set Test Oscillator output to 1.0 MHz, 100 mV rms.

h. Adjust A19R20 until correct count appears. Reduce input signal amplitude slightly and readjust A19R20 for maximum sensitivity.

i. Repeat step h until maximum sensitivity is obtained.

3. RATIO INPUT AMPLIFIER A20

Repeat steps a through e of step 2. Change A19(6) to A20(6).

a. Set SIGNAL INPUT SENSITIVITY to 0.1V range, AC-DC switch to DC, TIME BASE to EXT, and FUNCTION to 1 PERIOD AVERAGE. Set OUTPUT STD FREQ (rear panel) to 100 Hz. Connect a coaxial cable from OUTPUT STD FREQ (rear panel) to SIGNAL INPUT (front).

b. Connect Test Oscillator output to RATIO INPUT with 50-ohm termination at Counter. Set Test Oscillator output for 100 Hz, 100 mV rms.

c. Adjust A20R20 until correct count appears. Reduce input signal amplitude slightly and readjust A20R20 for maximum sensitivity.

d. Repeat step c until maximum sensitivity is obtained.

e. Do not change the setting of A19R20 or A20R20 once they have been adjusted.

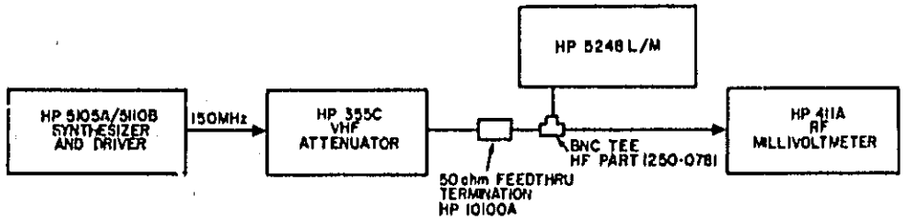
4. FUNCTION CONTROL A21

a. Set TIME BASE to 10 ms and FUNCTION to FREQUENCY, SENSITIVITY to .1 V, LEVEL control to PRESET and AC-DC switch to AC.

Table 5-4. Adjustments Cont'd.

4. FUNCTION CONTROL A21 Cont'd.

b. Set Synthesizer to 150 MHz, 100 mV rms. Connect Synthesizer to the Counter SIGNAL INPUT as shown below.



NOTE: Be sure to monitor the input voltage at the input jack and not at the output of the source. You will not get predictable readings because of line losses.

c. Observe correct counter display. Reduce Synthesizer output amplitude slightly and adjust A21R34 for maximum sensitivity.

d. Repeat step c until maximum sensitivity is obtained.

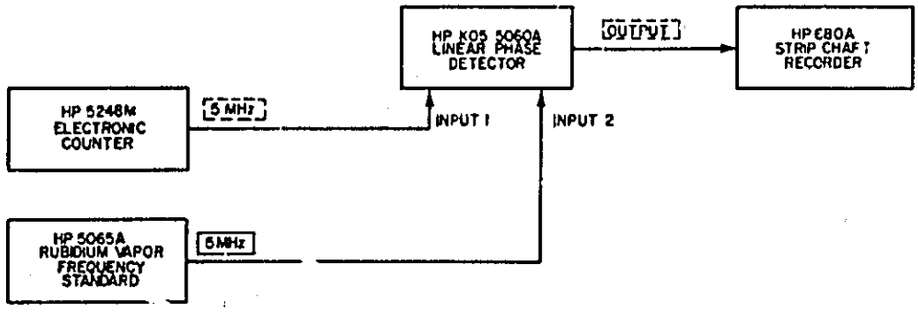
NOTE: Do not change the setting of A19R20.

5. OSCILLATOR ADJUSTMENTS 5248M (for 5248L See Step 6)

NOTE: This adjustment should be made only after Counter has been on for 72 hours.

CAUTION: Field disassembly of Oscillator Assembly A24 voids the warranty. The only oscillator adjustments are COARSE, FINE, and FILTER. The factory set temperature adjustment should not be changed.

a. Connect equipment as shown below.



b. Position pen on Strip Chart Recorder to left edge of paper by depressing zero pushbutton on Phase Detector and adjusting the associated control.

c. Position pen on Strip Chart Recorder to right edge of paper by depressing full scale pushbutton on Phase Detector and adjusting associated control. (It may be necessary to use zero control on Recorder also.) Recheck zero and full scale.

d. Set Strip Chart Recorder RANGE 1V, CHART SPEED 4 div/minute.

e. Adjust Counter oscillator COARSE (rear panel) and/or fine (inside plug-in compartment) controls for minimum rate of change on Strip Chart Recorder.

f. Set chart speed to 2 div/hr and let unit run for at least 4 hours. Use procedure in TIME BASE FREQUENCY CHECK (In-Cabinet Performance Check, Table 5-3) to calculate drift for 5248M.

Table 5-4. Adjustments Cont'd.

5. OSCILLATOR ADJUSTMENTS 5248M (for 5248L See Step 6) Cont'd.

g. Drift should not exceed 36 full sweeps in 4 hours which would be 5 parts in 10^{10}. For example:

$$\frac{\Delta t}{t} = \frac{36 \times .2 \times 10^{-6}}{4 \times 60 \times 60} = \frac{7.2 \times 10^{-6}}{1.44 \times 10^{4}} = 5 \times 10^{-10}$$

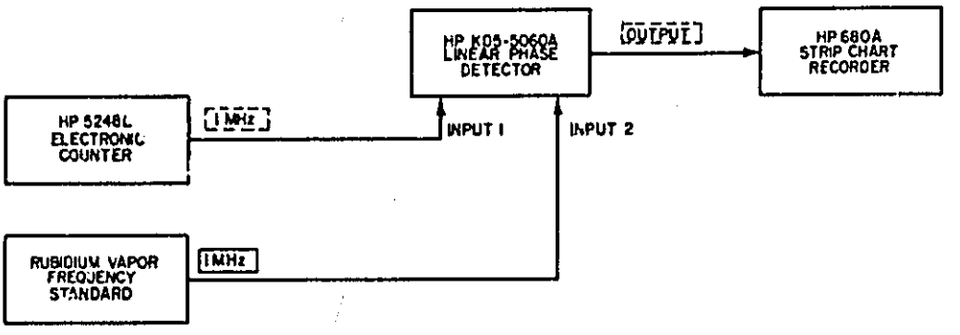
h. FILTER ADJUSTMENT. Normally, the 5 MHz filter adjustment (rear panel) will not require tuning. If, however, due to crystal aging, the 5 MHz OUTPUT (rear panel) decreases below .9 V rms (2.5 V peak-to-peak) the filter should be tuned as follows:

(1) Connect oscilloscope with 10:1 divider probe to 5 MHz OUTPUT (rear panel).

(2) Adjust filter control (access hole located above COARSE FREQ ADJ, rear panel) with an insulated tuning tool for maximum signal.

6. OSCILLATOR ADJUSTMENTS 5248L (for 5248M See Step 5)

a. Connect equipment as shown below.



b. Set Counter controls as follows.

SAMPLE RATE	slightly cw out of POWER OFF
FUNCTION	MANUAL START
MODE (rear panel)	INT STD FREQ
OUTPUT (rear panel)	1 MHz

c. Repeat steps b, c, d of step 5, 5248M Oscillator Adjustments.

d. Adjust Counter COARSE (rear panel) and/or medium and fine (inside plug-in compartment) for minimum rate of change on Strip Chart Recorder.

e. Set Chart speed to 4 div/hr and run for 4 hours. Use procedure in TIME BASE FREQUENCY CHECK (Table 5-3) to calculate drift for 5248L.

f. The amount of drift should not exceed 43.2 full scale sweeps in 4 hours which would be 3 parts in 10^{9}. For example:

$$\frac{\Delta t}{t} = \frac{43.2 \times 10^{-6}}{4 \times 60 \times 60} = \frac{4.32 \times 10^{-5}}{1.44 \times 10^{4}} = 3 \times 10^{-9} \text{ or 3 parts in } 10^{9}$$

7. MULTIPLIER/DIVIDER A26 (5248M)

a. With power off, remove top and bottom covers (unlock the two 1/4 turn fasteners and lift covers).

b. Turn Counter on, set OUTPUT STD FREQ to 10 MHz, MODE switch to INT STD FREQ. Connect Oscilloscope to OUTPUT STD FREQ (rear panel) jack and adjust A26C9, A26C14, and A26C18 for maximum 10 MHz output.

c. Disconnect Oscilloscope and connect RF Voltmeter to the OUTPUT connector; output should be greater than 1 V rms.

Table 5-4. Adjustments Cont'd.

7. MULTIPLIER/DIVIDER A26 (5248M) Cont'd.

d. Connect Oscilloscope to A26(6) at XA26, signal should be 10 MHz, 5 V peak-to-peak.

e. Set OUTPUT STD FREQ switch (rear panel) to 1 MHz, and connect Oscilloscope to OUTPUT connector; signal should be 1 MHz, greater than 5 V peak-to-peak.

f. Connect Oscilloscope to A26(12) at XA26, signal should be 1 MHz, 11 V or greater rectangular wave.

g. Connect Oscilloscope to A26(13) at XA26, signal should be 1 MHz, 5 V or greater rectangular wave.

8. 10 TO 100 MHz MULTIPLIER A36

a. With power off, remove top and bottom covers (unlock the two 1/4 turn fasteners and lift covers). Remove A36.

b. Install Extender Board (HP Part No. 05245-6022) in A36 connector and install A36 into Extender.

c. Set Trimmer Capacitors C7, C8, and C12 to mid-position, R12 to mid-position, and T2 slug near bottom of coil.

d. Connect 1 MHz OUTPUT (rear panel) from Counter to Oscilloscope SYNC INPUT.

e. Observing A26Q4 base signal on Oscilloscope, adjust L2, C7, C8, and C12 for maximum amplitude of 50 MHz.

f. Amplitude should be 3.0 to 4.0 V peak-to-peak. Repeat step d until maximum signal is obtained.

g. Observing signal at A36(12), adjust L9 and R12 for maximum 100 MHz signal. Amplitude should be 2.5 to 4.0 V peak-to-peak, with minimum 50 MHz modulation.

h. Detune and retune one at a time: L2, C7, C8, and C12. Check 100 MHz for any spurious outputs or sudden loss of signal.

5-23. TROUBLESHOOTING

5-24. Troubleshooting Aids

5-25. THEORY OF OPERATION. Section IV provides information with logic diagrams on Counter operation in all operating modes.

5-26. SCHEMATIC DIAGRAMS. Schematic diagrams and the operation of individual assemblies is provided in Section VIII.

5-27. COMPONENT LOCATION. Photographs of printed circuit assemblies with component callouts are included in Section VIII with the schematics.

5-28. Troubleshooting Procedure

5-29. The following paragraphs, steps, and charts aid locating problems. Use this section to isolate trouble to an assembly; then go to that assembly schematic and operation in Section VIII to locate the defective component.

5-30. TROUBLE AT TURN ON. If Counter fails to turn on (no display, decimal point, or measurement units) make the following checks:

a. Line voltage switch set for correct voltage (115V or 230V).

b. Power cord plugged into counter and power source.

c. Line fuse good.

d. AC power available at source.

e. If the oven lamp comes on but the counter gives no indication of power applied, check SAMPLE RATE switch S5 for proper operation.

f. Check A6, A7, and T2.

g. If Counter comes on but oven lamp fails to operate properly, check S4, T1, A24, and lamp.

5-31. TROUBLE DURING SELF CHECK. If the counter has trouble in some, but not all functions, use the following procedure:

a. Set up counter for Self Check, Figure 3-5.

b. Using Table 5-5, locate the defective assembly.

EXAMPLE: With the counter set up as follows:

SAMPLE RATE . . . slightly cw out of POWER OFF
FUNCTION . . . . . FREQUENCY
TIME BASE . . . . . 10 ms
SENSITIVITY . . . . . CHECK

If correct indication is observed on the counter, change the TIME BASE to .1 s; if the counter's display is now incorrect, the trouble must be either A11 or A32, since these assemblies are the only new factors put in the measurement circuit by changing the TIME BASE switch. Since A10 through A14 are identical and A29 through A34 are identical, they can be interchanged to locate the defective assembly.

c. Before getting involved in troubleshooting assemblies, study Table 5-5 and double check control settings.

5-32. TROUBLE DURING OPERATION. There are some assemblies that are not checked during the Self Check. If unit operates normally during Self Check but fails to function properly during operation, assemblies A1, A4, A5, A19, and A20 must be checked.

5-33. OSCILLATOR CHECK. The time base oscillator is checked for operation, but not accuracy, during Self Check when measuring frequency. To check accuracy refer to In-Cabinet Performance Check, Table 5-3.

Table 5-5. Assembly Check

Function	Time Base Switch	Displays	Assemblies Checked																	
			2	3	10	11	12	13	14	15	16	26	27*	28	29	30	31	32	33	34
Frequency	1 µs	00000100. MHz	x								x	x	x							
	10 µs	0000100.0 MHz	x							x	x	x	x	x						
	.1 ms	000100.00 MHz	x						x	x	x	x	x	x	x					
	1 ms	00100000. kHz	x					x	x	x	x	x	x	x	x	x				
	10 ms	0100000.0 kHz	x				x	x	x	x	x	x	x	x	x	x	x			
	.1 s	100000.00 kHz	x			x	x	x	x	x	x	x	x	x	x	x	x	x		
	1 s	10000.000 kHz	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	10 s	0000.0000 kHz	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Period Average																				
1		00000001		x										x	x					
10		00000010		x							x			x	x	x				
100		00000100		x						x	x			x	x	x	x			
1K		00001000		x					x	x	x			x	x	x	x	x		
10K		00010000		x				x	x	x	x			x	x	x	x	x	x	
100K		00100000		x			x	x	x	x	x			x	x	x	x	x	x	x

* A27 used in 5248L only.

Assemblies 8, 9, and 36 are checked in all frequency check positions.

The following assemblies are checked in all positions used in the self check table: 6, 7, 17, 18, 21, 22, 23, 24, 25, and 35.

The SENSITIVITY switch (A1) is in the CHECK position for all self check functions.

Assemblies 4, 5, 19, and 20 are not checked in self check.

Assembly 24 is check for operation, but not accuracy or stability.

Figure 5-1. 5248L Top Internal

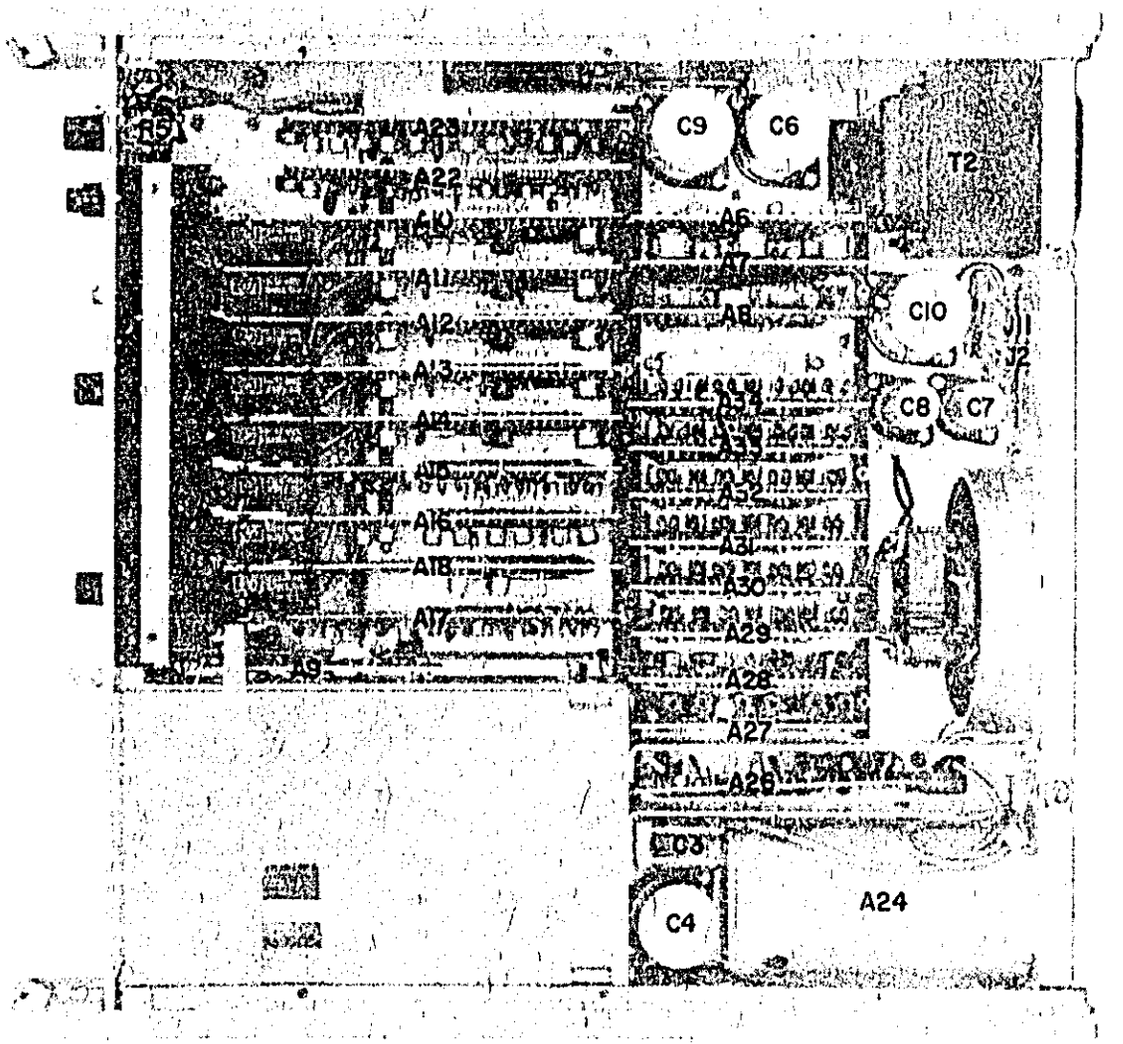


Figure 5-2. 5248L Bottom Internal

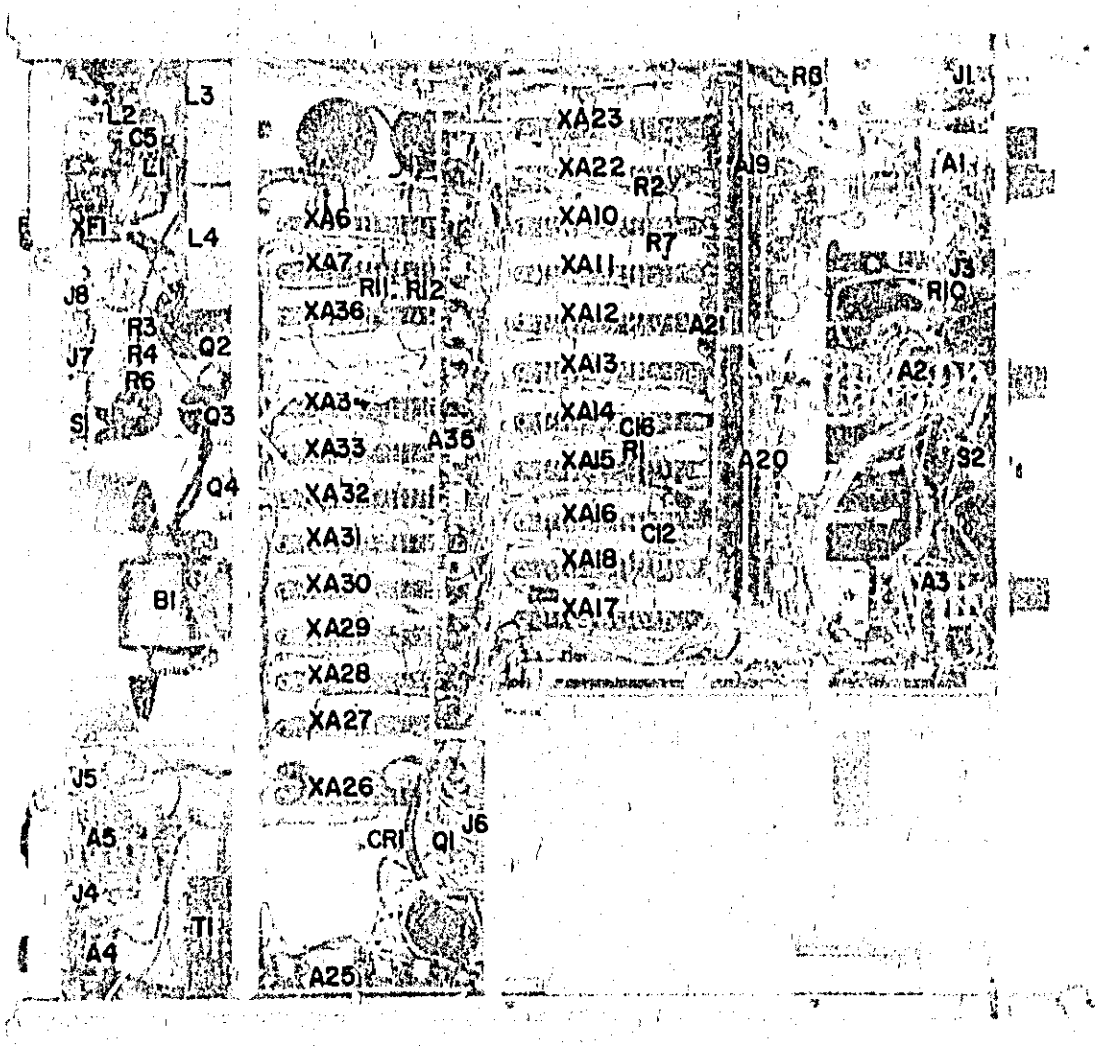


Figure 5-3. 5248M Top Internal

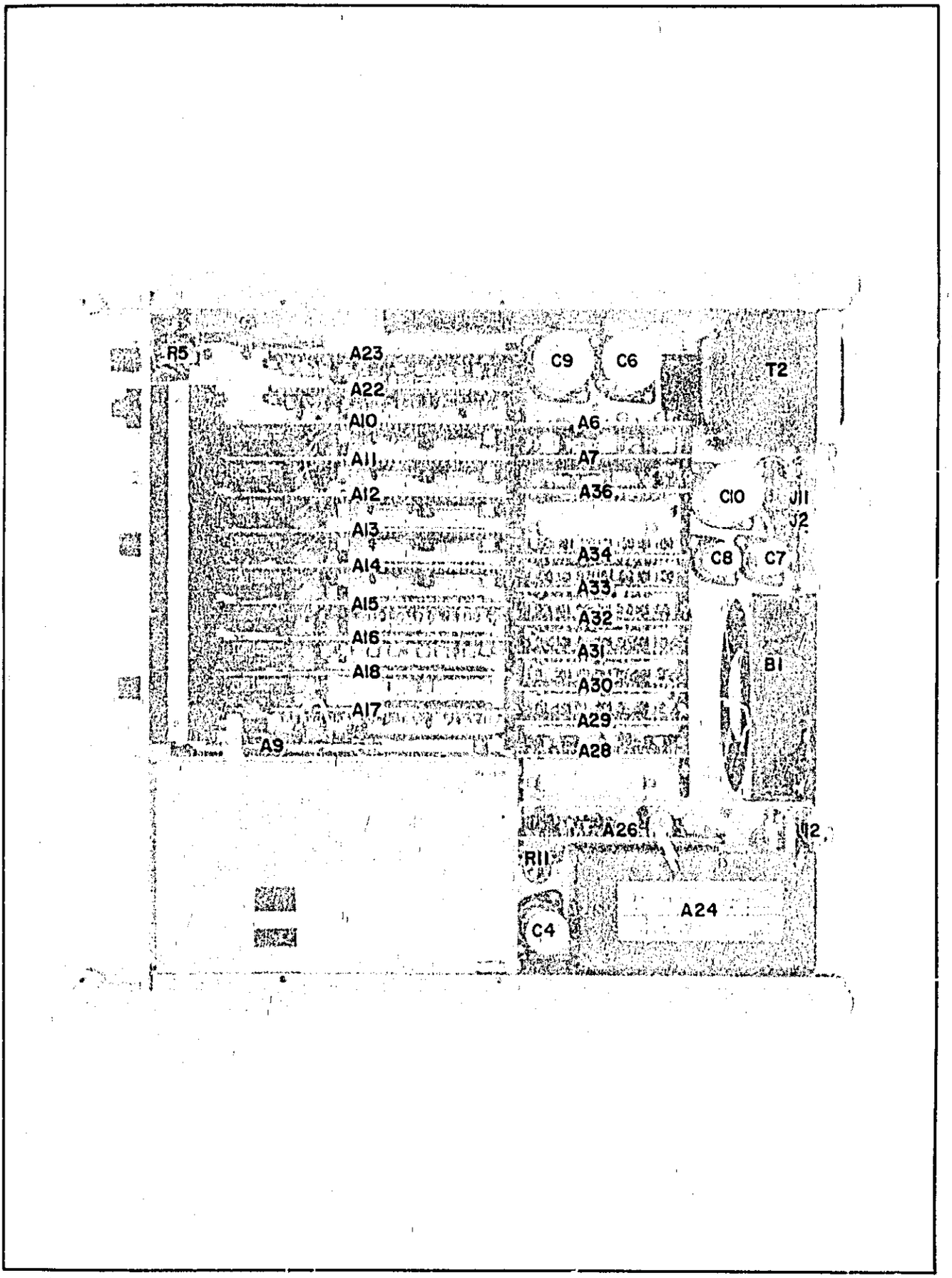
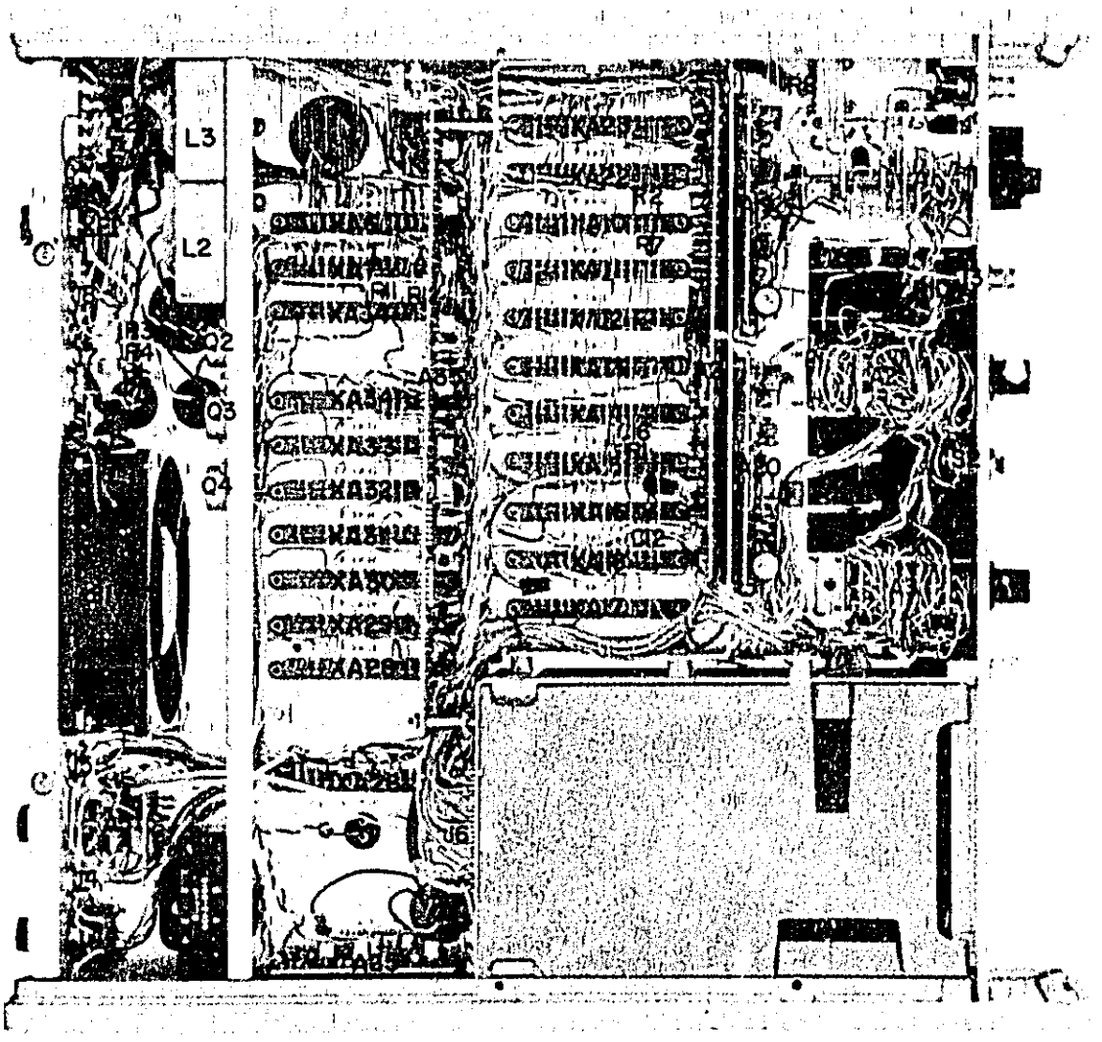


Figure 5-4. 5248M Bottom Internal



PARTS LIST

SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION

6-2. This section contains information for ordering replacement parts. Tables 6-1, 6-1A (A24 for 5248M), 6-3 (Option 02), and 6-4 (Option 03) list parts in reference designator alpha-numerical order and indicates the description and HP part number for each part, together with any applicable notes. Table 6-2 lists parts in alpha-numerical order of their HP part number and provide the following explanation for each part.

a. Description of part (see abbreviations below).

b. Typical manufacturer of the part in a five-digit code; see list of manufacturers in Table 6-5.

c. Manufacturer's part number.

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

6-3. Miscellaneous parts are listed in Table 6-1; modular cabinet parts are listed in Figure 6-1.

6-4. ORDERING INFORMATION

6-5. To obtain replacement parts, address order or inquiry to your local Hewlett-Packard Sales and Service office (see lists at rear of this 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 DESIGNATORS

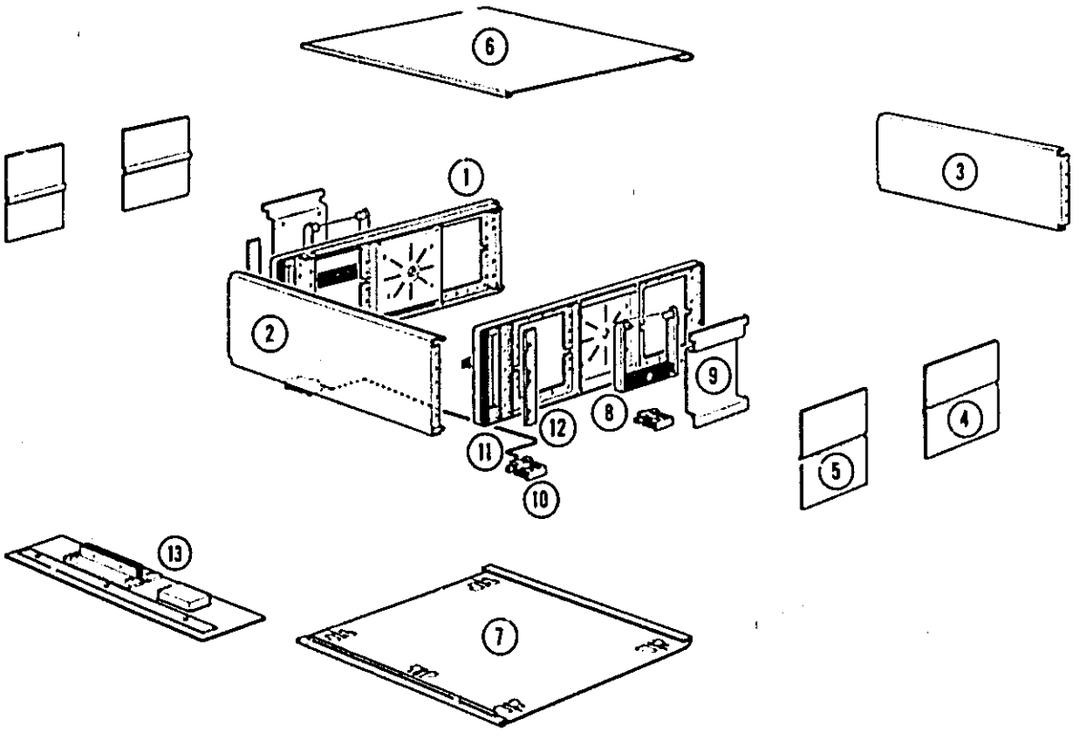
A	assembly	F	fuse	MP	mechanical part	U	integrated circuit
B	motor	FL	filter	P	plug	V	vacuum, tube, neon bulb, photocell, etc.
BT	battery	IC	integrated circuit	Q	transistor	VR	voltage regulator
C	capacitor	J	jack	R	resistor	W	cable
CP	coupler	K	relay	RT	thermistor	X	socket
CR	diode	L	inductor	S	switch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

ABBREVIATIONS

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

01194-14

Figure 6-1. Modular Cabinet Parts



ITEM NO.	DESCRIPTION	HP PART NO.		
		STANDARD	OPTION A85	OPTION X95
1	Side Frame Assembly	5060-0732	←	←
2	Front Panel 5248L only Front Panel 5248M only	05248-20025 05248-20027	05248-20009 05248-20010	05248-20009 05248-20010
3	Rear Panel 5248L only Rear Panel 5248M only	05248-00003 05248-00004	← ←	← ←
4	Rear Side Plate Cover	5000-8711	5000-8711	5000-0738
5	Front Side Plate Cover	5000-8709	5000-8709	5000-0739
6	Top Cover	05243-0010	05243-0010	5243A-1C
7	Bottom Cover	05243-0009	05243-0009	5243A-1B
8	Side Handle Assembly	5060-0222	←	←
9	Retainer Handle Assembly	5060-8737	5060-8737	5060-0766
10	Foot Assembly	5060-0767	←	←
11	Tilt Stand	1490-0030	←	←
12	Trim Strip	5000-0051	—	—
13	Rack Mount Kit	05243-6043	5243A-44A	5243A-44A

Table 6-1. Reference Designation Index

Reference Designation	# Part No.	Description #	Note
A1	05248-60010	SWITCH ASSY:ATTENUATOR	
A1C1	0160-2262	C:FXD CER 16 PF 5% 500VDCW	
A1C2	0160-2260	C:FXD CER 13 PF 5% 500VDCW	
A1C3	0150-0069	C:FXD CER 1000 PF +100-20% 500VDCW	
A1C4	0160-2550	C:FXD CER 1.0 PF 500VDCW	
A1C5	0160-2248	C:FXD CER 4.3 0.25 PF 500VDCW	
A1C6	0140-0169	C:FXD MICA 100 PF 5% 500VDCW	
A1C7	0150-0115	C:FXD CER 27 PF 10% 500VDCW	
A1C8	0160-0130	C:FXD MY 0.022 UF 2% 600VDCW	
A1C9	0180-0061	C:FXD CER 20 PF 10% 100VDCW	
A1L1	9100-0346	COIL:FXD 0.05 UH 20%	
A1L2	9100-0346	COIL:FXD 0.05 UH 20%	
A1R1	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1R2	0757-0344	R:FXD MET FLM 1.00 MEGOHM 1% 1/4W	
A1R3	0757-0348	R:FXD MET FLM 34 OHM 1% 1/8W	
A1R4	0757-0348	R:FXD MET FLM 34 OHM 1% 1/8W	
A1R5	0757-0972	R:FXD MET FLM 100K OHM 2% 1/4W	
A1R6	0686-1055	R:FXD COMP 1 MEGOHM 5% 1/2W	
A1R7	0757-0350	R:FXD MET FLM 909K OHM 1% 1/4W	
A1R8	0757-0972	R:FXD MET FLM 100K OHM 2% 1/4W	
A1R9		NOT ASSIGNED	
A1R10	0757-0948	R:FXD MET FLM 10K OHM 2% 1/4W	
A1R11	2100-1924	R:VAR COMP 5K OHM 20% LIN 1/5W (S1)	
A1R12	0698-3431	R:FXD FLM 23.7 OHM 1% 1/8W	
A1S1	3100-2491	SWITCH:ROTARY 5 POS. 4SECT	
A1S2		PART OF R11,P/O LEVEL/PRESET	
A1S3	3101-1342	SWITCH:SLIDE SPDT 0.5A	
	05245-2016	COUPLER	
	05248-00001	BRACKET:SHIELD	
A2		TIME BASE SWITCH ASSY	
A2C1	0150-0122	C:FXD CER 2000 PF 20% 500VDCW	
A2L1	9140-0137	COIL:FXD RF 1 MH 5%	
A2R1	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A2S1	3100-2493	SWITCH:ROTARY 11 POS. 10 SECT	
A3	3100-2492	SWITCH:ROTARY 10 POS. 7 SECT	
A4	05248-60020	ASSY:MODE SWITCH FOR 5248L ONLY	
A4C1	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A4R1	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A4S1	3100-1876	SWITCH:ROTARY 1 SECT 3 POS	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A4	5245L-6028	SWITCH ASSY:MODE FOR 5248M ONLY	
A4S1	3100-2067	SWITCH:ROTARY 1 SECT 3 POS	
A5	05248-60015	SWITCH ASSY:OUTPUT	
A5S1	3100-0390	SWITCH:ROT 2-SECT 9-POS HP SPEC	
A5A1	05248-60014	BOARD ASSY:OUTPUT AMPLIFIER	
	05248-20014	BOARD:BLANK PC	
A5A1C1	0150-0035	C:FXD CER 20 PF 10% 600VDCW	
A5A1CR1	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A5A1Q1	1854-0009	TRANSISTOR:SILICON NPN 2N709	
A5A1Q2	1854-0009	TRANSISTOR:SILICON NPN 2N709	
A5A1R1	0683-1325	R:FXD COMP 1300 OHM 5% 1/4W	
A5A1R2	0683-1335	R:FXD COMP 13K OHM 5% 1/4W	
A5A1R3	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A5A1R4	0683-3325	R:FXD COMP 3300 OHM 5% 1/4W	
A5A1R5	0683-2725	R:FXD COMP 2700 OHM 5% 1/4W	
A5A1R6	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A5A1R7	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A5A1R8	0683-8215	R:FXD COMP 820 OHM 5% 1/4W	
A6	5243A-65L	ASSY:RECTIFIER BOARD	
	5243A-65L-1	BOARD, BLANK	
A6C1	0170-0040	C:FXD MY .047 UF 10% 200VDCW	
A6C2	0160-0314	C:FXD MY 0.01 UF 5% 400VDCW	
A6C3	0160-0314	C:FXD MY 0.01 UF 5% 400VDCW	
A6C4	0170-0040	C:FXD MY .047 UF 10% 200VDCW	
A6CR1	1901-0045	DIODE:SILICON 100PIV	
A6CR2	1901-0045	DIODE:SILICON 100PIV	
A6CR3	1901-0045	DIODE:SILICON 100PIV	
A6CR4	1901-0045	DIODE:SILICON 100PIV	
A6CR5	1901-0029	DIODE:SILICON 600 PIV	
A6CR6	1901-0029	DIODE:SILICON 600 PIV	
A6CR7	1901-0029	DIODE:SILICON 600 PIV	
A6CR8	1901-0029	DIODE:SILICON 600 PIV	
A6CR9	1901-0045	DIODE:SILICON 100PIV	
A6CR10	1901-0045	DIODE:SILICON 100PIV	

See introduction to this section for ordering information

Reference Designation	HP Part No.	Description #	Note
A6CR11	1901-0045	DIODE:SILICON 100PIV	
A6CR12	1901-0045	DIODE:SILICON 100PIV	
A6CR13	1901-0049	DIODE:SILICON 50PIV	
A6CR14	1901-0049	DIODE:SILICON 50PIV	
A6CR15	1901-0049	DIODE:SILICON 50PIV	
A6CR16	1901-0049	DIODE:SILICON 50PIV	
A7	5243A-65H	ASSY:REGULAR BOARD	
	5243A-65H-1	BOARD:BLANK	
A7C1	0170-0040	C:FXD MY .047 UF 10% 200VDCW	
A7C2	0180-0097	C:FXD ELECT 47UF 10% 35VDCW	
A7C3	0170-0040	C:FXD MY .047 UF 10% 200VDCW	
A7C4	0180-0098	C:FXD ELECT 100 UF 20% 20VDCW	
A7C5	0180-0098	C:FXD ELECT 100 UF 20% 20VDCW	
A7CR1	1902-0017	DIODE,BREAKDOWN:6.81V 10% 400 MW	
A7CR2	1902-0214	DIODE:SILICON BREAKDOWN 56.2V 10%	
A7CR3	1902-0017	DIODE,BREAKDOWN:6.81V 10% 400 MW	
A7CR4	1902-0057	DIODE BREAKDOWN:6.49V	
A7Q1	1853-0001	TRANSISTOR:PNP SILICON 30V 900MW	
A7Q2	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A7Q3	1853-0001	TRANSISTOR:PNP SILICON 30V 900MW	
A7Q4	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A7Q5	1850-0048	TRANSISTOR:GERMANIUM 2N650 PNP	
A7R1	0758-0015	R:FXD ME / OX 220 OHM 5% 1/2W	
A7R2	0686-1025	R:FXD COMP 1000 OHM 5% 1/2W	
A7R3	0686-2235	R:FXD COMP 22K OHM 5% 1/2W	
A7R4	0758-0015	R:FXD MET OX 220 OHM 5% 1/2W	
A7R5	2100-1412	R:VAR COMP 500 OHM 20% LIN 1/4W	
A7R6	0758-0015	R:FXD MET OX 220 OHM 5% 1/2W	
A7R7	0689-2035	R:FXD COMP 20K OHM 5% 1W	
A7R8	0758-0015	R:FXD MET OX 220 OHM 5% 1/2W	
A7R9	0686-8215	R:FXD COMP 820 OHM 5% 1/2W	
A7R10	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A7R11	0758-0015	R:FXD MET OX 220 OHM 5% 1/2W	
A7R12	2100-1412	R:VAR COMP 500 OHM 20% LIN 1/4W	
A7R13	0758-0028	R:FXD MET OX 270 OHM 5% 1/2W	
A7R14	0686-8215	R:FXD COMP 820 OHM 5% 1/2W	
A7R15	0686-2735	R:FXD COMP 27K OHM 5% 1/2W	
A7R16	0686-6215	R:FXD COMP 620 OHM 5% 1/2W	
A7R17	2100-1412	R:VAR COMP 500 OHM 20% LIN 1/4W	
A7R18	0686-2025	R:FXD COMP 2000 OHM 5% 1/2W	
A7R19	0686-1525	R:FXD COMP 1500 OHM 5% 1/2W	
A7R20	0683-1525	R:FXD COMP 1500 OHM 5% 1/4W	

See introduction to this section for ordering information

Reference Designation	HP Part No.	Description #	Note
A8	05248-60007	BOARD ASSY:DECIMAL POINT	
	05248-20007	BOARD:BLANK PC	
A8CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR9	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR10	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR11	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR12	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR13	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR14	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR15	1901-0025	DIODE:SILICON 100WV 100MA	
A8DS1	2140-0028	LAMP:GLOW 1/15W	
A8DS2	2140-0028	LAMP:GLOW 1/15W	
A8DS3	2140-0028	LAMP:GLOW 1/15W	
A8DS4	2140-0028	LAMP:GLOW 1/15W	
A8DS5	2140-0028	LAMP:GLOW 1/15W	
A8DS6	2140-0028	LAMP:GLOW 1/15W	
A8DS7	2140-0028	LAMP:GLOW 1/15W	
A8DS8	2140-0028	LAMP:GLOW 1/15W	
A8R1	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R2	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R3	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R4	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R5	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R6	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R7	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R8	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R9	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R10	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R11	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R12	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R13	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R14	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R15	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R16	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A8R17	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A8R18	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A8R19	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R20	0683-1245	R:FXD COMP 120K OHM 5% 1/4W	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A9	05248-60008	BOARD ASSY:MEASUREMENT UNITS	
	05248-20008	BOARD:BLANK PC	
A9C1	0150-0012	C:FXD CER 0.01 UF 20% 1000VDCW	
A9CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR9	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR10	1901-0025	DIODE:SILICON 100WV 100MA	
A9DS1	2140-0015	LAMP:GLOW NEON NE-2H	
A9DS2	2140-0015	LAMP:GLOW NEON NE-2H	
A9DS3	2140-0015	LAMP:GLOW NEON NE-2H	
A9DS4	2140-0015	LAMP:GLOW NEON NE-2H	
A9DS5	2140-0015	LAMP:GLOW NEON NE-2H	
A9DS6	2140-0015	LAMP:GLOW NEON NE-2H	
A9R1	0686-5135	R:FXD COMP 51K OHM 5% 1/2W	
A9R2	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A9R3	0686-5135	R:FXD COMP 51K OHM 5% 1/2W	
A9R4	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A9R5	0686-5135	R:FXD COMP 51K OHM 5% 1/2W	
A9R6	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A9R7	0686-5135	R:FXD COMP 51K OHM 5% 1/2W	
A9R8	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A9R9	0686-5135	R:FXD COMP 51K OHM 5% 1/2W	
A9R10	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A9R11	0686-5135	R:FXD COMP 51K OHM 5% 1/2W	
A9R12	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A9R13	0683-1245	R:FXD COMP 120K OHM 5% 1/4W	
A9R14	0683-1245	R:FXD COMP 120K OHM 5% 1/4W	
A9R15	0683-1245	R:FXD COMP 120K OHM 5% 1/4W	
A9R16	0683-1245	R:FXD COMP 120K OHM 5% 1/4W	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A10	05212-6002	BOARD ASSY:DECIMAL +1248	
	05212-2001	BOARD:BLANK PC	
	05212-6014	READOUT BLOCK ASSY	
A10C1	0140-0194	C:FXD MICA 110 PF 5%	
A10C2	0140-0217	C:FXD MICA 140 PF 2%	
A10C3	0140-0194	C:FXD MICA 110 PF 5%	
A10C4	0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	
A10C5	0140-0194	C:FXD MICA 110 PF 5%	
A10C6	0140-0194	C:FXD MICA 110 PF 5%	
A10C7	0140-0195	C:FXD MICA 130 PF 5% 300 VDCW	
A10C8	0140-0194	C:FXD MICA 110 PF 5%	
A10C9	0140-0194	C:FXD MICA 110 PF 5%	
A10C10	0140-0196	C:FXD MICA 150 PF 5%	
A10C11	0140-0198	C:FXD MICA 200 PF 5%	
A10C12	0140-0198	C:FXD MICA 200 PF 5%	
A10C13	0150-0121	C:FXD CER 0.1 UF +80-20% 50VDCW	
A10CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A10CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A10CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A10CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A10CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A10CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A10CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A10CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A10CR9	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR10	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR11	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR12	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR13	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR14	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10DS1		NSR PART OF READOUT BLOCK ASSY	
A10DS2		NSR PART OF READOUT BLOCK ASSY	
A10DS3		NSR PART OF READOUT BLOCK ASSY	
A10DS4		NSR PART OF READOUT BLOCK ASSY	
A10DS5		NOT ASSIGNED	
A10DS6	1970-0009	ELECTRON TUBE:INDICATOR 10 DIGIT	
A10L1	9140-0161	COIL:FXD 3600UH 5%	
A10Q1	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10Q2	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10Q3	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10Q4	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10Q5	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	

See introduction to this section for ordering information

Reference Designation	HP Part No.	Description #	Note
A10C6	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10Q7	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10Q8	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10R1	0696-4735	R:FXD COMP 47K OHM 5% 1/2W	
A10R2		NSR PART OF READOUT BLOCK ASSY	
A10R3		NOT ASSIGNED	
A10R4		NOT ASSIGNED	
A10R5		NOT ASSIGNED	
A10R6	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A10R7	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A10R8	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A10R9	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A10R10	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R11	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R12	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R13	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R14	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R15	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R16	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R17	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R18	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R19	0683-4335	R:FXD COMP 43K OHM 5% 1/4W	
A10R20	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R21	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R22	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R23	0683-1815	R:FXD COMP 180 OHM 5% 1/4W	
A10R24	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A10R25	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R26	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R27	0683-4335	R:FXD COMP 43K OHM 5% 1/4W	
A10R28	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R29	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R30	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R31	0683-4335	R:FXD COMP 43K OHM 5% 1/4W	
A10R32	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R33	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R34	0683-1815	R:FXD COMP 180 OHM 5% 1/4W	
A10R35	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A10R36	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R37	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R38	0683-4335	R:FXD COMP 43K OHM 5% 1/4W	
A10R39	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R40	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R41	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R42	0683-4335	R:FXD COMP 43K OHM 5% 1/4W	
A10R43	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R44	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	

See introduction to this section for ordering information

Reference Designation	HP Part No.	Description #	Note
A10R45	0683-1815	R:FXD COMP 180 OHM 5% 1/4W	
A10R46	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A10R47	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R48	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R49	0683-4335	R:FXD COMP 43K OHM 5% 1/4W	
A10R50	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R51	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R52	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R53	0683-4335	R:FXD COMP 43K OHM 5% 1/4W	
A10R54	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R55	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R56	0683-1815	R:FXD COMP 180 OHM 5% 1/4W	
A10R57	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A10R58	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R59	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R60	0683-4335	R:FXD COMP 43K OHM 5% 1/4W	
A10R61	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R62	0683-7525	R:FXD COMP 750G OHM 5% 1/4W	
A10R63	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A10R64	0683-4335	R:FXD COMP 43K OHM 5% 1/4W	
A10V1		NSR PART OF READOUT BLOCK ASSY	
A11		SAME AS A10, USE PREFIX A11	
A12		SAME AS A10, USE PREFIX A12	
A13		SAME AS A10, USE PREFIX A13	
A14		SAME AS A10, USE PREFIX A14	
A15	05232-6014	ASSY:DECIMAL COUNTER (5 MHZ)	
	05232-2011	BOARD:BLANK PC	
	05212-6014	READOUT BLOCK ASSY	
A15C1	0140-0145	C:FXD MICA 22 PF 5%	
A15C2	0140-0145	C:FXD MICA 22 PF 5%	
A15C3	0160-0196	C:FXD MICA 24PF 5% 300VDCW	
A15C4	0160-0196	C:FXD MICA 24PF 5% 300VDCW	
A15C5	0160-2306	C:FXD MICA 27 PF 5%	
A15C6	0160-2306	C:FXD MICA 27 PF 5%	
A15C7	0160-0169	C:FXD MICA 17 PF 5%	
A15C8	0160-2306	C:FXD MICA 27 PF 5%	
A15C9	0160-2561	C:FXD CER 2000 PF 20% 500VDCW	
A15C10	0160-0171	C:FXD MICA 33 PF 5% 300VDCW	
A15C11	0140-0145	C:FXD MICA 22 PF 5%	
A15C12	0160-2306	C:FXD MICA 27 PF 5%	
A15C13	0160-2561	C:FXD CER 2000 PF 20% 500VDCW	
A15C14	0140-0190	C:FXD MICA 39 PF 5%	
A15C15	0140-0190	C:FXD MICA 39 PF 5%	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A15C16	0140-0191	C:FXD MICA 56 PF 5%	
A15C17	0160-0179	C:FXD MICA 33 PF 5% 300VDCW	
A15CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR9	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR10	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR11	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR12	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR13	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR14	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR15	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR16	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR17	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR18	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR19	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR20	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR21	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR22	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR23	1901-0040	DIODE:SILICON 30MA 30WV	
A15DS1		NSR PART OF READOUT BLOCK ASSY	
A15DS2		NSR PART OF READOUT BLOCK ASSY	
A15DS3		NSR PART OF READOUT BLOCK ASSY	
A15DS4		NSR PART OF READOUT BLOCK ASSY	
A15DS5		NOT ASSIGNED	
A15DS6	1970-0009	ELECTRON TUBE:INDICATOR 10 DIGIT	
A15Q1	1853-0034	TRANSISTOR:SILICON PNP	
A15Q2	1853-0034	TRANSISTOR:SILICON PNP	
A15Q3	1853-0034	TRANSISTOR:SILICON PNP	
A15Q4	1853-0034	TRANSISTOR:SILICON PNP	
A15Q5	1853-0034	TRANSISTOR:SILICON PNP	
A15Q6	1853-0034	TRANSISTOR:SILICON PNP	
A15Q7	1853-0034	TRANSISTOR:SILICON PNP	
A15Q8	1853-0034	TRANSISTOR:SILICON PNP	
A15R1	0686-4735	R:FXD COMP 47K OHM 5% 1/2W	
A15R2		NSR PART OF READOUT BLOCK ASSY	
A15R3		NOT ASSIGNED	
A15R4		NOT ASSIGNED	
A15R5		NOT ASSIGNED	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A15R6	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A15R7	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A15R8	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A15R9	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A15R10	0761-0005	R:FXD MET OX 2200 OHM 5% 1W	
A15R11	0683-5645	R:FXD COMP 560K OHMS 5% 1/4W	
A15R12	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R13	0761-0010	R:FXD MET OX 1.8K OHM 5% 1W	
A15R14	0758-0004	R:FXD MET OX 2700 OHM 5% 1/2W	
A15R15	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R16	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R17	0758-0004	R:FXD MET OX 2700 OHM 5% 1/2W	
A15R18	0758-0045	R:FXD MET OX 3900 OHM 5% 1/2W	
A15R19	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R20	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R21	0758-0045	R:FXD MET OX 3900 OHM 5% 1/2W	
A15R22	0761-0005	R:FXD MET OX 2200 OHM 5% 1W	
A15R23	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R24	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R25	0761-0010	R:FXD MET OX 1.8K OHM 5% 1W	
A15R26	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R27	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R28	0683-2035	R:FXD COMP 20K OHM 5% 1/4W	
A15R29	0683-2035	R:FXD COMP 20K OHM 5% 1/4W	
A15R30	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A15R31	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A15R32	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R33	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R34	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A15R35	0683-3325	R:FXD COMP 3300 OHM 5% 1/4W	
A15R36	0683-2235	R:FXD COMP 22K OHM 5% 1/4W	
A15R37	0683-5625	R:FXD COMP 5600 OHM 5% 1/4W	
A15R38	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A15R39	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A15R40	0683-4705	R:FXD COMP 47 OHM 5% 1/4W	
A15R41	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A15R42	0683-2235	R:FXD COMP 22K OHM 5% 1/4W	
A15R43	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A15R44	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A15R45	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A15R46	0683-4705	R:FXD COMP 47 OHM 5% 1/4W	
A15R47	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A15R48	0683-2235	R:FXD COMP 22K OHM 5% 1/4W	
A15R49	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A15R50	0683-4715	R:FXD COMP 470 OHM 5% 1/4W	
A15R51	0683-2725	R:FXD COMP 2700 OHM 5% 1/4W	
A15R52	0683-2235	R:FXD COMP 22K OHM 5% 1/4W	
A15R53	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A15R54	0683-4705	R:FXD COMP 47 OHM 5% 1/4W	

See introduction to this section for ordering information

Reference Designation	& Part No.	Description #	Note
A15R55	0683-5625	RESISTOR:FXD COMP 5600 OHM 5% 1/4W	
A15R56	0683-3625	RESISTOR:FXD COMP 3600 OHM 5% 1/4W	
A15R57	0683-4715	RESISTOR:FXD COMP 470 OHM 5% 1/4W	
A15R58	0683-4715	RESISTOR:FXD COMP 470 OHM 5% 1/4W	
A15R59	0683-3625	RESISTOR:FXD COMP 3600 OHM 5% 1/4W	
A15R60	0683-1045	RESISTOR:FXD COMP 100K OHMS 5% 1/4W	
A15R61	0683-9115	RESISTOR:FXD COMP 910 OHM 5% 1/4W	
A15R62	0683-2735	RESISTOR:FXD COMP 27K OHM 5% 1/4W	
A15R63	0683-1535	RESISTOR:FXD COMP 15K OHM 5% 1/4W	
A15R64	0683-2735	RESISTOR:FXD COMP 27K OHM 5% 1/4W	
A15R65	0683-8225	RESISTOR:FXD COMP 8200 OHMS 5% 1/4W	
A15R66	0683-2715	RESISTOR:FXD COMP 270 OHM 5% 1/4W	
A15R67	0683-2735	RESISTOR:FXD COMP 27K OHM 5% 1/4W	
A15R68	0683-1045	RESISTOR:FXD COMP 100K OHMS 5% 1/4W	
A15V1		NSR PART OF READOUT BLOCK ASSY	
A16	05247-6001	BOARD ASSY:DECIMAL COUNTER	
	05247-2004	BOARD:BLANK	
	05212-6014	READOUT BLOCK ASSY	
A16C1	0160-2306	CAPACITOR:FXD MICA 27 PF 5%	
A16C2	0160-2930	CAPACITOR:FXD CER 0.01 UF +80-20% 100VDCW	
A16C3	0140-0194	CAPACITOR:FXD MICA 110 PF 5%	
A16CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR9	1902-0041	DIODE:BREAKDOWN 5.11V 5% 400MW	
A16DS1		NSR PART OF READOUT BLOCK ASSY	
A16DS2		NSR PART OF READOUT BLOCK ASSY	
A16DS3		NSR PART OF READOUT BLOCK ASSY	
A16DS4		NSR PART OF READOUT BLOCK ASSY	
A16DS5		NOT ASSIGNED	
A16DS6	1970-0009	ELECTRON TUBE:INDICATOR 10 DIGIT	
A16IC1	1820-0322	INTEGRATED CIRCUIT	
A16Q1	1854-0071	TRANSISTOR:SILICON NPN	
A16Q2	1854-0071	TRANSISTOR:SILICON NPN	
A16Q3	1854-0003	TRANSISTOR:NPN SILICON	
A16Q4	1854-0003	TRANSISTOR:NPN SILICON	
A16Q5	1854-0003	TRANSISTOR:NPN SILICON	

See introduction to this section for ordering information

Reference Designation	& Part No.	Description #	Note
A16Q6	1854-0003	TRANSISTOR:NPN SILICON	
A16Q7	1854-0071	TRANSISTOR:SILICON NPN	
A16Q8	1853-0036	TRANSISTOR:SILICON PNP	
A16Q9	1854-0003	TRANSISTOR:NPN SILICON	
A16Q10	1854-0003	TRANSISTOR:NPN SILICON	
A16Q11	1853-0036	TRANSISTOR:SILICON PNP	
A16Q12	1854-0003	TRANSISTOR:NPN SILICON	
A16Q13	1854-0003	TRANSISTOR:NPN SILICON	
A16R1	0686-4735	RESISTOR:FXD COMP 47K OHM 5% 1/2W	
A16R2		NSR PART OF READOUT BLOCK ASSY	
A16R3		NOT ASSIGNED	
A16R4		NOT ASSIGNED	
A16R5		NOT ASSIGNED	
A16R6	0683-3945	RESISTOR:FXD COMP 390K OHM 5% 1/4W	
A16R7	0683-3945	RESISTOR:FXD COMP 390K OHM 5% 1/4W	
A16R8	0683-3945	RESISTOR:FXD COMP 390K OHM 5% 1/4W	
A16R9	0683-3945	RESISTOR:FXD COMP 390K OHM 5% 1/4W	
A16R10	0683-1545	RESISTOR:FXD COMP 150K OHM 5% 1/4W	
A16R11	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A16R12	0757-0924	RESISTOR:FXD NET FLM 1.0K OHM 2% 1/4W	
A16R13	0683-2735	RESISTOR:FXD COMP 27K OHM 5% 1/4W	
A16R14	0757-0912	RESISTOR:FXD NET FLM 330 OHM 2% 1/4W	
A16R15	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A16R16	0758-0023	RESISTOR:FXD NET OX 240 OHM 5% 1/2W	
A16R17	0683-8225	RESISTOR:FXD COMP 8200 OHMS 5% 1/4W	
A16R18	0683-8225	RESISTOR:FXD COMP 8200 OHMS 5% 1/4W	
A16R19	0683-8225	RESISTOR:FXD COMP 8200 OHMS 5% 1/4W	
A16R20	0683-5635	RESISTOR:FXD COMP 56K OHMS 5% 1/4W	
A16R21	0683-1045	RESISTOR:FXD COMP 100K OHMS 5% 1/4W	
A16R22	0683-7525	RESISTOR:FXD COMP 7500 OHM 5% 1/4W	
A16R23	0683-5135	RESISTOR:FXD COMP 51K OHM 5% 1/4W	
A16R24	0683-7505	RESISTOR:FXD COMP 75 OHM 5% 1/4W	
A16R25	0683-1545	RESISTOR:FXD COMP 150K OHM 5% 1/4W	
A16R26	0683-5135	RESISTOR:FXD COMP 51K OHM 5% 1/4W	
A16R27	0683-7525	RESISTOR:FXD COMP 7500 OHM 5% 1/4W	
A16R28	0683-5635	RESISTOR:FXD COMP 56A OHMS 5% 1/4W	
A16R29	0683-5635	RESISTOR:FXD COMP 56K OHMS 5% 1/4W	
A16R30	0683-1045	RESISTOR:FXD COMP 100K OHMS 5% 1/4W	
A16R31	0683-7525	RESISTOR:FXD COMP 7500 OHM 5% 1/4W	
A16R32	0683-5135	RESISTOR:FXD COMP 51K OHM 5% 1/4W	
A16R33	0683-7505	RESISTOR:FXD COMP 75 OHM 5% 1/4W	
A16R34	0683-1545	RESISTOR:FXD COMP 150K OHM 5% 1/4W	
A16R35	0683-5135	RESISTOR:FXD COMP 51K OHM 5% 1/4W	
A16R36	0683-5125	RESISTOR:FXD COMP 5100 OHM 5% 1/4W	
A16R37	0683-1325	RESISTOR:FXD COMP 1300 OHM 5% 1/4W	
A16R38	0683-7525	RESISTOR:FXD COMP 7500 OHM 5% 1/4W	
A16R39	0683-3325	RESISTOR:FXD COMP 3300 OHM 5% 1/4W	

See introduction to this section for ordering information

Table 6-1. Reference Designation Index

Reference Designation	# Part No.	Description #	Note
A16R40	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A16R41	0683-8225	R:FXD COMP 8200 OHMS 5% 1/4W	
A16R42	0683-1325	R:FXD COMP 1300 OHM 5% 1/4W	
A16R43	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A16R44	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R45	0683-1315	R:FXD COMP 130 OHM 5% 1/4W	
A16R46	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R47	0683-1535	R:FXD COMP 15K OHM 5% 1/4W	
A16R48	0683-7505	R:FXD COMP 75 OHM 5% 1/4W	
A16R49	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A16R50	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A16R51	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R52	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A16R53	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R54	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A16R55	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A16R56	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A16R57	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A16R58	0683-7525	R:FXD COMP 750J OHM 5% 1/4W	
A16R59	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R60	0683-6805	R:FXD COMP 68 OHM 5% 1/4W	
A16R61	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A16R62	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R63	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R64	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A16V1		PSR PART OF READOUT BLOCK ASSY	
A17	05248-60021	BOARD ASSY: HIGH FREQUENCY DECIMAL COUNTER	
	05248-20021	BLANK BOARD	
A17C1	0150-0061	C:FXD 20 PF 100V	
A17C2	0160-3277	C:FXD .01 MF 20%	
A17C3	0160-3277	C:FXD .01 MF 20%	
A17C4	0160-3277	C:FXD .01 MF 20%	
A17C5	0160-3277	C:FXD .01 MF 20%	
A17CR1	1902-0528	DIODE BREAKDOWN 1N5524D 5.6V, 1%	
A17IC1	1820-0101	INTEGRATED CIRCUIT	
A17IC2	1820-0143	INTEGRATED CIRCUIT	
A17IC3	1820-0143	INTEGRATED CIRCUIT	
A17IC4	1820-0143	INTEGRATED CIRCUIT	
A17Q1	1853-0254	TRANSISTOR	
A17Q2	1854-0009	TRANSISTOR 2N709	
A17Q3	1853-0034	TRANSISTOR	
A17Q4	1853-0034	TRANSISTOR	
A17Q5	1853-0034	TRANSISTOR	
A17Q6	1853-0034	TRANSISTOR	
A17Q7	1853-0034	TRANSISTOR	
A17Q8	1854-0009	TRANSISTOR 2N709	
A17Q9	1853-0034	TRANSISTOR	
A17Q10	1853-0034	TRANSISTOR	
A17Q11	1853-0034	TRANSISTOR	
A17Q12	1853-0034	TRANSISTOR	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A17R1	0757-0924	R:FXD 1K 2% 1/4W	
A17R2	0757-0900	R:FXD 100 OHM 2% 1/8W	
A17R3	0757-0948	R:FXD 10K 2% 1/4W	
A17R4	0757-0940	R:FXD 4.7K 2% 1/4W	
A17R5	0757-0919	R:FXD 620 OHM 2% 1/8W	
A17R6	0757-0924	R:FXD 1K 2% 1/4W	
A17R7	0757-0924	R:FXD 1K 2% 1/4W	
A17R8	0757-0907	R:FXD 200 OHM 2% 1/8W	
A17R9	0757-0924	R:FXD 1K 2% 1/4W	
A17R10	0757-0924	R:FXD 1K 2% 1/4W	
A17R11	0757-0907	R:FXD 200 OHM 2% 1/8W	
A17R12	0757-0907	R:FXD 200 OHM 2% 1/8W	
A17R13	0757-0907	R:FXD 200 OHM 2% 1/8W	
A17R14	0757-0911	R:FXD 300 OHM 2% 1/8W	
A17R15	0757-0911	R:FXD 300 OHM 2% 1/8W	
A17R16	0757-0893	R:FXD 61 OHM 2% 1/4W	
A17R17	0757-0931	R:FXD 2K 2% 1/4W	
A17R18	0757-0907	R:FXD 200 OHM 2% 1/8W	
A17R19	0757-0907	R:FXD 200 OHM 2% 1/8W	
A17R20	0757-0924	R:FXD 1K 2% 1/4W	
A17R21	0757-0924	R:FXD 1K 2% 1/4W	
A17R22	0757-0907	R:FXD 200 OHM 2% 1/8W	
A17R23	0757-0907	R:FXD 200 OHM 2% 1/8W	
A17R24	0757-0907	R:FXD 200 OHM 2% 1/8W	
A17R25	0757-0924	R:FXD 1K 2% 1/4W	
A17R26	0757-0924	R:FXD 1K 2% 1/4W	
A17R27	0757-0907	R:FXD 200 OHM 2% 1/8W	
A17R28	0757-0907	R:FXD 200 OHM 2% 1/8W	
A17R29	0757-0919	R:FXD 620 OHM 2% 1/8W	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
A18	05247-6008	BOARD ASSY:READOUT	
	05247-2009	BOARD:BLANK PC	
	05212-6014	READOUT BLOCK ASSY	
A18CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A18DS1		NSR PART OF READOUT BLOCK ASSY	
A18DS2		NSR PART OF READOUT BLOCK ASSY	
A18DS3		NSR PART OF READOUT BLOCK ASSY	
A18DS4		NSR PART OF READOUT BLOCK ASSY	
A18DS5		NOT ASSIGNED	
A18DS6	1970-0009	ELECTRON TUBE:INDICATOR 10 DIGIT	
A18Q1	1854-0003	TRANSISTOR:NPN SILICON	
A18Q2	1854-0003	TRANSISTOR:NPN SILICON	
A18Q3	1854-0003	TRANSISTOR:NPN SILICON	
A18Q4	1854-0003	TRANSISTOR:NPN SILICON	
A18Q5	1854-0003	TRANSISTOR:NPN SILICON	
A18Q6	1854-0003	TRANSISTOR:NPN SILICON	
A18Q7	1854-0003	TRANSISTOR:NPN SILICON	
A18Q8	1854-0003	TRANSISTOR:NPN SILICON	
A18R1	0686-4735	R:FXD COMP 47K OHM 5% 1/2W	
A18R2		NSR PART OF READOUT BLOCK ASSY	
A18R3		NOT ASSIGNED	
A18R4		NOT ASSIGNED	
A18R5		NOT ASSIGNED	
A18R6	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A18R7	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A18R8	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A18R9	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A18R10	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A18R11	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A18R12	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R13	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A18R14	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A18R15	0683-9105	R:FXD COMP 91 OHM 5% 1/4W	
A18R16	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R17	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A18R18	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A18R19	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A18R20	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A18R21	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R22	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A18R23	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A18R24	0683-9105	R:FXD COMP 91 OHM 5% 1/4W	
A18R25	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R26	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A18R27	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A18R28	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A18R29	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A18R30	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R31	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A18R32	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A18R33	0683-9105	R:FXD COMP 91 OHM 5% 1/4W	
A18R34	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R35	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A18R36	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A18R37	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A18R38	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A18R39	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R40	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A18R41	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A18R42	0683-6805	R:FXD COMP 68 OHM 5% 1/4W	
A18R43	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R44	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A18R45	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A18V1		NSR PART OF READOUT BLOCK	
A19	05428-60022	BOARD ASSY:AMPLIFIER	
	05248-20022	BLANK BOARD	
A19C1	0150-0093	C:FXD .01 MF 100V	
A19C2	0160-0127	C:FXD 1 MF 25V	
A19C3	0150-0116	C:FXD 47 PF 500V	
A19C4	0160-2013	C:FXD 39 PF 300V	
A19C5	0160-2030	C:FXD .01 MF 100V	
A19C6	0160-2030	C:FXD .01 MF 100V	
A19C7	0160-3277	C:FXD .01 MF 20%	
A19C8	0160-3277	C:FXD .01 MF 20%	
A19C9	0160-2030	C:FXD .01 MF 100V	
A19C10	0140-0214	C:FXD 60 PF 300V	
A19C11	0160-3277	C:FXD .01 MF 20%	
A19CR1	1901-0376	DIODE SIL 35V	
A19CR2	1901-0040	DIODE SIL 30WV	
A19CR3	1901-0040	DIODE SIL 30WV	
A19CR4	1901-0376	DIODE SIL 35V	
A19CR5	1901-0040	DIODE SIL 30WV	
A19CR6	1901-0040	DIODE SIL 30WV	
A19CR7	1901-0040	DIODE SIL 30WV	
A19CR8	1902-0580	DIODE BREAKDOWN 4.75V	
A19Q1A	1855-0334	TSTR FET DUAL	
A19Q1B	1855-0334	TSTR FET DUAL	
A19Q2A	1853-0208	TRANSISTOR PNP	
A19Q2B	1853-0208	TRANSISTOR PNP	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
A19Q3	1853-0015	TRANSISTOR 2N3640	
A19Q4	1854-0345	TRANSISTOR 2N5179	
A19Q5	1854-0345	TRANSISTOR 2N5179	
A19R1	0757-0948	R:FXD 10K 2% 1/4W	
A19R2	0757-0950	R:FXD 12K 2% 1/4W	
A19R3	0757-0898	R:FXD 82 OHM 2% .25W	
A19R4	0757-0948	R:FXD 10K 2% 1/4W	
A19R5	0757-0929	R:FXD 1.6K 2% 1/4W	
A19R6	0757-0950	R:FXD 12K 2% 1/4W	
A19R7	0698-3113	R:FXD 100 OHM 5% .1W	
A19R8	0757-0943	R:FXD 6.2K 2% 1/4W	
A19R9	0698-5172	R:FXD 13 OHM 5%	
A19R10	0698-5562	R:FXD 120 OHM 5%	
A19R11	0757-0909	R:FXD 240 OHM 2% .2W	
A19R12	2100-2061	R:VAR 200 OHM 30%	
A19R13	0698-3113	R:FXD 100 OHM 5% .1W	
A19R14	0698-6241	R:FXD 750 OHM 5%	
A19R15	0698-5562	R:FXD 120 OHM 5%	
A19R16	0757-0945	R:FXD 7.5K 2% 1/4W	
A19R17	0757-0938	R:FXD 3.9K 2% 1/4W	
A19R18	0698-5172	R:FXD 13 OHM 5%	
A19R19	0757-0943	R:FXD 6.2K 2% 1/4W	
A19R20	0757-0920	R:FXD 680 OHM 2% .2W	
A19R21	0698-4130	R:FXD 39 OHM 5%	
A19R22	2100-1754	R:VAR 50 OHM 10%	
A19R23	0757-0927	R:FXD 1.3K 2% 1/4W	
A19R24	0698-3113	R:FXD 100 OHM 5% .1W	
A19R25	0698-3378	R:FXD 51 OHM 5%	
A19R26	0757-0927	R:FXD 1.3K 2% 1/4W	
A19R27	0698-4130	R:FXD 39 OHM 5%	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
A20	05245-6014	ASSY:INPUT AMPLIFIER BOARD	
	05245-2014	BOARD:BLANK PC	
A20C1	0160-0127	C:FXD CER 1.0 UF 20% 25VDCW	
A20C2	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A20C3	0150-0042	C:FXD EI 4.7 PF 5% 500VDCW	
A20C4	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A20C5	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A20C6	0150-0073	C:FXD CER 100 PF 10% 500VDCW	
A20C7	0160-0127	C:FXD CER 1.0 UF 20% 25VDCW	
A20C8	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A20C9	0150-0063	C:FXD CER 20 PF 10% 100VDCW	
A20C10	0160-2935	C:FXD CER 0.01 UF +80-20% 100VDCW	
A20CR1	1901-0376	DIODE:SILICON 35V	
A20CR2	1901-0040	DIODE:SILICON 30MA 30WV	
A20CR3	1901-0376	DIODE:SILICON 35V	
A20CR4	1901-0040	DIODE:SILICON 30MA 30WV	
A20CR5	1902-0540	DIODE BREAKDOWN:4.75V 2%	
A20CR6	1901-0040	DIODE:SILICON 30MA 30WV	
A20CR7	1901-0040	DIODE:SILICON 30MA 30WV	
A20Q1	1855-0047	TRANSISTOR:DUAL N-CHANNEL FET	
A20Q2	1854-0249	TRANSISTOR:DUAL NPN SILICON	
A20Q3	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A20Q4	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A20Q5	1854-0009	TRANSISTOR:SILICON NPN 2N709	
A20Q6	1854-0009	TRANSISTOR:SILICON NPN 2N709	
A20R1	0757-0898	R:FXD MET FLM 82 OHM 2% 1/4W	
A20R2	0683-1625	R:FXD COMP 1600 OHM 5% 1/4W	
A20R3	0757-0948	R:FXD MET FLM 10K OHM 2% 1/4W	
A20R4	0757-0950	R:FXD MET FLM 12K OHM 2% 1/4W	
A20R5	0757-0940	R:FXD MET FLM 4.7K OHM 2% 1/4W	
A20R6	0757-0952	R:FXD MET FLM 15K OHM 2% 1/4W	
A20R7	0757-0909	R:FXD MET FLM 240 OHM 2% 1/4W	
A20R8	0757-0932	R:FXD MET FLM 2.2K OHM 2% 1/4W	
A20R9	0757-0936	R:FXD MET FLM 3.3K OHM 2% 1/4W	
A20R10	0757-0916	R:FXD MET FLM 470 OHM 2% 1/4W	
A20R11	0757-0900	R:FXD MET FLM 100 OHM 2% 1/4W	
A20R12	0757-0904	R:FXD MET FLM 150 OHM 2% 1/4W	
A20R13	0757-0936	R:FXD MET FLM 3.3K OHM 2% 1/4W	
A20R14	0757-0916	R:FXD MET FLM 470 OHM 2% 1/4W	
A20R15	0757-0909	R:FXD MET FLM 240 OHM 2% 1/4W	
A20R16	0757-0932	R:FXD MET FLM 2.2K OHM 2% 1/4W	
A20R17	0757-0920	R:FXD MET FLM 680 OHM 2% 1/4W	
A20R18	0757-0952	R:FXD MET FLM 15K OHM 2% 1/4W	
A20R19	0757-0972	R:FXD MET FLM 100K OHM 2% 1/4W	
A20R20	2100-1513	R:VAR WW 50 OHM 5% LIN 1W	
A20R21	0757-0930	R:FXD MET FLM 1800 OHM 2% 1/4W	
A20R22	0757-0914	R:FXD MET FLM 390 OHM 2% 1/4W	
A20R23	0757-0902	R:FXD MET FLM 120 OHM 2% 1/4W	
A20R24	0757-0930	R:FXD MET FLM 1800 OHM 2% 1/4W	
A20R25	0757-0948	R:FXD MET FLM 10K OHM 2% 1/4W	
A20R26	0757-0950	R:FXD MET FLM 12K OHM 2% 1/4W	
	0340-0060	FEEDTHRU:INSULATED MOUNTING	
	0380-0111	SPACER: THREADED 1/4 in.	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
A21	05248-60023	BOARD ASSY: FUNCTION CONTROL	
	05248-20023	BLANK BOARD	
A21C1	0160-0127	C:FXD 1 UF 25V	
A21C2	0160-3277	C:FXD .01 UF 20%	
A21C3	0160-2930	C:FXD .01 UF 100V	
A21C4	0160-0127	C:FXD 1 UF 25V	
A21C5	0160-0127	C:FXD 1 UF 25V	
A21C6	0160-2930	C:FXD .01 UF 100V	
A21C7	0160-0093	C:FXD .01 UF 100V	
A21C8	0160-2327	C:FXD 1000 PF 75V	
A21C9	0160-2327	C:FXD 1000 PF 75V	
A21C10	0160-2327	C:FXD 1000 PF 75V	
A21C11	0180-0210	C:FXD 3.3 UF 15V	
A21C12	0140-0203	C:FXD 30 PF 500V	
A21C13	0160-2327	C:FXD 1000 PF 75V	
A21C14	0160-2327	C:FXD 1000 PF 75V	
A21C15	0160-2327	C:FXD 1000 PF 75V	
A21C16	0160-3277	C:FXD .01 UF 20%	
A21C17	0140-0149	C:FXD 470 PF 300V	
A21C18	0140-0149	C:FXD 470 PF 300V	
A21C19	0160-2327	C:FXD 1000 PF 75V	
A21C20	0160-2327	C:FXD 1000 PF 75V	
A21C21	0140-0149	C:FXD 470 PF 300V	
A21C22	0140-0149	C:FXD 470 PF 300V	
A21C23	0160-0178	C:FXD 27 PF 300V	
A21C24	0160-2327	C:FXD 1000 PF 75V	
A21C25	0160-2930	C:FXD .01 UF 100V	
A21CR1	1901-0040	DIODE SIL 30WV	
A21CR2	1901-0040	DIODE SIL 30WV	
A21CR3	1901-0040	DIODE SIL 30WV	
A21CR4	1901-0040	DIODE SIL 30WV	
A21CR5	1901-0040	DIODE SIL 30WV	
A21CR6	1901-0040	DIODE SIL 30WV	
A21CR7	1901-0040	DIODE SIL 30WV	
A21CR8	1901-0040	DIODE SIL 30WV	
A21CR9	1901-0040	DIODE SIL 30WV	
A21CR10	1901-0040	DIODE SIL 30WV	
A21CR11	1901-0040	DIODE SIL 30WV	
A21CR12	1901-0040	DIODE SIL 30WV	
A21CR13	1902-0580	DIODE BREAKDOWN 4.75V	
A21CR14	1902-0173	DIODE BREAKDOWN 9.53V	
A21CR15	05378-60014	DIODE AY	
A21CR16	1910-0016	DIODE GERM 60WIV	
A21CR17	1910-0016	DIODE GERM 60WIV	
A21CR18	05378-60014	DIODE AY	
A21CR19		NOT ASSIGNED	
A21CR20	1902-0041	DIODE BREAKDOWN 5.11V	
A21L1	9100-2247	COIL CHOKE .1 UH	
A21L2	9100-2247	COIL CHOKE .1 UH	
A21L3	9100-2247	COIL CHOKE .1 UH	
A21L4	9140-0146	COIL F. RF 10 MH	
A21L5	9140-0146	COIL F. RF 10 MH	
A21L6	9100-2250	COIL .18 UH 10%	
A21Q1	1854-0005	TRANSISTOR 2N3640	
A21Q2	1854-0005	TRANSISTOR 2N3640	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
A21Q3	1854-0073	TRANSISTOR	
A21Q4	1854-0048	TRANSISTOR 2N2857	
A21Q5	1854-0005	TRANSISTOR 2N3640	
A21Q6	1854-0005	TRANSISTOR 2N3640	
A21Q7	1854-0005	TRANSISTOR 2N3640	
A21Q8	1854-0005	TRANSISTOR 2N3640	
A21Q9	1854-0005	TRANSISTOR 2N3640	
A21Q10	1854-0005	TRANSISTOR 2N3640	
A21Q11	1853-0015	TRANSISTOR 2N3640	
A21Q12	1853-0015	TRANSISTOR 2N3640	
A21Q13	1853-0015	TRANSISTOR 2N3640	
A21Q14	1853-0015	TRANSISTOR 2N3640	
A21Q15	1854-0345	TRANSISTOR 2N2179	
A21Q16	1854-0005	TRANSISTOR 2N3640	
A21Q17	1854-0345	TRANSISTOR 2N2179	
A21R1	0683-5615	R:FXD 560 OHM 1/4W	
A21R2	0698-8562	R:FXD 120 OHM 5% 1/8W	
A21R3	0683-1315	R:FXD 130 OHM 1/4W	
A21R4	0683-1315	R:FXD 130 OHM 1/4W	
A21R5	0683-5125	R:FXD 5.1K 5% 1/4W	
A21R6	0683-4325	R:FXD 4.3K 5% 1/4W	
A21R7	0683-5125	R:FXD 5.1K 5% 1/4W	
A21R8	0683-5125	R:FXD 5.1K 5% 1/4W	
A21R9	0683-5125	R:FXD 5.1K 5% 1/4W	
A21R10	0683-5125	R:FXD 5.1K 5% 1/4W	
A21R11	0683-1035	R:FXD 10K 5% 1/4W	
A21R12	0683-5135	R:FXD 51K 5% 1/4W	
A21R13	0683-1035	R:FXD 10K 5% 1/4W	
A21R14	0683-1035	R:FXD 10K 5% 1/4W	
A21R15	0683-1035	R:FXD 10K 5% 1/4W	
A21R16	0683-1035	R:FXD 10K 5% 1/4W	
A21R17	0683-6815	R:FXD 680 OHM 1/4W	
A21R18	0683-6815	R:FXD 680 OHM 1/4W	
A21R19	0683-1525	R:FXD 5K 5% 1/4W	
A21R20	0683-8215	R:FXD 820 OHM 1/4W	
A21R21	0683-3625	R:FXD 3.6K 5% 1/4W FACTORY SELECTED VALUE	
A21R22	0683-7505	R:FXD 75 OHM 1/4W	
A21R23	0683-3315	R:FXD 330 OHM 1/4W	
A21R24	0683-4705	R:FXD 47 OHM 1/4W	
A21R25	0698-3381	R:FXD 150 OHM 5% FACTORY SELECTED VALUE	
A21R26	0698-6241	R:FXD 750 OHM 5% 1/8W	
A21R27	0683-1315	R:FXD 130 OHM 1/4W	
A21R28	0683-1225	R:FXD 1.2K 5% 1/4W	
A21R29	0683-1815	R:FXD 180 OHM 1/4W	
A21R30	0683-3915	R:FXD 390 OHM 1/4W	
A21R31	0683-4715	R:FXD 470 OHM 1/4W	
A21R32	0683-6815	R:FXD 680 OHM 1/4W	
A21R33	0683-3625	R:FXD 3.6K 5% 1/4W FACTORY SELECTED VALUE	
A21R34	2100-1772	R:VAR 500 OHM 10%	
A21R35	0683-4315	R:FXD 430 OHM 1/4W	
A21R36	0683-4715	R:FXD 470 OHM 1/4W	
A21R37	0683-6815	R:FXD 680 OHM 1/4W	
A21R38	0683-4715	R:FXD 470 OHM 1/4W	
A21R39	0698-3113	R:FXD 100 OHM 5% 1/8W	
A21R40	0683-4725	R:FXD 4.7K 5% 1/4W	

See introduction to this section for ordering information

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

Reference Designation	& Part No.	Description #	Note
A21R41	0683-4725	R:FXD 4.7K 5% 1/4W	
A21R42	0683-4725	R:FXD 4.7K 5% 1/4W	
A21R43	0683-4725	R:FXD 4.7K 5% 1/4W	
A21R44	0683-3905	R:FXD 39 OHM 1/4W	
A21R45	0683-1025	R:FXD 1K 1/4W FACTORY SELECTED VALUE	
A21R46	0683-4735	R:FXD 47K 1/4W	
A21R47	0683-4735	R:FXD 47K 1/4W	
A21R48	0683-2015	R:FXD 200 OHM 1/4W	
A21R49	0683-4315	R:FXD 430 OHM 1/4W	
A21R50	0698-3111	R:FXD 30 OHM 5% .12W	
A21R51	0683-1625	R:FXD 1.6K 5% 1/4W	
A21R52	0683-2015	R:FXD 200 OHM 1/4W	
A21R53	0683-1025	R:FXD 1K 1/4W	
A21R54	0757-0904	R:FXD 150 OHM 2% .2W	
A21R55	0683-1325	R:FXD 1.3K 5% 1/4W	
A21R56	0757-0900	R:FXD 100 OHM 2% .2W	
A21R57	0683-3915	R:FXD 390 OHM 1/4W	
A21R58	0683-8215	R:FXD 820 OHM 1/4W	
A21R59	0683-7505	R:FXD 75 OHM 1/4W	
A21R60	0698-0241	R:FXD 750 OHM 5% 1/8W	
A21R61	0757-0921	R:FXD 750 OHM 2% .2W	
A21R62	2100-1754	R:VAR 50 OHM 10%	

See introduction to this section for ordering information

Reference Designation	& Part No.	Description #	Note
A22	05248-60013	BOARD ASSY:GATE CONT	
	05248-20013	BOARD:BLANK PC	
A22C1	0160-2199	C:FXD MICA 30 PF 5%	
A22C2	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A22C3	0150-0050	C:FXD CER 1000 PF 600VDCW	
A22C4	0150-0050	C:FXD CER 1000 PF 600VDCW	
A22C5	0140-0149	C:FXD MICA 470 PF 5%	
A22C6	0180-0117	C:FXD ELECT TA 2.7UF 10% 35VDCW	
A22C7	0140-0194	C:FXD MICA 110 PF 5%	
A22C8	0140-0200	C:FXD MICA 390 PF 5%	
A22C9	0160-0180	C:FXD MY 3300PF 5%	
A22C10	0160-2229	C:FXD MICA 5000 PF 5%	
A22CR1	1902-0041	DIODE:ZENER:BREAKDOWN 5.11V 5% 400MW	
A22CR2	1901-0040	DIODE:SILICON 30MA 30WV	
A22CR3	1901-0040	DIODE:SILICON 30MA 30WV	
A22CR4	1901-0040	DIODE:SILICON 30MA 30WV	
A22CR5	1901-0040	DIODE:SILICON 30MA 30WV	
A22CR6	1901-0040	DIODE:SILICON 30MA 30WV	
A22CR7	1901-0040	DIODE:SILICON 30MA 30WV	
A22CR8	1901-0040	DIODE:SILICON 30MA 30WV	
A22CR9	1901-0040	DIODE:SILICON 30MA 30WV	
A22IC1	1820-0054	INTEGRATED CIRCUIT	
A22IC2	1820-0077	INTEGRATED CIRCUIT	
A22Q1	1854-0009	TRANSISTOR:SILICON NPN 2N709	
A22Q2	1854-0009	TRANSISTOR:SILICON NPN 2N709	
A22Q3	1854-0009	TRANSISTOR:SILICON NPN 2N709	
A22Q4	1853-0009	TRANSISTOR:SILICON PNP	
A22Q5	1854-0009	TRANSISTOR:SILICON NPN 2N709	
A22Q6	1853-0009	TRANSISTOR:SILICON PNP	
A22Q7	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A22Q8	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A22Q9	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A22Q10	1854-0094	TRANSISTOR:SILICON NPN	
A22Q11	1854-0094	TRANSISTOR:SILICON NPN	
A22Q12	1854-0009	TRANSISTOR:SILICON NPN 2N709	
A22Q13	1854-0009	TRANSISTOR:SILICON NPN 2N709	
A22Q14	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A22Q15	1854-0005	TRANSISTOR:SILICON NPN 2N708	

See introduction to this section for ordering information

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

Reference Designation	HP Part No.	Description #	Note
A22Q16	1854-0022	TRANSISTOR:NPN SILICON	
A22R1	0683-4725	RESD COMP 4700 OHM 5% 1/4W	
A22R2	0683-7535	RESD COMP 75K OHM 5% 1/4W	
A22R3	0683-3325	RESD COMP 3300 OHM 5% 1/4W	
A22R4	0683-2715	RESD COMP 270 OHM 5% 1/4W	
A22R5	0683-5625	RESD COMP 5600 OHM 5% 1/4W	
A22R6	0683-3025	RESD COMP 3000 OHM 5% 1/4W	
A22R7	0683-4725	RESD COMP 4700 OHM 5% 1/4W	
A22R8	0683-3325	RESD COMP 3300 OHM 5% 1/4W	
A22R9	0683-4725	RESD COMP 4700 OHM 5% 1/4W	
A22R10	0683-3325	RESD COMP 3300 OHM 5% 1/4W	
A22R11	0683-1235	RESD COMP 12K OHM 5% 1/4W	
A22R12	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R13	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R14	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R15	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R16	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R17	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R18	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R19	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R20	0683-1545	RESD COMP 150K OHM 5% 1/4W	
A22R21	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R22	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R23	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R24	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R25	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R26	0683-9115	RESD COMP 910 OHM 5% 1/4W	
A22R27	0683-2015	RESD COMP 200 OHM 5% 1/4W	
A22R28	0683-1025	RESD COMP 1000 OHM 5% 1/4W	
A22R29	0683-1325	RESD COMP 1300 OHM 5% 1/4W	
A22R30	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R31	0683-4735	RESD COMP 47K OHM 5% 1/4W	
A22R32	0683-5125	RESD COMP 5100 OHM 5% 1/4W	
A22R33	0683-5125	RESD COMP 5100 OHM 5% 1/4W	
A22R34	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A22R35	0683-1325	RESD COMP 1300 OHM 5% 1/4W	
A22R36	0683-1325	RESD COMP 1300 OHM 5% 1/4W	
A22R37	0683-1525	RESD COMP 1500 OHM 5% 1/4W	
A22R38	0683-2035	RESD COMP 20K OHM 5% 1/4W	
A22R39	0683-1545	RESD COMP 150K OHM 5% 1/4W	
A22R40	0683-1225	RESD COMP 1200 OHM 5% 1/4W	
A22R41	0683-1825	RESD COMP 1800 OHM 5% 1/4W	
A22R42	0683-2425	RESD COMP 2400 OHM 5% 1/4W	
A22R43	0683-2735	RESD COMP 27K OHM 5% 1/4W	
A22R44	0683-1625	RESD COMP 1600 OHM 5% 1/4W	
A22R45	0683-4725	RESD COMP 4700 OHM 5% 1/4W	

See Introduction to this section for ordering information

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

Reference Designation	HP Part No.	Description #	Note
A23	05247-6010	ASSY:SAMPLING CONTROL BOARD	
	05247-7010	BOARD:BLANK	
A23C1	0140-0159	CAPD MICA 1000 UUF 2%	
A23C2	0160-2930	CAPD CER 0.01 UF +80-20% 100VDCM	
A23C3	0140-0156	CAPD MICA 1500 PF 2%	
A23C4	0180-0393	CAPD ELECT [illegible] 10VDCM	
A23C5	0180-0022	CAPD ELECT TA [illegible] 10VDCM	
A23C6	0140-0149	CAPD MICA [illegible]	
A23C7	0140-0162	CAPD MICA 4700 PF 10%	
A23C8	0180-0100	CAPD ELECT TA 4.7UF 10% 35VDCM	
A23C9	0160-0161	CAPD MY 0.01 UF 10% 200VDCM	
A23C10		NOT ASSIGNED	
A23C11	0140-0200	CAPD MICA 390 PF 5%	
A23C12	0150-0121	CAPD CER 0.1 UF +80-20% 50VDCM	
A23C13	0150-0121	CAPD CER 0.1 UF +80-20% 50VDCM	
A23CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A23CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A23CR3	1901-0040	DIODE:SILICON 30MA 30WV	
A23CR4	1910-0018	DIODE:GER 60WV	
A23CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A23CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A23CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A23CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A23CR9	1901-0040	DIODE:SILICON 30MA 30WV	
A23CR10	1902-3059	DIODE BREAKDOWN:SILICON 5.63V 5%	
A23Q1	1851-0017	TRANSISTOR:2N1304	
A23Q2	1850-0040	TRANSISTOR:GERMANIUM PNP	
A23Q3	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A23Q4	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A23Q5	1853-0001	TRANSISTOR:PNP SILICON 30V 900MW	
A23Q6	1850-0101	TRANSISTOR:SPL2N582	
A23Q7	1850-0040	TRANSISTOR:GERMANIUM PNP	
A23Q8	1851-0024	TRANSISTOR:GERMANIUM NPN	
A23Q9	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A23Q10	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A23Q11	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A23Q12	1851-0017	TRANSISTOR:2N1304	
A23R1	0686-3025	RESD COMP 3000 OHM 5% 1/2W	
A23R2	0686-1325	RESD COMP 1.3K OHM 5% 1/2W	
A23R3	0686-2725	RESD COMP 2700 OHM 5% 1/2W	
A23R4	0686-1025	RESD COMP 1000 OHM 5% 1/2W	
A23R5	0686-1035	RESD COMP 10K OHM 5% 1/2W	

See Introduction to this section for ordering information

Reference Designation	HP Part No.	Description #	Note
A23R6	0686-1035	RESD COMP 10K OHM 5% 1/2W	
A23R7	0686-2225	RESD COMP 2200 OHM 5% 1/2W	
A23R8	0686-2225	RESD COMP 2200 OHM 5% 1/2W	
A23R9	0686-4735	RESD COMP 47K OHM 5% 1/2W	
A23R10	0686-1035	RESD COMP 10K OHM 5% 1/2W	
A23R11	0686-4735	RESD COMP 47K OHM 5% 1/2W	
A23R12	0686-4735	RESD COMP 47K OHM 5% 1/2W	
A23R13	0686-7525	RESD COMP 7500 OHM 5% 1/2W	
A23R14	0686-3625	RESD COMP 3600 OHM 5% 1/2W	
A23R15		NOT ASSIGNED	
A23R16	0686-2035	RESD COMP 20K OHM 5% 1/2W	
A23R17	0686-9125	RESD COMP 9100 OHM 5% 1/2W	
A23R18	0758-0015	RESD MET OX 220 OHM 5% 1/2W	
A23R19	0686-1025	RESD COMP 1000 OHM 5% 1/2 W	
A23R20	0686-2225	RESD COMP 2200 OHM 5% 1/2W	
A23R21		NOT ASSIGNED	
A23R22	0686-1325	RESD COMP 1.3K OHM 5% 1/2W	
A23R23	0686-4735	RESD COMP 47K OHM 5% 1/2W	
A23R24	0686-2035	RESD COMP 20K OHM 5% 1/2W	
A23R25	0686-1035	RESD COMP 10K OHM 5% 1/2W	
A23R26	0686-1525	RESD COMP 1500 OHM 5% 1/2W	
A23R27	0758-0015	RESD MET OX 220 OHM 5% 1/2W	
A23R28	0686-1035	RESD COMP 10K OHM 5% 1/2W	
A23R29	0686-2725	RESD COMP 2200 OHM 5% 1/2W	
A23R30	0686-2225	RESD COMP 2200 OHM 5% 1/2W	
A23R31	0686-1225	RESD COMP 1200 OHM 5% 1/2W	
A23R32	0686-4725	RESD COMP 4700 OHM 5% 1/2W	
A23R33	0686-4725	RESD COMP 4700 OHM 5% 1/2W	
A23R34	0686-2735	RESD COMP 27K OHM 5% 1/2W	
A23R35	0686-4715	RESD COMP 470 OHM 5% 1/2W	
A23R36	0686-4715	RESD COMP 470 OHM 5% 1/2W	
A24	00105-6012	CRYSTAL OSC/OVEN ASSY PARTS IN THIS ASSY ARE NOT RECOMMENDED FOR FIELD REPLACEMENT TABLE 6-1A LISTS PARTS FOR 00105-6012 PREFIX ALL PARTS A24	
A24	5243A-69A	ASSY:CRYSTAL OVEN FOR 5248L ONLY	
	5243A-69A-1	BOARD:BLANK PC	
A24 C1	0130-0001	CAPVAR CER 7-45PF 500VDCW	
A24 C2	0160-0124	CAFXD POR 180PF 2% 500VDCW	
A24 C3	0140-0151	CAFXD MICA 820 PF 2%	
A24 C4	0140-0166	CAFXD MICA 17,000PF 2% 300VDCW	
A24 C5	0140-0159	CAFXD MICA 3000 PF 2%	
A24 C6	0170-0055	CAFXD MY 0.1UF 20% 200VDCW	

See introduction to this section for ordering information

Reference Designation	HP Part No.	Description #	Note
A24 C7	0170-0040	CAFXD MY .047 UF 10% 200VDCW	
A24 R1	0727-0081	RESD DEPC 600 OHM 1% 1/2W	
A24 R2	0727-0105	RESD DEPC 1200 OHM 1% 1/2W	
A24 R3	0727-0387	RESD DEPC 442 OHM 1% 1/2W	
A24 R4	2100-0354	RESVAR WW 1000 OHM 10% LIN 2W	
A24 Y1	5080-0031	CRYSTAL:QUARTZ 1.0MHZ	
A25	05245-6024	ASSY:OVEN POWER SUPPLY BOARD FOR 5248M ONLY	
	05245-2024	BOARD:BLANK PC	
A25C1	0160-0162	CAFXD MY 0.022 UF 10% 200VDCW	
A25C2	0180-0117	CAFXD ELECT TA 2.7UF 10% 35VDCW	
A25C3	0180-0117	CAFXD ELECT TA 2.7UF 10% 35VDCW	
A25C4	0180-0117	CAFXD ELECT TA 2.7UF 10% 35VDCW	
A25CR1	1901-0045	DIODE:SILICON 100PIV	
A25CR2	1901-0045	DIODE:SILICON 100PIV	
A25CR3	1901-0045	DIODE:SILICON 100PIV	
A25CR4	1901-0045	DIODE:SILICON 100PIV	
A25CR5A	1902-0247	DIODES:MATCHED PAIR 20V 1%	
A25CR5B		PART OF A25CR5A	
A25Q1	1853-0001	TRANSISTOR:PNP SILICON 30V 900MW	
A25Q2	1854-0020	TRANSISTOR:NPN SILICON	
A25Q3	1853-0001	TRANSISTOR:PNP SILICON 30V 900MW	
A25Q4	1854-0003	TRANSISTOR:NPN SILICON	
A25Q5	1854-0003	TRANSISTOR:NPN SILICON	
A25R1	0757-0972	RESD MET FLM 100K OHM 2% 1/4W	
A25R2	0757-0893	RESD MET FLM 51 OHM 2% 1/4W	
A25R3	0757-0924	RESD MET FLM 1.0K OHM 2% 1/4W	
A25R4	0687-3311	RESD COMP 330 OHM 10% 1/2W	
A25R5	0699-0002	RESD COMP 6.8 OHM 10% 1/2W	
A25R6	0757-0926	RESD MET FLM 1.2K OHM 2% 1/4W	
A25R7	0757-0938	RESD MET FLM 3.9K OHM 2% 1/4W	
A25R8	0757-0926	RESD MET FLM 1.2K OHM 2% 1/4W	
A25	5243A-65T	BOARD ASSY:OVEN CONTROL FOR 5248L ONLY	
	5243A-65T-1	BOARD:BLANK PC	
A25 C1	0180-0100	CAFXD ELECT TA 4.7UF 10% 35VDCW	
A25 C2	0180-0100	CAFXD ELECT TA 4.7UF 10% 35VDCW	
A25 C3	0180-0100	CAFXD ELECT TA 4.7UF 10% 35VDCW	
A25 C4	0180-0049	CAFXD AL ELECT 20UF 50VDCW	
A25 C5	0180-0100	CAFXD ELECT TA 4.7UF 10% 35VDCW	

See introduction to this section for ordering information

Reference Designation	HP Part No.	Description #	Note
A25 C6	0170-0024	C:FXD MY 0.022UF 20% 200VDCW	
A25 C7	0180-0100	C:FXD ELECT TA 4.7UF 10% 35VDCW	
A25 CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A25 CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A25 CR3	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A25 CR4	1901-0026	DIODE:SILICON 0.75A 200 PIV	
A25 CR5	1901-0026	DIODE:SILICON 0.75A 200 PIV	
A25 CR6	1901-0026	DIODE:SILICON 0.75A 200 PIV	
A25 CR7	1901-0026	DIODE:SILICON 0.75A 200 PIV	
A25 CR8	1901-0026	DIODE:SILICON 0.75A 200 PIV	
A25 Q1	1850-0054	TRANSISTOR:GERMANIUM PNP 2N652A	
A25 Q2	1853-0001	TRANSISTOR:PNP SILICON 30V 900MW	
A25 Q3	1850-0054	TRANSISTOR:GERMANIUM PNP 2N652A	
A25 Q4	1853-0012	TRANSISTOR:GERMANIUM PNP	
A25 R1	0683-4325	R:FXD COMP 4300 OHM 5% 1/4W	
A25 R2	0683-4325	R:FXD COMP 4300 OHM 5% 1/4W	
A25 R3	0683-8215	R:FXD COMP 820 OHM 5% 1/4W	
A25 R4	0683-1235	R:FXD COMP 12K OHM 5% 1/4W	
A25 R5	0683-1835	R:FXD COMP 18K OHM 5% 1/4W	
A25 R6	0689-0565	R:FXD COMP 5.6 OHM 5% 1W	
A25 R7	0767-0001	R:FXD MET FLM 400 OHM 5% 3W	
A25 R8	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A25 R9	0683-2205	R:FXD COMP 22 OHM 5% 1/4W	
A25 R10	0683-1515	R:FXD COMP 150 OHM 5% 1/4W	
A26	05248-60019	ASSY:MULTIPLIER/DIVIDER BOARD FOR 5248M ONLY	
	05248-20019	BOARD:BLANK PC	
A26C1	0150-0122	C:FXD CER 2000 PF 20% 500VDCW	
A26C2	0180-1745	C:FXD ELECT 1.5 UF 10% 20VDCW	
A26C3	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A26C4	0180-0291	C:FXD ELECT 1UF 10% 35VDCW	
A26C5	0160-0161	C:FXD MY 0.01 UF 10% 200VDCW	
A26C6	0150-0122	C:FXD CER 2000 PF 20% 500VDCW	
A26C7		NOT ASSIGNED	
A26C8	0140-0220	C:FXD MICA 200 PF 1% 300VDCW	
A26C9	0130-0015	C:VAR CER 9-50 PF	
A26C10	0160-0369	C:FXD MICA 17 PF 5%	
A26C11	0150-0050	C:FXD CER 1000 PF 600VDCW	
A26C12	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A26C13	0140-0220	C:FXD MICA 200 PF 1% 300VDCW	
A26C14	0130-0015	C:VAR CER 9-50 PF	
A26C15	0160-0369	C:FXD MICA 17 PF 5%	
A26C16	0160-0361	C:FXD MICA 640 PF 1% 300VDCW	
A26C17	0140-0227	C:FXD MICA 340 PF 1% 300VDCW	
A26C18	0130-0015	C:VAR CER 9-50 PF	
A26C19	0150-0050	C:FXD CER 1000 PF 600VDCW	
A26C20	0180-1745	C:FXD ELECT 1.5 UF 10% 20VDCW	
A26C21	0150-0122	C:FXD CER 2000 PF 20% 500VDCW	
A26C22	0160-2199	C:FXD MICA 30 PF 5%	
A26C23	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A26C24	0160-0134	C:FXD MICA 220PF 5% 300VDCW	
A26C25	0150-0122	C:FXD CER 2000 PF 20% 500VDCW	
A26C26	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A26CR1	1901-0040	DIODE:SILICON 30MA 30WV	
A26CR2	1901-0040	DIODE:SILICON 30MA 30WV	
A26CR3	1901-0040	DIODE:SILICON 30MA 30WV	
A26CR4	1901-0040	DIODE:SILICON 30MA 30WV	
A26CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A26CR6	1901-0040	DIODE:SILICON 30MA 30WV	
A26CR7	1902-3182	DIODE BREAKDOWN:SILICON 12.1V 5%	
A26IC1	1820-0082	CIRCUIT:HP 5064-0002	
A26L1	9140-0138	COIL/CHOKE 180 UH 5%	
A26L2	9100-0348	COIL:FXD 1.0 UH 1%	
A26L3	9100-0348	COIL:FXD 1.0 UH 1%	
A26L4	9100-0348	COIL:FXD 1.0 UH 1%	
A26L5	9140-0158	COIL:FXD RF 1 UH 10%	
A26Q1	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A26Q2	1853-0036	TRANSISTOR:SILICON PNP	
A26Q3	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A26Q4	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A26Q5	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A26Q6	1853-0036	TRANSISTOR:SILICON PNP	
A26Q7	1853-0036	TRANSISTOR:SILICON PNP	
A26Q8	1853-0036	TRANSISTOR:SILICON PNP	
A26Q9	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A26Q10	1853-0036	TRANSISTOR:SILICON PNP	
A26Q11	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A26Q12	1853-0036	TRANSISTOR:SILICON PNP	
A26Q13	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A26Q14	1853-0036	TRANSISTOR:SILICON PNP	
A26R1	0683-1535	R:FXD COMP 15K OHM 5% 1/4W	
A26R2	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A26R3	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A26R4	0683-1235	R:FXD COMP 12K OHM 5% 1/4W	
A26R5	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	

See introduction to this section for ordering information

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

Reference Designation	& Part No.	Description #	Note
A26R6	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A26R7	0683-1125	R:FXD COMP 1100 OHM 5% 1/4W	
A26R8	0683-3375	R:FXD COMP 3.3K OHM 5% 1/4W	
A26R9	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A26R10	0683-5625	R:FXD COMP 5600 OHM 5% 1/4W	
A26R11	0757-0894	R:FXD MET FLM 56 OHM 2% 1/4W	
A26R12	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A26R13	0683-5115	R:FXD COMP 510 OHM 5% 1/4W	
A26R14	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A26R15	0683-2725	R:FXD COMP 2700 OHM 5% 1/4W	
A26R16	0683-6225	R:FXD COMP 6200 OHM 5% 1/4W	
A26R17	0683-5115	R:FXD COMP 510 OHM 5% 1/4W	
A26R18	0757-0922	R:FXD MET FLM 820 OHM 2% 1/4W	
A26R19	0683-6815	R:FXD COMP 680 OHM 5% 1/4W	
A26R20	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A26R21	0757-0920	R:FXD MET FLM 680 OHM 2% 1/4W	
A26R22	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A26R23	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A26R24	0683-9125	R:FXD COMP 9100 OHM 5% 1/4W	
A26R25	0683-1525	R:FXD COMP 1500 OHM 5% 1/4W	
A26R26	0683-3315	R:FXD COMP 330 OHM 5% 1/4W	
A26R27	0683-6825	R:FXD COMP 6800 OHM 5% 1/4W	
A26R28	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A26R29	0683-4325	R:FXD COMP 4300 OHM 5% 1/4W	
A26R30	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A26R31	0683-7515	R:FXD COMP 750 OHM 5% 1/4W	
A26R32	0683-2015	R:FXD COMP 200 OHM 5% 1/4W	
A26R33	0757-0914	R:FXD MET FLM 390 OHM 2% 1/4W	
A26R34	0683-3325	R:FXD COMP 3.3K OHM 5% 1/4W	
A26R35	0683-1625	R:FXD COMP 1600 OHM 5% 1/4W	
A26R36	0683-3915	R:FXD COMP 390 OHM 5% 1/4W	
A26R37	0757-0908	R:FXD MET FLM 220 OHM 2% 1/4W	
A26R38	0683-1825	R:FXD COMP 1800 OHM 5% 1/4W	
A26R39	0683-9105	R:FXD COMP 91 OHM 5% 1/4W	
A26R40	0683-2725	R:FXD COMP 2700 OHM 5% 1/4W	
A26R41	0683-6225	R:FXD COMP 6200 OHM 5% 1/4W	
A26R42	0683-4715	R:FXD COMP 470 OHM 5% 1/4W	
A26R43	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A26R44	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A26R45	0757-0929	R:FXD MET FLM 1.6K OHM 2% 1/4W	
A26R46	0757-0923	R:FXD MET FLM 910 OHM 2% 1/4W	
A26R47	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A26R48	0683-8215	R:FXD COMP 820 OHM 5% 1/4W FACTORY SELECTED VALUE	
A26R49	0683-1815	R:FXD COMP 180 OHM 5% 1/4W	
A26R50	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A26R51	0683-8215	R:FXD COMP 820 OHM 5% 1/4W	
A26R52	0698-6984	R:FXD COMP 470 OHM 5% 1/4W FACTORY SELECTED VALUE	

See introduction to this section for ordering information

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

Reference Designation	& Part No.	Description #	Note
A26	05245-6013	BOARD ASSY:OSCILLATOR FOR 5248L ONLY	
	05245-2006	BOARD:BLANK PC	
A26 C1	0160-0194	C:FXD MY 0.015UF 10%	
A26 C2	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCM	
A26 C3	0170-0084	C:FXD MY 0.068UF 20% 50VDCM	
A26 C4	0160-0127	C:FXD CER 1.0 UF 20% 25VDCM	
A26 C5	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCM	
A26 C6	0170-0084	C:FXD MY 0.068UF 20% 50VDCM	
A26 C7	0140-0200	C:FXD MICA 390 PF 5%	
A26 C8	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCM	
A26 C9	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCM	
A26 C10	0160-0194	C:FXD MY 0.015UF 10%	
A26 C11	0140-0190	C:FXD MICA 39 PF 5%	
A26 C12	0160-0194	C:FXD MY 0.015UF 10%	
A26 C13	0170-0084	C:FXD MY 0.068UF 20% 50VDCM	
A26 C14	0160-0194	C:FXD MY 0.015UF 10%	
A26 C15	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCM	
A26 C16	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCM	
A26 C17	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCM	
A26 C18	0160-0194	C:FXD MY 0.015UF 10%	
A26 C19	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCM	
A26 C20	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCM	
A26 C21	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCM	
A26 C22	0140-0152	C:FXD MICA 1000 PF 5% 300VDCM	
A26 C23	0150-0050	C:FXD CER 1000 PF 600VDCM	
A26 C24	0140-0203	C:FXD MICA 30 PF 5%	
A26 C25	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCM	
A26 C26	0180-0100	C:FXD ELECT TA 4.7UF 10% 35VDCM	
A26 CR1	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A26 CR2	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A26 L1	9140-0138	COIL/CHOKE 180 UH 5%	
A26 L2	9140-0137	COIL:FXD RF 1 MH 5%	
A26 L3	9140-0137	COIL:FXD RF 1 MH 5%	
A26 L4	9140-0138	COIL/CHOKE 180 UH 5%	
A26 L5	9140-0138	COIL/CHOKE 180 UH 5%	
A26 Q1	1853-0009	TRANSISTOR:SILICON PNP	
A26 Q2	1853-0009	TRANSISTOR:SILICON PNP	
A26 Q3	1853-0009	TRANSISTOR:SILICON PNP	
A26 Q4	1853-0009	TRANSISTOR:SILICON PNP	
A26 Q5	1853-0009	TRANSISTOR:SILICON PNP	
A26 Q6	1853-0009	TRANSISTOR:SILICON PNP	
A26 Q7	1853-0009	TRANSISTOR:SILICON PNP	
A26 R1	0683-1825	R:FXD COMP 1800 OHM 5% 1/4W FACTORY SELECTED PART	

See introduction to this section for ordering information

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

Reference Designation	Part No.	Description #	Note
A26 R2	0683-2225	R:FXD COMP 2.2K OHM 5% 1/4W	
A26 R3	0683-3915	R:FXD COMP 390 OHM 5% 1/4W	
A26 R4	0683-3915	R:FXD COMP 390 OHM 5% 1/4W	
A26 R5	0683-3915	R:FXD COMP 390 OHM 5% 1/4W	
A26 R6	0683-3915	R:FXD COMP 390 OHM 5% 1/4W	
A26 R7	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A26 R8	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A26 R9	0683-1535	R:FXD COMP 15K OHM 5% 1/4W	
A26 R10	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A26 R11	0683-2725	R:FXD COMP 2700 OHM 5% 1/4W	
A26 R12	0683-2225	R:FXD COMP 2.2K OHM 5% 1/4W	
A26 R13	0683-1235	R:FXD COMP 12K OHM 5% 1/4W	
A26 R14	0683-2725	R:FXD COMP 2700 OHM 5% 1/4W	
A26 R15	0683-1305	R:FXD COMP 13 OHM 5% 1/4W	
A26 R16	0683-1825	R:FXD COMP 1800 OHM 5% 1/4W	
A26 R17	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A26 R18	0683-2715	R:FXD COMP 270 OHM 5% 1/4W	
A26 R19	0683-6225	R:FXD COMP 6200 OHM 5% 1/4W	
A26 R20	0683-2725	R:FXD COMP 2700 OHM 5% 1/4W	
A26 R21	0683-2215	R:FXD COMP 220 OHM 5% 1/4W	
A26 R22	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A26 R23	0683-1525	R:FXD COMP 1500 OHM 5% 1/4W	
A26 R24	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A26 R25	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A26 R26	0683-1525	R:FXD COMP 1500 OHM 5% 1/4W	
A26 R27	0683-3315	R:FXD COMP 330 OHM 5% 1/4W	
A26 R28	0683-9125	R:FXD COMP 9100 OHM 5% 1/4W	
A26 R29	0683-2725	R:FXD COMP 2700 OHM 5% 1/4W	
A26 R30	0757-0937	R:FXD MET FLM 3.6K OHM 2% 1/4W	
A26 R31	0757-0914	R:FXD MET FLM 390 OHM 2% 1/4W	
A26 R32	0683-1825	R:FXD COMP 1800 OHM 5% 1/4W	
A26 R33	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A26 R34	0683-9115	R:FXD COMP 910 OHM 5% 1/4W	
A26 R35	0683-9105	R:FXD COMP 91 OHM 5% 1/4W	
A26 R36	0686-8215	R:FXD COMP 820 OHM 5% 1/2W	
A26 R37	0758-0014	R:FXD MET FLM 180 OHM 5% 1/2W	
A26 R38	0683-1825	R:FXD COMP 1800 OHM 5% 1/4W	
A27	5245A-65C	ASSY:DECIMAL COUNTER FOR 5248L ONLY	
	5243A-65C	BOARD:BLANK PC	
A27C1	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A27C2	0140-0196	C:FXD MICA 150 PF 5%	
A27C3	0160-[illegible]0	C:FXD CER 0.01 UF +80-20% 100VDCW	
A27C4	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A27C5	0140-0200	C:FXD MICA 390 PF 5%	

See introduction to this section for ordering information

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

Reference Designation	Part No.	Description #	Note
A27C6	0160-0196	C:FXD MY 0.015UF 10%	
A27C7	0140-0201	C:FXD MICA 12 PF 5%	
A27C8	0140-0208	C:FXD MICA 680 PF 5%	
A27C9	0160-0155	C:FXD MY 3300 PF 10%	
A27C10	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A27C11	0140-0192	C:FXD MICA 68 PF 5%	
A27C12	0160-0196	C:FXD MY 0.015UF 10%	
A27C13	0140-0195	C:FXD MICA 130 PF 5% 300 VDCW	
A27C14	0160-0153	C:FXD MY 0.001 UF 10% 200VDCW	
A27C15	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A27C16	0140-0199	C:FXD MICA 240 PF 5%	
A27C17	0160-0196	C:FXD MY 0.015UF 10%	
A27C18	0140-0209	C:FXD MICA 5.0 PF 10%	
A27C19	0140-0199	C:FXD MICA 240 PF 5%	
A27C20	0140-0200	C:FXD MICA 390 PF 5%	
A27L1	9140-0127	COIL:VAR 8.3-18.7 UH	
A27L2	9140-0127	COIL:VAR 8.3-18.7 UH	
A27L3	9140-0126	COIL:VAR 1.76-4.02 MH	
A27L4	9140-0126	COIL:VAR 1.76-4.02 MH	
A27L5	9140-0125	COIL:VAR 0.9-1.9 UH	
A27L6	9140-0125	COIL:VAR 0.9-1.9 UH	
A27Q1	1850-0091	TRANSISTOR:GERMANIUM 2N2048 PNP	
A27Q2	1850-0091	TRANSISTOR:GERMANIUM 2N2048 PNP	
A27Q3	1850-0091	TRANSISTOR:GERMANIUM 2N2048 PNP	
A27R1	0683-1525	R:FXD COMP 1500 OHM 5% 1/4W	
A27R2	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A27R3	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A27R4	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A27R5	0683-5125	R:FXD COMP 5100 OHM 5% 1/4W	
A27R6	0683-2225	R:FXD COMP 2.2K OHM 5% 1/4W	
A27R7	0683-4715	R:FXD COMP 470 OHM 5% 1/4W	
A27R8	0683-1135	R:FXD COMP 11K OHM 5% 1/4W	
A27R9	0683-2225	R:FXD COMP 2.2K OHM 5% 1/4W	
A27R10	0683-2225	R:FXD COMP 2.2K OHM 5% 1/4W	
A27R11	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A27R12	0683-9125	R:FXD COMP 9100 OHM 5% 1/4W	
A27R13	0683-2225	R:FXD COMP 2.2K OHM 5% 1/4W	
A27R14	0683-6815	R:FXD COMP 680 OHM 5% 1/4W	
A27R15	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A27R16	0683-4715	R:FXD COMP 470 OHM 5% 1/4W	
A27R17	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A28	05232-6009	ASSY:DECADE DIVIDER BOARD	
A28C1	0140-0191	C:FXD MICA 56 PF 5%	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
A28C2	0140-0193	CAPACITOR:FXD MICA 82 PF 5%	
A28C3	0150-0121	CAPACITOR:FXD CER 0.1 UF +80-20% 50VDCW	
A28C4	0140-0191	CAPACITOR:FXD MICA 56 PF 5%	
A28C5	0150-0122	CAPACITOR:FXD CER 2000 PF 20% 500VDCW	
A28C6	0140-0191	CAPACITOR:FXD MICA 56 PF 5%	
A28C7	0160-0181	CAPACITOR:FXD MICA 30PF 5% 300VDCW	
A28C8	0140-0192	CAPACITOR:FXD MICA 68 PF 5%	
A28C9	0140-0192	CAPACITOR:FXD MICA 68 PF 5%	
A28C10	0140-0193	CAPACITOR:FXD MICA 82 PF 5%	
A28C11	0140-0193	CAPACITOR:FXD MICA 82 PF 5%	
A28C12	0140-0195	CAPACITOR:FXD MICA 130 PF 5% 300 VDCW	
A28C13	0140-0193	CAPACITOR:FXD MICA 82 PF 5%	
A28C14	0140-0193	CAPACITOR:FXD MICA 82 PF 5%	
A28C15	0140-0176	CAPACITOR:FXD MICA 100 PF 2%	
A28C16	0140-0195	CAPACITOR:FXD MICA 130 PF 5% 300 VDCW	
A28CR1	1901-0040	DIODE:SILICON 30MA 30WV	
A28CR2	1901-0040	DIODE:SILICON 30MA 30WV	
A28CR3	1901-0040	DIODE:SILICON 30MA 30WV	
A28CR4	1901-0040	DIODE:SILICON 30MA 30WV	
A28CR5	1901-0040	DIODE:SILICON 30MA 30WV	
A28CR6	1901-0040	DIODE:SILICON 30MA 30WV	
A28CR7	1901-0040	DIODE:SILICON 30MA 30WV	
A28CR8	1901-0040	DIODE:SILICON 30MA 30WV	
A28CR9	1901-0040	DIODE:SILICON 30MA 30WV	
A28CR10	1901-0040	DIODE:SILICON 30MA 30WV	
A28CR11	1901-0040	DIODE:SILICON 30MA 30WV	
A28Q1	1853-0034	TRANSISTOR:SILICON PNP	
A28Q2	1853-0034	TRANSISTOR:SILICON PNP	
A28Q3	1853-0034	TRANSISTOR:SILICON PNP	
A28Q4	1853-0034	TRANSISTOR:SILICON PNP	
A28Q5	1853-0034	TRANSISTOR:SILICON PNP	
A28R1	0683-2725	RESISTOR:FXD COMP 2700 OHM 5% 1/4W	
A28R2	0758-0024	RESISTOR:FXD MET OX 100 OHM 5% 1/2W	
A28R3	0758-0043	RESISTOR:FXD MET OX 1800 OHM 5% 1/2W	
A28R4	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A28R5	0683-3325	RESISTOR:FXD COMP 3300 OHM 5% 1/4W	
A28R6	0683-2235	RESISTOR:FXD COMP 22K OHM 5% 1/4W	
A28R7	0683-6205	RESISTOR:FXD COMP 62 OHM 5% 1/4W	
A28R8	0683-1115	RESISTOR:FXD COMP 110 OHM 5% 1/4W	
A28R9	0683-2235	RESISTOR:FXD COMP 22K OHM 5% 1/4W	
A28R10	0683-6205	RESISTOR:FXD COMP 62 OHM 5% 1/4W	
A28R11	0683-2235	RESISTOR:FXD COMP 22K OHM 5% 1/4W	
A28R12	0758-0043	RESISTOR:FXD MET OX 1800 OHM 5% 1/2W	
A28R13	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A28R14	0683-3325	RESISTOR:FXD COMP 3300 OHM 5% 1/4W	
A28R15	0683-2735	RESISTOR:FXD COMP 27K OHM 5% 1/4W	
A28R16	0758-0043	RESISTOR:FXD MET OX 1800 OHM 5% 1/2W	
A28R17	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A28R18	0683-3325	RESISTOR:FXD COMP 3300 OHM 5% 1/4W	
A28R19	0683-2235	RESISTOR:FXD COMP 22K OHM 5% 1/4W	
A28R20	0683-6205	RESISTOR:FXD COMP 62 OHM 5% 1/4W	
A28R21	0683-1115	RESISTOR:FXD COMP 110 OHM 5% 1/4W	
A28R22	0683-1025	RESISTOR:FXD COMP 1000 OHM 5% 1/4W	
A28R23	0683-6205	RESISTOR:FXD COMP 62 OHM 5% 1/4W	
A28R24	0683-2235	RESISTOR:FXD COMP 22K OHM 5% 1/4W	
A28R25	0758-0043	RESISTOR:FXD MET OX 1800 OHM 5% 1/2W	
A28R26	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A28R27	0683-3325	RESISTOR:FXD COMP 3300 OHM 5% 1/4W	
A28R28	0758-0004	RESISTOR:FXD MET OX 2700 OHM 5% 1/2W	
A28R29	0683-1235	RESISTOR:FXD COMP 12K OHM 5% 1/4W	
A28R30	0683-2725	RESISTOR:FXD COMP 2700 OHM 5% 1/4W	
A28R31	0683-2235	RESISTOR:FXD COMP 22K OHM 5% 1/4W	
A28R32	0683-2205	RESISTOR:FXD COMP 22 OHM 5% 1/4W	
A28R33	0683-1115	RESISTOR:FXD COMP 110 OHM 5% 1/4W	
A28R34	0683-1025	RESISTOR:FXD COMP 1000 OHM 5% 1/4W	
A28R35	0683-2235	RESISTOR:FXD COMP 22K OHM 5% 1/4W	
A28R36	0683-4705	RESISTOR:FXD COMP 47 OHM 5% 1/4W	
A28R37	0683-2235	RESISTOR:FXD COMP 22K OHM 5% 1/4W	
A28R38	0758-0004	RESISTOR:FXD MET OX 2700 OHM 5% 1/2W	
A28R39	0683-1235	RESISTOR:FXD COMP 12K OHM 5% 1/4W	
A28R40	0683-2725	RESISTOR:FXD COMP 2700 OHM 5% 1/4W	
A28R41	0683-5635	RESISTOR:FXD COMP 56K OHMS 5% 1/4W	
A28R42	0683-3025	RESISTOR:FXD COMP 3000 OHM 5% 1/4W	
A28R43	0758-0004	RESISTOR:FXD MET OX 2700 OHM 5% 1/2W	
A28R44	0683-1235	RESISTOR:FXD COMP 12K OHM 5% 1/4W	
A28R45	0683-2725	RESISTOR:FXD COMP 2700 OHM 5% 1/4W	
A28R46	0683-2235	RESISTOR:FXD COMP 22K OHM 5% 1/4W	
A28R47	0683-6805	RESISTOR:FXD COMP 68 OHM 5% 1/4W	
A28R48	0683-1025	RESISTOR:FXD COMP 1000 OHM 5% 1/4W	
A28R49	0683-2235	RESISTOR:FXD COMP 22K OHM 5% 1/4W	
A28R50	0683-2235	RESISTOR:FXD COMP 22K OHM 5% 1/4W	
A28R51	0758-0004	RESISTOR:FXD MET OX 2700 OHM 5% 1/2W	
A28R52	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A28R53	0683-3325	RESISTOR:FXD COMP 3300 OHM 5% 1/4W	
A29	5212A-65C	DECADE DIVIDER	
	5212A-65C-1	BOARD:BLANK	
A29C1	0150-0121	CAPACITOR:FXD CER 0.1 UF +80-20% 50VDCW	
A29C2	0140-0194	CAPACITOR:FXD MICA 110 PF 5%	
A29C3	0140-0195	CAPACITOR:FXD MICA 130 PF 5% 300 VDCW	
A29C4	0140-0195	CAPACITOR:FXD MICA 130 PF 5% 300 VDCW	
A29C5	0140-0196	CAPACITOR:FXD MICA 150 PF 5%	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A29C6	0140-0196	CAPACITOR:FXD MICA 150 PF 5%	
A29C7	0140-0196	CAPACITOR:FXD MICA 150 PF 5%	
A29C8	0140-0199	CAPACITOR:FXD MICA 240 PF 5%	
A29C9	0140-0195	CAPACITOR:FXD MICA 130 PF 5% 300 VDCW	
A29C10	0140-0195	CAPACITOR:FXD MICA 130 PF 5% 300 VDCW	
A29C11	0140-0193	CAPACITOR:FXD MICA 82 PF 5% FACTORY SELECTED VALUE	
A29C12	0140-0198	CAPACITOR:FXD MICA 200 PF 5%	
A29C13	0140-0198	CAPACITOR:FXD MICA 200 PF 5%	
A29C14	0140-0200	CAPACITOR:FXD MICA 390 PF 5%	
A29CR1	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A29CR2	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A29CR3	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A29CR4	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A29CR5	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A29Q1	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A29Q2	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A29Q3	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A29Q4	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A29Q5	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A29Q6	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A29Q7	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A29Q8	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A29R1	0683-3915	RESISTOR:FXD COMP 390 OHM 5% 1/4W	
A29R2	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A29R3	0683-6825	RESISTOR:FXD COMP 6800 OHM 5% 1/4W	
A29R4	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A29R5	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A29R6	0683-3925	RESISTOR:FXD COMP 3900 OHM 5% 1/4W	
A29R7	0683-2015	RESISTOR:FXD COMP 200 OHM 5% 1/4W	
A29R8	0683-3925	RESISTOR:FXD COMP 3900 OHM 5% 1/4W	
A29R9	0683-6825	RESISTOR:FXD COMP 6800 OHM 5% 1/4W	
A29R10	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A29R11	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A29R12	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A29R13	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A29R14	0683-6825	RESISTOR:FXD COMP 6800 OHM 5% 1/4W	
A29R15	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A29R16	0683-8225	RESISTOR:FXD COMP 8200 OHMS 5% 1/4W	
A29R17	0683-3925	RESISTOR:FXD COMP 3900 OHM 5% 1/4W	
A29R18	0683-2015	RESISTOR:FXD COMP 200 OHM 5% 1/4W	
A29R19	0683-3925	RESISTOR:FXD COMP 3900 OHM 5% 1/4W	
A29R20	0683-6825	RESISTOR:FXD COMP 6800 OHM 5% 1/4W	
A29R21	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A29R22	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A29R23	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A29R24	0683-6835	RESISTOR:FXD COMP 68K OHM 5% 1/4W	
A29R25	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A29R26	0683-6825	RESISTOR:FXD COMP 6800 OHM 5% 1/4W	
A29R27	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A29R28	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A29R29	0683-3925	RESISTOR:FXD COMP 3900 OHM 5% 1/4W	
A29R30	0683-2015	RESISTOR:FXD COMP 200 OHM 5% 1/4W	
A29R31	0683-3925	RESISTOR:FXD COMP 3900 OHM 5% 1/4W	
A29R32	0683-6825	RESISTOR:FXD COMP 6800 OHM 5% 1/4W	
A29R33	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A29R34	0683-8225	RESISTOR:FXD COMP 8200 OHMS 5% 1/4W	
A29R35	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A29R36	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A29R37	0683-6825	RESISTOR:FXD COMP 6800 OHM 5% 1/4W	
A29R38	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A29R39	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A29R40	0683-3925	RESISTOR:FXD COMP 3900 OHM 5% 1/4W	
A29R41	0683-2015	RESISTOR:FXD COMP 200 OHM 5% 1/4W	
A29R42	0683-3925	RESISTOR:FXD COMP 3900 OHM 5% 1/4W	
A29R43	0683-6825	RESISTOR:FXD COMP 6800 OHM 5% 1/4W	
A29R44	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A29R45	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A29R46	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A30	5212A-65C	DECADE DIVIDER SAME AS A29,USE PREFIX A30	
A31	5212A-65C	DECADE DIVIDER SAME AS A29,USE PREFIX A31	
A32	5212A-65C	DECADE DIVIDER SAME AS A29,USE PREFIX A32	
A33	5212A-65C	DECADE DIVIDER SAME AS A29,USE PREFIX A33	
A34	5212A-65C	DECADE DIVIDER SAME AS A29,USE PREFIX A34	
A35	05248-60004	BOARD ASSY:TIME BASE CONTROL	
	05248-20004	BOARD:BLANK PC	
A35C1	0150-0093	CAPACITOR:FXD CER 0.01 UF +80-20% 100VDCW	
A35C2	0150-0093	CAPACITOR:FXD CER 0.01 UF +80-20% 100VDCW	
A35C3	0150-0093	CAPACITOR:FXD CER 0.01 UF +80-20% 100VDCW	
A35C4	0160-0298	CAPACITOR:FXD MY 0.0015 UF 10% 200VDCW	
A35C5	0160-0134	CAPACITOR:FXD MICA 220PF 5% 300VDCW	
A35C6	0160-0134	CAPACITOR:FXD MICA 220PF 5% 300VDCW	
A35C7	0140-0194	CAPACITOR:FXD MICA 110 PF 5%	
A35C8	0160-0134	CAPACITOR:FXD MICA 220PF 5% 300VDCW	
A35C9	0160-0134	CAPACITOR:FXD MICA 220PF 5% 300VDCW	
A35C10	0140-0194	CAPACITOR:FXD MICA 110 PF 5%	

See introduction to this section for ordering information

Reference Designation	Hp Part No.	Description #	Note
A35C11	0160-0134	CAPACITOR:FXD MICA 220PF 5% 300VDCW	
A35C12	0160-0134	CAPACITOR:FXD MICA 220PF 5% 300VDCW	
A35C13	0140-0194	CAPACITOR:FXD MICA 110 PF 5%	
A35C14	0160-0134	CAPACITOR:FXD MICA 220PF 5% 300VDCW	
A35C15	0160-0134	CAPACITOR:FXD MICA 220PF 5% 300VDCW	
A35C16	0140-0194	CAPACITOR:FXD MICA 110 PF 5%	
A35C17	0160-0134	CAPACITOR:FXD MICA 220PF 5% 300VDCW	
A35C18	0160-0134	CAPACITOR:FXD MICA 220PF 5% 300VDCW	
A35C19	0140-0194	CAPACITOR:FXD MICA 110 PF 5%	
A35CR1	1902-0041	DIODE:BREAKDOWN 5.11V 5% 400MW	
A35CR2	1910-0016	DIODE:GERMANIUM 100MA AT 0.35V 60PIV	
A35CR3	1901-0040	DIODE:SILICON 30MA 30WV	
A35CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR9	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR10	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR11	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR12	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR13	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR14	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR15	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR16	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR17	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR18	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR19	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR20	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR21	1901-0025	DIODE:SILICON 100WV 100MA	
A35CR22	1901-0025	DIODE:SILICON 100WV 100MA	
A35IC1	1820-0077	INTEGRATED CIRCUIT	
A35IC2	1820-0068	INTEGRATED CIRCUIT	
A35Q1	1854-0094	TRANSISTOR:SILICON NPN	
A35Q2	1854-0094	TRANSISTOR:SILICON NPN	
A35Q3	1850-0040	TRANSISTOR:GERMANIUM PNP	
A35Q4	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A35Q5	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A35Q6	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A35Q7	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A35Q8	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A35Q9	1854-0094	TRANSISTOR:SILICON NPN	
A35Q10	1854-0094	TRANSISTOR:SILICON NPN	
A35Q11	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A35Q12	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A35Q13	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A35Q14	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A35Q15	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A35Q16	1454-0005	TRANSISTOR:SILICON NPN 2N708	
A35R1	0683-1525	RESISTOR:FXD COMP 1500 OHM 5% 1/4W	
A35R2	0683-3625	RESISTOR:FXD COMP 3600 OHM 5% 1/4W	
A35R3	0683-1525	RESISTOR:FXD COMP 1500 OHM 5% 1/4W	
A35R4	0686-3015	RESISTOR:FXD COMP 300 OHM 5% 1/2W	
A35R5	0686-2715	RESISTOR:FXD COMP 270 OHM 5% 1/2W	
A35R6	0683-2225	RESISTOR:FXD COMP 2.2K OHM 5% 1/4W	
A35R7	0683-1535	RESISTOR:FXD COMP 15K OHM 5% 1/4W	
A35R8	0683-2035	RESISTOR:FXD COMP 20K OHM 5% 1/4W	
A35R9	0683-1825	RESISTOR:FXD COMP 1800 OHM 5% 1/4W	
A35R10	0683-3025	RESISTOR:FXD COMP 3000 OHM 5% 1/4W	
A35R11	0683-1535	RESISTOR:FXD COMP 15K OHM 5% 1/4W	
A35R12	0683-1535	RESISTOR:FXD COMP 15K OHM 5% 1/4W	
A35R13	0683-4715	RESISTOR:FXD COMP 470 OHM 5% 1/4W	
A35R14	0686-3025	RESISTOR:FXD COMP 3000 OHM 5% 1/2W	
A35R15	0683-1535	RESISTOR:FXD COMP 15K OHM 5% 1/4W	
A35R16	0683-3035	RESISTOR:FXD COMP 30K OHM 5% 1/4W	
A35R17	0683-3025	RESISTOR:FXD COMP 3000 OHM 5% 1/4W	
A35R18	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A35R19	0683-1015	RESISTOR:FXD COMP 100 OHM 5% 1/4W	
A35R20	0683-1535	RESISTOR:FXD COMP 15K OHM 5% 1/4W	
A35R21	0683-1535	RESISTOR:FXD COMP 15K OHM 5% 1/4W	
A35R22	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A35R23	0683-4725	RESISTOR:FXD COMP 4700 OHM 5% 1/4W	
A35R24	0683-1845	RESISTOR:FXD COMP 180K OHM 5% 1/4W	
A35R25	0683-4725	RESISTOR:FXD COMP 4700 OHM 5% 1/4W	
A35R26	0683-3025	RESISTOR:FXD COMP 3000 OHM 5% 1/4W	
A35R27	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A35R28	0683-3025	RESISTOR:FXD COMP 3000 OHM 5% 1/4W	
A35R29	0683-1535	RESISTOR:FXD COMP 15K OHM 5% 1/4W	
A35R30	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A35R31	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A35R32	0683-3025	RESISTOR:FXD COMP 3000 OHM 5% 1/4W	
A35R33	0683-4725	RESISTOR:FXD COMP 4700 OHM 5% 1/4W	
A35R34	0683-1535	RESISTOR:FXD COMP 15K OHM 5% 1/4W	
A35R35	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A35R36	0683-0475	RESISTOR:FXD COMP 4.7 OHM 5% 1/4W	
A35R37	0683-0475	RESISTOR:FXD COMP 4.7 OHM 5% 1/4W	
A35R38	0683-7515	RESISTOR:FXD COMP 750 OHM 5% 1/4W	
A35R39	0683-1845	RESISTOR:FXD COMP 180K OHM 5% 1/4W	
A35R40	0683-4725	RESISTOR:FXD COMP 4700 OHM 5% 1/4W	
A35R41	0683-4735	RESISTOR:FXD COMP 47K OHM 5% 1/4W	
A35R42	0683-3025	RESISTOR:FXD COMP 3000 OHM 5% 1/4W	
A35R43	0683-1535	RESISTOR:FXD COMP 15K OHM 5% 1/4W	
A35R44	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
A35R45	0683-6225	RESISTOR:FXD COMP 6200 OHM 5% 1/4W	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
A35R46	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A35R47	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A35R48	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A35R49	0683-5115	R:FXD COMP 510 OHM 5% 1/4W	
A35R50	0683-1845	R:FXD COMP 180K OHM 5% 1/4W	
A35R51	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A35R52	0683-1535	R:FXD COMP 15K OHM 5% 1/4W	
A35R53	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A35R54	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A35R55	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A35R56	0683-1535	R:FXD COMP 15K OHM 5% 1/4W	
A35R57	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A35R58	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A35R59	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A35R60	0683-1845	R:FXD COMP 180K OHM 5% 1/4W	
A35R61	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A35R62	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A35R63	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A35R64	0683-1535	R:FXD COMP 15K OHM 5% 1/4W	
A35R65	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A35R66	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A35R67	0683-1535	R:FXD COMP 15K OHM 5% 1/4W	
A35R68	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A35R69	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A35R70	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A35R71	0683-1845	R:FXD COMP 180K OHM 5% 1/4W	
A35R72	0683-4125	R:FXD COMP 4700 OHM 5% 1/4W	
A35R73	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A35R74	0683-2435	R:FXD COMP 24K OHM 5% 1/4W	
A35R75	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A35R76	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A35R77	0683-8215	R:FXD COMP 820 OHM 5% 1/4W	
A36	05248-60002	BOARD ASSY:MULTIPLIER	
	05248-20002	BOARD:BLANK PC	
A36C1	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A36C2	0150-0050	C:FXD CER 1000 PF 600VDCW	
A36C3	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A36C4	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A36C5	0140-0206	C:FXD MICA 270 PF 5%	
A36C6	0140-0200	C:FXD MICA 390 PF 5%	
A36C7	0130-0017	C:VAR CER 8-50 PF	
A36C8	0130-0016	C:VAR CER 5-25 PF NPO	
A36C9	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A36C10	0140-0192	C:FXD MICA 68 PF 5%	
A36C11	0140-0201	C:FXD MICA 1 PF 5%	
A36C12	0130-0017	C:VAR CER 8-50 PF	
A36C13	0140-0190	C:FXD MICA 39 PF 5%	
A36C14	0140-0190	C:FXD MICA 39 PF 5%	
A36C15	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A36C16	0140-0145	C:FXD MICA 22 PF 5%	
A36CR1	1901-0114	DIODE:SILICON 10MV	
A36CR2	1901-0114	DIODE:SILICON 10MV	
A36CR3	1901-0092	DIODE:SILICON 20MV STEP RECOVERY	
A36L1	9140-0144	COIL:FXD RF 4.7 UH	
A36L2	9140-0125	COIL:VAR 0.9-1.9 UH	
A36L3	5275A-60F	COIL:FXD RF	
A36L4	5275A-60E	COIL:FXD RF	
A36L5	5275A-60G	COIL:FXD RF	
A36L6		PART OF A36L5	
A36L7	9140-0145	COIL:FXD RF 8.2 UH	
A36L8	9140-0145	COIL:FXD RF 8.2 UH	
A36Q1	1850-0077	TRANSISTOR:GERMANIUM 2N1397 PNP	
A36Q2	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A36Q3	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A36Q4	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A36R1	0683-1035	R:FXD C MP 10K OHM 5% 1/4W	
A36R2	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A36R3	0683-1225	R:FXD COMP 1200 OHM 5% 1/4W	
A36R4	0683-6815	R:FXD COMP 680 OHM 5% 1/4W	
A36R5	0683-3325	R:FXD COMP 3300 OHM 5% 1/4W	
A36R6	0683-4325	R:FXD COMP 4300 OHM 5% 1/4W	
A36R7	0683-1505	R:FXD COMP 15 OHM 5% 1/4W	
A36R8	0683-1525	R:FXD COMP 1500 OHM 5% 1/4W FACTORY SELECTED PART	
A36R9	0683-8 5	R:FXD COMP 820 OHM 5% 1/4W	
A36R10	0683-4705	R:FXD COMP 47 OHM 5% 1/4W	
A36R11	0683-2715	R:FXD COMP 270 OHM 5% 1/4W	
A36R12	2100-1758	R:VAR WW 1K OHM 5% 1W	
A36R13	0683-2015	R:FXD COMP 200 OHM 5% 1/4W	
A36T1	5275A-60D	TRANSFORMER:R RF	
B1	3140-0052	MOTOR:SHADED POLE FOR 5248L ONLY	
	3160-0097	FAN:TUBE AXIAL FOR 5246M ONLY	
C1		NOT ASSIGNED	
C2	0130-0003	C:VAR CER 1.5-7 PF FOR 5248L ONLY	
C3	0121-0013	C:VAR AIR 6-100.5 PF FOR 5248L ONLY	
C4	0180-0047	C:FXD ELECT 500 UF 75VDCW FOR 5248L ONLY	
C4	0180-1999	C:FXD ELECT 500 UF -10+100% 50VDCW FOR 5246M ONLY	
C5	0150-0119	C:FXD CER 2 X 0.01 UF 20% 250VAC	
C6	0180-0329	C:FXD ELECT 975UF -10+50% 40VDCW	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
C7	0180-0107	CAPACITOR:FXD ELECT 20UF -10/+100% 200VDCW	
C8	0180-0107	CAPACITOR:FXD ELECT 20UF -10/+100% 100VDCW	
C9	0180-0129	CAPACITOR:FXD ELECT 975UF -10+50% 40VDCW	
C10	0180-0130	CAPACITOR:FXD ELECT 1900UF -10+50% 15VDCW	
C11		NOT ASSIGNED	
C12	0160-0093	CAPACITOR:FXD CER 0.01 UF +80-20% 100VDCW	
C13		NOT ASSIGNED	
C14	0150-0012	CAPACITOR:FXD CER 0.01 UF 20% 1000VDCW	
C15	0160-0127	CAPACITOR:FXD CER 1.0 UF 20% 25VDCW FOR 5248M ONLY	
C16	0150-0079	CAPACITOR:FXD CER 10/0.5 PF 500VDCW FOR 5248L ONLY	
C17	0160-0174	CAPACITOR:FXD CER 0.47 UF +80-20% 25VDCW	
C18	0160-0174	CAPACITOR:FXD CER 0.47 UF +80-20% 25VDCW	
C19	0160-0153	CAPACITOR:FXD CER 3000 PF 10%	
CR1	1902-0039	DIODE BREAKDOWN:1N1597A(FOR 5248L ONLY)	
CR2	1901-0033	DIODE:SILICON	
CR3	1901-0033	DIODE:SILICON	
DS1	1450-0349	INDICATOR/GLOW-LAMP NEON	
DS2	1450-0352	LIGHT:INDICATOR	
F1	2110-0303	FUSE:CARTRIDGE 2AMP 250V SLOW BLOW	
F1	2110-0312	FUSE:CARTRIDGE 1AMP 250V SLOW BLOW	
J1	1250-0118	CONNECTOR:BNC	
J2	1250-0118	CONNECTOR:BNC	
J3	1250-0118	CONNECTOR:BNC	
J4	1250-0118	CONNECTOR:BNC	
J5	1250-0118	CONNECTOR:BNC	
J6	1251-0101	CONNECTOR:FEMALE 50-CONTACT	
J7	1250-0118	CONNECTOR:BNC	
J8	1250-0118	CONNECTOR:BNC	
J9		NOT ASSIGNED	
J10		NOT ASSIGNED	
J11	1251-0101	CONNECTOR:FEMALE 50-CONTACT	
J12	1250-0118	CONNECTOR:BNC FOR 5248M ONLY	
L1	9140-0136	COIL:FXD RF 22 UH	
L2	9140-0136	COIL: FXD RF 22 UH	
L3	9100-2830	CHOKE:0.040 MY	
L4	9100-2830	CHOKE:0.040 MY	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
P1	1250-0911	CONNECTOR:RF SHORT 50 OHM (FOR 5248M ONLY)	
Q1	1850-0090	TRANSISTOR:GERMANIUM PNP 2N1838 FOR 5248L ONLY	
Q2	1850-0038	TRANSISTOR:GERMANIUM PNP	
Q3	1850-0038	TRANSISTOR:GERMANIUM PNP	
Q4	1850-0038	TRANSISTOR:GERMANIUM PNP	
R1	0686-2235	RESISTOR:FXD COMP 22K OHM 5% 1/2W	
R2	0683-2245	RESISTOR:FXD COMP 220K OHM 5% 1/4W	
R3	0683-8235	RESISTOR:FXD COMP 82K OHM 5% 1/4W	
R4	0683-2735	RESISTOR:FXD COMP 27K OHM 5% 1/4W	
R5	2100-0318	RESISTOR:VAR 250K OHM 20% 1/4W/SPST SW	
R6	0686-1045	RESISTOR:FXD COMP 100K OHM 5% 1/2W	
R7	0686-7735	RESISTOR:FXD COMP 7.5K OHM 5% 1/2W	
R8		NOT ASSIGNED	
R9	0683-5105	RESISTOR:FXD COMP 51 OHM 5% 1/4W	
R10	0683-1055	RESISTOR:FXD COMP 1 MEGOHM 5% 1/4W	
R11	2100-2430	RESISTOR:VAR WW 20K OHM 10% LIN 1W (PART OF W2)	
R12	0683-1015	RESISTOR:FXD COMP 100 OHM 5% 1/4W	
R13	0683-8215	RESISTOR:FXD COMP 820 OHM 5% 1/4W	
R14	0683-1035	RESISTOR:FXD COMP 10K OHM 5% 1/4W	
S1	3101-0037	SWITCH:TOGGLE SPST	
S2	3101-0014	SWITCH:PUSHBUTTON SPDT	
S3		PART OF R5	
S4	3101-1272	SWITCH:SLIDE 4PDT	
T1	9100-2439	TRANSFORMER:POWER FOR 5248M ONLY	
T1	9100-0166	TRANSFORMER:POWER FOR 5248L ONLY	
T2	9100-2829	TRANSFORMER	
W1	8120-1348	CABLE ASSY:POWER CORD	
W2	05245-6025	CABLE ASSY:RFC FOR 5248M ONLY	
W3	05245-6036	CABLE ASSY:OSCILLATOR OUTPUT FOR 5248M ONLY	
W4	05245-6027	CABLE ASSY:LOW LEVEL OUTPUT FOR 5248M ONLY	
W5	05248-60009	CABLE ASSY:SWITCH	
W6	05245-6004	CABLE:PRINTER OUTPUT	
W7	5243A-188	CABLE ASSY:OVEN POWER SUPPLY	
XA1- XA5		NOT ASSIGNED NOT ASSIGNED	
XA6	1251-0139	CONNECTOR:2315 CONTACT	
XA7	1251-0135	CONNECTOR:BODY 15 PIN	
XA8		NOT ASSIGNED	
XA9		NOT ASSIGNED	
XA10	1251-0135	CONNECTOR:BODY 15 PIN	
XA11	1251-0135	CONNECTOR:BODY 15 PIN	
XA12	1251-0135	CONNECTOR:BODY 15 PIN	
XA13	1251-0135	CONNECTOR:BODY 15 PIN	
XA14	1251-0135	CONNECTOR:BODY 15 PIN	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
XA15	1251-0135	CONNECTOR:BODY 15 PIN	
XA16	1251-0135	CONNECTOR:BODY 15 PIN	
XA17	1251-0135	CONNECTOR:BODY 15 PIN	
XA18	1251-0135	CONNECTOR:BODY 15 PIN	
XA19	1251-1669	CONNECTOR:PC 10 CONTACTS	
XA20	1251-1669	CONNECTOR:PC 10 CONTACTS	
XA21	1251-1670	CONNECTOR:PC 11 CONTACTS(2 REQ'D)	
XA22	1251-0135	CONNECTOR:BODY 15 PIN	
XA23	1251-0135	CONNECTOR:BODY 15 PIN	
XA24		NOT ASSIGNED	
XA25		NOT ASSIGNED	
XA26	1251-0135	CONNECTOR:BODY 15 PIN	
XA27	1251-0135	CONNECTOR:BODY 15 PIN FOR 5248L ONLY	
XA28	1251-0135	CONNECTOR:BODY 15 PIN	
XA29	1251-0135	CONNECTOR:BODY 15 PIN	
XA30	1251-0135	CONNECTOR:BODY 15 PIN	
XA31	1251-0135	CONNECTOR:BODY 15 PIN	
XA32	1251-0135	CONNECTOR:BODY 15 PIN	
XA33	1251-0135	CONNECTOR:BODY 15 PIN	
XA34	1251-0135	CONNECTOR:BODY 15 PIN	
XA35		NOT ASSIGNED	
XA36	1251-0135	CONNECTOR:BODY 15 PIN	
XF1	1400-0084	FUSEHOLDER:EXTRACTOR POST TYPE	
XW1	1251-2357	CONNECTOR:POWER 3 PIN MALE	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
MP1	0370-0077	KNOB:SKIRTED BAR	
MP2	0370-0077	KNOB:SKIRTED BAR	
MP3	0370-0077	KNOB:SKIRTED BAR	
MP4	0370-0077	KNOB:SKIRTED BAR	
MP5	0370-0099	KNOB:BLK CONCENTRIC(ATTEN. SWITCH)	
MP6	0370-0084	KNOB:BLK ROUND 5/8" DIA	
MP7	0370-0134	KNOB:RED ROUND 1/2" DIA	
MP8	0510-0123	FASTENER:PUSH-ON TYPE	
MP9	1200-0043	INSULATOR:TRANSISTOR MOUNTING	
MP10	1200-0043	INSULATOR:TRANSISTOR MOUNTING	
MP11	1200-0043	INSULATOR:TRANSISTOR MOUNTING	
MP12			
MP13	1200-0083	BUSHING:INSULATOR, NYLON	
MP14	1200-0083	BUSHING:INSULATOR, NYLON	
MP15	1200-0083	BUSHING:INSULATOR, NYLON	
MP16	1200-0083	BUSHING:INSULATOR, NYLON	
MP17	1200-0083	BUSHING:INSULATOR, NYLON	
MP18	1200-0083	BUSHING:INSULATOR, NYLON	
MP19	1200-0092	BUSHING:TRANSISTOR(5248L ONLY)	
MP20	1200-0097	BUSHING:TRANSISTOR(5248L ONLY)	
MP21	1520-0001	PLATE:MOUNTING ELECTROLYTIC CAPACITOR	
MP22	1520-0001	PLATE:MOUNTING ELECTROLYTIC CAPACITOR	
MP23	1520-0001	PLATE:MOUNTING ELECTROLYTIC CAPACITOR	
MP24	1520-0001	PLATE:MOUNTING ELECTROLYTIC CAPACITOR(5248I ONLY)	
MP25	1520-0007	PLATE:MOUNTING(5248M ONLY)	
MP26	3150-0037	FILTER:AIR	
MP27	3160-0060	FAN BLADE:PROPELLER(5248L ONLY)	
MP28	3160-0097	FAN:TUBE AXIAL(5248M ONLY)	
MP29	5040-0170	SUPPORT:BOARD	
MP30	5040-0170	SUPPORT:BOARD	
MP31	5040-0170	SUPPORT:BOARD	
MP32	5040-0170	SUPPORT:BOARD(5248M ONLY)	
MP33	5212L-85A	SUPPORT:READOUT	
MP34	5212L-85B	READOUT:UNITS	
MP35	05243-2019	PANEL:PLUG IN	
MP36	05243-0012	BRACKET:SWITCH(A2)	
MP37	05243-0012	BRACKET:SWITCH(A3)	
MP38	5243A-20A	HOUSING:FAN(5248L ONLY)	
MP39	5243A-12C	SUPPORT:CAPACITOR(5248L ONLY)	
MP40	5243A-12F	BRACKET:CRYSTAL OVEN(5248L ONLY)	
MP41	5243A-47C	SUPPORT:PANEL(BLOCK)	
MP42	5243A-55A	SHIELD:OSCILLATOR	
MP43	5243L-12A	GUSSET:MIDDLE(5248L ONLY)	
MP44	5243L-12B	BRACKET:BOARD	
MP45	5243L-17A	BUSHING:LATCH	
MP46	5243L-41A	PLATE:CASTING(5248L ONLY)	
MP47	05243-2018	HOUSING:PLUG IN	
MP48	05243-2019	PANEL:PLUG IN (LIGHT GRAY)	
MP49	05243-2014	SHAFT:LATCH	
MP50	05243-2015	KNOB:LATCH	
MP51	05243-2013	PANEL	
MP52	05243-0008	RETAINER:FRONT PANEL	
MP53	5243L-83A	HOLDER:DECIMAL	
MP54	05243-0021	PLATE:CASTING(5248M ONLY)	
MP55	05243-4003	INSERT:READOUT UNITS	

See introduction to this section for ordering information

Table 6-1. Reference Designation Index

Reference Designation	Part No. #	Description #	Note
MP56	5243L-91A	SPRING:LATCH	
MP57	5243L-107A	BAR	
MP58	5243L-110A	GUIDE BOARD:FRONT	
MP59	5243L-110B	GUIDE BOARD:REAR	
MP60	05243-0007	RETAINER:LATCH'	
MP61	05245-4803	READOUT COVER:AMBER	
MP62	05245-0018	GUSSET:MIDDLE(5248M ONLY)	
MP63	05248-00002	CHASSIS:MAIN	
MP64	05248-00005	CHASSIS:MAIN	
MP65	05248-00006	CHASSIS:AMPLIFIER	
MP66	05243-2023	PANEL: PLUG-IN (MINT GRAY)	

See introduction to this section for ordering information

Table 6-1A. Reference Designation Index (A24 for 5248M) Cont'd.

Reference Designation	Part No.	Description #	Note
		PREFIX ALL PARTS A24	
A1	00105-6006	AC CONTROLLER ASSY	
	00105-2006	BOARD BLANK	
A1C1	0160-2671	C:FXD MY 0.1 UF 5% 80VDCW	
A1C2	0160-2672	C:FXD MY 0.047 UF 5% 80VDCW	
A1C3	0180-0100	C:FXD ELECT TA 4.7UF 10% 35VDCW	
A1C4	0180-0100	C:FXD ELECT TA 4.7UF 10% 35VDCW	
A1C5	0150-0050	C:FXD CER 1000 PF 600VDCW	
A1C6	0180-0100	C:FXD ELECT TA 4.7UF 10% 35VDCW	
A1C7	0180-0100	C:FXD ELECT TA 4.7UF 10% 35VDCW	
A1C8	0180-0100	C:FXD ELECT TA 4.7UF 10% 35VDCW	
A1C9	0180-0100	C:FXD ELECT TA 4.7UF 10% 35VDCW	
A1C10	0180-0100	C:FXD ELECT TA 4.7UF 10% 35VDCW	
A1C11	0150-0122	C:FXD CER 2000 PF 20% 500VDCW	
A1CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A1CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A1F1	2110-0254	FUSE:THERMAL 15A	
A1F2	2110-0254	FUSE:THERMAL 15A	
A1Q1	1854-0023	TRANSISTOR:SILICON NPN	
A1Q2	1854-0023	TRANSISTOR:SILICON NPN	
A1R1	0757-0923	R:FXD MET FLM 910 OHM 2% 1/4W	
A1R2	0757-0916	R:FXD MET FLM 470 OHM 2% 1/4W	
A1R3	2100-2224	R:VAR WW 200 OHM 5% LIN 1W	
A1R4	0757-0922	R:FXD MET FLM 820 OHM 2% 1/4W	
A1R5	0757-0939	R:FXD MET FLM 4.3K OHM 2% 1/4W	
A1R6	0757-0939	R:FXD MET FLM 4.3K OHM 2% 1/4W	
A1R7	0757-0976	R:FXD MET FLM 150K OHM 2% 1/4W	
A1R8	0757-0904	R:FXD MET FLM 150 OHM 2% 1/4W	
A1R9	0757-0913	R:FXD MET FLM 360 OHM 2% 1/4W	
A1R10	0757-0913	R:FXD MET FLM 360 OHM 2% 1/4W	
A1R11	0757-0900	R:FXD MET FLM 100 OHM 2% 1/4W	
A1RT1	0837-0035	THERMISTOR:DISC TYPE	
A2	00105-6010	ASSY:OSCILLATOR AND AGC 5MHZ	
	00105-2005	BOARD:BLANK	
A2A1	00105-6005	ASSY:OSCILLATOR 5MHZ	
A2A1C1	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A2A1C2	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A2A1C3	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A2A1C4	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A2A1C5	0160-2649	C:FXD GLASS 100 PF 5% 500VDCW	
A2A1C6	0160-2670	C:FXD GLASS 11 PF 5% 500VDCW	
A2A1C7	0121-0179	C:VAR: GLASS 1-28 PF	
A2A1C8	0180-0218	C:FXD ELECT .15 UF 10% 35VDCW	
A2A1C9	0160-3025	C:FXD GLASS 75 PF 5% 500VDCW	
A2A1C10	0160-2648	C:FXD GLASS 300 PF 5% 300VDCW	
A2A1C11	0160-0212	C:FXD GLASS 3000PF 5% 300V	
A2A1C12	0160-2671	C:FXD MY 0.1 UF 5% 80VDCW	
A2A1CR1	0122-0011	DIODE:CAPACITOR VARI 100 PF	
A2A1L1	9100-2820	CHOKE:180 UH 5%	
A2A1L2	00105-8004	COIL:FREQ PADING(TYPICAL VALUE 30UH)	
A2A1L3	00105-8005	COIL:MODE SUPRESSOR .47UH	
A2A1Q1	1854-0073	TRANSISTOR:SILICON NPN	
A2A1R1	0757-0931	R:FXD MET FLM 2.0K OHM 2% 1/4W	
A2A1R2	0757-0909	R:FXD MET FLM 240 OHM 2% 1/4W	
A2A1R3	0721-0025	R:FXD OEPC 4.99 MEGOHM 2% 1/8W	
A2A1R4	0757-0948	R:FXD MET FLM 10K OHM 2% 1/4W	
A2A1R5	0757-0948	R:FXD MET FLM 10K OHM 2% 1/4W	
A2A1R6	0721-0025	R:FXD OEPC 4.99 MEGOHM 2% 1/8W	
A2A1Y1	5080-0949	CRYSTAL:5MHZ	
A2A2	00105-6109	ASSY:AGC N.S.R. ORDER ASSY00105-6010	
	00105-6003	ASSY:AGC INPUT BOARD	
	00105-2003	BLANK BOARD	
	00105-6004	ASSY:AGC OUTPUT BOARD	
	00105-2004	BOARD:BLANK	
A2A2C1	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A2A2C2	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A2A2C3	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A2A2C4	0180-0218	C:FXD ELECT .15 UF 10% 35VDCW	
A2A2C5	0121-0046	C:VARI CER 9-35 PF	
A2A2C6	0160-0179	C:FXD MICA 33 PF 5% 300VDCW	
A2A2C7	0180-0218	C:FXD ELECT .15 UF 10% 35VDCW	
A2A2C8	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A2A2C9	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A2A2C10	0160-0763	C:FXD MICA 5 PF 10%	
A2A2C11	0121-0046	C:VARI CER 9-35 PF	
A2A2C12	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A2A2C13	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A2A2C14	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A2A2C15	0140-0190	C:FXD MICA 39 PF 5%	
A2A2C16	0180-0218	C:FXD ELECT .15 UF 10% 35VDCW	
A2A2CR1	1902-0049	DIODE,BREAKDOWN: 6.19V 5%	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
		PREFIX ALL PARTS A24	
A2A2CR2	1902-0063	DIODE:BREAKDOWN:15V	
A2A2CR3	1901-0040	DIODE:SILICON 30MA 30WV	
A2A2CR4	1901-0040	DIODE:SILICON 30MA 30WV	
A2A2Q1	1854-0073	TRANSISTOR:SILICON NPN	
A2A2Q2	1854-0073	TRANSISTOR:SILICON NPN	
A2A2R1	0757-0936	R:FXD MET FLM 3.3K OHM 2% 1/4W	
A2A2R2	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A2A2R3	2100-1738	R:VAR WW 10K OHM 30% LIN 1/2W	
A2A2R4	0757-0948	R:FXD MET FLM 10K OHM 2% 1/4W	
A2A2R5	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A2A2R6	0757-0346	R:FXD MET FLM 10 OHM 1% 1/8W	
A2A2R7	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A2A2R8	0757-0941	R:FXD MET FLM 5.1K OHM 2% 1/4W	
A2A2R9	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A2A2R10	0757-0948	R:FXD MET FLM 10K OHM 2% 1/4W	
A2A2R11	0757-0931	R:FXD MET FLM 2.0K OHM 2% 1/4W	
A2A2R12	2100-2216	R:VAR CERMET FLM 5K OHM 30% LIN 1/2W	
A2A2R13	0757-0893	R:FXD MET FLM 51 OHM 2% 1/4W	
A2A2R14	0757-0935	R:FXD MET FLM 3.0K OHM 2% 1/4W	
A2A2R15	0757-0954	R:FXD MET FLM 18K OHM 2% 1/4W	
A2A2R16	0757-0941	R:FXD MET FLM 5.1K OHM 2% 1/4W	
A2A2R17	0757-0931	R:FXD MET FLM 2.0K OHM 2% 1/4W	
A2A2T1	00105-8007	TRANSFORMER:AGC INPUT	
A2A2T2	00105-8002	TRANSFORMER:AGC OUTPUT	
	1251-1636	CONNECTOR:JACK	
	0360-1334	TERMINAL:SOLDER STUD	
A3	00105-6007	ASSY:POWER AMPLIFIER BOARD	
	00105-2007	BLANK BOARD	
A3C1	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A3C2	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A3C3	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A3C4	0180-0160	C:FXD ELECT 22UF 35VDCW	
A3C5	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A3C6	0140-2326	C:FXD MICA 150 PF 5%	
A3C7	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A3C8	0160-2188	C:FXD MY 3900 PF 5%	
A3C9	0160-0178	C:FXD MICA 27PF 5% 300VDCW	
A3C10	0121-0046	C:VARI CER 9-35 PF	
A3C11	0140-0208	C:FXD MICA 680 PF 5%	
A3C12	0121-0046	C:VARI CER 9-35 PF	
A3C13	0160-0145	C:FXD MICA 82PF 2% 100VDCW	
A3C14	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	
A3C15	0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
		PREFIX ALL PARTS A24	
A3CR1	1901-0049	DIODE:SILICON 50PIV	
A3CR2	1901-0049	DIODE:SILICON 50PIV	
A3CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A3L1	9100-2430	INDUCTOR:220 UH	
A3L2	9100-2430	INDUCTOR:220 UH	
A3L3	9100-2430	INDUCTOR:220 UH	
A3Q1	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A3Q2	1854-0023	TRANSISTOR:SILICON NPN	
A3Q3	1854-0039	TRANSISTOR:SILICON 2N3053	
A3Q4	1854-0020	TRANSISTOR:NPN SILICON	
A3Q5	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A3Q6	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A3R1	0757-0893	R:FXD MET FLM 51 OHM 2% 1/4W	
A3R2	0757-0954	R:FXD MET FLM 18K OHM 2% 1/4W	
A3R3	0757-0962	R:FXD MET FLM 39K OHM 2% 1/4W	
A3R4	0757-0956	R:FXD MET FLM 22K OHM 2% 1/4W	
A3R5	0757-0910	R:FXD MET FLM 270 OHM 2% 1/4W	
A3R6	0757-0956	R:FXD MET FLM 22K OHM 2% 1/4W	
A3R7	0757-0937	R:FXD MET FLM 3.6K OHM 2% 1/4W	
A3R8	0698-0001	R:FXD COMP 4.7 OHM 5% 1/2W	
A3R9	0757-0898	R:FXD MET FLM 82 OHM 2% 1/4W	
A3R10	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A3R11	0757-0900	R:FXD MET FLM 100 OHM 2% 1/4W	
A3R12	2100-2060	R:VARI CERMET FLM 50 OHM 30% LIN 1/2W	
A3R13	0757-0900	R:FXD MET FLM 100 OHM 2% 1/4W	
A3R14	0757-0946	R:FXD MET FLM 8.2K OHM 2% 1/4W	
A3R15	0757-0948	R:FXD MET FLM 10K OHM 2% 1/4W	
A3R16	0757-0941	R:FXD MET FLM 5.1K OHM 2% 1/4W	
A3R17	0757-0900	R:FXD MET FLM 100 OHM 2% 1/4W	
A3R18	0757-0918	R:FXD MET FLM 560 OHM 2% 1/4W	
A3R19	2100-1984	R:VARI CERMET FLM 100 OHM 30% LIN 1/2W	
A3T1	00105-8003	TRANSFORMER:POWER AMP	
C1	0160-3036	C:FXD CER 5000 PF +80-20% 200VDCW	
C2	0160-3036	C:FXD CER 5000 PF +80-20% 200VDCW	
C3	0160-3036	C:FXD CER 5000 PF +80-20% 200VDCW	
C4	0160-3036	C:FXD CER 5000 PF +80-20% 200VDCW	
C5	0160-2437	C:FXD CER 5000 PF +80-20% 200VDCW	
C6	0160-2437	C:FXD CER 5000 PF +80-20% 200VDCW	
C7	0160-2437	C:FXD CER 5000 PF +80-20% 200VDCW	
C8	0160-2437	C:FXD CER 5000 PF +80-20% 200VDCW	
J1	1250-0901	CONNECTOR:RF BULKHEAD	
J2	1250-0901	CONNECTOR:RF BULKHEAD	
J3	1250-0901	CONNECTOR:RF BULKHEAD	
J4	1250-0901	CONNECTOR:RF BULKHEAD	
L1	9100-2430	INDUCTOR:220 UH	

See introduction to this section for ordering information

Reference Designation	HP Part No.	Description #	Note
		PREFIX ALL PARTS A24	
L2	9100-2430	INDUCTOR:220 UH	
R1	0757-0948	RESD MET FLM 10K OHM 2% 1/4W	
R2	0757-0948	RESD MET FLM 10K OHM 2% 1/4W	
R3	0757-0948	RESD MET FLM 10K OHM 2% 1/4W	
R4	0757-0948	RESD MET FLM 10K OHM 2% 1/4W	
ST1	0440-0055	THERMOSTAT:ADJUSTABLE	
Y1	0410-0040	CRYSTAL:QUARTZ	
		MISCELLANEOUS	
	1205-0036	HEAT DISSIPATOR	
	00105-0006	POWER AMPLIFIER SHIELD	
	00105-0002	COVER:OVEN	
	00105-2001	COVER:CONNECTOR END	
	00105-2002	COVER:NON-CONNECTOR END	
	00105-6002	CHAMBER ASSY:INCL HR1 HR2 ST1 EXCEPT	
	00105-2015	COVER:CRYSTAL	
	00105-2014	BOARD BLANK	

See introduction to this section for ordering information

◊ Part No.	Description #	Mfr.	Mfr. Part No.	TQ	
				L	M
0121-0013	C:VAR AIR 6-100.5 PF	28480	0121-0013	1	
0130-0001	C:VAR CER 7-65PF 500VDCW	28480	0130-0001	1	
0130-0003	C:VAR CER 1.5-7 PF	28480	0130-0003	1	
0130-0015	C:VAR CER 9-50 PF	72982	3192-000-V2P0-470R		3
0130-0016	C:VAR CER 5-25 PF	28480	0130-0016	1	1
0130-0017	C:VAR CER 8-50 PF	28480	0130-0017	2	2
0140-0145	C:FXD MICA 22 PF 5%	28480	0140-0145	4	4
0140-0149	C:FXD MICA 470 PF 5%	28480	0140-0149	6	6
0140-0151	C:FXD MICA 820 PF 2%	28480	0140-0151	1	
0140-0152	C:FXD MICA 1000 PF 5% 300VDCW	04062	DM16F102J	1	
0140-0156	C:FXD MICA 1500 PF 2%	28480	0140-0156	1	1
0140-0159	C:FXD MICA 3000 PF 2%	28480	0140-0159	2	1
0140-0162	C:FXD MICA 4700 PF 10%	28480	0140-0162	1	1
0140-0166	C:FXD MICA 17,000PF 2% 300VDCW	28480	0140-0166	1	
0140-0169	C:FXD MICA 100 PF 5% 500VDCW	72982	654-01706A2	1	1
0140-0176	C:FXD MICA 100 PF 2%	28480	0140-0176	1	1
0140-0190	C:FXD MICA 39 PF 5%	28480	0140-0190	6	5
0140-0191	C:FXD MICA 56 PF 5%	28480	0140-0191	4	4
0140-0192	C:FXD MICA 68 PF 5%	28480	0140-0192	4	3
0140-0193	C:FXD MICA 82 PF 5%	28480	0140-0193	5	5
0140-0194	C:FXD MICA 110 PF 5%	28480	0140-0194	49	49
0140-0195	C:FXD MICA 130 PF 5% 300 VDCW	04062	DM15F131J 300V	32	31
0140-0196	C:FXD MICA 150 PF 5%	28480	0140-0196	24	23
0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	04062	RDM15FE181J3C	5	5
0140-0198	C:FXD MICA 200 PF 5%	28480	0140-0198	22	22
0140-0199	C:FXD MICA 240 PF 5%	28480	0140-0199	8	6
0140-0200	C:FXD MICA 390 PF 5%	28480	0140-0200	12	9
0140-0201	C:FXD MICA 12 PF 5%	28480	0140-0201	2	1
0140-0203	C:FXD MICA 10 PF 5%	28480	0140-0203	2	1
0140-0206	C:FXD MICA 270 PF 5%	28480	0140-0206	1	1
0140-0208	C:FXD MICA 680 PF 5%	28480	0140-0208	1	
0140-0209	C:FXD MICA 5.0 PF 10%	28480	0140-0209	1	
0140-0217	C:FXD MICA 140 PF 2%	28480	0140-0217	5	5
0140-0220	C:FXD MICA 200 PF 1% 300VDCW	28480	0140-0220		2
0140-0227	C:FXD MICA 340 PF 1% 300VDCW	28480	0140-0227		1
0150-0009	C:FXD CER 10/0.5 PF 500VDCW	72982	315-000-C0G0-100D	1	
0150-0012	C:FXD CER 0.01 UF 20% 1000VDCW	56289	29C214A3	2	2
0150-0035	C:FXD CER 20 PF 10% 500VDCW	71590	TYPE DD 200	2	2
0150-0042	C:FXD CER 11 4.7 PF 5% 500VDCW	78488	TYPE GA	2	2
0150-0050	C:FXD CER 1000 PF 400VDCW	77630	D8D		
0150-0061	C:FXD CER 20 PF 10% 100VDCW	56289	53C47	1	1
0150-0069	C:FXD CER 1000 PF +100-20% 500VDCW	72982	801-0100-C0G1022	1	1
0150-0073	C:FXD CER 100 PF 10% 500VDCW	56289	40C200A2	14	14
0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	91418	TA	1	19
0150-0115	C:FXD CER 27 PF 10% 500VDCW	72982	301-000-U2J0-270K	1	1
0150-0119	C:FXD CER 2 X 0.01 UF 20% 250WVAC	56289	36C219A	1	1
0150-0121	C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C50B1S-CML	14	14
0150-0122	C:FXD CER 2000 PF 20% 500VDCW	72982	801-000-Y5S-202M	2	0
0160-0126	C:FXD POR 180PF 2% 500VDCW	95275	VY13C181G	1	
0160-0127	C:FXD CER 1.0 UF 20% 25VDCW	56289	5C13C5-CML	9	9
0160-0130	C:FXD MY 0.022 UF 2% 600VDCW	84411	TYPE 663-UW	1	1
0160-0134	C:FXD MICA 220PF 5% 300VDCW	14655	RDM15F221J3C	10	11
0160-0153	C:FXD MY 1000 PF 10%	28480	0160-0153	1	1
0160-0155	C:FXD MY 5100 PF 10%	28480	0160-0155	1	
0160-0157	C:FXD MY 0.0047 UF 10% 200VDCW	28480	0160-0157	1	

See introduction to this section for ordering information

◊ Part No.	Description #	Mfr.	Mfr. Part No.	TQ	
				L	M
0160-0161	C:FXD MY 0.01 UF 10% 200VDCW	28480	0160-0161	9	2
0160-0162	C:FXD MY 0.022 UF 10% 200VDCW	28480	0160-0162	2	2
0160-0174	C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B75-CML	2	2
0160-0178	C:FXD MICA 27PF 5% 300VDCW	04062	RDM15E270J3S	2	2
0160-0179	C:FXD MICA 33 PF 5% 300VDCW	04062	DM15E330J 300V	2	2
0160-0180	C:FXD MY 3300PF 5%	28480	0160-0180	1	1
0160-0181	C:FXD MICA 30PF 5% 300VDCW	14655	RDM15E300J3S	1	1
0160-0194	C:FXD MY 0.015UF 10%	28480	0160-0194	2	1
0160-0196	C:FXD MICA 24PF 5% 300VDCW	04062	RDM15C240J3S	1	1
0160-0198	C:FXD MY 0.0015 UF 10% 200VDCW	56289	192P152Y2-PTS	1	1
0160-0314	C:FXD MY 0.01 UF 5% 400VDCW	84411	TYPE 663UW	1	1
0160-0341	C:FXD MICA 680 PF 1% 300VDCW	28480	0160-0341	1	1
0160-0369	C:FXD MICA 17 PF 5%	28480	0160-0369	1	1
0160-0374	C:FXD CER 0.001 UF 20% 75VDCW	12574	855-.001-98	21	21
0160-2197	C:FXD MICA 10 PF 5%	28480	0160-2197	1	1
0160-2199	C:FXD MICA 30 PF 5%	28480	0160-2199	1	1
0160-2229	C:FXD MICA 3000 PF 5%	28480	0160-2229	1	1
0160-2248	C:FXD CER 4.3 0.25 PF 500VDCW	28480	0160-2248	1	1
0160-2252	C:FXD CER 6.2-0.25 PF 500VDCW	72982	301-HPD-6.2 PF	1	1
0160-2260	C:FXD CER 12 PF 5% 500VDCW	72982	301-000-C0G0 130J	1	1
0160-2262	C:FXD CER 16 PF 5% 500VDCW	72982	301-HPD-16PF	1	1
0160-2306	C:FXD MICA 27 PF 5%	28480	0160-2306	15	15
0160-2327	C:FXD CER 100 PF 20% 75VDCW	28480	0160-2327	12	12
0160-2550	C:FXD CER 1.0 PF 500VDCW	72982	301-000-C0G0-1R0B	1	1
0160-2563	C:FXD CER 2000 PF 20% 500 VDCW	72982	801-012-Y5S-202M	2	2
0160-2930	C:FXD CER 0.01 UF +80 20% 100VDCW	91418	TA	27	25
0160-3028	C:FXD CER 10PF 10% 75VDCW	12574	MIN-C-10-K	2	2
0160-3029	C:FXD CER 7.5/0.5 PF 75VDCW	12574	MIN-C-7.5-D	2	2
0160-3277	C:FXD CER 0.01 UF 20% 50VDCW	96733	G5048R103M	2	2
0170-0024	C:FXD MY 0.022UF 20% 200VDCW	56289	192P22302	1	
0170-0040	C:FXD MY .047 UF 10% 200VDCW	28480	0170-0040	5	4
0170-0055	C:FXD MY 0.1UF +-5% 200VDCW	56289	192P10402	1	
0170-0084	C:FXD MY 0.068UF 20% 50VDCW	84411	601PE STYLE 5	1	1
0180-0022	C:FXD ELECT TA 4UF 10VDCW	56289	150D395X9035B2		1
0180-0047	C:FXD ELEC: 500 UF 75VDCW	56289	D32443 DFP	1	
0180-0049	C:FXD AL ELECT 20UF 50VDCW	56289	30D206G050DC4MI	1	
0180-0097	C:FXD ELECT 47UF 10% 35VDCW	56289	15C0476A90335	1	1
0180-0098	C:FXD ELECT 100 UF 20% 20VDCW	28480	0180-0098	2	2
0180-0100	C:FXD ELECT TA 4.7UF 10% 35VDCW	56289	150D475X9035B2	2	2
0180-0107	C:FXD ELECT 20UF -10/+100% 200VDCW	56289	CJ4154	1	1
0180-0117	C:FXD ELECT TA 2.7UF 10% 35VDCW	56289	150D275X9035 B2	2	4
0180-0129	C:FXD ELECT 975UF -10+50% 40VDCW	56289	D35782	2	2
0180-0130	C:FXD ELECT 1500UF -10+50% 15VDCW	00853	PL13-505-10C7-02	1	1
0180-0210	C:FXD ELECT 3.3 UF 20% 15VDCW	82376	TFS 3.3M-15	1	1
0180-0291	C:FXD ELECT 1UF 10% 35VDCW	56289	150D105X9035A2	1	2
0180-0393	C:FXD ELECT 39 UF 10% 10VDCW	56289	150D396X9010B2-DYS	1	1
0180-1745	C:FXD ELECT 1.5 UF 10% 20VDCW	28480	0180-1745		2
0180-1999	C:FXD ELECT 100 UF -10+100% 50VDCW	56289	D45786-DFP	1	1
0340-0038	FEEDTHRU:TERMINAL	28480	0340-0038	1	1
0340-0060	FEEDTHRU:INSULATED MOUNTING	28480	0340-0060	1	1
0370-0077	KNOB:5/8 SK BAR	28480	0370-0077	1	1
0370-0084	KNOB:ROUND SK 5/8 DIA	28480	0370-0084	1	1
0370-0099	KNOB:SKIRTED BAR 5/8 DIA	28480	0370-0099	1	1
0370-0134	KNOB:ROUND;RED 1/2 DIA	28480	0370-0134	1	1
0380-0111	SPACER:THREADED 1/4"	00866	D8D8	3	3

See introduction to this section for ordering information

# Part No.	Description #	Mfr.	Mfr. Part No.	TQ L.	TQ M.
0510-0123	FASTENER:PUSH-ON TYPE	78553	C1200B-014-4	1	1
0684-2405	RIFBD COMP 24 OHM 5% 1/8W	01121	BB 2405	4	4
0683-0475	RIFBD COMP 4.7 OHM 5% 1/4W	01121	CB 4765	7	7
0683-1015	RIFBD COMP 100 OHM 5% 1/4W	01121	CB 1015	14	11
0683-1025	RIFBD COMP 1000 OHM 5% 1/4W	01121	CB 1025	17	15
0683-1035	RIFBD COMP 10K OHM 5% 1/4W	01121	CB 1035	115	170
0683-1045	RIFBD COMP 100K OHMS 5% 1/4W	01121	CB 1045	36	36
0683-1055	RIFBD COMP 1 MEGOHM 5% 1/4W	01121	CB 1055	15	15
0683-1115	RIFBD COMP 110 OHM 5% 1/4W	01121	CB 1115	3	3
0683-1125	RIFBD COMP 1100 OHM 5% 1/4W	01121	CB 1125		1
0683-1135	RIFBD COMP 11K OHM 5% 1/4W	01121	CB 1135	1	
0683-1225	RIFBD COMP 1200 OHM 5% 1/4W	01121	CB 1225	3	3
0683-1235	RIFBD COMP 12K OHM 5% 1/4W	01121	CB 1235	8	7
0683-1245	RIFBD COMP 120K OHM 5% 1/4W	01121	CB 1245	5	5
0683-1305	RIFBD COMP 13 OHM 5% 1/4W	01121	CB 1305	1	
0683-1315	RIFBD COMP 130 OHM 5% 1/4W	01121	CB 1315	4	4
0683-1325	RIFBD COMP 1300 OHM 5% 1/4W	01121	CB 1325	2	2
0683-1335	RIFBD COMP 13K OHM 5% 1/4W	01121	CB 1335	1	1
0683-1505	RIFBD COMP 15 OHM 5% 1/4W	01121	CB 1505	1	1
0683-1515	RIFBD COMP 150 OHM 5% 1/4W	01121	CB 1515	1	
0683-1525	RIFBD COMP 1500 OHM 5% 1/4W	01121	CB 1525	8	6
0683-1535	RIFBD COMP 15K OHM 5% 1/4W	01121	CB 1535	16	14
0683-1545	RIFBD COMP 150K OHM 5% 1/4W	01121	CB 1545	11	11
0683-1625	RIFBD COMP 1600 OHM 5% 1/4W	01121	CB 1625	4	5
0683-1635	RIFBD COMP 16K OHM 5% 1/4W	01121	CB 1635	5	4
0683-1815	RIFBD COMP 180 OHM 5% 1/4W	01121	CB 1815	23	24
0683-1825	RIFBD COMP 1800 OHM 5% 1/4W	01121	CB 1825	8	5
0683-1835	RIFBD COMP 18K OHM 5% 1/4W	01121	CB 1835	1	
0683-1845	RIFBD COMP 180K OHM 5% 1/4W	01121	CB 1845	5	5
0683-2015	RIFBD COMP 200 OHM 5% 1/4W	01121	CB 2015	26	29
0683-2025	RIFBD COMP 2000 OHM 5% 1/4W	01121	CB 2025	7	8
0683-2035	RIFBD COMP 20K OHM 5% 1/4W	01121	CB 2035	4	4
0683-2705	RIFBD COMP 27 OHM 5% 1/4W	01121	CB 270.	2	1
0683-2715	RIFBD COMP 270 OHM 5% 1/4W	01121	CB 2715	3	3
0683-2725	RIFBD COMP 2.7K OHM 5% 1/4W	01121	CB 2725	8	8
0683-2235	RIFBD COMP 22K OHM 5% 1/4W	01121	CB 2235	15	15
0683-2245	RIFBD COMP 220K OHM 5% 1/4W	01121	CB 2245	2	2
0683-2405	RIFBD COMP 24 OHM 5% 1/4W	01121	CB 2405	2	2
0683-2425	RIFBD COMP 2400 OHM 5% 1/4W	01121	CB 2425	1	1
0683-2435	RIFBD COMP 24K OHM 5% 1/4W	01121	CB 2435	1	1
0683-2715	RIFBD COMP 270 OHM 5% 1/4W	01121	CB 2715	3	2
0683-2725	RIFBD COMP 2700 OHM 5% 1/4W	01121	CB 2725	10	8
0683-2735	RIFBD COMP 27K OHM 5% 1/4W	01121	CB 2735	10	10
0683-3025	RIFBD COMP 3000 OHM 5% 1/4W	01121	CB 3025	14	14
0683-3035	RIFBD COMP 30K OHM 5% 1/4W	01121	CB 3035	1	1
0683-3315	RIFBD COMP 330 OHM 5% 1/4W	01121	CB 3315	2	2
0683-3325	RIFBD COMP 3300 OHM 5% 1/4W	01121	CB 3325	14	14
0683-3615	RIFBD COMP 360 OHM 5% 1/4W	01121	CB 3615	1	1
0683-3625	RIFBD COMP 3600 OHM 5% 1/4W	01121	CB 3625	5	5
0683-3905	RIFBD COMP 39 OHM 5% 1/4W	01121	CB 3905	1	1
0683-3915	RIFBD COMP 390 OHM 5% 1/4W	01121	CB 3915	12	9
0683-3925	RIFBD COMP 3900 OHM 5% 1/4W	01121	CB 3925	91	91
0683-3945	RIFBD COMP 390K OHM 5% 1/4W	01121	CB 3945	32	32
0683-4315	RIFBD COMP 430 OHM 5% 1/4W	01121	CB 4315	2	2

See introduction to this section for ordering information

# Part No.	Description #	Mfr.	Mfr. Part No.	TQ L.	TQ M.
0683-4325	RIFBD COMP 4300 OHM 5% 1/4W	01121	CB 4325	1	1
0683-4335	RIFBD COMP 43K OHM 5% 1/4W	01121	CB 4335	45	45
0683-4705	RIFBD COMP 47 OHM 5% 1/4W	01121	CB 4705	6	6
0683-4715	RIFBD COMP 470 OHM 5% 1/4W	01121	CB 4715	25	24
0683-4725	RIFBD COMP 4700 OHM 5% 1/4W	01121	CB 4725		
0683-4735	RIFBD COMP 47K OHM 5% 1/4W	01121	CB 4735	129	139
0683-5105	RIFBD COMP 51 OHM 5% 1/4W	01121	CB 5105	1	1
0683-5115	RIFBD COMP 510 OHM 5% 1/4W	01121	CB 5115	11	11
0683-5125	RIFBD COMP 5100 OHM 5% 1/4W	01121	CB 5125	10	10
0683-5135	RIFBD COMP 51K OHM 5% 1/4W	01121	CB 5135		
0683-5615	RIFBD COMP 560 OHM 5% 1/4W	01121	CB 5615	1	1
0683-5625	RIFBD COMP 5600 OHM 5% 1/4W	01121	CB 5625	66	66
0683-5635	RIFBD COMP 56K OHMS 5% 1/4W	01121	CB 5635	1	1
0683-6705	RIFBD COMP 67 OHM 5% 1/4W	01121	CB 6705		
0683-6715	RIFBD COMP 670 OHM 5% 1/4W	01121	CB 6715		
0683-6725	RIFBD COMP 6700 OHM 5% 1/4W	01121	CB 6725	1	1
0683-6805	RIFBD COMP 68 OHM 5% 1/4W	01121	CB 6805	2	2
0683-6815	RIFBD COMP 680 OHM 5% 1/4W	01121	CB 6815	1	1
0683-6825	RIFBD COMP 6800 OHM 5% 1/4W	01121	CB 6825	48	48
0683-6835	RIFBD COMP 68K OHM 5% 1/4W	01121	CB 6835	14	14
0683-7505	RIFBD COMP 75 OHM 5% 1/4W	01121	CB 7505	1	1
0683-7515	RIFBD COMP 750 OHM 5% 1/4W	01121	CB 7515	2	2
0683-7525	RIFBD COMP 7500 OHM 5% 1/4W	01121	CB 7525	1	1
0683-7535	RIFBD COMP 75K OHM 5% 1/4W	01121	CB 7535	1	1
0683-8215	RIFBD COMP 820 OHM 5% 1/4W	01121	CB 8215	1	1
0683-8225	RIFBD COMP 8200 OHMS 5% 1/4W	01121	CB 8225	12	12
0683-8235	RIFBD COMP 82K OHM 5% 1/4W	01121	CB 8235	1	1
0683-9105	RIFBD COMP 91 OHM 5% 1/4W	01121	CB 9105	1	1
0683-9115	RIFBD COMP 910 OHM 5% 1/4W	01121	CB 9115	1	1
0683-9125	RIFBD COMP 9100 OHM 5% 1/4W	01121	CB 9125	1	1
0686-1041	RIFBD COMP 100K OHM 10% 1/4W	01121	EB 1041	1	1
0686-1025	RIFBD COMP 1000 OHM 5% 1/2W	01121	EB 1025	1	1
0686-1035	RIFBD COMP 10K OHM 5% 1/2W	01121	EB 1035	1	1
0686-1045	RIFBD COMP 100K OHM 5% 1/2W	01121	EB 1045	1	1
0686-1055	RIFBD COMP 1 MEGOHM 5% 1/2W	01121	EB 1055	1	1
0686-1225	RIFBD COMP 1200 OHM 5% 1/2W	01121	EB 1225	1	1
0686-1325	RIFBD COMP 1.3K OHM 5% 1/2W	01121	EB 1325	1	1
0686-1525	RIFBD COMP 1500 OHM 5% 1/2W	01121	EB 1525	1	1
0686-2035	RIFBD COMP 20K OHM 5% 1/2W	01121	EB 2035	1	1
0686-2225	RIFBD COMP 2200 OHM 5% 1/2W	01121	EB 2225	1	1
0686-2235	RIFBD COMP 22K OHM 5% 1/2W	01121	EB 2235	1	1
0686-2715	RIFBD COMP 270 OHM 5% 1/2W	01121	EB 2715	1	1
0686-2725	RIFBD COMP 2700 OHM 5% 1/2W	01121	EB 2725	1	1
0686-2735	RIFBD COMP 27K OHM 5% 1/2W	01121	EB 2735	1	1
0686-3015	RIFBD COMP 300 OHM 5% 1/2W	01121	EB 3015	1	1
0686-3025	RIFBD COMP 3000 OHM 5% 1/2W	01121	EB 3025	1	1
0686-3325	RIFBD COMP 3300 OHM 5% 1/2W	01121	EB 3325	1	1
0686-3625	RIFBD COMP 3600 OHM 5% 1/2W	01121	EB 3625	1	1
0686-4715	RIFBD COMP 470 OHM 5% 1/2W	01121	EB 4715	1	1
0686-4725	RIFBD COMP 4700 OHM 5% 1/2W	01121	EB 4725	1	1
0686-4735	RIFBD COMP 47K OHM 5% 1/2W	01121	EB 4735	1	1
0686-5135	RIFBD COMP 51K OHM 5% 1/2W	01121	EB 5135	1	1
0686-6215	RIFBD COMP 620 OHM 5% 1/2W	01121	EB 6215	1	1
0686-7525	RIFBD COMP 7500 OHM 5% 1/2W	01121	EB 7525	42	42

See introduction to this section for ordering information

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

◊ Part No.	Description #	Mfr.	Mfr. Part No.	TQ L	TQ M
0686-8215	RESISTOR:COMP 820 OHM 5% 1/2W	01121	EB 8215	3	2
0686-9125	RESISTOR:COMP 9100 OHM 5% 1/2W	01121	EB 9125	1	1
0687-3311	RESISTOR:COMP 330 OHM 10% 1/2W	01121	EB 3311		1
0689-0565	RESISTOR:COMP 5.6 OHM 5% 1W	01121	GB 5605	1	
0689-2035	RESISTOR:COMP 20K OHM 5% 1W	01121	GB 2035	1	1
0698-3111	RESISTOR:COMP 30 OHM 5% 1/8W	28480	0698-3111	1	1
0698-3113	RESISTOR:CARBON 100 OHM 5% 1/8W	28480	0698-3113	8	8
0698-3378	RESISTOR:CARBON 51 OHM 5% 1/8W	28480	0698-3378	3	3
0698-3381	RESISTOR:COMP 150 OHM 5% 1/8W	28480	0698-3381	1	1
0698-3435	RESISTOR:MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435	1	1
0698-5180	RESISTOR:COMP 2K OHM 5% 1/8W	28480	0698-5180	1	1
0698-5425	RESISTOR:COMP 8.2K OHM 10% 1/8W	28480	0698-5425	1	1
0698-5561	RESISTOR:COMP 6.8 OHM 5% 1/8W	28480	0698-5561	2	2
0698-5562	RESISTOR:CARBON 120 OHM 5% 1/8W	28480	0698-5562	2	2
0698-6449	RESISTOR:COMP 390 OHM 5% 1/8W	28480	0698-6449	1	1
0699-0002	RESISTOR:COMP 6.8 OHM 10% 1/2W	01121	EB 6801		1
0727-0081	RESISTOR:DEPC 600 OHM 1% 1/2W	28480	0727-0081	1	
0727-0105	RESISTOR:DEPC 1200 OHM 1% 1/2W	28480	0727-0105	1	
0727-0387	RESISTOR:DEPC 442 OHM 1% 1/2W	28480	0727-0387	1	
0757-0180	RESISTOR:MET FLM 31.6 OHM 1% 1/8W	28480	0757-0180	4	4
0757-0344	RESISTOR:MET FLM 1.00 MEGOHM 1% 1/4W	28480	0757-0344	1	1
0757-0350	RESISTOR:MET FLM 909K OHM 1% 1/4W	28480	0757-0350	1	1
0757-0368	RESISTOR:MET FLM 34 OHM 1% 1/8W	28480	0757-0368	2	2
0757-0378	RESISTOR:MET FLM 11.0 OHM 1% 1/8W	28480	0757-0378	1	1
0757-0420	RESISTOR:MET FLM 750 OHM 1% 1/8W	28480	0757-0420	2	2
0757-0893	RESISTOR:MET FLM 51 OHM 2% 1/4W	28480	0757-0893	1	2
0757-0894	RESISTOR:MET FLM 56 OHM 2% 1/4W	28480	0757-0894		1
0757-0898	RESISTOR:MET FLM 82 OHM 2% 1/4W	28480	0757-0898	1	1
0757-0900	RESISTOR:MET FLM 100 OHM 2% 1/4W	28480	0757-0900	4	4
0757-0902	RESISTOR:MET FLM 120 OHM 2% 1/4W	28480	0757-0902	3	3
0757-0904	RESISTOR:MET FLM 150 OHM 2% 1/4W	28480	0757-0904	1	1
0757-0905	RESISTOR:MET FLM 160 OHM 2% 1/4W	28480	0757-0905	1	1
0757-0906	RESISTOR:MET FLM 180 OHM 2% 1/4W	28480	0757-0906	1	1
0757-0907	RESISTOR:MET FLM 200 OHM 2% 1/4W	28480	0757-0907	11	11
0757-0908	RESISTOR:MET FLM 220 OHM 2% 1/4W	28480	0757-0908		1
0757-0909	RESISTOR:MET FLM 240 OHM 2% 1/4W	28480	0757-0909	4	4
0757-0911	RESISTOR:MET FLM 300 OHM 2% 1/4W	28480	0757-0911	2	2
0757-0912	RESISTOR:MET FLM 330 OHM 2% 1/4W	28480	0757-0912	1	1
0757-0914	RESISTOR:MET FLM 390 OHM 2% 1/4W	28480	0757-0914	2	2
0757-0916	RESISTOR:MET FLM 470 OHM 2% 1/4W	28480	0757-0916	2	2
0757-0917	RESISTOR:MET FLM 510 OHM 2% 1/4W	28480	0757-0917	3	3
0757-0918	RESISTOR:MET FLM 560 OHM 2% 1/4W	28480	0757-0918	1	1
0757-0920	RESISTOR:MET FLM 680 OHM 2% 1/4W	28480	0757-0920	1	2
0757-0922	RESISTOR:MET FLM 820 OHM 2% 1/4W	28480	0757-0922		1
0757-0923	RESISTOR:MET FLM 910 OHM 2% 1/4W	28480	0757-0923		1
0757-0924	RESISTOR:MET FLM 1.0K OHM 2% 1/4W	28480	0757-0924	22	23
0757-0926	RESISTOR:MET FLM 1.2K OHM 2% 1/4W	28480	0757-0926	1	3
0757-0928	RESISTOR:MET FLM 1.5K OHM 2% 1/4W	28480	0757-0928	1	1
0757-0929	RESISTOR:MET FLM 1.6K OHM 2% 1/4W	28480	0757-0929		1
0757-0930	RESISTOR:MET FLM 1800 OHM 2% 1/4W	28480	0757-0930	2	2
0757-0931	RESISTOR:MET FLM 2.0K OHM 2% 1/4W	28480	0757-0931	4	4
0757-0932	RESISTOR:MET FLM 2.2K OHM 2% 1/4W	28480	0757-0932	2	2
0757-0935	RESISTOR:MET FLM 3.0K OHM 2% 1/4W	28480	0757-0935	3	3
0757-0936	RESISTOR:MET FLM 3.3K OHM 2% 1/4W	28480	0757-0936	2	2
0757-0938	RESISTOR:MET FLM 3.9K OHM 2% 1/4W	28480	0757-0938	1	2
0757-0940	RESISTOR:MET FLM 4.7K OHM 2% 1/4W	28480	0757-0940	3	3
0757-0946	RESISTOR:MET FLM 8.2K OHM 2% 1/4W	28480	0757-0946	4	4
0757-0948	RESISTOR:MET FLM 10K OHM 2% 1/4W	28480	0757-0948	8	8
0757-0950	RESISTOR:MET FLM 12K OHM 2% 1/4W	28480	0757-0950	2	2
0757-0952	RESISTOR:MET FLM 15K OHM 2% 1/4W	28480	0757-0952	4	4
0757-0953	RESISTOR:MET FLM 16K OHM 2% 1/4W	28480	0757-0953	8	8
0757-0972	RESISTOR:MET FLM 100K OHM 2% 1/4W	28480	0757-0972	3	4
0758-0004	RESISTOR:MET OX 2700 OHM 5% 1/2W	28480	0758-0004	6	6
0758-0014	RESISTOR:MET FLM 180 OHM 5% 1/2W	28480	0758-0014	1	1
0758-0015	RESISTOR:MET OX 220 OHM 5% 1/2W	28480	0758-0015	1	1
0758-0023	RESISTOR:MET OX 240 OHM 5% 1/2W	28480	0758-0023	1	1
0758-0024	RESISTOR:MET OX 100 OHM 5% 1/2W	28480	0758-0024	1	1
0758-0028	RESISTOR:MET OX 270 OHM 5% 1/2W	28480	0758-0028	1	1
0758-0030	RESISTOR:MET OX 510 OHM 5% 1/2W	28480	0758-0030	1	1
0758-0043	RESISTOR:MET OX 1800 OHM 5% 1/2W	28480	0758-0043	1	2
0758-0045	RESISTOR:MET OX 3900 OHM 5% 1/2W	28480	0758-0045	2	2
0761-0005	RESISTOR:MET OX 2200 OHM 5% 1W	28480	0761-0005	2	2
0761-0010	RESISTOR:MET OX 1.8K OHM 5% 1W	28480	0761-0010	2	
0767-0001	RESISTOR:MET FLM 400 OHM 5% 3W	28480	0767-0001	1	
1200-0043	INSULATOR:TRANSISTOR MOUNTING	71785	293011	1	1
1200-0076	INSULATOR:TRANSISTOR	02735	DF 14A	1	1
1200-0081	BUSHING:INSULATOR NYLON	76365	9745SPECIAL	1	1
1200-0092	BUSHING:TRANSISTOR	02735	495334 1	1	1
1250-0118	CONNECTOR:BNC	28480	1250-0118	7	8
1250-0911	CONNECTOR:RF "HOT" 50 OHM	98291	51-001-0020		1
1251-0101	CONNECTOR:FEMALE 50-CONTACT	28480	1251-0101	2	2
1251-0135	CONNECTOR:BODY 15 PIN	28480	1251-0135	22	21
1261-2357	CONNECTOR:POWER 3 PIN MALE	87930	1069-1	1	1
1251-0159	CONNECTOR:2X15 CONTACT	28480	1251-0159	1	1
1251-1669	CONNECTOR:PC 10 CONTACTS	28480	1251-1669	2	2
1251-1670	CONNECTOR:PC 15 CONTACTS(2 REQ'D)	28480	1251-1670	1	1
1400-0084	FUSEHOLDER:EXTRACTION POST TYPE	79315	3420.4	1	1
1450-0049	INDICATOR:GLOW-LAMP NEON	28480	1450-0049	1	1
1450-0352	LIGHT:INDICATOR	72765	792A	1	1
1490-0030	STAND:TILT	28480	1490-0030	1	1
1520-0001	PLATE:MOUNTING ELECTROLYTIC CAPACITOR	28480	1520-0001	1	1
1520-0003	PLATE:MOUNTING	90201	BP2	1	1
1820-0054	INTEGRATED CIRCUIT	28480	1820-0054	1	1
1820-0068	INTEGRATED CIRCUIT	28480	1820-0068	1	1
1820-0077	INTEGRATED CIRCUIT	28480	1820-0077	2	2
1820-0082	CIRCUIT:HP 5086-0002	28480	1820-0082		1
1820-0322	INTEGRATED CIRCUIT	28480	1820-0322	1	
1850-0040	TRANSISTOR:GERMANIUM PNP	28480	1850-0040	3	3
1850-0048	TRANSISTOR:GERMANIUM 2N650 PNP	04713	2N650	1	1
1854-0054	TRANSISTOR:SILICON PNP 2N652A	04713	2N652A	2	
1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	28480	1850-0062	61	61
1850-0077	TRANSISTOR:GERMANIUM 2N1397 PNP	86684	2N1397	1	1
1850-0090	TRANSISTOR:GERMANIUM PNP 2N1838	02735	2N1838	1	
1850-0091	TRANSISTOR:GERMANIUM 2N2048 PNP	87216	2N2048	1	
1850-0092	TRANSISTOR:GERMANIUM 2N2043A PNP	04713	2N2043	3	
1850-0098	TRANSISTOR:GERMANIUM PNP SELECTED	28480	1850-0098	3	3

See introduction to this section for ordering information

↓ Part No.	Description #	Mfr.	Mfr. Part No.	TQ L	TQ M
1850-0101	TRANSISTOR:SPL 2N582	28480	1850-0101	1	1
1851-0017	TRANSISTOR:2N1304	01295	2N1304	2	2
1851-0024	TRANSISTOR:GERMANIUM NPN	01295	2N388A	1	1
1853-0001	TRANSISTOR:PNP SILICON 30V 900MW	28480	1853-0001	4	5
1853-0009	TRANSISTOR:SILICON PNP	28480	1853-0009	14	7
1853-0015	TRANSISTOR:SILICON PNP 2N3640	28480	1853-0015	16	17
1853-0034	TRANSISTOR:SILICON PNP	28480	1853-0034	11	17
1853-0036	TRANSISTOR:SILICON PNP	28480	1853-0036		1
1854-0003	TRANSISTOR:NPN SILICON	28480	1854-0003	16	18
1854-0005	TRANSISTOR:SILICON NPN 2N708	02735	2N708	19	23
1854-0009	TRANSISTOR:SILICON NPN 2N709	07263	2N709	11	11
1854-0020	TRANSISTOR:NPN SILICON	28480	1854-0020		1
1854-0022	TRANSISTOR:NPN SILICON	28480	1854-0022	1	1
1854-0048	TRANSISTOR:SILICON NPN 2N2857	28480	1854-0048	7	7
1854-0071	TRANSISTOR:SILICON NPN	28480	1854-0071	3	3
1854-0073	TRANSISTOR:SILICON NPN	28480	1854-0073	1	1
1854-0094	TRANSISTOR:SILICON NPN	28480	1854-0094	6	6
1854-0249	TRANSISTOR:DUAL NPN SILICON	28480	1854-0249	2	2
1854-0262	TRANSISTOR:SILICON NPN	28480	1854-0262	8	8
1854-0315	TRANSISTOR:SILICON NPN 2N3633	03877	2N3633	9	9
1855-0047	TRANSISTOR:DUAL N-CHANNEL FET	28480	1855-0047	2	2
1901-0025	DIODE:SILICON 100MW 100MA	28480	1901-0025	119	118
1901-0026	DIODE:SILICON 0.75A 200 PIV	28480	1901-0026	5	
1901-0029	DIODE:SILICON 600 PIV	28480	1901-0029	4	4
1901-0033	DIODE:SILICON 100MA 180MW	28480	1901-0033	2	2
1901-0040	DIODE:SILICON 30MA 30MW	28480	1901-0040	57	62
1901-0045	DIODE:SILICON 100PIV	28480	1901-0045	8	12
1901-0049	DIODE:SILICON 50PIV	28480	1901-0049	4	4
1901-0092	DIODE:SILICON 20MV STEP RECOVERY	28480	1901-0092	1	1
1901-0114	DIODE:SILICON 10MV	28480	1901-0114	2	2
1901-0345	DIODE:SILICON HOT CARRIER 5MIV	28480	1901-0345	16	16
1901-0376	DIODE:SILICON 35V	28480	1901-0376	4	4
1902-0017	DIODE:BREAKDOWN 6.81V 10% 400 MW	28480	1902-0017	2	2
1902-0032	DIODE BREAKDOWN:5.49V 5%	28480	1902-0032	1	1
1902-0039	DIODE BREAKDOWN:1N1597A	04713	1N1579A	1	
1902-0041	DIODE:BREAKDOWN 5.11V 5% 400MW	28480	1902-0041	4	4
1902-0057	DIODE BREAKDOWN:6.49V	28480	1902-0057	1	1
1902-0173	DIODE BREAKDOWN:9.53V 5%	28480	1902-0173	1	1
1902-0214	DIODE:SILICON BREAKDOWN 56.2V 10%	28480	1902-0214	1	1
1902-0247	DIODE:MATCHED PAIR 20V 1%	28480	1902-0247		1
1902-0580	DIODE BREAKDOWN:6.75V 2%	28480	1902-0580	4	4
1902-3002	DIODE BREAKDOWN:2.37V 5%	28480	1902-3002	2	2
1902-3059	DIODE BREAKDOWN:SILICON 3.83V 5%	28480	1902-3059	1	1
1902-3182	DIODE BREAKDOWN:SILICON 12.1V 5%	28480	1902-3182		1
1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	28480	1910-0016	67	64
1912-0012	DIODE GERMANIUM TUNNEL 3MA	28480	1912-0012	3	3
1910-0009	ELECTRON TUBE:INDICATOR 10 DIGIT	83594	B5991	8	8
2100-0318	RIVAR 250K OHM 20% 1/4W/SPST SW	28480	2100-0318	1	1
2100-0354	RIVAR WW 1000 OHM 10% LIN 2W	28480	2100-0354	1	
2100-0961	RIVAR WW 1K OHM 5% 1W	28480	2100-0961	1	1
2100-1412	RIVAR COMP 500 OHM 20% LIN 1/4W	28480	2100-1412	3	3
2100-1513	RIVAR WW 50 OHM 5% LIN 1W	28480	2100-1513	2	2
2100-1772	RIVAR WW 500 OHM 10% LIN 1/2W	28480	2100-1772	1	1

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↓ Part No.	Description #	Mfr.	Mfr. Part No.	TQ L	TQ M
2100-1924	R:VAR COMP 5K OHM 20% LIN 1/5W	28480	2100-1924	1	1
2100-2430	R:VAR WW 20K OHM 10% LIN 1W	28480	2100-2430		1
2110-0303	FUSE:CARTRIDGE 7AMP 250V SLOW BLOW	71400	MDL2	1	1
2110-0312	FUSE:CARTRIDGE 1AMP 250V SLOW BLOW	75915	313001	1	1
2140-0015	LAMP:GLOW NEON NE-2H	24455	NE 2H	4	4
2140-0028	LAMP:GLOW 1/15W	24455	NE 2E FROSTED	1	1
3100-0390	SWITCH:ROT 2-SECT 9-POS HP SPEC	28480	3100-0390		1
3100-1876	SWITCH:ROTARY	28480	3100-1876	1	
3100-2067	SWITCH:ROTARY 1 SECT 3 POS	28480	3100-2067		1
3100-2491	SWITCH:ROTARY 5 POS, 4SECT	28480	3100-2491	1	1
3100-2492	SWITCH:ROTARY 10 POS, 7 SECT	28480	3100-2492	1	1
3100 7493	SWITCH:ROTARY 11 POS, 10 SECT	28480	3100-2493		1
3101-0014	SWITCH:PUSHBUTTON SPDT	82389	45-1106	1	1
3101-0272	SWITCH:SLIDE 4PDT	42190	6633JQ	1	1
3101-0037	SWITCH:TOGGLE SPST	04009	81050-E		1
3101-1342	SWITCH:SLIDE SPDT 0.5A	79727	7202	1	1
3140-0052	MOTOR:SHADED POLE	28480	3140-0052		1
3150-0037	FILTER:AIR	28480	3150-0037	1	1
3160-0060	FAN BLADE:PROPELLER	28480	3160-0060	1	1
3160-0097	FAN:TUBE AXIAL	28480	3160-0097	1	1
5000-0051	TRIM STRIP	28480	5000-0051	2	2
5000-0738	COVER:REAR SIDE PLATE	28480	5000-0738	2	2
5000-0739	COVER:FRONT SIDEPLATE	28480	5040-0170	2	2
5040-0170	SUPPORT:BOARD(A1,A2)	28480	5040-0732	2	2
5040-0732	SIDE FRAME ASSY	28480	5060-0763	2	2
5060-0763	HANDLE ASSY-SIDE	28480	5060-0766	2	2
5060-0766	HANDLE ASSY:RETAINER	28480	5060-0767	4	4
5060-0767	FOOT ASSY:FM	28480	5060-0031	1	1
5080-0031	CRYSTAL:QUARTZ 1.0MHZ	28480	5060-0060	40	40
5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	28480	7120-0249	1	1
7120-0249	NAMEPLATE:DELCAL	28480	7120-1819	1	1
7120-1819	PLATE:SERIAL LICENSE	28480	8120-0078	1	1
8120-1348	CABLE ASSY:POWER CORD	28480	9100-0166	1	1
9100-0166	TRANSFORMER:POWER	36196	H-10886	1	1
9100-0346	COIL:FXD 0.05 UH 20%	28480	9100-0348	1	1
9100-0348	COIL:FXD 1.0 UH 1%	28480	9100-2247	5	5
9100-2247	COIL:FXD RF 0.10 UH 10%				
9100-2250	COIL/CHOKE 0.18 UH 10%	28480	9100-2250	1	1
9100-2251	COIL:FXD RF 0.22 UH 10%	28480	9100-2251	1	1
9100-2439	TRANSFORMER:POWER	28480	9100-2439	1	1
9100-2829	TRANSFORMER	28480	9100-2829	1	1
9100-2830	CHOKE:0.040 HY	28480	9100-2830	1	1
9140-0125	COIL:VAR 0.9-1.9 UH	28480	9140-0125	1	
9140-0126	COIL:VAR 1.76-4.02 NH	28480	9140-0126	2	2
9140-0127	COIL:VAR 8.3-18.7 UH	28480	9140-0127	2	2
9140-0136	COIL:FXD RF 22 UH	28480	9140-0136	1	1
9140-0137	COIL:FXD RF 1 MH 5%	28480	9140-0137	3	3
9140-0138	COIL/CHOKE 180 UH 5%	28480	9140-0138	1	1
9140-0141	COIL:FXD RF 0.68 UH	28480	9140-0141	1	1
9140-0144	COIL:FXD RF 4.7 UH	28480	9140-0144	2	2
9140-0145	COIL:FXD RF 8.2 UH	28480	9140-0145	2	2
9140-0146	COIL:FXD RF 10.0 UH	99800	1025-44		1
9140-0158	COIL:FXD RF 1 UH 10%	99800	1025-20	1	
9140-0159	COIL:FXD 0.47UH 20%	99800	1025-SERIES	1	1
9140-0161	COIL:FXD 3400UH 5%	99800	2500-54	1	1
9140-0170	COIL:FXD RF 0.15 UH 20%	36196	IA 1503M		1

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↯ Part No.	Description #	Mfr.	Mfr. Part No.	TQ	
				L	M
00105-6012	CRYSTAL OSC/OVEN ASSY	28480	00105-6012		1
05212-2001	BOARD:BLANK PC	28480	05212-2001	5	5
05212-6002	BOARD ASSY:DECIMAL +1248	28480	05212-6002	5	5
05212-6014	READOUT BLOCK ASSY	28480	05212-6014	8	8
05232-2011	BOARD:BLANK PC	28480	05232-2011	1	1
05232-6009	ASSY:DECADE DIVIDER BOARD	28480	05232-6009	1	1
05232-6014	ASSY:DECIMAL COUNTER (5 MHZ)	28480	05232-6014	1	1
05243-0007	RETAINER:LATCH	28480	05243-0007	1	1
05243-0008	RETAINER:FRONT PANEL	28480	05243-0008	1	1
05243-2013	PANEL	28480	05243-2013	1	1
05243-2014	SHAFT:LATCH	28480	05243-2014	1	1
05243-2015	KNOB	28480	05243-2015	1	1
05243-2018	HOUSING:PLUG IN	28480	05243-2018	1	1
05243-2019	PANEL:PLUG IN (LIGHT GRAY)	28480	05243-2019	1	1
05243-2023	PANEL: PLUG-IN (MINT GRAY)	28480	05243-2023	1	1
05245-0012	BRACKET:SWITCH	28480	05245-0012	1	1
05245-0018	GUSSET:MODULE	28480	05245-0018		1
05245-2008	BOARD:BLANK PC	28480	05245-2008	1	
05245-2014	BOARD:BLANK PC	28480	05245-2014	1	1
05245-2016	COUPLER	28480	05245-2016	1	1
05245-2023	BOARD:BLANK PC	28480	05245-2023		1
05245-2024	BOARD:BLANK PC	28480	05245-2024		1
05245-4001	INSERT:UNITS READOUT	28420	05245-4001		1
05245-4003	READOUT COVER:AMBER	28480	05245-4003	1	1
05245-6004	CABLE:PRINTER OUTPUT	28480	05245-6004	1	1
05245-6013	BOARD ASSY:OSCILLATOR	28480	05245-6013	1	
05245-6014	ASSY:INPUT AMPLIFIER BOARD	28480	05245-6014	1	1
05245-6023	ASSY:MULTIPLIER/DIVIDER BOARD	28480	05245-6023		1
05245-6024	ASSY:OVEN POWER SUPPLY BOARD	28480	05245-6024		1
05245-6025	CABLE ASSY:EFC	28480	05245-6025		1
05245-6027	CABLE ASSY:LOW LEVEL OUTPUT	28480	05245-6027		1
05245-6036	CABLE ASSY:OSCILLATOR OUTPUT	28480	05245-6036		1
05247-2002	BOARD:BLANK	28480	05247-2002	1	1
05247-2004	BOARD:BLANK	28480	05247-2004	1	1
05247-2009	BOARD:BLANK PC	28480	05247-2009	1	1
05247-2010	BOARD:BLANK	28480	05247-2010	1	1
05247-6001	BOARD ASSY:DECIMAL COUNTER	28480	05247-6001	1	1
05247-6002	BOARD ASSY:MI-FREQ	28480	05247-6002	1	1
05247-6008	BOARD ASSY:READOUT	28480	05247-6008	1	1
05247-6010	ASSY:SAMPLING CONTROL BOARD	28480	05247-6010	1	1
05247-8002	COIL:IFBD RF	28480	05247-8002	2	2
05248-00001	BRACKET:SHIELD	28480	05248-00001	1	1
05248-00002	CHASSIS:MAIN	28480	05248-00002	1	
05248-00003	PANEL:REAR	28480	05248-00003	1	
05248-00004	PANEL:REAR	28480	05248-00004		1
05248-00005	CHASSIS:MAIN	28480	05248-00005		1
05248-00006	CHASSIS:AMPLIFIER	28480	05248-00006	1	1
05248-20001	BOARD:BLANK PC	28480	05248-20001	1	1
05248-20002	BOARD:BLANK PC	28480	05248-20002	1	1
05248-20003	BOARD:BLANK PC	28480	05248-20003	1	1
05248-20004	BOARD:BLANK PC	28480	05248-20004	1	1
05248-20007	BOARD:BLANK PC	28480	05248-20007	1	1
05248-20008	BOARD:BLANK PC	28480	05248-20008	1	1
05248-20009	PANEL:FRONT	28480	05248-20009	1	
05248-20010	PANEL:FRONT	28480	05248-20010		1

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↯ Part No.	Description #	Mfr.	Mfr. Part No.	TQ	
				L	M
05248-20013	BOARD:BLANK PC	28480	05248-20013	1	1
05248-20014	BOARD:BLANK PC	28480	05248-20014	1	1
05248-60001	BOARD ASSY:AMPLIFIER A	28480	05248-60001	1	1
05248-60002	BOARD ASSY:MULTIPLIER	28480	05248-60002	1	1
05248-60003	BOARD ASSY:FUNCTION CONT	28480	05248-60003	1	1
05248-60004	BOARD ASSY:TIME BASE CONTROL	28480	05248-60004	1	1
05248-60007	BOARD ASSY:DECIMAL POINT	28480	05248-60007	1	1
05248-60008	BOARD ASSY:MEASUREMENT UNITS	28480	05248-60008	1	1
05248-60009	CABLE ASSY:SWITCH	28480	05248-60009	1	1
05248-60010	SWITCH ASSY:ATTENUATOR	28480	05248-60010	1	1
05248-60013	BOARD ASSY:GATE CONT	28480	05248-60013	1	1
05248-60014	BOARD ASSY:OUTPUT AMPLIFIER	28480	05248-60014	1	1
05248-60015	SWITCH ASSY:OUTPUT	28480	05248-60015	1	1
05248-60020	PCB:MODE SWITCH	28480	05248-60020	1	1
10503-6001	CABLE ASSY: BNC BNC	28480	10503-6001	1	1
5212A-41B	COVER:PLATE	28480	5212A-41B	1	1
5212A-65C	DECADE DIVIDER	28480	5212A-65C	6	6
5212A-65C-1	BOARD:BLANK	28480	5212A-65C-1	6	6
5212L-83A	SUPPORT:READOUT	28480	5212L-83A	1	1
5212L-83B	READOUT:UNITS	28480	5212L-83B	1	1
5243A-1B	COVER:BOTTOM	28480	5243A-1B	1	
5243A-1C	COVER:TOP	28480	5243A-1C	1	1
5243A-12E	SUPPORT:CAPACITOR	28480	5243A-12E	1	1
5243A-12F	BRACKET:CRYSTAL OVEN	28480	5243A-12F	1	1
5243A-16B	CABLE ASSY:OVEN POWER SUPPLY	28480	5243A-16B	1	1
5243A-20A	HOUSING:FAN	28480	5243A-20A	1	
5243A-44A	KIT:5-1/4" RACK MOUNT	28480	5243A-44A	1	
5243A-47C	SUPPORT:PANEL(BLUE)	28480	5243A-47C	1	1
5243A-55A	SHIELD:DISC	28480	5243A-55A	1	1
5243A-65C-1	BOARD:BLANK PC	28480	5243A-65C-1	1	1
5243A-65H	ASSY:REGULAR BOARD	28480	5243A-65H	1	
5243A-65H-1	BOARD:BLANK	28480	5243A-65H-1	1	
5243A-65L	ASSY:SELECTIFIER BOARD	28480	5243A-65L	1	1
5243A-65L-1	BOARD:BLANK	28480	5243A-65L-1	1	1
5243A-65T	BOARD ASSY:OVEN CONTROL	28480	5243A-65T	1	1
5243A-65T-1	BOARD:BLANK PC	28480	5243A-65T-1	1	
5243A-69A	ASSY:CRYSTAL OVEN	28480	5243A-69A	1	
5243A-69A-1	BOARD:BLANK PC	28480	5243A-69A-1	1	
5243L-107A	BAR	28480	5243L-107A	1	1
5243L-110A	GUIDE BOARD:FRONT	28480	5243L-110A	1	1
5243L-110B	GUIDE BOARD:REAR	28480	5243L-110B	1	1
5243L-12A	GLASS:TIMEBASE	28480	5243L-12A	1	
5243L-12B	BRACKET:BOARD	28480	5243L-12B	1	1
5243L-17A	BUSHING:LATCH	28480	5243L-17A	1	1
5243L-41A	PLATE:CASTING	28480	5243L-41A	1	1
5243L-83A	HOLDER:DECIMAL	28480	5243L-83A	1	1
5243L-91A	SPRING:LATCH	28480	5243L-91A	2	2
5245A-65C	ASSY:DECIMAL COUNTER	28480	5245A-65C	1	1
5245L-6028	SWITCH ASSY:MODE	28480	5245L-6028		1
5275A-60D	TRANSFORMER:VAR RF	28480	5275A-60D	1	
5275A-60E	COIL:IFBD RF	28480	5275A-60E	1	1
5275A-60F	COIL:IFBD RF	28480	5275A-60F	1	1
5275A-60G	COIL:IFBD RF	28480	5275A-60G	1	1

See introduction to this section for ordering information

Reference Designation	↳ Part No.	Description #	Note
A8	05248-60018	ASSY:DECIMAL POINT BOARD(+1224)OPT 02	
	05248-20018	BOARD:BLANK PC	
A8CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR9	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR10	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR11	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR12	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR13	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR14	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR15	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR16	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR17	1901-0025	DIODE:SILICON 100WV 100MA	
A8CR18	1901-0025	DIODE:SILICON 100WV 100MA	
A8DS1	2140-0028	LAMP:GLOW 1/15W	
A8DS2	2140-0028	LAMP:GLOW 1/15W	
A8DS3	2140-0028	LAMP:GLOW 1/15W	
A8DS4	2140-0028	LAMP:GLOW 1/15W	
A8DS5	2140-0028	LAMP:GLOW 1/15W	
A8DS6	2140-0028	LAMP:GLOW 1/15W	
A8DS7	2140-0028	LAMP:GLOW 1/15W	
A8DS8	2140-0028	LAMP:GLOW 1/15W	
A8R1	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R2	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R3	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R4	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R5	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R6	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R7	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R8	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R9	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R10	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R11	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R12	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R13	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R14	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R15	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A8R16	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A8R17	0683-1245	R:FXD COMP 120K OHM 5% 1/4W	
A8R18	0683-1245	R:FXD COMP 120K OHM 5% 1/4W	
A8R19	0683-1245	R:FXD COMP 120K OHM 5% 1/4W	
A8R20	0683-1245	R:FXD COMP 120K OHM 5% 1/4W	

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Reference Designation	↳ Part No.	Description #	Note
A9	52491-6501	ASSY:MEASUREMENT UNITS(+1224)OPT 02	
	52491-6501-1	BOARD:BLANK PC	
A9C1	0150-0012	C:FXD CER 0.01 UF 20% 1000VDCW	
A9CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR9	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR10	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR11	1901-0025	DIODE:SILICON 100WV 100MA	
A9CR12	1901-0025	DIODE:SILICON 100WV 100MA	
A9DS1	2140-0015	LAMP:GLOW NEON NE-2H	
A9DS2	2140-0015	LAMP:GLOW NEON NE-2H	
A9DS3	2140-0015	LAMP:GLOW NEON NE-2H	
A9DS4	2140-0015	LAMP:GLOW NEON NE-2H	
A9DS5	2140-0015	LAMP:GLOW NEON NE-2H	
A9DS6	2140-0015	LAMP:GLOW NEON NE-2H	
A9R1	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A9R2	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A9R3	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A9R4	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A9R5	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A9R6	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A9R7	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A9R8	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A9R9	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A9R10	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A9R11	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A9R12	0683-1055	R:FXD COMP 51K OHM 5% 1/4W	
A9R13	0683-1245	R:FXD COMP 120K OHM 5% 1/4W	
A9R14	0683-1245	R:FXD COMP 120K OHM 5% 1/4W	
A9R15	0683-1245	R:FXD COMP 120K OHM 5% 1/4W	
A9R16	0683 1245	R:FXD COMP 120K OHM 5% 1/4W	
A10	05212-6016	ASSY:DECIMAL COUNTING BOARD(+1224)OPT 02	
	05212-2016	BOARD:BLANK PC	
	05212-6011	READOUT BLOCK ASSY	
A10C1	0140-0190	C:FXD MICA 39 PF 5%	
A10C2	0140-0185	C:FXD MICA 22 PF 5%	
A10C3	0140-0193	C:FXD MICA 82 PF 5%	
A10C4	0140-0193	C:FXD MICA 82 PF 5%	
A10C5	0140-0204	C:FXD MICA 47 PF 5% 500VDCW	
A10C6	0140-0197	C:FXD MICA 180 PF 5% 300VDCW	
A10C7	0160-2203	C:FXD MICA 91 PF 5%	
A10C8	0140-0192	C:FXD MICA 68 PF 5%	
A10C9	0140-0197	C:FXD MICA 180 PF 5% 300VDCW	
A10C10	0140-0217	C:FXD MICA 390 PF 2%	

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Reference Designation	ϟ Part No.	Description #	Note
A10C11	0160-2203	C:FXD MICA 91 PF 5%	
A10C12	0140-0193	C:FXD MICA 82 PF 5%	
A10C13	0160-2206	C:FXD MICA 160 PF 5%	
A10C14	0140-0195	C:FXD MICA 130 PF 5% 300VDCW	
A10C15	0160-2206	C:FXD MICA 160 PF 5%	
A10CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A10CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A10CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A10CR4	1901-0025	DIODE:SILICON 00WV 100MA	
A10CR5	1901-0025	DIODE:SILICON 00WV 100MA	
A10CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A10CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A10CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A10CR9	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR10	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR11	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR12	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR13	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR14	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR15	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR16	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR17	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR18	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10DS1		NSR PART OF READOUT BLOCK ASSY	
A10DS2		NSR PART OF READOUT BLOCK ASSY	
A10DS3		NSR PART OF READOUT BLOCK ASSY	
A10DS4		NSR PART OF READOUT BLOCK ASSY	
A10DS5		NOT ASSIGNED	
A10DS6	1970-0009	ELECTRON TUBE:INDICATOR 10 DIGIT	
A10Q1	5080-0060	TRANSISTOR:GERMANIUM PNP	
A10Q2	5080-0060	TRANSISTOR:GERMANIUM PNP	
A10Q3	5080-0060	TRANSISTOR:GERMANIUM PNP	
A10Q4	5080-0060	TRANSISTOR:GERMANIUM PNP	
A10Q5	5080-0060	TRANSISTOR:GERMANIUM PNP	
A10Q6	5080-0060	TRANSISTOR:GERMANIUM PNP	
A10Q7	5080-0060	TRANSISTOR:GERMANIUM PNP	
A10Q8	5080-0060	TRANSISTOR:GERMANIUM PNP	
A10R1	0686-4735	R:FXD COMP 47K OHM 5% 1/2W	
A10R2		NSR PART OF READOUT BLOCK ASSY	
A10R3-A10R5		NOT ASSIGNED	
A10R6	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A10R7	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A10R8	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A10R9	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A10R10	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R11	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A10R12	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A10R13	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R14	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R15	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	

See introduction to this section for ordering information

Reference Designation	ϟ Part No.	Description #	Note
A10R16	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R17	0683-1815	R:FXD COMP 180 OHM 5% 1/4W	
A10R18	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R19	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R20	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A10R21	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A10R22	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R23	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R24	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A10R25	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R26	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A10R27	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A10R28	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R29	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R30	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R31	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R32	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R33	0683-1815	R:FXD COMP 180 OHM 5% 1/4W	
A10R34	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A10R35	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R36	0683-8225	R:FXD COMP 8200 OHM 5% 1/4W	
A10R37	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A10R38	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R39	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A10R40	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A10R41	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R42	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R43	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R44	0683-8225	R:FXD COMP 8200 OHM 5% 1/4W	
A10R45	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R46	0683-1815	R:FXD COMP 180 OHM 5% 1/4W	
A10R47	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R48	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R49	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R50	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A10R51	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R52	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A10R53	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A10R54	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R55	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R56	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R57	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R58	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R59	0683-1815	R:FXD COMP 180 OHM 5% 1/4W	
A10R60	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R61	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R62	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R63	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A10R64	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A10R65	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A10V1		NSR PART OF READOUT BLOCK ASSY	
A11		SAME AS A10; USE PREFIX A11	
A12		SAME AS A10; USE PREFIX A12	
A13		SAME AS A10; USE PREFIX A13	
A14		SAME AS A10; USE PREFIX A14	

See introduction to this section for ordering information

Table 6-3. Reference Designation Index (Option 02) Cont'd.

Reference Designation	HP Part No.	Description #	Note
A15	05232-6010	ASSY:DECIMAL COUNTER W/APDC(+1234)OPT 02	
	05232-2010	BOARD:BLANK PC	
	05212-6011	READOUT BLOCK ASSY	
A15C1	0160-0389	C:FXD MICA 17 PF 5%	
A15C2	0160-0389	C:FXD MICA 17 PF 5%	
A15C3	0140-0204	C:FXD MICA 47 PF 5% 500VDCW	
A15C4	0140-0204	C:FXD MICA 47 PF 5% 500VDCW	
A15C5	0140-0204	C:FXD MICA 47 PF 5% 500VDCW	
A15C6	0140-0204	C:FXD MICA 47 PF 5% 500VDCW	
A15C7	0140-0194	C:FXD MICA 330 PF 5%	
A15C8	0140-0204	C:FXD MICA 47 PF 5% 500VDCW	
A15C9	0140-0204	C:FXD MICA 47 PF 5% 500VDCW	
A15C10	0160-2563	C:FXD CER 2000 PF 20% 500VDCW	
A15C11	0160-2563	C:FXD CER 2000 PF 20% 500VDCW	
A15C12	0140-0191	C:FXD MICA 56 PF 5%	
A15C13	0160-2306	C:FXD MICA 27 PF 5%	
A15C14	0140-0190	C:FXD MICA 51 PF 5% 300VDCW	
A15C15	0140-0190	C:FXD MICA 51 PF 5% 300VDCW	
A15C16	0140-0191	C:FXD MICA 56 PF 5% 300VDCW	
A15C17	0140-0191	C:FXD MICA 56 PF 5% 300VDCW	
A15CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR9	1901-0040	DIODE:SILICON 30V 10MA	
A15CR10	1901-0040	DIODE:SILICON 30V 10MA	
A15CR11	1901-0040	DIODE:SILICON 30V 10MA	
A15CR12	1901-0040	DIODE:SILICON 30V 10MA	
A15CR13	1901-0040	DIODE:SILICON 30V 10MA	
A15CR14	1901-0040	DIODE:SILICON 30V 10MA	
A15CR15	1901-0040	DIODE:SILICON 30V 10MA	
A15CR16	1901-0040	DIODE:SILICON 30V 10MA	
A15CR17	1901-0040	DIODE:SILICON 30V 10MA	
A15CR18	1901-0040	DIODE:SILICON 30V 10MA	
A15CR19	1901-0040	DIODE:SILICON 30V 10MA	
A15CR20	1901-0040	DIODE:SILICON 30V 10MA	
A15CR21	1901-0040	DIODE:SILICON 30V 10MA	
A15DS1		NSR PART OF READOUT BLOCK ASSY	
A15DS2		NSR PART OF READOUT BLOCK ASSY	
A15DS3		NSR PART OF READOUT BLOCK ASSY	
A15DS4		NOT ASSIGNED	
A15DS5		NOT ASSIGNED	
A15DS6	1970-0001	ELECTRON TUBE:INDICATOR 10 DIGIT	
A15Q1	1853-0034	TRANSISTOR:SILICON PNP	
A15Q2	1853-0034	TRANSISTOR:SILICON PNP	
A15Q3	1853-0034	TRANSISTOR:SILICON PNP	
A15Q4	1853-0034	TRANSISTOR:SILICON PNP	
A15Q5	1853-0034	TRANSISTOR:SILICON PNP	
A15Q6	1853-0034	TRANSISTOR:SILICON PNP	
A15Q7	1853-0034	TRANSISTOR:SILICON PNP	
A15Q8	1853-0034	TRANSISTOR:SILICON PNP	
A15R1	0686-4735	R:FXD COMP 47K OHM 5% 1/2W	
A15R2		NSR PART OF READOUT BLOCK ASSY	
A15R3-A15R5		NOT ASSIGNED	
A15R6	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A15R7	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A15R8	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A15R9	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A15R10	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A15R11	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A15R12	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A15R13	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A15R14	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A15R15	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A15R16	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A15R17	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A15R18	0761-0010	R:FXD MET OX 1800 OHM 5% 1W	
A15R19	0761-0010	R:FXD MET OX 1800 OHM 5% 1W	
A15R20	0758-0004	R:FXD MET OX 2200 OHM 5% 1/2W	
A15R21	0758-0004	R:FXD MET FLM 2700 OHM 5% 1/2W	
A15R22	0758-0004	R:FXD MET FLM 2700 OHM 5% 1/2W	
A15R23	0758-0004	R:FXD MET FLM 2700 OHM 5% 1/2W	
A15R24	0758-0004	R:FXD MET FLM 2700 OHM 5% 1/2W	
A15R25	0758-0004	R:FXD MET FLM 2700 OHM 5% 1/2W	
A15R26	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R27	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R28	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R29	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R30	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R31	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R32	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R33	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R34	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A15R35	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A15R36	0683-1835	R:FXD COMP 18K OHM 5% 1/4W	
A15R37	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A15R38	0683-4735	R:FXD COMP 470 OHM 5% 1/4W	
A15R39	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A15R40	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A15R41	0683-1835	R:FXD COMP 18K OHM 5% 1/4W	
A15R42	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A15R43	0683-1115	R:FXD COMP 110 OHM 5% 1/4W	
A15R44	0683-1325	R:FXD COMP 1000 OHM 5% 1/4W	
A15R45	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A15R46	0683-1835	R:FXD COMP 18K OHM 5% 1/4W	
A15R47	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A15R48	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A15R49	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A15R50	0683-1835	R:FXD COMP 18K OHM 5% 1/4W	
A15R51	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A15R52	0683-1115	R:FXD COMP 110 OHM 5% 1/4W	
A15R53	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A15R54	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A15R55	[illegible]	R:FXD COMP 8200 OHM 5% 1/4W	
A15R56	0683-3625	R:FXD COMP 3600 OHM 5% 1/4W	
A15R57	0683-3625	R:FXD COMP 3600 OHM 5% 1/4W	
A15R58	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A15R59	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A15R60	0683-1135	R:FXD COMP 11K OHM 5% 1/4W	
A15R61	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A15R62	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A15R63	0683-1235	R:FXD COMP 12K OHM 5% 1/4W	
A15R64	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A15R65	0683-3935	R:FXD COMP 39K OHM 5% 1/4W	
A15V1		NSR PART OF READOUT BLOCK ASSY	
A16	05248-60016	ASSY:DECIMAL COUNTER BOARD(<1274)OPT 02	
	05248-80016	BOARD:BLANK PC	
	05219-6014	READOUT BLOCK ASSY	
A16C1	0160-3106	C:FXD MICA 27 PF 5%	
A16C2	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A16C3	0140-0194	C:FXD MICA 330 PF 5%	
A16CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR9	1902-0041	DIODE BREAKDOWN:5.11V 5%	
A16CR10	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR11	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR12	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR13	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR14	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR15	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR16	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR17	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR18	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR19	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR20	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR21	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR22	1901-0025	DIODE:SILICON 100WV 100MA	
A16DS1		NSR PART OF READOUT BLOCK ASSY	
A16DS2		NSR PART OF READOUT BLOCK ASSY	
A16DS3		NSR PART OF READOUT BLOCK ASSY	
A16DS4		NSR PART OF READOUT BLOCK ASSY	
A16DS5		NOT ASSIGNED	
A16DS6	1970-0009	ELECTRON TUBE:INDICATOR 10 DIGIT	
A16IC1	1820-0322	INTEGRATED CIRCUIT	
A16Q1	1854-0071	TRANSISTOR:SILICON NPN 2N3391	
A16Q2	1854-0071	TRANSISTOR:SILICON NPN 2N3391	
A16Q3	1854-0003	TRANSISTOR:SILICON NPN	
A16Q4	1854-0003	TRANSISTOR:SILICON NPN	
A16Q5	1854-0003	TRANSISTOR:SILICON NPN	

See Introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A16Q6	1854-0003	TRANSISTOR:SILICON NPN	
A16Q7	1854-0071	TRANSISTOR:SILICON NPN 2N3391	
A16Q8	1853-0016	TRANSISTOR:SILICON PNP	
A16Q9	1854-0003	TRANSISTOR:SILICON NPN	
A16Q10	1854-0003	TRANSISTOR:SILICON NPN	
A16Q11	1853-0016	TRANSISTOR:SILICON PNP	
A16Q12	1854-0003	TRANSISTOR:SILICON NPN	
A16Q13	1854-0003	TRANSISTOR:SILICON NPN	
A16Q14	1854-0045	TRANSISTOR:SILICON NPN	
A16Q15	1854-0045	TRANSISTOR:SILICON NPN	
A16Q16	1854-0045	TRANSISTOR:SILICON NPN	
A16Q17	1854-0045	TRANSISTOR:SILICON NPN	
A16Q18	1854-0045	TRANSISTOR:SILICON NPN	
A16R1	0686-4715	R:FXD COMP 470 OHM 5% 1/2W	
A16R2		NSR PART OF READOUT BLOCK ASSY	
A16R3-A16R5		NOT ASSIGNED	
A16R6	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A16R7	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A16R8	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A16R9	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A16R10	0683-3545	R:FXD COMP 350K OHM 5% 1/4W	
A16R11	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A16R12	0757-0274	R:FXD MET FLM 1.0K OHM 2% 1/8W	
A16R13	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A16R14	0757-0912	R:FXD MET FLM 330 OHM 2% 1/8W	
A16R15	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A16R16	0758-0073	R:FXD MET OX 240 OHM 5% 1/2W	
A16R17	0683-8225	R:FXD COMP 8200 OHM 5% 1/4W	
A16R18	0683-8225	R:FXD COMP 8200 OHM 5% 1/4W	
A16R19	0683-8225	R:FXD COMP 8200 OHM 5% 1/4W	
A16R20	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A16R21	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A16R22	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R23	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R24	0683-7505	R:FXD COMP 75 OHM 5% 1/4W	
A16R25	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A16R26	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R27	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R28	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A16R29	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A16R30	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R31	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R32	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R33	0683-7505	R:FXD COMP 75 OHM 5% 1/4W	
A16R34	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A16R35	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R36	0683-5125	R:FXD COMP 5100 OHM 5% 1/4W	
A16R37	0683-[illegible]	R:FXD COMP 1300 OHM 5% 1/4W	
A16R38	0683-75[illegible]	R:FXD COMP 7500 OHM 5% 1/4W	
A16R39	[illegible]	R:FXD COMP 3300 OHM 5% 1/4W	
A16R40	[illegible]	R:FXD COMP 56K OHM 5% 1/4W	
A16R41	0683-8225	R:FXD COMP 8200 OHM 5% 1/4W	
A16R42	0683-1325	R:FXD COMP 1300 OHM 5% 1/4W	
A16R43	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A16R44	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R45	0683-1315	R:FXD COMP 130 OHM 5% 1/4W	

See Introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A16R46	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R47	0683-1535	R:FXD COMP 15K OHM 5% 1/4W	
A16R48	0683-7505	R:FXD COMP 75 OHM 5% 1/4W	
A16R49	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A16R50	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A16R51	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R52	0683-1035	R:FXD COMP 1030 OHM 5% 1/4W	
A16R53	0683-7535	R:FXD COMP 7500 OHM 5% 1/4W	
A16R54	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A16R55	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R56	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A16R57	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A16R58	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R59	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R60	0683-6805	R:FXD COMP 68 OHM 5% 1/4W	
A16R61	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A16R62	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R63	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R64	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A16R65	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R66	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A16R67	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R68	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A16R69	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R70	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16V1		NSR PART OF READOUT BLOCK ASSY	
A18	05248-60017	ASSY:READOUT BOARD(+12V)OPT 02	
	05248-20017	BOARD:BLANK PC	
	05212-6014	READOUT BLOCK ASSY	
A18CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR9	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR10	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR11	1901-0025	DIODE:SILICON 100WV 100MA	
A16CA12	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR13	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR14	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR15	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR16	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR17	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR18	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR19	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR20	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR21	1901-0025	DIODE:SILICON 100WV 100MA	
A18DS1		NSR PART OF READOUT BLOCK ASSY	
A18DS2		NSR PART OF READOUT BLOCK ASSY	
A18DS3		NSR PART OF READOUT BLOCK ASSY	
A18DS4		NSR PART OF READOUT BLOCK ASSY	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A18DS5		NOT ASSIGNED	
A18DS6	1970-0009	ELECTRON TUBE:INDICATOR 10 DIGIT	
A18Q1	1854-0003	TRANSISTOR:SILICON NPN	
A18Q2	1854-0003	TRANSISTOR:SILICON NPN	
A18Q3	1854-0003	TRANSISTOR:SILICON NPN	
A18Q4	1854-0003	TRANSISTOR:SILICON NPN	
A18Q5	1854-0003	TRANSISTOR:SILICON NPN	
A18Q6	1854-0003	TRANSISTOR:SILICON NPN	
A18Q7	1854-0003	TRANSISTOR:SILICON NPN	
A18Q8	1854-0003	TRANSISTOR:SILICON NPN	
A18Q9	1854-0045	TRANSISTOR:SILICON NPN	
A18Q10	1854-0045	TRANSISTOR:SILICON NPN	
A18Q11	1854-0045	TRANSISTOR:SILICON NPN	
A18Q12	1854-0045	TRANSISTOR:SILICON NPN	
A18Q13	1854-0045	TRANSISTOR:SILICON NPN	
A18R1	0686-4735	R:FXD COMP 47K OHM 5% 1/4W	
A18R2		NSR PART OF READOUT BLOCK ASSY	
A18R3-A18R5		NOT ASSIGNED	
A18R6	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A18R7	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A18R8	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A18R9	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A18R10	0683-2035	R:FXD COMP 2000 OHM 5% 1/4W	
A18R11	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A18R12	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R13	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A18R14	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A18R15	0683-9105	R:FXD COMP 91 OHM 5% 1/4W	
A18R16	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R17	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A18R18	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A18R19	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A18R20	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A18R21	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R22	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A18R23	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A18R24	0683-9105	R:FXD COMP 91 OHM 5% 1/4W	
A18R25	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R26	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A18R27	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A18R28	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A18R29	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A18R30	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R31	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A18R32	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A18R33	0683-9105	R:FXD COMP 91 OHM 5% 1/4W	
A18R34	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R35	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A18R36	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A18R37	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A18R38	0683-5635	R:FXD COMP 56K OHM 5% 1/4W	
A18R39	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A18R40	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A18R41	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	

See introduction to this section for ordering information

Table 6-3. Reference Designation Index (Option 002)

Reference Designation	Part No.	Description #	Note
A18R42	0683-6805	RESISTOR COMP 68 OHM 5% 1/4W	
A18R43	0683-7525	RESISTOR COMP 7500 OHM 5% 1/4W	
A18R44	0683-5635	RESISTOR COMP 56K OHM 5% 1/4W	
A18R45	0683-5135	RESISTOR COMP 51K OHM 5% 1/4W	
A18R46	0683-1045	RESISTOR COMP 100K OHM 5% 1/4W	
A18R47	0683-1045	RESISTOR COMP 100K OHM 5% 1/4W	
A18R48	0683-1045	RESISTOR COMP 100K OHM 5% 1/4W	
A18R49	0683-5135	RESISTOR COMP 51K OHM 5% 1/4W	
A18R50	0683-5135	RESISTOR COMP 51K OHM 5% 1/4W	
A18R51	0683-5135	RESISTOR COMP 51K OHM 5% 1/4W	
A1W1		NSR PART OF READOUT BLOCK ASSY	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
A 8	05248-60005	DECIMAL POINT ASSY	
	05248-20005	BOARD:BLANK PC	
A 8CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A 8CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A 8CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A 8CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A 8CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A 8CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A 8CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A 8CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A 8CR9	1901-0025	DIODE:SILICON 100WV 100MA	
A 8CR10	1901-0025	DIODE:SILICON 100WV 100MA	
A 8CR11	1901-0025	DIODE:SILICON 100WV 100MA	
A 8CR12	1901-0025	DIODE:SILICON 100WV 100MA	
A 8CR13	1901-0025	DIODE:SILICON 100WV 100MA	
A 8CR14	1901-0025	DIODE:SILICON 100WV 100MA	
A 8CR15	1901-0025	DIODE:SILICON 100WV 100MA	
A 8DS1	2140-0028	LAMP:GLOW 1/15W	
A 8DS2	2140-0028	LAMP:GLOW 1/15W	
A 8DS3	2140-0028	LAMP:GLOW 1/15W	
A 8DS4	2140-0028	LAMP:GLOW 1/15W	
A 8DS5	2140-0028	LAMP:GLOW 1/15W	
A 8DS6	2140-0028	LAMP:GLOW 1/15W	
A 8DS7	2140-0028	LAMP:GLOW 1/15W	
A 8DS8	2140-0028	LAMP:GLOW 1/15W	
A 8Q1	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A 8Q2	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A 8Q3	1850-0062	TRANSISTOR:GERMANIUM ALLOY JUNCTION	
A 8R1	0683-1055	RESD COMP 1 MEGOHM 5% 1/4W	
A 8R2	0683-6835	RESD COMP 68K OHM 5% 1/4W	
A 8R3	0683-1055	RESD COMP 1 MEGOHM 5% 1/4W	
A 8R4	0683-6835	RESD COMP 68K OHM 5% 1/4W	
A 8R5	0683-1	RESD COMP 1 MEGOHM 5% 1/4W	
A 8R6	0683-68..	RESD COMP 68K OHM 5% 1/4W	
A 8R7	0683-1055	RESD COMP 1 MEGOHM 5% 1/4W	
A 8R8	0683-6835	RESD COMP 68K OHM 5% 1/4W	
A 8R9	0683-1055	RESD COMP 1 MEGOHM 5% 1/4W	
A 8R10	0683-6835	RESD COMP 68K OHM 5% 1/4W	
A 8R11	0683-1055	RESD COMP 1 MEGOHM 5% 1/4W	
A 8R12	0683-6835	RESD COMP 68K OHM 5% 1/4W	
A 8R13	0683-1055	RESD COMP 1 MEGOHM 5% 1/4W	
A 8R14	0683-6835	RESD COMP 68K OHM 5% 1/4W	
A 8R15	0683-1055	RESD COMP 1 MEGOHM 5% 1/4W	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
A 8R16	0683-1045	RESD COMP 100K OHMS 5% 1/4W	
A 8R17	0683-1045	RESD COMP 100K OHMS 5% 1/4W	
A 8R18	0683-1045	RESD COMP 100K OHMS 5% 1/4W	
A 8R19	0683-6835	RESD COMP 68K OHM 5% 1/4W	
A 8R20	0683-1045	RESD COMP 100K OHMS 5% 1/4W	
A 8R21	0683-1045	RESD COMP 100K OHMS 5% 1/4W	
A 8R22	0683-1045	RESD COMP 100K OHMS 5% 1/4W	
A 8R23	0683-1025	RESD COMP 1000 OHM 5% 1/4W	
A 9	05248-60006	MEASUREMENTS UNITS ASSY	
	05248-20006	BOARD:BLANK PC	
A 9C1	0150-0012	CAPD CER 0.01 UF 20% 1000VDCW	
A 9CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A 9CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A 9CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A 9CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A 9CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A 9CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A 9CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A 9CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A 9CR9	1901-0025	DIODE:SILICON 100WV 100MA	
A 9CR10	1901-0025	DIODE:SILICON 100WV 100MA	
A 9CR11	1901-0025	DIODE:SILICON 100WV 100MA	
A 9DS9	2140-0015	LAMP:GLOW NEON NE-2H	
A 9DS10	2140-0015	LAMP:GLOW NEON NE-2H	
A 9DS11	2140-0015	LAMP:GLOW NEON NE-2H	
A 9DS12	2140-0015	LAMP:GLOW NEON NE-2H	
A 9DS13	2140-0015	LAMP:GLOW NEON NE-2H	
A 9DS14	2140-0015	LAMP:GLOW NEON NE-2H	
A 9DS.5	2140-0015	LAMP:GLOW NEON NE-2H	
A 9R1	0686-5135	RESD COMP 51K OHM 5% 1/2W	
A 9R2	0683-1055	RESD COMP 1 MEGOHM 5% 1/4W	
A 9R3	0686-5135	RESD COMP 51K OHM 5% 1/2W	
A 9R4	0683-1055	RESD COMP 1 MEGOHM 5% 1/4W	
A 9R5	0686-5135	RESD COMP 51K OHM 5% 1/2W	
A 9R6	0683-1055	RESD COMP 1 MEGOHM 5% 1/4W	
A 9R7	0686-5135	RESD COMP 51K OHM 5% 1/2W	
A 9R8	0683-1055	RESD COMP 1 MEGOHM 5% 1/4W	
A 9R9	0686-5135	RESD COMP 51K OHM 5% 1/2W	
A 9R10	0683-1055	RESD COMP 1 MEGOHM 5% 1/4W	
A 9R11	0686-5135	RESD COMP 51K OHM 5% 1/2W	
A 9R12	0683-1055	RESD COMP 1 MEGOHM 5% 1/4W	
A 9R13	0683-1245	RESD COMP 120K OHM 5% 1/4W	
A 9R14	0683-1245	RESD COMP 120K OHM 5% 1/4W	
A 9R15	0683-1245	RESD COMP 120K OHM 5% 1/4W	

See introduction to this section for ordering information

Table 6-4. Reference Designation Index (Option 003)

Reference Designation	# Part No.	Description #	Note
A 9R16	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A10	05212-6003	DECIMAL COUNTER ASSY	
	05212-2002	BOARD:BLANK	
	05212-6014	READOUT BLOCK ASSY	
A10C1	0140-0194	C:FXD MICA 110 PF 5%	
A10C2	0140-0217	C:FXD MICA 140 PF 2%	
A10C3	0140-0194	C:FXD MICA 110 PF 5%	
A10C4	0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	
A10C5	0140-0194	C:FXD MICA 110 PF 5%	
A10C6	0140-0194	C:FXD MICA 110 PF 5%	
A10C7	0140-0195	C:FXD MICA 130 PF 5% 300 VDCW	
A10C8	0140-0194	C:FXD MICA 110 PF 5%	
A10C9	0140-0194	C:FXD MICA 110 PF 5%	
A10C10	0140-0196	C:FXD MICA 150 PF 5%	
A10C11	0140-0198	C:FXD MICA 200 PF 5%	
A10C12	0140-0198	C:FXD MICA 200 PF 5%	
A10C13	0150-0121	C:FXD CER 0.1 UF +80-20% 50VDCW	
A10CR1	1901-0025	DIODE:SILICON 100MV 100MA	
A10CR2	1901-0025	DIODE:SILICON 100MV 100MA	
A10CR3	1901-0025	DIODE:SILICON 100MV 100MA	
A10CR4	1901-0025	DIODE:SILICON 100MV 100MA	
A10CR5	1901-0025	DIODE:SILICON 100MV 100MA	
A10CR6	1901-0025	DIODE:SILICON 100MV 100MA	
A10CR7	1901-0025	DIODE:SILICON 100MV 100MA	
A10CR8	1901-0025	DIODE:SILICON 100MV 100MA	
A10CR9	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR10	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR11	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR12	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR13	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10CR14	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A10DS1		NSR PART OF READOUT BLOCK ASSY	
A10DS2		NSR PART OF READOUT BLOCK ASSY	
A10DS3		NSR PART OF READOUT BLOCK ASSY	
A10DS4		NSR PART OF READOUT BLOCK ASSY	
A10DS5		NOT ASSIGNED	
A10DS6	1970-0009	ELECTRON TUBE:INDICATOR 10 DIGIT	
A10L1	9140-0161	COIL:FXD 3600UH 5%	
A10Q1	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10Q2	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10Q3	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10Q4	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10Q5	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10Q6	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10Q7	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10Q8	5080-0060	TRANSISTOR:GERMANIUM PNP SELECTED	
A10R1	0686-4735	R:FXD COMP 47K OHM 5% 1/2W	
A10R2		NSR PART OF READOUT BLOCK ASSY	
A10R3		NOT ASSIGNED	
A10R4		NOT ASSIGNED	
A10R5		NOT ASSIGNED	
A10R6	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A10R7	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A10R8	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A10R9	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A10R10	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R11	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R12	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R13	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R14	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R15	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R16	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R17	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A10R18	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R19	0683-4335	R:FXD COMP 43K OHM 5% 1/4W	
A10R20	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R21	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R22	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R23	0683-1815	R:FXD COMP 180 OHM 5% 1/4W	
A10R24	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A10R25	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R26	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R27	0683-4335	R:FXD COMP 43K OHM 5% 1/4W	
A10R28	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R29	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R30	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R31	0683-4335	R:FXD COMP 43K OHM 5% 1/4W	
A10R32	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R33	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R34	0683-1815	R:FXD COMP 180 OHM 5% 1/4W	
A10R35	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A10R36	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A10R37	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R38	0683-4335	R:FXD COMP 43K OHM 5% 1/4W	
A10R39	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R40	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A10R41	0686-7525	R:FXD COMP 7500 OHM 5% 1/2W	
A10R42	0683-4335	R:FXD COMP 43K OHM 5% 1/4W	
A10R43	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A10R44	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A10R45	0683-1815	RESD COMP 180 OHM 5% 1/4W	
A10R46	0683-1045	RESD COMP 100K OHMS 5% 1/4W	
A10R47	0683-3925	RESD COMP 3900 OHM 5% 1/4W	
A10R48	0686-7525	RESD COMP 7500 OHM 5% 1/2W	
A10R49	0683-4335	RESD COMP 43K OHM 5% 1/4W	
A10R50	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A10R51	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A10R52	0686-7525	RESD COMP 7500 OHM 5% 1/2W	
A10R53	0683-4335	RESD COMP 43K OHM 5% 1/4W	
A10R54	0683-4735	RESD COMP 47K OHM 5% 1/4W	
A10R55	0683-3925	RESD COMP 3900 OHM 5% 1/4W	
A10R56	0683-1815	RESD COMP 180 OHM 5% 1/4W	
A10R57	0683-1045	RESD COMP 100K OHMS 5% 1/4W	
A10R58	0683-3925	RESD COMP 3900 OHM 5% 1/4W	
A10R59	0686-7525	RESD COMP 7500 OHM 5% 1/2W	
A10R60	0683-4335	RESD COMP 43K OHM 5% 1/4W	
A10R61	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A10R62	0683-7525	RESD COMP 7500 OHM 5% 1/4W	
A10R63	0683-4725	RESD COMP 4700 OHM 5% 1/4W	
A10R64	0683-4335	RESD COMP 43K OHM 5% 1/4W	
A10U1		NSR PART OF READOUT BLOCK ASSY	
A11		SAME AS A10, USE PREFIX A11	
A12		SAME AS A10, USE PREFIX A12	
A13		SAME AS A10, USE PREFIX A13	
A14		SAME AS A10, USE PREFIX A14	
A15	05232-6012	ASSY:DIVIDER/DECIMAL BOARD	
	05232-2012	BOARD:BLANK	
	05212-6014	READOUT BLOCK ASSY	
A15C1	0140-0145	CAPFXD MICA 22 PF 5%	
A15C2	0140-014-	CAPFXD MICA 22 PF 5%	
A15C3	0160-0196	CAPFXD MICA 24PF 5% 300VDCW	
A15C4	0160-0196	CAPFXD MICA 24PF 5% 300VDCW	
A15C5	0160-2306	CAPFXD MICA 27 PF 5%	
A15C6	0160-2306	CAPFXD MICA 27 PF 5%	
A15C7	0160-0369	CAPFXD MICA 17 PF 5%	
A15C8	0160-2306	CAPFXD MICA 27 PF 5%	
A15C9	0160-2563	CAPFXD CER 2000 PF 20% 500VDCW	
A15C10	0160-0179	CAPFXD MICA 33 PF 5% 300VDCW	
A15C11	0140-0145	CAPFXD MICA 22 PF 5%	
A15C12	0160-2306	CAPFXD MICA 27 PF 5%	
A15C13	0160-2563	CAPFXD CER 2000 PF 20% 500VDCW	
A15C14	0140-0190	CAPFXD MICA 39 PF 5%	
A15C15	0140-0190	CAPFXD MICA 39 PF 5%	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A15C16	0140-0191	CAPFXD MICA 56 PF 5%	
A15C17	0160-0179	CAPFXD MICA 33 PF 5% 300VDCW	
A15CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A15CR9	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR10	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR11	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR12	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR13	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR14	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR15	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR16	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR17	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR18	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR19	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR20	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR21	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR22	1901-0040	DIODE:SILICON 30MA 30WV	
A15CR23	1901-0040	DIODE:SILICON 30MA 30WV	
A15DS1		NSR PART OF READOUT BLOCK ASSY	
A15DS2		NSR PART OF READOUT BLOCK ASSY	
A15DS3		NSR PART OF READOUT BLOCK ASSY	
A15DS4		NSR PART OF READOUT BLOCK ASSY	
A15DS5		NOT ASSIGNED	
A15DS6	1970-0009	ELECTRON TUBE:INDICATOR 10 DIGIT	
A15Q1	1853-0036	TRANSISTOR:SILICON PNP	
A15Q2	1853-0036	TRANSISTOR:SILICON PNP	
A15Q3	1853-0036	TRANSISTOR:SILICON PNP	
A15Q4	1853-0036	TRANSISTOR:SILICON PNP	
A15Q5	1853-0036	TRANSISTOR:SILICON PNP	
A15Q6	1853-0036	TRANSISTOR:SILICON PNP	
A15Q7	1853-0036	TRANSISTOR:SILICON PNP	
A15Q8	1853-0036	TRANSISTOR:SILICON PNP	
A15R1	0686-4735	RESD COMP 47K OHM 5% 1/2W	
A15R2		NSR PART OF READOUT BLOCK ASSY	
A15R3		NOT ASSIGNED	
A15R4		NOT ASSIGNED	
A15R5		NOT ASSIGNED	

See introduction to this section for ordering information

Reference Designation	ϕ Part No.	Description #	Note
A15R6	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A15R7	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A15R8	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A15R9	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A15R10	0761-0003	R:FXD MET OX 2200 OHM 5% 1W	
A15R11	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R12	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R13	0761-0010	R:FXD MET OX 1.8K OHM 5% 1W	
A15R14	0758-0004	R:FXD MET OX 2700 OHM 5% 1/2W	
A15R15	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R16	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R17	0758-0004	R:FXD MET OX 2700 OHM 5% 1/2W	
A15R18	0758-0045	R:FXD MET OX 3900 OHM 5% 1/2W	
A15R19	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R20	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R21	0758-0045	R:FXD MET OX 3900 OHM 5% 1/2W	
A15R22	0761-0005	R:FXD MET OX 2200 OHM 5% 1W	
A15R23	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R24	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A15R25	0761-0010	R:FXD MET OX 1.8K OHM 5% 1W	
A15R26	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R27	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R28	0683-2035	R:FXD COMP 20K OHM 5% 1/4W	
A15R29	0683-2035	R:FXD COMP 20K OHM 5% 1/4W	
A15R30	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A15R31	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A15R32	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R33	0683-1635	R:FXD COMP 16K OHM 5% 1/4W	
A15R34	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A15R35	0683-3325	R:FXD COMP 3300 OHM 5% 1/4W	
A15R36	0683-2235	R:FXD COMP 22K OHM 5% 1/4W	
A15R37	0683-5625	R:FXD COMP 5600 OHM 5% 1/4W	
A15R38	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A15R39	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A15R40	0683-4705	R:FXD COMP 47 OHM 5% 1/4W	
A15R41	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A15R42	0683-2235	R:FXD COMP 22K OHM 5% 1/4W	
A15R43	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A15R44	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A15R45	0683-1325	R:FXD COMP 1300 OHM 5% 1/4W	
A15R46	0683-4705	R:FXD COMP 47 OHM 5% 1/4W	
A15R47	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A15R48	0683-2235	R:FXD COMP 22K OHM 5% 1/4W	
A15R49	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A15R50	0683-4715	R:FXD COMP 470 OHM 5% 1/4W	
A15R51	0683-2725	R:FXD COMP 2700 OHM 5% 1/4W	
A15R52	0683-2235	R:FXD COMP 22K OHM 5% 1/4W	
A15R53	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A15R54	0683-4705	R:FXD COMP 47 OHM 5% 1/4W	

See introduction to this section for ordering information

Reference Designation	ϕ Part No.	Description #	Note
A15R55	0683-5625	R:FXD COMP 5600 OHM 5% 1/4W	
A15R56	0683-3625	R:FXD COMP 3600 OHM 5% 1/4W	
A15R57	0683-4715	R:FXD COMP 470 OHM 5% 1/4W	
A15R58	0683-4715	R:FXD COMP 470 OHM 5% 1/4W	
A15R59	0683-3625	R:FXD COMP 3600 OHM 5% 1/4W	
A15R60	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A15R61	0683-9115	R:FXD COMP 910 OHM 5% 1/4W	
A15R62	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A15R63	0683-1535	R:FXD COMP 15K OHM 5% 1/4W	
A15R64	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A15R65	0683-8225	R:FXD COMP 8200 OHMS 5% 1/4W	
A15R66	0683-2715	R:FXD COMP 270 OHM 5% 1/4W	
A15R67	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A15R68	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A15V1		NSR PART OF READOUT BLOCK ASSY	
A16	05247-6004	ASSY:DECIMAL DECADE BOARD	
	05247-2004	BOARD:BLANK	
	05212-6014	READOUT BLOCK ASSY	
A16C1	0160-2306	C:FXD MICA 27 PF 5%	
A16C2	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A16C3	0140-0194	C:FXD MICA 110 PF 5%	
A16CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A16CR9	1902-0041	DIODE:BREAKDOWN 5.11V 5% 400MW	
A16J1		NSR PART OF READOUT BLOCK ASSY	
A16J52		NSR PART OF READOUT BLOCK ASSY	
A16D53		NSR PART OF READOUT BLOCK ASSY	
A16D54		NSR PART OF READOUT BLOCK ASSY	
A16D55		NOT ASSIGNED	
A16D56	1970-0009	ELECTRON TUBE:INDICATOR 10 DIGIT	
A16IC1	1820-0322	INTEGRATED CIRCUIT	
A16Q1	1854-0071	TRANSISTOR:SILICON NPN	
A16Q2	1854-0071	TRANSISTOR:SILICON NPN	
A16Q3	1854-0003	TRANSISTOR:NPN SILICON	
A16Q4	1854-0003	TRANSISTOR:NPN SILICON	
A16Q5	1854-0003	TRANSISTOR:NPN SILICON	

See introduction to this section for ordering information

Table 6-4. Reference Designation Index (Option 003) (Cont'd)

Reference Designation	Part No.	Description #	Note
A16C6	1854-0003	TRANSISTOR:NPN SILICON	
A16C7	1854-0071	TRANSISTOR:SILICON NPN	
A16C8	1853-0036	TRANSISTOR:SILICON PNP	
A16C9	1854-0003	TRANSISTOR:NPN SILICON	
A16Q10	1854-0003	TRANSISTOR:NPN SILICON	
A16Q11	1853-0036	TRANSISTOR:SILICON PNP	
A16C12	1854-0003	TRANSISTOR:NPN SILICON	
A16Q13	1854-0003	TRANSISTOR:NPN SILICON	
A16R1	0686-4735	R:FXD COMP 47K OHM 5% 1/2W	
A16R2		NSR PART OF READOUT BLOCK ASSY	
A16R3		NOT ASSIGNED	
A16R4		NOT ASSIGNED	
A16R5		NOT ASSIGNED	
A16R6	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A16R7	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A16R8	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A16R9	0683-3945	R:FXD COMP 390K OHM 5% 1/4W	
A16R10	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A16R11	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A16R12	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A16R13	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A16R14	0757-0912	R:FXD MET FLM 330 OHM 2% 1/4W	
A16R15	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A16R16	0758-0023	R:FXD MET OX 240 OHM 5% 1/2W	
A16R17	0683-8225	R:FXD COMP 8200 OHMS 5% 1/4W	
A16R18	0683-8225	R:FXD COMP 8200 OHMS 5% 1/4W	
A16R19	0683-8225	R:FXD COMP 8200 OHMS 5% 1/4W	
A16R20	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A16R21	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A16R22	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R23	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R24	0683-7505	R:FXD COMP 75 OHM 5% 1/4W	
A16R25	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A16R26	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R27	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R28	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A16R29	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A16R30	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A16R31	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R32	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R33	0683-7505	R:FXD COMP 75 OHM 5% 1/4W	
A16R34	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A16R35	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R36	0683-5125	R:FXD COMP 5100 OHM 5% 1/4W	
A16R37	0683-1325	R:FXD COMP 1300 OHM 5% 1/4W	
A16R38	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R39	0683-3325	R:FXD COMP 3300 OHM 5% 1/4W	
A16R40	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A16R41	0683-8225	R:FXD COMP 8200 OHMS 5% 1/4W	
A16R42	0683-1325	R:FXD COMP 1300 OHM 5% 1/4W	
A16R43	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A16R44	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R45	0683-1315	R:FXD COMP 130 OHM 5% 1/4W	
A16R46	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R47	0683-1535	R:FXD COMP 15K OHM 5% 1/4W	
A16R48	0683-7505	R:FXD COMP 75 OHM 5% 1/4W	
A16R49	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A16R50	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A16R51	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R52	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A16R53	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R54	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A16R55	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A16R56	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A16R57	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A16R58	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R59	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R60	0683-6805	R:FXD COMP 68 OHM 5% 1/4W	
A16R61	0683-1545	R:FXD COMP 150K OHM 5% 1/4W	
A16R62	0683-5135	R:FXD COMP 51K OHM 5% 1/4W	
A16R63	0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	
A16R64	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A16V1		NSR PART OF READOUT BLOCK ASSY	
A18	05247-6009	ASSY:READOUT BOARD	
	05247-2009	BOARD:BLANK PC	
	05212-6014	READOUT BLOCK ASSY	
A18CR1	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR2	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR3	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR4	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR5	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR6	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR7	1901-0025	DIODE:SILICON 100WV 100MA	
A18CR8	1901-0025	DIODE:SILICON 100WV 100MA	
A18DS1		NSR PART OF READOUT BLOCK ASSY	
A18DS2		NSR PART OF READOUT BLOCK ASSY	
A18DS3		NSR PART OF READOUT BLOCK ASSY	
A18DS4		NSR PART OF READOUT BLOCK ASSY	
A18DS5		NOT ASSIGNED	
A18DS6	1970-0009	ELECTRON TUBE:INDICATOR 10 DIGIT	
A18Q1	1854-0003	TRANSISTOR:NPN SILICON	

See introduction to this section for ordering information

See introduction to this section for ordering information

Table 6-4. Reference Designation Index (Option 003)

Reference Designation	Part No.	Description #	Note
A18Q2	1854-0003	TRANSISTOR:NPN SILICON	
A18Q3	1854-0003	TRANSISTOR:NPN SILICON	
A18Q4	1854-0003	TRANSISTOR:NPN SILICON	
A18Q5	1854-0003	TRANSISTOR:NPN SILICON	
A18Q6	1854-0003	TRANSISTOR:NPN SILICON	
A18Q7	1854-0003	TRANSISTOR:NPN SILICON	
A18Q8	1854-0003	TRANSISTOR:NPN SILICON	
A18R1	0686-4735	RESD COMP 47K OHM 5% 1/2W	
A18R2		NSR PART OF READOUT BLOCK ASSY	
A18R3		NOT ASSIGNED	
A18R4		NOT ASSIGNED	
A18R5		NOT ASSIGNED	
A18R6	0683-3945	RESD COMP 390K OHM 5% 1/4W	
A18R7	0683-3945	RESD COMP 390K OHM 5% 1/4W	
A18R8	0683-3945	RESD COMP 390K OHM 5% 1/4W	
A18R9	0683-3945	RESD COMP 390K OHM 5% 1/4W	
A18R10	0683-2025	RESD COMP 2000 OHM 5% 1/4W	
A18R11	0683-5635	RESD COMP 56K OHMS 5% 1/4W	
A18R12	0683-7525	RESD COMP 7500 OHM 5% 1/4W	
A18R13	0683-1545	RESD COMP 150K OHM 5% 1/4W	
A18R14	0683-5135	RESD COMP 51K OHM 5% 1/4W	
A18R15	0683-9105	RESD COMP 91 OHM 5% 1/4W	
A18R16	0683-7525	RESD COMP 7500 OHM 5% 1/4W	
A18R17	0683-5635	RESD COMP 56K OHMS 5% 1/4W	
A18R18	0683-1045	RESD COMP 100K OHMS 5% 1/4W	
A18R19	0683-2025	RESD COMP 2000 OHM 5% 1/4W	
A18R20	0683-5635	RESD COMP 56K OHMS 5% 1/4W	
A18R21	0683-7525	RESD COMP 7500 OHM 5% 1/4W	
A18R22	0683-1545	RESD COMP 150K OHM 5% 1/4W	
A18R23	0683-5135	RESD COMP 51K OHM 5% 1/4W	
A18R24	0683-9105	RESD COMP 91 OHM 5% 1/4W	
A18R25	0683-7525	RESD COMP 7500 OHM 5% 1/4W	
A18R26	0683-5635	RESD COMP 56K OHMS 5% 1/4W	
A18R27	0683-1045	RESD COMP 100K OHMS 5% 1/4W	
A18R28	0683-2025	RESD COMP 2000 OHM 5% 1/4W	
A18R29	0683-5635	RESD COMP 56K OHMS 5% 1/4W	
A18R30	0683-7525	RESD COMP 7500 OHM 5% 1/4W	
A18R31	0683-1545	RESD COMP 150K OHM 5% 1/4W	
A18R32	0683-5135	RESD COMP 51K OHM 5% 1/4W	
A18R33	0683-9105	RESD COMP 91 OHM 5% 1/4W	
A18R34	0683-7525	RESD COMP 7500 OHM 5% 1/4W	
A18R35	0683-5635	RESD COMP 56K OHMS 5% 1/4W	
A18R36	0683-1045	RESD COMP 100K OHMS 5% 1/4W	
A18R37	0683-2025	RESD COMP 2000 OHM 5% 1/4W	
A18R38	0683-5635	RESD COMP 56K OHMS 5% 1/4W	
A18R39	0683-7525	RESD COMP 7500 OHM 5% 1/4W	
A18R40	0683-1545	RESD COMP 150K OHM 5% 1/4W	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
A18R41	0683-5135	RESD COMP 51K OHM 5% 1/4W	
A18R42	0683-6805	RESD COMP 68 OHM 5% 1/4W	
A18R43	0683-7525	RESD COMP 7500 OHM 5% 1/4W	
A18R44	0683-5635	RESD COMP 56K OHMS 5% 1/4W	
A18R45	0683-1045	RESD COMP 100K OHMS 5% 1/4W	
A18V1		NSR PART OF READOUT BLOCK ASSY	

See introduction to this section for ordering information

Table 6-5. Code List of Manufacturers

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

Code No.	Manufacturer	Address
00000	U.S.A Common	Any supplier of U.S.
00136	McCoy Electronics	Mount Holly Springs, Pa.
00213	Sage Electronics Corp.	Rochester, N.Y.
00287	Cemco, Inc.	Danielson, Conn.
00334	Humidial	Colton, Calif.
00348	Micitron, Co., Inc.	Valley Stream, N.Y.
00373	Garlock Inc.	Cherry Hill, N.J.
00656	Aerovox Corp.	New Bedford, Mass.
00779	Amp, Inc.	Harrisburg, Pa.
00781	Aircraft Radio Corp.	Boonton, N.J.
00809	Crowen, Ltd.	Whitby, Ontario, Canada
00815	Northern Engineering Laboratories, Inc.	Burlington, Wis.
00853	Sangamo Electric Co., Pickens Div.	Pickens, S.C.
00866	Goe Engineering Co.	City of Industry, Cal.
00891	Carl E. Holmes Corp.	Los Angeles, Cal.
00928	Microlab Inc.	Livingston, N.J.
01002	General Electric Co., Capacitor Dept.	Hudson Falls, N.Y.
01009	Alden Products Co.	Brockton, Mass.
01121	Allen Bradley Co.	Milwaukee, Wis.
01255	Litton Industries, Inc.	Beverly Hills, Cal.
01281	TRW Semiconductors, Inc.	Lawndale, Cal.
01295	Texas Instruments, Inc., Transistor Products Div.	Dallas, Texas
01349	The Alliance Mfg. Co.	Alliance, Ohio
01538	Small Parts Inc.	Los Angeles, Cal.
01589	Pacific Relays, Inc.	Van Nuys, Cal.
01670	Gudebrod Bros. Silk Co.	New York, N.Y.
01930	Amerock Corp.	Rockford, Ill.
01960	Pulse Engineering Co.	Santa Clara, Cal.
02114	Ferroxcube Corp. of America	Saugerties, N.Y.
02116	Wheelock Signals, Inc.	Long Branch, N.J.
02286	Cole Rubber and Plastics Inc.	Sunnyvale, Cal.
02660	Amphenol-Borg Electronics Corp.	Broadview, Ill.
02735	Radio Corp. of America, Semiconductor and Materials Division	Somerville, N.J.
02771	Vocaline Co. of America Inc.	Old Saybrook, Conn.
02777	Hopkins Engineering Co.	San Fernando, Cal.
02875	Hudson Tool & Die	Newark, N.J.
03296	Nylon Molding Corp.	Springfield, N.J.
03508	G.E. Semiconductor Prod. Dept.	Syracuse, N.Y.
03705	Apex Machine & Tool Co.	Dayton, Ohio
03797	Fidema Corp.	Compton, Calif.
03818	Parker Seal Co.	Los Angeles, Cal.
03877	Transitron Electric Corp.	Wakefield, Mass.
03888	Pyrofilm Resistor Co., Inc.	Cedar Knolls, N.J.
03954	Singer Co., Diehl Div., Finderne Plant	Somerville, N.J.
04009	Arrow, Hart and Hegeman Elect. Co.	Hartford, Conn.
04013	Taruus Corp.	Lambertville, N.J.
04062	Arco Electronic Inc.	Great Neck, N.Y.
04217	Essex Wire	Los Angeles, Cal.
04222	Hi-Q Division of Aerovox	Myrtle Beach, S.C.
04354	Precision Paper Tube Co.	Wheeling, Ill.
04404	Palo Alto Division of Hewlett-Packard Co	Palo Alto, Cal.
04651	Sylvania Electric Products, Microwave Device Div.	Mountain View, Cal.
04673	Dakota Engr. Inc	Culver City, Cal.
04713	Motorola Inc Semiconductor Prod. Div	Phoenix, Arizona
04732	Filtron Co., Inc. Western Div.	Culver City, Cal.
04773	Automatic Electric Co.	Northlake, Ill.
04796	Sequoia Wire Co.	Redwood City, Cal.
04811	Precision Coil Spring Co.	El Monte, Cal.
04870	P.M. Motor Company	Westchester, Ill.
04919	Component Mfg. Service Co.	Bridgewater, Mass.
05006	Twentieth Century Plastics, Inc.	Los Angeles, Cal.
05277	Westinghouse Electric Corp. Semiconductor Dept	Youngwood, Pa.
05347	Ultronix, Inc.	San Mateo, Cal.
05397	Union Carbine Corp., Elect. Div.	New York, N.Y.
05574	Viking Ind. Inc.	Canoga Park, Cal.
05583	Icore Electro-Plastics Inc.	Sunnyvale, Cal
05616	Cosmo Plastic (c/o Electrical Spec. Co.)	Cleveland, Ohio
05624	Barber Colman Co.	Rockford, Ill.
05728	Tiffen Optical Co.	Roslyn Heights, Long Island, N.Y.
05729	Metro-Tel Corp.	Westbury, N.Y.
05783	Stewart Engineering Co.	Santa Cruz, Cal
05820	Wakefield Engineering Inc.	Wakefield, Mass.
06004	Bassick Co., Div. of Stewart Warner Corp.	Bridgeport, Conn.
06090	Raychem Corp.	Redwood City, Cal.
06175	Bausch and Lomb Optical Co.	Rochester, N.Y.
06402	E.T.A. Products Co. of America	Chicago, Ill.
06540	Amatom Electronic Hardware Co., Inc.	New Rochelle, N.Y.
06555	Beede Electrical Instrument Co., Inc.	Penacook, N.H.
06666	General Devices Co., Inc.	Indianapolis, Ind.
06751	Components Inc., Artz Div.	Phoenix, Arizona
06812	Torrington Mfg. Co., West Div.	Van Nuys, Cal
06980	Varian Assoc. Eimac Div.	San Carlos, Cal.
07088	Kelvin Electric Co.	Van Nuys, Cal.
07126	Digitran Co.	Pasadena, Cal.
07137	Transistor Electronics Corp.	Minneapolis, Minn
07138	Westinghouse Electric Corp., Electronic Tube Div.	Elmira, N.Y.
07149	Filmohm Corp.	New York, N.Y.
07233	Cinch-Graphik Co.	City of Industry, Cal.
07256	Silicon Transistor Corp.	Carle Place, N.Y.
07261	Avnet Corp.	Culver City, Cal.
07263	Fairchild Camera & Inst. Corp., Semiconductor Div.	Mountain View, Cal.
07322	Minnesota Rubber Co.	Minneapolis, Minn
07387	Birtcher Corp, The	Monterey Park, Cal.
07397	Sylvania Elect. Prod. Inc., Mt. View Operations	Mountain View, Cal.
07700	Technical Wire Products Inc.	Cranford, N.J.
07829	Bodine Elect. Co.	Chicago, Ill.
07910	Continental Device Corp.	Hawthorne, Cal.
07933	Raytheon Mfg. Co., Semiconductor Div.	Mountain View, Cal.
07980	Hewlett-Packard Co., New Jersey Division	Rockaway, N.J.
08145	U.S. Engineering Co.	Los Angeles, Cal.
08289	Blinn, Delbert Co.	Pomona, Cal.
08358	Borgess Battery Co.	Niagara Falls, Ontario, Canada
08524	Deutsch Fastener Corp.	Los Angeles, Cal.
08664	Bristol Co., The	Waterbury, Conn.
08717	Sloan Company	Sun Valley, Cal.
08718	ITT Cannon Electric Inc., Phoenix Div.	Phoenix, Arizona
08727	National Radio Lab. Inc.	Paramus, N.J.
08792	CDS Electronics Semiconductor Operations, Div. of CdS Inc	Lowell, Mass.
08806	General Electric Co., Miniature Lamp Dept.	Cleveland, Ohio
08984	Mel-Rain	Indianapolis, Ind
09026	Babcock Relays Div.	Costa Mesa, Cal.
09097	Electronic Enclosures Inc.	Los Angeles, Calif.
09134	Texas Capacitor Co.	Houston, Texas
09145	Tech. Ind. Inc, Atohm Elect.	Burbank, Cal.
09250	Electro Assemblies, Inc.	Chicago, Ill.
09353	C & K Components Inc.	Newton, Mass.
09569	Mallory Battery Co. of Canada, Ltd.	Toronto, Ontario, Canada
09795	Pennsylvania Florocarbon	Clifton Heights, Penn.
09922	Burndy Corp.	Norwalk, Conn
10214	General Transistor Western Corp.	Los Angeles, Cal.
10411	Ti-Tal, Inc.	Berkeley, Cal.
10646	Carborundum Co.	Niagara Falls, N.Y.
11236	CTS of Berne, Inc.	Berne, Ind
11237	Chicago Telephone of California, Inc.	So. Pasadena, Cal
11242	Bay State Electronics Corp.	Waltham, Mass.
11312	Teledyne Inc., Microwave Div.	Palo Alto, Cal
11314	National Seal	Downey, Cal
11453	Precision Connector Corp	Jamaica, N.Y.
11534	Duncan Electronics Inc.	Costa Mesa, Cal
11711	General Instrument Corp., Semiconductor Division Products Group	Newark, N.J.
11717	Imperial Electronic, Inc.	Buena Park, Cal
11810	Melabs, Inc.	Palo Alto, Cal
12136	Philadelphia Handle Co.	Camden, N.J.
12361	Grove Mfg. Co., Inc.	Shady Grove, Pa.
12574	Gulton Ind. Inc., Data System Div.	Albuquerque, N.M.
12697	Clarostat Mfg. Co.	Dover, N.H.
12728	Elmar Filter Corp.	W. Haven, Conn.
12859	Nippon Electric Co., Ltd	Tokyo, Japan
12881	Micro Electronics Corp	Clark, N.J.
12930	Delta Semiconductor Inc.	Newport Beach, Cal
12954	Dickson Electronics Corp	Scottsdale, Arizona
13019	Airco Supply Co., Inc	Wichita, Kansas
13061	Wilco Products	Detroit, Mich.
13103	Thermalloy	Dallas, Texas
13327	Solitron Devices Inc	Tappan, N.Y.
13396	Telefunken (GmbH)	Hanover, Germany
13835	Midland-Wright Div. of Pacific Industries, Inc.	Kansas City, Kansas
14099	Sem-Tech	Newbury Park, Cal
14193	Calif. Resistor Corp	Santa Monica, Cal
14298	American Components, Inc	Conshohocken, Pa.
14433	ITT Semiconductor, a Div. of Int. Telephone and Telegraph Corporation	West Palm Beach, Fla
14493	Hewlett-Packard Company	Loveland, Colo
14655	Cornell Dubilier Electric Corp	Newark, N.J.
14674	Corning Glass Works	Corning, N.Y.
14752	Electro Cube Inc.	San Gabriel, Cal
14936	Williams Mfg. Co.	San Jose, Cal
15106	The Sphere Co., Inc.	Little Falls, N.J.
15203	Webster Electronics Co.	New York, N.Y.
15287	Sconica Corp.	Northridge, Cal
15291	Adjustable Bushing Co.	N. Hollywood, Cal
15558	Micron Electronics	Garden City, Long Island, N.Y.
15566	Ampmore Ind. Corp.	Lynbrook, N.Y.
15637	Metron Co.	Costa Mesa, Cal
15772	Twentieth Century Coil Spring Co.	Santa Clara, Cal
15801	Fenwal Elect. Inc.	Framingham, Mass.
15818	Amelco Inc.	Mountain View, Cal
16037	Spruce Pine Mica Co.	Spruce Pine, N.C.
16179	Omni-Spectra Inc.	Detroit, Ill.
16352	Computer Diode Corp.	Lodi, N.J.
16554	Electrod Co.	Union, N.J.
16585	Boots Aircraft Nut Corp.	Pasadena, Cal
16688	Ideal Power Meter Co., Inc., De Jur Meter Div.	Brooklyn, N.Y.
16758	Delco Radio Div. of G.M. Corp	Kokomo, Ind
17109	Thermometrics Inc.	Canoga Park, Cal
17474	Transco Company	Mountain View, Cal
17675	Hamlin Metal Products Corp	Akron, Ohio
17745	Angstrohm Prec. Inc.	No. Hollywood, Cal
17856	Siliconix Inc.	Sunnyvale, Cal
17870	McGraw-Edison Co.	Manchester, N.H.
18042	Power Design Pacific Inc	Palo Alto, Cal
18083	Clevite Corp Semiconductor Div.	Palo Alto, Cal
18324	Signetics Corp	Sunnyvale, Cal
18476	Ty-Car Mfg. Co., Inc.	Holliston, Mass.
18486	TRW Elect Comp Div.	Des Plaines, Ill.
18565	Chomerics	Plainville, Mass.
18583	Curtis Instrument, Inc.	Mt. Kisco, N.Y.
18612	Vishay Instruments Inc.	Malvern, Pa.
18873	E.I. DuPont and Co., Inc.	Wilmington, Del.
18911	Durant Mfg. Co.	Milwaukee, Wis.
19315	The Bendix Corp., Navigation & Control Div.	Teterboro, N.J.
19500	Thomas A. Edison Industries, Div. of McGraw-Edison	West Orange, N.J.
19589	Concoa	Baldwin Park, Cal.

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Table 6-5. Code List of Manufacturers (Cont'd)

Code No	Manufacturer	Address
15648	LRC Electronics	Horseheads, N.Y.
19701	Electra Mfg. Co.	Independence, Kansas
20183	General Atronics Corp.	Philadelphia, Pa.
21220	Executone, Inc.	Long Island City, N.Y.
21355	Fafnir Bearing Co., The	New Britian, Conn.
21520	Fansteel Metallurgical Corp.	N. Chicago, Ill.
23020	General Reed Co.	Meturchen, N.J.
23042	Texscan Corp.	Indianapolis, Ind.
23283	British Radio Electronics Ltd.	Washington, D.C.
24455	G E. Lamp Division, Nela Park,	Cleveland, Ohio
24655	General Radio Co.	West Concord, Mass.
24681	Memtor Inc., Comp Div.	Huntington, Ind.
26365	Grien Reproducer Corp.	New Rochelle, N.Y.
26480	Grobert File Co of America, Inc.	Carlstadt, N.J.
	Compar Hollister Co.	Hollister, Cal.
27002	Hamilton Watch Co.	Lancaster, Pa.
28480	Hewlett-Packard Co.	Palo Alto, Cal.
28520	Heyman Mfg. Co.	Kenilworth, N.J.
30817	Instrument Specialties Co., Inc.	Little Falls, N.J.
33173	G E. Receiving Tube Dept.	Owensboro, Ky.
33434	Leetronix Inc.	Chicago, Ill.
36196	Janwyck Coil Products, Ltd.	Haskenbury, Ontario, Canada
36287	Junningham, W.H. & Hill, Ltd.	Toronto, Ontario, Canada
37942	P.R. Mallory & Co., Inc.	Indianapolis, Ind.
39543	Mechanical Industries Prod. Co.	Akron, Ohio
40920	Miniature Precision Bearings, Inc.	Keene, N.H.
40931	Honeywell Inc.	Minneapolis, Minn.
42190	Meter Co.	Chicago, Ill.
43990	C.A. Norgren Co.	Englewood, Colo.
44655	Ohmite Mfg. Co.	Skokie, Ill
46384	Penn Eng. & Mfg. Corp.	Doylestown, Pa.
4790	Polaroid Corp.	Cambridge, Mass.
48620	Precision Thermometer & Inst. Co.	Southampton, Pa.
49956	Microwave & Power Tube Div.	Waltham, Mass.
52090	Rosan Controller Co.	Westminster, Md.
52983	HP Co., Med. Elec. Div.	Waltham, Mass.
54294	Shallcross Mfg. Co.	selma, N.C.
55026	Simpson Electric Co.	Chicago, Ill.
55933	Sonotone Corp.	Elmsford, N.Y.
55938	Raytheon Co. Commercial Apparatus & System Div.	So. Norwalk, Conn.
56137	Spaulding Fibre Co., Inc.	Tonawanda, N.Y.
56289	Sprague Electric Co.	North Adams, Mass.
56474	Superior Elect. Co.	Bristol, Conn.
59446	Telex Corp.	Tulsa, Okla.
59730	Thomas & Betts Co.	Elizabeth, N.J.
60741	Triplett Electrical Inst. Co.	Bluffton, Ohio
61775	Union Switch and Signal Div. of Westinghouse Air Brake Co.	Pittsburgh, Pa.
62119	Universal Electric Co.	Owosso, Mich
63743	Ward-Leonard Electric Co.	Mt. Vernon, N.Y.
64959	Western Electric Co., Inc.	New York, N.Y.
65092	Weston Inst. Inc. Weston-Newark	Newark, N.J.
66295	Wittek Mfg. Co.	Chicago, Ill.
66346	Minnesota Mining & Mfg. Co. Revere Mineum Div.	St. Paul, Minn.
70276	Allen Mfg. Co.	Hartford, Conn.
70309	Allied Control	New York, N.Y.
70318	Allmetal Screw Product Co., Inc.	Garden City, N.Y.
70417	Amplex, Div. of Chrysler Corp.	Detroit, Mich
70485	Atlantic India Rubber Works, Inc.	Chicago, Ill.
70563	Amperite Co., Inc.	Union City, N.J.
70674	ADC Products Inc.	Minneapolis, Minn.
70903	Belden Mfg. Co.	Chicago, Ill.
70998	Bird Electric Corp	Cleveland, Ohio
71002	Birnbach Radio Co.	New York, N.Y.
71034	Bliley Electric Co., Inc.	Erie, Pa
71041	Boston Gear Works Div. of Murray Co. of Texas	Quincy, Mass.
71218	Bud Radio, Inc.	Willoughby, Ohio
71279	Cambridge Thermionics Corp.	Cambridge, Mass
71286	Camloc Fastener Corp.	Paramus, N.J.
71313	Cardwell Condenser Corp.	Lindenhurst, L.I., N.Y.
71400	Bussmann Mfg. Div. of McGraw-Edison Co.	St. Louis, Mo.
71436	Chicago Condenser Corp.	Chicago, Ill.
71447	Calif. Spring Co., Inc.	Pico-Rivera, Cal.
71450	CTS Corp.	Elkhart, Ind.
71468	ITT Cannon Electric Inc.	Los Angeles, Cal.
71471	Cinema, Div. Aerovox Corp.	Burbank, Cal.
71482	C.P. Clare & Co.	Chicago, Ill
71590	Centralab Div. of Globe Union Inc.	Milwaukee, Wis
71616	Commercial Plastics Co.	Chicago, Ill
71700	Cornish Wire Co., The	New York, N.Y.
71707	Coto Coil Co., Inc.	Providence, R.I.
71744	Chicago Miniature Lamp Works	Chicago, Ill
71785	Cinch Mfg. Co., Howard B. Jones Div.	Chicago, Ill
71984	Dow Corning Corp.	Midland, Mich
72136	Electro Motive Mfg. Co., Inc.	Willimantic, Conn
72619	Dialight Corp.	Brooklyn, N.Y.
72656	Indiana General Corp., Electronics Div.	Keasby, N.J.
72699	General Instrument Corp., Cap Division	Newark, N.J.
72765	Drake Mfg. Co.	Harwood Heights, Ill
72825	Hugh H. Eby Inc.	Philadelphia, Pa.
72975	Fahnestock Co.	Chicago, Ill
72982	Elastic Stop Nut Corp.	Union, N.J.
72994	Robert M. Hadley Co.	Los Angeles, Cal.
72982	Erie Technological Products, Inc.	Erie, Pa.
73061	Hansen Mfg. Co., Inc.	Princeton, Ind.
73076	H.M. Harper Co.	Chicago, Ill
73138	Beckman Instruments, Inc. Helipot Div. of Berkman Inst., Inc.	Fullerton, Cal
73293	Hughes Products Division of Hughes Aircraft Co.	Newport Beach, Cal.
73445	Amperex Electronic Co.	Hicksville, L.I., N.Y.
73506	Bradley Semiconductor Corp.	New Haven, Conn
73559	Carling Electric, Inc.	Hartford, Conn
73586	Circle F Mfg. Co.	Trenton, N.J.
73682	George K. Garrett Co., Div. MSL Industries, Inc.	Philadelphia, Pa
73734	Federal Screw Products, Inc.	Chicago, Ill
73743	Fischer Special Mfg. Co.	Cincinnati, Ohio
73793	General Industries Co., The	Elyria, Ohio
73846	Goshen Stamping & Tool Co.	Goshen, Ind
73899	JFD Electronics Corp.	Brooklyn, N.Y.
73905	Jennings Radio Mfg. Corp.	San Jose, Cal
73957	Groove-Pin Corp.	Ridgefield, N.J.
74276	Signalite Inc.	Neptune, N.J.
74455	J.H. Winns, and Sons	Winchester, Mass
74861	Industrial Condenser Corp.	Chicago, Ill
74868	R.F. Products Division of Amphenol-Borg Electronic Corp.	Danbury, Conn
74970	E.F. Johnson Co.	Waseca, Minn
75042	International Resistance Co.	Philadelphia, Pa
75263	Keystone Carbon Co., Inc.	St. Marys, Pa
75378	CTS Knights, Inc.	Sandwich, Ill
75382	Kulka Electric Corp.	Mt. Vernon, N.Y.
75818	Lenz Electric Mfg. Co.	Chicago, Ill.
75915	Littelfuse, Inc.	Des Plaines, Ill
76005	Lord Mfg. Co.	Erie, Pa
76210	C.W. Marwedel	San Francisco, Cal
76493	General Instrument Corp., Micamold Division	Newark, N.J.
76487	James Millen Mfg. Co., Inc.	Malden, Mass
76493	J.W. Miller Co.	Los Angeles, Cal
76530	Cinch-Monadnock, Div. of United Carr Fastener Corp.	San Leandro, Cal
76545	Mueller Electric Co.	Cleveland, Ohio
76703	National Union	Newark, N.J.
76854	Oak Manufacturing Co.	Crystal Lake, Ill
77068	The Bendix Corp., Electrodynamics Div.	N. Hollywood, Cal.
77075	Pacific Metals Co.	San Francisco, Cal
77221	Phaostron Instrument and Electronic Co.	So. Pasadena, Cal
77252	Philadelphia Steel and Wire Corp.	Philadelphia, Pa
77342	American Machine & Foundry Co. Potter & Brumfield Div.	Princeton, Ind.
77630	TRW Electronic Components Div.	Camden, N.J.
77638	General Instrument Corp., Rectifier Division	Brooklyn, N.Y.
77764	Resistance Products Co.	Harrisburg, Pa.
77969	Rubbercraft Corp. of Calif.	Torrance, Cal
78189	Shakeproof Division of Illinois Tool Works	Elgin, Ill
78277	Sigma	So. Braintree, Mass
78283	Signal Indicator Corp.	New York, N.Y.
78290	Struthers-Dunn Inc.	Pitman, N.J.
78488	Stackpole Carbon Co.	St. Marys, Pa
78493	Standard Thomson Corp.	Waltham, Mass
78553	Tinnerman Products, Inc.	Cleveland, Ohio
78590	Transformer Engineers	San Gabriel, Cal
78947	Unimite Co.	Newtonsville, Mass
79136	Waldes Kohinoor Inc.	Long Island City, N.Y.
79142	Veeder Root, Inc.	Hartford, Conn
79251	Wemco Mfg. Co.	Chicago, Ill
79727	Continental-Wirt Electronics Corp.	Philadelphia, Pa
79963	Zierick Mfg. Corp.	New Rochelle, N.Y.
80031	Mepco Division of Sessions Clock Co.	Morristown, N.J.
80033	Prestole Corp.	Toledo, Ohio
80120	Schnitzer Alloy Products Co.	Elizabeth, N.J.
80131	Electronic Industries Association Standard base or semi-conductor device, any manufacturer.	
80207	Tinman Switch, Div. Mason Electronics Corp.	Wallingford, Conn
80223	United Transformer Corp.	New York, N.Y.
80248	Oxford Electric Corp.	Chicago, Ill
80294	Bourns Inc.	Riverside, Cal
80411	Arco Div. of Robertshaw Controls Co.	Columbus, Ohio
80486	All Star Products Inc.	Defiance, Ohio
80509	Avery Label Co.	Monrovia, Cal
80583	Hammerland Co., Inc.	Mars Hill, N.C.
80640	Stevens, Arnold, Co., Inc.	Boston, Mass
80813	Dimco Gray Co.	Dayton, Ohio
81030	International Inst. Inc.	Orange, Conn
81073	Grayhill Co.	LaGrange, Ill
81095	Triad Transformer Corp.	Venice, Cal
81312	Winchester Elec. Div. Litton Ind., Inc.	Oakville, Conn
81349	Military Specification	
81483	International Rectifier Corp.	El Segundo, Cal.
81541	Airpax Electronics, Inc.	Cambridge, Maryland
81800	Barry Controls, Div. Barry Wright Corp.	Watertown, Mass
82042	Carter Precision Electric Co.	Skokie, Ill
82047	Sperti Faraday Inc., Copper Braid Electric Div.	Hoboken, N.J.
82116	Electric Regulator Corp.	Norwalk, Conn
82142	Jeffers Electronics Division of Speer Carbon Co.	Du Bois, Pa
82170	Fairchild Camera & Inst. Corp., Space & Defense Systems Div.	Paramus, N.J.
82209	Maguire Industries, Inc.	Greenwich, Conn
82219	Sylvania Electric Prod., Inc. Electronic Tube Division	Emporium, Pa
82376	Astron Corp.	East Newark, Harrison, N.J.
82389	Switchcraft, Inc.	Chicago, Ill
82647	Metals & Controls Inc., Spencer Products	Attleboro, Mass.
82768	Phillips-Advance Control Co.	Joliet, Ill
82866	Research Products Corp.	Madison, Wis
82877	Rotron Mfg. Co., Inc.	Woodstock, N.Y.
82893	Vector Electronic Co.	Glendale, Cal
83058	Carr Fastener Co.	Cambridge, Mass.
83086	New Hampshire Ball Bearing, Inc.	Peterborough, N.H.
83125	General Instrument Corp., Capacitor Div.	Darlington, S.C.
83148	ITT Wire and Cable Div.	Los Angeles, Cal
83186	Victory Eng. Corp.	Springfield, N.J.
83298	Bendix Corp., Red Bank Div.	Red Bank, N.J.
83315	Hubbell Corp.	Mundelein, Ill
83324	Rosan Inc.	Newport Beach, Cal.
83330	Smith, Herman H., Inc.	Brooklyn, N.Y.
83332	Tech Labs.	Palisades Park, N.J.
83385	Central Screw Co.	Chicago, Ill.
83501	Gavitt Wire and Cable Co., Div. of Amerace Corp.	Brookfield, Mass.
83594	Burroughs Corp., Electronic Tube Div.	Plainfield, N.J.
83740	Union Carbide Corp. Consumer Prod. Div.	New York, N.Y.
83777	Model Eng. and Mfg., Inc.	Huntington, Ind
83821	Loyd Scruggs Co.	Festus, Mo
83942	Aeronautical Inst. & Radio Co.	Lodi, N.J.
84171	Arco Electronics Inc.	Great Neck, N.Y.
84396	A.J. Gleaner Co., Inc.	San Francisco, Cal.
84411	TRW Capacitor Div.	Ogallala, Neb

Table 6-5. Code List of Manufacturers (Cont'd)

Code No.	Manufacturer	Address
04870	Sarkes Tarzian, Inc	Bloomington, Ind
05454	Boonton Molding Company	Boonton, N J
05471	A.B. Boyd Co.	San Francisco, Cal.
05 *	R.M. Bracamonte & Co	San Francisco, Cal.
05660	Kolled Korde, Inc	Ramden, Conn.
05911	Seamless Rubber Co	Chicago, Ill.
06174	Fafnir Bearing Co.	Los Angeles, Calif
06197	Clifton Precision Products Co., Inc	Clifton Heights, Pa
06579	Precision Rubber Products Corp	Dayton, Ohio
06684	Radio Corp. of America, Electronic Comp. & Devices Division	Harrison, N.J.
06928	Seastrom Mfg. Co.	Glendale, Cal.
07024	Marco Industries	Anaheim, Cal.
07216	Philco Corporation (Lansdale Division)	Lansdale, Pa.
07473	Western Fibrous Glass Products Co.	San Francisco, Cal.
07664	Van Waters & Rogers Inc.	San Francisco, Cal.
07930	Tower Mfg. Corp.	Providence, R.I.
08140	Cutler-Hammer, Inc.	Lincoln, Ill.
08220	Gould-National Batteries, Inc.	St. Paul, Minn.
08698	General Mills, Inc.	Buffalo, N.Y.
09231	Graybar Electric Co.	Oakland, Cal
09473	G.E. Distributing Corp	Schenectady, N.Y.
09479	Security Co.	Detroit, Mich.
09665	United Transformer Co.	Chicago, Ill.
09030	United Shoe Machinery Corp.	Beverly, Mass.
09179	U.S. Rubber Co., Consumer Ind. & Plastics Prod Div.	Passaic, N.J.
09265	Belleville Specialty Tool Mfg., Inc.	Belleville, Ill.
09763	United Carr Fastener Corp.	Chicago, Ill.
09970	Bearing Engineering Co.	San Francisco, Cal.
01146	ITT Cannon Elect. Inc., Salem Div	Salem, Mass.
01260	Connor Spring Mfg. Co	San Francisco, Cal.
01345	Miller Dial & Nameplate Co.	El Monte, Cal.
01418	Radio Materials Co.	Chicago, Ill.
01506	Augat Inc.	Attleboro, Mass.
01637	Dale Electronics, Inc	Columbus, Nebr.
01662	Elco Corp.	Willow Grove, Pa.
01673	Epiphone Inc.	New York, N.Y.
01737	Gremar Mfg. Co., Inc.	Wakefield, Mass.
01827	K F Development Co.	Redwood City, Cal.
01886	Malco Mfg., Inc.	Chicago, Ill.
01929	Honeywell Inc., Micro Switch Division	Freeport, Ill.
01961	Nahm-Bros. Spring Co.	Oakland, Cal
02180	Tru-Connector Corp.	Peabody, Mass.
02367	Elgeet Optical Co., Inc.	Rochester, N.Y.
02607	Tensolite Insulated Wire Co., Inc.	Tarrytown, N.Y.
02702	IMC Magnetics Corp.	Westbury, L.I., N.Y.
02966	Hudson Lamp Co.	Kearney, N.J.
03332	Sylvania Electric Prod Inc., Semiconductor Div.	Woburn, Mass.
03369	Robbins & Myers Inc.	Palisades Park, N.J.
03410	Stemco Controls, Div. of Essex Wire Corp	Mansfield, Ohio
03632	Waters Mfg. Co	Culver City, Cal
03929	G.V Controls	Livingston, N.J.
04137	General Cable Corp.	Bayonne, N.J.
04144	Raytheon Co., Comp. Div., Ind. Comp. Operations	Quincy, Mass.
04148	Scientific Electronics Products, Inc.	Loveland, Colo.
04154	Wagner Elect. Corp., Tung-Sol Div.	Newark, N.J.
04197	Curtiss-Wright Corp., Electronics Div.	East Paterson, N.J.
04222	South Chester Corp.	Chester, Pa
04330	Wire Cloth Products, Inc.	Bellwood, Ill.
04375	Automatic Metal Products Co	Brooklyn, N.Y.
04682	Worcester Pressed Aluminum Corp.	Worcester, Mass.
04696	Magnecraft Electric Co.	Chicago, Ill.
05023	George A. Philbrick Researchers, Inc.	Boston, Mass.
05146	Alco Elect. Mfg. Co.	Lawrence, Mass
05236	Allen Products Corp.	Dianta, Fla.
05238	Continental Connector Corp.	Woodside, N.Y.
05263	Leecraft Mfg. Co., Inc.	Long Island, N.Y.
05265	National Coil Co.	Sheridan, Wyo.
05275	Vitramon, Inc.	Bridgeport, Conn
05348	Gordon Corp.	Bloomfield, N.J
05354	Methode Mfg. Co.	Rolling Meadows, Ill
05566	Arnold Engineering Co.	Marengo, Ill
05712	Dage Electric Co., Inc.	Franklin, Ind
05984	Siemon Mfg. Co.	Wayne, Ill.
05987	Weckesser Co.	Chicago, Ill
06067	Microwave Assoc., West, Inc.	Sunnyvale, Cal.
06095	Bi-Q Div. of Aerovox Corp.	Olean, N.Y
06256	Thordarson-Meissner In.	Mt. Carmel, Ill
06296	Solar Mfg. Co.	Los Angeles, Cal.
06396	Microswitch, Div. of Minn.-Honeywell	Freeport, Ill.
06330	Carlton Screw Co.	Chicago, Ill
06341	Microwave Associates, Inc	Burlington, Mass
06501	Excel Transformer Co	Oakland, Cal
06508	Xcelite, Inc	Orchard Park, N.Y
06733	San Fernando Elec Mfg. Co.	San Fernando, Cal.
06881	Thomson Ind. Inc	Long Island, N.Y
07404	Industrial Retaining Ring Co	Irvington, N.J.
07539	Automatic & Precision Mfg.	Englewood, N.J.
07979	Bron Resistor Corp	Yonkers, N.Y
07983	Litton System Inc., Adler-Westrex Commun. Div	New Rochelle, N.Y
08141	R-Tronics, Inc	Jamaica, N.Y
08159	Rubber Tech, Inc	Gardena, Cal
08220	Hewlett-Packard Co, Medical Elec. Div.	Pasadena, Cal
08278	Microlot, Inc.	So. Pasadena, Cal
08291	Sealectro Corp	Mamaroneck, N.Y
08376	Zero Mfg. Co	Burbank, Cal
08410	Etc Inc	Cleveland, Ohio
08731	General Mills Inc., Electronics Div	Minneapolis, Minn
08734	Parco Divis of Hewlett-Packard Co	Palo Alto, Cal
08821	North Hills Electronics, Inc	Glen Cove, N.Y
08978	International Electronic Research Corp	Burbank, Cal
09109	Columbia Technical Corp	New York, N.Y
09313	Varian Associates	Palo Alto, Cal
09378	Atlee Corp	Worcester, Mass
09515	Marshall Ind., Capacitor Div	Monrovia, Cal
09707	Control Switch Division, Controls Co of America	El Segundo, Cal
09800	Delevan Electronics Corp	East Aurora, N.Y
09848	Wilco Corporation	Indianapolis, Ind
09928	Branson Corp	Whippany, N.J
09934	Rembrandt, Inc	Boston, Mass
09942	Hoffman Electronics Corp, Semiconductor Division	El Monte, Cal
09957	Technology Instrument Corp of California	Newbury Park, Cal

The following HP Vendors have no number assigned in the latest supplement to the Federal Supply Code for Manufacturers Handbook

0000F	Malco Tool and Die	Los Angeles, Calif
0000Z	Willow Leather Products Corp.	Newark, N.J.
000AB	ETA	England
000BB	Precision Instrument Comp. Co.	Van Nuys, Cal.
000CS	Hewlett-Packard Co., Colorado Springs Div.	Colorado Springs, Colorado
000MM	Rubber Eng. & Development	Hayward, Cal.
000NN	A "N" D Mfg. Co.	San Jose, Cal.
000QQ	Cualtron	Oakland, Cal
000WW	California Eastern Lab	Burlington, Cal.
000YY	S K Smith Co	Los Angeles, Cal

00015-49
Revised: May, 1970

From: Handbook Supplements
H4-1 Dated January 1970

BACK DATING MANUAL CHANGES

SECTION VII

OPTIONS, SPECIALS, AND MANUAL CHANGES

7-1. OPTIONS

7-2. The standard counter is supplied with BCD output code of +1248. The counter can be ordered with +1224 or -1248 output codes. Option 002 and Option 003 change the output code but have no effect on counter operation.

7-3. Option 002: +1224 BCD Code

7-4. To change counter output code from +1248 code to +1224 code, install Option 002 assemblies A8 through A16 and A18. Stock numbers for these assemblies are shown in Table 7-1. Schematic diagrams and operation are in Section VIII.

7-5. Option 003: -1248 BCD Code

7-6. To change counter output code from +1248 code to -1248 code, install Option 003 assemblies A8 through A16 and A18. Stock numbers for these assemblies are shown in Table 7-1. Schematic diagrams and operation are in Section VIII.

7-7. Parts lists for Option 002 and Option 003 assemblies are given in Tables 6-3 and 6-4.

7-8. SPECIAL

7-9. Two rear panel connectors added to the standard counter permit remote selection of FUNCTION and TIME BASE, without affecting normal counter operation. SENSITIVITY, SAMPLE RATE, and AC/DC INPUT cannot be remote controlled.

7-10. Circuit diagram, operation, and parts for remote control are shown in Section VIII, Figure 8-36.

7-11. MANUAL CHANGES

7-12. This manual applies directly to standard Model 5248L and 5248M having serial prefix number 1124A (refer to paragraph 1-5).

7-13. Newer Instruments

7-14. As changes are made, newer instruments may have serial number prefixes not listed in this manual. The manuals for these instruments will be supplied with an added "Manual Change" sheet with the required information. If this sheet is missing, contact your nearest Hewlett-Packard Sales and Service office, listed at the back of this manual.

7-15. Older Instruments

7-16. To adapt this manual to Model 5248L and 5248M counters with serial prefix 836-, make changes listed under CHANGE 1, 2, and 3. For counters with serial prefix 848- or 952-, make changes listed under CHANGE 2 and 3. For Model 5248L with serial prefix 0976A and Model 5248M with serial prefix 1032A make changes listed under CHANGE 3 and 4.

CHANGE 1:

Page 6-4, Table 6-1:
Delete A10CR2 and CR3

Page 8-13, Figure 8-6:
Change A3S1DF(4) to read "To Gate 6 A21(23)"

Page 8-25, Figure 8-12:
Delete A10CR2 and CR3
Delete To J6(12)

Page 8-47, Figure 8-23:
Delete A21R13
Delete Pin 19, and statements "To A11(13)2 and "From A2S1DF(4)"
Add below statement "From J6(32)" "A2S1DF(4)"

Table 7-1. Assemblies for Optional BCD Outputs

Assembly	Standard +1248	Option 002 +1224	Option 003 -1248
A8 Decimal Point	05248-60007	05248-60018	05248-60005
A9 Measurement Units	05248-60008	5243L-65B	05248-60006
A10-A14 Decimal Counter	05212-6002	05212-6016	05212-6003
A15 5 MHz Decimal Counter	05232-6014	05232-6010	05232-6012
A16 Int. Freq. Decimal Counter	05247-6001	05248-60016	05247-6004
A18 Readout	05247-6008	05248-60017	05247-6009

CHANGE 1 (Continued):

Page 6-13, Table 6-1:
Change A21R6 to 5100 ohms, HP Part No. 0683-5125; A21R12 to 10K ohms HP Part No. 0683-1035

Page 8-49, Figure 8-24:
Delete A22R14
Change "Stop from A10(3)" to "Stop from J6(22)"

Page 6-14, Table 6-1:
Delete A22R14

Page 8-77, Figure 8-35:
Change J6(12) to read "BCDB A10(14)"

CHANGE 2:

The upper frequency limit of the instruments with this and lower serial prefixes was 135 MHz. This change revises the operating instruction manual to show the 135 MHz limit. At the pages and places listed below (*) change 150 MHz to 135 MHz.

Page 1-1, Paragraph 1-2, line 3, *.
Page 1-2, Table 1-2, lines 2, 3, 30, and 42, *.
Page 1-7, Paragraph 1-44, line 2, *.
Page 3-0, Figure 3-1, *.
Page 3-3, Figure 3-3, line 8, *.
Page 3-8, Figure 3-8, line 2, *.
Page 3-10, Figure 3-10, line 1 *.
Page 5-2, Table 5-3, lines 2, 3, 13, and 19, *.
Page 5-3, Table 5-3, lines 12, 14, and 23, *.
Page 5-4, Table 5-3, lines 4 and 39, *.
Page 5-5, Table 5-3, lines 7, 12, 29, and 31, *.
Page 5-8a, PERFORMANCE CHECK TEST CARD, lines 7, 8, 19, 28-36, (change digits on each line from 150 to 135)*.
Page 5-8c, PERFORMANCE CHECK TEST CARD, lines 15 and 26, *.
Page 5-10, Table 5-4, line 2 and diagram between 5105A and 355C*.

Page 5-0, Table 5-1:
Change HP Part No. as follows:

Assembly	From	To
A17	05247-6002	05247-60021
A19	05248-60001	05248-60022
A21	05248-60003	05248-60023
A26 (5248M)	05248-6023	05248-60019

Page 6-22, Table 6-1:
Change A35R13 from 0686-4715 470 ohms to 0686-6116 510 ohms.
Change A35R14 from 0686-3025 3000 ohms to 0686-2725 2700 ohms.

Page 8-73, Figure 8-33:
Change R13 from 470 to 510.
Change R14 from 3000 to 2700.

Page 6-15, Table 6-1:
Change A23CR4 from 1910-0016 to 1901-0025 Silicon Diode

Page 6-8, Table 6-1:
Delete A17 05248-60021 Board Assembly:High Frequency, and all parts prefixed A17
Add A17 05247-6002 Board Assembly:High Frequency and all parts in Table 7-2.

CHANGE 2 (Continued):

Page 6-11, Table 6-1:
Delete A19 05248-60022 Board Assembly:Amplifier and all parts prefixed A19
Add A19 05248-60001 Input Amplifier and all parts listed in Table 7-3.

Page 6-12, Table 6-1:
Delete A21 05248-60023 Board Assembly:Function Control and all parts prefixed A21
Add A21 05248-60003 Board Assembly:Function Control and all parts in Table 7-4

Page 6-16, Table 6-1:
Change A26 05248-60019 Assembly:Multiplier Divider to A26 05248-6023
Change 05248-20019 Board:Blank PC to 05248-2023 Board:Blank PC

Page 8-3, Figure 8-2:
Change assembly numbers on diagram as follows:

Assembly	From	To
A17	05248-60021	05247-6002
A19	05248-60022	05248-60001
A21	05248-60023	05248-60003

Page 8-5, Figure 8-3:
Change assembly numbers on diagram as follows:

Assemly	From	To
A17	05248-60021	05247-6002
A19	05248-60022	05248-60001
A21	05248-60023	05248-60003
A26	05248-60019	05248-6023

Page 8-37:
Delete Figure 8-18, A17 High Frequency Decimal Counter schematic and component locator photo; replace with Figure 7-1 and Figure 7-2

Page 8-43:
Delete Figure 8-21, A19 Signal Input Amplifier schematic and component locator photo; replace with Figure 7-3 and Figure 7-4

Pages 8-46, 47:
Delete Figure 8-23, A21 Function Control schematic and component locator photo; replace with Figure 7-5 and Figure 7-6

Page 8-65:
Delete component locator photo and replace with Figure 7-7
Change Part No. at top of Figure 8-29, A26 Multiplier/Divider assembly from (05248-60019) to (05248-6023)
Change connector pin numbers around schematic as follows: 8 to 10; 9 to 11, 11 to 9; 10 to 8; 12 to 14; and 14 to 12.
Change A26R52 to 510 and remove asterisk and Note #3.

Page 6-2, Table 6-1:
Delete A1C9
Delete A1R12

Page 6-17, Table 6-1:
Change A26R52 to 0683-5115 510 OHMs
Delete "Factory Selected" notation and asterisk
Change A26R34 to 0683-3325 R:FXD COMP 3300 OHM 5% 1/4W

CHANGE 3:

Pages 6-23, 24; Table 6-1:
Change F1 2110-0303 to 2110-0006
F1 F1 2110-0312 to 2110-0007
S4 3101-1272 to 3101-0034
W1 8120-1348 to 8120-0078
XW1 1251-2357 to 1251-0148

Page 6-31, 32; Table 6-2:
Change 1251-2357 to 1251-0148
2110-0303 to 2110-0006
2110-0312 to 2110-0007
3101-1272 to 3101-0034
8120-1348 to 8120-0078

CHANGE 4:

Page 6-1, Figure 6-1:
Replace parts table with the following table:

Item No.	Description	HP Part Number
1	Side Frame Assembly	5060-0732
2	Front Panel for 5248L only Front Panel for 5248M only	05248-20003 05248-20010
3	Rear Panel for 5248L only Rear Panel for 5248M only	05248-00003 05248-00004
4	Rear Side Plate Cover	5000-0738
5	Front Side Plate Cover	5000-0739
6	Top Cover	5243A-1C
7	Bottom Cover	5243A-1B
8	Side Handle Assembly	5060-0222
9	Retainer Handle Assembly	5060-0766
10	Foot Assembly	5060-0767
11	Tilt Stand	1490-0030
12	Trim Strip	5000-0051
13	5-1/4" Rack Mount Kit	5243A-44A

Page 6-23, Table 6-1:
Delete from MP48 description (LIGHT GRAY).

Page 6-24, Table 6-1:
Delete MP66 05243-2023 PANEL: PLUG-IN (MINT GRAY).

Page 6-32, Table 6-2:
Delete from 05243-2019 description (LIGHT GRAY).
Delete 05243-2023 PANEL: PLUG-IN (MINT GRAY); 28480; 05243-2023; TQ 1; 1.

Table 7-2. Reference Designation Index

Reference Designation	✓ Part No.	Description #	Note
A17	05247-6002	BOARD ASSY:HI-FREQ	
	05247-2002	BOARD:BLANK	
A17C1	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C2	0180-0291	C:FXD ELECT 1UF 10% 35VDCW	
A17C3	0150-0073	C:FXD CER 100 PF 10% 500VDCW	
A17C4	0160-3029	C:FXD CER 7.5/0.5 PF 75VDCW	
A17C5	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C6	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C7	0150-0073	C:FXD CER 100 PF 10% 500VDCW	
A17C8	0150-0073	C:FXD CER 100 PF 10% 500VDCW	
A17C9	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C10	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C11	0160-3029	C:FXD CER 7.5/0.5 PF 75VDCW	
A17C12	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C13	0160-3028	C:FXD CER 10PF 10% 75VDCW	
A17C14	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C15	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C16	0160-3028	C:FXD CER 10PF 10% 75VDCW	
A17C17	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C18	0160-2197	C:FXD MICA 10 PF 5%	
A17C19	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C20	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C21	0150-0073	C:FXD CER 100 PF 10% 500VDCW	
A17C22	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C23	0150-0073	C:FXD CER 100 PF 10% 500VDCW	
A17C24	0160-3028	C:FXD CER 10PF 10% 75VDCW	
A17C25	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C26	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C27	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C28	0150-0073	C:FXD CER 100 PF 10% 500VDCW	
A17C29	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C30	0160-3028	C:FXD CER 10PF 10% 75VDCW	
A17C31	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C32	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C33	0150-0073	C:FXD CER 100 PF 10% 500VDCW	
A17C34	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C35	0150-0035	C:FXD CER 20 PF 10% 400VDCW	
A17C36	0150-0073	C:FXD CER 100 PF 10% 500VDCW	
A17C37	0160-3028	C:FXD CER 10PF 10% 75VDCW	
A17C38	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C39	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C40	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C41	0150-0073	C:FXD CER 100 PF 10% 500VDCW	
A17C42	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C43	0160-3028	C:FXD CER 10PF 10% 75VDCW	
A17C44	0150-0073	C:FXD CER 100 PF 10% 500VDCW	
A17C45	0160-2199	C:FXD MICA 30 PF 5%	
A17C46	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C47	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C48	0150-0073	C:FXD CER 100 PF 10% 500VDCW	
A17C49	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17C50	0150-0073	C:FXD CER 100 PF 10% 500VDCW	
A17C51	0160-3028	C:FXD CER 10PF 10% 75VDCW	
A17C52	0160-0127	C:FXD CER 1.0 UF 20% 25VDCW	
A17C53	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A17CR1	1901-0025	DIODE:SILICON 100MV 100MA	
A17CR2	1901-0345	DIODE:SILICON HOT CARRIER 5MIV	
A17CR3	1901-0345	DIODE:SILICON HOT CARRIER 5MIV	
A17CR4	1901-0345	DIODE:SILICON HOT CARRIER 5MIV	
A17CR5	1901-0345	DIODE:SILICON HOT CARRIER 5MIV	
A17CR6	1912-0012	DIODE GERMANIUM TUNNEL:10MA	
A17CR7	1901-0345	DIODE:SILICON HOT CARRIER 5MIV	
A17CR8	1901-0345	DIODE:SILICON HOT CARRIER 5MIV	
A17CR9	1902-3002	DIODE BREAKDOWN:2.37V 5%	
A17CR10	1901-0345	DIODE:SILICON HOT CARRIER 5MIV	
A17CR11	1901-0345	DIODE:SILICON HOT CARRIER 5MIV	
A17CR12	1901-0345	DIODE:SILICON HOT CARRIER 5MIV	
A17CR13	1901-0345	DIODE:SILICON HOT CARRIER 5MIV	
A17CR14	1902-3002	DIODE BREAKDOWN:2.37V 5%	
A17CR15	1902-0041	DIODE:BREAKDOWN 5.11V 5% 400MW	

See introduction to this section for ordering information

Table 7-2. Reference Designation Index (Cont'd)

Reference Designation	Part No.	Description #	Note
A17CR16	1901-0345	DIODE:SILICON HOT CARRIER 5WIV	
A17CR17	1901-0345	DIODE:SILICON HOT CARRIER 5WIV	
A17CR18	1901-0345	DIODE:SILICON HOT CARRIER 5WIV	
A17CR19	1901-0345	DIODE:SILICON HOT CARRIER 5WIV	
A17CR20	1901-0345	DIODE:SILICON HOT CARRIER 5WIV	
A17CR21	1901-0345	DIODE:SILICON HOT CARRIER 5WIV	
A17L1	9140-0170	COIL:FXD RF 0.15 UH 20%	
A17L2	9140-0159	COIL:FXD 0.47UH 20%	
A17L3	9100-2251	COIL:FXD RF 0.22 UH 10%	
A17L4	9100-2251	COIL:FXD RF 0.22 UH 10%	
A17L5	9100-2247	COIL:FXD RF 0.10 UH 10%	
A17L6	05247-8002	COIL:FXD RF	
A17L7	9140-0141	COIL:FXD RF 0.68 UH	
A17L8	9140-0141	COIL:FXD RF 0.68 UH	
A17L9	9140-0141	COIL:FXD RF 0.68 UH	
A17L10	9140-0141	COIL:FXD RF 0.68 UH	
A17L11	05247-8002	COIL:FXD RF	
A17L12	9140-0141	COIL:FXD RF 0.68 UH	
A17L13	9140-0141	COIL:FXD RF 0.68 UH	
A17Q1	1853-0034	TRANSISTOR:SILICON PNP	
A17Q2	1854-0262	TRANSISTOR:SILICON NPN	
A17Q3	1854-0262	TRANSISTOR:SILICON NPN	
A17Q4	1854-0315	TRANSISTOR:SILICON NPN 2N3633	
A17Q5	1854-0315	TRANSISTOR:SILICON NPN 2N3633	
A17Q6	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A17Q7	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A17Q8	1854-0048	TRANSISTOR:SILICON NPN 2N2857	
A17Q9	1854-0048	TRANSISTOR:SILICON NPN 2N2857	
A17Q10	1854-0315	TRANSISTOR:SILICON NPN 2N3633	
A17Q11	1854-0315	TRANSISTOR:SILICON NPN 2N3633	
A17Q12	1854-0262	TRANSISTOR:SILICON NPN	
A17Q13	1854-0262	TRANSISTOR:SILICON NPN	
A17Q14	1854-0262	TRANSISTOR:SILICON NPN	
A17Q15	1854-0262	TRANSISTOR:SILICON NPN	
A17Q16	1854-0315	TRANSISTOR:SILICON NPN 2N3633	
A17Q17	1854-0315	TRANSISTOR:SILICON NPN 2N3633	
A17Q18	1854-0048	TRANSISTOR:SILICON NPN 2N2857	
A17Q19	1854-0048	TRANSISTOR:SILICON NPN 2N2857	
A17Q20	1854-0262	TRANSISTOR:SILICON NPN	
A17Q21	1854-0262	TRANSISTOR:SILICON NPN	
A17Q22	1854-0315	TRANSISTOR:SILICON NPN 2N3633	
A17Q23	1854-0315	TRANSISTOR:SILICON NPN 2N3633	
A17Q24	1854-0009	TRANSISTOR:SILICON NPN 2N709	
A17Q25	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A17R1	0757-0900	R:FXD MET FLM 100 OHM 2% 1/4W	

See introduction to this section for ordering information

Reference Designation	Part No.	Description #	Note
A17R2	0757-0948	R:FXD MET FLM 10K OHM 2% 1/4W	
A17R3	0757-0953	R:FXD MET FLM 16K OHM 2% 1/4W	
A17R4	0757-0902	R:FXD MET FLM 120 OHM 2% 1/4W	
A17R5	0757-0378	R:FXD MET FLM 11.0 OHM 1% 1/8W FACTORY SELECTED PART	
A17R6	0757-0940	R:FXD MET FLM 4.7K OHM 2% 1/4W	
A17R7	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A17R8	0698-5561	R:FXD COMP 6.8 OHM 5% 1/8W	
A17R9	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A17R10	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A17R11	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A17R12	0757-0907	R:FXD MET FLM 200 OHM 2% 1/4W	
A17R13	0757-0946	R:FXD MET FLM 8.2K OHM 2% 1/4W	
A17R14	0757-0180	R:FXD MET FLM 31.6 OHM 1% 1/8W	
A17R15	0698-5561	R:FXD COMP 6.8 OHM 5% 1/8W	
A17R16	0757-0938	R:FXD MET FLM 3.9K OHM 2% 1/4W	
A17R17	0757-0940	R:FXD MET FLM 4.7K OHM 2% 1/4W	
A17R18	0757-0907	R:FXD MET FLM 200 OHM 2% 1/4W	
A17R19	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A17R20	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A17R21	0757-0917	R:FXD MET FLM 510 OHM 2% 1/4W	
A17R22	0757-0948	R:FXD MET FLM 10K OHM 2% 1/4W	
A17R23	0757-0907	R:FXD MET FLM 200 OHM 2% 1/4W	
A17R24	0757-0918	R:FXD MET FLM 560 OHM 2% 1/4W	
A17R25	0757-0953	R:FXD MET FLM 16K OHM 2% 1/4W	
A17R26	0757-0931	R:FXD MET FLM 2.0K OHM 2% 1/4W	
A17R27	0698-3435	R:FXD MET FLM 38.3 OHM 1%1/8W	
A17R28	0757-0893	R:FXD MET FLM 51 OHM 2% 1/4W	
A17R29	0683-2405	R:FXD COMP 24 OHM 5% 1/4W	
A17R30	0757-0953	R:FXD MET FLM 16K OHM 2% 1/4W	
A17R31	0757-0931	R:FXD MET FLM 2.0K OHM 2% 1/4W	
A17R32	0757-0907	R:FXD MET FLM 200 OHM 2% 1/4W	
A17R33	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A17R34	0757-0948	R:FXD MET FLM 10K OHM 2% 1/4W	
A17R35	0698-3378	R:FXD CARBON 51 OHM 5% 1/8W	
A17R36	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A17R37	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A17R38	0757-0907	R:FXD MET FLM 200 OHM 2% 1/4W	
A17R39	0757-0906	R:FXD MET FLM 180 OHM 2% 1/4W	
A17R40	0757-0180	R:FXD MET FLM 31.6 OHM 1% 1/8W	
A17R41	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A17R42	0698-3378	R:FXD CARBON 51 OHM 5% 1/8W	
A17R43	0757-0928	R:FXD MET FLM 1.5K OHM 2% 1/4W	
A17R44	0757-0907	R:FXD MET FLM 200 OHM 2% 1/4W	
A17R45	0683-2405	R:FXD COMP 24 OHM 5% 1/8W	
A17R46	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A17R47	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A17R48	0757-0935	R:FXD MET FLM 3.0K OHM 2% 1/4W	
A17R49	0683-2405	R:FXD COMP 24 OHM 5% 1/8W	

See introduction to this section for ordering information

Table 7-2. Reference Designation Index (Cont'd)

Reference Designation	Part No.	Description #	Note
A17R50	0757-0946	RESD MET FLM 8.2K OHM 2% 1/4W	
A17R51	0757-0953	RESD MET FLM 16K OHM 2% 1/4W	
A17R52	0757-0953	RESD MET FLM 16K OHM 2% 1/4W	
A17R53	0698-3113	RESD CARBON 100 OHM 5% 1/8W	
A17R54	0698-3113	RESD CARBON 100 OHM 5% 1/8W	
A17R55	0757-0924	RESD MET FLM 1.0K OHM 2% 1/4W	
A17R56	0757-0924	RESD MET FLM 1.0K OHM 2% 1/4W	
A17R57	0757-0907	RESD MET FLM 200 OHM 2% 1/4W	
A17R58	0698-5625	RESD COMP 8.2K OHM 10% 1/8W	
A17R59	0757-0180	RESD MET FLM 31.6 OHM 1% 1/8W	
A17R60	0698-3113	RESD CARBON 100 OHM 5% 1/8W	
A17R61	0698-3113	RESD CARBON 100 OHM 5% 1/8W	
A17R62	0757-0946	RESD MET FLM 8.2K OHM 2% 1/4W	
A17R63	0757-0907	RESD MET FLM 200 OHM 2% 1/4W	
A17R64	0757-0924	RESD MET FLM 1.0K OHM 2% 1/4W	
A17R65	0757-0924	RESD MET FLM 1.0K OHM 2% 1/4W	
A17R66	0698-5180	RESD COMP 2K OHM 5% 1/8W	
A17R67	0757-0900	RESD MET FLM 100 OHM 2% 1/4W	
A17R68	0757-0917	RESD MET FLM 510 OHM 2% 1/4W	
A17R69	0757-0948	RESD MET FLM 10K OHM 2% 1/4W	
A17R70	0757-0907	RESD MET FLM 200 OHM 2% 1/4W	
A17R71	0698-3378	RESD CARBON 51 OHM 5% 1/8W	
A17R72	0757-0953	RESD MET FLM 16K OHM 2% 1/4W	
A17R73	0757-0926	RESD MET FLM 1.2K OHM 2% 1/4W	
A17R74	0757-0931	RESD MET FLM 2.0K OHM 2% 1/4W	
A17R75	0757-0905	RESD MET FLM 160 OHM 2% 1/4W	
A17R76	0757-0953	RESD MET FLM 16K OHM 2% 1/4W	
A17R77	0684-2405	RESL COMP 24 OHM 5% 1/8W	
A17R78	0757-0917	RESD MET FLM 510 OHM 2% 1/4W	
A17R79	0757-0935	RESD MET FLM 3.0K OHM 2% 1/4W	
A17R80	0757-0924	RESD MET FLM 1.0K OHM 2% 1/4W	
A17R81	0757-0924	RESD MET FLM 1.0K OHM 2% 1/4W	
A17R82	0757-0907	RESD MET FLM 200 OHM 2% 1/4W	
A17R83	0757-0946	RESD MET FLM 8.2K OHM 2% 1/4W	
A17R84	0757-0180	RESD MET FLM 31.6 OHM 1% 1/8W	
A17R85	0684-2405	RESD COMP 24 OHM 5% 1/8W	
A17R86	0698-3113	RESD CARBON 100 OHM 5% 1/8W	
A17R87	0698-3113	RESD CARBON 100 OHM 5% 1/8W	
A17R88	0757-0935	RESD MET FLM 3.0K OHM 2% 1/4W	
A17R89	0757-0907	RESD MET FLM 200 OHM 2% 1/4W	
A17R90	0757-0924	RESD MET FLM 1.0K OHM 2% 1/4W	
A17R91	0757-0924	RESD MET FLM 1.0K OHM 2% 1/4W	
A17R92	0757-0924	RESD MET FLM 1.0K OHM 2% 1/4W	
A17R93	0757-0948	RESD MET FLM 10K OHM 2% 1/4W	
A17R94	0757-0909	RESD MET FLM 240 OHM 2% 1/4W	
A17R95	0757-0909	RESD MET FLM 240 OHM 2% 1/4W	
A17R96	0757-0909	RESD MET FLM 240 OHM 2% 1/4W	
A17R97	0757-0953	RESD MET FLM 16K OHM 2% 1/4W	
A17R98	0757-0909	RESD MET FLM 240 OHM 2% 1/4W	
A17R99	0757-0931	RESD MET FLM 2K OHM 2% 1/4W	

See introduction to this section for ordering information

Table 7-3. Reference Designation Index

Reference Designation	◊ Part No.	Description #	Note
A19	05248-60001	BOARD ASSY:AMPLIFIER	
	05248-20001	BOARD:BLANK PC	
A19C1	0160-0127	C:FXD CER 1.0 UF 20% 25VDCW	
A19C2	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A19C3	0150-0042	C:FXD TE 4.7 PF 5% 500VDCW	
A19C4	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A19C5	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A19C6	0150-0073	C:FXD CER 100 PF 10% 500VDCW	
A19C7	0160-0127	C:FXD CER 1.0 UF 20% 25VDCW	
A19C8	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A19C9	0140-0190	C:FXD MICA 39 PF 5%	
A19C10	0160-2930	C:FXD CER 0.01 UF +80-20% 100VDCW	
A19C11	0160-2252	C:FXD CER 0.2-0.25 PF 500VDCW	
A19CR1	1901-0376	DIODE:SILICON 35V	
A19CR2	1901-0040	DIODE:SILICON 30MA 30WV	
A19CR3	1901-0376	DIODE:SILICON 35V	
A19CR4	1901-0040	DIODE:SILICON 30MA 30WV	
A19CR5	1902-0560	DIODE BREAKDOWN:4.75V 2%	
A19CR6	1901-0040	DIODE:SILICON 30MA 30WV	
A19CR7	1901-0040	DIODE:SILICON 30MA 30WV	
A1901	1855-0047	TRANSISTOR:DUAL N-CHANNEL FET	
A1902	1854-0749	TRANSISTOR:DUAL NPN SILICON	
A1903	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A1904	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A1905	1854-0048	TRANSISTOR:SILICON NPN 2N2857	
A1906	1854-0048	TRANSISTOR:SILICON NPN 2N2857	
A19R1	0757-0902	R:FXD MET FLM 120 OHM 2% 1/4W	
A19R2	0683-1625	R:FXD COMP 1600 OHM 5% 1/4W	
A19R3	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A19R4	0683-1235	R:FXD COMP 12K OHM 5% 1/4W	
A19R5	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A19R6	0757-0952	R:FXD MET FLM 15K OHM 2% 1/4W	
A19R7	0683-1815	R:FXD COMP 180 OHM 5% 1/4W	
A19R8	0683-2225	R:FXD COMP 2.2K OHM 5% 1/4W	
A19R9	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A19R10	0757-0911	R:FXD MET FLM 300 OHM 2% 1/4W	
A19R11	0757-0900	R:FXD MET FLM 100 OHM 2% 1/4W	
A19R12	0698-3113	R:FXD CARBON 100 OHM 5% 1/8W	
A19R13	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A19R14	0757-0911	R:FXD MET FLM 300 OHM 2% 1/4W	
A19R15	0683-1815	R:FXD COMP 180 OHM 5% 1/4W	
A19R16	0683-2225	R:FXD COMP 2.2K OHM 5% 1/4W	
A19R17	0683-6815	R:FXD COMP 680 OHM 5% 1/4W	
A19R18	0757-0952	R:FXD MET FLM 15K OHM 2% 1/4W	
A19R19	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A19R20	2100-1513	R:VAR WW 50 OHM 5% LIN 1W	
A19R21	0683-1825	R:FXD COMP 1800 OHM 5% 1/4W	
A19R22	0698-8649	R:FXD COMP 390 OHM 5% 1/8W	
A19R23	0698-5562	R:FXD CARBON 120 OHM 5% 1/8W	
A19R24	0683-1825	R:FXD COMP 1800 OHM 5% 1/4W	
A19R25	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A19R26	0683-1235	R:FXD COMP 12K OHM 5% 1/4W	
	0340-0060	FEEDTHRU:INSULATED MOUNTING	
	0380-0111	SPACER:THREADED 1/4"	

See introduction to this section for ordering information

Table 7-4. Reference Designation Index

Reference Designation	# Part No.	Description #	Note
A21	05248-60003	BOARD ASSY:FUNCTION CONT	
	05248-20003	BOARD:BLANK PC	
A21C1	0160-0127	CAPXD CER 1.0 UF 20% 25VDCW	
A21C2	0160-3277	CAPXD CER 0.01 UF 20% 50VDCW	
A21C3	0160-7930	CAPXD CER 0.01 UF +80-20% 100VDCW	
A21C4	0160-0127	CAPXD CER 1.0 UF 20% 25VDCW	
A21C5	0160-0127	CAPXD CER 1.0 UF 20% 25VDCW	
A21C6	0160-2930	CAPXD CER 0.01 UF +80-20% 100VDCW	
A21C7	0160-2930	CAPXD CER 0.01 UF +80-20% 100VDCW	
A21C8	0160-2327	CAPXD CER 1000 PF 20% 75VDCW	
A21C9	0160-2327	CAPXD CER 1000 PF 20% 75VDCW	
A21C10	0160-2327	CAPXD CER 1000 PF 20% 75VDCW	
A21C11	0180-0210	CAPXD ELECT 3.3 UF 20% 15VDCW	
A21C12	0140-0203	CAPXD MICA 30 PF 5%	
A21C13	0160-2327	CAPXD CER 1000 PF 20% 75VDCW	
A21C14	0160-2327	CAPXD CER 1000 PF 20% 75VDCW	
A21C15	0160-2327	CAPXD CER 1000 PF 20% 75VDCW	
A21C16	0160-3277	CAPXD CER 0.01 UF 20% 50VDCW	
A21C17	0140-0149	CAPXD MICA 470 PF 5%	
A21C18	0140-0149	CAPXD MICA 470 PF 5%	
A21C19	0160-2327	CAPXD CER 1000 PF 20% 75VDCW	
A21C20	0160-2327	CAPXD CER 1000 PF 20% 75VDCW	
A21C21	0140-0149	CAPXD MICA 470 PF 5%	
A21C22	0140-0149	CAPXD MICA 470 PF 5%	
A21C23	0160-0178	CAPXD MICA 27PF 5% 300VDCW	
A21C24	0160-2327	CAPXD CER 1000 PF 20% 75VDCW	
A21C25	0160-2930	CAPXD CER 0.01 UF +80-20% 100VDCW	
A21C26	0160-2327	CAPXD CER 1000 PF 20% 75VDCW	
A21C27	0160-2930	CAPXD CER 0.01 UF +80-20% 100VDCW	
A21C28	0160-0178	CAPXD MICA 27PF 5% 300VDCW	
A21C29	0160-2327	CAPXD CER 1000 PF 20% 75VDCW	
A21C30	0160-2327	CAPXD CER 1000 PF 20% 75VDCW	
A21C31	0160-2930	CAPXD CER 0.01 UF +80-20% 100VDCW	
A21CR1	1901-0040	DIODE:SILICON 30MA 30WV	
A21CR2	1901-0040	DIODE:SILICON 30MA 30WV	
A21CR3	1901-0040	DIODE:SILICON 30MA 30WV	
A21CR4	1901-0040	DIODE:SILICON 30MA 30WV	
A21CR5	1901-0040	DIODE:SILICON 30MA 30WV	
A21CR6	1901-0040	DIODE:SILICON 30MA 30WV	
A21CR7	1901-0040	DIODE:SILICON 30MA 30WV	
A21CR8	1901-0040	DIODE:SILICON 30MA 30WV	
A21CR9	1901-0040	DIODE:SILICON 30MA 30WV	
A21CR10	1901-0040	DIODE:SILICON 30MA 30WV	

See introduction to this section for ordering information

Reference Designation	# Part No.	Description #	Note
A21CR11	1901-0040	DIODE:SILICON 30MA 30WV	
A21CR12	1901-0040	DIODE:SILICON 30MA 30WV	
A21CR13	1902-0580	DIODE BREAKDOWN:6.75V 2%	
A21CR14	1902-0173	DIODE BREAKDOWN:9.53V 5%	
A21CR15	1912-0012	DIODE GERMANIUM TUNNEL:10MA	
A21CR16	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60WIV	
A21CR17	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60WIV	
A21CR18	1912-0012	DIODE GERMANIUM TUNNEL:10MA	
A21CR19	1901-0025	DIODE:SILICON 100WV 100MA	
A21CR20	1902-0580	DIODE BREAKDOWN:6.75V 2%	
A21CR21	1902-0032	DIODE BREAKDOWN:5.49V 5%	
A21L1	9100-2247	COIL:FXD RF 0.10 UH 10%	
A21L2	9100-2247	COIL:FXD RF 0.10 UH 10%	
A21L3	9100-2247	COIL:FXD RF 0.10 UH 10%	
A21L4	9140-0144	COIL:FXD RF 10.0 UH	
A21L5	9140-0144	COIL:FXD RF 10.0 UH	
A21L6	9100-2250	COIL/CHOKE 0.18 UH 10%	
A21L7	9100-2247	COIL:FXD RF 0.10 UH 10%	
A21L8	9100-0346	COIL:FXD 0.05 UH 20%	
A21Q1	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A21Q2	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A21Q3	1454-0072	TRANSISTOR:SILICON NPN	
A21Q4	1854-0048	TRANSISTOR:SILICON NPN 2N2857	
A21Q5	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A21Q6	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A21Q7	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A21Q8	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A21Q9	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A21Q10	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A21Q11	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A21Q12	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A21Q13	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A21Q14	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A21Q15	1854-0315	TRANSISTOR:SILICON NPN 2N3633	
A21Q16	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A21R1	0683-5615	RESFXD COMP 560 OHM 5% 1/4W	
A21R2	0698-5562	RESFXD CARBON 120 OHM 5% 1/8W	
A21R3	0683-1315	RESFXD COMP 130 OHM 5% 1/4W	
A21R4	0683-1315	RESFXD COMP 130 OHM 5% 1/4W	
A21R5	0683-5125	RESFXD COMP 5100 OHM 5% 1/4W	
A21R6	0683-5125	RESFXD COMP 5100 OHM 5% 1/4W	
A21R7	0683-5125	RESFXD COMP 5100 OHM 5% 1/4W	
A21R8	0683-5125	RESFXD COMP 5100 OHM 5% 1/4W	
A21R9	0683-5125	RESFXD COMP 5100 OHM 5% 1/4W	
A21R10	0683-5125	RESFXD COMP 5100 OHM 5% 1/4W	

See introduction to this section for ordering information

Table 7-4. Reference Designation Index (Cont'd)

Reference Designation	Part No.	Description #	Note
A21R11	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A21R12	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A21R13	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A21R14	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A21R15	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A21R16	0683-1035	RESD COMP 10K OHM 5% 1/4W	
A21R17	0683-6815	RESD COMP 680 OHM 5% 1/4W	
A21R18	0683-6815	RESD COMP 680 OHM 5% 1/4W	
A21R19	0683-1525	RESD COMP 1500 OHM 5% 1/4W	
A21R20	0683-8215	RESD COMP 820 OHM 5% 1/4W	
A21R21	0683-3625	RESD COMP 3600 OHM 5% 1/4W FACTORY SELECTED PART	
A21R22	0683-7505	RESD COMP 75 OHM 5% 1/4W	
A21R23	0683-3315	RESD COMP 330 OHM 5% 1/4W	
A21R24	0683-4705	RESD COMP 47 OHM 5% 1/4W	
A21R25	0698-3381	RESD COMP 150 OHM 5% 1/8W FACTORY SELECTED PART	
A21R26	0757-0420	RESD MET FLM 750 OHM 1% 1/8W	
A21R27	0683-1315	RESD COMP 130 OHM 5% 1/4W	
A21R28	0683-1225	RESD COMP 1200 OHM 5% 1/4W	
A21R29	0683-1815	RESD COMP 180 OHM 5% 1/4W	
A21R30	0683-3915	RESD COMP 390 OHM 5% 1/4W	
A21R31	0683-4715	RESD COMP 470 OHM 5% 1/4W	
A21R32	0683-6815	RESD COMP 680 OHM 5% 1/4W	
A21R33	0683-3625	RESD COMP 3600 OHM 5% 1/4W	
A21R34	2100-1772	RESVAR WW 500 OHM 10% LIN 1/2W	
A21R35	0683-4315	RESD COMP 430 OHM 5% 1/4W	
A21R36	0683-4715	RESD COMP 470 OHM 5% 1/4W	
A21R37	0683-6815	RESD COMP 680 OHM 5% 1/4W	
A21R38	0683-4715	RESD COMP 470 OHM 5% 1/4W	
A21R39	0698-3113	RESD CARBON 100 OHM 5% 1/8W	
A21R40	0683-4725	RESD COMP 4700 OHM 5% 1/4W	
A21R41	0683-4725	RESD COMP 4700 OHM 5% 1/4W	
A21R42	0683-4725	RESD COMP 4700 OHM 5% 1/4W	
A21R43	0683-4725	RESD COMP 4700 OHM 5% 1/4W	
A21R44	0683-3905	RESD COMP 39 OHM 5% 1/4W	
A21R45	0683-1015	RESD COMP 100 OHM 5% 1/4W	
A21R46	0683-4735	RESD COMP 47K OHM 5% 1/4W	
A21R47	0683-4735	RESD COMP 47K OHM 5% 1/4W	
A21R48	0683-2015	RESD COMP 200 OHM 5% 1/4W	
A21R49	0683-4315	RESD COMP 430 OHM 5% 1/4W	
A21R50	0698-3111	RESD COMP 30 OHM 5% 1/8W	
A21R51	0683-1425	RESD COMP 1400 OHM 5% 1/4W	
A21R52	0683-2015	RESD COMP 200 OHM 5% 1/4W	
A21R53	0683-1025	RESD COMP 1000 OHM 5% 1/4W	
A21R54	0683-2405	RESD COMP 24 OHM 5% 1/4W	
A21R55	0683-1325	RESD COMP 1300 OHM 5% 1/4W	
A21R56	0758-0030	RESD MET OX 510 OHM 5% 1/2W	
A21R57	0683-3915	RESD COMP 390 OHM 5% 1/4W	
A21R58	0683-8215	RESD COMP 820 OHM 5% 1/4W	
A21R59	0683-1015	RESD COMP 100 OHM 5% 1/4W FACTORY SELECTED PART	
A21R60	0757-0420	RESD MET FLM 750 OHM 1% 1/8W	
A21MP	0340-0060	FEEDTHRU:INSULATED MOUNTING	
	0360-0111	SPACER:THREADED 1/4"	

See introduction to this section for ordering information

Figure 7-1. A17 Component Locator

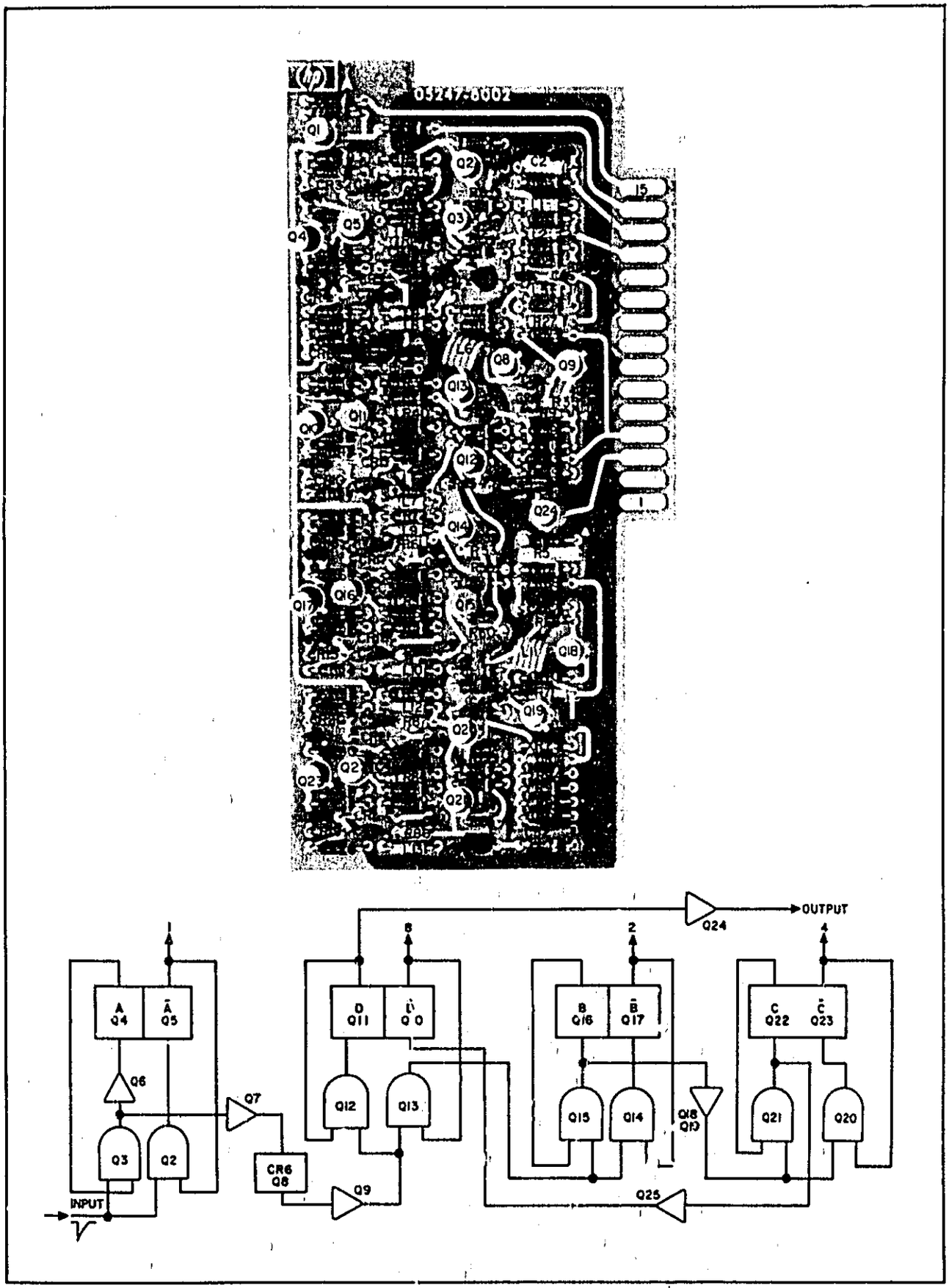


Figure 7-2. A17 High Decimal Counter Schematic

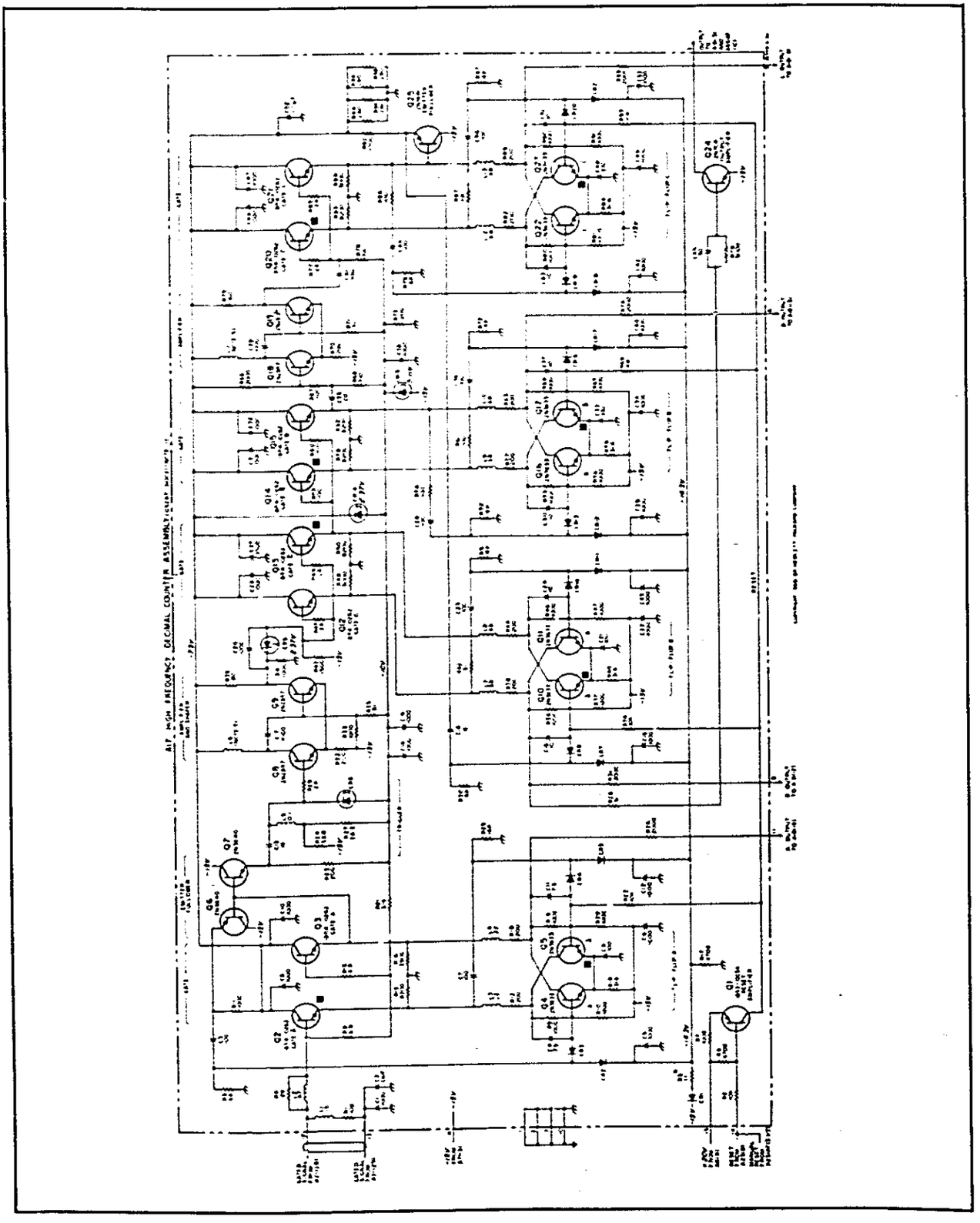


Figure 7-3. Component Locator

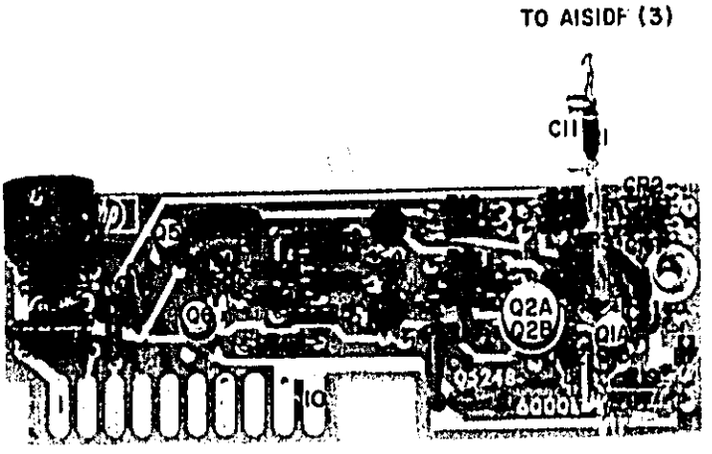


Figure 7-4. A19 Signal Input Amplifier Schematic

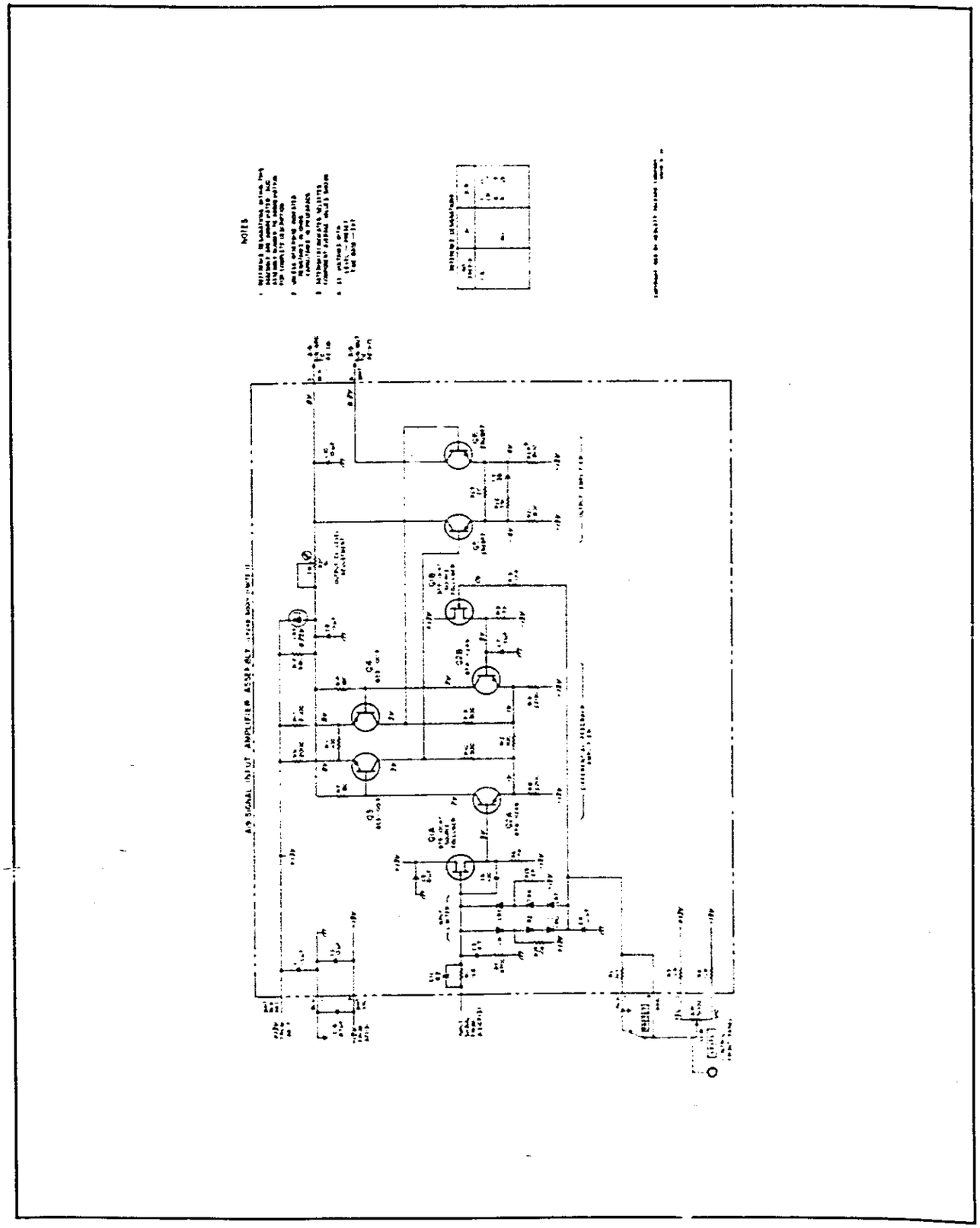


Figure 7-5. A21 Component Locator

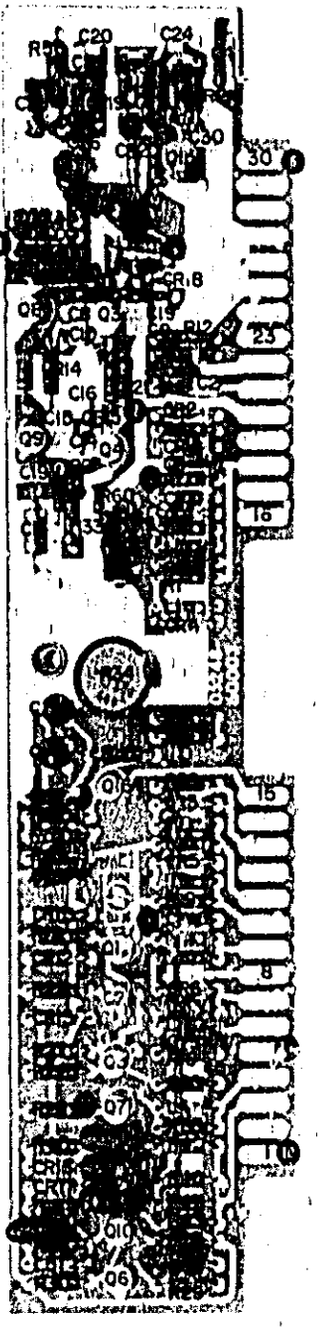


Figure 7-6. A2i Function Control Schematic

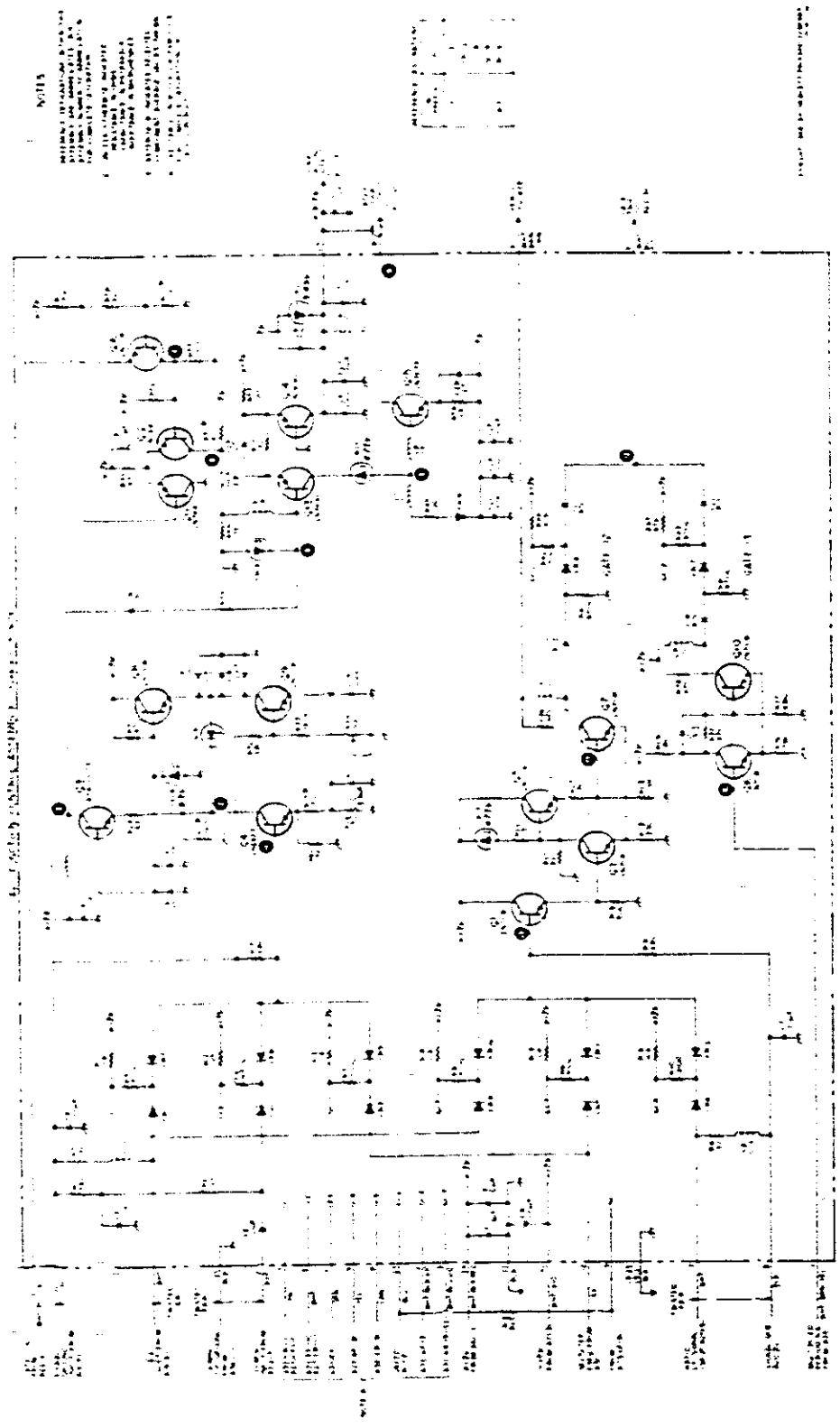
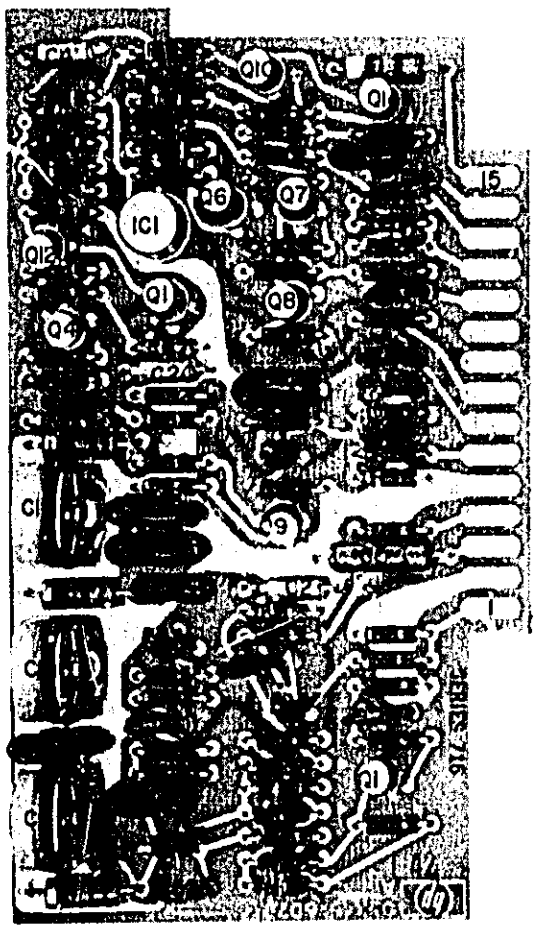


Figure 7 .. A26 Multiplier/Divider Parts Location (5248M)



SCHEMATIC DIAGRAMS

SECTION VIII

CIRCUIT DIAGRAMS

8-1. This section contains the following:

a. General notes for schematic diagrams in Figure 8-1.

b. Block diagrams for 5248L (Figure 8-2) and 5248M (Figure 8-3).

c. Schematic diagrams and component locators for assemblies including theory of operation and trouble-shooting procedures in Figures 8-4 through 8-36.

d. Schematic diagrams and component locators for Option 02 and 03 assemblies including theory of operation.

8-2. The diagrams, when unfolded, can be used with other parts of the manual or when the manual is closed.

8-3. DC voltages are measured with HP Model 412A VTVM.

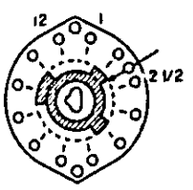
8-4. Shaded areas on the schematic diagrams indicate printed circuit assemblies. All components within the shaded area are mounted on that board.

Figure 8-1. Schematic Diagram Notes

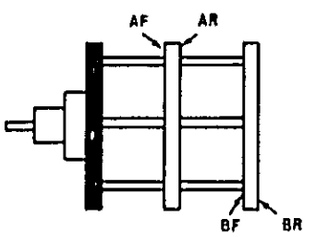
SYMBOLS

- FRONT PANEL
- REAR PANEL
- INTERIOR AND PC BOARDS
- WIPER MOVES TOWARD "CW" WHEN CONTROL IS ROTATED CLOCKWISE
- POWER LINE GROUND
- CIRCUIT COMMON GROUND
- FLOATING GROUND
- CHASSIS GROUND
- KNOB CONTROL
- SCREWDRIVER ADJUST
- MAIN SIGNAL PATH
- FEEDBACK PATH
- TEST POINT
- "AND" GATE
- "OR" GATE
- INVERTER
- NAND GATE
- NOR GATE
- EXCLUSIVE NOR

SWITCH DESIGNATIONS



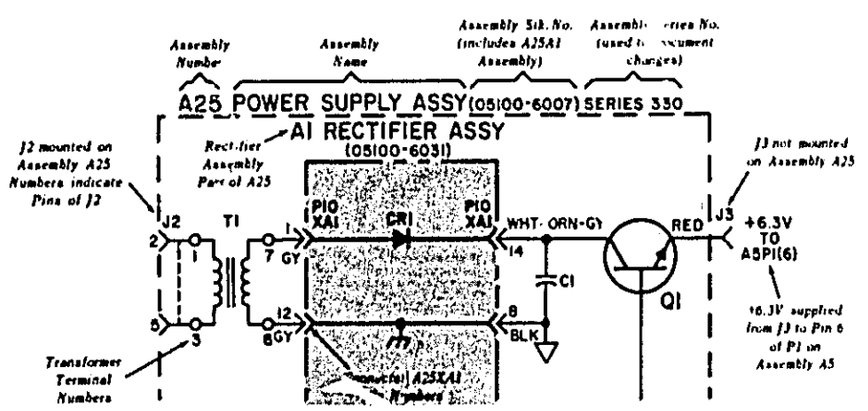
A3S1	SWITCH S1 WITHIN ASSEMBLY A3	
B	2ND WAFER FROM FRONT (A=1ST, ETC)	
R	REAR OF WAFER (F=FRONT)	
A3S1BR(2-1/2)	(2-1/2)	TERMINAL LOCATION (2½) (VIEWED FROM FRONT)



REFERENCE DESIGNATIONS

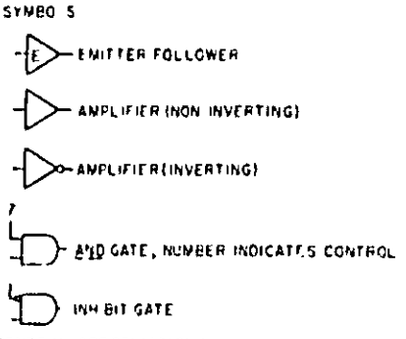
REFERENCE DESIGNATIONS WITHIN ASSEMBLIES ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION. JACKS ARE THE STATIONARY CONNECTORS AND PLUGS ARE THE MORE MOVEABLE OF TWO CONNECTORS.

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



NOTES

1 SYMBOLS



2 GENERAL ABBREVIATIONS
- DP = DECIMAL POINT
- DR = DIGITAL RECORDER
- GC = GATE CONTROL
- MU = MEASUREMENT UNIT
- BCD = BINARY CODED DECIMAL
- DCA = DECIMAL COUNTER ASSY
- DDA = DECADE DIVIDER ASSY
- MPS = MULTIPLIED PERIOD SIG

3 SWITCH SITUATION ABBREVIATIONS
- · = AND
- + = OR
- B = ANY TIME BASE POSITION EXCEPT "EXT" OR 0.1μSEC
- B_B = TIME BASE POSITION 0.1μSEC
- C = INPUT SWITCH: CHECK
- $\bar{C}$ = INPUT SWITCH: NOT CHECK
- E = TIME BASE SWITCH: EXT
- $\bar{E}$ = TIME BASE SWITCH: NOT EXT
- F = FUNCTION SWITCH: FREQUENCY
- M = FUNCTION SWITCH: MANUAL START OR MANUAL STOP
- $\bar{M}$ = FUNCTION SWITCH: NOT (MANUAL START OR MANUAL STOP)
- P = FUNCTION SWITCH: PERIOD AVERAGE (FOR ANY POSITION)
- P_A = FUNCTION SWITCH: PERIOD AVERAGE (FOR SPECIFIC POSITION)
- T_I = FUNCTION SWITCH: TIME INT
- $\bar{T}_I$ = FUNCTION SWITCH: NOT TIME INT
- PI = PLUG-IN "ON"

4 DP LAMPS ARE DESIGNATED 0 THRU 7 FOR EACH POSITION FROM RIGHT TO LEFT AS VIEWED FROM FRONT

5. DP AND MU LAMPS OPERATE AS TABULATED WHEN INPUT SWITCH IS NOT CHECK, LAMPS OPERATE IN CHECK ONLY IF FUNCTION SWITCH IS SET TO FREQUENCY

6. DP AND MU LAMPS ARE LIGHTED BY +17.0V CONTROL SUPPLIED TO APPROPRIATE A5 - A9 TERMINAL FROM SWITCH

7 * = SWITCH POSITIONS DO NOT PERMIT VALID MEASUREMENT

GATE CONTROL SUMMARY (NOTE 3)

GATE CONTROL DESIGNATION	INTERNAL CONTROL: SWITCH SITUATION FOR ON STATE (-15V), WITH (PLUG IN OFF)	INTERNAL CONTROL: SOURCE
1	$\bar{C}$ (M + C + P + PI)	A2SIC(F-10), A3SIG(R-10)
2	$\bar{C}$ (M + F + E)	A2SIC(R-11), A3SIF(F-10)
3	C P + B F	A3SID (F-11)
4	$\bar{C}$ $\bar{T}_I$ E	A2SIB (F-8)
5	$\bar{C}$ $\bar{E}$ P	A3SIC (R-9)
6	B_B ($\bar{C}$ P + $\bar{T}_I$ + C M) + C F	A3SID (F-4)
7	100K P_A	A3SIA (F-9)
8	10K P_A	A3SIA (F-8)
9	1K P_A	A3SIA (F-7)
10	100 P_A	A3SIA (F-6)
11	10 P_A	A3SIA (F-5)
12	F + 1 P_A	A3SIA (F-3,4)
13	ANY P_A EXCEPT 1 P_A	A3SIA (R-9 1/2)
21	(10S) (M + F + P $\bar{C}$ + PI)	A2SIA (F-4)
22	(1S) (M + F + P·$\bar{C}$ + PI)	A2SIA (F-5)
23	(0.1S) (M + F + P·$\bar{C}$ + PI)	A2SIA (F-6)
24	(10mS) (M + F + P·$\bar{C}$ + PI)	A2SIA (F-7)
25	(1mS) (M + F + P·$\bar{C}$ + PI)	A2SIA (F-8)
26	(0.1mS) (M + F + P·$\bar{C}$ + PI)	A2SIA (F-9)
27	(10μS) (M + F + P $\bar{C}$ + PC + PI)	A2SIA (F-10)
28	(1μS) (M + F + P·$\bar{C}$ + PI)	A2SIA (F-11)
29	(0.1μS) (M + F + P·$\bar{C}$ + PI)	A2SIA (F-12)

DECIMAL POINT SITUATIONS (NOTES 3 THRU 6)

FUNCTION SWITCH	TIME BASE SWITCH: 0.1μS	1μS	10μS	0.1mS	1mS	10mS	0.1S	1S	10S	EXT	0.1μSEC
M START	–	–	–	–	–	–	–	–			—
M STOP	–	–	–	–	–	–	–	–	–	–	—
F	–	0	1	2	0	1	2	3	4	–	—
1 P_A	1	0	2	1	0	2	1	0	–	0	2
10 P_A	2	1	0	2	1	0	2	1	–	1	3
100 P_A	3	2	1	0	2	1	0	–	–	2	4
1K P_A	4	3	2	1	0	2	–	–	–	3	5
10K P_A	5	4	3	2	1	–	–	–	–	4	6
100K P_A	6	5	4	3	–	–	–	–	–	5	7
T_I	–	–	–	–	–	–	–	–	–	–	—

MEASUREMENT UNITS SITUATIONS (NOTES 3,5,6,7)

FUNCTION SWITCH	TIME BASE SWITCH: 0.1μS	1μS	10μS	0.1mS	1mS	10mS	0.1S	1S	10S	EXT	0.1μSEC
M START	–	–	–	–	–	–	–	–	–	–	—
M STOP	–	–	–	–	–	–	–	–	–	–	—
F	*	MHz	MHz	MHz	KHz	KHz	KHz	KHz	KHz	*	*
1 P_A	μS	μS	mS	mS	mS	SEC	SEC	SEC	*	–	μS
10 P_A	μS	μS	μS	mS	mS	mS	SEC	SEC	*	–	μS
100 P_A	μS	μS	μS	μS	mS	mS	mS	*	*	–	μS
1K P_A	μS	μS	μS	μS	μS	mS	*	*	*	–	μS
10K P_A	μS	μS	μS	μS	μS	*	*	*	*	–	μS
100K P_A	μS	μS	μS	μS	*	*	*	*	*	–	μS
T_I	–	–	–	–	–	–	–	–	–	–	—

DECIMAL POINT AND MEASUREMENT UNITS CONTROL SOURCE

DP DESIGNATION	INTERNAL SOURCE		MU DESIGNATION	INTERNAL SOURCE
7	A2SIF(R-6)		MHz	A2SIG(R-6)
6	A2SIF(R-5)		KHz	A2SIG(R-4)
5	A2SIF(R-8)		SEC	A2SIH(F-5)
4	A2SIF(F-7)		mS	A2SIJ(F-5)
3	A2SIG(F-4 1/2)		μS	A2SIJ(F-7)
2	A2SIE(F-10)		*	A2SIK(F-4)
1	A2SIE(F-9)			
0	A2SIE(F-8)			

5248-0-2

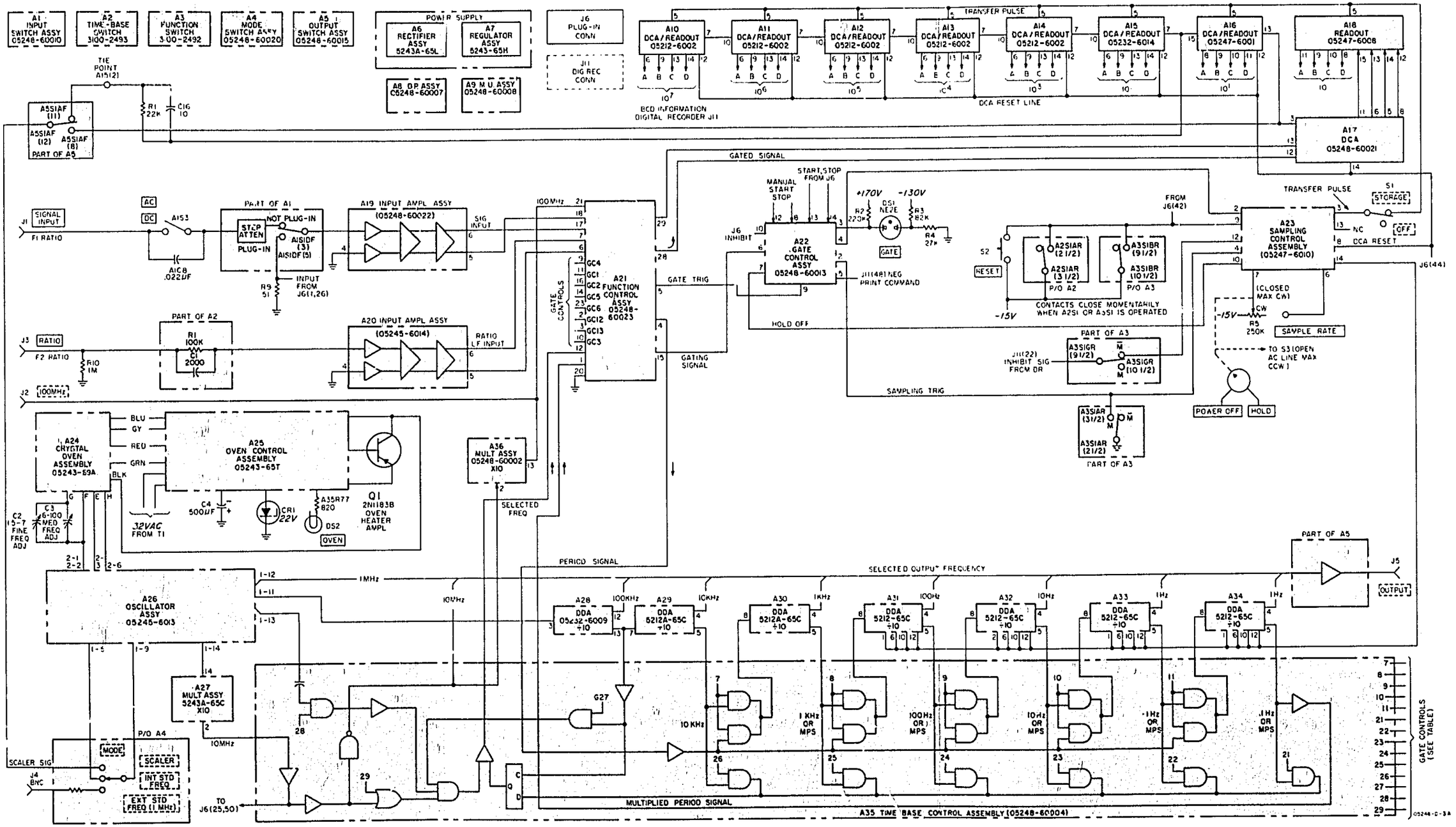
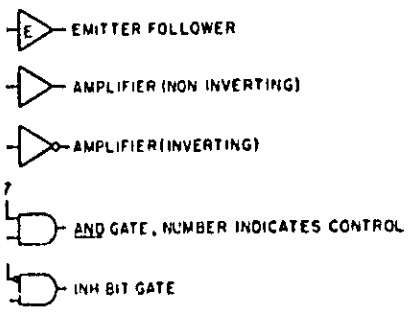


Figure 8-2. Model 5248L Block Diagram

NOTES

1. SYMBOLS



2. GENERAL ABBREVIATIONS
   - DP = DECIMAL POINT
   - DR = DIGITAL RECORDER
   - GC = GATE CONTROL
   - MU = MEASUREMENT UNIT
   - BCD = BINARY CODED DECIMAL
   - DCA = DECIMAL COUNTER ASSY
   - DDA = DECADE DIVIDER ASSY
   - MPS = MULTIPLIED PERIOD SIG

3. SWITCH SITUATION ABBREVIATIONS
   - · = AND
   - + = OR
   - B = ANY TIME BASE POSITION EXCEPT "EXT" OR 0.1μSEC
   - B_B = TIME BASE POSITION: .01μSEC
   - C = INPUT SWITCH: CHECK
   - $\bar{C}$ = INPUT SWITCH: NOT CHECK
   - E = TIME BASE SWITCH: EXT
   - $\bar{E}$ = TIME BASE SWITCH: NOT EXT
   - F = FUNCTION SWITCH: FREQUENCY
   - M = FUNCTION SWITCH: MANUAL START OR MANUAL STOP
   - $\bar{M}$ = FUNCTION SWITCH: NOT (MANUAL START OR MANUAL STOP)
   - P = FUNCTION SWITCH: PERIOD AVERAGE (FOR ANY POSITION)
   - P_A = FUNCTION SWITCH: PERIOD AVERAGE (FOR SPECIFIC POSITION)
   - T_I = FUNCTION SWITCH: TIME INT
   - $\bar{T}_I$ = FUNCTION SWITCH: NOT TIME INT
   - PI = PLUG-IN "ON"

4. DP LAMPS ARE DESIGNATED 0 THRU 7 FOR EACH POSITION FROM RIGHT TO LEFT AS VIEWED FROM FRONT

5. DP AND MU LAMPS OPERATE AS TABULATED WHEN INPUT SWITCH IS NOT CHECK. LAMPS OPERATE IN CHECK ONLY IF FUNCTION SWITCH IS SET TO FREQUENCY

6. DP AND MU LAMPS ARE LIGHTED BY +170V CONTROL SUPPLIED TO APPROPRIATE A8-A9 TERMINAL FROM SWITCH

7. * = SWITCH POSITIONS DO NOT PERMIT VALID MEASUREMENT.

GATE CONTROL SUMMARY (NOTE 3)

GATE CONTROL DESIGNATION	INTERNAL CONTROL: SWITCH SITUATION FOR ON STATE (-15V), WITH (PLUG IN OFF)	INTERNAL CONTROL: SOURCE
1	B(CM+C+P+PI)	A2SIC(F-10), A3SID(R-10)
2	$\bar{C}$ (M+F+E)	A2SIC(R-11), A3SIE(F-10)
3	C P + B F	A3SID (F-11)
4	$\bar{C}$ $\bar{T}_I$ E	A2SIB (F-8)
5	$\bar{C}$ $\bar{E}$ P	A3SIC (R-9)
6	B_B ($\bar{C}$ P + T_I + C M) + C F	A3SID (F-4)
7	100K P_A	A3SIA (F-9)
8	10K P_A	A3SIA (F-8)
9	1K P_A	A3SIA (F-7)
10	100P_A	A3SIA (F-6)
11	10P_A	A3SIA (F-5)
12	F + 1P_A	A3SIA (F-3,4)
13	ANY P_A EXCEPT 1P_A	A3SIA (R-9 1/2)
21	(10S)·(M+F+P·$\bar{C}$+PI)	A2SIA (F-4)
22	(1S)·(M+F+P·$\bar{C}$+PI)	A2SIA (F-5)
23	(0.1S)·(M+F+P·$\bar{C}$+PI)	A2SIA (F-6)
24	(10mS)·(M+F+P·$\bar{C}$+PI)	A2SIA (F-7)
25	(1mS)·(M+F+P·$\bar{C}$+PI)	A2SIA (F-8)
26	(0.1mS)·(M+F+P·$\bar{C}$+PI)	A2SIA (F-9)
27	(10μS)·(M+F+P$\bar{C}$+PC+PI)	A2SIA (F-10)
28	(1μS)·(M+F+P·$\bar{C}$+PI)	A2SIA (F-11)
29	(0.1μS)·(M+F+P·$\bar{C}$+PI)	A2SIA (F-12)

DECIMAL POINT SITUATIONS (NOTES 3 THRU 6)

FUNCTION SWITCH	TIME BASE SWITCH: 0.1μS	1μS	10μS	0.1mS	1mS	10mS	0.1S	1S	10S	EXT	0μSEC
M START	–	–	–	–	–	–	–	–	–	–	—
M STOP	–	–	–	–	–	–	–	–	–	–	—
F	–	0	1	2	0	1	2	3	4	–	—
1P_A	1	0	2	1	0	2	1	0	–	0	2
10P_A	2	1	0	2	1	0	2	1	–	1	3
100P_A	3	2	1	0	2	1	0	–	–	2	4
1KP_A	4	3	2	1	0	2	–	–	–	3	5
10KP_A	5	4	3	2	1	–	–	–	–	4	6
100KP_A	6	5	4	3	–	–	–	–	–	5	7
T_I	–	–	–	–	–	–	–	–	–	–	—

MEASUREMENT UNITS SITUATIONS (NOTES 3,5,6,7)

FUNCTION SWITCH	TIME BASE SWITCH: 0.1μS	1μS	10μS	0.1mS	1mS	10mS	0.1S	1S	10S	EXT	0μSEC
M START	–	–	–	–	–	–	–	–	–	–	–
M STOP	–	–	–	–	–	–	–	–	–	–	–
F	*	MHz	MHz	MHz	KHz	KHz	KHz	KHz	KHz	*	*
1P_A	μS	μS	mS	mS	mS	SEC	SEC	SEC	*	–	μS
10P_A	μS	μS	μS	mS	mS	mS	SEC	SEC	*	–	μS
100P_A	μS	μS	μS	μS	mS	mS	mS	*	*	–	μS
1KP_A	μS	μS	μS	μS	μS	mS	*	*	*	–	μS
10KP_A	μS	μS	μS	μS	μS	*	*	*	*	–	μS
100KP_A	μS	μS	μS	μS	*	*	*	*	*	–	μS
T_I	–	–	–	–	–	–	–	–	–	–	–

DECIMAL POINT AND MEASUREMENT UNITS CONTROL SOURCE

DP DESIGNATION	INTERNAL SOURCE		MU DESIGNATION	INTERNAL SOURCE
7	A2SIF(R-6)		MHz	A2SIG(R-6)
6	A2SIF(R-5)		KHz	A2SIG(R-4)
5	A2SIF(R-8)		SEC	A2SIH(F-5)
4	A2SIF(F-7)		mS	A2SIJ(F-5)
3	A2SIG(F-4)1/2		μS	A2SIJ(F-7)
2	A2SIE(F-10)		*	A2SIK(F-4)
1	A2SIE(F-9)			
0	A2SIE(F-8)			

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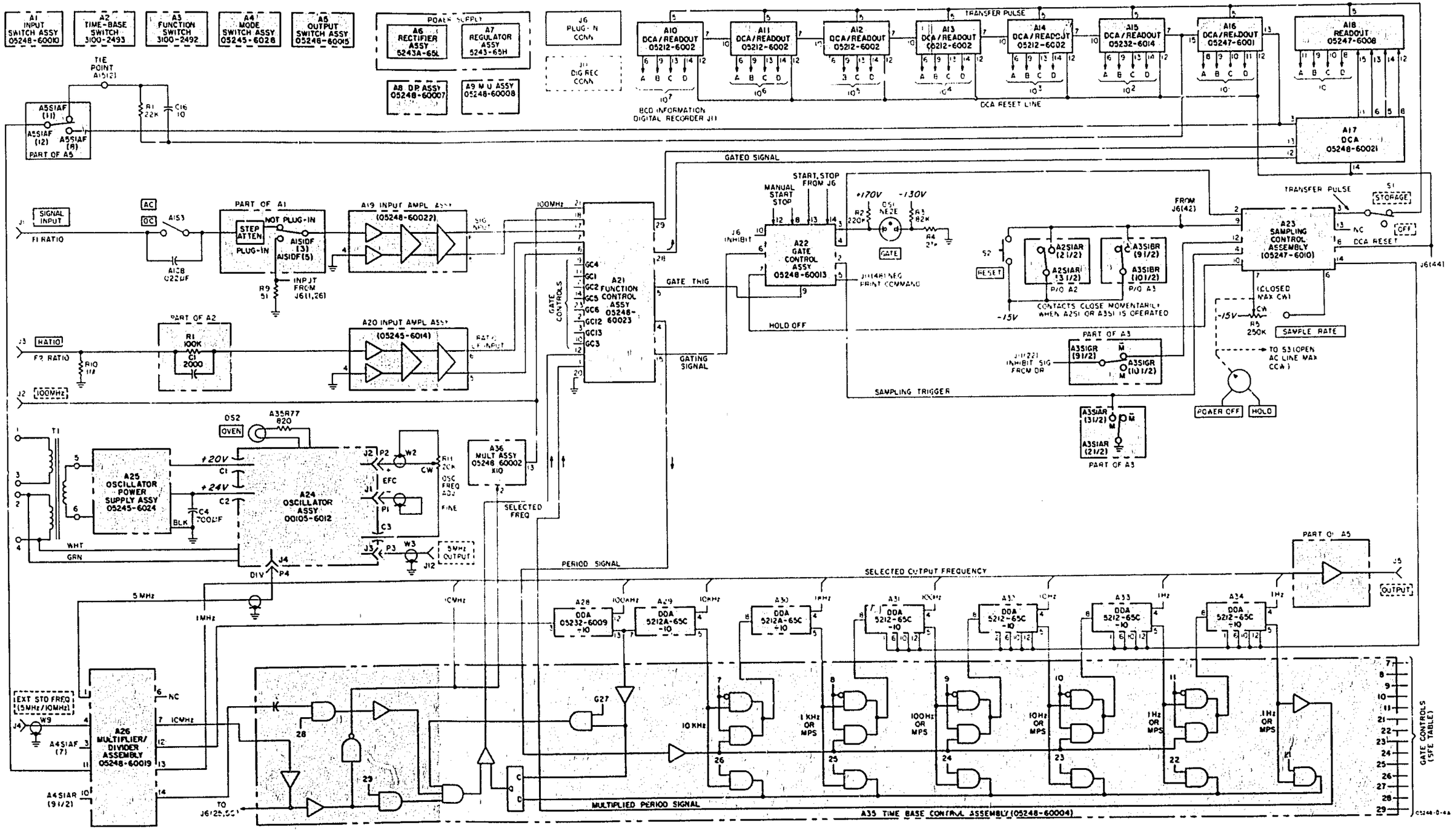
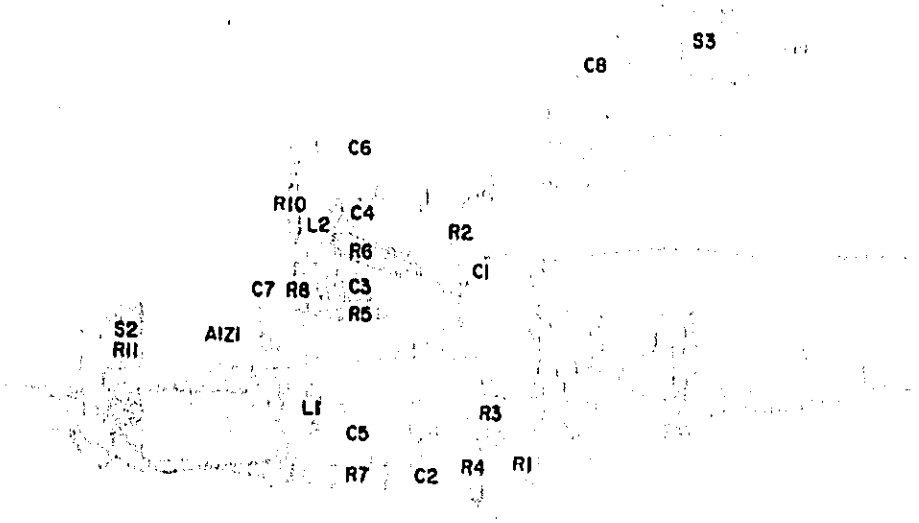


Figure 8-3. Model 5248M Block Diagram



A1 OPERATION

The front panel SENSITIVITY switch is a five-position switch (CHECK, 10, 1, .1, and PLUG-IN) which:

a. Provides two attenuation steps (X10 and X100) when set to 1 or 10. Output goes to input amplifier A19.

b. Connects plug-in output to input amplifier when set to PLUG-IN.

c. Produces gate controls 1, 2, 3, 5, 6, and 27 by routing switched -15 volts from A3 (FUNCTION switch). Distinguishes between CHECK and not-CHECK positions.

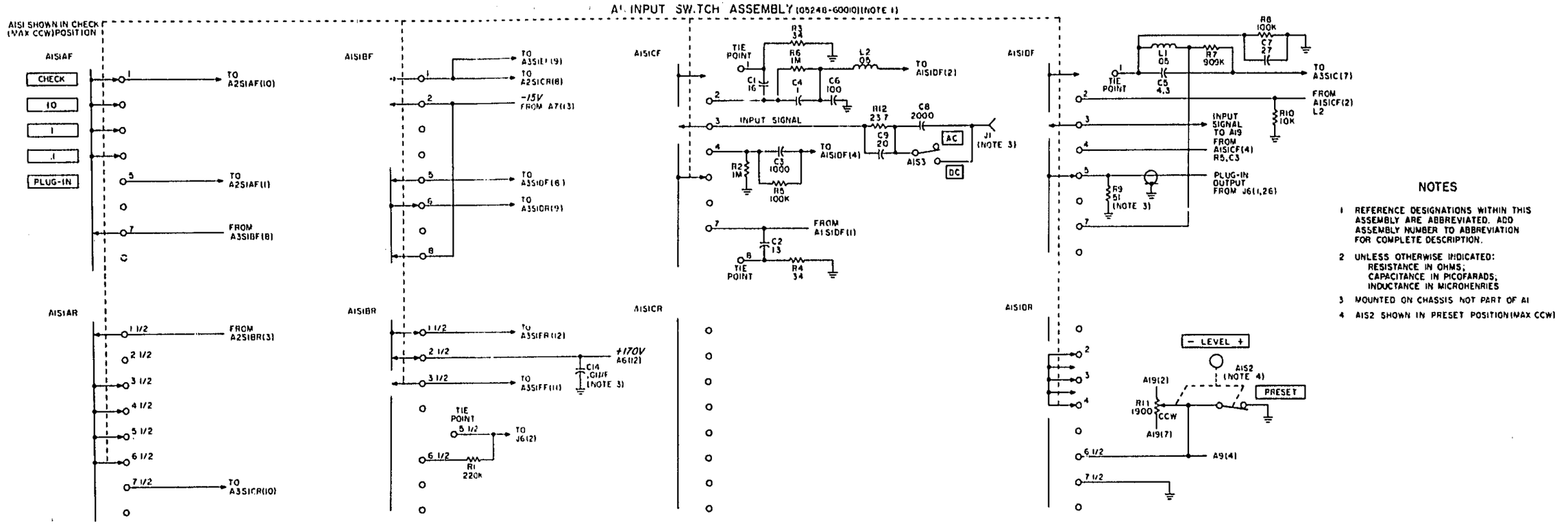
d. Combines switched -15 volts from A3 to generate gate controls 4, 21, 22, 23, 24, 25, 26, 27, 28, and 29. Switching for these gate controls is finished in A2 (TIME BASE switch).

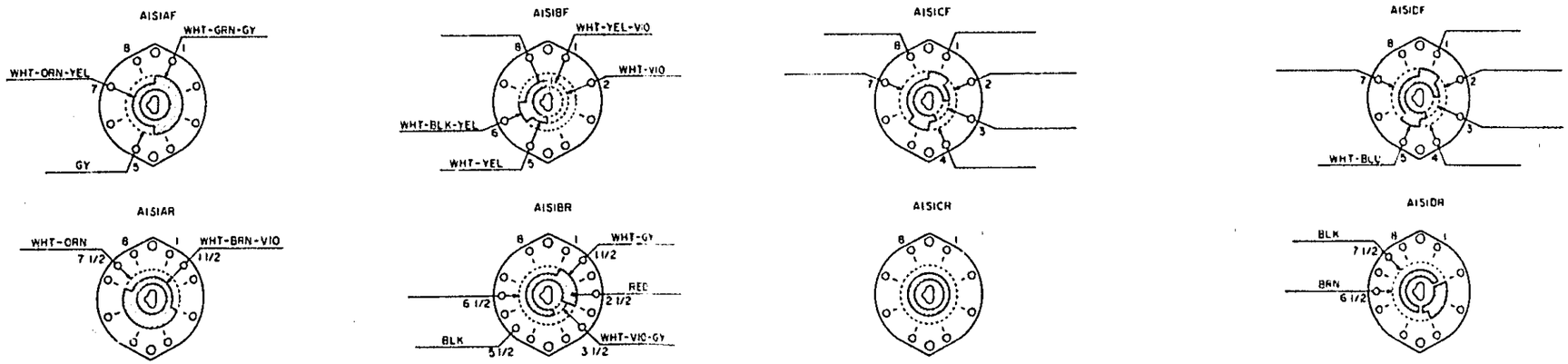
e. Switches +170 volts as first step in generating lamp control voltages; further switching is done by A3, and final switching by A2.

f. -LEVEL+ on the front panel adjusts input trigger level from -0.3 volt to +0.3 volt. Level control range is increased to ±3 volts dc when the input sensitivity is set at 1 volt rms, and ±30 volts dc for 10 volt rms. Maximum counterclockwise position (PRESET) closes A1S2 which sets the trigger level at ground potential for all attenuator positions.

A1 TROUBLESHOOTING

Check output A1S1DF(3) for proper signal in all positions (not-CHECK), to locate trouble to specific position. If all positions are bad, remove A19 and recheck. When the bad position is found, the trouble may be traced to the specific resistor, capacitor, or switch section.





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. MOUNTED ON CHASSIS NOT PART OF A1
4. A1S2 SHOWN IN PRESET POSITION(MAX CCW)

REFERENCE DESIGNATIONS

NO PREFIX	A1
C14	C1-9
J1	L1,2
R9	R1-12
	S1-3

05248-0-8A

Figure 8-4. A1 Sensitivity Switch

A2 OPERATION

The front panel TIME BASE switch assembly is an 11-position switch (EXT, 10s, 1s, .1s, 10ms, 1ms, .1ms, 10μs, 1μs, .1μs, .01μs) which:

a. Produces gate controls 4 and 21 through 29 using switched -15 volts from A1.

b. Produces all decimal point control voltages by connecting +170 volts from A3 to A8 Decimal Point Assembly.

c. Produces all measurement units control voltages by connecting +170 volts from A3 to A3 Measurement Units Assembly.

d. Generates reset pulses by momentarily supplying -15 volts while time base switch is between detent positions, resetting all counter circuits when time base selection is changed during a measurement operation.

e. Connects Ratio f_2 frequency from EXT connector on front panel to Input Amplifier A20 when switch is in EXT position.

A2 TROUBLESHOOTING

If assembly is not working, check all positions to isolate problem to a specific time base position. Check all input voltages that are routed for different functions to ensure problem is in A2. When the bad position is found, trouble may be traced to the defective switch section.

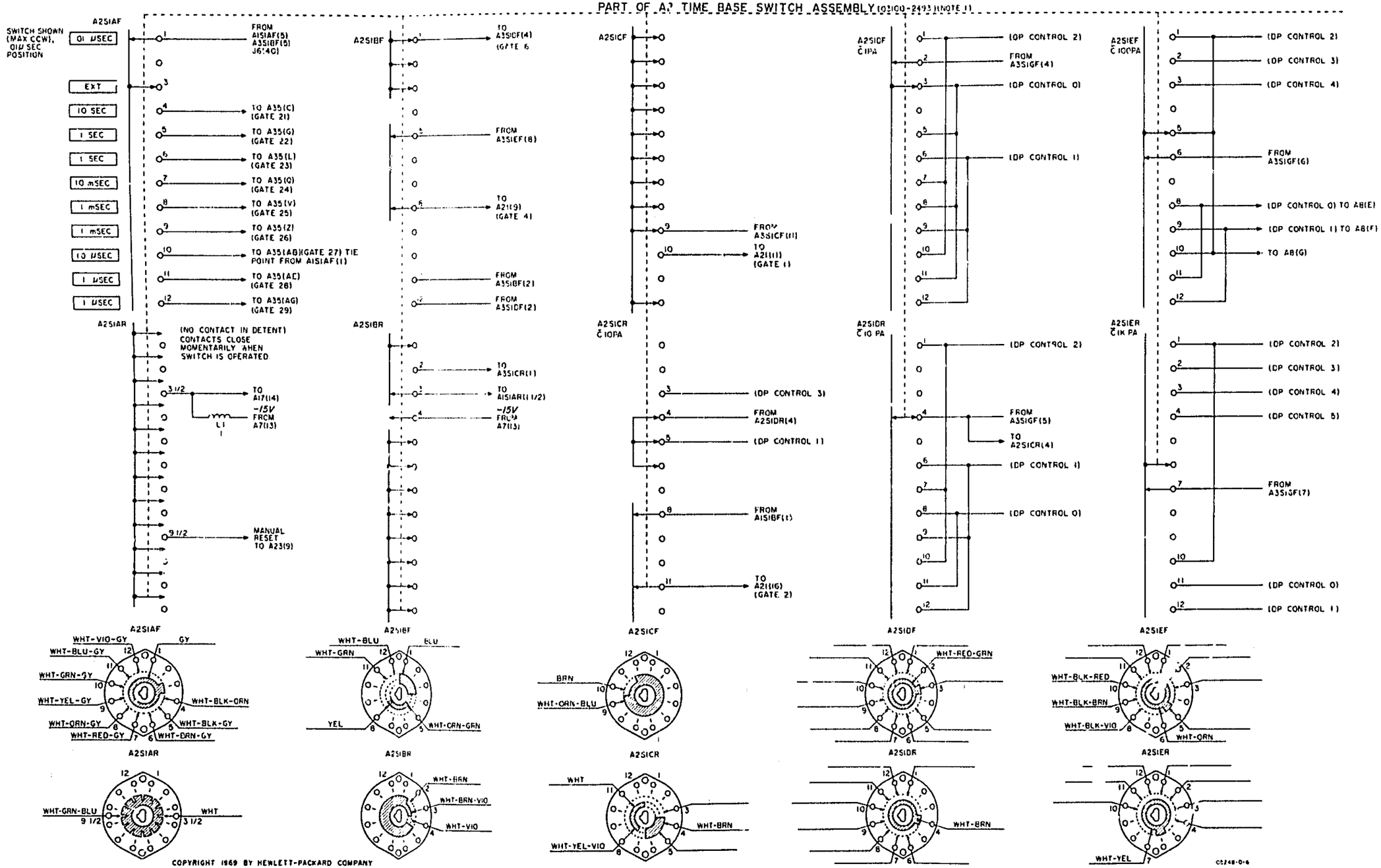
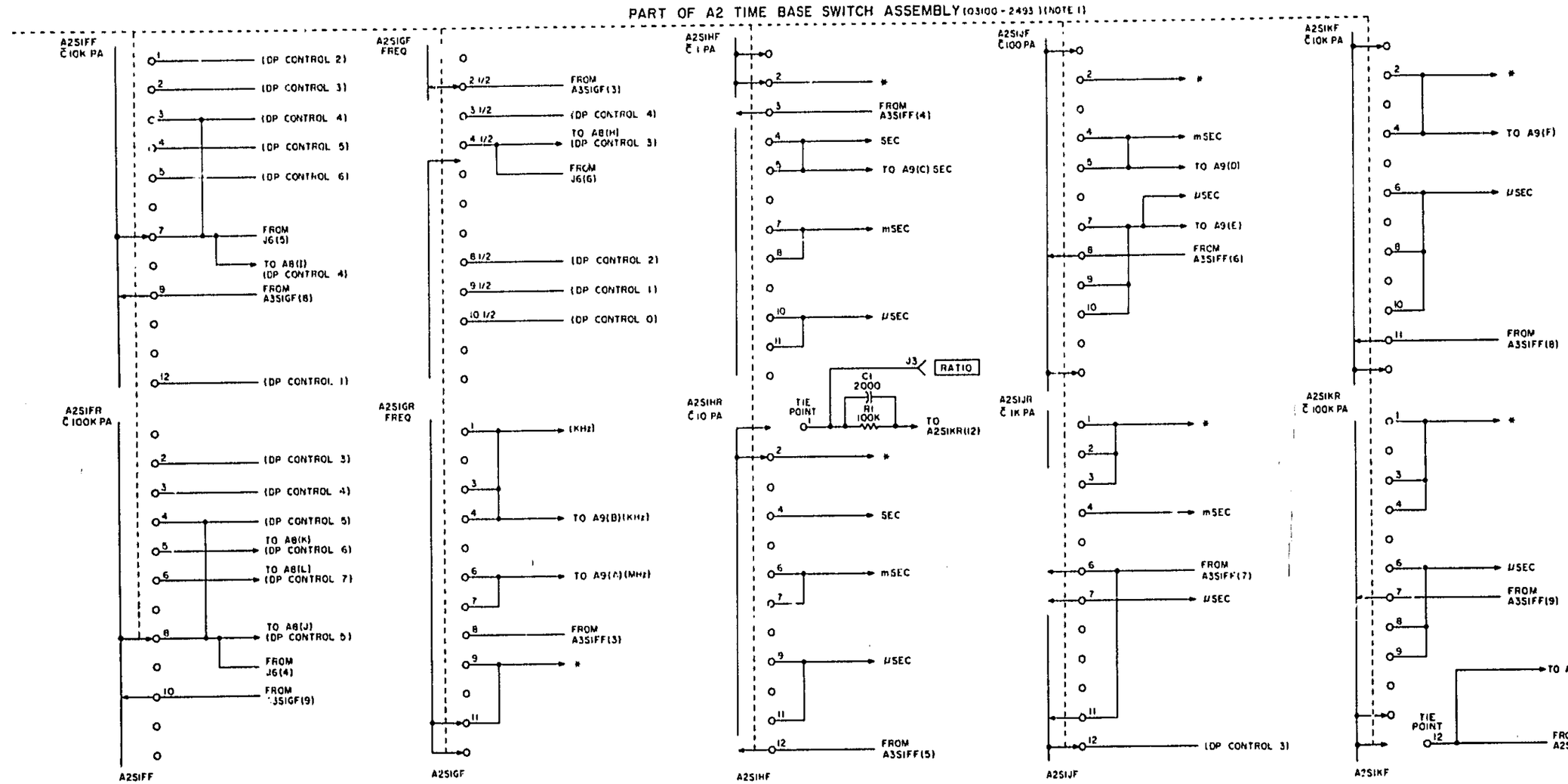


Figure 8-5. A2 Time Base Switch (Sheet 1 of 2)

PART OF A2 TIME BASE SWITCH ASSEMBLY (03100-2493) (NOTE 1)



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

REFERENCE DESIGNATIONS

NO PREFIX	A2
J3	C1
	L1
	R1
	S1

Figure 8-5. A2 Time Base Switch (Sheet 2 of 2)

A3 OPERATION

The front panel FUNCTION switch assembly is a 10-position switch (MANUAL STOP: MANUAL START: FREQUENCY: PERIOD AVERAGE for 1, 10, 100, 1K, 10K, and 100K periods: and TIME INT.) which:

a. Produces gate controls 7 through 13 by switching -15 volts from power supply.

b. Contributes to generation of gate control 1 through 6 and 21 through 29.

c. Contributes to generation of decimal point and measurement units controls from switched +170 volts A1.

d. Produces start and stop input voltages (-15 volts) to gate control assembly A23 when switched to MANUAL START and MANUAL STOP.

e. Shorts sample rate trigger pulse to ground when switched to MANUAL START or MANUAL STOP. This inhibits operation of sample rate and holdoff multivibrators and prevents the reset amplifier from operating in manual functions. Manual Reset is by the RESET pushbutton.

f. Prevents display storage by disabling storage switch when switched to MANUAL START or MANUAL STOP.

g. Opens inhibit signal line between the DIGITAL RECORDER connector and A23 when switched to MANUAL START or MANUAL STOP to prevent triggering the holdoff multivibrator which would inhibit the gate flip-flop.

h. Generates reset pulses by momentarily supplying -15 volts while switch is between detent positions; resets all counter circuits when function selection is changed during a measurement, except between MANUAL START and MANUAL STOP.

A3 TROUBLESHOOTING

All positions of A3 can be checked by SELF CHECK procedure Figure 3-5. When the bad position is found, the trouble may be traced to a defective switch section. Check all input signals to A3 to insure proper assembly isolation.

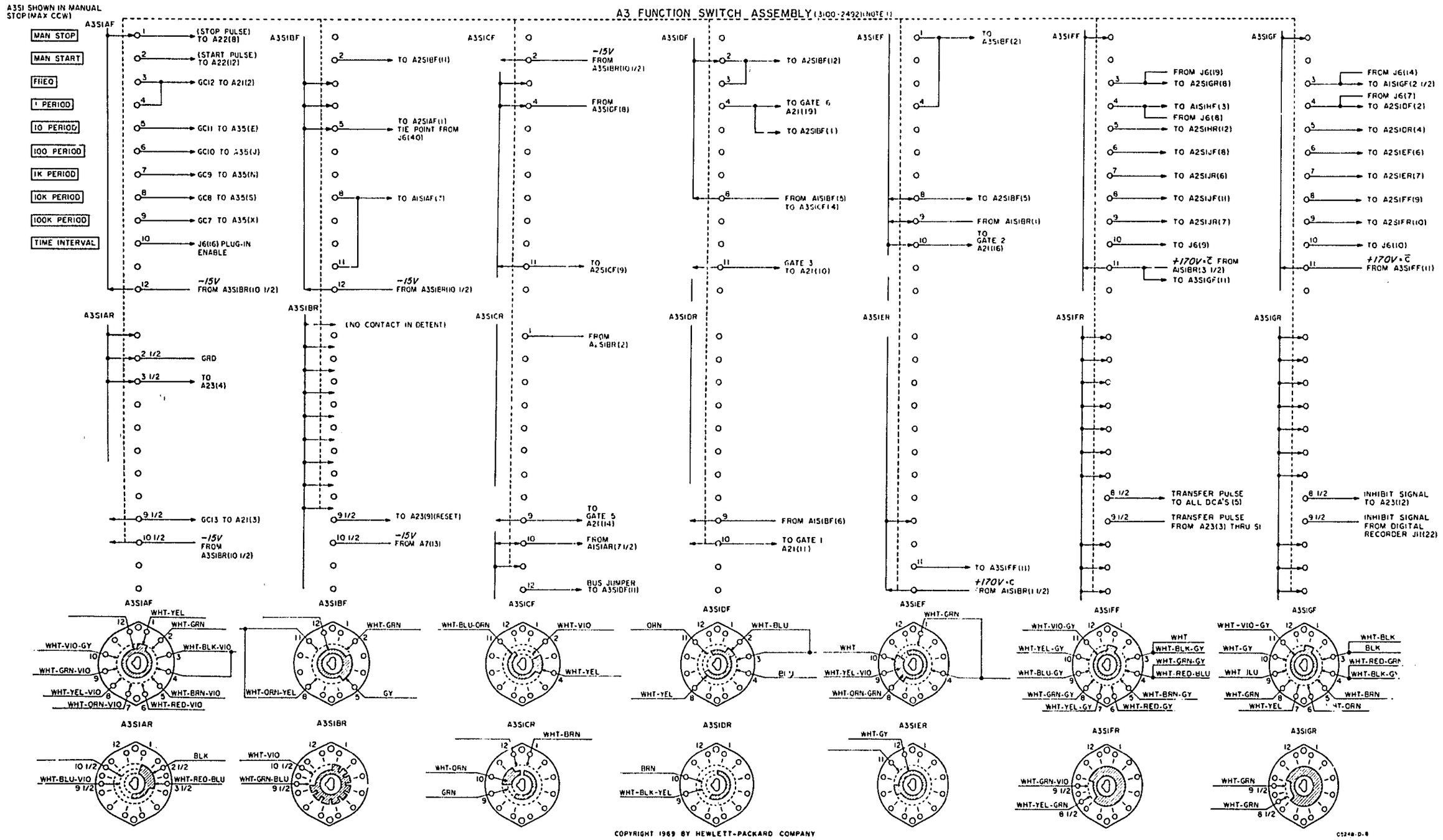


Figure 8-6. A3 Function Switch

A5A1

A4 OPERATION (5248L)

The rear panel MODE switch assembly is a three-position switch (EXT STD FREQ 1 MHz, INT STD FREQ, SCALER) which:

a. Connects external 1 MHz standard to A26 in EXT STD FREQ 1 MHz position.

b. Connects internal 1 MHz to A26 in INT STD FREQ position.

c. With A5, connects output of first or second decimal counter (A16 or A17) to A26 in SCALER position.

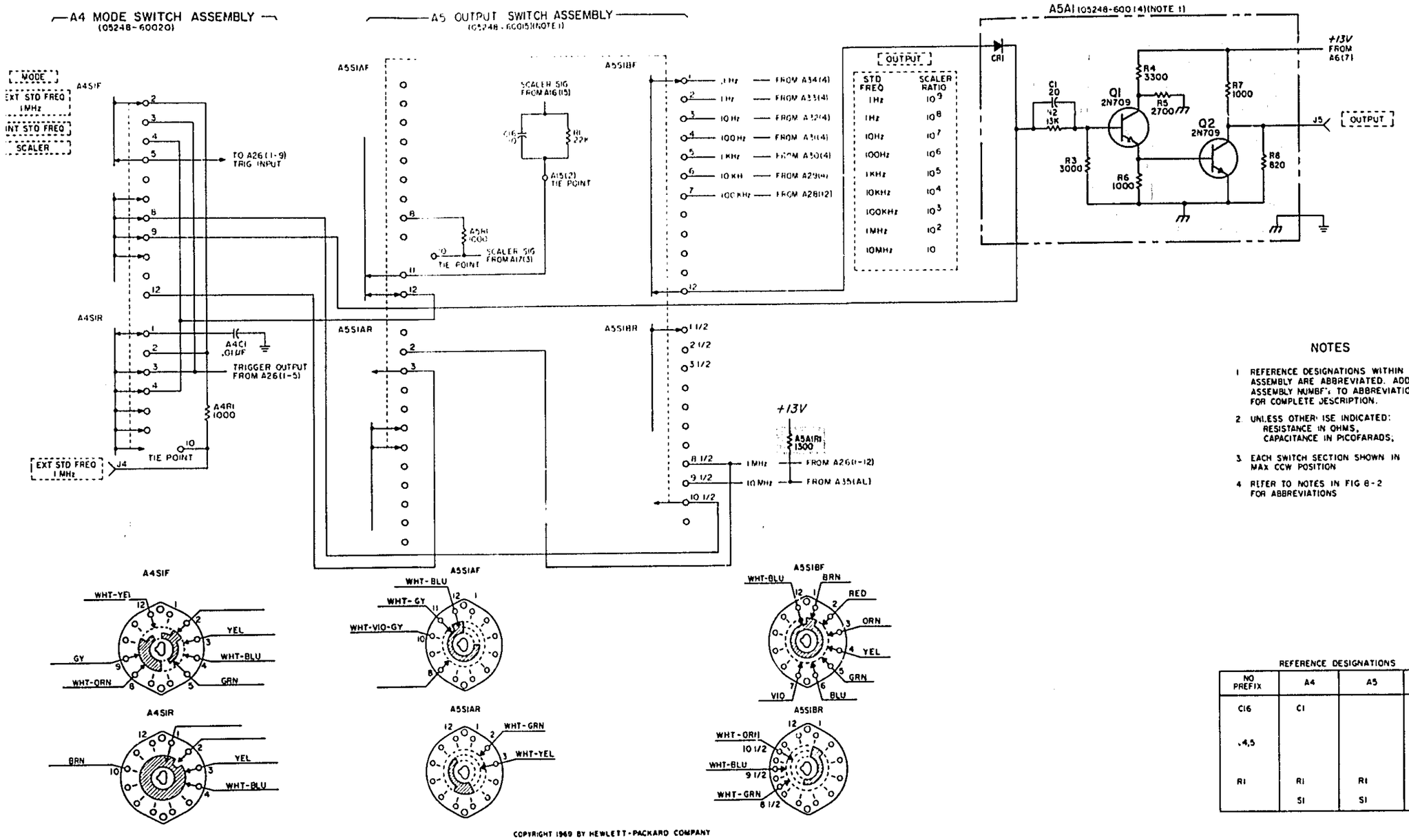
d. Provides AC ground through bypass capacitor A4C1 for signals not selected as input for A26.

A5 OPERATION

The output switch assembly for the 5248L is identical with A5 for the 5248M. See Figure 8-8 for operation and troubleshooting.

A4, A5 TROUBLESHOOTING

See A4, A5 TROUBLESHOOTING for the 5248M, Figure 8-8.



NOTES

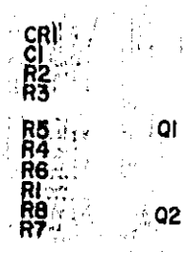
1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS, CAPACITANCE IN PICOFARADS.
3. EACH SWITCH SECTION SHOWN IN MAX CCW POSITION
4. REFER TO NOTES IN FIG 8-2 FOR ABBREVIATIONS

REFERENCE DESIGNATIONS

NO PREFIX	A4	A5	A5A1
C16	C1		C1
			CR1
-4,5			
			Q1,2
R1	R1	R1	R1-8
	S1	S1	

05248-0-9

Figure 8-7. A4 Mode Switch (5248L)
A5 Output Switch
A5A1 Output Amplifier



A5A1

A5

A4 OPERATION (5248M)

The rear-panel MODE switch assembly is a three-position switch (EXT STD FREQ 5 MHz/10 MHz, INT STD FREQ, SCALER). Operating functions are:

a. EXT STD FREQ 5 MHz/10 MHz position: +13 volt gate control voltage is connected to A26. A5A1 is connected to 1 MHz or 10 MHz when A5 is set to 1 MHz or 10 MHz.

b. INT STD FREQ position: -15 volt gate control voltage is connected to A26(3) and +13 volt gate control voltage is connected to A26(10).

c. SCALER position: -15 volt gate control voltage is connected to A26(3) and +20 volt gate control voltage is connected to A26(10). A5A1 is connected to scaler ratio 10 to 10^2 signals when A5 is set to SCALER RATIO 10 or 10^2.

A5 OPERATION (5248M)

The rear-panel OUTPUT switch assembly includes amplifier stage A5A1 and a nine-position switch (.1 Hz through 10 MHz and 10 through 10^9 in decade steps). Switch functions are to:

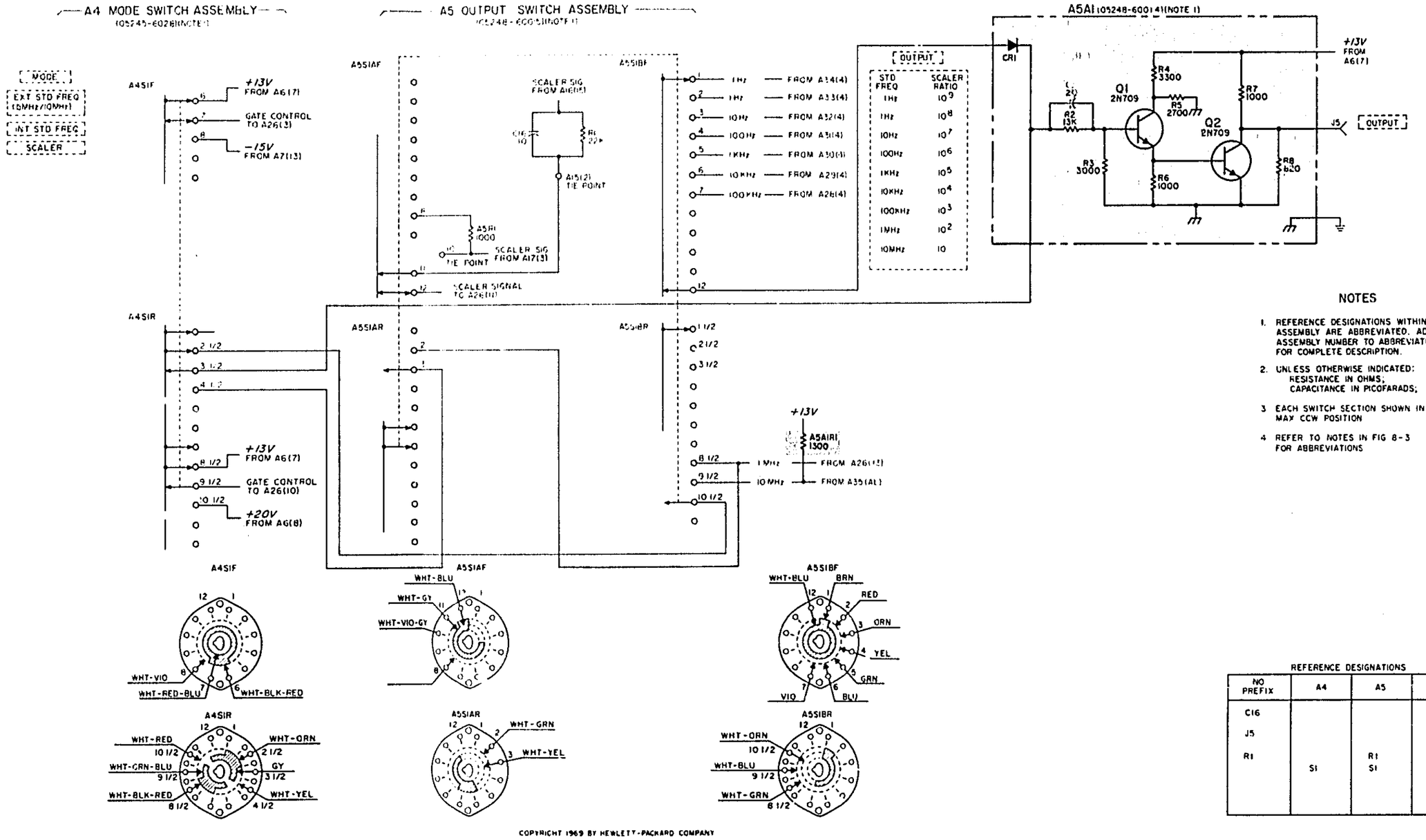
a. Provide standard frequency signals at OUTPUT connector from counter time base when MODE switch is not in SCALER position. Provides output frequencies from .1 Hz to 10 MHz in decade steps.

b. Provide scaling of input signals by factor of 10 to 10^9 (in decade steps) at the OUTPUT connector when MODE switch is set to SCALER and FUNCTION switch is set to MANUAL START.

c. Amplify all selected output frequencies.

A4, A5 TROUBLESHOOTING

Check A5A1 inputs and outputs to check amplifier operation. Check all positions of A4 and A5 to locate defective position. Check gate control voltages from A4 and inputs to A5 to ensure problem is in A4, A5.



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;
3. EACH SWITCH SECTION SHOWN IN MAX CCW POSITION
4. REFER TO NOTES IN FIG 8-3 FOR ABBREVIATIONS

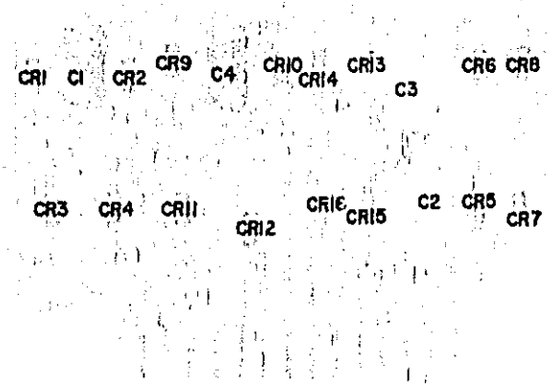
REFERENCE DESIGNATIONS

NO PREFIX	A4	A5	A5A1
C16			C1
J5			CR1
R1		R1	Q1,2
	S1	S1	R1-8

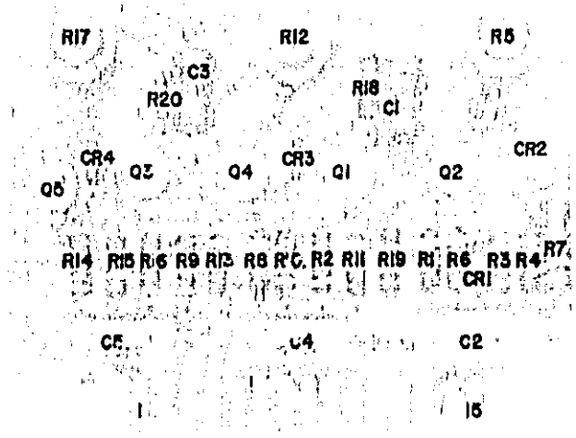
05248-0-10

Figure 8-8. A4 Mode Switch (5248M)
A5 Output Switch
A5A1 Output Amplifier

A6



A7



A6, A7 OPERATION

PRIMARY POWER, 115 or 230 volts ac is connected through LC filter C5A, C5B, L1, and L2, fuse F1 and front panel power switch S3B (part of SAMPLE RATE control) to T1 and T2 primaries. T1 supplies power continuously to the crystal oven heater control circuits; turning off counter does not turn off power to the oven.

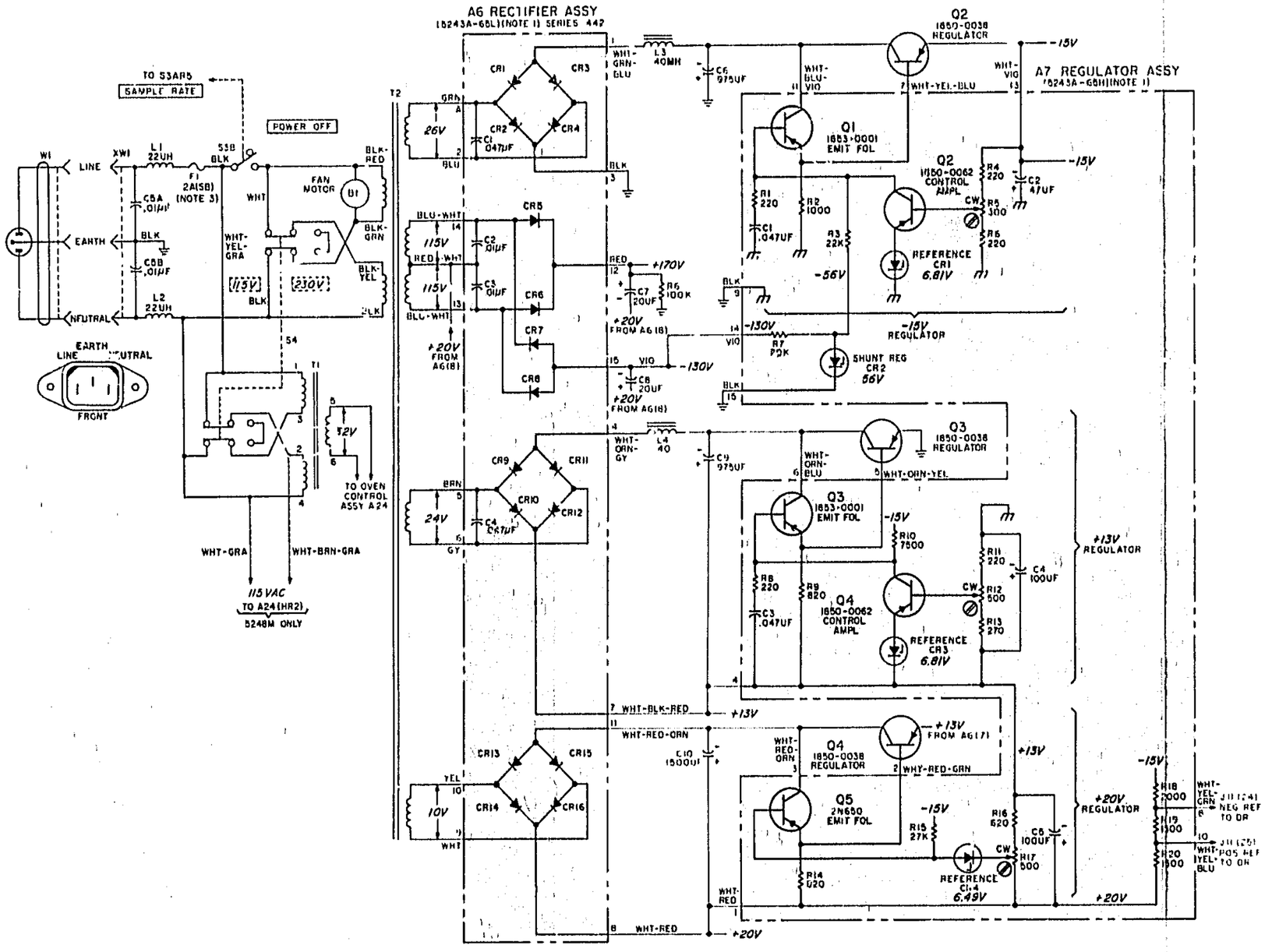
-15 VOLT SUPPLY; the regulated -15 volt supply consists of fullwave rectifier A6CR1 through A6CR4, filter L3-C6, regulator Q2, and filter A7C2. A7R4, A7R5 and A7R6 divider supply a sample of the regulated output to A7Q2. Output of A7Q2 controls driver A7Q1, which controls regulator Q2. A7R5 adjusts the regulated output voltage by controlling A7Q2 bias. Breakdown diode A7CR1 provides a 6.8 volt reference to A7Q2.

-130 VOLT and +170 VOLT supplies consist of two fullwave rectifiers that supply unregulated +150 volts each. Using +20 volts applied to filter C7, summation across R6 produces +170 volts. Applying +20 volts to filter C8 with no summation resistor and A7CR7, A7CR8 reversed produces -130 volts. The -130 volt supply is the source for shunt regulator A7CR2 which provides -56 volts reference to the -15 volt regulator circuit.

+13 VOLT and +20 VOLT supplies. The +13 volt supply is similar to the -15 volt supply. The only significant difference is that the negative leg is grounded and the positive leg provides the regulated output. The +20 volts is obtained by adding a 7 volt source to the +13 volt supply. The 7 volt regulator consists of Q4 and A7Q5. A 7 volt zener diode and a bias adjustment circuit provide the reference voltage for this supply.

A6, A7 TROUBLESHOOTING

Check all power supply voltages to determine the defective section; see Section V ADJUSTMENTS. Make power source checks in Section V TROUBLESHOOTING. It may be necessary to isolate A6, A7 from rest of counter to determine that the problem is in the power supply. Defective assemblies could cause loading. Check T2 secondaries for proper voltages. Check A6CR1 through A6CR16 for open or short. Check reference diodes A7CR1 through A7CR4. Check regulators Q2, Q3, and Q4 (chassis) for open or short.



POWER DISTRIBUTION

ASSY	-15V	+13V	+20V	+170V	-130V	GRD	ASSY	-15V	+13V	+20V	+170V	-130V	GRD
A1	✓			✓		✓	A19	✓	✓				✓
A2	✓						A20	✓	✓				✓
A3	✓					✓	A21	✓	✓				✓
A4							A22	✓	✓				✓
A5		✓				✓	A23	✓	✓	✓			✓
A6	RECTIFIER ASSY					✓	A24						✓
A7	REGULATOR ASSY					✓	A25	(32VAC)					✓
A8	✓		✓				A26	✓	✓	✓			✓
A9	✓		✓				A27	✓					✓
A10	✓		✓	✓	✓		A28	✓	✓				
A11	✓		✓	✓	✓		A29	✓	✓				
A12	✓		✓	✓	✓		A30	✓	✓				
A13	✓		✓	✓	✓		A31	✓	✓				
A14	✓		✓	✓	✓		A32	✓	✓				
A15	✓		✓	✓	✓		A33	✓	✓				
A16	✓		✓	✓	✓	✓	A34	✓	✓				
A17	✓		✓	✓	✓	✓	A35	✓	✓	✓			
A18	✓		✓	✓	✓		A36	✓	✓	✓	✓	✓	✓
							J6						

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. FOR 230V OPERATION, OPERATE S4 TO 230V POSITION AND INSTALL 1A(5B) FUSE F1

REFERENCE DESIGNATIONS

NO PREFIX	A6	A7
B1 C5-10 F1 L1-4 Q2-4 R6 S3,4 T1,2 W1 XW1	C1-4 CR1-16	C1-5 CR1-4 Q1-5 R1-20

Figure 8-9. A6 Rectifier A7 Regulator

NOTES

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

2 UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS.

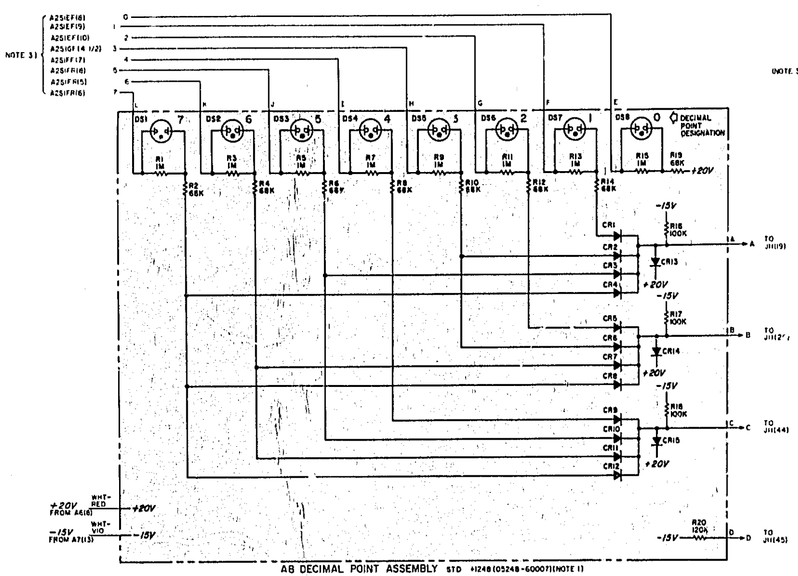
3 INPUT OF +170V FOR DP CONTROLS AND MU CONTROLS IS REQUIRED TO TURN LAMPS ON, SEE TABLE ON FIG 8-2 FOR COMPLETE DESCRIPTION

A8 OPERATION

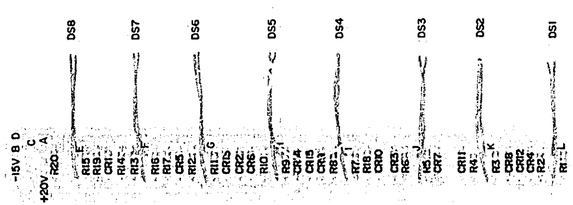
Decimal point (DP) assembly A8 holds eight neon lamps designated 0 through 7 from right to left looking at the front panel. The control signal is +170 volts and is applied to the selected lamp from A2 (TIME BASE switch). OR gates encode the DP control signal from decimal to binary-coded-decimal (BCD), which goes to the DIGITAL RECORDER connector (rear panel). See A9 schematic for BCD output levels for appropriate A8 assembly.

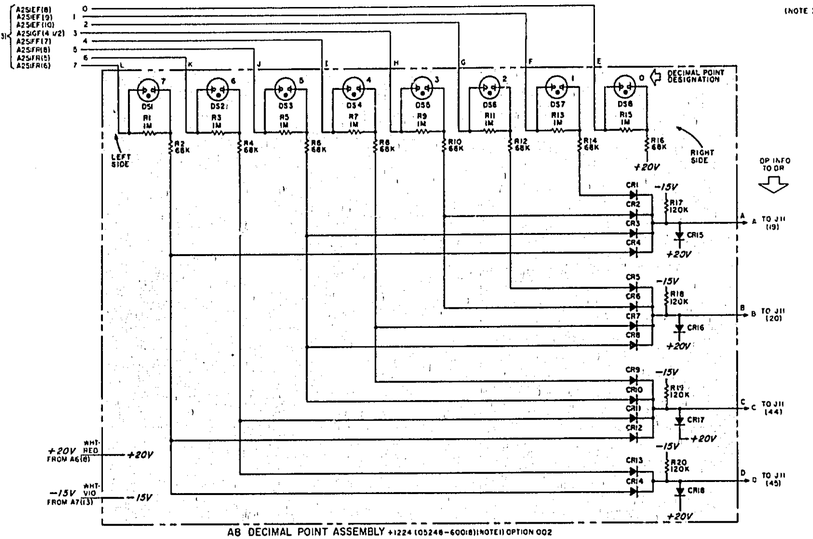
A8 TROUBLESHOOTING

Check input signal for each lamp. If all signals are wrong, troubleshoot A2. When trouble is located to a specific DP, the trouble may be traced to the specific neon, resistor, or diode. See Section V, MAINTENANCE. If DP lamps function properly but the BCD output is bad, then trace the defective line to the specific component.

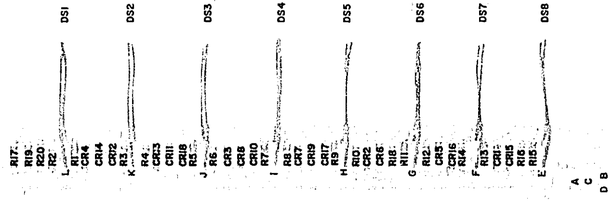


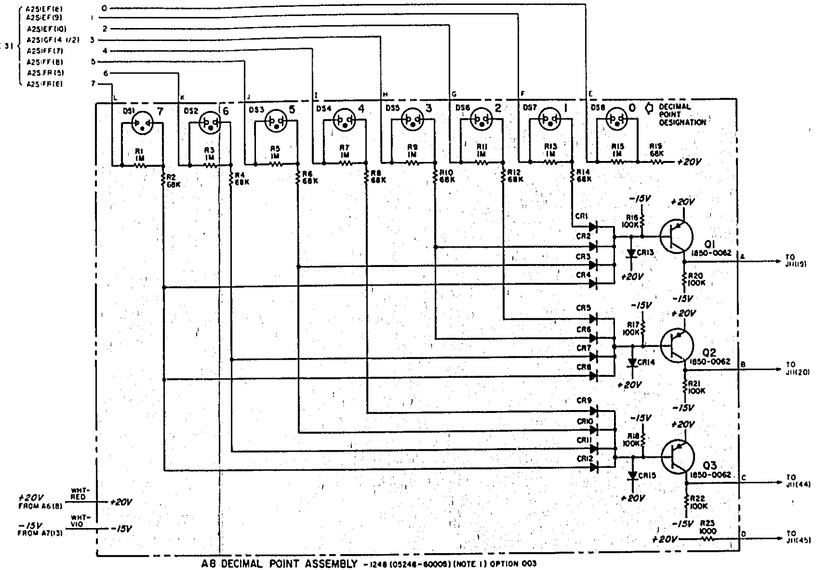
REFERENCE DESIGNATIONS
A8 (REGULAR)
CR1-15
DS1-8
R1-20





REFERENCE DESIGNATIONS
A8 (OPTION 002)
CR1-18
DS1-8
R1-20





REFERENCE DESIGNATIONS
A8 (OPTION 003)
CR1-15
DS1-8
Q1-3
R1-23

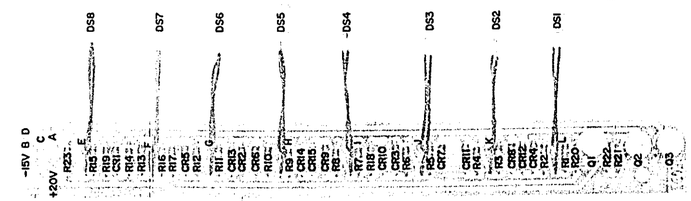


Figure 8-10. A8 Decimal Point (Standard)
A8 Decimal Point (Option 002)
A8 Decimal Point (Option 003)

NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS;
3. INPUT OF +170V FOR DP CONTROLS AND MU CONTROLS IS REQUIRED TO TURN LAMPS ON; SEE TABLE ON FIG 8-2 FOR COMPLETE DESCRIPTION

A9 OPERATION

The measurement units assembly holds six neon lamps at the right side of the counter display, designated MHz, kHz, Sec, ms, and * (asterisk). The measurement units control signal (+170 volts) is applied to the selected lamp through the TIME BASE switch. OR gates encode the measurement units control signal from decimal to BCD, which goes to the DIGITAL RECORDER connector. The BCD output for each A8 assembly (STD, OPT 002, and OPT 003) is shown below applicable schematic.

A9 TROUBLESHOOTING

Check all input signals to ensure problem is on A9, and to locate defective measurement unit. When trouble is located to a specific measurement unit, trace circuit to locate defective neon, resistor, or diode. If lamps operate properly but digital recorder output is bad, trace the defective line to the specific component.

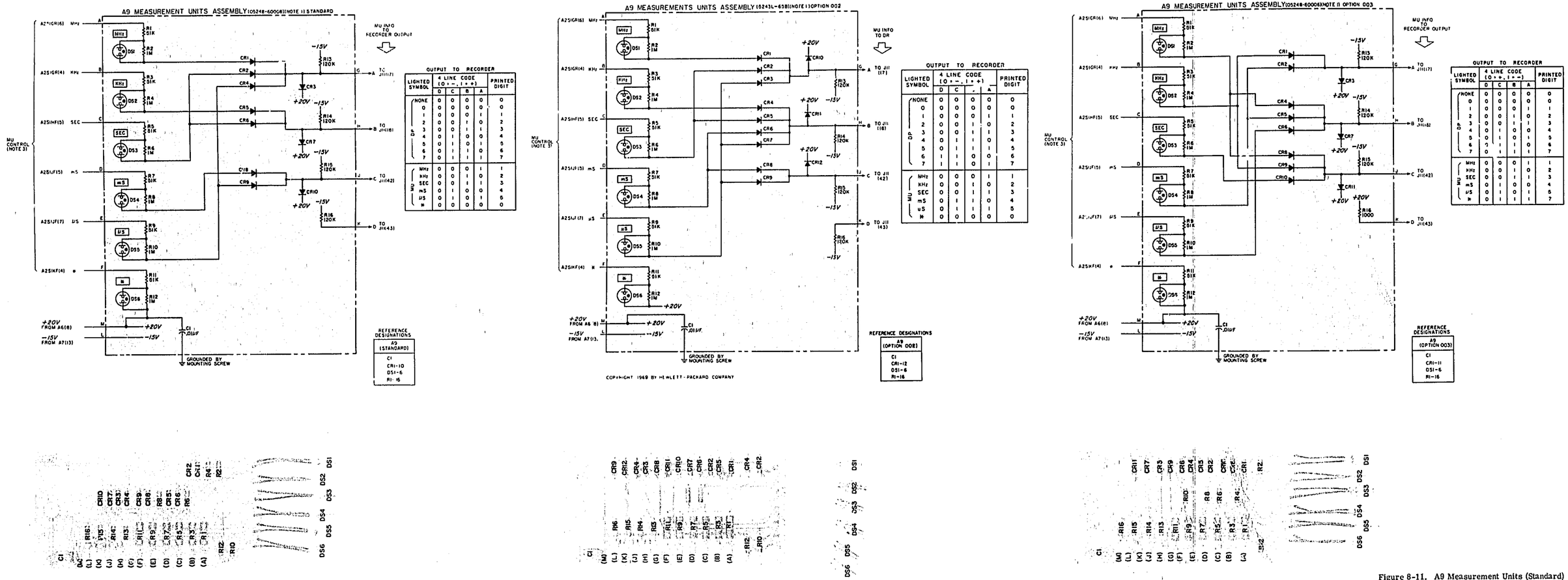
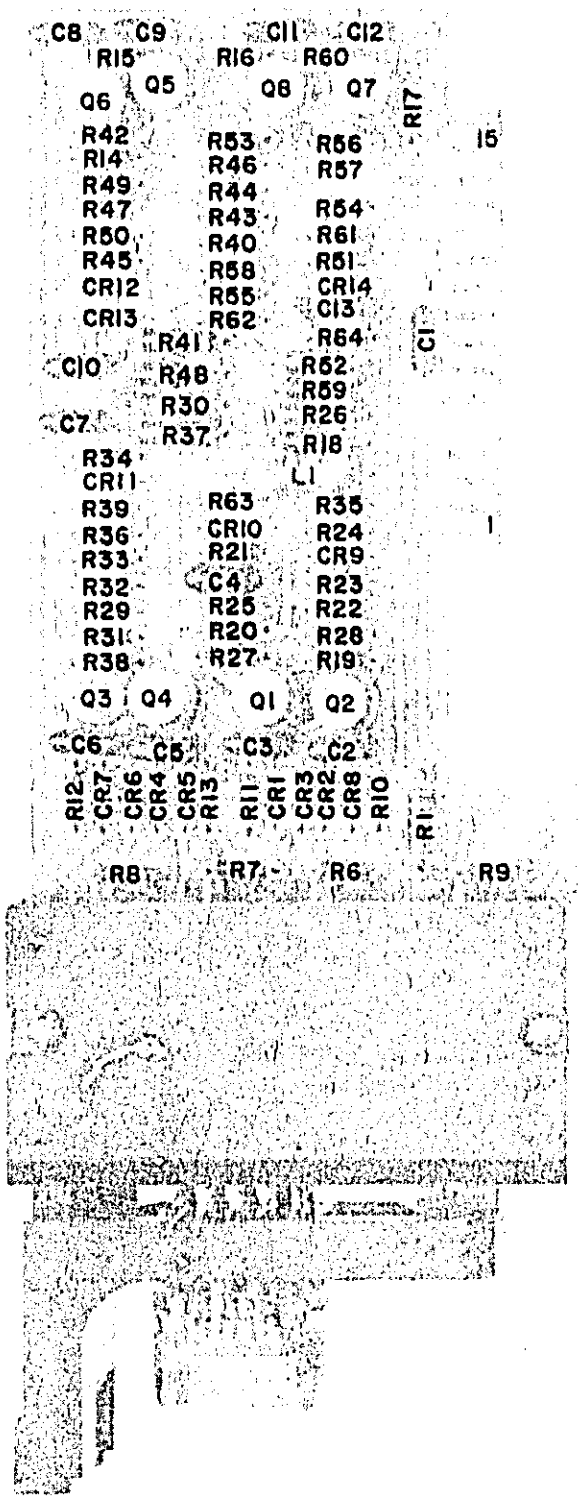
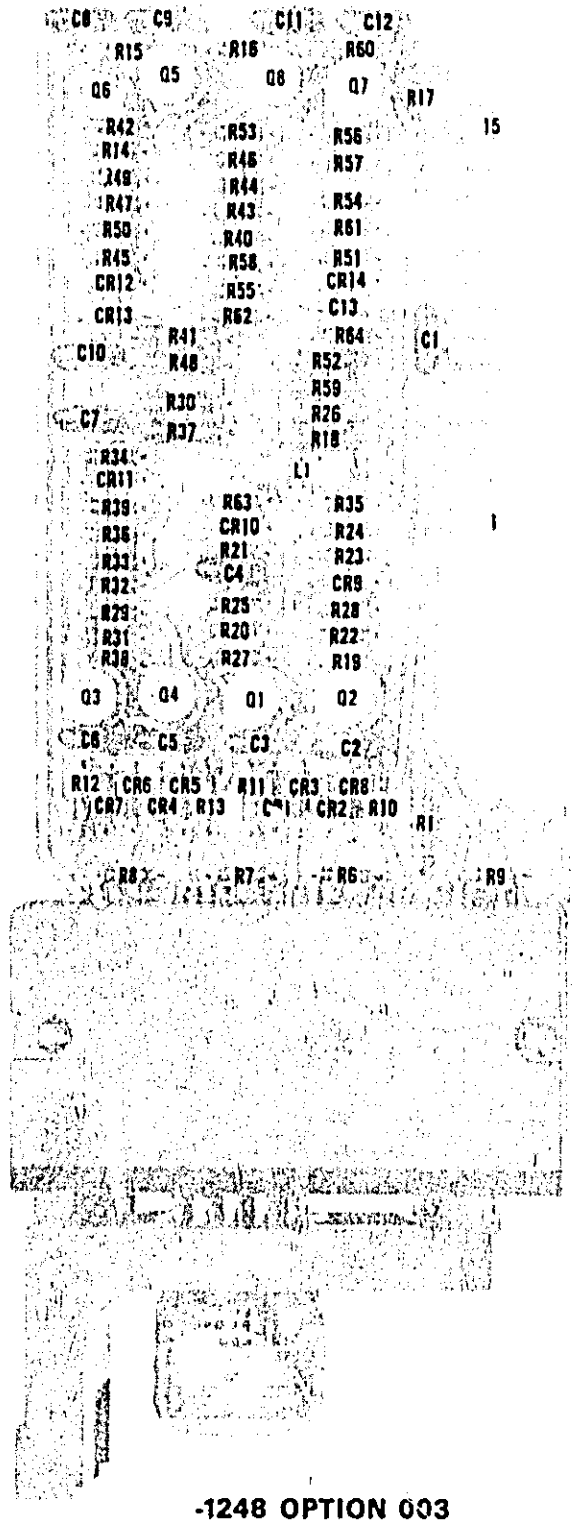


Figure 8-11. A9 Measurement Units (Standard)
A9 Measurement Units (Option 002)
A9 Measurement Units (Option 003)



+1248 STANDARD



-1248 OPTION 003

A10-A14

A10-A14 OPERA[illegible]

Input signal is appli[illegible] Binary "A" through C1. CR9, CR11 through CR13 steer only positive pulses to Q1 through Q8. A10-A14 are shown in the reset condition or 0 count. The first pulse to Binary "A" turns Q1 off and drives its collector to -15 volts. This negative step is coupled to Q2 base through R27 and C3 to turn Q2 on. Binary "A" remains in this state until another pulse is applied. Conducting transistors at this time are Q2, Q3, Q5, and Q7 which cause DS1A, DS2B, DS3B, and DS4B to be on. DS1A turns V1Q on, DS2B turns on V1F DS3B turns on V1M, and DS4B turns on V1T; this allows -130 volts to be applied to numeral 1 of DS6 (V1R is off and inhibits digits 0, 2, 4, and 6). The truth table shows binaries, V1 sections, decimal digits, and BCD outputs for different binary states.

With S1 Storage Switch (rear panel) in STORE, binaries count normally but DS1A through DS4B are inhibited from changing states. After the main gate closes, a pulse is fed via S1 to A10 through A14(5), enabling the neons to assume a new state which reflects the states of Binaries A through D. If S1 is OFF, or FUNCTION switch is in MANUAL START, neons will be enabled continuously and each time a binary changes state DS6 displays this new number.

The feature that changes A10-A14 from a conventional Binary Counter to a Decimal Counter is the automatic reset that occurs on the count of 10. This is accomplished as follows: at count of 8, Q8 will be turned on, and feed back a negative voltage to CR10 anode to inhibit the 9th and 10th pulses from affecting Binary "B". The 10th pulse will cause Q2 collector to go positive; this positive pulse will feed forward to Q8 base turning it off, resetting Binary "D". All binaries are in a reset state or count of 0 at this time.

A10-A14 TROUBLESHOOTING

Since A10-A14 are identical, they may be interchanged to isolate the bad board. The trouble can be further isolated to either the counting section (Binaries) or readout. If the output pulse at pin 10 is correct but readout digit is wrong, problem is R10 through R17, DS1A through DS4B, CR1 through CR8, R6 through R9, V1, R2, or DS6. A fuzzy display is usually DS6; interchange with good display tube to confirm.

To troubleshoot binaries, remove input wire at pin 7. Push manual RESET (front panel) and observe condition of all binaries. Q1, Q3, Q5, Q7 should be on and Q2, Q4, Q6, Q8 should be off. Touch jumper wire between pins 7 and 15. DS6 should read "1"; touch jumper to ground and again to pin 15, DS6 should read "2". This will check out all binaries. If DCA counts properly this way, but will not count fast pulses, check C1 through C12, CR9, or output stage of preceding assembly.

If DCA works properly in all respects except that DIGITAL RECORDER output is incorrect, check R24, R35, R46, and R57.

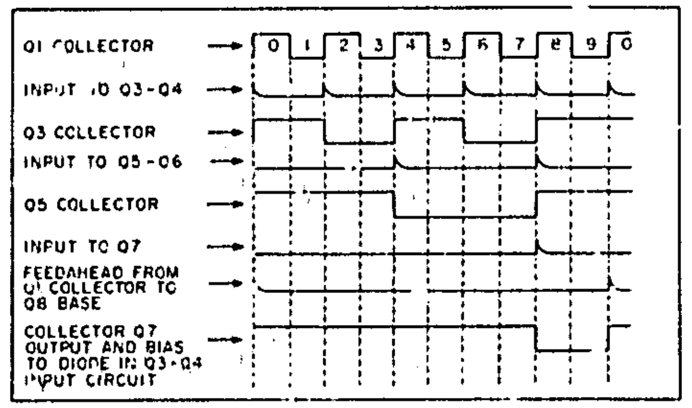
NOTES

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. FILLED SQUARE (■) INDICATES CONDUCTING ELEMENT FOR DECIMAL "0" (BCD "0000")
4. REFERENCE DESIGNATIONS IN PARENTHESES INDICATE LIGHT DESTINATION FOR DS1-DS4. LIGHT SOURCE IS NOTED NEAR EACH V1 SECTION
5. FOR DS1-DS4, SECTION A LIGHTS ON "1"; SECTION B LIGHTS ON "0"
6. STANDARD hp 5248L/M USES 05212-6002 DCA'S. OPTION 002 INSTRUMENTS USE 05212-6016 DCA'S, SHOWN IN FIG. 8-13
   OPTION 003 INSTRUMENTS USE 05212-6003 DCA'S.
   THIS SCHEMATIC IS FOR THE STANDARD AND OPTION 003, OPTION 003 HAS "1" STATE NEGATIVE, OTHERWISE BOARDS ARE IDENTICAL.
   OUTPUT RESISTORS WITH DOUBLE ASTERISK (**) CONNECTIONS FOR "1" STATE POSITIVE, FOLLOW − + − + TO APPROPRIATE COLLECTOR, FOR "1" STATE NEGATIVE WILL BE CONNECTED TO — - — - — COLLECTOR.
7. OUTPUT LEVEL
   STANDARD: (+1248) 0 = −8V, 1 = +18V
   OPTION 003: (−1248) 0 = +18V, 1 = −8V

TRUTH TABLE

DIGIT	4 LINE CODE (0 = +, 1 = −)				RELEVANT STAGES				
					V1	BINARY			
	D	C	B	A		D	C	B	A
0	0	0	0	0	KPRT				
1	0	0	0	1	FMOT				
2	0	0	1	0	HNRT				
3	0	0	1	1	EMOT				
4	0	1	0	0	JPRT				
5	0	1	0	1	DLOT				
6	0	1	1	0	GNRT				
7	0	1	1	1	CLOT				
8	1	0	0	0	BS				
9	1	0	0	1	AS				

WAVEFORMS

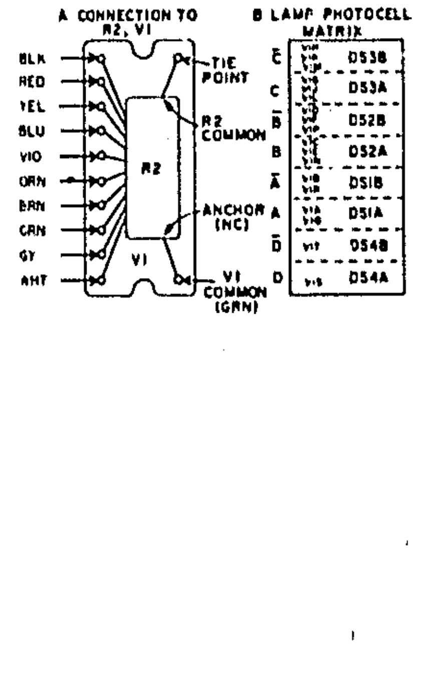


REFERENCE DESIGNATIONS

NO PREFIX	A10 THRU A14 (STANDARD) (OPTION 003)
C19 CR2, 3	C1-13 CR1-14 DS1-6 L1 Q1-8 R1-6 V1

DELETED:
DS5
R3-5

PHYSICAL LAYOUT



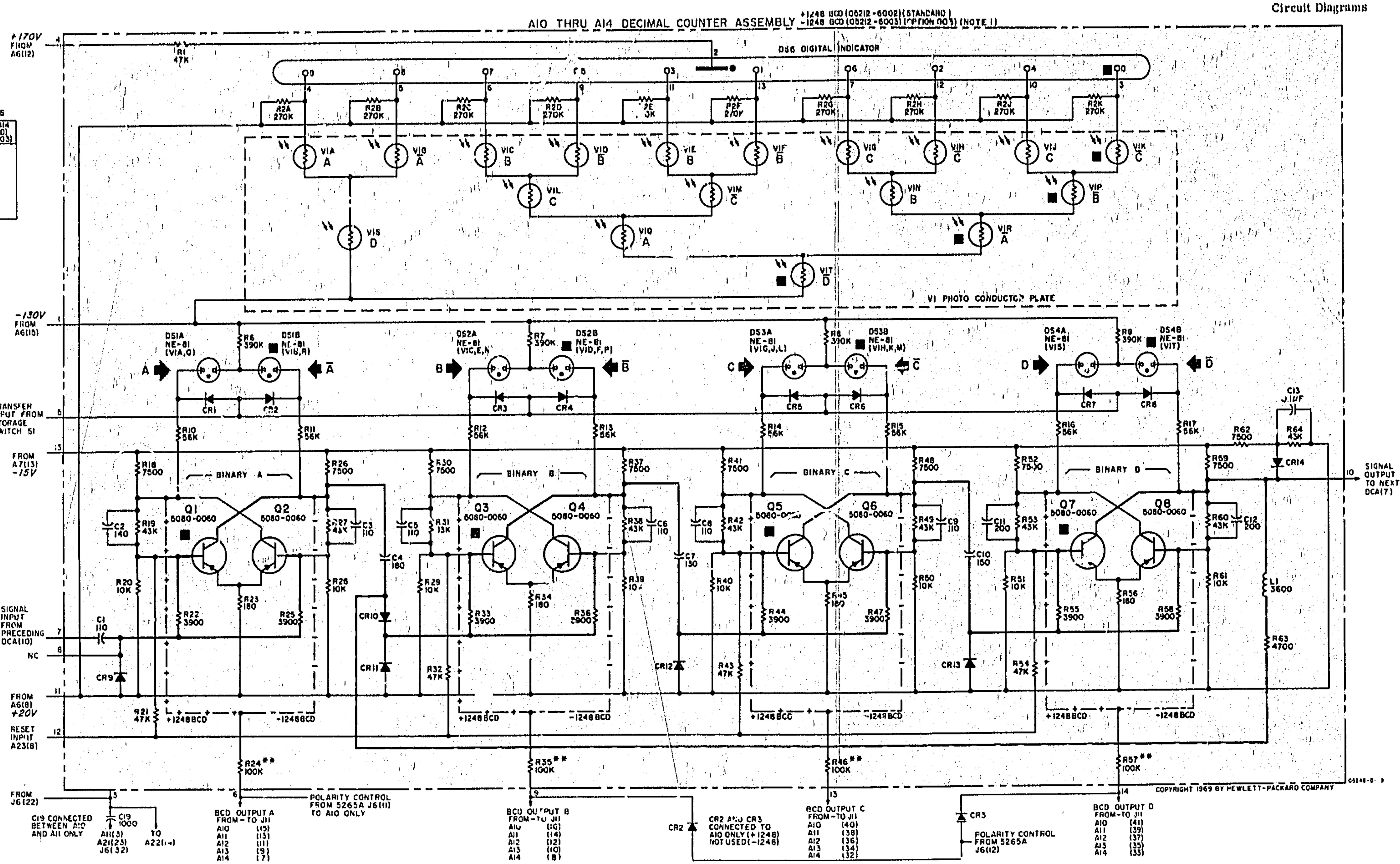
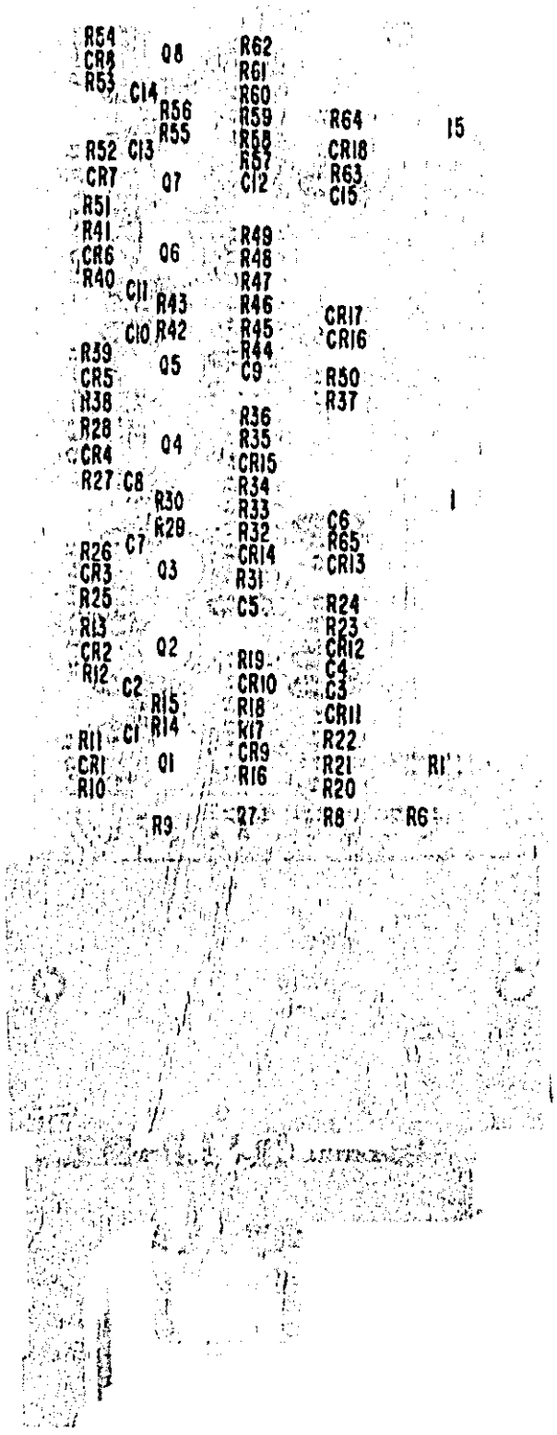


Figure 8-12. A10-A14 Decimal Counters
(+1248 Standard)
(-1248 Option 003)



A10-A14 (OPTION 002) OPERATION

Operation for A10-A14 (Option 002) is identical with decade dividers A29-A34, except A10-A14 have readout display, BCD outputs, and steering diodes. Readout section operation is discussed in Figure 8-12. Different from the DDA's, a reset pulse is applied through pin 12 to all binaries to reset decimal counters to zero.

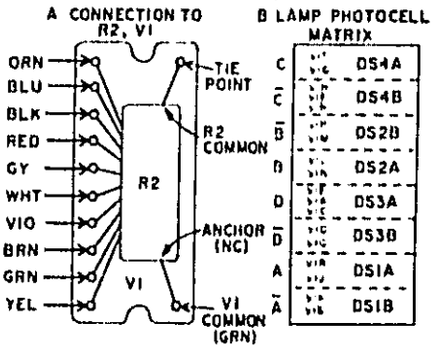
A10-A14 TROUBLESHOOTING

Follow same troubleshooting procedure for A10-A14, Figure 8-12.

NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESIGNATION.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS;
   CAPACITANCE IN PICOFARADS;
3. REFERENCE DESIGNATIONS IN PARENTHESES INDICATE LIGHT DESIGNATION FOR DS1-DS4; LIGHT SOURCE IS NOTED NEAR EACH VI SECTION
4. FOR DS1-DS4, SECTION A LIGHTS ON "1"; SECTION B LIGHTS ON "0"
5. FILLED SQUARE (■) INDICATES CONDUCTING ELEMENT FOR DECIMAL "0" (BCD "0000")
6. OUTPUT LEVEL:
   OPTION 002;(+1224): 0 = −8V, 1 = +18V

PHYSICAL LAYOUT
(PLATE 040-51)



TRUTH TABLE

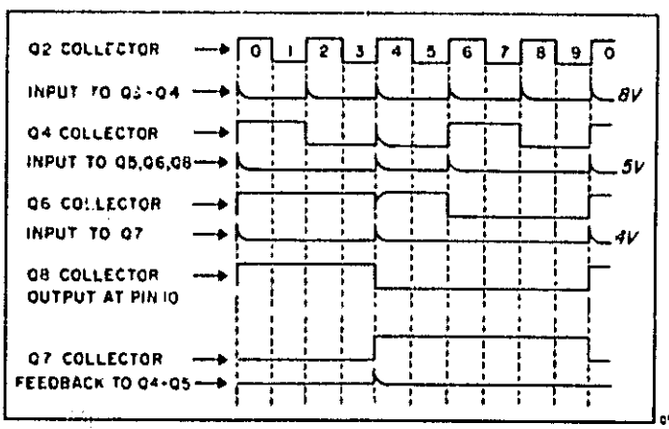
DIGIT	4 LINE CODE (0 = −, 1 = +)				RELEVANT STAGES				
					V1	BINARY			
	D	C	B	A		D	C	B	A
0	0	0	0	0	HPS				
1	0	0	0	1	DMR				
2	0	0	1	0	FNS				
3	0	0	1	1	BLR				
4	0	1	1	0	KQT				
5	0	1	1	1	JQT				
6	1	1	0	0	GPS				
7	1	1	0	1	CMR				
8	1	1	1	0	ENS				
9	1	1	1	1	ALR				

REFERENCE DESIGNATIONS

NO PREFIX	A10-A14 (OPTION 002)
C19	C1 - 15 CR1 - 18 DS1 - 6 Q1 - 8 R1 - 65

DELETED.
DS5
R3,4,5

WAVEFORMS



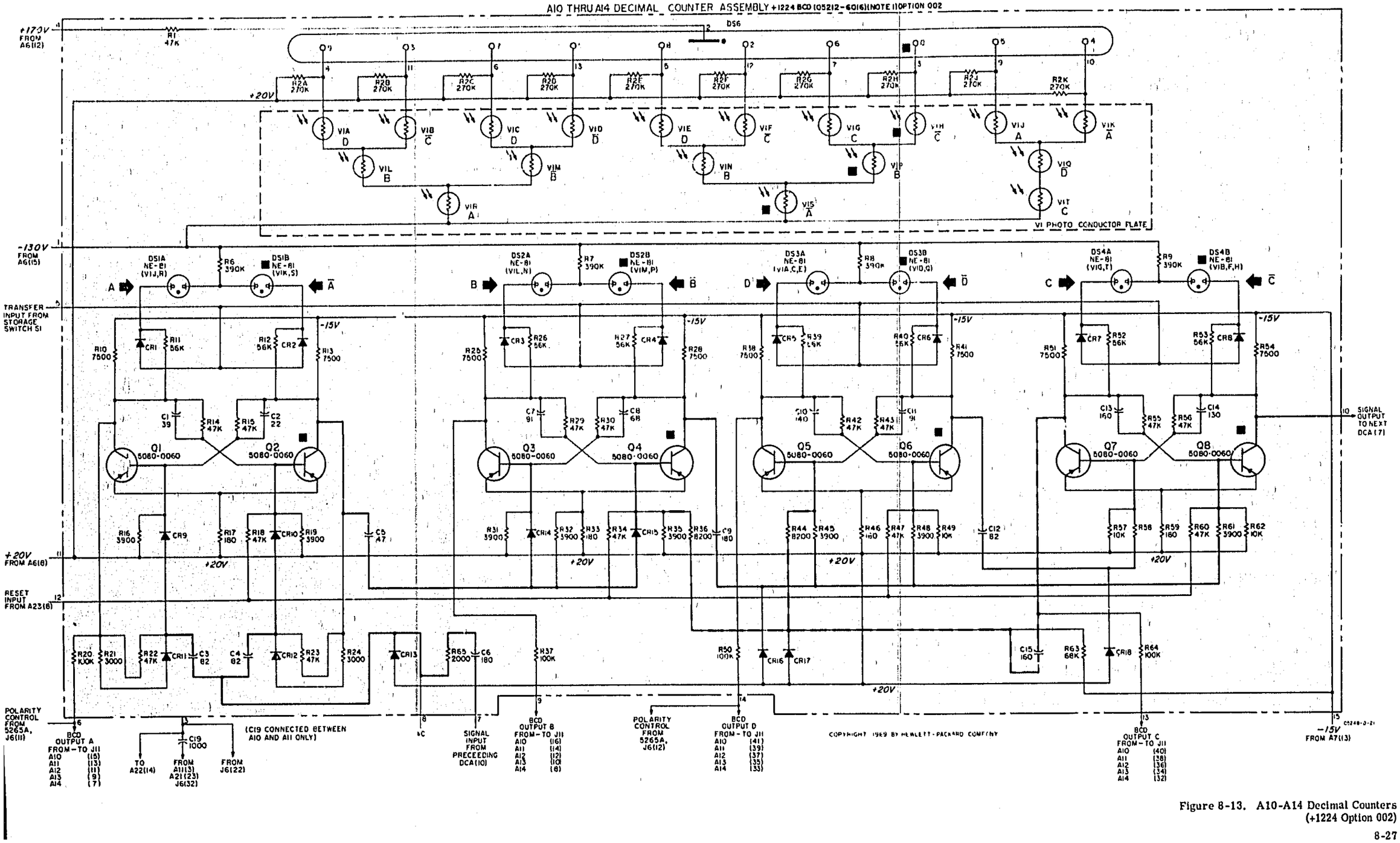
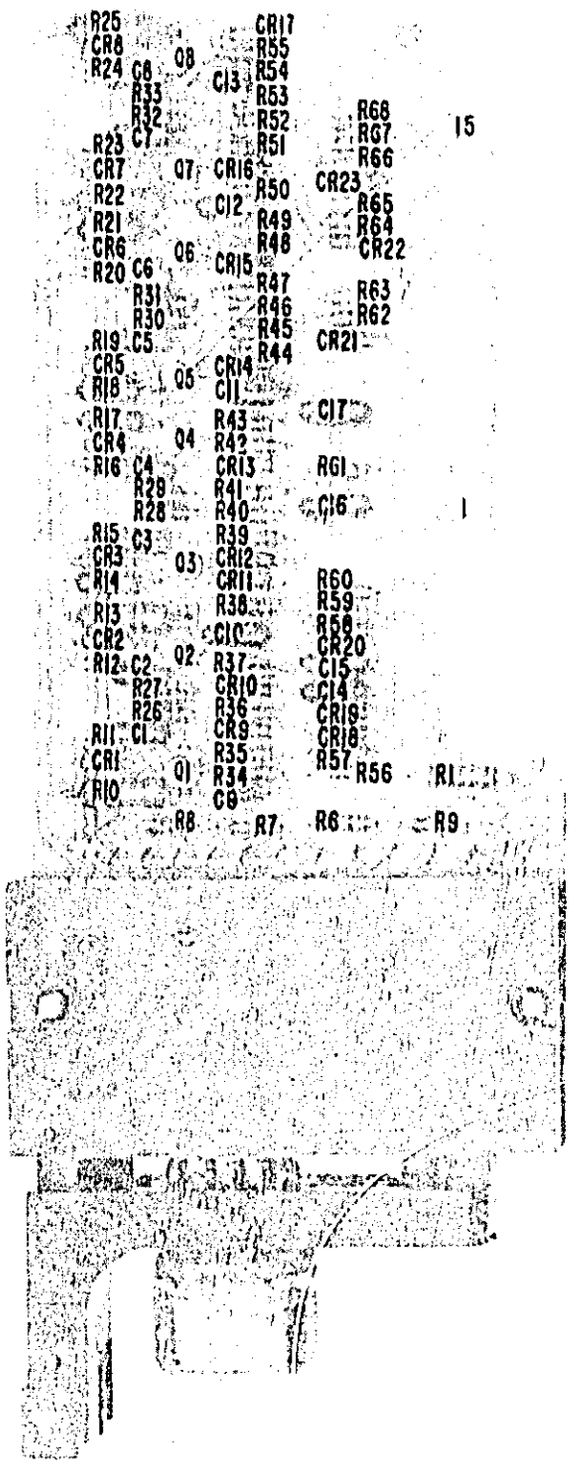
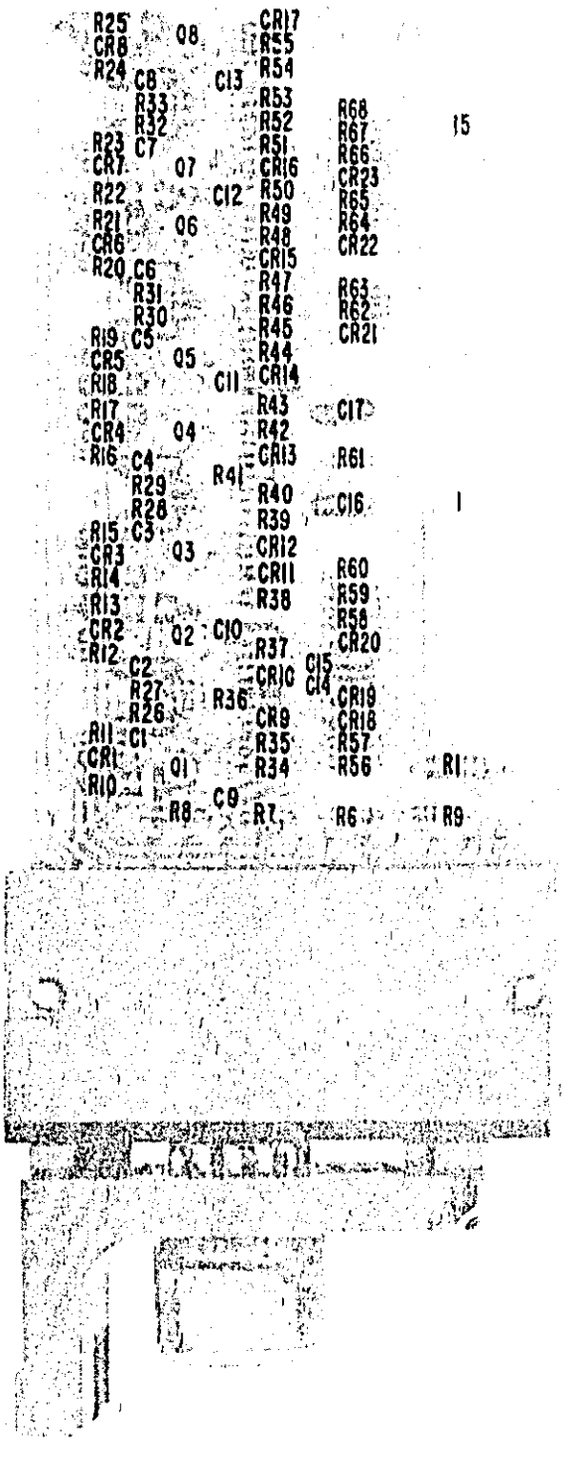


Figure 8-13. A10-A14 Decimal Counters (+1224 Option 002)



+1248 STANDARD



-1248 OPTION 003

A15

A15 OPERATION

The 5 MHz decimal counter operation is similar to A10-A14, except the circuits have been modified by the use of: a) high frequency transistors; b) reduced time constants in the interstage coupling network; and c) steering diodes. The readout section of DCA A15 is identical to A10-A14.

A15 TROUBLESHOOTING

Follow the same troubleshooting procedure for A15 as that described for A10-A14, except when checking the binaries. To check binary operation for A15: Set A1 to CHECK, A2 to 1 μs, A3 to MANUAL START, and observe signal at A15(8). Trace signal forward through DCA to locate defective component.

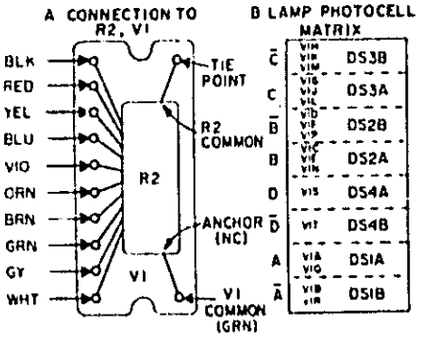
NOTES

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;
3. FILLED SQUARE (■) INDICATES CONDUCTING ELEMENT FOR DECIMAL "0" (BCD "0000")
4. REFERENCE DESIGNATIONS IN PARENTHESES INDICATE LIGHT DESTINATION FOR DS1-DS4 LIGHT SOURCE IS NOTED NEAR EACH VI SECTION
5. FOR DS1-DS4, SECTION A LIGHTS ON "1" SECTION B LIGHTS ON "0"
6. STANDARD hp 5248L/M USES 05232-6014 DCA'S.
   OPTION 002 INSTRUMENTS USE 05232-6010 DCA'S, SHOWN IN FIG. 8-15
   OPTION 003 INSTRUMENTS USE 05232-6012 DCA'S.
   THIS SCHEMATIC IS FOR THE STANDARD AND OPTION 003, OPTION 003 HAS "1" STATE NEGATIVE OTHERWISE BOARDS ARE IDENTICAL.
   OUTPUT RESISTORS WITH DOUBLE ASTERISK (**) CONNECTIONS FOR "1" STATE POSITIVE, FOLLOW — + — + TO APPROPRIATE COLLECTOR, FOR "1" STATE NEGATIVE WILL BE CONNECTED TO — - — - — COLLECTOR.
7. OUTPUT LEVEL:
   STANDARD: (+1248); 0 = −8V, 1 = +18V
   OPTION 003: (−1248); 0 = +18V, 1 = −8V

TRUTH TABLE

DIGIT	4 LINE CODE D	C	B	A	VI	RELEVANT STAGES BINARY D	C	B	A
0	0	0	0	0	KPRT				
1	0	0	0	1	FMQT				
2	0	0	1	0	HNRT				
3	0	0	1	1	EMQT				
4	0	1	0	0	JPRT				
5	0	1	0	1	DLQT				
6	0	1	1	0	GNRT				
7	0	1	1	1	CLQT				
8	1	0	0	0	BS				
9	1	0	0	1	AS				

PHYSICAL LAYOUT

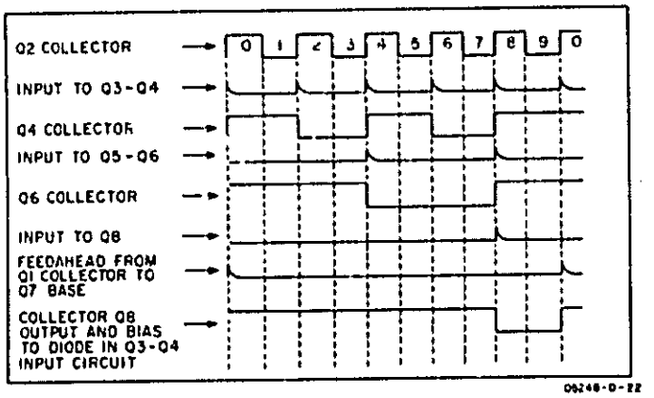


REFERENCE DESIGNATIONS

A15 (STANDARD) (OPTION 003)
C1-17 CR1-23 DS1-6 Q1-8 R1-68 VI

DELETED:
DS5
R3-5

WAVEFORMS



05248-D-22

A15 5MHz DECIMAL COUNTER ASSEMBLY -1248(05232-6012) OPTION 003
+1248(05232-6014) STANDARD (NOTE 1)

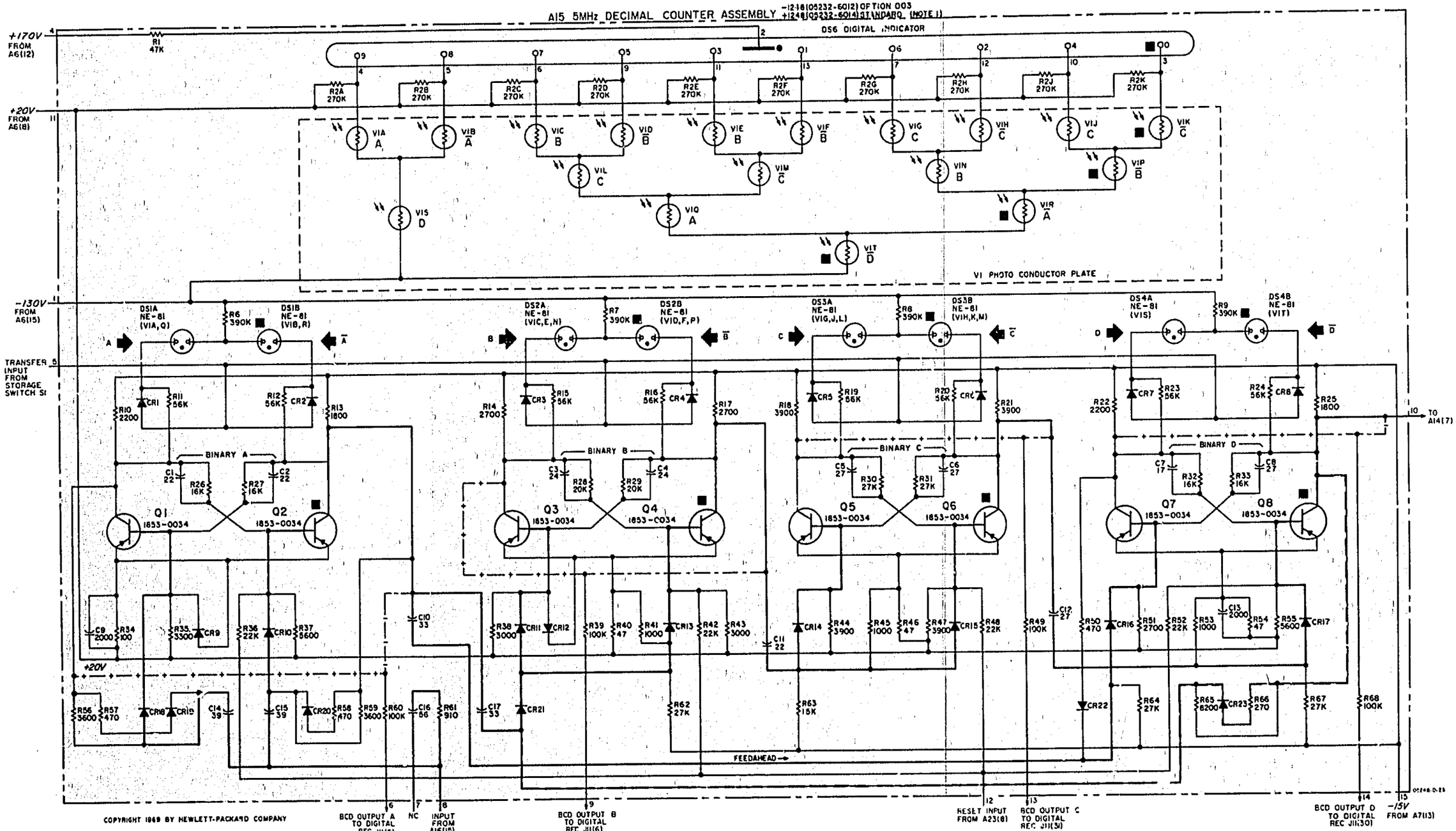
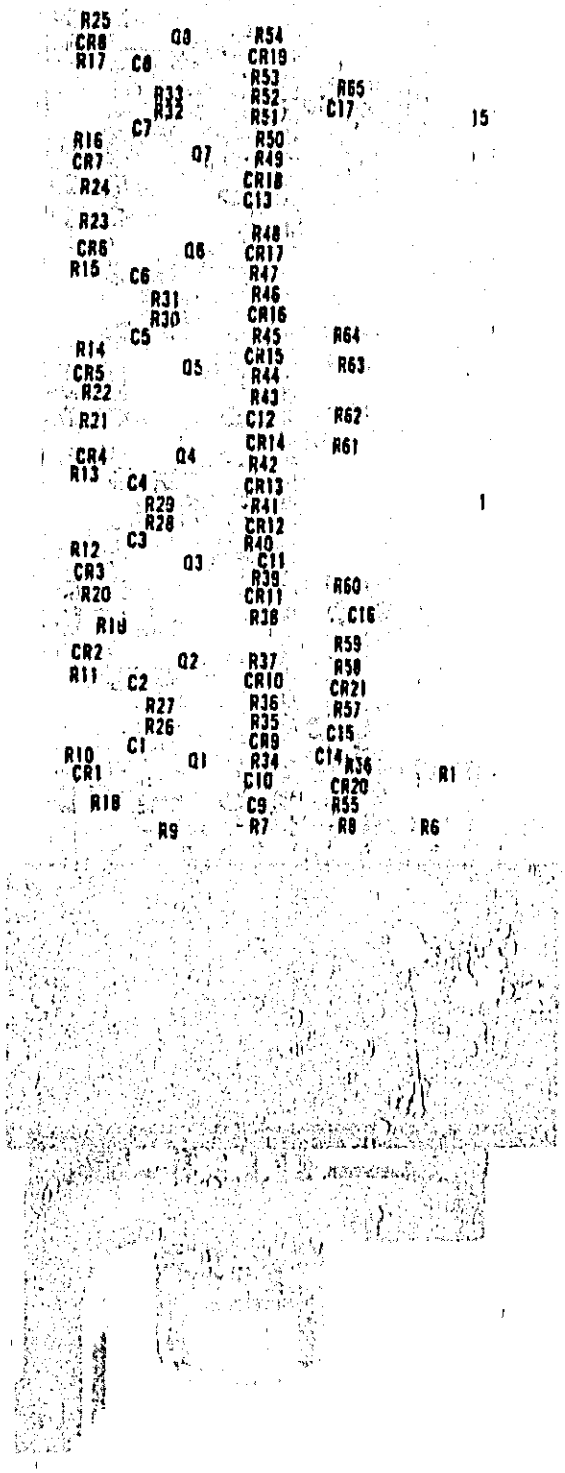


Figure 8-14. A15 5 MHz Decimal Counter
(+1248 Standard)
(-1248 Option 003)



A15 (OPTION 002) OPERATION

The 5 MHz decimal counter operation for Option 002 is identical to A10-A14 (Option 002). The circuits have been modified by the use of: a) high frequency transistors; b) reduced time constants in the interstage coupling network, and c) steering diodes.

A15 (OPTION 002) TROUBLESHOOTING

Follow the same troubleshooting procedure for A15 (Option 002) as that described for A10-A14, except when checking the binaries. Follow procedure described for A15 (standard) to check binary stages. Observe feed-forward and feed-back pulses.

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 MICROFARADS;
3. FILLED SQUARE (■) INDICATES CONDUCTING ELEMENT FOR DECIMAL "0" (BCD "0000").
4. REFERENCE DESIGNATIONS IN PARENTHESES INDICATE LIGHT DESTINATION FOR DS1-DS4. LIGHT SOURCE IS NOTED NEAR EACH V1 SECTION
5. FOR DS1-DS4, SECTION "A" LIGHTS ON "1" SECTION "B" LIGHTS ON "0"
6. OUTPUT LEVELS:
   OPTION 002; (+1224), 0 = −8V, 1 = +18V

TRUTH TABLE

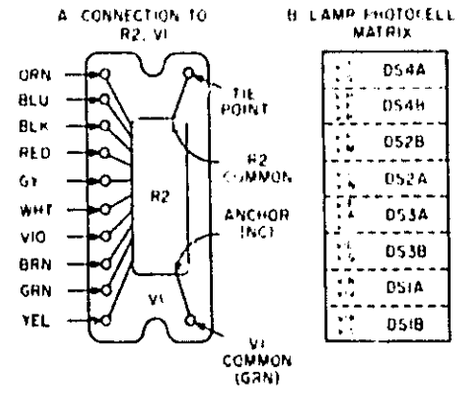
DIGIT	4 LINE CODE (0 = −8V, 1 = +18V)				RELEVANT STAGES				
	D	C	B	A	V1	BINARY D	C	B	A
0	0	0	0	0	HPS				
1	0	0	0	1	CNR				
2	0	0	1	0	ENS				
3	0	0	1	1	ALR				
4	0	1	1	0	HQT				
5	0	1	1	1	JQT				
6	1	1	0	0	GHS				
7	1	1	0	1	CNR				
8	1	1	1	0	ENS				
9	1	1	1	1	ALR				

REFERENCE DESIGNATIONS

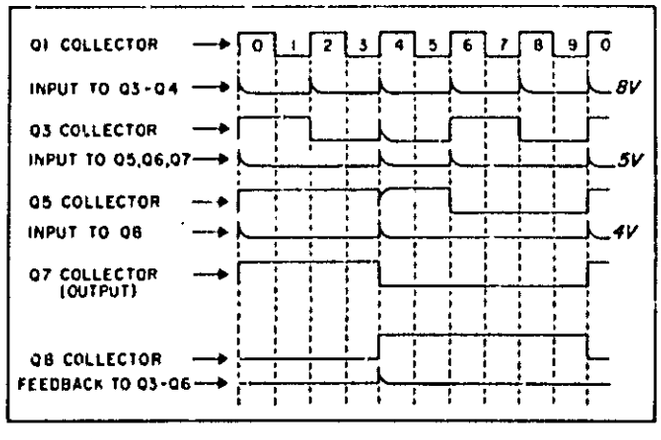
A15 (OPTION 002)
C 1-17 CR1-21 DS1-6 Q 1-8 R 1-65 V 1

DELETED:
DS5
R3-5

PHYSICAL LAYOUT
(PLATE 040 3)



WAVEFORMS



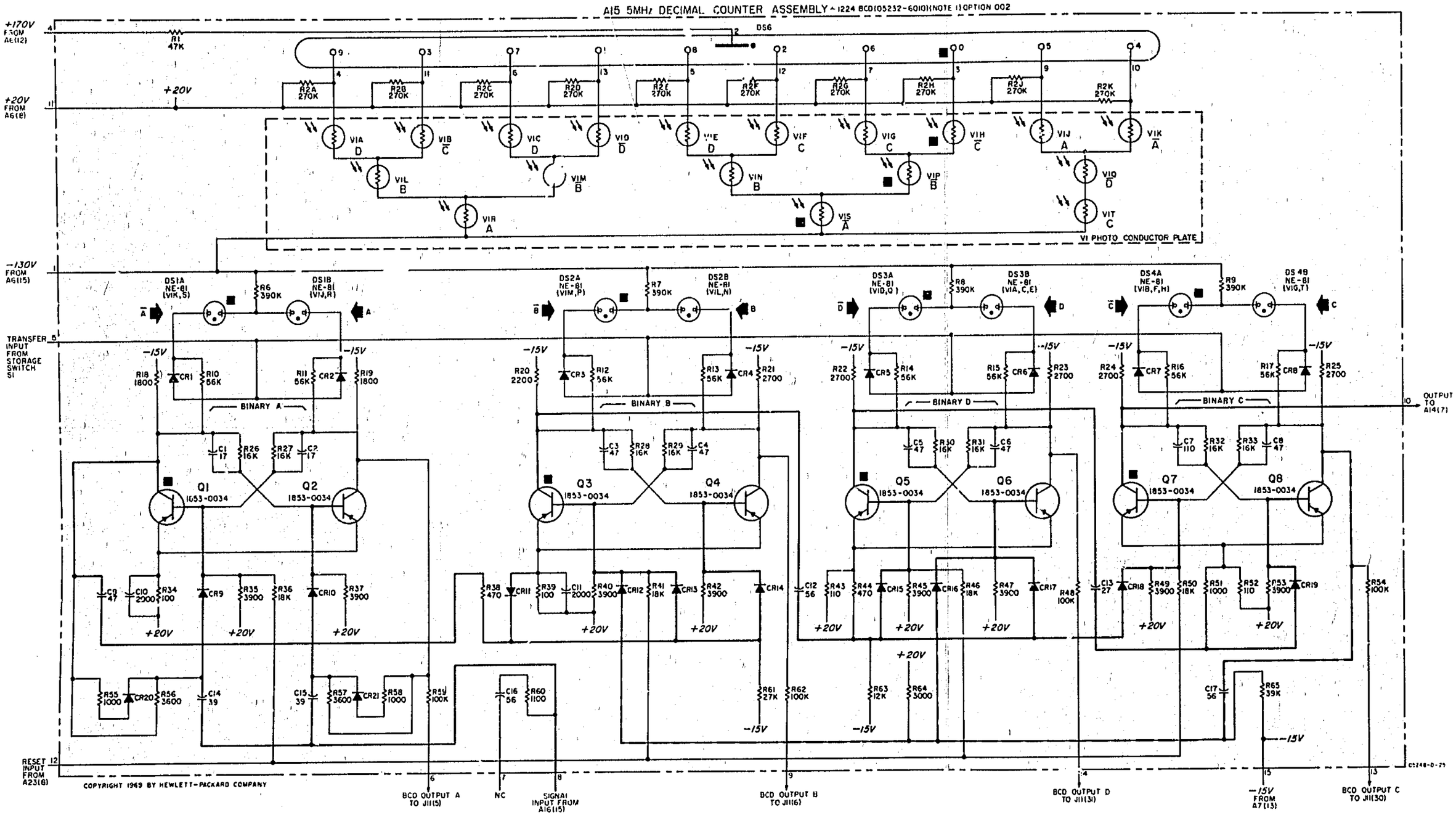
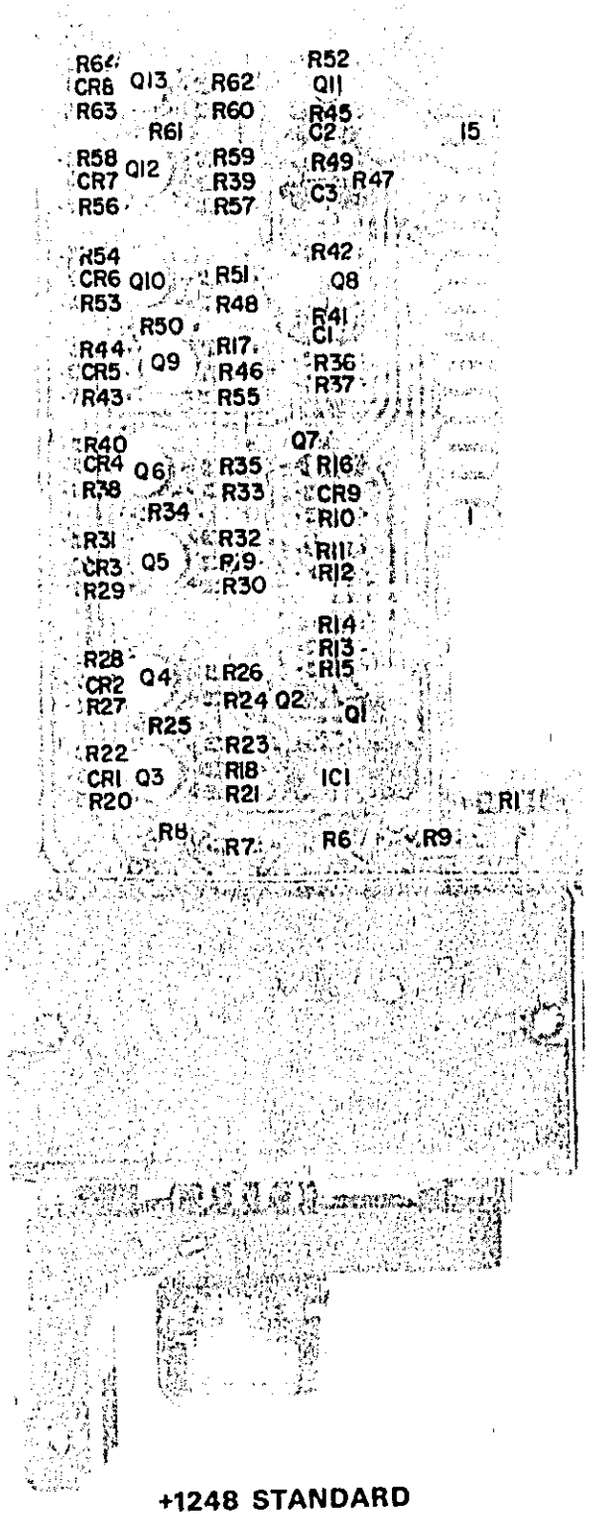
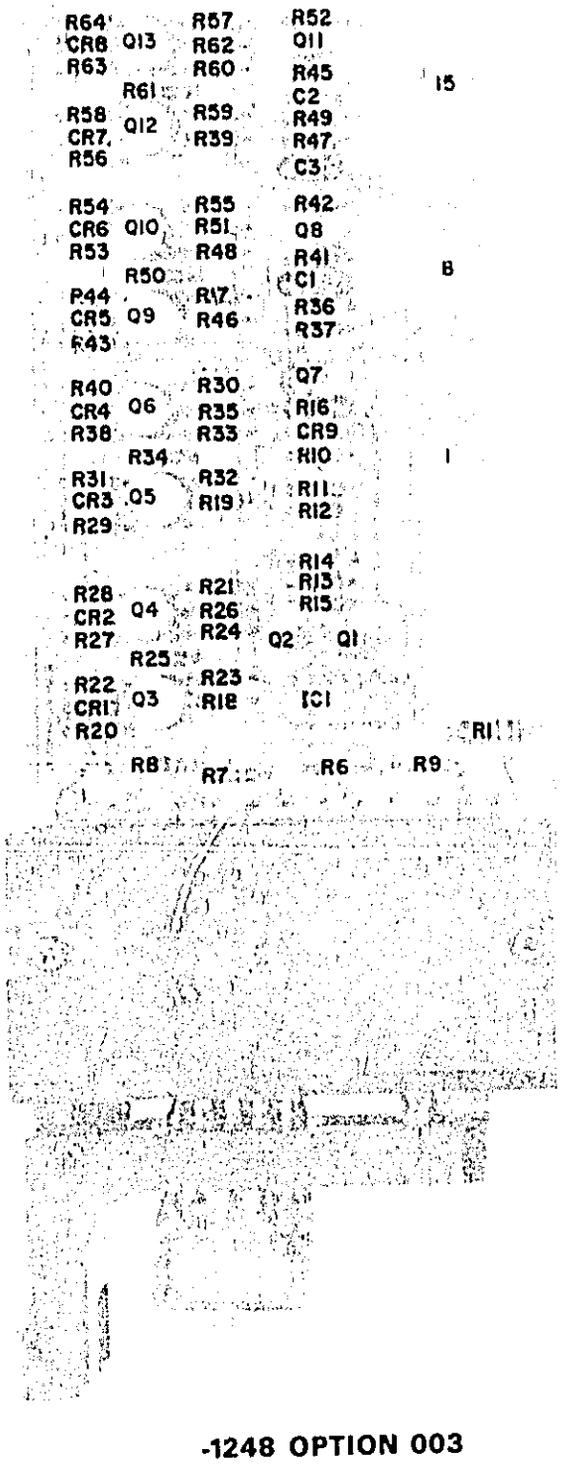


Figure 8-15. A15 5 MHz Decimal Counter (+1224 Option 002)



+1248 STANDARD



-1248 OPTION 003

A16

A16 OPERATION

The input signal at pin 13 drives integrated decimal counter IC1, which provides BCD 1248 output to amplifiers Q3 through Q6 and Q9 through Q13. A positive level to any of these amplifiers will cause the conducting transistor to cut off and the non-conducting transistor to go on. Removing this positive level causes the amplifier to return to its original state. Reset on count 10 is done inside IC1. Manual reset pulse is applied through Q1 and Q2 to IC1 pin 14. Count of 8 level is applied to Q7, where its emitter goes to Q12 for amplifier D, and its collector goes to the trigger circuit consisting of Q8 and Q11. The negative level on count 8 seen on Q8 base will precondition trigger circuit so at count 10 a positive step will be seen on Q11 collector.

The readout section of A16 is identical to A10-A14, except off transistor enables neons.

A16 TROUBLESHOOTING

For readout section troubleshooting, follow procedure for A10-A14. Set Counter controls: A1 to CHECK, FUNCTION to MANUAL START, TIME BASE to .1 s. Observe waveforms at pins 5, 9, 2, and 12 of IC1 to ensure decade counter is operating properly. Output at pin 15 should go negative for counts 8 and 9, then positive on count 10. If BCD output is bad, see A10-A14 TROUBLESHOOTING. If DCA will not manual reset, check reset amplifier Q1 and Q2.

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;
3. FILLED SQUARE (■) INDICATES CONDUCTING ELEMENT FOR DECIMAL "0" (BCD "0000")
4. REFERENCE DESIGNATIONS IN PARENTHESES INDICATE LIGHT DESTINATION FOR DS1-DS4 LIGHT SOURCE IS NOTED NEAR EACH V1 SECTION
5. FOR DS1-DS4, SECTION A LIGHTS ON "1", SECTION B LIGHTS ON "0"
6. STANDARD hp 5248L/M USES 05247-6001 DCA'S.
   OPTION002 INSTRUMENTS USE 05248-6001G DCA'S, SHOWN IN FIG. 8-17
   OPTION003 INSTRUMENTS USE 05247-6004 DCA'S.
   THIS SCHEMATIC IS FOR THE STANDARD AND OPTION 003, OPTION003 HAS "-" STATE NEGATIVE OTHERWISE BOARDS ARE IDENTICAL.
   OUTPUT RESISTORS WITH DOUBLE ASTERISK (**) CONNECTIONS FOR "1" STATE POSITIVE, FOLLOW – + – + TO APPROPRIATE COLLECTOR, FOR "1" STATE NEGATIVE WILL BE CONNECTED TO — - — - — COLLECTOR.
7. OUTPUT LEVEL:
   STANDARD (+1248): 0 = −8V, 1 = +18V
   OPTION 003: (−1248) 0 = +18V, 1 = −8V

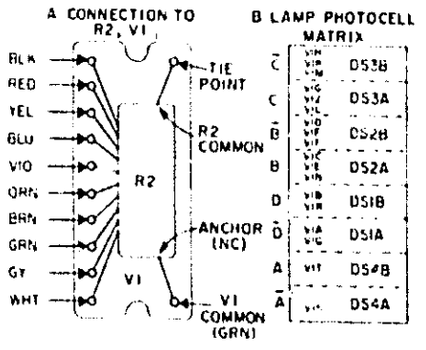
REFERENCE DESIGNATIONS

A16 (STANDARD) (OPTION003)
C1-3
CR1-9
DS1-6
IC1
Q1-13
R1-64
V1

DELETED: DS5, R3-8

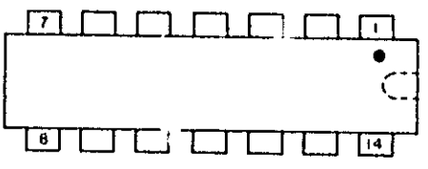
05248-D-26

PHYSICAL LAYOUT



TRUTH TABLE

DIGIT	4 LINE CODE				V1	RELEVANT STAGES BINARY			
	D	C	B	A		D	C	B	A
0	0	0	0	0	KPRT				
1	0	0	0	1	FMQT				
2	0	0	1	0	HNRT				
3	0	0	1	1	EMQT				
4	0	1	0	0	JPRT				
5	0	1	0	1	DLQT				
6	0	1	1	0	GNRT				
7	0	1	1	1	CLQT				
8	1	0	0	0	BS				
9	1	0	0	1	AS				



IC1
1820-0322
(TOP VIEW)

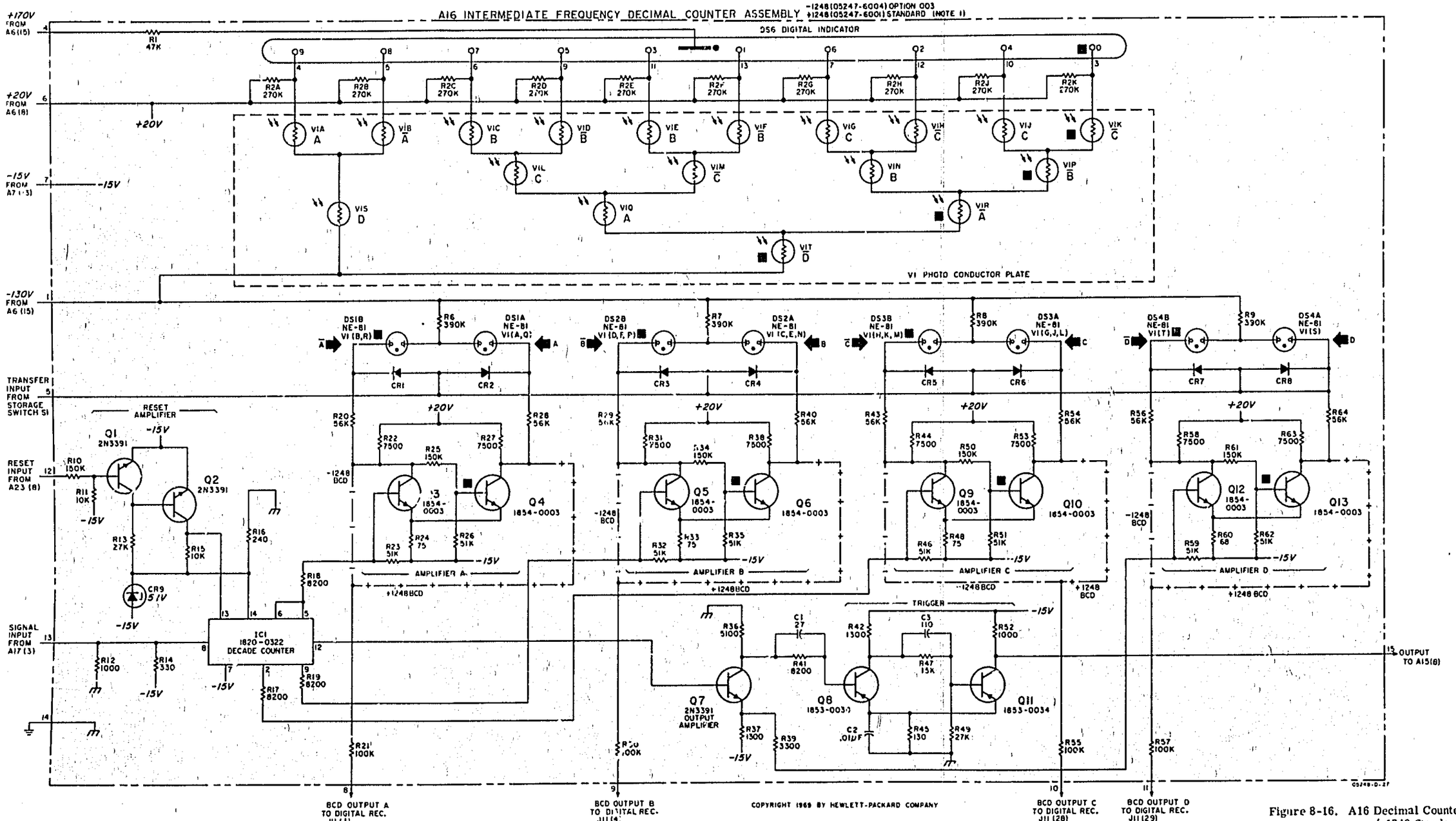
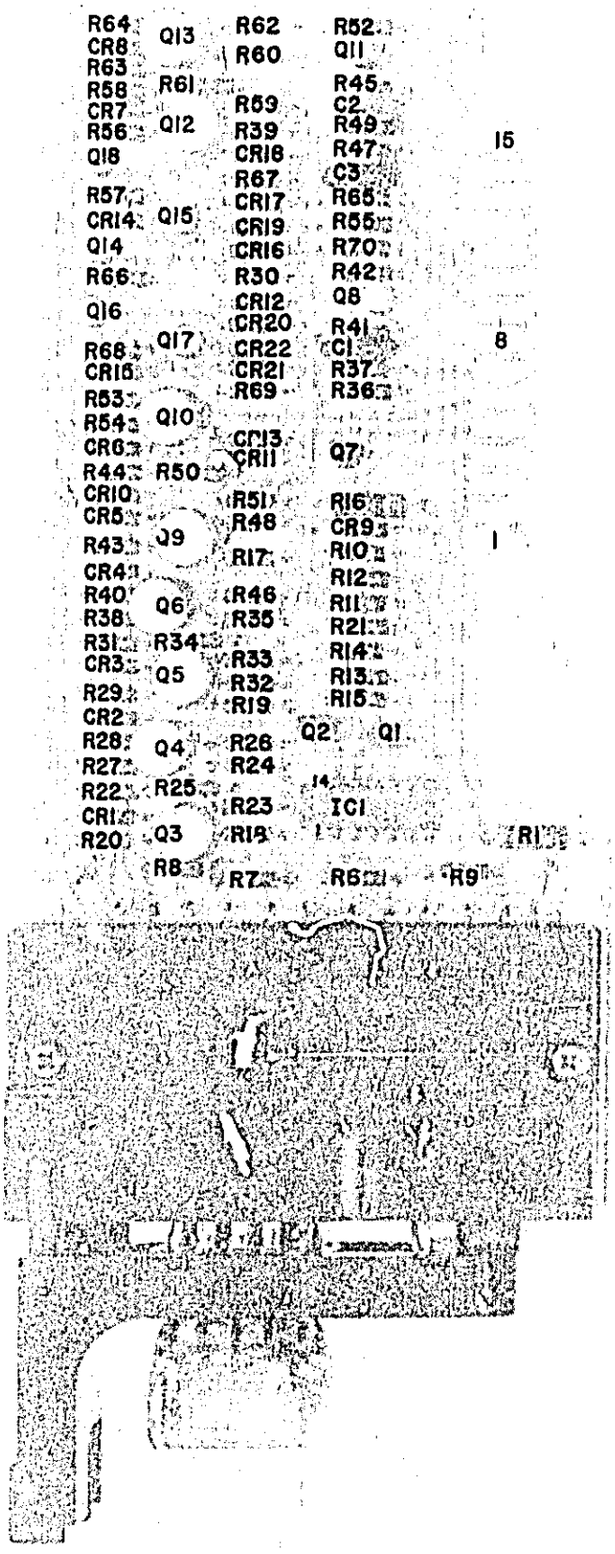


Figure 8-16. A16 Decimal Counter (+1248 Standard) (-1248 Option 003)



A16 (OPTION 002) OPERATION

Operation for A16 (Option 002) is identical to that for A16 standard and Option 003, except the amplifier outputs are fed to a decoding matrix for 1224 code output. Decoding matrix consists of CR10 through Q14 through Q18. See Figure 8-16 for A16 operation and Figure 8-20 for decoding explanation.

A16 TROUBLESHOOTING

See Figure 8-16, A16 troubleshooting.

Decoding equation represented by logic diagram:

A' = A (no decoding of A bit is necessary)
B' = $B\overline{C} + \overline{B}C + D$
C' = B + D
D' = BC + D

A = 1248 A' = 1224

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.
3. FILLED SQUARE (■) INDICATES CONDUCTING ELEMENT FOR DECIMAL "0" (BCD "0000").
4. REFERENCE DESIGNATIONS IN PARENTHESES INDICATE LIGHT DESTINATION FOR DS1-DS4. LIGHT SOURCE IS NOTED NEAR EACH VI SECTION.
5. FOR DS1-DS4, SECTION A LIGHTS ON "1", SECTION B LIGHTS ON "0".
6. OUTPUT LEVEL OPTION 002: 0 = −8V, 1 = +18V.

TRUTH TABLE DS5

COUNT	4 LINE CODE D	C	B	A	VI	RELEVANT STAGES BINARY D	C	B	A
0	0	0	0	0	HFRT				
1	0	0	0	1	HFQT				
2	0	0	1	0	HQRT				
3	0	0	1	1	HQQT				
4	0	1	0	0	QFRT				
5	0	1	0	1	QFQT				
6	0	1	1	0	QQRT				
7	0	1	1	1	QQQT				
8	1	0	0	0	RS				
9	1	0	0	1	AS				

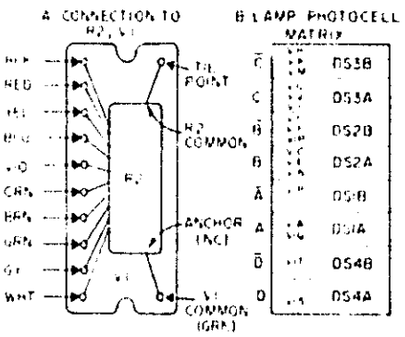
REFERENCE DESIGNATIONS

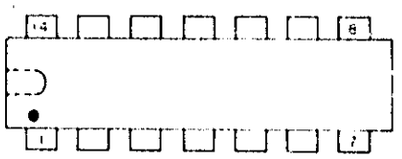
A16 (OPTION 002)
C1-3
CR1-22
DS1-6
IC1
Q1-18
R1-70
VI

DELETED DS5 R3-5

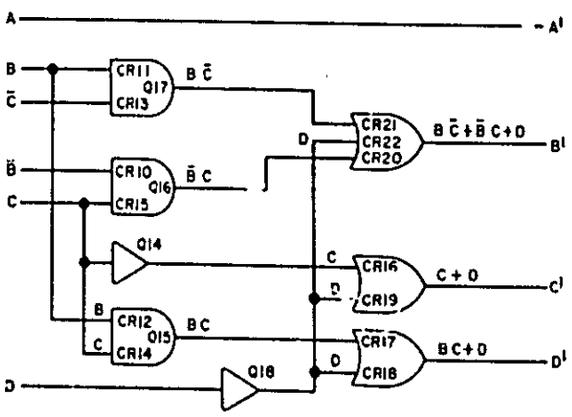
09248-D-54

PHYSICAL LAYOUT





DIGIT	+1248 D	C	B	A
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1



DIGIT	+1224 D	C	B	A
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	1	0
5	0	1	1	1
6	1	1	0	0
7	1	1	0	1
8	1	1	1	0
9	1	1	1	1

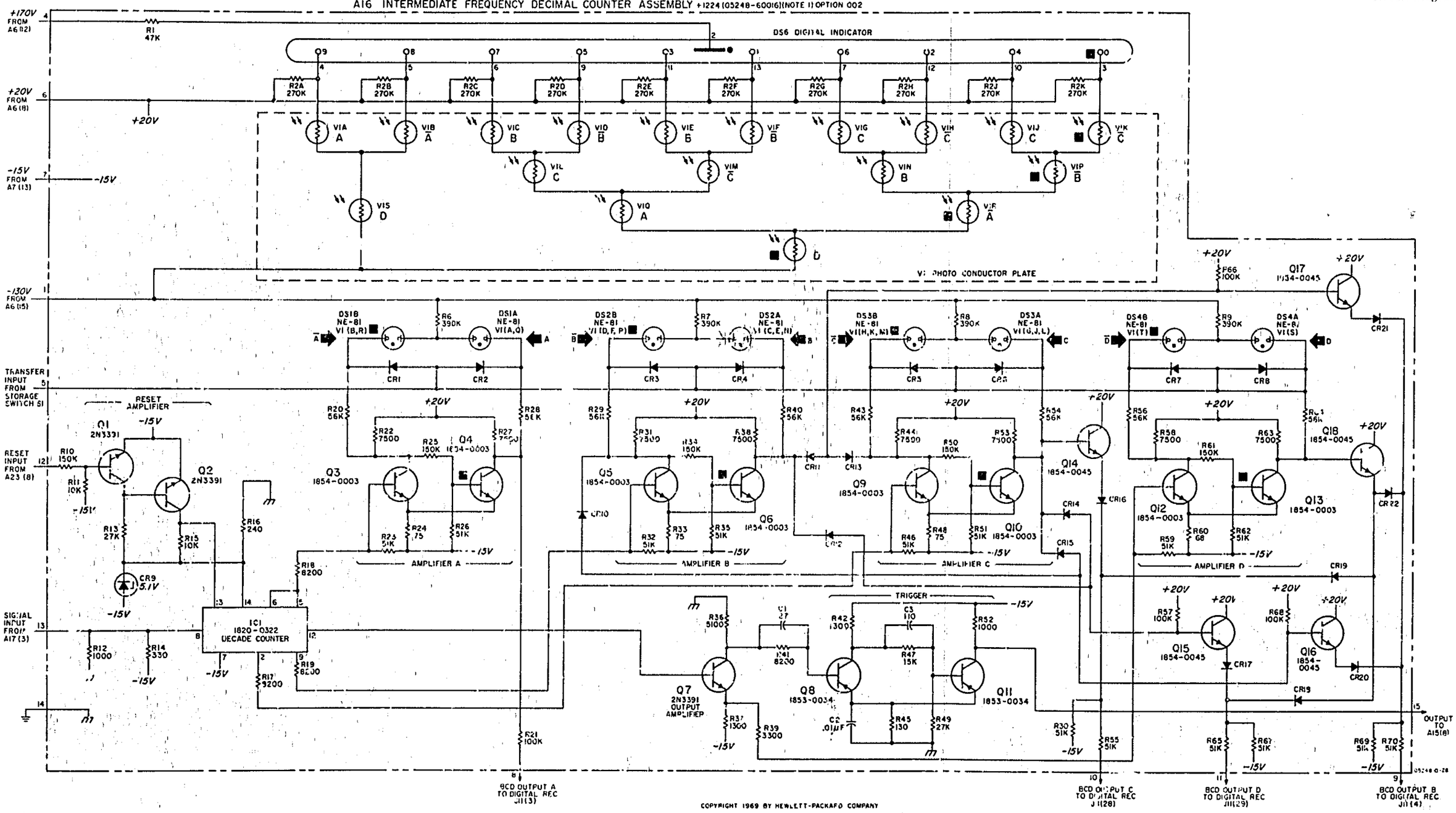


Figure 8-17. A16 Decimal Counter (+1224 Option 002)

SCHEMATIC DIAGRAMS CON'T

A17 OPERATION

IC1, and ECL (Emitter Coupled Logic) level flip-flop, transfers the signal at the D input to the Q output, on the positive transition of the gated input clock pulse. Since the D input is coupled from the $\overline{Q}$ output in this circuit, the flip-flop changes state with each positive transition of the input clock pulse.

IC2, IC3, and IC4 are ECL level gates connected as clocked J-K flip-flops. The clock is obtained by tieing J and K inputs together. The J-K flip-flop is toggled high when all remaining J inputs are low and the clock makes a positive transition. This flip-flop is toggled low when all remaining input K are low and the clock makes a positive transition.

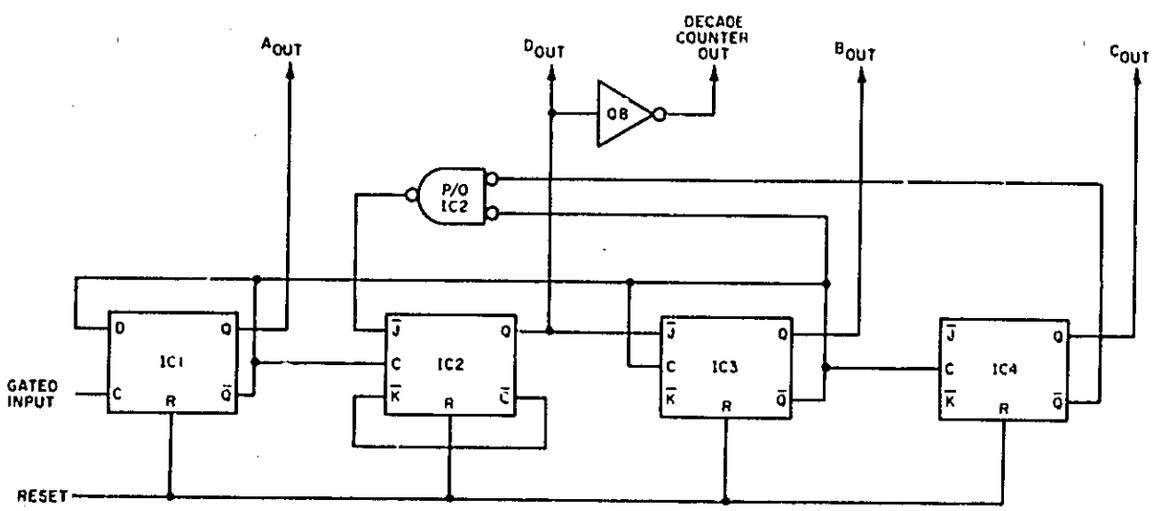
If all remaining J and K inputs are tied low and the clock makes a positive transition, the flip-flop will change state. The reset pulse set the Q output on all the IC's low.

Transistors Q4 and Q5, Q6 and Q7, Q9 and Q10, and Q11 and Q12 convert the ECL level outputs of the IC's to a level compatible with the remainder of the instrument.

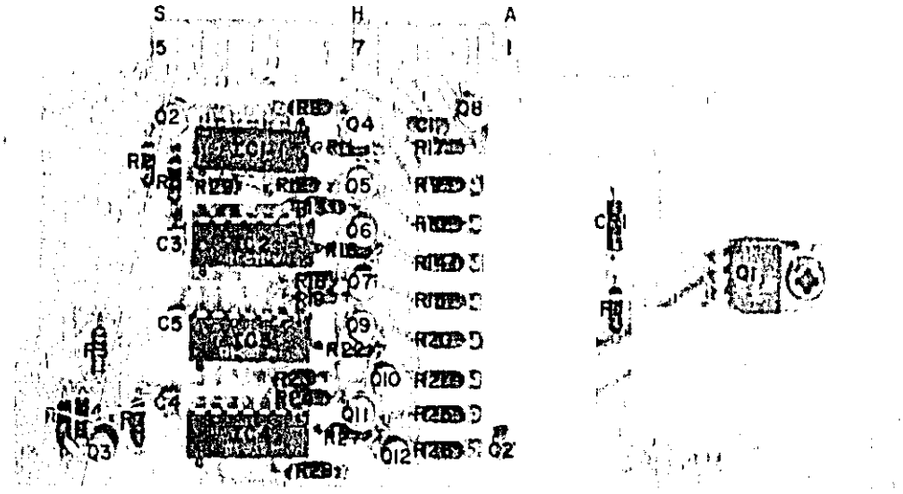
The output of the high frequency decade divider is the D (BCD) output inverted through Q8. The useful output is a positive transition at pin 3 on every 10th gated input pulse.

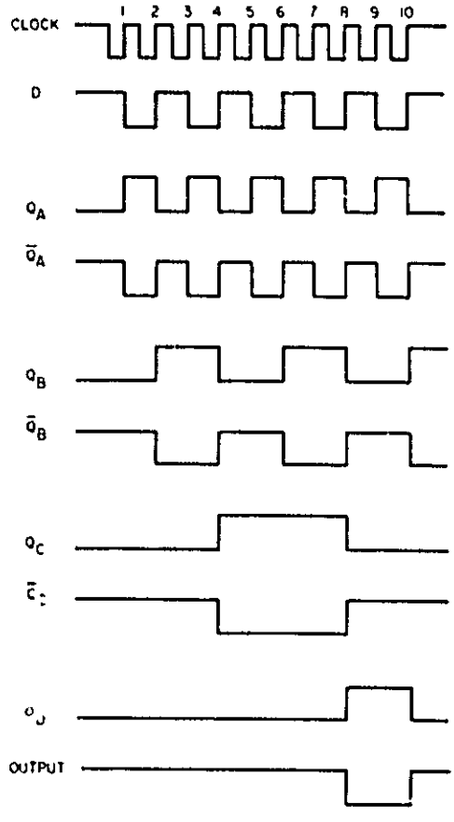
A17 TROUBLESHOOTING

Set FUNCTION switch to MANUAL START; SENSITIVITY to CHECK; TIME BASE to 1 ms. Using oscilloscope and X10 probe, observe the 1 kHz signal at A17(12). Do not ground Pin 13. Follow signal path in accompanying signal path block diagram to locate defective circuit. Defect in A18 can cause A17 to stop counting. Remove A18 to isolate trouble to A17. If A17 counts low frequencies but not high frequencies, change TIME BASE switch to .01 us. Using sampling scope and X10 probe, observe 100 MHz input and trace circuit as discussed previously.



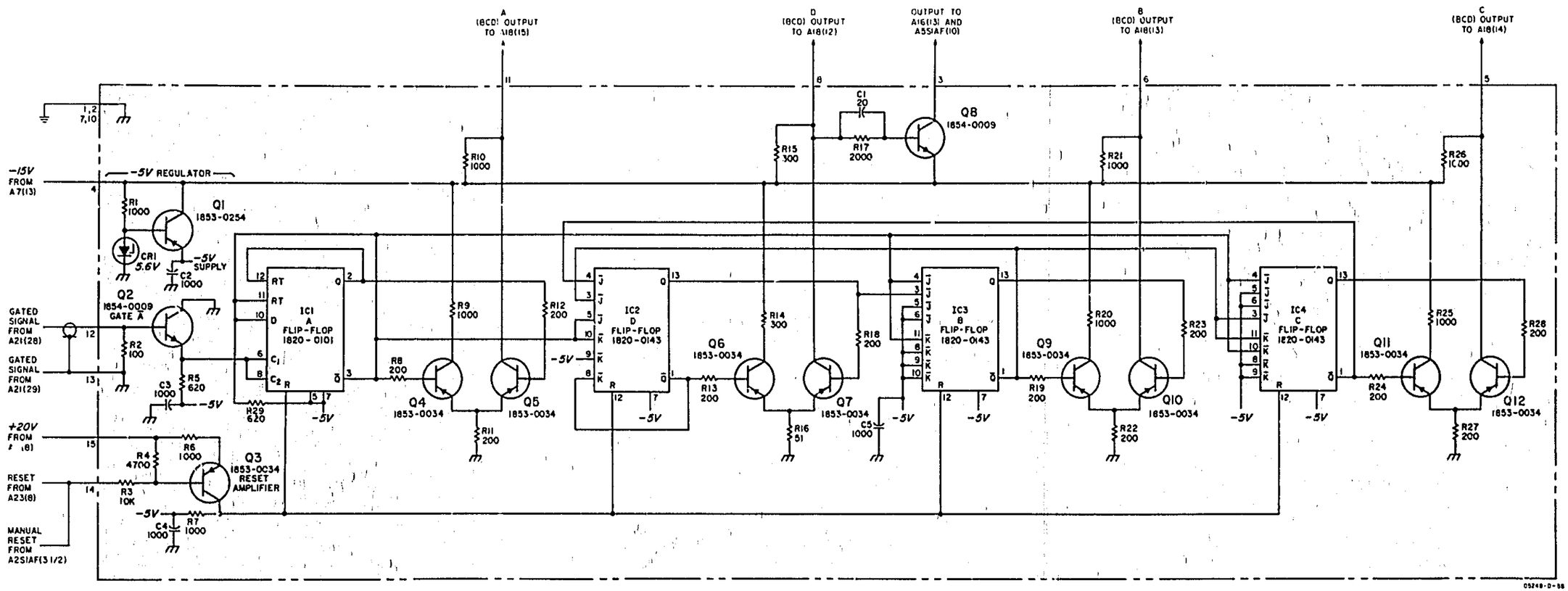
A17 Signal Path Block Diagram





A17 ...ing Diagram

A17 HIGH FREQUENCY DECADE ASSEMBLY (05248-60021)(NOTE 1)



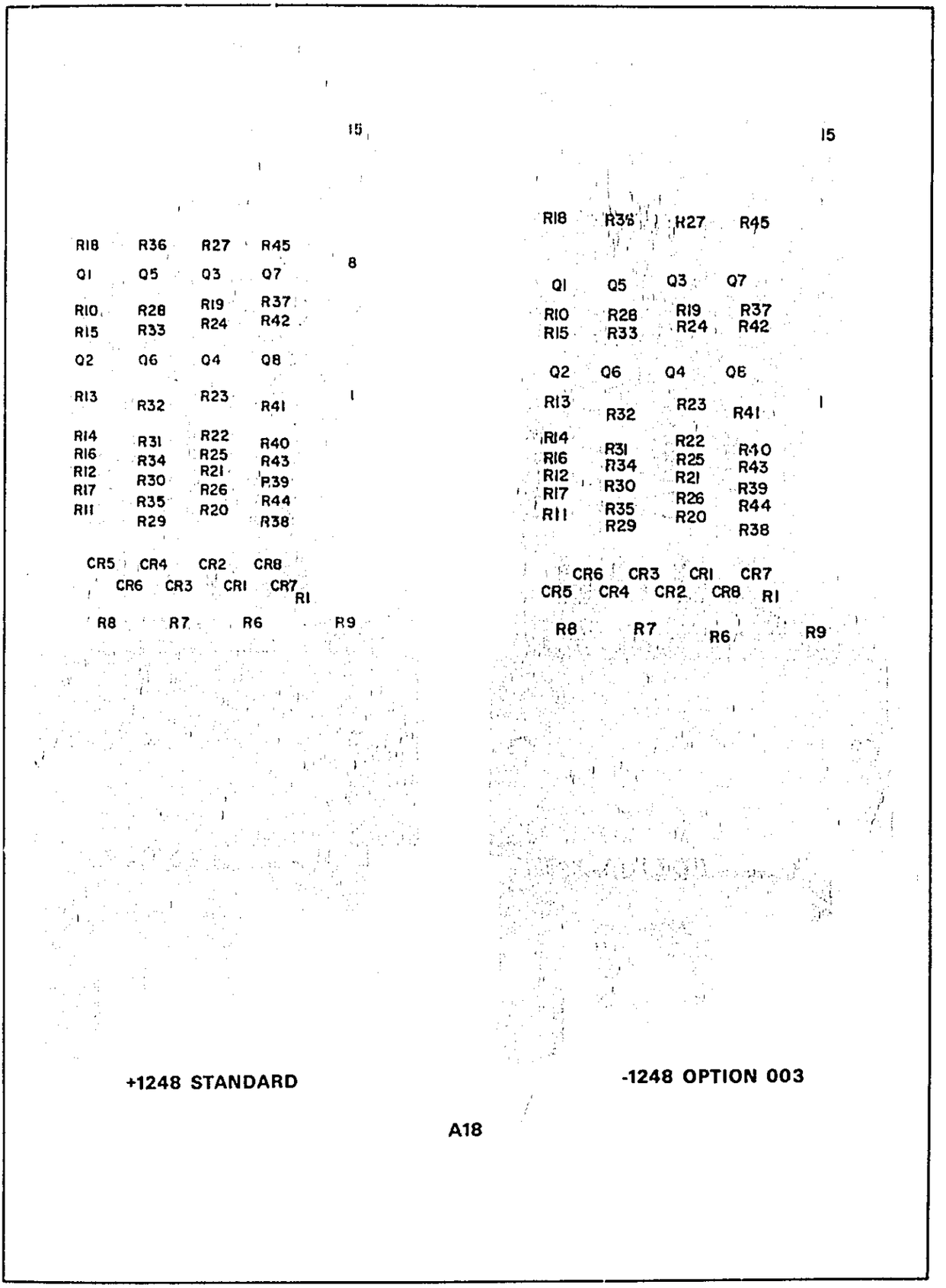
NOTES

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;

REFERENCE DESIGNATIONS

A17
C1-5 CR1 IC1-4 Q1-12 R1-29

Figure 8-18. A17 High Frequency Decimal Counter



A18 OPERATION

High Frequency Readout operation is identical to A16 (Intermediate Frequency Decimal Counter Assembly) operation. The difference between these assemblies is that A16 decimal counting is done by A16IC1, whereas A18 decimal counting is done by A17.

A18 TROUBLESHOOTING

Check input signals from A17. Follow troubleshooting procedure for A16.

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;
3. FILLED SQUARE (■) INDICATES CONDUCTING ELEMENT FOR DECIMAL "0" (BCD "0000")
4. REFERENCE DESIGNATIONS IN PARENTHESES INDICATE LIGHT DESIGNATION FOR DS1-DS4; LIGHT SOURCE IS NOTED NEAR EACH VI SECTION
5. STANDARD hp 5248L/M USES 05247-6008 DCA'S
   OPTION 002 INSTRUMENTS USE 05248-60017 DCA'S, SHOWN IN FIG 8-20
   OPTION 003 INSTRUMENTS USE 05247-6009 DCA'S
   THIS SCHEMATIC IS FOR THE STANDARD AND OPTION 003
   OPTION 003 HAS "1" STATE NEGATIVE OTHERWISE BOARDS ARE IDENTICAL.
   OUTPUT RESISTORS WITH DOUBLE ASTERISK (**) CONNECTIONS FOR "1" STATE POSITIVE, FOLLOW − → + TO APPROPRIATE COLLECTOR, FOR "1" STATE NEGATIVE WILL BE CONNECTED TO ——— COLLECTOR
6. OUTPUT LEVEL
   STANDARD (+1248): 0 = −8V, 1 = +18V
   OPTION 003 (−1248): 0 = +18V, 1 = −8V

TRUTH TABLE

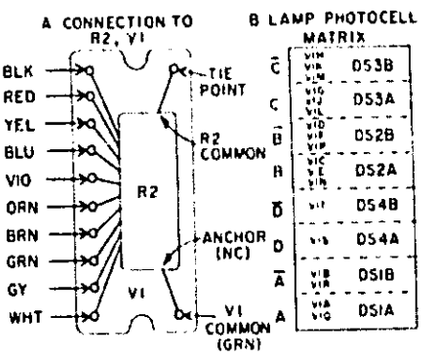
DIGIT	4 LINE CODE				RELEVANT STAGES VI	BINARY			
	D	C	B	A		D	C	B	A
0	0	0	0	0	KPRT				
1	0	0	0	1	FMOT				
2	0	0	1	0	HNRT				
3	0	0	1	1	EMOT				
4	0	1	0	0	JPRT				
5	0	1	0	1	DLOT				
6	0	1	1	0	GNRT				
7	0	1	1	1	CLOT				
8	1	0	0	0	BS				
9	1	0	0	1	AS				

REFERENCE DESIGNATIONS

A18 (STANDARD) (OPTION 003)
CR1-8 DS1-6 Q1-8 R1-45 VI

DELETED: 05248-0-3
DS5
R3-5

PHYSICAL LAYOUT



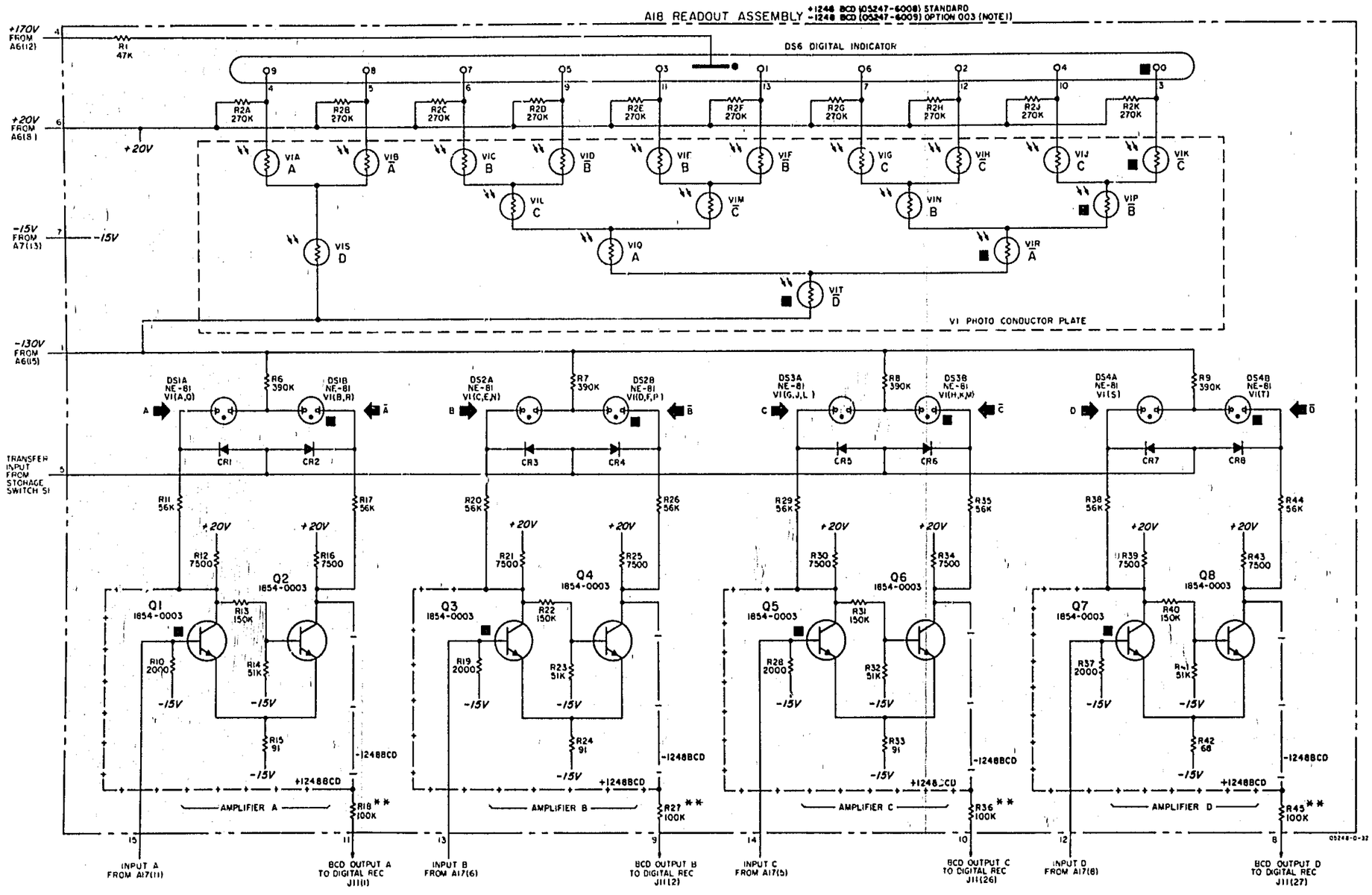
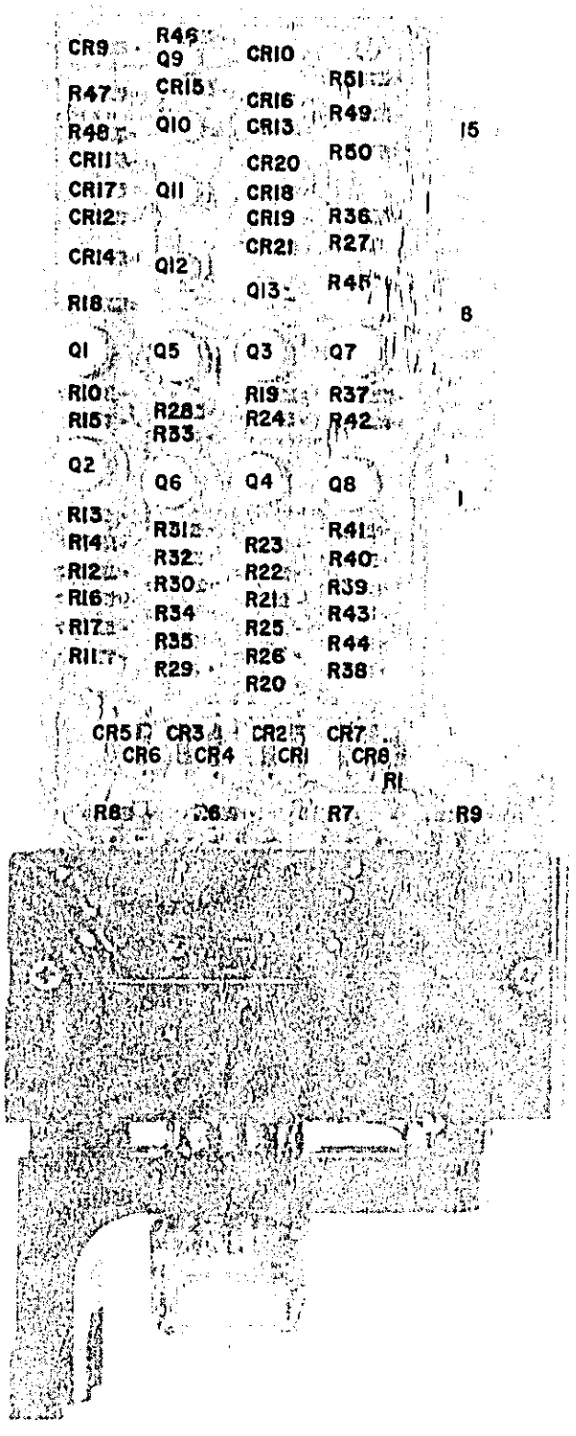


Figure 8-19. A18 Readout
(+1248 Standard)
(-1248 Option 003)



A18 (OPTION 002) OPERATION

Readout assembly A19 (Option 002) is identical with A18 standard and Option 003 except output lines are fed to a decoding matrix to provide a 1224 output code. Decoding matrix consists of CR9 through CR21 and Q9 through Q13. The truth table and logic diagram on the next page show how decoding is done.

Example: If decimal digit 6 is displayed on DS6, the following conditions will exist on amplifiers Q1 through Q8: A = 0, B = 1, C = 1, D = 0, and $\overline{A}$ = 1, $\overline{B}$ = 0, $\overline{C}$ = 0, $\overline{D}$ = 1.

Decoding equation represented by logic diagram:

A' = A (no decoding of A bit is necessary)
B' = B$\overline{C}$ + $\overline{B}$C + D
C' = B + D
D' = BC + D

A = 1248 code A' = 1224 code

Since in the example described above A = 0 the A' = 0, none of the conditions necessary to produce a B' are present and its output will be 0. B is 1 making C' = 1. B and C are 1, causing D' = 1.

A18 TROUBLESHOOTING

Follow troubleshooting for A18, Figure 8-19.

NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS
3. FILLED SQUARE (■) INDICATES CONDUCTING ELEMENT FOR DECIMAL "0" (BCD "0000")
4. REFERENCE DESIGNATIONS IN PARENTHESES INDICATE LIGHT DESTINATION FOR DS1-DS4, LIGHT SOURCE IS NOTED NEAR EACH VI SECTION
5. OUTPUT LEVEL: OPTION 002: 0= −8V, 1= +18V

TRUTH TABLE
DS6

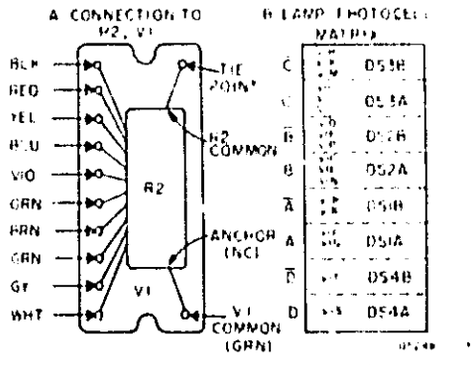
DIGIT	4 LINE CODE (BCD)				VI	RELEVANT STAGES BINARY			
	D	C	B	A		D	C	B	A
0	0	0	0	0	PPPT				
1	0	0	0	1	PNQT				
2	0	0	1	0	PART				
3	0	0	1	1	PLQT				
4	0	1	0	0	APPT				
5	0	1	0	1	ALQT				
6	0	1	1	0	LART				
7	0	1	1	1	LLQT				
8	1	0	0	0	BS				
9	1	0	0	1	AS				

REFERENCE DESIGNATIONS

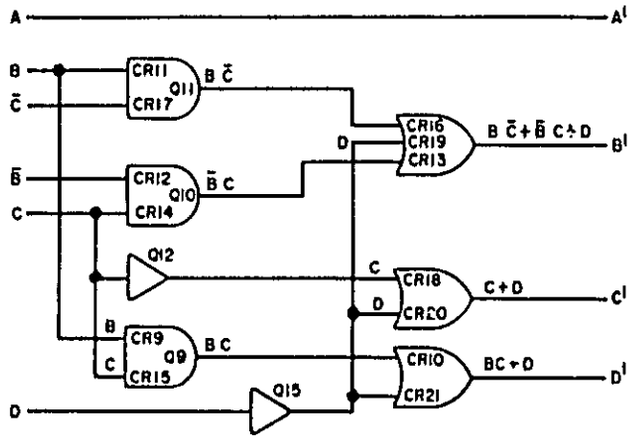
A1B (OPTION 002)
CR1-21 DS1-6 Q1-13 R1-51 VI

DELETED:
DS5
R3-5

PHYSICAL LAYOUT



DIGIT	+1248			
	D	C	B	A
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1



DIGIT	+1224			
	D	C	B	A
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	1	0
5	0	1	1	1
6	1	1	0	0
7	1	1	0	1
8	1	1	1	0
9	1	1	1	1

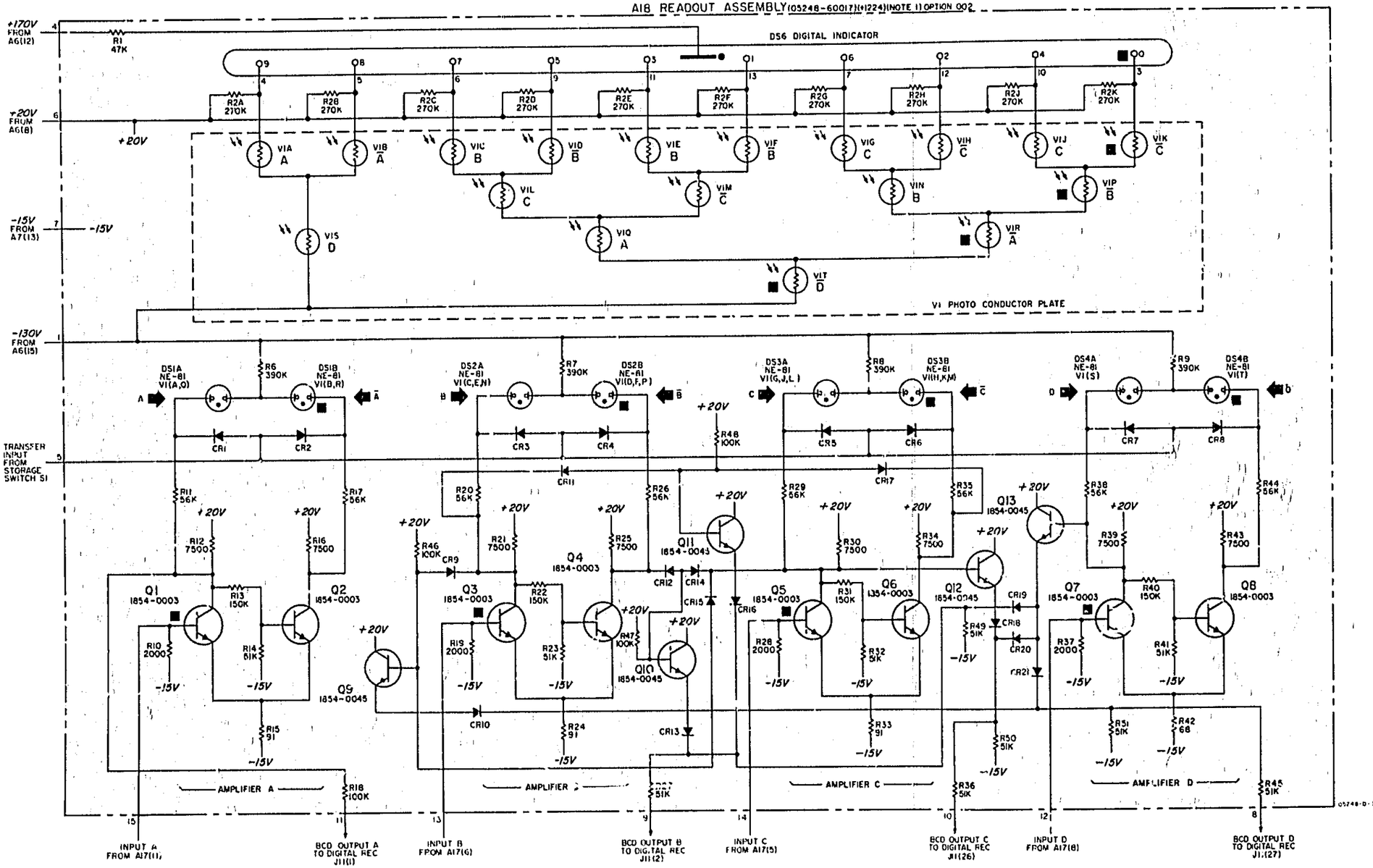
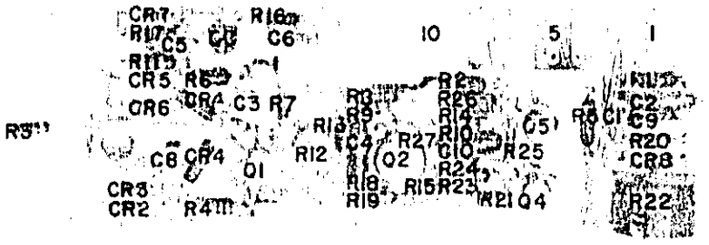


Figure 8-20. A18 Readout (+1224 Option 002)



A19 OPERATION

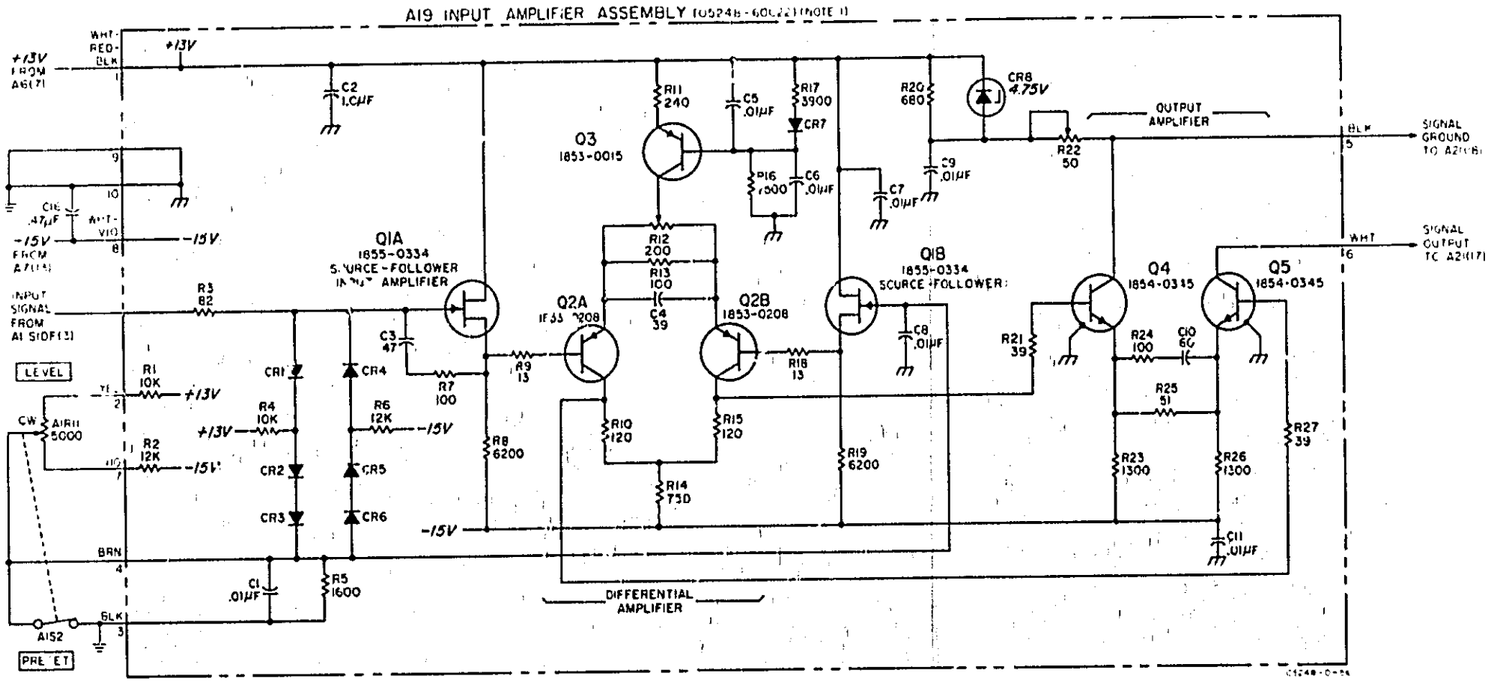
The input amplifier is broad band - 1 Hz to 50 MHz - with a gain of 5. The amplifier comprises three sections: 1) input limiter, 2) differential amplifier, and 3) output amplifier.

1) The input signal is applied to limiting diodes CR1 and CR4 which protect the input and, together with CR3 and CR6, determine the Q1A triggering level. With the LEVEL control in PRESET, there will be zero volts applied to CR3 and CR6 and the input triggering level will be zero. The voltage is also applied to Q1B and controls the stage gain and signal level to output amplifier 3), Q4 and Q5.

2) The differential amplifier includes Q2A, Q2B, and Q3, with signal source Q1A and reference source Q1B. The output circuit is matched to a 130 ohm load.

A19 TROUBLESHOOTING

A sampling oscilloscope is recommended for observing signals on this circuit board. If low frequency signals are traced with a regular oscilloscope, a X10 probe should be used (the circuit would be loaded excessively with a low impedance probe). Do not connect signal ground (Pin 5) to oscilloscope ground.



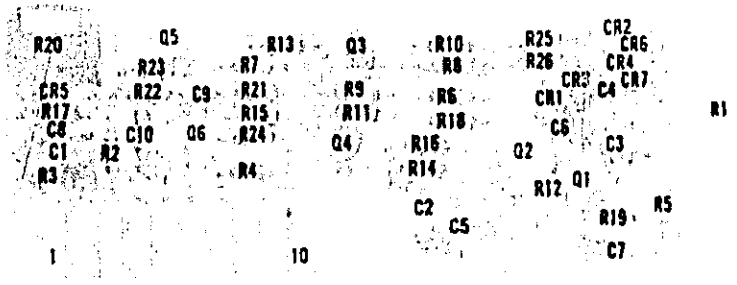
NOTES

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,

REFERENCE DESIGNATIONS

NO PREFIX	A1	A19
C16	R11 S2	C1-11 CR1-8 Q1-5 R1-27

Figure 8-21. A19 Signal Input Amplifier

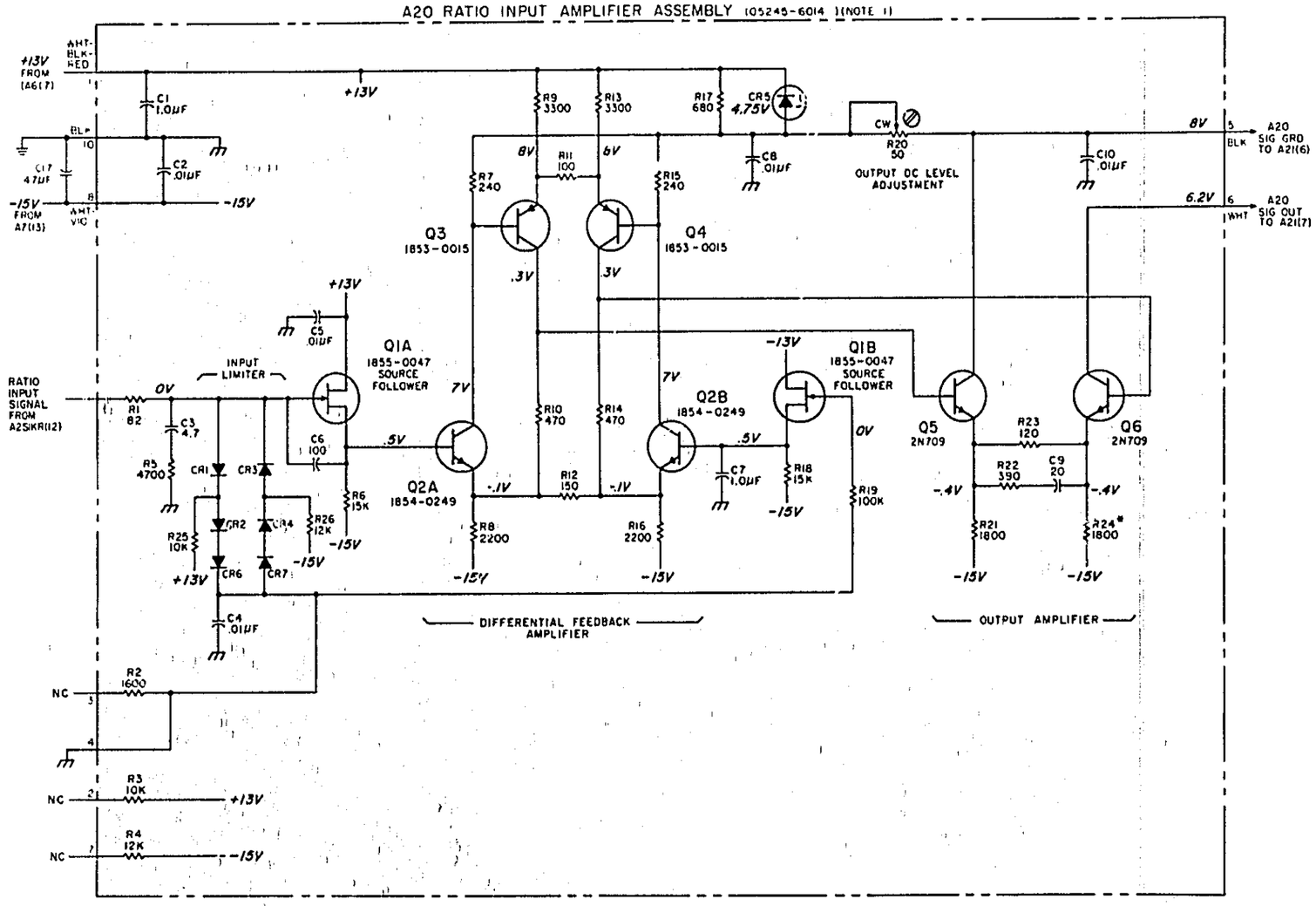


A20 OPERATION

The operation of A20 is identical to that of A19 with two exceptions: 1) components values are different because of the different frequency range and, 2) A20 Pin 4 is tied to ground.

A20 TROUBLESHOOTING

Follow same procedure as for A19. Do not connect Pin 5 (signal ground) to scope ground.



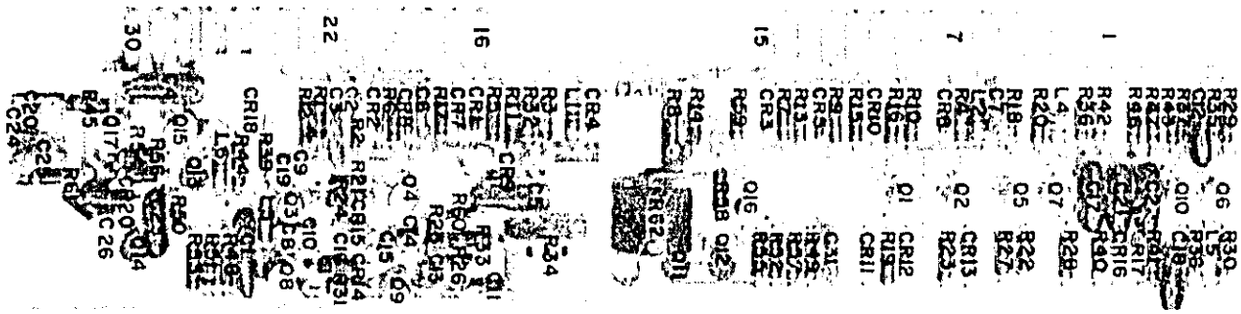
NOTES

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;
3. ASTERISK(*) INDICATES SELECTED COMPONENT, AVERAGE VALUES SHOWN

REFERENCE DESIGNATIONS

NO PREFIX	A20
C17	C1 - 10 CR1 - 7 Q1 - 6 R1 - 26

Figure 8-22. A20 Ratio Input Amplifier



A21 OPERATION

The Function Control assembly switches counter logic circuits to perform the various counting functions. Gates 1 through 6 are controlled by the TIME BASE and FUNCTION switches and select the routes the gating signal and the signal to be counted will follow. This assembly also generates the period trigger, multiple period trigger, and frequency trigger.

The Main Gate is controlled by the signal from A22; however this gate signal is generated as a result of the gate trigger sent to A22 from A21 gates 12 or 13. With A1 INPUT switch in CHECK, Gate 6 will be enabled to route the 100 MHz self check signal to Q4 and Q9, through the frequency trigger network to the Main Gate. Gate 3 will be enabled by FUNCTION switch set to FREQUENCY. A selected time base from A35 will be routed to Q1, the period trigger network, to gate 12 (enabled by FUNCTION in FREQUENCY). The output of Gate 12 goes to A22 to set the gate flip-flop and this signal is fed back to enable the Main Gate. Counter operation using different function and signal paths are shown in Figures 4-1 through 4-5, and gate control information is opposite Figure 8-2.

A21 TROUBLESHOOTING

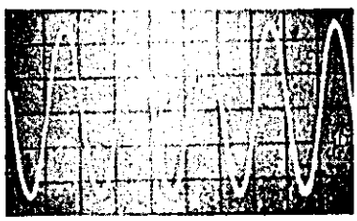
NOTE

Waveforms (1) thru (15) are applicable only to FUNCTION CONTROL board HP Part No. 05248-60003.

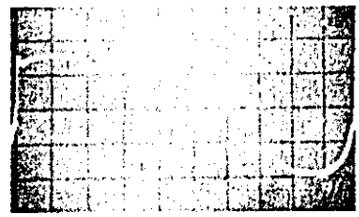
Set FUNCTION to MANUAL START; SENSITIVITY to .1 V; -LEVEL+ to PRESET, and connect 1 MHz, 100 mV signal to counter SIGNAL INPUT. Check signals at TP1 through TP6 for waveforms 1 through 6 (defective input stage on A17 will cause incorrect signal to appear on TP5 and TP6). Change FUNCTION to FREQUENCY and set TIME BASE to 1 ms. Check TP4, TP7, and TP8 for waveforms 7 through 9. Change TIME BASE to 10 µs and check TP12 for waveform 10. Change FUNCTION to 1 PERIOD AVERAGE and check TP9, TP11, and TP12 for waveforms 11, 12, and 13. Change FUNCTION to 10 PERIOD AVERAGE and counter input signal to 300 kHz at 100 mV. Check TP10 and TP12 for waveforms 14 and 15.

CAUTION

Do not connect Pin 20 (signal ground) to scope ground. All measurements taken with scope ground connected to chassis. To prevent circuit damage, turn counter OFF when connecting or disconnecting test probe.

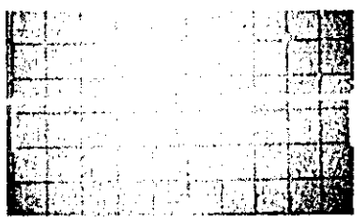


❶ Vert: .2 V/cm
Horz: .5 µs/cm

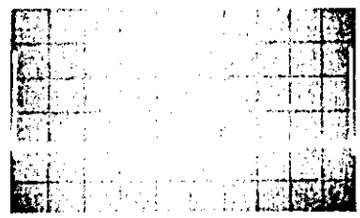


❷ Vert: .1 V/cm
Horz: .2 µs/cm

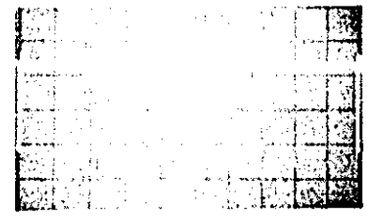
❸ Vert: .05 V/cm
Horz: .2 µs/cm



❹ Vert: .05 V/cm
Horz: .2 µs/cm



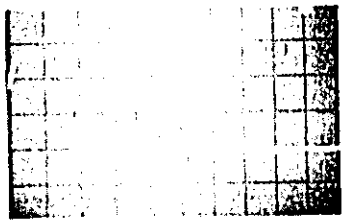
❺ Vert: .05 V/cm
Horz: .2 µs/cm



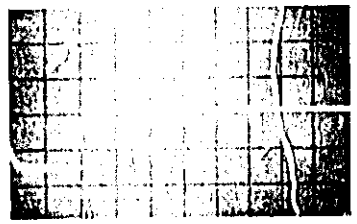
❻ Vert: .2 V/cm
Horz: .2 µs/cm

All waveforms taken with HP 175A Scope and HP 10003A 10:1 Divider Probe. Sync - INT Coupling - AC

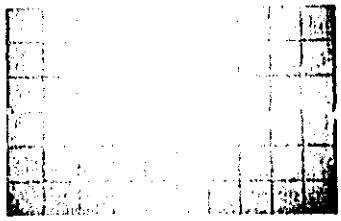
❼ Vert: .5 V/cm
Horz: .2 ms/cm



❽ Vert: 1 V/cm
Horz: .2 ms/cm

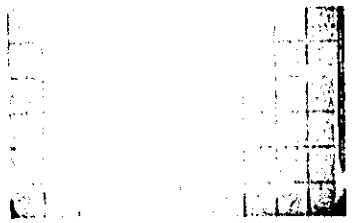


❾ Vert: 1 V/cm
Horz: .5 ms/cm



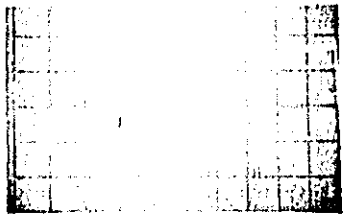
❿ Vert: 1 V/cm
Horz: 5 μs/cm

⓫ Vert: .2 V/cm
Horz: .5 μs/cm

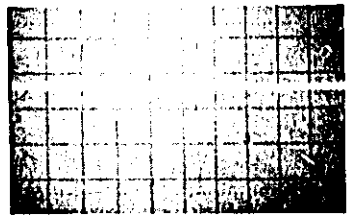


⓬ Vert: .2 V/cm
Horz: .5 μs/cm

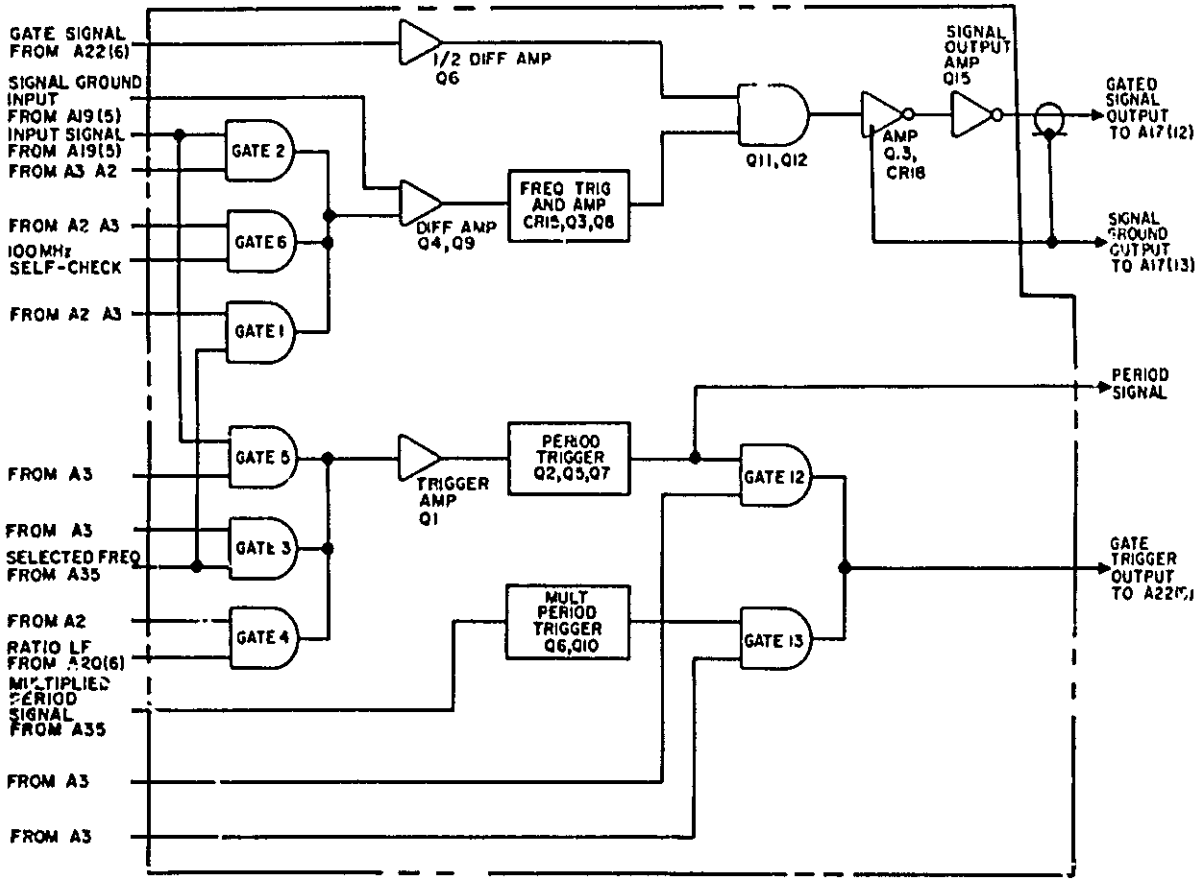
⓭ Vert: 1 V/cm
Horz: .5 μs/cm



⓮ Vert: 2 V/cm
Horz: 10 μs/cm



⓯ Vert: 1 V/cm
Horz: 10 μs/cm



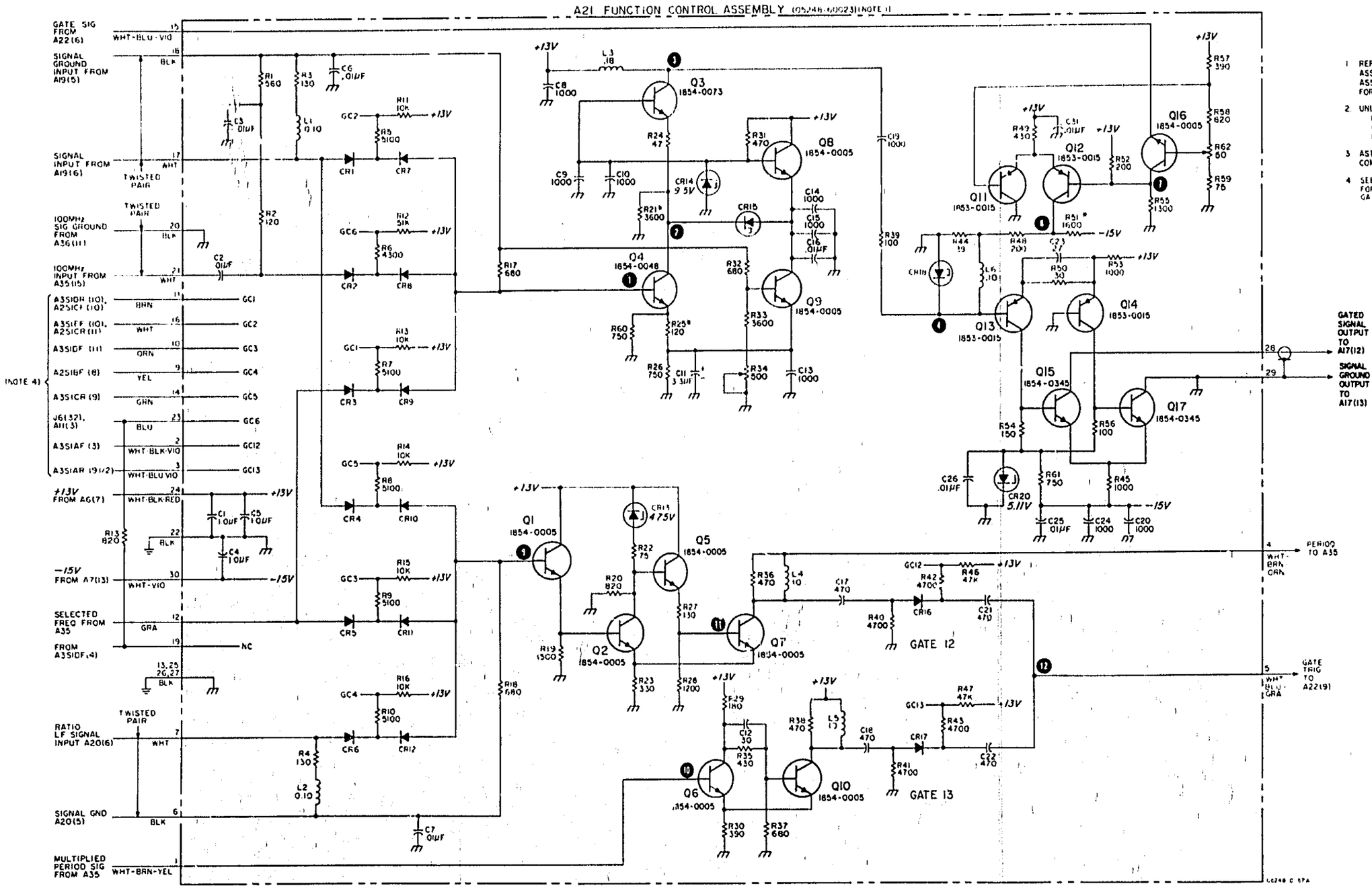
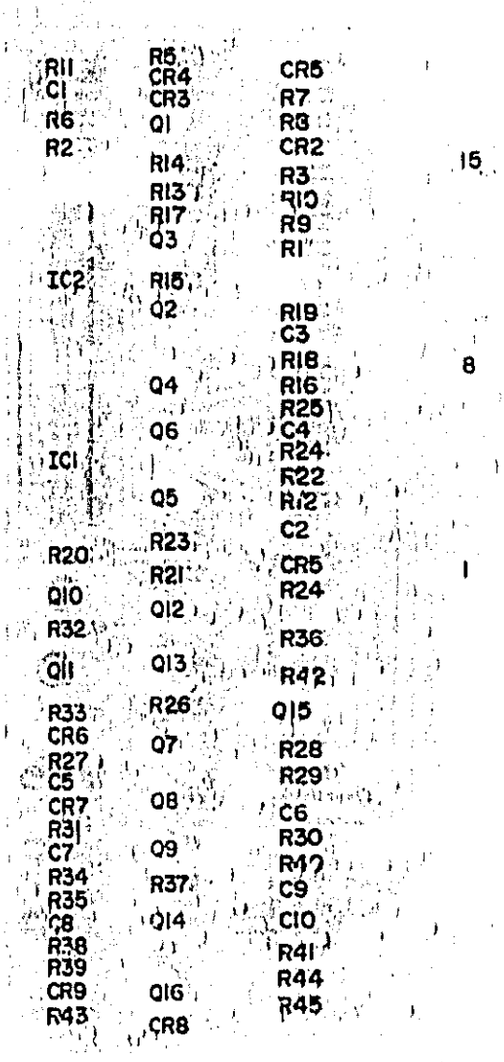


Figure 8-23. A21 Function Control



A22 OPERATION

The Gate Control Board provides: signal to enable Main Gate (A21), transfer pulse to A23, sampling trigger to A23, print command to DIGITAL RECORDER connector, and control signal to gate light.

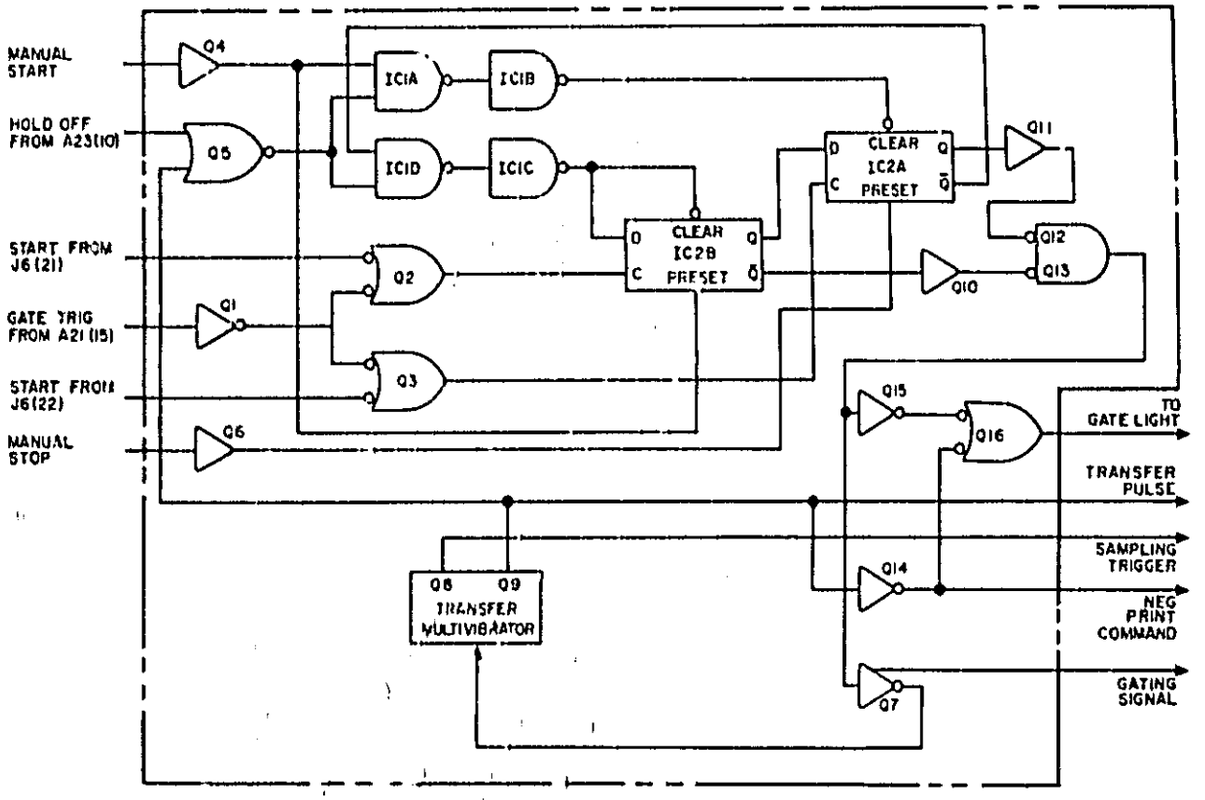
With the FUNCTION switch in MANUAL START, the Main Gate will be enabled continuously and will be inhibited only when FUNCTION switch is turned to MANUAL STOP. This is achieved as follows: -15 volts applied to Q4 from FUNCTION switch will drive IC1A input to +5 volts; IC1A output will be 0 volts, causing IC1B output to go to +5 volts. This signal applied to the clear input of IC2A will drive the Q side to 0 volts causing Q11 output to be low enabling one half of AND gate (Q12 and Q13). The manual start signal from Q4 is also applied to the preset input of IC2B causing its $\bar{Q}$ side to go low and through Q10 the other half of the AND gate will be enabled. The output of Q12 and Q13 will go positive and turn on Q15 to provide a low input to NOR gate Q16 and turn on gate light. From Q12 and Q13, the positive signal is coupled to Q7, whose emitter signal drives the Main Gate on A21. Q7 collector signal is AC coupled to the transfer multivibrator. The transfer multivibrator will not see positive pulses because of steering diode CR6. Turning FUNCTION switch to MANUAL STOP puts Q6 output at 0 volts which is applied to IC2A preset, causing Q and $\bar{Q}$ to reverse states. Q11 output will inhibit AND gate Q12 and Q13 and its output will go to 0 volts. This signal is coupled to Q15 and Q7,

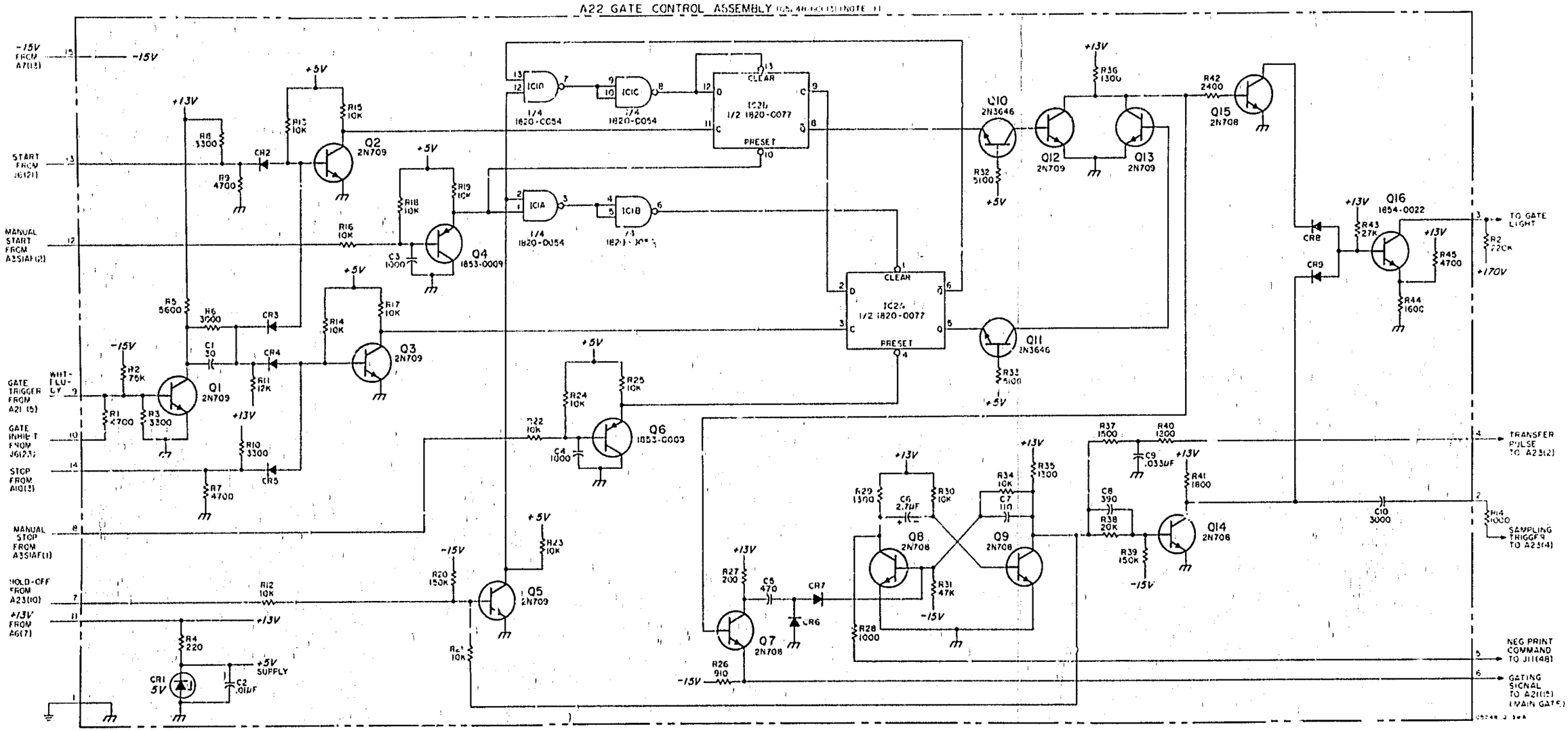
through Q7, and the gating signal will now go to -15 volts to inhibit the Main Gate. The other output from Q7 is positive and will set the transfer multivibrator (Q8 output will be 0 volts and Q9 output will be +13 volts, until multivibrator time delay has ended). Q9 signal is the transfer pulse to A23, also fed through Q14 to keep the gate light on for the duration of the pulse (Q15 enable signal was removed when Q12 and Q13 output went low). The pulse from Q9 is coupled to NOR gate Q5 which will inhibit IC1A and IC1D to prevent IC2A and IC2B from changing states until data transfer is complete (pulse time).

During FREQUENCY or PERIOD AVERAGE measurements, pulses from A21 are applied to Q1 to drive IC2A and IC2B and turn the gate on and off. The rate of these pulses may be faster than the sample rate, (which is established by A23) and an inhibit signal will be applied to Q5 (hold-off). This hold-off inhibits pulses from affecting IC2A and IC2B until counter circuits are ready for another sample.

A22 TROUBLESHOOTING

After problem has been isolated to A22 by checking all inputs and outputs to this assembly: set FUNCTION switch to MANUAL START and check for signals described in A22 OPERATION; set FUNCTION switch to MANUAL STOP and check for proper voltages. If A22 operates in MANUAL but not in FREQUENCY, check Q1, Q2, and Q3. If A22 fails with plug-in unit only, check CR2 and CR5.





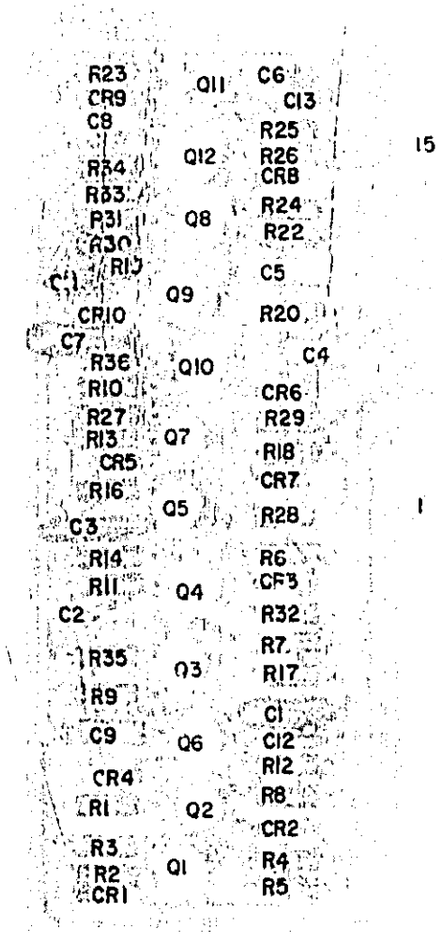
NOTES

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;

REFERENCE DESIGNATIONS

NO PREFIX	A22
R2,14	C1-10 CR1-9 IC1,2 Q1-16 R1-45

Figure 8-24. A22 Gate Control



A23 OPERATION

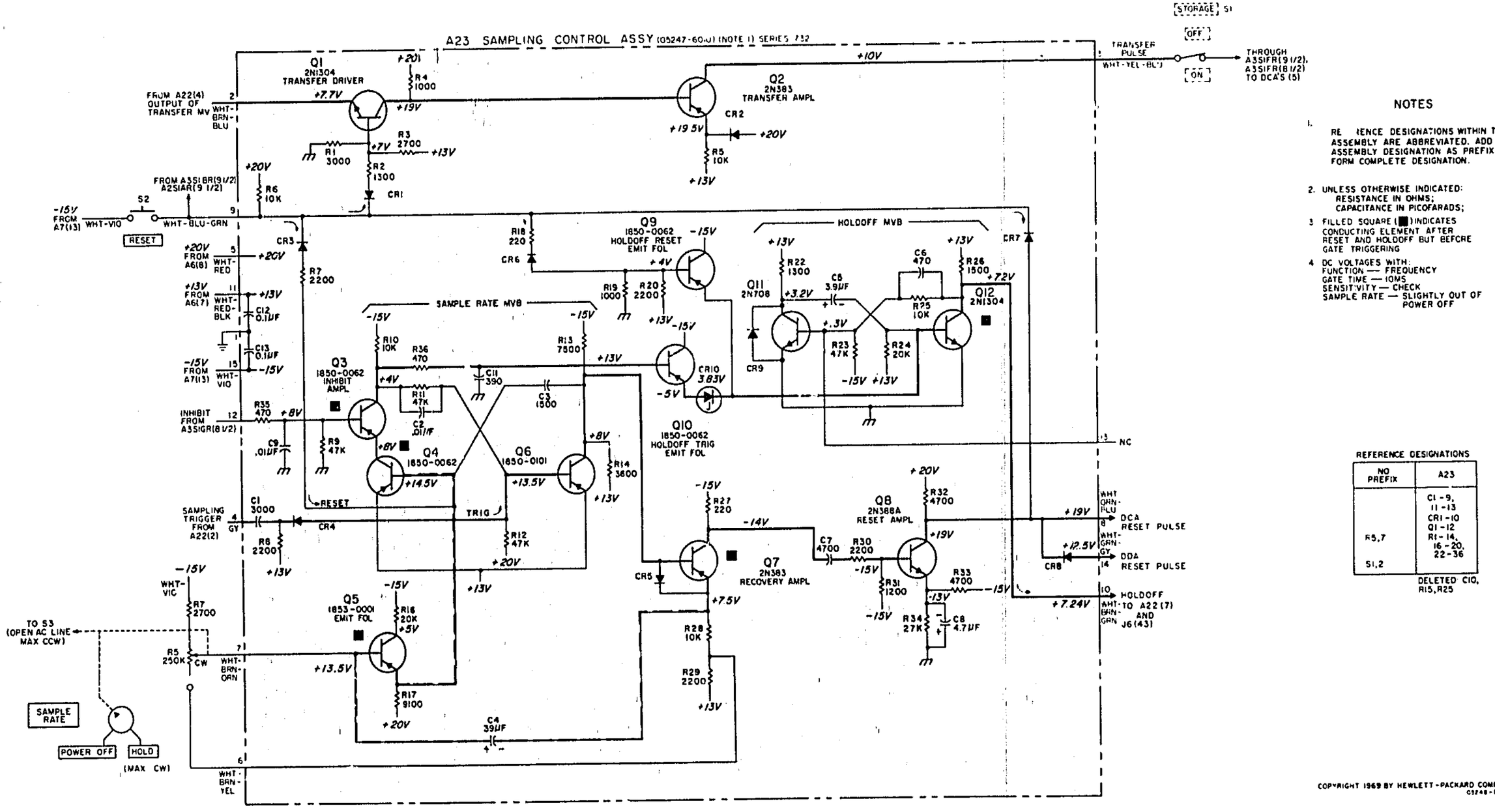
During normal operation, the sampling control assembly receives the positive transfer pulse and the sampling trigger pulse from A22. A23 outputs are: a) the amplified and inverted transfer pulse, b) reset pulses for the decimal counters and decade dividers, and c) the holdoff signal which prevents retriggering of the gate flip-flop in A22. The positive transfer pulse is amplified without inversion by Q1, then amplified and inverted by Q2. During manual reset (RESET pushbutton pressed, TIME BASE switch rotated, or FUNCTION switch rotated; except between MANUAL START or STOP) -15 volts is amplified and inverted by Q1, and amplified and inverted by Q2. Action of other circuits resets all decimal counters to zero before the reset contacts open; then the voltage on the transfer pulse line transfers the zero count to the front-panel numerical display.

The negative step of the sampling trigger pulse from A22(2) normally triggers the sample-rate one-shot and starts operation of all sample-rate control circuits. Multivibrator feedback is through quick-recovery Q7, capacitor C4, and emitter follower Q5. Sample-rate output pulse duration is controlled by the SAMPLE RATE control and is variable between 50 milliseconds and 2 seconds. When the SAMPLE RATE control is in HOLD, the multivibrator is held from resetting, keeping Q12 output in a holdoff state. Pressing RESET will override all circuits and upon release will allow the counter to go through another cycle.

An amplified reset output is taken from A7, differentiated, amplified by Q8, and supplied as the DCA and DDA reset pulse. A second output from the sample-rate multivibrator is amplified by Q10 to drive the holdoff one-shot (Q11-Q12). The holdoff one-shot output positive pulse normally begins about 1 microsecond after the end of the gating signal and ends 50 milliseconds after the end of the sample-rate pulse. Inhibit amplifier Q3 is in series with Q4 collector, and inhibits the sample-rate multivibrator during manual functions.

A23 TROUBLESHOOTING

The voltages shown on the schematic diagram are typical with the SAMPLE RATE slightly out of POWER OFF, FUNCTION in FREQUENCY, and TIME BASE in 10 ms. Voltages taken with HP Model 412A VTVM, referenced to chassis. Signal tracing of A23 may be simplified by setting FUNCTION to MANUAL START, and depressing RESET; follow this reset pulse through suspected circuits.



NOTES

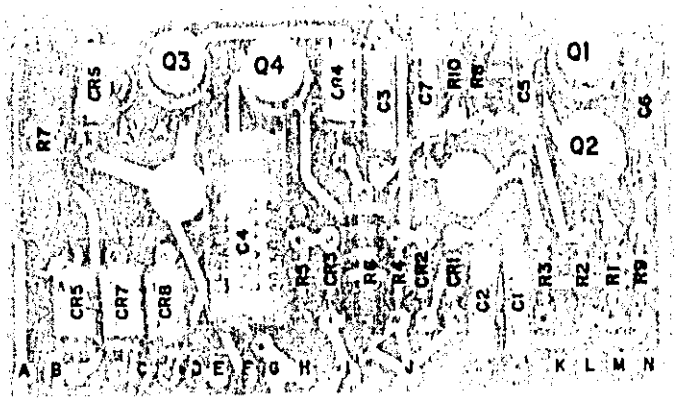
1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY DESIGNATION AS PREFIX TO FORM COMPLETE DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS;
3. FILLED SQUARE (■) INDICATES CONDUCTING ELEMENT AFTER RESET AND HOLDOFF BUT BEFORE GATE TRIGGERING
4. DC VOLTAGES WITH: FUNCTION — FREQUENCY GATE TIME — 10MS SENSITIVITY — CHECK SAMPLE RATE — SLIGHTLY OUT OF POWER OFF

REFERENCE DESIGNATIONS

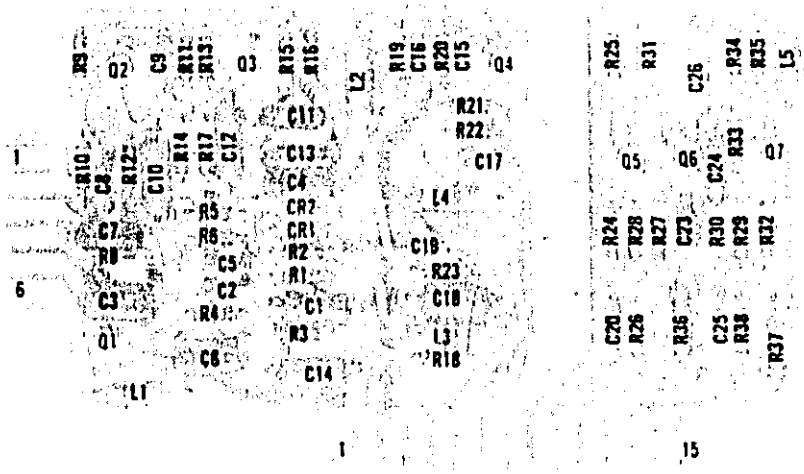
NO PREFIX	A23
R5,7	C1 - 9, 11 - 13 CR1 - 10 Q1 - 12 R1 - 14, 16 - 20, 22 - 36
S1,2	

DELETED: C10, R15, R25

Figure 8-25. A23 Sampling Control



A25



A26

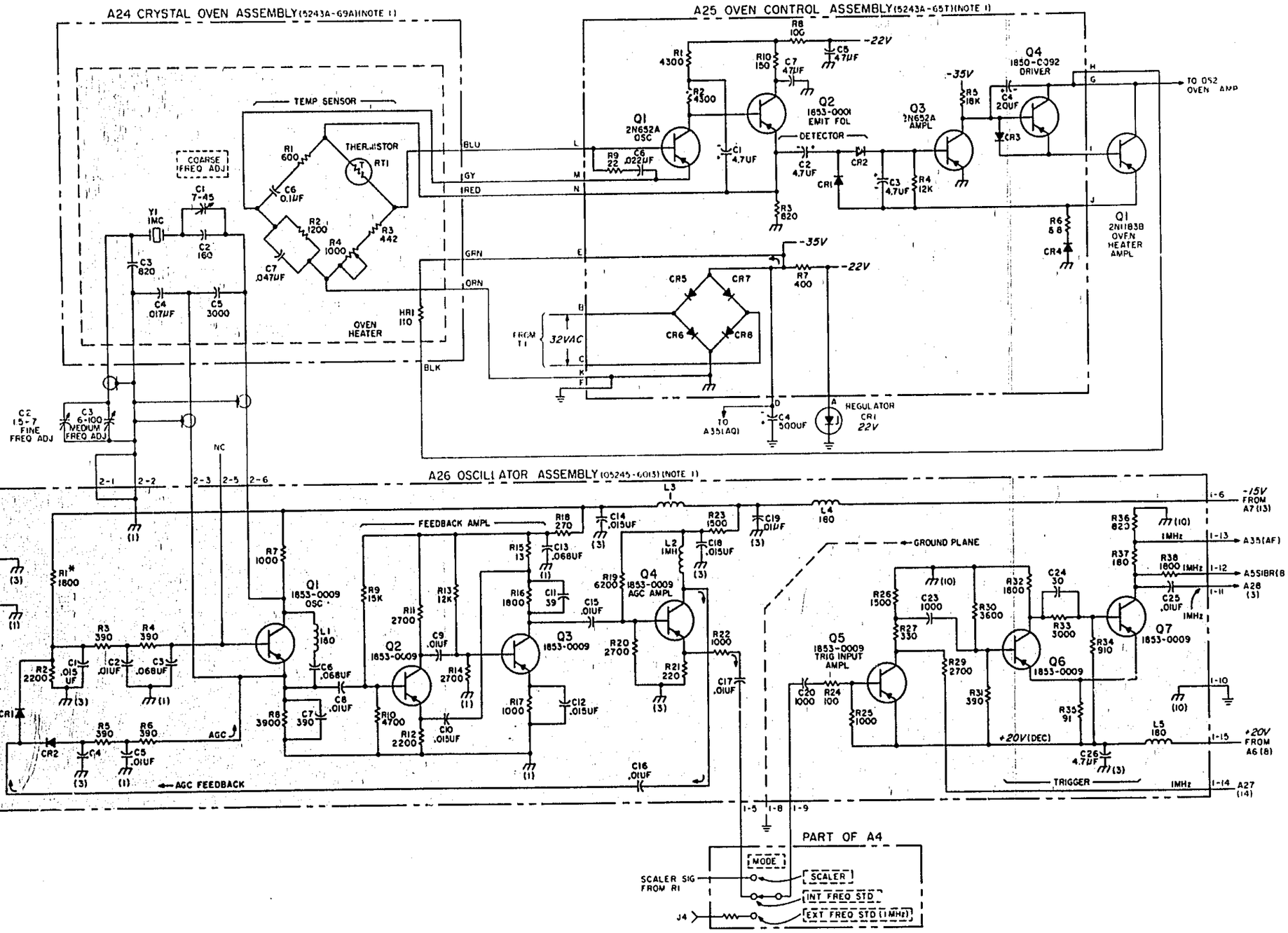
A24, A25, and A26 OPERATION (5248L)

The Crystal Oven Assembly is a thermally insulated chamber which contains a heating element, temperature sensing circuit, and crystal. The Oven Control Assembly includes oscillator A25Q1 which produces a 3 kHz output whose amplitude is controlled by the temperature-sensing element in the oven. The oscillator output is amplified by A25Q2, detected to produce a DC level whose amplitude is inversely proportional to oven temperature. The DC level is amplified and applied to the heating element in the oven. The oven control assembly contains its own power supply which operates continuously whenever power is connected to the counter. Read A24 OPERATION for the 5248M, specifically section on proportional temperature control.

The oscillator assembly includes the Q1 oscillator circuit which is connected to the 1 MHz crystal in A24. The 1 MHz oscillator output is amplified by A26Q2, A26Q3, and A26Q4. A26Q4 collector output is detected and applied to A26Q1 as AGC, controlling power dissipation in the crystal to a constant low value. A26Q4 emitter output is supplied to the rear panel MODE switch where it is usually routed to amplifier A26Q5 and trigger A26Q6-A26Q7. Outputs of 1 MHz are taken from both A26Q5 and A26Q7. When MODE is in SCALER, signals from A5 are routed through Q5, Q6, and Q7.

A24, A25, and A26 TROUBLESHOOTING (5248L)

Isolate trouble to oscillator section by checking counter operation with MODE switch in EXT FREQ STD and SCALER. With MODE switch in EXT FREQ STD and a 1 MHz, 1 V rms signal applied to J4, check collectors Q5, Q6, and Q7 for 1 MHz. Signal trace from Q4 emitter back through Q1 to locate defective oscillator component. If frequency is unstable, drifts excessively or off frequency, check oven temperature control circuit. A24R4 is a factory adjustment - do not adjust.



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
4. A26 IS CONNECTED TO TWO SOCKETS, MAIN SOCKET DESIGNATION IS XA26-1, END SOCKET (GOVEN) DESIGNATION IS XA26-2

REFERENCE DESIGNATIONS

NO PREFIX	A24	A25	A26
C2-4 CR1 J4 Q1	C1-7 HR1 R1-4 RT1 Y1	C1-7 CR1-8 Q1-4 R1-10	C1-27 CR1-4 L1-5 Q1-7 R1-38

DELETED.
C21,22,27
CR3,4

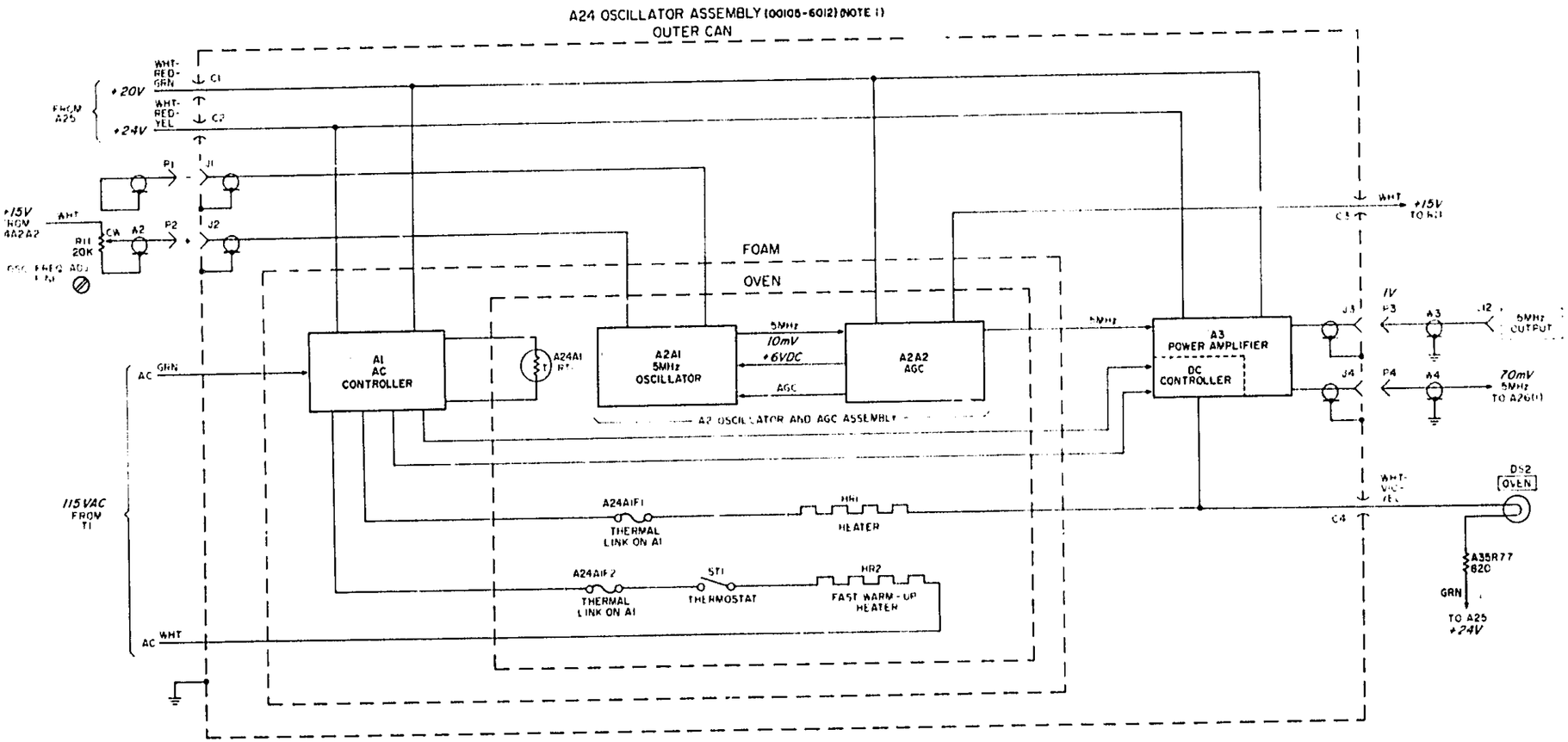
Figure 8-26. A24 Crystal Oven, A25 Oven Control, A26 1 MHz Oscillator (5248L)

A24 OPERATION (5248M)

The sealed crystal oscillator and oven control assembly has four sub-assemblies: a) ac controller A24A1, b) oscillator A24A2A1, c) AGC A24A2A2, and d) power amplifier A24A3. Figure 8-27 is a block diagram showing these sub-assemblies.

Any attempt to open the oven voids the warranty.

Power for the assembly is supplied from a power supply that is separate from the regular counter power supplies. Whenever the counter is plugged into an ac line this power supply maintains the oven temperature at a constant level even when the counter is switched off.



NOTES

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2. UNLESS OTHERWISE INDICATED:
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   CAPACITANCE IN PICOFARADS;

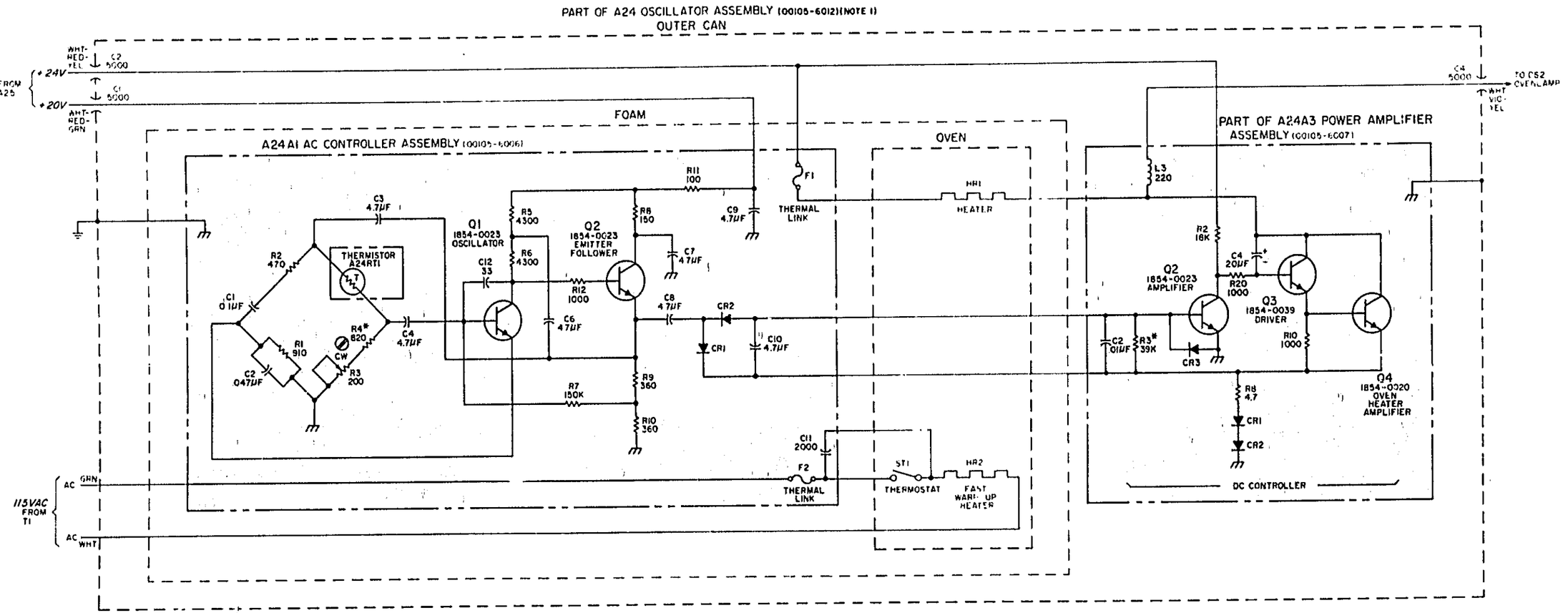
REFERENCE DESIGNATIONS

NO PREFIX	A24	A24A1	A35
DS2	C1-4	F1,2	
J12	J1-4		
P1-4	HR1,2		
R11	RT1		R77
W2-4	ST1		

Figure 8-27. A24 Crystal Oscillator and Oven Block Diagram (5248M) (Sheet 1 of 4)

OVEN TEMPERATURE CONTROL. Two heaters are used to maintain oven temperature: HR1, proportionally controlled to provide a continuous control of oven temperature; and HR2, used for fast warmup, is thermostatically controlled. Proportional controlled heater (HR1) current is a function of oven temperature. Thermostatically controlled heater (HR2) has the heater "on" or "off", depending on the thermostat

AC CONTROLLER SUB-ASSEMBLY A24A1. AC controller A24A1 consists of a Wein bridge oscillator with emitter follower A1Q2, and detector diodes A1CR1 and A1CR2. Across A1C10 is a dc signal voltage proportional to the oven temperature. The oscillator frequency (about 3 kHz) is determined by the phase-shifting network of the bridge (A1R1-A1C2 and A1R2-A1C1), which maximizes the feedback at the oscillator frequency. Oscillator amplitude is determined by the level of the degenerative feedback to A1Q1 base, which depends on the setting of A1R3, the resistance of thermistor A24RT1, and the amplitude of the oscillator output signal. The thermistor resistance increases as its temperature decreases, decreasing the amount of degenerative feedback to A1Q1 base, causing the oscillator output level to increase. The increase in level causes the detector dc output voltage to A3Q2 to be more negative, A3Q4 conduction increases, and the heater increases oven temperature.



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2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS; INDUCTANCE IN MICROHENRIES
3. ASTERISK (*) INDICATES SELECTED COMPONENT, AVERAGE VALUES SHOWN

REFERENCE DESIGNATIONS

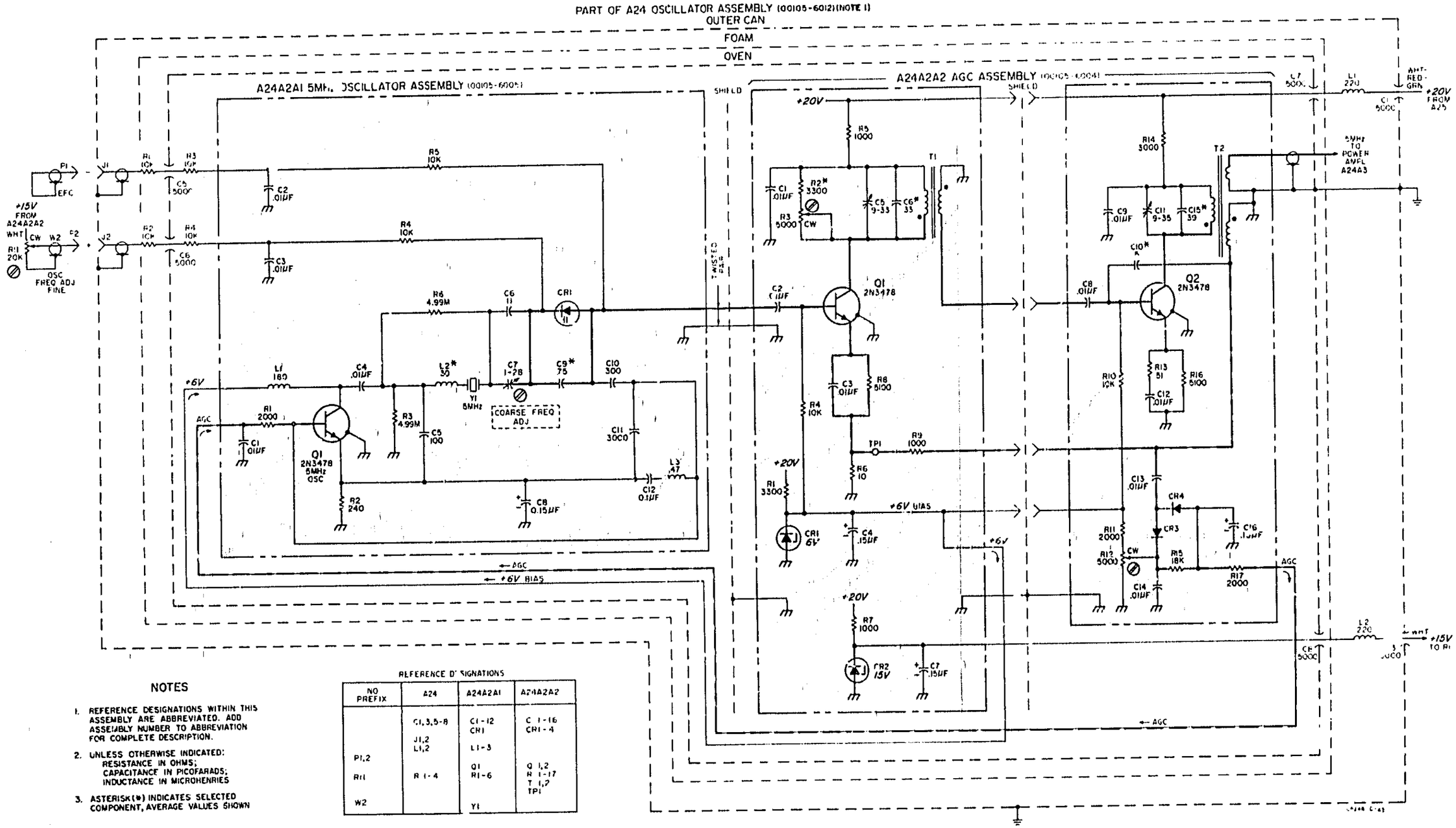
A24	A24A1	A24A3
C1,2,4	C1-12 CR1,2 F1,2	C2,4 CR1-3
HR1,2	Q1,2 R 1-12	L3 Q 2-4 R2,3,8,10, 20
RT1 ST1		

DELETED:
C5

Figure 8-27. A24A1 AC Controller
A24A3 Power Amplifier
(Sheet 2 of 4)

OSCILLATOR SUB-ASSEMBLY A24A2A1. The internal standard frequency is generated by a 5 MHz crystal-controlled oscillator within the oven. Oscillator transistor A2A1Q1 drives the resonant loop of A2A1Y1, A2A1L2, A2A1C6, A2A1C7, A2A1C9, and varactor A2A1CR1. The capacitance of varactor A2A1CR1 increases as the reverse biasing voltage across it increases, providing the means of controlling the oscillator frequency electrically. Oscillator frequency increases as the reverse-biasing voltage increases. R11 controls the bias on the varactor. Feedback path through ac voltage divider to A2A1Q1 base, capacitor A2A1C8 makes the junction of A2A1C11 and A2A1C12 a ground for the 5 MHz signal. Base bias for oscillator transistor A2A1Q1 is developed by the AGC circuit in A2A2. As the oscillator output level increases, the forward base-emitter bias decreases, reducing the emitter current and the output.

AGC SUB-ASSEMBLY A24A2A2. The AGC (Automatic Gain Control) circuit contained within the oven provides amplification of the oscillator signal and AGC to the oscillator. The AGC signal prevents crystal mechanical vibrations from becoming so large that they would destroy the crystal. Two tuned amplifier stages are used to provide signal to the AGC detector circuit. The open-loop gain of A2A2Q1 tuned stage is adjusted by A2A2R3; the closed-loop gain of the amplifier is determined by A2A2R9 and A2A2R6. The output of this stage is in phase with the input signal from the oscillator. This signal is fed back to A2A2Q1 emitter to stabilize the gain of the amplifier pairs, to A2A2Q2 base to provide neutralization, and through A2A2C13 to AGC detector circuit. The AGC signal is a dc voltage, proportional to the output signal from A2A2T2. It is subtracted from the bias established by A2A2R11 and A2A2R12 to provide a dc bias which controls the gain of oscillator transistor A2A1Q1, thus decreasing the forward bias as the sensed output level increases.



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3. ASTERISK(*) INDICATES SELECTED COMPONENT, AVERAGE VALUES SHOWN

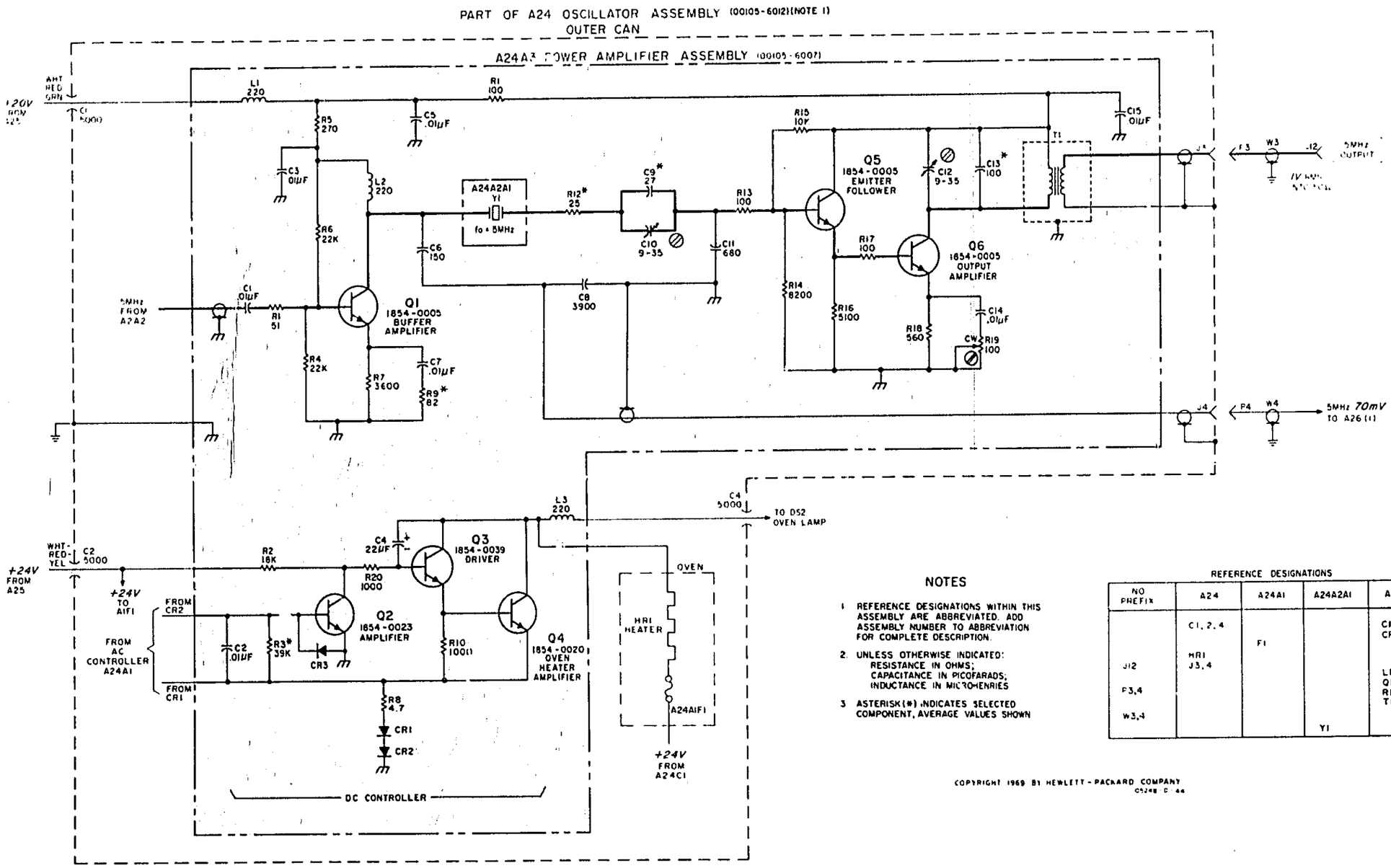
REFERENCE DESIGNATIONS

NO PREFIX	A24	A24A2A1	A24A2A2
	C1,3,5-8 J1,2 L1,2	C1-12 CR1 L1-3	C 1-16 CR1-4
P1,2		Q1	Q 1,2
R11	R 1-4	R1-6	R 1-17 T 1,2 TP1
W2		Y1	

Figure 8-27. A24A2 5 MHz Oscillator and AGC (Sheet 3 of 4)

POWER AMPLIFIER SUB-ASSEMBLY A24A3. The power amplifier sub-assembly contains a buffer amplifier, crystal filter, oscillator assembly output filter, and the DC controller for control of oven heater HR1. The input to A3Q1 buffer amplifier is the 100 mV, 5 MHz signal from the AGC assembly inside the oven. A3Q1 output drives the crystal filter, and through ac voltage divider A3C6-A3C8 produces the 70 mV rms output signal that is available to drive A26Q1. The filter output passes through emitter follower A3Q5, whose output drives amplifier A3Q6 to produce the 1 volt rms output signal. A3Q6 gain is adjusted by R19. A3C10 adjusts the frequency of the crystal filter. R12 adjusts bandwidth. The series capacitor-resistor network in parallel with emitter resistors in both A3Q1 and A3Q6 are ac bypass networks which reduce emitter degeneration and increases the ac gain. The dc current is limited by large value emitter resistors.

The proportional temperature control circuit. Current through HR1 is controlled by A3Q4. Diodes A3CR1 and A3CR2 are forward-biased, developing a constant 1.2 volts. The voltage across A3R8 depends on the heater current through it plus the voltage developed by A3CR1 and A3CR2. When heater current increases, A3R8 voltage goes more positive increasing A3Q2 conduction, decreasing A3Q3 and A3Q4 conduction, reducing A3R8 current. The input signal to the DC controller is a negative-going voltage that increases as oven temperature decreases, causing heater current to increase.



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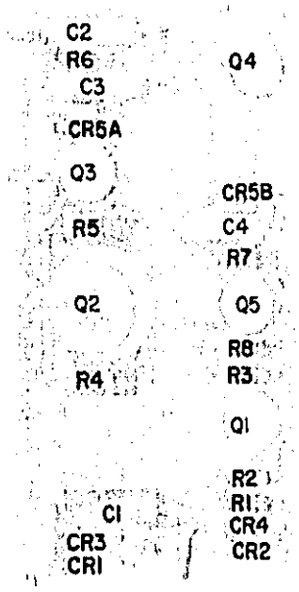
3. ASTERISK (*) INDICATES SELECTED COMPONENT, AVERAGE VALUES SHOWN

REFERENCE DESIGNATIONS

NO PREFIX	A24	A24A1	A24A2A1	A24A3
	C1, 2, 4			C1-15
		F1		CR1-3
	HR1			
J12	J3, 4			L1-3
P3,4				Q1-6
				R1-20
W3,4				T1
			Y1	

Figure 8-27. A24A3 Power Amplifier (Sheet 4 of 4)



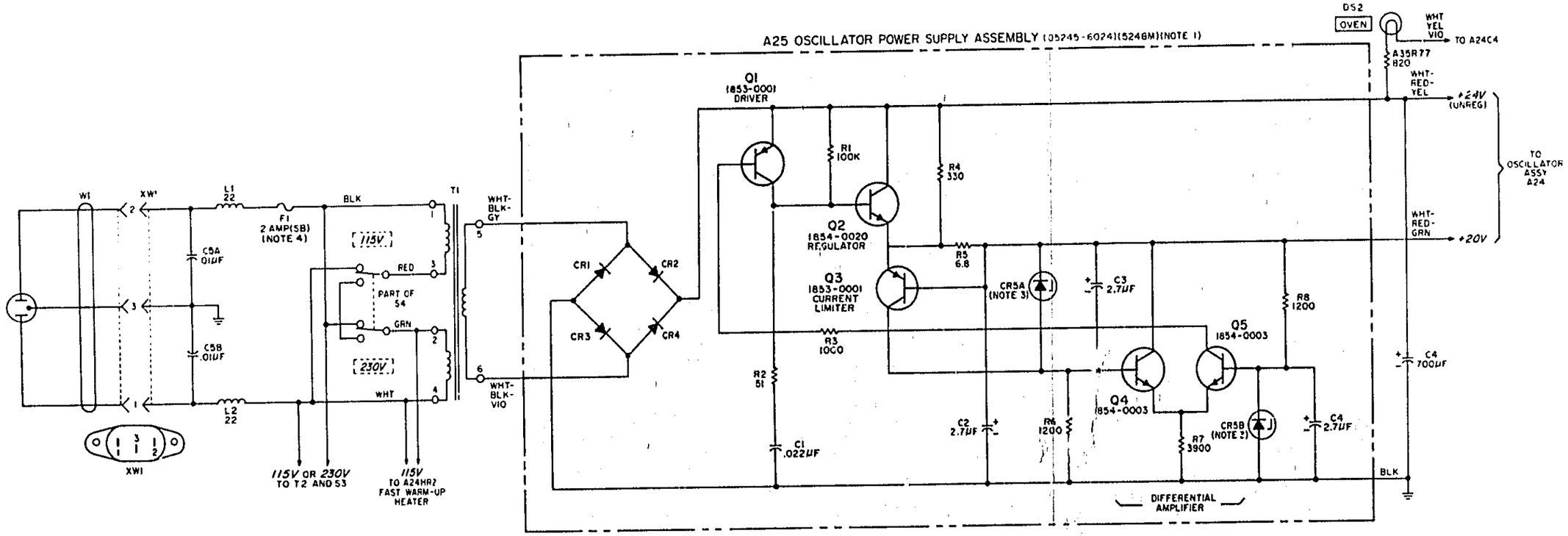
A25 OPERATION (5248M)

Oscillator power is separate from the counter's main power supply. Except for power transformer T1 and filter capacitor C4, all components are on A25. This supply operates whenever the counter is plugged into an ac line. Fast warmup heater A24HR2 is connected across one primary of T1, so it is always operating from a 115-volt source.

Breakdown diodes A25CR5A and A25CR5B determine the voltages at A25Q4 and A24Q5 bases, respectively. Transistors A25Q4 and A25Q5 form a differential amplifier whose output voltage is proportional to the voltage difference between their bases. The differential amplifier output controls conduction of driver A25Q1, which controls series regulator transistor A25Q2. Current limiter A25Q3 provides a second input signal to the differential amplifier at A25Q4 base. This signal is proportional to the power supply output current. The current limiter transistor is forward-biased by the voltage drop across A25R5, which reflects the power supply output current. If this current increases, the forward-bias at A25Q3 increases, increasing A25Q3 conduction to make A25Q4 base more positive (the same effect as an increase in the power supply voltage). The increased conduction of A25Q4, through the differential amplifier, causes the driver and regulator transistors to decrease conduction, limiting current available at the power supply output.

A25 TROUBLESHOOTING (5248M)

Check bridge for 24 volts. Vary line voltage ±10% and observe +20 volt output for proper regulation. Check A25CR5A and A25CR5B. Ensure problem is in power supply and not A24.



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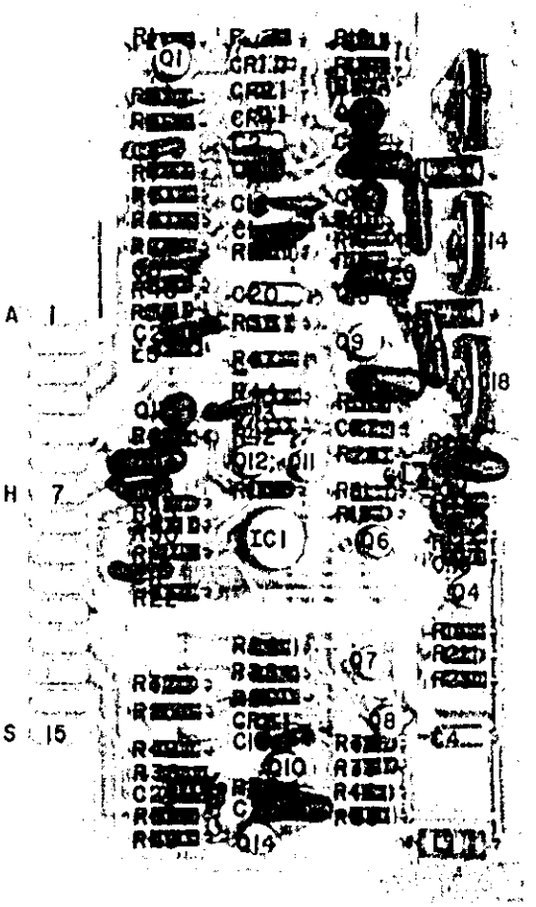
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS;
   CAPACITANCE IN PICOFARADS;
   INDUCTANCE IN MICROHENRIES
3. CR5A AND CR5B ARE A MATCHED PAIR OF BREAKDOWN DIODES. SUM OF BREAKDOWN VOLTAGES=20V±1%
4. FOR 230V OPERATION, SET S4 TO 230V POSITION AND INSTALL 1AMP SLO-BLO FUSE FOR F1

REFERENCE DESIGNATIONS

NO PREFIX	A25	A35
C4,5 D52 F1	C 1-4 CR1-5	
L1,2		
	Q 1-5 R 1-8	R77
S4 T1 W1 XW1		

Figure 8-28. A25 Oscillator Power Supply (5248M)



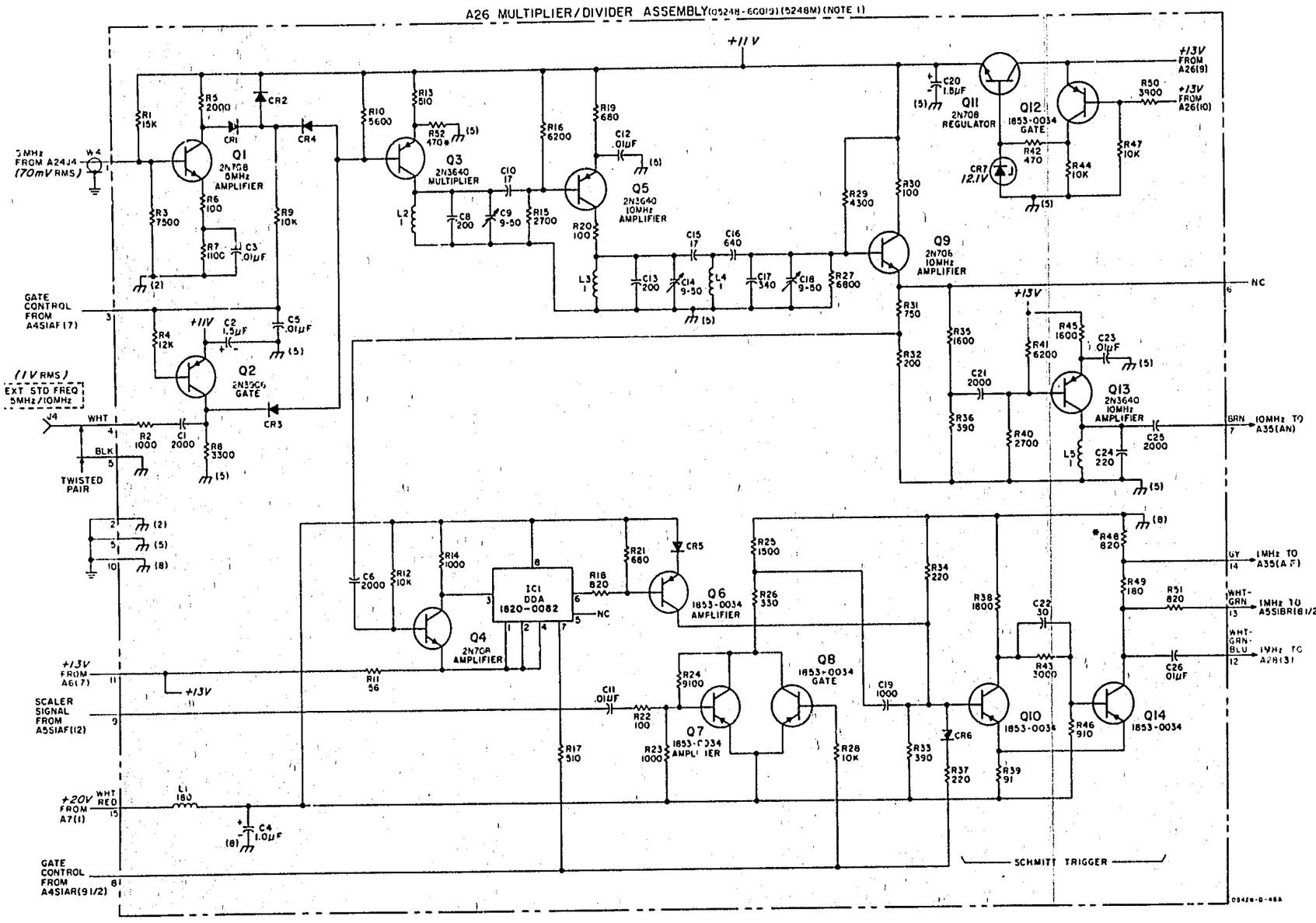
A26 OPERATION

The Multiplier/Divider assembly provides: 2) multiplication of the internal or external 5 MHz time base signal to 10 MHz, b) division of 10 MHz to 1 MHz, c) waveshaping of scaler signals.

With MODE in INT STD FREQ, 5 MHz amplifier Q1 is enabled and the 5 MHz signal from A24 is fed to the multiplier. Q3, Q5, and associated circuitry form a narrow band pass filter which is tuned to 10 MHz, resulting in 10 MHz at Q9 emitter. When MODE switch is in EXT STD FREQ, signal path is through Q2, Q3, Q5, and Q9. From Q9 the 10 MHz signal goes to Q13 and out to A35, and through Q4 to IC1 (DDA). IC1 1 MHz output goes through Q6 to waveshaping network Q10-Q14 (when MODE is not in SCALER). When MODE is in SCALER Q12 is inhibited and Q8 is enabled by gate signal from A4, and scaler signal from A5 will go through Q7, to Q10-Q14, and out.

A26 TROUBLESHOOTING

Set MODE switch to INT STD FREQ and check Q6 collector for 1 MHz signal. Check pin 7 for 10 MHz and Q14 collector for 1 MHz. Change MODE to EXT STD FREQ, connect 5 MHz or 10 MHz 1 V rms to J4, and check Q14 collector for 1 MHz. Change MODE switch to SCALER; OUTPUT to 10^2; SENSITIVITY to .1 V; -LEVEL+ to PRESET; FUNCTION to MANUAL START; connect 10 MHz, 100 mV rms to SIGNAL INPUT connector, and check Q14 collector for 100 kHz.



NOTES

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2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS; INDUCTANCE IN MICROHENRIES
3. ASTERISK (*) DENOTES FACTORY SELECTED VALUE

REFERENCE DESIGNATIONS

NO PREFIX	A26
J4	C1-26 CR1-7 IC1 L1-5 Q1-14 R1-52
W4	

DELETED
C7

IC1 (TOP)

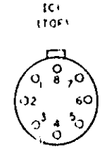
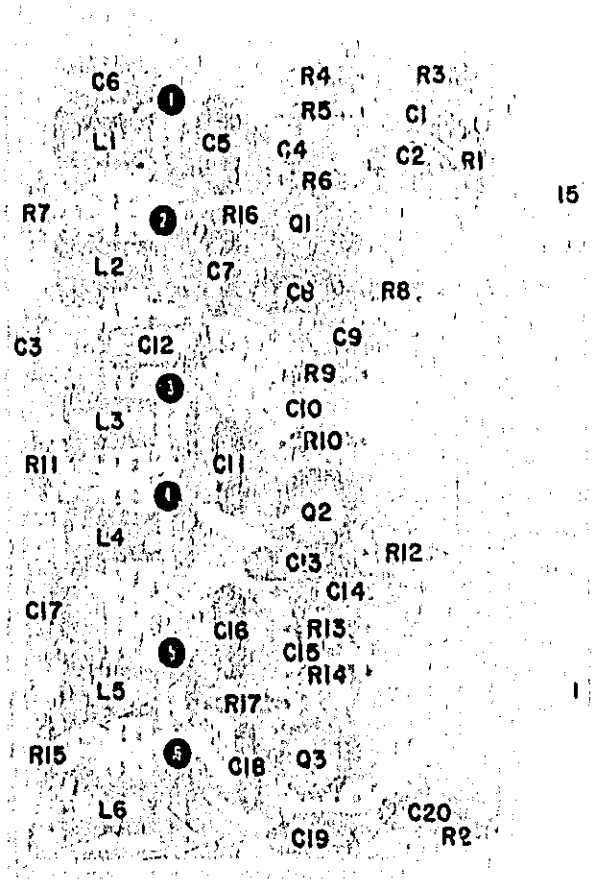


Figure 8-29. A26 Multiplier/Divider (5248M)



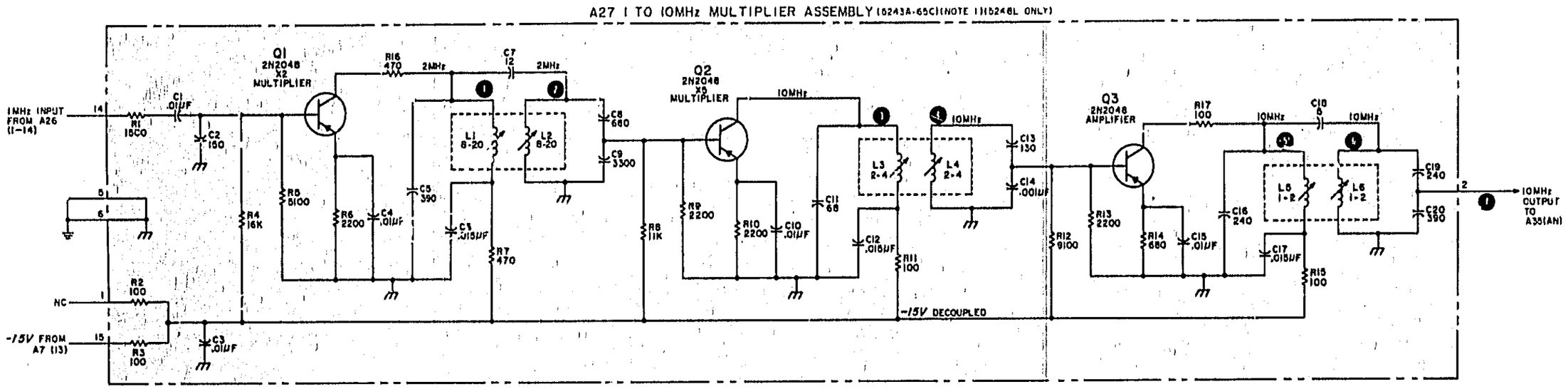
A27 OPERATION (5248L)

The 1 to 10 MHz multiplier assembly is used with the 5248L to provide a 10 MHz signal. The first stage consisting of A27Q11 and the tuned collector circuit multiply the input by two. A27Q1 collector circuit is tuned to the second harmonic of the 1 MHz input or 2 MHz. The output of second stage A27Q2 is tuned to the 5th harmonic of 2 MHz or 10 MHz. The 10 MHz is coupled to A27Q3 for amplification and sent to the tuned output circuit. L4 and L5 are tuned for maximum 10 MHz signal at TP7. C18 is for neutralization of output tuned circuit.

A27 ADJUSTMENT (5248L)

Adjustment information for this assembly is not included in Section V, ADJUSTMENTS, since it is not necessary unless components have been replaced.

With Counter turned OFF, place A27 on extender board, reinstall into counter and turn power ON. Connect X10 probe to TP1 through TP6 and, with an insulated tuning tool, adjust associated inductors for maximum signal at the desired frequency at these test points. Observe signal at TP7 and readjust L3 through L6 for maximum 10 MHz signal.



NOTES

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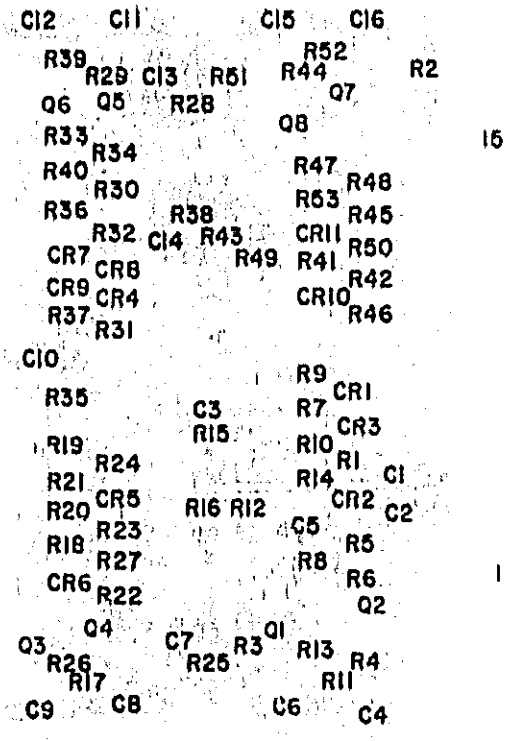
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS;
   CAPACITANCE IN PICOFARADS;
   INDUCTANCE IN MICROHENRIES
3. L1-L2, L3-L4, L5-L6 ARE MUTUALLY COUPLED

REFERENCE DESIGNATIONS

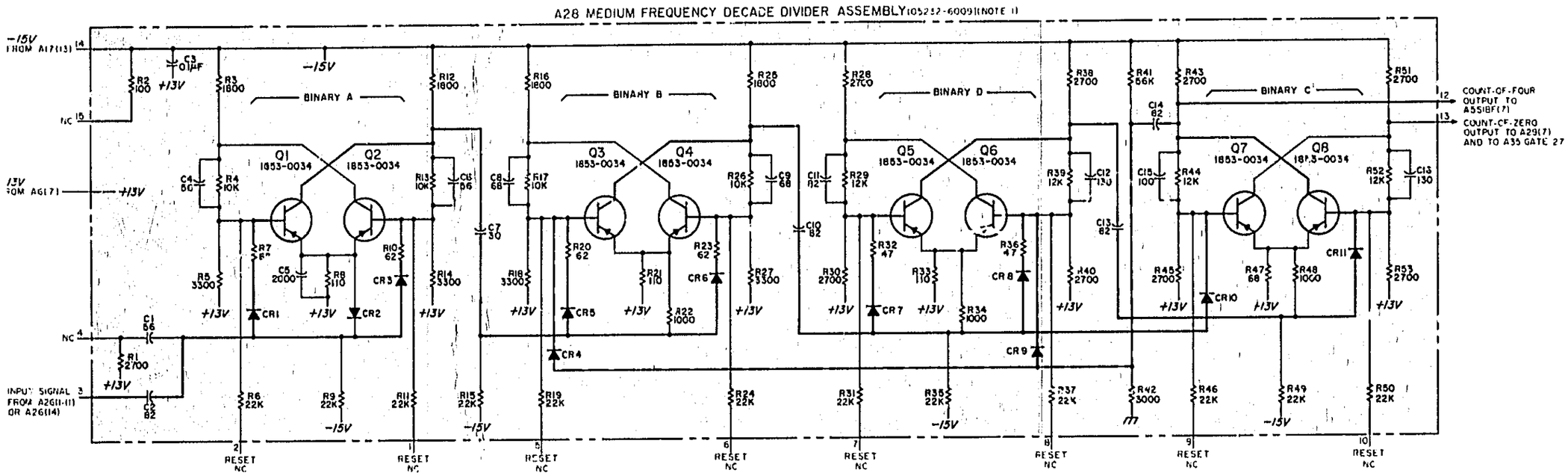
A27
C1-20 L1-6 Q1-3 R1-17

Figure 8-30. A27 10 MHz Multiplier (5248L)



A28 OPERATION

The Medium Frequency Decade Divider assembly reduces the frequency of its input by a factor of ten. Basic operation is identical to that described for the Decimal Counting Assemblies A10-A14, except there is no displayed count.



NOTES

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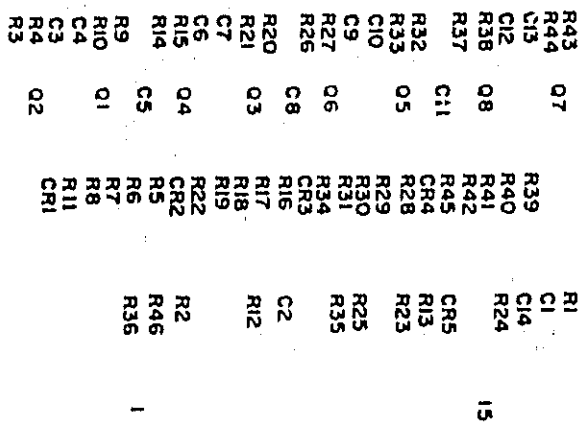
2 UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS, CAPACITANCE IN PICOFARADS.

REFERENCE DESIGNATIONS

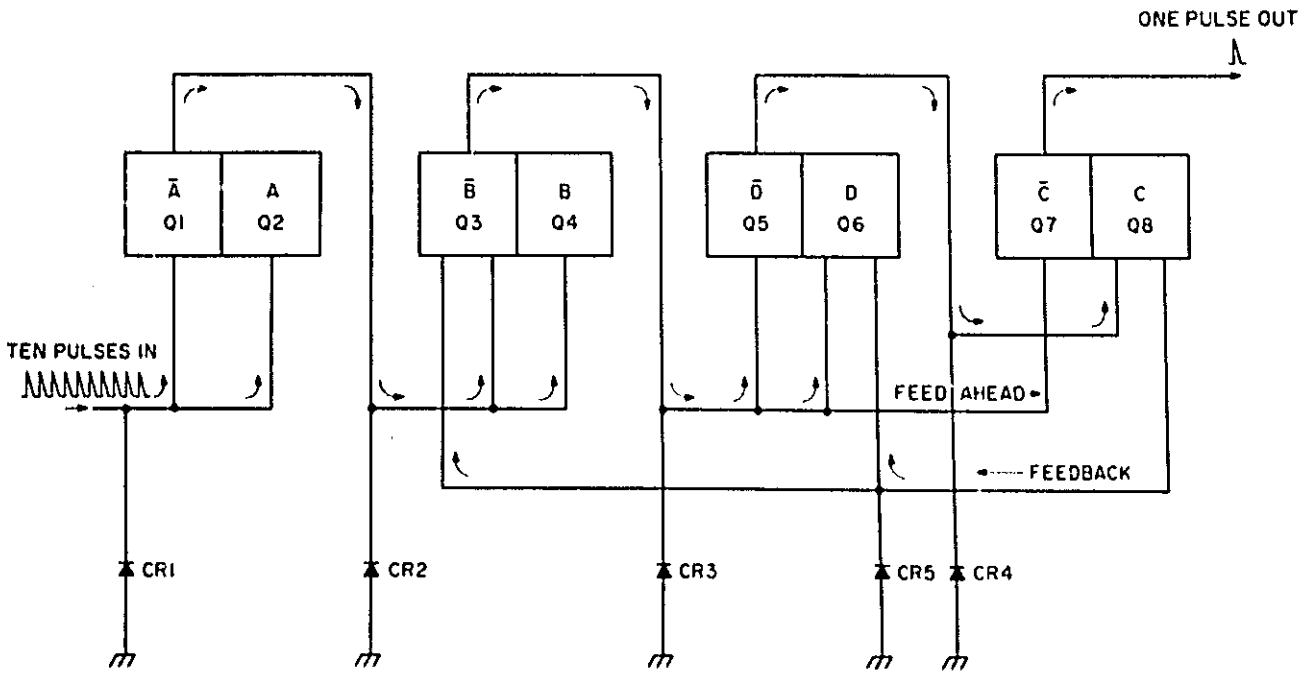
A28
C1 - 16
CR1 - 11
Q1 - 8
R1 - 53

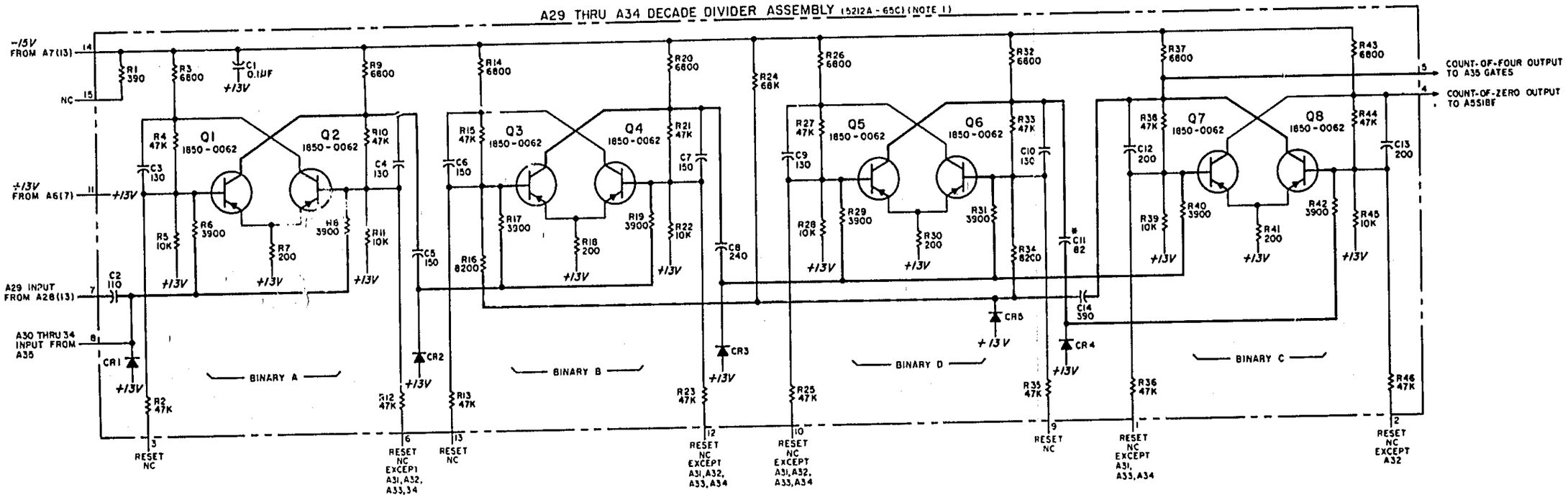
Figure 8-31. A28 Decade Divider



A29-A34 OPERATION

A block diagram of a typical decade divider is shown below. A decade divider is an arrangement of four cascaded binaries (flip-flops) so for every ten input pulses, there is one output pulse. When a frequency is applied, the first binary divides by two, and again by two in the second binary (a total of four) and so on, with an expected total division of sixteen at the output of the fourth binary. Division by ten is obtained by a feedahead pulse to the fourth binary and feedback pulses to the second and third binaries. Therefore, after the eighth input pulse is received the binaries will be in a state as if they had counted fourteen pulses. When the ninth and tenth pulses are received the output pulse is produced. Operation is similar to that for decimal counters except there is no display connected to the binaries. Note that A31 through A34 are supplied with a reset input so that only a certain number of input pulses to the decade dividers is necessary after reset before an output is produced.





NOTES

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2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS;
3. ASTERISK (*) INDICATES SELECTED COMPONENT - AVERAGE VALUE SHOWN.

REFERENCE DESIGNATIONS

A29 THRU A34
C1-14
CR1-5
Q1-8
R1-46

WAVEFORMS

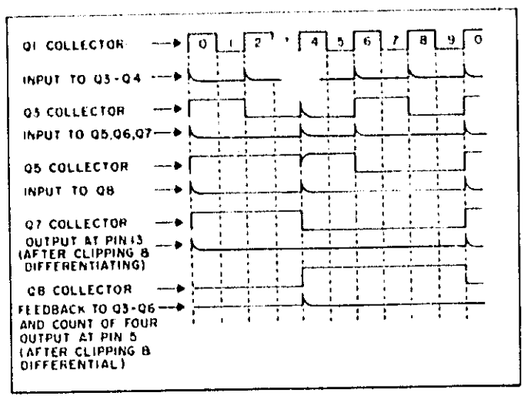


Figure 8-32. A29-A34 Decade Dividers

A35 OPERATION

The Time Base control assembly is an arrangement of gates, controlled by the FUNCTION switch and TIME BASE switch to: a) lower the output impedance of the 10 MHz signal from multiplier A27 (5248L) or A26 (5248M), b) select a frequency between .1 Hz and 10 MHz for selected gate time, and c) provide a multiplied period signal.

The 10 MHz input signal to A is amplified and routed to J6 (25, 50) and through Q2, to Q4 (gate 29); also from Q2 through IC2A to A5 for 10 MHz OUTPUT, and to A36 to be multiplied for 100 MHz output. The TIME BASE switch controls gates 21 through 29. FUNCTION switch controls gates 7 through 11. Switch positions and gate affected are shown below. With FUNCTION in FREQUENCY and TIME BASE in .1 μs, gate 29 will be enabled and the 10 MHz signal will be applied to AND gate IC2B. Gates 21 through 28 will be inhibited. Q5 emitter and Q6 collector will be at +5 volts enabling IC2B to pass the signal on to IC2C, Q9, and out to A21. Signals for .1 μs, 1 μs, and 10 μs are routed through Q9. All other selected time base signals go through Q10. IC1 is a flip-flop to isolate gates 21 through 26 from gates 27 through 29.

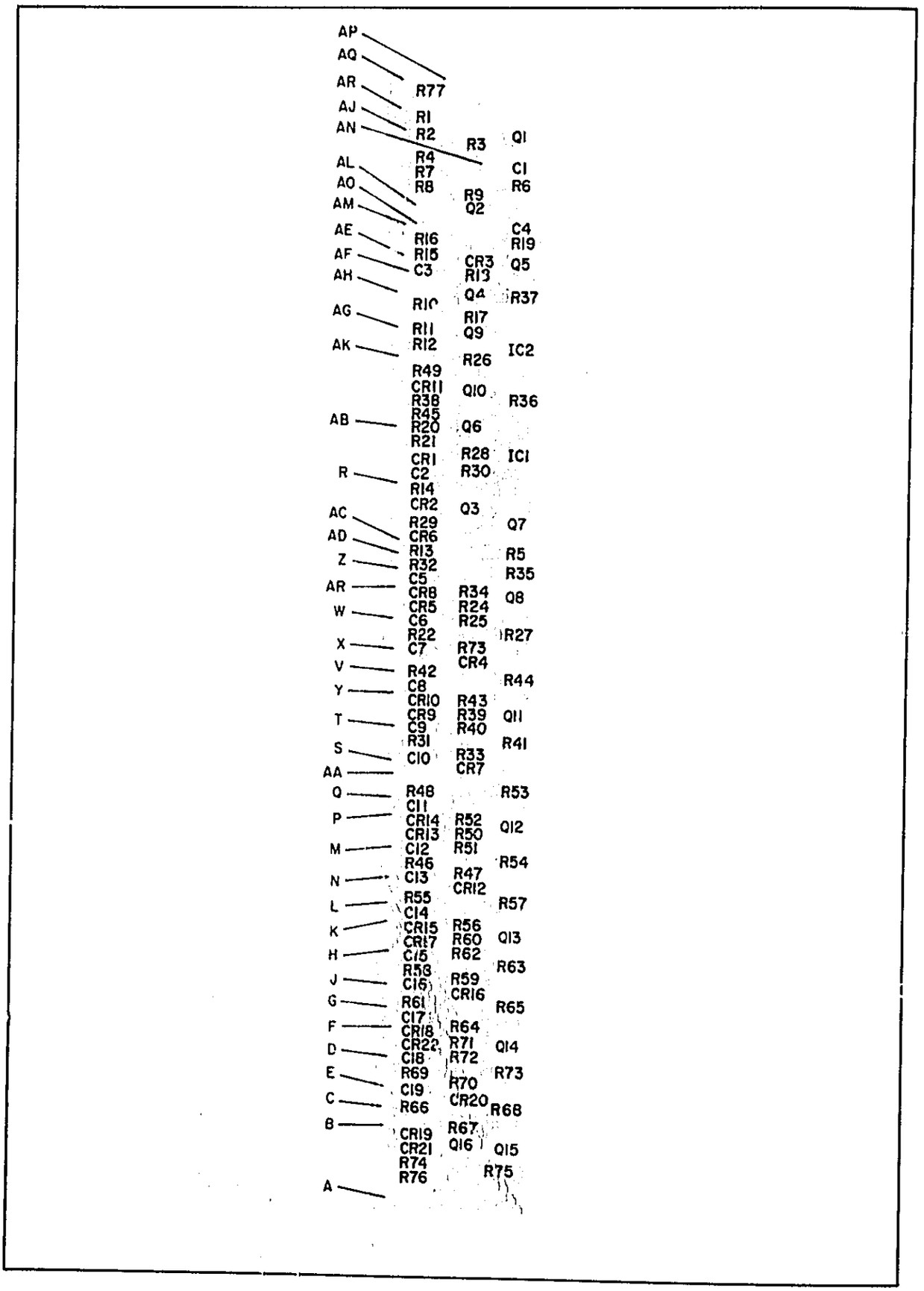
FUNCTION Switch in FREQUENCY	
TIME BASE Switch	Gate Enabled
10 s	21
1 s	22
.1 s	23
10 ms	24
1 ms	25
.1 ms	26
10 μs	27
1 μs	28
.1 μs	29

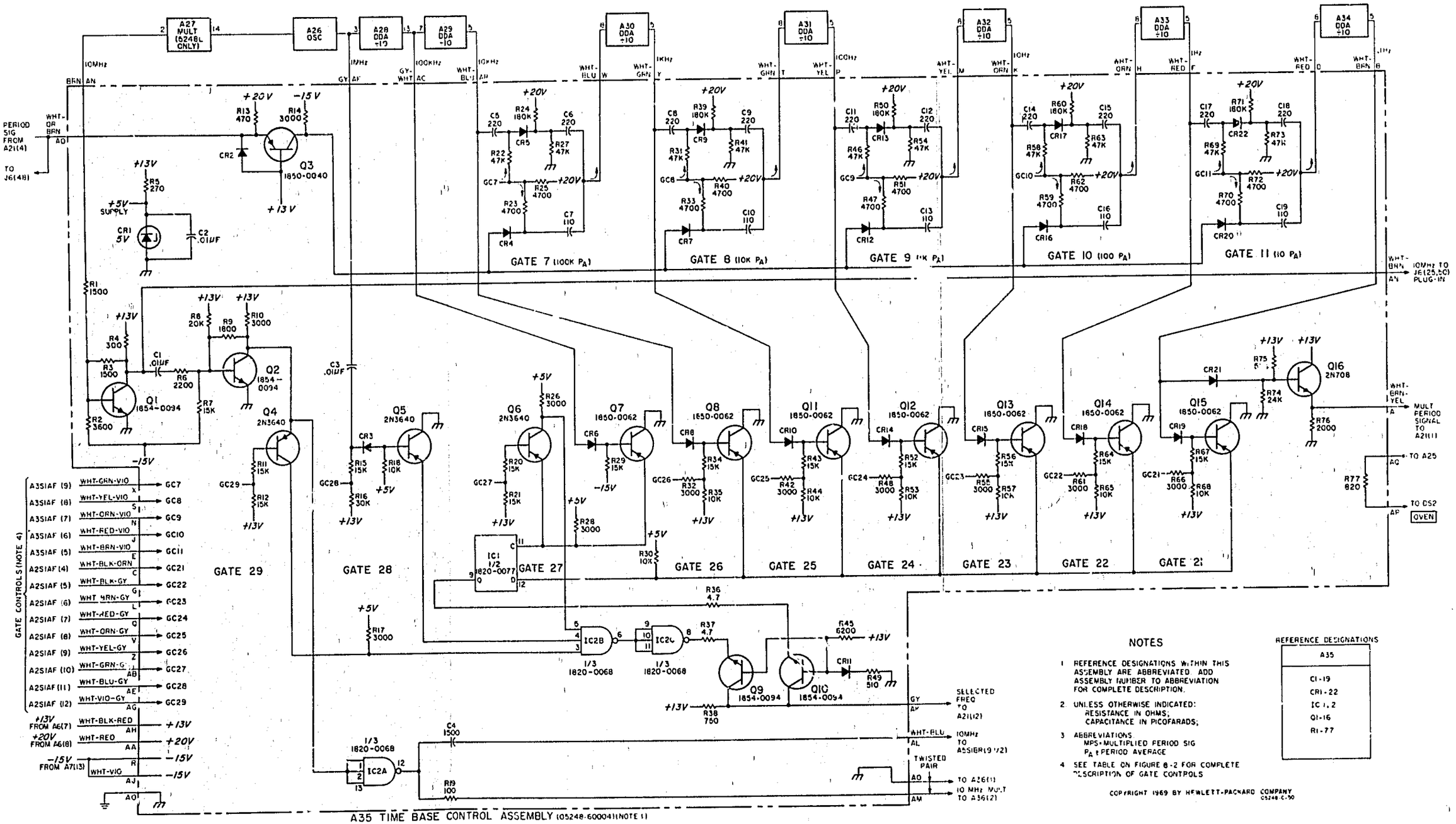
Gates 7 through 11 are made up of two gates each: normally open gates CR5, CR9, CR13, CR17, CR22 and normally closed gates CR4, CR7, CR12, CR16, and CR20. When FUNCTION switch is in 1K PERIOD AVERAGE, CR13 is reverse biased to prevent the A31 signal from passing through. CR12 is forward biased to allow the period signal from Q3 to go to A32. Gates 7, 8, 10, 11 will not change their state.

A35 TROUBLESHOOTING

Set Counter controls to: SENSITIVITY in CHECK; -LEVEL+ in PRESET; FUNCTION in FREQUENCY. Gates 21 through 29, IC1, IC2B, IC2C, Q1, Q2, and Q4 can be checked and the problem isolated to a particular gate by rotating TIME BASE switch through all its positions except .01 μs and EXT. Change FUNCTION to 10 PERIOD AVERAGE and check gate 11, Q3, and Q16. Rotate FUNCTION through 100 PERIOD AVERAGE, 1K PERIOD AVERAGE, 10K PERIOD AVERAGE, and 100K PERIOD AVERAGE to check remaining gates. Check signal at junction of C4 and R19 to check IC2A.

FUNCTION Switch	Gate Controlled
10 PERIOD AVERAGE	11
100 PERIOD AVERAGE	10
1K PERIOD AVERAGE	9
10K PERIOD AVERAGE	8
100K PERIOD AVERAGE	7





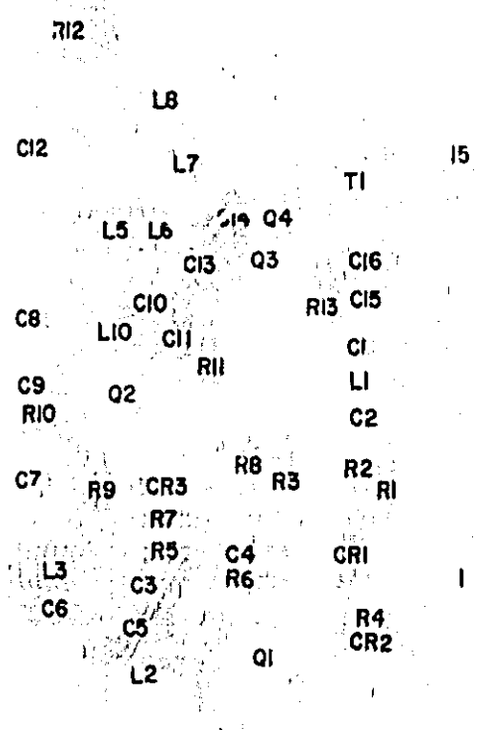
NOTES

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;
3. ABBREVIATIONS MPS = MULTIPLIED PERIOD SIG P_A = PERIOD AVERAGE
4. SEE TABLE ON FIGURE 8-2 FOR COMPLETE DESCRIPTION OF GATE CONTROLS

REFERENCE DESIGNATIONS

A35
C1-19
CR1-22
IC 1, 2
Q1-16
R1-77

Figure 8-33. A35 Time Base Control

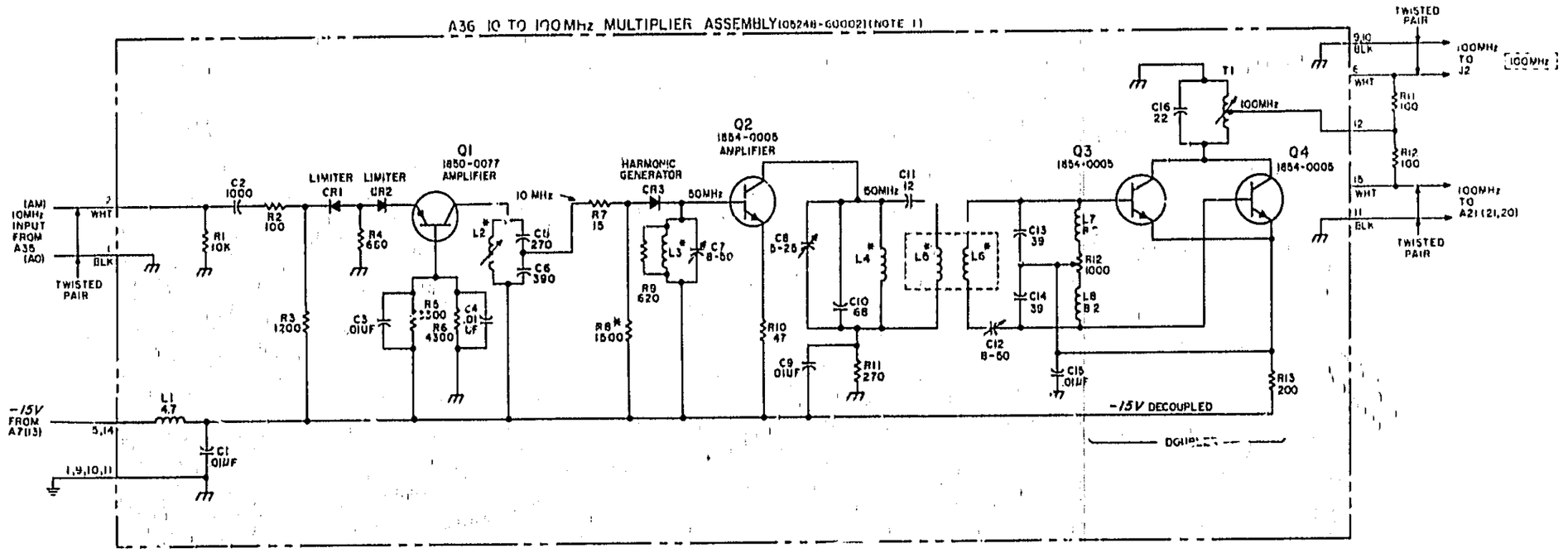


A36 OPERATION

The 10 to 100 MHz Multiplier assembly provides 100 MHz signal to J2 and A21. The 10 MHz signal to be multiplied from A35 is applied through limiters CR1 and CR2 to amplifier Q1. The 10 MHz is fed through harmonic generator CR3 to the base circuit of Q2 which is tuned to the 5th harmonic or 50 MHz. Q2 collector and Q3 input circuit are tuned to 50 MHz. Q3 and Q4 form a full wave rectifier, with T1 and C15 tuned to the ripple frequency or 100 MHz.

A36 TROUBLESHOOTING

When troubleshooting A36, first try adjustments outlined in Section V under Adjustments for A36. A36 is susceptible to parasitic oscillations which will cause deterioration of the desired signal. Use only a sampling oscilloscope and X10 probe when signal tracing this assembly.



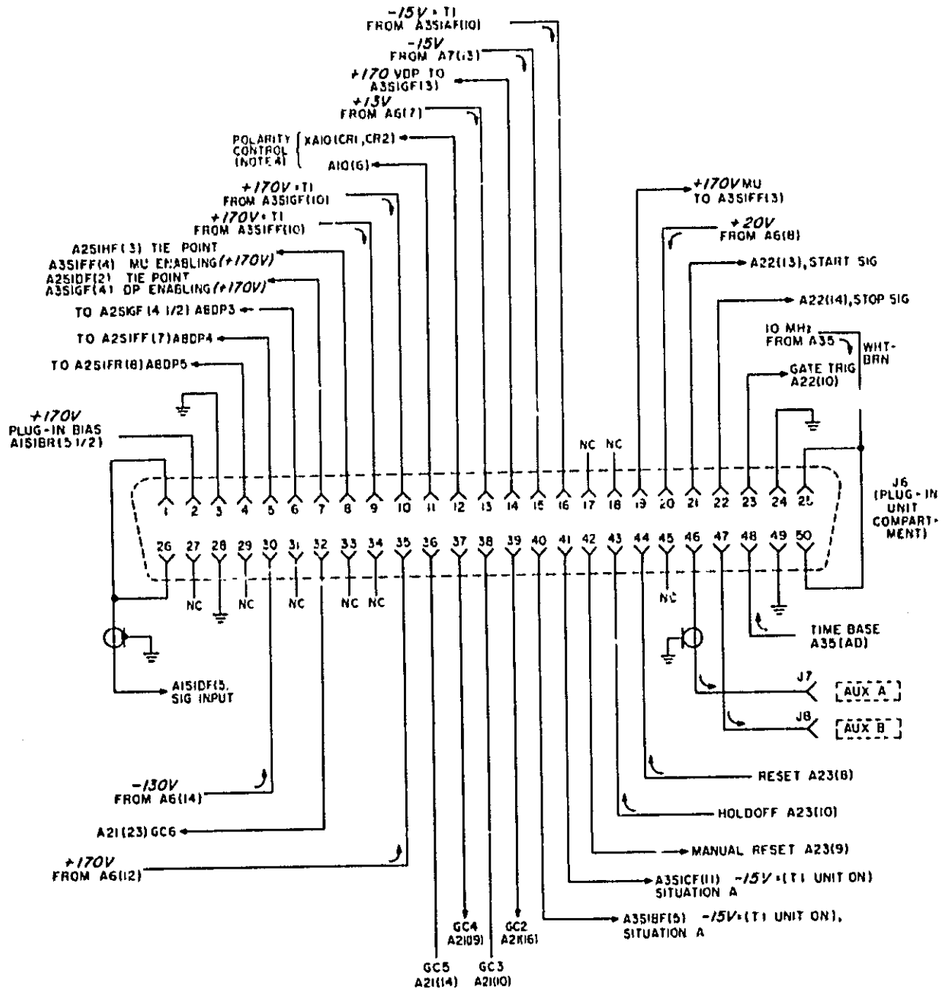
NOTES

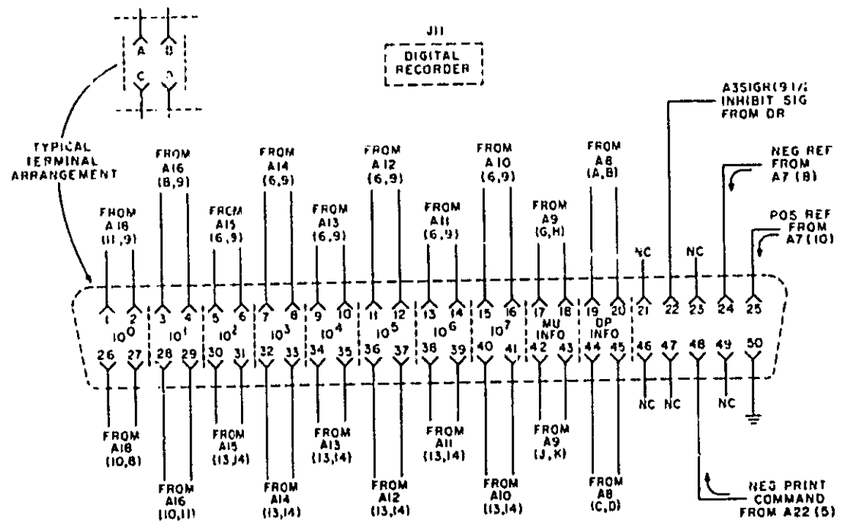
1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS;
   CAPACITANCE IN PICOFARADS;
   INDUCTANCE IN MICROHENRIES
3. ASTERI "*") INDICATES SELECTED COMPONENT
4. L5,L6 ARE MUTUALLY COUPLED

REFERENCE DESIGNATIONS

NO PREFIX	A36
R11,12	C1-16 CR1-3 L1-8 Q1-4 R1-13 T1

Figure 8-34. A36 100 MHz Multiplier





NOTES

1. ABBREVIATIONS
   SITUATION A = IRRELEVANT VOLTAGES APPEAR IN OTHER MODES OF OPERATION
   SITUATION B = DIFFERENT SIGNAL MAY BE SUPPLIED BY DIFFERENT PLUG-IN UNIT
   DP = DECIMAL POINT
   DR = DIGITAL RECORDER
   MU = MEASUREMENT UNIT
   T.I. = TIME INTERVAL
2. REFER TO NOTES ON FIG 8-2 FOR ADDITIONAL ABBREVIATIONS
3. CONNECTORS VIEWED FROM WIRING SIDE
4. 5265A PLUG-IN PROVIDES POLARITY CONTROL FROM J6(11) TO A10(6) AND J6(12) TO CR2,CR3 AT XA10 FOR STANDARD COUNTER. OPTION 02 J6(11) TO A10(6) AND J6(12) TO A10(14). OPTION 03 POLARITY CONTROL DISABLED.

05249-0-62

Figure 8-35. J6, J11 Connector Wiring

Table 1. FUNCTION Program

Selected Function	J9 Pins Requiring -15V
MANUAL START	2, 15
MANUAL STOP	2, 14
FREQUENCY	2, 3, 12
1 PERIOD AVERAGE	1, 5, 12
10 PERIOD AVERAGE	1, 11, 13, 5
100 PERIOD AVERAGE	1, 10, 13, 5
1K PERIOD AVERAGE	1, 9, 13, 5
10K PERIOD AVERAGE	1, 8, 13, 5
100K PERIOD AVERAGE	1, 7, 13, 5

Table 2. TIME BASE Program

Time Base	J9 Pins Requiring -15V
10 s	21
1 s	22
.1 s	23
10 ms	24
1 ms	25
.1 ms	26
10 μs	27
1 μs	28
* .1 μs	29
*.01 μs	6

* Use only when FUNCTION programmed PERIOD AVERAGE.

Table 3. CHECK Program

Check Function	J9 Pins Requiring -15V
MANUAL	1, 15; 6 or any 21 thru 29
FREQUENCY	3, 6, 12, any 21 thru 28
1 PERIOD AVERAGE	1, 3, 12, 27
10 PERIOD AVERAGE	1, 3, 11, 13, 27
100 PERIOD AVERAGE	1, 3, 10, 13, 27
1K PERIOD AVERAGE	1, 3, 9, 13, 27
10K PERIOD AVERAGE	1, 3, 8, 13, 27
100K PERIOD AVERAGE	1, 3, 7, 13, 27

REMOTE CONTROL

Two rear panel connectors (J9 and J10) added to the standard counter permit remote control of counter FUNCTION and TIME BASE selection. SAMPLE RATE, SENSITIVITY, and AC/DC INPUT cannot be remote controlled.

To program desired FUNCTION, connect -15 volts to J9 pins listed in Table 1. To program desired TIME BASE, connect -15 volts to J9 pins listed in Table 2. To program CHECK, connect -15 volts to J9 pins listed in Table 3. With counter on, -15 volts is available at J9(30). With FUNCTION switch set to TIME INT, -15 volts is available at J10(32).

To select correct decimal point and measurement unit for function and time base used, connect +170 volts to J10 pins listed in Table 4. +170 volts is available at J10(20) when the counter is on, and at J10(21, 22) when FUNCTION switch is set to TIME INT. J9, J10, and mating connector part numbers are listed in Table 5. Information in the Operating and Service Manual for the standard instrument also applies to this special instrument.

For remote control, set counter controls as follows:

FUNCTION . . . . . TIME INT
TIME BASE . . . . . not EXT or .01 μs
SENSITIVITY . . . . . not CHECK
SAMPLE RATE . . slightly cw out of POWER OFF
STORAGE . . . . . OFF

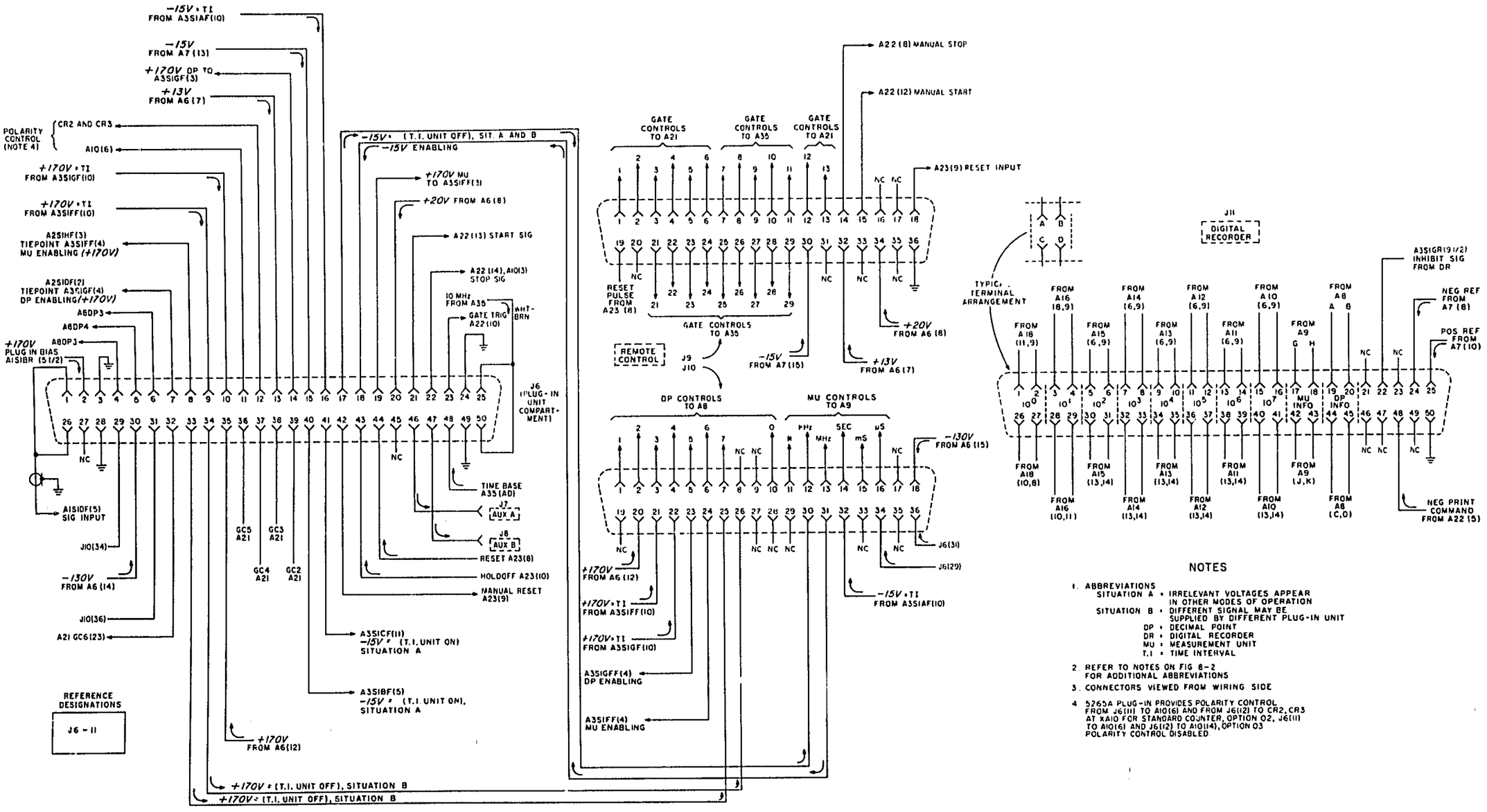
NOTE
For Remote Totalizing operation refer to Figure 3-9.

Table 5. Connector Part Numbers

Connector	HP Part No.	Amphenol Part No.
J9, J10	1251-0085	57-40360
J9, J10 Mate	1251-0084	57-30360

Table 4. Pins on J10 Requiring +170V for Decimal Point and Measurement Unit Control

FUNCTION	TIME BASE										
	.01 μs	.1 μs	1 μs	10 μs	.1 ms	1 ms	10 ms	.1 s	1 s	10 s	EXT
MANUAL START	-	-	-	-	-	-	-	-	-	-	-
MANUAL STOP	-	-	-	-	-	-	-	-	-	-	-
FREQUENCY	11	11	10, 13	1, 13	2, 13	10, 12	1, 12	2, 12	3, 12	4, 12	11
1 PERIOD AVERAGE	2, 16	1, 16	10, 16	2, 15	1, 15	10, 15	2, 14	1, 14	10, 14	11	10
10 PERIOD AVERAGE	3, 16	2, 16	1, 16	10, 16	2, 15	1, 15	10, 15	2, 14	1, 14	11	1
100 PERIOD AVERAGE	4, 16	3, 16	2, 16	1, 16	10, 16	2, 15	1, 15	10, 15	11	11	2
1K PERIOD AVERAGE	5, 16	4, 16	3, 16	2, 16	1, 16	10, 16	2, 15	11	11	11	3
10K PERIOD AVERAGE	6, 16	5, 16	4, 16	3, 16	2, 16	1, 16	11	11	11	11	4
100K PERIOD AVERAGE	7, 16	6, 16	5, 16	4, 16	3, 16	11	11	11	11	11	5



NOTES

1. ABBREVIATIONS
   SITUATION A • IRRELEVANT VOLTAGES APPEAR IN OTHER MODES OF OPERATION
   SITUATION B • DIFFERENT SIGNAL MAY BE SUPPLIED BY DIFFERENT PLUG-IN UNIT
   DP • DECIMAL POINT
   DR • DIGITAL RECORDER
   MU • MEASUREMENT UNIT
   T.I • TIME INTERVAL
2. REFER TO NOTES ON FIG 8-2 FOR ADDITIONAL ABBREVIATIONS
3. CONNECTORS VIEWED FROM WIRING SIDE
4. 5265A PLUG-IN PROVIDES POLARITY CONTROL FROM J6(11) TO AIO(6) AND FROM J6(12) TO CR2, CR3 AT XAIO FOR STANDARD COUNTER, OPTION 02, J6(11) TO AIO(6) AND J6(12) TO AIO(14), OPTION 03 POLARITY CONTROL DISABLED

Figure 8-36. J6, J9-J11 Connector Wiring
Remote Operation (Special)

MANUAL CHANGES

HEWLETT PACKARD

MANUAL CHANGES

MANUAL DESCRIPTION

INSTRUMENT: 5248L/M Electronic Counters
SERIAL PREFIX: 1124A
DATE PRINTED: Oct 1971
HP PART NO: 05248-90014

CHANGE DATE: August 16, 1977

(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 OR SERIAL NUMBER	MAKE THE FOLLOWING CHANGES TO YOUR MANUAL
1244A (5248L/M)	1
1336A (5248L/M)	1,2
1412A (5248L/M)	1,2,3
1452A (5248L)	1,3,4

IF YOUR INSTRUMENT HAS SERIAL PREFIX OR SERIAL NUMBER	MAKE THE FOLLOWING CHANGES TO YOUR MANUAL
1452A (5248M) (5248L)	1,3,4,5
1452A01926 & above	1,3,4,5
1544A (5248L)	1,3,4,5,6
1544A02025 (5248L)	1,3,4,5,6,7
1544A02041 (5248L)	1,3,4,5,6,7,8
1644A (5248L)	1,3,4,5,6,7,8,9
►1720A	1,2,3,4,5,6,7,8,9,10

►NEW OR REVISED ITEM

ERRATA

Page 1-2,
Table 1-2, RATIO MEASUREMENTS:
Add "Impedance: 1 MΩ , approximately 20PF dc-coupled.
Overload: Diodes protect input circuit up to 120V rms."

Page 1-3, Table 1-2, GENERAL Cont'd:
Delete "Time Base External Input (front panel):" and specs listed under this heading.

Page 1-3, Table 1-2, Digital Output, BCD Reference Levels:
Change "approximately +18V" to "approximately +8V".

Page 1-4, Paragraph 1-16:
Change last sentence to read:
"This means that the 5 MHz base frequency will fall between 5,000,000.0175 and and 4,999,999.9825".

Page 6-1, Figure 6-1:
Delete Option A85 and Option X95 columns from parts list.
Transpose part numbers for items 4 and 5 in STANDARD column.

Page 6-2/3, Table 6-1:
Change A6CR1-4, 9-16 to 1901-0028 400 PIV
Change A1S3 from 3101-1342 to 3101-1500.

Page 6-4, Table 6-1:
Change A10-14C7 from 0140-0195 to 0140-0196 150 PF.

Page 6-14, Table 6-1:
Change A25CR1-4 to 1901-0028 400 PIV.

Page 6-15, Table 6-1:
Change A26Q6 from 1853-0034 to 1853-0331.
Change A25Q2 from 1853-0071 to 1853-0086.

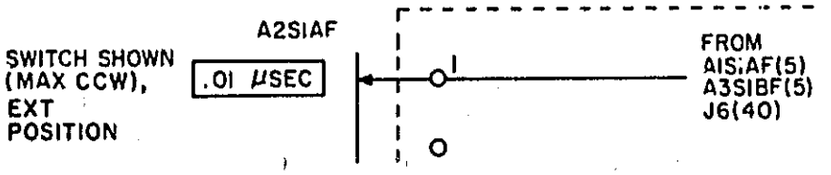
4365-5622-5844-6116-6093-6407-6971-7034-7094-7481

ERRATA (Cont'd)

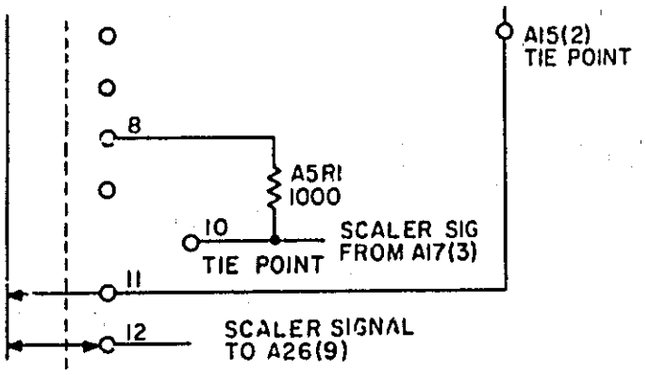
Page 6-22, Table 6-1:
Change S1 from 3101-0037 to 3101-0036.
Change Q1 from 1850-0090 to 1853-0052 2N3740.
Add 0340-0160 INSULATOR: TRANSISTOR.
(0340-0162 is required when 1850-0090 replaced with 1853-0052)

Page 6-30, Table 6-2:
Change 1850-0090 to 1853-0052 2N3740.
Add 0340-0160 INSULATOR: TRANSISTOR

Page 8-9, Figure 8-5, Switch A2S1AF:
Change description as shown in following partial schematic:



Page 8-17, Figure 8-8:
Change destination of lead from A6S1AF12 as shown in following partial schematic:



Page 8-27, Figure 8-13:
Change A10-14R34 to 27K.

Page 8-47, Figure 8-23:
Change A21L3 to ".1 UH".
A21L6 to ".18 UH".
Add to A21R45 an asterisk (*).

Page 8-49, Figure 8-24, A22 schematic:
Change A22IC1D output pins from to 11.

Page 8-53, Figure 8-26:
Add to A25R4 an asterisk (*).

Page 8-65, Figure 8-29, A26 MULTIPLIER/DIVIDER schematic:
Change A26Q6 from 1853-0034 to 1853-0331.

ERRATA (Cont'd)

Page 1-7, Table 1-3, Accessories Supplied or Available:
Change 5243A-44 to 05243-6043.
Change 5020-0709 to 5020-7622.
Change 5020-0708 to 5020-7621.
Change 05243-4001 to 05580-2042.
Change 05243-9004 to 05243-9005.
Change 05243-6022 to 05245-6022.

Page 6-2, Table 6-1:
Change A2R1 to 0683-1045; R: FXD COMP 100K OHM 5% 1/4W.

Page 6-10, Table 6-1:
Change A20C2, C4, C5, C8, and C10 from 0160-2930 to 0150-0093.

► Page 5-9, Table 5-4, Adjustments:
Add the following to step 2a. "Set A19R12 so A19Q4 and Q5 base voltages are within 100 mV of each other."
Change A19R20 to A19R22 in two places in step 2h.

CHANGE 1

Page 6-15, Table 6-1:
Change A26IC1 from 1820-0082 to 1820-0413.
With this change board 05248-60019 is SERIES 1244.

Page 8-65, Figure 8-29:
Change A26IC1 from 1820-0082 to 1820-0413 and at top of schematic add "SERIES 1244".

CHANGE 2 (1336A)

Page 6-4, Table 6-1:
Change A10CR9-14 from 1910-0016 to 1901-0040 DIODE: SILICON.
Change A10Q1-8 from 5080-0060 to 1853-0217 TRANSISTOR: PNP SILICON.

Page 6-19, Table 6-1:
Change A29CR1-5 from 1910-0016 to 1901-0040 DIODE: SILICON.
Change A29Q1-8 from 1850-0062 to 1853-0217 TRANSISTOR: SILICON.

Page 6-34, Table 6-3, Option 002:
Change A10CR9-18 from 1910-0016 to 1901-0040 DIODE: SILICON.
Change A10Q1-8 from 5080-0060 to 1853-0217 TRANSISTOR: PNP SILICON.

Page 6-40, Table 6-4, Option 003:
Change A10CR9-14 from 1910-0016 to 1901-0040 DIODE: SILICON.
Change A10Q1-8 from 5080-0060 to 1853-0217 TRANSISTOR: PNP SILICON.

Page 8-25, Figure 8-12, A10-A14 schematic:
Change A10Q1-8 from 5080-0060 to 1853-0217.

Page 8-27, Figure 8-13, A10-A14 schematic:
Change A10Q1-8 from 5080-0060 to 1853-0217.

Page 8-71, Figure 8-32, A29-A34 schematic:
Change A10Q1-8 from 1850-0062 to 1853-0217.

With this change assemblies in above three items are SERIES 1336.

CHANGE 3 (1412A)

Page 6-19, Table 6-1:
Change A29R41 from 0683-2015 to 0683-1015 100 OHM.
Change A29R38, 44 from 0683-4735 to 0683-3935 39K.

With these change assy 5212A-65C is SERIES 1412.

Page 8-71, Figure 8-32, A29-34 schematic:
Change A29R41 from 200 to 100 OHM.
Change A29R38, 44 from 47K to 39K.

NOTE: TEST WAVEFORMS SHOWN ON PAGES 8-46 AND 8-47 ARE OBTAINED BY USING AN HP MODEL 10007A 1:1 PROBE INSTEAD OF 10003A 10:1 DIVIDER PROBE LISTED ON BOTTOM OF PAGE 8-46.

CHANGE 4 (1452A)

Page 6-4, Table 6-1:
Change A10CR9-14 from 1901-0040 to 1910-0016 DIODE: GERM.
Change A10Q1-8 from 1853-0217 to 5060-0060 TRANS: GERM.

Page 6-19, Table 6-1:
Change A29CR1-5 from 1901-0040 to 1910-0016 DIODE: GERM.
Change A29Q1-8 from 1853-0217 to 1850-0062 TRANS: GERM.

Page 6-34, Table 6-3, Option 002:
Change A10CR9-18 from 1901-0040 to 1910-0016 DIODE: GERM.
Change A10Q1-8 from 1853-0217 to 5080-0060 TRANS: GERM.

Page 6-40, Table 6-4, Option 003:
Change A10CR9-14 from 1901-0040 to 1910-0016 DIODE: GERM.
Change A10Q1-8 from 1853-0217 to 5060-0060 TRANS: GERM.

Page 8-25, Figure 8-12, A10-14 Schematic:
Change A10Q1-8 from 1853-0217 to 5080-0060 TRANS: GERM.

Page 8-27, Figure 8-13, A10-14 schematic:
Change A10Q1-8 from 1853-0217 to 5080-0060 TRANS: GERM.

Page 8-71, Figure 8-32, A29-34 schematic:
Change A29Q1-8 from 1853-0217 to 1850-0062 TRANS: GERM.

The above seven changes (pages 6-4 thru 8-71) supersede relevant data in CHANGE 2. Assemblies are all SERIES 1436A.

Page 6-20, Table 6-1: TIME BASE CONTROL ASSY 05248-60004.
Change A35R10 from 0683-3025 (3000) to 0683-2025 2000 OHM.
Change A35R11, R20 from 0683-1535 (15K) to 0683-6825 6800 OHM.
Change A35R15 from 0683-1535 (15K) to 0683-1035 10K OHM.
Change A35R17, R26 from 0683-3025 (3000) to 0683-1035 10K OHM.
Change A35R28 from 0683-3025 (3000) to 0683-1025 1000 OHM.
With these changes, A35 circuit board is SERIES 1432A.

Page 8-73, Figure 8-33, A35 schematic:
Change A35R10 from 3000 to 2000 ohms.
Change A35R11 and R20 from 15K to 6800 ohms.
Change A35R15 from 15K to 10K ohm.
Change A35R17 and R26 from 3000 to 10K ohm.
Change A35R28 from 3000 to 1000 ohm.
Add " SERIES 1432A" at bottom of schematic.

Page 6-10, Table 6-1:
Change A20C2, A20C4, A20C5, A20C8, and A20C10 from HP Part No. 0160-2930 to 0160-0093.

CHANGE 5 (1452A for 6248M) (SERIAL 1452A01926 AND ABOVE FOR 6248L)

Page 6-11, Table 6-1, A21 Reference Designation Index:
Change A21R33 from 0683-3625 (3600 ohms) to 0683-2725; R: FXD COMP 2700 OHM 5% 1/4W; MFR CODE 01121; MFR PART NO. CB2725.

Change A21R34 from 2100-1757 (500 ohms) to 2100-1758; R: VAR 1000 OHM 5% WIRE WOUND SIDE ADJUST.

Page 8-47, Figure 8-23, A21 Function Control Schematic:
Change A21R33 from 3600 to 2700 ohms
Change A21R34 from 500 to 1000 ohms.

CHANGE 6 (1544A) (5248L ONLY)

Page 6-21, Table 6-1:
Change A36Q1 from 1850-0077 (germanium 2N1397 PNP transistor) to 1853-0036 (silicon 2N3906 PNP transistor). The 1853-0036 transistor is the recommended replacement part for A36Q1 in all 5248L/M instruments.

Pages 6-30 and 6-31, Table 6-2:
Delete Part No. 1850-0077 and change "TQ" column for Part No. 1853-0036 from "0" to 1 for 5248L and from "1" to "2" for 5248M.

Page 8-76, Figure 8-34, A36 Schematic Diagram:
Change A1Q1 from 1850-0077 (2N1397) to 1853-0036 (2N3906).
Add "SERIES 1544" at top of schematic diagram.

CHANGE 7 (1544A02025 AND ABOVE) (5248L ONLY)

Page 1-0, Figure 1-1, Model 5248 and Accessories:

The 5248L Electronic Counter is furnished less the RACK MOUNTING KIT and 10503A BNC-BNC cable assembly described in this manual in Figure 1-1 and Table 1-3. 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. 05243-6043. The BNC-BNC Model 10503A Cable Assembly can be ordered as an additional cost accessory as HP Part No. 10503-6003. Disregard any manual references stating the instrument is supplied with a rack mounting kit.

Pages 6-23 and 6-30, Tables 6-1 and 6-2, Designation Index and Replaceable Parts:
Change XF1 fuseholder from 1400-0084 to the following recommended replacement for all instruments:
Delete 1400-0084 Fuseholder for XF1.
Add 2110-0464; FUSEHOLDER BODY UL/IEC; 75915; 345002-010.
Add 2110-0465; FUSEHOLDER BAYONET CAP; 75915; 345003-020.
Add 2950-0054; NUT FUSEHOLDER MTG 1/2-28; 28480; 2950-0054.

CHANGE 8 (1544A02041 AND ABOVE) (5248L ONLY)

Page 6-3, Table 6-1, A7 Reference Designation Index:
Change A7Q5 from 1850-0048 (Germanium) to 1853-0217; TRANSISTOR: PNP Si.

Page 6-13, Table 6-1, A23 Reference Designation Index:
Change A23Q6 from 1850-0101 (Germanium) to 1853-0217; TRANSISTOR: PNP Si.

Page 6-30 and 6-31, Table 6-2, Replaceable Parts:
Change 1850-0048 (Ge) to 1853-0217; TRANSISTOR: PNP Si.; 28480; 1853-0217.
Change 1850-0101 (Ge) to 1853-0217; TRANSISTOR: PNP Si.; 28480; 1853-0217.

Page 8-19, Figure 8-9, A7 Schematic Diagram:
Change A7Q5 from 2N650 (Ge) to 1853-0217 (Si).

Page 8-51, Figure 8-25, A23 Schematic Diagram:
Change A23Q6 from 2N582 (Ge) to 1853-0217 (Si).

Page 6-19, Table 6-1, A29 Reference Designator Index:
Change A29Q1 thru Q8 from 1850-0062 to 1853-0217; TRANSISTOR: PNP SILICON.

Page 6-30, Table 6-2, Replaceable Parts:
Change 1850-0062 to 1853-0217; TRANSISTOR SI PNP; 28480; 1850-0062.

Page 8-71, Figure 8-32, A29-A34 Schematic Diagram:
Change A29Q1 thru A29Q8 to 1853-0217.

CHANGE 9 (1644A) (5248L ONLY)

Page 6-19, Table 6-1, A29 (5212A-65C) Replaceable Parts:
Change A29R6, R8, R17, R19, R29, R31, R40, and R42 from 0683-3925 (3900Ω) to 0683-6225; R: FXD COMP 6200 OHMS 5% 1/4W.

NOTE: This change applies to any 5212A-65C circuit board with the transistor change in CHANGE 8.

Page 8-71, Figure 8-32, A29-A34 Decade Divider Schematic:
Change A29R6, R8, R17, R19, R29, R31, R40, and R42 to 6200 ohms.

NOTE: Changes 8 and 9 are applicable to any 5212A-65C circuit boards used in the 5248L and 5248M counters.

▶CHANGE 10 (1720A) (5248L ONLY)

NOTE: This change replaces crystal oven assembly A24 and oven-coated assembly A25 with a 10 MHz component oscillator for A24 and an oscillator control assembly for A25. The new oscillator control assembly supplies regulated voltages for the 10 MHz component oscillator and a decade divider integrated circuit to divide the 10 MHz output from A24 and provide a 1 MHz time base signal. The new component oscillator and control assembly will equal or butter the stability specifications of the original assemblies which they replace.

Page 6-14, Table 6-1, Reference Designation Index:
Delete A24 Part No. 5243A-69A crystal oven assembly and all components with reference designators having a prefix of A24.

Add A24; 10544-60036; ASSY: CRYSTAL OSCILLATOR-10 MHz FOR 5248L ONLY shown in attached Replaceable Parts table. Field repair of this oscillator is not recommended. Exchange oscillator assemblies are available for repair.

Pages 6-14 and 6-15, Table 6-1, Reference Designation Index:
Delete A25 Part No. 5243A-65T oven control assembly and all associated components with reference designations having a prefix of A25.

Add A25; 05245-60033; BOARD ASSY: OSCILLATOR CONTROL FOR 5248L ONLY and the replaceable parts listed in the attached Replaceable Parts table for the 05245-60033 assembly.

Pages 6-21 and 6-22, Table 6-1, Reference Designation Index:
Delete part numbers for chassis mounted components C2 (0130-0003), C3 (0121-0013), CR1 (1902-0039) and oven heater amplifier transistor Q1 (1853-0052).

Change "Description" for C2, C3, CR1, and Q1 to NOT ASSIGNED.

Page 6-24, Table 6-1, Reference Designation Index:
Add MISCELLANEOUS PARTS listed in attached table of Replaceable Parts.

Page 6-28 thru 6-32, Table 6-2, Replaceable Parts:
Change Table 6-2 to reflect the above changes listed for Table 6-1.

Page 6-47; Table 6-5, Manufacturers Code List:
Add attached Manufacturers Code List to Table 6-5.

Page 8-53 Figure 8-26, Schematic Diagram:
Delete A24 (5243A-69A), A25 (5243A-65T), C2 (fine freq. adj.), C3 (medium freq. adj.), CR1 (regulator), and Q1 (oven heater amplifier).

Delete connection between A25 and 500 UF capacitor C4. This capacitor is used with the new oven control assembly to filter the positive dc output from the bridge rectifier. The OVEN indicator lamp DS2 also obtains power from the positive terminal of C4.

Replace A24 and A25 in Figure 8-26 with A24 and A25 shown on the attached diagram. The 1 MHz output from A25 connects to A26 pins 2-1, 2-2, and 2-3. Changed wiring to DS2 and A35R77 is shown in the diagram.

The 1 MHz signal from A25 is fed into the emitter of A26Q1 and is coupled to the input of A26Q2 by capacitor A26C8. This connection bypasses A26Q1 and disables the AGC feedback circuit in A26.

Replace component locator illustration for A26 with attached component locator for 05245-60033.

OSCILLATOR ADJUSTMENT

Oscillator adjustment for the new time base oscillator requires the same procedure as the original oscillator.

The new oscillator has only two controls for adjustment in place of three. The COARSE FREQ ADJUST ($\approx 2 \times 10^{-6}$) is located under an added plug-button on the rear of the instrument. The FINE FREQ ADJUST ($\approx 5 \times 10^{-8}$) is inside the plug-in compartment in the same basic location as before.

The 10544-60036 component oscillator for A24 and the 05245-60033 oscillator control assembly for A25 will provide a 1 MHz time base with specifications equal or better than the original 1 MHz time base.

Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A24	10544-60036	1	CRYSTAL OSCILLATOR ASSY (10 MHz) NOT RECOMMENDED FOR FIELD REPAIR OSCILLATOR IS ON THE EXCHANGE PROGRAM AS PART NUMBER 10544-60536	28480	10544-60036
A25	05245-60033	1	BOARD ASSEMBLY, OSCILLATOR CONTROL	28480	05245-60033
A25C1	0160-0576	5	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A25C2	0160-0576		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A25C3	0180-0116	3	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A25C4	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A25C5	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A25C6	0180-1746	1	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A25C7	0160-3466	1	CAPACITOR-FXD 100PF +-10% 1KVDC CER	28480	0160-3466
A25C8	0160-0576		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A25C9	0160-0576		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A25C10	0160-0576		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A25C11	0160-0485	1	CAPACITOR-FXD 510PF +-5% 500VDC MICA	28480	0160-0485
A25CR1	1901-0366	1	DIODE-PWR RECT 600V 1A	02036	1N4005
A25CR2	1902-0091	1	DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=+.009%	02036	1N751A
A25J1	1251-2035	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	04500	252-15-30-300
A25L1	9100-1788	1	COIL: FXD; NON-MOLDED RF CHOKE; .75UH	05674	VK200-20/4B
A25L2	9140-0131	1	COIL-MLD 10MH 5% Q=80 .24DX.75LG	02178	24-1313-10J
A25L3	9100-2272	1	COIL-MLD 47UH 10% Q=45 .095DX.25LG	02178	69-1326-3K
A25Q1	1854-0071	1	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A25R1	0683-1115	1	RESISTOR 110 5% .25W FC TC=-400/+600	01607	CB1115
A25R2	0683-2425	1	RESISTOR 2.4K 5% .25W FC TC=-400/+700	01607	CB2425
A25R3	0756-0007	1	RESISTOR 150 5% .25W F TC=0+-100	03418	C5-1/4-TO-151-J
A25R4	0683-0825	1	RESISTOR 8.2 5% .25W FC TC=-400/+500	01607	CB8205
A25R5	0757-0200	1	RESISTOR 5.62K 1% .125W F TC=0+-100	03298	C4-1/8-TO-5621-F
A25R6	0757-0439	1	RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-TO-6811-F
A25R7	0758-0003	1	RESISTOR 1K 5% .25W F TC=0+-100	03418	C5-1/4-TO-1001-J
A25R8	0683-1025	2	RESISTOR 1K 5% .25W FC TC=-400/+600	01607	CB1025
A25R9	0683-3325	2	RESISTOR 3.3K 5% .25W FC TC=-400/+700	01607	CB3325
A25R10	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01607	CB1025
A25R11	0683-1525	1	RESISTOR 1.5K 5% .25W FC TC=-400/+700	01607	CB1525
A25R12	0683-5105	2	RESISTOR 51 5% .25W FC TC=-400/+500	01607	CB5105
A25R13	0683-3325		RESISTOR 3.3K 5% .25W FC TC=-400/+700	01607	CB3325
A25U1			SEE MISCELLANEOUS PARTS		
A25U2	1820-0439	1	IC V RGLTR	02236	723PC
A25U3	1820-1490	1	IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS90N
A25XU1	1251-4861	1	CONNECTOR	27264	22-15-2031
			MISCELLANEOUS PARTS		
	0360-0124	3	TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-0124
	0380-0059	2	SPACER-RVT-ON .25LG .152ID .250D BRS	28480	0380-0059
	0380-0111	2	STANDOFF-RVT-ON .25LG 4-32THD .250D BRS	28480	0380-0111
P2	1251-0198	1	CONNECTOR-PC EDGE 6-CONT/ROW 1-ROW	04500	250-06-30-210
R15	0683-5105		RESISTOR 51 5% .25W FC TC=-400/+500	01607	CB5105
R16	2100-3103	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	73138	89PR10K
U1	1826-0393	1	IC V RGLTR	0339F	LM317T
W8	05245-60034	1	CABLE ASSEMBLY, OSCILLATOR OUT/P2, R15	28480	05245-60034
W9	05245-60035	1	CABLE ASSEMBLY, FINE ADJUST	28480	05245-60035
W10	05245-60037	1	CABLE ASSEMBLY, OSCILLATOR POWER SUPPLY	28480	05245-60037
Z2	2100-3487	1	ADAPTER, POT/PANEL MOUNT(FOR R16)	73138	89A
	6960-0007	1	PLUG-HOLE DOME-HD FOR 1-D-HOLE BRS	04PIC	D-629C
	05245-00024	1	BRACKET, MOUNTING FOR A24 AND A25	28480	05245-00024

See introduction to this section for ordering information

Manufacturers Code List

MFR NO.	MANUFACTURER NAME	ADDRESS		ZIP CODE
0160G	ALLEN-BRADLEY CO	MILWAUKEE	WI	
0169H	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS	TX	
0203G	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX	AZ	
05674	BARD-PARKER DIV BECTON DICKINSON	DANBURY	CT	06810
02178	AIRCO SPEER ELEK DIV AIR RDCN CO	NOGALES	AZ	
0223G	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW	CA	
03298	CORNING GLASS WORKS (BRADFORD)	BRADFORD	PA	
0340F	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA	CA	
0341B	CORNING GLASS WORKS (WILMINGTON)	WILMINGTON	NC	
27264	MOLEX PRODUCTS CO	DOWNERS GROVE I		60515
28480	HP DIV 00 CORPORATE	PALO ALTO	CA	
0420J	SPRAGUE ELECTRIC CO	NORTH ADAMS	MA	
0421C	STIMPSON EDWIN B CO INC	BROOKLYN	NY	
0450G	TRW ELEK COMPONENTS CINCH DIV	ELK GROVE VLGE	IL	
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV	FULLERTON	CA	92634
28480	NO M/F DESCRIPTION FOR THIS MFG NUMBER